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## European Technical Assessment

**ETA 11/0428**  
of 29/10/2014

### General Part

Technical Assessment Body issuing the ETA	SP Sveriges Tekniska Forskningsinstitut
Trade name of the construction product	Hilti Firestop Coating CFS-CT
Product family to which the construction product belongs	Fire Stopping and Fire Sealing Product- Penetration seal "Hilti Firestop Single Board Seal" for fire resistant walls and floors in buildings
Manufacturer	Hilti AG Feldkircherstrasse 100 9494 Schaan Liechtenstein
Manufacturing plants	Hilti Werk 4a, Werk 9a, Werk 17
This European Technical Assessment contains	40 pages including 4 Annexes which form an integral part of this assessment.
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This version replaces	ETA 11/0428 issued on 14/03/2012

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Specific parts

## **1 Technical description of the product**

### **1.1 Definition of the construction product**

This European Technical Assessment refers to a Firestop coating for use in penetration seals with the designation "Hilti Firestop Coating CFS-CT". Hilti Firestop Coating CFS-CT may be either applied on site onto a MW board as specified in Table 1 or used in the form of the Hilti Firestop Board CFS-CT B (pre-coated with Hilti Firestop Coating CFS-CT).

Hilti Firestop Coating CFS-CT is a white, ablative 1-component product and is composed essentially of filling substances and an acrylic binder.

Hilti Firestop Coating CFS-CT is supplied in pails/buckets of different size. The coating is sprayed or painted on mineral wool boards and partially on the services (for detail see Annex 2). For the installation procedure see Annex 3.1.

Hilti Firestop Board CFS-CT B is a mineral wool board pre-coated with Hilti Firestop Coating CFS-CT. The board is supplied in of the dimensions 1000 x 600 x 50 mm. The thickness of the coating is 0.7 mm. For the installation procedure see Annex 3.2.

Ancillary products referred to in this European Technical Assessment within the framework of evaluating resistance to fire (see Annexes 1 and 2) are not covered by this ETA and cannot be CE-marked on the basis of it

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

### **2.1 Intended use**

Hilti Firestop Coating CFS-CT is intended to form part of a penetration seal ("Hilti Firestop Double Board Seal"), which is used to maintain the fire resistance of a separating element (wall or floor) when and where services pass through.

The "Hilti Firestop Single Board Seal" is made of one mineral wool (MW) board, the Hilti Firestop Coating CFS-CT, the Hilti Firestop Acrylic Sealant CFS-S ACR (to close any gaps between the opening edges and the seal or between services and the seal) and other components as listed in Annex 1 depending on the type of services included.

The seal may be either formed by applying Hilti Firestop Coating CFS-CT on site onto a MW board as specified in Table 1 or by using the pre-coated MW board Hilti Firestop Board CFS-CT B 2S (coated on both faces with Hilti Firestop Coating CFS-CT).

The separating elements must be classified in accordance with EN 13501-2 for the required fire resistance period or fulfil the requirements of the relevant Eurocode. This ETA does not cover use of this product as a penetration seal in sandwich panel constructions.

Hilti Firestop Single Board Seal may be used to provide a penetration seal with the following specific services, single, multiple or mixed:

Blank seal	(no services) as given in Annex 2
Cables	Services as given in Annex 2
Metal pipes	Services as given in Annex 2
Plastic pipes	Services as given in Annex 2
Composite pipes	Services as given in Annex 2
Mixed (combination)	Services as given in Annex 2

For the maximum seal size see Annex 2.

Penetration seals require a minimum separation of 200 mm. For minimum distances between services within a penetration seal (multiple or mixed penetration seal) see Annex 2.

Maximum distance [mm] from surface of the building element for first support / fixing of services: see Annex 2.

Annex 2 gives details of penetration seals for which fire resistance tests were carried out. This ETA covers assemblies installed in accordance with the provisions given in 4.3 and Annex 3.

Although a penetration seal is intended for indoor applications only, the construction process may result in it being subjected to more exposed conditions for a period before the building envelope is closed. For this case provisions shall be made to protect temporarily exposed penetration seals according to the instructions of the manufacturer.

The specific elements of construction that Hilti Firestop Single Board Seal may be used to provide a penetration seal in, are as follows:

- a) Flexible walls: The wall must have a minimum thickness of 100 or 112 mm, respectively (for detail see Annex 2) and comprise timber or steel studs lined on both faces with one or several layers of boards of minimum 25 mm overall thickness. For timber stud walls there must be a minimum distance of 100 mm of the seal to any stud and the cavity between stud and seal must be filled with minimum 100 mm insulation of Class A1 or A2 (in accordance with EN 13501-1) in the cavity between stud and seal. An aperture framing must be installed made of C-studs and boards that have been used for the lining of the wall, minimum thickness of the board 12.5 mm.
- b) Rigid walls: The wall must have a minimum thickness of 100 or 112 mm, respectively (for detail see Annex 2) and comprise concrete, blockwork or masonry, with a minimum density of 650 kg/m<sup>3</sup>.
- c) Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 600 kg/m<sup>3</sup>.

## 2.2 Use category

Hilti Firestop Coating CFS-CT fulfils the requirements of use category Y<sub>2</sub> in accordance with ETAG 026-2, Section 1.2 (intended for use at temperatures between -20 °C and + 70°C, but with no exposure to rain nor UV).

## 2.3 Working life

The provisions made in this ETA are based on an assumed intended working life of the product for the intended use of 10 years, provided that it is subject to appropriate use and maintenance.

The indications given on the intended working life cannot be interpreted as a guarantee given by the producer or the assessment body, but are to be used 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 essential requirements.

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

### 3.1 Essential characteristics and their performance

Basic requirement for construction work	Essential characteristics	Performance
BWR 1 - Mechanical resistance and stability	None	Clause 3.1.1
BWR 2 - Safety in case of fire	Reaction to fire	Clause 3.1.2.1
	Resistance to fire	Clause 3.1.2.2 and Annex 2
BWR 3 - Hygiene, health and the environment	Air permeability (material property)	Clause 3.1.3.1
	Water permeability (material property)	Clause 3.1.3.2
	Content and/or release of dangerous substances	Declaration of conformity by the manufacturer Clause 3.1.3.3
BWR 4 - Safety in use	Mechanical resistance and stability	Clause 3.1.4.1
	Resistance to impact / movement	Clause 3.1.4.2
	Adhesion	Clause 3.1.4.3
BWR 5 - Protection against noise	Airborne sound insulation	Clause 3.1.5.1
BWR 6 - Energy economy and heat retention	Thermal properties	Clause 3.1.6.1
	Water vapor permeability	Clause 3.1.6.2
BWR 7- Sustainable use of natural resources	None	Clause 3.1.7
General aspects relating to fitness for use - Durability and serviceability	Use category	Clause 3.1.8.1
	Flexibility	Clause 3.1.8.2
	Compatibility	Clause 3.1.8.3

#### 3.1.1 Mechanical resistance and stability (BWR 1)

Not relevant, no performance assessed (NPA)

#### 3.1.2 Safety in case of fire (BWR 2)

##### 3.1.2.1 Reaction to fire

Hilti Firestop Coating CFS-CT on a MW board fulfils the requirements for reaction to fire class 'D-s2,d0' according to EN 13501-1. The reaction to fire classification of the mineral wool board used for Hilti Firestop Board CFS-CT B 2S is class A1.

### 3.1.2.2 Resistance to fire

The resistance to fire performance according to EN 13501-2 of penetration seals "Hilti Firestop Single Board Seal" incorporating Hilti Firestop Coating CFS-CT with a mineral wool board according to Table 1 or Hilti Firestop Coated Board CFS-CT B 2S is given in Annex 2.

Information on ancillary products which were tested within the framework of this European Technical Assessment for evaluating resistance to fire are given in Annex 1.

Any changes in the material, the composition, the dimensions or the properties of the ancillary products shall be notified to SP Certification without delay, which will decide whether a new assessment will be necessary.

### 3.1.3 Hygiene, health and the environment (BWR 3)

#### 3.1.3.1 Air permeability

The gas permeability regarding the gases air, nitrogen (N<sub>2</sub>), carbon dioxide (CO<sub>2</sub>) and CH<sub>4</sub> (methane) has been tested according to the principles of EN 1026 for a coating thickness of 1 mm (CO<sub>2</sub> and CH<sub>4</sub>) and 2 mm (N<sub>2</sub>). The following flow rates per area (q/A) have been achieved for the given air pressure differences (Δp). The flow rate index indicates the type of gas:

*Gas permeability of Hilti Firestop Coating CFS-CT*

Δp [Pa]	q/A N <sub>2</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]	q/A CO <sub>2</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]	q/A CH <sub>4</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]
50	≤ 0.032	≤ 0.060	≤ 0.065
250	≤ 0.159	≤ 0.299	≤ 0.327

The declared values refer to a body of pure Hilti Firestop Coating CFS-CT on mineral wool board without any penetrating installation.

#### 3.1.3.2 Water permeability

The water permeability has been tested according to Annex C of ETAG 026-2. The specimen consisted of 0.7 mm Hilti Firestop Coating CFS-CT (dry film thickness) on mineral wool.

Test result: Water tight to 1000 mm head of water or water tight to 9806 Pa.

#### 3.1.3.3 Release of dangerous substances

According to the manufacturer's declaration, the product specification has been compared with the list of dangerous substances of the European Commission to verify that that it does not contain such substances above the acceptable limits.

A written declaration in this respect was submitted by the ETA-holder.

Note: In addition to the specific clauses relating to dangerous substances contained in this European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Product Directive, these requirements need also to be complied with, when and where they apply.

### 3.1.4 Safety and accessibility in use (BWR 4)

#### 3.1.4.1 Mechanical resistance and stability

No performance assessed (NPA)



### 3.1.4.2 Resistance to impact and movement

No performance assessed (NPA)

### 3.1.4.3 Adhesion

No performance assessed (NPA)

## 3.1.5 Protection against noise (BWR 5)

### 3.1.5.1 Airborne sound insulation

Test reports for noise reduction according to EN ISO 140-3, EN ISO 140-10 and EN ISO 717-1 have been provided.

The acoustic tests were performed in a flexible wall and in a rigid wall. The acoustic characteristics of the walls itself have not been measured.

According to these tests reports the single number ratings are:

	Flexible wall	Rigid wall
	CFS- CT B 2S, 50 mm	CFS-CT B 2S, 50 mm
Nominal density of board [kg/m <sup>3</sup> ]	150	150
No. of board faces coated	2	2
Specimen size [mm x mm]	600 x 500	620 x 520
D <sub>n,e,w</sub> (C; C <sub>tr</sub> ) [dB]	39 (-2;-4)	30 (-2;-3)
R <sub>w</sub> (C; C <sub>tr</sub> ) [dB]	32 (-2;-4)	23 (-2;-3)

Test setup: As test specimen a mineral wool board of 150 kg/m<sup>3</sup> density has been used, coated with Hilti Firestop Coating CFS-CT on both sides. The coating thickness was 1 mm. The joints around the board have been sealed with Hilti Firestop Acrylic Sealant CFS-S ACR.

Structure of the flexible wall: 2 x 12.5 mm plasterboard on both sides of a 50 mm metal stud frame. The void was filled with a 40 mm mineral wool slab.

Structure of the rigid wall: 175 mm thick concrete wall with a density of 2000 kg/m<sup>3</sup> which was plastered on both sides. The opening was reduced to the test specimen size by means of block work of 175 mm thickness, plastered on both sides and a pre-fabricated concrete frame.

It should be noticed that both above mentioned results apply to the total wall construction of the size 1.25 m x 1.50 m (= 1.88 m<sup>2</sup>), i.e. the given wall with 0.322 m<sup>2</sup> Hilti Firestop Single Board Seal in case of rigid walls and a size of 1.38 x 1.5 m (= 2.07 m<sup>2</sup>), i.e. the given wall with 0.30 m<sup>2</sup> and 0.20 m<sup>2</sup> respectively seal Hilti Firestop Single Board Seal in case of flexible walls.

D<sub>n,e,w</sub>: weighted element-normalized level difference of small building elements (given with spectrum adaptation terms C and C<sub>tr</sub>)

R<sub>w</sub>: weighted sound reduction index (given with spectrum adaptation terms C and C<sub>tr</sub>)

### **3.1.6 Energy economy and heat retention (BWR 6)**

#### **3.1.6.1 Thermal properties**

##### **Hilti Firestop Coating CFS-CT**

The insulation performance of a mineral wool slab is slightly reduced by the coating and is regarded to 3.0 to 3.4% with double-sided coating. This has to be considered when selecting a mineral wool board if a required regulatory nominal  $\lambda$ -value has to be achieved.

#### **3.1.6.2 Water vapor permeability**

No performance assessed (NPA).

### **3.1.7 Sustainable use of natural resources (BWR 7)**

Not relevant, no performance assessed (NPA).

### **3.1.8 General aspects relating to fitness for use - Durability and serviceability**

#### **3.1.8.1 Use category**

Hilti Firestop Coating CFS-CT fulfils the requirements of use category  $Y_2$  in accordance with ETAG 026-2, Section 1.2. Since the requirements for type  $Y_2$  are met, also the requirements for type  $Z_1$  and  $Z_2$  are fulfilled.

Type  $Y_2$ : Products intended for use at temperatures between -20 °C and + 70°C, but with no exposure to rain nor UV.

Type  $Z_1$ : Products intended for use at internal conditions with high humidity, excluding temperatures below 0°C.1

Type  $Z_2$ : Products intended for uses at internal conditions with humidity classes other than  $Z_1$ , excluding temperatures below 0°C.

#### **3.1.8.2 Flexibility Hilti Firestop Coating CFS-CT**

The flexibility of Hilti Firestop Coating CFS-CT has been tested in accordance with EN ISO 1519 with the result of no crack formation on a mandrel of 2 mm diameter for a coating thickness of 1.0 mm.

#### **3.1.8.3 Compatibility of Hilti Firestop Coating CFS-CT with metals/plastics**

Hilti Firestop Coating CFS-CT has been tested in accordance with EOTA Technical Report TR024, 4.3.6 for compatibility in permanent contact with metals and plastics with the result of no interaction with copper, galvanized steel and stainless steel as well as PE, PVC and ABS.

#### **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 of the - Commission decision of 22 June 1999 (OJ L 178/52 of 14/07/99, p. 3), as amended by Decision of the Commission 2001/596/EC of 8 January 2001 (OJ L 209/33 of 2/8/2001, p.2) the system of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011 and EC delegated act no 568/2014 of 18 February 2014 ) given in the following table apply:

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire stopping and fire sealing products	For fire compartmentation and/or fire protection or fire performance	Any	1

#### **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 at SP Sveriges Tekniska Forskningsinstitut.

Issued in Borås on 29.10.2014  
By SP Sveriges Tekniska Forskningsinstitut

Lennart Månsson  
Certification Manager

# 1 ANNEX 1 Description of Product(s) and Product Literature

## 1.1 Products

### 1.1.1 Hilti Firestop Coating CFS-CT

A detailed specification of the product is contained in document "Identification / Product Specification relating to the European Technical Assessment ETA-11/0428 and ETA-11/0429 - Hilti Firestop Coating CFS-CT" which is a non-public part of this ETA.

The Control Plan is defined in document "Control Plan" relating to the European Technical Assessment ETA-11/0428 and ETA-11/0429 - Hilti Firestop Coating CFS-CT" which is a non-public part of this ETA.

### 1.1.2 Hilti Firestop Board CFS-CT B 2S

Hilti Firestop Board CFS-CT B 2S is a mineral wool board pre-coated on both faces with Hilti Firestop Coating CFS-CT. The thickness of the coating is 0.7 mm.

A detailed specification of the product is contained in document "Identification / Product Specification relating to the European Technical Assessment ETA-11/0428 and ETA-11/0429 - Hilti Firestop Board CFS-CT B 2S" which is a non-public part of this ETA.

The "Control Plan" is defined in document "Control Plan relating to the European Technical Assessment ETA-11/0428 and ETA-10/0429 - Hilti Firestop Board CFS-CT B 2S" which is a non-public part of this ETA.

**Table 1: Specification for mineral wool boards suitable for being used together with Hilti Firestop Coating CFS-CT**

Manufacturer	Product designation
Flumroc	Flumroc 341
Isover	Fireprotect 150
Isover	Orsil Pyro
Isover	Orsil S
Isover	Orsil T
Isover	Protect BSP 150
Isover	Stropoterm
Knauf	HERALAN BS-15
Knauf	HERALAN DDP-S
Knauf	HERALAN DP-15
Paroc	FPS 14
Paroc	FPS 17
Paroc	Pyrotech Slab 140
Paroc	Pyrotech Slab 160
Rockwool	Hardrock II, Hardrock 040
Rockwool	RP-XV
Rockwool	RPB-15, ProRox SL 980

## 1.2 Ancillary Products

### 1.2.1 Hilti Firestop Acrylic Sealant CFS-S ACR

For specification and further details see ETA-10/0292

### 1.2.2 Hilti Firestop Collar CFS-C

For specification and further details see ETA-10/0403

### 1.2.3 Hilti Firestop Wrap CFS-W

For specification and further details see ETA-10/0405

### 1.2.4 Hilti Firestop Sleeve CFS-SL M

For specification and further details see ETA-11/0153

### 1.2.5 Fixing for Hilti Firestop Collars CFS-C

- Threaded rods M8, galvanised, minimum strength category 4.6
- Nuts M8, galvanised (e.g. according to EN ISO 4032)
- Washers:
  - at a collar hook: A 8.4-28 s = 2 mm, galvanised (e.g. according to EN ISO 7089)
  - at the top side of a floor seal: A 8.4-40 s = 3 mm, galvanised (e.g. according to EN ISO 7089)

### 1.2.6 Mineral wool products for additional protection

**Table 2: Specification for mineral wool products suitable for being used as additional protection for cables/cable supports and metal pipes according to 1.2**

Characteristic	Specification	Unit
Stone wool according to EN 14303		
Reaction to fire class according to EN 13501-1	A1 or A2	-
Thermal conductivity at 20°C	≤ 0.040	W/(mK)
Density	35 - 45	kg/m <sup>3</sup>
Surface	Al-foil faced on one side	-

The following list contains suitable products but may not be exhaustive:

<b>Manufacturer</b>	<b>Product designation</b>
Flumroc	Flumroc 341
Isover	Ultimate U TFA 34, Fireprotect 150, Protect BSP 150, Orsil Pyro, Orsil S, Orsil T, Stropoterm
Knauf	Lamella Forte LLMF AluR, HERALAN BS-15, HERALAN DDP-S, HERALAN DP-15
Paroc	Lamella Mat 35 Alu Coat, FPS 14, FPS 17, Pyrotech Slab 140, Pyrotech Slab 160
Rockwool	Klimafix, Klimarock, Rockwool 133 (Lamella mat), Hardrock II, RP-XV, RPB-15

### 1.2.7 Pipe insulation products

**Table 3: Specification for mineral wool products suitable for being used as pipe insulation**

<b>Interrupted insulation</b>
Stone wool according to EN 14303, class A2 or A1 according to EN 13501-2, Al-faced

<b>Sustained insulation</b>	
<b>Manufacturer</b>	<b>Product designation</b>
Isover	Coquilla AT-LR
Isover	Protect BSR 90 alu
Paroc	Section AluCoat T
Rockwool	Conlit Pipe sections
Rockwool	Klimarock
Rockwool	RS 800 pipe sections
TP Termoprodukt	TP-Protect RS 1, TP-Protect RS 105, TP-Protect RS 120, TP-Protect RS 150

**Table 4: PE-X pipes according to EN ISO 15875**

The following list contains suitable products but may not be exhaustive:

<b>Manufacturer</b>	<b>Product designation</b>
Uponor	Uponor PE-Xa pipes
Wirsbo (now Uponor)	Wirsbo PE-Xa pipes, Uponor Wirsbo PE-Xa pipes

### **Table 5: PE-X pipe-in-pipe**

Pipes according to Table D.4, delivered as pre-assembled pipe-in-pipe product or installed on site within ducting (protection pipe) made of PE-HD (high density polyethylene). The ducting or the outer pipe of the pipe-in-pipe product is a corrugated pipe. The key to the dimensions given in Annex C is given in the following example:

PE-X 12x2 + PE-HD 25/20:

Inner pipe made of PE-X,  $\varnothing a = 12 \text{ mm}$ ,  $s = 2 \text{ mm}$ ;

Ducting made of PE-HD, corrugated pipe with  $\varnothing_{\text{max}} = 25 \text{ mm}$ ,  $\varnothing_{\text{min}} = 20 \text{ mm}$

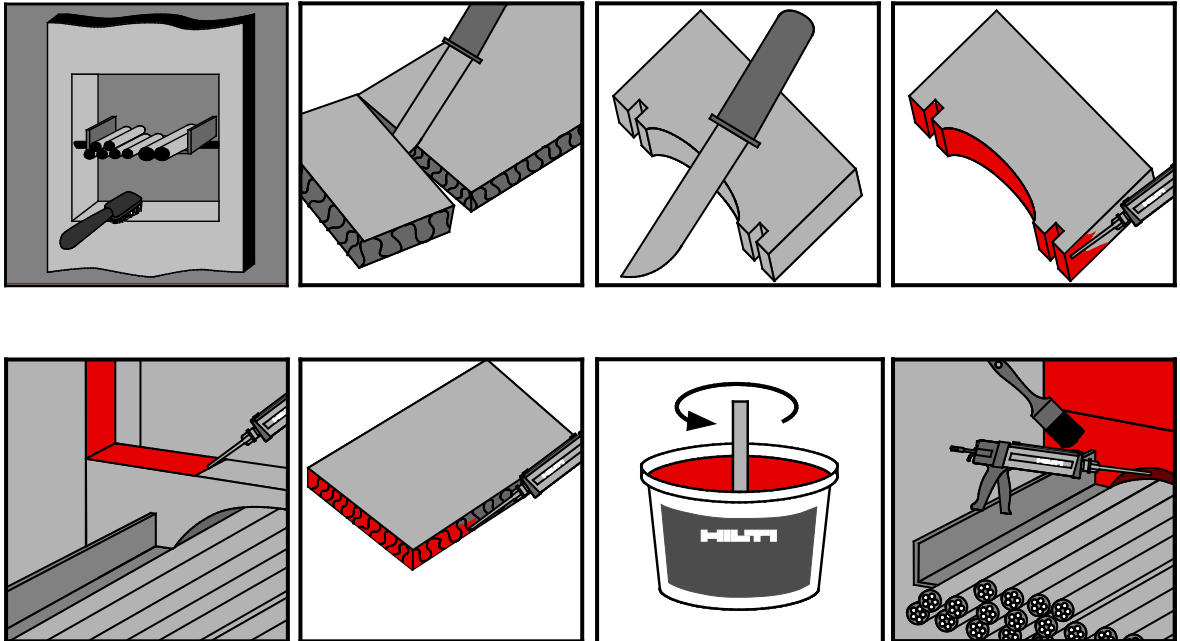
### **1.3 Technical product literature**

- Technical data sheet Hilti Firestop Single Board Seal – Hilti Firestop Coating CFS-CT (including all components and ancillary products as defined in 1.1 and 1.2).
- Safety Data Sheet acc. to 1907/2006/EC, Article 31, for Hilti Firestop Coating CFS-CT

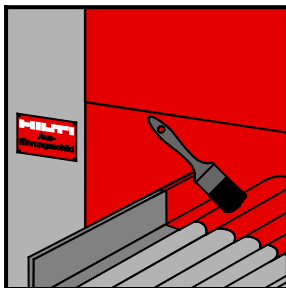
## 1.4 Installation

### 1.4.1 Installation of the penetration seal "Hilti Firestop Single Board Seal", when using a MW board according to Table 1 and Hilti Firestop Coating CFS-CT

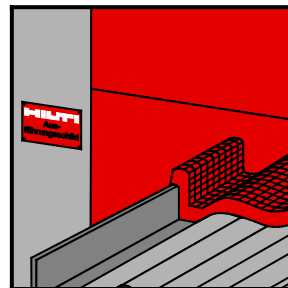
The installation should be conducted as follows:



- In case AP<sub>1</sub>, AP<sub>2</sub> or AP<sub>3</sub> is required:



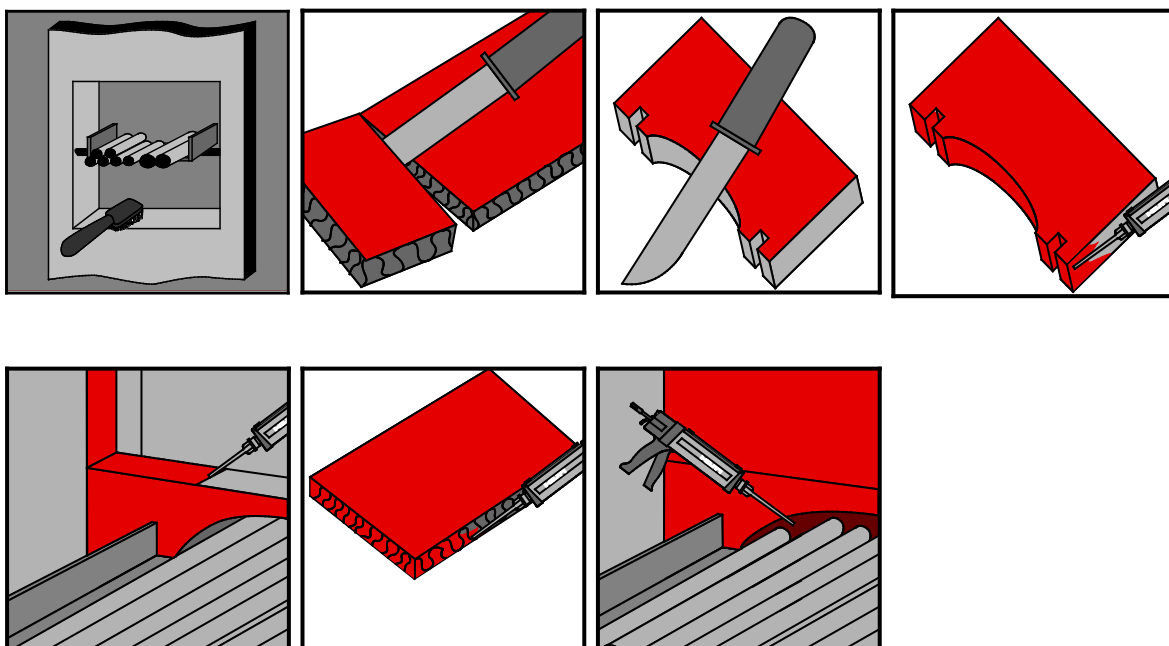
- In case AP<sub>4</sub> is required:



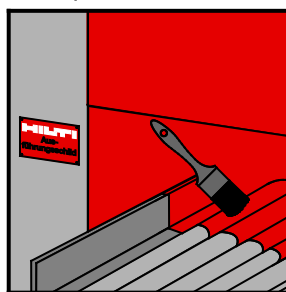
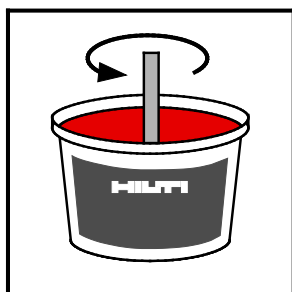


1.4.2 Installation of the penetration seal "Hilti Firestop Single Board Seal", when using the pre-coated boards Hilti Firestop Board CFS-CT B 2S

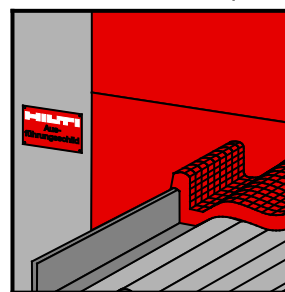
The installation should be conducted as follows:



- In case AP<sub>1</sub>, AP<sub>2</sub> or AP<sub>3</sub> is required:



- In case AP<sub>4</sub> is required:



### 1.4.3 Application temperature

The intended application temperature range is: +5°C to +40°C

### 1.4.4 Re-penetration / removal of services

If single services (cables, pipes) are installed later on, a hole is drilled through the mineral wool panel and the services passed through; the remaining annular space has to be sealed with Hilti Firestop Acrylic Sealant CFS-S ACR. In case the coating has been damaged during installation of the additional service it must be repaired. Depending on the type of service and the required fire resistance additional firestopping components, e.g. Hilti Firestop Bandage CFS-B or Hilti Firestop Collars CFS-C or CFS-C P, and/or additional protections AP<sub>1</sub> to AP<sub>4</sub> according to 1.2 may be necessary – for details see Annex 2.

In case services are removed, the remaining hole has to be filled with mineral wool according to the specification given in Table 1 and coated with Hilti Firestop Coating CFS-CT. Before coating any gaps have to be filled with Hilti Firestop Acrylic Sealant CFS-S ACR.

## 1.5 Indications to the manufacturer

### 1.5.1 Packaging, transport and storage

In the accompanying document and/or on the packaging the manufacturer shall give information as to transport and storage.

At least the following shall be indicated: storing temperature, type of storage, maximum duration of storage and required data related to minimum temperature for transport and storage.

Storage:	Store in a dry place protected from moisture	
Storage temperature:	CFS-CT:	+5° up to max. +30°C
	CFS-CT B 2S:	0° up to max. +40°C

### 1.5.2 Use, maintenance, repair

The fire resistance of penetration seals executed using Hilti Firestop Coating CFS-CT / Hilti Firestop Coated Boards CFS-CT B 2S shall not be negatively affected by future changes to buildings or building elements.

The assessment of the fitness for use is based on the assumption that damaged seals are replaced or repaired. It is also assumed that replacement of components during maintenance/repair will be undertaken using materials specified by this European Technical Assessment.

## 2 ANNEX 2 RESISTANCE TO FIRE CLASSIFICATION OF PENETRATION SEALS HILTI FIRESTOP SINGLE BOARD SEAL

### 2.1 General Information Hilti Firestop Single Board Seal

The seals may only be penetrated by the services described in Annex 2. Other parts or support constructions must not penetrate the seal.

The service support construction must be fixed to the building element containing the penetration seal or a suitable adjacent building element, on both sides of the penetration in such a manner that in the case of fire, no additional load is imposed on the seal. Furthermore it is assumed that this support is maintained on the unexposed side, for the required period of fire resistance.

Specific considerations:

- Pipes must be perpendicular to the seal surface.
- The function of the pipe seal in case of pneumatic dispatch systems, pressurised air systems etc. is guaranteed only when the systems are shut off in case of fire.
- The assessment does not address any risks associated with leakage of dangerous liquids or gases caused by failure of the pipe(s) in case of fire.
- The durability assessment does not take account of the possible effect of substances permeating through the pipe on the penetration seal.

The classifications for metal, plastic and composite pipes relate to C/U (capped inside the furnace/uncapped outside), U/C (uncapped inside the furnace/capped outside) and U/U (uncapped inside the furnace/uncapped outside). For further information refer to national regulations.

#### 2.1.1 Additional protection for cable/small conduit penetrations

Depending on the required fire resistance additional protection (AP) may be required (for details see Annex 2):

- AP<sub>1</sub>:** cables / small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables / small conduits of 150 mm from the surface of the seal, thickness 0.7 mm.
- AP<sub>2</sub>:** cables / small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables / small conduits of 150 mm from the surface of the seal, thickness 1 mm.
- AP<sub>3</sub>:** cables / small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables / small conduits of 200 mm from the surface of the seal, thickness 1 mm.
- AP<sub>4</sub>:** Mineral wool mat according to Table 2, wrapped around cables /cable support (trays, ladders), Al-faced side outside, fixed with wire, width (length along the cables/small conduits) 200 mm, thickness 30 mm.

### **2.1.2 Additional components for composite and plastic pipe penetrations**

In some cases (see Annex 2) Hilti Firestop Wrap CFS-W EL or SG (see ETA-10/0405) is wrapped around the pipe on each side of the seal (with floor applications on bottom side only) and positioned within the annular gap so that the outer edge of the wrap is flush with the surface of the construction element. For necessary number of layers of the wrap and further details see Annex 2.

In some cases (see Annex 2) Hilti Firestop Collar CFS-C (see ETA-10/0403) or Hilti Firestop Collar CFS-C P (see ETA-10/0404) is placed around the pipe on each side of the seal (with floor applications on bottom side only) and fixed with threaded rods and nuts (see Annex 1.2.7). For required type of collar and further details see Annex 2.

## 2.2 Flexible walls according to 2.1 a) and rigid walls according to 2.1 b), minimum thickness 100 mm

### Penetration seal:

Two 50 mm Hilti Firestop Boards CFS-CT B 2S (A<sub>1</sub>) or mineral wool boards according to Table 1 coated with Hilti Firestop Coating CFS-CT (A<sub>1</sub>), dry thickness of coating 0.7 mm on both sides, all cut edges of boards sealed with Hilti Firestop Acrylic Sealant CFS-S ACR, remaining gaps around cables / cable supports (trays, ladders etc.) and other services filled with Hilti Firestop Acrylic Sealant CFS-S ACR.

The board may be positioned flush to the surface of the building element or in any position within the building element.

Maximum distance for 1<sup>st</sup> service support: 250 mm.

Maximum seal size: 1175 x 600 mm (width x height)

Minimum distances in mm (see illustration below):

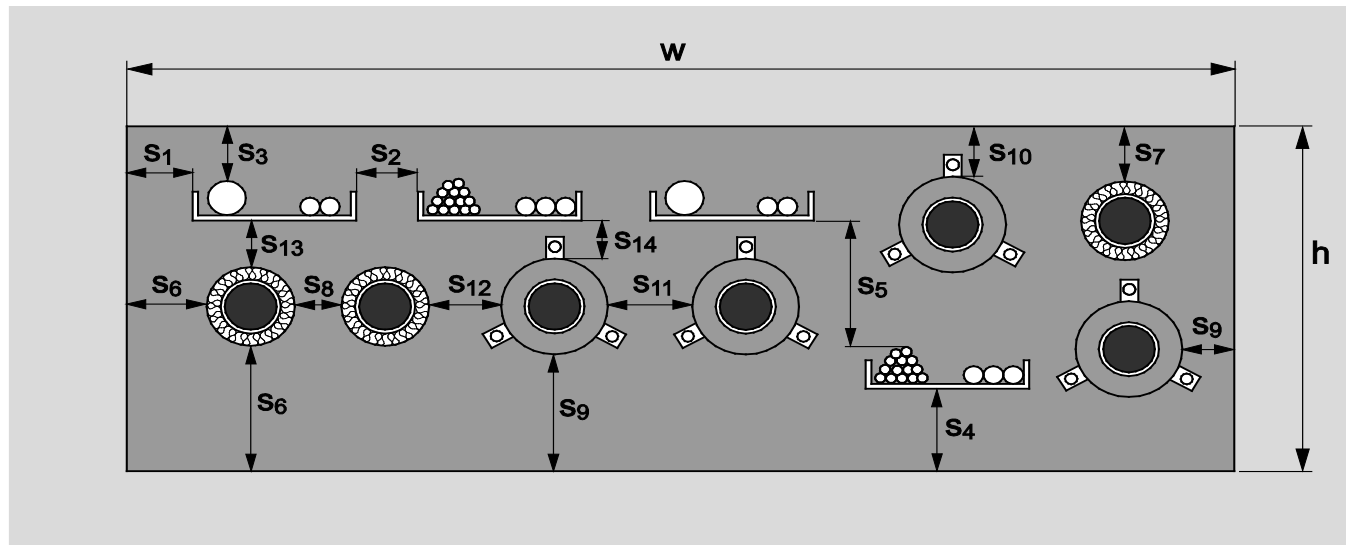
$s_1 = 50$  (distance between cables/cable supports and seal edge)

$s_2 = 0$  (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)

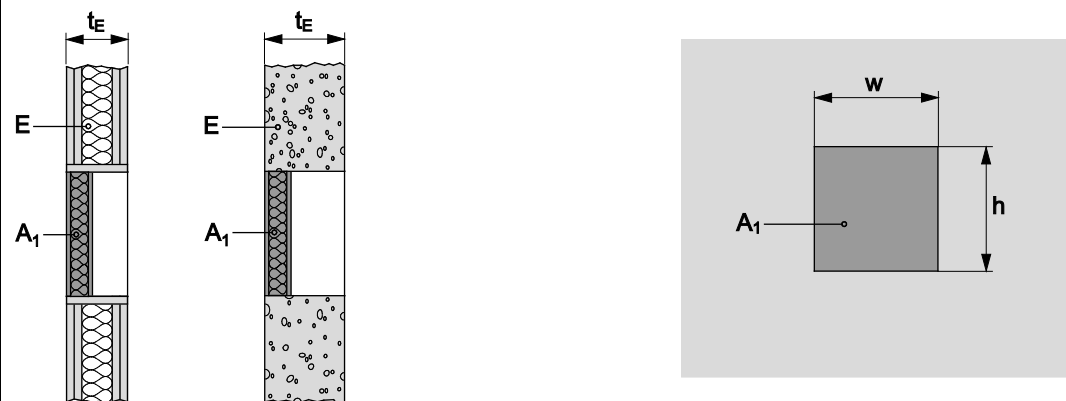
$s_5 = 80$  (distance between cables and cable support above)



**Penetrating services :(single, multiple or mixed):**

**2.2.1 Blank seal (no services) \***

Construction details (for symbols and abbreviations see Annex 4):



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

Classification

EI 45

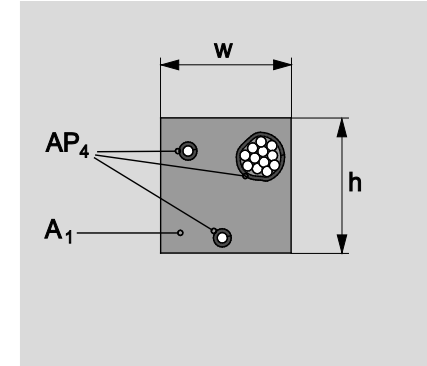
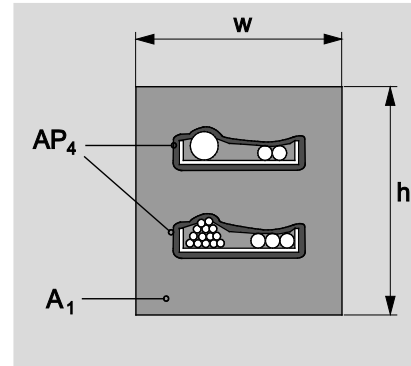
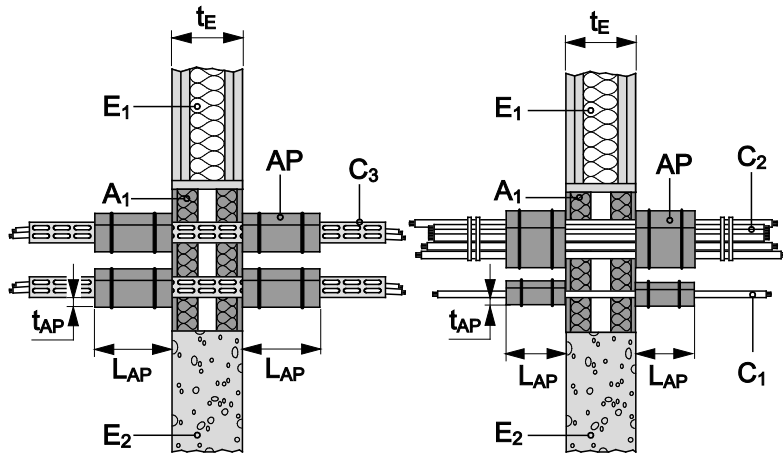
**2.2.2 Cables**

Construction details (for symbols and abbreviations see Annex 4):

Additional protection AP<sub>2</sub> or AP<sub>4</sub> according to 1.2. may be used. AP<sub>4</sub> is illustrated below.

AP<sub>2</sub>: cables / small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables / small conduits of 150 mm from the surface of the seal, thickness 1 mm.

AP<sub>4</sub>: Mineral wool mat according to Table 2, wrapped around cables /cable support (trays, ladders) on both sides of the seal, Al-faced side outside, fixed with wire, width (length along the cables/small conduits) 200 mm, thickness 20 mm.



		Classification	
Additional protection according to 1.2:		AP <sub>2</sub>	AP <sub>4</sub>
All sheathed cable types currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables), with or without cable supports, with a diameter of:			
Maximum Ø 80 mm		EI 30	EI 45
Tied cable bundle, maximum diameter of single cable 21 mm, with or without cable supports:			
Maximum Ø 100 mm		EI 30	EI 45
<b>2.2.3 Small conduits and tubes</b>			
Construction details: see 2.3.2			
		Classification	
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports			
Additional protection according to 1.2		AP <sub>2</sub>	AP <sub>4</sub>
Plastic conduits and tubes		EI 45-U/C	EI 45-U/C
Steel conduits and tubes		-	EI 30-C/U

### 2.3 Flexible walls according to 2.2 a) and rigid walls according to 2.2 b), minimum thickness 112 mm

#### Penetration seal:

50 mm Hilti Firestop Board CFS-CT B 2S (A<sub>1</sub>) or a mineral wool board according to Table 1 coated with Hilti Firestop Coating CFS-CT (A<sub>1</sub>), dry thickness of coating 0.7 mm on both sides, all cut edges of boards sealed with Hilti Firestop Acrylic Sealant CFS-S ACR, remaining gaps around cables / cable supports (trays, ladders etc.) and other services filled with Hilti Firestop Acrylic Sealant CFS-S ACR.

Maximum distance for 1st service support: 250 mm.

Maximum seal size: 1175 x 600 mm (width x height).

Minimum distances in mm (for illustration see Annex 2.2):

- s<sub>1</sub> = 0 (distance between cables/cable supports and seal edge)
- s<sub>2</sub> = 0 (distance between cable supports)
- s<sub>3</sub> = 0 (distance between cables and upper seal edge)
- s<sub>6</sub> = 10 (distance between metal pipes and seal edge)
- s<sub>8</sub> = 0 (distance between metal pipes)
- s<sub>9</sub> = 77 (distance between plastic pipes/pipe closure devices and seal edge)
- s<sub>11</sub> = 0 (distance between plastic pipes/pipe closure devices)
- s<sub>12</sub> = 49 (distance between metal pipes and plastic pipes/pipe closure devices)
- s<sub>13</sub> = 56 (distance between cables/cable supports and metal pipes)
- s<sub>14</sub> = 32 (distance between cables/cable supports and plastic pipes/pipe closure devices)

#### Penetrating services (single, multiple or mixed):

In addition to the services referred to in Annex 2.2 the following services with the classifications given below are covered:

#### 2.3.1 Cables

Construction details: see Annex 2.3.2	Classification
Additional protection according to Annex 1.2	AP <sub>1</sub>
All sheathed cable types currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable supports, with a maximum diameter of 80 mm, with or without cable supports)	EI 45



Non-sheathed cables (wires) currently and commonly used in building practice in Europe, with or without cable supports, with a maximum diameter of 17 mm	EI 45
Tied cable bundle, maximum diameter 100 mm, maximum diameter of single cable 21 mm, with or without cable supports	EI 45
<b>2.3.2 Small conduits and tubes</b>	
Construction details: see Annex 2.3.2	
	<b>Classification</b>
Additional protection according to Annex 1.2	AP <sub>1</sub>
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports	
Plastic conduits and tubes	EI 45 U/C
Steel conduits and tubes	EI 45 C/U
<b>2.3.3 Metal pipes with mineral wool insulation according to Table 3</b>	
Construction details: (for symbols and abbreviations see Annex 4)	
Continued insulation, interrupted (CI)	Local insulation, interrupted (LI)

<b>2.3.3.1 Steel pipes with mineral wool insulation according to Table 3</b>			
<b>Steel pipes (C) with continued insulation (D) – interrupted – C/U</b>			
Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Insulation thickness ( $t_D$ ) [mm]	Classification
32	4.0 – 14.2	$\geq 20$	EI 45-C/U
32 – 114.3	3.6 – 14.2	$\geq 30$	EI 45-C/U

<b>Steel pipes (C) with local insulation (D) – interrupted – C/U</b>				
Pipe		Insulation		Classification
diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
32	4.0 – 14.2	20	$\geq 500$	EI 45-C/U
114.3	3.6 – 14.2	30	$\geq 500$	EI 45-C/U

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 1050°C, e.g. . low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

<b>2.3.3.2 Copper pipes with mineral wool insulation according to Table 3</b>				
<b>Copper pipes (C) with continued insulation (D) – sustained</b>				
Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Insulation thickness ( $t_D$ ) [mm]	Classification	
42	1.5 - 14.2	$\geq 20$	EI 45-C/U	
<b>Copper pipes (C) with local insulation (D) – sustained</b>				
Pipe		Insulation		Classification
diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
42	1.5 - 14.2	20	$\geq 500$	EI 45-C/U

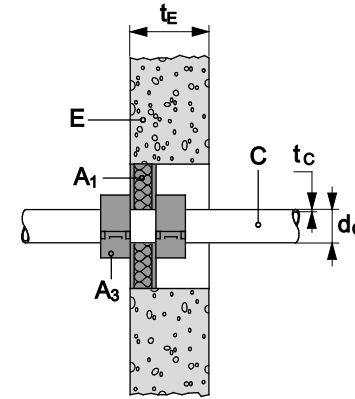
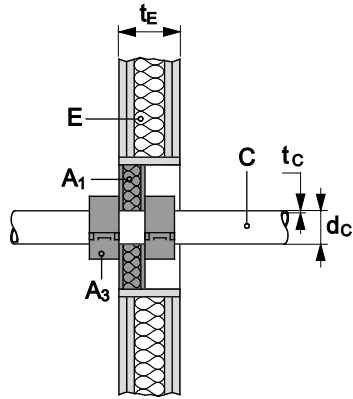
The field of application given above for copper pipes is also valid for other metal pipes with lower heat conductivity than copper and a melting point of minimum 1100°C, e.g. unalloyed steel, low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

## 2.3.4 Plastic pipes

### 2.3.4.1 Plastic pipes with Hilti Firestop Collar CFS-C

Construction details: (for symbols and abbreviations see Annex 4)

Hilti Firestop Collars CFS-C are installed on both sides of the seal, fixed together by threaded rods, washers and nuts as specified in Annex 1.2.



#### PVC-U pipes (C) according to EN ISO 1452-2, EN ISO 15493, DIN 8061/8062 – U/C

Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	Collar size ( $A_3$ )	No. of hooks	Classification
32	1.8	CFS-C 50/1.5"	2	EI 45-U/C
110	2.2 – 8.2	CFS-C 110/4"	4	EI 45-U/C

The results are also valid for PVC-U pipes according EN 1329-1<sup>16</sup> and EN 1453-1<sup>17</sup> as well as PVC-C pipes according 1566-1

#### PE-X pipes (C) according to EN ISO 15875 (see also Table 4)

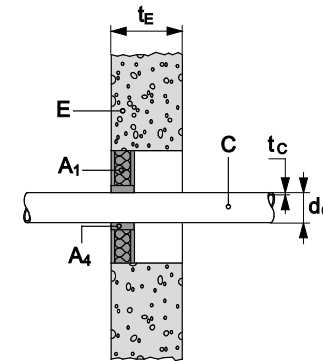
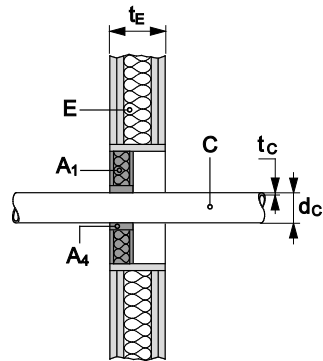
Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	Collar size ( $A_3$ )	No. of hooks	Classification
12	2.0	CFS-C 50/1.5"	2	EI 45-U/C
Bundle of 3 pipes 12x2	-	CFS-C 50/1.5"	2	EI 45-U/C
32	4.5	CFS-C 50/1.5"	2	EI 45-U/C

Pipe-in-pipe (PE-X in PE-HD ducting, see Table 5)			
Pipe dimensions [mm]	Collar size ( $A_3$ )	No. of hooks	Classification
PE-X 12x2 + PE-HD 25/20	CFS-C 50/1.5"	2	EI 45-U/C
PE-X 28x4 + PE-HD 54/44	CFS-C 63/2"	2	EI 45-U/C
Bundle of 3 PE-X 22x3 + PE_HD 34/28	CFS-C 110/4"	4	EI 45-U/C

### 2.3.4.2 Plastic pipes with Hilti Firestop Wrap CFS-W

Construction details: (for symbols and abbreviations see Annex 4)

The number of layers of Firestop Wrap CFS-W ( $A_2$ ) given below is wrapped around the pipe on each side of the seal and positioned within the annular gap so that the outer edge of the wrap is flush with the surface of the seal.



### PVC-U pipes (C) according to EN ISO 1452-2, EN ISO 15493, DIN 8061/8062 – U/C

Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	No. of layers of Hilti Firestop Wrap CFS-W EL	Classification
32	1.8	2	EI 45-U/C
110	2.2 – 8.2	2	EI 45-U/C

The results are also valid for PVC-U pipes according EN 1329-1<sup>16</sup> and EN 1453-1<sup>17</sup> as well as PVC-C pipes according 1566-1

<b>PE pipes (C) according to EN ISO 15494 and DIN 8074/8075</b>			
Pipe diameter (d <sub>c</sub> ) [mm]	Pipe wall thickness t <sub>c</sub> [mm]	No. of layers of Hilti Firestop Wrap CFS-W EL	Classification
32 - 110	1.8/2.7 <sup>2</sup> – 6.3	2	EI 45-U/C
<b>PE-X pipes (C) according to EN ISO 15875 (see also Table 4)</b>			
Pipe diameter (d <sub>c</sub> ) [mm]	Pipe wall thickness t <sub>c</sub> [mm]	No. of layers of Hilti Firestop Wrap CFS-W EL	Classification
12	2.0	1	EI 45-U/C
Bundle of 3 pipes 12x2	-	1	EI 45-U/C
32	4.5	1	EI 45-U/C
<b>Pipe-in-pipe (PE-X in PE-HD ducting, see Table 5)</b>			
Pipe dimensions [mm]		No. of layers of Hilti Firestop Wrap CFS-W EL	Classification
PE-X 12x2 + PE-HD 25/20		1	EI 45-U/C
PE-X 28x4 + PE-HD 54/48		1	EI 45-U/C
Bundle of 3 PE-X 22x3 + PE_HD 34/28		1	EI 45-U/C

<sup>2</sup> Interpolation for minimum wall thickness between 1.8 mm for 32 mm diameter pipes and 2.7 mm for 110 mm diameter pipes

<b>2.3.5 Composite pipes</b>				
Pipes: "Geberit Mepla" composite pipes (PE-Xb/Al/PE-HD) of Geberit Vertriebs AG, a company of the Geberit Group				
<b>2.3.5.1 Composite pipes Geberit Mepla with Hilti Firestop Collar CFS-C</b>				
Construction details see 2.4.4.1				
Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	Collar size ( $A_3$ )	No. of hooks	Classification
16	2.25	CFS-C 50/1.5"	2	EI 45-U/C
<b>2.3.5.2 Composite pipes Geberit Mepla with Hilti Firestop Wrap CFS-W</b>				
Construction details see 2.4.4.2				
Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	No. of layers of Hilti Firestop Wrap CFS-W	Classification	
16	2.25	1	EI 45-U/C	
<b>2.3.5.3 Composite pipes Geberit Mepla with mineral wool insulation according Table 3 and with Hilti Firestop Wrap CFS-W</b>				
Construction details see 2.4.4.2				
1 layer of Firestop Wrap CFS-W ( $A_2$ ) is wrapped around the pipe on each side of the seal and positioned within the annular gap so that the outer edge of the wrap is flush with the surface of the wall.				
<b>Composite pipes Geberit Mepla (C) with continued insulation (D) – interrupted</b>				
Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	Insulation thickness ( $t_D$ ) [mm]	Classification	
63	4.5	$\geq 20$	EI 45-U/C	
<b>Composite pipes Geberit Mepla (C) with local insulation (D) – interrupted</b>				
Pipe		Insulation		Classification
diameter ( $d_c$ ) [mm]	wall thickness ( $t_c$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
63	4.5	20	$\geq 250$	EI 45-U/C

<b>Bundle of 3 composite pipes (C) with continued insulation (D) wrapped around the bundle – interrupted</b>				
Pipe diameter ( $d_c$ ) [mm]	Pipe wall thickness $t_c$ [mm]	Insulation thickness ( $t_D$ ) [mm]		Classification
32	3.0	$\geq 20$		EI 45-U/C
<b>Bundle of 3 composite pipes (C) with local insulation (D) wrapped around the bundle – interrupted</b>				
Pipe		Insulation		Classification
diameter ( $d_c$ ) [mm]	wall thickness ( $t_c$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
32	3.0	20	$\geq 250$	EI 45-U/C

## 2.4 Rigid floors according to 2.2 c), minimum thickness 150 mm

### Penetration seal:

50 mm Hilti Firestop Board CFS-CT B 2S (A1) or a mineral wool board according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A1), dry thickness of coating 0.7 mm on both sides, all cut edges of boards sealed with Hilti Firestop Acrylic Sealant CFS-S ACR, remaining gaps around cables / cable supports (trays, ladders etc.) and other services filled with Hilti Firestop Acrylic Sealant CFS-S ACR.

The board may be positioned flush to the surface of the building element or in any position within the building element.

Maximum distance for 1<sup>st</sup> service support: 100 mm.

Maximum seal size: see Figure below.

Minimum distances in mm:

$s_1 = 0$  (distance between cables/cable supports and 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)

$s_6 = 45$  (distance between metal pipes and seal edge)

$s_8 = 20$  (distance between metal pipes)

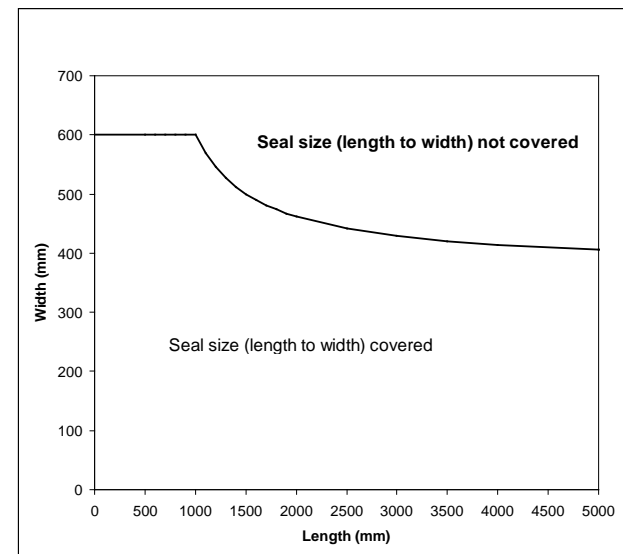
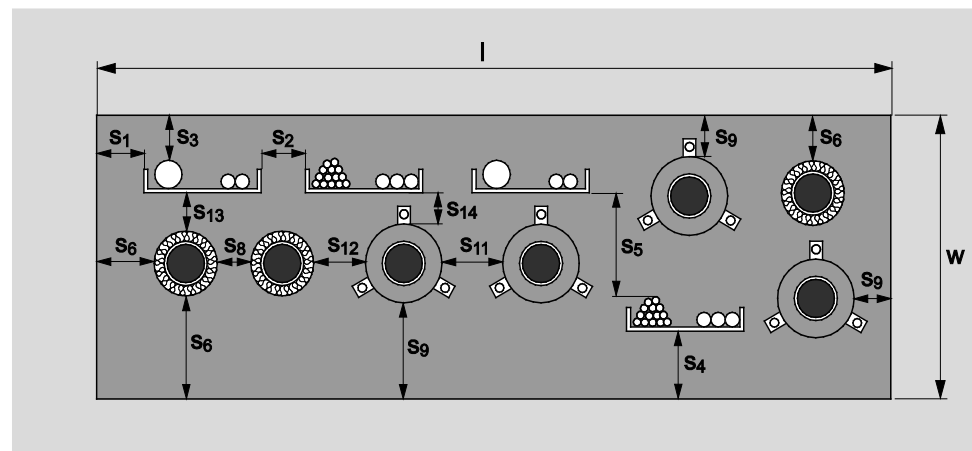
$s_9 = 74$  (distance between plastic pipes/pipe closure devices and seal edge)

$s_{11} = 0$  (distance between plastic pipes/pipe closure devices)

$s_{12} = 50$  (distance between metal pipes and plastic pipes/pipe closure devices)

$s_{13} = 46$  (distance between cables/cable supports and metal pipes)

$s_{14} = 32$  (distance between cables/cable supports and plastic pipes / pipe closure devices)



Seal sizes covered in all floor applications (length x width)



**Penetrating services: (single, multiple or mixed)**

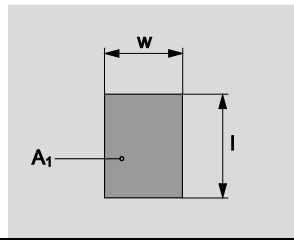
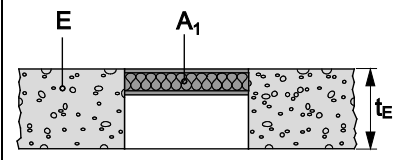
**2.4.1 Blank seal (no services) \***

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

Construction details (for symbols and abbreviations see Annex 4):

Classification

Maximum size 600 x 1000 mm (width x length)



EI 45

## 2.4.2 Cables

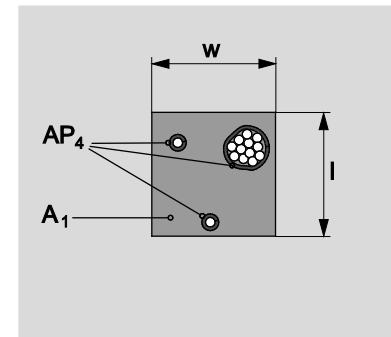
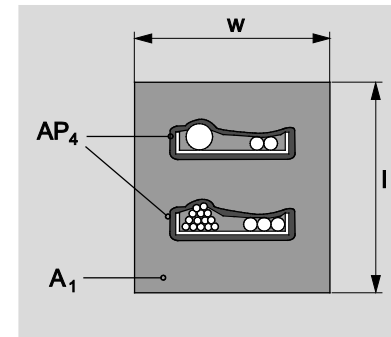
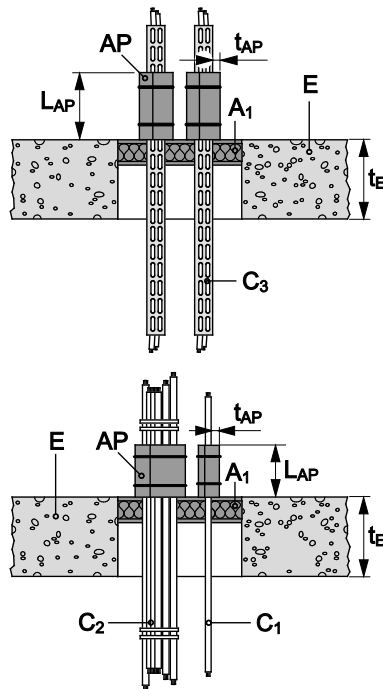
(single, multiple or mixed)

Construction details (for symbols and abbreviations see Annex 4):

Additional protection  $AP_3$  or  $AP_4$  according to 1.2 may be used.  $AP_4$  is illustrated below.

$AP_3$ : cables / small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables / small conduits of 200 mm from the surface of the seal, thickness 1 mm.

$AP_4$ : Mineral wool mat according to Table 2, wrapped around cables /cable support (trays, ladders), Al-faced side outside, fixed with wire, width (length along the cables/small conduits) 200 mm, thickness 30 mm.



	Classification	
Additional protection:	AP <sub>3</sub>	AP <sub>4</sub>
All sheathed cable types currently and commonly used in building practice in Europe (e.g. power, control, signal, telecommunication, data, optical fibre cables, with or without cable support ,with a diameter of:		
Maximum Ø 80 mm	EI 45	EI 45
Non-sheathed cables (wires) currently and commonly used in building practice in Europe, with or without cable support , with a diameter of:		
Maximum Ø 17 mm	EI 45	EI 45
Maximum Ø 24 mm	EI 30	EI 30
Tied cable bundle, maximum diameter of single cable 21 mm, with or without cable support		
Maximum Ø 100 mm	EI 45	EI 45

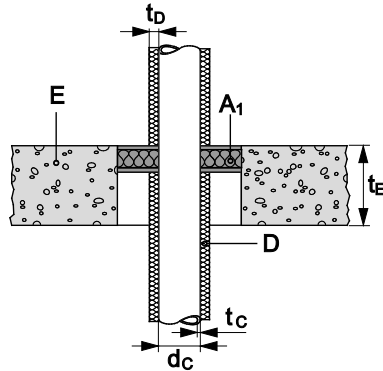
<b>2.4.3 Small conduits and tubes</b> (single, multiple or mixed)		
Construction details: see Annex 2.6.2		
	Classification	
Additional protection:	AP <sub>3</sub>	AP <sub>4</sub>
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable support		
Plastic conduits and tubes	EI 45-U/C	EI 45-U/C
Steel conduits and tubes	EI 45-C/U	EI 45-C/U

## 2.4.4 Metal pipes

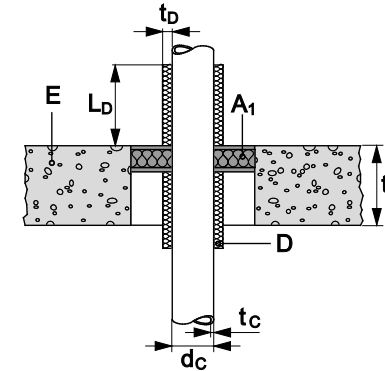
### 2.4.4.1 Metal pipes with mineral wool insulation according to Table 3

Construction details (for symbols and abbreviations see Annex 4):

Continued insulation, interrupted (CI)



Local insulation, interrupted (LI)



#### Steel pipes (C) with continued insulation (D) – interrupted – C/U

Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Insulation thickness ( $t_D$ ) [mm]	Classification
32	4.0 – 14.2	$\geq 20$	EI 45-C/U
32 – 114.3	3.6 – 14.2	$\geq 30$	EI 45-C/U

#### Steel pipes (C) with local insulation (D) – interrupted – C/U

Pipe		Insulation		Classification
diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
32	4.0 – 14.2	20	$\geq 500$	EI 45-C/U
114.3	3.6 – 14.2	30	$\geq 500$	EI 45-C/U

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 1050°C, e.g. low alloyed steel, cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

<b>Copper pipes (C) with continued insulation (D) – interrupted – C/U</b>				
Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Insulation thickness ( $t_D$ ) [mm]	Classification	
42	1.5 – 14.2	$\geq 20$	EI 45-C/U	
<b>Copper pipes (C) with local insulation (D) – interrupted – C/U</b>				
Pipe		Insulation		Classification
diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	
42	1.5 – 14.2	20	$\geq 500$	EI 45-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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

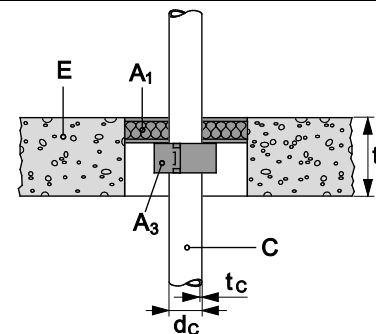
#### 2.4.5 Plastic pipes with Hilti Firestop Collar CFS-C

Construction details

(for symbols and abbreviations see Annex 4):

Hilti Firestop Collar CFS-C ( $A_3$ ) is installed on the bottom side of the seal, fixed by threaded rods, washers and nuts as specified in Annex 1.2.

No additional protection.



#### PVC-U pipes (C) according to EN ISO 1452-2, EN ISO 15493, DIN 8061/8062 – U/C

Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_{C1}$ ) [mm]	Collar size ( $A_3$ )	No. of hooks	Classification
32	1.8	CFS-C 50/1.5"	2	EI 45-U/C
110	2.2 – 8.2	CFS-C 110/4"	4	EI 45-U/C

The results are also valid for PVC-U pipes according EN 1329-1<sup>16</sup> and EN 1453-1<sup>17</sup> and PVC-C pipes according EN 1566-1

### 3 ANNEX 3 Reference Documents

#### 3.1 References to standards mentioned in the ETA:

DIN 8061	Unplasticized polyvinyl chloride (PVC-U) pipes - General quality requirements and testing
DIN 8062	Unplasticized polyvinyl chloride (PVC-U) pipes - Dimensions
DIN 8074	Polyethylene (PE) - Pipes PE 63, PE 80, PE 100, PE-HD - Dimensions
DIN 8075	Polyethylene (PE) pipes - PE 63, PE 80, PE 100, PE-HD - General quality requirements, testing
DIN 19531-10	Pipes and fittings made of unplasticized polyvinyl chloride (PVC-U) socket for waste and soil discharge systems inside buildings - Part 10: Fire behavior, quality control and installation recommendations
EN 1026	Windows and doors – Air permeability – Test method
EN 1329-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system
EN 1366-3	Fire resistance tests for service installations - Part 3: Penetration seals
EN 1453-1	Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes and the system
EN 12667	Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance
EN 13501-1	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
EN 13501-2	Fire classification of construction products and building elements – Part 2: Classification using test data from fire resistance tests
EN ISO 140-3	Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements
EN ISO 140-10	Acoustics – Measurements of sound insulation in buildings and of building elements – Part 10: Laboratory measurement of airborne sound insulation of small building elements
EN ISO 717-1	Acoustics – Rating of sound insulation of buildings and of building elements – Part 1: Airborne sound insulation
EN ISO 1452-2	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) - Part 2: Pipes
EN ISO 1519	Paints and varnishes – Bend test (cylindrical mandrel)

EN ISO 4032	Hexagon nuts, style 1 - Product grades A and B
EN ISO 7089	Plain washers - Normal series - Product grade A
EN ISO 15493	Plastics piping systems for industrial applications - Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) - Specifications for components and the system; Metric series
EN ISO 15494	Plastics piping systems for industrial applications - Polybuten (PB), polyethylene (PE) and polypropylene (PP) - Specifications for components and the system; Metric series
EN ISO 15875	Plastics piping systems for hot and cold water installations - Cross-linked polyethylene (PE-X)

### 3.2 Other referenced documents

EOTA TR 001	Determination of impact resistance of panels and panel assemblies
EOTA TR 024	Characterization, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products

## 4 ANNEX 4 Abbreviations used in drawings

Abbreviation	Description
A <sub>1</sub>	Mineral wool board coated with Hilti Firestop Coating CFS-CT or Hilti Firestop Coated Board CFS-CT B 1S / CFS-CT B 2S
A <sub>3</sub>	Hilti Firestop Collar CFS-C
A <sub>4</sub>	Hilti Firestop Wrap CFS-W EL or SG
AP <sub>1</sub> to AP <sub>4</sub>	Additional protection for services
C, C <sub>1</sub> , C <sub>2</sub> , C <sub>3</sub>	Penetrating services
D	Pipe insulation
d <sub>c</sub>	Pipe diameter
E	Building element (wall, floor)
h	Height of the penetration seal
l	Length of the penetration seal
L <sub>AP</sub>	Length of the additional protection
L <sub>D</sub>	Length of the pipe insulation
s <sub>1</sub> , s <sub>2</sub> , ....	Distances
t <sub>c</sub>	Pipe wall thickness
t <sub>D</sub>	Thickness of insulation
t <sub>E</sub>	Thickness of the building element
w	Width of the penetration seal