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# European Technical Assessment

**ETA-12/0101**  
of 30.04.2017

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 Mortar CFS-M RG

**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 7a

**This European Technical Assessment contains**

35 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**

Guideline for European technical approval for "Fire Stopping and Fire Sealing Products", ETAG 026 Part 2: "Penetration Seals", edition August 2011, used as European Assessment Document (EAD)

**This European Technical Assessment replaces**

European technical approval ETA-12/0101 with validity from 30.04.2012 to 29.04.2017

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Specific parts

## 1 Technical description of the product

“Hilti Firestop Mortar CFS-M RG” is a kit to be used as a mixed penetration seal based on cement and aggregates.

Additional components	Characteristics
Additional Protection (AP)	Mineral wool mat (for details see Annex D of the ETA) for cable/small conduit penetrations, wrapped around cables /cable support (trays, ladders), Al-faced outside, fastened with wire, width (length along the cables/small conduits) 200 mm, thickness 30 mm.
Hilti Firestop Bandage CFS-B	Graphite based pipe wrap with classification E according to EN 13501-1.
Hilti Firestop Collar CFS-C	Pipe closure device for plastic pipes made from an intumescent inlay in a steel housing with fastening hooks with classification F according to EN 13501-1.
Hilti Firestop Collar CFS-C P	Pipe closure device for plastic pipes made from an intumescent inlay in a steel housing with fastening hooks with classification E according to EN 13501-1.
Fixing components	for “Hilti Firestop Collar CFS-C” and “Hilti Firestop Collar CFS-C P”. For specification see Annex B.2 and B.3 of the ETA.
Hilti Firestop Wrap CFS-W	Intumescent wrap used as pipe closure device for plastic pipes with classification E according to EN 13501-1.

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

### 2.1 Intended use

“Hilti Firestop Mortar CFS-M RG” is intended to be used as a mixed penetration seal to temporarily or permanently reinstate the fire resistance performance of rigid wall constructions and rigid floor constructions where they have been provided with apertures which are penetrated by various cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions (perforated or non-perforated steel cable trays and steel ladders).

The maximum opening size of the penetration seal in walls is 1200 mm x 2000 mm (width x height). For more details and details regarding the maximum opening size in floor applications, and details regarding blank seals, see Annex C of the ETA.

The installation of a blank penetration seal with the dimensions as specified in Annex C of the ETA is allowed.

“Hilti Firestop Mortar CFS-M RG” can be installed only in separating elements as follows:

Rigid walls type A: The wall must have a minimum thickness of 150 mm and comprise concrete, aerated concrete or masonry, with a minimum density of 550 kg/m<sup>3</sup>.

- Rigid walls type B: The wall must have a minimum thickness of 175 mm and comprise concrete or masonry (e.g. hollow brick), with a minimum density of 1100 kg/m<sup>3</sup>.
- Rigid floors type A: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 550 kg/m<sup>3</sup>.
- Rigid floors type B: The floor must have a minimum thickness of 150 mm and comprise concrete with a minimum density of 2400 kg/m<sup>3</sup>.
- Rigid floors type C: The floor must have a minimum thickness of 175 mm and comprise concrete with a minimum density of 2400 kg/m<sup>3</sup>.

This European Technical Assessment does not cover sandwich panel constructions.

“Hilti Firestop Mortar CFS-M RG” 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 support constructions shall not penetrate the penetration seal.

The first support of the cables, conduits and pipes shall be located at maximum 260 mm away from both faces of wall constructions and maximum 300 mm from the upper face of floor constructions, for details see Annex C of the ETA.

## 2.2 Use category

“Hilti Firestop Mortar CFS-M RG” is intended for use at temperatures between - 5°C and + 7°C, but with no exposure to rain and can therefore – according to ETAG 026-Part 2 clause 2.4.12.1.3.3 – 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 Mortar CFS-M RG” of 10 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 effect 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 and
- > pneumatic dispatch systems, compressed air systems, etc. are switched off by additional means in case of fire.

## 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.5 of the ETA
<b>BWR 3</b>	Air permeability (material property)	EN 1026:2000	Clause 3.2.1 of the ETA
	Water permeability (material property)	No performance assessed	
	Content and/or release of dangerous substances	European Council Directive 67/548/EEC and Regulation (EC) No 1272/2008 as well as EOTA TR 034, edition October 2015	Declaration of conformity by the manufacturer
<b>BWR 4</b>	Mechanical resistance and stability	EOTA TR001	Clause 3.3.1 of the ETA
	Resistance to impact / movement	EOTA TR001	Clause 3.3.2 of the ETA
	Adhesion	EOTA TR001	Clause 3.3.3 of the ETA
<b>BWR 5</b>	Airborne sound insulation	EN ISO 20140-1:2010 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

“Hilti Firestop Mortar CFS-M RG” was assessed according to ETAG 026-Part 2 clause 2.4.1 and classified according to EN 13501-1:2007+A1:2009.

Component	Class according to EN 13501-1:2007+A1:2009
Hilti Firestop Mortar CFS-M RG	A1

#### 3.1.2 Resistance to fire

“Hilti Firestop Mortar CFS-M RG” was tested according to ETAG 026-Part 2 clause 2.4.2, EN 13631-1 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 Mortar CFS-M RG” 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.

The classifications are not valid for sandwich panel constructions.

### 3.2 Hygiene, health and environment (BWR 3)

#### 3.2.1 Air permeability

The air permeability of “Hilti Firestop Mortar CFS-M RG” with a thickness of 150 mm was tested according to EN 1026:2000 in a reinforced concrete wall with a thickness of 150 mm. The size of the opening was 1000 mm x 500 mm.

“Hilti Firestop Mortar CFS-M RG” was tested as blank penetration seal according to ETAG 026-Part 2 clause 2.4.3. Any other components were not included in these tests.

Pressure [Pa]	150 to 900	1050	2100
q/A air [m <sup>3</sup> /(h·m <sup>2</sup> )]	<0,0009	0,0012	0,0014

Pressure [Pa]	3750 to 4350	4500	4650	4800	4950
q/A air [m <sup>3</sup> /(h·m <sup>2</sup> )]	<0,0009	0,0012	0,0011	0,0018	0,0022

#### 3.2.2 Water permeability

No performance assessed.

### 3.2.3 Release of dangerous substances

According to the manufacturer's declaration the components of "Hilti Firestop Mortar CFS-M RG" do not contain dangerous substances detailed in Council Directive 67/548/EEC and Regulation (EC) no 1272/2008 as well as EOTA TR 034 (General ER 3 Checklist for ETAGs/CUAPs/ETAs- Content and/or release of dangerous substances in products/kits), edition October 2015 above the acceptable limits.

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

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 Products Regulation, these requirements need also to be complied with, when and where they apply.

## 3.3 Safety in use (BWR 4)

### 3.3.1 Mechanical resistance and stability

In impact tests according to EOTA TR001 the requirements for the highest risk zone type (Type IV) have been fulfilled as defined for internal walls in EOTA TR 001 A.1 and for floors in EOTA TR 001 A.4 for safety in use (600 Nm soft body impact, 10 Nm hard body impact) as well as serviceability (120 Nm soft body impact, 6 Nm hard body impact).

### 3.3.2 Resistance to impact / movement

See clause 3.3.1 of the ETA

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

See clause 3.3.1 of the ETA

## 3.4 Protection against noise (BWR 5)

### 3.4.1 Airborne sound insulation

The airborne sound insulation of "Hilti Firestop Mortar CFS-M RG" was tested according to EN ISO 20140-2:2010 and EN ISO 717-1.

The acoustic tests were performed in a rigid wall. Hilti Firestop Mortar CFS-M RG was tested as a blank mortar seal without penetrating elements. The seal was 500 mm wide and 600 mm high with a thickness of 175 mm. The area of Hilti Firestop Mortar CFS-M RG was 0,3 m<sup>2</sup>.

"Hilti Firestop Mortar CFS-M RG" was tested as blank penetration seal according to ETAG 026-Part 2 clause 2.4.9. Any other components were not included in these tests.

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

Weighted element-normalized level difference:  $D_{n,w} = 59$  dB

From this  $D_{n,w}$  the weighted sound reduction index calculates to:  $R_w = 52$  dB

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

#### 3.5.1 Thermal properties

The thermal properties of “Hilti Firestop Mortar CFS-M RG” were tested according to EN 12667:2001.

Component	$\lambda_{10}$ in W/(m*K)
Hilti Firestop Mortar CFS-M RG	0,232

#### 3.5.2 Water vapour permeability

No performance assessed.

### 3.6 General aspects relating to fitness for use

All components of “Hilti Firestop Mortar CFS-M RG” fulfil the requirements for the intended use category.

“Hilti Firestop Mortar CFS-M RG” is therefore appropriate for use at temperatures between - 5°C and + 7°C, but with no exposure to rain and can therefore – according to ETAG 026-Part 2 clause 2.4.12.1.3.3 – be categorized as Type Y1. Since the requirements for Type Y1 are met, also the requirements for Type Y2, Z1 and Z2 are fulfilled.

## 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.

<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



<b>Product(s)</b>	<b>Intended use(s)</b>	<b>Level(s) or class(es)</b> (reaction to fire)	<b>System</b> 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
* 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)			
** Products/materials not covered by footnote (*)			
*** 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)			

**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 once a year for surveillance of the manufacturer.

Issued in Vienna on 30.04.2017  
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits  
Managing Director

## ANNEX A REFERENCE DOCUMENTS and LIST OF ABBREVIATIONS

### A.1 References to standards mentioned in the ETA

EN 1026	Windows and doors – Air permeability – Test method
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 20140-10	Acoustics; measurement of sound insulation in buildings and of building elements; part 10: laboratory measurement of airborne sound insulation of small building elements (ISO 140-10:1991)
EN ISO 717-1	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

### A.2 Other reference documents

EOTA TR 001	Determination of impact resistance of panels and panel assemblies
EOTA TR 024	Characterisation, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products
	Safety Data Sheet according to 1907/2006/EC, Article 31, for Hilti Firestop Mortar CFS-M RG

### A.3 Abbreviations used in drawings

Abbreviation	Description
A <sub>1</sub>	Hilti Firestop Mortar CFS-M RG according to Annex B.1 of the ETA
A <sub>2</sub>	Hilti Firestop Bandage CFS-B according to Annex B.6 of the ETA
A <sub>3</sub>	Hilti Firestop Collar CFS-C P or CFS-C according to Annex B.2 and B.3 of the ETA
A <sub>4</sub>	Hilti Firestop Wrap CFS-W according to Annex B.5 of the ETA
AP	Additional protection according to clause 1.1.2 of the ETA
C, C <sub>1</sub> , C <sub>2</sub> , C <sub>3</sub>	Penetrating Elements
D	Pipe insulation
d <sub>A</sub>	Overlap of mortar (seal type 2)
d <sub>c</sub>	Pipe diameter
E	Building element (wall, floor)
h	Height of penetration seal
l	Length of the penetration seal
L <sub>D</sub>	Length of local pipe insulation
L <sub>AP</sub>	Length of the additional protection AP
s <sub>1</sub> to s <sub>14</sub>	Distances
t <sub>A1</sub>	Thickness of the mortar seal
t <sub>AP</sub>	Thickness of the additional protection AP
t <sub>c</sub>	Wall thickness of the pipe
t <sub>D</sub>	Thickness of the pipe insulation
t <sub>E</sub>	Thickness of the building element (wall, floor)
w	Width of penetration seal



**ANNEX C**

**RESISTANCE TO FIRE CLASSIFICATION OF PENETRATION SEALS MADE OF HILTI FIRESTOP MORTAR CFS-M RG**

**C.1 Rigid wall type A according to clause 1.2.1 of the ETA (density  $\geq 550 \text{ kg/m}^3$ ), minimum thickness 150 mm**

**Penetration seal**

Hilti Firestop Mortar CFS-M RG ( $A_1$ ), thickness ( $t_{A1}$ )  $\geq 150 \text{ mm}$  (opening depth  $t_E$  filled completely).

Maximum distance to first service support construction: 260 mm subject to deviating values given in the tables below.

Maximum seal size:  $w \times h = 1200 \times 2000 \text{ mm}$

Minimum distances in mm (see illustration below):

$s_1 = 0$  (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)

$s_6 = 0$  (distance between metal pipes and seal edge)

$s_8 = 0$  (distance between metal pipes) in case of mineral wool insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

$s_8 = 10$  (distance between metal pipes) in case of Armaflex insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

$s_9 = 117$  (distance between plastic pipes/pipe closure devices and seal edge)

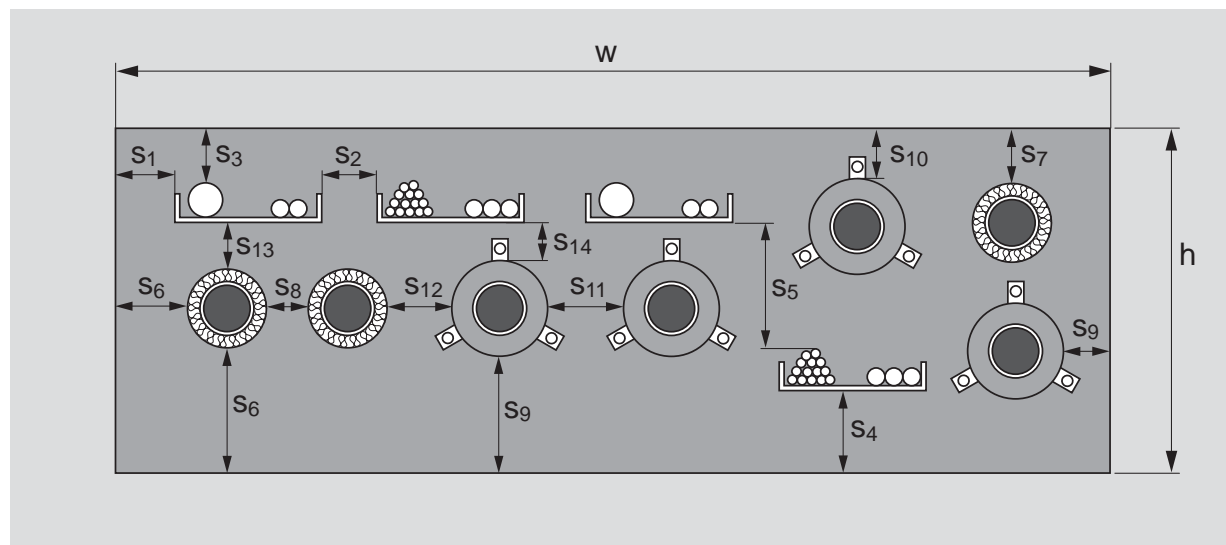
$s_{11} = 0$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collar CFS-C P and linear arrangement; in case of cluster arrangement  $s_{11} = 100 \text{ mm}$

$s_{11} = 50$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collar CFS-C and linear arrangement; in case of cluster arrangement  $s_{11} = 100 \text{ mm}$

$s_{12} = 0$  (distance between metal pipes and plastic pipes/pipe closure devices)

$s_{13} = 0$  (distance between cables/cable supports and metal pipes)

$s_{14} = 0$  (distance between cables/cable supports and plastic pipes/pipe closure devices)



Penetrating elements (single, multiple or mixed):				
C.1.1 Cables				
Construction details (for symbols and abbreviations see Annex A.3 of the ETA): Additional protection AP according to clause 1.1.2 of the ETA may be used as illustrated below.				
<b>Cables on trays without additional protection</b> 	<b>Cables on trays with additional protection AP</b> 			
<b>Single cables / cable bundles without additional protection</b> 	<b>Single cables / cable bundles with additional protection AP</b> 			
		<b>Classification</b>		
Additional protection according to clause 1.1.2 of the ETA:		<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;">without</td> <td style="width: 50%; text-align: center;">with</td> </tr> </table>	without	with
without	with			
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 $\varnothing$ 21 mm	EI 120	EI 120		
$21 \leq \varnothing \leq 50$ mm	EI 90	EI 120		
$50 \leq \varnothing \leq 80$ mm	EI 90	EI 120		
Non-sheathed cables (wires) currently and commonly used in building practice in Europe, with or without cable supports, with a diameter of:				
Maximum $\varnothing$ 17 mm	EI 30	EI 120		
Maximum $\varnothing$ 24 mm	EI 30	EI 120		
Tied cable bundle <sup>3</sup> , maximum diameter of single cable 21 mm, with or without cable support. For tied cable bundles the space between the cables needs not be sealed.				
Maximum $\varnothing$ 100 mm	EI 120	EI 120		

<sup>3</sup> Several cables running in the same direction and bound closely together by mechanical means

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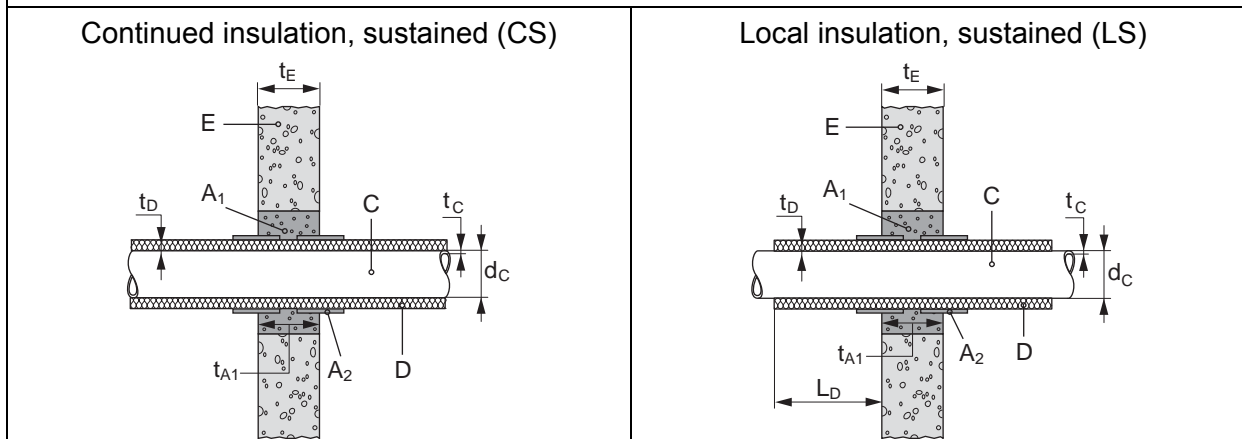


**C.1.3.2 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B**

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

For specification of Armaflex AF see Annex D Table D.3 of the ETA.

Two layers of Firestop Bandage CFS-B ( $A_2$ ) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fastened with wire.



**Steel pipes (C) with continued insulation (D) – sustained**

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
19	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 120-C/U
19 - 41	76,0	2,9 – 14,2 <sup>5</sup>	EI 120-C/U
41	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 120-C/U

**Steel pipes (C) with local insulation (D) – sustained**

Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
19	≥ 500	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 120-C/U
19 - 41	≥ 500	76,0	2,9 – 14,2 <sup>5</sup>	EI 120-C/U
41	≥ 500	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 60-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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

**Copper pipes (C) with continued insulation (D) – sustained**

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
19	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 120-C/U
19 - 41	54	1,5 – 14,2 <sup>5</sup>	EI 120-C/U
41	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 120-C/U

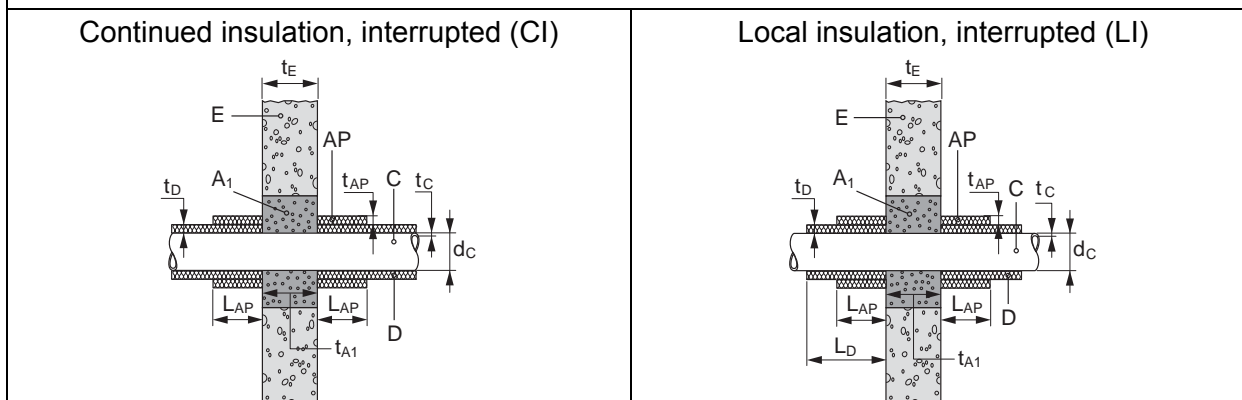


<b>Copper pipes (C) with local insulation (D) – sustained</b>				
Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
19	$\geq 500$	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 120-C/U
19 - 41	$\geq 500$	54	1,5 – 14,2 <sup>5</sup>	EI 120-C/U
41	$\geq 800$	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

**C.1.3.3 Metal pipes with Armaflex AF insulation**

Construction details (for symbols and abbreviations see Annex A.3 of the ETA):  
 Additional protection with Armaflex AF, thickness 25 mm over a length of 200 mm from the seal on both sides. For specification of Armaflex AF see Annex D Table D.3 of the ETA.  
 Maximum distance to first service support construction from mortar seal: 200 mm



**Steel pipes (C) with continued insulation (D) – interrupted**

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
$\geq 25$	114,3	7,1 – 14,2 <sup>5</sup>	EI 120-C/U

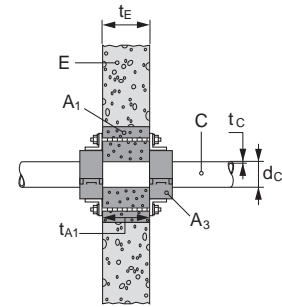
**Steel pipes (C) with local insulation (D) – interrupted**

Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
25	$\geq 780$	114,3	7,1 – 14,2 <sup>5</sup>	EI 120-C/U

### C.1.4 Plastic pipes with Hilti Firestop Collar CFS-C P

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

Hilti Firestop Collars CFS-C P ( $A_3$ ) are installed on both sides of the mortar seal, fastened together by threaded rods, washers and nuts as specified in Annex B.4 of the ETA.



#### C.1.4.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,4 – 5,6	CFS-C P 50/1.5"	2	EI 120-U/U
63	3,0 – 4,7	CFS-C P 63/2"	2	EI 120-U/U
75	2,2 – 3,6	CFS-C P 75/2.5"	3	EI 180-U/U
90	2,7 – 4,3	CFS-C P 90/3"	3	EI 120-U/U
110	2,2 – 8,1	CFS-C P 110/4"	4	EI 120-U/U
110	8,1	CFS-C P 110/4"	4	EI 180-U/U
125	3,7 – 6,0	CFS-C P 125/5"	4	EI 120-U/U
160	2,5 – 11,8	CFS-C P 160/6"	6	EI 120-U/U
160	11,8	CFS-C P 160/6"	6	EI 180-U/U

#### C.1.4.2 PE pipes according to EN ISO 15494 and DIN 8074/8075

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,9	CFS-C P 50/1.5"	2	EI 180-U/U
50	2,9 – 4,6	CFS-C P 50/1.5"	2	EI 120-U/U
63	1,8 – 5,8	CFS-C P 63/2"	2	EI 90-U/U
63	3,6 – 5,8	CFS-C P 63/2"	2	EI 120-U/U
75	1,9 – 6,8	CFS-C P 75/2.5"	3	EI 120-U/U
90	2,2 – 8,2	CFS-C P 90/3"	3	EI 120-U/U
110	2,7 – 10,0	CFS-C P 110/4"	4	EI 120-U/U
125	3,1 – 7,1	CFS-C P 125/5"	4	EI 120-U/U
160	4,0 – 9,1	CFS-C P 160/6"	6	EI 120-U/U
160	9,1	CFS-C P 160/6"	6	EI 180-U/U

<b>C.1.4.3 PE pipes according to EN 1519-1<sup>9</sup></b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	3,0	CFS-C P 50/1.5"	2	EI 120-U/U
63	3,0	CFS-C P 63/2"	2	EI 180-U/U
75	3,0	CFS-C P 75/2.5"	3	EI 120-U/U
90	3,5	CFS-C P 90/3"	3	EI 180-U/U
110	4,2	CFS-C P 110/4"	4	EI 120-U/U
125	4,8	CFS-C P 125/5"	4	EI 120-U/U
160	6,2	CFS-C P 160/6"	6	EI 120-U/U

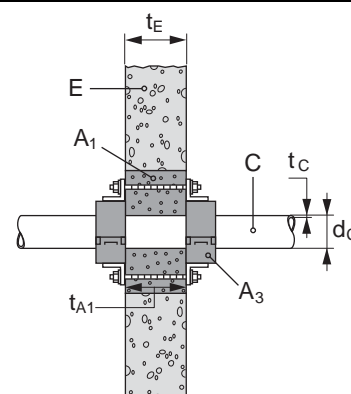
### C.1.5 Plastic pipes with Hilti Firestop Collar CFS-C

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

Hilti Firestop Collars CFS-C ( $A_3$ ) are installed on both sides of the mortar seal, fastened together by threaded rods, washers and nuts as specified in Annex B.8 of the ETA.

Maximum distance of 1st support from mortar seal: 200 mm

Restrictions by national building regulations to use seals with classification extension U/C have to be considered.



### C.1.5.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,2	CFS-C 50/1.5"	2	EI 180-U/C
110	3,7 – 12,8	CFS-C 110/4"	3	EI 180-U/C

<sup>9</sup> In Germany high-density polyethylene (PE-HD) pipes for hot-water resistant waste and soil discharge systems (HT) inside buildings have additionally to comply with DIN 19535-10.

**C.2 Rigid wall type B according to clause 1.2.1 of the ETA (density  $\geq 1100 \text{ kg/m}^3$ ),  
 minimum thickness 175 mm**

**Penetration seal**

Hilti Firestop Mortar CFS-M RG ( $A_1$ ), thickness ( $t_{A1}$ )  $\geq 150 \text{ mm}$  (opening depth  $t_E$  filled completely).

Maximum distance to first service support construction: 230 mm.

Maximum seal size:  $w \times h = 1000 \times 1500 \text{ mm}$

Minimum distances in mm (for illustration see Annex C.1 of the ETA):

$s_9 = 210$  (distance between plastic pipes/pipe closure devices and seal edge)

$s_{11} = 100$  (distance between plastic pipes/pipe closure devices

$s_1 = 0$  (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)

$s_6 = 0$  (distance between metal pipes and seal edge)

$s_8 = 0$  (distance between metal pipes) in case of mineral wool insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

$s_8 = 10$  (distance between metal pipes) in case of Armaflex insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

$s_9 = 117$  (distance between plastic pipes/pipe closure devices and seal edge)

$s_{11} = 0$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collar CFS-C P and linear arrangement; in case of cluster arrangement  $s_{11} = 100 \text{ mm}$

$s_{11} = 50$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collar CFS-C and linear arrangement; in case of cluster arrangement  $s_{11} = 100 \text{ mm}$

$s_{11} = 100$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Wrap CFS-W

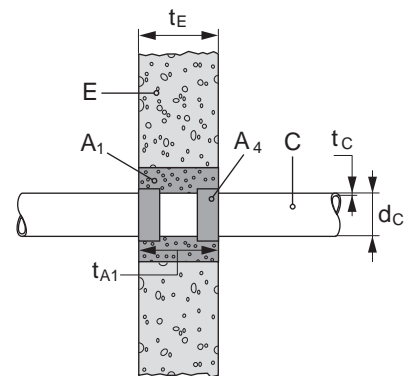
$s_{12} = 0$  (distance between metal pipes and plastic pipes/pipe closure devices)

$s_{13} = 0$  (distance between cables/cable supports and metal pipes)

$s_{14} = 0$  (distance between cables/cable supports and plastic pipes/pipe closure devices)

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

Hilti Firestop Wrap CFS-W ( $A_4$ ) on both sides of the mortar seal, flush with the surface of the seal



<b>Penetrating elements: in addition to the elements as in Annex C.1 of the ETA (single, multiple or mixed):</b>				
<b>C.2.1 Plastic pipes with Hilti Firestop Wrap CFS-W</b>				
<b>C.2.1.1 PVC pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062</b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W (A <sub>1</sub> )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
≤ 32	1,8	CFS-W EL	1	EI 240-U/C
90	3,2	CFS- W SG	90/3"	EI 240-U/C
110	3,2	CFS- W SG	110/4"	EI 240-U/C
> 75 ≤ 110	3,2	CFS-W EL	2	EI 240-U/C
160	3,2 – 13,0	CFS- W SG	160/6"	EI 240-U/C
> 125 ≤ 160	3,2 – 13,0	CFS-W EL	3	EI 240-U/C
<b>C.2.1.2 PE pipes according to EN ISO 15494 and DIN 8074/8075</b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W (A <sub>1</sub> )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
≤ 32	1,8	CFS-W EL	1	EI 240-U/C
90	2,7	CFS- W SG	90/3"	EI 240-U/C
110	2,7	CFS- W SG	110/4"	EI 240-U/C
> 75 ≤ 110	2,7	CFS-W EL	2	EI 240-U/C
160	4,0 – 14,6	CFS- W SG	160/6"	EI 240-U/C
> 125 ≤ 160	4,0 – 14,6	CFS-W EL	3	EI 240-U/C
<b>C.2.1.3 PE pipes according to EN 1519-1<sup>9</sup></b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W (A <sub>1</sub> )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
160	6.2	CFS-W SG	160/6"	EI 180-U/C
> 125 ≤ 160	6.2	CFS-W EL	3	EI 180-U/C

**C.3 Rigid floor type A according to clause 1.2.1 of the ETA (density  $\geq 550 \text{ kg/m}^3$ ), minimum thickness 150 mm**

**Penetration seal**

Type 1: Hilti Firestop Mortar CFS-M RG ( $A_1$ ), thickness ( $t_{A1}$ )  $\geq 150 \text{ mm}$  (opening depth  $t_E$  filled completely).

Type 2: Hilti Firestop Mortar CFS-M RG ( $A_1$ ), thickness ( $t_{A1}$ )  $\geq 200 \text{ mm}$  (opening depth  $t_E$  filled completely), with an overlap of the mortar seal of 50 mm over the top side of the floor on all sides of the opening.

Maximum distance to first service support construction: 300 mm.

Maximum seal size: see figure below

Minimum distances in mm (for illustration see below):

$s_1 = 0$  (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)

$s_6 = 0$  (distance between metal pipes and seal edge)

$s_8 = 0$  (distance between metal pipes) in case of mineral wool insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

$s_8 = 12$  (distance between metal pipes) in case of Armaflex insulation and linear arrangement; in case of cluster arrangement  $s_8 = 100 \text{ mm}$

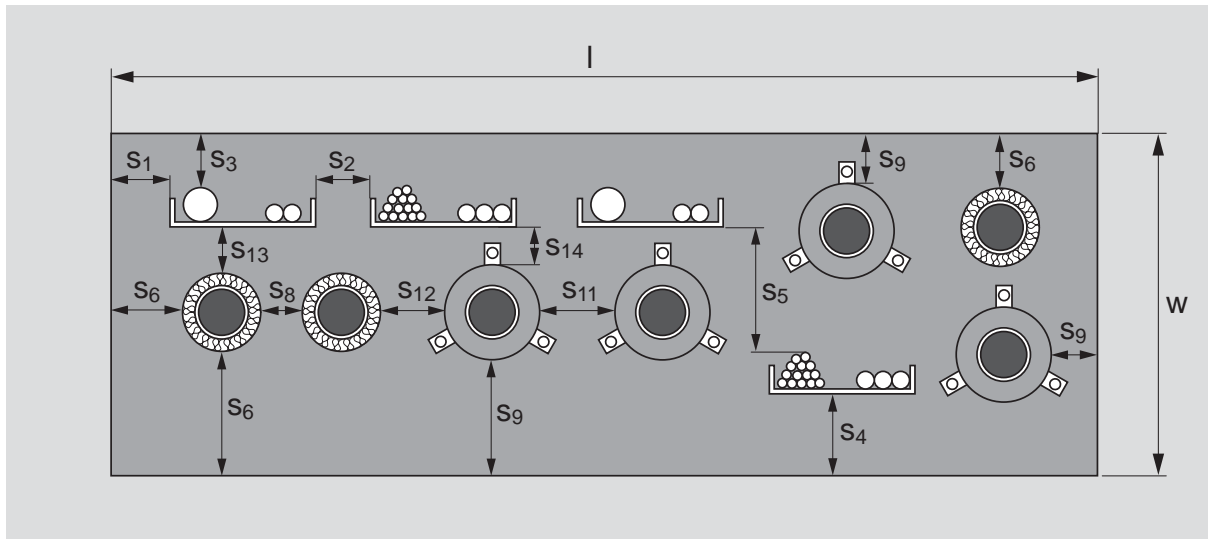
$s_9 = 0$  (distance between plastic pipes/pipe closure devices and seal edge)

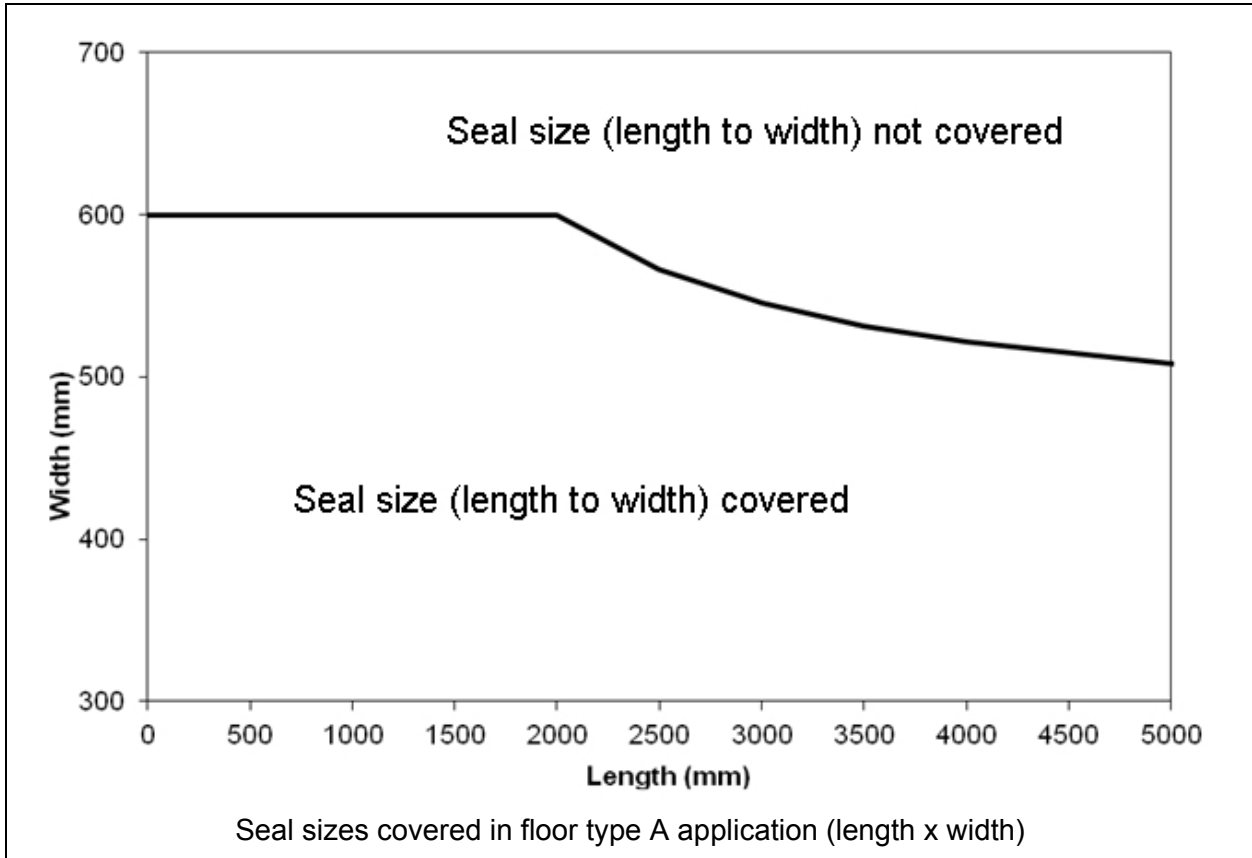
$s_{11} = 0$  (distance between plastic pipes/pipe closure devices) and linear arrangement; in case of cluster arrangement  $s_{11} = 100 \text{ mm}$

$s_{12} = 30$  (distance between metal pipes and plastic pipes/pipe closure devices)

$s_{13} = 30$  (distance between cables/cable supports and metal pipes)

$s_{14} = 18$  (distance between cables/cable supports and plastic pipes/pipe closure devices)





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

**C.3.1 Cables**

Construction details (for symbols and abbreviations see Annex A.3 of the ETA):  
 Additional protection AP according to clause 1.1.2 of the ETA as illustrated below depending on the required classification.

**Seal type 1**

<p>Cables on trays without additional protection</p>	<p>Single cables / cable bundles without additional protection</p>
<p>Cables on trays with additional protection AP</p>	<p>Single cables / cable bundles with additional protection AP</p>



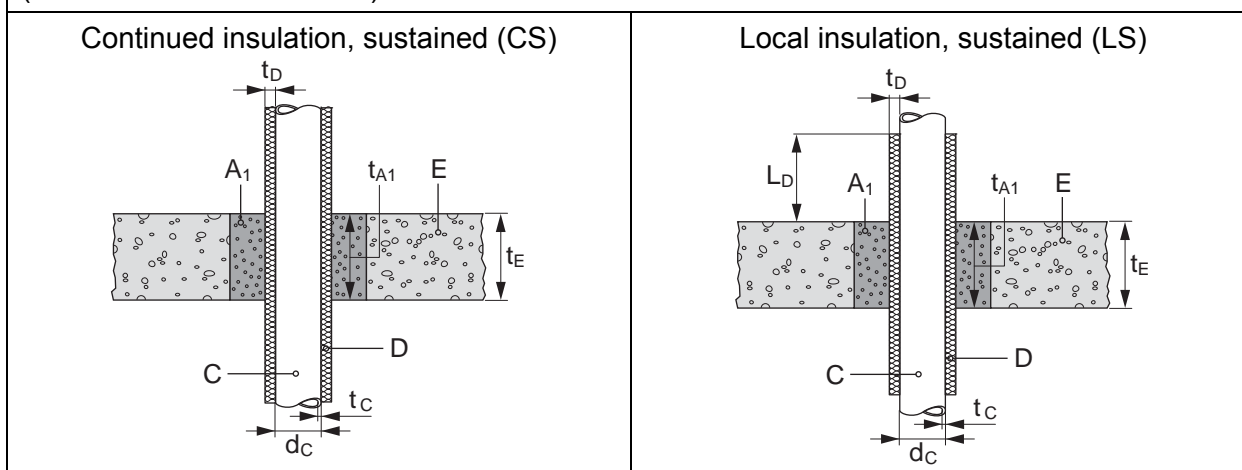


<b>C.3.2 Small conduits and tubes</b>			
Construction details: see Annex C.1.1 of the ETA			
In case a conduit is installed with open ends on both sides of the floor (case U/U) the ends of the conduit must be closed using an acrylic sealant, e.g. Hilti Firestop Sealant CFS-S ACR: for metal conduits the end below the floor, for plastic conduits both ends.			
		Classification	
Seal thickness (mm)	200 (Type 2)	150 (Type 1)	150 (Type 1)
$\varnothing \leq 16$ mm, arranged linear, with or without cables, with or without cable supports			
Additional protection according to clause 1.1.2 of the ETA:	without	without	with
Plastic conduits and tubes	EI 120-U/C	EI 90-U/C	EI 90-U/C
Steel conduits and tubes	EI 120-C/U	EI 90-C/U	EI 90-C/U

### C.3.3 Metal pipes

#### C.3.3.1 Metal pipes with mineral wool insulation according to Table C.2 of the ETA

Construction details (for symbols and abbreviations see Annex A.3 of the ETA): Seal type 1 (see Annex C.2 of the ETA)



#### Steel pipes (C) with continued insulation (D) – sustained

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
$\geq 20$	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 120-C/U
$\geq 40$	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 120-C/U

#### Steel pipes (C) with local insulation (D) – sustained

Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
20	$\geq 500$	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 120-C/U
40	$\geq 500$	76,0	2,9 – 14,2 <sup>5</sup>	EI 120-C/U
40	$\geq 700$	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 120-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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

<b>Copper pipes (C) with continued insulation (D) – sustained</b>				
Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification	
$\geq 20$	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 120-C/U	
$\geq 40$	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 120-C/U	
<b>Copper pipes (C) with local insulation (D) – sustained</b>				
Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
20	$\geq 500$	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 120-C/U
40	$\geq 500$	54	1,5 – 14,2 <sup>5</sup>	EI 120-C/U
40	$\geq 800$	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 120-C/U

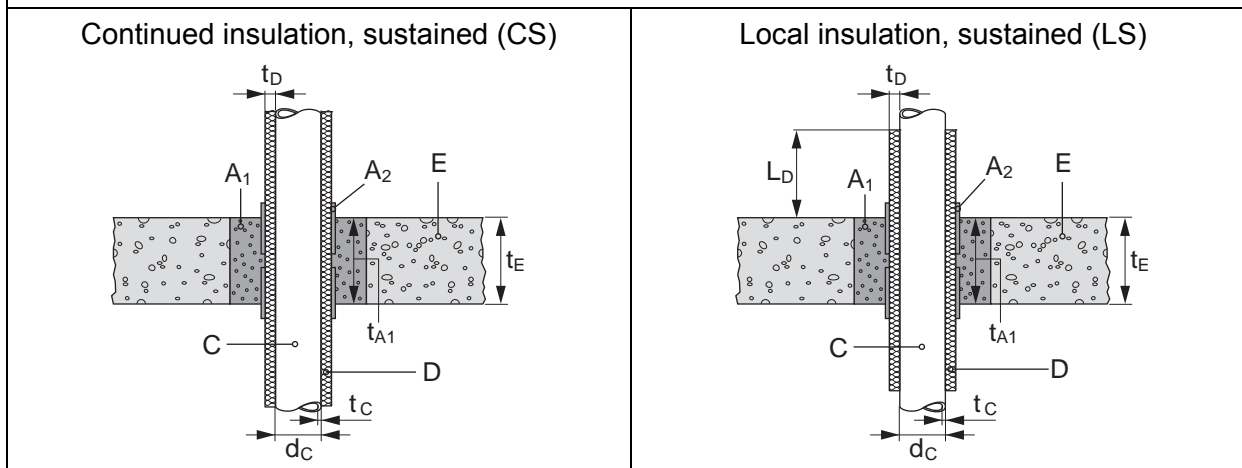
The field of application given above for copper pipes is also valid for other metal pipes with lower heat conductivity than copper and a melting point of minimum 1100 °C, e.g. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

**C.3.3.2 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B**

Construction details (for symbols and abbreviations see Annex A.3 of the ETA): Seal type 1 (see Annex C.2 of the ETA)

For specification of Armaflex AF see Annex D Table D.3 of the ETA.

Two layers of of Firestop Bandage CFS-B ( $A_2$ ) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fastened with wire.



**Steel pipes (C) with continued insulation (D) – sustained**

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
19	26,7	2,2 – 14,2 <sup>5</sup>	EI 120-C/U
19	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 90-C/U
19 – 41	76,0	2,9 – 14,2 <sup>5</sup>	EI 90-C/U
41	76,0	2,9 – 14,2 <sup>5</sup>	EI 120-C/U
41	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 90-C/U

<b>Steel pipes (C) with local insulation (D) – sustained</b>				
Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
19	$\geq 500$	26,7	2,2 – 14,2 <sup>5</sup>	EI 120-C/U
19	$\geq 500$	26,7 – 76,0	2,2 / 2,9 <sup>4</sup> – 14,2 <sup>5</sup>	EI 90-C/U
19 - 41	$\geq 500$	76,0	2,9 – 14,2 <sup>5</sup>	EI 90-C/U
41	$\geq 500$	76,0	2,9 – 14,2 <sup>5</sup>	EI 120-C/U
41	$\geq 700$	76,0 – 168,3	2,9 / 3,6 <sup>6</sup> – 14,2 <sup>5</sup>	EI 90-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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

<b>Copper pipes (C) with continued insulation (D) – sustained</b>			
Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
19	28	1,0 – 14,2 <sup>5</sup>	EI 120-C/U
19	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 90-C/U
19 - 41	54	1,5 – 14,2 <sup>5</sup>	EI 90-C/U
41	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 120-C/U

<b>Copper pipes (C) with local insulation (D) – sustained</b>				
Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
19	$\geq 500$	28	1,0 – 14,2 <sup>5</sup>	EI 120-C/U
19	$\geq 500$	28 - 54	1,0 / 1,5 <sup>7</sup> – 14,2 <sup>5</sup>	EI 90-C/U
19 - 41	$\geq 500$	54	1,5 – 14,2 <sup>5</sup>	EI 90-C/U
41	$\geq 500$	54	1,5 – 14,2 <sup>5</sup>	EI 120-C/U
41	$\geq 800$	54 - 89	1,5 / 2,0 <sup>8</sup> – 14,2 <sup>5</sup>	EI 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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys) and Ni.

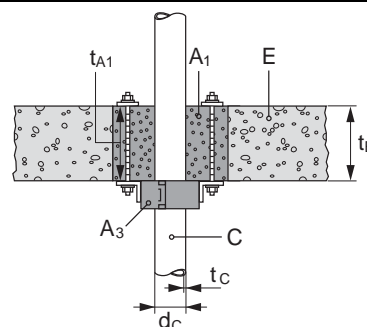
### C.3.4 Plastic pipes with Hilti Firestop Collar CFS-C P

#### Construction details

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

Seal type 1 (see Annex C.2 of the ETA)

Hilti Firestop Collars CFS-C P ( $A_3$ ) are installed on the bottom side of the mortar seal, fastened by threaded rods through the mortar seal, washers and nuts as specified in Annex B.8 of the ETA.



<b>C.3.4.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062</b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,4 – 5,6	CFS-C P 50/1.5"	2	EI 120-U/U
63	3,0 – 4,7	CFS-C P 63/2"	2	EI 120-U/U
75	2,2 – 3,6	CFS-C P 75/2.5"	3	EI 120-U/U
90	2,7 – 4,3	CFS-C P 90/3"	3	EI 120-U/U
110	1,8 – 8,1	CFS-C P 110/4"	4	EI 120-U/U
125	3,7 – 6,0	CFS-C P 125/5"	4	EI 120-U/U
160	2,5 – 11,8	CFS-C P 160/6"	6	EI 120-U/U
<b>C.3.4.2 PE pipes according to EN ISO 15494 and DIN 8074/8075</b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,9 – 4,6	CFS-C P 50/1.5"	2	EI 120-U/U
63	1,8 – 5,8	CFS-C P 63/2"	2	EI 120-U/U
75	1,9 – 6,8	CFS-C P 75/2.5"	3	EI 120-U/U
90	2,2 – 8,2	CFS-C P 90/3"	3	EI 120-U/U
110	2,7 – 10,0	CFS-C P 110/4"	4	EI 120-U/U
125	3,1 – 7,1	CFS-C P 125/5"	4	EI 120-U/U
160	4,0 – 9,1	CFS-C P 160/6"	6	EI 120-U/U
<b>C.3.4.3 PE pipes according to EN 1519-1<sup>9</sup></b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	3,0	CFS-C P 50/1.5"	2	EI 120-U/U
63	3,0	CFS-C P 63/2"	2	EI 120-U/U
75	3,0	CFS-C P 75/2.5"	3	EI 120-U/U
90	3,5	CFS-C P 90/3"	3	EI 120-U/U
110	4,2	CFS-C P 110/4"	4	EI 120-U/U
125	4,8	CFS-C P 125/5"	4	EI 120-U/U
160	6,2	CFS-C P 160/6"	6	EI 120-U/U

**C.4 Rigid floor type B according to clause 1.2.1 of the ETA (density  $\geq 2400 \text{ kg/m}^3$ ), minimum thickness 150 mm**

**Penetration seal**

Hilti Firestop Mortar CFS-M RG (A<sub>1</sub>), thickness ( $t_{A1}$ )  $\geq 150 \text{ mm}$  (opening depth  $t_E$  filled completely).

Maximum distance to first service support construction: 200 mm.

Maximum seal size: 1200 x 700 mm (l x w); for higher lengths see figure below

Minimum distances in mm (for illustration see Annex C.3 of the ETA):

$s_1 = 20$  (distance between cables/cable supports and seal edge)

$s_2 = 0$  (distance between cable supports)

$s_3 = 8$  (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 cables support above)

$s_6 = 30$  (distance between metal pipes and seal edge)

$s_8 = 100$  (distance between metal pipes)

$s_9 = 40$  (distance between plastic pipes/pipe closure devices and seal edge)

$s_{11} = 0$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collars CFS-C P and linear arrangement

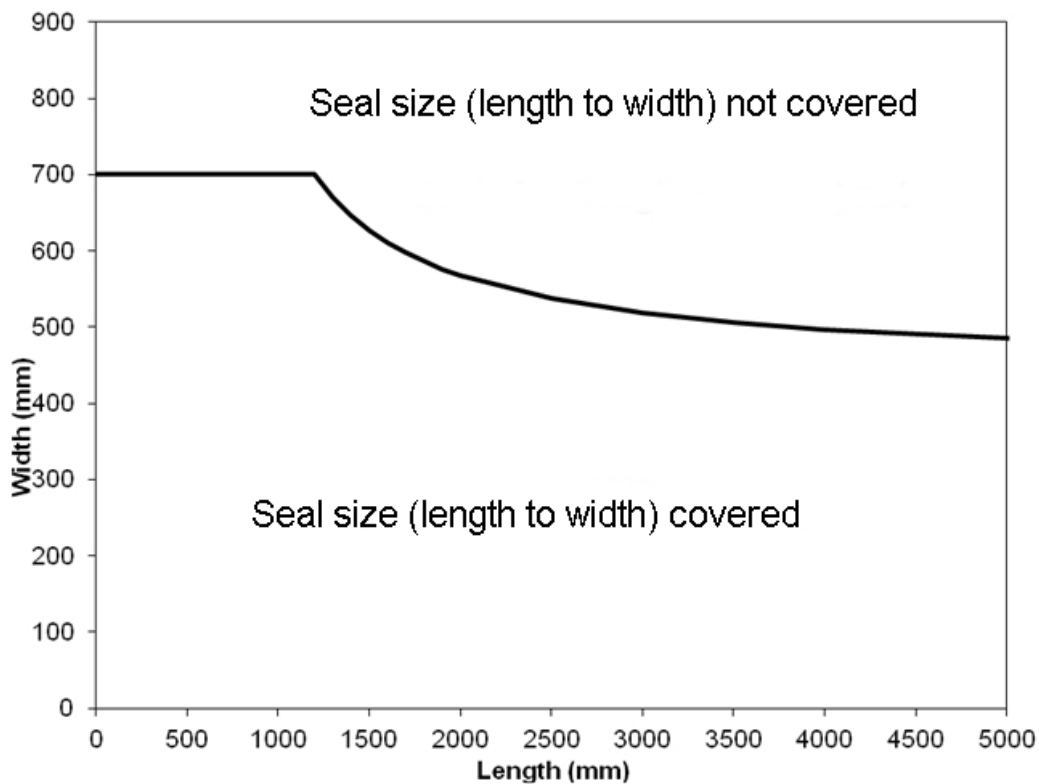
$s_{11} = 50$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collars CFS-C and linear arrangement

$s_{11} = 100$  (distance between plastic pipes/pipe closure devices) in all cases of cluster arrangement

$s_{12} = 40$  (distance between metal pipes and plastic pipes/pipe closure devices)

$s_{13} = 20$  (distance between cables/cable supports and metal pipes)

$s_{14} = 40$  (distance between cables/cable supports and plastic pipes/pipe closure devices)

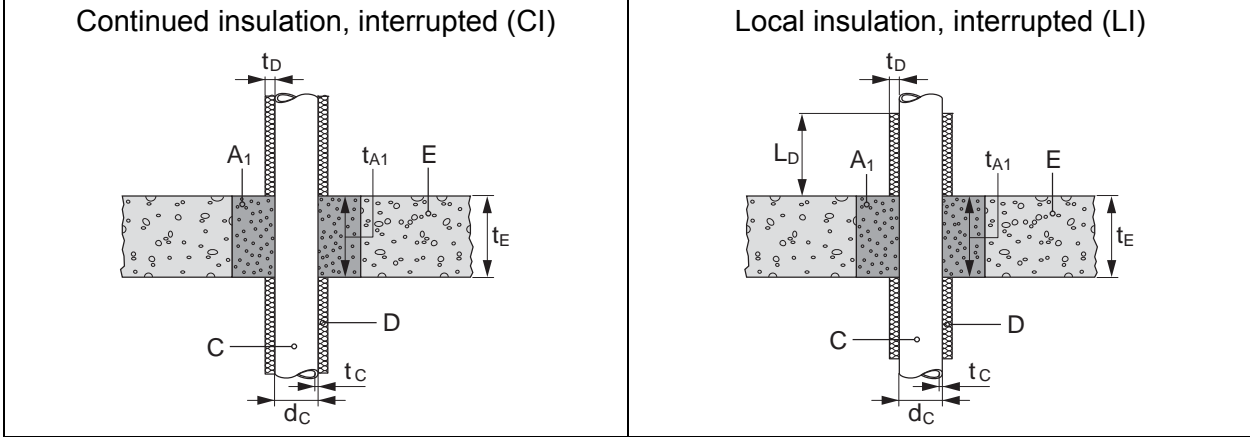


Seal sizes covered in floor type B application (length x width)

**Penetrating elements: in addition to the e as in Annex C.3 of the ETA (single, multiple or mixed):**

**C.4.1 Metal pipes with mineral wool insulation according to Table C.2 of the ETA**

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



**Steel pipes (C) with continued insulation (D) – interrupted**  
 Maximum distance of 1st support from mortar seal: 200 mm

Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification
$\geq 40$	114,3	3,7 – 14,2 <sup>5</sup>	EI 120-C/U

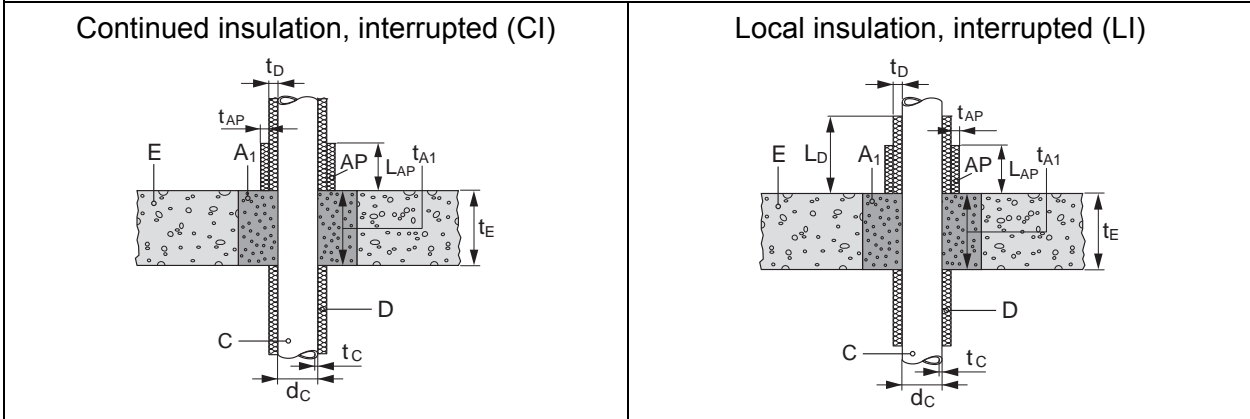
**Steel pipes (C) with local insulation (D) – interrupted**  
 Maximum distance of 1st support from mortar seal: 200 mm

Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
40	$\geq 800$	114,3	3,7 – 14,2 <sup>5</sup>	EI 120-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. cast iron, stainless steels, Ni alloys (NiCu, NiCr and NiMo alloys)

**C.4.2 Metal pipes with Armaflex AF insulation**

Construction details (for symbols and abbreviations see Annex A.3 of the ETA):  
 For specification of Armaflex AF see Annex D Table D.3 of the ETA.  
 Additional protection with Armaflex AF, thickness 25 mm over a length of  $L_{AP} = 200$  mm from the seal on the top side of the floor.



<b>Steel pipes (C) with continued insulation (D) – interrupted</b>				
Insulation thickness ( $t_D$ ) [mm]	Pipe diameter ( $d_C$ ) [mm]	Pipe wall thickness ( $t_C$ ) [mm]	Classification	
$\geq 25$	114,3	7,1 – 14,2 <sup>5</sup>	EI 180-C/U	
<b>Steel pipes (C) with local insulation (D) – interrupted</b>				
Insulation		Pipe		Classification
thickness ( $t_D$ ) [mm]	length ( $L_D$ ) [mm]	diameter ( $d_C$ ) [mm]	wall thickness ( $t_C$ ) [mm]	
25	$\geq 800$	114,3	7,1 – 14,2 <sup>5</sup>	EI 180-C/U

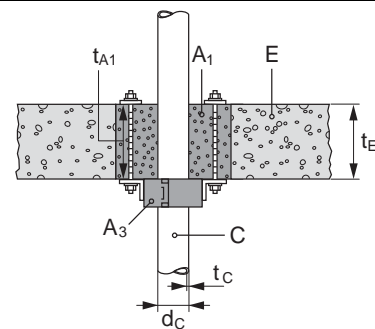
#### C.4.3 Plastic pipes with Hilti Firestop Collar CFS-C

##### Construction details

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

Hilti Firestop Collars CFS-C ( $A_3$ ) are installed on the bottom side of the mortar seal, fastened by threaded rods through the mortar seal, washers and nuts as specified in Annex B.8 of the ETA.

Restrictions by national building regulations to use seals with classification extension U/C have to be considered.



##### C.4.3.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062

Pipe diameter $d_C$ (mm)	Pipe wall thickness $t_C$ (mm)	Collar size ( $A_1$ )	No. of hooks	Classification
50	2,0	CFS-C 50/1.5"	2	EI 180-U/C
110	2,7 – 12,3	CFS-C 110/4"	3	EI 180-U/C

The results are also valid for PVC-C pipes according to EN 1566-1 and PVC-U pipes according EN 1329-1 and EN 1453-1.

**C.5 Rigid floor type C according to clause 1.2.1 of the ETA (density  $\geq 2400 \text{ kg/m}^3$ , minimum floor thickness 175 mm)**

**Penetration seal**

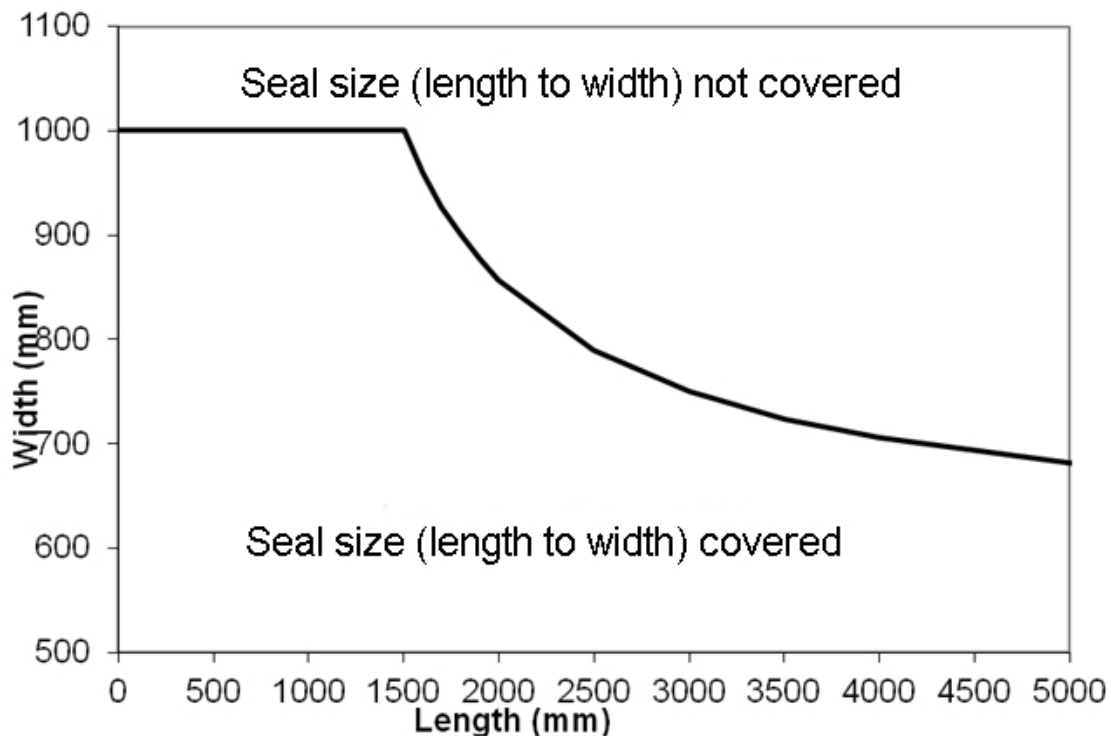
Hilti Firestop Mortar CFS-M RG (A<sub>1</sub>), thickness ( $t_{A1}$ )  $\geq 175 \text{ mm}$  (opening depth  $t_E$  filled completely).

Maximum distance to first service support construction: 200 mm.

Maximum seal size: 1500 x1000 mm (l x w); for higher lengths see figure below

Minimum distances in mm (for illustration see Annex C.3 of the ETA):

- $s_9 = 52$  (distance between plastic pipes/pipe closure devices and seal edge)
- $s_{11} = 100$  (distance between plastic pipes/pipe closure devices)
- $s_1 = 20$  (distance between cables/cable supports and seal edge)
- $s_2 = 0$  (distance between cable supports)
- $s_3 = 8$  (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 cables support above)
- $s_6 = 30$  (distance between metal pipes and seal edge)
- $s_8 = 100$  (distance between metal pipes)
- $s_9 = 52$  (distance between plastic pipes/pipe closure devices and seal edge)
- $s_{11} = 0$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collars CFS-C P and linear arrangement
- $s_{11} = 50$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Collars CFS-C and linear arrangement
- $s_{11} = 100$  (distance between plastic pipes/pipe closure devices) in case of Hilti Firestop Wraps CFS-W and linear arrangement
- $s_{11} = 100$  (distance between plastic pipes/pipe closure devices) in all cases of cluster arrangement
- $s_{12} = 40$  (distance between metal pipes and plastic pipes/pipe closure devices)
- $s_{13} = 20$  (distance between cables/cable supports and metal pipes)
- $s_{14} = 40$  (distance between cables/cable supports and plastic pipes/pipe closure devices)



Seal sizes covered in floor application (length x width)

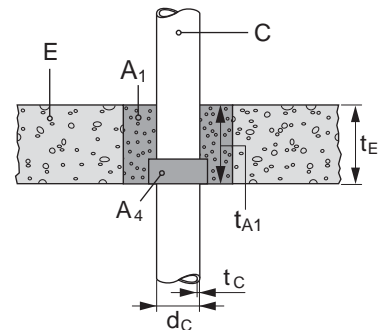


**Penetrating elements: in addition to the elements as in Annex C.3 and C.4 of the ETA (single, multiple or mixed):**

**C.5.1 Plastic pipes with Hilti Firestop Wrap CFS-W**

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

Hilti Firestop Wrap CFS-W ( $A_4$ ) on the underside of the mortar seal flush with the lower surface of the mortar seal.



**C.5.1.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062**

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W ( $A_1$ )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
$\leq 32$	1,8	CFS-W EL	1	EI 120-U/C
50	2,2 – 3,6	CFS-W SG	50/1.5"	EI 120-U/C
63	2,2 – 3,6	CFS- W SG	63/2"	EI 120-U/C
75	2,2 – 3,6	CFS- W SG	75/2.5"	EI 120-U/C
$> 32 \leq 75$	2,2 – 3,6	CFS-W EL	1	EI 120-U/C
90	3,2 – 6,0	CFS- W SG	90/3"	EI 120-U/C
110	3,2 – 6,0	CFS- W SG	110/4"	EI 120-U/C
$> 75 \leq 110$	3,2 – 6,0	CFS-W EL	2	EI 120-U/C
125	3,7 – 6,0	CFS- W SG	125/5"	EI 120-U/C
$> 110 \leq 125$	3,7 – 6,0	CFS-W EL	2	EI 120-U/C
160	2,5 – 3,2	CFS- W SG	160/6"	EI 60-U/C
$> 125 \leq 160$	2,5 – 3,2	CFS-W EL	3	EI 60-U/C
160	3,2 – 13,0	CFS- W SG	160/6"	EI 120-U/C
$> 125 \leq 160$	3,2 – 13,0	CFS-W EL	3	EI 120-U/C

<b>C.5.1.2 PE pipes according to EN ISO 15494 and DIN 8074/8075</b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W (A <sub>1</sub> )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
≤ 32	1,8	CFS-W EL	1	EI 120-U/C
50	1,9 – 6,8	CFS-W SG	50/1.5"	EI 120-U/C
63	1,9 – 6,8	CFS- W SG	63/2"	EI 120-U/C
75	1,9 – 6,8	CFS- W SG	75/2.5"	EI 120-U/C
> 32 ≤ 75	1,9 – 6,8	CFS-W EL	1	EI 120-U/C
90	2,7 – 7,1	CFS- W SG	90/3"	EI 120-U/C
110	2,7 – 7,1	CFS- W SG	110/4"	EI 120-U/C
> 75 ≤ 110	2,7 – 7,1	CFS-W EL	2	EI 120-U/C
125	3,2 – 7,1	CFS- W SG	125/5"	EI 120-U/C
>110 ≤ 125	3,2 – 7,1	CFS-W EL	2	EI 120-U/C
160	4,0 – 14,6	CFS- W SG	160/6"	EI 120-U/C
> 125 ≤ 160	4,0 – 14,6	CFS-W EL	3	EI 120-U/C
<b>C.5.1.3 PE pipes according to EN 1519-1<sup>9</sup></b>				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Type of CFS-W (A <sub>1</sub> )	Size (CFS-W SG) / No. of layers (CFS-W EL)	Classification
50	3,0	CFS-W SG	50/1.5"	EI 120-U/C
63	3,0	CFS- W SG	63/2"	EI 120-U/C
75	3,0	CFS- W SG	75/2.5"	EI 120-U/C
≤ 75	3,0	CFS-W EL	1	EI 120-U/C
90	4,8	CFS- W SG	90/3"	EI 120-U/C
110	4,8	CFS- W SG	110/4"	EI 120-U/C
125	4,8	CFS- W SG	125/5"	EI 120-U/C
>75 ≤ 125	4,8	CFS-W EL	2	EI 120-U/C
160	6,2	CFS- W SG	160/6"	EI 120-U/C
> 125 ≤ 160	6,2	CFS-W EL	3	EI 120-U/C

## ANNEX D

### SPECIFICATION OF MINERAL WOOL PRODUCTS AND PIPE INSULATION PRODUCTS

**Table D.1: Specification for mineral wool products suitable for being used as additional protection for cables/cable supports**

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:

Manufacturer	Product designation
Isover	Ultimate U TFA 34
Knauf	Lamella Forte LLMF AluR
Paroc	Lamella Mat 35 Alu Coat
Rockwool	Klimafix
Rockwool	Klimarock
Rockwool	Rockwool 133 (Lamella mat)

**Table D.2: Specification for mineral wool products suitable for being used as pipe insulation**

Interrupted insulation	
Stone wool according to EN 14303, class A2 or A1 according to EN 13501-1, Al-faced	
Sustained insulation	
Manufacturer	Product designation
Isover	Coquilla AT-LR
Isover	Protect 1000 S alu
Isover	Protect BSR 90 alu
Paroc	Section AluCoat T
Rockwool	Conlit Pipe sections
Rockwool	Klimarock
Rockwool	RS 800 pipe sections

**Table D.3: Specification for flexible elastomeric foam (FEF) products suitable for being used as pipe insulation**

Manufacturer	Product designation
Armacell International GmbH	Armaflex AF (CE marked according to EN 14304)