WARRINGTONFIRE
AUSTRALIA
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Regulatory information report

Service penetrations through metal deck composite floors protected with Hilti Firestop products

Sponsor: Hilti New Zealand Ltd

Report number: FAS210222 Revision: RIR1.1

Issued date: 24 June 2024 Expiry date: 30 June 2029

Quality management

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RIR1.1	Issue: 24 Jun 2024	Reason for issue	Report issued to Hilti for review and comment.	
			Prepared by	**Reviewed by**
	Expiry: 30 Jun 2029	**Name**	Renz Rabusa	Alim Rasel
		Signature		
RIR1.0 numbering is skipped to maintain consistency with the original assessment report.				

Warringtonfire* Australia Pty Ltd
ABN 81 050 241 524

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Executive summary

This report contains the minimum information required for regulatory compliance and refers to the referenced assessment report FAS210222 R1.1.

The report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of a series of service penetrations through composite metal deck floor protected with Hilti products in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The analysis in sections 5 to 13 of the referenced report found that the proposed systems, together with the described variations, are expected to achieve nominated FRLs as shown in Table 1 – in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 6 of this report. The results of this report are valid until 30 June 2029.

Table 1 Variations and assessment outcomes

No	Description of variations	Outcome table	Reference test	DTS provision	Evidence of suitability
1.	Single uPVC rigid conduit with diameter less than 50 mm with cables penetrating through a metal deck composite floor. The cables can be but are not limited to flat and circular TPS power cables, fire-rated cables, TDI cables, data cables, coax cables and fibre optics. A maximum conductor area of 30.78 mm^2 is permitted.	Table 7	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
2.	PP flexible conduit bundle with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.	Table 8	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
	uPVC flexible conduit with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.				
	Either uPVC or PP conduit with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.				
3.	PVC insulated, PVC or XLPE sheathed copper cables up to 4 × 400 mm^2 penetrating through a metal deck composite floor.	Table 9	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
4.	PVC or XLPE insulated communication cables penetrating through a metal deck composite floor. Cables include but are not limited to data, Cat6, coaxial and fibre optics cables with a maximum total conductor area of up to 18.2 mm^2.	Table 10	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)

No	Description of variations	Outcome table	Reference test	DTS provision	Evidence of suitability
5.	Cable bundles up to 60.8 × 41 mm in size with circular and flat cables up to 5.7 × 12.2 mm in size penetrating through a metal deck composite floor. Cables include but are not limited to TPS, sub-mains, SDI and fire-rated cables with a maximum of 3 cores. A maximum total conductor size of 300 mm^2 is permitted for the bundle.	Table 11	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
6.	D1 standard power cable sets in accordance with Appendix D1 of AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray and consisting of: • One circular single core PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 630 mm^2. • Three three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 6 mm^2. • Eight three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 16 mm^2. • One three core plus earth PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 185 mm^2.	Table 12	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
	D1 standard power cable sets in accordance with AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray consisting of any combination of circular single core or multi-core PVC or XLPE insulated, PVC sheathed copper cables up to a maximum conductor area of 3,600 mm^2.			S1C2(c)	A5G3(1)(d)

No	Description of variations	Outcome table	Reference test	DTS provision	Evidence of suitability
7.	Power cable sets penetrating through a metal deck composite floor with or without a cable tray up to a maximum conductor area of 3,600 mm^2 consisting of: • Single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2. • Single core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2. • Non-standard single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2. • Non-standard core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2.	Table 13	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
8.	PE-Xa pipe up to 25 mm in diameter penetrating through a metal deck composite floor.	Table 14	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
	PE-Xa/AL/PE-Xa pipe up to 32 mm in diameter penetrating through a metal deck composite floor.			S1C2(c)	A5G3(1)(d)
9.	Up to 2 PE-Xa pipes up to 20 mm in diameter and uPVC rigid conduit up 25 mm in diameter filled with electrical cables, data coax and fibre optics with a maximum conductor area of 25 mm^2 penetrating through a metal deck composite floor.	Table 15	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)

Contents

1. Introduction

This report contains the minimum information sufficient for regulatory compliance and refers to the assessment report FAS210222 R1.1.

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of a series of service penetrations through a metal deck composite floor system protected with Hilti products in accordance with AS 1530.4:2014[1] and AS 4072.1:2005 (R2016)[2].

This report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code (NCC) to support the use of the material, product, form of construction or design as given within the scope of is report. It also references test evidence for meeting deemed-to-satisfy (DTS) provisions of the NCC that apply to the assessed systems.

This report was prepared at the request of Hilti New Zealand Ltd. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Hilti New Zealand Ltd	Level 1 Tower B 600 Great South Road Ellerslie 1051 New Zealand

2. Framework for the assessment

2.1 Assessment approach

An assessment is a professional opinion about the expected performance of a component or element of structure subjected to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021[3].

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

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

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

[1] Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[2] Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements Service penetrations and control joints (Reconfirmed 2016), AS 4072.1:2005, Standards Australia, NSW.
[3] Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

This report uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design and performance based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance of the elements in accordance with AS 1530.4:2014.

The expected performance of the systems with the variations documented in this report has been determined by assessing the performance of tested systems against the expected impact of each variation. The systems tested in accordance with AS 1530.4:2014, and detailed within Appendix B of the referenced report, are generally considered to be more onerous than the listed system variations which are generally expected to yield a performance equivalent to the tested systems.

2.2 Compliance with the National Construction Code

This report has been prepared to meet the evidence of suitability requirements of the NCC 2022[4] under A5G3 (1) (d). It references test evidence for meeting deemed-to-satisfy (DTS) provisions of the NCC under A5G5 for fire resistance level that apply to the assessed systems based on Specifications 1 and 2 for fire resistance for building elements.

The proposed details and systems (building elements) in the referenced assessment report are confirmed to be assessed, without the aid of an active fire suppression system, based on prototype tests that are equivalent to or more severe than a standard fire test as specified in section 4.4, in accordance with NCC 2022 S1C2(b). It is also confirmed that the differences between the proposed systems and details compared to the tested prototypes are considered minor in accordance with NCC 2022 S1C2(c).

This report may also be used to demonstrate compliance with the requirements for evidence of suitability under the relevant sections of previous versions of the NCC.

2.3 Declaration

The ‘Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence’ prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal FAS210222 fee 2.0 on 11 March 2024, Hilti New Zealand Ltd confirmed that:

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

3. Requirements and limitations of this report

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3. The referenced assessment report details the methods of construction, test conditions and assessed results expected in accordance with AS 1530.4:2014.
- This report applies to floor systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014 where horizontal elements must be exposed to heat from the underside only.

[4] National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia

- this report has been prepared based on the fire resistance performance and condition of the systems at the time they were tested. Any deterioration of fire resistance performance due to external factors including but not limited to passage of time and exposure to elements – is not considered in the referenced assessment report.
- The performance of the metal deck composite floor systems remains outside the scope of this report. This report was prepared under the assumption that the proposed metal deck composite floor system will either be designed in accordance with AS/NZS 2327:2017[5] for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an Accredited Testing Laboratory (ATL). In addition, the minimum thickness stipulated in Table 7.7.2.2 of AS/NZS 2327:2017 is also assumed to be met by the proposed metal deck composite floor systems. These are defined in the relevant tables in the report.
- This report is only valid for the assessed systems and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this report. If there are changes to the system, a reassessment will need to be done by an ATL
- The figures illustrated in sections 4.5of this report represent the tested system in general. These were included for the purpose of illustrating the local fire stopping systems around the services in the forms of sealant, fireplug, collars, fireblock, foam only. The services, separating element and the applicable location of installation remains as outlined in the respective outcome tables. Therefore, the stipulation in these outcome tables take precedence over the illustration.
- This report has been prepared using information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may have been incorporated into the referenced assessment report as a result.
- This report is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of the referenced assessment report.

4. Description of the specimen and variations

4.1 Description of assessed systems

The assessed systems consist of service penetrations through a metal deck composite floor system protected with Hilti Firestop products. It is understood that the proposed composite metal deck floor system will either be designed in accordance with AS/NZS 2327:2017 for required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL – refer to section 3. In addition, the minimum thickness stipulated in Table 7.7.2.2 of AS/NZS 2327:2017 is also assumed to be met by the proposed metal deck composite floor systems.

The services installed through the composite metal deck composite floor system include:

- Single rigid conduits
- Electrical conduit bundles
- Electrical cable bundles
- PE-X pipes
- Cable tray systems.

[5] Standards Australia and Standards New Zealand, 2017,Composite structures – Composite steel-concrete construction in buildings, AS/NZS 2327:2017, Standards Australia, NSW.

4.2 Referenced test data

The assessment of the variation to the tested systems and the determination of the expected performance are based on the results of the fire test documented in the reports summarised in Table 3. Further details of the tested systems are included in Appendix B of the referenced report.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
FRT180468 R1.0	Hilti New Zealand Ltd	18 May 2021	Warringtonfire Australia

4.3 Variations to the tested systems

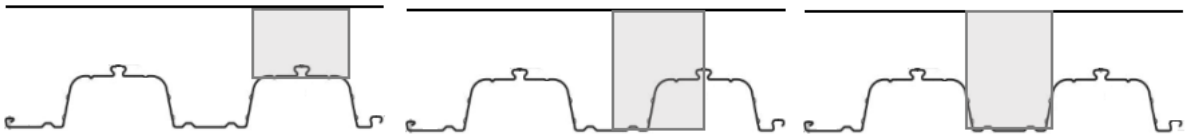
The variations to the tested systems – together with the referenced standard fire tests – are described in Table 4.

Table 4 Variations to the tested systems

No	Description of variations	Reference test	DTS provision	Evidence of suitability
1.	Single uPVC rigid conduit with diameter less than 50 mm with cables penetrating through a metal deck composite floor. The cables can be but are not limited to flat and circular TPS power cables, fire-rated cables, TDI cables, data cables, coax cables and fibre optics. A maximum conductor area of 30.78 mm^2 is permitted.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
2.	PP flexible conduit bundle with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
	uPVC flexible conduit with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.			
	Either uPVC or PP conduit with cables penetrating through a metal deck composite floor. A maximum conductor size of up to 31.06 mm^2 is permitted.			
3.	PVC insulated, PVC or XLPE sheathed copper cables up to 4 × 400 mm^2 penetrating through a metal deck composite floor.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
4.	PVC or XLPE insulated communication cables penetrating through a metal deck composite floor. Cables include but are not limited to data, Cat6, coaxial and fibre optics cables with a maximum total conductor area of up to 18.2 mm^2.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)

No	Description of variations	Reference test	DTS provision	Evidence of suitability
5.	Cable bundles up to 60.8 × 41 mm in size with circular and flat cables up to 5.7 × 12.2 mm in size penetrating through a metal deck composite floor. Cables include but are not limited to TPS, sub-mains, SDI and fire-rated cables with a maximum of 3 cores. A maximum total conductor size of 300 mm^2 is permitted for the bundle.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
6.	D1 standard power cable sets in accordance with Appendix D1 of AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray and consisting of: • One circular single core PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 630 mm^2. • Three three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 6 mm^2. • Eight three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 16 mm^2. • One three core plus earth PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 185 mm^2.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
	D1 standard power cable sets in accordance with AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray consisting of any combination of circular single core or multi-core PVC or XLPE insulated, PVC sheathed copper cables up to a maximum conductor area of 3,600 mm^2.		S1C2(c)	A5G3(1)(d)
7.	Power cable sets penetrating through a metal deck composite floor with or without a cable tray up to a maximum conductor area of 3,600 mm^2 consisting of: • Single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2. • Single core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2. • Non-standard single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2. • Non-standard core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)
8.	PE-Xa pipe up to 25 mm in diameter penetrating through a metal deck composite floor.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)

No	Description of variations	Reference test	DTS provision	Evidence of suitability
	PE-Xa/AL/PE-Xa pipe up to 32 mm in diameter penetrating through a metal deck composite floor.		S1C2(c)	A5G3(1)(d)
9.	Up to 2 PE-Xa pipes up to 20 mm in diameter and uPVC rigid conduit up 25 mm in diameter filled with electrical cables, data coax and fibre optics with a maximum conductor area of 25 mm^2 penetrating through a metal deck composite floor.	FRT180468 R1.0	S1C2(c)	A5G3(1)(d)



Upper flute Mid flute Lower flute

Figure 1 Service penetration installation locations

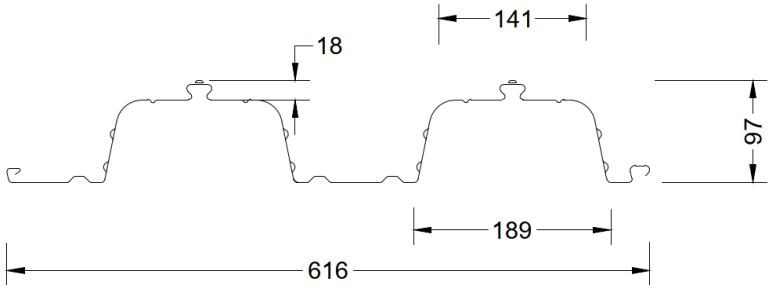
4.4 Test standard

AS 1530.4:2014 sets out procedures for determining the fire resistance of various elements of construction when subjected to standard fire exposure conditions.

4.5 Schedule of components

Table 5 outlines the schedule of components for the tested systems as in FRT180468 R1.0. We have based this schedule of component from the reference test report shown in Table 3.

Table 5 Schedule of components of tested systems

Item	Description		
Separating element (SE)			
1.	Item name	Steel deck	
	Product name	ComFlor 80	
	Material	Galvanised steel	
	Thickness	0.75 mm	
	Profile		
	Thickness	Minimum Maximum	61 mm 140 mm
2.	Item name	Concrete	
	Type	Normal weight concrete	
	Compressive strength	40 MPa	
	Aggregate	14 mm	
	Density	2373 kg/m^3	
3.	Item name	Steel reinforcement	
	Product name	SL 81 mesh	
	Size	Main wire	7.6 mm
		Grid size	100 mm × 100 mm

Item	Description	
SE	Overall size	2000 mm × 2000 mm × 140 mm
	Restraint conditions	Not restrained at all
	Installation	The steel deck (item 1) formed the floor system and interlocked to each other with underlap and overlap legs. The deck consisted of 3 full and one partial flooring profiles secured to each other. The steel reinforcement (item 3) was on top of the steel deck crown. The concrete (item 2) was cast on top of the floor profile up to 140 mm thick. The concrete was cured for at least 150 days.
Fire-stopping protections		
Sealant		
4.	Item name	Sealant CP 606
5.	Item name	Sealant CP 611A
	Product name	Hilti Firestop intumescent sealant CP611A
	Density	1403 kg/m^3
Putty		
6.	Item name	Putty
	Product name	Hilti Firestop putty bandage CFS-P BA
	Size	100 mm wide × 3 mm thick
Block		
7.	Item name	Block
	Product name	Hilti Firestop Block CFS-BL
	Size	200 mm × 130 mm × 50 mm
8.	Item name	Plug 107
	Product name	Hilti Firestop Plug CFS-PL 107
	Size	Ø 115 mm × 75 mm high
9.	Item name	Plug 132
	Product name	Hilti Firestop Plug CFS-PL 132
	Size	Ø 140 mm × 75 mm high
Foam		
10.	Item name	Foam
	Product name	Hilti Firestop Foam CFS-F FX / CP 660
Backing rod		
11.	Item name	Backing rod
	Product general name	Close cell backing rod
	Size	Ø 7 mm and Ø 20 mm

Item	Description	
	Description	• The Ø 7 mm backing rod was used at the location where a minimum annular gap was required (5 mm). • The Ø 20 mm backing rod was used at the location where the gap was too large for the Ø 7 mm backing rod.
Services		
12.	Item name	400 mm^2 Cu cable
13.	Item name	400 mm^2 AL cable
14.	Item name	2.5 mm^2 TPS 3C+E
15.	Item name	2.5 mm^2 TPS 2C+E
16.	Item name	Cat 6 cable
17.	Item name	RG 6 cable
18.	Item name	Fibre optics cable
19.	Item name	D1 power cable group
20.	Item name	300 mm cable tray
21.	Item name	D2 communication cable group
22.	Item name	150 mm cable tray
23.	Item name	Up to 25 mm rigid uPVC conduit
24.	Item name	Up to 50 mm rigid uPVC conduit
25.	Item name	Up to 20 mm PP flexible conduit
26.	Item name	Up to 25 mm PP flexible conduit
27.	Item name	Up to 20 mm uPVC flexible conduit
28.	Item name	Up to 25 mm uPVC flexible conduit
29.	Item name	Up to 20 mm PE-Xa pipe
30.	Item name	Up to 25 mm PE-Xa pipe
31.	Item name	Up to 32 mm PE-Xa/Al/PE-Xa pipe
32.	Item name	600 mm cable tray
Penetration system A		
A	Service	25 mm PE-Xa pipe (item 30)
	Service detail	• The service protruded 530 mm from the exposed side and 2000 mm from the unexposed side of the separating element. • The service was capped on both the unexposed and exposed sides with sealant CP 606 (item 4). • The service was offset from the centre of the aperture with a 5 mm annular gap on one side.
	Location	The specimen was installed at the thinnest part of the separating element.
	Service support	The pipe was supported at 470 mm and 1470 mm from the unexposed side of the separating element with pipe clamps.
	Aperture size	Ø 45 mm
	Local fire-stopping protection	

Item	Description	
	Protection	• Backing rods (item 11) were inserted around the service at a depth of 50 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 50 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by backing rods (item 11).
Penetration system B		
B	Service	• 25 mm PP flexible conduit (item 26) with 7 × Cat 6 cables (item 16). • 25 mm uPVC flexible conduit (item 28) with 3 × 2.5 mm^2 TPS 2C+E (item 14). • 20 mm uPVC flexible conduit (item 27) with 3 × Cat 6 cables (item 16). • 20 mm uPVC flexible conduit (item 27) with 3 × RG 6 cables (item 17). • 25 mm uPVC flexible conduit (item 28) with: – 4 × Cat 6 cables (item 16) – 2 × Fibre optic cables (item 18). • 20 mm PP flexible conduit (item 25) with 3 × RG 6 cables (item 17).
	Service detail	• The conduits were bundled together and protruded 530 mm on the exposed side and 2000 mm on the unexposed side of the separating element. • The copper cables inside the conduits were cut to 1140 mm long, with 500 mm protruding on the exposed side and 500 mm on the unexposed side. • The fibre optic cables (item 18) inside the conduits were cut to 2640 mm long, with 530 mm protruding on the exposed side and 2000 mm on the unexposed side. • The ends of the conduits on both the exposed and unexposed sides were sealed with Sealant CP 606 (item 4).
	Location	The specimen was installed at the thinnest part of the separating element.
	Service support	The specimen was supported by pipe clamps at 220 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 102 mm
	Local fire-stopping protection	
	Protection	• The aperture was protected by a plug 107 (item 8). • The plug 107 (item 8) was cored with a Ø 76 mm hole at the centre, and the core hole was enlarged to fit the service. • The service was inserted into the core hole. Sealant CP 611A / CFS-IS (item 5) was inserted into the gap between the service and the plug 107 (item 8) to a depth of 20 mm and finished flush on the unexposed side of the plug 107.
Penetration system C		
C	Service	32 mm PE-Xa/AL/PE-Xa pipe (item 31)
	Service detail	• The service protruded 530 mm from the exposed side and 2000 mm from the unexposed side of the separating element. • The service was capped on both the unexposed and exposed sides with sealant CP 606 (item 4). • The service was offset from the centre of the aperture with a 5 mm annular gap on one side.
	Location	The specimen was installed at the thinnest part of the separating element.

Item	Description	
	Service support	The specimen was supported by pipe clamps at 470 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 52 mm
	Local fire-stopping protection	
	Protection	• Backing rods (item 11) were inserted around the service at a depth of 50 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 50 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by backing rods (item 11).
Penetration system D		
D	Service	• 50 mm rigid uPVC conduit (item 24) with: – 4 × fibre optic cables (item 18) – 4 × 2.5 mm^2 TPS 2C+E (item 15) – 3 × Cat 6 cables (item 16).
	Service detail	• The conduit (item 24) was bundled together and protruded 530 mm on the exposed side and 2000 mm on the unexposed side of separating element. • The copper cables inside the conduit were cut to 1140 mm long, with 500 mm protruding on the exposed side and 500 mm on the unexposed side. • The fibre optic cables (item 18) inside the conduit were cut to 2640 mm long, with 500 mm protruding on the exposed side and 2000 mm on the unexposed side. • The service was offset from the centre of the aperture with a 5 mm annular gap on one side. • The ends of the conduit on both the exposed and unexposed side were sealed with sealant CP 606 (item 4).
	Location	The specimen was installed at the thinnest part of the separating element.
	Service support	The specimen was supported by pipe clamps at 470 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 72 mm
	Local fire-stopping protection	
	Protection	• A backing rod (item 11) was inserted around the service at a depth of 55 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 55 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by a backing rod (item 11).
Penetration system E		
E	Service	• 50 mm rigid uPVC conduit (item 24) with: – 4 × fibre optic cables (item 18) – 4 × 2.5 mm^2 TPS 2C+E (item 15) – 3 × Cat 6 cables (item 16).

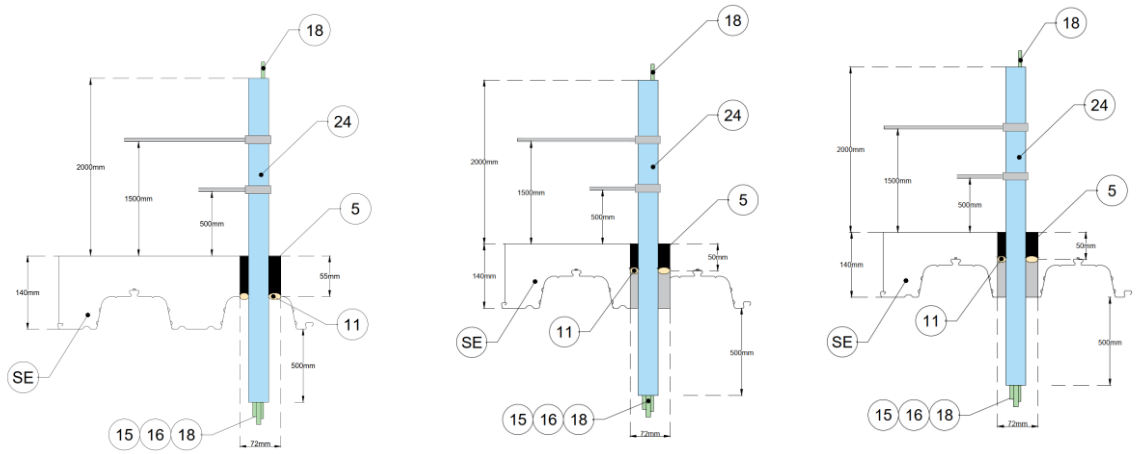
Item	Description	
	Service detail	• The conduit (item 24) protruded 530 mm on the exposed side and 2000 mm on the unexposed side. • The copper cables inside the conduits were cut to 1140 mm long, with 500 mm protruding on the exposed side and 500 mm on the unexposed side. • The fibre optic cables (item 18) inside the conduits were cut to 2640 mm long, with 500 mm protruding on the exposed side and 2000 mm on the unexposed side. • The service was offset from the centre of the aperture with a 5 mm annular gap on one side. • The ends of the conduit on both the exposed and unexposed side were sealed with sealant CP 606 (item 4).
	Location	The specimen was installed at the thickest part of the separating element.
	Service support	The specimen was supported by pipe clamps at 470 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 72 mm
	Local fire-stopping protection	
	Protection	• Backing rods (item 11) were inserted around the service at a depth of 50 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 50 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by backing rods (item 11).
Penetration system F		
F	Service	4 × 400 mm^2 Cu cables (item 12)
	Service detail	• 4 × 400 mm^2 Cu cables (item 12) were bundled together and protruded 500 mm on the exposed side and 500 mm on the unexposed side of the separating element. • The ends of the cables on the exposed side were sealed with sealant CP 606 (item 4). • The bundle size of the service was approximately Ø 79 mm
	Location	The specimen was installed at the thinnest part of the separating element.
	Service support	The specimen was supported by pipe clamps at 220 mm and 470 mm from the unexposed side.
	Aperture size	Ø 132 mm
	Local fire-stopping protection	
	Protection	• The aperture was protected by a plug 132 (item 9). • The plug 132 (item 9) was cored with a Ø 76 mm hole at the centre and the core hole was enlarged to fit the service. • The service bundle was inserted into the core hole. Sealant CP 611A / CFS-IS (item 5) was inserted into the gap between the service and the plug 132 (item 9) to a depth of 20 mm and finished flush on the unexposed side of the plug 132. • A layer of putty (item 6) was wrapped around the service above the plug on the unexposed side with a 50 mm overlap. • The putty was installed with the mesh of the putty was always facing outward.
Penetration system G		

Item	Description	
G	Service	40 × 2.5 mm^2 TPS 2C+E (item 15)
	Service detail	• 40 × 2.5 mm^2 TPS 2C+E (item 15) were bundled together and protruded 500 mm on the exposed side and 500 mm on the unexposed side of the separating element. • The end of the cables on the exposed side was sealed with sealant CP 606 (item 4). • The bundle size of the cables was approximately 60.8 mm × 41 mm.
	Location	The specimen was installed at the slope of the crown of the metal decking. Half of the aperture was on the thickest part of the separating element and half was on the thinnest part.
	Service support	The specimen was supported by pipe clamps at 220 mm and 470 mm from the unexposed side.
	Aperture size	Ø 102 mm
	Local fire-stopping protection	
	Protection	• The aperture was protected by a plug 107 (item 8). • The plug 107 (item 8) was cored with a Ø 64 mm hole at the centre and the core hole was enlarged to fit the service. • The service was inserted into the core hole. Sealant CP 611A / CFS-IS (item 5) was inserted into the gap between the service and the plug 107 (item 8) to a depth of 20 mm and finished flush on the unexposed side of the plug 107. • A layer of putty (item 6) was wrapped around the service above the plug on the unexposed side with a 50 mm overlap. • The putty was installed with the mesh of the putty was always facing outward.
Penetration system H		
H	Service	• 2 × 20 mm Pe-Xa pipes (item 29) • 25 mm rigid uPVC conduit (item 23) with: – 2 × 2.5 mm^2 TPS 2C + E (item 15) – 2.5 mm^2 TPS 3C+E (item 14).
	Service detail	• The 20 mm Pe-Xa pipes (item 29) were bundled together and protruded 530 mm on the exposed side and 2000 mm on the unexposed side of the separating element. • The 25 mm rigid uPVC conduit (item 23) protruded 530 mm on the exposed side and 60 mm on the unexposed side. • The TPS cables inside the conduit protruded 500 mm on the exposed side and 500 mm on the unexposed side (with 440 mm outside the conduit). • The ends of the pipes on both the exposed and unexposed side were sealed with sealant CP 606 (item 4). • The end of the conduit on the exposed side was sealed with sealant CP 606 (item 4). It was sealed with sealant CP 611A / CFS-IS (item 5) on the unexposed side. • The ends of the cables on the unexposed side were sealed with sealant CP 606 (item 4).
	Location	The specimen was installed at the thinnest part of the separating element.

Item	Description	
	Service support	• The 25 mm rigid uPVC conduit (item 23) was supported by a pipe clamp at 50 mm from the unexposed side. • The cables outside the conduit were supported by a pipe clamp at 470 mm. • The 20mm Pe-Xa pipes (item 29) were supported by pipe clamps at 470 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 72 mm
	Local fire-stopping protection	
	Protection	• Backing rods (item 11) were inserted around the service at a depth of 50 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 50 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by a backing rod (item 11).
Penetration system I		
I	Service	• 50 mm rigid uPVC conduit (item 24) with: – 4 × fibre optic cables (item 18) – 4 × 2.5 mm^2 TPS 2C+E (item 15) – 3 × Cat 6 cables (item 16).
	Service detail	• The conduit (item 24) was bundled together and protruded 530 mm on the exposed side and 2000 mm on the unexposed side. • The copper cables inside the conduits were cut to 1140 mm long, with 500 mm protruding on the exposed side and 500 mm on the unexposed side. • The fibre optic cables (item 18) inside the conduits were cut to 2640 mm long, with 500 mm protruding on the exposed side and 2000 mm on the unexposed side. • The service was offset from the centre of the aperture with a 5 mm annular gap on one side. • The ends of the conduit on both the exposed and unexposed side were sealed with sealant CP 606 (item 4).
	Location	The specimen was installed at the slope of the crown of the metal decking. Half of the aperture was on the thickest part of the separating element and half was on the thinnest part.
	Service support	The specimen was supported by pipe clamps at 470 mm and 1470 mm from the unexposed side.
	Aperture size	Ø 72 mm
	Local fire-stopping protection	
	Protection	• The backing rod (item 11) was inserted around the service at a depth of 50 mm on the unexposed side of the separating element. • Sealant CP611A / CFS-IS (item 5) was applied into the gap between the service and the separating element to a depth of 50 mm and finished flush on the unexposed side. • The sealant CP611A / CFS-IS (item 5) was supported by a backing rod (item 11).
Penetration system J		
J	Service	70 × Cat 6 cables (item 16)

Item	Description		
	Service detail		• 70 × Cat 6 cables (item 16) were bundled together and protruded 530 mm on the exposed side and 500 mm on the unexposed side of separating element. • The ends of the cables on the exposed side were sealed with sealant CP 606 (item 4). • The bundle size of the cables was approximately Ø 58 mm
	Location		The specimen was installed at the thickest part of the separating element.
	Service support		The specimen was supported by pipe clamps at 220 mm and 470 mm from the unexposed side.
	Aperture size		Ø 102 mm
	Local fire-stopping protection		
	Protection		• The aperture was protected by a plug 107 (item 8). • The plug 107 (item 8) was cored with a Ø 64 mm hole at the centre and the core hole was enlarged to fit the service. • The service was inserted into the core hole. Sealant CP 611A / CFS-IS (item 5) was inserted into the gap between the service and the plug 107 (item 8) to a depth of 20 mm and finished flush on the surface of the plug 107. • A layer of putty (item 6) was wrapped around the service above the plug on the unexposed side with a 50 mm overlap. • The putty was installed with the mesh of the putty was always facing outward.
Penetration system K			
K	Service	Cable tray system 1	• 9 × 400 mm^2 copper main power cables (item 12) • 9 × 400 mm^2 aluminium main power cables (item 13) • 600 mm cable tray (item 32)
		Cable tray system 2	• D2 communication cable group (item 21) • 150 mm cable tray (item 22)
		Cable tray system 3	• D1 power cable group (item 19) • 300 mm cable tray (item 20)
	Service detail	Cable tray system 1	• The copper main power cables (item 12) and aluminium main power cables (item 13) were bundled in a trefoil configuration and tied to the cable tray with stainless steel cable ties. • The size of each cable bundle was approximately 198 mm wide × 62 mm high. • The copper main power cable (item 12) bundles were installed on the east side of the cable tray (item 32). The aluminium main power cable (item 13) bundles were installed on the west side of the cable tray. • The service protruded 500 mm from the exposed and the unexposed side of the separating element. • The service was located 40 mm away from the aperture on the east edge and 100 mm away from the cable tray systems 1 and 2. • The west edge of the cable tray was in contact with the separating element.

Item	Description		
		Cable tray system 2	• The cables (item 21) were secured to the 150 mm cable tray (item 22) with stainless steel cable ties. • The cable group system protruded 500 mm from the exposed and the unexposed side of the separating element. • The service was located 5 mm away from the aperture and 100 mm away from cable tray system 1. The bottom of the cable tray was in contact with the separating element. • The cables were installed according to AS 1530.4 appendix D for group B cable configuration. • The size of the cable bundle was approximately 145 mm wide × 110 mm high.
		Cable tray system 3	• The cables (item 19) were secured to the 300 mm cable tray (item 20) with stainless steel cable ties. • The cable group system protruded 500 mm from the exposed and the unexposed side of the separating element. • The service was located 5 mm away from the aperture and 100 mm away from cable tray system 1. The bottom of the cable tray was in contact with the separating element. • The cables were installed according to AS 1530.4 appendix D for group A cable configuration. • The size of the 16 mm² cable bundle was approximately 70 mm × 40 mm. • The size of the 6 mm² cable bundle was approximately 26 mm × 25 mm.
	Service support	The service was supported at 220 mm and 470 mm on the unexposed side of the separating element by fixing the channel with L angles.	
	Aperture size	650 mm × 400 mm	
	Main fire-stopping protection		
	Protection	• The aperture in the separating element was protected by blocks (item 7) and with foam (item 10). • The blocks (item 7) filled up the gap around the aperture and all the cable tray systems. • The foam (item 10) was used at one of the long edges of the aperture between the blocks (item 7) and the separating element. It was also used in the 40 mm gap between the cable tray (item 32) of cable tray system 1 and the separating element – to the full depth (130 mm) of the blocks.	
	Local fire-stopping protection		
	Protection	• The blocks (item 7) were cut into a smaller size to fit the cable tray systems. • The interface between the cable tray systems and the blocks (item 7) was filled with sealant CP 611A / CFS-IS (item 5) to a depth of 20 mm from both the exposed and the unexposed side and finished flush on the surface of the blocks. • The interface between the separating element and the cable trays was filled with sealant CP 611A / CFS-IS (item 5) for the full depth. • Two layers of putty (item 6) were applied on all cable tray systems on the unexposed side above the sealant CP611A / CFS-IS (item 5). The first layer of putty was wrapped on top of the cable bundles only. The second layer of putty was wrapped around the cable bundles and the cable tray, with a 50 mm overlap. • The putty was installed with the mesh of the putty was always facing outward.	



Upper flute installation **Mid flute installation** **Lower flute installation**

Figure 2 Single uPVC rigid conduit with cables installation through metal deck composite floor

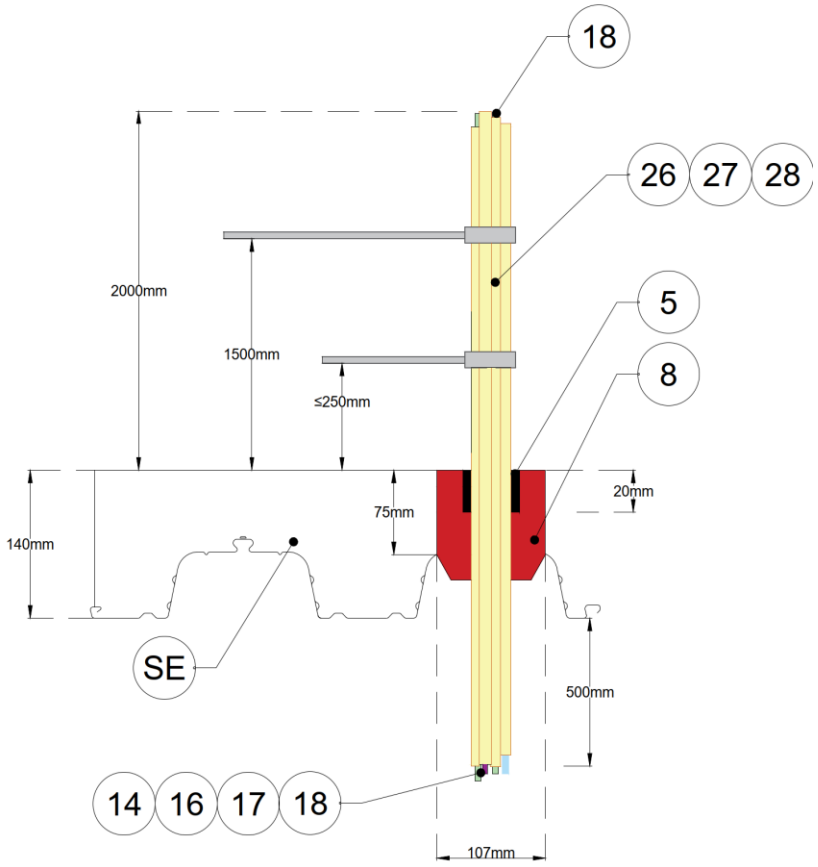


Figure 3 Electrical conduit bundle installation through metal deck composite floor

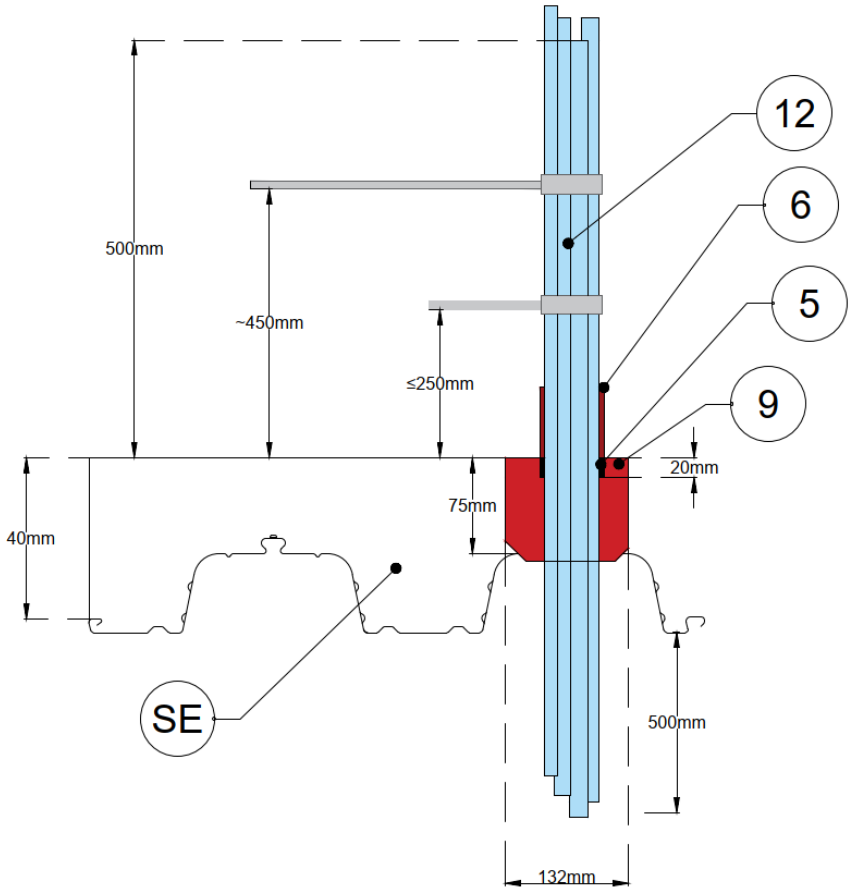


Figure 4 Copper cables installation through metal deck composite floor

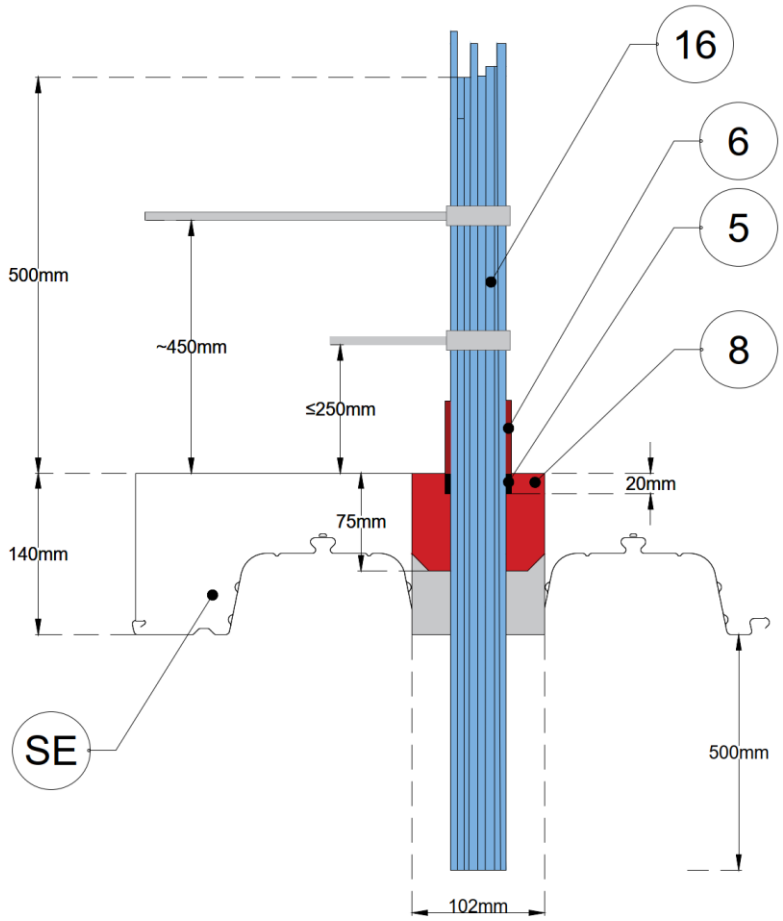


Figure 5 Communication cables installation through metal deck composite floor

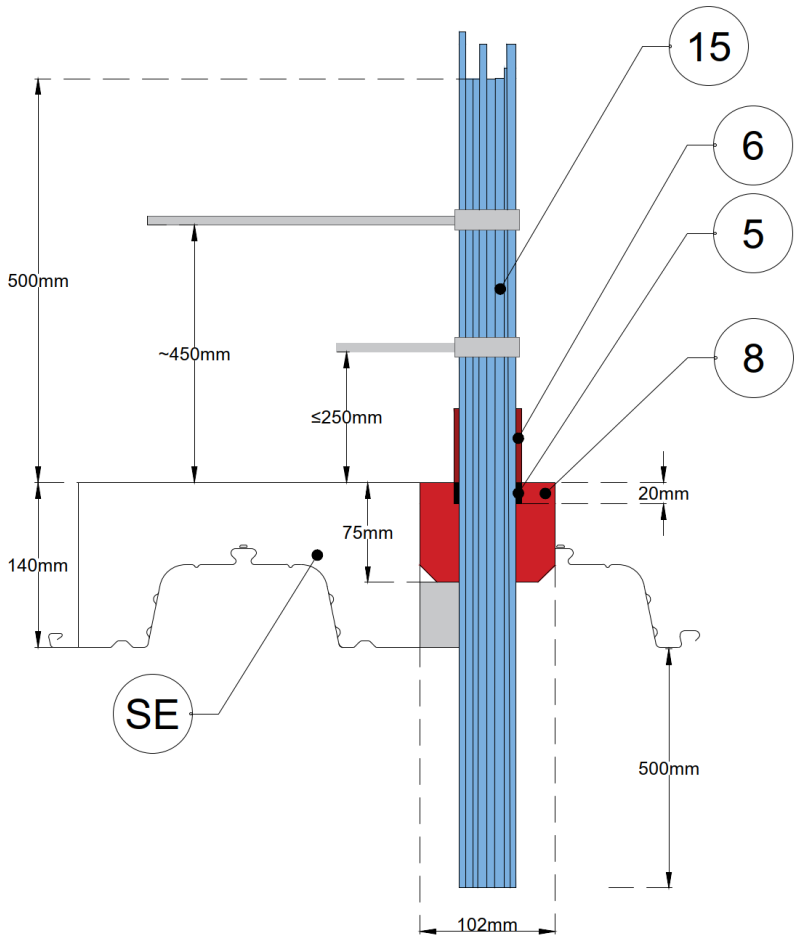


Figure 6 Circular and flat cable bundles installation through metal deck composite floor

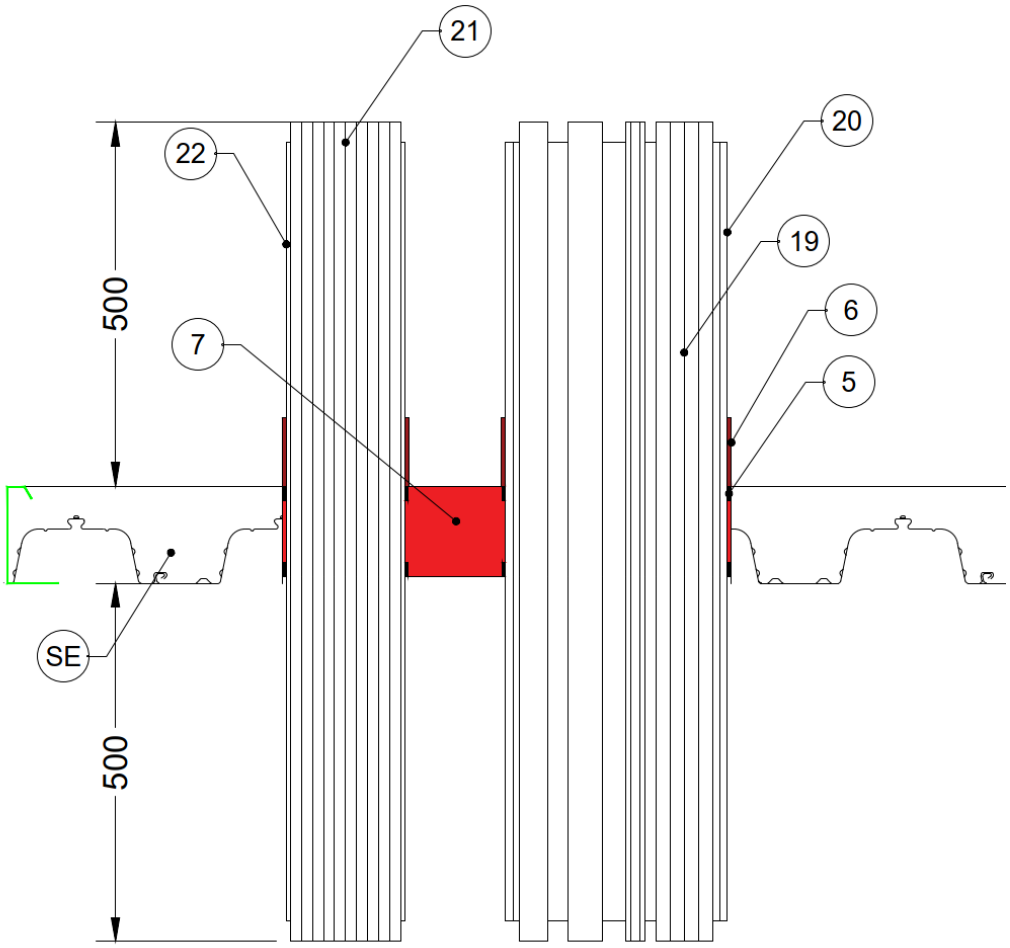


Figure 7 Standard D1 power cable set installation through metal deck composite floor

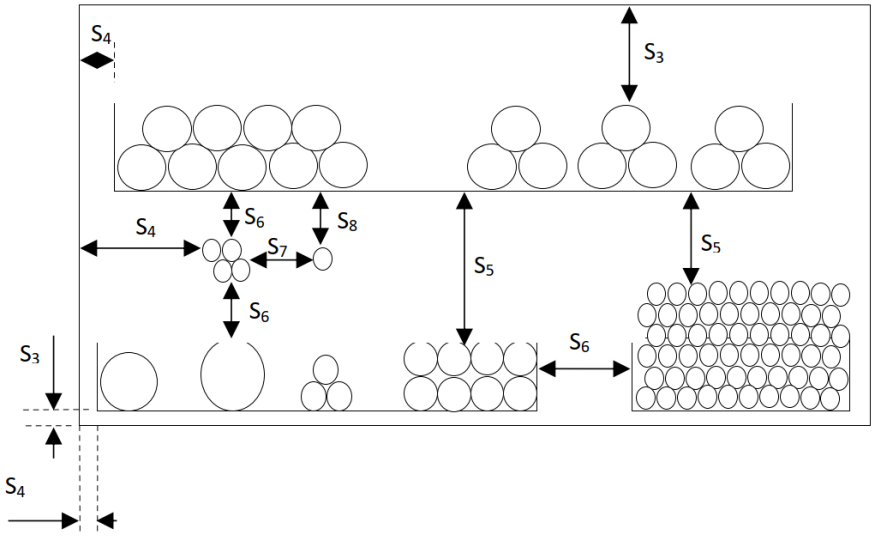


Figure 8 Spacing requirements for services through Hilti Firestop Blocks CFS-BL

Table 6 Spacing requirements for services through Hilti Firestop Block CFS-BL

Nominated distance, mm	Details
S_3 = 0 or Minimum 40	Minimum distance between cable tray/ Cable bundle and horizontal edge of aperture
S_4 = 0 or Minimum 5	Minimum distance between cable tray/ Cable bundle and vertical edge of aperture
S_5 = Minimum 100	Minimum vertical distance between cable tray/ cable bundle and cable tray/ cable bundle
S_6 = Minimum 100	Minimum horizontal distance between cable tray/ cable bundle and cable tray/ cable bundle
If S_3 or S_4 are 0, the interface between the separating element and the cable tray or bundle must be sealed with CP611A / CFS-IS to the full depth.	

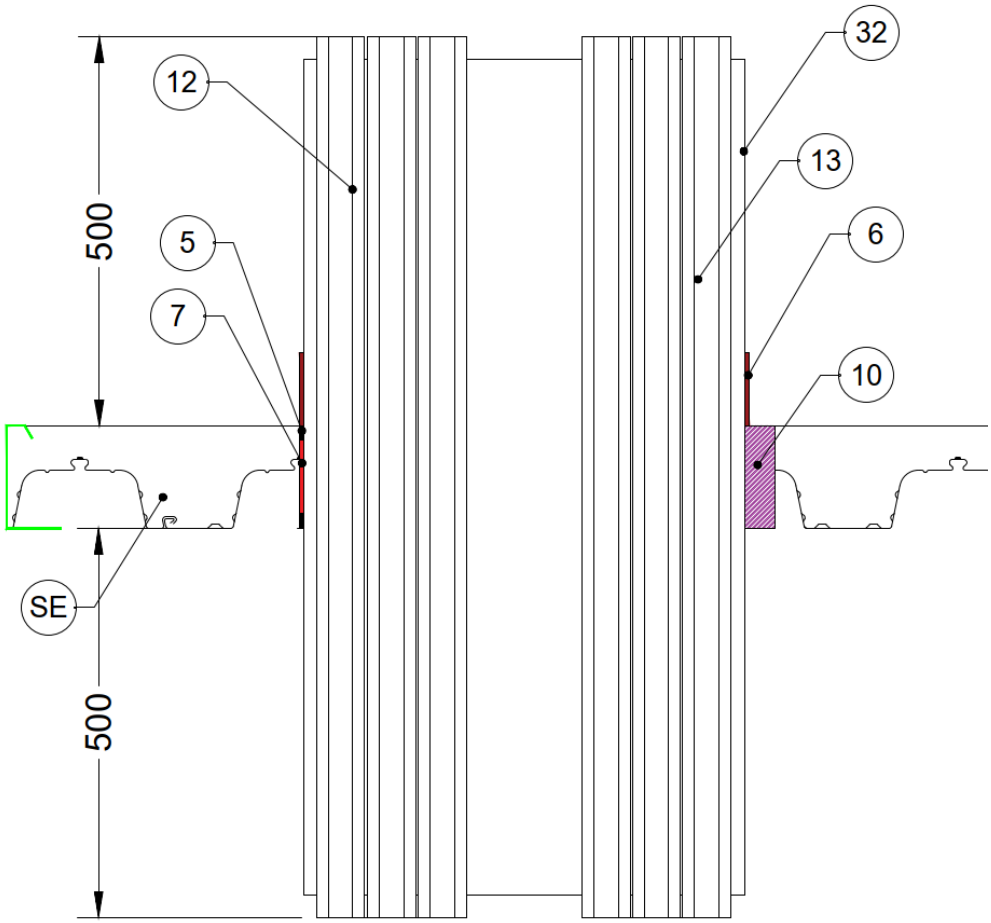


Figure 9 Non-standard power cable set installation through metal deck composite floor

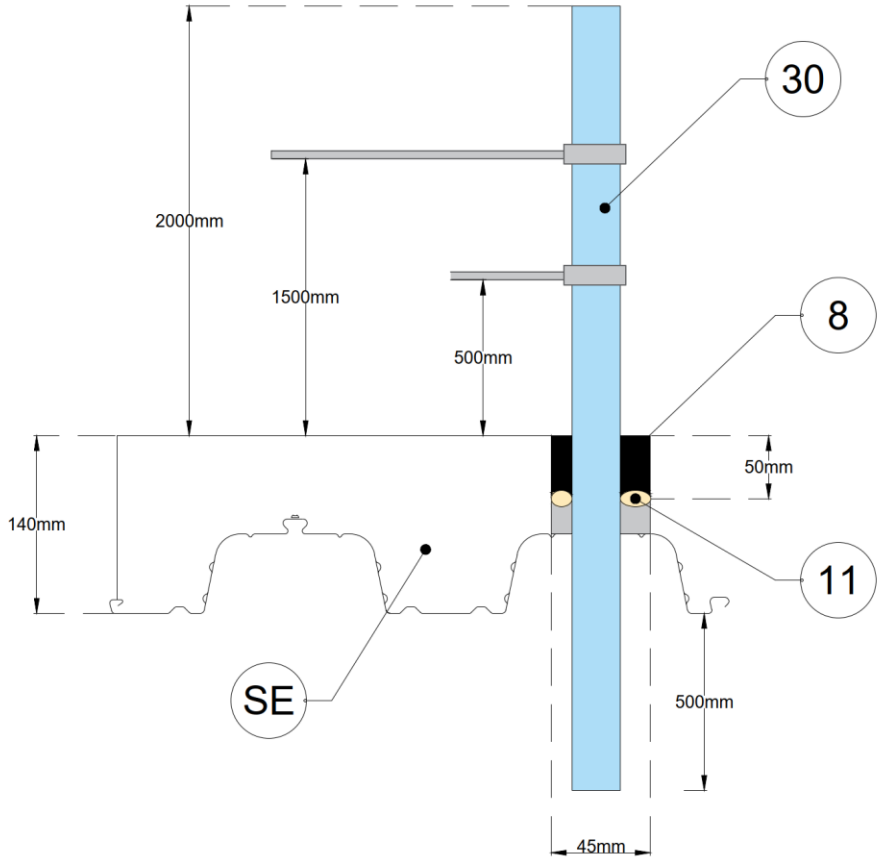


Figure 10 PE-Xa pipe installation through metal deck composite floor

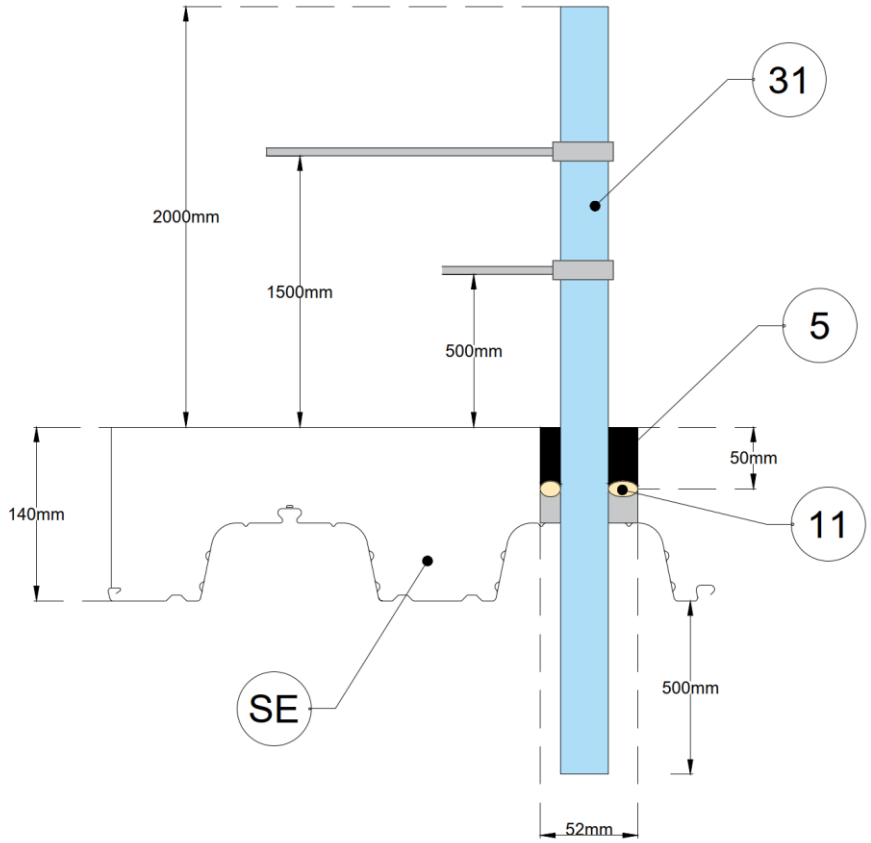


Figure 11 PE-Xa/AL/PE-Xa pipe installation through metal deck composite floor

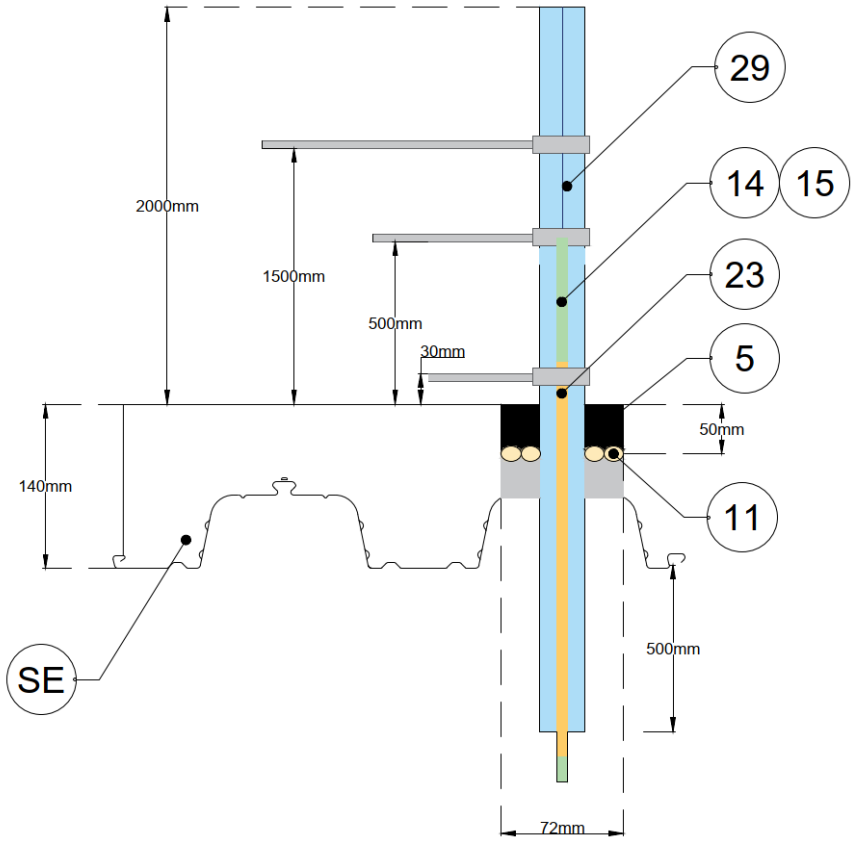


Figure 12 PE-Xa pipe and uPVC conduit installation through metal deck composite floor

5. Conclusion

Details of the assessment and discussion are only available in the referenced main assessment report. It has been concluded that the proposed systems, together with the described variations, are expected to achieve the nominated FRLs nominated in Table 7 to Table 15.

Table 7 Assessed single rigid conduit

Service	Conduit wall thickness, mm	Main firestop system	Annular gap, mm		Sealant depth, mm	Aperture size, mm	Penetration location (refer to Figure 1)	FRL
			Min	Max				
Single uPVC rigid conduit with diameter less than 50 mm with cables penetrating through a metal deck composite floor. The cables can be but are not limited to flat and circular TPS power cables, fire-rated cables, TDI cables, data cables, coax cables and fibre optics. A maximum conductor area of 30.78 mm^2 is permitted.	Maximum 3.6	Hilti CP611A / CFS-IS applied with backing rod – refer to Figure 2	5	17	55	72	Upper flute Mid flute Lower flute	-/120/120

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration systems D, E and I in FRT180468 R1.0.

Table 8 Assessed electrical conduit bundle

Service	Cables	Conduit, mm	Wall thickness, mm	Bundle diameter, mm	Minimum edge distance, mm	Main firestop system	Firestop sealant	Aperture, mm	Penetration location (refer to Figure 1)	FRL
PP flexible conduit bundle with cables. Maximum conductor size, 31.06 mm^2	Cables include but are not limited to flat and circular TPS power cables, FR, TDI, data, coax and optical fibre	20 or 25	0.5	80	20	Hilti CFS-PL 107 firestop plug – refer to Figure 3	CP611A / CFS-IS intumescent sealant up to 20 mm depth – refer to Figure 3	102	Upper flute Mid flute Lower flute	-/120/90
uPVC flexible conduit with cables Maximum conductor size, 31.06 mm^2										
Either uPVC or PP flexible conduit with cables Maximum conductor size, 31.06 mm^2		20 - 25								

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system B in FRT180468 R1.0.

Table 9 Assessed copper cables

Services	Cable diameter, mm	Cable bundle diameter, mm	Main Firestop system	Annular gap seal	Additional protection	Aperture size	Penetration location (refer to Figure 1)	FRL
PVC insulated, PVC or XLPE sheathed copper cables up to 4 × 400 mm^2 penetrating through a metal deck composite floor.	Maximum 33	Maximum 80	Hilti CFS-PL 132 Firestop plug – refer to Figure 4	Hilti CP611A / CFS-IS up to 20 mm depth – refer to Figure 4	1 layer of Hilti CFS-P BA putty bandage wrapped around the cable bundle, with bandage overlapped by 50 mm – refer to Figure 4	132	Upper flute Mid flute Lower flute	-/60/30

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system F in FRT180468 R1.0.

Table 10 Assessed communication cables

Services	Cable diameter, mm	Cable bundle diameter, mm	Main Firestop system	Annular gap seal	Additional protection	Aperture size	Penetration location (refer to Figure 1)	FRL
PVC or XLPE insulated communication cables penetrating through a metal deck composite floor. Cables include but are not limited to data, Cat6, coaxial and fibre optics cables with a maximum total conductor area of up to 18.2 mm^2.	Maximum 7	Maximum 58	Hilti CFS-PL 107 Firestop plug* - refer to Figure 5	Hilti CP611A / CFS-IS up to 20 mm depth – refer to Figure 5	1 layer of Hilti CFS-P BA putty bandage wrapped around the cable bundle, with bandage overlapped by 50 mm – refer to Figure 5	102	Lower flute	-/120/60

Services	Cable diameter, mm	Cable bundle diameter, mm	Main Firestop system	Annular gap seal	Additional protection	Aperture size	Penetration location (refer to Figure 1)	FRL

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- *CFS-PL 132 can be used for -/120/30.
- Firestop system to be installed as per tested system – ie penetration system J in FRT180468 R1.0.

Table 11 Assessed electrical cables

Services	Cable size, mm	Cable bundle size, mm	Main Firestop system	Annular gap seal	Additional protection	Aperture size	Penetration location (refer to Figure 1)	FRL
Cable bundles with circular and flat cables penetrating through a metal deck composite floor. Cables include but are not limited to TPS, sub-mains, SDI and fire-rated cables with a maximum of 3 cores. A maximum total conductor size of 300 mm^2 is permitted for the bundle.	Maximum 5.7 × 12.2	Maximum 60.8 × 41	Hilti CFS-PL 107 or 132 Firestop plug – refer to Figure 6	Hilti CP611A / CFS-IS up to 20 mm depth – refer to Figure 6	1 layer of Hilti CFS-P BA putty bandage wrapped around the cable bundle, with bandage overlapped by 50 mm – refer to Figure 6	102 or 132	Mid flute	-/120/45

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system G in FRT180468 R1.0.

Table 12 Assessed D1 cables

D1 standard power cable sets in accordance with Appendix D1 of AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray	Max cable in bundle	Maximum cable diameter, mm	Maximum bundle size	Annular gap, mm	Main fire protection	Sealant	Additional protection	Penetration location (refer to Figure 1)	FRL
Circular single core PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 630 mm^2.	1	41	NA	10	CFS-BL fire block in gaps in aperture around services with CFS-F FX / CP 660 flexible fire stop foam to single long edge of aperture – refer to Figure 7	Hilti CP611A / CFS-IS intumescent sealant installed to nominal depth of 20 mm topside and underside of CFS-BL – refer to Figure 7	1 layer of Hilti CFS-P BA putty bandage over cables + 1 layer of Hilti CFS-P BA putty bandage wrapped over the 1st layer and around the cables & cable tray (top side of floor only) – refer to Figure 7	Mid flute	-/120/60
Three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 6 mm^2.	3	13	26 mm × 25 mm or 30 mm diameter or equivalent surface area						
Three core plus earth PVC or XLPE insulated, PVC sheathed copper cables with a maximum conductor area of 16 mm^2.	8	18	70 mm × 40 mm or 60 mm diameter or equivalent surface area						
One three core plus earth PVC or XLPE insulated, PVC sheathed copper cable with a maximum conductor area of 185 mm^2.	1	52	NA						

D1 standard power cable sets in accordance with Appendix D1 of AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray	Max cable in bundle	Maximum cable diameter, mm	Maximum bundle size	Annular gap, mm	Main fire protection	Sealant	Additional protection	Penetration location (refer to Figure 1)	FRL
D1 standard power cable sets in accordance with AS 1530.4:2014 penetrating through a metal deck composite floor with or without a cable tray consisting of any combination of circular single core or multi-core PVC or XLPE insulated, PVC sheathed copper cables up to a maximum conductor area of 3,600 mm^2 with cable bundle conductor areas of up to 630 mm^2.	NA	52	198 mm × 62 mm or 124 mm diameter or equivalent surface area	10	CFS-BL fire block in gaps in aperture around services with CFS-F FX / CP 660 flexible fire stop foam to single long edge of aperture – refer to Figure 7	Hilti CP611A / CFS-IS intumescent sealant installed to nominal depth of 20 mm topside and underside of CFS-BL – refer to Figure 7	1 layer of Hilti CFS-P BA putty bandage over cables + 1 layer of Hilti CFS-P BA putty bandage wrapped over the 1st layer and around the cables & cable tray (top side of floor only) – refer to Figure 7	Mid flute	-/120/60

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system K in FRT180468 R1.0.

Table 13 Assessed non-standard power cable sets

Non-standard power cable sets penetrating through a metal deck composite floor with or without a cable tray	Maximum conductor area, mm^2	Max cable in bundle	Maximum cable diameter, mm	Maximum bundle size	Annular gap, mm	Main fire protection	Sealant	Additional protection	Penetration location (refer to Figure 1)	FRL
Single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2.	3600	3 bundles of 3 in triangular formation	33 mm	198 mm × 62 mm or equivalent surface area	10	CFS-BL fire block in gaps in aperture around services with CFS-F FX / CP 660 flexible fire stop foam to single long edge of aperture – refer to Figure 9	Hilti CP611A / CFS-IS intumescent sealant installed to nominal depth of 20 mm topside and underside of CFS-BL – refer to Figure 9	1 layer of Hilti CFS-P BA putty bandage over cables + 1 layer of Hilti CFS-P BA putty bandage wrapped over the 1st layer and around the cables & cable tray (top side of floor only with 50 mm overlap) – refer to Figure 9	Mid flute	-/120/60
Single core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2.										
Non-standard single core PVC or XLPE insulated, PVC sheathed copper power cables of maximum conductor area up to 400 mm^2.		NA	33 mm	72 mm diameter or 198 mm × 62 mm or equivalent surface area						
Non-standard core PVC or XLPE insulated, PVC sheathed aluminium power cables of maximum conductor area up to 400 mm^2.			33 mm							

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system K in FRT180468 R1.0.

Table 14 Assessed PE-Xa and PE-Xa/AL/PE-Xa pipes

Services	Pipe diameter, mm	Pipe wall thickness, mm	Main fire stopping system	Sealant depth, mm	Aperture size, mm	Minimum Annular gap, mm	Penetration location (refer to Figure 1)	Service FRL
PE-Xa pipe penetrating through a metal deck composite floor.	16	2 – 2.25	Hilti CP611A / CFS-IS intumescent sealant (supported with PFF backing rod) – refer to Figure 10	50	38	5	Upper flute Mid flute Lower flute	-/120/120
	20	2.3 – 2.8			40			
	25	2.8 – 3.5			45			
PE-Xa/AL/PE-Xa pipe penetrating through a metal deck composite floor.	16	2.6	Hilti CP611A / CFS-IS intumescent sealant (supported with PFF backing rod) – refer to Figure 11	50	38	5	Upper flute Mid flute Lower flute	-/120/60
	20	2.9			40			
	25	3.7			45			
	32	3.5 – 4.7			50			

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration systems A and C in FRT180468 R1.0.

Table 15 Assessed PE-Xa pipe and conduit

Service	Conduit/pipe diameter, mm	Wall thickness, mm	Maximum number of pipe/conduit	Annular gap Min	Annular gap Max	Main Firestop system	Conduit capping	Sealant depth, mm	Aperture size, mm	Penetration location (refer to Figure 1)	FRL
Up to 2 PE-Xa pipes penetrating through a metal deck composite floor.	16	2 – 2.25	2	5	17	Hilti CP611A / CFS-IS intumescent sealant – refer to Figure 12	NA	50	72	Upper flute Mid flute Lower flute	-/120/90
	20	2.3 – 2.8	2								
uPVC rigid conduit filled with electrical cables, data coax and fibre optics with a maximum conductor area of 25 mm^2 penetrating through a metal deck composite floor.	16 – 25	2.1	1				End of conduit to be capped with Hilti CP606 Acrylic sealant to depth of 10 mm – refer to Figure 12				

Notes:

- The metal deck composite floor system must either be designed in accordance with AS/NZS 2327:2017 for the required period of fire performance or the FRL of the system will be established either through testing or assessment by an ATL. The minimum thickness of composite floor system must satisfy the requirement of Table 7.7.2.2 of AS/NZS 2327:2017.
- Firestop system to be installed as per tested system – ie penetration system H in FRT180468 R1.0.

6. Validity

Warringtonfire does not endorse the tested or assessed products and systems in any way. The conclusions of the referenced assessment may be used to directly assess fire resistance, but it should be recognised that a single test method will not provide a full assessment of fire resistance under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

The referenced assessment is based on test data, information and experience available at the time of preparation. If contradictory evidence becomes available to the assessing authority, the assessment will be unconditionally withdrawn and the report sponsor will be notified in writing. Similarly, the assessment should be re-evaluated, if the assessed construction is subsequently tested since actual test data is deemed to take precedence.

The sponsor is responsible for formally notifying Warringtonfire of any additional testing performed on their product/system. This obligation applies regardless of where the test was conducted, the results of the test, or whether it was initially considered part of Warringtonfire's ongoing assessment. The primary goal of this notification is to allow Warringtonfire to review the changes and determine whether they require re-evaluation or re-testing to determine whether the changes have affected the product's performance. It is important that the client promptly notify Warringtonfire if any such changes are implemented.

The procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. The sponsor is therefore recommended that the referenced assessment report be reviewed on, or before, the stated expiry date.

The referenced assessment represents our opinion about the performance of the proposed systems that is expected to be demonstrated when subjected to test conditions in accordance with AS 1530.4:2014, based on the evidence referred to in the referenced assessment report.

The referenced assessment is provided to Hilti New Zealand Ltd for their own specific purposes. The referenced assessment report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code. Building certifiers and other third parties must determine the suitability of the systems described in the referenced assessment report for a specific installation.