



Regulatory information report

Metal pipes penetrating walls and floors with Hilti CP 606 Firestop Acrylic Sealant / CFS-S ACR

Sponsor: Hilti (Aust.) Pty Ltd

Report number: 28418 Revision: RIR6.1

Issued date: 25 July 2023 Expiry date: 30 June 2028

Quality management

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| | | Prepared by | Reviewed by |
| | | Name | S. Hu K. Nicholls |
| RIR1.1 | Issue: 19 Aug 2015 | Reason for issue | Revised pipe insulation thickness |
| | | Prepared by | Reviewed by |
| | | Name | S. Hu K. Nicholls |
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| | | Name | Rami Al Darwish Omar Saad |
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| | | Prepared by | Reviewed by |
| | | Name | Dugald Watson Yomal Dias |
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| | Expiry: 30 Jun 2028 | Prepared by | Reviewed by |
| | | Name | Ananya Thomas Reviewed by |
| | | Signature |   |

*RIR5.0 and RIR6.0 was skipped to maintain consistency with the referenced assessment report.

Executive summary

This report contains the minimum information required for regulatory compliance and refers to the referenced assessment report 28418 R6.1.

The analysis conducted in the referenced assessment report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of various metal pipes penetrating flexible plasterboard walls, rigid walls and rigid floors – protected with Hilti CP 606 Firestop Acrylic Sealant and mineral fibre wrapping – in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Hilti CP 606 Firestop Acrylic Sealant is described by the manufacturer as a fire caulk that provides a flexible firestop seal for fire-rated joints and through penetrations.

The analysis in sections 6 to 9 of the referenced assessment report found that the proposed systems, together with the described variations, are expected to achieve the outcomes summarised in section 5 – in accordance with AS 1530.4:2014.

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1. Introduction

This report contains the minimum information sufficient for regulatory compliance and refers to the assessment report 28418 R6.1.

The analysis conducted in the referenced assessment report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of various metal pipes penetrating flexible plasterboard walls, rigid walls and rigid floors – protected with Hilti CP 606 Firestop Acrylic Sealant and mineral fibre wrapping – in accordance with AS 1530.4:2014¹ and AS 4072.1:2005².

The referenced assessment 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 the referenced assessment report. It also references test evidence for meeting deemed to satisfy (DTS) provisions of the NCC that apply to the assessed systems.

The referenced assessment was carried out at the request of Hilti (Aust.) Pty Ltd.

The sponsor details are included in Table 1.

Table 1 Sponsor details

| Sponsor | Address |
|-----------------------|-------------------------------------|
| Hilti (Aust.) Pty Ltd | 1G Homebush Bay Dr, Rhodes NSW 2138 |

2. Framework for the assessment

2.1 Assessment approach

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

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021³.

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.

The referenced 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

¹ Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.

² Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.

³ Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

evaluation of the potential fire resistance performance of the elements in accordance with AS 1530.4:2014.

The referenced assessment has been written in accordance with the general principles outlined in EN 15725:2010⁴ for extended application reports on the fire performance of construction products and building elements.

The referenced 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

The referenced assessment report has been prepared to meet the evidence of suitability requirements of the NCC 2022⁵ 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 referenced 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 15 May 2023, Hilti (Aust.) Pty Ltd confirmed that:

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

3. Requirements and limitations of the referenced assessment

- The scope of the referenced assessment report is limited to an assessment of the variations to the tested systems described in section 4.3.
- The referenced assessment report details the methods of construction, test conditions and assessed results expected in accordance with AS 1530.4:2014.
- The referenced assessment applies to services penetrating floor systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014, where horizontal elements must be exposed to heat from the underside only.
- The referenced assessment applies to services penetrating wall systems exposed to fire from each side in accordance with the requirements of AS 1530.4:2014, where vertical elements must be exposed to heat from the direction required to resist fire exposure.
- The deemed-to-satisfy condition for the fire resistance period of a 150 mm thick concrete slab is stated as -/180/180 in Table 5.5.1 in AS 3600:2018. An FRL of -/240/240 is attainable with a 175 mm thick concrete slab as per this standard. The referenced fire tests have shown that

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

⁵ National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia

some tested services penetrating a 150 mm thick concrete floor separating element maintained integrity performance for a period not less than 240 minutes under controlled laboratory conditions. Thus, integrity performance up to 240 minutes has been assessed in the referenced assessment report for minimum 150 mm thick concrete floor elements. The outcomes of the referenced assessment, which are based on these test results, shall not be interpreted as universally applicable for the assessed products in all practical applications. The FRL of the service is always limited by the FRL of the separating element.

- The referenced assessment report is only valid for the assessed system/s 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 the referenced assessment report – may invalidate the findings of the referenced assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL) that is accredited to the same nominated standards of the referenced assessment report.
- The clear spacing between adjacent services (inclusive of any insulation wrapping) or apertures – whichever is less – must not be less than 40 mm. Refer to section 4.4.
- The distance to the first pipe support must not be less than 250 mm for walls and 400 mm for floors.
- Hilti Firestop Joint Sealant CP 606 is stated by the manufacturer to be identical to Hilti Firestop Joint Sealant CFS-S ACR, and the only difference is the trade name. For the referenced assessment, the product is referred to as Hilti CP 606 Firestop Acrylic Sealant.
- The autoclaved aerated concrete (AAC) walls must have a nominal density of 510 kg/m³.
- The documentation that forms the basis for the referenced assessment report is listed in Appendix A of the referenced report.
- The referenced assessment report has been prepared using on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may have been incorporated into the referenced assessment report as a result.
- The referenced assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of the referenced assessment report.

4. Description of the specimen and variations

4.1 Description of assessed systems

The proposed systems include copper, ferrous metal and brass pipes penetrating flexible plasterboard walls, rigid walls and rigid floors through individual apertures. Local fire protection is provided by Hilti CP 606 Firestop Acrylic Sealant. Additionally, mineral fibre wrapping is used to provide insulation protection for the assessed services.

4.2 Referenced test data

The assessment of the variation to the tested systems and the determination of the expected performance is based on the results of the fire tests documented in the reports summarised in Table 2. Further details of the tested systems are included in Appendix A of the referenced report.

Table 2 Referenced test data

| Report number | Test sponsor | Test date | Testing authority |
|-------------------|-----------------------|------------------|-------------------|
| FSV 0855 | Hilti (Aust.) Pty Ltd | 27 August 2001 | CSIRO |
| FSV 0857 | Hilti (Aust.) Pty Ltd | 4 September 2001 | CSIRO |
| EWFA 2683500 R1.1 | Warringtonfire | 11 January 2012 | Warringtonfire |

| Report number | Test sponsor | Test date | Testing authority |
|-----------------|--|------------------|---------------------|
| FRT180461 R1.0 | Hilti (Aust.) Pty Ltd | 4 March 2019 | Warringtonfire |
| FRT180049 R3.0 | Hilti (Aust.) Pty Ltd | 12 March 2019 | Warringtonfire |
| FRT190095 R1.0 | Hilti (Aust.) Pty Ltd | 30 May 2019 | Warringtonfire |
| FRT190130 R2.0 | Dincol Construction System and Hilti Australia Pty Ltd | 11 July 2019 | Warringtonfire |
| FRT210149 R1.2 | Hilti (Aust.) Pty Ltd | 18 June 2021 | Warringtonfire |
| 16824A | Hilti AG | 5 November 2014 | Warringtonfire Gent |
| 16826A | Hilti AG | 10 December 2014 | Warringtonfire Gent |
| 318092507-12-en | Hilti Aktiengesellschaft | 3 May 2022 | IBS |
| 319091602-12-en | Hilti Aktiengesellschaft | 4 May 2022 | IBS |

4.3 Variations to the tested systems

The tested systems and variations to those tested system/s – together with the referenced standard fire tests – are described in Table 3.

Table 3 Variations to tested systems

| Item | Reference test | Description | Variations |
|--------------------|--|---|---|
| Services | FSV 0855, FSV 0857, EWFA 2683500 R1.1, FRT180461 R1.0, FRT180049 R3.0, FRT190095 R1.0 and FRT190130 R2.0 | <p>A summary of the tested systems has been provided below:</p> <ul style="list-style-type: none"> FSV 0855: uninsulated copper pipes (Ø150 mm and Ø32 mm) and brass pipes (Ø100 mm and Ø32 mm) penetrating a 230 mm thick masonry wall system. The annual gap was sealed with Hilti CP 606 Firestop Acrylic Sealant backed with a PE rod with a depth of 20 mm on each side of the wall. FSV 0857: uninsulated copper pipes (Ø150 mm and Ø32 mm) and brass pipes (Ø100 mm and Ø32 mm) penetrating a 154 mm thick framed plasterboard wall system. The annual gap was sealed with Hilti CP 606 Firestop Acrylic Sealant backed with a PE rod with a depth of 20 mm on each side of the wall. EWFA 2683500 R1.1: Ø150 mm copper pipe with a wall thickness of 2.03 mm penetrating a 90 mm thick steel framed plasterboard wall system. The local fire stopping protection included a fire sealant and Bradford Rockwool Fibertex 450 blanket wrapped around the service on both the exposed and unexposed sides. FRT180461 R1.0: insulated Ø32 mm, Ø100 mm, Ø200 mm and Ø15 mm copper pipes penetrating a 150 mm thick concrete floor slab. The local fire stopping protection included closed cell backing rod (20 mm thick), Hilti Firestop Acrylic sealant CP606 and Rockwool wrap (40 mm thick). FRT180049 R3.0: Ø16 mm, Ø32 mm, Ø100 mm and Ø200 mm copper pipes penetrating a 75 mm Hebel wall and protected with Hilti Firestop Acrylic Sealant CP606. FRT190095 R1.0: Ø15 mm and Ø100 mm copper pipes penetrating a 150 mm concrete floor – protected with Hilti | <p>The proposed services may be as follows</p> <ul style="list-style-type: none"> Copper, ferrous or brass pipes – up to Ø65 mm and 0.91 mm wall thickness Copper, ferrous or brass pipes – Ø80 mm to Ø100 mm and 1.22 mm wall thickness Copper or ferrous pipes – Ø125 mm and 1.42 mm wall thickness Copper or ferrous pipes – Ø150 mm and 1.63 mm wall thickness |
| Separating element | | | <p>The flexible wall separating elements may be as follows.</p> <ul style="list-style-type: none"> Minimum 90 mm thick steel or timber framed wall lined on each side with minimum 1 × 13 mm or 1 × 16 mm thick fire rated plasterboard with an established FRL of -/60/60 or 60/60/60 in accordance with AS 1530.4:2014 by an ATL. Minimum 96 mm thick steel or timber framed wall lined on each side with minimum 1 × 16 mm or 2 × 13 mm thick fire rated plasterboard with an established FRL of -/90/90 or 90/90/90 in accordance with AS 1530.4:2014 by an ATL. Minimum 116 mm thick steel or timber framed wall lined on each side with minimum 2 × 13 mm or 1 × 16 mm thick fire rated plasterboard with an established FRL of -/120/120 or 120/120/120 in accordance with AS 1530.4:2014 by an ATL. <p>The rigid wall separating elements may be as follows.</p> <ul style="list-style-type: none"> Minimum 75 mm thick concrete, autoclaved aerated concrete (Hebel or Speedpanel), or solid masonry wall that has an established FRL of -/120/120 established by design to AS 3600:2018⁶, AS 3700:2018⁷ by others or to AS 1530.4:2014 by an ATL. Speedpanel walls require aperture framing as prescribed in section 4.5. |

⁶ Standards Australia, 2018, Concrete structures, AS 3600:2018 (Incorporating Amendment No. 1), Standards Australia, NSW.

⁷ Standards Australia, 2018, Masonry structures, AS 3700:2018, Standards Australia, NSW.

| Item | Reference test | Description | Variations |
|------------------------|--|---|--|
| | | <p>Firestop Acrylic Sealant CP606 and mineral fibre wrapping.</p> <ul style="list-style-type: none"> FRT190130 R2.0: Ø100 mm copper pipe protected with Hilti CP 606 Firestop Acrylic Sealant and mineral fibre wrapping to a distance of 500 mm on both sides penetrating a 155 mm thick Dincel wall system. | <ul style="list-style-type: none"> Minimum 140 mm thick hollow masonry wall that has an established FRL of -/120/120 established by design to AS 3700:2018 by others or to AS 1530.4:2014 by an ATL. Minimum 155 mm thick Dincel walls filled with normal weight concrete with an established FRL of -/120/120 in accordance with AS 1530.4:2014 by an ATL. Minimum 230 mm thick concrete or solid masonry wall that has an established FRL of -/240/240 established by design to AS 3600:2018 or AS 3700:2018 by others. <p>The rigid floor separating elements may be as follows.</p> <ul style="list-style-type: none"> Minimum 120 mm thick concrete floor that has an established FRL up to -/240/240 established by design to AS 3600:2018 or testing by others. Aperture framing is required as per section 4.5 to achieve overall floor thickness of 150 mm. No aperture framing is required for floor thicknesses exceeding 150 mm. |
| Service spacing | 16824A, 16826A, 318092507-12-en, 319091602-12-en | The services tested in 16824A, 16826A, 318092507-12-en and 319091602-12-en incorporated 100 mm thick flexible plasterboard wall, 150 mm thick concrete floor, 140 mm thick cross laminated timber (CLT) floor and 140 mm thick CLT wall, respectively, as the separating elements. In each of these tests, various pipe penetrations, including plastic and metal pipes with various methods of protection, were installed through the separating element, with spacing between services varying from 0 mm to 50 mm. | Service to service spacing must conform to those specified in section 4.4. |
| Aperture framing | FRT210149 R1.2 | Specimen K of the tested system consisted of a Ø32 mm galvanised steel sprinkler pipe penetrating a 96 mm thick framed wall lined with 1 × 16 mm thick fire rated plasterboard. The wall framing consisted of 64 mm deep steel studs. Specimen K specifically had an aperture framing made of 1 × 13 mm thick fire rated plasterboard on both sides – effectively increasing the wall thickness to 122 mm in the vicinity of the service. The annular gap was filled with Hilti CP 606 Firestop Acrylic Sealant to the full depth of plasterboard and finished as a 30 mm × 50 mm fillet on both sides. | Aperture framing details must be as specified in section 4.5. |
| Annular gap protection | EWFA 2683500 R1.1, FSV 0857, | <ul style="list-style-type: none"> EWFA 2683500 R1.1: The separating element was a 90 mm thick plasterboard wall system. The relevant test specimen A had an annular gap of approximately 5 to | The annular gap size is typically limited to be minimum 5 mm and maximum 20 mm as shown in section 4.7 (Figure 7). |

| Item | Reference test | Description | Variations |
|------|-------------------------|---|--|
| | FSV 0855, FRT180461 R1. | <p>10 mm. The annular gap was filled to the full depth of the plasterboards and finished with a 30 mm × 30 mm filled on each side using a fire sealant that is different from Hilti CP 606 Firestop Acrylic Sealant.</p> <ul style="list-style-type: none"> • FSV 0857: The separating element was 154 mm thick plasterboard wall system. The relevant test specimens A and D had an annular gap of approximately 15 to 20 mm. The annular gap was filled to a depth of 20 mm with Hilti CP 606 Firestop Acrylic Sealant on both sides. PU foam backing was used to control the sealant depth to 20 mm. The sealant was finished flush with the face of the wall on both sides. • FSV 0855: The separating element was a 230 mm thick masonry wall. The relevant test specimens E and H had an annular gap of approximately 15 to 20 mm. The annular gap was filled to a depth of 20 mm with Hilti CP 606 Firestop Acrylic Sealant on both sides. PU foam backing was used to control the sealant depth to 20 mm. The sealant was finished flush with the face of the wall on both sides. • FRT180461 R1.0: The separating element was 150 mm thick concrete floor slab. The relevant test specimens B, C, D and E had an annular gap of approximately 15 to 20 mm. The annular gap was filled to a depth of 30 mm with Hilti CP 606 Firestop Acrylic Sealant on the top side only. A closed cell backing was used to control the sealant depth to 30 mm. The sealant was finished flush with the face of the floor. | <p>For rigid walls and floors, open or closed cell PEF backing rod or mineral fibre may be used as backing to sealant. The backing rod may be omitted if the specified sealant depth for minimum 20 mm or full depth can be achieved without it (typically in framed plasterboard walls where sealant is anyway provided to full depth of plasterboard).</p> <p>For single layer plasterboard walls where minimum depth of 20 mm cannot be achieved, aperture framing must be used as specified in section 4.5 to achieve the necessary depth of plasterboard.</p> <p>The annular gap for services penetrating rigid walls only may be increased up to maximum 40 mm, subject to providing an additional layer of 1 × 16 mm thick fire rated plasterboard aperture framing as shown in Figure 8.</p> |

4.4 Service to service spacing requirements

Figure 1 shows the spacing requirements for the services adjacent to each other.

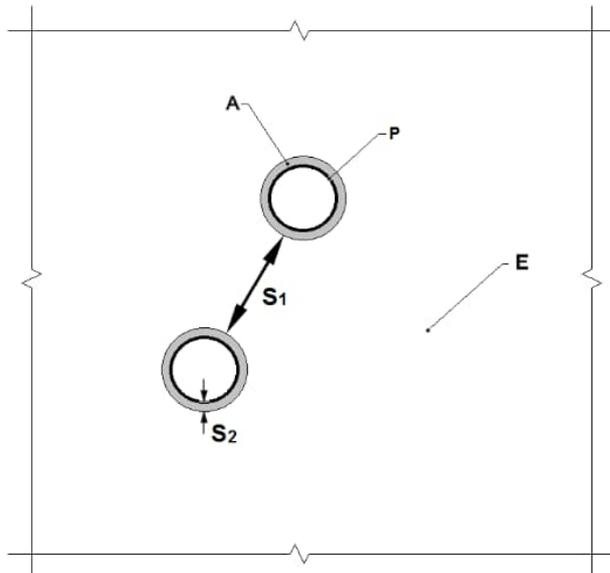


Figure 1 Distance requirements of penetrations

| Minimum distance valid for installations of services | Wall and floor (mm) |
|---|---|
| Distance between edges of adjacent penetrations (inclusive of any insulation wrapping) or apertures – whichever is lesser | $S_1 \geq 40$ |
| Distance between wall of pipe and edge of penetration | <ul style="list-style-type: none"> $5 \leq S_2 \leq 20$ for walls $5 \leq S_2 \leq 25$ for floors |

4.5 Aperture framing details for walls and floors

Aperture framing must be constructed from fire rated plasterboard or calcium silicate boards of similar thickness as illustrated in Figure 2.

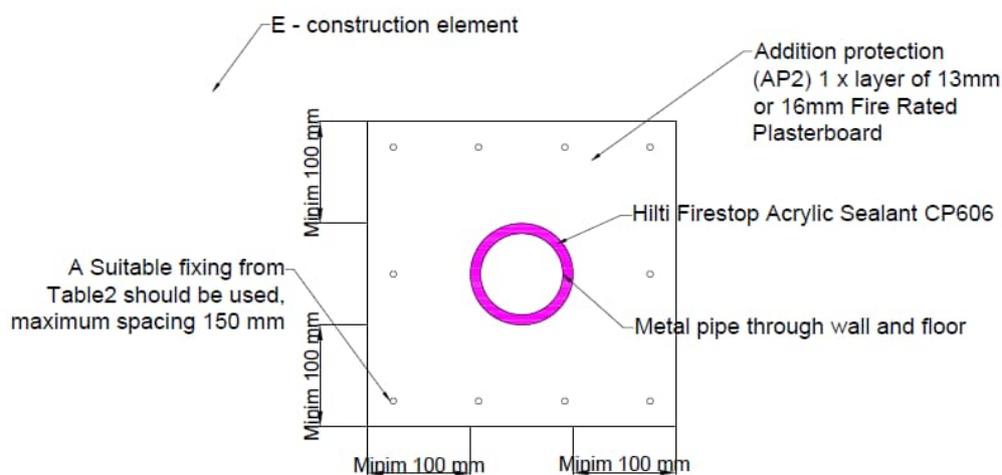


Figure 2 Generic aperture framing detail for flexible and rigid walls

4.5.1 Fixing details for aperture framing

The fixing details for fire rated plasterboard aperture framing described in section 4.5 above are summarised in Table 4.

Table 4 Fixing details for aperture framing

| Anchoring System | | Minimum Size | Flexible Wall (Plasterboard lined) | Aerated Concrete Wall (Hebel) | Solid Concrete Walls & Floors | |
|------------------------|---|--------------|------------------------------------|-------------------------------|-------------------------------|---|
| Hilti Screw Anchor | HUS3-P | M6 | | ✓* | ✓ | |
| | HUS3-H | | | ✓* | ✓ | |
| | HUS | | | ✓* | ✓ | |
| Hilti Expansion Anchor | HSA | | | | | ✓ |
| | HST | | | | | ✓ |
| | DBZ 6/45 | | | | | ✓ |
| | HFB | | | | | ✓ |
| Hilti Cavity Anchor | HTB-S | | | ✓ | | |
| | HHD-S | | | ✓ | | |
| Others | #14/10x65 mm Hex Head Type 17 Screw | | 14g | | ✓ | |
| | Laminating / Drywall / Plasterboard Screws, with steel washers of at least 19 mm in diameter, length as required. | 10g | ✓ | | | |
| | Threaded Rod with Nuts & Washer | M6 | ✓ | ✓ | ✓ | |

* Minimum length of Hilti HUS screw required for AAC (Hebel and Speedpanel) is 60 mm

4.5.2 Details specific to Speedpanel walls

Where beading is applied to a Speedpanel, all gaps in the profiled face of the panel must be filled with Hilti CP 606 Firestop Acrylic Sealant. Aperture framing must be constructed from fire rated plasterboard or calcium silicate type board of similar thickness, as shown in Figure 3.

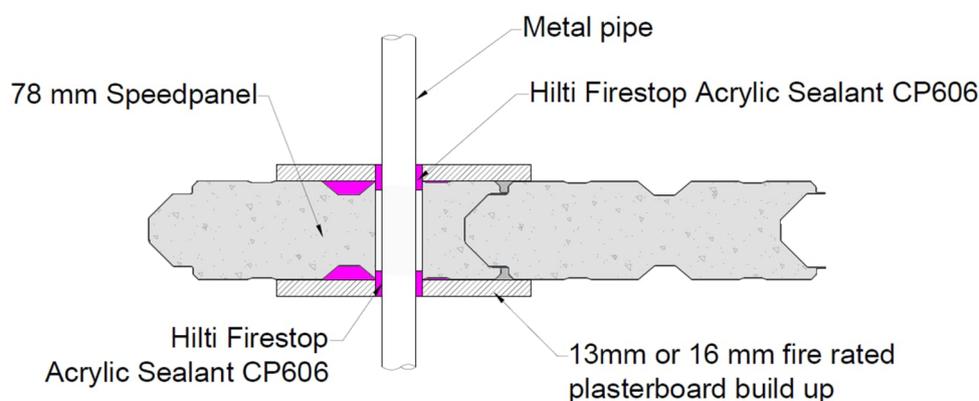


Figure 3 Aperture framing detail for services penetrating Speedpanel walls

4.6 Service lagging / wrapping details

Proposed services may be lagged or wrapped with insulation as follows.

- Minimum 38 mm thick mineral fibre insulation with a density not less than 140 kg/m³
- Minimum 35 mm thick pre-formed mineral fibre insulation with a density not less than 115 kg/m³

For wall systems, requiring two-way FRL, lagging must be symmetrically present on both sides. For floor systems requiring FRL for exposure from below only, lagging is specified only on the top side. Refer to section 5 for individual lagging specifications for the proposed range of services.

The lagging must be fixed with cable ties at 50 mm from each end and maximum 250 mm intervals. A bead of Hilti CP 606 Firestop Acrylic Sealant must be applied at the junction of the mineral fibre sleeve and the surface of the substrate, as illustrated in Figure 4 to Figure 6.

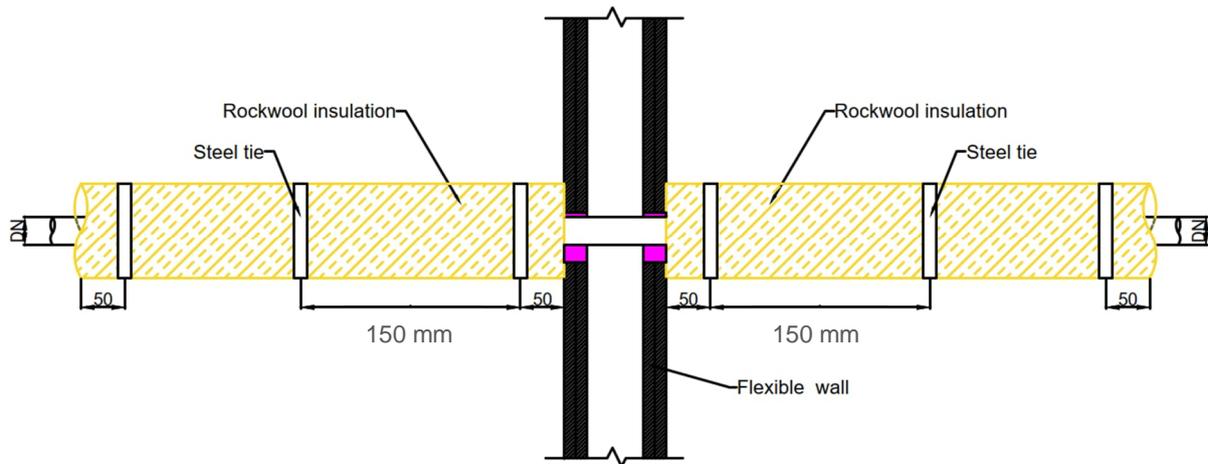


Figure 4 Lagging details for flexible walls

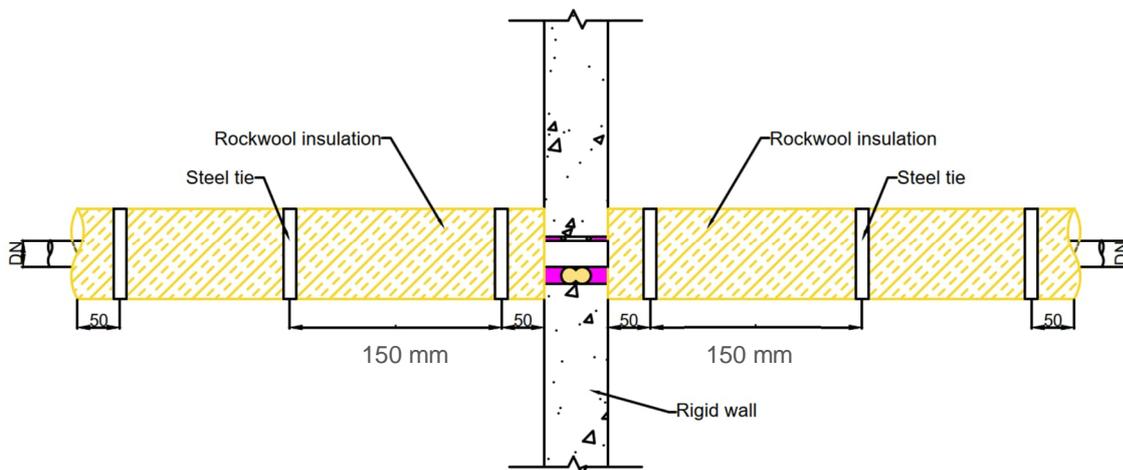


Figure 5 Lagging details for flexible rigid walls

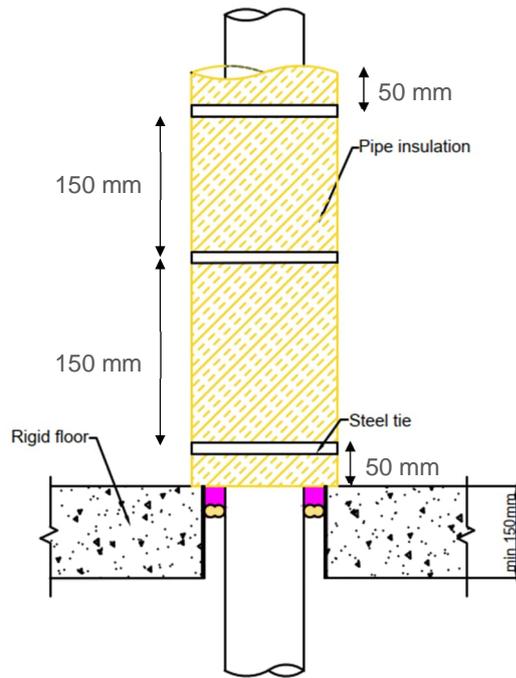


Figure 6 Lagging details rigid floors

4.7 Annular gap size

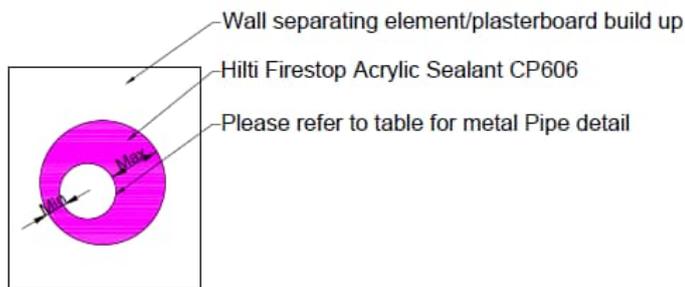


Figure 7 Annular gap minimum and maximum size illustration

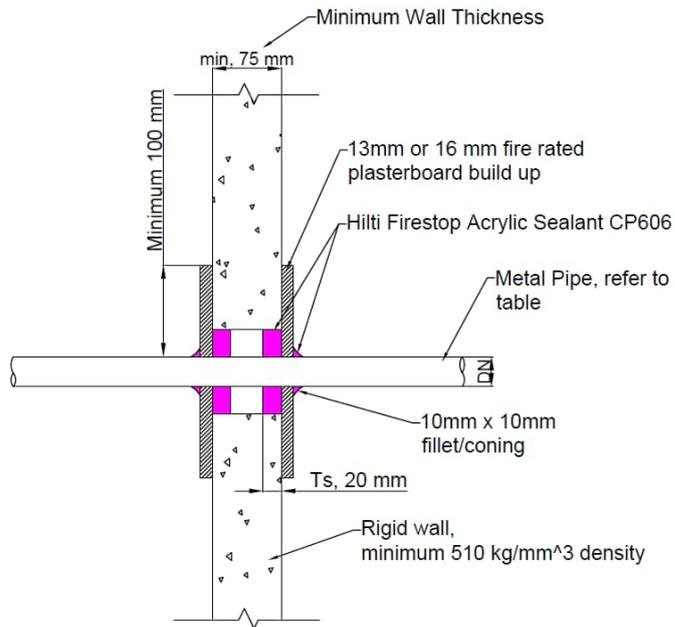


Figure 8 Larger annular gaps in rigid walls only

5. Assessment outcome

Details of the assessment and discussion are only available in the referenced main assessment report. The referenced assessment demonstrates that the proposed systems, together with the described variations, are expected to achieve the fire resistance levels (FRL) as stated below if tested in accordance with AS 1530.4:2014. A summary of the assessment outcome is outlined in Figure 9 to Figure 22 and Table 5 to Table 18.

5.1 Services penetrating -/60/60 or 60/60/60 plasterboard walls

5.1.1 Non-insulated services

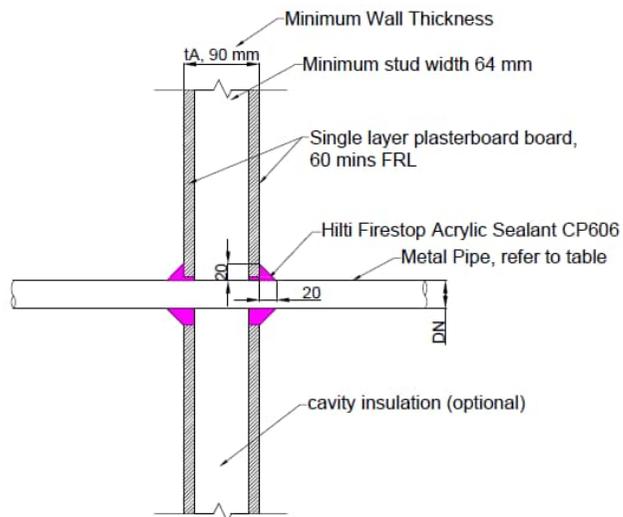


Figure 9 Non-insulated services penetrating -/60/60 and 60/60/60 framed walls – option 1

Table 5 Non-insulated services – Option 1 (refer to Figure 9)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Insulation | FRL |
|----------------------------------|------------------------------------|-----------------|--------------------------------|------------------------------|------------------|---|------------|--------|
| Copper, ferrous or brass | 1 hr FRL single layer plasterboard | N/A | Up to 65 | 0.91 | 5-20 | Full depth of single layer plasterboard with 20 mm × 20 mm fillet | None | -/60/- |
| | | | 80-100 | 1.22 | | | | |
| Copper, ferrous (steel and iron) | | | 125 | 1.42 | | | | |
| | | | 150 | 1.63 | | | | |

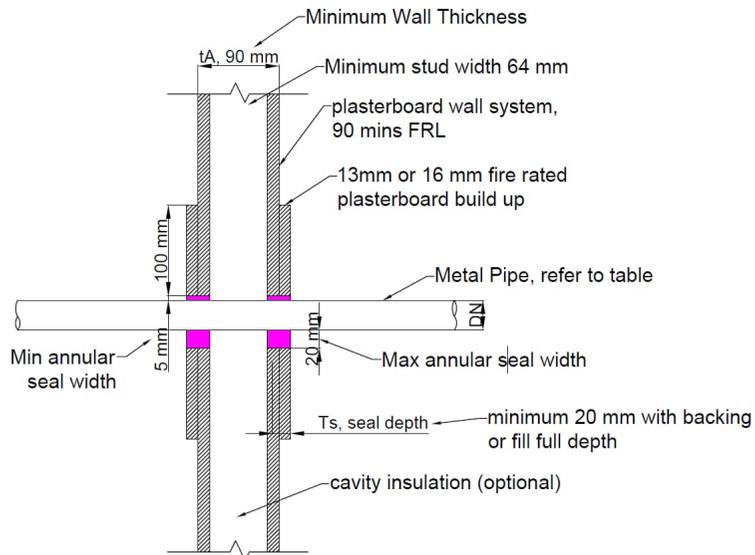


Figure 10 Non-insulated services penetrating -/60/60 and 60/60/60 framed walls – option 2

Table 6 Non-insulated services – Option 2 (refer to Figure 10)

| Metal pipe material | Separating element, t _A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Insulation | FRL |
|----------------------------------|------------------------------------|--|--------------------------------|------------------------------|------------------|--|------------|--------|
| Copper, ferrous or brass | 1 hr FRL single layer plasterboard | min. 13 mm fire rated plasterboard build up each side locally around the Copper pipe penetration | Up to 65 | 0.91 | 5-20 | Full depth of two layers of plasterboard | None | -/60/- |
| Copper, ferrous (steel and iron) | | | 80-100 | 1.22 | | | | |
| | | | 125 | 1.42 | | | | |
| | | | 150 | 1.63 | | | | |

5.1.2 Insulated services

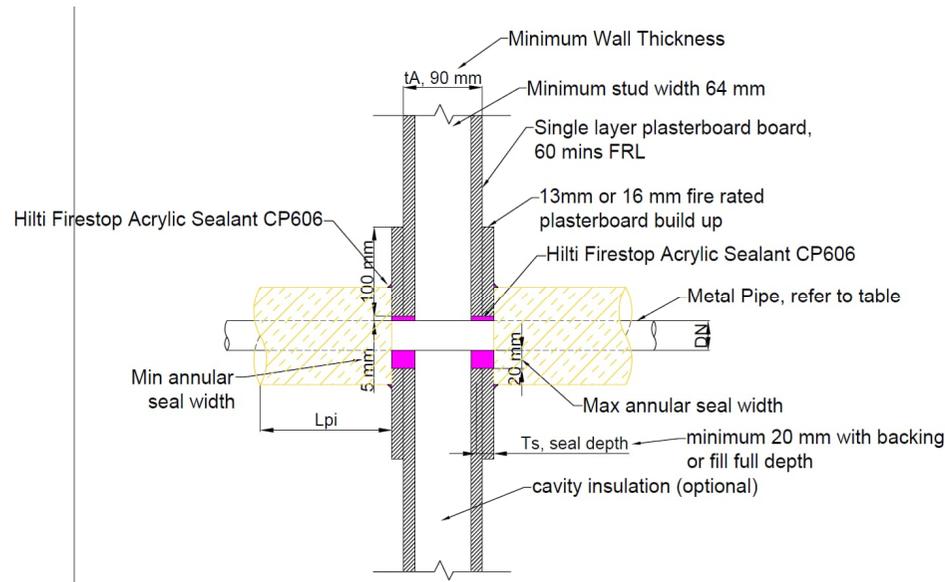


Figure 11 Insulated services penetrating -/60/60 and 60/60/60 framed walls

Table 7 Insulated services (refer to Figure 11)

| Metal pipe material | Separating element, t _A | Build up detail | Pipe nominal diameter, (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Insulation | insulation length (mm) | FRL |
|----------------------------------|------------------------------------|--|-----------------------------|------------------------------|------------------|----------------------------|--|------------------------|---------|
| Copper, ferrous or brass | 1 hr FRL single layer plasterboard | 13 mm plasterboard build up each side locally around the Copper pipe penetration | Up to 15 | 0.91 | 5-20 | Full depth of plasterboard | Mineral wool insulation, in the form of wrap or pre-formed, installed on each side of the wall | 200 | -/60/60 |
| | | | 20-32 | 0.91 | | | | 300 | |
| | | | 40-65 | 0.91 | | | | 400 | |
| | | | 80-100 | 1.22 | | | | 500 | |
| | | | 125 | 1.42 | | | | 600 | |
| Copper, ferrous (steel and iron) | | | 150 | 1.63 | | | | | |

5.2 Services penetrating -/90/90 or 90/90/90 plasterboard walls

5.2.1 Non-insulated services

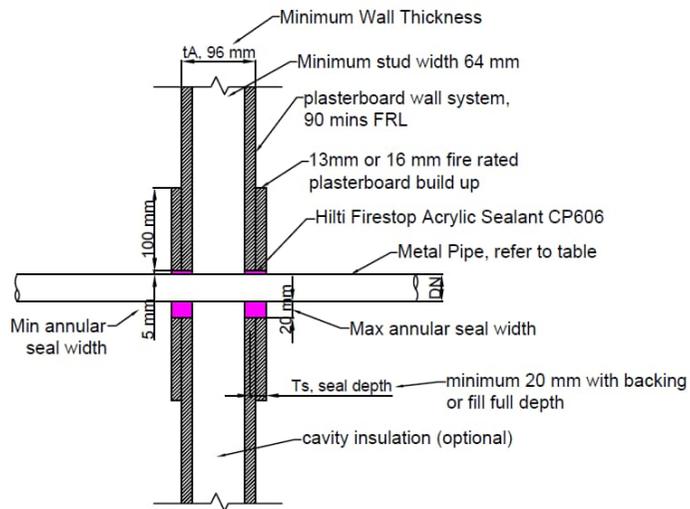


Figure 12 Non-insulated services penetrating -/90/90 and 90/90/90 framed walls

Table 8 Non-insulated services (refer to Figure 12)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Insulation | FRL |
|----------------------------------|---------------------------|--|-----------------------------|------------------------------|------------------|--------------------|------------|--------|
| Copper, ferrous or brass | 90 mins plasterboard wall | 13 mm plasterboard build up each side locally around the Copper pipe penetration | Up to 65 | 0.91 | 5-20 | 20 | None | -/90/- |
| Copper, ferrous (steel and iron) | | | 80-100 | 1.22 | | | | |
| | | | 125 | 1.42 | | | | |
| | | | 150 | 1.63 | | | | |

5.2.2 Insulated services

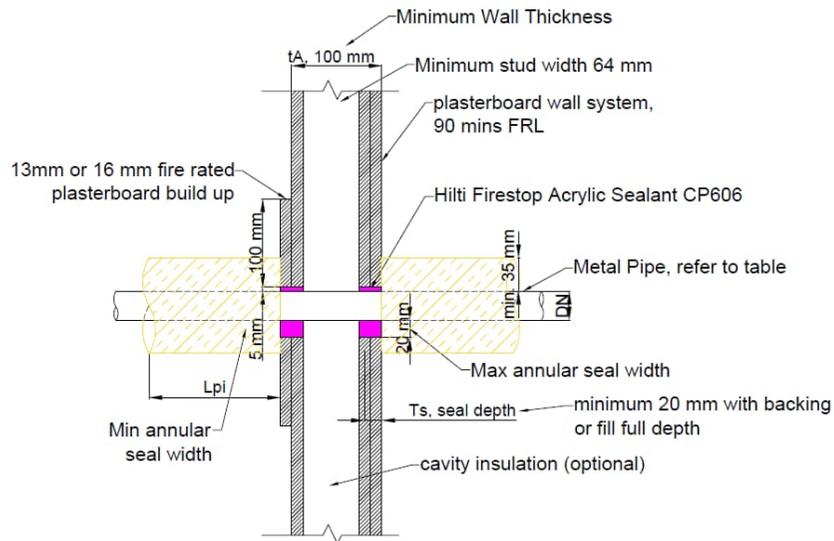


Figure 13 Insulated services penetrating -/90/90 and 90/90/90 framed walls

Table 9 Insulated services (refer to Figure 13)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Mini pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Pipe insulation config | insulation length (mm) | FRL |
|----------------------------------|---------------------------|--|--------------------------------|-------------------------------|------------------|--|---|------------------------|---------|
| Copper, ferrous or brass | 90 mins plasterboard wall | 13 mm plasterboard build up each side locally around the Copper pipe penetration | 15 | 0.91 | 5-20 | Full depth of two layers of plasterboard | Mineral wool insulation, in the form of wrap or preformed, installed on each side of the wall | 200 | -/90/90 |
| | | | 20-32 | 0.91 | | | | 300 | |
| | | | 40-65 | 0.91 | | | | 400 | |
| | | | 80-100 | 1.22 | | | | 500 | |
| 125 | | | 1.42 | 600 | | | | | |
| Copper, ferrous (steel and iron) | | | 150 | 1.63 | | | | | |

5.3 Services penetrating -/120/120 or 120/120/120 plasterboard walls

5.3.1 Non-insulated services

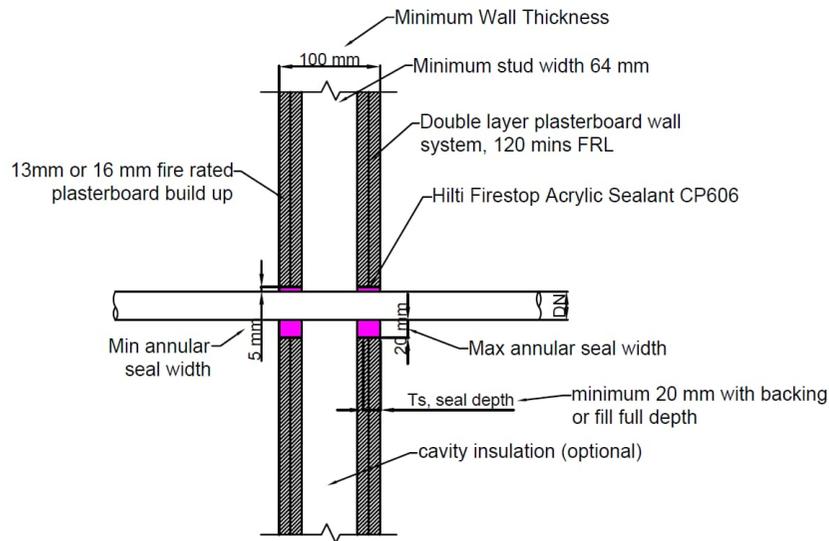


Figure 14 Non-insulated services penetrating -/120/120 and 120/120/120 framed walls

Table 10 Non-insulated services (refer to Figure 14)

| Metal pipe material | Separating element, t _A | Build up detail | Pipe nominal diameter, DN (mm) | Minimum pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Pipe insulation configuration | FRL |
|----------------------------------|--|-----------------|--------------------------------|----------------------------------|------------------|--------------------|-------------------------------|---------|
| Copper, ferrous or brass | 2 hr FRL double layer plasterboard wall system | N/A | Up to 65 | 0.91 | 5-20 | 20 | None | -/120/- |
| | | | 80-100 | 1.22 | | | | |
| Copper, ferrous (steel and iron) | | | 125 | 1.42 | | | | |
| | | | 150 | 1.63 | | | | |

5.3.2 Insulated services

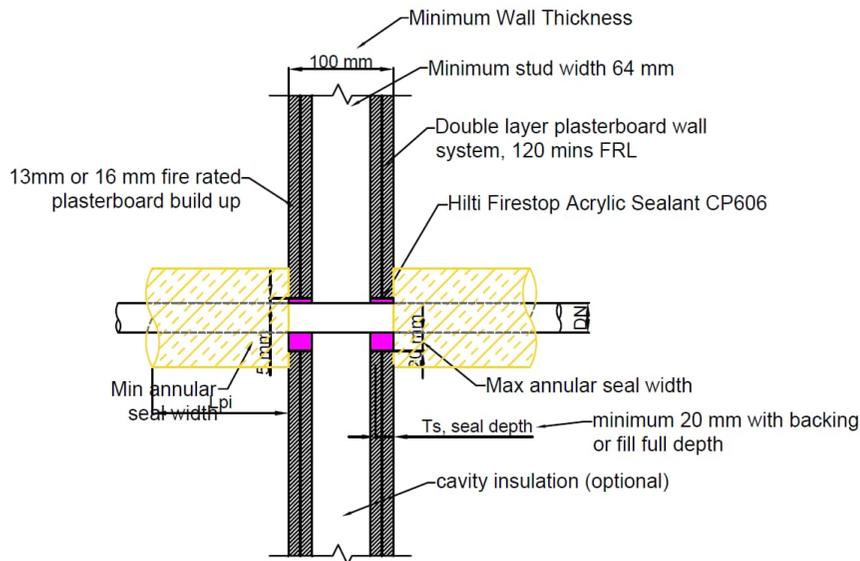


Figure 15 Insulated services penetrating -/120/120 and 120/120/120 framed walls

Table 11 Insulated services (refer to Figure 15)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Minimum pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Pipe insulation config | insulation length (mm) | FRL |
|----------------------------------|-----------------------------------|-----------------|--------------------------------|----------------------------------|------------------|--|---|------------------------|-----------|
| Copper, ferrous or brass | 120 FRL double layer plasterboard | Not required | 15 | 0.91 | 5-20 | Full depth of two layers of plasterboard | Mineral wool insulation, in the form of wrap or preformed, installed on each side of the wall | 200 | -/120/120 |
| | | | 20-32 | 0.91 | | | | 300 | |
| | | | 40-65 | 0.91 | | | | 400 | |
| | | | 80-100 | 1.22 | | | | 600 | |
| | | | 125 | 1.42 | | | | 750 | |
| Copper, ferrous (steel and iron) | | | 150 | 1.63 | | | | | |

5.4 Services penetrating -/120/120 and 120/120/120 rigid walls

5.4.1 Non-insulated services

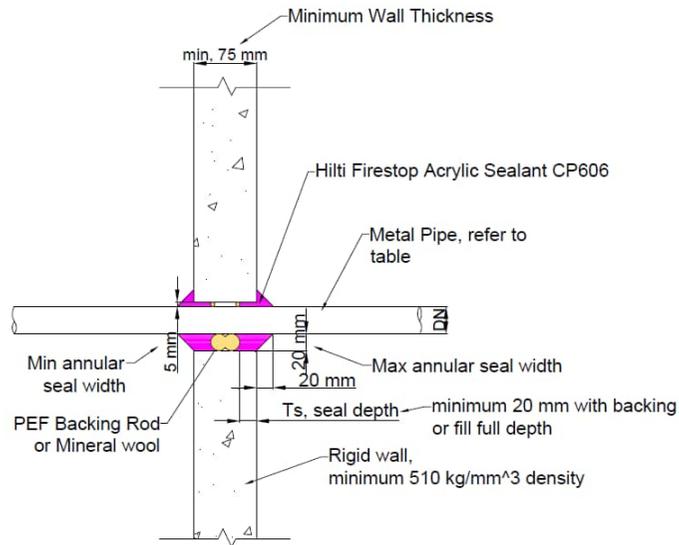


Figure 16 Non-insulated services penetrating -/120/120 and 120/120/120 rigid walls

Table 12 Non-insulated services (refer to Figure 16)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing configuration | Fillet/conning | FRL |
|----------------------------------|--|---|--------------------------------|------------------------------|------------------|--------------------|---|-----------------------------------|---------|
| Copper, ferrous or brass | Rigid wall, min 75 mm, with a min density of 510 kg/m ³ | Only required for Speedpanel, single layer of fire rated plasterboard 13 mm or 16 mm each side. | Up to 65 | 0.91 | 5-20 | 20 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | 20 mm x 20 mm fillet (both sides) | -/120/- |
| | | | 80-100 | 1.22 | | | | | |
| | | | 125 | 1.42 | | | | | |
| | | | 150 | 1.63 | | | | | |
| Copper, ferrous (steel and iron) | Speedpanel | | | | | | | | |

5.4.2 Insulated services

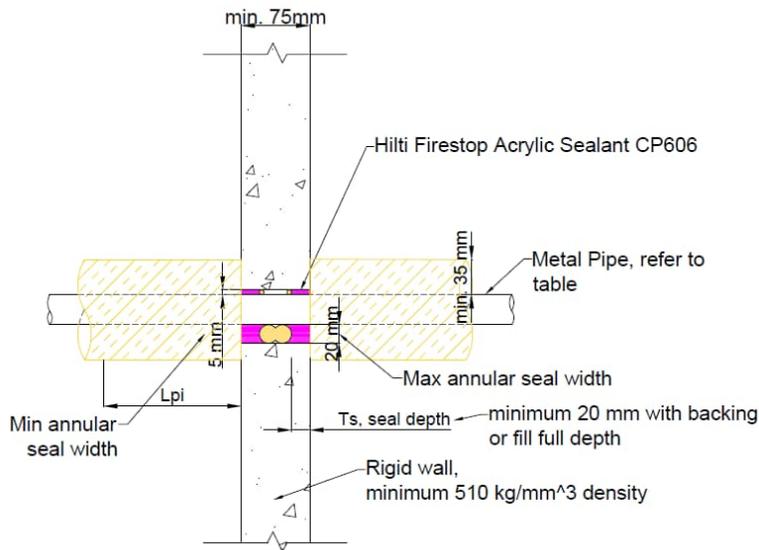


Figure 17 Insulated services penetrating -/120/120 and 120/120/120 rigid walls – Option 1

Table 13 Insulated services – Option 1 (refer to Figure 17)

| Metal pipe material | Separating element, t_A | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing configuration | Pipe insulation configuration | Insulation Length (mm) | FRL |
|----------------------------------|--|--------------------------------|------------------------------|------------------|--------------------|---|---|------------------------|----------|
| Copper, ferrous or brass | Rigid wall, min 75 mm, with a min density of 510 kg/m ³ | 15 | 0.91 | 5-20 | 20 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | Mineral wool insulation, in the form of wrap or preformed, installed on each side of the wall | 200 | -/120/60 |
| | | 20-32 | 0.91 | | | | | 300 | |
| | | 40-65 | 0.91 | | | | | 400 | |
| | | 80-100 | 1.22 | | | | | 600 | |
| | | 125 | 1.42 | | | | | 750 | |
| Copper, ferrous (steel and iron) | | 150 | 1.63 | | | | | | |

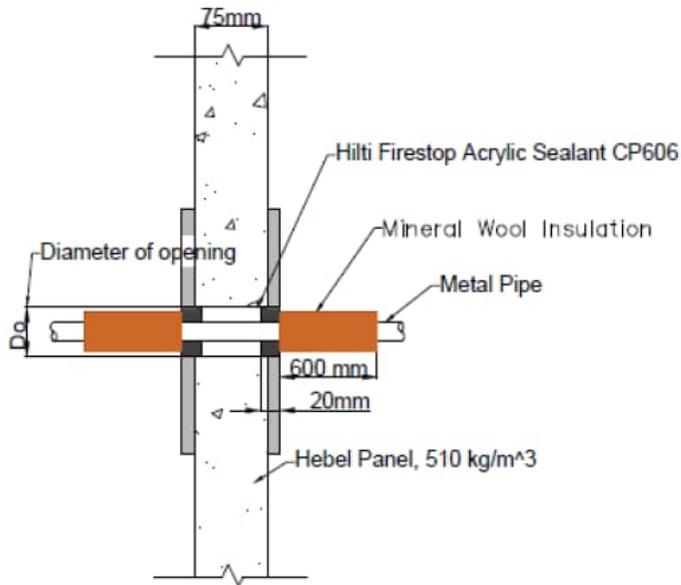


Figure 18 Insulated services penetrating -/120/120 and 120/120/120 rigid walls – Option 2

Table 14 Insulated services – Option 2 (refer to Figure 18)

| Metal pipe material | Separating element, t _A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing config | Pipe insulation config | Insulation Length (mm) | FRL |
|----------------------------------|--|---|--------------------------------|------------------------------|------------------|--------------------|---|---|------------------------|-----------|
| Copper, ferrous or brass | Rigid wall, min 75 mm, with a min density of 510 kg/m ³ | Single layer of fire rated plasterboard 13 mm or 16 mm each side. | 15 | 0.91 | 5-20 | 20 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | Mineral wool insulation, in the form of wrap or preformed, installed on each side of the wall | 200 | -/120/120 |
| | | | 20-32 | 0.91 | | | | | 300 | |
| | | | 40-65 | 0.91 | | | | | 400 | |
| | | | 80-100 | 1.22 | | | | | 600 | |
| | | | 125 | 1.42 | | | | | 750 | |
| Copper, ferrous (steel and iron) | Speedpanel | | 150 | 1.63 | | | | | | |

5.5 Services penetrating -/240/240 and 240/240/240 rigid walls

5.5.1 Non-insulated services

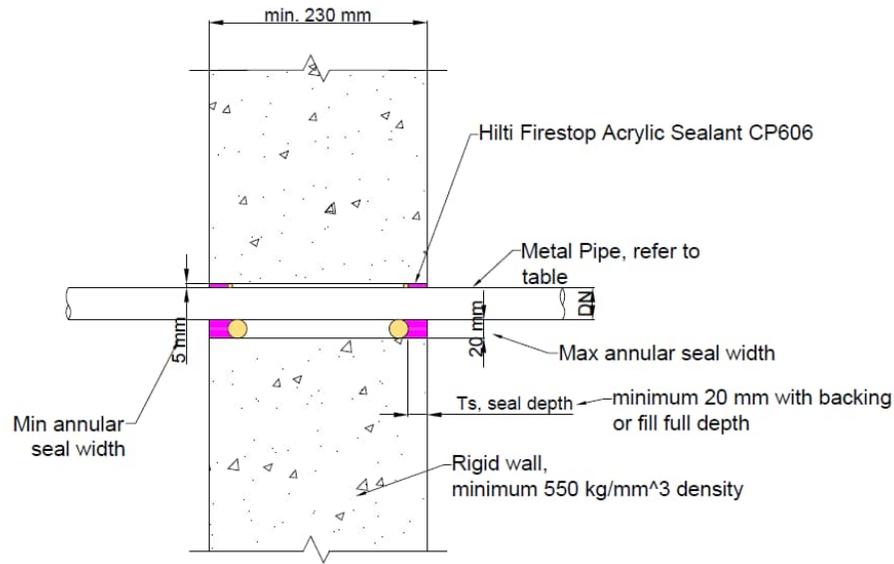


Figure 19 Non-insulated services penetrating -/240/240 and 240/240/240 rigid walls

Table 15 Non-insulated services (refer to Figure 19)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap | Sealant depth (mm) | Backing config | Insulation | FRL |
|----------------------------------|---|--|--------------------------------|------------------------------|-------------|--------------------|---|------------|---------|
| Copper, ferrous or brass | Rigid wall, min 230 mm, with a min density of 550 kg/m ³ | only required if the bare wall thickness is less than 230 mm | Up to 65 | 0.91 | 5-20 | 20 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | None | -/240/- |
| | | | 80-100 | 1.22 | | | | | |
| | | | 125 | 1.42 | | | | | |
| | | | 150 | 1.63 | | | | | |
| Copper, ferrous (steel and iron) | | | | | | | | | |

5.5.2 Insulated services

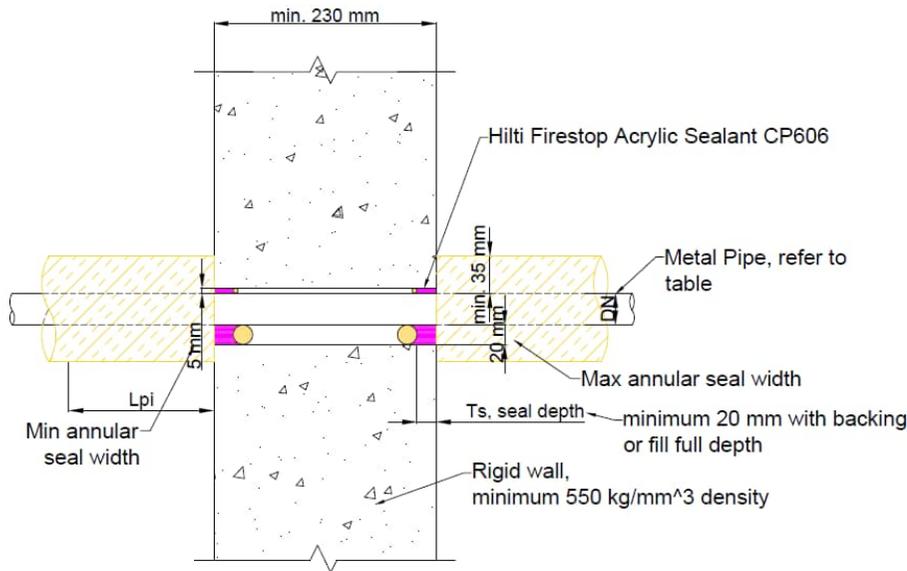


Figure 20 Insulated services penetrating -/240/240 and 240/240/240 framed rigid walls

Table 16 Insulated services (refer to Figure 20)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Min pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing config | Pipe insulation config | Insulation length (mm) | FRL |
|----------------------------------|---|--|--------------------------------|------------------------------|------------------|--------------------|---|---|------------------------|-----------|
| Copper, ferrous or brass | Rigid wall, min 230 mm, with a min density of 510 kg/m ³ | only required if the bare wall thickness is less than 230 mm | Up to 15 | 0.91 | 5-20 | 20 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | Mineral wool insulation, in the form of wrap or preformed, installed on each side of the wall | 200 | -/240/120 |
| | | | 20-32 | 0.91 | | | | | 300 | |
| | | | 40-65 | 0.91 | | | | | 400 | |
| | | | 80-100 | 1.22 | | | | | 600 | |
| | | | 125 | 1.42 | | | | | 750 | |
| Copper, ferrous (steel and iron) | | | 150 | 1.63 | | | | | | |

5.6 Services penetrating up to -/240/240 and 240/240/240 rigid floors

5.6.1 Non-insulated services

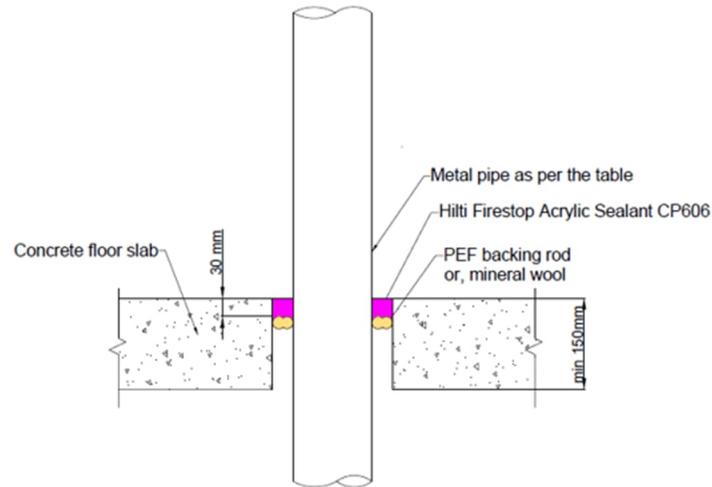


Figure 21 Non-insulated services penetrating -/240/240 and 240/240/240 rigid floors

Table 17 Non-insulated services (refer to Figure 21)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Minimum pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing configuration | Pipe insulation configuration | FRL |
|----------------------------------|---|-----------------|--------------------------------|----------------------------------|------------------|--------------------|---|-------------------------------|----------|
| Copper, ferrous or brass | Rigid floor, min 150 mm PVC pipe section/ Hilti cast in collar CP 680 P/PX/M series casted in floor can remain in the concrete floor" | None | Up to 65 | 0.91 | 5-25 | 30 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | None | -/240/-* |
| | | | 80-100 | 1.22 | | | | | |
| | | | 125 | 1.42 | | | | | |
| | | | 150 | 1.63 | | | | | |
| Copper, ferrous (steel and iron) | | | | | | | | | -/120/- |

*The FRL of the penetration is limited by that of the separating element. If the separating element has a stated FRL of -/120/120, then the fire resistance period (FRP) of the penetration is also limited to 120 minutes with respect to integrity and insulation.

5.6.2 Insulated services

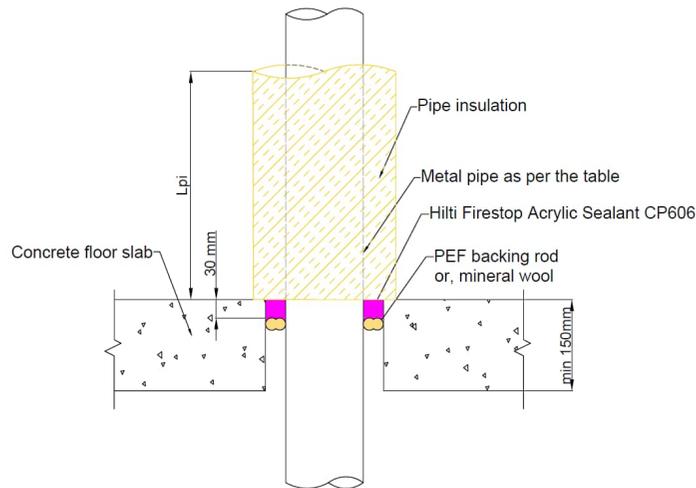


Figure 22 Insulated services penetrating -/240/240 and 240/240/240 framed rigid floors

Table 18 Insulated services (refer to Figure 22)

| Metal pipe material | Separating element, t_A | Build up detail | Pipe nominal diameter, DN (mm) | Mini pipe wall thickness (mm) | Annular gap (mm) | Sealant depth (mm) | Backing configuration | Pipe insulation config | Insulation length | FRL |
|----------------------------------|--|-----------------|--------------------------------|-------------------------------|------------------|--------------------|---|---|-------------------|------------|
| Copper, ferrous or brass | Rigid floor, min 150 mm PVC pipe section/ Hilti cast in collar CP 680 P/PX/M series casted in floor can remain in the concrete floor" | None | Up to 15 | 0.91 | 5-25 | 30 | PEF backing rod, CF 116, CF-F 750 GV, CF 126 or mineral rock wool | Mineral wool insulation, in the form of wrap or preformed, installed on top of floor only | 200 | -/240/120* |
| | | | 20-32 | 0.91 | | | | | 300 | |
| | | | 40-65 | 0.91 | | | | | 400 | |
| | | | 80-100 | 1.22 | | | | | 600 | |
| | | | 125 | 1.42 | | | | | 750 | |
| Copper, ferrous (steel and iron) | | | 150 | 1.63 | | | | | -/120/120 | |

*The FRL of the penetration is limited by that of the separating element. If the separating element has a stated FRL of -/120/120, then the fire resistance period (FRP) of the penetration is also limited to 120 minutes with respect to integrity and insulation.

6. Validity

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

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

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

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

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

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

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