



Regulatory information report

Assessment of plastic pipe penetrations in
walls and floors protected with Hilti Retrofit
Firestop Collar CFS-C P/CP 644 in
accordance with AS 1530.4:2014 and
AS 4072.1:2005

Sponsor: Hilti (Aust) Pty Ltd

Report number: 27006 Revision: RIR5.0

Issued date: 20 November 2023 Expiry date: 31 October 2028

Quality management

Version	Date	Information about the report	
RIR5.0	Issue: 20 Nov 2023	Reason for issue	Report update and revalidation for another 5 years
	Expiry: 31 Oct 2028	Name Signature	Prepared by
			Reviewed by
			Mohammed Mutafi
			

Executive summary

The analysis conducted in the referenced assessment report contains the minimum information required for regulatory compliance and refers to the referenced assessment report 27006 R5.0.

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 plastic pipe penetrations in walls and floors protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in accordance with AS 1530.4:2014 and AS 4072.1:2005.

The analysis in section 6 of the referenced report found that the proposed systems, together with the described variations, are expected to achieve the outcomes summarised in section 6.8 in accordance with AS 1530.4:2014.

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1. Introduction

The analysis conducted in the referenced assessment report contains the minimum information sufficient for regulatory compliance and refers to the assessment report 27006 R5.0.

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 plastic pipe penetrations in walls and floors protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in accordance with AS 1530.4:2014¹ and AS 4072.1:2005².

The analysis conducted in 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 Australia Pty Ltd	1G Homebush Bay Dr Rhodes NSW 2138
Hilti New Zealand Ltd	Hilti (New Zealand) Ltd P.O, Box 112030 Penrose, Auckland 1642, New Zealand

2. Framework for the assessment

2.1 Assessment approach

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

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 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 – e.g. size or configuration – it is not possible to subject a construction or a product to a fire test.

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.

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 has been written in accordance with the general principles outlined in EN 15725:2023⁴ 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 4 July 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, has 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 6.
- 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 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 wall systems exposed to fire from one 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 FRL of the service is limited by the FRL of the separating element.

⁴ European Committee for Standardization, 2023, Extended application reports 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

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

- The referenced assessment 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 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 documentation that forms the basis for the referenced assessment report is listed in Appendix A
- The referenced assessment report has been prepared using information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may have been incorporated into the referenced assessment report as a result.
- 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 consist of various services penetrating walls and floors. The separating elements include a wall system of steel or timber frame lined with two layers of fire grade plasterboard on each side, a 155 mm thick Dintel wall with polymer skins filled with normal weight concrete and a minimum of 120 mm thick concrete floors.

The services include unplasticized polyvinyl chloride (uPVC), polypropylene random copolymer (PPR), polyethylene (PE-100), RAUPIANO PLUS and insulated chlorinated polyvinyl chloride (CPVC) pipes. These services are protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644.

Hilti Retrofit Firestop Collar CFS-C P/CP 644 has various sizes, and the number of fixings depends on the service diameter. When used, the collar is clamped around the pipe and fixed to the wall. Table 4 and Table 5 show in detail the variation of pipes and collar sizes as well as the fixing methods.

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 is included in Appendix A of the referenced assessment report

Table 2 Referenced test data

Report number	Test sponsor	Test date	Testing authority
FSV 1025	Hilti Australia Pty Ltd	18/12/2003	CSIRO Manufacturing & Infrastructure Technology
FSH 1028	Hilti Australia Pty Ltd	10/01/2004	CSIRO Manufacturing & Infrastructure Technology
3209/3045 CR	Hilti Entwicklungsgesellschaft mbH	22/02/2005	MPA Braunschweig
283513/3313FR	Hilti Entwicklungsgesellschaft mbH	17/05/2011	Instituto Giordano
285773/3333FR	Hilti Entwicklungsgesellschaft mbH	16/05/2011	Instituto Giordano
283512/3312FR	Hilti Entwicklungsgesellschaft mbH	20/07/2011	Instituto Giordano
2626600.4	Hilti Australia Pty Ltd	21/10/2011	Exova Warringtonfire
2626601.2	Hilti Australia Pty Ltd	21/10/2011	Exova Warringtonfire
FRT190130	Hilti Australia Pty Ltd	11/07/2019	Warringtonfire Australia

4.3 Variations to the tested systems

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

Table 3 Variations to tested systems

Item	Reference test	Description	Variations
Services	FRT190130.2, FSV 1025 FSH 1028 EWFA 2626600.4 EWFA 2626601.2 283513/3313 FR 285773/3333 FR MPA 3209/3045 283512/3312FR	<p>In FRT190130.2, uPVC pipes sized Ø40, Ø100 and Ø150 mm were installed through a 155 mm Dincel structural walling system through apertures sized Ø50, Ø128 and Ø165 mm, respectively. The pipes were protected from both sides by a Hilti CFS-C P644 Firestop collars of sizes 50/1.5", 110/4" and 160/6", respectively.</p> <p>In FSV 1025, various uPVC pipes penetrated through a 115 mm thick plasterboard wall system consisting of 64 mm deep studs and 2 × 13 mm thick fire rated plasterboard on each side. The pipes were protected from both sides with Hilti CP 643 fire stop jackets. The relevant pipe specimens and corresponding collar sizes are as follows:</p> <ul style="list-style-type: none"> • uPVC pipes <ul style="list-style-type: none"> – Ø40 mm pipe with 50/1.5" collar size – Ø50 mm pipe with 63/2" collar size – Ø65 mm pipe with 75/2.5" collar size – Ø80 mm pipe with 90/3" collar size – Ø100 mm pipe with 110/4" collar size – Ø150 mm pipe with 160/6" collar size • HDPE pipes <ul style="list-style-type: none"> – Ø40 mm pipe with 50/1.5" collar size – Ø50 mm pipe with 63/2" collar size – Ø65 mm pipe with 75/2.5" collar size – Ø80 mm pipe with 90/3" collar size – Ø100 mm pipe with 110/4" collar size – Ø150 mm pipe with 160/6" collar size <p>In FSH 1028, various PVC pipes were installed through a 150 mm thick concrete slab. The pipes were protected from the underside of the slab with</p>	<p>The proposed services are as follows:</p> <ul style="list-style-type: none"> • Uninsulated pipes penetrating walls and floors as specified in Table 4 and illustrated in Figure 1, Figure 2, Figure 8 and Figure 9. • Insulated pipes penetrating walls as specified in Table 5 and illustrated in Figure 5 and Figure 6.
Separating element			<p>Flexible wall separating elements may be a 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> <p>Rigid wall separating elements may be as follows:</p> <ul style="list-style-type: none"> • Minimum 116 mm thick concrete, autoclaved aerated concrete 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. • Minimum 155 mm thick Dincel walls filled with normal weight concrete with an established FRL of -/120/120 in

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>Hilti CP 643 fire stop jackets. The relevant pipe specimens and corresponding collar sizes are as follows:</p> <ul style="list-style-type: none"> • Ø40 mm pipe with 50/1.5" collar size • Ø50 mm pipe with 63/2" collar size • Ø65 mm pipe with 75/2.5" collar size • Ø80 mm pipe with 90/3" collar size • Ø100 mm pipe with 110/4" collar size • Ø150 mm pipe with 160/6" collar size <p>In test EWFA 2626600.4, services A, B and C were PPR fibre reinforced pipes of sizes (Ø40 mm, Ø125 mm, Ø110 mm) and services D, E, F and G were PE-100 pipes of sizes (Ø40 mm, Ø110 mm, Ø125 mm and Ø200 mm). The services were installed in 128 mm thick steel framed wall lined on each side with minimum 2 × 16 mm thick fire rated plasterboard.</p> <p>In test EWFA 2626601.2, services A, B and C were PPR fibre reinforced pipes of sizes (Ø40 mm, Ø125 mm, Ø110 mm) and services D, E, F and G were PE-100 pipes of sizes (Ø40 mm, Ø110 mm, Ø125 mm and Ø200 mm). The services were installed in 120 mm thick normal weight reinforced concrete slab.</p> <p>In test 283513/3313 FR, services 16, 17 and 19 were RAUPIANO Plus PP pipes of sizes (Ø50 mm, Ø75 mm and Ø110 mm). The services were installed in a 100 mm thick steel framed wall lined on each side with minimum 2 × 12.5 mm thick fire rated plasterboard.</p> <p>In test 285773/3333 FR, services 16, 17 and 19 were RAUPIANO Plus PP pipes of sizes (Ø50 mm, Ø75 mm and Ø110 mm). The services were installed in a 150 mm thick concrete floor slab.</p> <p>In test MPA 3209/3045, services 14, 15 and 16 were RAUPIANO Plus PP pipes of sizes (Ø50 mm, Ø110 mm and Ø125 mm). The services were installed in a 150 mm thick concrete floor slab.</p> <p>In test 283512/3312FR, services 34, 35, 36 and 37 were cPVC pipes of sizes (Ø32 mm, Ø42 mm, Ø52 mm and Ø63 mm). The services were installed in a 100 mm thick steel framed wall system.</p>	<p>accordance with AS 1530.4:2014 by an ATL.</p> <p>The rigid floor separating element may be a minimum 120 mm thick concrete floor that has an established FRL not less than -/120/120 by design to AS 3600:2018 or testing by others.</p>
Main fire protection		In test FRT190130, services A, B and C were protected with CFS-C P644 collars fixed to both sides of the wall and a 10 mm bead of Firestop acrylic sealant CP606 was applied on the interface between the core hole and the	It is proposed to use Hilti retrofit collar CFS-C P/CP 644 instead of CP 643.
Annular gap size			The annular gap size is limited to the tested sizes as shown in Table 9 to Table 17

Item	Reference test	Description	Variations
Annular gap protection		<p>service. The relevant test specimens had an annular gap of approximately 5 to 14 mm.</p> <p>In test FSV 1025, services 1-6 were protected with CP 643 collar fixed to both sides of the wall. The annular gap was filled with 10 mm deep CP 606 sealant on each side. The relevant test specimens had an annular gap of approximately 6 to 12.5 mm.</p> <p>In test FSH 1028, services 1, 2, 3, 4, 5 and 6 were protected with CP 643 collar fixed to the underside of the slab. The annular gap was filled to the full depth of the concrete slab with a standard grade mortar. The relevant test specimens had an annular gap of approximately 7.5 to 10 mm.</p> <p>In test EWFA 2626600.4, services A, B, C, D, E, F and G were protected with CP 644 fixed to both sides of the wall. The annular gap was sealed with 10 mm deep CP 606 sealant backed with 10 mm backing rod each side. The relevant test specimens had an annular gap of approximately 5 to 25 mm.</p> <p>In test EWFA 2626601.2, services A, B, C, D, E, F and G were protected with CP 644 fixed to the underside of the slab, the annular gap was sealed with 10 mm deep CP 606 sealant, backed with 10 mm backing rod each side. The relevant test specimens had an annular gap of approximately 5 to 25 mm.</p> <p>In test 283513/3313 FR, services 16, 17 and 19 were protected with CFS-CP 644 collar from both sides. The annular gap was sealed with CFS- S ACR sealant to full depth of the wall lining. The pipes were further protected by 9 mm thick Therma-compact wrapped between the wall and pipe.</p> <p>In test 285773/3333 FR, services 16, 17 and 19 were protected with CFS-CP 644 collar from the underside of the slab. The annular gap was sealed with CFS- S ACR sealant on the unexposed side and backed with mineral wool. The pipes were further protected by 9 mm thick Therma-compact wrapped between the wall and pipe.</p> <p>In test MPA 3209/3045, services 14, 15 and 16 were protected with CP 644 collar fixed to the underside of the floor slab. The annular gap was filled with mortar between the pipe and floor.</p> <p>In test 283512/3312FR, services 34, 35, 36 and 37 were protected by CP 644 firestop collar, and the cPVC pipes were wrapped with Armaflex AF insulation extending 250 mm on each side of the wall. The annular gap was sealed with CFS-S ACR sealant to the depth of wall lining on each side.</p>	<p>For services penetrating flexible and rigid wall systems, the annular gap protection may be as follows:</p> <ul style="list-style-type: none"> • Hilti Firestop acrylic sealant CP 606 applied to a minimum depth of 10 mm on each side, backed with a PE backing rod. Refer to Figure 3. • Hilti Firestop acrylic sealant CP 606 applied to the full depth of plasterboard on each side (for framed walls) or full depth of wall (for rigid walls). Refer to Figure 4 and Figure 7. <p>For services penetrating rigid floors, the annular gap protection may be as follows:</p> <ul style="list-style-type: none"> • Hilti Firestop acrylic sealant CP 606 applied to a minimum depth of 10 mm from the bottom side, backed with a PE backing rod. Refer to Figure 10. • Gypsum plaster or mortar applied to the full depth of the concrete floor slab. Refer to Figure 11. <p>For pipes tested with insulation wraps. They must use the same wrap when installed in different separating elements they were positively assessed for.</p>

Table 4 Uninsulated pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in walls and floors

Pipe Material	Pipe Outside Diameter (mm)	Pipe Wall Thickness (mm)	Min. Aperture Diameter (mm)	Annular gap size (mm)	Max. Aperture Diameter (mm)	Hilti Retrofit Firestop Collar CFS-C P/CP 644 Size	No. of Fixings
PPR	40	6	45	5	50	50/1.5"	2
	50	6.9	55	5	60	50/1.5"	2
	65	8.6	70	5	75	75/2.5"	3
	80	10.3	85	5	90	90/3"	3
	100	12.3	105	5	110	110/4"	4
	110	15	115	5	120	110/4"	4
	125	19	130	5	135	125/5"	4
PE-100 (HDPE)	40	5	45	5	50	50/1.5"	2
	50	4.6	55	5	60	50/1.5"	2
	65	5.8	70	5	75	75/2.5"	3
	80	6.8	85	5	90	90/3"	3
	100	8.2	105	5	110	110/4"	4
	110	12	115	5	120	110/4"	4
	125	13	130	5	135	125/5"	4
	200	20	205	5	210	200/8"	8
uPVC*	43	2.0	48	5	53	50/1.5"	2
	56	2.2	61	5	66	63/2"	2
	69	2.7	74	5	79	75/2.5"	3
	85	2.9	90	5	95	90/3"	3
	110	3.2	115	5	120	110/4"	4
	160	4.5	165	5	170	160/6"	6
RAUPIANO PLUS	50	1.8	55	5	60	50/1.5"	2
	75	1.9	80	5	85	75/2.5"	3

Pipe Material	Pipe Outside Diameter (mm)	Pipe Wall Thickness (mm)	Min. Aperture Diameter (mm)	Annular gap size (mm)	Max. Aperture Diameter (mm)	Hilti Retrofit Firestop Collar CFS-C P/CP 644 Size	No. of Fixings
	90	2.2	95	5	100	90/3"	3
	110	2.7	115	5	120	110/4"	4

*Note: uPVC pipes are not sandwich-core type

Table 5 Insulated water supply pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in walls

Pipe Material	Pipe Outside Diameter (mm)	Pipe Wall Thickness (mm)	Insulation Thickness (mm)	Total Outside Diameter (mm)	Min. Aperture Diameter (mm)	Annular gap size (mm)	Max. Aperture Diameter (mm)	Hilti Retrofit Firestop Collar CFS-C P/CP 644 Size	No. of Fixings
CPVC	26.7	1.9-2.1	9	44.7	50	11.7	55	50/1.5"	2
	33.4	2.4-2.6	9	51.4	57	14.3	62	50/1.5"	2
	42.2	3.1-3.3	9	60.2	66	14.4	71	63/2"	2
	48.3	3.5-3.8	9	66.3	72	14.4	77	75/2.5"	3
	60.3*	4.4-4.7	13	86.3	92	18.4	97	75/2.5"	3

*Note: The application with a total outside diameter of 86.3 mm is installed with the insulation slightly compressed, to fit inside the 75/2.5" version of the Hilti Retrofit Firestop Collar

Table 6 Hilti Anchor types for Hilti retrofit firestop collar CFS-C P/CP 644 sizes smaller or equal to 90/3”

Anchoring solution		Minimum size	Flexible walls (Plasterboard lined)	Solid concrete Walls/Floors
Screw anchors	HUS	M6		x
Expansion anchors	HSA			x
	HST			x
	DBZ 6/45			x
Internally threaded anchor	HKD			x
Hollow core	HTB-S			x
	HHD-S		x	
Other	Threaded steel rods with nuts and washer		x	x
	Laminating/Drywall/Plasterboard screws at least 38 mm in length with steel washers of at least 19 mm in diameter	10g	x	

Table 7 Hilti anchor types for Hilti retrofit firestop collar CFS-C P/CP 644 sizes larger than 90/3”

Anchoring solution		Minimum size	Flexible walls (Plasterboard lined)	Solid concrete Walls/Floors
Screw anchors	HUS	M8		x
Expansion anchors	HAS			x
	HST			x
	DBZ 6/45			x
Internally threaded anchor	HKD			x
Hollow core	HTB-S			x
	HHD-S		x	
Other	Threaded steel rods with nuts and washer		x	x

4.4 Schedule of components

Table 8 outlines the schedule of components for the assessed systems.

Table 8 Schedule of components of assessed systems

Item	Description	
1.	Name	PPR pipe
	Material	Polypropylene
	Size	Refer to Table 4
	Installation	Pipes to be supported at 500 mm and 1500 mm with metal pipe brackets from the wall, as tested.
2.	Name	PE-100 (HDPE) pipe
	Material	High Density Polyethylene
	Size	Refer to Table 4
	Installation	Pipes to be supported at 500 mm and 1500 mm with metal pipe brackets from the wall.
3.	Name	Hilti Retrofit Firestop Collar CFS-C P/CP 644
	Size	Refer to Table 4 and Table 5
	Installation	Fixed to each side of wall constructions and fixed to underside of floor construction.
4.	Name	Annular Gap Seal and PE backing rod
	Specification	Hilti Firestop Acrylic Sealant CFS-S ACR/CP 606 and PE backing rod.
	Installation	Fit PE backing rod to annular gap to limit depth of sealant. For wall, fill an annular gap between pipe and wall on both side of the wall, at least 10 mm deep. For concrete floor, fill annular gap between pipe and floor slab on the exposed side, at least 10 mm deep.
5.	Name	Fixing
	Specification	For collar sizes smaller or equal to 90/3", refer to Table 6 for fixing types. For collar sizes larger than 90/3", refer to Table 7 for fixing types.
6.	Name	Support Construction – Wall
	Specification	Framed wall comprising of steel studs and timber clad with two layers of 13 mm or 16 mm thick fire resistance plasterboard each side; or Minimum 155 mm thick Dincel walls, filled with normal-weight concrete.
7.	Name	Support Construction - Floor
	Specification	Minimum 120 mm thick normal weight reinforced concrete slab
8.	Name	uPVC Pipe
	Material	uPVC*
	Size	Refer to Table 4
	Installation	Pipes to be supported at 500 mm and 1500 mm with metal pipe brackets from the wall on the unexposed side.
9.	Name	RAUPIANO PLUS Pipe
	Material	Polypropylene
	Size	Refer to Table 4
	Installation	Pipes to be supported at 500 mm and 1500 mm with metal pipe brackets from the wall on the unexposed side
10.	Name	CPVC Pipe

Item		Description
	Material	Chlorinated Polyvinyl Chloride
	Size	Refer to Table 5
	Installation	Pipes to be supported at 500 mm and 1500 mm
11.	Name	Pipe Insulation
	Material	9 mm or 13 mm thick Armaflex AF, elastomeric combustible insulation material
	Installation	Wrapped along CPVC pipes (item 10) with a length of 250 mm each side and continuous through the wall.
12.	Name	Annular Gap Seal
	Material	Hilti Firestop Acrylic Sealant CFS-S ACR/CP 606
	Installation	For walls, filled annular gap between pipe and wall on both side of the wall, the full depth of wall lining.
13.	Name	Annular Gap Seal
	Material	Gypsum plaster or mortar
	Installation	For concrete floors, filled annular gap between pipe and floor slab, the full depth of concrete slab.

Figure 1 to Figure 11 show the assessed systems.

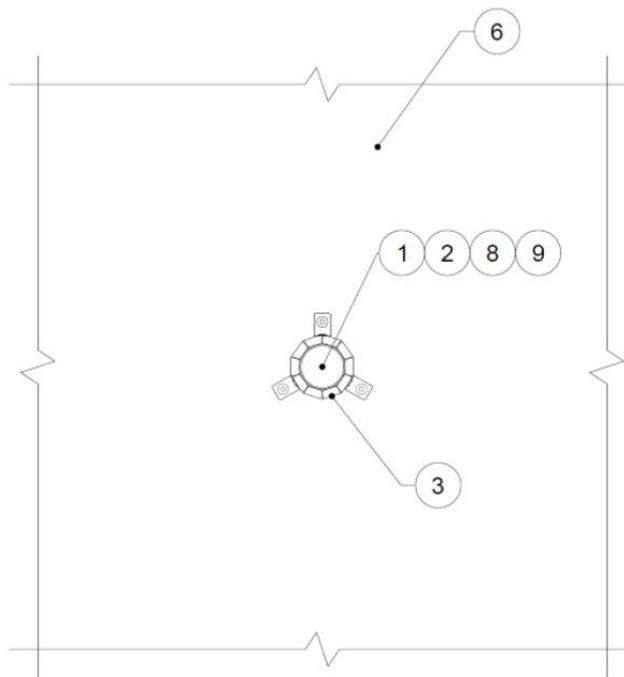


Figure 1 Uninsulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in plasterboard walls and Dincel walls (Wall elevation)

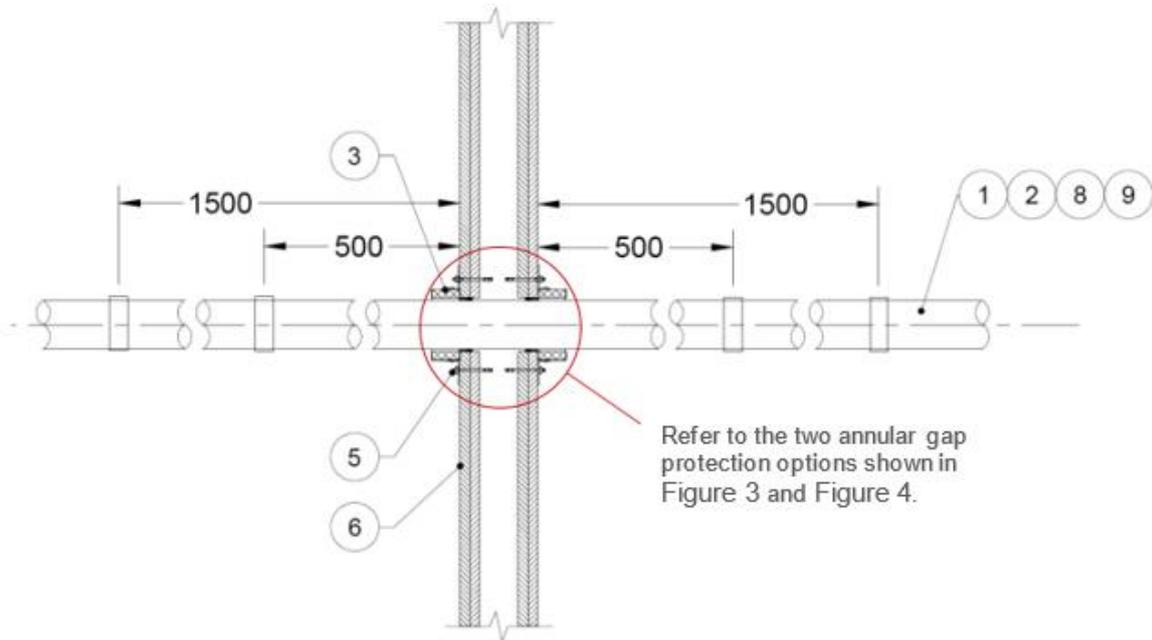


Figure 2 Uninsulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in plasterboard walls and Dintel walls (Wall side view)

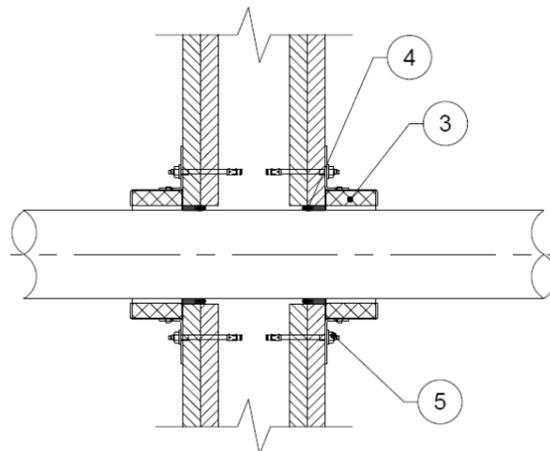


Figure 3 Sealant detail around uninsulated pipes in plaster board walls and Dintel walls option 1

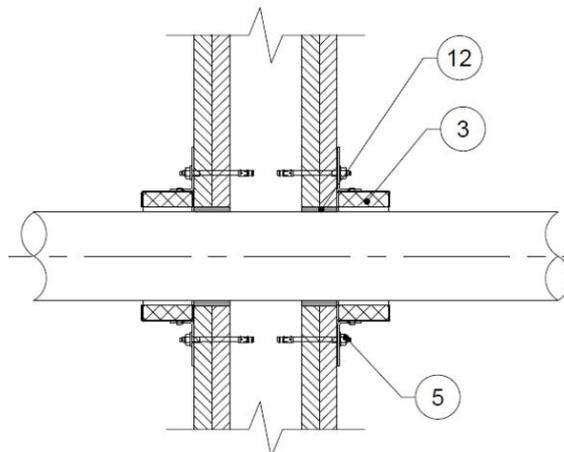


Figure 4 Sealant detail around uninsulated pipes in plaster board walls and Dintel walls option 2

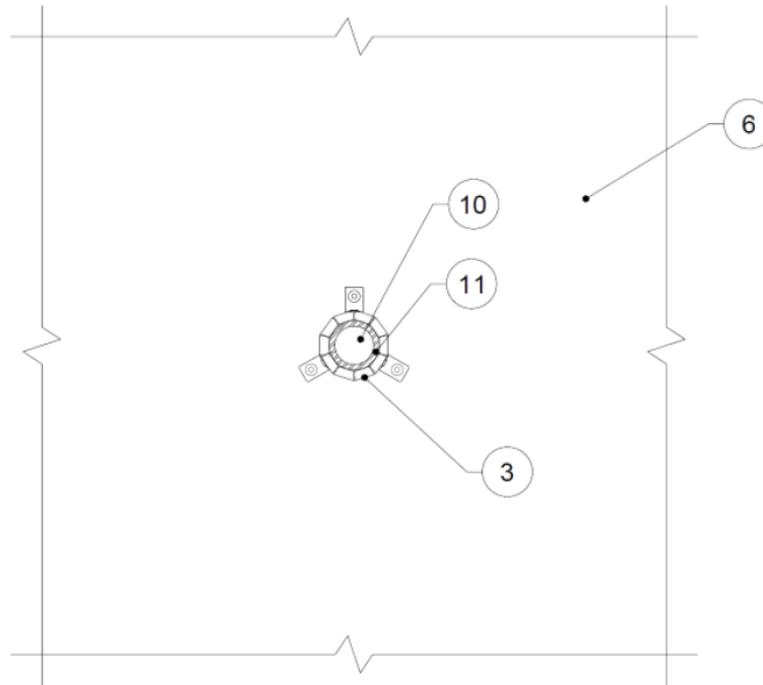


Figure 5 Insulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in plasterboard walls and Dintel walls (Wall elevation)

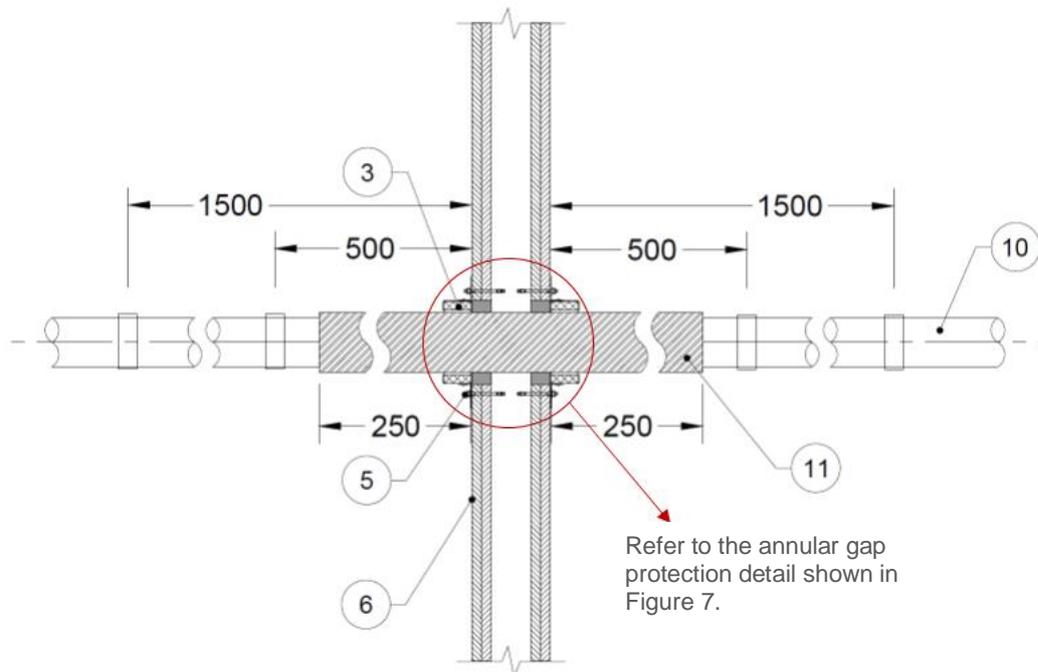


Figure 6 Insulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in plaster board walls and Dintel walls (Wall side view)

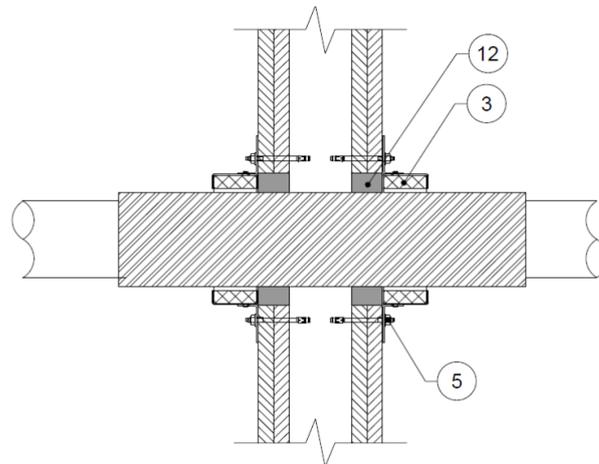


Figure 7 Sealant detail around Insulated pipes in plaster board walls and Dintel walls

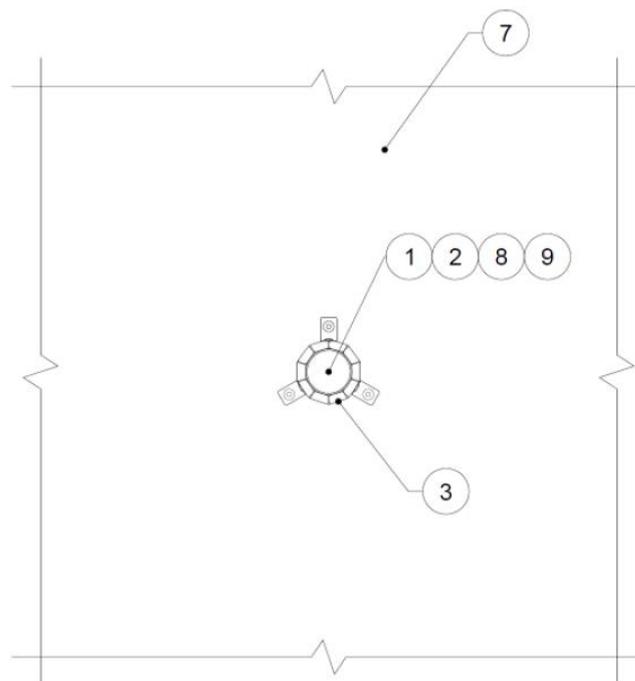


Figure 8 Uninsulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors (Concrete floor top view)

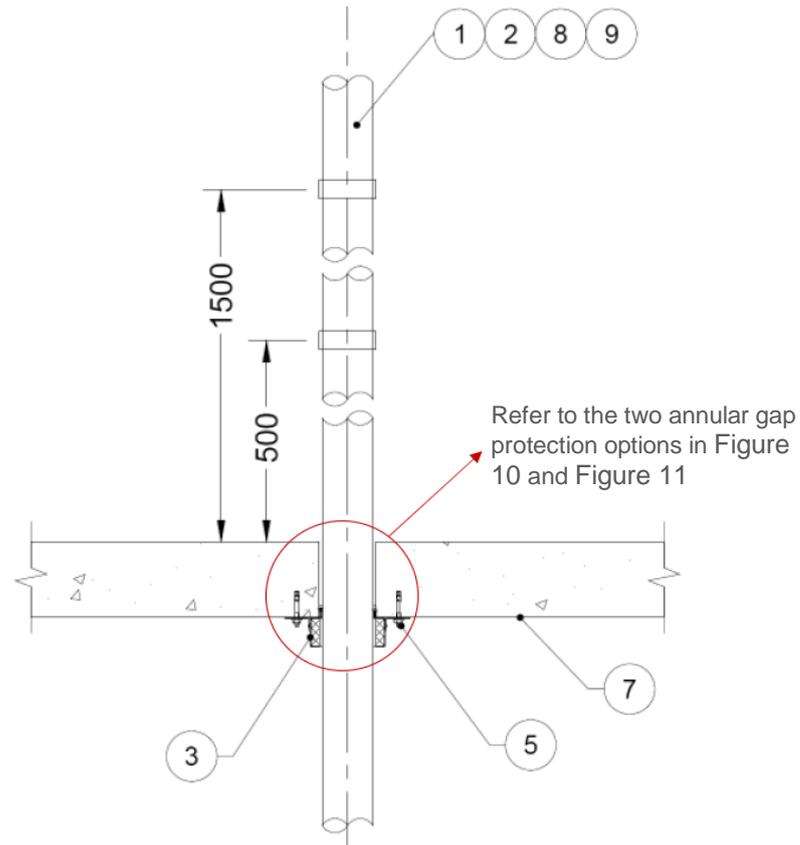


Figure 9 Uninsulated pipes with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors (Concrete floor section view)

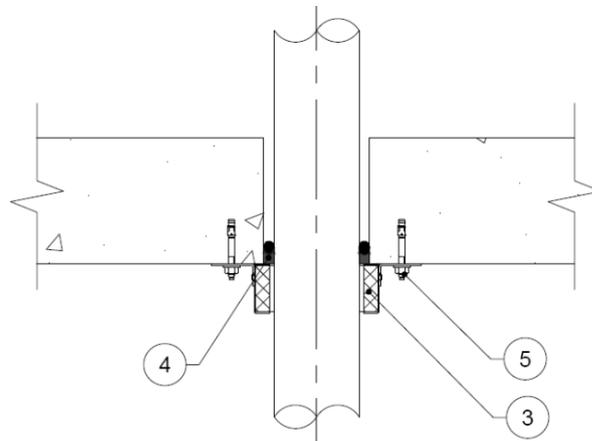


Figure 10 Sealant detail around uninsulated pipes in concrete floors option 1

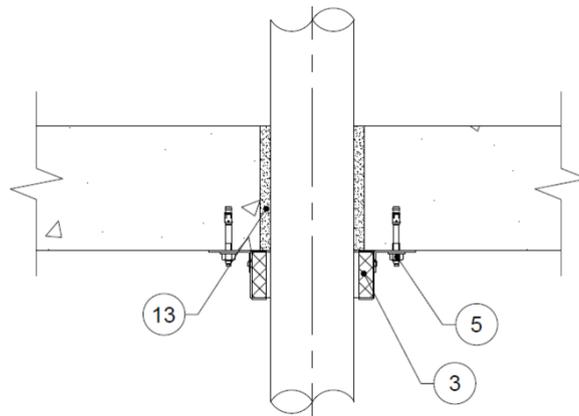


Figure 11 Sealant detail around uninsulated pipes in concrete floors option 2



Figure 12 CP 643 fire jacket (Extracted from Hilti website)



Figure 13 Hilti retrofit firestop collar CFS-C P/CP 644 (Extracted from Hilti website)

5. Assessment outcome

Details of the assessment and discussion are only available in the referenced main assessment report. A summary of the assessment outcome is outlined in Table 9 to Table 17.

5.1.1 Pipes in Wall Construction

Table 9 uPVC Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in Plaster board walls and Dintel walls

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL 2 × 13 mm thick Walls	FRL 2 × 16 mm thick Walls	FRL Minimum 155 mm thick Dintel walls
uPVC	43	2.0	Up to 5	50/1.5"	Figure 1, Figure 2, Figure 3 and Figure 4	-/120/90	-/120/90	-/120/120
	56	2.2	Up to 7.5	63/2"		-/120/120	-/120/120	-/120/120
	69	2.7	Up to 7.5	75/2.5"		-/120/90	-/120/90	-/120/120
	85	2.9	Up to 7.5	90/3"		-/120/90	-/120/90	-/120/120
	110	3.2	Up to 6	110/4"		-/120/120	-/120/120	-/120/120
	160	4.5	Up to 7.5	160/6"		-/120/120	-/120/120	-/120/120

*Note: FRL applies to normal uPVC pipes and not sandwich-core uPVC pipes. This restriction does not apply when the separating wall is a minimum 155 mm thick Dintel wall.

Table 10 PPR Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in Plaster board walls and Dintel walls

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL 2 × 13 mm thick Walls	FRL 2 × 16 mm thick Walls	FRL Minimum 155 mm thick Dintel walls
PPR	40	6	Up to 5	50/1.5"	Figure 1, Figure 2, Figure 3 and Figure 4	-/120/120	-/120/120	-/120/120
	50	6.9	Up to 5	50/1.5"		-/120/120	-/120/120	-/120/120
	65	8.6	Up to 7.5	75/2.5"		-/120/90	-/120/90	-/120/120
	80	10.3	Up to 7.5	90/3"		-/120/90	-/120/90	-/120/120
	100	12.3	Up to 7.5	110/4"		-/120/120	-/120/120	-/120/120
	110	15	Up to 7.5	110/4"		-/120/120	-/120/120	-/120/120
	125	19	Up to 12.5	125/5"		-/120/120	-/120/120	-/120/120

Table 11 PE-100 Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in Plaster board walls and Dintel walls

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL 2 × 13 mm thick Walls	FRL 2 × 16 mm thick Walls	FRL Minimum 155 mm thick Dintel walls
PE-100 (HDPE)	40	5	Up to 5	50/1.5"	Figure 1, Figure 2, Figure 3	-/120/120	-/120/120	-/120/120
	50	4.6	Up to 5	50/1.5"		-/120/120	-/120/120	-/120/120
	65	5.8	Up to 7.5	75/2.5"		-/120/90	-/120/90	-/120/120

	80	6.8	Up to 7.5	90/3"	and Figure 4	-/120/90	-/120/90	-/120/120
	100	8.2	Up to 12.5	110/4"		-/120/120	-/120/120	-/120/120
	110	12	Up to 12.5	110/4"		-/120/120	-/120/120	-/120/120
	125	13	Up to 12.5	125/5"		-/120/120	-/120/120	-/120/120
	200	20	Up to 25	200/8"		-/120/60	-/120/60	-/120/60

Table 12 REHAU RAUPIANO PLUS Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in Plaster board walls and Dintel walls

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL 2 × 13 mm thick Walls	FRL Minimum 155 mm thick Dintel walls
RAUPIANO PLUS	50	1.8	Up to 11	50/1.5"	Figure 1, Figure 2, Figure 3 and Figure 4	-/120/120	-/120/120
	75	1.9	Up to 8.5	75/2.5"		-/120/120	-/120/120
	90	2.2	Up to 7.5	90/3"		-/120/120	-/120/120
	110	2.7	Up to 16	110/4"		-/120/120	-/120/120

Table 13 Water Supply CPVC Pipes insulated with Armaflex AF and protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in Plaster board walls and Dintel walls

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Insulation Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL 100 mm Walls	FRL Minimum 155 mm thick Dintel walls
CPVC	26.7	1.9-2.1	9	Up to 5	50/1.5"	Figure 5, Figure 6 and Figure 7	- /120/120	-/120/120
	33.4	2.4-2.6	9	Up to 5	50/1.5"		- /120/120	-/120/120
	42.2	3.1-3.3	9	Up to 7.5	63/2"		- /120/120	-/120/120
	48.3	3.5-3.8	9	Up to 7.5	75/2.5"		- /120/120	-/120/120
	60.3*	4.4-4.7	13	Up to 7.5	75/2.5"		- /120/120	-/120/120

*Note: The application with a total outside diameter of 86.3 mm is installed with the insulation slightly compressed to fit inside the 75/2.5" version of the Hilti Retrofit Firestop Collar.

5.1.2 Pipes in Floor Construction

Table 14 uPVC Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL >120 mm slab	FRL >150 mm slab
*uPVC	43	2.0	Up to 10	50/1.5"	Figure 8, Figure 9, Figure 10 and Figure 11	-/120/120	-/240/240
	56	2.2	Up to 9.5	63/2"		-/120/120	-/240/240
	69	2.7	Up to 10	75/2.5"		-/120/120	-/240/240
	85	2.9	Up to 7.5	90/3"		-/120/120	-/240/240
	110	3.2	Up to 7	110/4"		-/120/120	-/240/240

	160	4.5	Up to 7.5	160/6"		-/120/120	-/240/240
*Note: FRL applies to normal uPVC pipes and not sandwich-core uPVC pipes							

Table 15 PPR Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL >120 mm slab
PPR	40	6	Up to 5	50/1.5"	Figure 8, Figure 9, Figure 10 and Figure 11	-/180/120
	50	6.9	Up to 5	50/1.5"		-/120/120
	65	8.6	Up to 7.5	75/2.5"		-/120/120
	80	10.3	Up to 7.5	90/3"		-/120/120
	100	12.3	Up to 7.5	110/4"		-/120/120
	110	15	Up to 7.5	110/4"		-/120/120
	125	19	Up to 12.5	125/5"		-/240/120

Table 16 PE-100 Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL >120 mm slab
PE-100 (HDPE)	40	5	Up to 5	50/1.5"	Figure 8, Figure 9, Figure 10 and Figure 11	-/180/120
	50	4.6	Up to 5	50/1.5"		-/90/90
	65	5.8	Up to 7.5	75/2.5"		-/90/90
	80	6.8	Up to 7.5	90/3"		-/90/90
	100	8.2	Up to 12.5	110/4"		-/90/90
	110	12	Up to 12.5	110/4"		-/90/90
	125	13	Up to 12.5	125/5"		-/60/60
	200	20	Up to 25	200/8"		-/30/30

Table 17 REHAU RAUPIANO PLUS Pipes protected with Hilti Retrofit Firestop Collar CFS-C P/CP 644 in concrete floors

Pipe Material	Outside Diameter (mm)	Pipe Wall Thickness (mm)	Annular gap size (mm)	Collar Size	Refer Figure	FRL >120 mm slab
RAUPIANO PLUS	50	1.8	Up to 11	50/1.5"	Figure 8, Figure 9, Figure 10 and Figure 11	-/120/120
	75	1.9	Up to 8.5	75/2.5"		-/120/120
	90	2.2	Up to 8.5	90/3"		-/120/120
	110	2.7	Up to 16	110/4"		-/120/120

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

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

The referenced assessment represents our opinion about the performance of the proposed systems that is expected to be demonstrated when subjected to test conditions in accordance with, 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.

Global locations



Warringtonfire Australia Pty Ltd
ABN 81 050 241 524

Perth

Suite 4.01, 256 Adelaide Terrace
Perth WA 6000
Australia
T: +61 8 9382 3844

Canberra

Unit 10, 71 Leichhardt Street
Kingston ACT 2604
Australia
T: +61 2 6260 8488

Melbourne

Level 4, 152 Elizabeth Street
Melbourne Vic 3000
Australia
T: +61 3 9767 1000

Sydney

Suite 802, Level 8, 383 Kent Street
Sydney NSW 2000
Australia
T: +61 2 9211 4333

Brisbane

Suite B, Level 6, 133 Mary Street
Brisbane Qld 4000
Australia
T: +61 7 3238 1700

Melbourne – NATA accredited laboratory

409-411 Hammond Road
Dandenong South Vic 3175
Australia
T: +61 3 9767 1000