Hilti CP 670 Firestop Coating System

Submission Folder

Product Information and Method Statement 2

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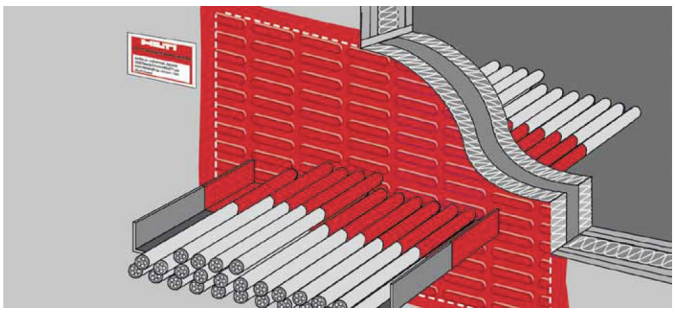
Firestop board, coating CP 670

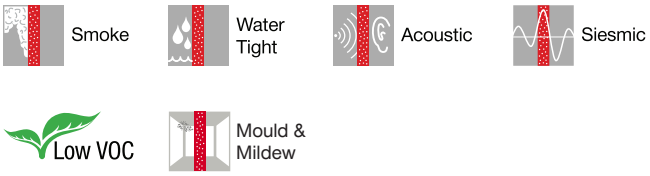


APPLICATIONS

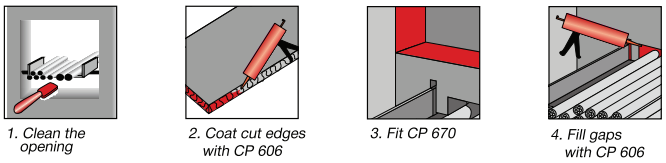
- Permanent firestopping of blank openings, cables, cable trays, non-combustible and combustible pipes in medium to large wall and floor openings
- Ideal for large openings

ADVANTAGES

- Solvent- and silicone-free
- Fully functional immediately after installation
- Smoke tight



Application Procedure



1. Clean the opening

2. Coat cut edges with CP 606

3. Fit CP 670

4. Fill gaps with CP 606

5. Fasten installation (if required)

Technical data	
Base materials	Drywall, Concrete, Masonry
Approx. density	1470 kg/m³
Application temperature range	5 - 40 °C
Temperature resistance range	-40 - 100 °C
Storage and transportation temperature range	5 - 30 °C
Shelf life[1)]	15 Months
Colour	White

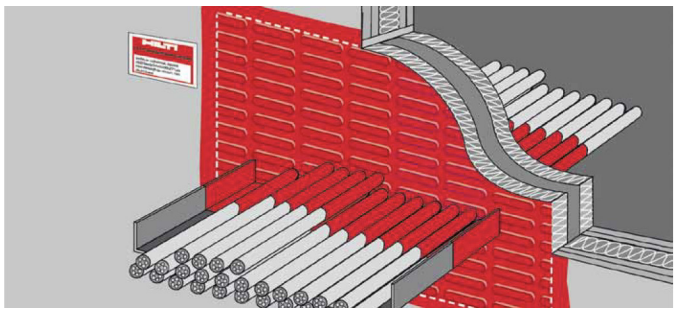
[1)] at 77°F/25°C and 50% relative humidity; from date of manufacture

Order Now **Watch Video**

Ordering designation	Weight	Sales pack quantity	Item number
ROCK WOOL 1.2X0.6-50/D160	-	5 pc	**3435517**
CP 670 6kg	6 kg	1 pc	**2281088**

Please visit Hilti website for the latest item numbers and related products

Firestop board CP 670



APPLICATIONS

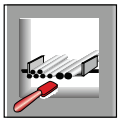
- Permanent firestopping of blank openings, cables, cable trays, non-combustible and combustible pipes in medium-to-large wall and floor openings
- Ideal for large openings

ADVANTAGES

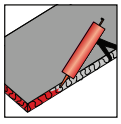
- Board pre-coated for immediate use
- Virtually no cracking or delamination during cutting
- Broad approval range

Technical data	
Base materials	Drywall, Concrete, Masonry
Dimensions (LxWxH)	1200 x 600 x 50 mm
Approx. board density	160 kg/m³
Application temperature range	5 - 40 °C
Temperature resistance range	-40 - 100 °C
Storage and transportation temperature range	0 - 40 °C
Colour	White

Application Procedure

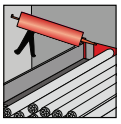


1. Clean the opening



2. Coat cut edges with CP 606

3. Fit CP 670



4. Fill gaps with CP 606

5. Fasten installation (if required)

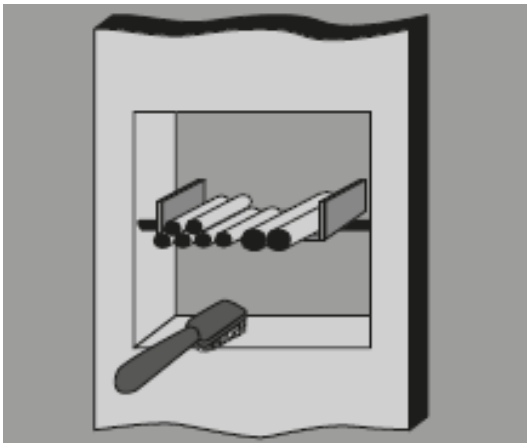
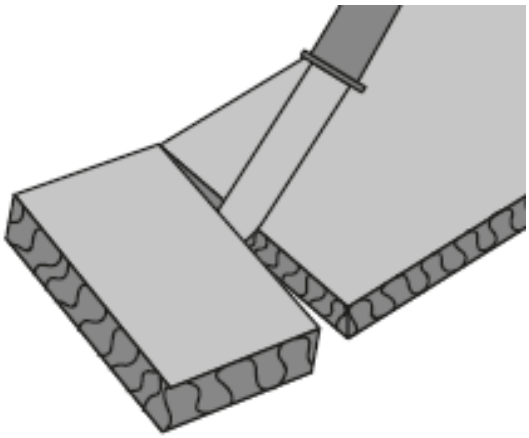
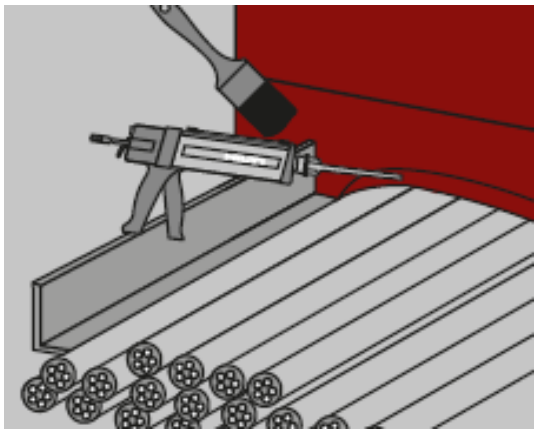
Order Now **Watch Video**

Ordering designation	Dimensions (LxWxH)	Sales pack quantity	Item number
CP 670 1200x600x50 white	1200 x 600 x 50 mm	16 pc	**236673**

Please visit Hilti website for the latest item numbers and related products

Subject: **Method Statement of CP 670**

Material: CP 670 Fire safety coating, Mineral wool board (density: 160kg/m^3) ,CP 606 Firestop sealant, Precoated Firestop Acoustic Board CP 670-50.

Setting Operation		
1	Clean the cables. The cables and cable supporting structures must be dry and free from dust, grease or oil, and installed in compliance with local building and electrical standards.	
2	Cut the mineral wool board to the required size. Use the correct no. of layers of mineral wool board according to the required FRR.	
3	Fit mineral wool board tightly into the opening and fill any gaps with loose mineral wool. Coat CP 670 on both side of mineral wool board (required wet film thickness of 1.1mm/ dry film thickness of 0.7mm). Apply min. 150mm CP 670 coating on both sides of cables*. *Coating on cables is not require for the case of 2 hours FRR in cable penetration in floor with max. opening size 1mx1m.	

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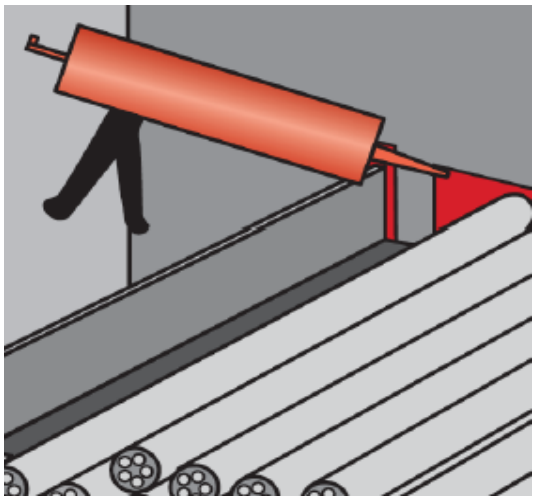
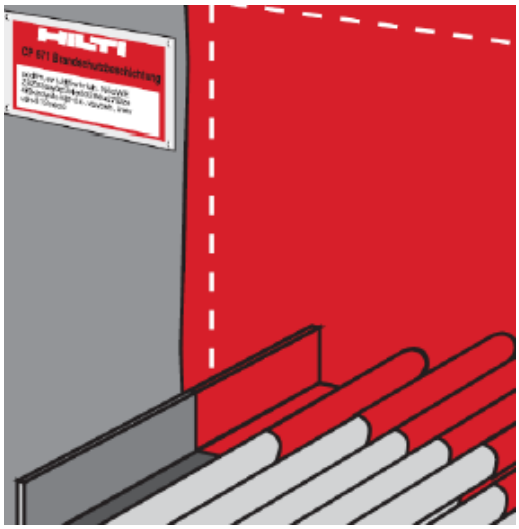
4	Fill the gaps between mineral wool board and opening, mineral wool and metal sleeve with CP606.	
5	For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.	

Safety precautions:

- Ensure adequate ventilation
- Wear protective clothing
- Aware of particular danger of slipping on leaked or spilled product.

ASSESSMENT REPORT

The Use of Hilti CP636, CP670, CFS-F FX and CFS-BL for Electrical Services Penetration Sealing Systems

Report No.: R22H09-1A

Issue Date: 3 November, 2022

Date of Review: 2 November, 2025

Report Sponsor

Hilti (Hong Kong) Limited
701-704 & 708B, Tower A Manulife Finance Centre,
223 Wai Yip Street, Kwun Tong, Kowloon, HK

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REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
03/11/2022	0	Initial version

THE USE OF HILTI CP636, CP670, CFS-F FX AND CFS-BL FOR ELECTRICAL SERVICES PENETRATION SEALING SYSTEMS

1 INTRODUCTION

This assessment report presents an appraisal for the use of the Hilti CP636, CP670, CFS-F FX, and CFS-BL for electrical services penetration sealing systems through concrete, AAC or blockwork like masonry wall or floor supporting construction. This appraisal is based on the substantial test evidence as mentioned in Section 3. This report is prepared for Hilti (Hong Kong) Limited of 701-704 & 708B, Tower A, Manulife Finance Centre, 223 Wai Yip Street, Kwun Tong, Kowloon, HK.

The proposed gap sealing systems used for electrical services penetration are required to provide a fire resistance performance of up to 240 minutes integrity and insulation with respect to BS 476: Part 20: 1987.

2 ASSUMPTIONS

The proposed systems are assumed to be installed in a similar manner to that of the previously tested system by competent installers. It is assumed that the modified systems will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED. Further assumptions related to the specific modifications will be stated in the report.

It is also assumed that the supporting structures to which the perimeter of the systems will be fixed are capable of supporting the proposed structure effectively.

Assuming that the issue of the original test report is valid, the current testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of Supporting Test Evidence

Report no.	Sections	Description
Primary Test Evidence		
WARRES report no. 62305/A	4.2	Supporting test evidence for the use of the Hilti "CP636" Firestop mortar with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 62305/B	4.2	Supporting test evidence for the use of the Hilti "CP636" Firestop mortar with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 62305/C	4.2	Supporting test evidence for the use of the Hilti "CP636" Firestop mortar with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 62320	4.2	Supporting test evidence for the use of the Hilti "CP636" Firestop mortar with electrical services penetration through floor. The test was conducted in accordance with BS476: Part 20: 1987.
WF report no. 101728	4.2	Supporting test evidence for the use of the Hilti "CP636" Firestop mortar with electrical services penetration through floor. The test was conducted in accordance with BS476: Part 20: 1987.
RED report no. R13C05	4.2	Supporting test evidence for the use of the Hilti "CP636 Firestop mortar and Hilti "CP670" fire safety coating with mineral wool system with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 124662	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.

Report no.	Sections	Description
WARRES report no. 124663	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
PAVUS report no. Pr-03-02.086	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP673" fire safety coating for the penetration of cable tray. The test was conducted in accordance with BS EN 1363-1: 1999 and prEN 1366-3: 2003.
RED report no. R16L28-1B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2A	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.

3.2 Primary Test Evidences

3.2.1 Warringtonfire Test Report No. WARRES 62305/A#

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP636 fire prevention mortar with cable trays containing services item penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 1st August, 1994. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test, the section of wall contained a 2,000 mm high by 1,200 mm wide aperture which was penetrated by various steel cable trays, either empty or supporting various electrical services. The aperture was sealed with a 150 mm thick layer of Hilti CP 636 Fire Prevention Mortar. The cable trays containing service items in the upper section of the aperture were additionally provided with a 0.5 mm thick coating of Hilti CP 611A fire Prevention Mastic within the thickness of the barrier. In addition three aperture were provided within CP 636 Mortar, and the other sealed with other products irrelevant to this assessment.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**151** Minutes
Insulation:	**121** Minutes

Note: An addendum to this report concludes that if the CP 655 Fire Prevention Bricks were not included in the construction and all serves were coated with CP 611A Fire Prevention Mastic within the thickness of the seal, the expected integrity performance would be 240 minutes.

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 62305/A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.2 *Warringtonfire Test Report No. WARRES 62305/B#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP636 fire prevention mortar with cable trays containing services item penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 16th August, 1994. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test, the section of wall contained a 600 mm high by 600 mm wide aperture which was penetrated one 200 mm wide, one 300 mm wide and one 500 mm wide cable tray. The aperture was sealed with a 100 mm thick layer of Hilti CP 636 Fire Prevention Mortar. The cable trays containing various electrical cables, coated within the thickness of the barrier with additionally 0.5 mm thick coating of Hilti CP 611A fire Prevention Mastic. In addition, three apertures were provided within CP 636 Mortar, and the other sealed with other products irrelevant to this assessment.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**240** Minutes
Insulation:	**86** Minutes

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 62305/B for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.3 *WARRES Test Report No. 62305/C#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP636 fire prevention mortar with cable trays containing services item penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 16th August, 1994. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test, the section of wall contained a 600 mm high by 1,200 mm wide aperture which was penetrated one 200 mm wide, one 300 mm wide and one 500 mm wide cable tray. The aperture was sealed with a 185 mm thick layer of Hilti CP 636 Fire Prevention Mortar. The cable trays containing various electrical cables. In addition, three apertures were provided within CP 636 Mortar, and the other sealed with other products irrelevant to this assessment.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**240** Minutes
Insulation:	**81** Minutes

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 62305/C for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.4 WARRES Test Report No. 62320#

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP636 fire prevention mortar with cable trays containing services item penetrating through under a floor mount situation was performance by the Warringtonfire testing laboratory on 17th August, 1994. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test, the section of wall contained a 600 mm by 1,000 mm aperture which was penetrated with seven (7) nos. of cable trays. The aperture was sealed with a 150 mm thick layer of Hilti CP 636 Fire Prevention Mortar. The cable trays containing various electrical cables.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**180** Minutes
Insulation:	**112** Minutes

The test was discontinued after a heating period of 180 minutes (See WARRES report no. 62320 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.5 *WARRES Test Report No. 101728#*

A fire resistance test stated to be in accordance with BS 476: Part 20: 1987 on eight different specimens of wall mounted sealings and one specimen of floor mounted sealings was performance by the Warringtonfire testing laboratory on 23rd April, 1998. The report was prepared for Hilti (Great Britain) Limited, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data. In this assessment, only the floor mounted system was concerned.

The floor mounted specimen was installed within a 600 mm by 600 mm aperture with 150 mm thick autoclaved aerated concrete slabs. The aperture was fitted with the 50 mm thick "RW6" mineral wool on the exposed side and the 75 m thick Hilti CP636" fire prevention mortar on the unexposed side. Two cable trays, referenced "A" and "B", were penetrating through the specimen.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**240** Minutes
Insulation:	**103** Minutes

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 101728 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.6 *RED Test Report No. R13C05#*

A fire resistance test be in accordance with BS 476: Part 20: 1987 on seven different specimens of wall mounted penetration sealings was performance by the RED testing laboratory on 18th April, 2013. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder. Specimens 'A', 'B', 'D' and 'G' were asymmetrical and the fire side of specimens were determined by the test sponsor. Specimens 'C', 'E' and 'F' were symmetrical and only one side of the specimens were tested as per test sponsor's request.

Specimen 'A' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 110 mm diameter by 3.5 mm thick by 1,800 mm long PVC pipes, namely specimens 'A1' and 'A2', incorporated with 'Hilti 643N/ CP 644' firestop collars at both of the exposed and unexposed sides. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. Each pipe was supported by a pipe ring at unexposed side, which was fixed to a M12 steel rod located at 460 mm and 480 mm from the fire barrier for specimens 'A1' and 'A2' respectively. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'B' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 150 mm diameter by 4.5 mm thick by 1,770 mm long G.M.S. pipes, namely specimens 'B1' and 'B2'. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The pipes were supported by pipe rings at both sides, which were fixed to M12 steel. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'C' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'D' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'D1' and 'D2'. Specimen 'D1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of nominal 7 mm diameter electrical cables while specimen 'D2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of nominal 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440

mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts. Nominal 250 mm coat back of 'Hilti CP 670' fire safety coating was applied on both of the exposed and unexposed sides of the steel cable trays with electrical cables. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'E' had overall dimensions of 1,200 mm wide by 600 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'F' had overall dimensions of 525 mm wide by 295 mm high. It was comprised of 'Hilti FS657/ CP657' intumescent firestop bricks and each brick was with sizes of 130 mm by 50 mm by 200 mm.

Specimen 'G' had overall dimensions of 1,200 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'G1' and 'G2' . Specimen 'G1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of 7 mm diameter electrical cables while specimen 'G2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick mineral wool board with density of 160 kg/m3 with nominal 35 mm thick 'Hilti CP 636' firestop mortar applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987, for the following periods:

Specimens	Penetration services	Integrity	Insulation	**Integrity**	**Insulation**
Specimen 'A'	A1	264 Minutes	162 Minutes	**264 Minutes**	**162 Minutes**
	A2	264 Minutes	162 Minutes		
Specimen 'B'	B1	264 Minutes	18 Minutes	**264 Minutes**	**18 Minutes**
	B2	264 Minutes	19 Minutes		
Specimen 'C'	--	264 Minutes	151 Minutes	**264 Minutes**	**151 Minutes**
Specimen 'D'	D1	264 Minutes	198 Minutes	**264 Minutes**	**60 Minutes**
	D2	264 Minutes	60 Minutes		
Specimen 'E'	--	264 Minutes	155 Minutes	**264 Minutes**	**155 Minutes**
Specimen 'F'	--	229 Minutes	209 Minutes	**229 Minutes**	**209 Minutes**
Specimen 'G'	G1	264 Minutes	100 Minutes	**264 Minutes**	**100 Minutes**
	G2	264 Minutes	104 Minutes		

The test was discontinued after a period of 264 minutes (See RED report no. R13C05 for full details)

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.7 *WARRES Test Report No. 124662#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 20th June, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the section of wall contained a 1,200 mm high by 1,800 mm wide aperture which was penetrating through various services. The aperture was sealed with two mineral wool panels with sizes of 600 mm wide by 1,200 mm high and 1,200 mm wide x 1,200 mm high, respectively. A vertical butt joint was incorporated. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity:	**125** Minutes (for cable trays position only)
Insulation:	**60** Minutes (for cable trays position only)

The test was discontinued after a heating period of 125 minutes (See WARRES report no. 124662 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.8 *WARRES Test Report No. 124663#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 4th July, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the wall assembly was formed by the internal steel channel section framework (30 mm thick) clad on both sides with 50 mm thick mineral wool panels coated with Hilti CP670 fire safety coating. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays (Specimens F, G, H, I, J, K and L) were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Specimen	Integrity	Insulation
F, G	211	136
H	213	146
I	213	108
J	213	105
K	213	123
L	213	101

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 124663 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.9 *PAVUS Test Report No. Pr-03-02.086**

Two fire resistance tests stated to be in accordance with BS EN 1363-1: 1999 and BS EN 1366-3: 2003 on a number of penetration services through the overall 100 mm thick mineral wool boards coated with dry thickness of 1 mm minimum Hilti CP 673 were performance by the Pavus testing laboratory on 21st and 22nd October, 2003. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test both the wall and floor supporting construction are identical. They are composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool boards coated with dry thick 1mm of Hitli CP 673, it is as declared by the applicant, the Hilti CP 673 and CP 670 are the same product but with different brand name in different market. For the CP 673 with the mineral wool boards system, a total of 15 nos. of services were penetrating through it. This includes 5 cable trays and a number of individual cables.

The specimen satisfied the performance requirements specified in BS EN 1363-1: 1999 for the following periods:

Integrity:	**Cotton pad**	**125** Minutes
	Gap gauge	**125** Minutes
	Sustained flaming	**125** Minutes
Insulation:		**122** Minutes

The test was discontinued after a heating period of 125 minutes (See Pavus test report no. Pr-03-02.086 for full details).

*Note: The test data is more than five years old; we have reviewed this data against the current test procedures as per BS EN 1366-3: 2003 and BS EN 1363-1: 1999 and found it suitable for this assessment.

3.2.10 RED Test Report No. R16L28-1#

A fire resistance test in accordance with BS 476: Part 20: 1987 on 7 nos, of penetration systems was performance by the RED testing laboratory on 20th January, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunkings, speed sleeve and cable trays, namely specimens '2a', '2b', '3', '6', '8', '9' and '10', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimen was tested as per test sponsor's request.

Specimen '2a' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

Specimen '2b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks.

Specimen '3' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-F FX' firestop foam.

Specimen '6' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimens '8', '9' and '10' were comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, upper and lower cable trays with electrical cables. The upper and lower cable trays were with a separation of 250 mm. The upper and lower cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 30 mm diameter 'Armoured Cable 35' and 3 nos. of 40 mm diameter 'Armoured Cable 70' electrical cables were incorporated into the upper and lower 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides.

For specimen '8', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. For specimen '9', the cable trays with electrical cables were penetrated through a fire barrier which constructed by nominal 100 mm thick 'CFS-F FX' firestop foam. While for specimen '10', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied on both sides.

The trunkings of specimens '2a', '2b' and '3', AV cables of specimen '6' and cable trays of specimen '8', '9' and '10' were fixed to 42 mm by 20 mm by 3 mm thick steel channels, located at 500 mm from the concrete wall, by M5 bolts and nuts on both sides. The steel channels were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel L-angles which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '2a'	**121** Minutes (No failure)	N/A
Specimen '2b'	**121** Minutes (No failure)	N/A
Specimen '3'	**121** Minutes (No failure)	N/A
Specimen '6'	**121** Minutes (No failure)	N/A
Specimen '8'	**121** Minutes (No failure)	**38** Minutes
Specimen '9'	**121** Minutes (No failure)	**61** Minutes
Specimen '10'	**121** Minutes (No failure)	**42** Minutes

The test was discontinued after a heating period of 121 minutes (See RED report no. R16L28-1B for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.11 RED Test Report No. R16L28-2A#

A fire resistance test in accordance with BS 476: Part 20: 1987 on 6 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking, speed sleeve and cable tray, namely specimens '2', '4a', '4b', '5b', '7' and '8', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '2' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '4a' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 200 mm thick 'CFS-F FX' firestop foam.

Specimen '4b' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '5b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '7' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimen '8' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve and 25 mm wide 'CP648-E' fire wrap, filled with 60% of 3 mm diameter AV cables.

The trunkings of specimens '4a', '4b' and '5b', AV cables of specimens '7 and '8' and cable trays of specimen '2' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	**Insulation**
Specimen '2'	**241** Minutes (No failure)	**85** Minutes
Specimen '4a'	**241** Minutes (No failure)	N/A
Specimen '4b'	**241** Minutes (No failure)	N/A
Specimen '5b'	**241** Minutes (No failure)	N/A
Specimen '7'	**241** Minutes (No failure)	N/A
Specimen '8'	**241** Minutes (No failure)	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.12 RED Test Report No. R16L28-2B#

A fire resistance test in accordance with BS 476: Part 20: 1987 on 4 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking and cable tray, namely specimens '1', '3a', '3b' and '6', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '1' was comprised of a fire barrier with sizes of 1,000 mm wide by 1.000 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 400 mm and had 2 nos. of 250 mm wide by 1.2 mm thick cable trays. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into one of the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '3a' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'CFS-F FX' firestop foam at the unexposed side and a layer of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 at the exposed side.

Specimen '3b' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied at the

unexposed side.

Specimen '6' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

The trunkings of specimen '6' and cable trays of specimens '1', '3a' and '3b' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	**Insulation**
Specimen '1'	**174** Minutes	**82** Minutes
Specimen '3a'	**177** Minutes	**101** Minutes
Specimen '3b'	**173** Minutes	**96** Minutes
Specimen '6'	**130** Minutes	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

4 PROPOSAL & DISCUSSION

4.1 The use of test evidence, which was tested in accordance with BS EN 1363-1: 1999, for the assessment of linear joint sealing system to BS 476: Part 20: 1987

Proposal

It is proposed that the test evidence of PAVUS test report no. Pr-03-02.086 for the penetration seal systems, which were tested in accordance with BS EN 1363-1: 1999, is suitable for use in the assessment against BS 476: Part 20: 1987.

Discussion

The fire test on the penetration seal systems as tested and described in the above test evidence was carried out in accordance with BS EN 1363-1: 1999. In reviewing the test, we have considered the design and installation of the specimens, the surrounding construction, the initial furnace temperature, the pressure in the furnace, the changes in the integrity criteria and the behaviour of the fire test, it is expected that if this fire test had been conducted in accordance with BS 476: Part 20: 1987 very similar results would have been achieved.

Fire tests to BS EN 1363-1: 1999 and BS 476: Part 20: 1987 have the same furnace temperature-time curve, i.e., the standard ISO temperature time curve represented by $T = 345 \log_{10}(8t + 1) + 20$, where T is the furnace temperature rise and t is the time of heating conditions. However, a more severe overpressure requirement of 5 Pa required by BS EN 1363-1: 1999 was used, which was normally deemed to be more onerous. The passing criteria for the standards of BS EN 1363-1: 1999 and BS 476: Part 20: 1987 are summarised as follows:

Integrity. Monitor the unexposed face of the specimen for evaluation of integrity. A failure of the test construction to maintain integrity occurs when collapse or sustained flaming on the unexposed face occurs or impermeability is exceeded.

Insulation. Failure occurs when (a) the mean unexposed face temperature increases by more than 140 °C above its initial value; or (b) the temperature recorded at any position on the unexposed face is in excess of 180 °C above its initial value; or (c) when integrity failure occurs.

Having stated these criteria, there is no significant difference between the tests to BS EN and British standards. Since the integrity and insulation criteria of BS EN 1363-1: 1999 are basically the same, we can conservatively conclude that the linear joint sealing system as tested and described in PAVUS report no. Pr-03-02.086 will achieve fire resistance performance not worse than tested if test to BS 476: Part 20: 1987.

4.2 The fire resistance performance of cable tray penetration sealing system through the Hilti CP636 firestop mortar with respect to BS 476: Part 20: 1987.

Proposal

It is proposed that Hilti CP636 firestop mortar may be used for the purpose of cable tray penetration sealing purpose under either the wall mounted or floor mounted situation. The required condition of the use of Hilti CP636 firestop mortar for various situation are as stated in the table below:

Table 1: Summary of the required condition of Hilti CP 636 for various FRR

Wall	Thickness	Aperture size		Integrity	Insulation
		Width	Height		
	100 mm	600 mm	600 mm	240	60
	150 mm	1,200 mm	2,000 mm	240	60
	150 mm	1,200 mm	2,000 mm	240	120[Note 1]
	50 mm x 160 kg/m^3 mineral wool with 35 mm thick CP 636 on both sides (overall 120 mm thick)	1,200 mm	1,200 mm	240	60
Floor	150 mm	1,000 mm	600 mm	180	60
	75 mm CP 636 + 50 mm x 160 kg/m^3 wool on exposed side	600 mm	600 mm	240	60

Note1: Coat with 0.5 mm thickness of Hilti CP 611A intumescent firestop mastic around the cables over a distance of 30 mm length at the middle of the penetration.

The clear distance between the top and bottom of the cable trays within one aperture shall be at least 100 mm apart from each other, and there is no limitation impose to the cable trays arranged side by side at the same height level. In all cases, the cable tray shall be adequately supported same as that tested, such that the weight of the cables together with the cable tray will not be added to the penetration sealing.

The assessment is conducted against the integrity and insulation criteria with respect to BS 476: Part 20: 1987.

Discussion

The Hilti CP636 firestop mortar had been substantially tested under various evidence. In the test evidence WARRES 62305/B, the 100 mm thick Hilti CP636 had been used to seal up a 600 mm by 600 mm masonry wall aperture penetrated with three cable trays penetrating through, the cables are applied with 30 mm wide by 0.5 mm thick Hilti CP611A firestop intumescent sealant at the mid-depth of the aperture. The WARRES 62305/A describe the test of the 150 mm thick Hilti CP636 used to seal up a 1,200 mm wide by 2,000 mm high aperture with various services penetrating through it. The cable trays

at the upper section of the aperture were applied with 0.5 mm thick Hilti CP611A while the cable trays at the lower section of the aperture was not applied with the Hilti CP611A. The test result stated the integrity failed at 151 minutes and the insulation failed at 121 minutes.

In the test evidence WARRES 62304/C the 185 mm thick Hilti CP 636 had been used to seal up a 1,200 mm wide by 600 mm high masonry wall aperture penetrated with 5 cable trays. All the cable trays were not applied with the Hilti CP611A and the system had achieved 240 minutes integrity and 86 minutes insulation with respect to BS 476: Part 22: 1987.

The test evidence R13C05 described the test for various penetration sealing, while among these, the Specimen "G" was the sealing system composed of a 50 mm thick by 160 k/m^3 mineral wool system sandwiched by the 35 mm thick Hilti CP636 firestop mortar on both sides. The aperture sizes were 1,200 mm by 1,200 mm with two cable trays penetrating through it. The system had achieved 264 minutes integrity and 100 minutes.

In the test evidence WARRES 62320, the floor mounted specimen was constructed by the 150 mm thick Hilti CP636 firestop mortar within a 150 mm thick masonry floor. The aperture sizes for the Hilti CP636 mortar was 600 mm by 1,000 and a totally of 7 nos. of cable trays were penetrating though it. The system had achieved the fire resistance performance of 180 minutes integrity and 112 minutes insulation.

In the test evidence WARRES 101728, the floor mounted specimen was constructed by the 75 mm thick Hilti CP636 firestop mortar on the unexposed side backed with the 50 mm thick by mineral wool within a 600 mm by 600 mm masonry floor aperture. Immediately after the test, an evenly distributed dead load of approximately 150 kg was placed on the upper face of the floor mounted seal and left in place for a period of approximately 10 minutes without collapse. In this test report, no density of the mineral wool had been mentioned, therefore, it is assumed to be the same as that used in R13C05.

For the proposed conditions of the use of Hilti CP636 firestop mortar for various aperture sizes and fire resistance performance as given in Table 1 are referenced to the direct test evidence and the appraisal is therefore considered as positive. In all the tests, the cable trays are penetrating though the Hilti CP636 firestop mortar in various configuration, and most of them did not have significant deterioration of the fire resistance performance, except that the clear distance between the two height level of cable trays shall be at least 100 mm apart from each other is imposed as the only condition.

4.3 The fire resistance performance of cable tray penetration sealing system through the mineral wool panel coated with Hilti CP670 fire safety coating with respect to BS 476: Part 20: 1987.

Proposal

It is proposed that mineral wool panel coated with Hilti CP670 fire safety coating may be used for the purpose of cable tray penetration sealing purpose under either the wall mounted or floor mounted situation. The required condition of the use of Hilti CP670 fire safety coating and the required thickness of the mineral wool panel for various situation are as stated in the table below:

Table 2: Summary of the required condition of Hilti CP670 and mineral wool panel for various FRR

Wall	Thickness	Aperture size		Cables remark	Integrity	Insulation
		Width	Height			
	50 mm x 160 kg/m³ with 0.7 mm thick CP670 on both sides	3,600 mm	2,000 mm	Nil	120	30
	50 mm x 160 kg/m³ with 0.7 mm thick CP670 on both sides	3,600 mm	2,000 mm	Coated with CP670, 150 mm long extend from wall on both sides	120	60
	2 x 50 mm x 160 kg/m³ with 0.7 mm thick CP 670 on both sides	3,600 mm	2,000 mm	Coated with CP670, 150 mm long extend from wall on both sides	240	120
Floor	2 x 50 mm x 160 kg/m³ with 0.7 mm thick CP 670 on both sides	3,600 mm	2,000 mm	Nil	120	60
	2 x 50 mm x 160 kg/m³ with 0.7 mm thick CP 670 on both sides	3,600 mm	2,000 mm	Coated with CP670, 150 mm long extend from wall on both sides	120	120
	2 x 50 mm x 160 kg/m³ with 0.7 mm thick CP 670 on both sides	600 mm	600 mm	Nil	240	60

The clear distance between the top and bottom of the cable trays within one aperture shall be at least 100 mm apart from each other, and there is no limitation impose to the cable trays arranged side by side at the same height level. In all cases, the cable tray shall be adequately supported same as that tested,

such that the weight of the cables together with the cable tray will not be added to the penetration sealing.

The assessment is conducted against the integrity and insulation criteria with respect to BS 476: Part 20: 1987.

Discussion

The system composed of the mineral wool panel coated with the Hilti CP670 fire safety coating had been substantially tested under various evidence. In the test evidence WARRES 124662, the 50 mm thick by 160 kg/m^3 mineral wool panel coated with nominal 1 mm thick Hilti CP670 fire safety coating was used to seal up the 1,800 mm wide by 1,200 mm high wall aperture. Two mineral wool panels, one 600 mm wide by 1,200 mm high and one 1,200 mm wide by 1,200 mm high were butt jointed side by side. Three cable trays penetrated through it and the system had achieved 120 minutes integrity and 60 minutes insulation performance.

The test evidence WARRES 124663, the 30 mm thick steel frame cladded with 50 mm thick by 160 kg/m^3 mineral wool on each side of the steel frame the exposed face of the panel was coated with nominal 1 mm thick Hilti CP670 fire safety coating. For the cable tray penetration, the specimen generally achieved the fire resistance of not less than 180 minutes integrity and 60 minutes insulation.

Test evidence PAVUS report no. Pr-03-02.086 described the test of the penetrating sealing system with aperture sizes of 1,000 mm x 2,000 mm for both the wall mounted and floor mounted situation. The system composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool panels coated with 0.7 mm thick Hilti CP670 fire safety coating. The system had achieved an overall 125 minutes integrity and 122 minutes insulation performance.

In the test evidence of R16L28-1B, specimen 8 was the cable trays penetrating through a 600 mm by 600 mm system composed of 50 mm thick by 160 kg/m^3 mineral panel coated with nominal 0.7 mm thick Hilti CP670 on both sides. The system had achieved 121 minutes integrity and 38 minutes insulation.

The evidence R16L28-2A described the test of a specimen (referenced '2'), which was the cable tray penetrated through a 600 mm x 600 mm floor mounted Hilti CP670 system. The system composed of two layers of 50 mm thick by 160 kg/m^3 mineral wool panel coated with nominal 0.7 mm thick Hilti CP670 fire safety coating had achieved the fire resistance performance of 240 minutes integrity and 60 minutes insulation performance. While the test evidence R16L28-2B described the test on the specimen (referenced '1'), which was the cable tray penetrated through a 1,000 mm x 1,000 mm floor mounted Hilti CP 670 system, which was the same as the one that in R16L28-2A. The system had achieved the fire resistance performance of 174 minutes integrity and 82 minutes insulation.

In the proposed design of the CP670 systems, for the wall application, the sizes of the system is assessed to become 3,600 mm wide by 2,000 mm high. From the test evidence of wall application, the system with various configuration had been tested. The 2,000 high system was tested in the PAVUS report no. Pr-03-02.086. While the regarding the width of the system, the test evidence WARRES 124662, had been tested with the single layer mineral wool panels incorporation of the vertical butt joints. The test

evidence proved the present of the butt joint shall not deteriorate the tested fire resistance performance. The proposal to increase the width to 3,600 mm which involves three mineral panels of 1,200 mm wide incorporated with two vertical butt joints are still considered as the reasonable proven in the test evidence. The height of 2,000 mm are the tested maximum height and since the height would be a more critical dimension in terms of this type of sealing, therefore the proposed height shall remain the same as that tested. While regarding the insulation performance, the overall thickness of the mineral wool panels, and the application of extended coating on the cables are considered as improvement of the insulation performance as reflected in the test results. Therefore, for the system that requires 120 minutes, only the cables coated with the Hilti CP670 can achieved the 120 minutes insulation. For the system that requires 240 minutes and with the larger aperture sizes, minimum two layers of the 50 mm thick x 160 kg/m^3 mineral wool panels is suggested as referenced to the flooring situation in test evidence R16L28-2B.

For the system in floor mounted situation, again, the maximum aperture sizes of 1,000 mm by 2,000 mm had been proven in the test evidence Pr-03-02.086, while the test evidence R16L28-2A and R16L28-2A also described the same systems achieved the fire resistance performance for floor-mounted situation. While in case the sealing aperture exceed 1,200 mm in width, additional framing shall be incorporated to provide adequate support to the system such that the short span of the system shall not exceed 1,200 mm. For all the floor system, two layers of 50 mm thick x 160 kg/m^3 mineral wool panels shall be used, and the two layers shall be staggered to each other with the overlapping distance of 400 mm. For the system requires 120 minutes insulation, the Hilti CP670 shall be applied to the cables as well.

While in the floor situation, the aperture sizes of 600 mm x 600 mm sealed with two layers of 50 mm thick x 160 kg/m^3 mineral wool panels and coated with Hilti CP670 on both sides to achieve 240 minutes integrity and 60 minutes insulation is the application direct adopted the tested configuration.

4.4 The fire resistance performance of cable tray penetration sealing system through the Hilti CFS-F FX firestop foam with respect to BS 476: Part 20: 1987.

Proposal

It is proposed that Hilti CFS-F FX firestop foam may be used for the purpose of cable tray penetration sealing purpose under either the wall mounted or floor mounted situation. The required condition of the use of Hilti CFS-F FX firestop foam for various situation are as stated in the table below:

Table 3: Summary of the required condition of Hilti CFS-F FX and mineral wool panel for various FRR

Wall	Thickness	Aperture size		Integrity	Insulation
		Width	Height		
	100 mm thick CFS-F FX firestop foam	600 mm	600 mm	120	60
Floor	150 mm thick CFS-F FX firestop foam on unexposed side and 50 mm x 100 kg/m3 mineral wool on exposed side.	600 mm	600 mm	120	60

The clear distance between the top and bottom of the cable trays within one aperture shall be at least 100 mm apart from each other, and there is no limitation impose to the cable trays arranged side by side at the same height level. In all cases, the cable tray shall be adequately supported same as that tested, such that the weight of the cables together with the cable tray will not be added to the penetration sealing.

The assessment is conducted against the integrity and insulation criteria with respect to BS 476: Part 20: 1987.

Discussion

The system that used the Hilti CFS-F FX firestop foam for the sealing of apertures on the floor and wall application are as described in the test evidence RED report nos. R16L28-1B and R16L28-2B. In R16L28-1B, specimen '9' was the use of the Hilti CFS-F FX firestop foam sealing up the 600 mm x 600 mm aperture with the present of the cable trays penetrating through it. The system had achieved the fire resistance performance of 121 minutes integrity and 61 minutes insulation. While in the test R16L28-2B, the specimen 3a was the aperture sealing with overall sizes of 600 mm x 600 mm and constructed by 150 mm thick Hilti CFS-F FX firestop foam on the unexposed side and backed with a layer of 50 mm x 100 kg/m^3 mineral wool panel on the exposed side. The system had achieved the fire resistance performance of 177 minutes integrity and 101 minutes insulation.

For the proposed conditions of the use of Hilti FS-F FX firestop foam as given in Table 3, the applications are referenced to the direct test evidence and since there were no significant performance buffer achieved in the test. The appraisal scope is therefore directly adopted the tested condition only. In all the tests, the cable trays are penetrating though the system, and most of them did not have significant deterioration of the fire resistance performance, except that the clear distance between the two height level of cable trays shall be at least 100 mm apart from each other is imposed as the only condition.

4.5 *The fire resistance performance of cable trunking application penetrating through masonry wall with respect to BS 476: Part 20: 1987.*

Proposal

It is proposed that for the cable trunking penetration through masonry wall, the void inside the trunking may be filled by the use of Hilti CFS-F FX firestop foam or CFS-BL firestop block with the following conditions:

(a) The maximum sizes of the trunking are up to 200 mm x 200 mm and shall be made of minimum 1mm thick steel, the sizes of the aperture may be up to 20 mm larger than the trunking. The clearance between the trunking and the supporting construction shall be sealed with minimum 10 mm deep Hilti "CP606" sealant on both sides of the wall, or at the unexposed side only for the floor mount situation;

(b) For the use of Hilti CFS-BL firestop block, the filling of the cables may be up to 60% of the trunking sectional area only. The Hilti CFS-BL will be filled the rest of nominal 40% of the sectional area;

(c) For the use of Hilti CFS-F FX firestop foam, the filling of the cables may be up to 60% of the trunking sectional area only. The Hilti CFS-F FX will be applied to the cables and filled up the rest of nominal 40% of the sectional area;

The cable trunking shall be supported by separate supporting system such that the weight of the trunking shall not be added to the sealant. The system shall be capable to satisfy 120 minutes integrity only performance with respect to BS 476: Part 20: 1987.

Discussion

The cable trunking systems penetrating through wall were tested under the test evidence R16L28-1B. Specimen referenced '2a', '2b' and 3' were the trunking specimen using either the Hilti CFS-BL and the CFS-F FX, the sizes of the trunkings were 100 mm x 100 mm and 200 mm x 200 mm. In all the specimens, the cables are filled up to 60% of the sectional area, and the rest of the 40% were filled with the Hilti CFS-BL and the CFS-F FX. The clearance between the trunking and the supporting construction shall be sealed with minimum 10 mm deep Hilti CP606 sealant on both sides of the wall. All three specimens had achieved the fire resistance performance of 120 minutes integrity with respect to BS476: Part 20: 1987.

The cable trunking systems penetrating through floor were tested under the test evidence R16L28-2B, in which the specimen '6' was a 100 mm x 100 mm cable trunking system. In the trunking, the cables are filled up to 60% of the sectional area, and the rest of the 40% were filled with the Hilti CFS-BL. The system had achieved 130 minutes integrity performance with respect to BS 476: Part 20: 1987.

For the performance that requires only the integrity performance, the expansion of the sealant to fill up the void for the required fire resistance duration is critical. In this case the 1 mm thick trunking is the metal that provide a rigid area for the forming for the expansion of the cable. The perimeter sealing with the use of the fire rated sealant is adequate as well. Based on this, the proposed design for the trunking sealing purpose is considered as acceptable.

5 CONCLUSION

The proposed use of Hilti CP636, CP670, CFS-F FX, and CFS-BL for electrical services penetration sealing systems through masonry wall or floor supporting construction as discussed in Section 4 of this report, are capable to maintain the fire resistance performance of up to 240 minutes integrity and various insulation performance with respect to BS 476: Part 20: 1987.

6 DECLARATION BY APPLICANT

We, Hilti (Hong Kong) Limited, confirm that the material, component or element of structure, which is the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:

Dr. SZE Lip-kit
Test Consultant
Research Engineering Development
Façade Consultants Limited

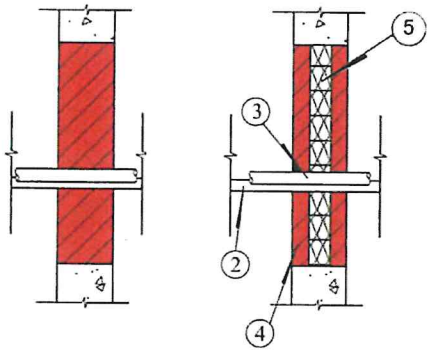
Reviewed by:

Ir Dr. YUEN Sai-wing, MHKIE (Fire)
Authorized Signature
Research Engineering Development
Façade Consultants Limited

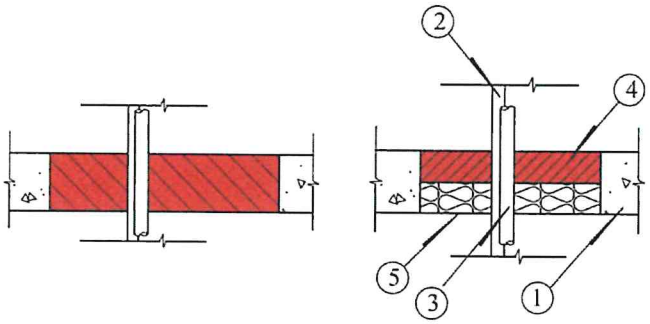
APPENDIX – DRAWINGS PROVIDED BY THE CLIENT

Drawing refers to Table 1 on cable tray penetration application by using CP636

FLOOR CASE



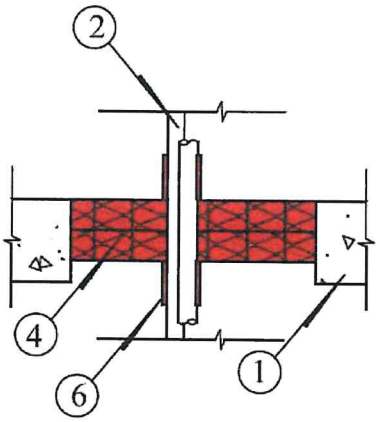
WALL CASE



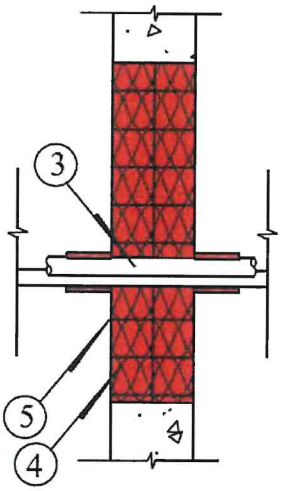
1. Concrete floor or wall assembly or fire-rated blockwall
2. Metal cable tray(s)
3. Cables
4. CP636
5. 50mm mineral wool board in 160 kg/m³
6. Minimum 150mm coat back of CP670 applied on both sides of the cable and cable tray penetration

Drawing refers to Table 2 on cable tray penetration application by using CP670

FLOOR CASE



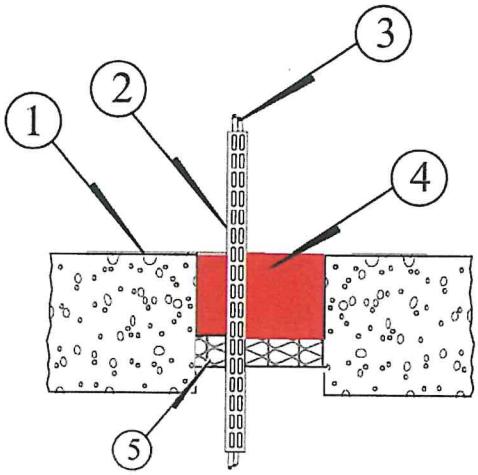
WALL CASE



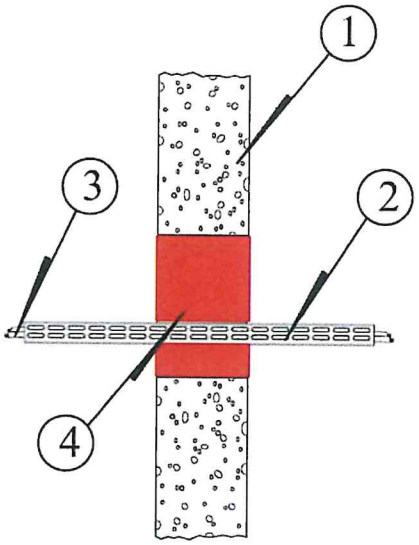
1. Concrete floor or wall assembly or fire-rated blockwall
2. Metal cable tray(s)
3. Cables
4. Double layer (50mm thickness each) mineral wool board in 160 kg/m³
5. Minimum 0.7mm dry thickness of CP670 applied on both sides of the mineral wool board
6. Minimum 150mm coat back of CP670 applied on both sides of the cable and cable tray penetration

Drawing refers to Table 3 on cable tray penetration application by using CFS-F FX

FLOOR CASE



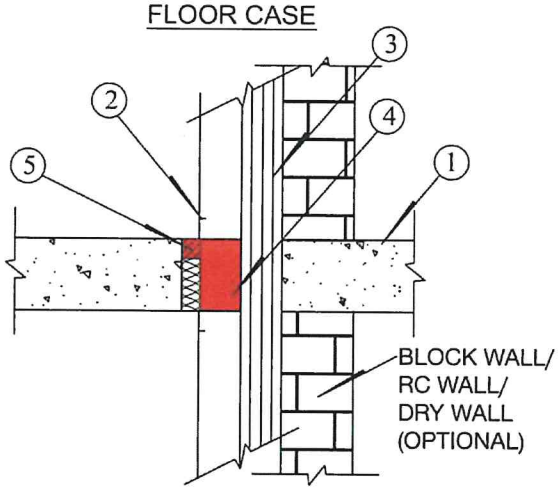
WALL CASE



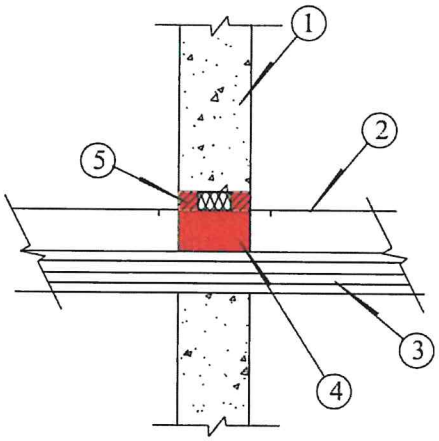
1. Concrete floor or wall assembly or fire-rated blockwall
2. Metal cable tray(s)
3. Cables
4. CFS-F FX
5. 50 mm mineral wool in 100 kg/m³ on exposed side

Drawing refers to Section 4.5 on cable trunking application by using CFS-BL or CFS-F FX

FLOOR CASE



WALL CASE



1. Concrete floor or wall assembly or fire-rated blockwall
2. 200mm x 200mm metal trunking
3. Filling of the cables up to 60% of the trunking sectional area only
4. CFS-F FX or CFS-BL
5. Fill the void by mineral wool with CP606 when annular space ≤ 30mm

- End of Report -

ASSESSMENT REPORT

The Use of Hilti CP670 for E&M Services Penetration Sealing Systems

Report No.: R24B05-1A

Issue Date: 25 February, 2025

Date of Review: 24 February, 2028

Report Sponsor

Hilti (Hong Kong) Limited
701-704 & 708B, Tower A Manulife Finance Centre,
223 Wai Yip Street, Kwun Tong, Kowloon, HK

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REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
25/02/2025	0	Initial version

THE USE OF HILTI CP670 FOR E&M SERVICES PENETRATION SEALING SYSTEMS

1 INTRODUCTION

This assessment report presents an appraisal for the use of the Hilti CP670 for electrical and mechanical services penetration sealing systems through concrete, AAC or blockwork like masonry wall or floor supporting construction. This appraisal is based on the substantial test evidence as mentioned in Section 3. This report is prepared for Hilti (Hong Kong) Limited of 701-704 & 708B, Tower A, Manulife Finance Centre, 223 Wai Yip Street, Kwun Tong, Kowloon, HK.

The proposed gap sealing systems used for electrical services penetration are required to provide a fire resistance performance of up to 120 or 240 minutes integrity and various insulation (depends on he design) with respect to BS 476: Part 20: 1987.

2 ASSUMPTIONS

The proposed systems are assumed to be installed in a similar manner to that of the previously tested system by competent installers. It is assumed that the modified systems will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED. Further assumptions related to the specific modifications will be stated in the report.

It is also assumed that the supporting structures to which the perimeter of the systems will be fixed are capable of supporting the proposed structure effectively.

Assuming that the issue of the original test report is valid, the current testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of Supporting Test Evidence

Report no.	Sections	Description
Primary Test Evidence		
RED report no. R13C05	4.2	Supporting test evidence for the use of the Hilti "CP636 Firestop mortar and Hilti "CP670" fire safety coating with mineral wool system with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 124662	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 124663	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
PAVUS report no. Pr-03-02.086	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP673" fire safety coating for the penetration of cable tray. The test was conducted in accordance with BS EN 1363-1: 1999 and prEN 1366-3: 2003.
RED report no. R16L28-1B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2A	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.

3.2 Primary Test Evidences

3.2.1 RED Test Report No. R13C05#

A fire resistance test be in accordance with BS 476: Part 20: 1987 on seven different specimens of wall mounted penetration sealings was performance by the RED testing laboratory on 18th April, 2013. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder. Specimens 'A', 'B', 'D' and 'G' were asymmetrical and the fire side of specimens were determined by the test sponsor. Specimens 'C', 'E' and 'F' were symmetrical and only one side of the specimens were tested as per test sponsor's request.

Specimen 'A' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 110 mm diameter by 3.5 mm thick by 1,800 mm long PVC pipes, namely specimens 'A1' and 'A2', incorporated with 'Hilti 643N/ CP 644' firestop collars at both of the exposed and unexposed sides. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. Each pipe was supported by a pipe ring at unexposed side, which was fixed to a M12 steel rod located at 460 mm and 480 mm from the fire barrier for specimens 'A1' and 'A2' respectively. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'B' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 150 mm diameter by 4.5 mm thick by 1,770 mm long G.M.S. pipes, namely specimens 'B1' and 'B2'. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The pipes were supported by pipe rings at both sides, which were fixed to M12 steel. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'C' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'D' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'D1' and 'D2'. Specimen 'D1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of nominal 7 mm diameter electrical cables while specimen 'D2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of nominal 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire

barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts. Nominal 250 mm coat back of 'Hilti CP 670' fire safety coating was applied on both of the exposed and unexposed sides of the steel cable trays with electrical cables. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'E' had overall dimensions of 1,200 mm wide by 600 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'F' had overall dimensions of 525 mm wide by 295 mm high. It was comprised of 'Hilti FS657/ CP657' intumescent firestop bricks and each brick was with sizes of 130 mm by 50 mm by 200 mm.

Specimen 'G' had overall dimensions of 1,200 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'G1' and 'G2' . Specimen 'G1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of 7 mm diameter electrical cables while specimen 'G2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick mineral wool board with density of 160 kg/m3 with nominal 35 mm thick 'Hilti CP 636' firestop mortar applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987, for the following periods:

Specimens	Penetration services	Integrity	Insulation	**Integrity**	**Insulation**
Specimen 'A'	A1	264 Minutes	162 Minutes	**264 Minutes**	**162 Minutes**
	A2	264 Minutes	162 Minutes		
Specimen 'B'	B1	264 Minutes	18 Minutes	**264 Minutes**	**18 Minutes**
	B2	264 Minutes	19 Minutes		
Specimen 'C'	--	264 Minutes	151 Minutes	**264 Minutes**	**151 Minutes**
Specimen 'D'	D1	264 Minutes	198 Minutes	**264 Minutes**	**60 Minutes**
	D2	264 Minutes	60 Minutes		
Specimen 'E'	--	264 Minutes	155 Minutes	**264 Minutes**	**155 Minutes**

Specimen 'F'	--	229 Minutes	209 Minutes	**229 Minutes**	**209 Minutes**
Specimen 'G'	G1	264 Minutes	100 Minutes	**264 Minutes**	**100 Minutes**
	G2	264 Minutes	104 Minutes		

The test was discontinued after a period of 264 minutes (See RED report no. R13C05 for full details)

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.2 *WARRES Test Report No. 124662#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 20th June, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the section of wall contained a 1,200 mm high by 1,800 mm wide aperture which was penetrating through various services. The aperture was sealed with two mineral wool panels with sizes of 600 mm wide by 1,200 mm high and 1,200 mm wide x 1,200 mm high, respectively. A vertical butt joint was incorporated. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity: **125** Minutes (for cable trays position only)

Insulation: **60** Minutes (for cable trays position only)

The test was discontinued after a heating period of 125 minutes (See WARRES report no. 124662 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.3 *WARRES Test Report No. 124663#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 4th July, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the wall assembly was formed by the internal steel channel section framework (30 mm thick) clad on both sides with 50 mm thick mineral wool panels coated with Hilti CP670 fire safety coating. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays (Specimens F, G, H, I, J, K and L) were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Specimen	Integrity	Insulation
F, G	211	136
H	213	146
I	213	108
J	213	105
K	213	123
L	213	101

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 124663 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.4 *PAVUS Test Report No. Pr-03-02.086**

Two fire resistance tests stated to be in accordance with BS EN 1363-1: 1999 and BS EN 1366-3: 2003 on a number of penetration services through the overall 100 mm thick mineral wool boards coated with dry thickness of 1 mm minimum Hilti CP 673 were performance by the Pavus testing laboratory on 21st and 22nd October, 2003. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test both the wall and floor supporting construction are identical. They are composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool boards coated with dry thick 1mm of Hitli CP 673, it is as declared by the applicant, the Hilti CP 673 and CP 670 are the same product but with different brand name in different market. For the CP 673 with the mineral wool boards system, a total of 15 nos. of services were penetrating through it. This includes 5 cable trays and a number of individual cables.

The specimen satisfied the performance requirements specified in BS EN 1363-1: 1999 for the following periods:

Integrity:	**Cotton pad**	**125** Minutes
	Gap gauge	**125** Minutes
	Sustained flaming	**125** Minutes
Insulation:		**122** Minutes

The test was discontinued after a heating period of 125 minutes (See Pavus test report no. Pr-03-02.086 for full details).

*Note: The test data is more than five years old; we have reviewed this data against the current test procedures as per BS EN 1366-3: 2003 and BS EN 1363-1: 1999 and found it suitable for this assessment.

3.2.5 *RED Test Report No. R16L28-1B#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 7 nos, of penetration systems was performance by the RED testing laboratory on 20th January, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunkings, speed sleeve and cable trays, namely specimens '2a', '2b', '3', '6', '8', '9' and '10', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimen was tested as per test sponsor's request.

Specimen '2a' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

Specimen '2b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks.

Specimen '3' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-F FX' firestop foam.

Specimen '6' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimens '8', '9' and '10' were comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, upper and lower cable trays with electrical cables. The upper and lower cable trays were with a separation of 250 mm. The upper and lower cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 30 mm diameter 'Armoured Cable 35' and 3 nos. of 40 mm diameter 'Armoured Cable 70' electrical cables were incorporated into the upper and lower 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides.

For specimen '8', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. For specimen '9', the cable trays with electrical cables were penetrated through a fire barrier which constructed by nominal 100 mm thick 'CFS-F FX' firestop foam. While for specimen '10', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied on both sides.

The trunkings of specimens '2a', '2b' and '3', AV cables of specimen '6' and cable trays of specimen '8', '9' and '10' were fixed to 42 mm by 20 mm by 3 mm thick steel channels, located at 500 mm from the concrete wall, by M5 bolts and nuts on both sides. The steel channels were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel L-angles which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '2a'	**121** Minutes (No failure)	N/A
Specimen '2b'	**121** Minutes (No failure)	N/A
Specimen '3'	**121** Minutes (No failure)	N/A
Specimen '6'	**121** Minutes (No failure)	N/A
Specimen '8'	**121** Minutes (No failure)	**38** Minutes
Specimen '9'	**121** Minutes (No failure)	**61** Minutes
Specimen '10'	**121** Minutes (No failure)	**42** Minutes

The test was discontinued after a heating period of 121 minutes (See RED report no. R16L28-1B for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.6 *RED Test Report No. R16L28-2A#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 6 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking, speed sleeve and cable tray, namely specimens '2', '4a', '4b', '5b', '7' and '8', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '2' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '4a' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 200 mm thick 'CFS-F FX' firestop foam.

Specimen '4b' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '5b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '7' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimen '8' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve and 25 mm wide 'CP648-E' fire wrap, filled with 60% of 3 mm diameter AV cables.

The trunkings of specimens '4a', '4b' and '5b', AV cables of specimens '7 and '8' and cable trays of specimen '2' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '2'	**241** Minutes (No failure)	**85** Minutes
Specimen '4a'	**241** Minutes (No failure)	N/A
Specimen '4b'	**241** Minutes (No failure)	N/A
Specimen '5b'	**241** Minutes (No failure)	N/A
Specimen '7'	**241** Minutes (No failure)	N/A
Specimen '8'	**241** Minutes (No failure)	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.7 *RED Test Report No. R16L28-2B#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 4 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking and cable tray, namely specimens '1', '3a', '3b' and '6', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '1' was comprised of a fire barrier with sizes of 1,000 mm wide by 1.000 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 400 mm and had 2 nos. of 250 mm wide by 1.2 mm thick cable trays. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into one of the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '3a' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'CFS-F FX' firestop foam at the unexposed side and a layer of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 at the exposed side.

Specimen '3b' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied at the

unexposed side.

Specimen '6' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

The trunkings of specimen '6' and cable trays of specimens '1', '3a' and '3b' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '1'	**174** Minutes	**82** Minutes
Specimen '3a'	**177** Minutes	**101** Minutes
Specimen '3b'	**173** Minutes	**96** Minutes
Specimen '6'	**130** Minutes	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

4 PROPOSAL & DISCUSSION

4.1 The use of test evidence, which was tested in accordance with BS EN 1363-1: 1999, for the assessment of linear joint sealing system to BS 476: Part 20: 1987

Proposal

It is proposed that the test evidence of PAVUS test report no. Pr-03-02.086 for the penetration seal systems, which were tested in accordance with BS EN 1363-1: 1999, is suitable for use in the assessment against BS 476: Part 20: 1987.

Discussion

The fire test on the penetration seal systems as tested and described in the above test evidence was carried out in accordance with BS EN 1363-1: 1999. In reviewing the test, we have considered the design and installation of the specimens, the surrounding construction, the initial furnace temperature, the pressure in the furnace, the changes in the integrity criteria and the behaviour of the fire test, it is expected that if this fire test had been conducted in accordance with BS 476: Part 20: 1987 very similar results would have been achieved.

Fire tests to BS EN 1363-1: 1999 and BS 476: Part 20: 1987 have the same furnace temperature-time curve, i.e., the standard ISO temperature time curve represented by $T = 345 \log_{10}(8t + 1) + 20$, where T is the furnace temperature rise and t is the time of heating conditions. However, a more severe overpressure requirement of 5 Pa required by BS EN 1363-1: 1999 was used, which was normally deemed to be more onerous. The passing criteria for the standards of BS EN 1363-1: 1999 and BS 476: Part 20: 1987 are summarised as follows:

Integrity. Monitor the unexposed face of the specimen for evaluation of integrity. A failure of the test construction to maintain integrity occurs when collapse or sustained flaming on the unexposed face occurs or impermeability is exceeded.

Insulation. Failure occurs when (a) the mean unexposed face temperature increases by more than 140 °C above its initial value; or (b) the temperature recorded at any position on the unexposed face is in excess of 180 °C above its initial value; or (c) when integrity failure occurs.

Having stated these criteria, there is no significant difference between the tests to BS EN and British standards. Since the integrity and insulation criteria of BS EN 1363-1: 1999 are basically the same, we can conservatively conclude that the linear joint sealing system as tested and described in PAVUS report no. Pr-03-02.086 will achieve fire resistance performance not worse than tested if test to BS 476: Part 20: 1987.

4.2 The fire resistance performance of E&M services penetration sealing system through the mineral wool panel coated with Hilti CP670 fire safety coating with respect to BS 476: Part 20: 1987.

Proposal

It is proposed that mineral wool panel coated with Hilti CP670 fire safety coating may be used for the purpose of blank sealing with/without various E&M services penetration under either the wall mounted or floor mounted situation. The wall or floor construction may be AAC or other masonry construction.

For the system required 240 minutes integrity performance, the required condition of the use of Hilti CP670 fire safety coating and the mineral wool panels to seal up the wall or floor aperture shall be via minimum two layers of 50 mm thick by 160 kg/m^3 density mineral wool panels coated with nominal 0.7 mm thick Hilti 'CP670' fire safety coating.

The Hilti 'CP670' coated with mineral wool panels allows various E&M services penetration through with the remarks of conditions for each service are as stated in Table1. It is assumed that penetration services shall have their own supporting frame to bear their self-weight. The weight of the penetration shall not be added up to the mineral wool panels.

Table 1: Summary of the required condition for the services penetrating the Hilti CP670 coaed mineral wool panels.

Wall	The size of aperture sealed up with Hilt CP670 with mineral wool panels may be up to 3,600 mm wide by 2,000 mm high			
	Application	***Remark***	***Integrity***	***Insulation***
	Blank seal	Nil	240	120
	Metal pipe (steel / copper) Pipe diameter up to 250 mm and the pipe wall thickness at least 2 mm	The clearance between pipe and the Hilti 'CP670' with mineral wool panels shall be just fit and sealed up with Hilti 'CP606' firestop sealant	240	N.A.
	PVC pipe Pipe diameter up to 110 mm with wall thickness up to 5.6 mm	The PVC pipe sealed up with one no. of Hilti 'CP643'^ pipe collar at the mid depth of the wall within the aperture and the gap clearance by 'CP606' firestop sealant	240	60
		The PVC pipe sealed up with one no. of Hilti 'CP643'^ pipe collar at each end of the wall and the gap clearance by Hilti 'CP606' firestop sealant	240	180
	Cable tray	The cables on the cable tray back-coated with the same nominal 0.7	240	120

		mm thick Hilti 'CP670' fire safety coating, 150 mm long extend from the wall on both sides		
	Cable Trunking with maximum 200 mm x 200 mm	Cable trunking may be filled with cables occupies up to 60% of the volume and the rest 40% filled with Hilti 'CFS-F FX' firestop foam. The trunking shall be just fit within the mineral wool panel and the clearance sealed with Hilti 'CP606' firestop sealant	240	
Floor	The size of aperture sealed up with Hilt 'CP670' with mineral wool panels may be up to 600 mm wide by 600 mm high			
	Blank seal	The aperature sizes is allowed to increase up to 1,200 mm x 1,200 mm	120	60
	Blank seal	Nil	240	60
	Metal pipe	The clearance between pipe and the Hilti 'CP670' with mineral wool panels shall be just fit and sealed up with Hilti 'CP606' firestop sealant	240	N.A.
	Cable tray	The cables on the cable tray back-coated with the same nominal 0.7 mm thick Hilti 'CP670' fire safety coating, 150 mm long extend from the wall on both sides	240	60
	Cable trunking with maximum 200 mm x 200 mm	Cable trunking may be filled with cables occupies up to 60% of the volume and the rest 40% filled with Hilti 'CFS-F FX' firestop foam. The trunking shall be just fit within the mineral wool panel and the clearance sealed with Hilti 'CP606' firestop sealant	240	N.A.

^Note: It is as declared by the client that the Hilti CP642 was an old product which had been phased out, the Hilti CP643 is a new product that replaced Hilti CP642 with similar composition. The Hilti CP643 had been tested under the reference R13C05.

The clear distance between the top and bottom of the services within one aperture shall be at least 100 mm apart from each other. In all cases, the services shall be adequately supported same as that tested, such that the weight of the services will not be added to the penetration sealing.

The assessment is conducted against the integrity and insulation criteria with respect to BS 476: Part 20: 1987.

Discussion

The test evidence WARRES 124663, the 30 mm thick steel frame cladded with 50 mm thick by 160 kg/m^3 mineral wool on each side of the steel frame the exposed face of the panel was coated with nominal 1 mm thick Hilti CP670 fire safety coating. For the cable tray penetration, the specimen generally achieved the fire resistance of not less than 180 minutes integrity and 60 minutes insulation.

Test evidence PAVUS report no. Pr-03-02.086 described the test of the penetrating sealing system with aperture sizes of 1,000 mm x 2,000 mm for both the wall mounted and floor mounted situation. The system composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool panels coated with 0.7 mm thick Hilti CP670 fire safety coating. The system had achieved an overall 125 minutes integrity and 122 minutes insulation performance.

In the test evidence of R16L28-1B, specimen 8 was the cable trays penetrating through a 600 mm by 600 mm system composed of 50 mm thick by 160 kg/m^3 mineral panel coated with nominal 0.7 mm thick Hilti CP670 on both sides. The system had achieved 121 minutes integrity and 38 minutes insulation.

The evidence R16L28-2A described the test of a specimen (referenced '2'), which was the cable tray penetrated through a 600 mm x 600 mm floor mounted Hilti CP670 system. The system composed of two layers of 50 mm thick by 160 kg/m^3 mineral wool panel coated with nominal 0.7 mm thick Hilti CP670 fire safety coating had achieved the fire resistance performance of 240 minutes integrity and 60 minutes insulation performance. While the test evidence R16L28-2B described the test on the specimen (referenced '1'), which was the cable tray penetrated through a 1,000 mm x 1,000 mm floor mounted Hilti CP 670 system, which was the same as the one that in R16L28-2A. The system had achieved the fire resistance performance of 174 minutes integrity and 82 minutes insulation.

In the proposed design of the CP670 systems, for the wall application, the sizes of the system is assessed to become 3,600 mm wide by 2,000 mm high. From the test evidence of wall application, the system with various configuration had been tested. The 2,000 high system was tested in the PAVUS report no. Pr-03-02.086. While the regarding the width of the system, the test evidence WARRES 124662, had been tested with the single layer mineral wool panels incorporation of the vertical butt joints. The test evidence proved the present of the butt joint shall not deteriorate the tested fire resistance performance. The proposal to increase the width to 3,600 mm which involves three mineral panels of 1,200 mm wide incorporated with two vertical butt joints are still considered as the reasonable proven in the test evidence. The height of 2,000 mm are the tested maximum height and since the height would be a more critical dimension in terms of this type of sealing, therefore the proposed height shall remain the same as that tested. While regarding the insulation performance, the overall thickness of the mineral wool panels, and the application of extended coating on the cables are considered as improvement of the insulation

performance as reflected in the test results. For the system that requires 240 minutes and with the larger aperture sizes, minimum two layers of the 50 mm thick x 160 kg/m^3 mineral wool panels is suggested as referenced to the flooring situation in test evidence R16L28-2A.

For the system in floor mounted situation, the test evidence R16L28-2A provide the only test evidence with the use of two layers of 50 mm thick by 160 kg/m^3 mineral wool coated with Hilti 'CP670' While in the floor situation, the aperture sizes of 600 mm x 600 mm sealed with two layers of 50 mm thick x 160 kg/m^3 mineral wool panels and coated with Hilti 'CP670' on both sides to achieve 240 minutes integrity and 60 minutes insulation, and in this case the sealing was incorporated with penetration of two cable trays. Therefore, for the blank seal situation, i.e. without the services penetration, the situation is considered as less onerous and is acceptable.

While in the test evidence R16L28-2B, specimen 1 was the sealing using the same configuration of two layers of 50 mm thick by 160 kg/m^3 mineral wool coated with Hilti 'CP670' with the penetration of cable trays. In this test, the aperture sizes is 1,200 mm by 1,200 mm and the specimen had achieved 174 minutes integrity and 82 minutes insulation.The achieved performance demonstrated a perforance overrun compared to the required performance. Therefore, based on this confidence buffer, it is reasonable to allow the aperture sizes increased to 1,200 mm x 1,200 mm for the application that requires only 120 minutes integrity and 60 minutes insulation.

In the proposal, the required conditions for various services penetration are basically adopted the tested condition directly. For the situation with metal pipe penetration, the situation was demonstrated in the test evidence WARRES report no. 124663, in which the wall mounted steel pipe, referenced item 'A' of 250 mm diameter by 6.3 mm wall thickness was passing through with the junction between the aperture and the pipe was sealed with Hilti "CP606" firestop sealant. In the same evidence, item 'D' was a 108 mm diameter by 2 mm wall thickness copper pipe penetrating through and sealed up with the same 'Hilti 'CP606' firestop sealant. Since both pipes are metal in nature and the melting point of both steel and copper are higher than the furnace temperature. In case if consider only the integrity performance, the same fire-rated protection that applied to either steel or copper shall behave the same. Therefore, the maximum diameter and wall thickness applies to both types of metal pipe. And since for the floor mounted situation, the similar condition of the penetration by cable tray had been demonstrated an had achieved also 240 minutes integrity. The penetration of metal pipe generally regards as a less onerous situation in comparison. Therefore, the penetration of metal pipe is also considered as acceptable, however in this case, only the integrity performance of the system is considered.

The penetration of the PVC pipe had been demonstrated in the test evidence WARRES report no. 124633 as well, and the Hilti 'CP643' firestop collar shall be used on top to ensure the sealing of the PVC pipe after it melts. The proposal again is adopting the direct tested condition, and the application confine to the wall situation only.

The penetration of the cable tray had been demonstrated in both the wall mounted and floor mounted condition, and under both conditions, the penetration shall be just fit and a back-coat of minimum 100 mm from the wall on the cables and cable tray is necessary.

The penetration of the cable trunking had been demonstrated under the floor mounted situation within a concrete floor aperture. However the interface between the cable trunking and the CP670 coated mineral wool is similar to that with the metal pipe situation, it is therefore considered that with the fire-rated protection application, the achieved fire rated performance shall be the similar. Also the volume within the cable trunking shall be filled with cables up to 60% of the volume only, the rest 40% shall be filled with Hilti "CFS F-FX' firestop foam same as that tested.

In summary, the proposed application of service penetration through the Hilti 'CP670' coated mineral wool panels is basically adopted the direct tested situation, and with the reasonable justification.

5 CONCLUSION

The proposed use of Hilti 'CP670' coated mineral wool panels for electrical and mechanical services penetration sealing systems through masonry wall or floor supporting construction as discussed in Section 4 of this report, are capable to maintain the fire resistance performance of up to 240 minutes integrity and various insulation performance with respect to BS 476: Part 20: 1987.

6 DECLARATION BY APPLICANT

We, Hilti (Hong Kong) Limited, confirm that the material, component or element of structure, which is the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:

Dr. SZE Lip-kit
Test Consultant
Research Engineering Development
Façade Consultants Limited

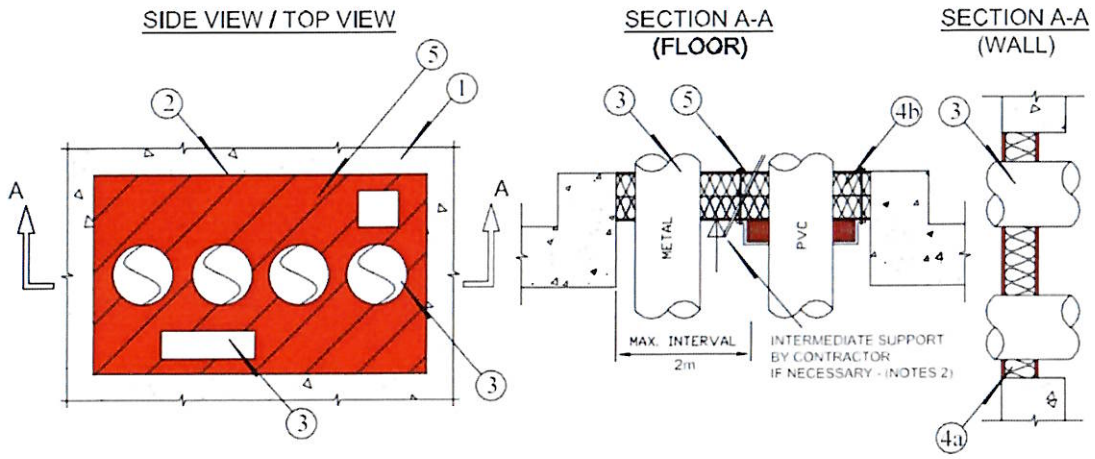
Reviewed by:

Ir Dr. YUEN Sai-wing, MHKIE (Fire)
Authorized Signature
Research Engineering Development
Façade Consultants Limited

APPENDIX – DRAWINGS PROVIDED BY THE CLIENT

MULTIPLE PENETRATION APPLICATION DETAIL

FIRE RESISTANCE RATING: UP TO -/240/-
PRODUCT USED: CP 670 FIRE SAFETY COATING
CP 606 FIRESTOP ACRYLIC SEALANT
CFS-F FX FIRESTOP FOAM
CP643 FIRESTOP COLLAR



1. CONCRETE FLOOR OR WALL ASSEMBLY
2. MARKING OUT OPENING ZONE. (SEE NOTES 1)
3. PENETRATING ITEM(S) TO BE ONE OR SEVERAL OF THE FOLLOWING:
   - COPPER PIPES, STEEL PIPES, STEEL TRUNKING, CABLE TRAYS & PVC-U PIPES
4. (a)DOUBLE LAYERED (50mm THICKNESS) MINERAL WOOL BOARD (MIN. 160kg/m^3 DENSITY)
   (b) DOUBLE LAYERED (50mm THICKNESS EACH) MINERAL WOOL BOARD (MIN. 160kg/m^3 DENSITY)
5. MINIMUM 0.7mm (DRY) THICKNESS **CP670 FIRE SAFETY COATING** APPLIED ON BOTH SIDES OF THE MINERAL WOOL BOARD.

NOTES :
1. MAXIMUM SIZE OF OPENING (WALL) = 3600mm x 2000mm . (OR EQUIVALENT AREA)
   (FLOOR) = 600mm x 600mm . (OR EQUIVALENT AREA)
2. FOR FLOOR APPLICATION OF SPAN OVER 2m, INTERMEDIATE SUPPORT(S) UNDER **CP670 FIRE SAFETY COATING** AT MAXIMUM INTERVAL OF 2m SHOULD BE PROVIDED BY CONTRACTOR.
3. GAPS BETWEEN MINERAL WOOL BOARD AND CONCRETE/METAL SLEEVES TO BE FULLY FILLED BY **CP 606 FIRESTOP ACRYLIC SEALANT.**
4. FIRESTOP JOINTS INSIDE THE METAL SLEEVES TO BE CONSIDERED SEPERATELY.

- End of Report -

ASSESSMENT REPORT

The Use of Hilti CP670 for E&M Services Penetration Sealing Systems

Report No.: R24B05-2A

Issue Date: 8 April, 2025

Date of Review: 7 April, 2028

Report Sponsor

Hilti (Hong Kong) Limited

701-704 & 708B, Tower A Manulife Finance Centre,

223 Wai Yip Street, Kwun Tong, Kowloon, HK

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REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
08/04/2025	0	Initial version

THE USE OF HILTI CP670 FOR E&M SERVICES PENETRATION SEALING SYSTEMS

1 INTRODUCTION

This assessment report presents an appraisal for the use of the Hilti CP670 for electrical and mechanical services penetration sealing systems through concrete, AAC or blockwork like masonry wall or floor supporting construction. This appraisal is based on the substantial test evidence as mentioned in Section 3. This report is prepared for Hilti (Hong Kong) Limited of 701-704 & 708B, Tower A, Manulife Finance Centre, 223 Wai Yip Street, Kwun Tong, Kowloon, HK.

The proposed gap sealing systems used for electrical services penetration are required to provide a fire resistance performance of up to 120 minutes integrity and various insulation performance, depends on the design, with respect to BS 476: Part 20: 1987.

2 ASSUMPTIONS

The proposed systems are assumed to be installed in a similar manner to that of the previously tested system by competent installers. It is assumed that the modified systems will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED. Further assumptions related to the specific modifications will be stated in the report.

It is also assumed that the supporting structures to which the perimeter of the systems will be fixed are capable of supporting the proposed structure effectively.

Assuming that the issue of the original test report is valid, the current testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of Supporting Test Evidence

Report no.	Sections	Description
Primary Test Evidence		
RED report no. R13C05	4.2	Supporting test evidence for the use of the Hilti "CP636 Firestop mortar and Hilti "CP670" fire safety coating with mineral wool system with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 124662	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
WARRES report no. 124663	4.3	Supporting test evidence for the use of Hilti "CP670" fire safety coating with mineral wool panel with electrical services penetration through wall. The test was conducted in accordance with BS476: Part 20: 1987.
PAVUS report no. Pr-03-02.086	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP673" fire safety coating for the penetration of cable tray. The test was conducted in accordance with BS EN 1363-1: 1999 and prEN 1366-3: 2003.
RED report no. R16L28-1B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2A	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.
RED report no. R16L28-2B	4.3	Supporting test evidence for the use of the mineral wool boards with Hilti "CP670" fire safety coating and the Hilti "CFS-F FX" for the penetration of cable tray through floor. The test was conducted in accordance with BS 476: Part 20: 1987.

3.2 Primary Test Evidences

3.2.1 RED Test Report No. R13C05#

A fire resistance test be in accordance with BS 476: Part 20: 1987 on seven different specimens of wall mounted penetration sealings was performance by the RED testing laboratory on 18th April, 2013. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder. Specimens 'A', 'B', 'D' and 'G' were asymmetrical and the fire side of specimens were determined by the test sponsor. Specimens 'C', 'E' and 'F' were symmetrical and only one side of the specimens were tested as per test sponsor's request.

Specimen 'A' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 110 mm diameter by 3.5 mm thick by 1,800 mm long PVC pipes, namely specimens 'A1' and 'A2', incorporated with 'Hilti 643N/ CP 644' firestop collars at both of the exposed and unexposed sides. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. Each pipe was supported by a pipe ring at unexposed side, which was fixed to a M12 steel rod located at 460 mm and 480 mm from the fire barrier for specimens 'A1' and 'A2' respectively. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'B' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 150 mm diameter by 4.5 mm thick by 1,770 mm long G.M.S. pipes, namely specimens 'B1' and 'B2'. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The pipes were supported by pipe rings at both sides, which were fixed to M12 steel. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'C' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'D' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'D1' and 'D2'. Specimen 'D1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of nominal 7 mm diameter electrical cables while specimen 'D2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of nominal 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire

barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts. Nominal 250 mm coat back of 'Hilti CP 670' fire safety coating was applied on both of the exposed and unexposed sides of the steel cable trays with electrical cables. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'E' had overall dimensions of 1,200 mm wide by 600 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'F' had overall dimensions of 525 mm wide by 295 mm high. It was comprised of 'Hilti FS657/ CP657' intumescent firestop bricks and each brick was with sizes of 130 mm by 50 mm by 200 mm.

Specimen 'G' had overall dimensions of 1,200 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'G1' and 'G2' . Specimen 'G1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of 7 mm diameter electrical cables while specimen 'G2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick mineral wool board with density of 160 kg/m3 with nominal 35 mm thick 'Hilti CP 636' firestop mortar applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987, for the following periods:

Specimens	Penetration services	Integrity	Insulation	**Integrity**	**Insulation**
Specimen 'A'	A1	264 Minutes	162 Minutes	**264 Minutes**	**162 Minutes**
	A2	264 Minutes	162 Minutes		
Specimen 'B'	B1	264 Minutes	18 Minutes	**264 Minutes**	**18 Minutes**
	B2	264 Minutes	19 Minutes		
Specimen 'C'	--	264 Minutes	151 Minutes	**264 Minutes**	**151 Minutes**
Specimen 'D'	D1	264 Minutes	198 Minutes	**264 Minutes**	**60 Minutes**
	D2	264 Minutes	60 Minutes		
Specimen 'E'	--	264 Minutes	155 Minutes	**264 Minutes**	**155 Minutes**

Specimen 'F'	--	229 Minutes	209 Minutes	**229 Minutes**	**209 Minutes**
Specimen 'G'	G1	264 Minutes	100 Minutes	**264 Minutes**	**100 Minutes**
	G2	264 Minutes	104 Minutes		

The test was discontinued after a period of 264 minutes (See RED report no. R13C05 for full details)

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.2 WARRES Test Report No. 124662#

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 20th June, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the section of wall contained a 1,200 mm high by 1,800 mm wide aperture which was penetrating through various services. The aperture was sealed with two mineral wool panels with sizes of 600 mm wide by 1,200 mm high and 1,200 mm wide x 1,200 mm high, respectively. A vertical butt joint was incorporated. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Integrity: **125** Minutes (for cable trays position only)

Insulation: **60** Minutes (for cable trays position only)

The test was discontinued after a heating period of 125 minutes (See WARRES report no. 124662 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.3 *WARRES Test Report No. 124663#*

A fire resistance test stated to be utilising the general principles of BS 476: Part 20: 1987 in conjunction with additional guidelines from prEN 1366-3: 1993 to evaluate the fire resistance performance of Hilti CP670 coating on both sides of mineral wool panel with cable trays penetrating through under a wall mount situation was performance by the Warringtonfire testing laboratory on 4th July, 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In the test, the wall assembly was formed by the internal steel channel section framework (30 mm thick) clad on both sides with 50 mm thick mineral wool panels coated with Hilti CP670 fire safety coating. The mineral wool panel was 50 mm thick by 160 kg/m^3 coated with nominal 1 mm thick Hitli "CP670" fire safety coating on both sides. In the test, various services were penetrating through it, whilst only the results for the cable trays (Specimens F, G, H, I, J, K and L) were concerned.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

Specimen	Integrity	Insulation
F, G	211	136
H	213	146
I	213	108
J	213	105
K	213	123
L	213	101

The test was discontinued after a heating period of 240 minutes (See WARRES report no. 124663 for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.4 *PAVUS Test Report No. Pr-03-02.086**

Two fire resistance tests stated to be in accordance with BS EN 1363-1: 1999 and BS EN 1366-3: 2003 on a number of penetration services through the overall 100 mm thick mineral wool boards coated with dry thickness of 1 mm minimum Hilti CP 673 were performance by the Pavus testing laboratory on 21st and 22nd October, 2003. The report was prepared for Hilti AG, the Hilti Entwicklungsgesellschaft mbH had given permission to use this data.

In the test both the wall and floor supporting construction are identical. They are composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool boards coated with dry thick 1mm of Hitli CP 673, it is as declared by the applicant, the Hilti CP 673 and CP 670 are the same product but with different brand name in different market. For the CP 673 with the mineral wool boards system, a total of 15 nos. of services were penetrating through it. This includes 5 cable trays and a number of individual cables.

The specimen satisfied the performance requirements specified in BS EN 1363-1: 1999 for the following periods:

Integrity:	**Cotton pad**	**125** Minutes
	Gap gauge	**125** Minutes
	Sustained flaming	**125** Minutes
Insulation:		**122** Minutes

The test was discontinued after a heating period of 125 minutes (See Pavus test report no. Pr-03-02.086 for full details).

*Note: The test data is more than five years old; we have reviewed this data against the current test procedures as per BS EN 1366-3: 2003 and BS EN 1363-1: 1999 and found it suitable for this assessment.

3.2.5 *RED Test Report No. R16L28-1B#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 7 nos, of penetration systems was performance by the RED testing laboratory on 20th January, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunkings, speed sleeve and cable trays, namely specimens '2a', '2b', '3', '6', '8', '9' and '10', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimen was tested as per test sponsor's request.

Specimen '2a' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

Specimen '2b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks.

Specimen '3' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,400 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-F FX' firestop foam.

Specimen '6' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimens '8', '9' and '10' were comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, upper and lower cable trays with electrical cables. The upper and lower cable trays were with a separation of 250 mm. The upper and lower cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 30 mm diameter 'Armoured Cable 35' and 3 nos. of 40 mm diameter 'Armoured Cable 70' electrical cables were incorporated into the upper and lower 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides.

For specimen '8', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. For specimen '9', the cable trays with electrical cables were penetrated through a fire barrier which constructed by nominal 100 mm thick 'CFS-F FX' firestop foam. While for specimen '10', the cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied on both sides.

The trunkings of specimens '2a', '2b' and '3', AV cables of specimen '6' and cable trays of specimen '8', '9' and '10' were fixed to 42 mm by 20 mm by 3 mm thick steel channels, located at 500 mm from the concrete wall, by M5 bolts and nuts on both sides. The steel channels were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel L-angles which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '2a'	**121** Minutes (No failure)	N/A
Specimen '2b'	**121** Minutes (No failure)	N/A
Specimen '3'	**121** Minutes (No failure)	N/A
Specimen '6'	**121** Minutes (No failure)	N/A
Specimen '8'	**121** Minutes (No failure)	**38** Minutes
Specimen '9'	**121** Minutes (No failure)	**61** Minutes
Specimen '10'	**121** Minutes (No failure)	**42** Minutes

The test was discontinued after a heating period of 121 minutes (See RED report no. R16L28-1B for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.6 *RED Test Report No. R16L28-2A#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 6 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking, speed sleeve and cable tray, namely specimens '2', '4a', '4b', '5b', '7' and '8', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '2' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '4a' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 200 mm thick 'CFS-F FX' firestop foam.

Specimen '4b' was comprised of a 200 mm by 200 mm by nominal 1.2 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '5b' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by nominal 150 mm thick 'CFS-F FX' firestop foam.

Specimen '7' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve filled with 60% of 3 mm diameter AV cables.

Specimen '8' was comprised of a nominal 110 mm diameter 'CFS-SL' speed sleeve and 25 mm wide 'CP648-E' fire wrap, filled with 60% of 3 mm diameter AV cables.

The trunkings of specimens '4a', '4b' and '5b', AV cables of specimens '7 and '8' and cable trays of specimen '2' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	Insulation
Specimen '2'	**241** Minutes (No failure)	**85** Minutes
Specimen '4a'	**241** Minutes (No failure)	N/A
Specimen '4b'	**241** Minutes (No failure)	N/A
Specimen '5b'	**241** Minutes (No failure)	N/A
Specimen '7'	**241** Minutes (No failure)	N/A
Specimen '8'	**241** Minutes (No failure)	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.7 *RED Test Report No. R16L28-2B#*

A fire resistance test in accordance with BS 476: Part 20: 1987 on 4 nos, of penetration systems was performance by the RED testing laboratory on 10th May, 2017. The report was prepared for Hilti (Hong Kong) Limited. In this test report, only trunking and cable tray, namely specimens '1', '3a', '3b' and '6', were considered. As requested by the test sponsor, the specimens were mounted within concrete line specimen holder. The specimens were symmetrical and only one side of specimens was tested as per test sponsor's request.

Specimen '1' was comprised of a fire barrier with sizes of 1,000 mm wide by 1.000 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 400 mm and had 2 nos. of 250 mm wide by 1.2 mm thick cable trays. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into one of the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides.

Specimen '3a' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'CFS-F FX' firestop foam at the unexposed side and a layer of nominal 50 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 at the exposed side.

Specimen '3b' was comprised of a fire barrier with sizes of 600 mm wide by 600 mm high, left and right cable trays with electrical cables. The left and right cable trays were with a separation of 200 mm. The left and right cable tray had a 250 mm wide by 1.2 mm thick and a 150 mm wide by 1.2 mm thick cable trays respectively. 3 nos. of 40 mm diameter 'Armoured Cable 70' and 3 nos. of 30 mm diameter 'Armoured Cable 35' electrical cables were incorporated into the left and right 250 mm wide by 1.2 mm thick cable tray respectively. The electrical cables were fixed to the cable tray by nominal 3 mm thick rings with 2 nos. of M5 bolts and nuts on both sides. The cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of nominal 150 mm thick 'ROCKWOOL' mineral wool boards with density of 100 kg/m^3 with nominal 15 mm thick 'FS-ONE MAX' intumescent firestop sealant applied at the

unexposed side.

Specimen '6' was comprised of a 100 mm by 100 mm by nominal 1 mm thick by 1,000 mm long trunking filled with 60% of 5 mm diameter 'CAT 6' cables. The cables were protected by 'CFS-BL' firestop blocks and 'CFS-F FX' firestop foam.

The trunkings of specimen '6' and cable trays of specimens '1', '3a' and '3b' were fixed to 50 mm by 50 mm by 3 mm thick steel brackets, located at 300 mm from the concrete floor, by M5 bolts and nuts on both sides. The steel brackets were supported by an external steel framework constructed by 50 mm by 50 mm by 3 mm steel brackets which in turn fixed to the concrete lining of test rig by 2 nos. of M10 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987 for the following periods:

	Integrity	**Insulation**
Specimen '1'	**174** Minutes	**82** Minutes
Specimen '3a'	**177** Minutes	**101** Minutes
Specimen '3b'	**173** Minutes	**96** Minutes
Specimen '6'	**130** Minutes	N/A

The test was discontinued after a heating period of 241 minutes (See RED report no. R16L28-2A for full details).

#Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

4 PROPOSAL & DISCUSSION

4.1 The use of test evidence, which was tested in accordance with BS EN 1363-1: 1999, for the assessment of linear joint sealing system to BS 476: Part 20: 1987

Proposal

It is proposed that the test evidence of PAVUS test report no. Pr-03-02.086 for the penetration seal systems, which were tested in accordance with BS EN 1363-1: 1999, is suitable for use in the assessment against BS 476: Part 20: 1987.

Discussion

The fire test on the penetration seal systems as tested and described in the above test evidence was carried out in accordance with BS EN 1363-1: 1999. In reviewing the test, we have considered the design and installation of the specimens, the surrounding construction, the initial furnace temperature, the pressure in the furnace, the changes in the integrity criteria and the behaviour of the fire test, it is expected that if this fire test had been conducted in accordance with BS 476: Part 20: 1987 very similar results would have been achieved.

Fire tests to BS EN 1363-1: 1999 and BS 476: Part 20: 1987 have the same furnace temperature-time curve, i.e., the standard ISO temperature time curve represented by $T = 345 \log_{10}(8t + 1) + 20$, where T is the furnace temperature rise and t is the time of heating conditions. However, a more severe overpressure requirement of 5 Pa required by BS EN 1363-1: 1999 was used, which was normally deemed to be more onerous. The passing criteria for the standards of BS EN 1363-1: 1999 and BS 476: Part 20: 1987 are summarized as follows:

Integrity. Monitor the unexposed face of the specimen for evaluation of integrity. A failure of the test construction to maintain integrity occurs when collapse or sustained flaming on the unexposed face occurs or impermeability is exceeded.

Insulation. Failure occurs when (a) the mean unexposed face temperature increases by more than 140 °C above its initial value; or (b) the temperature recorded at any position on the unexposed face is in excess of 180 °C above its initial value; or (c) when integrity failure occurs.

Having stated these criteria, there is no significant difference between the tests to BS EN and British standards. Since the integrity and insulation criteria of BS EN 1363-1: 1999 are basically the same, we can conservatively conclude that the linear joint sealing system as tested and described in PAVUS report no. Pr-03-02.086 will achieve fire resistance performance not worse than tested if test to BS 476: Part 20: 1987.

4.2 The fire resistance performance of E&M services penetration sealing system through the mineral wool panel coated with Hilti CP670 fire safety coating with respect to BS 476: Part 20: 1987.

Proposal

It is proposed that mineral wool panel coated with Hilti CP670 fire safety coating may be used for the purpose of blank sealing with/without various E&M services penetration under either the wall mounted or floor mounted situation. The wall or floor construction may be AAC or other masonry construction.

For the application of wall penetration, system required 120 minutes integrity performance, the required condition of the use of Hilti CP670 fire safety coating and the mineral wool panels to penetration sealing are as stated as below:

For wall mount situation:

1) Wall System A: minimum one (1) layer of 50 mm thick by 160 kg/m^3 density mineral wool panels coated with nominal 0.7 mm thick Hilti 'CP670' fire safety coating (Refer to Table 1).
2) Wall System B: minimum two (2) layers of 50 mm thick by 160 kg/m^3 density mineral wool panels coated with nominal 0.7 mm thick Hilti 'CP670' fire safety coating (Refer to Table 2).

For floor mount situation:

3) Floor System: minimum two (2) layers of 50 mm thick by 160 kg/m^3 density mineral wool panels coated with nominal 0.7 mm thick Hilti 'CP670' fire safety coating (refer to Table 3).

The Hilti 'CP670' coated with mineral wool panels allows various E&M services penetration through with the remarks of conditions for each service are as stated in Table1. It is assumed that penetration services shall have their own supporting frame to bear their self-weight. The weight of the penetration shall not be added up to the mineral wool panels.

The application of various systems are as shown in the tables below:

Table 1: Summary of the required condition for the services penetrating the Hilti CP670 coated mineral wool panels based on Wall System A

Wall	Wall System A: One layer of 50 mm thick by 150 kg/m^3 mineral wool. The size of aperture sealed up with Hilt CP670 with mineral wool panels may be up to 3,600 mm wide by 1,200 mm high			
	Application	***Remark***	***Integrity***	***Insulation***
	Blank seal	Nil	120	60
	Metal pipe (steel / copper) Pipe diameter up to 250 mm and the pipe wall thickness at least 2 mm	The clearance between pipe and the Hilti 'CP670' with mineral wool panels shall be just fit and sealed up with Hilti 'CP606' firestop sealant	120	N.A.
	PVC pipe Pipe diameter up to 110 mm with wall thickness up to 5.6 mm	The PVC pipe sealed up with one no. of Hilti 'CP643^' pipe collar at the mid depth of the wall within the aperture and the gap clearance by 'CP606' firestop sealant	120	30
		The PVC pipe sealed up with one no. of Hilti 'CP643^' pipe collar at each end of the wall and the gap clearance by Hilti 'CP606' firestop sealant	120	60
	Cable tray	The cables on the cable tray sealed with CP 606 without back-coated of CP 670	120	30
	Cable tray	The cables on the cable tray back-coated with the same nominal 0.7 mm thick Hilti 'CP670' fire safety coating, 150 mm long extend from the wall on both sides	120	60
	Cable Trunking with maximum 230 mm x 230 mm	Cable trunking may be filled with cables occupies up to 60% of the volume and the rest 40% filled with Hilti 'CFS-F FX' firestop foam. The trunking shall be just fit within the mineral wool panel and the clearance sealed with Hilti 'CP606' firestop sealant	120	N.A.
	Steel duct / damper up to 250 mm x 250 mm or 250 mm diameter	The clearance gap shall be within 10 mm and sealed with Hilti CP 606 acrylic sealant. Back-coated with 0.7 mm thick Hilti CP670, 110 mm long extend from the wall on both sides.	120	Depends on the design of duct

Table 2: Summary of the required condition for the services penetrating the Hilti CP670 coated mineral wool panels based on Wall System B

Wall	Wall System B: Two layers of 50 mm thick by 150 kg/m^3 mineral wool. The size of aperture sealed up with Hilt CP670 with mineral wool panels may be up to 5,000 mm wide@ by 2,000 mm high			
	Application	***Remark***	***Integrity***	***Insulation***
	Blank seal	Nil	120	120
	Metal pipe (steel / copper). pipe diameter up to 250 mm and the pipe wall thickness at least 2 mm	The clearance between pipe and the Hilti 'CP670' with mineral wool panels shall be just fit and sealed up with Hilti 'CP606' firestop sealant	120	N.A.
	Insulated metal pipe (steel / copper) with minimum 30 mm thick mineral wool insulation jacket. Pipe diameter up to 168.3 mm.	The clearance between the pipe and the wool panels shall be just fit, the mineral wool jacket are discounted at the penetration.	120	120
	PVC pipe Pipe diameter up to 160 mm with wall thickness up to 5.6 mm	The PVC pipe sealed up with one no. of Hilti 'CP643^' pipe collar at each end of the wall and the gap clearance by Hilti 'CP606' firestop sealant	120	120
	Cable tray	The cables on the cable tray back-coated with the same nominal 0.7 mm thick Hilti 'CP670' fire safety coating, 150 mm long extend from the wall on both sides	120	120
	Cable Trunking with maximum 230 mm x 230 mm	Cable trunking may be filled with cables occupies up to 60% of the volume and the rest 40% filled with Hilti 'CFS-F FX' firestop foam. The trunking shall be just fit within the mineral wool panel and the clearance sealed with Hilti 'CP606' firestop sealant	120	N.A.
	Steel duct / damper up to 250 mm x 250 mm or 250 mm diameter	The clearance gap shall be within 10 mm and sealed with Hilti CP 606 acrylic sealant. Back-coated with 0.7 mm thick Hilti CP670, 110 mm long extend from the wall on both sides.	120	Depends on the design of duct

@Note: the use of intermediate support at 2000 mm span is needed.

Table 3: Summary of the required condition for the services penetrating the Hilti CP670 coated mineral wool panels based on Floor System

Floor	The size of aperture sealed up with Hilt 'CP670' with mineral wool panels may be up to 1,200 mm wide by 5,000 mm long@			
	Blank seal		120	120
	Metal pipe	The clearance between pipe and the Hilti 'CP670' with mineral wool panels shall be just fit and sealed up with Hilti 'CP606' firestop sealant	120	N.A.
	Insulated metal pipe (steel / copper) with minimum 30 mm thick mineral wool insulation jacket. Pipe diameter up to 168.3 mm.	The clearance between the pipe and the wool panels shall be just fit, the mineral wool jacket are discounted at the penetration.	120	120
	PVC pipe Pipe diameter up to 160 mm with wall thickness up to 5.6 mm	The PVC pipe sealed up with one no. of Hilti 'CP643^' pipe collar at each end of the wall and the gap clearance by Hilti 'CP606' firestop sealant	120	120
	Cable tray	The cables on the cable tray back-coated with the same nominal 0.7 mm thick Hilti 'CP670' fire safety coating, 150 mm long extend from the wall on both sides	120	120
	Cable trunking with maximum 200 mm x 200 mm	Cable trunking may be filled with cables occupies up to 60% of the volume and the rest 40% filled with Hilti 'CFS-F FX' firestop foam. The trunking shall be just fit within the mineral wool panel and the clearance sealed with Hilti 'CP606' firestop sealant	120	N.A.

^Note: It is as declared by the client that the Hilti CP642 was an old product which had been phased out, the Hilti CP643 is a new product that replaced Hilti CP642 with similar composition. The Hilti CP643 had been tested under the reference R13C05.

@Note: the use of intermediate support at 2000 mm span is needed.

The clear distance between the top and bottom of the services within one aperture shall be at least 100 mm apart from each other. In all cases, the services shall be adequately supported same as that tested, such that the weight of the services will not be added to the penetration sealing.

The assessment is conducted against the integrity and insulation criteria with respect to BS 476: Part 20: 1987.

Discussion

The test evidence WARRES 124663, the 30 mm thick steel frame clad with 50 mm thick by 160 kg/m^3 mineral wool on each side of the steel frame the exposed face of the panel was coated with nominal 1 mm thick Hilti CP670 fire safety coating. For the cable tray penetration, the specimen generally achieved the fire resistance of not less than 180 minutes integrity and 60 minutes insulation.

Test evidence PAVUS report no. Pr-03-02.086 described the test of the penetrating sealing system with aperture sizes of 1,000 mm x 2,000 mm for both the wall mounted and floor mounted situation. The system composed of two layers of 50 mm thick by 150 kg/m^3 mineral wool panels coated with 0.7 mm thick Hilti CP670 fire safety coating. The system had achieved an overall 125 minutes integrity and 122 minutes insulation performance. For the layout of the system using two layers of 50 mm thick by 150 kg/m^3 with the two layers staggered with each other by at least 300 mm, the width of the sealing aperture may be extended to maximum 5,000 mm wide provided that intermediate support is provided at each maximum 2,000 mm span.

In the test evidence of R16L28-1B, specimen 8 was the cable trays penetrating through a 600 mm by 600 mm system composed of 50 mm thick by 160 kg/m^3 mineral panel coated with nominal 0.7 mm thick Hilti CP670 on both sides. The system had achieved 121 minutes integrity and 38 minutes insulation.

The evidence R16L28-2A described the test of a specimen (referenced '2'), which was the cable tray penetrated through a 600 mm x 600 mm floor mounted Hilti CP670 system. The system composed of two layers of 50 mm thick by 160 kg/m^3 mineral wool panel coated with nominal 0.7 mm thick Hilti CP670 fire safety coating had achieved the fire resistance performance of 240 minutes integrity and 60 minutes insulation performance. While the test evidence R16L28-2B described the test on the specimen (referenced '1'), which was the cable tray penetrated through a 1,000 mm x 1,000 mm floor mounted Hilti CP 670 system, which was the same as the one that in R16L28-2A. The system had achieved the fire resistance performance of 174 minutes integrity and 82 minutes insulation.

In the proposed design of the CP670 systems, for the wall application, the sizes of the system is assessed to become 3,600 mm wide by 2,000 mm high. From the test evidence of wall application, the system with various configuration had been tested. The 1,000 mm wide by 2,000 mm high floor and wall systems were tested in the PAVUS report no. Pr-03-02.086. While the regarding the width of the system, the test evidence WARRES 124662, had been tested with the single layer mineral wool panels incorporation of the vertical butt joints. The test evidence proved the present of the butt joint shall not deteriorate the tested fire resistance performance. The proposal to increase the width to 3,600 mm which

involves three mineral panels of 1,200 mm wide incorporated with two vertical butt joints are still considered as the reasonable proven in the test evidence. The height of 2,000 mm are the tested maximum height and since the height would be a more critical dimension in terms of this type of sealing, therefore the proposed height shall remain the same as that tested. While regarding the insulation performance, the overall thickness of the mineral wool panels, and the application of extended coating on the cables are considered as improvement of the insulation performance as reflected in the test results. For the floor system, minimum two layers of the 50 mm thick x 160 kg/m^3 mineral wool panels is suggested as referenced to the flooring situation in test evidence R16L28-2A.

For the system in floor mounted situation, the test evidence R16L28-2A provide the only test evidence with the use of two layers of 50 mm thick by 160 kg/m^3 mineral wool coated with Hilti 'CP670' While in the floor situation, the aperture sizes of 600 mm x 600 mm sealed with two layers of 50 mm thick x 160 kg/m^3 mineral wool panels and coated with Hilti 'CP670' on both sides to achieve 240 minutes integrity and 60 minutes insulation, and in this case the sealing was incorporated with penetration of two cable trays. Therefore, for the blank seal situation, i.e. without the services penetration, the situation is considered as less onerous and is acceptable.

In the proposal, the required conditions for various services penetration are basically adopted the tested condition directly. For the situation with metal pipe penetration, the situation was demonstrated in the test evidence WARRES report no. 124663, in which the wall mounted steel pipe, referenced item 'A' of 250 mm diameter by 6.3 mm wall thickness was passing through with the junction between the aperture and the pipe was sealed with Hilti "CP606" firestop sealant. In the same evidence, item 'D' was a 108 mm diameter by 2 mm wall thickness copper pipe penetrating through and sealed up with the same 'Hilti 'CP606' firestop sealant. Since both pipes are metal in nature and the melting point of both steel and copper are higher than the furnace temperature. In case if consider only the integrity performance, the same fire-rated protection that applied to either steel or copper shall behave the same. Therefore, the maximum diameter and wall thickness applies to both types of metal pipe. And since for the floor mounted situation, the similar condition of the penetration by cable tray had been demonstrated an had achieved also 240 minutes integrity. The penetration of metal pipe generally regards as a less onerous situation in comparison. Therefore, the penetration of metal pipe is also considered as acceptable, however in this case, only the integrity performance of the system is considered.

The penetration of the PVC pipe had been demonstrated in the test evidence WARRES report no. 124633 as well, and the Hilti 'CP643' firestop collar shall be used on top to ensure the sealing of the PVC pipe after it melts. The proposal again is adopting the direct tested condition, and the application confine to the wall situation only.

The penetration of the cable tray had been demonstrated in both the wall mounted and floor mounted condition, and under both conditions, the penetration shall be just fit and a back-coat of minimum 100 mm from the wall on the cables and cable tray is necessary.

The test evidence PVAS report no. Pr-03-02.086 described the test of the system using two layers of 50 mm thick by 150 kg/m^3 mineral wool and coated with Hilti CP670 firestop coating on each side and with

various services penetration included insulated metal pipe, cable tray, plastic pipe, etc. The test had proven that for each type of penetration, with the proper additional penetration sealing materials, the penetration is capable to provide 120 minutes integrity and insulation performance as show n in Table 2 and Table. The proposed application in the tables are basically adopted the same situation as that tested. The penetration of the cable trunking had been demonstrated under the floor mounted situation within a concrete floor aperture. However the interface between the cable trunking and the CP670 coated mineral wool is similar to that with the metal pipe situation, it is therefore considered that with the fire-rated protection application, the achieved fire rated performance shall be the similar. Also the volume within the cable trunking shall be filled with cables up to 60% of the volume only, the rest 40% shall be filled with Hilti "CFS F-FX' firestop foam same as that tested.

The proposed application of the air duct / damper penetration sealing system for wall penetration application only as shown in Table 1 is basically adopted the tested situation with minor modification to broaden the range of application to make it more practical. In the test, the air duct is 250 mm diameter, therefore, the allow application of the maximum 250 mm diameter service penetration is directly adopting the tested situation. While the smaller sizes of duct suppose to be a less onerous situation, the reduced duct sizes are considered as acceptable as well. But the hole on the mineral wool panel to allow the penetration of the air duct shall be tight fit with the clearance gap shall be within 10 mm and shall be sealed up with the Hilti 'CP606'. The duct in rectangular cross-section profile shall behave similarly with the circular duct, since the hole on the mineral wool can be cut in various profile to cope with the duct profile, provided that the clearance shall be within 10 mm as stated above. Also, in the application, the proposed thickness of the "CP 670" fire safety coating was suggested to be minimum 0.7 mm thick (dry film thickness), which is supported by the test evidence R13C05. In this test evidence, although the mineral wool was 100 mm thick, which is thicker compares to the current situation in this assessment, but since the 0.7 mm thick coating was not the main component to perform the integrity performance and with just minor function to the insulation. Therefore, the slight change of the coating from 1 mm thick to minimum 0.7 mm thick is considered as reasonably supported by direct test evidence.

The air duct that penetrating the wall shall carry the fire resistance performance at least to the integrity performance to ensure it will not deteriorate the sealing system. The fixing of the duct via the hanger away from the wall shall follow the tested situation since the fixing adequacy ensure the duct remain in position under the fire exposure situation. In case if the air duct/ damper satisfy both the integrity and insulation performance, then the sealing system shall be likely to maintain the full integrity and insulation performance. The damper that considered in this assessment would be the barrier that fit within the wall aperture connecting the air duct from different compartments.

In summary, the proposed application of service penetration through the Hilti 'CP670' coated mineral wool panels is basically adopted the direct tested situation, and with the reasonable justification.

5 CONCLUSION

The proposed use of Hilti 'CP670' coated mineral wool panels for electrical and mechanical services penetration sealing systems through masonry wall or floor supporting construction as discussed in Section 4 of this report, are capable to maintain the fire resistance performance of up to 120 minutes integrity and various insulation performance with respect to BS 476: Part 20: 1987.

6 DECLARATION BY APPLICANT

We, Hilti (Hong Kong) Limited, confirm that the material, component or element of structure, which is the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:

Dr. SZE Lip-kit
Test Consultant
Research Engineering Development
Façade Consultants Limited

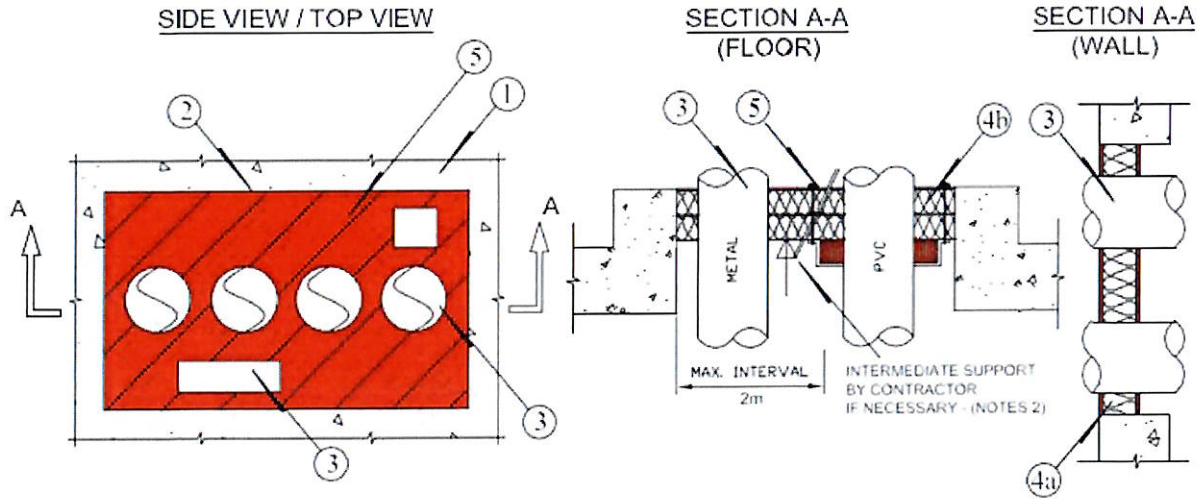
Reviewed by:

Ir Dr. YUEN Sai-wing, MHKIE (Fire)
Authorized Signature
Research Engineering Development
Façade Consultants Limited

APPENDIX – DRAWINGS PROVIDED BY THE CLIENT

MULTIPLE PENETRATION APPLICATION DETAIL

FIRE RESISTANCE RATING: UP TO -/120/120



1. CONCRETE FLOOR OR WALL ASSEMBLY
   A. CONCRETE WALL OR FIRE-RATED BLOCKWALL (MIN. 100mm THICKNESS).
   B. CONCRETE FLOOR (MIN. 150mm THICKNESS).
2. MARKING OUT OPENING ZONE. (SEE NOTES 1)
3. PENETRATING ITEM(S) TO BE ONE OR SEVERAL OF THE FOLLOWING:
   - COPPER PIPES, STEEL PIPES, STEEL TRUNKING, CABLE TRAYS & PVC-U PIPES
4. (a) SINGLE LAYERED (50mm THICKNESS) MINERAL WOOL BOARD (MIN. 160kg/m^3 DENSITY)
   (b) DOUBLE LAYERED (50mm THICKNESS EACH) MINERAL WOOL BOARD (MIN. 160kg/m^3 DENSITY)
5. MINIMUM 0.7mm (DRY) THICKNESS **CP670 FIRE SAFETY COATING** APPLIED ON BOTH SIDES OF THE MINERAL WOOL BOARD.

NOTES :
1. MAXIMUM SIZE OF OPENING OF WALL WITH SINGLE LAYERED MINERAL WOOL BOARD
   (WALL) = 3600mm x 1200mm . (OR EQUIVALENT AREA)
   MAXIMUM SIZE OF OPENING OF WALL WITH DOUBLED LAYERED MINERAL WOOL BOARD
   (WALL) = 2000mm x 5000mm . (OR EQUIVALENT AREA)
   MAXIMUM SIZE OF OPENING OF FLOOR WITH DOUBLED LAYERED MINERAL WOOL BOARD
   (FLOOR) = 1200mm x 5000mm. (OR EQUIVALENT AREA)
2. FOR FLOOR APPLICATION OF SPAN OVER 2m, INTERMEDIATE SUPPORT(S) UNDER **CP670 FIRE SAFETY COATING** AT MAXIMUM INTERVAL OF 2m SHOULD BE PROVIDED BY CONTRACTOR.
3. GAPS BETWEEN MINERAL WOOL BOARD AND CONCRETE/METAL SLEEVES TO BE FULLY FILLED BY **CP 606 FIRESTOP ACRYLIC SEALANT.**
4. FIRESTOP JOINTS INSIDE THE METAL SLEEVES TO BE CONSIDERED SEPERATELY.

- End of Report -

ASSESSMENT REPORT

The Fire Resistance Performance of Air Duct / Damper Penetration Sealing Systems

Report No.: R24C41-1A

Issue Date: 17 January, 2025

Date of Review: 16 January, 2028

Report Sponsor

Hilti (Hong Kong) Limited

701-704 & 708B, Tower A Manulife Finance Centre,

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REVISION HISTORY

Issue date (DD/MM/YYYY)	Issue number	Remark
17/01/2025	0	Initial version

THE FIRE RESISTANCE PERFORMANCE OF AIR DUCT / DAMPER PENETRATION SEALING SYSTEMS

1 INTRODUCTION

This assessment report presents an appraisal for the use of the Hilti "CP670" and "CP636" for air duct / damper penetration sealing purpose under the wall mounted situation. The appraisal will be based on the test evidence as shown in section 3 of this report. This report is prepared for Hilti (Hong Kong) Limited of 701-704 & 708B, Tower A, Manulife Finance Centre, 223 Wai Yip Street, Kwun Tong, Kowloon, HK.

The proposed sealing for the damper penetration system are required to provide a fire resistance performance of up to 120 minutes integrity with or without insulation performance, depends on the design of the air duct / damper, and up to 240 minutes integrity only with respect to BS 476: Part 20: 1987.

2 ASSUMPTIONS

The proposed systems are assumed to be installed in a similar manner to that of the previously tested system by competent installers. It is assumed that the modified systems will be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested with supporting test evidence or otherwise appraised by RED. Further assumptions related to the specific modifications will be stated in the report.

It is also assumed that the supporting structures to which the perimeter of the systems will be fixed are capable of supporting the proposed structure effectively.

Assuming that the issue of the original test report is valid, the current testing standard or testing experience has not been changed and the procedures adopted for the original report have been re-examined and reviewed that there have been no changes to the specification of the construction considered in the original report. If contradictory data or any related evidence becomes available to RED, the assessment will be unconditionally withdrawn and the sponsor will be notified. This report is based on the given information, in which is declared by report sponsor that no contradictory data has become available.

3 SUPPORTING DATA

3.1 Summary of Supporting Test Evidence

Report no.	Sections	Description
Primary Test Evidence		
Warringtonfire test report no. WARRES 124662	4.1	Supporting test evidence for the use of the Hilti 'CP670' for various type of penetration sealing system for 120 minutes integrity fire resistance performance with respect to BS 476: Part 20: 1987.
RED test report no. R13C05	4.1	Supporting test evidence for the use of the Hilti 'CP670' for various type of penetration sealing system for 120 minutes integrity fire resistance performance with respect to BS 476: Part 20: 1987.
LPC/BRE test report no. TE200637	4.1	Supporting test evidence for the use of the Hilti 'CP636' for sealing of damper penetration through wall aperture achieve 255 minutes integrity performance with respect to BS 476-20: 1987.
LPC/BRE test report no. TE200638	4.1	Supporting test evidence for the use of the Hilti 'CP636' for sealing of damper penetration through floor aperture achieve 245 minutes integrity performance with respect to BS 476-20: 1987.

3.2 Primary Test Evidence

3.2.1 Warringtonfire Test Report No. WARRES 124662*

A fire resistance test stated to be in accordance with BS 476: Part 20: 1987 and adopted the additional guidelines from prEN 1366-3 on a penetration sealing system mounted within a plasterboard partition was conducted at the Warringtonfire Laboratory on 20th June 2002. The report was prepared for Hilti Entwicklungsgesellschaft mbH, who had given permission to use this data.

In this report, only the item C was related to this assessment. The specimen item C was a 250 mm diameter by 6.3 mm wall thickness steel pipe passing through an aperture formed by 50 mm thick by 160 kg/m^3 mineral wool fiber with nominal 1.0 mm thick "CP670" fire safety coating on both sides. The gaps in between the steel pipe and the mineral wool were filled with liberal amounts of Hilti "CP606" acrylic mastic, intumescent joint filler. And then additionally coated for a distance of 110 mm from the fire barrier on both the exposed and unexposed faces with Hilti 'CP670' fire safety coating. The Steel pipe was supported via 'Hilti' support rings at 385 mm from the fire barrier on the exposed face and at 250 mm and 540 mm centres from the fire barrier.

From the test report, the overall specimen satisfied the performance requirements of 91 minutes integrity and 12 minutes insulation specified in BS 476: Part 20: 1987. Whilst the reported integrity and insulation failures were not contributed by the item C. Therefore, if only the item C specimen was considered, it shall satisfy the performance criteria for the following periods:

	Integrity	Insulation (max temp)
Specimen item C	**125** Minutes	<30 Minutes

The test was discontinued after a heating period of 125 minutes (See WARRES report no. 124662 for full details).

*Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.2 RED Test Report No. R13C05*

A fire resistance test in accordance with BS 476: Part 20: 1987 on seven nos. of penetration sealing systems and fire barriers was conducted at the RED testing Laboratory on 13th April, 2013. The report was prepared for Hilti (Hong Kong) Limited. Seven (7) numbers of specimens of penetration sealing systems and fire barriers, namely specimens 'A' to 'G', had been subjected to a test in order to determine their fire resistance performance. As requested by the test sponsor, the specimens were mounted within concrete lined specimen holder by the test sponsor. Specimens 'A', 'B', 'D' and 'G' were asymmetrical and the fire side of specimens were determined by the test sponsor. Specimens 'C', 'E' and 'F' were symmetrical and only one side of the specimens were tested as per test sponsor's request.

Specimen 'A' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 110 mm diameter by 3.5 mm thick by 1,800 mm long PVC pipes, namely specimens 'A1' and 'A2',

incorporated with 'Hilti 643N/ CP 644' firestop collars at both of the exposed and unexposed sides. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. Each pipe was supported by a pipe ring at unexposed side, which was fixed to a M12 steel rod located at 460 mm and 480 mm from the fire barrier for specimens 'A1' and 'A2' respectively. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'B' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of nominal 150 mm diameter by 4.5 mm thick by 1,770 mm long G.M.S. pipes, namely specimens 'B1' and 'B2'. The pipes were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The pipes were supported by pipe rings at both sides, which were fixed to M12 steel rods. The M12 steel rods were in turn fixed to an external steel framework by M12 bolts and nuts. The external steel framework was constructed by 40 mm by 40 mm by 2.5 mm thick steel channels and fixed to the concrete lining of test rig by M12 anchor bolts. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'C' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'D' had overall dimensions of 600 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'D1' and 'D2'. Specimen 'D1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of nominal 7 mm diameter electrical cables while specimen 'D2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of nominal 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m^3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts. Nominal 250 mm coat back of 'Hilti CP 670' fire safety coating was applied on both of the exposed and unexposed sides of the steel cable trays with electrical cables. 'Hilti CP 606' flexible firestop sealant was applied at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'E' had overall dimensions of 1,200 mm wide by 600 mm high. It was comprised of 2 layers of 50 mm thick mineral wool boards with density of 160 kg/m3 with nominal 0.7 mm thick (dry thickness) 'Hilti CP 670' fire safety coating applied on both sides. 'Hilti CP 606' flexible firestop sealant was applied

at the gaps between the fire barrier and concrete lining of test rig.

Specimen 'F' had overall dimensions of 525 mm wide by 295 mm high. It was comprised of 'Hilti FS657/ CP657' intumescent firestop bricks and each brick was with sizes of 130 mm by 50 mm by 200 mm thick. Specimen 'G' had overall dimensions of 1,200 mm wide by 1,200 mm high. It was comprised of 2 nos. of steel cable trays with electrical cables, namely specimens 'G1' and 'G2'. Specimen 'G1' was comprised of a 200 mm wide steel cable tray placed with 2 nos. of 7 mm diameter electrical cables while specimen 'G2' was comprised of a 300 mm wide steel cable tray placed with 4 nos. of 7 mm diameter electrical cables. The steel cable trays with electrical cables were penetrated through a fire barrier which constructed by a layer of 50 mm thick mineral wool board with density of 160 kg/m^3 with nominal 35 mm thick 'Hilti CP 636' firestop mortar applied on both sides. The steel cable trays with electrical cables were supported by an external steel framework which constructed by 25 mm by 25 mm by 1 mm thick steel angle bars located at 440 mm from the fire barrier. The external steel framework was fixed to the concrete lining of test rig by M12 anchor bolts.

The specimens satisfied the performance requirements specified in BS 476: Part 20: 1987, for the following periods:

Specimens	Penetration services	Integrity	Insulation	**Integrity**	**Insulation**
Specimen 'A'	A1	264 Minutes	162 Minutes	**264 Minutes**	**162 Minutes**
	A2	264 Minutes	162 Minutes		
Specimen 'B'	B1	264 Minutes	18 Minutes	**264 Minutes**	**18 Minutes**
	B2	264 Minutes	19 Minutes		
Specimen 'C'	--	264 Minutes	151 Minutes	**264 Minutes**	**151 Minutes**
Specimen 'D'	D1	264 Minutes	198 Minutes	**264 Minutes**	**60 Minutes**
	D2	264 Minutes	60 Minutes		
Specimen 'E'	--	264 Minutes	155 Minutes	**264 Minutes**	**155 Minutes**
Specimen 'F'	--	229 Minutes	209 Minutes	**229 Minutes**	**209 Minutes**
Specimen 'G'	G1	264 Minutes	100 Minutes	**264 Minutes**	**100 Minutes**
	G2	264 Minutes	104 Minutes		

The test was discontinued after a period of 264 minutes (see RED test report no. R13C05 for full details).

3.2.3 LPC/BRE Test Report No. 200637*

An ad-hoc fire resistance test stated to be employing the furnace heating conditions, appropriate procedures and criteria of BS 476: Part 20: 1987 on the 'Actionair' damper and HEVAC frame though a AAC blockwork wall aperture sealed with the use of Hilti 'CP636' firestop was performance by the LPC testing laboratory on 24th July, 2000. The report was prepared for Hilti (Gt Britain) Ltd., who had given permission to use this data.

The Hilti 'CP636' firestop mortar was used to seal an overall 580 mm wide x 600 mm high Actionair damper and HEVAC frame into an aperture, 700 mm x 700 mm, in a 150 mm thick aerated concrete block wall. The clearance that sealed up with the Hilti CP 636 were 65 mm wide on each vertical side an at the bottom of the damper, and 45 mm wide above the damper. The applied thickness of the Hilti 'CP636' fire stop mortar was 90 mm.

The specimens that as tested generally satisfied the performance requirements specified in BS 476: Part 20: 1987 for up to 255 minutes integrity. The test was discontinued after a heating period of 255 minutes (See BRE/LPC test report no. TE200637 for full details).

*Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

3.2.4 LPC/BRE Test Report No. 200638*

An ad-hoc fire resistance test stated to be employing the furnace heating conditions, appropriate procedures and criteria of BS 476: Part 20: 1987 on the 'Actionair' damper and HEVAC frame though a AAC blockwork wall aperture sealed with the use of Hilti 'CP636' firestop was performance by the LPC testing laboratory on 24th July, 2000. The report was prepared for Hilti (Gt Britain) Ltd., who had given permission to use this data.

The Hilti 'CP636' firestop mortar was used to seal an overall 680 mm wide x 700 mm high Actionair damper and HEVAC frame into an aperture, 800 mm x 800 mm, in a 150 mm thick aerated concrete block floor. The clearance that sealed up with the Hilti CP 636 and the damper were 65 mm wide on three sides and 45 mm wide on the forth side. The applied thickness of the Hilti 'CP636' fire stop mortar was 90 mm flushed with the bottom of the floor.

The specimens that as tested generally satisfied the performance requirements specified in BS 476: Part 20: 1987 for up to 255 minutes integrity. The test was discontinued after a heating period of 245 minutes (See BRE/LPC test report no. TE200638 for full details).

*Note: the test data is more than five years old; we have reviewed this data against the current test procedures as per BS 476: Part 20: 1987 and found it suitable for this assessment.

4 PROPOSAL & DISCUSSION

4.1 The fire resistance performance of air duct/damper penetration sealing system using Hilti 'CP670' fire safety coating backed with mineral wool panel

Proposal

It is proposed that Hilti "CP670" fire safety coating may be used to seal up the air duct/damper penetration systems through partition or masonry wall type provided that the wall shall be minimum 100 mm thick and shall be capable to provide at least 120 minutes fire resistance performance supported by separate test evidence. The air duct/damper and the boundary conditions for the penetration sealing shall be as follow:

Table 4.1: The proposed application of the penetration sealing system

Penetration services	Steel duct / damper up to 250 mm x 250 mm, or 250 mm diameter (with supporting evidence to provide adequate FRR)
Wall type	Masonry, concrete, gypsum, AAC, or drywall partition (with supporting evidence to provide adequate FRR)
Wall aperture sizes	Max. 1,200 mm x 1,200 mm
Application of sealing system	The use of minimum 50 mm thick by 160 kg/m^3 mineral wool coated with minimum 0.7 mm thick (dry film thickness) Hilti 'CP 670' fire safety coating on each side of the mineral wool to seal up the wall opening and within the mineral wool to cut the aperture to fit the air duct with maximum clearance of 10 mm. The 10 mm clearance shall be sealed with Hilti 'CP606' acrylic sealant. Hilti "CP 670" fire safety coating minimum 0.7 mm thick (dry film thickness) shall be additionally applied to cover the clearance and overlap the air duct with a distance of 110 mm long from the fire barrier on each side.

The proposed air duct / damper sealing system using the Hilti 'CP670' fire safety coating backed with mineral wool is required to provide the fire resistance performance of up to 120 minutes integrity with respect to BS 476: Part 20: 1987. In case if the air duct carries its own fire resistance performance in terms of both integrity and insulation performance, the sealing system is considered as capable of maintaining the insulation performance as well.

Discussion

The test evidence WARRES 124662 described the test of various penetration services through the drywall partition aperture. The aperture was sealed with 50 mm thick by 160 kg/m^3 mineral wool with nominal 1 mm thick Hilti 'CP670' fire safety coating on each side. The services were penetrated through the mineral wool. Among the specimens tested, item 1C was a steel duct with diameter up to 250 mm. The air duct penetrated a tight fit hole on the mineral wool panel and the clearance between the mineral wool panel and the duct was sealed up with the Hilti 'CP 606' and additionally coated with 1 mm thick CP

670 fire safety coating with a length of 110 mm from the panel. This penetration service achieved at least 125 minutes integrity performance and less than 30 minutes insulation with respect to the performance criteria as stated in BS 476: Part 20: 1987.

The test evidence R13C05 described the test of a nos. of penetration sealing systems. Among the 7 nos. of specimens, 5 nos. of them are the penetration sealing using the Hilti CP 670 fire safety coating backed with mineral wool to seal up the aperture and then allow the penetrations through it. The 0.7 mm thick (dry film thickness) CP670 coating was applied to each side of the 50 mm thick by 160 kg/m^3 mineral wool. Most of the system had achieved 240 minutes integrity and various insulation performance. The test was conducted in accordance with BS 476: Part 20: 1987 as well.

The proposed application of the air duct / damper penetration sealing system as shown in Table 4.1 is basically adopted the tested situation with minor modification to broaden the range of application to make it more practical. In the test, the air duct is 250 mm diameter, therefore, the allow application of the maximum 250 mm diameter service penetration is directly adopting the tested situation. While the smaller sizes of duct suppose to be a less onerous situation, the reduced duct sizes are considered as acceptable as well. But the hole on the mineral wool panel to allow the penetration of the air duct shall be tight fit with the clearance gap shall be within 10 mm and shall be sealed up with the Hilti 'CP606'. The duct in rectangular cross-section profile shall behave similarly with the circular duct, since the hole on the mineral wool can be cut in various profile to cope with the duct profile, provided that the clearance shall be within 10 mm as stated above. Also, in the application, the proposed thickness of the "CP 670" fire safety coating was suggested to be minimum 0.7 mm thick (dry film thickness), which is supported by the test evidence R13C05. In this test evidence, although the mineral wool was 100 mm thick, which is thicker compares to the current situation in this assessment, but since the 0.7 mm thick coating was not the main component to perform the integrity performance and with just minor function to the insulation. Therefore, the slight change of the coating from 1 mm thick to minimum 0.7 mm thick is considered as reasonably supported by direct test evidence.

The air duct that penetrating the wall shall carry the fire resistance performance at least to the integrity performance to ensure it will not deteriorate the sealing system. The fixing of the duct via the hanger away from the wall shall follow the tested situation since the fixing adequacy ensure the duct remain in position under the fire exposure situation. In case if the air duct/ damper satisfy both the integrity and insulation performance, then the sealing system shall be likely to maintain the full integrity and insulation performance. The damper that considered in this assessment would be the barrier that fit within the wall aperture connecting the air duct from different compartments.

The tested supporting construction is the plaster board drywall partition system with the overall thickness of the wall is 100 mm. The drywall partition is considered as the flexible supporting construction, while

compares to the rigid wall type like the concrete, gypsum blocks or AAC blocks wall, the aperture formed within the rigid wall type shall experience less lateral deflection. Therefore, it is expected that the results achieved for flexible wall type shall also applies to the rigid wall type boundary condition. The thickness of the wall shall be minimum 100 mm the same as that tested. The proposed wall aperture sizes of 1,200 mm x 1,200 mm are within the tested sizes and is therefore acceptable as well.

The application of the sealing system is also directly adopting the tested applied condition. The hole for air duct penetration shall be cut tight fit the air duct profile with maximum 10 mm wide gap clearance. The clearance shall be sealed with the Hilti 'CP606' acrylic sealant. An additional layer of nominal 0.7 mm thick (dry film thickness) Hilti 'CP670' fire safety coating is coated to cover the clearance gap and at the same time overlapped on the air duct surface by 110 mm from the mineral wool panel. The method of application follows the tested conditions and is therefore supported by direct test evidence.

4.2 *The fire resistance performance of air duct/damper penetration sealing system using Hilti 'CP636' firestop mortar*

Proposal

It is proposed that Hilti "CP636" firestop mortar may be used to seal up the air duct/damper penetration systems through masonry type wall or floor supporting construction provided that the construction shall be minimum 150 mm thick and shall be capable to provide at least 240 minutes fire resistance performance supported by separate test evidence. In this assessment, it is expected that the damper will be installed within the supporting construction, and the air duct are connecting the damper on one side or both. The installation of damper and the boundary conditions for the penetration sealing shall be as follow:

Table 4.2: The proposed application of the penetration sealing system

Penetration services	Damper up to 680 mm wide x 700 mm high (with supporting evidence to provide adequate FRR)
Wall type	Masonry, concrete, gypsum, AAC, or drywall partition (with supporting evidence to provide adequate FRR)
Wall aperture sizes	Max. 800 mm x 800 mm
Application of sealing system	The Hilti CP636 firestop mortar applied to the clearance between the damper or the damper casing with the clearance of 45 mm to 65 mm. The thickness of CP 636 to be applied shall be minimum 90 mm thick. The damper of damper casing shall have adequate steel tab to key the damper or damper casing into the mortar.

The proposed damper sealing system using Hilti 'CP636' firestop mortar is required to provide the fire resistance performance of up to 240 minutes integrity with respect to BS 476: Part 20: 1987.

Discussion

The test evidence BRE/LPC test report nos. TE200637 and TE200638 described the test of the damper mounted within the wall or floor aperture with the clearance and the fixing via the use of Hilti 'CP636' fire stop mortar. In both cases, the penetration sealing system had achieved the fire resistance performance of 255 minutes integrity only for wall situation, and 245 minutes integrity only for floor situation with respect to the performance criteria as stated in BS 476: Part 20: 1987.

The proposed application of the damper penetration sealing system as shown in Table 4.2 is basically adopted the tested situation with a reasonable modification considering both test evidence to broaden the range of application to make it more practical. In the test TE 200637, the damper of overall sizes 580 mm wide by 600 mm high was installed within the 700 mm x 700 mm wall aperture and sealed up with the Hilti 'CP 636' and the test TE 200638 is the damper of overall sizes 680 mm wide by 700 mm high installed within 800 mm x 800 mm floor aperture. Since the floor situation is considered as a more onerous case,

therefore the application of the successful test result in floor mounted condition to the wall mounted conditions is believed to be acceptable. While the smaller sizes of damper supposed to be a less onerous situation as well. The clearance between the damper and the wall aperture shall be within 45 mm to 65 mm is also the conditions same as that tested. In the test, the use of the steel tab at the perimeter of the damper embedded within the Hilti 'CP636' firestop mortar ensure the damper remain intact in position and ensure that the casing of the damper shall not deformed too much from the sealing system. This fixing method should therefore be followed.

The tested supporting construction is the AAC wall or floor system with overall thickness of 150 mm. The result from the low density supporting construction applies to high density supporting construction is considered as acceptable, provided the thickness of the supporting shall not smaller than that tested and the target supporting construction shall carry its own supporting test evidence to have the required fire resistance performance.

In this situation, since no insulation performance was assessed in the original test evidence, the appraisal for this application can only be done in terms of integrity performance only. Based on the discussion, it is believed that the penetration sealing system shall be capable to provide 240 minutes integrity performance with respect to BS 476: Part 20: 1987.

5 CONCLUSION

The proposed use of Hilti 'CP670' and 'CP636' penetration sealing systems as discussed in Section 4 of this report, are capable of maintaining the fire resistance performance of up to 120 minutes integrity with or without insulation, depends on the design and 240 minutes integrity performance with respect to BS 476: Part 20: 1987.

6 DECLARATION BY APPLICANT

We, Hilti (Hong Kong) Limited, confirm that the material, component or element of structure, which is the subject of the test report being reviewed, has not to our knowledge been subjected to another test to the standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of another test to the standard against which the assessment is being made.

We are not aware of any information that could affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to ask the assessing authority to withdraw the assessment.

7 VALIDITY

This assessment is based on test data, experience and the information supplied. The assessment will be invalidated if the assessed construction is subsequently tested since actual test data is deemed to take precedence over an expressed opinion. Any changes in the specification of product will invalidate this assessment. This assessment relates only to the specimen assessed and does not by itself infer that the product is approved under any other endorsements, approval or certification scheme. Since the appraisal method is under development, the laboratory reserved the right to supersede this assessment in case the appraisal method had been changed.

This report only relates to the specimen(s) tested and may only be reproduced by the sponsor in full, without comment, abridgement and modifications.

8 SIGNATORIES

Assessment by:

Dr. SZE Lip-kit
Test Consultant
Research Engineering Development
Façade Consultants Limited

Reviewed by:

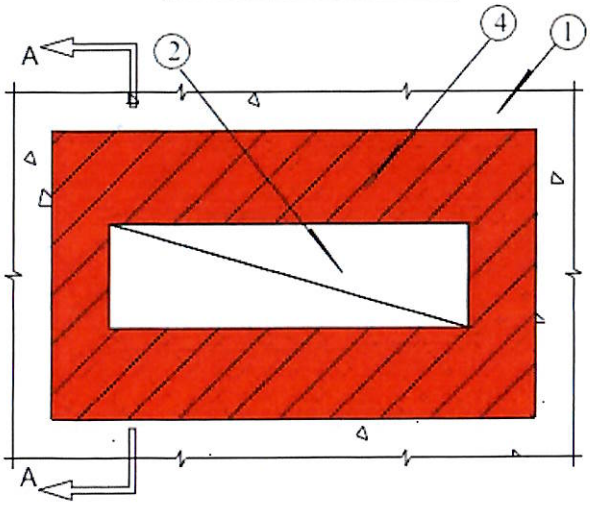
Ir Dr. YUEN Sai-wing, MHKIE (Fire)
Authorized Signature
Research Engineering Development
Façade Consultants Limited

APPENDIX A – SUMMARY OF PENETRATION SEALING IN DIFFERENT SCENARIOS

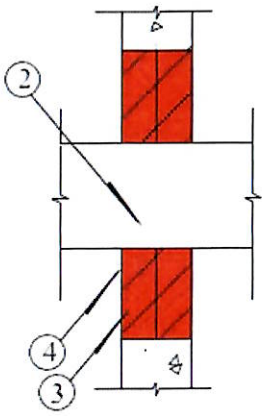
DAMPER PENETRATION DETAIL (1 OF 2)

FIRE RESISTANCE RATING: UP TO -/120/120
PRODUCT USED: CP 670 FIRE SAFETY COATING
CP 606 FIRESTOP ACRYLIC SEALANT

SIDE VIEW / TOP VIEW



SECTION A-A
(WALL)

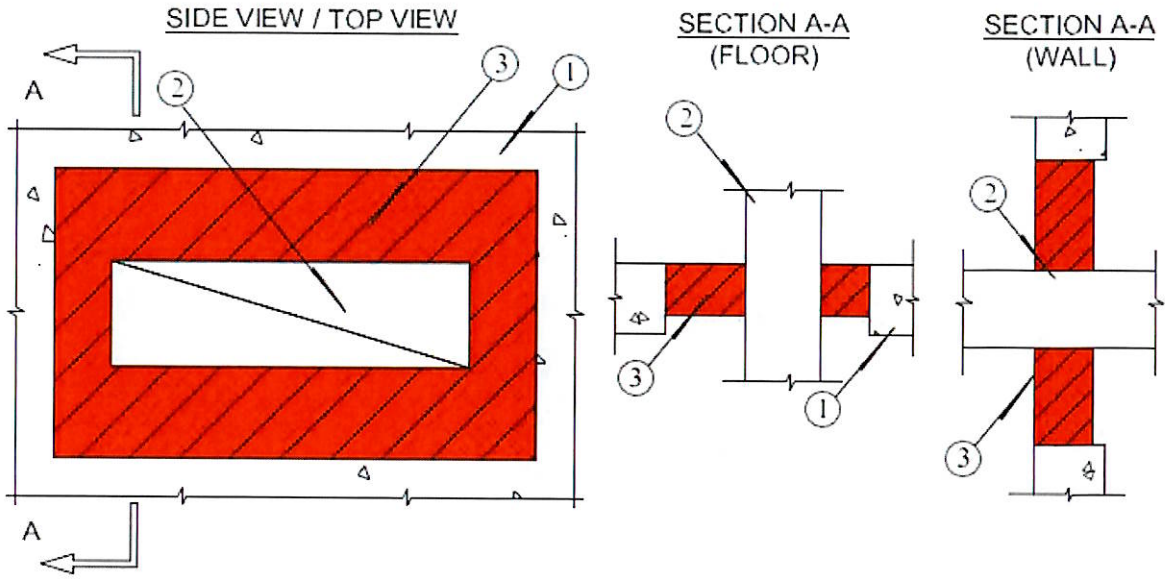


1. CONCRETE FLOOR OR WALL ASSEMBLY (120/120/120 F.R.R.):
   A. CONCRETE WALL OR FIRE-RATED BLOCKWALL
   B. CONCRETE FLOOR
2. METAL AIR DUCT
3. DOUBLE LAYERED (50mm THK EACH) MINERAL WOOL BOARD (MIN. 160kg/m^3 DENSITY)
4. MINIMUM 0.7mm (DRY) THICK **CP670 FIRE SAFETY COATING** APPLIED ON BOTH SIDES OF THE MINERAL WOOL BOARD.

NOTES :
1. MAXIMUM SIZE OF OPENING (WALL) =1200mm x 1200mm. (OR EQUIVALENT AREA)
2. GAPS BETWEEN MINERAL WOOL BOARD AND CONCRETE SURFACE /METAL SLEEVES TO BE FULLY FILLED BY **CP 606 FIRESTOP ACRYLIC SEALANT.**
3. THE JUNCTION BETWEEN THE APERTURE IN THE COATED BOARD AND THE AIRDUCT TO BE SEALED WITH **CP 606 FIRESTOP ACRYLIC SEALANT.**
4. FOR FLOOR APPLICATION OF SPAN OVER 2m, INTERMEDIATE SUPPORT(S) UNDER CP670 AT MAXIMUM INTERVAL OF 2m SHOULD BE PROVIDED BY CONTRACTOR.

DAMPER PENETRATION DETAIL (2 OF 2)

FIRE RESISTANCE RATING: UP TO -/240/-
PRODUCT USED: CP 636 FIRESTOP MORTAR



1. CONCRETE FLOOR OR WALL ASSEMBLY (240/240/204 F.R.R.):
   A. CONCRETE WALL OR FIRE-RATED BLOCKWALL (MIN. 150mm THICKNESS).
   B. CONCRETE FLOOR (MIN. 150mm THICKNESS).

2.1 FOR WALL APPLICATION, THE NORMAL SIZE FOR AIRDUCT CAN BE 580mm wide x 600mm HIGH OR EQUIVALENT AREA.

2.2 FOR FLOOR APPLICATION, THE NORMAL SIZE FOR AIRDUCT CAN BE 680mm wide x 700mm HIGH OR EQUIVALENT AREA.

3. MINIMUM 90mm THICK **CP636 FIRESTOP MORTAR** FULLY FILLED ACROSS THE ANNULAR SPACE BETWEEN THE AIRDUCT AND THE CONCRETE WALL/FLOOR.

NOTES :
1. MAXIMUM SIZE OF OPENING (WALL) = 700mm x 700mm. (OR EQUIVALENT AREA)
   (FLOOR) = 800mm x 800mm. (OR EQUIVALENT AREA)
2. FORMWORK CAN BE ANY RIGID SHEET MATERIAL CUT TO FIT THE CONTOUR OF THE AIRDUCT AND PREVENT LEAKAGE OF **CP636 FIRESTOP MORTAR** DURING INSTALLATION.
3. THE INTERNAL OF THE AIRDUCT IS FIRE-PROTECTED BY FIRE SHUTTER OR DAMPER INDEPENDENTLY.

- End of Report -

LEGEND
Technical Services, Inc.
www.legend-group.com
88 Empire Drive • St. Paul, Minnesota • 55103
(651) 642-1150 • fax (651) 642-1239

VOC Content Test Certificate

Friday October 23, 2009

Supplier: Hilti Entwicklungsgesellschaft mbH
BU Chemicals
Hiltistrasse 6
86916 Kaufering
GERMANY

Sample Description: Hilti CP 670

Date tested: July 20, 2009

Test Method: SCAQMD method 304-91 Determination of Volatile Organic Compounds (VOC) in various materials as referenced by South Coast Air Quality Management District (SCAQMD) rule 1168. The values also comply with the requirements of EPA test method #24.

Test Data: Legend Project Number 0903311

Specification	Product
LEED 2009 (LEED 3.0) **LEED 2.2** IEQ-4.1: Low-Emitting Materials – Architectural Paint , Non Flat	**Hilti** **CP 670**
Green Building Council of Australia Green Star Office Design 3.0, IEQ-13 Green Star Office Design 2.0, IEQ-13 Green Star Office Interiors 1.1, IEQ-11	
Architectural Paint, Non Flat; **VOC Limit: 150 g/L**	**Product contains: 38 g/L of VOC**

Al Noreen
Digitally signed by Al Noreen
DN: cn=Al Noreen, o, ou, email=anoreen@legend-group.com, c=US
Date: 2009.10.30 14:01:12 -05'00'

William Welbes
Vice President of Laboratory Operations

Allen Noreen, Ph.D.
Technical Director

Buildings Department

屋宇署

Our Ref. 本署檔號：(24) BD GR/BM/2(185)
Your Ref. 來函檔號：
Tel. No. 電　話：848 2838
Fax No. 圖文傳真：840 0451

26 May 1994

Hilti (Hong Kong) Ltd.
Unit 3 5/F Harbour Centre Tower 2
8 Hok Cheung Street Hung Hom
Kowloon

Dear Sirs,

Fire Resisting Penetration Sealing System
As Supplied By Hilti (GB) Ltd.

Thank you for your letters dated 4.3.94 and 27.4.94 and the accompanying test/assessment reports on the above. You are asking for comments on the acceptability of the fire resisting product in the context of relevant provisions of the Buildings Ordinance, Chapter 123 of the Law of Hong Kong and its subsidiary legislation.

Under the Buildings Ordinance, "authorized persons" (i.e. architects, engineers or surveyors registered with the Building Authority) are required to supervise building works including the selection and installation of fire resisting products and to certify compliance with the Buildings Ordinance upon completion of works. Authorized persons are therefore responsible for ensuring the safety requirements inter alia of fire resisting products in the building projects which they have been appointed by the developer to coordinate and supervise.

In establishing the acceptability of fire resisting products, reference may be made to the performance standards laid down in Building (Construction) Regulation 90, the current Code of Practice for Fire Resisting Construction issued by the Building Authority and British Standard 476: Parts 20 to 24. Reliance may also be placed on the test/assessment report prepared by a recognized laboratory or an equivalent establishment.

The Buildings Department has a list of recognized laboratories. This is available for reference at our office :

Technical Administration (Building) Unit
Buildings Department
11/F Murray Building
Garden Road Hong Kong

Before fire resisting products are installed in a building project, the authorized person appointed for the project should be approached for advice and guidance.

Your test/assessment reports are returned herewith. In this respect, please note that paragraph 3 of my letter dated 25 January 1994 is no longer applicable. The delay in replying is regretted.

Yours faithfully,

(Patrick H. Tsui)
Technical Secretary/Building
for Director of Buildings

PT/rcy/ac

4/F-12/F, Murray Building, Garden Road, Hong Kong 香港花園道美利大廈四樓至十二樓

消 防 處
防 火 組
香港九龍尖沙咀東部康莊道1號
消防總部大廈

FIRE SERVICES DEPARTMENT,
FIRE PROTECTION BUREAU,
FIRE SERVICES HEADQUARTERS BUILDING,
No. 1 Hong Chong Road,
Tsim Sha Tsui, East, Kowloon,
Hong Kong.

本處檔號 Our Ref.: FPB 207/0005
來函檔號 Your Ref.: L026/92HK
電訊掛號 Telex: 39607 HKFSD HX (24 小時 Hours)
圖文傳真 Fax: 852-3110066
852-3689744
電話 Tel. No.: 733 7596

29 April 1992

Hilti (Hong Kong) Ltd.,
Unit 3, 5/F, Harbour Centre,
Tower 2,
8 Hok Cheung Street,
Hunghom, Kowloon.

Dear Sirs,

"HILTI" Fire Prevention System

I refer to your letter of 30.3.92 and the enclosures attached thereto.

Based on the information contained in your letter under reference and the given test report, I understand that the captioned product is a building material which should be approved by the Director of Buildings and Lands. As such, I am not in a position to process your application and you are advised to refer your enquiry to the Director of Buildings and Lands, whose address is listed hereunder :-

The Director of Buildings and Lands,
(Attn.: Technical Secretary/Building, B.O.O.)
Murray Building,
Garden Road,
Central,
Hong Kong.

Please feel free to contact us should you have any other question in this matter.

Yours faithfully,

(TSE Yu-hing)
for Director of Fire Services

TYH/jt

ARCHITECTURAL SERVICES DEPARTMENT 建築署
QUEENSWAY GOVERNMENT OFFICES, 66 QUEENSWAY, HONG KONG. 香港金鐘道六十六號金鐘道政府合署
FAX 852-2869 0289

Our Ref : ASD 16/92101/AML/APP 06 June 1997
Your Ref. : --------
Tel. No. : 2867 3631
Fax No. : 2877 0594

Hilti (HK) Ltd
17/F, Tower 6, China HK City,
33 Canton Rd,. TST

Dear Sirs,

Architectural Services Department
List of Acceptable Materials
Hilti Firestop Products
Ref. no. 0001P

I am pleased to inform you that approval has been given to include the above product/material in this Department's List of Acceptable Materials. Initially, this listing is for a probationary status and this will be reviewed after the submission of satisfactory performance reports on completion of projects undertaken by this Department where your product has been used.

The Architectural Services Department List of Acceptable Materials is a restricted internal document. This letter should not be used for commercial or marketing purposes and failure to comply with this may result in the removal of the product from the List.

Yours faithfully,

WM Tang

(W.M. TANG)
Technical Secretary/2
for Chief Architect/ Central Management Branch
Architectural Services Department

Filecode : 95202 - LIST_LE.DOC
WMT/WHY/by

Attn. : To whom it may concer

Date : 1 April 2025
Ref. : 046/FP/SC/25

Subject : Country of Origin- Hilti CP 670 Firestop Coating System

Dear Sir / Madam,

Enclosed please find the information of Hilti CP 670 Firestop Coating System. .

Brand Name : Hilti

Model Name : Hilti CP 670 Firestop Coating System

Manufacturer : Hilti Corporation

Address of Manufacturer : FL-9494, Principality of Liechtenstein.

Manufacturer Contact Person : Spencer Cheung

Supplier : Hilti (Hong Kong) Ltd

Address of Supplier : 701-704, 7/F, Tower A, Manulife Financial Centre,
223 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

Supplier Contact Person : Spencer Cheung (+852 9732 1231)

Country of Origin : *(Attached)*

Should you have further questions, please do not hesitate to contact our Technical Representatives, Customer Service Hotline at 8228-8118, or email us at hksales@hilti.com.

Yours Faithfully,

Spencer Cheung
Head of Product Leadership Strategy

Hilti (Hong Kong) Ltd.
701-704 | Tower A | Manulife Financial Centre
223 Wai Yip Street | Kwun Tong
Kowloon | Hong Kong
P +852-8228 8118 I **F** +852-2954 1751
www.hilti.com.hk

Item number	Model Name	Country of Origin
2281088	Firestop coating CP 670 6kg	Germany
236673	CP 670 1200x600x50 2S white	Poland

7th Mar 2019

To Whom It May Concern:

Re: Hilti Coated Board System CP 670 – LEED Info.

- The Hilti Coated Board System CP 670 is manufactured in Germany.
- The package of Hilti Coated Board System CP 670 can be completely recycled.
- There is no recycled content in Hilti Coated Board System CP 670 and it cannot be recycled.
- The Hilti Coated Board System CP 670 does not share any rapidly renewable materials.
- The VOC content of Hilti Coated Board System CP 670 is 38g/l.

If you would like to know more about Hilti solutions for LEED buildings or should you have any further question please feel free to contact me at my email or mobile number as shown below.

Yours sincerely,

Dorothy Wai
Product Manager
Hilti (Hong Kong) Limited
M +852-9723 1157 | **F** +852-2764 3234 | **E** dorothy.wai@hilti.com
http://www.hilti.com.hk

Hilti (Hong Kong) Ltd.
701-704 | Tower A | Manulife Financial Centre
223 Wai Yip Street | Kwun Tong
Kowloon | Hong Kong
P +852-8228 8118 I **F** +852-2954 1751
www.hilti.com.hk

To whom it may concern

Date: 22nd April 2016

Dear Sir / Madam,

Subject: Hilti Firestop Products non-CFC and Ozone Confirmation

Referring to your enquiry about the captioned subject, please be advised that:

Hilti firestop products, CP670 Firestop Acoustic Board is free of CFC, HCFC nor other ozone depletion elements.

CFC, HCFC and ozone depletion elements were not used during the product process neither.

Should you have further questions, please do not hesitate to contact our Technical Representatives or Customer Service Hotline at 8228-8118.

Yours sincerely,

Andrew Lau
Product Manger

Hilti (Hong Kong) Ltd.
701-704 & 708A&B | Tower A | Manulife Financial Centre
223 Wai Yip Street | Kwun Tong
Kowloon | Hong Kong
P +852-8228 8118 I **F** +852-2954 1751
www.hilti.com.hk

20 Jan 2021

Strepoint Limited
Rm. 2102-3, Allway's Centre,
468 Jaffe Road, Causeway Bay,
Hong Kong.
Attn: Mr. Wilson Mak

Dear Wilson,

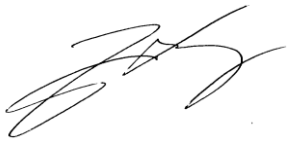
We thank you for your queries on the Model No. of ThermalRock S140.160 which is presented as TR-S140 and may cause confusion to customers with other product ThermalRock S140.

Please be informed that the **Product Name ThermalRock S140.160** with the **Nominal Density 160kg/m³** are the Key description for the product and is specific.

The Model No. TR-S140 is for internal use only.

Please find a sample of the Sticker Label for the product ROCKWOOL ThermalRock S140.160 which may be useful to clarify possible queries on this issue.

Yours faithfully
For and on behalf of
Rockwool Building Materials (Hong Kong) Ltd



Authorized Signature
Eunice Leung
General Manager Hong Kong
EL/ey/285

ROCKWOOL

For and on behalf of
ROCKWOOL Building Materials (Hong Kong) Ltd.

Authorized Signature

Material Information Statement

Articles

According to Regulation (EC) 1907/2006, Article 32
Revision: 07.04.2020 Version: 18

1 Identification of the articles and of the company undertaking

1.1 Product identifier

Trade name:

- Firestop Bandage CFS-B / CP 646
- Firestop Back Pan Strip CFS-BPS
- Firestop Block CFS-BL / CFS-BL P
- Firestop Board CP 675
- Firestop Boot CFS-BO
- Firestop Box Insert
- Firestop Cable Collar CFS-CC / CFS-RCC / CFS-RCC EXT
- Firestop Cable Module CFS-T
- Firestop Cast-in device CP 680 / CP 681 / CFS-CID /
- CFS-CID MD P/M
- Firestop Coated Board CFS-CT B / CP670 / CP673 / CP676
- Firestop Collar CFS-C / CFS-C P
- Firestop Collar CP 643 / CP 644
- Firestop Composite Sheet CFS-COS
- Firestop Cord CFS-CO
- Firestop Cushion CP 651N
- Firestop Drop-In Device CFS-DID
- Firestop Edge of Slab QuickSeal CFS-EOS QS
- Firestop Endless Collar CFS-C EL
- Firestop Filler Module CFS-T FB
- Firestop Gangplate CFS-SL GP
- Firestop Module Box CFS-MB / CP 657
- Firestop Plug CFS-PL / CP 658
- Firestop Plug Seal CFS-T RR / CFS-T RRS
- Firestop Retrofit Sleeve CFS-SL RK
- Firestop Sleeve CP 645
- Firestop Sleeve Kit CFS-SL SK
- Firestop Speed Sleeve CFS-SL / CFS-SL GA / CP 653
- Firestop Top Track Seal CFS-TTS
- Firestop Top Track Seal CFS-TTS MD
- Firestop Top Track Cover CFS-TTS MD
- Firestop Top Track Plug CFS-TTS MD
- Firestop Top Track Seal CFS-TTS 212
- Firestop Top Track Seal CFS-TTS R
- Firestop Wedge Seal CFS-T WD120
- Firestop Wrap Strip CFS-W EL / SG / P / CP 648
- Foil Tapes CS-FT
- Intumescent façade cavity closer CP674
- Joint Sealing Tapes CS-JST
- Mineral Wool
- Mineral Wool Boards
- Multifunctional Tapes CS-MFT
- Pre-coated Mineral Wool Boards
- Smoke & Acoustic Track Seal CS-TTS SA
- Speed Plug CP 777
- Speed Strip CP 767

1.2 Application of the listed articles

Construction industry.

Refer to Hilti product literature, technical data sheets, 3rd party published listings and national approvals for specific application information. For more details, please contact your local Hilti organization through http://www.hilti.group

1.3 Manufacturer / Supplier

Hilti AG
Feldkircherstr. 100
FL-9494 Schaan
Liechtenstein

Customer Service
Phone +423 (0)844 84 84 85
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2 Other information

A Safety Data Sheet is not required due to the classification of these products as “articles” according to Regulation (EC) No. 1907/2006 of 18 December 2006 (EU) / 29CFR 1910.1200 (U.S.A.). Consequently, these products are exempted from CLP / OSHA Labeling and SDS requirements.

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Informing department:
chemicals.hse@hilti.com

Hilti CP 670 Firestop Coating System Job Reference

Year	Project Name	Customer Name	Project type
2023	TPTL 244, YAU KING LANE & POK YIN RD	KINTAT ENGINEERINGS COMPANY LIMITED	Residential
2023	KAI TAK AREA 4B, SITE 3, NKIL 6574	KOON WO ELECTRICAL DEVELOPMENT	Residential
2023	KAI TAK AREA 4C, SITE 2, NKIL 6552	EFFORT ENGINEERING LIMITED	Residential
2023	SHING KAI RD, KAI TAK NKIL 6607	HUNS ENGINEERING COMPANY LIMITED	Hospitality
2023	SIU HONG, AREA 54 DD 132 TMTL 483	ORIENTAL FOUNDATION DEVELOPMENT LTD	Residential
2023	KAI TAK AREA 4B, SITE 1, NKIL 6576	EFFORT ENGINEERING LIMITED	Residential
2023	KAI TAK SPORTS PARK	SEM RESOURCES LIMITED	Sport & Recreation
2023	New - Office - 65-69 Shek Pai Wan Road, Aberdeen	SANKO SETSUBI CO LTD	Hospitality
2023	SIN FAT RD, KWUN TONG NKIL 6584	HIP HING CONSTRUCTION CO LTD	Residential
2023	WAN CHAI HOPEWELL CENTRE 2	FEI LUNG ENGINEERING CO LTD	Hospitality
2024	CYBERPORT PH5	GAMMON CONSTRUCTION LIMITED	Office
2024	KAM SHEUNG RD STATION PH1, LOT 1040 DD 103	KEIO ENGINEERING COMPANY LIMITED	Residential
2024	TIN SHUI WAI T.L.23 TIN WING STOP	TSUN WING ENGINEERING LTD	Residential
2024	KAI TAK AREA 4B, SITE 4, NKIL 6591	KOON WO ELECTRICAL DEVELOPMENT	Residential
2024	HO MAN TIN STATION RES (PACKAGE 2)	ORIENTAL FOUNDATION DEVELOPMENT LTD	Residential
2024	XRL WEST KLN TERMINUS PROPERTY DEVELOPMEI	ORIENTAL FOUNDATION DEVELOPMENT LTD	Office
2024	KWAI CHUNG HOSPITAL PH2 & 3	SOUTHA TECHNICAL LIMITED	Health
2024	R6 TRUNK ROAD T2 ED/2018/04	WELLFIELD M&E ENGINEERING LIMITED	Infrastructure
2024	HKIA 3508 TERMINAL 2	KEE SEE ENGINEERING CO LTD	Transport
2024	QUEEN MARY HOSPITAL PH1 (SS F501)	CORNWALL ELECTRICAL ENGINEERING	Health
2024	KAI TAK SPORTS PARK	KEE SEE ENGINEERING CO LTD	Sport & Recreation
2024	KAI TAK SPORTS PARK	SIMPLESTAR ENGINEERING LIMITED	Sport & Recreation
2025	XRL WEST KLN TERMINUS PROPERTY DEVELOPMEI	BOSEN E&M ENGINEERING LIMITED	Office