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# European Technical Assessment

**ETA-13/0099**  
of 28.12.2021

General part

**Technical Assessment Body issuing the European Technical Assessment**

Österreichisches Institut für Bautechnik (OIB)  
Austrian Institute of Construction Engineering

**Trade name of the construction product**

Hilti Firestop Block CFS-BL

**Product family to which the construction product belongs**

Fire Stopping and Fire Sealing Products:  
Penetration Seals

**Manufacturer**

Hilti AG  
Feldkircherstrasse 100  
9494 Schaan  
LIECHTENSTEIN

**Manufacturing plant**

Hilti production plant 4a

**This European Technical Assessment contains**

32 pages including Annexes A to D which form an integral part of this assessment.

**This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of**

European Assessment Document  
EAD 350454-00-1104 "Fire stopping and fire sealing products - Penetration seals"

**This European Technical Assessment replaces**

European Technical Assessment ETA-13/0099 from to 01.10.2018

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Specific parts

**1 Technical description of the product**

“Hilti Firestop Block CFS-BL” is used as a mixed penetration seal together with “Hilti Firestop Filler CFS-FIL” and in some cases with “Hilti Firestop Putty Bandage CFS-P BA” or with “Hilti Firestop Bandage CFS-B”.

Components	Characteristics
Hilti Firestop Block CFS-BL	Brick-shaped block based on a pre-cured, pre-formed PU-based firestop material according to Annex B.1 of the ETA.
Hilti Firestop Filler Mastic CFS-FIL	Acrylic based firestop filler mastic according to Annex B.2 of the ETA.
Hilti Firestop Putty Bandage CFS-P BA	Putty according to Annex B.3 of the ETA.
Hilti Firestop Bandage CFS-B	Graphite based pipe wrap according to Annex B.4 of the ETA.

Additional Components	Characteristics
Hilti Firestop Coating CFS-CT	Additional protection for penetration seals for waveguides according to Annex B.5 of the ETA

**2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)**

**2.1 Intended use**

“Hilti Firestop Block CFS-BL” is intended to be used as a mixed penetration seal to temporarily or permanently reinstate the fire resistance performance of flexible wall constructions, rigid wall constructions and rigid floor constructions where they have been provided with apertures, which are penetrated, by various cables, conduits, metal pipes, plastic pipes and multi-layer composite pipes.

The maximum opening size of the penetration seal in wall constructions is 1000 x 1000 mm, in floor constructions 1000 x 700 mm. For more details, see Annex C of the ETA.

“Hilti Firestop Block CFS-BL” was also tested in a sandwich panel construction.

“Hilti Firestop Block CFS-BL” can only be used as penetration seal for cables, metal pipes, plastic pipes or for mixed penetration (combination). Further details are given in Annex C of the ETA. Other parts or service support constructions shall not penetrate the penetration seal.

“Hilti Firestop Block CFS-BL” can be installed only in types of separating elements as specified in following table. For further details, see Annex C of the ETA.

Separating element	Construction	Maximum opening size of the penetration seal (width x height)
Flexible walls	<ul style="list-style-type: none"> <li>&gt; Steel studs or timber studs lined on both faces with minimum 2 layers of boards (minimum thickness 12,5 mm) according to EN 520 type F</li> <li>&gt; For timber studs walls there must be a minimum distance of 100 mm of the penetration seal to any timber stud. The cavity between the penetration seal and stud has to be closed with minimum of 100 mm of insulation with classification A1 or A2 according to EN 13501-1</li> <li>&gt; Minimum thickness 100 mm</li> </ul>	<p>1000 x 1000 mm For details see Annex C of the ETA</p>
Sandwich panel wall	<ul style="list-style-type: none"> <li>&gt; Paroc® line 200 AST® F+</li> <li>&gt; Internal sheet made of polyethylene (PE) coated zincified steel with sheet thickness of 0,5 mm and coating thickness of 25 µm</li> <li>&gt; Stone wool core with a thickness of 99 mm and a density of 115 kg/m<sup>3</sup></li> <li>&gt; External sheet made of polyethylene (PE) coated zincified steel with sheet thickness of 0,5 mm and coating thickness of 25 µm</li> <li>&gt; Minimum thickness 100 mm</li> <li>&gt; Reaction to fire classification A2-s1,d0</li> </ul>	<p>1000 x 1000 mm For details see Annex C of the ETA</p>
Rigid walls	<ul style="list-style-type: none"> <li>&gt; Aerated concrete, concrete, masonry</li> <li>&gt; Minimum density 450 kg/m<sup>3</sup></li> <li>&gt; Minimum thickness 100 mm</li> <li>&gt; The rigid wall shall be classified in accordance with EN 13501-2 for the required fire resistance period</li> </ul>	<p>1000 x 1000 mm For details see Annex C of the ETA</p>
Rigid floors	<ul style="list-style-type: none"> <li>&gt; Aerated concrete, concrete</li> <li>&gt; Minimum density 450 kg/m<sup>3</sup></li> <li>&gt; Minimum thickness 150 mm</li> <li>&gt; The rigid floor shall be classified in accordance with EN 13501-2 for the required fire resistance period</li> </ul>	<p>1000 x 700 mm For details see Annex C of the ETA</p>

## 2.2 Use conditions

“Hilti Firestop Block CFS-BL” is intended for use at temperatures below 0°C with exposure to UV, but with no exposure to rain and can therefore – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Y<sub>1</sub>. Since the requirements for Type Y<sub>1</sub> are met, also the requirements for Type Y<sub>2</sub>, Z<sub>1</sub> and Z<sub>2</sub> are fulfilled.

## 2.3 Working life

The provisions made in this European Technical Assessment are based on an assumed working life of “Hilti Firestop Block CFS-BL” of 25 years, provided the conditions laid down in the technical literature of the manufacturer relating to packaging, transport, storage, installation, use and repair are met.

The indications given on the intended working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, but are to be regarded only as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

The real working life might be, in normal use conditions, considerably longer without major degradation affecting the Basic requirements for construction works.

## 2.4 General assumptions

### 2.4.1 It is assumed that

- > damages to the penetration seal are repaired accordingly,
- > the installation of the penetration seal does not affect the stability of the adjacent building element – even in case of fire,
- > the lintel or floor above the penetration seal is designed structurally and in terms of fire protection such that no additional mechanical load (other than its own weight) is imposed on the penetration seal,
- > the installations are fixed to the adjacent building element in accordance with the relevant regulations in such a way that, in case of fire, no additional mechanical load is imposed to the penetration seal,
- > the support of the installations is maintained for the required period of fire resistance,
- > pneumatic dispatch systems, compressed air systems, etc. are switched off by additional means in case of fire and
- > the support of the installations is maintained for the required period of fire resistance.

2.4.2 This European Technical Assessment does not address any risks associated with the emission of dangerous liquids or gases caused by failure of the pipe(s) in case of fire nor does it prove the prevention of the transmission of fire through heat transfer via the medium in the pipes.

2.4.3 This European Technical Assessment does not verify the prevention of destruction of adjacent building elements with fire separating function or of the pipes themselves due to distortion forces caused by extreme temperatures. These risks shall be accounted for by taking appropriate measures when designing or installing the works.

2.4.4 The risk of downward spread of fire caused by burning material which drips through a pipe to floors below, is not considered in this European Technical Assessment (see EN 1366-3:2009, clause 1).

2.4.5 The durability assessment does not take into account the possible effect of the penetration seal of substances permeating through the pipe walls.

2.4.6 The assessment does not cover the avoidance of destruction of the penetration seal or the adjacent building element(s) by forces caused by temperature changes in case of fire. This has to be considered when designing the piping system.

## 2.5 Manufacturing

The European Technical Assessment is issued for the product on the basis of agreed data / information, deposited with the Österreichisches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data / information being incorrect, should be notified to the Österreichisches Institut für Bautechnik before the changes are introduced.

The Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European Technical Assessment and consequently the validity of the CE marking on the basis of the European Technical Assessment and if so whether further assessment or alterations to the European Technical Assessment, shall be necessary.

**3 Performance of the product and references to the methods used for its assessment**

Basic requirements for construction works	Essential characteristic	Method of verification	Performance
<b>BWR 2</b>	Reaction to fire	EN 13501-1:2007+A1:2009	Clause 3.1.1 of the ETA
	Resistance to fire	EN 13501-2:2007+A1:2009	Clause 3.1.2 and Annex C.1 to C.6 of the ETA
<b>BWR 3</b>	Air permeability	EN 1026:2000	Clause 3.2.1 of the ETA
	Water permeability	No performance assessed	
	Content, emission and/or release of dangerous substances	EN 16516:2020	Clause 3.2.3 of the ETA
<b>BWR 4</b>	Mechanical resistance and stability	No performance assessed	
	Resistance to impact / movement	No performance assessed	
	Adhesion	No performance assessed	
	Durability	EAD 350454-00-1104 clause 2.2.9.3.1	Clause 3.3.4 of the ETA
<b>BWR 5</b>	Airborne sound insulation	EN ISO 10140-1 and EN ISO 10140-2, EN ISO 717-1	Clause 3.4.1 of the ETA
<b>BWR 6</b>	Thermal properties	EN 12667:2001	Clause 3.5.1 of the ETA
	Water vapour permeability	No performance assessed	

**3.1 Safety in case of fire (BWR 2)**

**3.1.1 Reaction to fire**

The components of “Hilti Firestop Block CFS-BL” were assessed according to EAD 350454-00-1104 clause 2.2.1 and classified according to EN 13501-1:2007+A1:2009.

Component	Class according to EN 13501-1:2007+A1:2009
Hilti Firestop Block CFS-BL	<b>E</b>
Hilti Firestop Filler CFS-FIL	<b>E</b>
Hilti Firestop Putty Bandage CFS-P BA	<b>E</b>
Hilti Firestop Bandage CFS-B	<b>E</b>

3.1.2 Resistance to fire

“Hilti Firestop Block CFS-BL” was tested according to EAD 350454-00-1104 clause 2.2.2, EN 1363-1 and EN 1366-3:2009.

Based upon the gained test results and the field of application specified within EN 1363-1 and EN 1366-3:2009 the penetration seal “Hilti Firestop Block CFS-BL” has been classified according to EN 13501-2:2007+A1:2009. The individual fire resistance classes are listed in Annex C.1 to C.5 of the ETA.

The maximum fire resistance class of the penetration seal in vertical or horizontal separating element depends on the fire resistance class of the penetrating elements. The fire resistance class of the penetration seal is reduced to the fire resistance class of the penetrating element with the lowest fire resistance classification.

3.2 Hygiene, health and the environment (BWR 3)

3.2.1 Air permeability

The air permeability of “Hilti Firestop Block CFS-BL” was tested as blank penetration seal in an opening of 598 mm x 248 mm according to EAD 350454-00-1104 2 clause 2.2.3 by applying the test principles of EN 1026. The blocks were mounted in cross-wise, and length-wise orientation. “Hilti Firestop Filler CFS-FIL” was applied between the wall and the “Hilti Firestop Blocks CFS-BL”.

Pressure [Pa]	50	250	300	450	600
q/A air [m <sup>3</sup> /(h·m <sup>2</sup> )]	Cross-wise: impermeable				
q/A air [m <sup>3</sup> /(h·m <sup>2</sup> )]	Length-wise: impermeable				

3.2.2 Water permeability

No performance assessed.

3.2.3 Content, emission and/or release of dangerous substances

The content of semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC) in “Hilti Firestop Block CFS-BL” was assessed according to EN 16516. The loading factor for emission testing was 0,007 m<sup>2</sup>/m<sup>3</sup> according to EAD 350454-00-1104.

The concentration of SVOC has been below 0,005 mg/m<sup>3</sup> after 3 and after 28 days. The concentration of total emission of VOC after 3 days was 0,049 mg/m<sup>3</sup>, after 28 days the concentration was 0,009 mg/m<sup>3</sup>.

3.3 Safety and accessibility in use (BWR 4)

3.3.1 Mechanical resistance and stability

No performance assessed.

3.3.2 Resistance to impact / movement

No performance assessed.

Provisions shall be taken to prevent a person from stepping onto a horizontal penetration seal or falling against a vertical penetration seal (e.g. by covering with a wire mesh).

3.3.3 Adhesion

No performance assessed.

3.3.4 Durability

All components of “Hilti Firestop Block CFS-BL” fulfil the requirements for the intended use condition.

“Hilti Firestop Block CFS-BL” is therefore appropriate for conditions at temperatures below 0°C with exposure to UV, but with no exposure to rain and can – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Y<sub>1</sub>. Since the requirements for Type Y<sub>1</sub> are met, also the requirements for Type Y<sub>2</sub>, Z<sub>1</sub> and Z<sub>2</sub> are fulfilled.

### 3.4 Protection against noise (BWR 5)

#### 3.4.1 Airborne sound insulation

The airborne sound insulation of “Hilti Firestop Block CFS-BL” was tested according to EN ISO 10140-1 and EN ISO 10140-2. The rating of the sound insulation properties has been calculated in accordance with EN ISO 717-1.

The acoustic testing was performed in a flexible wall element. The wall element was constructed from 92 mm wide metal (0,36 mm thick galvanised steel) studs spaced at 610 mm centres. The wall was clad on each side with a double layer of 16 mm thick gypsum wallboard and filled with 100 mm thick “Thermafibre” mineral wool insulation. An additional beading of 12 mm fibre cement board was applied onto the exposed side. The wall element had an area of 6,8 m<sup>2</sup>. An opening of 597 x 292 mm (w x h) was filled with “Hilti Firestop Block CFS-BL” and tested as a blank penetration seal.

The reached values for the airborne sound insulation in accordance with EN ISO 717-1:1996+A1:2006 are as follows:

Component	R <sub>w</sub> (C; C <sub>tr</sub> ) [dB]
Hilti Firestop Block CFS-BL	52 (-2;-7)

### 3.5 Energy economy and heat retention (BWR 6)

#### 3.5.1 Thermal properties

The thermal properties of “Hilti Firestop Block CFS-BL” were tested according to EN 12667:2001.

Component	λ <sub>10</sub> in W/(m.K)
Hilti Firestop Block CFS-BL	0,089

#### 3.5.2 Water vapour permeability

No performance assessed.



**4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base**

According to the Decision 1999/454/EC<sup>1</sup>, amended by Decision 2001/596/EC<sup>2</sup> of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V of Regulation (EU) No 305/2011) is given in the following table.

Product(s)	Intended use(s)	Level(s) or class(es) (resistance to fire)	System of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	for fire compartmentation and/or fire protection or fire performance	any	1

In addition, according to the Decision 1999/454/EC, amended by Decision 2001/596/EC of the European Commission the system(s) of assessment and verification of constancy of performance, with regard to reaction to fire, is 3.

Product(s)	Intended use(s)	Level(s) or class(es) (reaction to fire)	System of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	For uses subject to regulations on reaction to fire	A1*, A2*, B*, C*	1
		A1**, A2**, B**, C**, D, E	3
		(A1 to E)***, F	4
<p>* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material)</p> <p>** Products/materials not covered by footnote (*)</p> <p>*** Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of class A1 according to Commission Decision 96/603/EC, as amended)</p>			

<sup>1</sup> Official Journal of the European Communities no. L 178, 14.7.1999, p. 52

<sup>2</sup> Official Journal of the European Communities no. L 209, 2.8.2001, p. 33

**5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the Technical Assessment Body Österreichisches Institut für Bautechnik.

The notified product certification body shall visit the factory at least twice a year for surveillance of the manufacturer.

Issued in Vienna on 28.12.2021  
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits  
Managing Director

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## ANNEX B

### DESCRIPTION OF PRODUCT(S) & PRODUCT LITERATURE

#### B.1 Hilti Firestop Block CFS-BL

Brick-like shaped blocks with dimensions of 200 x 130 x 50 mm (l x w x t). The Control Plan is defined in document "Control Plan relating to the European Technical Assessment ETA-13/0099 – Hilti Firestop Block CFS-BL", which is a non-public part of this ETA.

#### B.2 Hilti Firestop Filler Mastic CFS-FIL

"Hilti Firestop Filler Mastic CFS-FIL" is available as a cartridge of 310 ml or as a foil pack of 580 ml or in a pail of 19 litres.

The Control Plan is defined in document "Control Plan relating to the European Technical Assessment ETA-21/0256 – Hilti Firestop Filler Mastic CFS-FIL", which is a non-public part of the ETA.

Suitable dispensers:

"Hilti CFS-DISP" (for 310 ml cartridge)

"Hilti CS 270-P1" (for 580 ml foil pack)

"Hilti CD 4-A22" (for 310 ml cartridge or 580 ml foil pack)

#### B.3 Hilti Firestop Putty Bandage CFS-P BA

"Hilti Firestop Putty Bandage CFS-P BA" is delivered 100 mm in width, 3 mm in height and 5 m in length on a roll.

The Control Plan is defined in document "Control Plan relating to the European Technical Assessment ETA-13/0099 – "Hilti Firestop Block CFS-BL", which is a non-public part of this ETA.

#### B.4 Hilti Firestop Bandage CFS-B

"Hilti Firestop Bandage CFS-B" is supplied in roll form, with binding wire used to wrap around pipes and pipe insulation to form a penetration seal. The bandage is cut to a length which suits the overall diameter of pipe or pipe and insulation and wrapped around the penetration twice.

"Hilti Firestop Bandage CFS-B" is supplied in 125 mm width, 2 mm thick and 10 m length. The Control Plan is defined in document "Control Plan relating to the European Technical Assessment ETA-20/0993 – Hilti Firestop Bandage CFS-B", which is a non-public part of this ETA.

#### B.5 Hilti Firestop Coating CFS-CT

"Hilti Firestop Coating CFS-CT" is used as additional protection for penetration seals for waveguides. For details of the product, see European Technical Assessment ETA-11/0429 "Hilti Firestop Coating CFS-CT". For details of the application, see Annex C.2.2.d and C.5.2.c of the ETA.

The Control Plan is defined in document "Control Plan relating to the European Technical Assessment ETA-11/0429 – Hilti Firestop Coating CFS-CT", which is a non-public part of this ETA.

#### B.6 Technical product literature

Technical data sheet "Hilti Firestop Block CFS-BL" (including all ancillary products).

## ANNEX C

### RESISTANCE TO FIRE CLASSIFICATION OF PENETRATION SEALS MADE OF HILTI FIRESTOP BLOCK CFS-BL

#### C.1 General Information

##### C.1.1 Wall/floor constructions

a) Flexible wall:

The wall must have a minimum thickness of 100 mm and comprise timber or steel studs lined on both faces with minimum 2 layers of 12,5 mm thick boards according to EN 520 type F.

For timber stud wall constructions there must be a minimum distance of 100 mm of the penetration seal to any stud. The cavity between stud and penetration seal must be closed with minimum of 100 mm of insulation (classification A1 or A2 in accordance with EN 13501-1).

b) Rigid wall:

The wall must have a minimum thickness of 100 mm and comprise concrete, aerated concrete or masonry, with a minimum density of 450 kg/m<sup>3</sup>.

c) Rigid floor:

The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 450 kg/m<sup>3</sup>.

The walls / floors must be classified in accordance with EN 13501-2 for the required fire resistance period or fulfil the requirements of the relevant Eurocode.

d) Sandwich panel wall:

The partition is constructed of PAROC® line 200 AST panels with a thickness of 100 mm, a width of 1200 mm and a mineral (stone) wool core with a density of 115 kg/m<sup>3</sup>.

The sandwich panel construction must be classified in accordance with EN 13501-2 for the required fire resistance period and has to be set up according to the conditions related to the required fire resistance period. Acceptable variations in the sandwich construction are covered by the product standard EN 14509.

##### C.1.2 Aperture framing / beading / steel profile

The penetration seal depth for flexible wall, rigid wall or rigid floor is always 200 mm independent of the thickness of the wall or floor. In case of walls or floors with a thickness of less than 200 mm an aperture framing or a beading has to be used.

Aperture framing: box frame of 200 mm depth perpendicular to the wall/floor surface made of gypsum or calcium silicate boards with a thickness of at least 12,5 mm, centred in the wall (figure 1a, d) / flush to the soffit of the floor.

Beading: gypsum or calcium silicate board strips with a width of at least 100 mm ( $w_A$ , figure 1e) are installed around the opening with the necessary number of layers to form a frame on the top side of a floor or two frames of the same height on both sides of a wall (figure 1b, c, e).

In walls penetration seal is installed centred (figure 1a, b), in floors flush to the soffit of the floor (figure 1c).

The penetration seal depth for a sandwich panel construction is 130 mm (figure 1f). The penetration seals in the sandwich panel constructions do not require an aperture frame as described above. Instead, the opening perimeter is finished with 30 x 30 x 2 mm steel profiles, inward-aligned angle, fixed onto the panel with Ø3,5 x 30 mm self-drilling screws (figure 1g).

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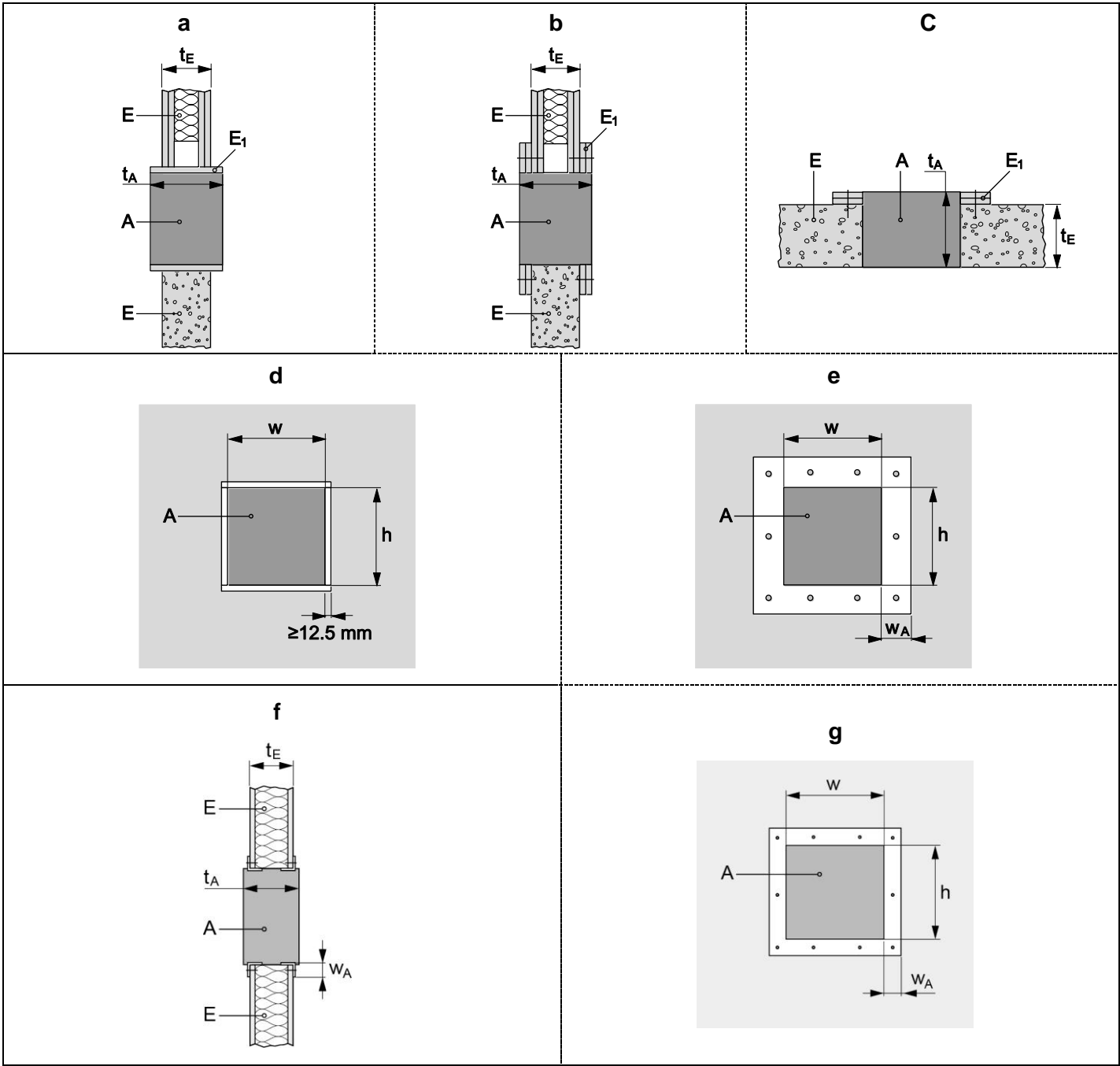
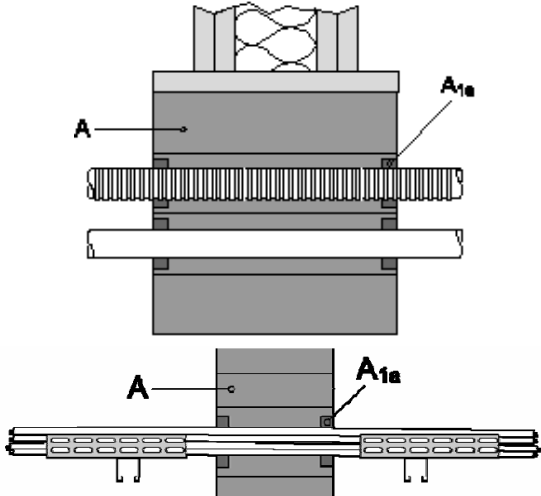
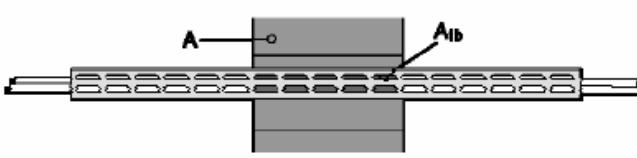
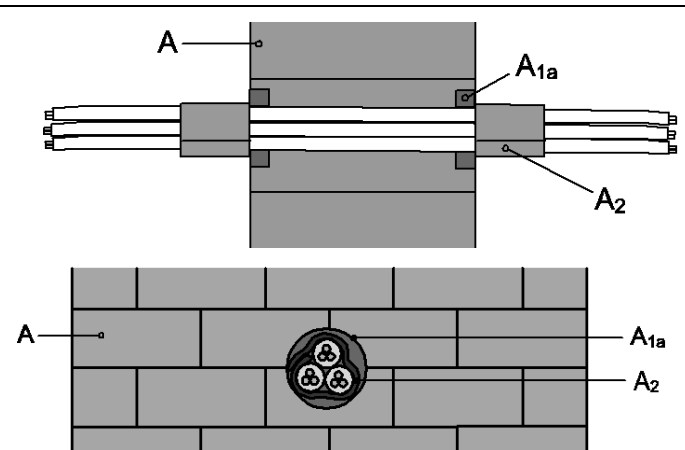


Figure 1: position of the penetration seal in walls / floors aperture framing / beading

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<p><b>C.1.3 Penetration seal types</b></p>	
<p>C.1.3.1 Penetration seal type 1 (A<sub>1</sub>) - blocks and filler</p>	
<p>a) <u>Services without cable supports (baskets, ladders, trays) in the area of the penetration seal</u></p> <ul style="list-style-type: none"> <li>Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL (A<sub>1a</sub>), depth 20 mm.</li> </ul>	 <p>Figure 2: penetration seal type A<sub>1a</sub></p>
<p>b) <u>Services on cable supports (baskets, ladders, trays) running through the penetration</u></p> <ul style="list-style-type: none"> <li>Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL (A<sub>1b</sub>) over the entire depth of the seal (200 mm).</li> </ul>	 <p>Figure 3: penetration seal type A<sub>1b</sub></p>
<p>C.1.3.2 Penetration seal type putty 1 (A<sub>2a</sub>) - blocks, filler and 1 layer putty bandage</p>	
<p>a) <u>Services without cable supports (baskets, ladders, trays) in the area of the penetration seal</u></p> <ul style="list-style-type: none"> <li>Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL (A<sub>1a</sub>), depth 20 mm.</li> <li>One layer of Hilti Firestop Putty Bandage CFS-P BA (A<sub>2</sub>) or Hilti Firestop Bandage CFS-B is wrapped around the services or group of services.</li> </ul>	 <p>Figure 4: filler (A<sub>1a</sub>) with 1 layer putty</p>

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- c) Services on cable supports (baskets, ladders, trays) running through the penetration
- Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL ( $A_{1b}$ ) over the entire depth of the seal (200 mm).
  - Services are additionally covered by a layer of Hilti Firestop Putty Bandage CFS-P BA ( $A_{2a}$ ).

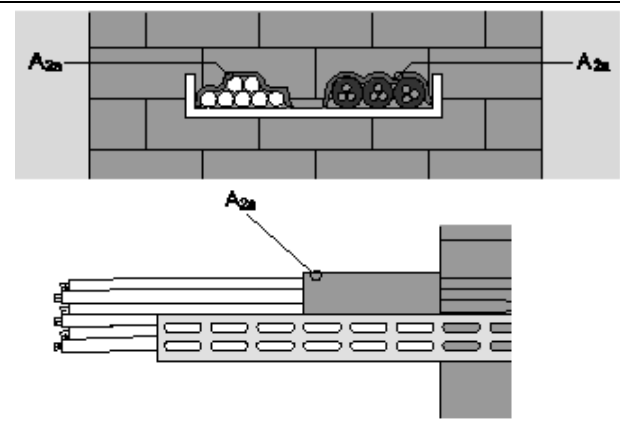


Figure 5: filler ( $A_{1b}$ ) with 1 layer putty ( $A_{2a}$ ), support tray

Hilti Firestop Putty Bandage CFS-P BA must be installed with the mesh outside/upside.  
For floor applications, Hilti Firestop Putty Bandage CFS-P BA is required on the top side, only.

C.1.3.3 Penetration seal type putty 2 ( $A_{2b}$ ) – blocks, filler and 2 layers putty bandage

- a) Services without cable supports (baskets, ladders, trays) in the area of the penetration seal
- Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL ( $A_{1a}$ ), depth 20 mm.
  - Two layers of Hilti Firestop Putty Bandage CFS-P BA ( $A_2$ ) are wrapped around the services or group of services.

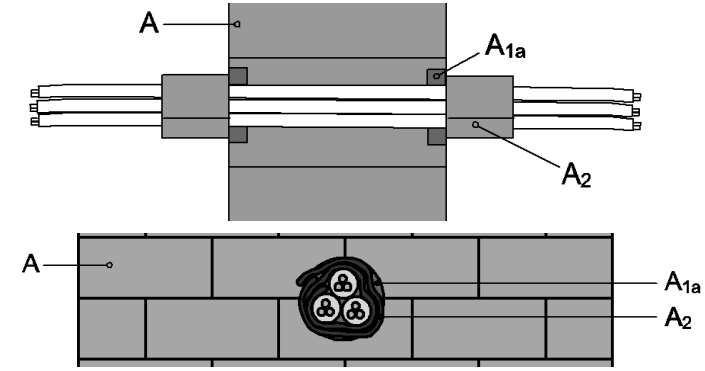


Figure 6: filler ( $A_{1a}$ ) with 2 layers of putty

- b) Services on cable supports (baskets, ladders, trays) running through the penetration
- Gaps between services and Hilti Firestop Blocks CFS-BL (A) are filled with Hilti Firestop Filler CFS-FIL ( $A_{1b}$ ) over the entire depth of the seal (200 mm).
  - Services are additionally covered by a layer of Hilti Firestop Putty Bandage CFS-P BA ( $A_{2a}$ ) on top of the services in the cable supports.
  - A second layer of Hilti Firestop Putty Bandage CFS-P BA ( $A_{2b}$ ) is laid on top of the first and then wrapped around the services including the cable supports ( $A_{2b}$ ).
  - The overlap of the putty wrapping must be at least 20 mm.

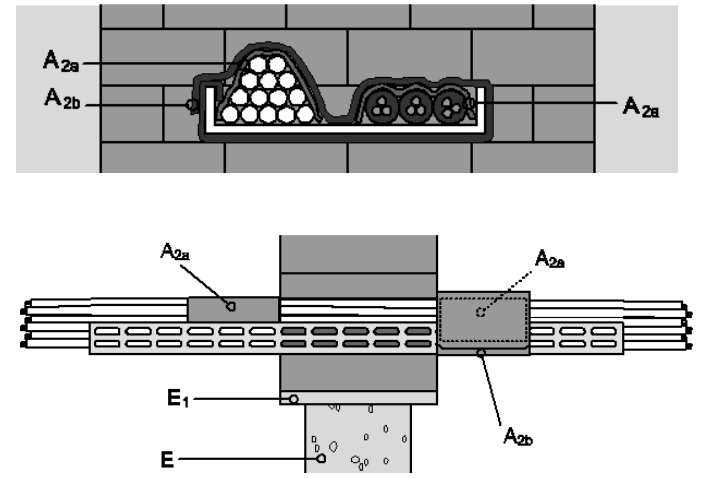


Figure 7: filler ( $A_{1b}$ ) plus 2 layers of putty, support tray

Hilti Firestop Putty Bandage CFS-P BA must be installed with the mesh outside/upside.  
For floor applications, Hilti Firestop Putty Bandage CFS-P BA is required on the top side, only.



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**C.1.4 Distance Requirements**

Distances valid for installations of services in wall and floor penetrations.

Minimum distances in mm (see Figure 8):

- $s_1 = 0$  (distance between cables/cable supports and vertical seal edge)
- $s_2 = 0$  (distance between cable supports)
- $s_3 = 0$  (distance between cables and upper seal edge)
- $s_4 = 0$  (distance between cable supports and bottom seal edge)
- $s_5 = 50$  (distance between cables and cable support above)
- $s_{20} - s_{23} = 0 \text{ } \varnothing < 16 \text{ mm}$   
 $= 50 \text{ } \varnothing > 16 \text{ mm}$   
 (distance between conduits/waveguides to each other or to other services or seal edges)

Distances for all other services  $\geq 200$  mm.

For sandwich panel construction according Annex C.4:

- $s_1, s_3, s_4 = 50$  (distance between cable/cable support to side/bottom seal edge)
- $s_5 = 50$  (distance between cables and cable support above)
- $s_6 = 100$  (distance between bus bars and cable support)
- $s_7 = 50$  (distance between bus bars and seal edge)
- $s_8 = 200$  (distance between fire damper and other services)
- $s_9 = 50$  (distance between fire damper and seal edge)

Distances for all other services  $\geq 200$  mm.

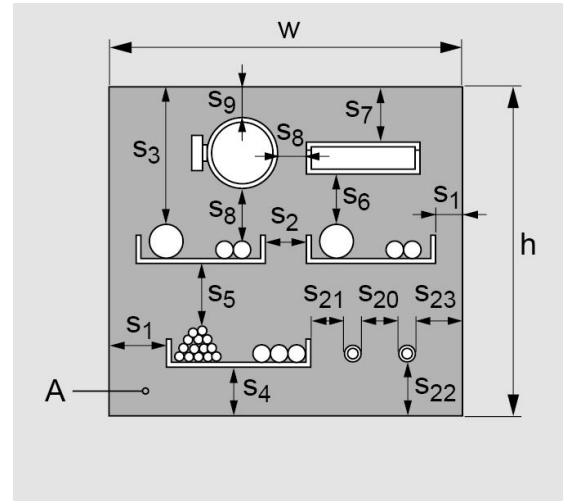


Figure 8: distances

**C.2 Flexible or rigid walls according to Annex C.1.1 of the ETA - minimum wall thickness 100 mm**

**C.2.1 Blank seal (no services) \***

Maximum seal size: 1000 x 1000 mm or an area of 10 000 cm<sup>2</sup>

Construction details (for symbols and abbreviations see Annex A.3 of the ETA):

Hilti Firestop Block CFS-BL (A) of thickness  $t_A \geq 200$  mm, centered regarding the thickness of the wall (E); aperture framing or beading (E1) according to Annex C.1.2 of the ETA.

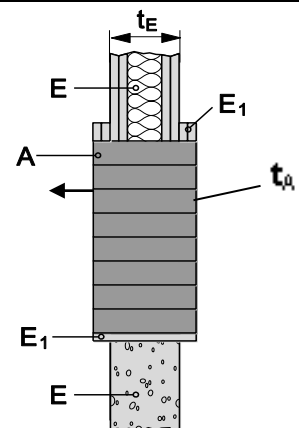


Figure 9: blank seal

**Classification: EI 120**

\* If services are added later on in a blank seal, only the services that fulfill the required classification, listed in the tables below, may be added.

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**C.2.2 Penetrating services in walls – 100 mm wall thickness**

Maximum seal size: 1000 x 1000 mm

Services shall be supported at maximum distance of 250 mm from both sides of wall

Abbreviation	Description
A, A <sub>1</sub> , A <sub>2</sub> , ...	Firestop products: A Hilti Firestop Block CFS-BL A <sub>1</sub> Hilti Firestop Filler CFS-FIL A <sub>2</sub> Hilti Firestop Putty Bandage CFS-P BA
C <sub>1</sub> , C <sub>2</sub> , C <sub>3</sub>	Penetrating services
E, E <sub>1</sub> , E <sub>2</sub> , ...	Separating elements
t <sub>E</sub>	Thickness of the separating element

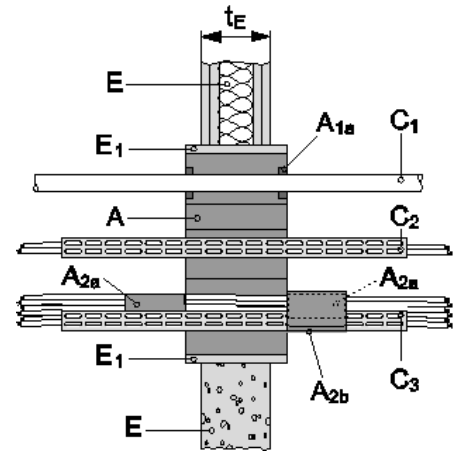


Figure 10: wall penetration

Construction details (for symbols and abbreviations see Annex C.2.2 of the ETA):

Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, centered regarding the thickness of the wall (E); aperture framing or beading (E<sub>1</sub>) according to Annex C.1.2 of the ETA.

Penetrating services (C<sub>1</sub>) with or without support tray within the seal, see Figure 10 of the ETA.

Penetrating cables (C<sub>2</sub>, C<sub>3</sub>) with or without support tray within the seal, see Figure 10 of the ETA.

For penetrations without support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler (A<sub>1a</sub>) according to Annex C.1.3.1a of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2a of the ETA
- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.3a of the ETA

For penetrations with support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler (A<sub>1b</sub>) according to Annex C.1.3.1b of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2b of the ETA
- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.3b of the ETA

C.2.2.a) Cables			
– All types of cables currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable supports)			
Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
All sheathed cables:	<b>Classification</b>		
$\varnothing \leq 21$ mm	EI 90 / E120	EI 90 / E120	EI 120
$21 \leq \varnothing \leq 50$ mm			
$50 \leq \varnothing \leq 80$ mm			
Tied cable bundle $\leq \varnothing 100$ mm; $\varnothing$ single cable $\leq 21$ mm	EI 120	EI 120	
Non-sheathed cables (wires) $\varnothing \leq 24$ mm	EI 60 / E120	EI 90 / E120	

C.2.2.b) Small conduits and tubes			
– $\varnothing \leq 16$ mm, wall thickness $\geq 1$ mm, arranged linear, with or without cables, with or without cable supports, minimum distance to each other = 0 mm			
Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
	<b>Classification</b>		
Plastic conduits and tubes $\varnothing \leq 16$ mm	EI 120 U/U		
Steel conduits and tubes $\varnothing \leq 16$ mm	EI 120 U/U		

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C.2.2.c) Conduits			
<ul style="list-style-type: none"> <li>– Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, centered regarding the thickness of the wall (E); aperture framing or beading (<math>E_1</math>) according to Annex C.1.2 of the ETA.</li> <li>– Conduits / tubes (<math>C_1</math>) without support tray within the seal, see Figure 10 of the ETA.</li> <li>– Wall thickness of polyolefin conduits: 1,55 to 2,30 mm</li> <li>– Wall thickness of PVC conduits: 1,90 to 2,80 mm</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Plastic conduits:	<b>Classification</b>		
Hegler HP-EPKS $16 \leq \varnothing \leq 40$ mm Hegler HP-EPKMH $20 \leq \varnothing \leq 40$ mm Hegler HP-EL $16 \leq \varnothing \leq 20$ mm HFXP and HFX $25 \leq \varnothing \leq 32$ mm * HFIRM $32 \leq \varnothing \leq 40$ mm * FXPM $\varnothing = 20$ mm FXPYF $\varnothing = 32$ mm	EI 120 U/U	---	---
Bundle $\varnothing \leq 100$ mm of rigid or flexible conduits - $\varnothing$ of single conduits $\leq 20$ mm			
* In case of conduits HFIRM ( $\varnothing 40$ mm) without cables inside there is no classification available, and for conduits HFX ( $\varnothing 25$ mm) classification is EI 30 U/U			

C.2.2.d) Waveguides (coaxial)			
<ul style="list-style-type: none"> <li>– Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, centered regarding the thickness of the wall (E); aperture framing or beading (<math>E_1</math>) according to Annex C.1.2 of the ETA.</li> <li>– Waveguides <math>27,8 \text{ mm} \leq \varnothing \leq 59,9</math> mm (<math>C_1</math>) without support tray within the seal, see Figure 10 of the ETA.</li> <li>– Additional protection: 0,7 mm thick “Hilti Firestop Coating CFS-CT” over a length of 150 mm from the surface of the penetration seal on each side of the wall.</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Coating</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Waveguides (coaxial):	<b>Classification</b>		
RFS Cellflex LCF 78-50 JA $\varnothing 27,8$ mm RFS Cellflex LCF 214-50 J $\varnothing 59,9$ mm RFS Heliflex HCA 78-50 JFNA $\varnothing 28,0$ mm RFS Heliflex HCA 158J $\varnothing 59,9$ mm RFS Radialflex RLKW 78-50 $\varnothing 28,5$ mm RFS Radialflex RLKU 158-50 JFLA $\varnothing 48,2$ mm	EI 120-U/C	---	---



Steel pipes, up to Ø 159 mm, wall thickness 2,0 mm – 14,2 mm <sup>4</sup> , insulation LS mineral wool, with minimum symmetrical total length 1800 mm	EI 60 C/U E 120 C/U	---	---
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- Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, centered regarding the thickness of the wall (E); aperture framing or beading (E<sub>1</sub>) according to Annex C.1.2 of the ETA.
- Metal pipes with flexible elastomeric foam insulation according to EN 14304, thickness 8,5 to 43 mm.
- Additional insulation, Armaflex mat wrapped around the service, thickness 19 mm, over a length of 300 mm.

Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Armaflex</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Elastomeric foam insulated metal pipes:	<b>Classification</b>		
Copper pipes, up to Ø 54 mm, wall thickness 1,0/1,5 mm <sup>3</sup> – 14,2 mm <sup>4</sup> , Armaflex insulation CS, thickness 8,5 – 43 mm <sup>6</sup>	EI 120 C/U	---	---
Steel pipes, up to Ø 114 mm, wall thickness 1,0/2,0 <sup>5</sup> mm – 14,2 <sup>4</sup> mm, Armaflex insulation CS, thickness 8,5 – 43 mm <sup>7</sup>	EI 90 C/U E 120 C/U	---	---

- Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, centered regarding the thickness of the wall (E); aperture framing or beading (E<sub>1</sub>) according to Annex C.1.2 of the ETA.
- Metal pipes with flexible elastomeric foam insulation according to EN 14304, thickness 8,5 to 43 mm.
- Additional insulation, mineral wool mat wrapped around the service, minimum density 40 kg/m<sup>3</sup>, minimum thickness 40 mm over a length of 500 mm.

Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Mineral wool</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Elastomeric foam insulated metal pipes:	<b>Classification</b>		
Steel pipes, Ø 159 mm, wall thickness 2,0 mm – 14,2 mm <sup>4</sup> , insulation CS Armaflex, thickness 19 mm	EI 90 C/U E 120 C/U	---	---

The field of application given above for copper pipes is also valid for other metal pipes with lower heat conductivity than copper and a melting point of minimum 1100°C, e.g. unalloyed steel, low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

The field of application given above for steel pipes is also valid for other metal pipes with lower heat conductivity than unalloyed steel and a melting point of minimum 1100°C, e.g. low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

<sup>6</sup> Interpolation of insulation thickness 8,5/9 mm and 38 mm for pipe diameter 28 mm and 54 mm for insulation thicknesses and pipe diameters in between.

<sup>7</sup> Interpolation of insulation thickness 8,5/15 mm and 38/43 mm for pipe diameter 28 mm (Cu pipe) and 114 mm for insulation thicknesses and pipe diameters in between.

**C.3 Flexible or rigid walls according to Annex C.1.1 of the ETA - minimum wall thickness 130 mm**

**C.3.1 Penetrating services (single, multiple)**

Construction details (for symbols and abbreviations see Annex C.2.2 of the ETA):

Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, centered regarding the thickness of the wall (E); aperture framing or beading ( $E_1$ ) according to Annex C.1.2 of the ETA.

Penetrating services ( $C_1$ ) with or without support tray within the seal, see Figure 10 of the ETA.

Penetrating cables ( $C_2, C_3$ ) with or without support tray within the seal, see Figure 10 of the ETA.

For penetrations without support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler ( $A_{1a}$ ) according to Annex C.1.3.1a of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2a of the ETA
- Penetration seal type putty 2 – blocks, filler and 2 layer putty bandage, according to Annex C.1.3.3a of the ETA

For penetrations with support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler ( $A_{1b}$ ) according to Annex C.1.3.1b of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2b of the ETA
- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.3b of the ETA

Services shall be supported at maximum 250 mm away from both faces of wall constructions.

Maximum seal size: 1000 x 1000 mm

**C.3.1.1 Cables**

– All types of cables currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable supports)

Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
All sheathed cables:	<b>Classification</b>		
$\varnothing \leq 21$ mm	EI 90 / E120	EI 120	EI 120
$21 \leq \varnothing \leq 50$ mm			
$50 \leq \varnothing \leq 80$ mm	EI 90 / E120	EI 90 / E120	
Tied cable bundle $\leq \varnothing 100$ mm; $\varnothing$ single cable $\leq 21$ mm	EI 120	EI 120	
Non-sheathed cables (wires) $\varnothing \leq 24$ mm	EI 60 / E120	EI 90 / E120	

**C.4 Sandwich panel wall according to Annex C.1.1 of the ETA - minimum wall thickness 100 mm**

**C.4.1 Penetrating services (single, multiple)**

Construction details (for symbols and abbreviations see Annex C.2.2 of the ETA):

Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 130$  mm, centered regarding the thickness of the wall (E); steel profiles (E<sub>1</sub>) according to Annex C.1.2 of the ETA.

For penetrations without support trays the following seal types apply:

- Penetration seal type putty 2 – blocks, filler and 2 layer putty bandage, according to Annex C.1.3.3a of the ETA

For penetrations with support trays the following seal types apply:

- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.1b of the ETA

Services shall be supported at maximum 250 mm away from both faces of wall constructions.

Maximum seal size: 1000 x 1000 mm

**C.4.1.1 Cables**

- All types of cables currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable supports)
- Penetrating cables (C<sub>2</sub>) without support tray within the seal see Figure 10 of the ETA.

Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
All sheathed cables:	<b>Classification</b>		
$\varnothing \leq 21$ mm	---	---	EI 90 / E 120
$21 \leq \varnothing \leq 50$ mm			
$50 \leq \varnothing \leq 80$ mm			
Tied cable bundle $\leq \varnothing 100$ mm			

**C.4.1.2 Small conduits and tubes**

- $\varnothing \leq 16$  mm, wall thickness  $\geq 1$  mm, arranged linear, with or without cables, with or without cable supports, minimum distance to each other = 0 mm
- Penetrating services (C<sub>1</sub>) with or without support tray within the seal, see Figure 10 of the ETA.

Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
	<b>Classification</b>		
Plastic conduits and tubes $\varnothing \leq 16$ mm	---	---	EI 90 / E 120
Steel conduits and tubes $\varnothing \leq 16$ mm			



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C.4.1.3 Bus bar			
– Additional insulation, Armaflex mat wrapped around the service, thickness 32 mm, over the length of 350 mm.			
<b>Penetration seal type:</b>	<b>Type 1 (Blocks + Filler) + <u>Armaflex</u></b>	<b>Type Putty 1 (Blocks, Filler + 1x Putty)</b>	<b>Type Putty 2 (Blocks, Filler + 2x Putty)</b>
	<b>Classification</b>		
EAE ELEKTRIK – Type: E-Line KXC 40505-B; 4000A – Maximum outer dimension of the section: 372 mm x 150 mm – Conductor material: Copper – Maximum number of conductors: 10 – Maximum section of the conductors: 140 mm x 6 mm	EI 90 / E 120	---	---

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**C.5 Rigid floors according to Annex C.1.1 of the ETA - minimum floor thickness 150 mm**

<b>C.5.1 Blank seal (no services) *</b>	
Maximum seal size: 1000 x 700 mm or an area of 7000 cm <sup>2</sup>	
<p>Construction details (for symbols and abbreviations see Annex A.3 of the ETA):</p> <p>Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, flush with the soffit of the floor (E); aperture framing or beading (E<sub>1</sub>) according to Annex C.1.2 of the ETA.</p> <p>Additional support construction for large seal size: metal band of 30 mm width and of 2 mm thickness.</p>	
Blank seal measurements in floors:	<b>Classification</b>
without support construction ( $w_2 \times l$ ): 1000 x 700 mm	EI 60
with support construction ( $w_2 \times l$ ): 1000 x 700 mm	EI 120
without support construction ( $w_1 \times l$ ): 500 x 700 mm	
* If services are added later on in a blank seal only the services listed in the tables below may be added that fulfill the required classification.	

**C.5.2 Penetrating services in floors – 150 mm floor thickness**

For floor installation maximum distance of 1st service support: 230 mm on the topside of the floor.	
Abbreviation	Description
A, A <sub>1</sub> , A <sub>2</sub> , ...	Firestop products: A Hilti Firestop Block CFS-BL A <sub>1</sub> Hilti Firestop Filler CFS-FIL A <sub>2</sub> Hilti Firestop Putty Bandage CFS-P BA
C, C <sub>1</sub> , C <sub>2</sub> , ...	Penetrating services
E, E <sub>1</sub> , E <sub>2</sub> , ...	Separating elements
t <sub>E</sub>	Thickness of the building element

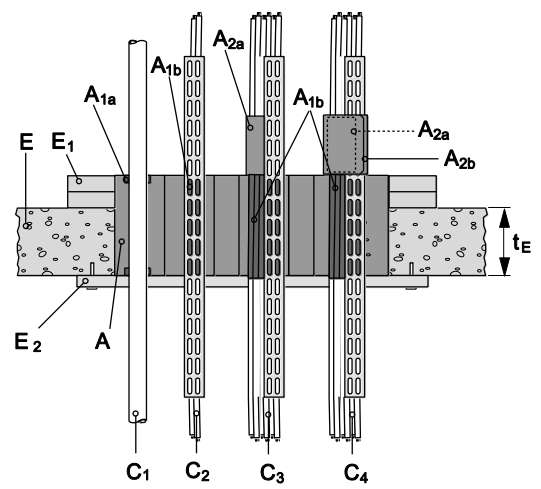


Figure 12: floor penetration

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Construction details (for symbols and abbreviations see Annex C.5.2 of the ETA):

Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, flush with the soffit of the floor (E); aperture framing or beading ( $E_1$ ) according to Annex C.1.2 of the ETA.

Penetrating services ( $C_1$ ) with or without support tray within the seal, see Figure 12 of the ETA.

Penetrating cables ( $C_2, C_3, C_4$ ) with or without support tray within the seal, see Figure 12 of the ETA.

For penetrations without support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler ( $A_{1a}$ ) according to Annex C.1.3.1a of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2a of the ETA – on the top side only
- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.3a of the ETA – on the top side only

For penetrations with support trays the following seal types apply:

- Penetration seal type 1 – blocks and filler ( $A_{1b}$ ) according to Annex C.1.3.1b of the ETA
- Penetration seal type putty 1 – blocks, filler and 1 layer putty bandage, according to Annex C.1.3.2b of the ETA – on the top side only
- Penetration seal type putty 2 – blocks, filler and 2 layers putty bandage, according to Annex C.1.3.3b of the ETA – on the top side only

C.5.2.a) Cables			
– All types of cables currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable supports)			
Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
All sheathed cables:	<b>Classification</b>		
$\varnothing \leq 21$ mm	EI 90 / E120	EI 90 / E120	EI 120
$21 \leq \varnothing \leq 50$ mm			
$50 \leq \varnothing \leq 80$ mm			
Tied cable bundle $\leq \varnothing 100$ mm; $\varnothing$ single cable $\leq 21$ mm	EI 120	EI 120	
Non-sheathed cables (wires) $\varnothing \leq 17$ mm	EI 90 / E120	EI 90 / E120	
Non-sheathed cables (wires) $\varnothing \leq 24$ mm	EI 90 / E120	EI 60 / E120	

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C.5.2.b) Small conduits and tubes			
<ul style="list-style-type: none"> <li>– <math>\varnothing \leq 16</math> mm, wall thickness <math>\geq 1</math> mm, arranged linear, with or without cables, with or without cable supports, minimum distance to each other = 0 mm</li> <li>– Penetrating services (<math>C_1</math>) with or without support tray within the seal, see Figure 12 of the ETA</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler)	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
	Classification		
Plastic conduits and tubes $\varnothing \leq 16$ mm	EI 120 U/U	---	---
Steel conduits and tubes $\varnothing \leq 16$ mm	EI 120 C/U	---	---

C.5.2.c) Metal pipes (with insulation)			
<ul style="list-style-type: none"> <li>– Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, flush with the soffit of the floor (E); aperture framing or beading (<math>E_1</math>) according to Annex C.1.2 of the ETA.</li> <li>– Metal pipes with mineral wool insulation, minimum density 85 kg/m<sup>3</sup>, minimum thickness 20 mm (up to <math>\varnothing 54</math> mm) or 30 mm (<math>\varnothing &gt; 54</math> mm)</li> <li>– Additional insulation on both sides, mineral wool mat wrapped around the service, minimum density 40 kg/m<sup>3</sup>, minimum thickness 20 mm (up to <math>\varnothing 54</math> mm) or 40 mm (<math>\varnothing &gt; 54</math> mm) over a length of 300 mm (up to <math>\varnothing 54</math> mm) or 500 mm (<math>\varnothing &gt; 54</math> mm)</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Mineral wool</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
	Classification		
Mineral wool insulated metal pipes:			
Copper pipes, up to $\varnothing 54$ mm, wall thickness 1,0/1,5 mm <sup>8</sup> – 14,2 <sup>4</sup> mm, insulation CS mineral wool	EI 120 C/U	---	---
Steel pipes, up to $\varnothing 159$ mm, wall thickness 1,0/2,0 <sup>9</sup> mm – 14,2 <sup>4</sup> mm, insulation LS mineral wool, minimum length 1200 mm (up to $\varnothing 54$ mm) or 1800 mm ( $\varnothing > 54$ mm), or CS	EI 120 C/U	---	---

<sup>8</sup> Interpolation of minimum pipe wall thickness between 1,0 mm for diameter 28 mm and 1,5 mm for 54 mm for pipe diameters in between. In accordance with prEN 1366-3:2016 the results are also valid for pipe diameters < 28 mm

<sup>9</sup> Minimum pipe wall thickness between 1,0 mm for diameter 28 – 54 mm (Cu pipe) and 2,0 mm for pipe diameters up to 159 mm. In accordance with prEN 1366-3:2016 the results are also valid for pipe diameters < 28 mm

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<ul style="list-style-type: none"> <li>– Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, flush with the soffit of the floor (E); aperture framing or beading (<math>E_1</math>) according to Annex C.1.2 of the ETA.</li> <li>– Metal pipes with flexible elastomeric foam insulation according to EN 14304, thickness 8,5 to 43 mm.</li> <li>– Additional insulation, Armaflex mat wrapped around the service, thickness 19 mm, over a length of 300 mm on both sides.</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Armaflex</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Elastomeric foam insulated metal pipes:	<b>Classification</b>		
Copper pipes, up to $\varnothing$ 54 mm, wall thickness 1,0/1,5 mm <sup>3</sup> – 14,2 mm <sup>4</sup> , Armaflex insulation CS, thickness 8,5 – 43 mm <sup>6</sup>	EI 120 C/U	---	---
The field of application given above is also valid for other metal pipes with lower heat conductivity than copper and a melting point of minimum 1100°C, e.g. unalloyed steel, low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.			

<ul style="list-style-type: none"> <li>– Hilti Firestop Blocks CFS-BL (A) of thickness <math>t_A \geq 200</math> mm, flush with the soffit of the floor (E); aperture framing or beading (<math>E_1</math>) according to Annex C.1.2 of the ETA.</li> <li>– Metal pipes with flexible elastomeric foam insulation according to EN 14304, thickness 8,5 to 43 mm.</li> <li>– Additional insulation, mineral wool mat wrapped around the service, thickness 30 mm, over a length of 500 mm</li> </ul>			
Penetration seal type:	Type 1 (Blocks + Filler) <u>+ Mineral wool</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Elastomeric foam insulated metal pipes:	<b>Classification</b>		
Steel pipes, up to $\varnothing$ 159 mm, wall thickness 2,0 mm – 14,2 mm <sup>4</sup> , insulation CS mineral wool, thickness 30 mm or more	EI 120 C/U	---	---
The field of application given above is also valid for other metal pipes with lower heat conductivity than unalloyed steel and a melting point of minimum 1100°C, e.g. low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)			

- Hilti Firestop Blocks CFS-BL (A) of thickness  $t_A \geq 200$  mm, flush with the soffit of the floor (E); aperture framing or beading (E1) according to Annex C.1.2 of the ETA.
- Metal pipes with flexible elastomeric foam insulation according to EN 14304, thickness 8,5 to 43 mm.
- First additional protection, 2 layer of Hilti Firestop Bandage CFS-B wrapped around the pipe with elastomeric foam insulation.
- Second additional insulation, mineral wool mat wrapped around the service, minimum density  $40 \text{ kg/m}^3$ , minimum thickness 20 mm ( $> \varnothing 54$  mm up to  $\varnothing 114$  mm) or 40 mm ( $\varnothing > 114$  mm) over a length of 300 mm (up to  $\varnothing 114$  mm) or 500 mm ( $\varnothing > 114$  mm).

Penetration seal type:	Type 1 (Blocks + Filler) <u>+ CFS-B</u> <u>+ Mineral wool</u>	Type Putty 1 (Blocks, Filler + 1x Putty)	Type Putty 2 (Blocks, Filler + 2x Putty)
Elastomeric foam insulated metal pipes:	<b>Classification</b>		
Steel pipes, $> \varnothing 54$ mm up to $\varnothing 114$ mm, wall thickness $1,0/2,0 \text{ mm}^5 - 14,2 \text{ mm}^4$ , insulation CS Armaflex, thickness 15 – 43 mm	EI 90 C/U E 120 C/U	---	---
Steel pipes, $\varnothing 114 - 159$ mm, wall thickness $2,0 \text{ mm} - 14,2 \text{ mm}^4$ , insulation CS Armaflex, thickness 15 – 19 mm <sup>10</sup>	EI 90 C/U E 120 C/U	---	---
Steel pipes, $\varnothing 114$ mm, wall thickness $2,0 \text{ mm} - 14,2 \text{ mm}^4$ , insulation CS Armaflex, thickness 15 – 43 mm <sup>6</sup>	EI 90 C/U E 120 C/U	---	---
Steel pipes, $\varnothing 114$ mm, wall thickness $2,0 \text{ mm} - 14,2 \text{ mm}^4$ , insulation CS Armaflex, thickness 43 mm	EI 120 C/U	---	---
Steel pipes, $\varnothing 159$ mm, wall thickness $2,0 \text{ mm} - 14,2 \text{ mm}^4$ , insulation CS Armaflex, thickness 19 mm	EI 120 C/U	---	---
The field of application given above is also valid for other metal pipes with lower heat conductivity than unalloyed steel and a melting point of minimum $1100^\circ\text{C}$ , e.g. low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)			

<sup>10</sup> Interpolation of insulation thickness 15 mm and 19 mm for pipe diameter 114 mm and 159 mm for insulation thicknesses and pipe diameters in between.



**ANNEX D**  
**ABBREVIATIONS USED IN DRAWINGS**

<b>Abbreviation</b>	<b>Description</b>
A, A <sub>1</sub> , A <sub>2</sub> ,...	Firestop products
C, C <sub>1</sub> , C <sub>2</sub> ,...	Penetrating services
E, E <sub>1</sub> , E <sub>2</sub> ,...	Building elements (wall, floor) inclusive framing/beading etc.
h	Height of penetration seal
s <sub>1</sub> , s <sub>2</sub> , s <sub>n</sub>	Distances
t <sub>A</sub>	Thickness of penetration seal
t <sub>E</sub>	Thickness of the building element
W	Max width of wall penetration
W <sub>1</sub>	Max width of floor penetration without support
W <sub>2</sub>	Max width of floor penetration with support
W <sub>A</sub>	Width of beading
l	Lengths of the floor penetration