



Fire assessment report


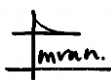
Penetrations in half wall systems

Sponsor: Trafalgar Group

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Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of services penetrating only one side of the wall in accordance with AS 1530.4:2014.

The analysis in section 5 of this report found that the proposed systems, together with the described variations, are expected to achieve an FRL as shown in Table 1, if tested in accordance with AS 1530.4:2014. 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 April 2027.

Table 1 Assessment outcome

Service	Separating element	Aperture size	Local protection	Referenced figures	FRL
3/8" + 3/4" pair coil insulated with 13 mm PE insulation or 3/8" + 3/4" pair coil insulated with 19 mm Ardent FR insulation	Minimum 92 mm steel stud frame clad with one layer of 13 mm fire-rated (FR) plasterboard on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture	Ø110 mm	The annular gaps around the service penetrations must be sealed with FyrePEX™ HP sealant to the full depth of the plasterboard (26 mm) and finished with a 30 mm × 30 mm sealant fillet.	Figure 1 and Figure 3	-/60/60
Ø20 mm PEX-AL-PEX pipe		Ø60 mm	The annular gaps around the service penetrations must be sealed with FyrePEX™ HP sealant to the full depth of the plasterboard (26 mm) and finished with a 50 mm × 50 mm sealant fillet.		-/60/60
Ø20 mm PEX-A pipe					
Ø20 mm PEX-B pipe					
Up to three TPS cables and/or two CAT6 cables	Minimum 64 mm steel stud frame clad with one layer of 13 mm fire-rated plasterboard on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture	Ø30 mm	The annular gaps around the service penetrations must be sealed with FyreFLEX sealant to the full depth of the plasterboard(s) and finished with a 30 mm × 30 mm sealant fillet.	Figure 1 and Figure 5	-/60/60
	Minimum 64 mm steel stud frame clad with one layer of 16 mm fire-rated plasterboard on each side				Figure 2 and Figure 4
	Minimum 64 mm steel stud frame clad with two layers of 13 mm fire rated plasterboards on each side				

Service	Separating element	Aperture size	Local protection	Referenced figures	FRL
Up to four TPS cables	Minimum 64 mm steel stud frame clad with one layer of 16 mm fire-rated plasterboard on each side	Ø30 mm	The annular gaps around the service penetrations must be sealed with FyreFLEX sealant to the full depth of the plasterboard and finished with a 30 mm x 30 mm sealant fillet.	Figure 2 and Figure 4	-/60/60
<p>Note: The assessed steel framed wall systems with fire rated plasterboards must have an established minimum FRL in accordance with AS 1530.4:2014. Overall FRL of the service will be governed by the FRL of the service and the wall.</p>					

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1. Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of services penetrating only one side of the wall in accordance with AS 1530.4:2014¹.

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 this assessment report. It also references test evidence for meeting deemed to satisfy (DTS) provisions of the NCC as applicable to the assessed systems.

This assessment was carried out at the request of Trafalgar Group. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Trafalgar Group	26a Ferndell St South Granville 2142 NSW Australia

2. Framework for the assessment

2.1 Assessment approach

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

No specific framework, methodology, standard or guidance documents exists in Australia for doing 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 2021².

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

This assessment 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 based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance if the elements were to be tested in accordance with AS 1530.4:2014.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer's stated design.

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 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.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the Evidence of Suitability requirements of the NCC 2019, including amendments³ under A5.2 (1) (d) and schedule 5 section 2(c).

This assessment has been written in accordance with the general principles outlined in EN 15725:2010⁴ for extended application reports on the fire performance of construction products and building elements. It also references test evidence for meeting a performance requirement or deemed to satisfy (DTS) provision of the NCC under A5.4 for fire resistance levels as applicable to the assessed systems.

This assessment report may also be used to demonstrate compliance with the requirements for Evidence of Suitability under NCC 2016 specification A2.3 section 2(c), including amendments⁵.

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 on 30 March 2022, Trafalgar Group confirmed 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.
- They agree to withdraw this 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 this assessment is being made and the results are not in agreement with this assessment.
- 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 – they agree to ask the assessing authority to withdraw the assessment.

3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results that are expected if the systems were tested in accordance with AS 1530.4:2014.
- This assessment is applicable to wall systems exposed to fire from each side but not simultaneously in accordance with the requirements of AS 1530.4:2014 where vertical elements must be exposed to heat from the direction required to resist fire exposure.
- 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 assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL) that is accredited to the same nominated standards of this report.
- The documentation that forms the basis for this report is listed in Appendix A and Appendix B.
- The assessed steel framed wall systems with fire rated plasterboards must have an established minimum FRL in accordance with AS 1530.4:2014 similar to the assessed FRL.
- The distance between the two apertures for a service must not be less than 1100 mm.

³ National Construction Code Volumes One and Two - Building Code of Australia 2019 including Amendments, Australian Building Codes Board, Australia

⁴ European Committee for Standardization, 2010, Extended application reports on the fire performance of construction products and building elements, EN 15725:2010, European Committee for Standardization, Brussels, Belgium.

⁵ National Construction Code Volumes One and Two - Building Code of Australia 2016 including Amendments, Australian Building Codes Board, Australia

- This report has been prepared based on 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 be incorporated into this report as a result.
- This assessment 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 this report.

4. Description of the specimen and variations

4.1 System description

The systems consist of half wall penetrations i.e. various services entering and exiting from the same side of the wall without penetrating through the wall to the other side.

The FRT180358.1 test consists of a pair coil (copper pipes Ø9 mm and Ø19 mm) with 13 mm PE insulation and a Ø20 mm PEX-AL-PEX pipe penetrating a 118 mm thick plasterboard wall system with a 13 mm FR plasterboard on each side. The services enter the wall lining only from one side (either from exposed or unexposed side), where they travel down the wall cavity and exit from the same side. A Ø20 mm PEX-a pipe penetrating a 118 mm thick plasterboard wall system with a 13 mm FR plasterboard on each side was also tested in test FRT180358.1. The services were protected with FyrePEX HP sealant.

In test FSP 1729, a combination of TPS and CAT6 cables was tested in accordance with AS 1530.4:2005 by penetrating a 96 mm plasterboard wall with a 16 mm thick FR plasterboard on each side. The cable penetrations were protected with FyreFLEX sealant.

FRT180354.1 consist of 2 × 3/8" + 3/4" Pair coil with 19mm Ardent FR insulation, 2× 2.5mm² 2C+E Electra Cables and 2× Delta Cables and a 3/8" + 3/4" pair coil insulated with 13 mm PE insulation, 1 Electra cable, 1 delta cable tested in a 116 mm thick plasterboard wall with two layers of 13 mm FR plasterboard on each side.

4.2 Referenced test data

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

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
FSP 1729	Fire Containment Pty Ltd	25 November 2015	CSIRO
FP6009	Fire Containment Pty Ltd	25 May 2017	Branz
FRT180358.1	Trafalgar Fire	3 October 2018	Warringtonfire
FRT180354.1	Trafalgar Fire	4 October 2018	Warringtonfire

4.3 Variations to the tested systems

An identical system has not been subject to a standard fire test. We have therefore assessed the systems using baseline test information for similar systems. The variations to the tested systems – together with the referenced standard fire tests – are described in Table 4.

Table 4 Variations to tested systems

Item	Reference test	Description	Variations
1	FRT180358.1	The referenced test consists of a pair coil with 13 mm PE insulation and a Ø20 mm PEX-ALPEX pipe	It is proposed to assess the performance of the services tested in the referenced test for an FRL of - /60/60 with an additional 13 mm

Item	Reference test	Description	Variations
		penetrating only half of the wall system. The specimens achieved an FRL of -/60/30 when tested in accordance with AS 1530.4:2014.	FR plasterboard thickening in the wall systems. It is also proposed to assess the performance of PEX-A and PEX-B pipes penetrating half of the wall. Furthermore, it is proposed to assess Ardent FR insulation as an alternative to the PE insulation on the pair coil.
2	FSP 1729	The referenced test report consists of a combination of TPS and CAT6 cables penetrating a 96 mm thick plasterboard wall with a 16 mm thick FR plasterboard on each side tested in accordance with AS 1530.4:2005.	<p>It is proposed to assess the performance of up to three TPS cables and/or two CAT6 cables in half wall systems in accordance with AS 1530.4:2014. The proposed wall system includes</p> <ul style="list-style-type: none"> • Minimum 64 mm steel stud frame clad with 13 mm fire-rated plasterboards on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture • Minimum 64 mm steel stud frame clad with 16 mm fire-rated plasterboards on each side • Minimum 64 mm steel stud frame clad with two layers 13 mm fire rated plasterboards on each side <p>It is also proposed to assess the performance of four TPS cables in half wall systems with a minimum 64 mm steel stud frame clad with 16 mm fire-rated plasterboards on each side in accordance with AS 1530.4:2014.</p>

4.4 Assessment standard

AS 1530.4:2014 sets out procedures and methods for fire tests on building materials, components, structures, and fire-resistance tests for elements of construction. Section 10 discusses the procedures and methods for service penetrations and control joints.

AS 4072.1:2005⁶ sets out the minimum requirements for the construction, installation and application of fire resistance tests to sealing systems around penetrations through separating building elements that are required to have an FRL.

4.5 Schedule of components

Table 5 outlines the schedule of components for the assessed systems

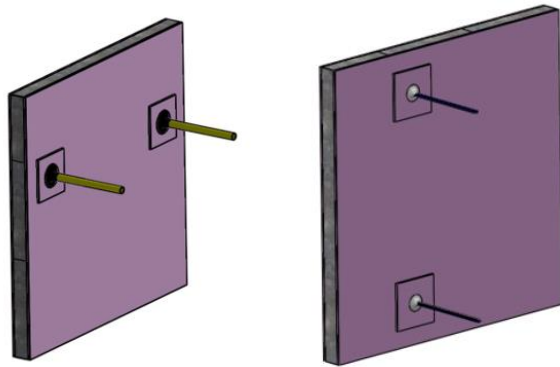
Table 5 Schedule of components of assessed systems

Item	Description	
1.	Product name	3/8" + 3/4" pair coil insulated with 13 mm PE insulation or 3/8" + 3/4" pair coil insulated with 19 mm Ardent FR insulation
	Dimensions	Outer diameter: 9.52 mm + 19.1 mm Inner diameter: 7.9 mm + 16.8 mm Thickness: 0.81 mm + 1.14 mm
	Separating element	Plasterboard wall with one layer of 13 mm FR plasterboard on each side of the minimum 92 mm steel stud with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture.

⁶ Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.

Item	Description	
	Sealant	FyrePEX™ HP
	Installation	The service is installed penetrating one side of the wall and returning from the same side of the wall. The sealant must be applied in the annular gaps to the full depth of the plasterboard on the side of the penetration (26 mm) and finished with a 30 mm × 30 mm fillet.
2.	Product name	Ø20 mm PEX-AL-PEX pipe, Ø20 mm PEX-A pipe or Ø20 mm PEX-B pipe
	Dimensions	Outer diameter: 20 mm
	Separating element	Plasterboard wall with one layer of 13 mm FR plasterboard on each side of the minimum 92 mm steel stud frame with an additional 13 mm FR plasterboard thickening around the penetration with 100 mm overlap in all directions from the aperture.
	Sealant	FyrePEX™ HP
	Installation	The service is installed penetrating one side of the wall and returning from the same side of the wall. The sealant must be applied in the annular gaps to the full depth of the plasterboard on the side of the penetration (26 mm) and finished with a 50 mm × 50 mm fillet.
3.	Product name	<ul style="list-style-type: none"> Up to three TPS and/or up to two CAT6 cables or Up to four TPS cables
	Separating element	<ul style="list-style-type: none"> Minimum 64 mm steel stud frame clad with 13 mm fire-rated plasterboards on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture Minimum 64 mm steel stud frame clad with 16 mm fire-rated plasterboards on each side Minimum 64 mm steel stud frame clad with two layers 13 mm fire rated plasterboards on each side.
	Sealant	FyreFLEX
	Installation	The service is installed penetrating one side of the wall and returning from the same side of the wall. The sealant must be applied in the annular gaps to the full depth of the plasterboard on the side of the penetration and finished with a 30 mm × 30 mm fillet.

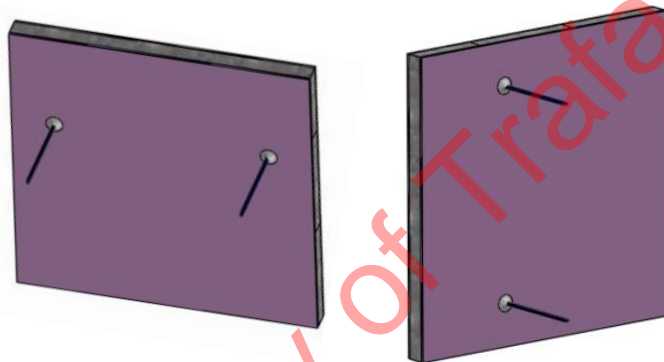
Figure 1 to Figure 5 show the assessed systems.



(a) Horizontally separated

(b) Vertically separated

Figure 1 Services penetrating a 13 mm FR plasterboard wall system



(a) Horizontally separated

(b) Vertically separated

Figure 2 Services penetrating a 16 mm or 2 x 13 FR plasterboard wall system

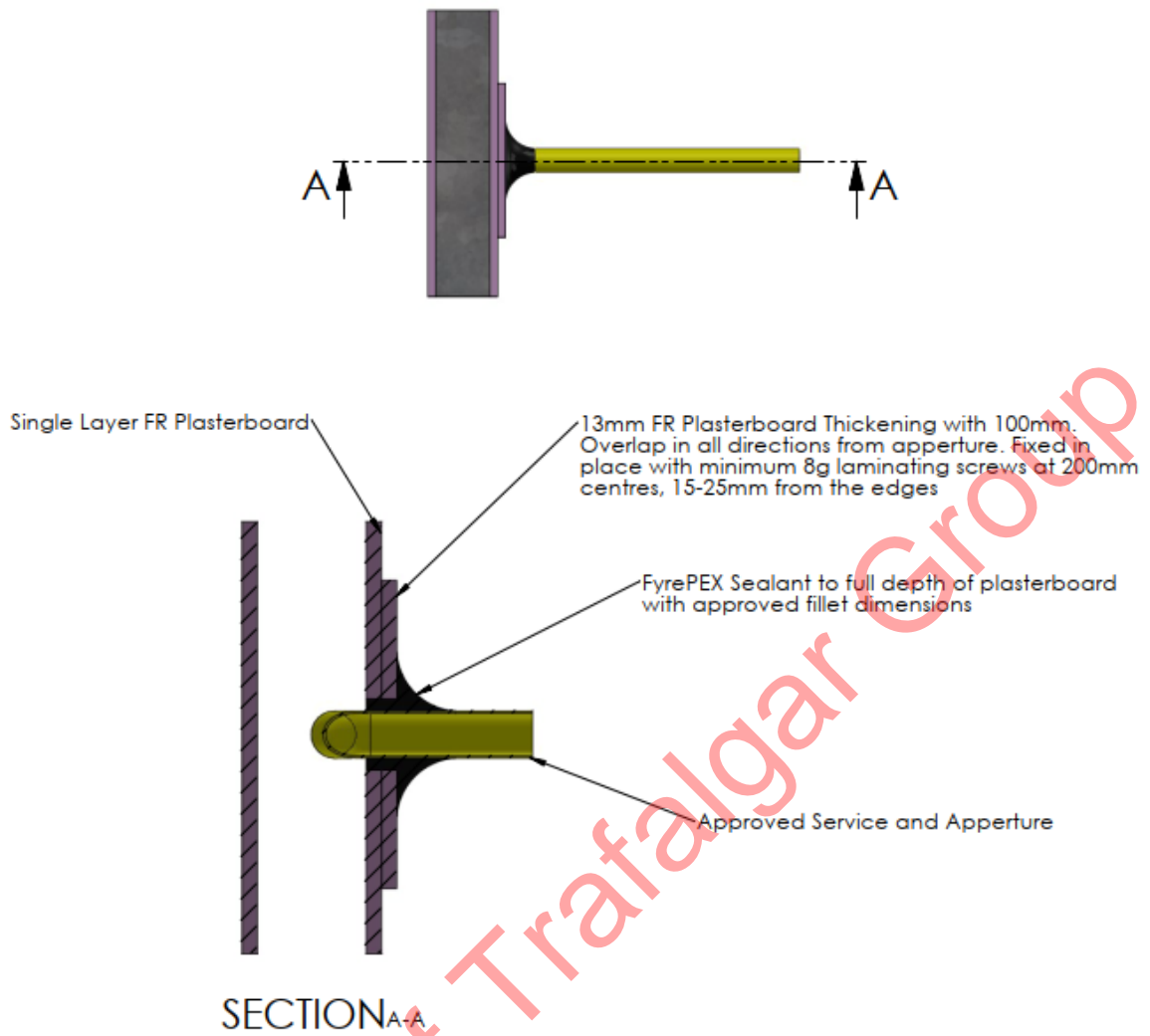


Figure 3 Pair coil and PEX-AL-PEX pipe penetration in a wall system with 13 mm FR plasterboard

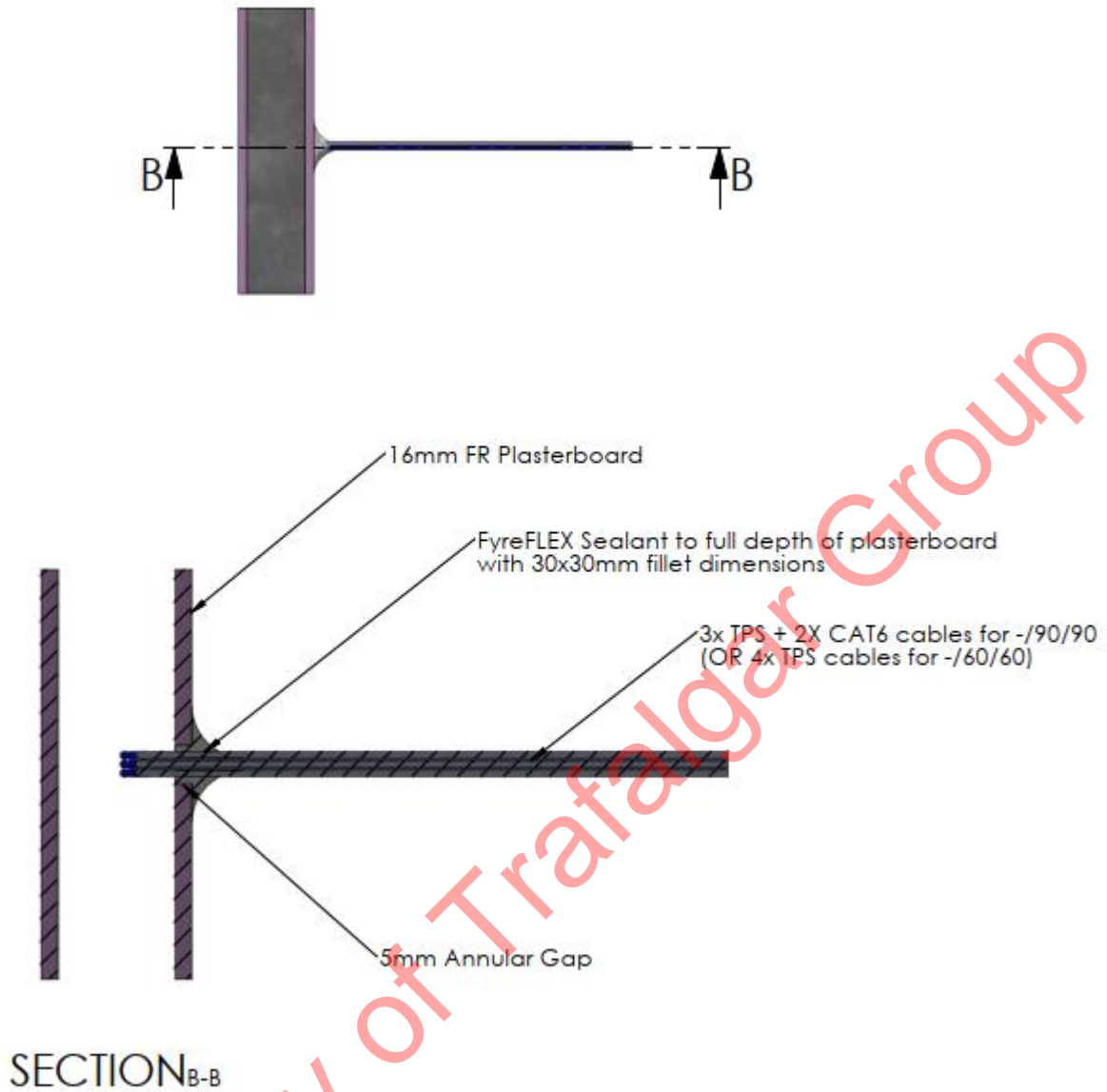


Figure 4 Cable penetration in a wall system with 16 mm or 2 × 13 mm FR plasterboard

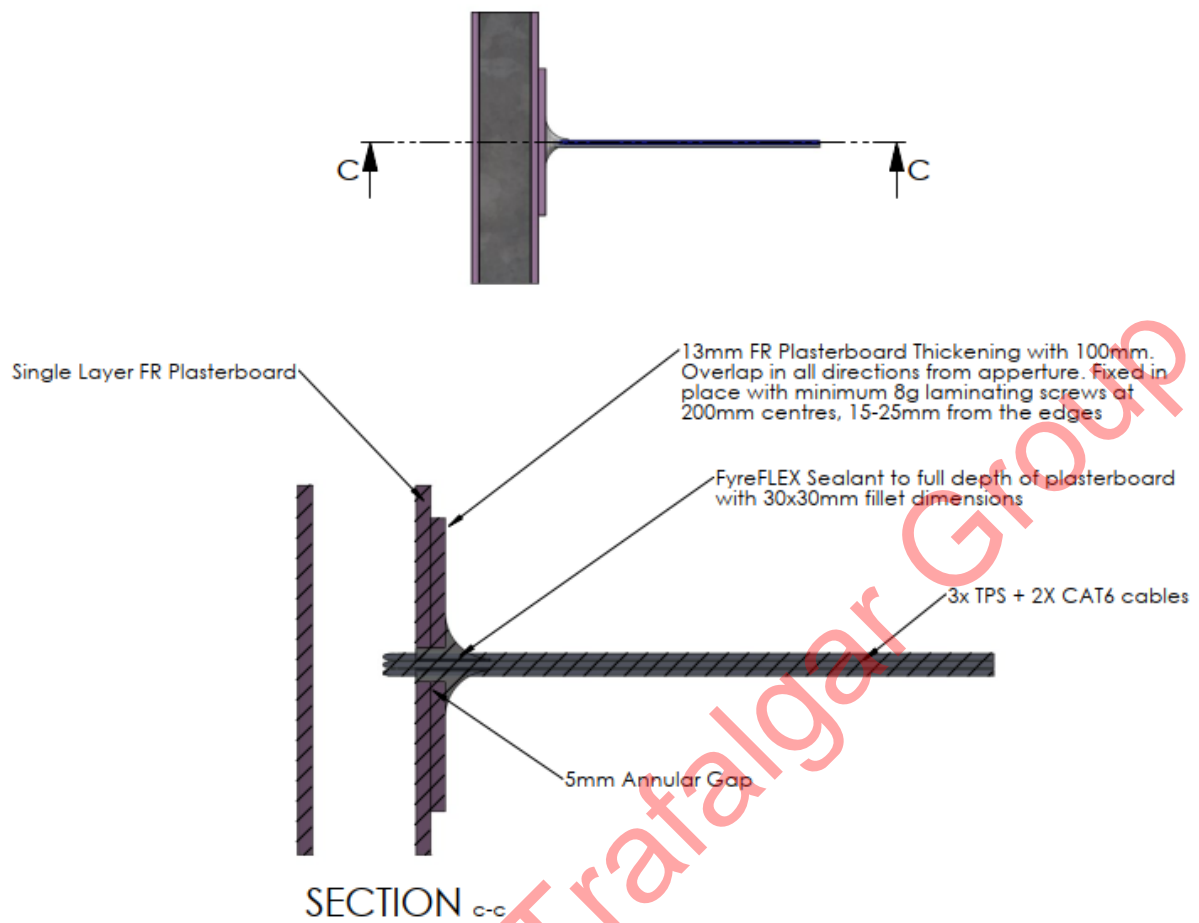


Figure 5 Cable penetration in a wall system with 13 mm FR plasterboard

5. Assessment

5.1 Description of variation

It is proposed to assess the performance of a pair coil (copper pipes Ø9 mm and Ø19 mm) with 13 mm PE insulation or 19 mm Ardent FR insulation, a Ø20 mm PEX-AL-PEX pipe, a Ø20 mm PEX-A pipe, a Ø20 mm PEX-B, TPS cables and CAT6 cables penetrating only from one side of the wall in accordance with AS 1530.4:2014.

5.2 Methodology

The method of assessment used is summarised in Table 6.

Table 6 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative Comparative

5.3 Assessment

5.3.1 Relevance of AS 1530.4:2005 test data with respect to AS 1530.4:2014

The fire resistance test FSP1729 was conducted in accordance with AS 1530.4:2005, which differs from AS 1530.4:2014. The effect these differences have on the fire resistance performance of the referenced test specimens is discussed below.

Discussion

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

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

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

Where:

T_t = furnace temperature at time t , in degrees Celsius.

T_0 = initial furnace temperature, in degrees Celsius.

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

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

Furnace pressure

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

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

Performance criteria

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

- structural adequacy (not relevant).
- integrity.
- insulation.

Integrity

As per AS 1530.4:2014, it stipulates that in addition to the 20 mm thick × 100 mm × 100 mm cotton pads, additional cotton pads shall be provided with a reduced 30 mm × 30 mm × 20 mm with additional wire frame holder and shall be used to determine integrity failure.

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

Insulation

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

Application of the test data to AS 1530.4:2014

The TPS and CAT6 cables tested in FSP1729 did not fail the integrity criteria for 120 minutes and failed insulation only at 94 minutes. Based on the above discussion and in the absence of any foreseeable integrity and insulation risk, it is concluded that the results relating to the integrity and insulation performance of the TPS and CAT6 – tested in FSP1729 – can be used to assess the integrity and insulation performance in accordance with AS 1530.4:2014.

5.3.2 3/8" + 3/4" pair coil insulated with 13 mm PE insulation or 3/8" + 3/4" pair coil insulated with 19 mm Ardent FR insulation

The wall system tested in FRT180358.1 consists of a 118 mm thick plasterboard wall with 13 mm FR plasterboard on each side of the wall. Specimen A and Specimen B in the referenced test report refer to a 3/8" + 3/4" pair coil insulated with 13 mm PE insulation penetrating the wall from one side and returning out from the same side after travelling down the cavity of the wall for a distance of 1100 mm. This configuration of half wall penetration was tested with the pair coil on the unexposed side (specimen A) as well as on the exposed side (specimen B). Both the top and bottom penetrations were sealed with FyrePEX™ HP sealant around the annular gaps to the full depth of the plasterboard (13 mm) and finished with a 30 mm × 30 mm fillet. The specimen which had the service penetrating only the unexposed side achieved an FRL of -/60/30, meaning there was no integrity failure for 61 minutes. However, the insulation performance of the service failed at 52 minutes. The specimen with the service on the exposed side of the wall also achieved an FRL of -/60/30, showing no integrity failure for 61 minutes but an insulation failure at 45 minutes. Upon investigating the insulation failure on the two specimens, it was noted that the insulation failure was recorded on the thermocouple on the plasterboard wall. The thermocouple on the sealant for the specimen with the service on the unexposed side did not show an insulation failure for 60 minutes.

It is proposed to introduce an additional local thickening around the service with a 13 mm fire rated plasterboard as shown in Figure 3 for the specimen to achieve an FRL of -/60/60. As the insulation failure occurred on the plasterboard wall, it is expected that increasing the wall thickness around the specimen will increase the insulation performance at least up to 60 minutes. The sealant depth will be at the full depth of the plasterboard lining, which is 26 mm in the proposed construction. Furthermore, a 3/8" + 3/4" pair coil insulated with 13 mm PE insulation and tested in a plasterboard wall system with two layers of 13 mm FR plasterboard on each side of the wall in FRT180354.1 achieved an FRL of -/120/90 with no integrity failure for 121 minutes and an insulation failure only after 90 minutes. The service penetrated through the full wall system and was protected with the same FyrePEX HP sealant on both sides. The performance of the service in FRT180354.1 provides additional supporting evidence that by increasing the thickness of the plasterboard layer, the insulation performance of the service can be prolonged.

Based on the above, the proposed construction with an additional 13 mm FR plasterboard thickening around the service is positively assessed to an FRL of -/60/60 in accordance with AS 1530.4:2014.

Furthermore, it is also proposed to assess the performance of a 3/8" + 3/4" pair coil insulated with and alternative 19 mm Ardent FR insulation instead of the 13 mm PE insulation assessed above. In FRT180354.1, Specimen C consisted of 2 × 3/8" + 3/4" Paircoil with 19 mm Ardent FR insulation, 2 × 2.5mm² 2C+E Electra Cables and 2 × Delta Cables whereas Specimen G consisted of 1 × 3/8" + 3/4" Paircoil with 13 mm PE Insulation, 1 × 2.5mm² 2C+E Electra Cables and 1 × Delta Cables tested in a 116 mm plasterboard wall system. Both the specimens were protected with FyrePEX HP in the annular gap to the full depth on both sides of the wall and did not fail the integrity criteria for

121 minutes. The specimen with the Ardent FR insulation failed insulation at 95 minutes whereas the specimen with PE insulation failed the insulation criteria at 94 minutes. As the larger penetration with double the number of services protected by Ardent FR insulation achieved similar results to the services protected with PE insulation, protecting the pair coil with Ardent FR insulation is positively assessed in this assessment report.

Therefore, 3/8" + 3/4" pair coil insulated with 19 mm Ardent FR insulation is also assessed to an FRL of -/60/60 in accordance with AS 1530.4:2014 when constructed in a similar configuration to the 3/8" + 3/4" pair coil insulated with 13 mm PE insulation with the additional 13 mm FR plasterboard thickening around the service as discussed above.

5.3.3 Ø20 mm PEX-AL-PEX pipe

It is proposed to assess the performance of a Ø20 mm PEX-AL-PEX pipe penetrating a plasterboard wall system only from one side to an FRL of -/60/60 based on test evidence from the test report FRT180358.1.

In FRT180358.1, a Ø20 mm PEX-AL-PEX pipe penetrated the wall from one side and returned out from the same side after travelling down the cavity of the wall for 1140 mm. The wall system in which the specimen was installed consists of a 92 mm steel frame clad with 13 mm FR plasterboard on each side of the wall. The PEX-AL-PEX pipe was installed and tested in both configurations, with the pipe on the unexposed side (specimen C) and the exposed side (specimen D) of the wall. Both top and bottom penetrations were sealed with FyrePEX™ HP sealant around the annular gaps to the full depth of the plasterboard (13 mm) and finished with a 30 × 30 mm fillet. Specimens C and D maintained integrity for 61 minutes, however failed insulation at 53 minutes and 56 minutes respectively. It was noted that for the specimen with the service on the unexposed side, the insulation failure had occurred on the sealant protecting the service. Therefore, for the specimen to maintain an insulation performance for 60 minutes, it is proposed to include an additional local thickening around the service with a 13 mm FR plasterboard and increase the size of the sealant fillet to 50 × 50 mm. The sealant must be applied in the annular gap to the full depth of the plasterboard, which will be increased to 26 mm in the proposed construction. This, along with the increased sealant fillet size of 50 × 50 mm, is expected to maintain the insulation criteria of the specimen for at least 60 minutes. Furthermore, a Ø20 mm PEX-AL-PEX pipe tested in a plasterboard wall system with two layers of 13 mm FR plasterboard on each side of the wall in FP6009 achieved an FRL of -/120/120 with no integrity or insulation failure for 125 minutes. The service penetrated through the full wall system and was protected with the same FyrePEX HP sealant on both sides. The performance of the service in FP6009 provides additional supporting evidence that by increasing the thickness of the plasterboard layer, the insulation performance of the service can be prolonged.

Therefore, a Ø20 mm PEX-AL-PEX pipe penetrating a minimum 92 mm steel frame clad with a 13 mm FR plasterboard on both sides and an additional local thickening as shown in Figure 3 is expected to achieve an FRL of -/60/60 in accordance with AS 1530.4:2014. The sealant must be applied around the annular gap to the full depth of the plasterboard lining and finished with a 50 mm × 50 mm fillet.

5.3.4 Ø20 mm PEX-A pipe or Ø20 mm PEX-B pipe

As discussed in section 5.3.3, a Ø20 mm PEX-AL-PEX pipe penetrating the wall from one side and returning out from the same side after travelling down the cavity of the wall for 1140 mm was tested in FRT180358.1. The pipe was sealed with FyrePEX™ HP sealant around the annular gaps to the full depth of the plasterboard (13 mm) and finished with a 30 × 30 mm fillet. PEX-A and PEX-B pipes are expected to achieve at least a similar result to the tested PEX-AL-PEX pipes because PEX-AL-PEX pipes are considered to perform worse among the three, in case of a fire due the welded aluminium tube reinforcement between the inner and outer PEX layers. As additional test evidence, in the same test a Ø20 mm PEX-A pipe was also tested which penetrated the full wall system. The pipe was sealed with FyrePEX™ HP sealant around the annular gaps to the full depth of the plasterboard (13 mm) and finished with a 30 × 30 mm fillet on both sides of the wall. The pipe did not fail integrity for 61 minutes whereas, it failed the insulation criteria at 59 minutes. The failure in insulation was observed only on the plasterboard on the unexposed side of the wall. The maximum temperatures recorded on the sealant and service on the unexposed side at 60 minutes were only 113 °C and 58 °C respectively.

Based on the above discussion, Ø20 mm PEX-A and PEX-B pipes are positively assessed to an FRL of -/60/60 in accordance with AS 1530.4:2014, when installed in a similar construction as the Ø20 mm PEX-AL-PEX pipe assessed in section 5.3.3, penetrating a minimum 92 mm steel frame clad with a 13 mm FR plasterboard on both sides with an additional local thickening as shown in Figure 3. The local thickening of the plasterboard wall is expected to increase the insulation performance of the system. The pipe should also be protected with FyrePEX HP sealant on both sides around the annular gap to the full depth of the plasterboard lining and finished with a 50 mm × 50 mm fillet that extends to the plasterboard.

5.3.5 TPS/CAT6 cables

In FSP 1729, three TPS and two 5 mm OD CAT6 cables penetrating a 64 mm steel frame clad with a 16 mm FR plasterboard on each side was tested in accordance with AS 1530.4:2005⁷. Section 5.3.1 shows that test results in accordance with AS 1530.4:2005 can be used to assess the performance in accordance with AS 1530.4:2014. The service penetrated the wall system from one side to the other. The service was protected with FyreFLEX sealant around the annular gaps on both the exposed and unexposed sides to the full depth of the plasterboard and finished with a 30 mm × 30 mm fillet. The specimen did not fail the integrity criteria for 120 minutes, whereas the insulation failed at 94 minutes. The insulation failure was observed on the wall system whereas, no insulation failure was observed on the sealant or service on the unexposed side for 120 minutes.

It is proposed to assess the performance of TPS or CAT6 cables when penetrating the tested wall from one side and returning from the same side. It is expected that the proposed system is not more onerous than the tested configuration; hence, it is positively assessed in this assessment. It is also proposed to assess the performance of the proposed cables in a 13 mm FR plasterboard system. The proposed wall system must be a wall system with 13 mm FR plasterboard on each side of a minimum 64 mm thick steel frame and an additional 13 mm FR plasterboard thickening around the penetration with 100 mm overlap in all directions from the aperture as shown in Figure 5. Provided that the above requirements are met, the proposed TPS and CAT6 cables are expected to achieve an FRL of -/60/60 in accordance with AS 1530.4:2014.

Furthermore, it was noted that in FSP 1729 the insulation failure for the cables occurred due to the temperature rise of more than 180 °C on the separating element on the unexposed side at 94 minutes. The temperature on the service and sealant on the unexposed side of the cables did not show an increase of 180 °C for 121 minutes. Therefore, it is expected that if the plasterboard wall system has an established FRL of up to -/120/120 in accordance with AS 1530.4:2014, the cables can be positively assessed to an FRL of up to -/120/120 in accordance with AS 1530.4:2014.

It is also proposed to assess the performance of four TPS cables when penetrating the wall from one side and returning from the same side in a 64 mm steel stud frame wall clad with one layer of 16 mm fire-rated plasterboard on each side. In FSP 1729, three TPS and two 5 mm OD CAT6 cables did not fail the integrity criteria for 120 minutes whereas the insulation criteria failed at 94 minutes – when a thermocouple placed on the wall exceeded the temperature threshold. In the proposed construction, number of TPS cables are increased to four from three which is expected to compromise the insulation performance. However, given the significant exhibited safety margin, it is considered that four TPS cables are capable of at least maintaining the integrity and insulation performance for 60 minutes in accordance with AS 1530.4:2014.

⁷ Standards Australia, 2005, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2005, Standards Australia, NSW.

5.4 Conclusion

This assessment demonstrates that various services installed in half wall configurations are expected to achieve FRLs as shown in Table 7 in accordance with AS 1530.4:2014. The services must penetrate only one side of the plasterboard wall, where they must enter and exit from the same side of the wall.

Table 7 Conclusion of the assessment

Service	Separating element	Aperture size	Local protection	Referenced figures	FRL
3/8" + 3/4" pair coil insulated with 13 mm PE insulation or 3/8" + 3/4" pair coil insulated with 19 mm Ardent FR insulation	Minimum 92 mm steel stud frame clad with one layer of 13 mm fire-rated (FR) plasterboard on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture	Ø110 mm	The annular gaps around the service penetrations must be sealed with FyrePEX™ HP sealant to the full depth of the plasterboard (26 mm) and finished with a 30 mm x 30 mm sealant fillet.	Figure 1 and Figure 3	-/60/60
Ø20 mm PEX-AL-PEX pipe		Ø60 mm	The annular gaps around the service penetrations must be sealed with FyrePEX™ HP sealant to the full depth of the plasterboard (26 mm) and finished with a 50 mm x 50 mm sealant fillet.		-/60/60
Ø20 mm PEX-A pipe					
Ø20 mm PEX-B pipe					
Up to three TPS cables and/or two CAT6 cables	Minimum 64 mm steel stud frame clad with one layer of 13 mm fire-rated plasterboard on each side with an additional 13 mm FR plasterboard local thickening around the penetration with 100 mm overlap in all directions from the aperture	Ø30 mm	The annular gaps around the service penetrations must be sealed with FyreFLEX sealant to the full depth of the plasterboard(s) and finished with a 30 mm x 30 mm sealant fillet.	Figure 1 and Figure 5	-/60/60
	Minimum 64 mm steel stud frame clad with one layer of 16 mm fire-rated plasterboard on each side			Figure 2 and Figure 4	-/90/90
	Minimum 64 mm steel stud frame clad with two layers of 13 mm fire rated plasterboards on each side				-/120/120
Up to four TPS cables	Minimum 64 mm steel stud frame clad with one layer of 16 mm fire-rated plasterboard on each side	Ø30 mm		Figure 2 and Figure 4	-/60/60

Note: The assessed steel framed wall systems with fire rated plasterboards must have an established minimum FRL in accordance with AS 1530.4:2014. Overall FRL of the service will be governed by the FRL of the service and the wall.

6. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this 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.

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

This assessment represents our opinion about the performance of the proposed systems expected to be demonstrated on a test in accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to Trafalgar Group for their own specific purposes. This 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 this report for a specific installation.

Appendix A Additional information and details of drawings

A.1 Details of drawings

Table 8 Details of drawings

Drawing title	Dwg no	Referenced figure	Date	Provided by
Plastic or insulated pipe penetration	1	Figure 1 and Figure 3	24 November 2022	Trafalgar Group
Cable penetration	2	Figure 2 and Figure 4		
Cable penetration + Thickening	3	Figure 1 and Figure 5		

Property of Trafalgar Group

Appendix B Summary of supporting test data

B.1 Test report – FSP1729

Table 9 Information about test report

Item	Information about test report
Report sponsor	Fire Containment Pty Ltd
Test laboratory	CSIRO, 14 Julius Avenue North Ryde, NSW 2113, Australia.
Test date	The fire resistance test was completed on 25 November 2015.
Test standards	The test was done in accordance with AS 1530.4:2005.
Variation to test standards	None
General description of tested specimen	Three TPS and two 5 mm OD CAT6 cables penetrating a 96 mm plasterboard wall system with a 16 mm FR plasterboard on each side was tested in this test. The service was protected with FyreFLEX sealant around the annular gaps on both the exposed and unexposed sides to the full depth of the plasterboard and finished with a 30 mm x 30 mm fillet. Only test specimen 2 is relevant for this assessment.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2005.

The test specimen achieved the following results.

Table 10 Results summary for this test report

Specimen	Description	Integrity	Insulation
2	Three TPS and two 5 mm OD CAT6 cables	No failure at 121 minutes	Failure at 94 minutes

B.2 Test report – FP6009

Table 11 Information about test report

Item	Information about test report
Report sponsor	Fire Containment Pty Ltd
Test laboratory	BRANZ, 1222 Moonshire Road Judgeford RD1 Porirua 5381, New Zealand
Test date	The fire resistance test was done on 25 May 2017.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	A Ø20 mm PEX-ALPEX pipe penetrating a wall system were tested in this test. The separating element consists of a 116 mm thick plasterboard wall with two layers of 13 mm FR plasterboard on each side of the wall. Only test specimen 5 is relevant to this assessment. The services were protected with FyrePEX™ HP sealant in the annular gaps around the services to the full depth of the plasterboard on both sides of the wall and finished flush with no fillet.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results.

Table 12 Results summary for this test report

Specimen	Description	Integrity	Insulation
5	Ø20 mm PEX-ALPEX pipe	No failure at 125 minutes	No failure at 125 minutes

B.3 Test report – FRT180358.1

Table 13 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Fire
Test laboratory	Warringtonfire Australia, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 3 October 2018.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	A pair coil with 13 mm PE insulation and a Ø20 mm PEX-ALPEX pipe penetrating only half of the wall system were tested in this test. Both the configurations of having the service on the exposed and unexposed side were tested for each of the services. The separating element consists of a 118 mm thick plasterboard wall with a 13 mm FR plasterboard on each side of the wall. A Ø20 mm PEX-A penetrating the full depth of the plasterboard wall systems was also tested. Only test specimens A, B, C, D and F are relevant to this assessment. The services were protected with FyrePEX™ HP sealant in the annular gaps around the services to the full depth of the plasterboard and finished with a 30 mm × 30 mm fillet.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results.

Table 14 Results summary for this test report

Specimen	Description	Integrity	Insulation
A	3/8" + 3/4" pair coil insulated with 13 mm PE insulation on the unexposed side	No failure at 61 minutes	Failure at 52 minutes
B	3/8" + 3/4" pair coil insulated with 13 mm PE insulation on the exposed side	No failure at 61 minutes	Failure at 45 minutes
C	Ø20 mm PEX-AL-PEX pipe on the unexposed side	No failure at 61 minutes	Failure at 53 minutes
D	Ø20 mm PEX-AL-PEX pipe on the exposed side	No failure at 61 minutes	Failure at 56 minutes
F	Ø20 mm PEX-A	No failure at 61 minutes	Failure at 59 minutes

B.4 Test report – FRT180354.1

Table 15 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Fire
Test laboratory	Warringtonfire Australia, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 4 October 2018.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	Various services penetrating a separating element of a 116 mm thick plasterboard wall with two layers of 13 mm FR plasterboard on each side of the wall were tested in this test. Only test specimens C and G are relevant to this assessment. The services were protected with FyrePEX™ HP sealant in the annular gaps around the services to the full depth of the plasterboard on both sides of the wall..
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results.

Table 16 Results summary for this test report

Specimen	Description	Integrity	Insulation
C	2 × 3/8" + 3/4" Pair coil with 19mm Ardent FR insulation, 2x 2.5mm ² 2C+E Electra Cables and 2x Delta Cables	No failure at 121 minutes	Failure at 95 minutes
G	3/8" + 3/4" pair coil insulated with 13 mm PE insulation, 1 Electra cable, 1 delta cable	No failure at 121 minutes	Failure at 94 minutes

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