FIRESTOP CENTRE LIMITED

FIRE ASSESSMENT REPORT

Service penetrations protected with Protecta FR Acrylic

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JENSEN HUGHES

Quality management

Revision	Date	Revision Description		
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		Prepared	**Reviewed**	**Authorised**
		Mahmoud Akl	Omar Saad	Omar Saad
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		Prepared	**Reviewed**	**Authorised**
		Mahmoud Akl	Omar Saad	Omar Saad
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		Prepared	**Reviewed**	**Authorised**
		Sukhi Sendanayake	Mahmoud Akl	Mahmoud Akl
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		Prepared	**Reviewed**	**Authorised**
		Sukhi Sendanayake	Mahmoud Akl	Omar Saad
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		Prepared	**Reviewed**	**Authorised**
		Sukhi Sendanayake	Mahmoud Akl	Mahmoud Akl
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		Prepared	**Reviewed**	**Authorised**
		Mohammed Mutafi	Mahmoud Akl	Mahmoud Akl
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Jensen Hughes Fire Testing Pty Ltd
ABN 81 050 241 524
Formerly Warringtonfire Australia Pty Ltd[1]

[1] Warringtonfire Australia Pty Ltd was acquired by Jensen Hughes in December 2023. Jensen Hughes Fire Testing Pty Ltd is not affiliated, associated, authorised, or endorsed by Warringtonfire Australia Pty Ltd, Warringtonfire Testing and Certification Limited or its “Warringtonfire” or “Certifire” brands.

Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance levels (FRL) of service penetrations protected with Protecta FR Acrylic if tested in accordance with AS 1530.4:2014 and assessed in accordance with AS 4072.1:2005 (R2016).

Protecta FR Acrylic is a sealant used to form a penetration seal around metallic pipes, plastic pipes, composite pipes, combustible cable conduits and electrical cables to reinstate the fire resistance performance of wall and floor constructions, where they have been provided with apertures for the penetration of services. They can also be used to form linear gap seals where gaps are present in wall and floor constructions and linear joint seals where wall and floor constructions abut.

The analysis in sections 5.0 to 7.0 of this report found that the proposed systems together with the described variations are likely to achieve the FRLs given, if tested in accordance with AS 1530.4:2014 and assessed in accordance with AS 4072.1:2005 (R2016).

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2.0, 3.0 and 8.0 of this report. The results of this report are valid until 30 April 2031.

Table 1 Overview of variations and assessment outcome

Item	Reference tests	Description	Variations
1	As given in Appendix B	The referenced tests were conducted in accordance with BS EN 1366-3:2009[2] and BS EN 1363-1:2012[3]	The proposed variation is to assess the likely fire resistance performance if tested in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).
2.		The referenced tests were conducted to demonstrate how Protecta FR Acrylic sealant is used to reinstate the fire resistance performance of flexible wall, rigid wall and floor constructions when penetrated by various cables, trays and metallic, plastic and composite pipes.	Assess the performance of various types and sizes of cables, metallic pipes, composite pipes and plastic pipes protected with Protecta FR Acrylic sealant and other supplementary fire sealing systems.
3.			In flexible and rigid wall systems: Flexible wall systems must have a minimum thickness of 75 mm and consist of steel or timber studs lined on both faces with 1 layer of minimum 12.5 mm thick fire rated plasterboard. The achieved FRLs are applicable to a flexible wall system with optional insulation and the aperture can optionally be lined. For timber framed walls, it is required that no part of the penetration seal is closer than 100 mm to a stud, the cavity is closed between the penetration seal and the stud, and minimum 100 mm of insulation is provided with the cavity between the penetration seal and the stud. Rigid walls must have a minimum thickness of 75 mm or as otherwise specified and consist of concrete, aerated concrete, or masonry with a minimum density of 650 kg/m3.

[2] European Committee for Standardization, 2009, Fire resistance tests for service installations. Penetration seals, BS EN 1366-3:2009, European Committee for Standardization, Brussels, Belgium.

[3] European Committee for Standardization, 2012, Fire resistance tests – General requirements, BS EN 1363-1:2012, European Committee for Standardization, Brussels, Belgium.

Item	Reference tests	Description	Variations
4.			In floor systems: Rigid floor thickness must be limited to 150 mm (as tested) and comprise aerated concrete with a minimum density of 650 kg/m³. Applicability of FRLs to thinner concrete slab of minimum thickness of 100 mm .
5.			As applicable to both walls and floors: The FRLs shown for PE pipes in section 6 are applicable to HDPE pipes. Apertures in the separating element must be maximum 300 × 300 mm or 100 × 1000 mm. Applicability of test results for cable configurations. The integrity rating achieved for insulated metallic and composite pipes can be applied to uninsulated pipes in systems penetrating walls.

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1.0 Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance levels (FRL) of service penetrations protected with Protecta FR Acrylic if tested in accordance with AS 1530.4:2014[4] and assessed in accordance with AS 4072.1:2005 (R2016)[5]. AS 4072.1:2005 in this document refers to AS 4072.1:2005 (R2016).

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 that apply to the assessed systems.

This assessment was carried out at the request of Firestop Centre Limited. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Firestop Centre Limited	Unit J, 657 Great South Road, Penrose, Auckland 1061, New Zealand

2.0 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[6].

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.

[4] 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.
[5] 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.
[6] 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 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 and performance 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 and assessed in accordance with AS 4072.1:2005 (R2016).

This assessment has been written in accordance with the general principles outlined in EN 15725:2023[7] for extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports.

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.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the NCC 2022[8] 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 this 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 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 assessment 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 on 13 February 2026, Firestop Centre Limited confirmed that:

- To their knowledge, the variation to 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.

[7] European Committee for Standardization, 2023, Extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports, EN 15725:2023, European Committee for Standardization, Brussels, Belgium.
[8] National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia.

3.0 Requirements and 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 in accordance with AS 1530.4:2014.
- The results of this assessment are applicable to fire exposure from either side for the assessed wall systems and fire exposure from below for the assessed floor systems.
- While it is recommended that for the elastomeric pipe insulation to be classified B-s3 as tested, the achieved results can be extended to cover an insulation material not deemed combustible as determined by AS 1530.1:1994 (R2016)[9].
- For CLT walls, density must be minimum 510 kg/m^3 and the adhesive used must be in the family of heat-resistant melamine-urea-formaldehyde. The outer lamella thicknesses must be equal to or greater than 33 mm.
- For CLT floors, density must be minimum 480 kg/m^3 and the adhesive used must be in the family of heat-resistant melamine-urea-formaldehyde. The slab thickness must be minimum 150 mm. The outer lamella thicknesses must be equal to or greater than 30 mm.
- In systems where insulation installed on metallic and composite pipes is interrupted, it has been established that the insulation does not contribute to the integrity rating of the system. Therefore, assuming insulation is zero, the integrity rating achieved shall be maintained when such systems are used on uninsulated pipes.
- Support of services in walls and floors must be maintained as per AS 1530.4:2014 and AS 4072.1:2005 (R2016) requirements.
- 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).
- The documentation that forms the basis for this report is listed in Appendix A.
- This report has been prepared based on information provided by others. Jensen Hughes 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 the expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

[9] Standards Australia, 1994, Methods for fire tests on building materials, components and structures – Part 1: Combustibility test for materials, AS 1530.1:1994, Standards Australia, NSW.

4.0 Description of the specimen and variations

4.1 Description of assessed system

4.1.1 Penetration seals

Protecta FR Acrylic is a sealant used to form a penetration seal around metallic pipes, plastic pipes, composite pipes, combustible cable conduits and electrical cables to reinstate the fire resistance performance of wall and floor constructions, where they have been provided with apertures for the penetration of services.

As confirmed by the report sponsor, the Protecta FR Acrylic is supplied in liquid form contained within 310 ml and 380 ml cartridges and 300 to 600 ml foil packs. The sealant is gunned into the aperture in the separating element/elements and around the service or services, to a specified depth utilising mineral fibre insulation backing material.

1. The intended use of Protecta FR Acrylic is to reinstate the fire resistance performance of flexible wall constructions, rigid wall constructions and rigid floor constructions where they are penetrated by various metal pipe services with and without combustible insulation, plastic pipes, combustible cable conduits, composite pipes and electrical cables.
2. The specific elements of construction that the Protecta FR Acrylic may be used to provide a penetration seal in, are as follows:
    a. Flexible walls: The wall must have a minimum thickness of 75 mm and comprise steel studs or timber studs* lined on both faces with minimum 1 layer of 12.5 mm thick boards. Apertures are not required to be lined. Wall cavity insulation is optional.
    b. Timber walls: The wall must have a minimum thickness of 100 mm and comprise solid wood or cross-laminated timber. Density must be minimum 510 kg/m^3 and the adhesive used must be in the family of heat-resistant melamine-urea-formaldehyde. The outer lamella thicknesses must be equal to or greater than 33 mm.
    c. Rigid walls: The wall must have a minimum thickness of 75 mm and comprise concrete, aerated concrete or masonry, with a minimum density of 650 kg/m^3. Wall elements are required to be otherwise tested or assessed by others for the required fire resistance period.
    d. Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 650 kg/m^3. Floor elements are required to be otherwise tested or assessed by others for the required fire resistance period unless otherwise specified in this report.

       Applicability of FRLs to thinner concrete slab of minimum thickness 100 mm is permissible. Insulation performance of the system will be governed by the concrete slab thickness as stated in AS/NZS 3600:2018[10]. The overall FRL of the system will be governed by the FRL extracted from AS/NZS 3600:2018.

       Floors are required to be otherwise tested or assessed by others to achieve a nominated FRL. In cases where the FRL of the floor is less than the penetration protecting the overall system, the FRL will be derated accordingly.
    e. Timber floors: The floor must have a minimum thickness of 150 mm and comprise solid wood or cross-laminated timber. Density must be minimum 480 kg/m^3 and the adhesive used must be in the

[10] Standards Australia, 2018, Concrete structures, AS 3600:2018 (Incorporating Amendment No. 1), Standards Australia, NSW.

family of heat-resistant melamine-urea-formaldehyde. The slab thickness must be minimum 150 mm. The outer lamella thicknesses must be equal to or greater than 30 mm.

*no part of the penetration seal may be closer than 100 mm to a stud, the cavity must be closed between the penetration seal and the stud, and minimum 100 mm of insulation confirmed to be deemed non-combustible in accordance with AS 1530.1:1994[11] must be provided within the cavity between the penetration seal and the stud.

Wall and floor elements are required to be otherwise tested or assessed by others for the required fire resistance period. In cases where the FRL of the wall or floor is less than that of the penetration, the FRL will be derated accordingly.

Protecta Fire Protection Systems which involve services penetrating both sides of a flexible wall may also be used in the situation where the services penetrate one side of the wall only and the remaining side of the wall is not penetrated at the same point (i.e. the services continues on the inside of the wall). All fire integrity and insulation ratings for such single-sided penetrations remain the same as for the equivalent double-sided penetrations for all services except bare metallic pipes. For bare metallic pipes, the thermal insulation ratings will be required to be derated unless a 13 mm or 16 mm baffle system is installed on the unexposed side as per the application.

3. The system Protecta FR Acrylic may be used to provide a penetration seal with specific single insulated metal pipes, uninsulated metal pipes, plastic pipes, combustible cable conduits, composite pipes and with specific electrical cables, single or in a bundle (for details see section 6.0).

   Test results for cables remain valid if the diameter of a single cable is reduced and/or the number of cables in a bunch is reduced provided that the overall diameter of the bunch of any individual cable is not greater than that tested.

   The test results obtained with the standard configuration cover all types of insulated cables with copper or aluminium conductors, fibre optic cables and bundled communication cables, except hollow cables.

   Results obtained from tests where the supports pass through the seal are applicable to those situations where the support is not continued but not vice versa.

4. The total amount of cross sections of services (including insulation) should not exceed 60% of the penetration area. The test results obtained using standard configuration for cable penetration systems are valid for:

   a. All type of steel cable trays and ladders

   b. Any penetration size equal or smaller than that tested, provided the total amount of cross sections of the cables (core and insulation) does not exceed 60% of the penetration.

5. Apertures in the separating element must be maximum Ø 504 mm, 300 × 300 mm or 100 × 1000 mm. The annular space/gap around the services must be infilled with Protecta FR Acrylic sealant and in some cases a mineral fibre insulation backing material. Blank seals up to 300 mm × 300 mm are permitted. For full details, see item 6.

6. In systems where insulation installed on metallic and composite pipes is interrupted, it has been established that the insulation doesn't contribute to the integrity rating of the system. Therefore, assuming insulation is zero, the integrity rating achieved must be maintained when such systems are used on uninsulated pipes.

[11] Standards Australia, 1994, Methods for fire tests on building materials, components and structures – Part 1: Combustibility test for materials, AS 1530.1:1994, Standards Australia, NSW.

7. Pipes must be supported at maximum 350 mm away from both faces of the wall constructions and from the upper face of floor constructions. Support of services in walls and floors must be maintained as per AS 1530.4:2014 and AS 4072.1:2005 (R2016) requirements.
8. Backing material may be stone wool or mineral wool (non-fibre glass) of the specified density and any generic mineral or stone wool product of density 35 kg/m³ may be substituted for Protecta Mineral Fibre BIO.
9. Penetrations of small services such as cables and pipes are permissible in linear gap seals. In situations where identical linear gap seals have been assessed with and without penetrations, the greater of the two aperture sizes can be used for the given FRL rating.
10. It was confirmed that where PP pipes are mentioned, this includes PP-MV, PP-H, PP-R and similar. Where PE pipes are mentioned, this includes PE-LD, PE-MD, PE-HD, PE-X, ABS and SAN+PVC plastic pipes.
11. Where single sided top face seals are described in section 6, these can also be used in composite floors if the thickness of the concrete at the thinnest location is the same or greater than the required depth. Composite floors with equivalent aperture sizes are required to be otherwise tested or assessed by others to achieve a nominated FRL. In cases where the FRL of the floor is less than the penetration protecting the overall system, the FRL will be derated accordingly to match with the FRL of the composite floor.

    Refer to section 6.0 for the assessed FRL given to each construction configuration.

4.1.2 Linear joint seals

Protecta FR Acrylic is an intumescent acrylic sealant used to Protect linear gap seals where gaps are present in wall and floor constructions and linear joint seals where wall and floor constructions abut.

It is confirmed by the report sponsor that the Protecta FR Acrylic is supplied in liquid form contained within 310 ml and 380 ml cartridges and 600 ml foil packs. The sealant is gunned into the aperture in the separating element/elements and around the service or services, to a specified depth utilising a backing material.

The intended use of system Protecta FR Acrylic is to reinstate the fire resistance performance of gaps in and joints in and between flexible wall and rigid wall constructions, gaps in and joints between rigid floor constructions.

12. The specific elements of construction that the system Protecta FR Acrylic may be used to provide a gap or joint seal in, are as follows:
    a. Flexible walls: The wall must have a minimum thickness of 75 mm and comprise steel or wooden studs lined on both faces with minimum 1 layer of 12.5 mm thick boards. The wall is permitted with or without insulation material between the boards.
    b. Rigid walls: The wall must have a minimum thickness of 75 mm and comprise concrete, aerated concrete or masonry, with a minimum density of 650 kg/m^3. Wall elements are required to be otherwise tested or assessed by others for the required fire resistance period.
    c. Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 650 kg/m^3. Floor elements are required to be otherwise tested or assessed by others for the required fire resistance period. In cases where the FRL of the floor is less than that of the penetration, the FRL will be derated accordingly.

In cases where the FRL of the wall or floor is less than that of the penetration, the FRL will be derated accordingly.

13. The system Protecta FR Acrylic may be used to provide a linear joint or gap seal with specific supporting constructions and substrates (for details see section 6.0).
14. Protecta Fire Protection Systems which involve linear seals on both sides of a flexible wall may also be used in the situation where the linear seal is on one side of the wall only and the remaining side of the wall is not punctured at the same point. All fire integrity and thermal insulation ratings for such single-sided linear seals remain the same as for the equivalent double-sided linear seal.
15. The maximum permitted joint/gap width for system Protecta FR Acrylic is 100 mm.

    Refer to section 6 for the assessed FRL given to each construction configuration

4.2 Referenced test data

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

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
WF 419763	Polyseam Ltd	19 November 2019	Warringtonfire, UK
WF 419764	Polyseam Ltd	12 December 2019	
WF 427934	Polyseam Ltd	14 April 2020	
WF 401855 Revision A	Polyseam Ltd	5 July 2018	
WF 419414	Polyseam Ltd	24 October 2019	
WF 19723A	Polyseam Ltd	25 June 2019	Warringtonfire, Belgium
WF 412849	Polyseam Ltd	9 April 2019	Warringtonfire, UK
WF 405610 Revision A	Polyseam Ltd	11 October 2018	
BMT/FEI/F15107	Polyseam Ltd	21 December 2015	
BMT/FEI/F16010	Polyseam Ltd	25 January 2016	
BMT/FEP/F16151 Revision A	Polyseam Ltd	21 June 2016	
WF 380112	Polyseam Ltd	16 February 2017	
WF 369796 Revision A	Polyseam Ltd	21 July 2016	
WF 372808	Polyseam Ltd	12 October 2016	
WF 382336	Polyseam Ltd	15 June 2017	
WF 375339	Polyseam Ltd	2 November 2016	
WF 380977	Polyseam Ltd	16 March 2017	
WF 384982	Polyseam Ltd	29 June 2017	
WF 395179 Revision A	Polyseam Ltd	6 February 2018	
WF 389526	Polyseam Ltd	21 September 2017	
WF 407685	Polyseam Ltd	29 November 2018	
WF 394021	Polyseam Ltd	8 January 2018	

Report number	Test sponsor	Test date	Testing authority
WF 405606 Revision A	Polyseam Ltd	4 October 2018	
WF 382338	Polyseam Ltd	31 May 2017	

4.3 Variations to the tested systems

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

Table 4 Variations to tested systems

Item	Reference tests	Description	Variations
1	As given in Appendix B	The referenced tests were conducted in accordance with BS EN 1366-3:2009[12] and BS EN 1363-1:2012[13]	The proposed variation is to assess the likely fire resistance performance if tested in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).
2.		The referenced tests were conducted to demonstrate how Protecta FR Acrylic sealant is used to reinstate the fire resistance performance of flexible wall, rigid wall and floor constructions when penetrated by various cables, trays and metallic, plastic and composite pipes.	Assess the performance of various types and sizes of cables, metallic pipes, composite pipes and plastic pipes protected with Protecta FR Acrylic sealant and other supplementary fire sealing systems.
3.			In flexible and rigid wall systems: Flexible wall systems must have a minimum thickness of 75 mm and consist of steel or timber studs lined on both faces with 1 layer of minimum 12.5 mm thick fire rated plasterboard. The achieved FRLs are applicable to a flexible wall system with optional insulation and the aperture can optionally be lined. For timber framed walls, it is required that no part of the penetration seal is closer than 100 mm to a stud, the cavity is closed between the penetration seal and the stud, and minimum 100 mm of insulation is provided with the cavity between the penetration seal and the stud. Rigid walls must have a minimum thickness of 75 mm or as otherwise specified and consist of concrete, aerated concrete, or masonry with a minimum density of 650 kg/m3.
4.			In floor systems: Rigid floor thickness must be limited to 150 mm (as tested) and comprise aerated concrete with a minimum density of 650 kg/m³. Applicability of FRLs to thinner concrete slab of minimum thickness of 100 mm .

[12] European Committee for Standardization, 2009, Fire resistance tests for service installations. Penetration seals, BS EN 1366-3:2009, European Committee for Standardization, Brussels, Belgium.

[13] European Committee for Standardization, 2012, Fire resistance tests – General requirements, BS EN 1363-1:2012, European Committee for Standardization, Brussels, Belgium.

Item	Reference tests	Description	Variations
5.			As applicable to both walls and floors: The FRLs shown for PE pipes in section 6 are applicable to HDPE pipes. Apertures in the separating element must be maximum 300 × 300 mm or 100 × 1000 mm. Applicability of test results for cable configurations. The integrity rating achieved for insulated metallic and composite pipes can be applied to uninsulated pipes in systems penetrating walls.

4.4 Test 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.

4.5 Reference standard

AS 4072.1:2005 (R2016) 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.

5.0 Assessment 1 – Applicability of test results in accordance with AS 1530.4:2014

5.1 Description of variation / background

This assessment report is prepared based on referenced tests provided in Appendix B describing fire resistance testing of fire seals and service penetration protection in various fire separating elements, tested in accordance with BS EN 1363-1:2012, BS EN 1366-3:2009 and BS EN 1366-4:2006. These standards differ from AS 1530.4:2014. The effect these differences have on the fire resistance performance of the test specimens if tested in accordance with AS 1530.4:2014 is discussed below.

5.2 Methodology

The method of assessment used is summarised in Table 5.

Table 5 Method of assessment

Assessment method	
Level of complexity	Complex assessment
NCC procedure for determining fire performance	Differs in only a minor degree from a tested prototype S1C2(b) and S1C2(c)
Type of assessment	Qualitative and comparative

5.3 Assessment

5.3.1 Specimen configuration

AS 1530.4:2014 specifies that the service(s) shall be installed so that it projects a minimum 500 mm on each side of the supporting construction, of which at least 200 mm shall extend beyond the extremities of the penetration sealing system. The penetration sealing system shall include any coating, wrapping or other protections to the services. The length of unprotected service on the unexposed face shall not be greater than 500 mm. For plastic pipes, the external projection away from the furnace shall be increased to a minimum of 2000 mm. The measurements shall not include any part of the plug or cap used to seal a pipe within the furnace.

With respect to the pipe end configurations, AS 1530.4:2014 stipulates that services end conditions shall be representative of those intended to be used in practice.

The EN standard stipulates the following field of application based on the tested pipe end configuration:

Table 6 Field of application rules for pipe end configurations

	Tested				
		U/U	C/U	U/C	C/C
Covered	U/U	Y	N	N	N
	C/U	Y	Y	N	N
	U/C	Y	Y	Y	N
	C/C	Y	Y	Y	Y
Y=acceptable, N=not acceptable					

Based on the review of the test data and the above field of application, it is the opinion of this testing authority that services tested with an open/open end fire configuration are considered to be the worst-case scenario as the hot gases will have a clear path to the unexposed side. As a result, the thermocouple placed on the service will likely record the highest temperature when compared to the rest of the pipe end configurations. Therefore, FRL achieved in U/U configuration can be extended to services tested in any of the pipe end configurations.

With respect to the services tested in an open/closed configuration or closed/closed configuration, it is considered that both configurations are not in line with the general requirement of the AS 1530.4:2014. However, AS 1530.4:2014 stipulates that “service end conditions shall be representative of those intended to be used in practice”, therefore, it is reasonable to extend the FRL achieved in both configurations provided that they are representative of the system used in practice.

With respect to the difference in the pipe projection from the wall and the floor system, it is considered that this difference will not likely introduce any detrimental effect to the wall system as the plastic pipe is expected to melt in the first few minutes in a test, and once the sealant is activated, this difference can be negligible.

In case of a floor system, it is argued that having a 2000 mm projection out of the floor slab at the unexposed side may include a detrimental effect due to stack effect but it is also argued that 500 mm projection as stipulated in the BS EN standard could also be considered as the most onerous case as more hot gases are expected to pass from the exposed to the unexposed side at a faster rate, hence increasing the temperature recorded by the TC placed on the service before the activation and closure of the fire rated sealant. In conclusion, considerable amount of research and test history has showed that the extension of

the pipe from the unexposed side will not likely have an impact on the performance of the plastic pipes, hence it can be positively assessed.

5.3.2 Furnace temperature measurement

The furnace thermocouples specified in AS 1530.4:2014 are type K, mineral insulated metal sheathed (MIMS), with a stainless-steel sheath having a wire of diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouples specified in EN 1363-1:2012 are plate thermometers comprised of an assembly of a folded nickel alloy plate, a thermocouple fixed to it and insulation material. A thermocouple is fixed to the side of the plate facing the specimen, with the thermocouple hot junction protected by a pad of insulating material.

The plate is to be constructed from 150 ± 1 mm long by 100 ± 1 mm wide by 0.7 ± 0.1 mm thick austenitic nickel-based superalloy strips.

The measuring junction is to consist of nickel chromium/nickel aluminium (Type K) wire as defined in EN 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter 1 mm to 3 mm, with the hot junctions electrically insulated from the sheath.

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

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

EN 1363-1:2012 specifies that each plate thermometer shall be at least 100 ± 50 mm from the nearest point of the exposed face of the test construction, whereas AS 1530.4:2014 stipulates a distance of 100 ± 10 mm.

The furnace control thermocouples required by EN 1363-1:2012 are less responsive than those specified by AS 1530.4:2014. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN 1363-1:2012, particularly when the furnace temperature is changing quickly in the early stages of the test. Furnace temperature regime

The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4:2014 follows the same trend as EN 1363-1:2012

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and BS EN1363-1:2012 are not appreciably different.

5.3.3 Furnace pressure regime

It is a requirement of both AS 1530.4:2014 and EN 1363-1:2012 that for vertical elements, the furnace shall be operated so that the neutral pressure plane (a pressure of 0 Pa) is established at a height 500 mm above the notional floor level.

For wall penetrations, AS 1530.4:2014 requires that – if the separating element has a height greater than 1 m – it shall be tested with a pressure of 20 ± 3 Pa at the top of the separating element and that the horizontal penetrating services shall be included in the zone where positive pressure exceeds 10 Pa.

EN 1366-3:2009 specifies that a minimum pressure of 20 Pa shall be maintained at the top of the uppermost penetration seal in a vertical supporting construction and that services shall only be included in the zone where the positive pressure exceeds 10 Pa.

Therefore, both standards require that a minimum pressure of 10 Pa be maintained at the lowest point of the lowest service.

It is a requirement of both AS 1530.4:2014 and EN 1363-1:2012 that for horizontal elements, a furnace gauge pressure of 20 Pa is established at a height 100 mm below the floor soffit level.

The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and EN 1363.1-:2012 are also not appreciably different.

5.3.4 Integrity performance criteria

In accordance with AS 1530.4:2014, while a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion if it collapses or sustains flaming on the unexposed face, which can ignite a cotton pad when applied for up to 30 seconds.

A specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 when any of the following occur:

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

Except for minor variations the integrity criteria in EN 1363.1:2012 are generally applied in a comparable manner.

5.3.5 Specimen temperature measurement

The specimen thermocouple specification of service penetrations is generally the same for AS 1530.4:2014 and BS EN 1366-3:2009.

For the penetration construction considered. AS 1530.4:2014 specifies the following locations for thermocouples to be placed.

- At not less than two points approximately 25 mm from the edge of the hole made for the passage of the service (one in uppermost vertical plane).
- On the surface of the penetrating service, at least two thermocouples located approximately 25 mm from the plane of the general surface of the penetrated element (one in uppermost vertical plane).
- At least two positions 25 mm from the interface of the separating element and main penetration seal.
- For penetrating sealing systems, BS EN 1363-1:2012 specifies thermocouples are fixed in generally similar locations on the unexposed face: on the supporting construction and/or seal and on the penetrating service adjacent at the plane of penetration, and on the penetrating service some distance from the plane of penetration.

Based on the above, the effect of the differences on the thermocouple locations of the tested construction and the specifications in AS 1530.4:2014 discussed on case-by-case basis.

5.3.6 Insulation performance criteria

The general insulation criteria of AS 1530.4:2014 and BS EN 1363.1:2012 are not appreciably different.

5.3.7 Application of test data to AS 1530.4:2014

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

In the referenced tests, some specimens were not in accordance with AS 1530.4:2014, especially the capping arrangement of pipes. Those services were included in the assessment with the same end conditions as tested.

Based on the above discussion, it is considered that the results relating to the integrity and insulation performance of the referenced tests can be used as a basis to assess the FRL of the specimens if tested in accordance with AS 1530.4:2014.

6.0 Assessment 2 – Fire resistance performance of services protected with Protecta FR Acrylic

6.1 Description of variation / background

Various service penetrations, including metal pipes, plastic pipes and cable configurations, are tested protected with Protecta FR Acrylic sealant. Other local protection systems such as service insulations have been tested in combination with Protecta FR Acrylic sealant for insulation performance.

6.2 Methodology

The method of assessment used is summarised in Table 5.

Table 7 Method of assessment

Assessment method	
Level of complexity	Complex assessment
NCC procedure for determining fire performance	Differs in only a minor degree from a tested prototype S1C2(b) and S1C2(c)
Type of assessment	Qualitative and comparative

6.3 Rigid wall constructions according to 4.1.1 with wall thickness of minimum 150 mm

6.3.1 Single side penetration seal with cables

Penetration seal: Cables (single) fitted at any position within the aperture, with Protecta FR Acrylic to either side of the wall (or at any position in between), backed with 'Protecta Mineral Fibre BIO'. Minimum separation between cables and the edge of the seal of 7 mm.
Construction details:

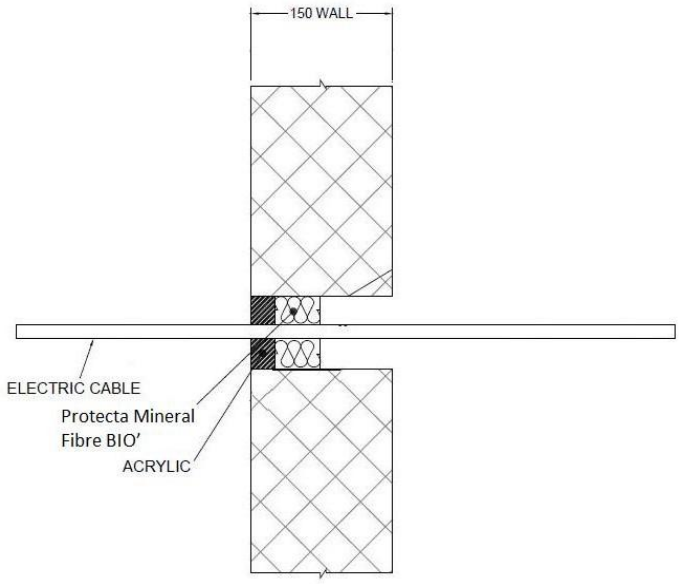


Table 8 Single cables protected with FR Acrylic sealant applied at one side of the wall backed with Protecta Mineral Fibre BIO or equivalent

Services	Sealant depth (mm)	Backing (mm)	Maximum seal size	FRL
Single electrical cables up to Ø21 mm	25	48 mm deep Protecta Mineral Fibre BIO insulation	Ø 87 mm	-/240/90
Blank seals			300 × 300 mm	-/240/60
Electric cables up to 21 mm diameter, single				
Blank seals			35 × 35 mm/ Ø 36 mm	-/240/120
Electric cables up to 21 mm diameter, single				

6.3.2 Double side penetration seal with cables

Penetration seal: Cables fitted with Protecta FR Acrylic to both sides of the wall, backed with stone wool or mineral fibre insulation. Maximum seal size of 300 × 300 mm and minimum separation between cables and the edge of the seal of 10 mm.

Construction details:

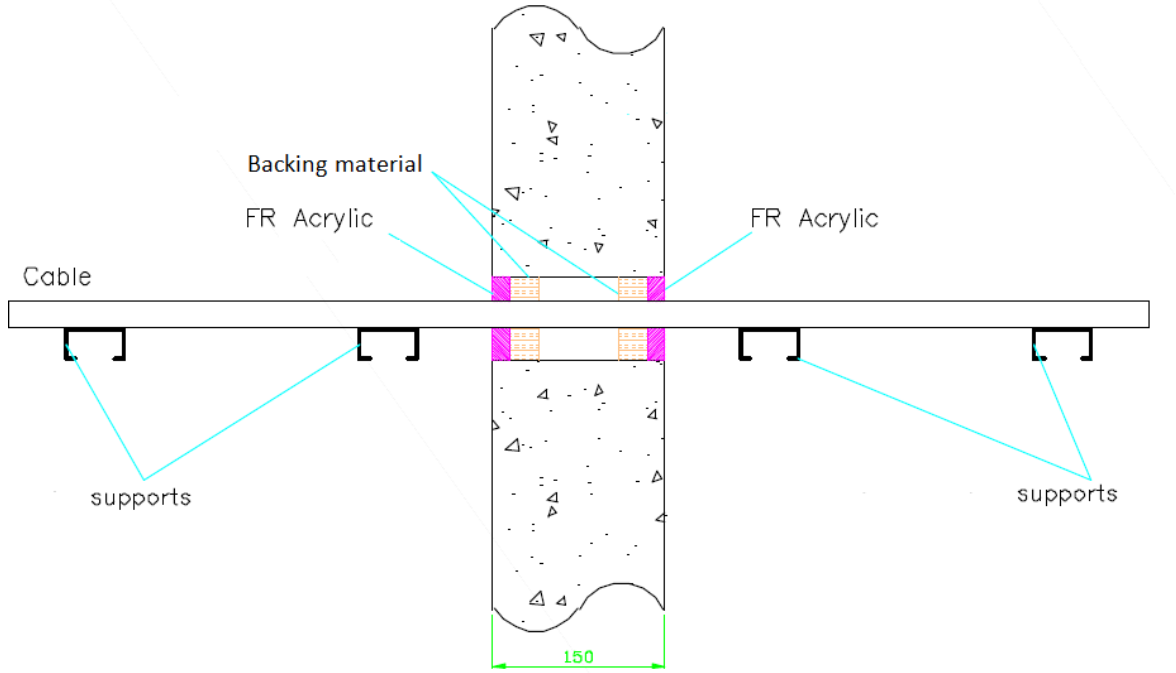


Table 9 Single cables protected with FR Acrylic sealant applied at both sides of the wall backed with stone wool or mineral fibre insulation

Services	Sealant depth	Backing (minimum)	Insulation	FRL
Blank seals	15 mm	25 mm Stonewool 35 kg/m³	None	-/240/240
Electric cables up to 21 mm diameter, single or in a bundle				-/240/120
Electric cables 22-80 mm diameter, single or in a bundle				-/120/60
Blank seals	25 mm	48 mm Protecta Mineral Fibre BIO		-/240/240
Electric cables up to 80 mm diameter, single or in a bundle				-/240/60
Cable up to 21 mm diameter, single or in a bundle up to 100 mm diameter				-/240/240

6.3.3 Single side penetration seal with metallic (and composite) pipes

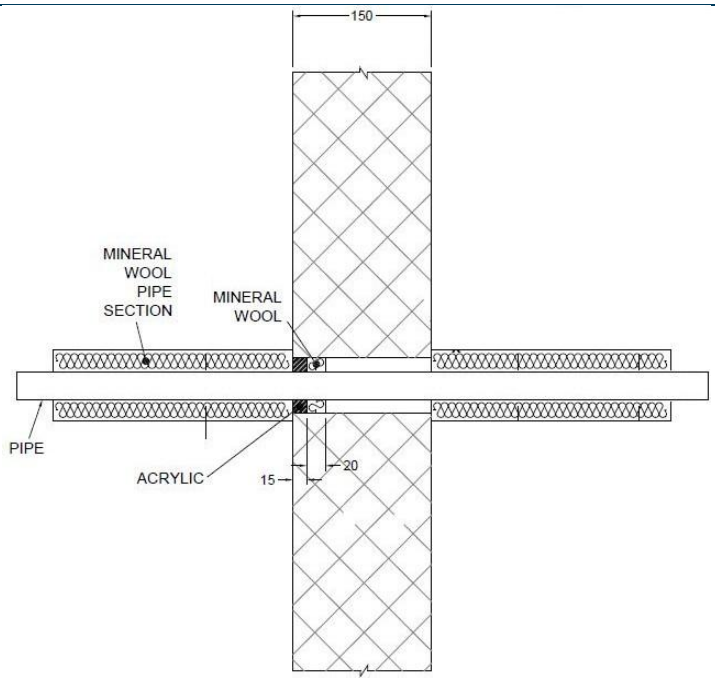
Penetration seal: LI (Local Interrupted) of minimum length stated below or CI (Continuous Interrupted) insulated metallic and composite pipes (single) fitted at any position within the aperture, with 15 mm deep Protecta FR Acrylic to either side of the wall (or at any position between), backed with 20 mm deep minimum 40 kg/m³ stone wool insulation.
Construction details:


Table 10 Copper pipes and Alupex composite pipes protected with FR Acrylic sealant applied at one side and wrapped with insulation

Services	Seal width around pipe	Insulation (minimum)	FRL
Copper or steel pipe up to 54 mm diameter/0.9-14.2 mm wall	8-9 mm	1000 mm length 20 mm Stone wool insulation 80 kg/m³	-240/180 C/U
Copper or steel pipe up to 12 mm diameter/0.9-5 mm wall	8 mm		-/240/240 C/U
Alupex composite pipe 75 mm diameter/7.5 mm wall	30 mm	25 mm Protecta Mineral Fibre BIO insulation, 600 mm long (min.)	-/120/120 C/U

Table 11 Mild or stainless-steel pipes (40 mm-219 mm) protected with Protecta FR Acrylic sealant applied at one side and wrapped with insulation at both sides

Pipe Diameter* (mm)	Wall thickness* (mm)	Seal width around pipe (mm)	Insulation	FRL
Mild or stainless steel pipe				
40	1.5-14.2	6-18	1000 mm length of 20 mm Stone wool insulation 80 kg/m³	-/240/240 C/U
40	1.5-14.2			-/180/90 C/U

Pipe Diameter* (mm)	Wall thickness* (mm)	Seal width around pipe (mm)	Insulation	FRL
50	1.7-14.2		1000 mm length of 30 mm Stone wool insulation 80 kg/m³	
60	1.9-14.2			
75	2.2-14.2			
90	2.5-14.2			
100	2.7-14.2			
115	3-14.2			
140	3.5-14.2			
165	3.9-14.2			
180	4.2-14.2			
200	4.6-14.2			
219	5.0-14.2			
*Typical pipe diameters shown, see below graph for intermediate sizes				

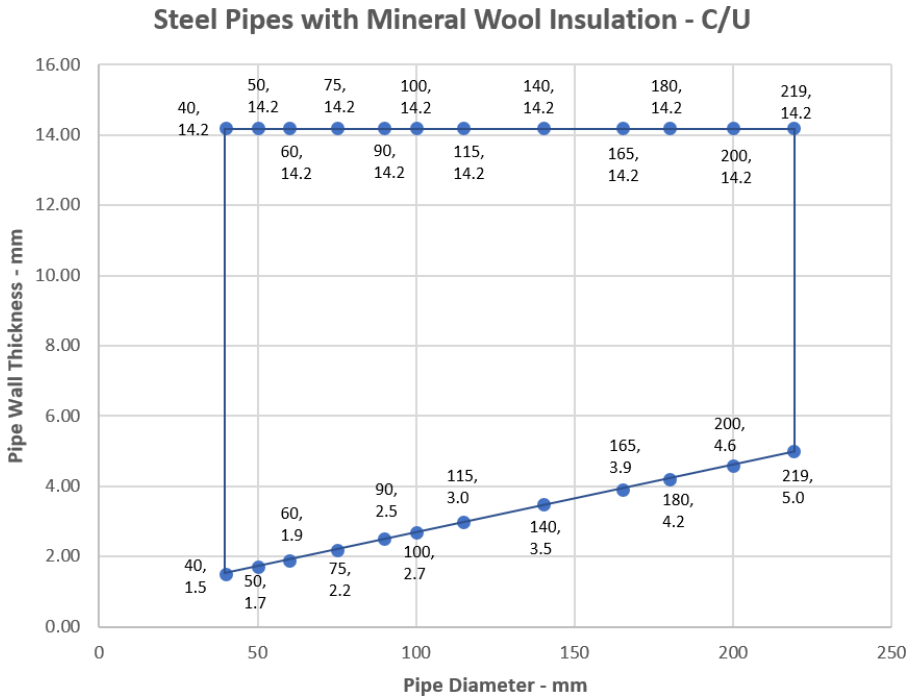


Figure 1 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

6.3.4 Single side penetration seal with metallic (and composite) pipes

Penetration seal:

LI (Local Interrupted) of minimum length stated below or CI (Continuous Interrupted) insulated metallic and composite pipes (single) fitted at any position within the aperture, with 25 mm deep Protecta FR Acrylic to either side of the wall (or at any position between), backed with 25 mm deep minimum 40 kg/m^3 stone wool insulation.

Construction details:

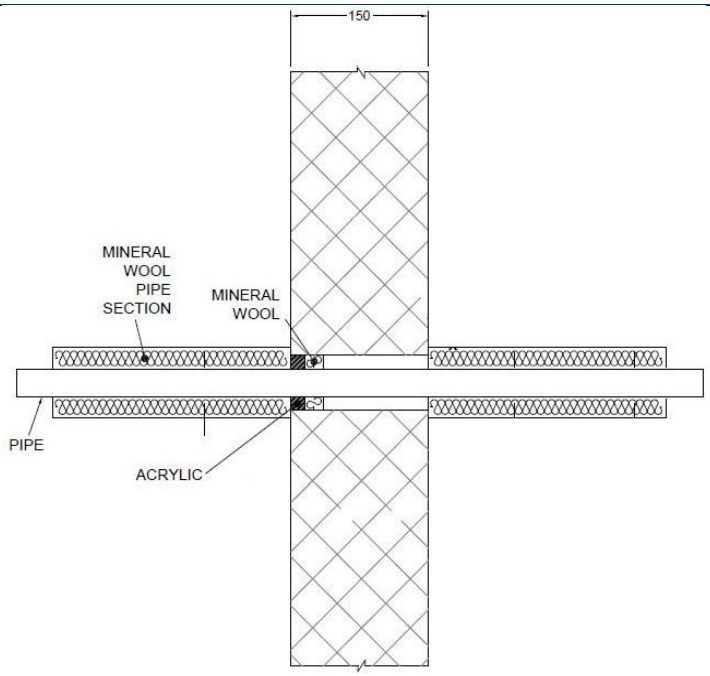


Table 12 Copper pipes and Alupex composite pipes protected with FR Acrylic sealant applied at one side and wrapped with insulation at both sides

Services	Maximum Seal size	Insulation (minimum)	FRL
Copper or steel pipe up to 54 mm diameter/0.9-14.2 mm wall	300 mm × 300 mm	1000 mm length 20 mm Stone wool insulation 80 kg/m^3	-/240/60 C/U
Alupex composite pipe 75 mm diameter/7.5 mm wall		25 mm Protecta Mineral Fibre BIO	

Table 13 Mild or stainless-steel pipes (40 mm-219 mm) protected with Protecta FR Acrylic sealant applied at one side and wrapped with insulation at both sides

Pipe Diameter (mm)	Wall Thickness (mm)	Maximum seal size (mm)	Insulation (min)	FRL
Mild or stainless steel pipes				
40	1.5-14.2	300 mm × 300 mm	1000 mm length of 20 mm Stone wool insulation 80 kg/m³	-/240/60 C/U
40	1.5-14.2		1000 mm length of 30 mm Stone wool insulation 80 kg/m³	
50	1.7-14.2			

Pipe Diameter (mm)	Wall Thickness (mm)	Maximum seal size (mm)	Insulation (min)	FRL
60	1.9-14.2			
75	2.2-14.2			
90	2.5-14.2			
100	2.7-14.2			
115	3.0-14.2			
140	3.5-14.2			
165	3.9-14.2			
180	4.2-14.2			
200	4.6-14.2			
219	5.0-14.2			
*Typical pipe diameters shown, see below graph for intermediate sizes				

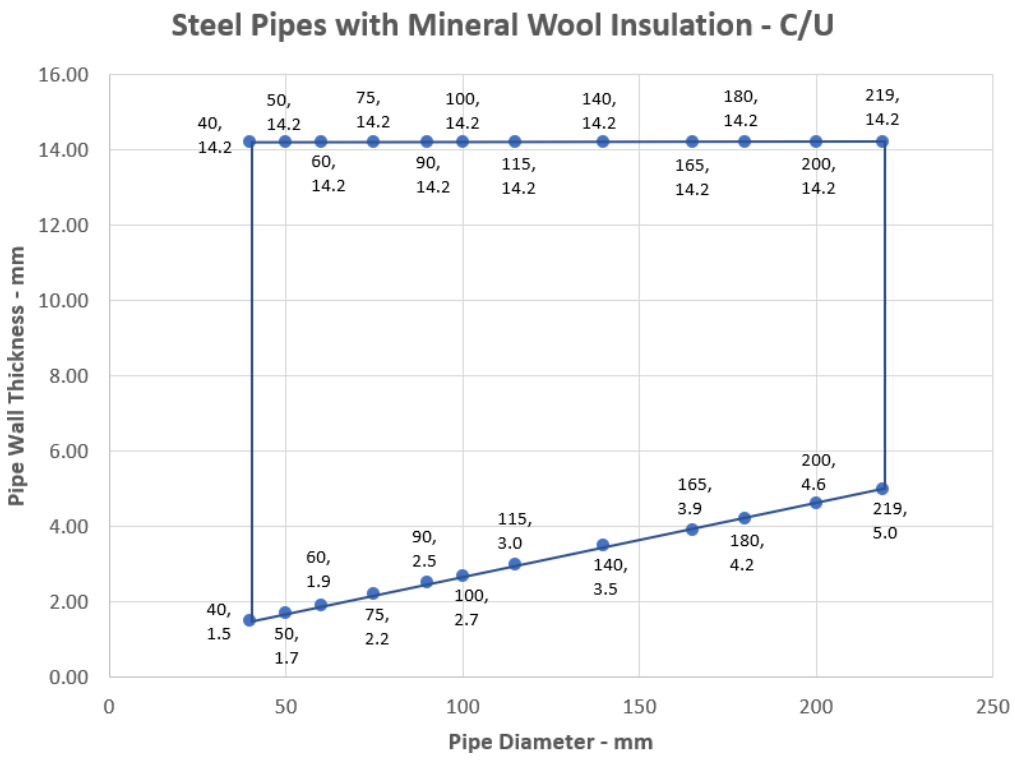


Figure 2 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

6.3.5 Single side penetration seal with metallic pipes

Penetration seal: CS (Continuous Sustained) insulated metallic (single), with 25 mm deep Protecta FR Acrylic to either side of the wall (or at any position between), backed with 48 mm deep Protecta Mineral Fibre BIO insulation. Minimum annular space 10 mm and minimum separation between penetrations seals of 30 mm. Maximum seal size 300 mm × 300 mm or Ø 504 mm.

Construction details:

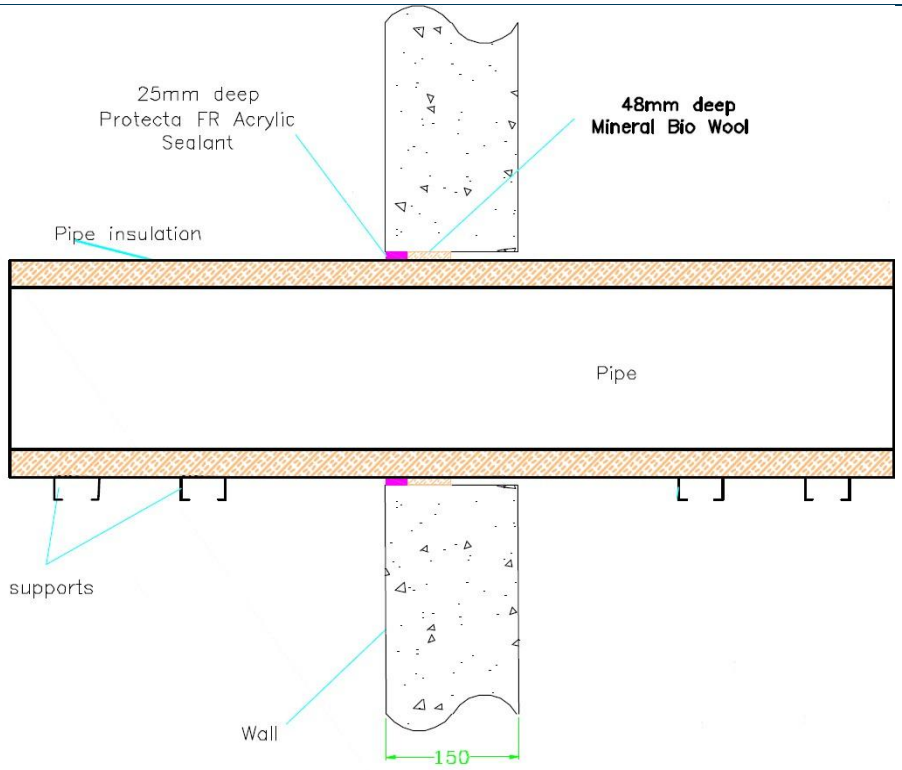


Table 14 Metallic pipes (pipe diameter 40-324 mm) protected with FR Acrylic sealant applied at one side and wrapped with stone wool

Pipe Diameter* (mm)	Wall Thickness* (mm)	Insulation	FRL
Mild or stainless steel pipes kg/m³			
40	1.0-14.2	20 mm thick stone, mineral wool 80 kg/m³	-/240/240 C/U
40	1-14.2	30-80 mm thick stone, mineral wool 80 kg/m³	-/180/180 C/U
50	1.2-14.2		
60	1.4-14.2		
75	1.6-14.2		
90	1.9-14.2		
100	2.1-14.2		
115	2.4-14.2		
140	2.9-14.2		
165	3.4-14.2		
180	3.6-14.2		

Pipe Diameter* (mm)	Wall Thickness* (mm)	Insulation	FRL
200	4.0-12.2		
219	4.3-14.2		
250	5.0-14.2		
300	5.9-14.2		
324	6.35-14.2		
*Typical pipe diameters shown, see below graph for intermediate sizes			

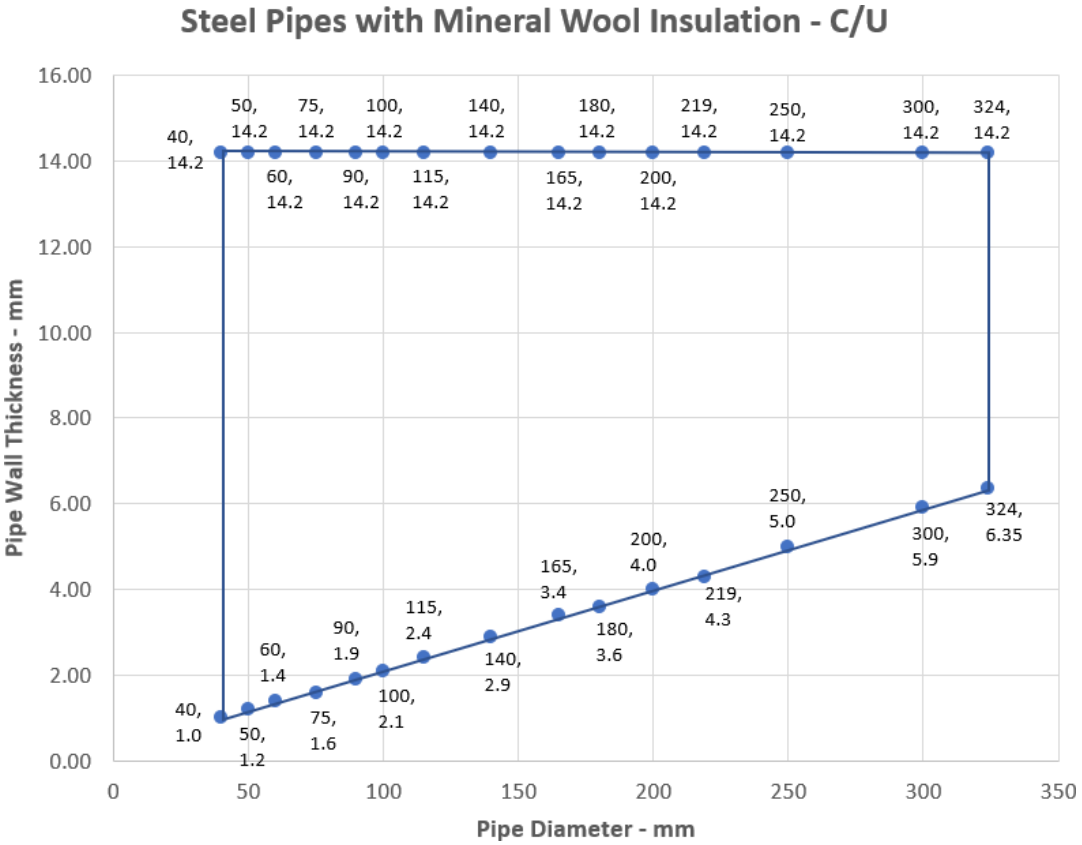


Figure 3 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

6.3.6 Double side penetration seal with metallic pipes

Penetration seal:

1000 mm (min.) LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic pipes (single) fitted at any position within the aperture, with 15 mm deep Protecta FR Acrylic to both sides of the wall, backed with 20 or 30 mm deep minimum 40 kg/m³ stone wool insulation.

Construction details:

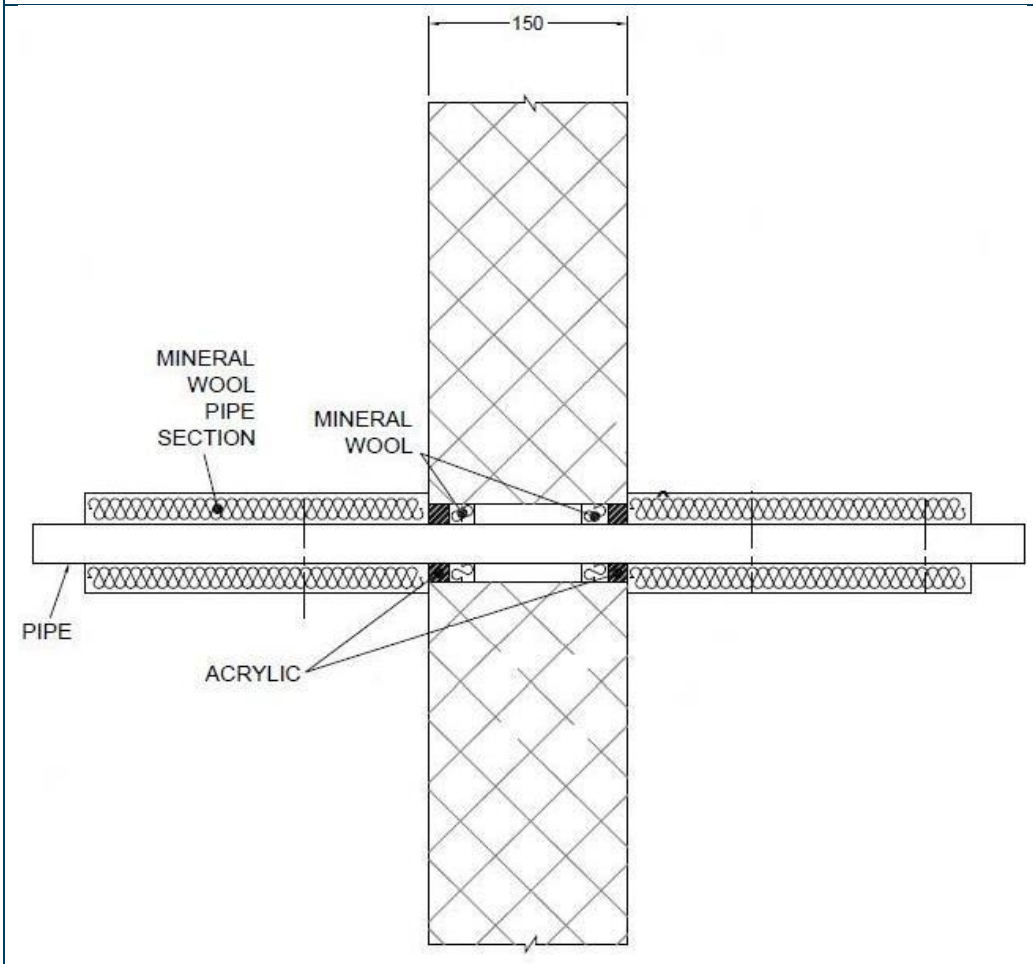


Table 15 Metallic pipes (pipe diameter 40-219 mm) protected with FR Acrylic sealant applied at to both sides and wrapped with stone wool

Pipe Diameter* (mm)	Wall Thickness* (mm)	Maximum seal size	Insulation (min)	FRL
Mild or stainless steel pipes				
40	1.5-14.2	300 mm × 300 mm	20 mm Stone wool insulation 80 kg/m³	-/240/240 C/U
40	1.5-14.2		30 mm Stone wool insulation 80 kg/m³	-/240/120 C/U
50	1.7-14.2			
60	1.9-14.2			
75	2.2-14.2			
90	2.5-14.2			

Pipe Diameter* (mm)	Wall Thickness* (mm)	Maximum seal size	Insulation (min)	FRL
100	2.7-14.2			
115	3.0-14.2			
140	3.5-14.2			
165	3.9-14.2			
180	4.2-14.2			
200	4.6-14.2			
219	5.0-14.2			
Note: Integrity rating achieved will not be affected if insulation on the above pipes is removed. * Typical pipe diameters shown, see below graph for intermediate sizes				

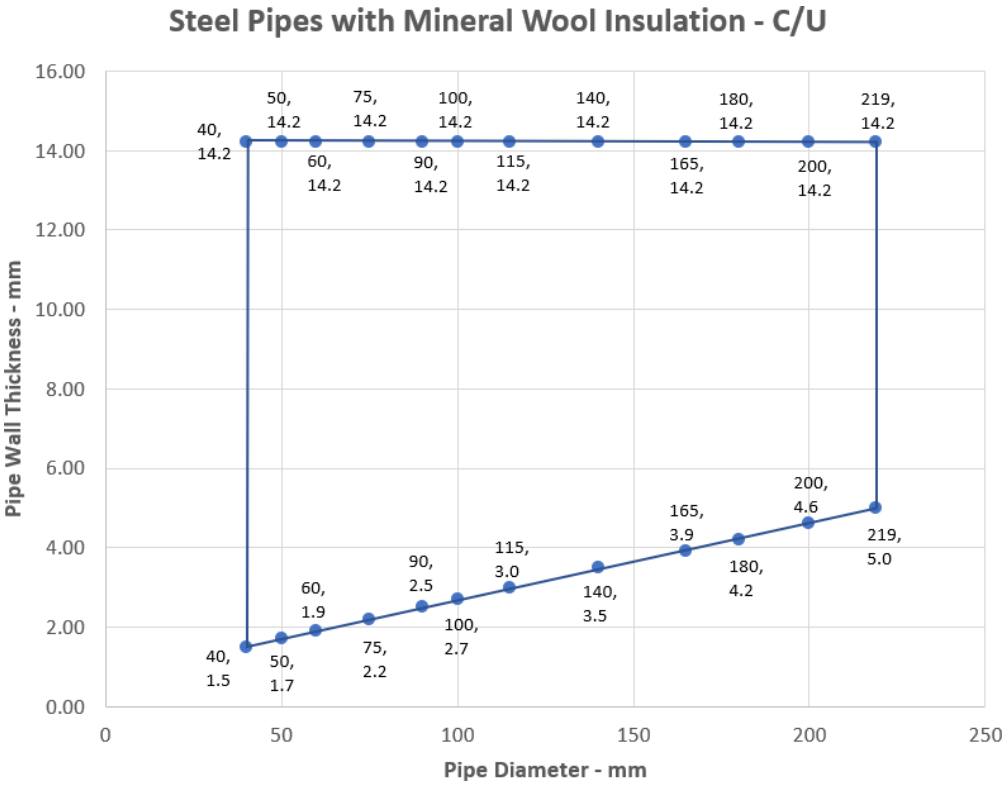


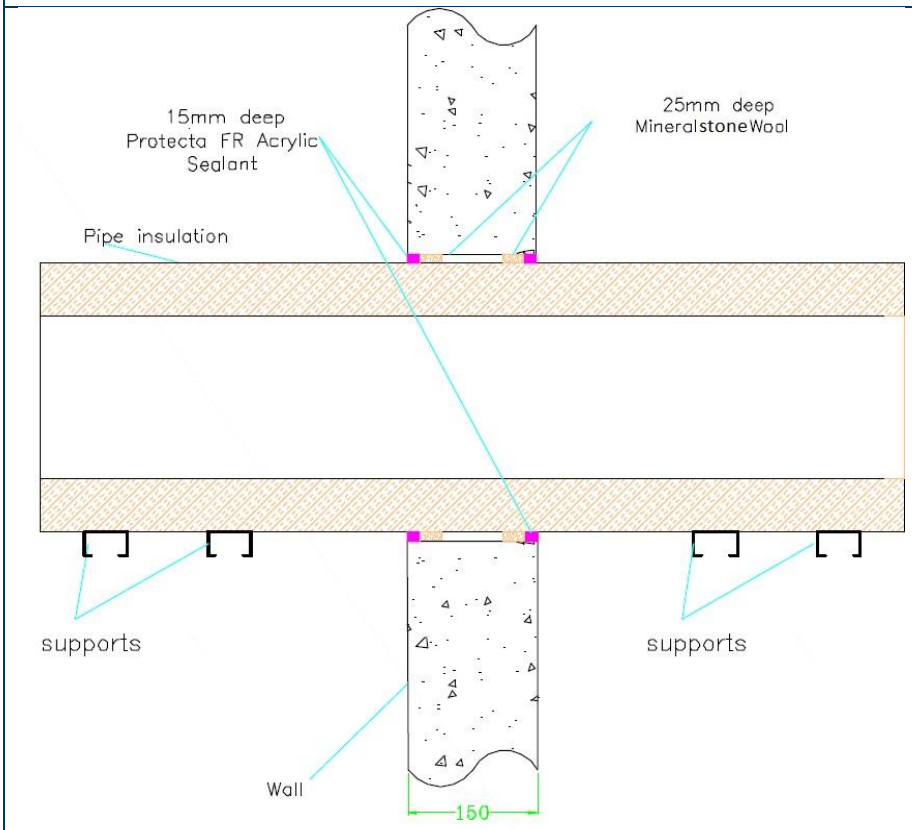
Figure 4 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

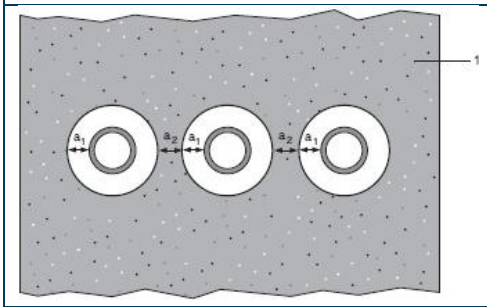
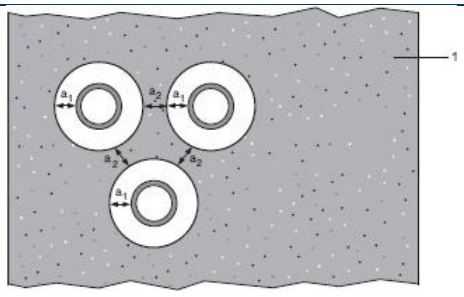
6.3.7 Double side penetration seal with metallic pipes

Penetration seal:

CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture, with 15 mm Protecta FR Acrylic to both sides of the wall, backed with 25 mm deep stone wool insulation minimum 35 kg/m^3. Minimum annular space 10 mm (A1) and minimum separation between penetration seals 30 mm (A2). Maximum seal size 300 × 300 mm / Ø 504 mm

Construction details:



Configuration 1	Configuration 2
	

Key

1 Supporting construction

a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

Table 16 Metallic pipes (pipe diameter 40-324 mm) protected with 15 mm FR Acrylic sealant applied at to both sides and wrapped with mineral wool insulation

Pipe Diameter* (mm)	Wall Thickness* (mm)	Maximum seal size	Insulation (min)	FRL
40	1.0-14.2	300 mm × 300 mm	20 mm Stone wool insulation 80 kg/m³	-/240/240 C/U
40	1.0-14.2		30 – 80 mm Stone wool insulation 80 kg/m³	
50	1.2-14.2			
60	1.4-14.2			
75	1.6-14.2			
90	1.9-14.2			
100	2.1-14.2			
115	2.4-14.2			
140	2.9-14.2			
165	3.4-14.2			
180	3.6-14.2			
200	4.0-14.2			
219	4.3-14.2			
250	5.0-14.2			
300	5.9-14.2			
324	6.35-14.2			
*Typical pipe diameters shown, see below graph for intermediate sizes				

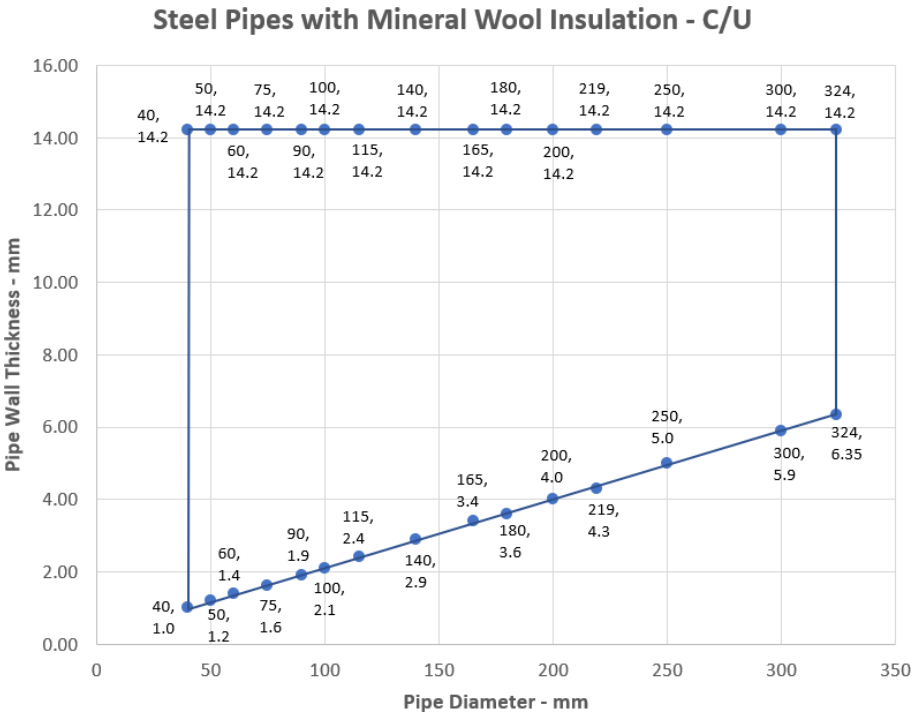
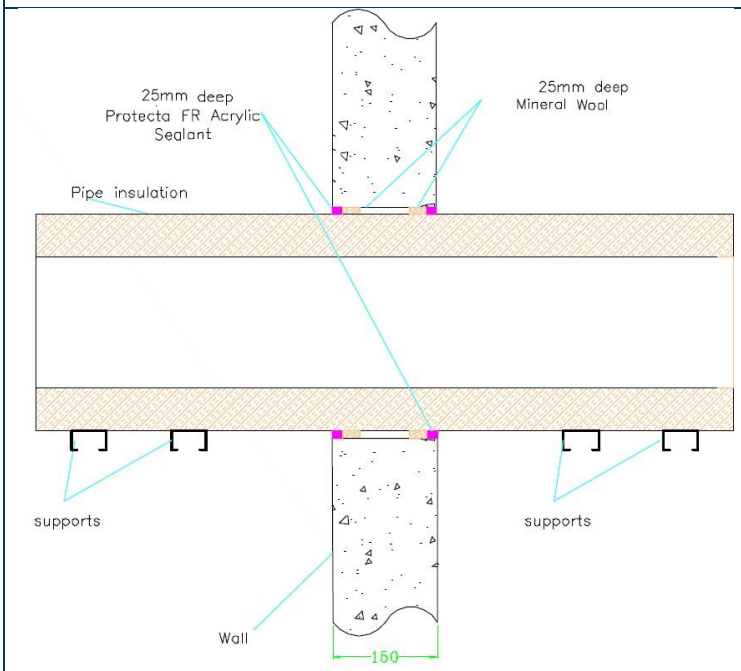


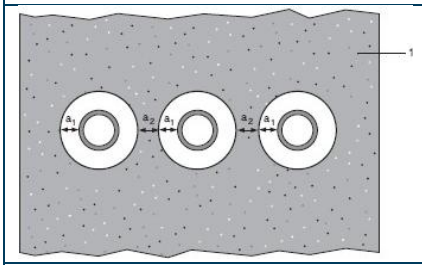
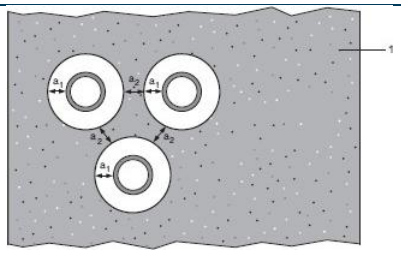
Figure 5 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

6.3.8 Double side penetration seal metallic pipes with combustible insulation

Penetration seal: CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture, with 25 mm Protecta FR Acrylic to both sides of the wall, backed with 25 mm deep stone wool insulation minimum 35 kg/m3. Minimum annular space 10 mm (A1) and minimum separation between penetration seals 30 mm (A2). Maximum seal size 300 × 300 mm / Ø 300 mm

Construction details:



Configuration 1	Configuration 2
	

Key
1 Supporting construction
a1 Pipe / top edge of seal separation
a2 Pipe / side edge of seal separation
a3 Pipe / pipe separation

Table 17 Double side penetration seal with mild or stainless steel pipes with 15 mm FR Acrylic sealant applied at both sides and wrapped with combustible insulation

Pipe Diameter (mm)	Wall Thickness (mm)	Maximum seal size	Insulation (min)	FRL
22	2.0-11	300 mm × 300 mm	13 mm thick Elastomeric insulation minimum class B-s3,d0	-/240/180 C/U
22-114	2.0-14.2		13-25 mm thick Elastomeric insulation minimum class B-s3,d0	-/120/90 C/U

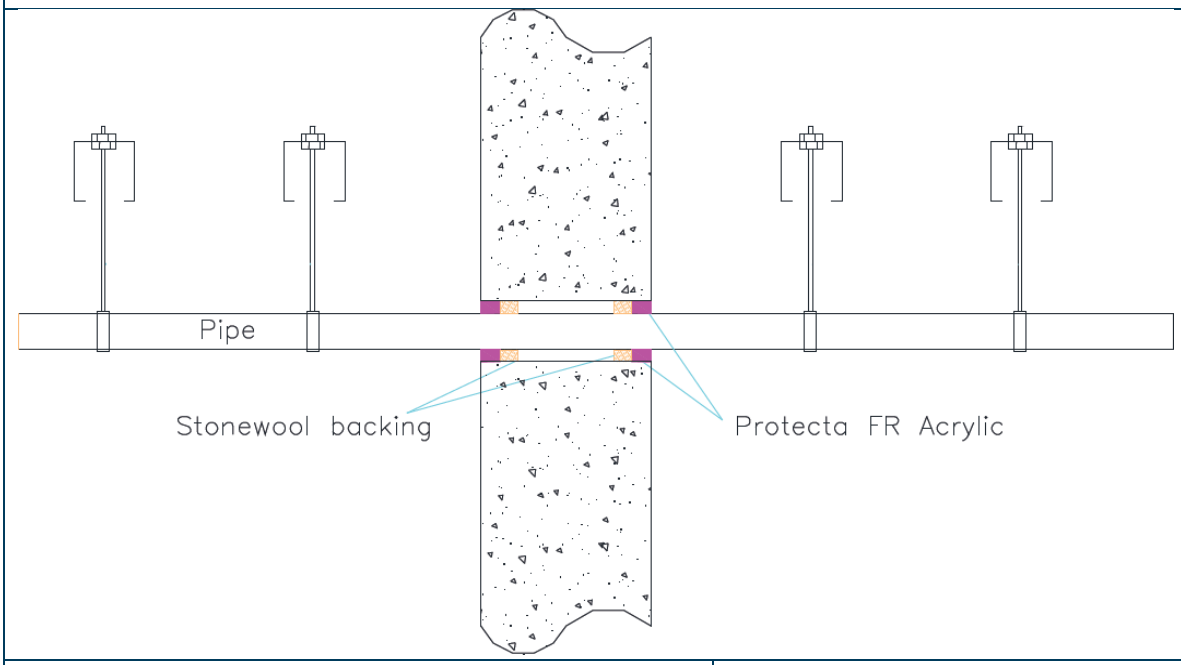
Pipe Diameter (mm)	Wall Thickness (mm)	Maximum seal size	Insulation (min)	FRL
22-114	2.0-14.2		25-50 mm thick Elastomeric insulation minimum class B-s3,d0	-/60/60 C/U

6.3.9 Double side penetration seal with plastic pipes

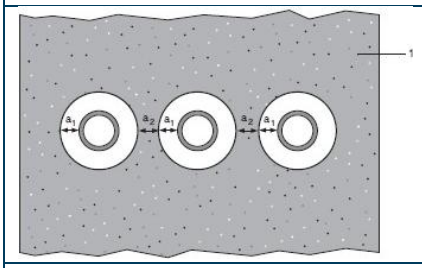
Penetration seal:

CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture, with 25 m Protecta FR Acrylic to both sides of the wall, backed with 25 mm deep stone wool insulation minimum 35 kg/m^3. Minimum annular space 10 mm (A1) and minimum separation between penetration seals 30 mm (A2). Maximum seal size 300 × 300 mm / Ø 300 mm

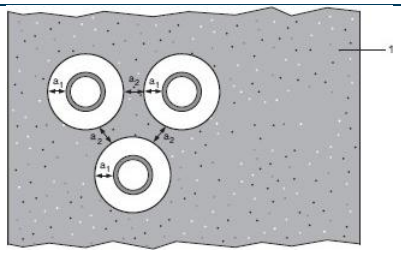
Construction details:



Configuration 1



Configuration 2



Key
1 Supporting construction
a1 Pipe / top edge of seal separation
a2 Pipe / side edge of seal separation
a3 Pipe / pipe separation

Table 18 Plastic pipes protected with Protecta FR Acrylic installed at both sides of the wall

Pipe material	Size	FRL
PVC-U pipe	6-32 mm diameter/1.0-2.4 mm wall	-/240/240 U/C
PP pipe	32 mm diameter/2.0-4.4 mm wall	-/180/180 C/U
	12-32 mm diameter/1.8-4.4 mm wall	-/240/240 C/U
PE pipe	20-32 mm diameter/2.0 mm wall	-/240/240 C/U
	20-32 mm diameter/2.0-4.4 mm wall	-/120/120 C/U

6.4 Flexible and rigid wall constructions according to 4.1.1 with wall thickness of minimum 75 mm

6.4.1 Double side penetration seal with cables

Penetration seal:

Cables (single or bundles up to Ø 100 mm) and pipes fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall. Minimum annular space 10 mm (A1) and minimum separation between penetration seals 30 mm (A2), maximum seal size 150 × 150 mm / 344 mm diameter (when incorporating a pipe of seal diameter -20 mm).

Construction details:

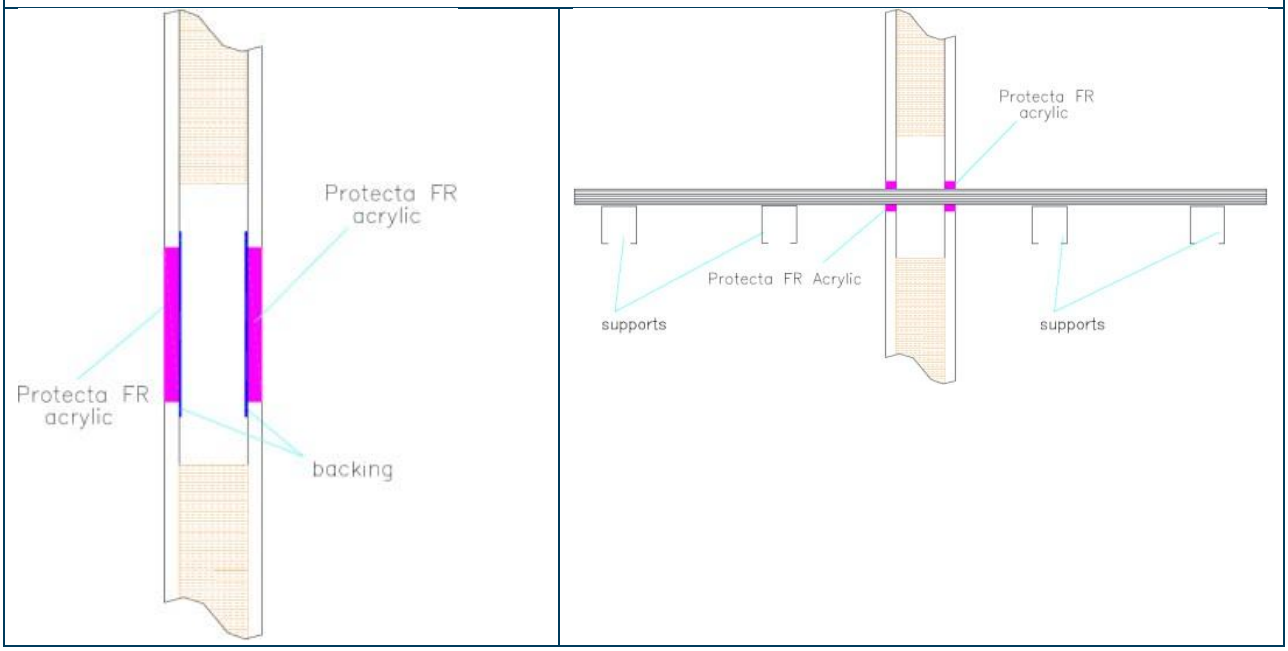


Table 19 Services in a 75 mm thick flexible and rigid wall protected with Protecta FR acrylic applied at both sides

Services	Sealant depth	Backing	FRL
None (blank)	12.5 mm	Any material	-/60/60
Cables up to Ø 21 mm single		None	-/60/45
Cables up to Ø 21 mm in bundles up to Ø 100 mm			-/45/30

Services	Sealant depth	Backing	FRL
Mild or stainless steel pipe			
4 mm diameter /0.7-2.0 mm wall	12.5 mm	None	-/60/45 C/U
5-22 mm diameter /0.7-11 mm wall*			-/60/30 C/U
Mild or stainless steel pipe with minimum 80 kg/m^3 density stone wool insulation Continuous Sustained (CS)			
40 mm diameter /1-14.2 mm wall, 20 mm insulation	12.5 mm	None	-/60/45 C/U
40-324 mm diameter /1.0-14.2 mm wall, 30 mm insulation*			
PVC-U pipe			
Ø 6-32 mm /1.0-1.8 mm wall, with bundle of cables up to 21 mm diameter*	12.5 mm	None	-/60/45 U/C
PP pipe			
Ø 20 mm /2.3 mm wall	12.5 mm	None	-/45/45 U/C
Ø 21-32 mm /2.3-4.4 mm wall*			-/30/30 U/C
Ø 21-32 mm /2.3-4.4 mm wall, with bundle of cables up to 21 mm diameter*			-/45/30 U/C
PE pipe			
Ø 20 mm /2.0 mm wall	12.5 mm	None	-/45/45 U/C
Ø 21-32 mm /2.0-3.0 mm wall*			-/30/30 U/C
Ø 21-32 mm /2.0-3.0 mm wall, with bundle of cables up to 21 mm* diameter			-/45/30 U/C
*See below graphs for interpolated pipe sizes			

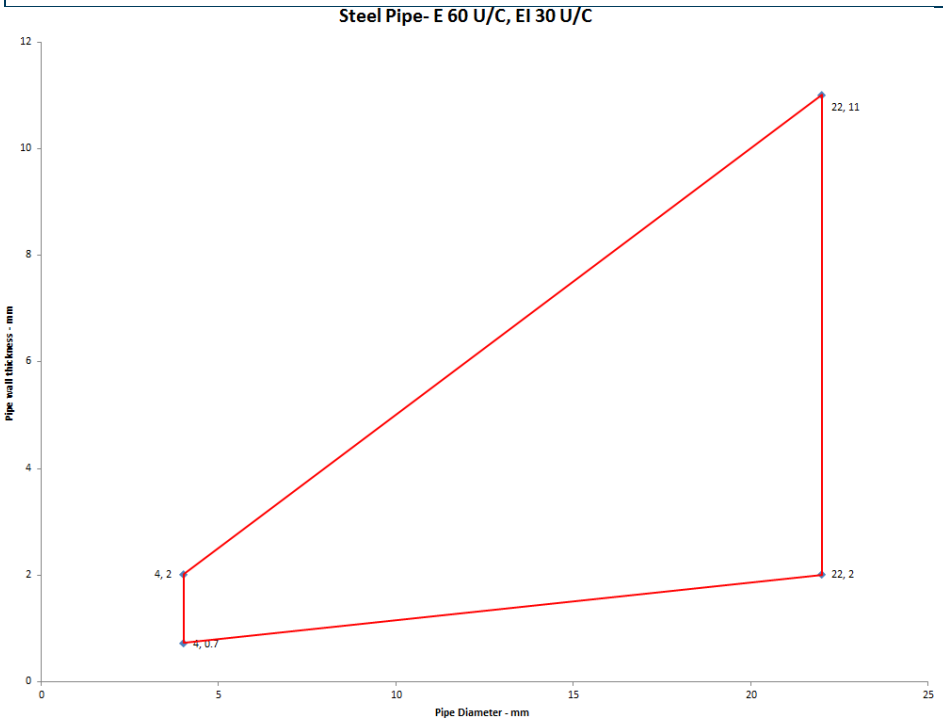


Figure 6 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

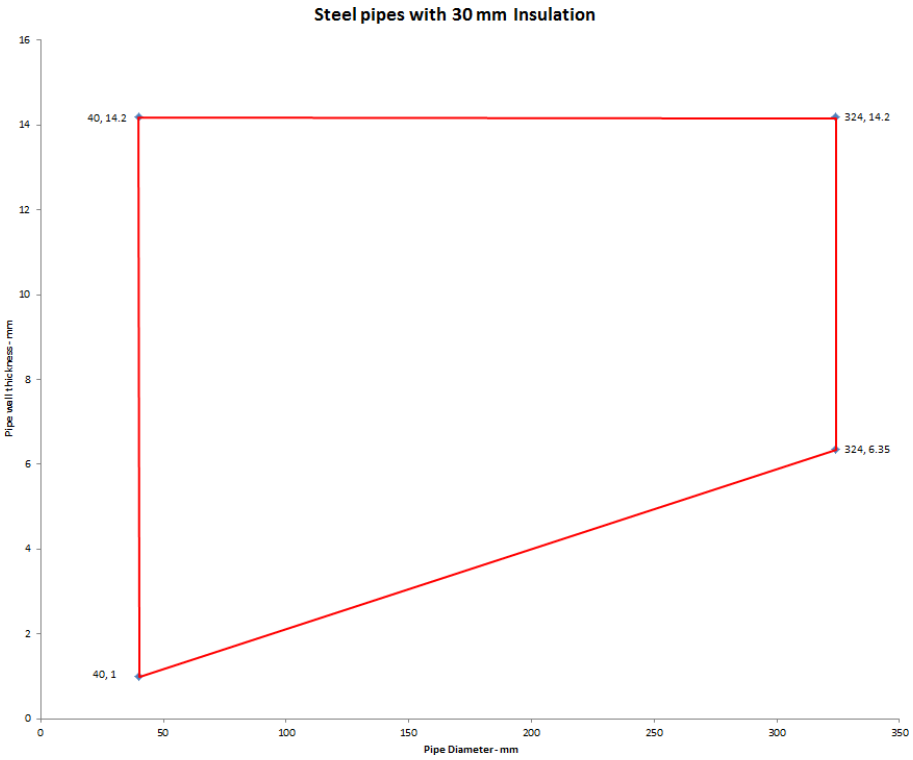


Figure 7 Intermediate pipe wall thicknesses for mild or stainless steel pipe diameters

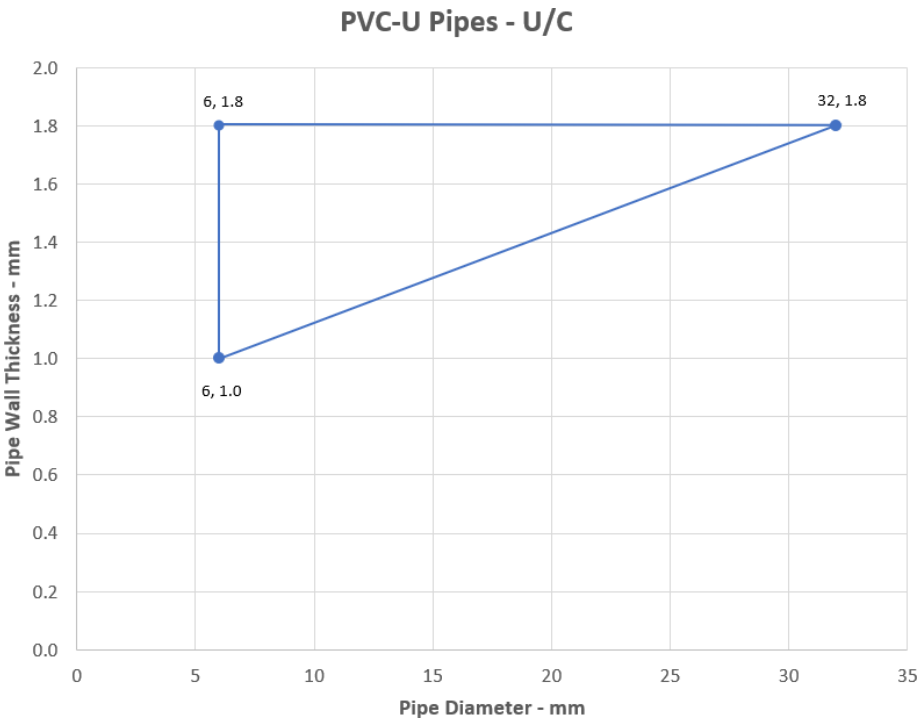


Figure 8Intermediate pipe wall thicknesses for PVC-U pipe diameters

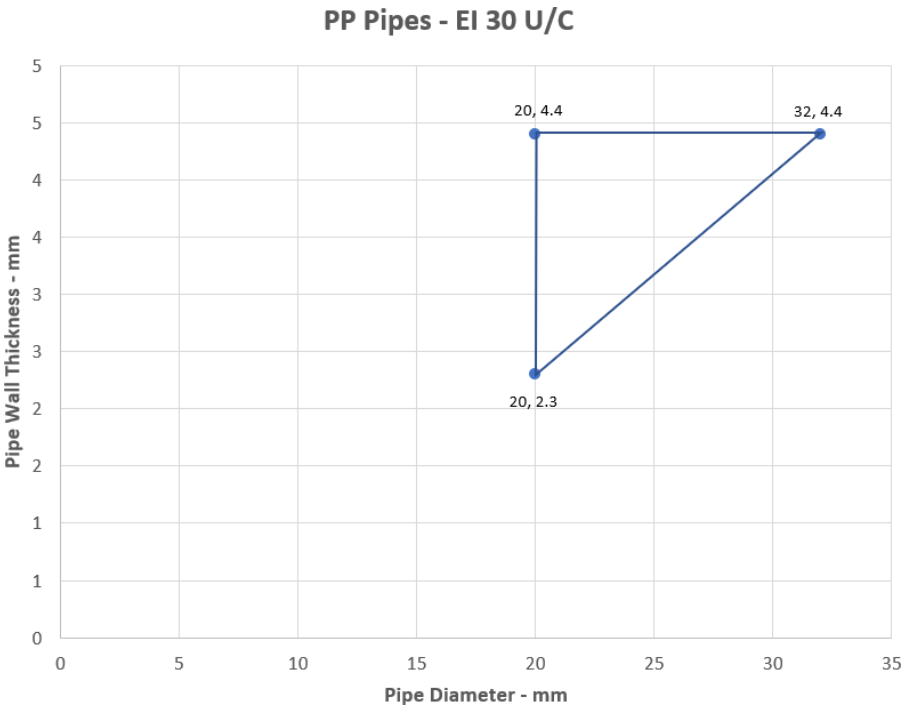


Figure 9 Intermediate pipe wall thicknesses for PP pipe diameters

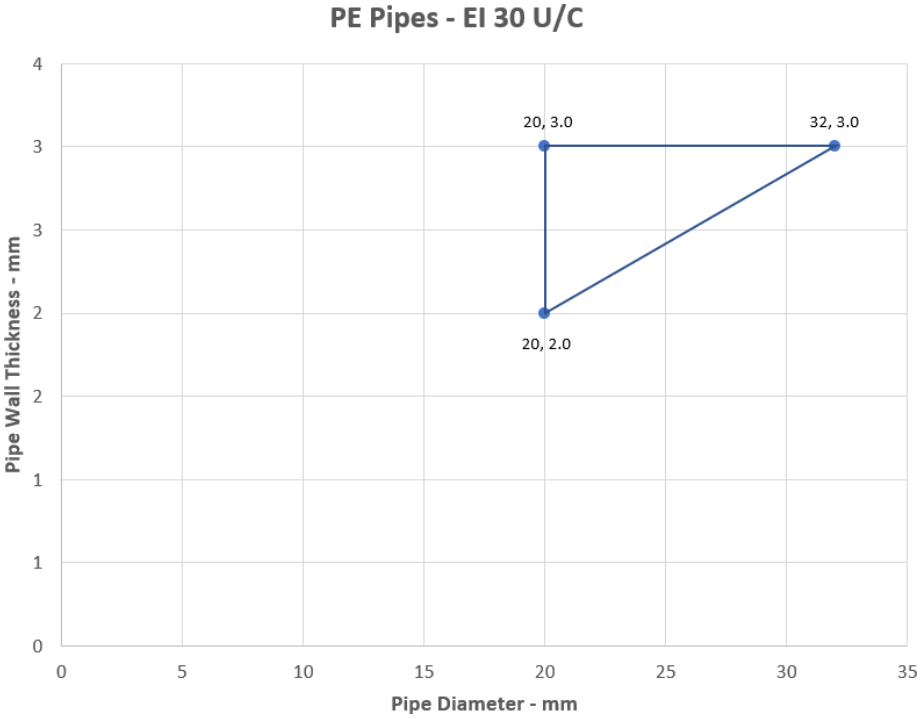


Figure 10 Intermediate pipe wall thicknesses for PE pipe diameters

6.5 Flexible and rigid wall constructions according to 4.1.1 with wall thickness of minimum 100 mm

6.5.1 Double side penetration seal with cables

Penetration seal:
Cables (single or bundles up to Ø 100 mm and conduits fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall.

Construction details:

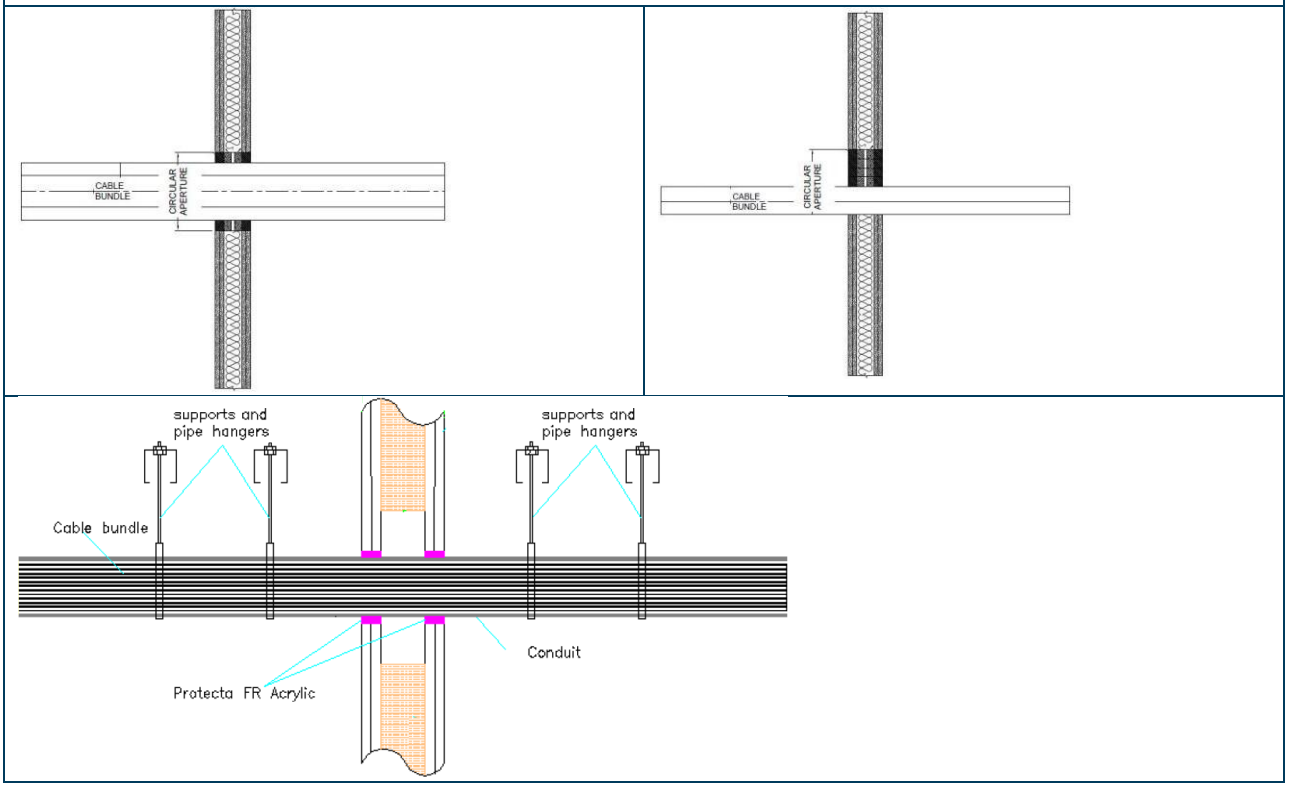


Table 20 Cables and cable bundles penetrating a 100 mm thick flexible and rigid wall protected with Protecta FR acrylic applied at both sides

Services	Sealant depth	Backing	Maximum aperture	FRL
None (blank)	12.5 mm	Stone wool 20 mm deep 35-140 kg/m^3	300 × 300 mm*	-/120/120
Cables up to Ø 21 mm, single or in bundles up to Ø 50 mm	12.5 mm	Stone wool 12.5 mm deep min. 33 kg/m^3		-/120/90
Electrical cables up to Ø 21 mm, single or in bundles up to Ø 100 mm	25 mm	Stone wool 20 mm deep min. 40 kg/m^3		-/120/120
Electrical cables up to Ø 80 mm, single or in bundles up to Ø 100 mm		25 mm Protecta Mineral Fibre BIO		-/120/60

Services	Sealant depth	Backing	Maximum aperture	FRL
Single 'E cable' - 1 × 185 mm^2 core HD603.3 electrical cable with PVC insulation, PVC sheath and 23-27 mm diameter	12.5 mm	Stone wool 20 mm deep min. 140 kg/m^3		-/120/60
*Or 30 mm wide × 3000 mm high for cables up to Ø 21 mm				

Table 21 Cable conduits fully or partially filled with cables up to 21 mm diameter penetrating a 100 mm thick flexible and rigid wall protected with Protecta FR acrylic applied at both sides

Services	Sealant depth	Backing	Maximum annular space	FRL
PVC-U pipe				
Maximum diameter 40 mm, wall thickness 1.0-1.9 mm for PVC pipes, fully or partially filled conduits with cables up to 21 mm diameter	25 mm	None	30 mm	-/120/120 U/C
PE pipe				
Maximum diameter 40 mm, wall thickness 2.0-3.0 mm for PE pipes, fully or partially filled conduits with cables up to 21 mm diameter	25 mm	None	30 mm	-/90/90 U/C
PP pipe				
Maximum diameter 40 mm, wall thickness 1.8-2.2 mm for PVC pipes, fully or partially filled conduits with cables up to 21 mm diameter	25 mm	None	30 mm	-/90/90 U/C

6.5.2 Double side penetration seal with metallic pipes

Penetration seal:

CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall, backed with stone wool insulation or 'Protecta Mineral Fibre BIO', 300 × 300 mm maximum seal size.

Construction details:

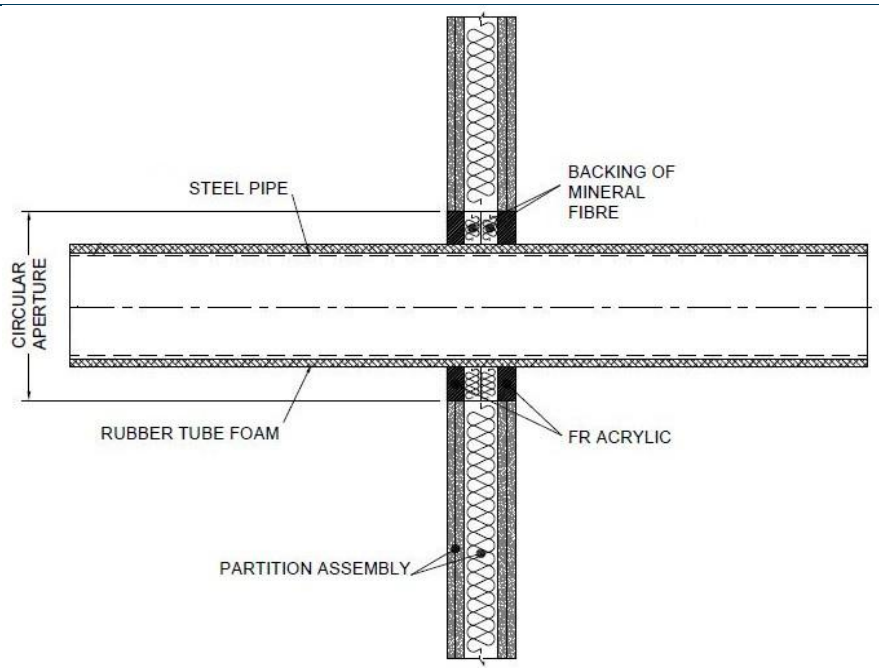


Table 22 Metallic pipes penetrating a 100 mm thick flexible and rigid wall protected with Protecta FR Acrylic applied at both sides

Services	Sealant depth	Backing (minimum)	Insulation	FRL
Mild or stainless steel pipes				
22 mm diameter/3-10 mm wall	25 mm	Stone wool 25 mm deep 35 kg/m^3	None	-/120/120 C/C
Maximum 165 mm diameter/ wall*	12.5 mm	12.5 mm stone wool 33 kg/m^3	9 mm Elastomeric insulation minimum class D-s3, d0	-/90/45 C/U
			13 -25 mm Elastomeric insulation minimum class D-s3, d0	-/60/60 C/U
40 mm diameter/1-14.2 mm wall*	12.5 mm	20 mm Stone wool 40 kg/m^3	13 -19 mm Elastomeric insulation minimum class B-s3, d0	-/120/120 C/C
40 mm diameter/1-14.2 mm wall*	25 mm	25 mm Protecta Mineral Fibre BIO		-/120/60 C/C
50 mm diameter/1.3-14.2 mm wall*				
60 mm diameter/1.6-14.2 mm wall*				

Services	Sealant depth	Backing (minimum)	Insulation	FRL
75 mm diameter/2-14.2 mm wall*				
90 mm diameter/2.4-14.2 mm wall*				
100 mm diameter/2.7-14.2 mm wall*				
115 mm diameter/3.1-14.2 mm wall*				
140 mm diameter/3.8-14.2 mm wall*				
165 mm diameter/4.5-14.2 mm wall*				
*Typical pipe diameters shown, see below graph for intermediate sizes				

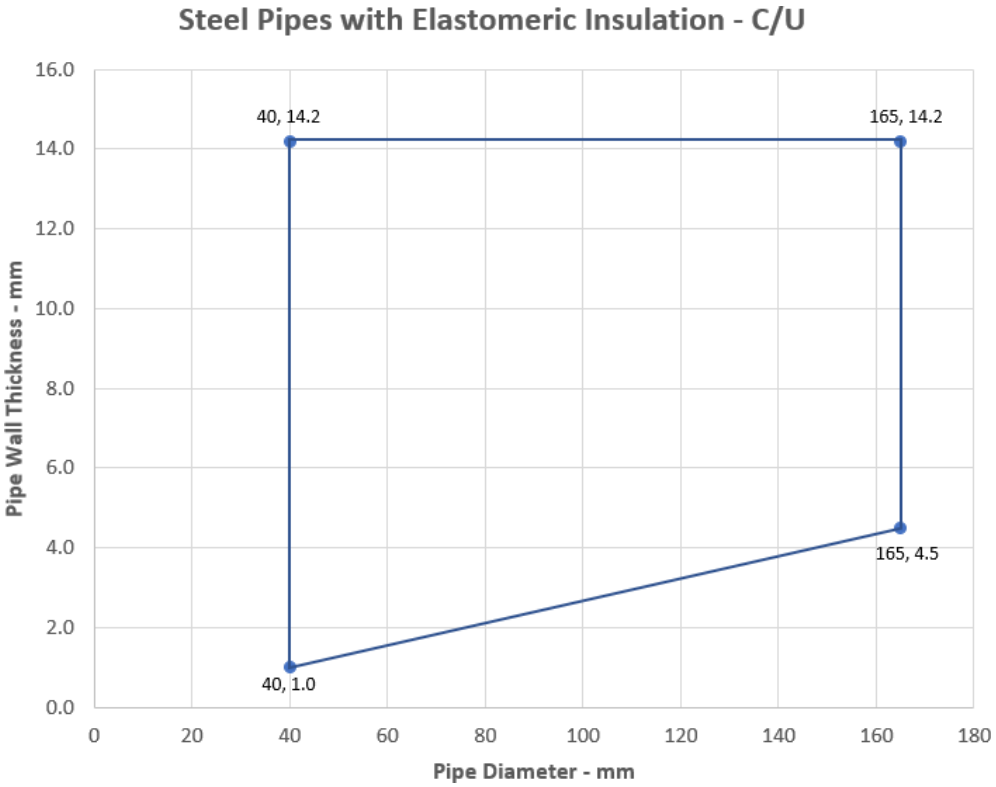


Figure 11 Intermediate pipe wall thicknesses for steel pipe diameters

Table 23 Metallic pipes penetrating a 100 mm thick flexible and rigid wall protected with Protecta FR Acrylic applied at both sides

Services	Sealant depth	Backing	Insulation	FRL
Copper or steel pipe				
12 mm diameter/1-6 mm wall	25 mm	25 mm Protecta Mineral Fibre BIO	9 mm Elastomeric insulation minimum class B-s3,d0	-/120/120 C/C
12-54 mm diameter/1-14.2 mm wall*			9-13 mm Elastomeric insulation minimum class B-s3,d0	-/120/60 C/C

Services	Sealant depth	Backing	Insulation	FRL
12-54 mm diameter/1-14.2 mm wall*			13-25 mm Elastomeric insulation minimum class B-s3,d0	-/60/60 C/C
Alupex Composite Pipe				
16 mm diameter/ wall*	12.5 mm	12.5 mm stone wool 33 kg/m^3	9 mm Elastomeric insulation minimum class D-s3, d0	-/120/90 C/C
Maximum 75 mm diameter/ wall*				-/60/45 C/C
			13-24 mm Elastomeric insulation minimum class D-s3, d0	-/90/60 C/C
			25 mm Elastomeric insulation minimum class D-s3, d0	-/90/90 C/C
16 mm diameter/2.25 mm wall	25 mm	25 mm Protecta Mineral Fibre BIO	9 mm Elastomeric insulation minimum class B-s3,d0	-/120/120 C/C
16 mm diameter/2.25 mm wall			9-25 mm Elastomeric insulation minimum class B-s3,d0	-/60/60 C/C
20 mm diameter/2.5 mm wall				
26 mm diameter/3 mm wall				
32 mm diameter/3 mm wall				
40 mm diameter/3.5 mm wall				
50 mm diameter/4 mm wall				
63 mm diameter/4.5 mm wall				
75 mm diameter/4.7 mm wall				
*Typical pipe diameters shown, see below graph for intermediate sizes				

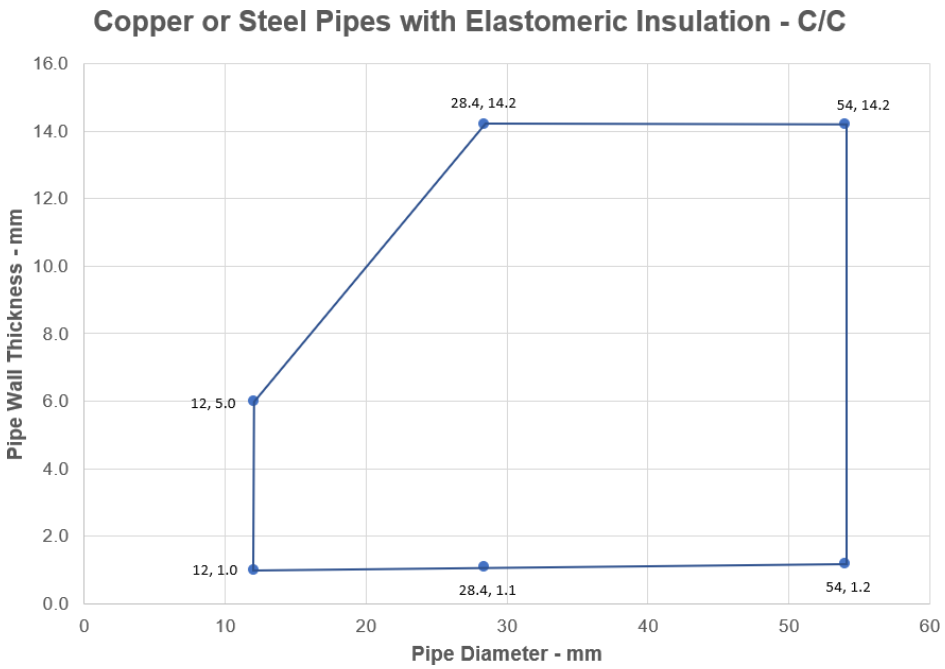


Figure 12 Intermediate pipe wall thicknesses for copper or steel pipe diameters

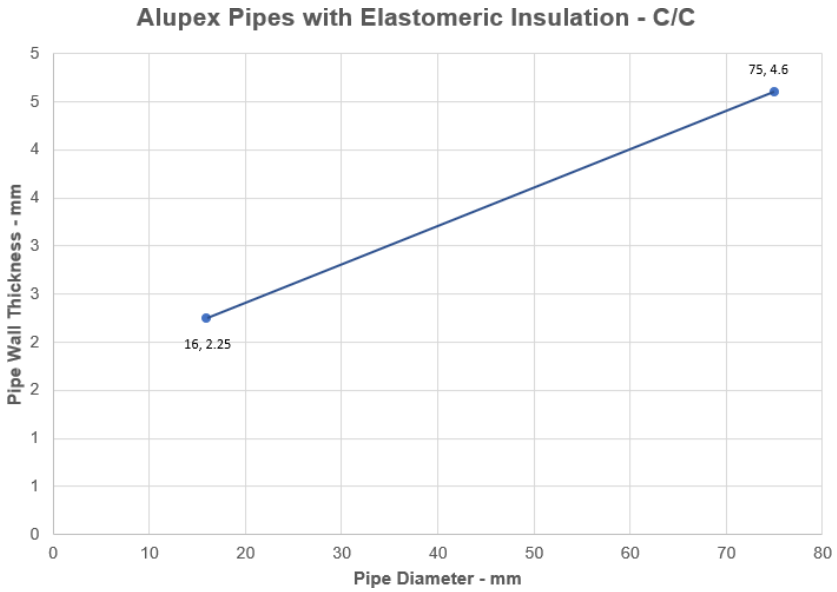


Figure 13 Intermediate pipe wall thicknesses for Alupex pipe diameters with elastomeric insulation

Table 24 Metallic pipes penetrating a 100 mm thick flexible and rigid wall protected with Protecta FR Acrylic applied at both sides

Services	Sealant depth	Backing (minimum)	Insulation	FRL
Mild or stainless steel pipe				
16 mm diameter/ wall*	25 mm	None	15 mm thick phenolic insulation	-/90/90 C/U
Maximum 273 mm/ wall*			25 mm thick phenolic insulation	-/90/60 C/U
			26-100 mm thick phenolic insulation	-/60/60 C/U
*Typical pipe diameters shown, see below graph for intermediate sizes				

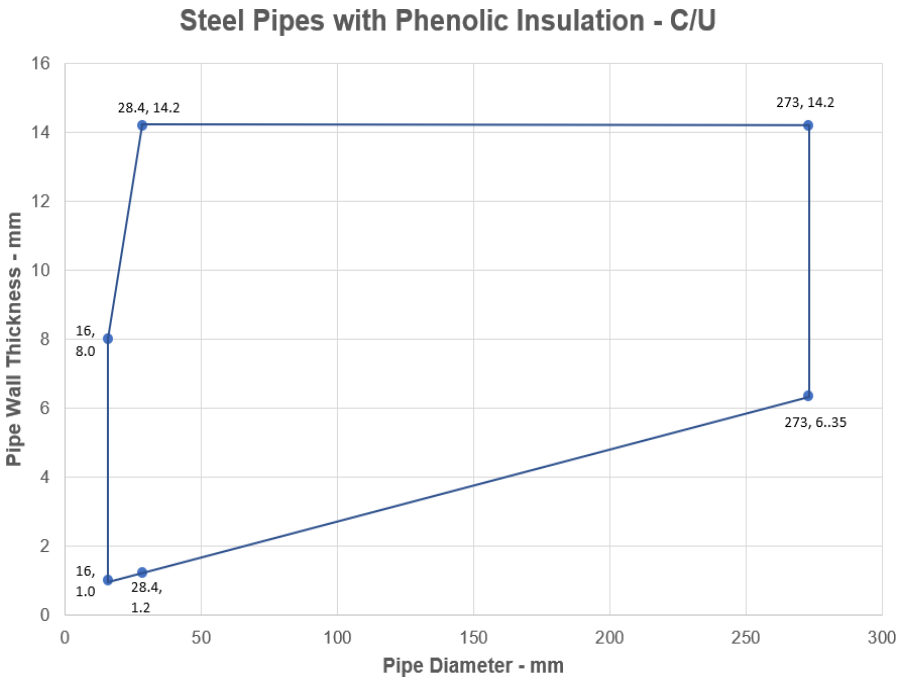
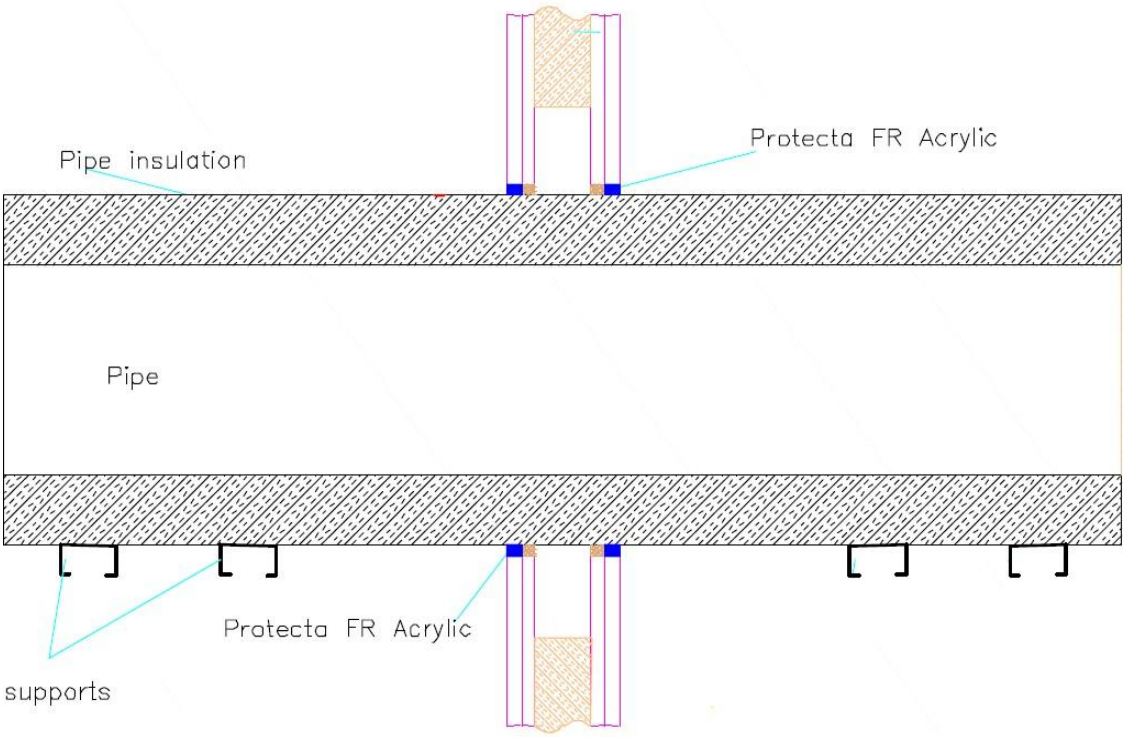


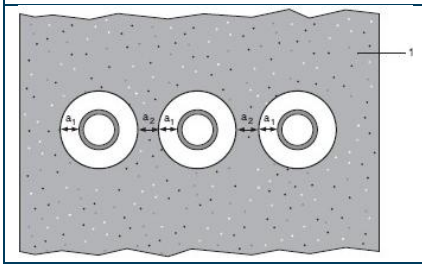
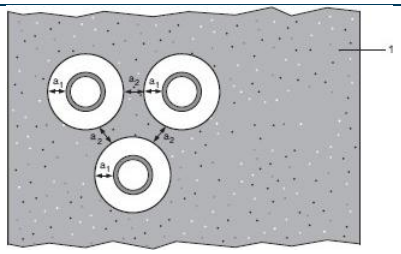
Figure 14 Intermediate pipe wall thicknesses for steel pipe diameters with Phenolic insulation

6.5.3 Double side penetration seal with metallic pipes

Penetration seal: CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture, with 12.5 mm Protecta FR Acrylic to both sides of the wall, backed with 12.5 mm deep stone wool insulation minimum 35 kg/m^3. Minimum annular space 10 mm (A1) and minimum separation between penetration seals 30 mm (A2). Maximum seal size 300 × 300 mm / Ø 504 mm

Construction details:



Configuration 1	Configuration 2
	

Key
1 Supporting construction
a1 Pipe / top edge of seal separation
a2 Pipe / side edge of seal separation
a3 Pipe / pipe separation

Table 25 Metallic pipes penetrating a 100mm thick flexible and rigid wall protected with Protecta FR Acrylic applied at both sides and stone wool insulation around the pipe

Services	Insulation	FRL
Mild or stainless steel pipes		
40 mm diameter/1-14.2 mm wall	20 mm thick stone, mineral wool min. 80 kg/m^3	-/120/90 C/U
40 mm diameter/1-14.2 mm wall*	30-80 mm thick stone, mineral wool min. 80 kg/m^3	
50 mm diameter/1.2-14.2 mm wall*		
60 mm diameter/1.4-14.2 mm wall*		
75 mm diameter/1.6-14.2 mm wall*		
90 mm diameter/1.9-14.2 mm wall*		
100 mm diameter/2.1-14.2 mm wall*		
115 mm diameter/2.4-14.2 mm wall*		
140 mm diameter/2.9-14.2 mm wall*		
165 mm diameter/ 3.4-14.2 mm wall*		
180 mm diameter/ 3.6-14.2 mm wall*		
200 mm diameter/ 4.0-14.2 mm wall*		
219 mm diameter/ 4.3-14.2 mm wall*		
250 mm diameter/ 5.0-14.2 mm wall*		
300 mm diameter/ 5.9-14.2 mm wall*		
324 mm diameter/ 6.35-14.2 mm wall*		

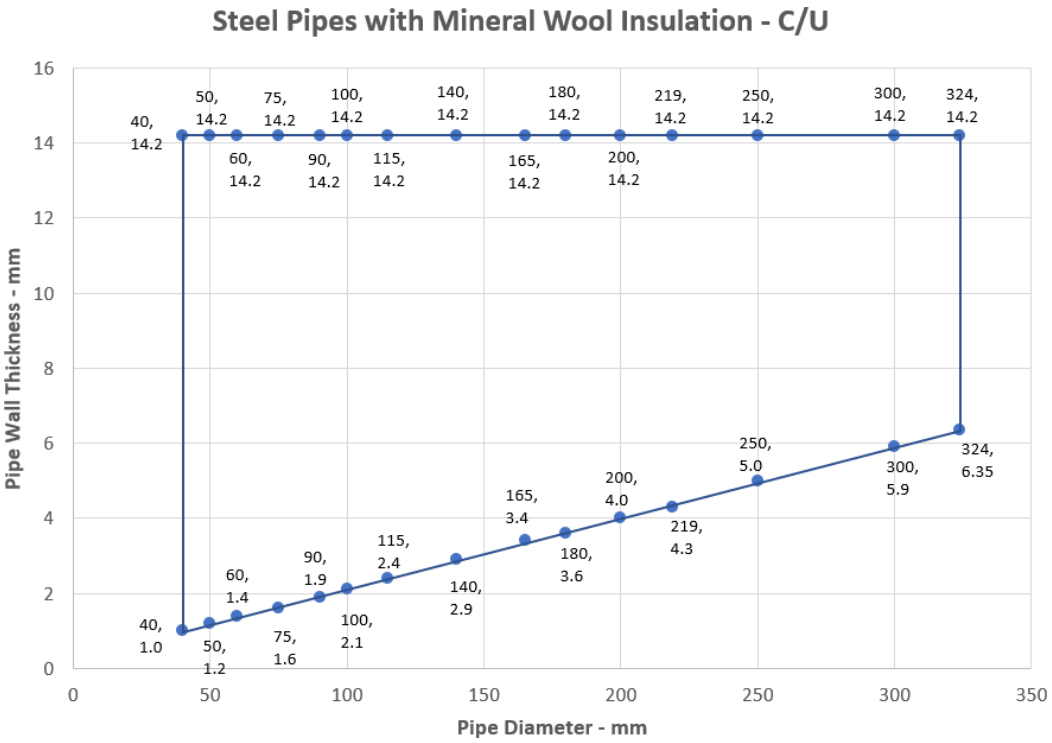


Figure 15 Intermediate pipe wall thicknesses for steel pipe diameters]

Table 26 Pipes penetrating a 100mm thick flexible and rigid wall protected with Protecta FR Acrylic applied at both sides and stone wool insulation around the pipe

Services	Insulation	FRL
PEX pipe in pipe system		
15 mm diameter × 2.5 mm wall inner /25 mm diameter outer	None	-/120/120 C/C
Alupex pipe		
16-20 mm diameter/2.0 mm wall	None	-/120/120 C/C
16-75 mm diameter/2.25-4.6 mm	20-50 mm thick glass wool or stone, mineral wool min. 75 kg/m^3	-/120/120 C/C
Mild or Stainless Steel pipe		
4 mm diameter/1.0-2.0 mm wall	None	-/90/90 C/C
5-30 mm diameter/1.0-14.2 mm wall*		
30 mm diameter/2.0-14.2 mm wall		-/120/120 C/U
Copper or steel pipe		
6-12 mm diameter/0.7-6.0 mm wall*	None	-/90/60 C/C
13-22 mm diameter/0.7-11 mm wall*		-/90/30 C/C
12-54 mm diameter/0.9-14.2 mm wall*	20-80 mm thick stone, mineral wool min. 80 kg/m^3	-/120/60 C/C
*See below graphs for interpolated pipe sizes		

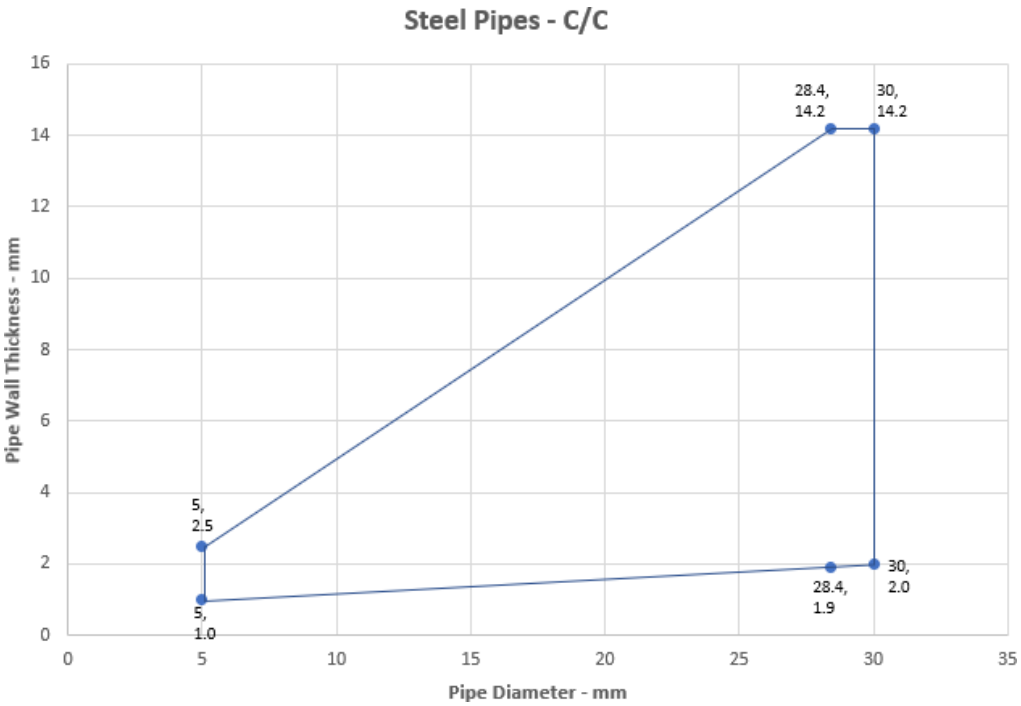


Figure 16 Intermediate pipe wall thicknesses for steel pipe diameters

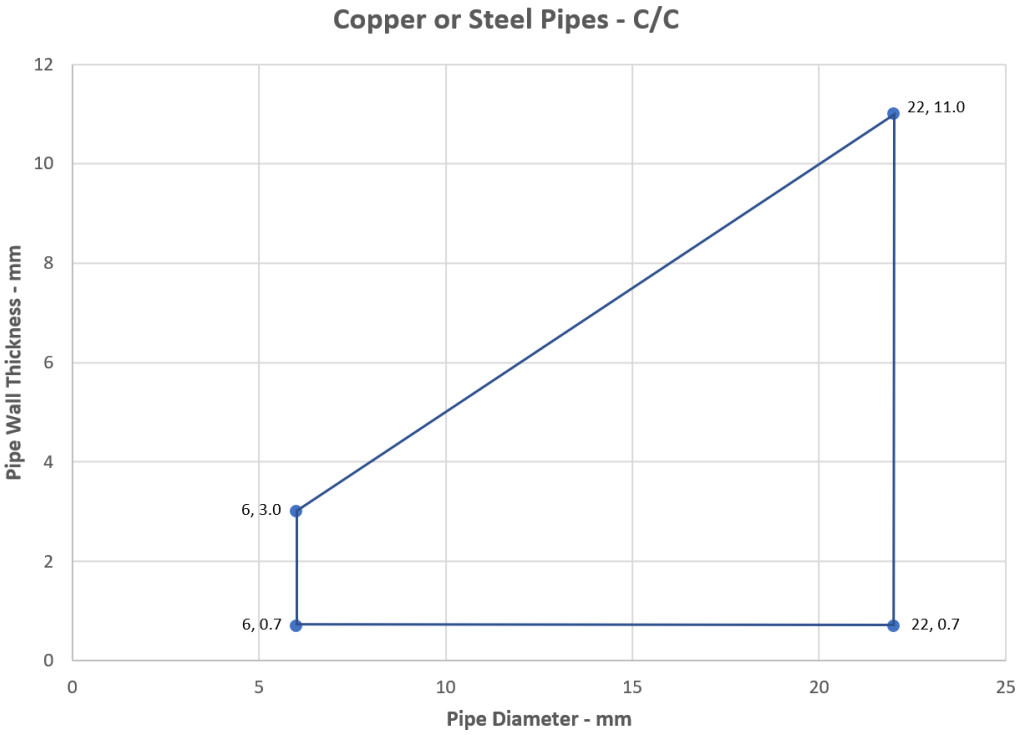


Figure 17 Intermediate pipe wall thicknesses for copper or steel pipe diameters

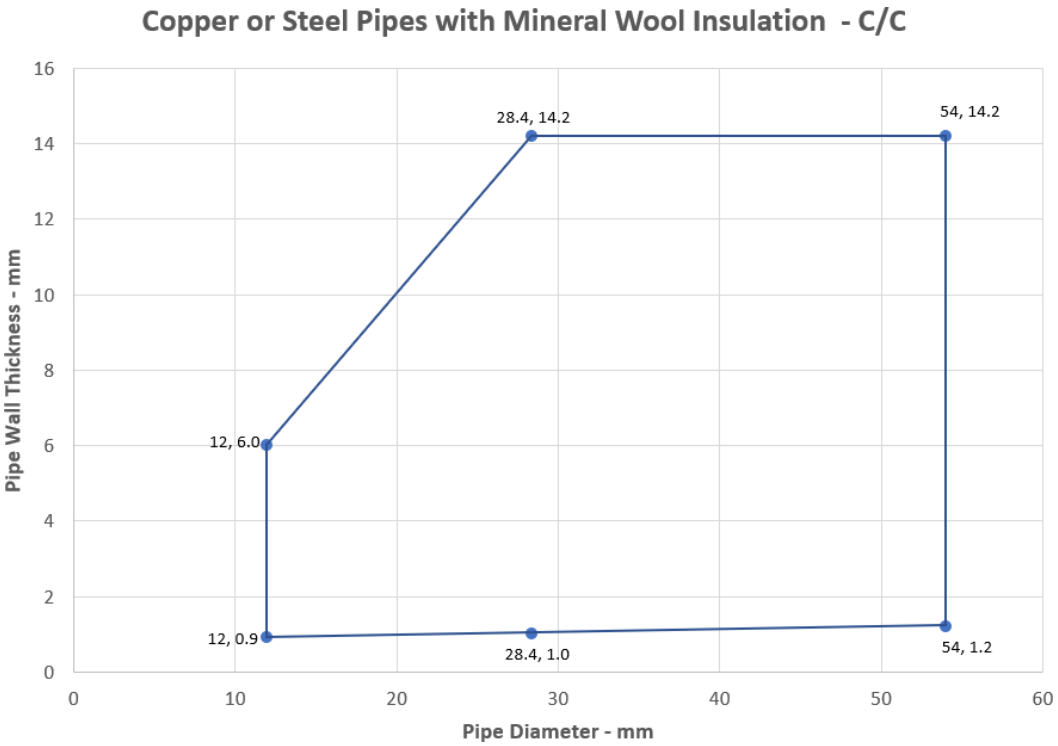


Figure 18 Intermediate pipe wall thicknesses for copper or steel pipe diameters with mineral wool insulation

6.5.4 Double side penetration seal with composite pipes

Penetration seal: CI (Continuous Interrupted) or CS (Continuous Sustained) insulated composite pipes (single) fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall, minimum 10 mm seal width around service, maximum seal size 300 × 300 mm, backed with stonewool.

Construction details:

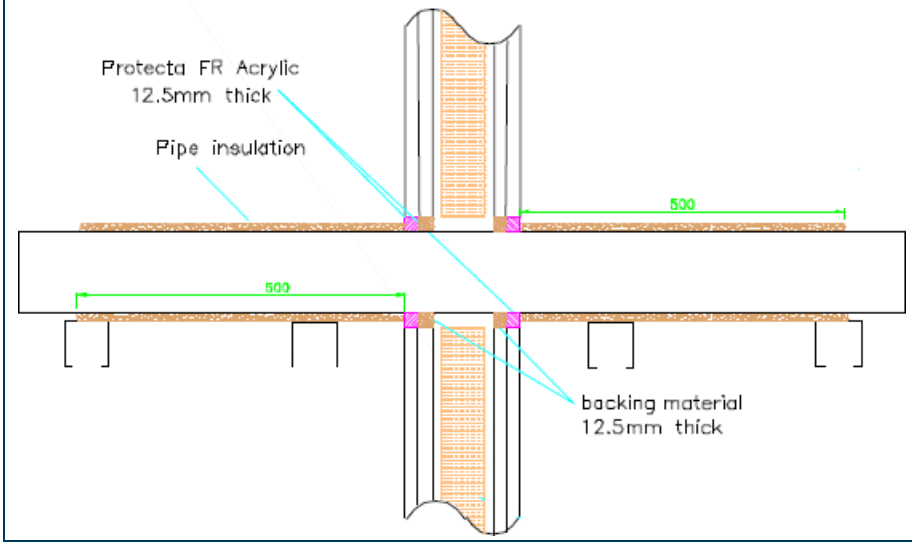


Table 27 Insulated Alupex composite pipes protected with Protecta FR Acrylic installed at both sides of the wall

Services	Sealant depth	Backing (minimum)	Insulation (minimum)	FRL
Alupex composite pipes				
16 mm diameter/2.25 mm wall	12.5 mm	12.5 mm stonewool 40 kg/m^3	20 mm stonewool 80 kg/m^3, 500 mm length from both sides of the seal	-/120/120 C/C
20 mm diameter/2.5 mm wall				
26 mm diameter/3 mm wall				
32 mm diameter/3 mm wall				
40 mm diameter/3.5 mm wall				
50 mm diameter/4 mm wall				
63 mm diameter/4.5 mm wall				
75 mm diameter/4.7 mm wall				

6.5.5 Double side penetration seal with metallic (and composite) pipes

Penetration seal: LI (Local Interrupted) of minimum length stated below or CI (Continuous Interrupted) insulated metallic pipes and composite (single) fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall, min. 10 mm seal width around service, backed with stone wool insulation or 'Protecta Mineral Fibre BIO'.

Construction details:

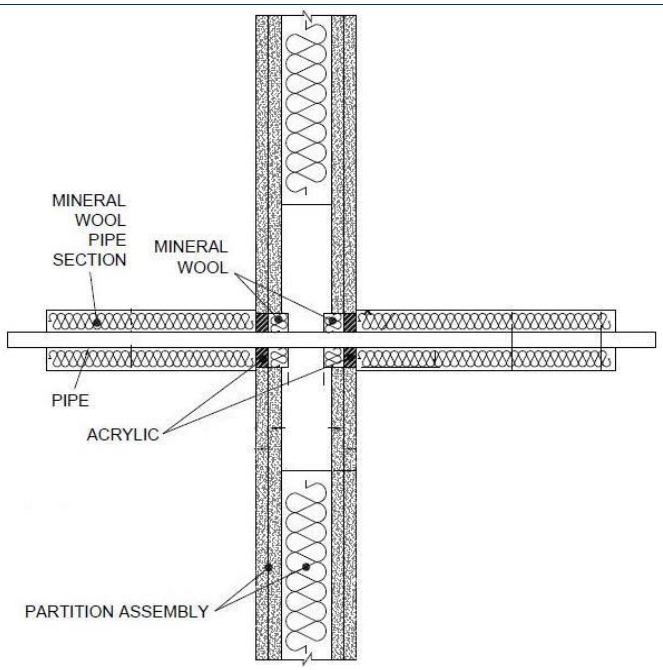


Table 28 Metallic and composite pipes protected with Protecta FR Acrylic installed at both sides of the wall with insulation

Services	Sealant depth	Backing (minimum)	Insulation (minimum)	FRL
Maximum aperture size 300 × 300 mm				
Copper or steel pipe up to 54 mm diameter/1-14.2 mm wall	12.5 mm	20 mm Stone wool 40 kg/m^3	500 mm length of 20 mm stone wool 80 kg/m^3	-/120/120 C/U
Alupex composite pipe 75 mm diameter/7.5 mm wall		20 mm Stone wool 140 kg/m^3	600 mm length of 25 mm Protecta Mineral Fibre BIO	-/60/60 C/U
Mild or stainless steel pipes				
Maximum aperture size 300 × 300 mm				
40 mm diameter/1-14.2 mm wall	12.5 mm	20 mm Stone wool 40 kg/m^3	500 mm length of 20 mm stone wool 80 kg/m^3	-/120/120 C/U
40 mm diameter/1-14.2 mm wall*			500 mm length of 30 mm stone wool 80 kg/m^3	-/120/90 C/U
50 mm diameter/1.2-14.2 mm wall*				
60 mm diameter/1.4-14.2 mm wall*				
75 mm diameter/1.7-14.2 mm wall*				
90 mm diameter/2-14.2 mm wall*				
100 mm diameter/2.2-14.2 mm wall*				
115 mm diameter/2.5-14.2 mm wall*				
140 mm diameter/3-14.2 mm wall*				
165 mm diameter/3.5-14.2 mm wall*	12.5 mm	20 mm Stone wool 40 kg/m^3	500 mm length of 30 mm stone wool 80 kg/m^3	-/120/90 C/U
180 mm diameter/3.8-14.2 mm wall*				
200 mm diameter/4.2-14.2 mm wall*				
219 mm diameter/4.5-14.2 mm wall*				
Note: Integrity rating achieved will not be affected if insulation on the above pipes is removed. *Typical pipe diameters shown, see below graph for intermediate sizes				

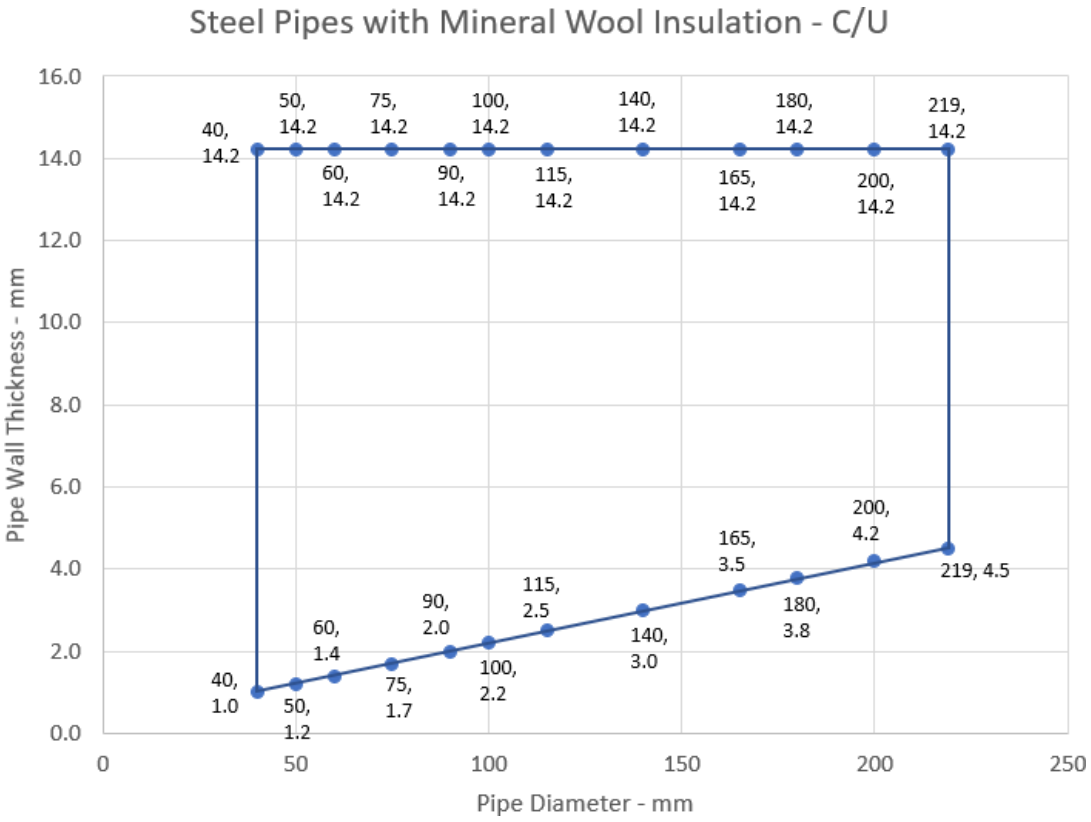


Figure 19 Intermediate pipe wall thicknesses for steel pipe diameters with mineral wool insulation

6.5.6 Double side penetration seal with plastic pipes

Penetration seal: Combustible pipes (single) fitted at any position within the aperture, with Protecta FR Acrylic to both sides of the wall, Minimum annular space 10 mm and minimum separation between penetration seals 30 mm (A2).

Construction details:

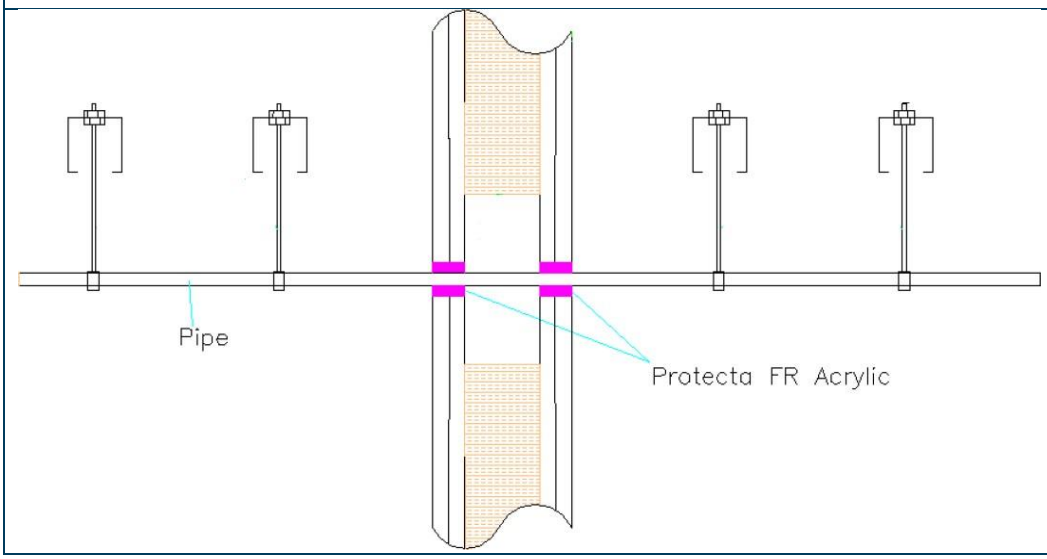


Table 29 Plastic pipes protected with Protecta FR Acrylic applied at both sides of the wall

Pipe material	Sealant depth	Pipe size	Maximum annular space	FRL
PVC-U pipe	25 mm	Ø 6-32 mm /1.0-2.4 mm wall*	10 mm	-/120/120 U/C
			30 mm	-/120/90 U/C
		Ø 6-32 mm /1.0-1.6 mm wall		-/120/120 C/C
PP pipe		Ø 20 mm /2.2 mm wall		-/120/120 U/C
		Ø 20 mm /2.2-4.4 mm wall		-/60/60 U/C
		Ø 20-32 mm /1.8-4.4 mm wall	30 mm	-/60/60 C/C
PE pipe		Ø 20 mm /2.0 mm wall	30 mm	-/120/120 U/C
		Ø 20-32 mm /2.0-3.0 mm wall	30 mm	-/90/90 C/C
Uponor Wirsbo PEX pipe in pipe system		Diameter up to 54 mm/0.4 mm wall thickness (outer pipe), 28 mm diameter/4.0 mm wall thickness (inner pipe)	30 mm	-/60/45 C/C
*See below graphs for interpolated pipe sizes				

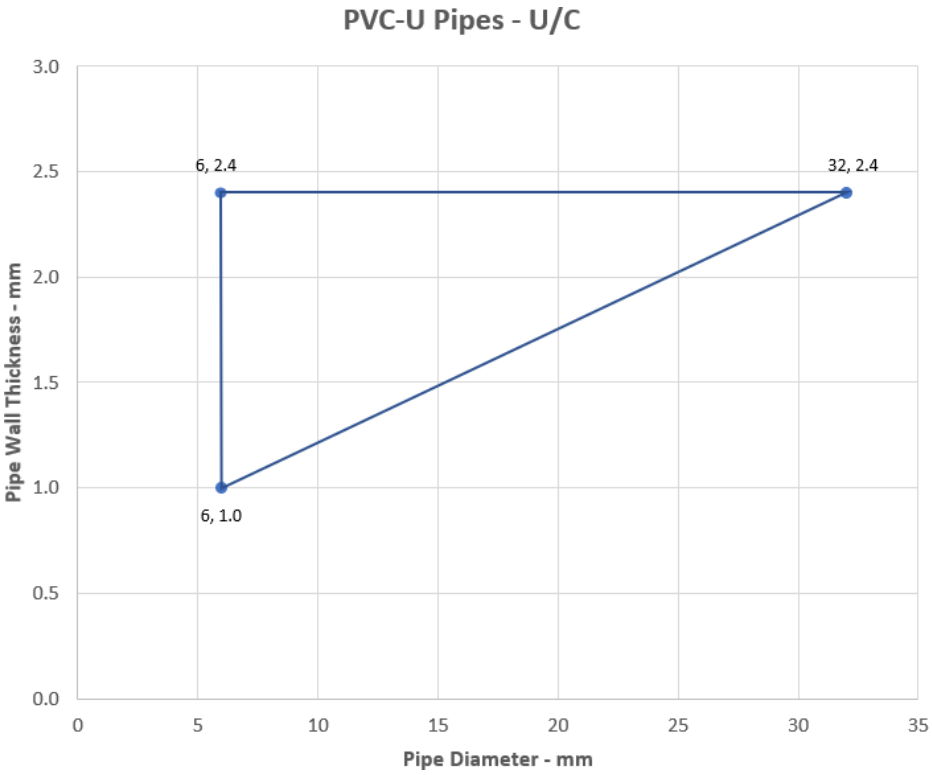


Figure 20 Intermediate pipe wall thicknesses for PVC-U pipe diameters

6.6 Flexible and rigid wall constructions according 4.1.1 with wall thickness of minimum 120 mm

6.6.1 Double side penetration seal with cables

Penetration seal: Non-insulated metallic pipes (single) fitted at any position within the aperture, with 15 mm deep Protecta FR Acrylic to both sides of the wall, backed with stone wool insulation.

Construction details:

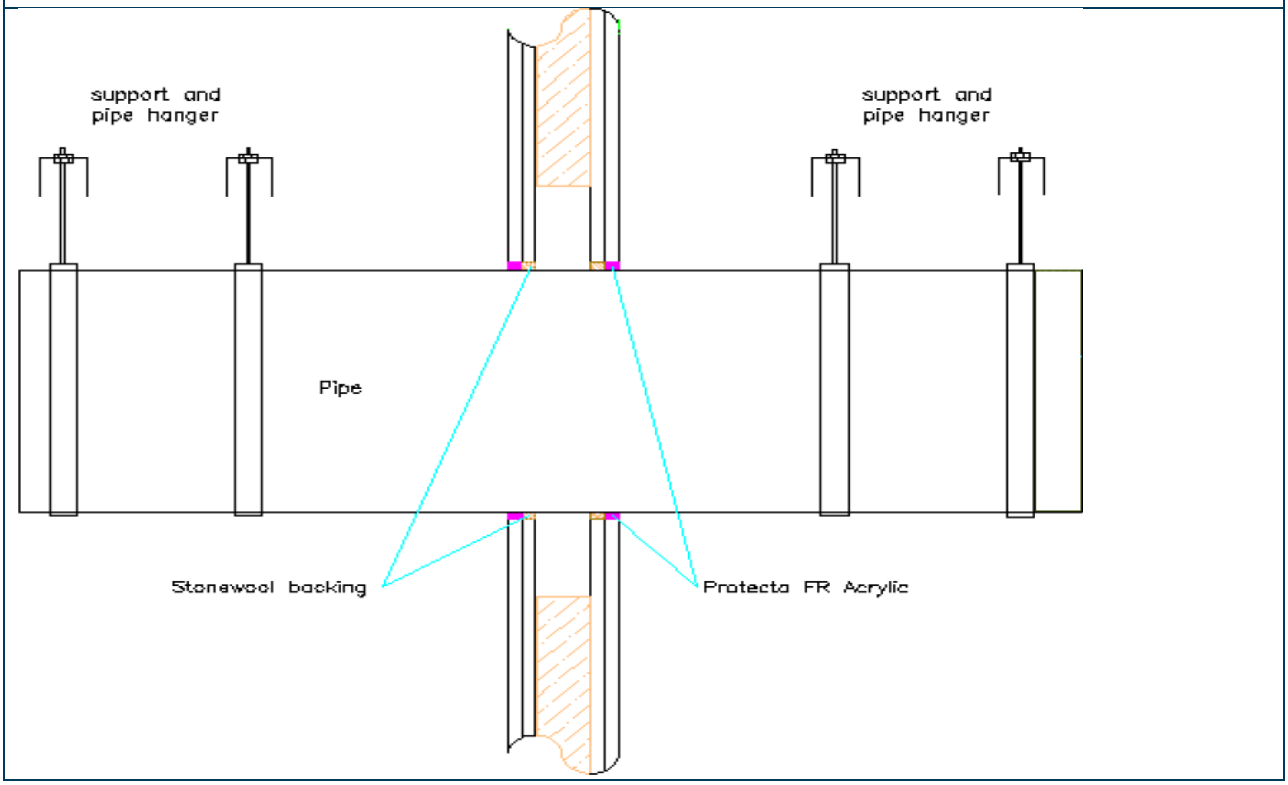


Table 30 Metallic pipes protected with Protecta FR Acrylic sealant and backed with stone wool insulation

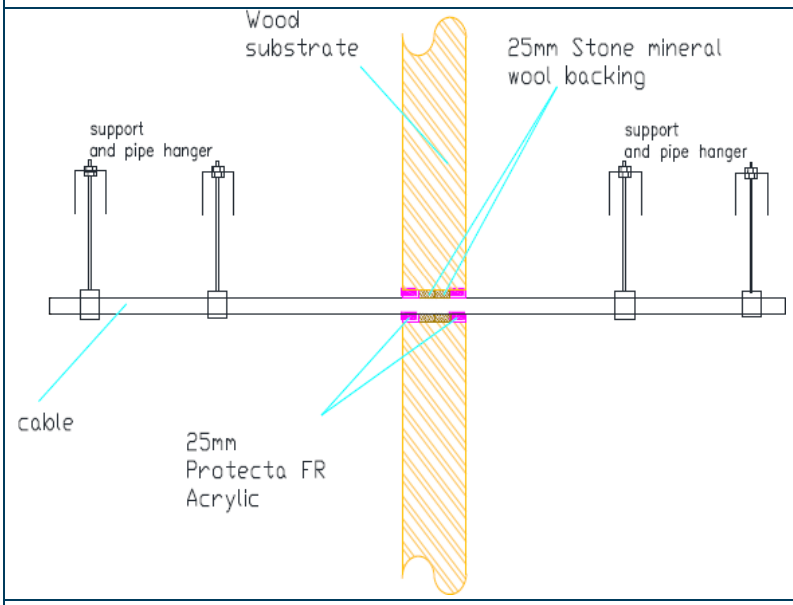
Services	Sealant depth	Backing	FRL
Mild or stainless steel pipe			
30 - 324 mm diameter /1.6-14.2 mm wall	15 mm	15 mm stone wool	-/120/- C/U
Copper or steel pipe			
12 - 54 mm diameter /0.9-14.2 mm wall	15 mm	15 mm stone wool	-/120/- C/C
Alupex Pipe			
16-75 mm diameter/2.0-4.6 mm wall	15 mm	15 mm stone wool	-/120/30 C/C

6.7 Timber wall constructions with wall thickness of minimum 100 mm

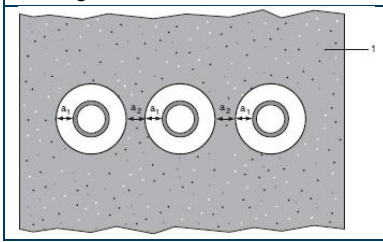
6.7.1 Double side penetration seal with cables

Penetration seal: Cables fitted at any position within the aperture, sealed with Protecta FR Acrylic, minimum 25 mm deep to both sides of the wall and backed with stone wool insulation (minimum 33kg/m³), minimum 25 mm deep. Minimum annular space 10 mm (a1) and minimum separation between penetration seals 0 mm (a2).

Construction details:



Configuration 1



Key
1 Supporting construction
a1 Pipe / top edge of seal separation
a2 Pipe / side edge of seal separation
a3 Pipe / pipe separation

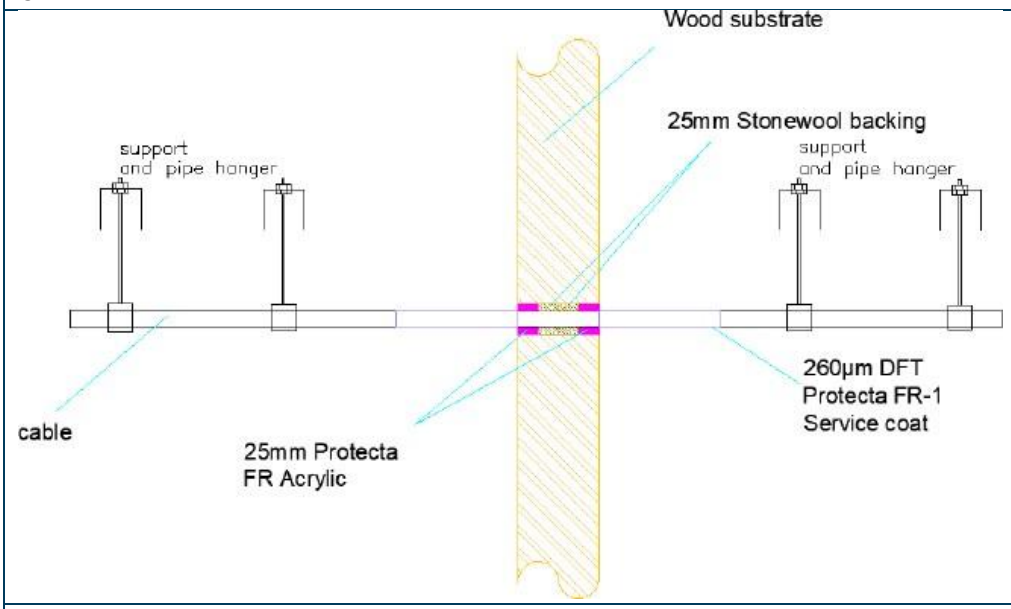
Table 31 Cables penetrating aperture with Protecta FR Acrylic 25 mm deep to both sides of the wall and backed with stone wool insulation (minimum 33 kg/m³) 25 mm deep in timber walls

Services	Sealant depth	Backing	Maximum aperture	FRL
None (blank)	25 mm	Stone wool 25 mm deep min. 33 kg/m³	Ø 180 mm	-/120/120
Cables up to Ø 14 mm, single or in bundles up to Ø 100 mm				-/90/90
Cables up to Ø 21 mm, single or in bundles up to Ø 100 mm				-/90/30
Cables up to Ø 50 mm, single or in bundles up to Ø 100 mm				-/90/30
Telecom cables up to Ø 14 mm single or in bundles up to Ø 100 mm				-/90/60

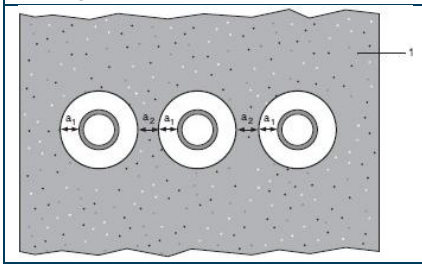
6.7.2 Double side penetration seal with cables and Protecta Service Coat FR-1

Penetration seal: Cables fitted at any position within the aperture with Protecta Service Coat FR-1, sealed with Protecta FR Acrylic, minimum 25 mm deep to both sides of the wall and backed with stone wool insulation (minimum 33 kg/m^3), minimum 25 mm deep. Minimum annular space 10 mm (a1) and minimum separation between penetration seals 0 mm (a2).

Construction details:



Configuration 1



Key
1 Supporting construction
a1 Pipe / top edge of seal separation
a2 Pipe / side edge of seal separation
a3 Pipe / pipe separation

Table 32 Cables in timber walls protected with Protecta Service Coat FR-1 and Protecta FR Acrylic backed with Stone wool insulation

Services	Sealant depth	Backing	Maximum aperture	Insulation minimum	FRL
None (blank)	25 mm	Stone wool 25 mm deep min. 33 kg/m^3	Ø 180 mm	Protecta Service Coat FR-1, 260-micron DFT extending 150 mm from both sides of the seal	-/120/120
Cables up to Ø 21 mm, single					-/90/90
Cables up to Ø 50 mm, single or in bundles up to Ø 100 mm					-/90/60

7.0 Assessment 3 – Assessment of specific variations

7.1 Description of variation

The tested systems are to be varied as per the variations described in section 4.0.

7.2 Methodology

The method of assessment used is summarised in Table 5.

Table 33 Method of assessment

Assessment method	
Level of complexity	Complex assessment
NCC procedure for determining fire performance	Differs in only a minor degree from a tested prototype S1C2(b) and S1C2(c)
Type of assessment	Qualitative and comparative

7.3 Assessment

7.3.1 Assessment of combustible pipes, cables, metal pipes and linear gap seals protected with Protecta FR Acrylic sealant installed in flexible and rigid wall systems if tested in accordance with AS 1530.4:2014

Proposed construction

The proposed construction is summarized below:

- Flexible wall systems must have a minimum thickness of 75 mm and consist of steel or timber studs lined on both faces with 1 layer of minimum 12.5 mm thick fire rated plasterboard. The achieved FRLs are applicable to a flexible wall system with optional insulation and the aperture can optionally be lined.
- For timber framed walls, it is required that no part of the penetration seal is closer than 100 mm to a stud, the cavity is closed between the penetration seal and the stud, and minimum 100 mm of insulation is provided with the cavity between the penetration seal and the stud.
- Rigid walls must have a minimum thickness of 75 mm or as otherwise specified and consist of concrete, aerated concrete, or masonry with a minimum density of 650 kg/m^3.

It is proposed that the integrity rating achieved for insulated metallic and composite pipes can be applied to uninsulated pipe in systems penetrating walls.

Discussion

Considering the referenced test WF375339, the tested constructions consisted of a flexible wall system that comprise a 50 mm steel stud cladded with one layer of 12.5 mm on each side. The cavity between the plasterboard and steel studs was friction fitted with 50 mm thick mineral wool which was cut back 100 mm from all around the aperture.

In other test reports, the tested construction consisted of a flexible wall system that comprise of a 50 mm steel stud cladded with two layers of 12.5 mm on each side. The cavity between the plasterboard and steel studs was friction fitted with 50 mm thick mineral wool which was cut back 100 mm from all around the aperture.

As the insulation was cut all around the aperture, the FRL achieved can be applicable to wall systems with or without insulation. Moreover, as the aperture was not lined in the referenced tests, the FRL will also be applicable to apertures with optional lining.

In flexible walls, it is considered that the gaps between the pipe and the construction must be sealed by a bead of Protecta FR Acrylic sealant. A bead of Protecta FR Acrylic shall be sufficient for any gaps that are less than 8 mm. Any bigger gaps shall be sealed with 25 mm deep FR Acrylic sealant.

Similarly, in rigid walls, gaps that are less than 8 mm must be sealed by a bead of FR Acrylic sealant. However, in larger gaps, 20 mm deep FR Acrylic sealant shall be used backed with 20 mm stone wool.

It is proposed that the integrity rating achieved for insulated metallic and composite pipes can be applied to uninsulated pipe in systems penetrating walls. AS 1530.4:2014 stipulates, a specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 when any of the following occurs:

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

Upon closer inspection of the referenced tested specimens, it was observed that the tested systems without insulation were able to maintain integrity with no significant observations on cracks or gaps forming around the penetration on the unexposed side that could have promoted an integrity failure. Moreover, it is considered that the insulation provided on the metallic and composite pipes is for insulation rating purposes only as it was interrupted and did not continue through the penetration aperture.

Based on this discussion, it is established that the insulation around the pipes has no bearing on the fire integrity rating of the systems. In cases where insulation is not required, it is reasonable to consider that removing the insulation on the metallic pipes will not introduce any detrimental effect to the integrity performance of the pipe systems, and so this can be positively assessed.

7.3.2 Assessment of combustible pipes, cables, metal pipes and linear gaps seals protected with Protecta FR Acrylic sealant installed in floor systems if tested in accordance with AS 1530.4:2014

Proposed construction

Rigid floor thickness shall be limited to 150 mm (as tested) and comprise aerated concrete with a minimum density of 650 kg/m³, floors are required to be otherwise tested to achieve FRL of 240/240/240 or -/240/240.

The proposed construction shall be as tested subject to the following variations:

- It is proposed that the integrity rating achieved for insulated metallic and composite pipes is applied to uninsulated pipe in systems penetrating floors.
- Applicability of FRLs to thinner concrete slab of minimum thickness of 100 mm.

Discussion

It is considered that the proposed construction will be similar to the construction referenced in Appendix B which consisted of various plastic pipes, metallic and composite pipes and cable services installed within a reinforced AAC lintel floor slab on top of a 1.5 m × 1.5 m furnace aperture.

Applicability of FRLs given to 150 mm thick floors to thinner concrete slabs of minimum thickness 100 mm is permissible. Insulation performance of the system will be governed by the concrete slab thickness as stated in AS/NZS 3600:2018. The overall FRL of the system will be governed by the FRL extracted from AS/NZS 3600:2018 as shown below:

Table 34 Maximum fire resistance for given slab thicknesses

Effective Slab Thickness	Maximum Fire Resistance
100mm	90 minutes
120 mm	120 minutes
150 mm	180 minutes
175 mm	240 minutes

Similar to the above discussion in walls, it is established that the insulation around the pipes has no bearing on the fire integrity rating of the systems. In cases where insulation is not required, it is reasonable to consider that removing the insulation on the metallic pipes will not introduce any detrimental effect to the integrity performance of the pipe systems, hence can be positively assessed.

Therefore, it is considered that the various pipes and cable services summarised in section 6.0 will achieve the given FRLs if tested in accordance with AS 1530.4:2014.

7.3.3 Applicability in both walls and floors

The following is applicable to both wall and floor systems penetrated by services protected with Protecta FR Acrylic sealant:

+ It was confirmed that the tested Polyethylene pipes were PE100 which as confirmed by report sponsor and pipe manufacturer is similar to HDPE pipes. Therefore, the FRLs shown for PE pipes in section 6 are applicable to HDPE pipes.
+ Test results for cables remain valid if the diameter of a single cable is reduced and/or number of cables in a bunch is reduced provided that overall diameter of the bunch of any individual cable is not greater than tested.
+ The test results obtained with standard configuration covers all types of insulated cables with copper or aluminium conductors, fibre optic cables and bundled communication cables, except hollow cables.
+ Results obtained from tests where the supports pass through the seal are applicable to those situations where the support is not continued but not vice versa.
+ The test results obtained using standard configuration for cable penetration systems are valid for:
  - All type of steel cable trays and ladders
  - Any penetration size equal or smaller than that tested, provided the total amount of cross sections of the cables (core and insulation) does not exceed 60% of the penetration.

- Support of services in walls and floors must be maintained as per AS 1530.4:2014 and AS 4072.1:2005 (R2016) requirements.
- Apertures in the separating element must be maximum 300 mm × 300 mm or 100 × 1000 mm. The annular space/gap around the services must be infilled with mineral fibre insulation backing material and Protecta FR Acrylic sealant. Blank seals up to 300 × 300mm are permitted.
- Backing material may be stone wool or mineral wool (non-fibre glass) of the specified density and any generic mineral or stone wool product of density of 35 kg/m³ may be substituted for Protecta Mineral Fibre BIO.
- In systems were insulation installed on metallic and composite pipes is interrupted, it has been established that the insulation does not contribute to the integrity rating of the system. Therefore, assuming insulation is zero, the integrity rating achieved must be maintained.

8.0 Validity

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

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 sponsor is responsible for formally notifying Jensen Hughes 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 Jensen Hughes' ongoing assessment. The primary goal of this notification is to allow Jensen Hughes 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 Jensen Hughes 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 this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance of the proposed system/s 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 this report.

This assessment is provided to Firestop Centre Limited 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 Drawings and additional information

Table 35 Details of figures

Figures	Source
All drawings of construction details and graphical representation of intermediate service diameters and wall thicknesses as provided in section 6.0	Extracted from the European Technical Assessment ETA-21/0046 of 2021/01/01 and ETA-21/0035 of 2021/01/01 provided by Polyseam Ltd

Appendix B Summary of supporting test data

B.1 Test report – WF 419763

Table 36 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 19 November 2019.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009. The partition framing comprised of 50 mm × 25 mm high steel c-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs. The framing was clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The services referenced in this assessment report are D1-D3, E1-E3. All pipes and cables measured 1200 mm long with a minimum of 500 mm protruding from the exposed face. The mineral wool insulation within the partition wall was removed for 100 mm surrounding all apertures.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 37.

Table 37 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
D1 – Steel pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	Ø 343 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with no backing material. Intumescent size is 10 mm wide × 25 mm deep	25 mm thick Phenolic foam - CS	-/90/60
D2 – Steel pipe with outer diameter of 16 mm and pipe wall thickness of 1.0 mm.	Ø 66 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with no backing material. Intumescent size is 10 mm wide × 25 mm deep	15 mm thick Phenolic foam - CS	-/90/90
D3 – Steel pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	Ø 383 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with no backing material. Intumescent size is 30 mm wide × 25 mm deep	25 mm thick Phenolic foam - CS	-/90/60
E1 – Gerberit Mepla Alupex pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 113 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	9 mm thick Armaflex Ace Elastomeric foam - CS	-/60/30

Specimen	Aperture	Seal description	Service insulation	FRL
E2 – Steel pipe with outer diameter of 165 mm and pipe wall thickness of 4.5 mm.	Ø 203 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	9 mm thick Armaflex Ace Elastomeric foam - CS	-/90/45
E3 – Steel pipe with outer diameter of 165 mm and pipe wall thickness of 4.5 mm.	Ø 235 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	25 mm thick Elastomeric foam - CS	-/60/60

B.2 Test report – WF 419764

Table 38 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 12 December 2019.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m × 150 mm thick blockwork wall. The services referenced in this assessment report are C1-C3, K1-K3, L1-L3, M1-M3. All pipes and cables measured 1200 mm long with a minimum of 500 mm protruding from the exposed face.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 39.

Table 39 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
C1 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
C2 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/120
C3 – PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.8 mm.	Ø 32 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
K1 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 92 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240

Specimen	Aperture	Seal description	Service insulation	FRL
K2 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 1.8 mm.	Ø 32 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
K3 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 92 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
L1 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 1.6 mm.	Ø 92 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
L2 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	Ø 92 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
L3 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 92 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
M1 – PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 80 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
M2 – PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.8 mm.	Ø 72 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240

Specimen	Aperture	Seal description	Service insulation	FRL
M3 – PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	ø 26 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240

B.3 Test report – WF 427934

Table 40 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 14 April 2020.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009. The partition framing comprised of 50 mm × 25 mm high steel c-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs. The framing was clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The services referenced in this assessment report are E1, E2, K1, K2. All pipes and cables measured 1200 mm long with a minimum of 500 mm protruding from the exposed face. The mineral wool insulation within the partition wall was removed for 100 mm surrounding all apertures.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 41.

Table 41 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
E1 – Steel pipe with outer diameter of 165 mm and pipe wall thickness of 4.5 mm.	Ø 221 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	13 mm thick Armaflex Ace Elastomeric – CS	-/60/60
E2 – Gerberit Mepla pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 121 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	13 mm thick Armaflex Ace Elastomeric – CS	-/90/60
K1 – Steel pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	Ø 533 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with no backing material. Intumescent size of acrylic is 30 mm wide × 25 mm deep	100 mm thick Phenolic foam – CS	-/60/60

Specimen	Aperture	Seal description	Service insulation	FRL
K2 – Steel pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	ø 493 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with no backing material. Intumescent size of acrylic is 10 mm wide × 25 mm deep. Fitted between plasterboard and pipe insulation on both faces.	100 mm thick Phenolic foam – CS	-/60/60

B.4 Test report – WF 401855 Revision A

Table 42 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 5 July 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009. The partition framing comprised of 50 mm × 25 mm high steel c-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high steel U-channel head and base track, with 50 mm thick, 35 kg/m^3 density mineral wool insulation friction fitted between the studs. The framing was clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The services referenced in this assessment report are B, D, E. All pipes and cables measured 1200 mm long with a minimum of 500 mm protruding from the exposed face. The mineral wool insulation within the partition wall was removed for 100 mm surrounding all apertures.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 43.

Table 43 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
B – 11No. Type F cable bundle with diameter of 50 mm.	ø 70 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	None	-/120/90
D – Gerberit Mepla Alupex pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	ø 145 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	25 mm thick Kaiflex ST - CS	-/90/90

Specimen	Aperture	Seal description	Service insulation	FRL
E – Gerberit Mepla Alupex pipe with outer diameter of 16 mm and pipe wall thickness of 2.25 mm.	ø 54 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep	9 mm thick Kaiflex ST - CS	-/120/90

B.5 Test report – WF 419414

Table 44 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 24 October 2019.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high × 100 mm thick Nordisk Massivtre (Nordic Solid Wood) CLT partition wall section. The wall included two horizontal joints located at 600 mm from the threshold and 1800 mm from the threshold. A timber section stated by the client as European Redwood with a nominal density of 510 kg/m^3 density sources from the TRADA timber database, measuring 3 m wide and 95 mm high and 12 mm thick was used to connect the three section of the CLT wall via a loose tongue joint. Lamell 1 is 18.5 mm thick, Lamell 2 is 21 mm thick, lamell 3 is 21 mm thick, lamell 4 is 21 mm thick and lamell 5 is 18.5 mm thick. The services referenced in this assessment report are D1, D3, E1-E3, F. All pipes and cables measured 1200 mm long with a minimum of 500 mm protruding from the exposed face.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 45.

Table 45 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
D1 – Type E cable with diameter of 25 mm.	ø 45 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep Protecta FR-1 service coat on both face at a length of 150 mm protruding from both faces of the supporting construction nominally 260 µm DFT (400 µm WFT)	None	-/90/60
D2 – Type C1 cable with diameter of 40 mm.	ø 60 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep Protecta FR-1 service coat on both face at a length of 150 mm protruding from both faces of the supporting construction nominally 260 µm DFT (400 µm WFT)	None	-/90/90
E1 – Type A3 cable with diameter of 11 mm.	ø 31 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/120

Specimen	Aperture	Seal description	Service insulation	FRL
E2 – Type A3 cable with diameter of 11 mm.	Ø 31 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep Protecta FR-1 service coat on both face at a length of 150 mm protruding from both faces of the supporting construction nominally 260 µm DFT (400 µm WFT)	None	-/120/120
E3 – Type B cable with diameter of 18 mm.	Ø 38 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep Protecta FR-1 service coat on both face at a length of 150 mm protruding from both faces of the supporting construction nominally 260 µm DFT (400 µm WFT)	None	-/90/90
F – Blank seal	Ø 180 mm	Protecta FR Acrylic on both faces with 2 layers of Ø 180 mm × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is Ø 180 mm × 25 mm deep	-	-/120/120

B.6 Test report – WF 19723A

Table 46 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	WFRGENT NV – Ottergemsesteenweg-Zuid 711, B-9000 Gent, Belgie.
Test date	The fire resistance test was completed on 25 June 2019.
Test standards	The test was done in accordance with BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a cross laminated timber floor M Crosslam 150 5s NSI DL. The material was Spruce (Picea abies) and the slab dimensions were 1320 mm × 3300 mm. The slab thickness is 150 mm. The density is 480 kg/m^3. The services referenced are A1, A2, A3, A5, H1, H2, H3, H4, H5, I1, I2, I3, I4, I5, N1, N2, N3, N4, Q, Y1, Y2, Y3, Y4 and Y5.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 47.

Table 47 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
A1 - Type F cable bundle with diameter of 100 mm.	Ø 120 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/90
A2 - Type C2 cable with diameter of 46 mm.	Ø 66 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/120
A3 - Type C1 cable with diameter of 42 mm.	Ø 62 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep. Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/90
A5 - Type E cable with diameter of 25 mm.	Ø 45 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/90

Specimen	Aperture	Seal description	Service insulation	FRL
H1 –PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
H2 –PP pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
H3 –PE pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
H4 –PE-X pipe in pipe with outer pipe diameter of 25 mm and pipe wall thickness of 1.0 mm and inner pipe diameter 15 mm and thickness 2.5 mm	Ø 45 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
H5 –PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.8 mm.	Ø 32 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
I1 –PVC pipe with outer diameter of 32 mm and pipe wall thickness of 1.6 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
I2 –PVC pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
I3 –PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
I4 –PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120

Specimen	Aperture	Seal description	Service insulation	FRL
I5 –PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	Ø 26 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
Q – Blank seal	Ø 220 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	None	-/120/120
N1 - Type B cable with diameter of 18 mm.	Ø 38 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/90
N2 - Type A2 cable with diameter of 12 mm.	Ø 32 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/120
N3 - Type A1 cable with diameter of 11 mm.	Ø 31 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/120
N4 - Type A3 cable with diameter of 10 mm.	Ø 30 mm	Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep Protecta FR-1 service coat on the unexposed face with a length of 150 mm and thickness of 360 µm	None	-/120/120
Y1 – Fe pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	Ø 145 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	25 mm thick × 500 mm long glass wool insulation	-/120/60
Y2– Geberit Mepla A pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 113 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	25 mm thick × 500 mm long glass wool insulation	-/120/90

Specimen	Aperture	Seal description	Service insulation	FRL
Y3 –Cu pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	ø 124 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	20 mm thick × 500 mm long glass wool insulation	-/120/90
Y4 – Geberit Mepla A pipe with outer diameter of 16 mm and pipe wall thickness of 2.25 mm.	ø 54 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	20 mm thick × 500 mm long glass wool insulation	-/120/120
Y5 – Fe pipe with outer diameter of 15 mm and pipe wall thickness of 0.7 mm.	ø 184 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 25 mm deep	20 mm thick × 500 mm long glass wool insulation	-/120/120

B.7 Test report – WF 412849

Table 48 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 9 April 2019.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3000 mm wide × 3000 mm high cross laminated timber wall construction, into a refractory lined steel restraint frame. The timber wall included a joint at mid-height of the wall. A timber section stated by the sponsor as European Redwood with a nominal density of 510 kg/m^3 measuring 95 mm high × 34 mm wide was used to connect the upper and lower wall sections via a loose tongue joint. The total cross-section is 100 mm with lamell 1 being 33 mm, lamell 2 being 34 mm and lamell 3 being 33 mm. Material cross-glued wood, also called cross/laminated timber. Lumber Norweigian Spruce, glue is heat-resistant melamine-urea-formaldehyde from Dynea AS. The services referenced in this report are A1-A5, D1-D5, E1-E5, F1, F2, F4, H, I1-I4, K1-K4, L1-L5.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 49.

Table 49 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
A1 – Copper pipe with outer diameter of 15 mm and pipe wall thickness of 0.7 mm.	Ø 35 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	20 mm thick Isover CLIMPIPE Section Alu2 local interrupted (LI) 500 mm each face	-/90/90
A2 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 74 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	20 mm thick Isover CLIMPIPE Section Alu2 local interrupted (LI) 500 mm each face	-/90/60
A3 – Gerberit Mepla pipe with outer diameter of 16 mm and pipe wall thickness of 2.25 mm.	Ø 36 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	20 mm thick Isover CLIMPIPE Section Alu2 local interrupted (LI) 500 mm each face	-/90/90
A4 – Gerberit Mepla pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 95 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick Isover CLIMPIPE Section Alu2 local interrupted (LI) 500 mm each face	-/90/90
A5 – Steel pipe with outer diameter of 273 mm and pipe wall thickness of 6.35 mm.	Ø 293 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick Isover CLIMPIPE Section Alu2 local interrupted (LI) 500 mm each face	-/90/60
D1 – PVC-U pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	Ø 26 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
D2 – PVC-U pipe with outer diameter of 32 mm and pipe wall thickness of 1.6 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
D3 – PVC-U pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90

Specimen	Aperture	Seal description	Service insulation	FRL
D4 – PE-HD pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
D5 – PE-HD pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
E1 – Cable type C1 with diameter of 42 mm.	Ø 62 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/30
E2 – Cable type C2 with diameter of 46 mm.	Ø 66 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
E3 – Cable type C3 with diameter of 40 mm.	Ø 60 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/30
E4 – Cable type E with diameter of 25 mm.	Ø 45 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/45
E5 – 35 No. of Cable type F with diameter of cable bundle 100 mm.	Ø 120 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/60
F1 – Cable type A1 with diameter of 11 mm	Ø 31 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
F2 – Cable type A2 with diameter of 12 mm	Ø 32 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
F4 – Cable type B with diameter of 18 mm	Ø 38 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/45

Specimen	Aperture	Seal description	Service insulation	FRL
H – Blank seal	Ø 400 mm	Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	-	-/90/45
I1 – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 1.5 mm.	Ø 152 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	9 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/60/30
I2 – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 1.5 mm.	Ø 184 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/30/30
I3 – Copper pipe with outer diameter of 12 mm and pipe wall thickness of 0.7 mm.	Ø 50 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	9 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/90/60
I4 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 92 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	9 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/60/30
K1 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 124 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/30/-
K2 – Gerberit Mepla pipe with outer diameter of 16 mm and pipe wall thickness of 2.25 mm.	Ø 54 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	9 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/90/90
K3 – Gerberit Mepla pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 113 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	9 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/60/45
K4 – Gerberit Mepla pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 145 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick Armacell Armaflex ACE elastomeric foam - CS	-/45/45

Specimen	Aperture	Seal description	Service insulation	FRL
L1 – PE-HD pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
L2 – PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.8 mm.	Ø 32 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
L3 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
L4 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
L5 – Uponor Wirsbo PEX pipe with outer diameter of 32 mm, inner diameter of 15 mm and pipe wall thickness of 0.6 mm (outer) and 2.5 mm (inner).	Ø 45 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90

B.8 Test report – WF 405610 Revision A

Table 50 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 11 October 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 17 apertures. The service referenced in this report is F1, F2, F3 and F4.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 51.

Table 51 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
F1 – Gerberit Melpa (MLC) pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 95 mm	Pipe capping: C/C Protecta FR Acrylic flush on unexposed face with 10 mm wide × 48 mm deep stone mineral wool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/90
F2 – Steel pipe with outer diameter of 63 mm and pipe wall thickness of 1.5 mm.	Ø 83 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 15 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/30
F3 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 74 mm	Pipe capping: C/C Protecta FR Acrylic flush on unexposed face with 10 mm wide × 48 mm deep stone mineral wool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/0
F4– Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	Ø 344 mm	Pipe capping: C/U Protecta FR Acrylic flush on unexposed faces with 10 mm wide × 48 mm deep stone mineral wool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/15

B.9 Test report – BMT/FEI/F15107

Table 52 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 21 December 2015.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009 and BS EN 1366-4:2006 +A1:2010.
Variation to test standards	None.
General description of tested specimen	The vertical supporting construction comprised of 1500 mm wide × 1500 mm × 150 mm thick reinforced AAC lintels and blocks, built within a refractory lined steel restraint frame in front of a 1.5 m × 1.5 m furnace aperture. The supporting construction included 5 apertures. The horizontal supporting construction comprised of a reinforced AAC blockwork / lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 3 apertures. The fire seal was constructed from Protecta EX Mortar, 1100 mm long × 550 mm wide × 50 mm thick cast into the floor slab, over 50 mm thick rock mineral fibre batt – 140 kg/m^3 density (supplied by Exova Warringtonfire) fitted flush with the exposed face of the floor slab. The services referenced in this report are C, D, E and G.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 53.

Table 53 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
C – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	ø 404 mm	Pipe capping: C/U Protecta FR Acrylic on exposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	30 mm thick stonewool (80 kg/m^3) continuous through seal.	-/60/60
D – Steel pipe with outer diameter of 40 mm and pipe wall thickness of 1.00 mm.	ø 100 mm	Pipe capping: C/U Protecta FR Acrylic on exposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	20 mm thick stonewool (80 kg/m^3) continuous through seal.	-/240/240
E – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	ø 504 mm	Pipe capping: C/U Protecta FR Acrylic on exposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	80 mm thick stonewool (80 kg/m^3) continuous through seal.	-/240/120
G – Linear joint seal with 1000 mm length ×1000 mm width × 100 mm depth.	-	90 mm thick rock mineral fibre (33 kg/m^3 density) friction fitted within cavity and coated on the unexposed face with 10 mm thick Protecta FR Acrylic.	None	-/240/240

B.10 Test report – BMT/FEI/F16010

Table 54 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 25 January 2016.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009 and BS EN 1366-4:2006.
Variation to test standards	None.
General description of tested specimen	The vertical supporting construction comprised of 1500 mm wide × 1500 mm × 150 mm thick reinforced AAC lintels and blocks, built within a refractory lined steel restraint frame in front of a 1.5 m × 1.5 m furnace aperture. The supporting construction included 5 apertures. The horizontal supporting construction comprised of a reinforced AAC blockwork / lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 3 apertures. The services referenced in this report are C, D and E.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 55.

Table 55 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
C – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	ø 504 mm	Pipe capping: C/U Protecta FR Acrylic on unexposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	80 mm thick stonewool (80 kg/m^3) continuous through seal.	-/240/240
D – Steel pipe with outer diameter of 40 mm and pipe wall thickness of 1.00 mm.	ø 100 mm	Pipe capping: C/U Protecta FR Acrylic on unexposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	20 mm thick stonewool (80 kg/m^3) continuous through seal.	-/240/240
E – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	ø 404 mm	Pipe capping: C/U Protecta FR Acrylic on unexposed side only with 10 mm wide × 48 mm deep Protecta Mineral Bio Wool backing. Seal size of acrylic is 10 mm wide × 25 mm deep.	30 mm thick stonewool (80 kg/m^3) continuous through seal.	-/240/240

B.11 Test report – BMT/FEP/F16151 Revision A

Table 56 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 21 June 2016.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009 and BS EN 1366-4:2006 +A1:2010.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high steel c-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The fire seal aperture was not fitted with seal stud at the perimeter or lined with plasterboard. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral rock wool. The services referenced in this report are 1, 3a, 3b, 3c, 3d, 3e, 31, 34, and 37.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 57.

Table 57 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
1 – Linear joint seal with 900 mm length ×25 mm width × 10012.5 mm depth.	-	12.5 mm thick Protecta FR Acrylic on both faces up to the head track of the partition.	None	-/90/90
3a – Diameter 90 mm bundle of type F cables fitted through a 250 mm long 2.7 mm thick PP pipe with diameter of 110 mm	ø 130 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep. 210 mm deep × 4.5 mm thick graphite central within transit and 20 mm thick Protecta open cell foam disc at each end of transit cut to fit around cables.	None	-/90/90

Specimen	Aperture	Seal description	Service insulation	FRL
3b –250 mm long 2.7 mm thick PP pipe with diameter of 110 mm.	Ø 130 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep. 210 mm deep × 4.5 mm thick Protecta intumescent v1 central within transit and 20 mm thick Protecta open cell foam disc at each end of transit.	None	-/90/0
3c – Diameter 30 mm bundle of type F cables fitted through a 250 mm long 1.8 mm thick PP pipe with diameter of 40 mm.	Ø 60 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep. 210 mm deep × 1.5 mm thick Protecta intumescent v1 central within transit and 20 mm wide Protecta open cell foam disc at each end of transit cut to fit around cables.	None	-/90/90
3d – Diameter 70 mm bundle of type F cables fitted through a 250 mm long 2.8 mm thick PP pipe with diameter of 90 mm.	Ø 110 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep. 210 mm deep × 4.0 mm thick Protecta intumescent v1 central within transit and 20 mm wide Protecta open cell foam disc at each end of transit cut to fit around cables.	None	-/90/90
3e – Diameter 50 mm bundle of type F cables fitted through a 250 mm long 2.5 mm thick PP pipe with diameter of 63 mm.	Ø 83 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep. 210 mm deep × 2.0 mm thick Protecta intumescent v1 central within transit and 20 mm wide Protecta open cell foam disc at each end of transit cut to fit around cables.	None	-/90/90
31 – Copper pipe with outer diameter of 6 mm and pipe wall thickness of 0.7 mm.	Ø 26 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/90/60
34 – Steel pipe with outer diameter of 4 mm and pipe wall thickness of 1.0 mm.	Ø 24 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/90/90

Specimen	Aperture	Seal description	Service insulation	FRL
37 – Copper pipe with outer diameter of 22 mm and pipe wall thickness of 1.0 mm.	ø 42 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stone wool mineral fibre (35 kg/m^3) backing. Seal size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/90/30

B.12 Test report – WF 380112

Table 58 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 16 February 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012, BS EN 1366-3:2009 and BS EN 1366-4:2006 =A1:2010.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high steel c-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 35 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The fire seal apertures were unlined. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral rock wool. The services referenced in this report are E1, E2, E3, E4, F1, F2, F3, F4, G1, G2, G3, G4, H1, H2, H3, H4, T1, T2, T3 and T4.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 BS EN 1366-4:2006 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 59.

Table 59 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
E2 – PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	ø 26 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/120/120
E2 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	ø 52 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/120/120
E3 – PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	ø 80 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/120
E4 – PP pipe with outer diameter of 20 mm and pipe wall thickness of 2.2 mm.	ø 80 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/120
F1 – PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	ø 40 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/60/60

Specimen	Aperture	Seal description	Service insulation	FRL
F2 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	ø 52 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/60/45
F3 – PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	ø 66 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/90
F4 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	ø 92 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/60/60
G1 – PP pipe with outer diameter of 20 mm and pipe wall thickness of 2.2 mm.	ø 40 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/60/45
G2 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 1.8 mm.	ø 52 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/45/45
G3 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 1.8 mm.	ø 92 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/45
G4 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	ø 92 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/45
H1 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	ø 52 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/45/45
H2 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	ø 52 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 10 mm wide sealant on both faces.	None	-/120/45
H3 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 2.4 mm.	ø 92 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/120/90
H4 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	ø 92 mm	Pipe capping: U/C Protecta FR Acrylic 25 mm deep × 30 mm wide sealant on both faces.	None	-/45/45
T1 – Steel pipe with outer diameter of 30 mm and pipe wall thickness of 2.0 mm.	ø 50 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (35 kg/m^3 density). Seal size of acrylic is 10 mm wide × 12.5 mm deep	None	-/120/120

Specimen	Aperture	Seal description	Service insulation	FRL
T2 – Rodona PE-Xb/Al/PE-Xb pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (35 kg/m^3 density). Seal size of acrylic is 10 mm wide × 12.5 mm deep	None	-/120/120
T3 – Diamond PE-Xb/Al/PE-Xb pipe with outer diameter of 16 mm and pipe wall thickness of 2.0 mm.	Ø 36 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (35 kg/m^3 density). Seal size of acrylic is 10 mm wide × 12.5 mm deep	None	-/120/120
T4 – Copper pipe with outer diameter of 15 mm and pipe wall thickness of 0.9 mm.	Ø 35 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (35 kg/m^3 density). Seal size of acrylic is 10 mm wide × 12.5 mm deep	None	-/120/15

B.13 Test report – WF 369796 Revision A

Table 60 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 21 July 2016.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of 1500 mm wide × 1500 mm × 150 mm thick reinforced AAC lintels and blocks, built within a refractory lined steel restraint frame in front of a 1.5 m × 1.5 m furnace aperture. The supporting construction included 10 apertures. The services referenced in this report are A, B, C, D, E, F, G, H and J.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 61.

Table 61 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
A – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 184 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	K-flex 25 mm thick elastomeric insulation continuous through fire seal.	-/120/90
B – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 234 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	K-flex 50 mm thick elastomeric insulation continuous through fire seal.	-/60/60
C – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 200 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	K-flex 13 mm thick elastomeric insulation continuous through fire seal.	-/45/45
D – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 160 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	K-flex 13 mm thick elastomeric insulation continuous through fire seal.	-/60/45
E– Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 224 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	K-flex 25 mm thick elastomeric insulation continuous through fire seal.	-/60/60

Specimen	Aperture	Seal description	Service insulation	FRL
F – Steel pipe with outer diameter of 22 mm and pipe wall thickness of 2.0 mm.	Ø 68 mm	Pipe capping: U/U Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	K-flex 13 mm thick elastomeric insulation continuous through fire seal.	-/240/180
G – Steel pipe with outer diameter of 114 mm and pipe wall thickness of 2.0 mm.	Ø 274 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	K-flex 50 mm thick elastomeric insulation continuous through fire seal.	-/30/30
H – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	Ø 504 mm	Pipe capping: C/U Protecta FR Acrylic fitted on the exposed side with 10 mm wide × 48 mm deep Protecta Mineral Bio backing (128 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	Stonewool 80 mm thick (80 kg/m^3 density) continuous through fire seal.	-/180/180
J – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	Ø 404 mm	Pipe capping: C/U Protecta FR Acrylic fitted on the exposed side with 10 mm wide × 48 mm deep Protecta Mineral Bio backing (128 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	Stonewool 30 mm thick (80 kg/m^3 density) continuous through fire seal.	-/240/180

B.14 Test report – WF 372808

Table 62 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 12 October 2016.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC blockwork/lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 13 apertures. The services referenced in this report are T, U and V.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 63.

Table 63 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
T – Copper pipe with outer diameter of 15 mm and pipe wall thickness of 0.9 mm.	Ø 35 mm	Pipe capping: C/C Protecta FR Acrylic on the unexposed face fitted up to friction fitted 10 mm wide × 48 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/120/60
U – Steel pipe with outer diameter of 4 mm and pipe wall thickness of 1.0 mm.	Ø 24 mm	Pipe capping: C/U Protecta FR Acrylic on the unexposed face fitted up to friction fitted 10 mm wide × 48 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/120/120
V – Copper pipe with outer diameter of 6 mm and pipe wall thickness of 0.7 mm.	Ø 26 mm	Pipe capping: C/C Protecta FR Acrylic on the unexposed face fitted up to friction fitted 10 mm wide × 48 mm deep stonewool backing (35 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/120/120

B.15 Test report – WF 382336

Table 64 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 15 June 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 21 apertures. The services referenced in this report are D1, D2, D3 and D4.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 65.

Table 65 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
D1 – Copper pipe with outer diameter of 12 mm and pipe wall thickness of 0.9 mm.	Ø 32 mm	Pipe capping: C/C Protecta FR Acrylic on the unexposed side with 10 mm wide × 15 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/45
D2 – Steel pipe with outer diameter of 16 mm and pipe wall thickness of 1.0 mm.	Ø 36 mm	Pipe capping: C/U Protecta FR Acrylic on the unexposed side with 10 mm wide × 15 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/120
D3 – PE-X/AL/PEX pipe with outer diameter of 16 mm and pipe wall thickness of 2.0 mm.	Ø 36 mm	Pipe capping: C/C Protecta FR Acrylic on the unexposed side with 10 mm wide × 15 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/120
D4 – PE-X/AL/PEX pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: C/C Protecta FR Acrylic on the unexposed side with 10 mm wide × 15 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/120/120

B.16 Test report – WF 375339

Table 66 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 2 November 2016.
Test standards	The test was done in accordance with BS EN 1363-1:2012, BS EN 1366-3:2009 and BS EN 1366-4:2006 +A1:2010.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high galvanised steel C-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 35 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 1 layer of 12.5 mm thick Type F plasterboard. The fire seal aperture was not fitted with seal stud at the perimeter or lined with plasterboard. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral rock wool. The services referenced in this report are B1, B2, B3, B4, C1, C2, C3, C4, D, E1, E2, E3, F1, F2, F3, G1, G2, G3, H, M, O.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012.

The test specimen achieved the following results – see Table 67.

Table 67 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
B1 – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	Ø 404 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	30 mm thick stonewool (80 kg/m^3 density)	-/60/45
B2 – Steel pipe with outer diameter of 40 mm and pipe wall thickness of 1.0 mm.	Ø 100 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	20 mm thick stonewool (80 kg/m^3 density)	-/60/45
B3 – Steel pipe with outer diameter of 22 mm and pipe wall thickness of 2.0 mm.	Ø 42 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/30
B4 – Steel pipe with outer diameter of 4 mm and pipe wall thickness of 0.7 mm.	Ø 404 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45

Specimen	Aperture	Seal description	Service insulation	FRL
C1 – Type A1 cable (from BSEN 1366-3 standard cable for penetration sealing systems)	Ø 34 mm	Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
C2 – Type A2 cable (from BSEN 1366-3 standard cable for penetration sealing systems)	Ø 35 mm	Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
C3 – Type B cable (from BSEN 1366-3 standard cable for penetration sealing systems)	Ø 41 mm	Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
C4 – Type A3 cable (from BSEN 1366-3 standard cable for penetration sealing systems)	Ø 34 mm	Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
D – Type F cable bundle with diameter of 100 mm (from BSEN 1366-3 standard cable for penetration sealing systems)	Ø 120 mm	Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/45/30
E1 – PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/45/45
E2 – PP pipe with outer diameter of 20 mm and pipe wall thickness of 2.3 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/45/45
E3 – PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	Ø 26 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
F1 - Type F cable bundle with 24 mm diameter fitted through a PE conduit with a diameter of 32 mm and thickness of 3 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/45/30
F2 - Type F cable bundle with 21 mm diameter fitted through a PP conduit with a diameter of 32 mm and thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/45/30

Specimen	Aperture	Seal description	Service insulation	FRL
F3 - Type F cable bundle with 26 mm diameter fitted through a PVC conduit with a diameter of 32 mm and thickness of 1.8 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/45
G1 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/30/30
G2 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/30/30
G3 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 1.8 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with intumescent size of 10 mm wide × 12.5 mm deep.	None	-/60/15
H - Seal	150 mm × 150 mm	Protecta FR Acrylic on both faces with a depth of 12.5 mm on each face and 2 mm thick ×180 mm × 180 mm corrugated cardboard as backing material.	None	-/60/60
M – Horizontal linear joint seal	-	Protecta FR Acrylic on both faces up to the head track of the partition with 910 mm length × 25 mm width × 12.5 mm depth.	None	-/60/45
O – Vertical linear joint seal	-	Protecta FR Acrylic on both faces up to the stud section of the partition with 900 mm length × 15 mm width × 12.5 mm depth.	None	-/60/45

B.17 Test report – WF 380977

Table 68 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 16 March 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3000 mm wide ×3000 mm × 150 mm thick blockwork wall, built within a refractory lined steel restraint frame in front of a 3 m × 3 m furnace aperture. The supporting construction included 113 apertures. The services referenced in this report are A1, A2, A3, B1, B2 and B3.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 69.

Table 69 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
A1 –PVC pipe with outer diameter of 32 mm and pipe wall thickness of 1.6 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/240/240
A2 –PP pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/180/180
A3 –PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/240/240
B1 –PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/240/240
B2 –PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep.	None	-/240/240

Specimen	Aperture	Seal description	Service insulation	FRL
B3 –PVC pipe with outer diameter of 6 mm and pipe wall thickness of 1.0 mm.	ø 66 mm	Pipe capping: U/C Protecta FR Acrylic on both faces with 30 mm wide × 25 mm deep Rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep.	None	-/240/240

B.18 Test report – WF 384982

Table 70 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 29 June 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high galvanised steel C-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density Rockwool Flexiwool insulation friction fitted between the studs and clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The fire seal apertures were lined with steel stud faced with 2 layers of 12.5 mm thick Type F plasterboard. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with rock mineral wool and intumescent mastic sealant. The services referenced in this report E3, E4, G1, G2, G3, K1, K2, K3, K4, O1, O2, and O3.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 71.

Table 71 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
E3 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 1.8 mm.	Ø 52 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
E4 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 52 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
G1 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 114 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	20 mm thick foil faced rock mineral wool (80 kg/m^3 density)	-/120/60
G2 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 234 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	20 mm thick foil faced rock mineral wool (80 kg/m^3 density)	-/120/90

Specimen	Aperture	Seal description	Service insulation	FRL
G3 – Copper pipe with outer diameter of 12 mm and pipe wall thickness of 0.9 mm.	Ø 72 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	20 mm thick foil faced rock mineral wool (80 kg/m^3 density)	-/120/90
K1 – PP pipe with outer diameter of 32 mm and pipe wall thickness of 4.4 mm.	Ø 52 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
K2 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	Ø 52 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
K3 – Copper pipe with outer diameter of 12 mm and pipe wall thickness of 0.9 mm.	Ø 32 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/120/60
K4 – PP pipe with outer diameter of 20 mm and pipe wall thickness of 1.9 mm.	Ø 40 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/120/120
O1 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 2.0 mm.	Ø 92 mm	Pipe capping: C/C 30 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
O2 – PVC pipe with outer diameter of 32 mm and pipe wall thickness of 1.6 mm.	Ø 92 mm	Pipe capping: C/C 30 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/120/120
O3 – PE pipe with outer diameter of 32 mm and pipe wall thickness of 3.0 mm.	Ø 92 mm	Pipe capping: C/C 30 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90

B.19 Test report – WF 395179 Revision A

Table 72 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 6 February 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high galvanised steel C-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The insulation was removed for 100 mm around each penetration. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral rock wool. The services referenced in this report are B, C, G, H, I1, I2, I3, P1, P2, P3 and P4.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 73.

Table 73 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
I1 – Gerberit Mepla Alu-pex pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 145 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	25 mm thick Isover Climpipe Section Alu2 glass wool	-/120/120
I2 – Gerberit Mepla Alu-pex pipe with outer diameter of 16 mm and pipe wall thickness of 2.25 mm.	Ø 76mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	20 mm thick Isover Climpipe Section Alu2 glass wool	-/120/120
I2 – Gerberit Mepla Alu-pex pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 195mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	50 mm thick Isover Climpipe Section Alu2 glass wool	-/120/120

Specimen	Aperture	Seal description	Service insulation	FRL
P1 – 1No. type B cable with outer diameter of 18 mm.	Ø 38 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/120/90
P21 – 1No. type A1 cable with outer diameter of 14 mm.	Ø 34 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/120/120
P3 – 1No. type A2 cable with outer diameter of 12 mm.	Ø 32 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/120/90
P4 – 1No. type A3 cable with outer diameter of 11 mm.	Ø 31 mm	Protecta FR Acrylic on both faces with 10 mm wide × 12.5 mm deep stonewool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 12.5 mm deep.	None	-/120/120

B.20 Test report – WF 389526

Table 74 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 21 September 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 50 mm × 25 mm high galvanised steel C-section studs fitted at nominally 600 mm centres and 52 mm wide × 35 mm high galvanised steel U-channel head and base track, with 50 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 2 layers of 12.5 mm thick Type F plasterboard. The insulation was removed for 100 mm around each penetration. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral rock wool. The services referenced in this report are F1, F2, F3, J1 and J3.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 75.

Table 75 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
F1 – 43.No type F cable bundle with diameter 36 mm fitted through a 1200 mm long PVC conduit with outer diameter of 40 mm and thickness of 1.9 mm.	Ø 60 mm	Pipe capping: U/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/120/120
F2 – 40.No type F cable bundle with diameter 35 mm fitted through a 1200 mm long PE conduit with outer diameter of 40 mm and thickness of 2.4 mm.	Ø 60 mm	Pipe capping: U/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
F3 – 40.No type F cable bundle with diameter 36 mm fitted through a 1200 mm long PP conduit with outer diameter of 40 mm and thickness of 1.8 mm.	Ø 60 mm	Pipe capping: U/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/90/90
J1 – Uponor Wirsbo PEX pipe in pipe system with outer pipe diameter 54 mm and thickness of 0.4 mm. Inner pipe diameter 28 mm and thickness 4 mm.	Ø 74 mm	Pipe capping: C/C 10 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/60/45

Specimen	Aperture	Seal description	Service insulation	FRL
J3 – Uponor Wirsbo PEX pipe in pipe system with outer pipe diameter 54 mm and thickness of 0.4 mm. Inner pipe diameter 28 mm and thickness 4 mm.	Ø 114 mm	Pipe capping: C/C 30 mm wide × 25 mm deep Protecta FR Acrylic on both faces.	None	-/60/60

B.21 Test report – WF 407685

Table 76 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 29 November 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 3 m wide × 3 m high steel stud / plasterboard clad partition, built in accordance with BS EN 1366-3:2009 into a refractory lined steel restraint frame. The partition framing comprised of 60 mm × 25 mm high galvanised steel C-section studs fitted at nominally 600 mm centres and 62 mm wide × 35 mm high galvanised steel U-channel head and base track, with 60 mm thick, 33 kg/m^3 density mineral wool insulation friction fitted between the studs and clad on both faces with 2 layers of 15 mm thick Type F plasterboard. The fire seal apertures A, D, H and J were unlined. The supporting construction was fixed on the top and bottom edges; the vertical edges remained free. The gap between the vertical edges and restraint frame were sealed with mineral wool and intumescent mastic sealant. The services referenced in this report are I1, I2, I3 and I4.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 77.

Table 77 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
I1 – Steel pipe with outer diameter of 63.5 mm and pipe wall thickness of 1.6 mm.	Ø 83.5 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 15 mm deep stone mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 15 mm deep.	None	-/120/15
I2 – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 74 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 15 mm deep stone mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 15 mm deep.	None	-/120/0
I3 – Geberit Mepla MLC pipe with outer diameter of 75 mm and pipe wall thickness of 4.6 mm.	Ø 95 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 15 mm deep stone mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 15 mm deep.	None	-/120/30

Specimen	Aperture	Seal description	Service insulation	FRL
I4 – Steel pipe with outer diameter of 324 mm and pipe wall thickness of 6.35 mm.	ø 344 mm	Pipe capping: C/U Protecta FR Acrylic on both faces with 10 mm wide × 15 mm deep stone mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 15 mm deep	None	-/120/15

B.22 Test report – WF 394021

Table 78 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 8 January 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC blockwork/lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 6 apertures. The service referenced in this report is B.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 79

Table 79 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
B – Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	ø 124 mm	Pipe capping: C/C Protecta FR Acrylic on both faces with 10 mm wide × 25 mm deep friction fitted Protecta Mineral Bio backing (128 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	25 mm thick foil wrapped phenolic foam insulation.	-/120/90

B.23 Test report – WF 405606 Revision A

Table 80 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, St Andrews Road, Huddersfield, West Yokshire, HD1, 6SB, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 4 October 2018.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-4:2006 +A1:2010.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC blockwork/lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 6 apertures. The service referenced in this report is B.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-4:2006.

The test specimen achieved the following results – see Table 81.

Table 81 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
C – Linear joint seal	1100 mm long × 30 mm wide × 150 mm deep	15 mm deep × 30 mm wide between the void increasing to approximately 50 mm wide due to the angle of the steel Protecta FR Acrylic flush with both faces up to a 25 mm deep Stonewool backing friction fitted within cavity (35 kg/m^3 density)	None	-/240/45
D– Linear joint seal	1100 mm long × 30 mm wide × 150 mm deep	25 mm deep × 30 mm wide Protecta FR Acrylic flush with the unexposed face up to a 50 mm deep Stonewool backing friction fitted within cavity (35 kg/m^3 density)	None	-/180/15
E – Linear joint seal	1100 mm long × 30 mm wide × 150 mm deep	25 mm deep × 30 mm wide between the void increasing to approximately 50 mm wide due to the angle of the steel Protecta FR Acrylic flush with the unexposed face up to a 50 mm deep Stonewool backing friction fitted within cavity (35 kg/m^3 density)	None	-/240/30

B.24 Test report – WF 382338

Table 82 Information about test report

Item	Information about test report
Report sponsor	Polyseam Ltd, Shaw Park, Silver Street, Huddersfield, West Yokshire, HD5, 9AF, UK.
Test laboratory	Warringtonfire, Chiltern House, Stocking Lane, High Wycombe, HP14, 4ND, UK.
Test date	The fire resistance test was completed on 31 May 2017.
Test standards	The test was done in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.
Variation to test standards	None.
General description of tested specimen	The supporting construction comprised of a 150 mm thick reinforced AAC lintel floor slab built on top of 1.5 m × 1.5 m furnace aperture. The floor slab included 24 apertures. The services referenced in this report are A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, D3, E1, E2, E3, G1, G2, and G3.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:2012 and BS EN 1366-3:2009.

The test specimen achieved the following results – see Table 83

Table 83 Results summary for this test report

Specimen	Aperture	Seal description	Service insulation	FRL
A1 –PVC pipe with outer diameter of 50 mm and pipe wall thickness of 3.7 mm.	Ø 110 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
A2 –PE pipe with outer diameter of 40 mm and pipe wall thickness of 2.4 mm.	Ø 100 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/180/180
A3 –PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.8 mm.	Ø 72 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
B1 –PP pipe with outer diameter of 75 mm and pipe wall thickness of 6.8 mm.	Ø 95 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/90/90
B2 –PP pipe with outer diameter of 12 mm and pipe wall thickness of 1.2 mm.	Ø 32 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240

Specimen	Aperture	Seal description	Service insulation	FRL
B3 –PE pipe with outer diameter of 40 mm and pipe wall thickness of 2.4 mm.	Ø 60 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
C1 –PVC pipe with outer diameter of 50 mm and pipe wall thickness of 2.4 mm.	Ø 70 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
C2 –PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 40 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
C3 –PVC pipe with outer diameter of 50 mm and pipe wall thickness of 3.7 mm.	Ø 70 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
D1 –Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 234 mm	Pipe capping: C/C Protecta FR Acrylic flush on unexposed face with 10 mm wide × 48 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	Foil wrapped stonewool (80 kg/m^3 density) insulation 80 mm thick	-/240/180
D2 –Copper pipe with outer diameter of 54 mm and pipe wall thickness of 1.2 mm.	Ø 114 mm	Pipe capping: C/C Protecta FR Acrylic flush on unexposed face with 10 mm wide × 48 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	Foil wrapped stonewool (80 kg/m^3 density) insulation 20 mm thick	-/240/180
D3 –Copper pipe with outer diameter of 12 mm and pipe wall thickness of 0.9 mm.	Ø 72 mm	Pipe capping: C/C Protecta FR Acrylic flush on unexposed face with 10 mm wide × 48 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	Foil wrapped stonewool (80 kg/m^3 density) insulation 20 mm thick	-/240/240
E1 –PP pipe with outer diameter of 75 mm and pipe wall thickness of 6.8 mm.	Ø 135 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/90/90

Specimen	Aperture	Seal description	Service insulation	FRL
E2 –PVC pipe with outer diameter of 50 mm and pipe wall thickness of 2.4 mm.	Ø 110 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
E3 –PE pipe with outer diameter of 20 mm and pipe wall thickness of 2.0 mm.	Ø 80 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 30 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 30 mm wide × 25 mm deep	None	-/240/240
G1 – Type F cable bundle with diameter 36 mm fitted through a PVC conduit with outer diameter of 40 mm and thickness of 1.9 mm.	Ø 60 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/240/240
G2 – Type F cable bundle with diameter 36 mm fitted through a PP conduit with outer diameter of 40 mm and thickness of 1.8 mm.	Ø 60 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/180/180
G3 – Type F cable bundle with diameter 34 mm fitted through a PE conduit with outer diameter of 40 mm and thickness of 2.4 mm.	Ø 60 mm	Pipe capping: U/C Protecta FR Acrylic flush on both faces with 10 mm wide × 25 mm deep rock mineral wool backing (33 kg/m^3 density). Intumescent size of acrylic is 10 mm wide × 25 mm deep	None	-/180/180