



INSPECTION GUIDEBOOK

For Fire protection Installation



TABLE OF CONTENTS

1. Fire protection Basics	4
1.1 Active and Passive Fire protection	4
1.2 Compartmentations	4
1.3 Firestop systems	5
2. Difference between firestopping and fire blocking	6
3. Firestop codes and standards	7
3.1 Building Codes requirements	7
3.2 Applicable standards	8
4. Third party testing agencies	9
5. Listed firestop systems	10
6. Engineering judgments (EJ)	11
7. Inspection Process	13
8. Inspection guidelines for through penetrations firestop systems	14
8.1 Example comparison	14
8.1.1 Correct Installation	14
8.1.2 Incorrect Installation	15
9. Inspection guidelines for fire resistive joints	16
9.1 Example comparison	16
9.1.1 Correct Installation	16
9.1.2 Incorrect Installation	16
10. Inspection guidelines for perimeter fire barrier systems	17
10.1 Example comparison	17
10.2.1 Correct Installation	17
10.2.2 Incorrect Installation	17
11. Appendix	18
Appendix-A	18
Appendix-B	19
Appendix-C	20

12. Performance of construction materials under fire 21

12.1 Mineral wool vs. Insulation 21

12.2 Combustible and Non-combustible pipes 21

12.3 Compatibility with CPVC pipes 22

12.4 Dependency on tested system. 22

DISCLAIMER

The following information is intended to provide code enforcement and construction professionals with a basic understanding of fire protection systems and recommend guidelines for conducting quality reviews of the installation of various firestopping applications commonly encountered in building construction. This inspection guidebook is not intended to be all encompassing or to be used as a design guide. It is for information and educational purposes only



1. FIRE-PROTECTION BASICS

Fire protection refers to the measures taken to prevent fires from igniting, reducing the impact of an uncontrolled fire, or extinguishing fires. There are three primary strategies for fire protection in construction:



Figure 1: HCH ID: 212574

Detection systems are designed to detect and alert the presence of smoke, fire, carbon monoxide, or other fire-related emergencies, suppression systems are used to extinguish, control fire spread, and containment systems prevent the spread of fire and smoke and allow occupants to evacuate a building.

Fire detection and suppression systems are categorized as active fire protection systems that utilize smoke detectors, sprinklers etc. to detect and stop the fire, whereas fire containment is designed to help prevent the spread of fire or smoke.

1.1 Active and Passive Fire-Protection

- **Active Fire-Protection:** Active fire protection refers to anything that needs a follow-up action to help stop or combat a fire. This comes in action immediately after the fire starts like activation of fire sprinklers until the fire is completely extinguished like hoses, water spray, deluge, etc.
- **Passive Fire-Protection:** Passive fire protection system slows or impedes the spread of fire or smoke without system activation, and is usually stationary like Fire resistance rated walls, floors, glass, intumescent paint, or coating etc.

1.2 Compartmentation

Compartmentation is the key principle to ensure that there are physical (or “passive”) barriers in place to restrict the movement of fire and smoke within a building allowing more time for occupants to safely evacuate a building and protect valuable assets. It is the responsibility of architects, planners, engineers and building owners to ensure effective and well-designed compartmentation. Compartments help stop the spread of fire, limit the fuel supply and cut off the supply of oxygen. Therefore, they attack the three main components of a fire: heat, fuel, and oxygen. Compartments also protect escape routes, such as corridors and stairs, allowing more time for occupants to safely evacuate the building and for firefighters to extinguish the flames.

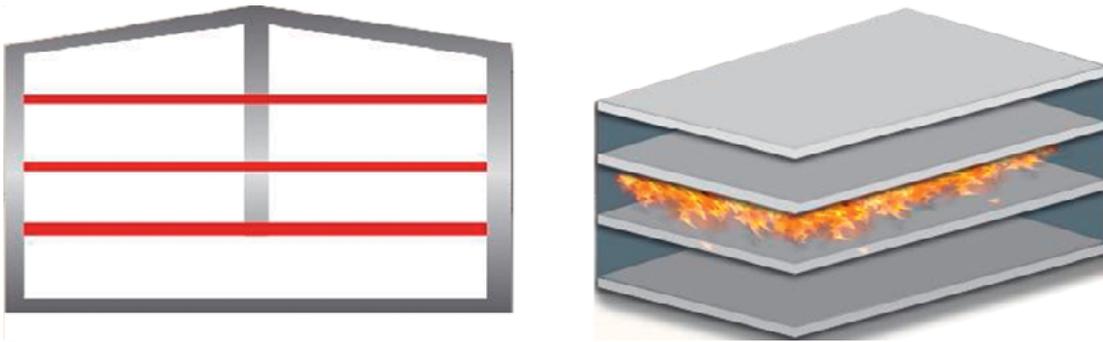


Fig. 2: Horizontal compartments along the height of the building

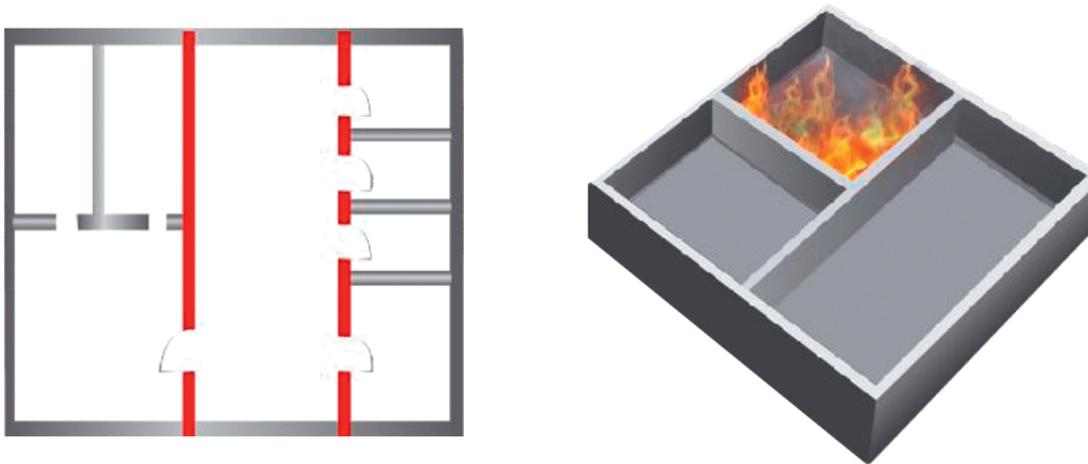


Fig. 3: Vertical compartments dividing the floor plan into sections

Compartments help stop the spreading of fire, limit the fuel supply, and cut off the supply of oxygen. Therefore, they attack the three main components of a fire: heat, fuel, and oxygen. Additional guidance on compartmentation is given by different local regulations based on:

1. The type and occupancy of the building (e.g., hospital, mall, hotel, residential or industrial building etc.)
2. The fire load in the building (e.g., storage room with hazardous liquids)
3. The height of the building (e.g., single-family house or high-rise building)
4. The availability of a sprinkler system

1.3 Firestop Systems

Throughout building, the fire-rated assemblies are breached to allow the passage of piping, conduct, cable trays and other building system components to extend from room to room. In addition, openings or gaps between the wall and floor surfaces of the fire rated assemblies might exist to allow for movement or deflection of the assembly. To restore the integrity of the fire rated assembly, all the openings or penetrations need to be sealed to maintain the original fire rating equal to that of the assembly. There are three types of systems, i.e. through penetration firestop systems, fire resistive joint systems and perimeter fire containment systems.

2. DIFFERENCE BETWEEN FIRESTOPPING AND FIREBLOCKING

Often firestopping products and fire blocking materials are mistakenly interchanged. However, the purpose and application for using a firestopping product versus a fire blocking material differ as described below.

- **Firestopping:** “Firestopping” is a process whereby certain materials, some of them specially manufactured, are used to resist (or stop) the spread of fire and its byproducts through openings made to accommodate penetrations in fire-rated walls, floors, and floor/ceiling assemblies.
- **Fireblocking:** “Fire blocking” is defined as generic materials, such as lumber, structural wood panels, gypsum board, cement fiberboard or particleboard, insulation batts or blankets of glass, or mineral wool, installed within concealed spaces to resist or block the migration of fire and hot gases for an undetermined period. Fire blocking is used to subdivide or block off the stud cavity inside a wall, in a soffit over cabinets, between stair stringers at the top and bottom of a run, in an exterior cornice, or in the space between the combustible finish materials and the wall itself.

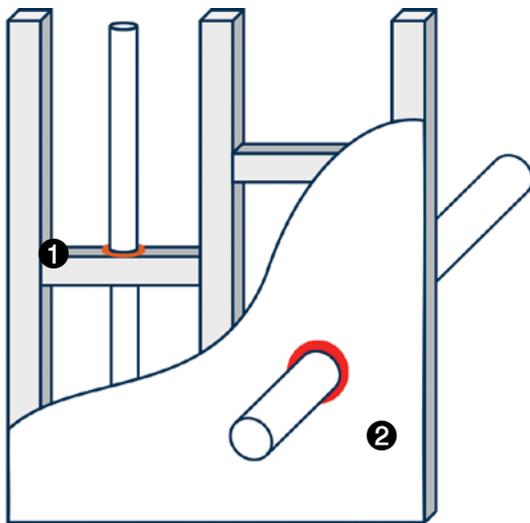


Fig. 4: Difference between firestopping and fire blocking

- ❶ Fireblocking – the use of approved building material to resist or block the migration of fire and hot gases within concealed spaces.
- ❷ Firestopping – a form of fire protection that is used to seal around penetrations (openings) through a fire-rated wall or floor assembly.

3. FIRESTOP CODES AND STANDARDS

3.1 Building Codes requirements

Firestopping is well defined in the model building codes and safety codes. The various firestop codes and standards help to define where firestopping is required within a building, the appropriate testing standards, and other requirements to ensure life safety. The following list references some of the relevant code sections related to firestopping.

- International Building Code (IBC) (2018 Edition)
 - Section 714.4.1.2 Through Penetration Firestop (walls)
 - Section 714.4.2 Membrane Penetrations
 - Section 714.5.1.2 Through Penetration Firestop (floors)
 - Section 714.5.4 Smoke Barriers
 - Section 715.1 Joints
 - Section 715.4 Curtain Wall
 - Section 715.6 Joints (Smoke Barriers)
- International Fire Code (IFC) (2018 Edition)
 - Section 701.2 Fire Resistance Rated Construction
 - Section 701.3 Smoke Barriers
 - Section 701.4 Smoke Partitions

Apart from these international standards, we also have a few local standards cross-referring to international standards.

- **Australia:**
 - Regulation / National Code: NCC 2022 covers fire protection and cross-refers to local test standard (equal or more severe); firestopping requirements are clear for service penetrations (C4D15) & joints (C4D16). Lack of coverage of CW & cavity barriers, referred to as C1P2.
 - Test standards: Local test standards – AS 1530.4 & AS 4072.1 (EN 1366 – 3 & 4) available for penetrations & joints
 - Application / inspection standards:
 - AS 1851 available for maintenance & inspection
 - No specific application standards available
 - Table 1.11A Page “16” Routine service requirements for each section
 - Table 1.16.1 Page “19” Routine service records
 - Table 1.16.12 Page “20” Service tags or labels
 - Full section 12 Page “119” Passive fire and smoke systems
- **New Zealand:**
 - Regulation: Building Act 2004
 - National Code: NZBC captures the functional requirement & performance criteria in clause C for firestopping.
 - Test standards: Acceptable solution refers AS/NZS 1530.4, AS/NZS 4072.1 & NZS/BS 476 21 & 22 for service penetrations. Alternate solution refers to EN, ASTM.
 - Application standards: Some relevant application specific standards are available e.g. AS/NZS standard for linear joints and penetrations
 - Others: Inspection is carried out by council and/or building inspectors

3.2 Applicable Standards

Test Standards relevant to firestop Systems:



1. AS 1530.4 “Methods for fire tests on building materials, components and structures, Part 4: Fire-resistance tests for elements of construction”
2. AS 4072.1 “Components for the protection of openings in fire-resistant separating elements Service penetrations and control joints”
3. ASTM E 1399 “Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems”
4. ASTM E 1966 (ANSI/UL 2079) “Standards Test Method for Fire-Resistive Joint Systems
5. ASTM E 2174 “Standard Practice for On-Site Inspection of Installed Firestops”
6. ASTM E 2307 “Standard Test Method for Determining the Fire Resistance of Perimeter Fire Barrier Systems Using the Intermediate Scale, Multi-Story Test Apparatus”
7. ASTM E 2336 “Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
8. ASTM E 2393 “Standard Practice for On-Site Inspection of Installed Fire Resistive Joint System and Perimeter Fire Barriers”
9. ASTM E 2750 “Standard Guide for Extension of Data from Firestop Penetration System Tests Conducted in Accordance with ASTM E814”
10. ASTM E 814 (ANSI/UL 1479) “Standard Test Method for Fire Tests of Through-Penetration Firestops”
11. ICC ES AC179 “Acceptance Criteria for Metallic HVAC Duct Enclosure Assemblies”
12. ISO 6944 “Fire Resistance Tests – Ventilation Ducts”

4. THIRD PARTY TESTING AGENCIES

In Australia, all firestop systems must comply with NCC 2022. For this, two methods are mentioned in the code:

1. Engineering Judgement (EJ)
2. Evidence of suitability in the form of any one or combination of the following:
 - a. A current certificate stating that the design, properties and performance of the product fulfils specific requirements of the BCA.
 - b. A report issued by accredited testing laboratory that the set of tests conducted to demonstrate the fulfillment of BCAs specific requirements.

Accredited testing laboratories, recognized by the National Association of Testing Authorities Australia (NATA), conduct fire testing on firestop manufacturer products according to specific standards. Upon successful testing, these labs generate detailed results, which are included in design listings within fire resistance directories and certificates accredited by JAS-ANZ. Certification bodies like UL use these results to issue certifications, although UL itself does not perform the testing. These directories and certificates are essential resources during the plan review and inspection processes.

5. UL-AU CERTIFICATES

A UL-AU certified firestop system contains complete information about a tested system as per an Australian/New Zealand standards. It shows a typical assembly of all involved components/parameters with their detailed description. It mentions the overall fire rating of the testing system along with a few possible variations of different parameters, size range of different penetrating components, along with different possible materials and provides the list of all applicable product range for the given assembly.

Form-ULID-000287 (DCS:00-IC-F0895) – Version 3.0

UL-AU CERTIFICATE

Certificate No.	UL-AU-230002	→ Certification number and Date of Issue
Page	1/55	
Date of Issue	2023-11-01	

Certificate Holder	Hilti (Aust.) Pty. Ltd 1G Homebush Bay Drive PO Box 3217 Rhodes NSW 2138, Australia	→ Certification Holder (AU) Manufacturer & sourcing plant
Manufacturer	Hilti AG, Feldkircherstrasse 100 FL-9494 Schaan Liechtenstein Internet: www.hilti.com	
Production Sites (Factory)	Hilti Plant 5a Hilti Plant 5b	

Certified Product Description	Firestopping Collar	→ Product name
Model(s)	Hilti Firestop Collar CFS-C P	
Trade Name or Trademark	Hilti Firestop Collar CFS-C P	
Rating Information	Refer to Appendix A	→ Tested to local standards: AS 1530.4 & AS 4072.1
Standard tested to	AS 1530.4:2014 and AS 4072.1:2005	
Test Report References	See page 53 to 55	
Listing Category and File Ref	AUEC.R55417	
Additional Information and Conditions	See page 2	
Expiry date	2033-11-01	→ 10-years expiry period

 Stuart Foster Certification Officer	This is to certify that the descriptive details of the product identified herein ("Certified Product") have been investigated and found to conform with the Standard(s) indicated on this Certificate. In accordance with the UL-AU Mark Scheme requirements and AS/NZS accreditation requirements. The designated Certificate Holder is authorized to use the UL-AU Mark for the Certified Product manufactured at the production facility identified above, in accordance with the UL-AU Mark Licensee Service Agreement. Only those Products bearing the UL-AU Mark for Australia should be considered as being covered by UL's UL-AU Mark Scheme. This certificate shall remain valid through to the expiration date, unless terminated earlier in accordance with the License Agreement including without limitation if the Standard identified on this Certificate is amended or withdrawn prior to the expiration date. This Certificate remains the property of UL International New Zealand Ltd. If the client provides copies of the verification documents to others, the documents will be the client's. All dates are in Year-Month-Day format (YYYY-MM-DD).
 Certification Body www.jas-anz.org/register	→ Signed by Certification Officer UL International New Zealand Ltd, 54 Tarnedale Grove, Albany, Auckland 0632, New Zealand. +64 9 415 3355, customerservice.anz@ul.com, http://newzealand.ul.com 

Fig 5. Sample AU-UL certificate of Through-penetration system

A UL system gives you information on different variations for a particular assembly/system. It is a complete document and considered credible among all the countries following UL/ASTM Standards. One should first check the availability of a tested system for a particular arrangement at site. In case it is not available, only then the contractor should use manufacturer's Engineering Judgment (EJ) services.

It is important to keep in mind that a manufacturer can have multiple approved systems for a specific assembly and penetrant combination, but the installation guidelines and fill materials are not interchangeable between those systems.

6. ENGINEERING JUDGMENTS (EJ)

At times, a contractor may encounter a unique job-site condition for a firestopping application which has not been tested and listed. In such cases, customized Engineering Judgment (EJ) firestop details are provided only by the firestop manufacturer for a single application or for an entire project to account for these unique applications.

HILTI ENGINEERING JUDGMENT / FIRESTOP DETAIL			
PROJECT:	HILTI Market Organization: Australia	Page:	2/2
CUSTOMER:	HILTI Contact Partner:	Eng. number:	
		Date:	
		Tel:	

Firestop Seals according to: Fire resistance of the Hilti Firestop Blocks CFS-BL
Rating: FRL -90/90

DETAILS:

- Wall assembly - concrete or aerated concrete, min. 200 mm thickness (min. FRL -90/90).
- Coaxial cables - individual cable max. diameter 60 mm, up to 5 cables per opening.
- Hilti Firestop Block CFS-BL - installed in 200 mm depth to close all gaps around penetration service, installed according to installation instructions.
- Hilti CP 505 firestop flexible sealant - filled the space/cavity around the cables in a depth of 10 mm.
- Hilti CFS-P BA Putty Bandage (100.X.3 MM) - two layers wrapped around single cables or cable bundle, installed on top side of the floor.

Notes:

- Opening size = max. 200 x 100 mm.
- Annular gap = 0 mm.
- Services to be supported rigidly on both sides of the seal.
- For more information about the installation please see installation instructions.

Note:

The specification was prepared on the basis of the data and information given to Hilti by the customer, the respective Hilti product information and the existing level of technical knowledge state of the art. This specification refers to the expected use of the resistance performance, should the proposed detail be subjected to the stipulated fire test and applied within the stipulated use limits.

The accuracy of this specification is guaranteed provided that:

- only original Hilti products as defined in this specification are used.
- these specific products are used and installed only in a manner which represents the state of the art and by strictly obeying the conditions and conditions mentioned in this specification as well as all relevant technical instructions, the opening manual, the setting manual and the installation manual and other data sheets of Hilti.
- the proposed performance, the test prerequisites and criteria conform with the conditions actually existing on the site and have been checked and agreed by the user.

RH ENGINEERING JUDGMENT FIRESTOP DETAIL			
PROJECT:	HILTI Market Organization: Australia	Page:	2/2
CUSTOMER:	HILTI Contact Partner:	Eng. number:	
		Date:	
		Tel:	

ENGINEERING JUDGMENT FIRESTOP DETAIL
PROJECT:
CONTRACTOR:
F-RATING = 3-HR.
MOVEMENT CAPABILITY = 32.5 % COMPRESSION OR EXTENSION

CROSS-SECTIONAL VIEW

- CONCRETE FLOOR ASSEMBLY (UL/CUL CLASSIFIED) (MINIMUM 4-1/2" THICK) (3-HR. FIRE-RATING).
- CONCRETE OR CONCRETE BLOCK WALL ASSEMBLY (UL/CUL CLASSIFIED) (MINIMUM 8" THICK) (3-HR. FIRE-RATING).
- MINIMUM 9" THICKNESS MINERAL WOOL (MINIMUM 4 PCF DENSITY) COMPRESSED 50%.
- MINIMUM 1.8" (WET) THICKNESS HILTI CFS-SP WB FIRESTOP JOINT SPRAY APPLIED WITHIN THE JOINT, FLUSH WITH EACH SURFACE OF WALL AND OVERLAPPING MINIMUM 1/2" ONTO FLOOR AND WALL ON BOTH SIDES OF JOINT.

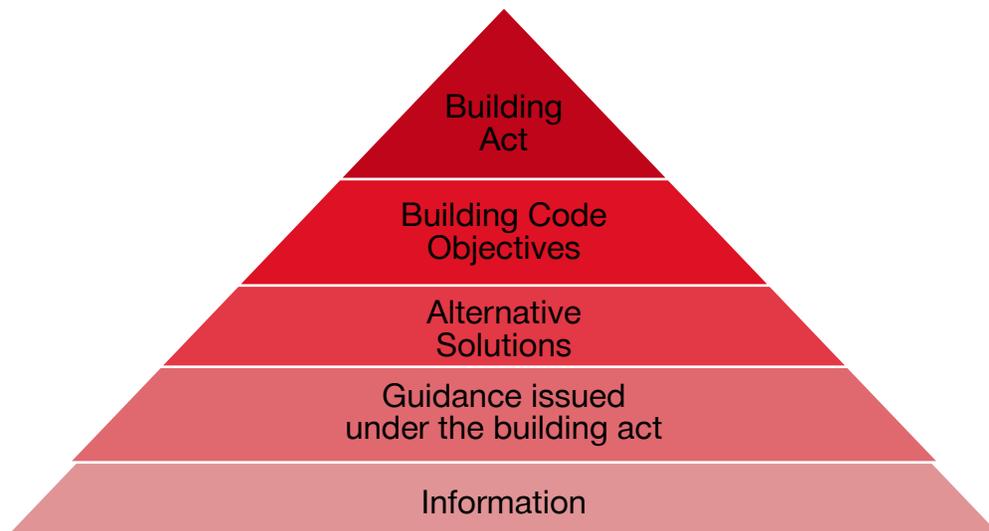
NOTES: 1. MAXIMUM WIDTH OF JOINT = 2-1/2"
2. F-RATING MAY NOT EQUAL F-RATING IN ACCORDANCE WITH UL 2073

THIS ENGINEERING JUDGMENT REPRESENTS A FIRESTOP SYSTEM THAT WOULD BE EXPECTED TO PASS THE STATED RATINGS IF TESTED. (REFERENCE: UL SYSTEM NO. HW-D-1958)

HILTI Hilti Firestop Systems	UAE, Dubai Investment Park, B05-HILTI (44584)	Sheet: 1 of 1	Drawing No: 5000000044-3a
Designed by: Rahaf Alhallaq		Scale: 1:1	REV: 28, 2022
Checked by: Ram Al-Diak			

Saving Lives & Assets through Innovation & Education

Per International Firestop Counsel (IFC) guidelines, engineering judgments are firestop designs created by qualified professional based off third-party tested and approved systems. These designs are in accordance with the recommended IFC guidelines for evaluating firestop system engineering judgments. The International Building Code (IBC) justifies the use of engineering judgments as referenced under sections 703.2 Fire Resistance Ratings and 703.3 Alternative Methods for Determining Fire Resistance, IBC 2012. The testing and rating process ensures that each specifically designed system will maintain or exceed the hourly fire rating, as tested, for which it was approved.



Below are some of the fundamental guidelines recommended by the IFC for evaluating engineering judgments:

- Use tested systems in lieu of EJs when available.
- Issued only by qualified technical personnel.
- Issued for a single construction project and are not transferable to another job without review by the issuing entity.
- Issued only in those locales where local permit their use as suitable for meeting building code requirements.
- Indicate clearly that the recommended firestop system is an Engineering Judgment and NOT a listed system.
- Identify project name, contractor, non-standard conditions and required hourly rating.
- Shows date of issue and authorization signatures as well as issuer's name, address, and telephone number.
- Reference the number of the tested system(s) the design is based on.
- Qualified professional creating it may include engineers trained for EJs by the Firestop Manufacturer.
- Multiple suppliers can be used for a project to minimize the need for Ejs, but material from different manufacturers cannot be used for a single system.

The project plan submittals should clearly identify which details are based on engineering judgments and these details should be provided to the field inspector.

7. INSPECTION PROCESS

The performance of any passive fire protection system to impede the spread of smoke and fire is directly proportional to the quality of the installation. Firestop inspections provide quality control and quality assurance that the firestop systems installed on a project meet the required fire resistance requirements defined by the building code and local jurisdiction. Inspection is conducted by the fire department, however in most cases detail checklists and guidelines are not available nationally. The inspecting authorities may follow ASTM E2174 "Standard Practice for On-Site Inspection of Penetration Firestops" and ASTM E2393 "Standard Practice for On-Site Inspection of Fire-Resistant Joint Systems and Perimeter Fire Barriers". The National Building Code of The Philippines cross-refers to ASTM E2393. These ASTM standards provide guidelines for conducting visual inspection and destructive testing of firestop installations. Since it is not feasible to inspect every firestop penetration or the entire length of a fire-resistive joint, the referenced ASTM standards for on-site inspection can provide general guidelines for the percentage of work to inspect. The firestop inspection process typically begins by obtaining the approved firestop system documentation. During the construction phase, the Contractor should maintain documentation of all the listed firestop systems and engineering judgments that were utilized on the project. These firestop system details should serve as a blueprint for the firestop installer to properly select and install the appropriate firestopping materials. These documents will also serve as a blueprint for inspectors when verifying the proper installation of the firestopping materials.

Some of the recommended guidelines and best practices for performing a quality on-site inspection of firestopping installations include:

- Coordinate/schedule the on-site inspection during the installation phase and again at a final walk-through.
- Contractors should not conceal any firestop systems until after the work has been inspected and approved.
- Review the construction documents to identify the location of the fire rated wall/floor assemblies within the building.
- Obtain a copy of the approved firestop system submittal package for the project.
- Compare the installed firestop system with the corresponding firestop detail within the approved submittal package.
- Observe empty containers, boxes, or other packaging to identify the specific firestopping products installed are as specified in the submittal package.

The following sections of this guidebook provide more detailed guidelines for inspecting specific types of firestop systems on a project.



Fig. 6: Sealant thickness measurement when wet

8. INSPECTION GUIDELINES FOR THROUGH PENETRATIONS FIRESTOP SYSTEMS

When a building system component, such as plumbing piping, electrical conduit, cabling, etc., penetrates through a fire rated floor or wall assembly, the fire resistance integrity of that assembly is breached. An appropriate firestopping material must be installed per a tested firestop system that matches the specific penetration application to restore the integrity of the fire rated assembly.

For firestopping of through penetrations, some of the commonly used firestopping materials include:

- Preformed firestop products such as firestop plugs (Hilti CFS-PL), firestop collars (Hilti CFS C-P), firestop bandage (Hilti CFS-B) or putty bandage (Hilti CFS-P BA) for single pipe penetrations.
- Firestop blocks (Hilti CFS-BL) for multiple pipe penetrations in large openings.
- Firestop devices such as a firestop speed sleeve (Hilti CFS-SL GA) for cable bundles.
- Cast-in-place firestop floor devices (Hilti CP 680-P)
- Acrylic based firestop sealants (Hilti CP 606)
- Silicone based firestop sealants (Hilti CFS-SP SIL)

8.1 EXAMPLE COMPARISON

8.1.1 Correct Installation

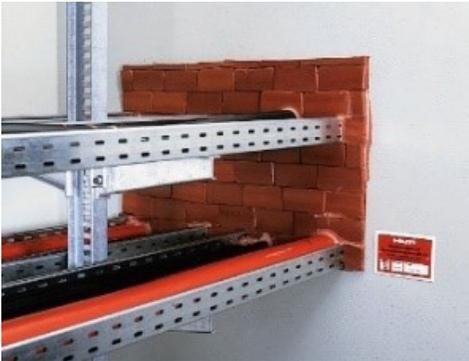


Fig 8: Preformed firestop block, Hilti CFS-BL Firestop Block, used for sealing large openings with multiple through penetrations. The firestop block should be stacked with staggered seams within the opening (HCH ID: 132413)



Fig 9: Preformed Fire Plug, Hilti CFS-PL with cables penetrating from top (HCH ID: 165538)



Fig 10: Firestop Collar, Hilti CFS C-P used for sealing large metallic pipes (HCH ID: 224330)



Fig 11: Speed sleeve with gang plate, Hilti CFS-SL GA for small cable bundles (HCH ID: 182005)

8.1.2 Incorrect Installation



Fig 15: Sealant not properly tooled leaving gaps in the installation



Fig 16: Multiple cable collars Hilti CFS C-P used for sealing a large opening leaving gaps in the installation



Fig 17: Blank opening (Bottom one out of 2 sealed small openings)



Fig 19: Gaps in opening not sealed properly after using cable collar Hilti CFS C-P



Fig 20: Incorrect installation of collar installed on top of floor



Fig 21: Incorrect on the Left as the Red intumescent strip is not evenly distributed leaving gaps, Correct on the Right

9. INSPECTION GUIDELINES FOR FIRE RESISTIVE JOINTS

When a fire rated wall/floor assembly intersects another wall/floor assembly an opening or joint exists that needs to be properly sealed in accordance with a fire resistive joint system. The fire resistive joints occur at the top-of-wall (head-of-wall), bottom-of-wall, floor-to-wall, wall-to-wall, and floor-to-floor conditions.

Fire resistive joint systems are designed to prevent the spread of fire through a linear opening between the two-fire rated wall/floor assemblies. In addition, most joint systems also accommodate movement, compression and/or extension, of the joint.

For fire resistive joint systems, some commonly used firestopping materials include:

- Preformed firestop products such as a firestop top track seal (Hilti CFS-TTS E)
- Flexible, silicone-based firestop sealants (Hilti CP 606)

9.1 EXAMPLE COMPARISON

9.1.1 Correct Installation



Fig 24: Sealant, Hilti CP 606 Mineral wool between sealants (HCH ID:150200)



Fig 25: Sealant applied to wall and ceiling Top of wall joint (HCH ID: 1963319)

9.1.2 Incorrect Installation



Fig 30: Visible gap in sealant application breaching the fire integrity of the system



Fig 31: Inadequate width of the gap between two surfaces to fill it with sealant as per tested system



Fig 32: Head of Wall Joint Width Exceeded Listed System requirements

10. INSPECTION GUIDELINES FOR PERIMETER FIRE BARRIER SYSTEMS

A perimeter fire barrier system is designed to prevent the spread of fire through a linear opening between a fire rated floor assembly and a non-fire rated exterior wall assembly. The continuity requirements of the building codes state that the rating of a floor assembly must extend to and be tight against an exterior wall assembly.

For a perimeter fire barrier system, some of the common firestopping materials used include:

- Silicone based firestop spray (Hilti CFS SP SIL)

10.1 EXAMPLE COMPARISON

10.1.1 Correct Installation



Fig 35: Sealant, Hilti CFS-SP SIL application in Edge of Slab assembly (HCH ID: 113631)



Fig 36: Correct depth of sealant, Hilti CFS-SP SIL (HCH ID: 128903)

10.1.2 Incorrect Installation



Fig 38: Cracked sealant coating due to insufficient width, uneven application etc.

11. APPENDIX

Appendix-A CHECKLIST FOR THROUGH PENETRATIONS

CHECK POINTS	OBSERVATION	COMMENTS
1) Is the hourly fire rating of the referenced firestop system or EJ greater than or equal to the fire rating of the floor/wall assembly being penetrated?	Yes No N/A	
2) Does the floor or wall construction match the floor/wall assembly listed in the firestop system or EJ?	Yes No N/A	
3) Does the penetrating Item(s) match the acceptable list of penetrants (material, size, diameter, insulation type and thickness, etc.) shown in the firestop system or EJ?	Yes No N/A	
4) Does the field installation comply with the following requirements of the referenced firestop system or EJ?	Yes No N/A	
a) Size of opening	Yes No N/A	
b) Minimum and maximum annular space requirements	Yes No N/A	
c) Proper backing material (when required)	Yes No N/A	
d) Proper firestopping product, including type, amount, thickness, orientation, etc.	Yes No N/A	
e) Proper accessories installed, including anchor/fasteners, mounting or cover plates, frames, etc.	Yes No N/A	
f) For multiple penetrants: proper distance between penetrating items	Yes No N/A	
g) For cables: allowable cable size, spacing, bundle size, and percent fill of opening	Yes No N/A	
5) For wall assemblies, verify that the field installation was installed properly on both sides of the wall.	Yes No N/A	

Appendix-B CHECKLIST FOR JOINTS

CHECK POINTS	OBSERVATION	COMMENTS
1) Is the hourly fire rating of the referenced fire resistive joint system or EJ greater than or equal to the fire rating of the floor/wall assembly?	Yes No N/A	
2) Does the floor and/or wall construction match the floor/wall assembly listed in the firestop system or EJ?	Yes No N/A	
3) Is the fire resistive joint system tested for movement required for the assembly? Does it match the required class and type of movement?	Yes No N/A	
4) Does the field installation comply with the following requirements of the referenced fire resistive joint system or EJ?	Yes No N/A	
a) Minimum and/or maximum width of the joint	Yes No N/A	
b) Proper backing material (when required), including proper orientation and compression of backing material	Yes No N/A	
c) Proper firestopping product, including type, amount, thickness, orientation, etc.	Yes No N/A	
d) Proper accessories installed, including anchor/fasteners, mounting or cover plates, frames, etc.	Yes No N/A	
e) For firestop spray products: does the applied firestop spray overlap the adjacent surfaces properly?	Yes No N/A	

Appendix-C

CHECKLIST FOR CURTAIN WALL JOINTS

CHECK POINTS	OBSERVATION	COMMENTS
1) Is the hourly fire rating of the referenced perimeter fire barrier system or EJ greater than or equal to the fire rating of the floor assembly?	Yes No N/A	
2) Does the floor construction and the exterior wall construction match the floor/wall construction listed in the perimeter fire barrier system or EJ?	Yes No N/A	
3) Does the curtain wall construction comply with the following requirements of the referenced perimeter fire barrier system or EJ?	Yes No N/A	
a) Does the system include vision glass (if applicable)?		
b) Proper spacing of mullions and transoms?		
c) Proper mullion coverings (type, thickness, density, etc.)		
d) Proper curtain wall spandrel insulation (type, thickness, density, etc.)		
e) Proper spandrel panel perimeter angles or stiffeners (dimensions, gauge, fastener spacing, etc.)		
4) Does the field installation of the firestopping materials comply with the following requirements of the referenced fire resistive joint system or EJ?	Yes No N/A	
a) Minimum and/or maximum width of the joint		
b) Proper backing material installed including proper orientation, depth, and compression of backing material		
c) Proper firestopping product, including type, amount, thickness, orientation, etc.		
d) Proper accessories installed, including support clips for backing material.		
e) For firestop spray products: does the applied firestop spray overlap the adjacent surfaces properly?		

12. PERFORMANCE OF CONSTRUCTION MATERIALS UNDER FIRE

A perimeter fire barrier system is designed to prevent the spread of fire through a linear opening between a fire rated floor assembly and a non-fire rated exterior wall assembly. The continuity requirements of the building codes state that the rating of a floor assembly must extend to and be tight against an exterior wall assembly.

For a perimeter fire barrier system, some of the common firestopping materials used include:

- Silicone based firestop spray (Hilti CFS SP SIL)

12.1 Mineral wool vs. Insulation

Mineral wool is a key component used in many firestop systems as a backing material for the firestop sealant to be installed against when you have larger annular space.

The reason for its popularity as an ideal firestop backing material is that it does not conduct heat and can resist temperatures over 1,000°C. Since, its density is over three times as compared to fiberglass, so mineral wool offers better acoustic insulation properties. Other materials used on site for insulation purposes like foam etc. usually burn easily and quickly in case of fire, thus are not suitable alternatives to mineral wool. When inspecting firestopping applications, it is imperative that the proper backing material is installed, including the proper orientation and compression, per the listed firestop system.

For the correct installation of Mineral Wool (MW), it needs to be cut perpendicular to the fibers and to assembled along the fibers to allow for the required compression.

12.2 Combustible and Non-Combustible Pipes

Combustible and non-combustible material pipes act in different ways in case of a fire hazard due to the difference in their flammable properties.

Combustible pipes like plastic pipes (PVC), burn away creating a hole/opening in place of the pipe. Combustible pipe penetrations generally require intumescent materials to properly firestop around the penetration and that could be an intumescent sealant or intumescent device such as a firestop collar or firestop cast-in device. Intumescent products consist of materials which rapidly expand when exposed to fire and seals or close the annular space around the combustible pipe as it burns away.

Non-combustible pipe like metallic pipes does not burn. They melt leaving a char or residue behind. For non-combustible pipes, non-intumescent products, such as flexible or elastomeric firestop sealants, are generally sufficient to properly firestop a non-combustible pipe penetration.

Different plastic pipes like PP, PPR have different composition, pipe thickness/schedule (SDR) and will act differently in case of fire. Thus, always refer to a tested UL Firestop System or Engineering Judgment which will identify the appropriate

firestopping products to be installed for the specific application.

12.3 Compatibility with CPVC pipes

Chlorinated polyvinyl chloride (CPVC) is a thermoplastic produced by chlorination of polyvinyl chloride (PVC) resin. CPVC is significantly more flexible than PVC, has greater insulation than that of copper and can also withstand higher temperatures. CPVC is easy to work with, including machining, welding, forming, and offers high corrosion resistance at elevated temperatures. It can be bent, shaped, and welded, making it a better choice for a wide variety of processes and applications. It also has fire-retardant properties.

When firestopping CPVC pipes, care must be taken not to allow the pipe to meet any material that may result in failure. Incorrect sealant may contain phthalates and phosphate esters which can migrate from the sealant and into the CPVC pipe, which can then cause it to weaken, split or crack. Therefore, it is important that the products that are used in conjunction with these CPVC piping systems do not contain any of these components and are chemically compatible.

12.4 Dependency on tested system

The performance of various materials is heavily dependent on sealing of the site system according to the tested one.

- It is important to check the annular gap between penetrants in case of multiple penetration. The gaps should be according to the tested system, otherwise it could result in deviation from the required fire rating.
- System tested for closed pipe cannot be used to create EJs for open pipe and vice-versa. For closed systems, the unexposed side (non-fireside) of the through penetrating item is capped or sealed during the test. The exposed side is always capped or connected whereas the open pipe is not pressurized and is not connected to anything or open to atmosphere at at least one end.
- Application of firestopping material on dampers should be avoided as it can hamper the proper functioning of dampers. If it is not avoidable, approval from damper manufacturers should be attained beforehand.
- Similarly, the tested system should indicate the requirement of firestopping material on retaining angles. (Retaining angles are used to stiffen large ducts preventing it from bending in case of fire).



Hilti Corporation
9494 Schaan, Liechtenstein
P +423-234 2965

www.facebook.com/hiltigroup
www.hilti.group