



Importance of firestop in mission critical facilities

Milan, 8th November 2018

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Introduction

What is firestop and why is it especially important when designing cable runs in critical facilities?

How can firestop affect:

- server contamination from dust during cabling changes?
- spread of airborne disease in a hospital?
- patient recovery time as a result of noise?

What do designers need to understand?

To answer these questions we must first understand some basics...



Fire statistics in Italy



Every year

- 30-50.000 fires
- 152 deaths (in 2012)
- 200 M€ in property damage



A fire department
responds to a fire **every
44 seconds**



More than **6 out of 10**
civilian deaths caused by
fire were due to fires in
buildings

Sources:

Nucleo Investigativo Antincendi Roma, "Gli incendi di natura elettrica", 2017

Corpo Nazionale Vigili del Fuoco, "Statistiche sulle vittime di incendi ed esplosioni", 2012



Why passive fire protection is so important for data centers?

7.000 €/min

**Most non-home fires (78 %) begin with
electronic equipment**

Sources:

Research published by Ponemon institute in Dec 2013
John R Hall report – Issues Mar 2012
National Fire Protection Association (NFPA) Report





Fires in Data Centers



Date	Location	Datacenter
2014	Thailand	Cowboyminers
2014	South Korea	Samsung
2014	Argentina	Iron Mountain
2014	USA	Iowa Legislative Building
2013	USA	NSA Spy Center
2012	Canada	Shaw Data Center



More recent on July 26th

A nearly-complete AWS (Amazon Web Services) data center was on fire for 8 hours.

It was comprised of seven levels, three above and four below ground, where the fire started.

Around 300 workers were on site. 5 men died. 50 people were injured.



Why Smoke & Fire are key concerns?

- **3/4** of all fire deaths are caused by smoke inhalation
- Approximately **57%** of people killed in fires are not in the room of the fire's origin
- 47% of survivors caught in a fire **could not see** more than 3.5 metres.
- Smoke travels **0.6 - 2.2 meters per second** under fire conditions



Sources:

Hall, Jr. John R. NFPA Fire Analysis & Research, Quincy, MA. "Burns, Toxic Gases, and other Hazards".

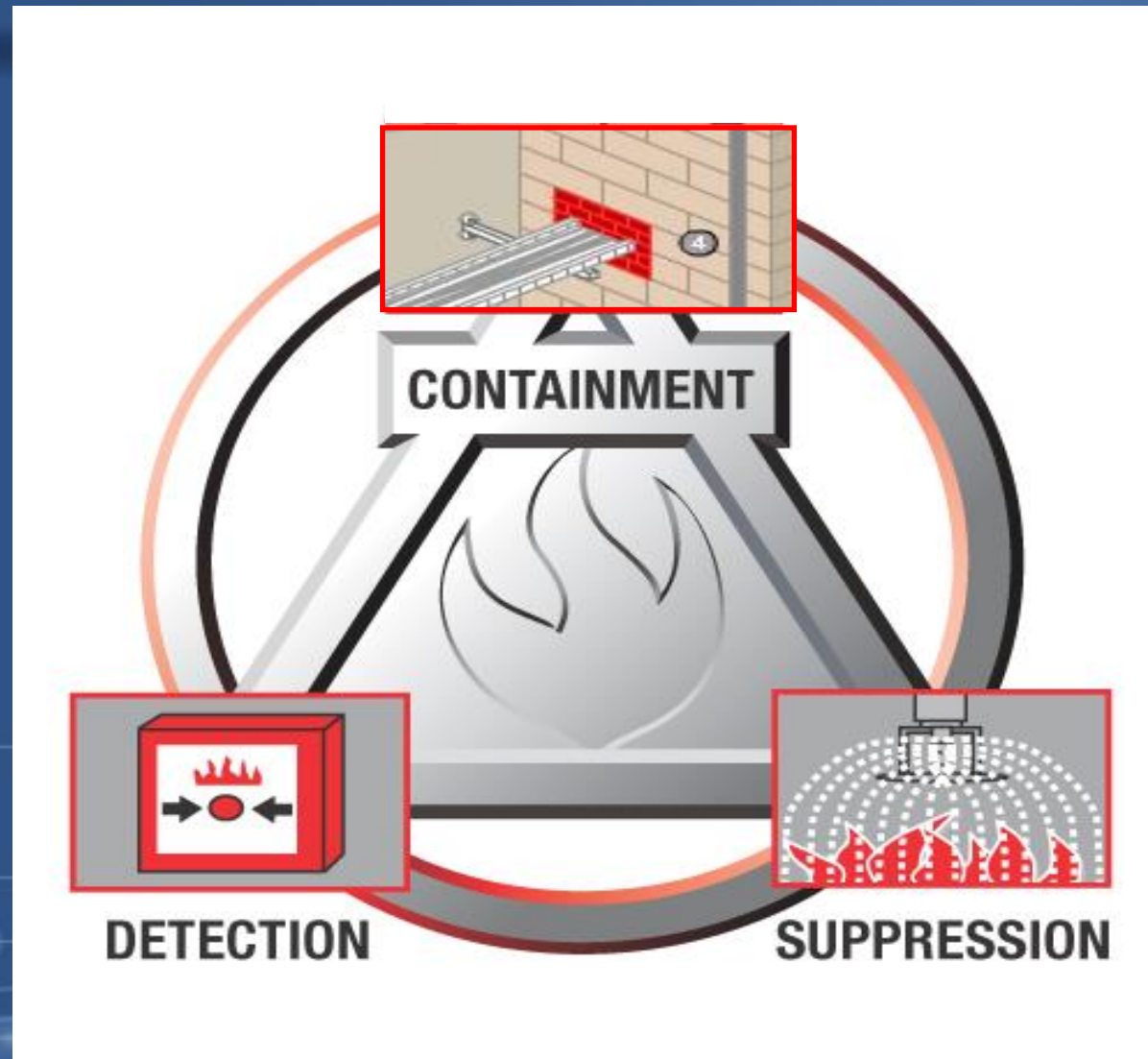
NFPA Fire Protection Handbook, 18th Ed. Table 8-1P. Pg. 8-17

NFPA Fire Protection Handbook, 18th Ed. Table 1-1P. Pg.1-15.

Estimate based upon ceiling jet velocity calculations for typical ceiling heights and heat release rates.



We can't rely on a single action to keep people and assets safe



The balanced approach to Fire Protection

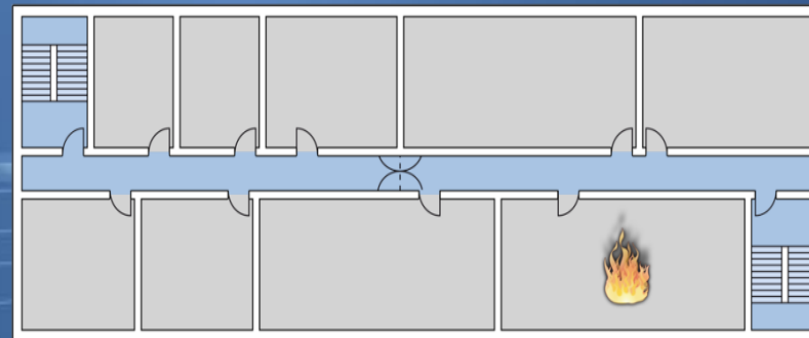
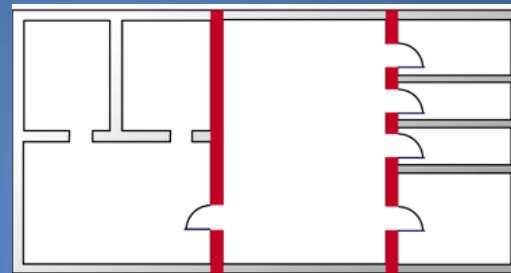


The Elements of Compartmentation

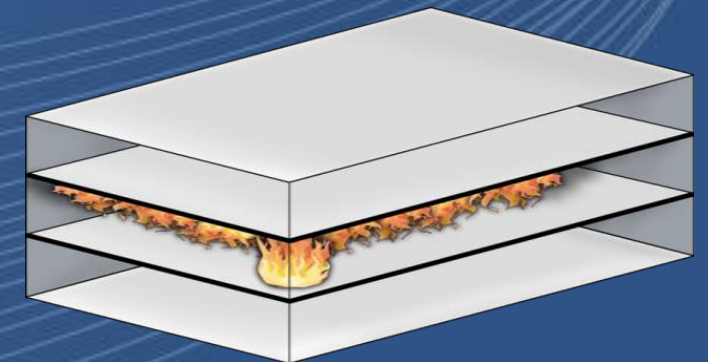
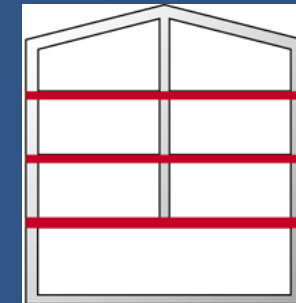
The spread of fire can be restricted by dividing a building into separate compartments with **fire-resistive walls and floors** increasing the availability of escape routes for occupants.

Compartmentation protects **escape routes** such as corridors or stairs.

Fire walls



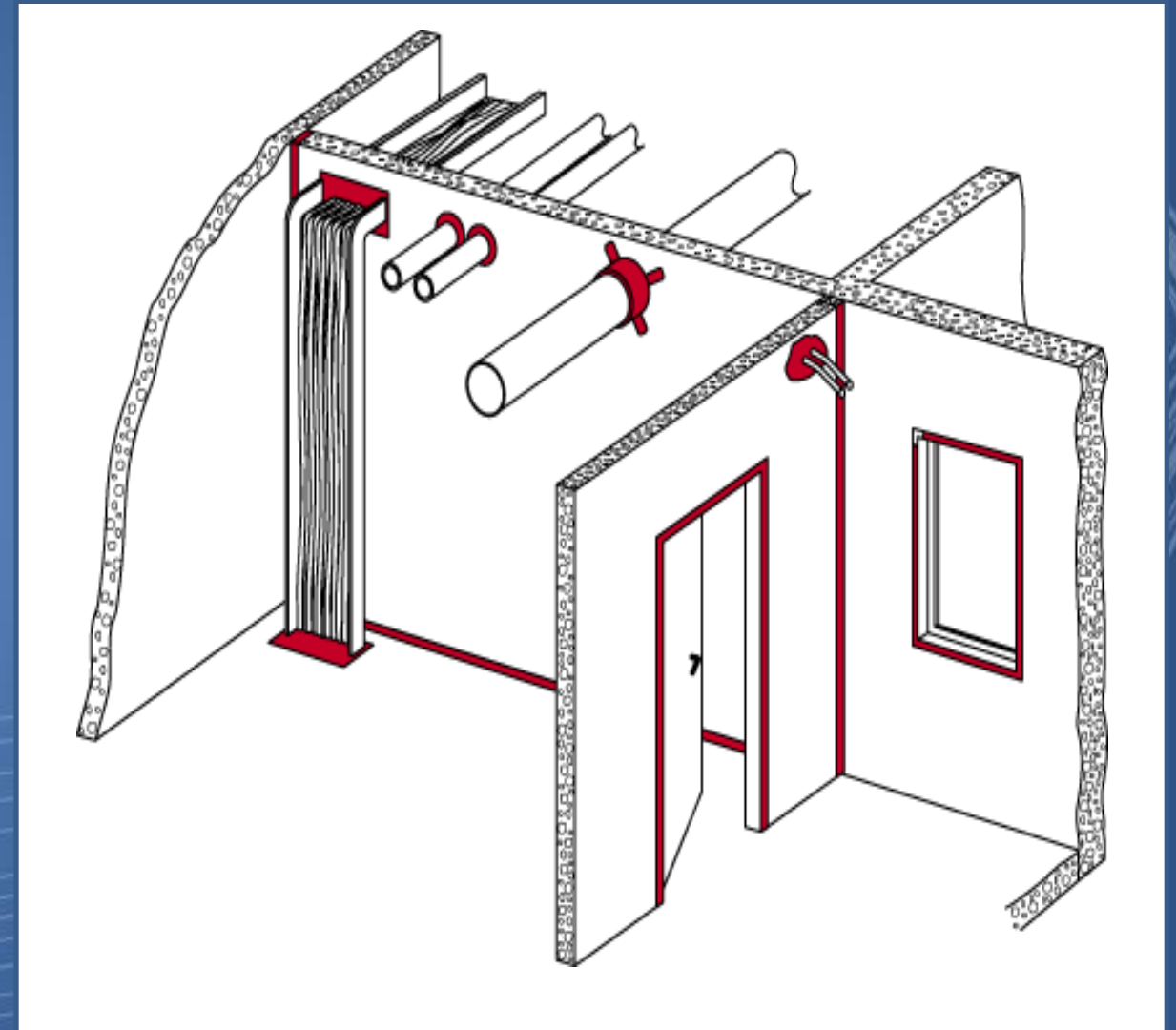
Fire floors





What is Firestop?

- Firestop systems (if installed correctly), help **restore the integrity** of a floor or wall as it is penetrated by an object or joint and resist the spread of smoke and fire.
- Firestop is part of the **life safety plan** in building structures.





Firestop required by codes and building regulations





Codes and standards by location

- Codes in most countries require firestopping to be tested, designed and installed per a **testing standard**.


- Firestop systems are tested according to international standards such as:

Europe: EN 1363, DIN 4102

USA: ASTM E 814 / UL 1479

Canada: CAN/ULC S-115

- A successful test yields an **approval** or firestop listing.



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European technical approval
ETA-11/0153

(English language translation, the original version is in German language)


Handelsbezeichnung Trade name	Hilti Brandschutzkleber CFS-SL Hilti Firestop Sleeve CFS-SL
Zulassungsinhaber Holder of approval	Hilti AG Feldkircherstrasse 100 6854 Schaan Liechtenstein
Zulassungsgegenstand und Verwendungszweck	Abschottung Penetration seal
Generische type and use of construction product	
Geltungsdauer vom Validity from	28.06.2013
bis to	27.06.2018
Hersteller Manufacturing plant	Hilti Werk 14

Diese Europäische technische Zulassung umfasst
 This European technical approval contains


14 Seiten inklusive 3 Anhängen
 14 pages including 3 Annexes

Diese Europäische technische Zulassung ersetzt
 This European technical approval replaces

ETA-11/0153 mit Geltungsdauer von 06.06.2011 bis
 05.06.2016
 ETA-11/0153 with validity from 06.06.2011 to 05.06.2016


 European Organisation for Technical Approvals
 Organisation Européenne pour l'Attestation Technique

Page 14 of the European technical approval ETA-11/0153, with validity from 28.06.2013 to 27.06.2018, replaces ETA-11/0153, with validity from 06.06.2011 to 05.06.2016

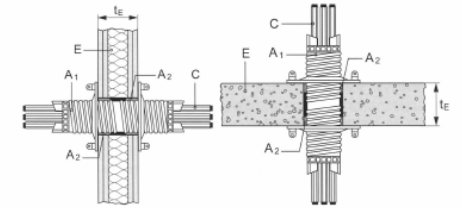

 Member of EOTA

ANNEX C
RESISTANCE TO FIRE CLASSIFICATION OF PENETRATIONS SEALS MADE FROM HILTI FIRE-STOP SLEEVE CFS-SL

Flexible and rigid walls and rigid floors according to 1.2.1

Penetration seal:
 Hilti Firestop Sleeve CFS-SL (A₁) centred in the wall and fixed by means of two flanges delivered together with the sleeve. Hilti Firestop Acrylic Sealant CFS-S ACR is used to seal the gap between opening edge and sleeve (A₂). Opening size: CFS-SL S between 63 - 73 mm, CFS-SL M and CFS-SL L between 113 - 122 mm diameters.


Construction details:



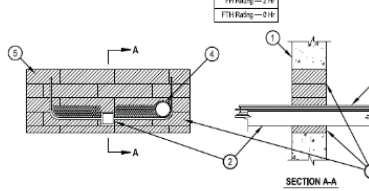
Penetrating services	Classification			
	CFS-SL S		CFS-SL M / L	
	Wall	Floor	Wall	Floor
All sheathed cable types currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables with a diameter of:				
C.1 Maximum Ø 21 mm	EI 60	EI 120	EI 120	EI 120
C.2 Maximum Ø 50 mm	-	-	EI 90	EI 120
C.3 Maximum Ø 80 mm	-	-	EI 60	EI 60
C.4 Tied cable bundle, maximum diameter of 36 mm, maximum diameter of single cable 21 mm	EI 60	EI 120	-	-
C.5 Tied cable bundle, maximum diameter of 86 mm, maximum diameter of single cable 21 mm	-	-	EI 90	EI 120
C.6 Blank seal (no services penetrating)	EI 60	EI 120 ¹⁾	EI 120 ²⁾	EI 120 ³⁾

¹⁾ If cables are added later on only cables with a diameter < 21 mm (C.1) or a tied cable bundle according to C.4 may be added if the required classification is EI 120.
²⁾ If cables are added later on only cables with a diameter < 21 mm (C.1) may be added if the required classification is EI 120.
 If the seal is used in a wall with a requirement of EI 90 cables with a diameter < 50 mm (C.2) or a tied cable bundle according to C.5 may be added later on. If the seal is used in a wall with a requirement of EI 60 or EI 30 cables with a diameter ≤ 80 mm (C.3) or a tied cable bundle according to C.5 may be added later on.
³⁾ If cables are added later on only cables with a diameter ≤ 50 mm (C.2) or a tied cable bundle according to C.5 may be added if the required classification is EI 120 or EI 90.
 If the seal is used in a floor with a requirement of EI 60, EI 45 or EI 30 cables with a diameter ≤ 80 mm (C.3) or a tied cable bundle according to C.5 may be added later on.

OIB 280-004/09-343


 System No. W-J-4016

ANSI/UL 4710 (2013)	CAN/ULC S-115
F Rating—2-H	F Rating—2-H
T Rating—2-H	T Rating—2-H
F Rating—2-H	F Rating—2-H
T Rating—2-H	T Rating—2-H



SECTION A-A

1. Wall Assembly—18 in. (457 mm) thick reinforced (lightweight or normal weight) (105/150 and/or 100/240 lb/ft³) concrete. Wall may also be constructed of any UL Classified Concrete Block*. Max area of opening is 20 in. x 20 in. (508 mm x 508 mm).
 Use Concrete Block (CAZ) category in the Test Reference Directory for names of manufacturers.
 2. Cable Tray—Max 18 in. (457 mm) wide by 18 in. (457 mm) deep "open" cable tray. The 18 in. (457 mm) wide by 24 in. (609 mm) deep "closed" cable tray formed of 16 (1.27 in. (32 mm) thick aluminum. The 18 in. (457 mm) deep "U" shaped trays spaced 6 in. (152 mm) OC formed from 12 in. (305 mm) by 12 in. (305 mm) reinforced aluminum flange. One cable tray to be installed in the opening. The similar space between the cable tray and cables to the periphery of the opening shall be 1 in. (25 mm) to 4-1/2 in. (114 mm) max. Cable tray to be rigidly supported on both sides of wall assembly.



Steps in fire test procedure



1. Assembly is placed on furnace.



2. Assembly is exposed to fire test.



3. Assembly is subjected to hose stream test (if required)



4. Assembly results after hose stream.



Intertek






Bicsi



Officially approved systems

The **ETA** (European Technical Assessment) is the official document granted to a manufacturer based on third-party tests.



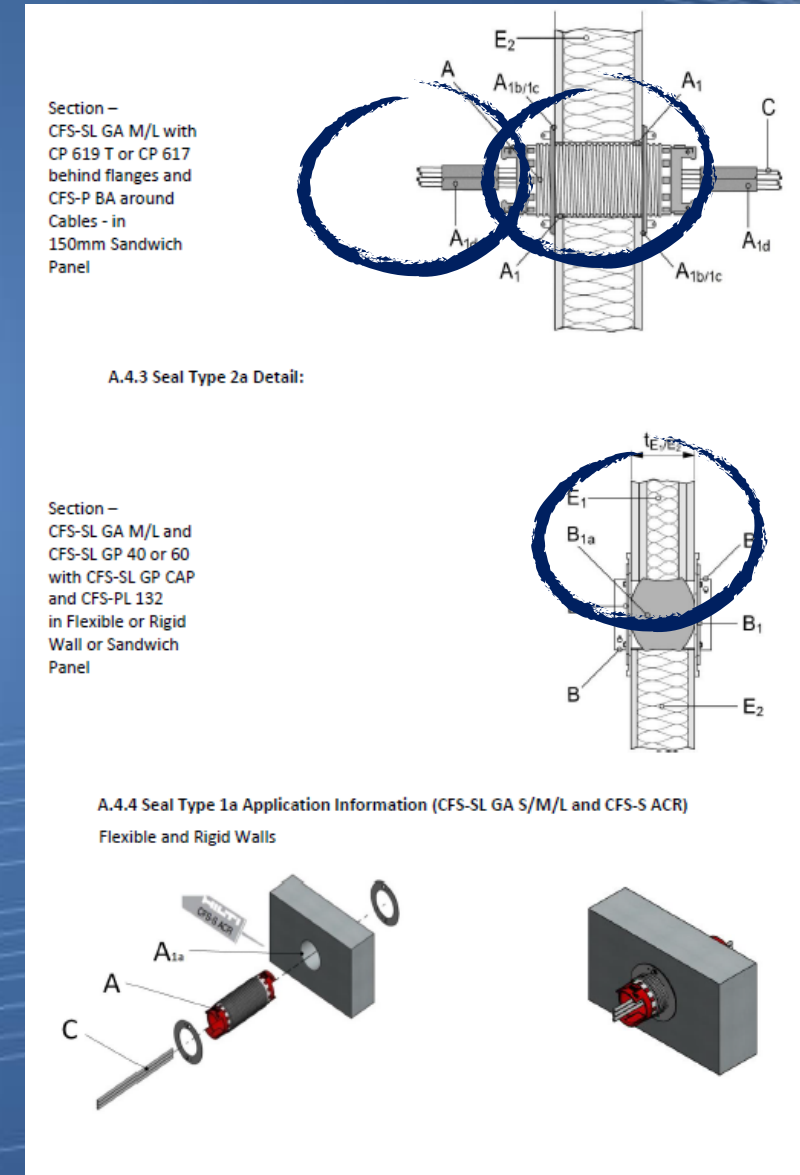
 <small>UL INTERNATIONAL (UK) LTD Wonersh House, Building C, The Guildway, Old Portsmouth Road, Guildford, GU3 1LR, United Kingdom.</small>	 <small>designated according to Article 29 of Regulation (EU) No 305/2011</small>	<small>Member of</small>  <small>www.eota.eu</small>
<small>designated according to Article 29 of the Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment, www.eota.eu)</small>		
European Technical Assessment	ETA 17/0081 of 08/08/2018	
<small>Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:</small>		
UL International (UK) Ltd		
<small>Trade name of the construction product</small>	Hilti Firestop Sleeve CFS-SL GA	
<small>Product family to which the construction product belongs</small>	Fire Stopping and Sealing Product: • Penetration Seals	
<small>Manufacturer</small>	Hilti AG, Feldkircherstrasse 100 FL-9494 Schaan Liechtenstein Internet: www.hilti.com	
<small>Manufacturing plant(s)</small>	HILTI plant 14	
<small>This European Technical Assessment contains</small>	24 Pages including 3 Annexes which form an integral part of this Assessment.	
<small>This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of</small>	EAD 350454-00-1104, September 2017	
<small>This version replaces</small>	ETA 17/0081, Dated 21/06/2017	
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ETA 17/0081 of 08/08/2018		



Officially approved systems

It contains the **field of application** consisting of:

1. Base material (a fire-rated wall or floor assembly)
2. A penetrating item or items passing through an opening in the assembly
3. The materials designed to help prevent the spread of fire through the openings.





What is the average hourly rating of any firestop product?

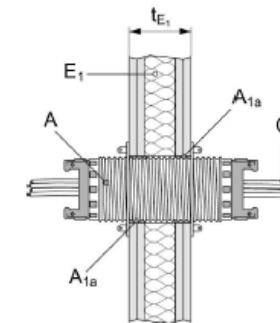


Seal Type Variation	Seal Detail	Ancillary product		
		Wall	100mm Sandwich Panel	150mm Sandwich Panel
1a	Single Devices	CFS-S ACR	-	-
1b	Single Devices	-	-	CP 619 T or CP 617. And CFS-P BA
2a	Ganged Devices	CFS-SL GP 40 or 60, CFS-SL GP CAP & CFS-PL 132		

A.4.1 Seal Type 1a Detail:

Section –
CFS-SL GA S/M/L
and CFS-S ACR
in Flexible or Rigid
Wall

Recommended A_{1a}
(CFS-S ACR) installed
to 25mm depth into
wall



ZERO

Only Firestop Systems
have ratings!



How do you address this application?



Not all firestop applications are tested
What if the site condition deviates from tested design?



In absence of tested system: Engineering Judgements

- Based upon **interpolations of previously tested** firestop systems (referenced on the form)
- Limited only to the specific conditions upon which it was rendered.
- Site specific; **Not transferrable**
- If no related testing data available, the EJ is unlikely.




Typical Engineering Judgment Conditions:

- Annular space larger/smaller than tested
- Irregular hole shape
- Hole shape different than tested...

ENGINEERING JUDGMENT FIRESTOP DETAIL			
PROJECT : TORRE ATRIO BOGOTA			
CONTRACTOR : PERMASTEELISA			
F-RATING = 2-HR. (SEE NOTE NO. 2 BELOW)			
CROSS-SECTIONAL VIEW			
<p>1. SPANDREL GLASS AND ALUMINUM MULLION CURTAIN WALL ASSEMBLY (NON FIRE-RATED).</p> <p>2. CONCRETE FLOOR ASSEMBLY (MINIMUM 6" THICK) (2-HR. FIRE-RATING).</p> <p>3. MINIMUM 2" THICK FOIL FACED CURTAIN WALL INSULATION (MINERAL WOOL MIN. 8 PCF DENSITY) SECURELY ATTACHED TO FRAMING MEMBERS PER METHODS DESCRIBED IN ANY UL OR INTERTEK APPROVED PERIMETER JOINT SYSTEM. CURTAIN WALL INSULATION TO COMPLETELY FILL SPANDREL AT FLOOR LEVEL AND COVER VERTICAL MULLIONS.</p> <p>4. STEEL BACK PAN.</p> <p>5. MINIMUM 4" THICKNESS MINERAL WOOL SAFING (MIN. 4 PCF DENSITY) COMPRESSED 33%, FLUSH WITH TOP SURFACE OF FLOOR ASSEMBLY.</p> <p>6. MINIMUM 1/8" (WET) THICKNESS HILTI CFS-SP WB FIRESTOP JOINT SPRAY OR MINIMUM 2mm (WET) THICKNESS HILTI CFS-SP SIL FIRESTOP SILICONE JOINT SPRAY TO COMPLETELY COVER MINERAL WOOL, OVERLAPPING MINIMUM 1/2" ONTO CONCRETE FLOOR AND CURTAIN WALL.</p>			
<p>NOTES : 1. MAXIMUM WIDTH OF JOINT = 8".</p> <p>2. FIRE-RATING OF ASSEMBLY IS DEPENDENT UPON THE PERFORMANCE OF CURTAIN WALL ASSEMBLY UNDER FIRE CONDITIONS.</p>			
<p>THIS ENGINEERING JUDGMENT REPRESENTS A FIRESTOP SYSTEM THAT WOULD BE EXPECTED TO PASS THE STATED RATINGS IF TESTED. (REFERENCE : INTERTEK SYSTEM NO. HUBPF 120-09 & CEJ 127 P)</p>			
<p>HilTI Firestop Systems</p>	<p>HILTI, Inc. Plano, Texas USA (800) 879-8000</p> <p>Designed by <i>Matthew D. Baker</i> CFP</p>	<p>Sheet 1 of 1</p> <p>Scale 5/32" = 1"</p> <p>Date Jan. 10, 2017</p>	<p>Drawing No. 250070a</p>
<p>Saving Lives through Innovation and Education</p>			



Airflow mitigation

Data	Power	Cooling	Other
Data Cabling	Electric Cabling	Piping/Ducts	Fire, Gas Suppression
			Emergency Lighting
Highest risk			Access & Security Control Cabling

- ✓ Creates largest volume of openings through wall and floor assemblies
- ✓ Present unique challenge due to continuous **cable re-penetration**



Cable Re-penetration increases risks to people and assets

O



Pre-engineered firestop eliminates the risk of human error

New construction



- Traditional systems are also the most often **incorrectly installed**
- **Inspection failures** are common yet don't catch all incorrect installations

Renovation



- When repenetrating, there is lack of coordination resulting in **wide-open penetrations**
- **Higher risks** to fire protection
- Increase **energy costs**

Solution



- Cable pathway devices **reduce risk**
- **Correct firestop**, built in
- Easy to **repenetrate**, accommodates future cables



Solutions should fit application needs

Performance Requirements

✓ Minimum Code compliance for firestop system rating

- ✓ Ensure life safety and property loss prevention
- ✓ Correct installation
- ✓ Re-penetrability (MAC work)
- ✓ Ease of inspection
- ✓ Prevent airborne disease transmission
- ✓ Prevent dust contamination
- ✓ Room pressurization
- ✓ Reduce cooling and heating costs



Solution

Traditional Firestop System
(generates dust and greater potential to human error)

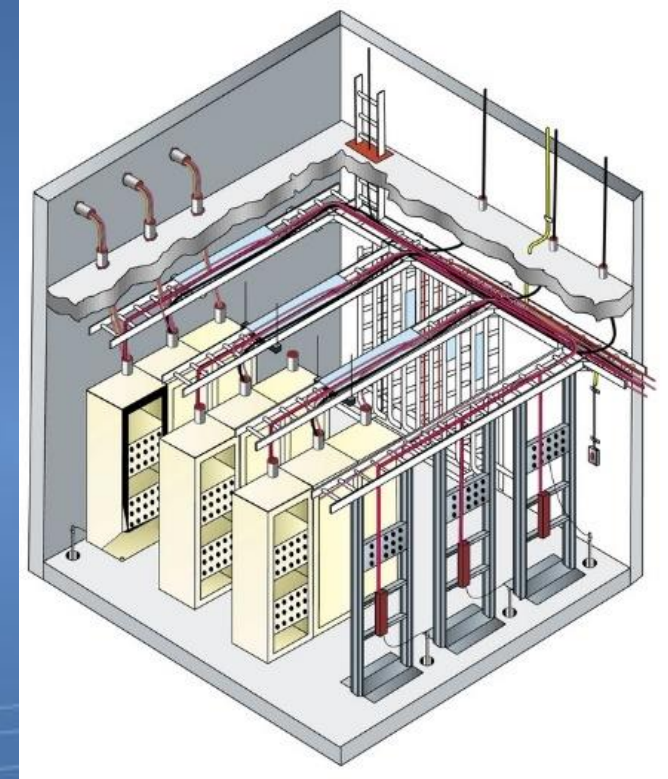
Pre-formed firestop system
(fiber-free for easy cable changes)

Bicsi



Clearly convey your design intent

- Mandate cable pathway devices in **Master specs**
- **Draw** cable pathways devices on Datacom or Telecom details
- Carry out installation with **Hilti Documentation Manager** for easy life during inspection



System No. C-AJ-3284			
ANSI/UL1479 (ASTM E814)		CANULC S115	
F Rating — 3 Hr		F Rating — 3 Hr	
T Rating — 1/2 Hr		FT Rating — 1/2 Hr	
L Rating At Ambient — Less Than 1 CFM (See Item 2)		FH Rating — 3 Hr	
L Rating At 400 F — Less Than 1 CFM (See Item 2)		FTH Rating — 1/2 Hr	
		L Rating At Ambient — Less Than 1 CFM (See Item 2)	
		L Rating At 400 F — Less Than 1 CFM (See Item 2)	

1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Floor may also be constructed of any min 6 in. thick UL Classified hollow-core Precast Concrete Units*. Opening in floor or wall to be max 3 in. (76 mm) diam for 2" device and max 5 in. (127 mm) diam for 4" device. See Concrete Blocks (CAZT) and Precast Concrete Units (CFTV) categories in the Fire Resistance Directory for names of manufacturers.

2. Cables — Within the loading area for each firestop device, the cables may represent a 0 to 100 percent visual fill. Cables to be tightly bundled within the device and rigidly supported on both sides of floor or wall assembly. Any combination of the following types of cables may be used:

A. Max 100 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) jacketing and insulation.

B. Max 7/C No. 12 AWG copper conductor control cable with PVC or XLPE jacket and insulation.

C. Max 4/0 AWG Type RHH ground cable.

D. Max 4 pr No. 22 AWG Cat 6 computer cables.

E. Max RG 6/U coaxial cable with fluorinated ethylene insulation and jacketing.

F. Fiber optic cable with polyvinyl chloride (PVC) or polyethylene (PE) jacket and insulation having a max diam of 1/2 in. (13 mm).

G. Max 20/C No. 22 AWG shielded printer cable with PVC jacket.

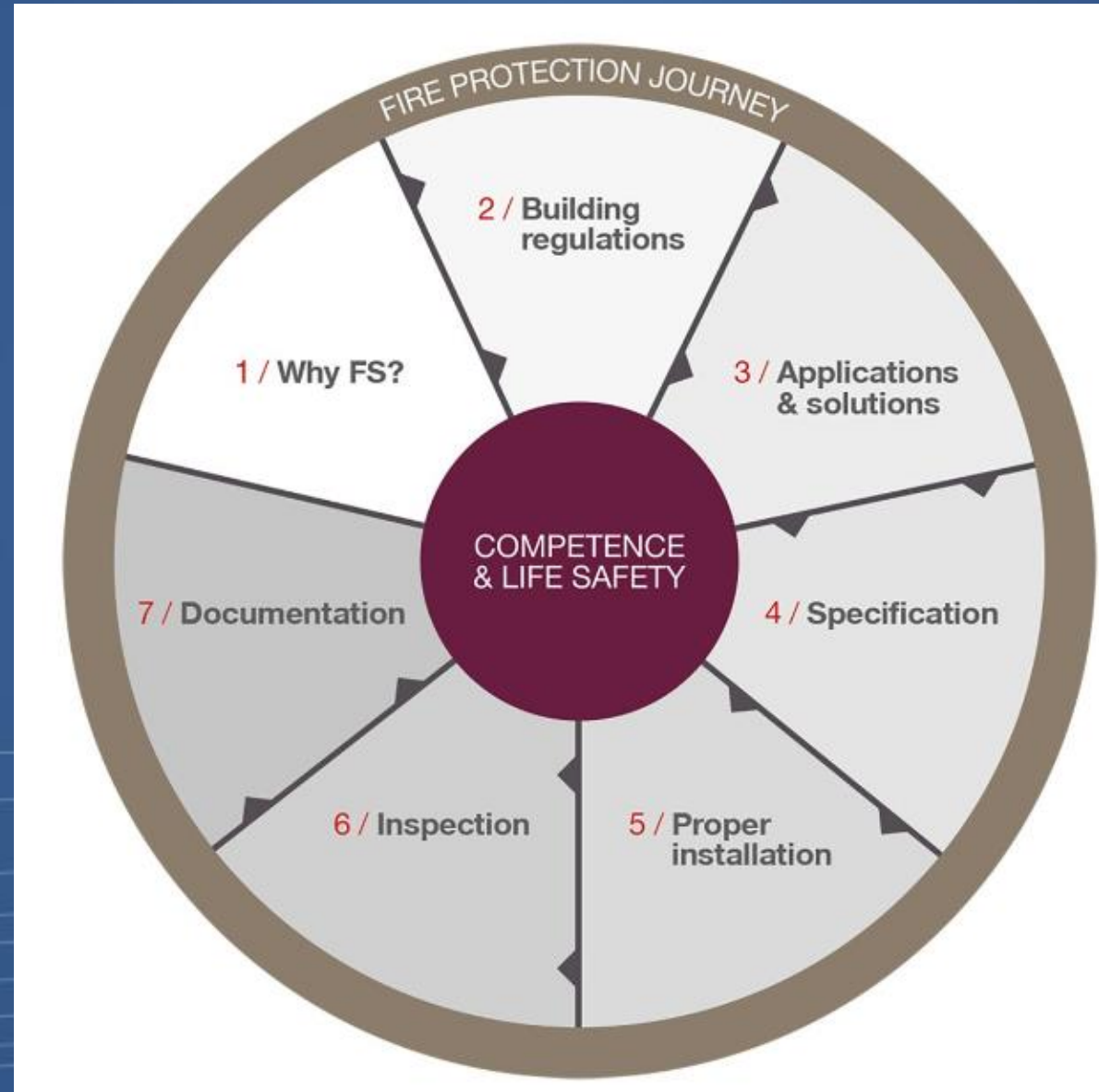
H. Through-Penetrating Product* - Two copper conductors No. 18 AWG (or smaller) Power or Non Power Limited Fire Alarm Cable with or without a jacket under a metal armor.

I. Max 1/4 in. (6 mm) diameter S-Video Cable consisting of 2 max 24 AWG 75 ohm coax or twisted pair cable with PE insulation and PVC jacket.

AFC CABLE SYSTEMS INC.



The firestop journey





3 things to remember

- **Fire & Smoke** are devastating occurrence that happen more often than we think
- Designers should consider maintenance and **future cable capacity**
- Reach out to us for **support!**



Thank you

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Bicsi