SITAC
Box 553
SE 371 23 Karlskrona
SWEDEN

Tfn.: +46-(0)10-516 63 00
Fax: +46-(0)455-206 88
E-mail: info@sitac.se

Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

SITAC
MEMBER OF EOTA

European Technical Approval ETA-11/0429

Handelsnamn Trade name	**Hilti Firestop Double Board Seal,** Hilti Firestop Double Board Seal
Innehavare Holder of approval	**Hilti AG** **Feldkircherstrasse 100** **9494 Schaan** **Liechtenstein**
Produktbeskrivning och avsedd användning	**Tätningssystem för genomföringar i brandavskiljande väggar och bjälklag i byggnader**
Generic type and use of construction product	Penetration seals for fire resistant walls and floors in buildings
Giltighetstid Validity: **från** from **t o m** to	**2012-03-14** 14.03.2012 **2017-03-13** 13.03.2017
Tillverkningsställe Manufacturing plant	**Hilti Werk 9a**

Godkännandet innehåller This Approval contains	47 sidor inklusive 4 bilagor 47 Pages including 4 Annexes

TABLE OF CONTENTS

I LEGAL BASIS AND GENERAL CONDITIONS

1 This European Technical Approval is issued by SITAC in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC[4];
- Guideline for European Technical Approval of Fire Stopping and Fire Sealing Products: ETAG 026 Part 1: "General" and Part 2: "Penetration Seals".

2 The SITAC is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant(s). Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by SITAC, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of SITAC. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in English. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11.2.1989, p. 12

2 Official Journal of the European Communities L 220, 30.8.1993, p. 1

3 Official Journal of the European Union L 284, 31.10.2003, p. 1

4 Official Journal of the European Communities L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product(s) and intended use

1.1 Definition of the construction product

1.1.1 Definition of the penetration seal

Penetration seal Hilti Firestop Double Board Seal to reinstate the fire resistance performance of wall and floor constructions, where they have been provided with apertures for the penetration of services are made of two adjacent mineral wool (MW) boards, 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 1.1.2 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 D.1 or by using the pre-coated MW board Hilti Firestop Board CFS-CT B 1S (coated on one face with Hilti Firestop Coating CFS-CT). Hilti Firestop Board CFS-CT B 2S (coated on both faces with Hilti Firestop Coating CFS-CT), which is the pre-coated board for single board seals (for further details see ETA-11/0428) may also be used. In the following this document only refers to Hilti Firestop Board CFS-CT B 1S.
For details of the seal construction see Annex C.

1.1.2 Definition of the components

1.1.2.1 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 sizes. The coating is sprayed or painted to mineral wool boards and partially on the services (for detail see Annex C). For the installation procedure see 4.2.1.

1.1.2.2 Mineral wool (MW) boards

For specification of suitable MW boards see Table D.1 in Annex D. For the installation procedure see 4.2.1.

1.1.2.3 Hilti Firestop Board CFS-CT B 1S

Hilti Firestop Board CFS-CT B 1S is a mineral wool board pre-coated on one face with Hilti Firestop Coating CFS-CT. The board is supplied in sizes of 1000 x 600 x 50 mm and 1200 x 600 x 50 mm. The thickness of the coating is 0.7 mm. For the installation procedure see 4.2.2.

1.1.2.4 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 board is supplied in sizes of 1000 x 600 x 50 mm and 1200 x 600 x 50 mm. The thickness of the coating is 0.7 mm. For the installation procedure see 4.2.2.

1.1.2.5 Hilti Firestop Acrylic Sealant CFS-S ACR (see ETA-10/0292)

Hilti Firestop Acrylic Sealant CFS-S ACR is used as filler to close any gaps between the opening edges and the seal or between services and the seal.

1.1.2.6 Additional protection for cable/small conduit penetrations

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

AP_1: 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_2: 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_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 2 mm.

AP_4: Mineral wool mat according to Table D.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 20 mm.

AP_5: Mineral wool mat according to Table D.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.

1.1.2.7 Additional components for composite and plastic pipe penetrations

In case of metal pipes or composite pipes insulated with combustible insulation (reaction to fire class B to E according EN 13501-1) a **Hilti Firestop Bandage CFS-B** (see ETA-10/0212) is 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 fixed with wire. For necessary number of layers of the bandage see Annex C.

In some cases an additional protection (AP) over the bandage is required. Two types of additional protection as described below may be used - for details see Annex C:

AP_6: Armaflex AF19 pipe insulation wrapped around the bandage/pipe insulation, fixed with wire, length along the pipe 300 mm, thickness 19 mm.

AP_7: Mineral wool mat according to Table D.2, wrapped around the bandage/pipe insulation, fixed with wire, length along the pipe 300 mm, thickness 20 mm.

1.1.2.8 Additional components for plastic pipe penetrations

Hilti Firestop Collar CFS-C (see ETA-10/0403) or **CFS-C P** (see ETA-10/0404): for details see Annex C.

Fixing components for Hilti Firestop Collars CFS-C and CFS-C P: for specification see Annex B.8

1.2 Intended use and use category

1.2.1 Intended use

The intended use of Hilti Firestop Double Board Seal is to reinstate the fire resistance performance of flexible wall constructions, rigid wall constructions and rigid floor constructions where they are penetrated by services.

(1) The specific elements of construction that Hilti Firestop Double 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, 112 or 135 mm, respectively (for detail see Annex C) 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 closed and 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 mm and comprise concrete, blockwork or masonry, with a minimum density of 650 kg/m^3.

c) Rigid walls: The wall must have a minimum thickness of 150 mm and comprise concrete, blockwork or masonry, with a minimum density of 600 kg/m^3.

d) Rigid walls: The wall must have a minimum thickness of 150 mm and comprise concrete, blockwork or masonry, with a minimum density of 760 kg/m^3.

e) Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 670 kg/m^3.

The supporting construction must be classified in accordance with EN 13501-2 for the required fire resistance period.

This ETA does not cover use of this product as a penetration seal in sandwich panel constructions.

(2) Hilti Firestop Double Board Seal may be used to provide a penetration seal with the following specific services, single, multiple or in combination:

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

For the maximum seal size see Annex C.

(3) 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 C.

(4) Maximum distance (mm) from surface of the building element for first support / fixing of services: see Annex C.

1.2.2 Working life

The provisions made in this European Technical Approval are based on an assumed working life of the Hilti Firestop Double Board Seal of 10 years, provided that the conditions laid down in sections 4.2/5.1/5.2 for the packaging / transport / storage / installation / use / repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

1.2.3 Use Category

The use category of Hilti Firestop Coating CFS-CT is Type Y_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.[5]

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

2 Characteristics of product(s) and methods of verification

The identification tests and the assessment of the fitness for use according to the Essential Requirements were carried out in compliance with the "ETA Guidance no. 026-Part 2" concerning Penetration Seals – edition January 2008 (called ETAG 026-2 in this ETA).

ETAG Clause No.	ETA Clause No.	Characteristic	Assessment of characteristic
Mechanical resistance and stability			
		None	Not relevant

Safety in case of fire			
2.4.1	2.1	Reaction to fire	Class D-s2 d0 according to EN 13501-1:2007
2.4.2	2.2	Resistance to fire	see clause 2.2 and Annex C to E
Hygiene, health and environment			
2.4.3	2.3	Air permeability (material property)	Flow rate per area
2.4.4	2.4	Water permeability (material property)	Water tight to 1000 mm head of water

[5] These uses apply for internal humidity class 5 in accordance with EN ISO 13788

2.4.5	2.5	Release of dangerous substances	Declaration of manufacturer
Safety in use			
2.4.6	2.6	Mechanical resistance and stability	Risk zone type according to EOTA TR001 A.1
2.4.7	2.7	Resistance to impact/movement	see clause 2.6
2.4.8	2.8	Adhesion	see clause 2.6
Protection against noise			
2.4.9	2.9	Airborne sound insulation	R_w, $D_{n,e,w}$
Energy economy and heat retention			
2.4.10	2.10	Thermal properties	λ_{10} according to EN 12667
2.4.11	2.11	Water vapour permeability	No performance determined
General aspects relating to fitness for use			
2.4.12	2.12	Durability and serviceability	Y_2

2.1 Reaction to fire

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

2.2 Resistance to fire

Penetration seals Hilti Firestop Double Board Seal have been tested in accordance with prEN 1366-3:2003, installed within apertures in flexible walls (drywalls) and rigid floors (metal and plastic pipes), EN 1366-3:2004, installed within apertures in rigid floors (cables, metal and plastic pipes), prEN 1366:2007 installed within apertures in rigid walls (cables, metal and plastic pipes) and in accordance with EN 1366-3:2009, installed in flexible walls (drywalls), rigid walls and concrete floors (cables, metal, composite and plastic pipes).

The seals were penetrated by cables, tied cable bundles, small conduits, steel and copper pipes, including pipes with insulation, composite pipes and plastic pipes.

Based upon these test results and the field of direct application specified within EN 1366-3:2009, penetration seals Hilti Firestop Double Board Seal have been classified in accordance with EN 13501-2, as shown in Annex C.

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

For details of suitable wall and floor constructions for penetration seals see 1.2.1.

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.
- It is assumed that compressed air systems are switched off by other means in the case of fire.
- 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 approval 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 relate to C/U (capped inside the furnace/uncapped outside) for metal pipes and U/C (uncapped inside the furnace/capped outside) for plastic and composite pipes. For further information refer to national regulations.

2.3 Air permeability

The gas permeability regarding the gases air, nitrogen (N_2), carbon dioxide (CO_2) and CH_4 (methane) has been tested according to the principles of EN 1026 for a coating thickness of 1 mm (CO_2 and CH_4) and 2 mm (N_2). 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_2 [$m^3/(h \cdot m^2)$]**	**q/A CO_2 [$m^3/(h*m^2)$]**	**q/A CH_4 [$m^3/(h*m^2)$]**
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.

2.4 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 9806 Pa.

2.5 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.

In addition to the specific clauses relating to dangerous substances contained in this ETA, 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.

2.6 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 for safety in use (500 Nm soft body impact, 10 Nm hard body impact) as well as serviceability (120 Nm soft body impact, 6 Nm hard body impact). The maximum dimension of the penetration seal is 1.0 x 1.5 m.

In case of horizontal penetration seals precautions have to be taken to prevent a person stepping onto the penetration seal from falling through the seal.

2.7 Resistance to impact/movement

See 2.6

2.8 Adhesion

See 2.6

2.9 Airborne sound insulation

Test reports from 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:

	CFS-CT on MW board 2x50 mm	CFS-CT on MW board 2x50 mm	CFS-CT B 1S 2x50 mm
Nominal density of board [kg/m^3]	140	150	160
No. of board faces coated	1	2	1
Air gap between boards [mm]	55	0	55
Specimen size [mm x mm]	400 x 500	600 x 500	400 x 500
$D_{n,e,w}$ (C; Ctr) [dB]	58 (-4;-8)	52 (-3;-7)	60 (-4;-9)
R_w (C; Ctr) [dB]	51 (-4;-8)	45 (-3;-7	53 (-4;-9)

Test setup: 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. Several variations have been tested: the pre-coated board CFS-CT B 1S as well as other mineral wool boards coated with CFS-CT, single and double layer seals, the latter with and without air gap between the boards. The coating thickness was 1 mm for boards coated on both sides and 0.7 mm for boards coated on 1 side only. The joints around the board have been sealed with Hilti Firestop Acrylic Sealant CFS-S ACR.

Rigid wall:

	CFS-CT on MW board 2x50 mm	CFS-CT on MW board 2x60 mm
Nominal density of board [kg/m^3]	150	150
No. of board faces coated	2	2
Air gap between boards [mm]	30	0
Specimen size [mm x mm]	620 x 520	620 x 520
$D_{n,e,w}$ (C; Ctr) [dB]	42 (-3;-5)	44 (-4;-7)
R_w (C; Ctr) [dB]	35 (-3;-5)	37 (-4;-7)

Test setup: Structure of the rigid wall: 175 mm thick concrete wall with a density of 2000 kg/m³ 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. Single and double layer seals have been tested, the latter with a variation in board thickness and different air gap between the boards. The coating thickness was 1 mm. The joints around the board have been sealed with Hilti Firestop Acrylic Sealant CFS-S ACR.

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 m²), i.e. the given wall with 0.322 m² Hilti Firestop Double Board Seal in case of rigid walls and a size of 1.38 x 1.5 m (= 2.07 m²), i.e. the given wall with 0.30 m² and 0.20 m² respectively Hilti Firestop Double Board Seal in case of flexible walls.

$D_{n,e,w}$: weighted element-normalized level difference of small building elements (given with spectrum adaptation terms C and C_{tr})

R_w: weighted sound reduction index (given with spectrum adaptation terms C and C_{tr})

2.10 Thermal properties

2.10.1 Hilti Firestop Coating CFS-CT

The insulation performance of a mineral wool slab is slightly reduced by the coating, 2.2% with one-sided coating, 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 λ-value has to be achieved.

2.10.2 Hilti Firestop Board CFS-CT B 1S

Thermal conductivity coefficient according to EN 12667 for a double layer of the boards:
λ_{10} = 0.039 W/mK.

2.11 Water vapour permeability

No performance determined

2.12 Durability and serviceability

2.12.1 Durability

Hilti Firestop Coating CFS-CT has been tested in accordance with EOTA Technical Report TR024, Table 4.1 for the Y_2 use category specified in EOTA ETAG 026: Part 2 and the results of the test have

demonstrated suitability for penetration seals intended for use at temperatures between -20°C and +70°C but with no exposure to rain nor UV (Y_2).

2.12.2 Serviceability

2.12.2.1 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.

2.12.2.2 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, galvanised steel and stainless steel as well as PE, PVC and ABS.

3 Evaluation and attestation of conformity and CE-marking

3.1 System of attestation of conformity

According to the Decision 1999/454/EC of the European Commission[6] system 1 of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(a) Tasks for the manufacturer:

- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the approved body:

- (3) initial type–testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European Technical Approval.

[6] Official Journal of the European Communities N° L 178, 14,7,1999, p. 52

The manufacturer may only use constituent materials stated in the technical documentation of this European Technical Approval.

For the components which the ETA-holder does not manufacture by himself, he shall make sure that factory production control carried out by the other manufacturers gives the guaranty of the components compliance with the European Technical Approval.

The factory production control and the provisions taken by the ETA-holder for components not produced by himself shall be in accordance with the "Control Plan relating to the European Technical Approval ETA-11/0429" which is part of the technical documentation of this European Technical Approval. The "Control Plan" is laid down in the context of the factory production control system operated by the manufacturer and deposited at SITAC.[7]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the "Control Plan".

3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body (bodies) which is (are) approved for the tasks referred to in section 3.1 in the field of penetration seals in order to allow the manufacturer to undertake the actions laid down in section 3.3. For this purpose, the "Control Plan" referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body or bodies involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of the European Technical Approval ETA-11/0429 issued on 14.03.2012.

Additional information

The manufacturer shall provide a technical data sheet and installation instruction with the following minimum information:

Technical data sheet:

- Field of application:
  - Building elements for which the penetration seal is suitable, type and properties of the building elements like minimum thickness, density, and – in case of lightweight constructions – the construction requirements.
  - Services for which the penetration seal is suitable, type and properties of the services like material, diameter, thickness etc. in case of pipes including insulation materials; necessary/allowed supports/fixings (e.g. cable trays)
  - Limits in size, minimum thickness etc. of the penetration seal

- Construction of the penetration seal including the necessary components and additional products (e.g. backfilling material) with clear indication where they are generic or specific.

[7] The Control Plan is a confidential part of the European Technical Approval and only handed over to the approved body or bodies involved in the procedure of attestation of conformity.

Installation instruction:
Steps to be followed
Procedure in case of retrofitting
Stipulations on maintenance, repair and replacement

3.2.2 Tasks of approved bodies

The approved body (bodies) shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the "Control Plan relating to the European Technical Approval ETA-11/0429".

The approved body (bodies) shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in (a) written report (reports).

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European Technical Approval.

In cases where the provisions of the European Technical Approval and its "Control Plan" are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform the SITAC without delay.

3.3 CE marking

The CE marking shall be affixed on the product itself, on a label attached to it, on its packaging or on the commercial documents accompanying the components of the product unit. The marking „CE“ shall be followed by the identification number of the approved certification body and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European Technical Approval,
- the number of the guideline for European Technical Approval
- the name of the product and the use category/categories of the product as listed in accordance with the provisions of the ETAG
- “see ETA-11/0429 for relevant characteristics”

Example of CE marking and accompanying information for Hilti Firestop Double Board Seal:

CE	"CE"-marking
1234	Identification number of approved certification body
Hilti AG Feldkircherstrasse 100, Schaan, Liechtenstein	Name and address of the producer (legal entity responsible for the manufacturer)
04	Two last digits of year of affixing the CE marking
1234-CPD-0321	Number of EC certificate of conformity
ETA-11/0429	Number of European Technical Approval
ETAG N° 026 part 2	Number of guideline for European Technical Approval
Hilti Firestop Coating CFS-CT for Penetration Seal Hilti Firestop Double Board Seal	Name
"see ETA-11/0429 for relevant characteristics"	Reference to ETA for relevant characteristics

4 Assumptions under which the fitness of the product(s) for the intended use was favourably assessed

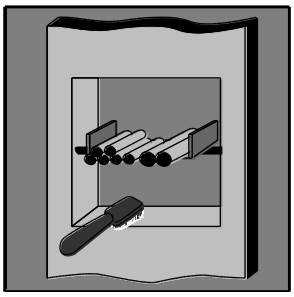
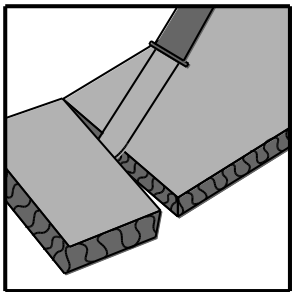
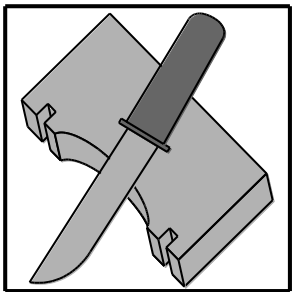
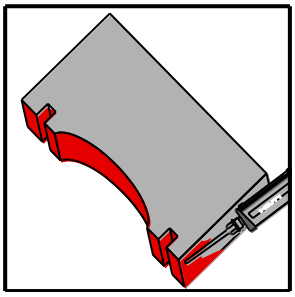
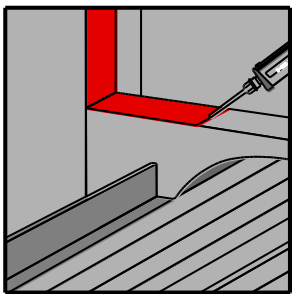
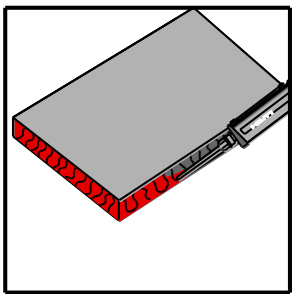
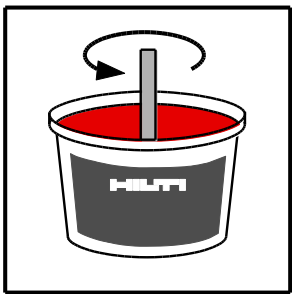
4.1 Manufacturing

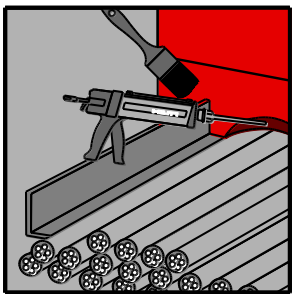
The European Technical Approval is issued for the product on the basis of agreed data/information, deposited with the SITAC, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, shall be notified to the SITAC before the changes are introduced. The SITAC will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

4.2 Installation

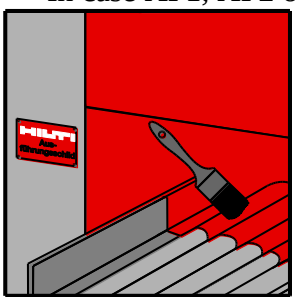
The ETA is issued under the assumption that the installation of the approval product is performed in accordance with the manufacturer's technical literature.

4.2.1 Installation of the penetration seal, when using a MW board according to Table D.1 and Hilti Firestop Coating CFS-CT, should be conducted as follows:

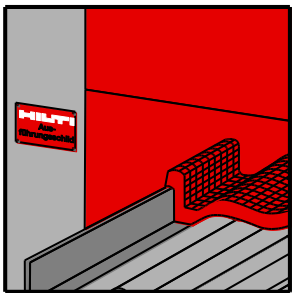










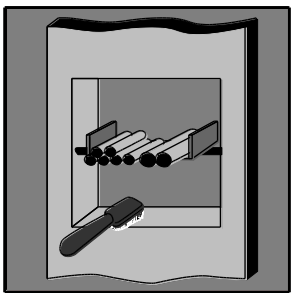
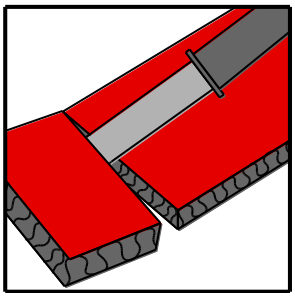
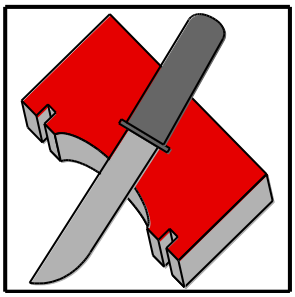
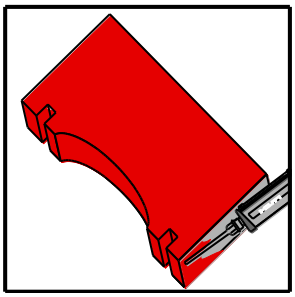
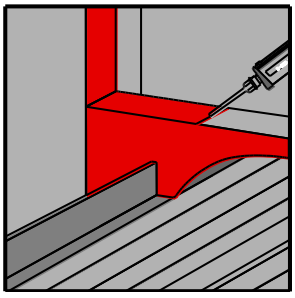
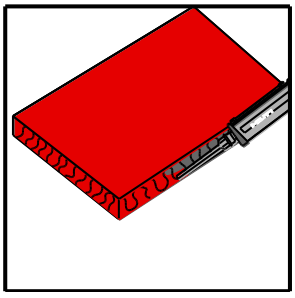
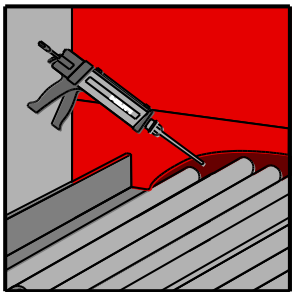
- In case AP1, AP2 or AP3 is required:



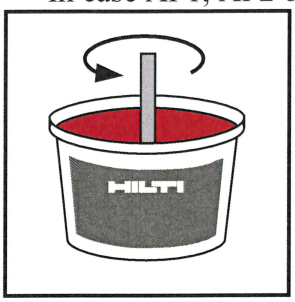
- In case AP4 or AP5 is required:

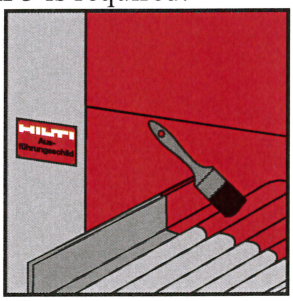


4.2.2 Installation of the penetration seal, when using the pre-coated boards Hilti Firestop Board CFS-CT B 1S or CFS-CT B 2S, should be conducted as follows:

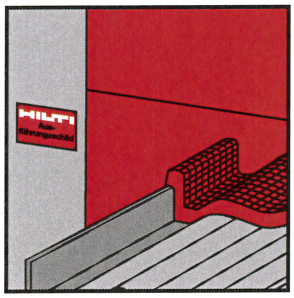








- In case AP1, AP2 or AP3 is required:





- In case AP4 or AP5 is required:



- Application temperature: +5°C to +40°C.

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_1 to AP_7 according to 1.1.2.6 and 1.1.2.7 may be necessary – for details see Annex C.

In case services are removed the remaining hole has to be filled with mineral wool according to the specification given in Table D.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.

5 Indications to the manufacturer

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: -5° up to max. +50°C

5.2 Use, maintenance, repair

The Hilti Firestop Coating CFS-CT and the Hilti Firestop Boards CFS-CT B 1S or CFS-CT B 2S should be installed and used as described earlier in this document.

The assessment of the fitness for use is based on the assumption that damage, for example caused by accidental impact, is repaired. The relevant manufacturer instructions shall be followed.

On behalf of SITAC

Borås, 14 March 2012

Lennart Månsson

P900172

ANNEX A

REFERENCE DOCUMENTS and LIST OF ABBREVIATIONS

A.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 behaviour, 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 14303	Thermal insulation products for building equipment and industrial installations - Factory made mineral wool (MW) products – Specification
EN 14304	Thermal insulation products for building equipment and industrial installations - Factory made flexible elastomeric foam (FEF) products - Specification
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 - Polybutene (PB), polyethylene (PE) and polypropylene (PP) - Specifications for components and the system; Metric series

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

A.3 Abbreviations used in drawings

Abbreviation	Description
A_1	Mineral wool board coated with Hilti Firestop Coating CFS-CT or Hilti Firestop Coated Board CFS-CT B 1S
A_2	Hilti Firestop Bandage CFS-B
A_3	Hilti Firestop Collar CFS-C or CFS-C P
AP_1 to AP_7	Additional protection for services
C, C_1, C_2, C_3	Penetrating services
D	Pipe insulation
d_c	Pipe diameter
E_1, E_2	Building element (wall, floor)
h	Height of the penetration seal
l	Length of the penetration seal
L_{AP}	Length of the additional protection
L_D	Length of the pipe insulation
s_1, $s_{2, ...}$	Distances
t_{AP}	Thickness of additional protection
t_c	Pipe wall thickness
t_D	Thickness of insulation
t_E	Thickness of the building element
w	Width of the penetration seal

ANNEX B

DESCRIPTION OF PRODUCT(S) & PRODUCT LITERATURE

B.1 Hilti Firestop Coating CFS-CT

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

B.2 Hilti Firestop Board CFS-CT B 1S

A detailed specification of the product is contained in document “Identification / Product Specification relating to the European Technical Approval ETA-11/0428 and ETA 0429 - Hilti Firestop Board CFS-CT B 1S” which is a non-public part of this ETA.

The "Control Plan" is defined in document "Control Plan” relating to the European Technical Approval ETA-11/0428 and ETA-10/0429 - Hilti Firestop Board CFS-CT B 1S” which is a non-public part of this ETA.

B.3 Hilti Firestop Board CFS-CT B 2S

A detailed specification of the product is contained in document “Identification / Product Specification relating to the European Technical Approval 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 Approval ETA-11/0428 and ETA-10/0429 - Hilti Firestop Board CFS-CT B 2S” which is a non-public part of this ETA.

B.4 Hilti Firestop Acrylic Sealant CFS-S ACR

For specification and further details see ETA-10/0292

B.5 Hilti Firestop Collar CFS-C

For specification and further details see ETA-10/0403

B.6 Hilti Firestop Collar CFS-C P

For specification and further details see ETA-10/0404

B.7 Hilti Firestop Bandage CFS-B

For specification and further details see ETA-10/0212

B.8 Fixing for Hilti Firestop Collars CFS-C and CFS-C P

- 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)

B.9 Technical product literature

- Technical data sheet Hilti Firestop Double Board Seal – Hilti Firestop Coating CFS-CT (including all components as defined in 1.1.2).
- Safety Data Sheet acc. to 1907/2006/EC, Article 31, for Hilti Firestop Coating CFS-CT

ANNEX C

RESISTANCE TO FIRE CLASSIFICATION OF PENETRATION SEALS HILTI FIRESTOP DOUBLE BOARD SEAL

C.1 Flexible walls according to 1.2.1 and rigid walls according to 1.2.1 b), minimum thickness 100 mm

Penetration seal:

Two 50 mm Hilti Firestop Boards CFS-CT B 1S[8] (A_1) or mineral wool boards according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A_1), dry thickness of coating 0.7 mm on the outer side[9], 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.

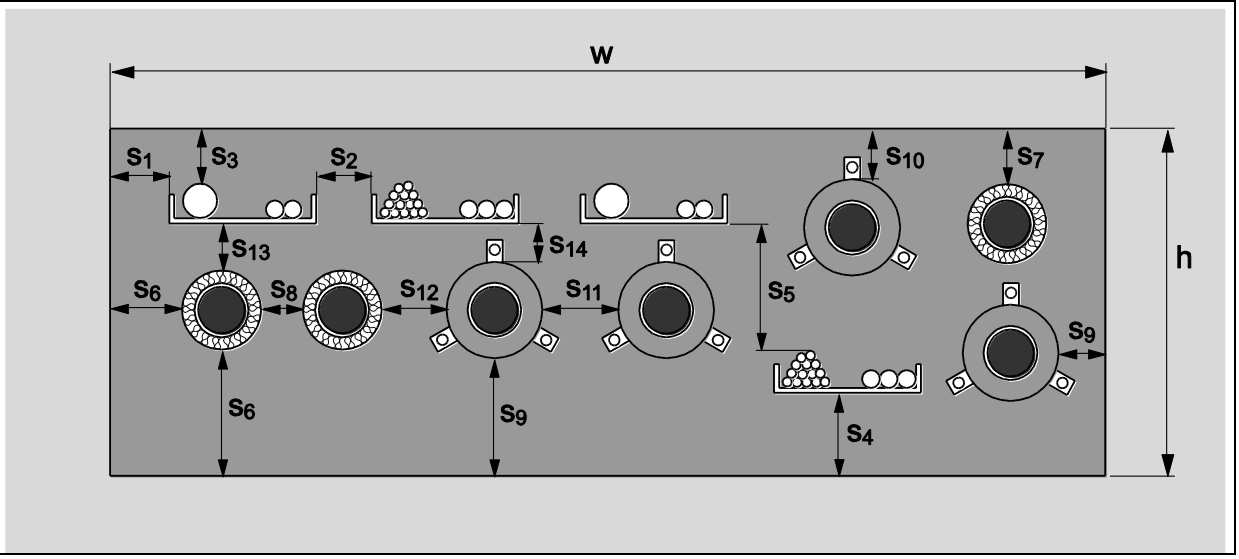
The boards have to be positioned flush to the surface of the building element on each side of the wall.

Maximum distance for 1st service support: 250 mm.

Maximum seal size: 1200 x 1200 mm (width x height).

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 = 3 (distance between metal pipes and seal edge)
s_8 = 0 (distance between metal pipes)
s_9 = 17 (distance between plastic pipes/pipe closure devices and seal edge)
s_{11} = 0 (distance between plastic pipes/pipe closure devices)
s_{12} = 30 (distance between metal pipes and plastic pipes/pipe closure devices)
s_{13} = 3 (distance between cables/cable supports and metal pipes)
s_{14} = 42 (distance between cables/cable supports and plastic pipes/pipe closure devices)

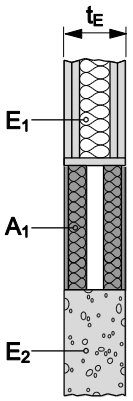
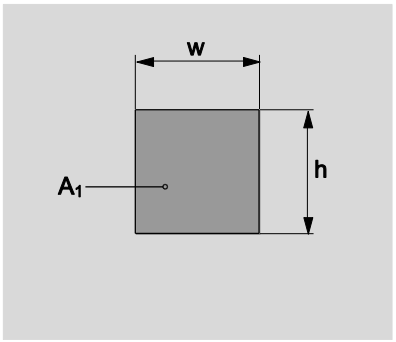


[8] Hilti Firestop Boards CFS-CT B 2S (coated on both faces) may also be used

[9] The board may also be coated on both faces

Penetrating services (single, multiple or mixed):

C.1.1 Blank seal (no services) *

Construction details (for symbols and abbreviations see Annex A.3):	Classification
 	EI 120
* 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	

C.1.2 Cables

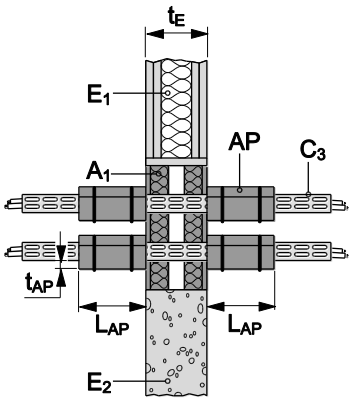
Construction details (for symbols and abbreviations see Annex A.3):

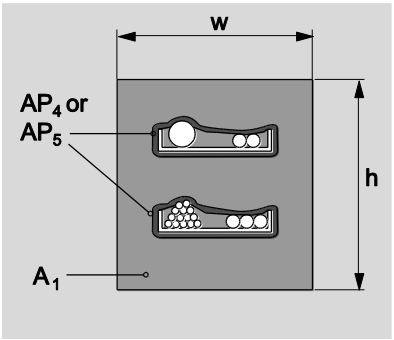
Additional protection AP_2, AP_4 or AP_5 according to 1.1.2.6 may be used. AP_4 and AP_5 are illustrated below.

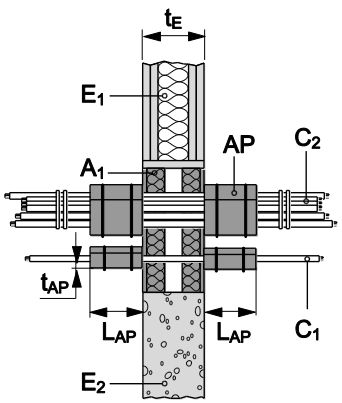
AP_3: cables/small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables/small conduits of 200 mm from the surface of the seal, thickness 2 mm.

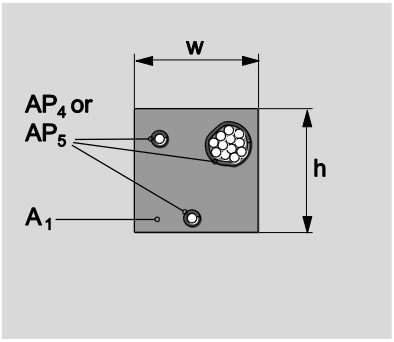
AP_4: Mineral wool mat according to Table D.2, wrapped around cables /cable support (trays, ladders), Al-faced side outside, fixed with wire, width (length along the cables/small conduits) 200 mm, thickness 20 mm.

AP_5: Mineral wool mat according to Table D.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 according to 1.1.2.6:	AP_3	AP_4	AP_5
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 21 mm	EI 90	EI 120	EI 120
21 ≤ Ø ≤ 50 mm	EI 90	EI 90	EI 120
50 ≤ Ø ≤ 80 mm	EI 90	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 Ø 17 mm	EI 60	EI 120	EI 120
Maximum Ø 24 mm	EI 60	EI 120	EI 120
Tied cable bundle, maximum diameter of single cable 21 mm, with or without cable supports			
Maximum Ø 100 mm	EI 90	EI 120	EI 120

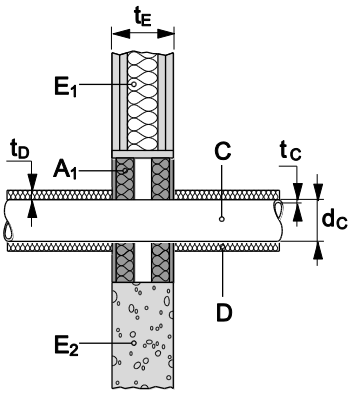
C.1.3 Small conduits and tubes			
Construction details: see C.1.2			
	Classification		
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports			
Additional protection according to 1.1.2.6	AP_3	AP_4	AP_5
Plastic conduits and tubes	EI 120-U/C	EI 120-U/C	EI 120-U/C
Steel conduits and tubes	EI 90-C/U	EI 120-C/U	EI 120-C/U

C.1.4 Metal pipes

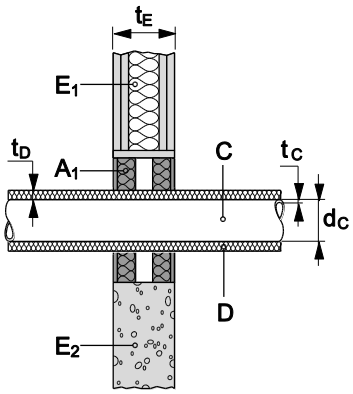
C.1.4.1 Metal pipes with mineral wool insulation according to Table D.3

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

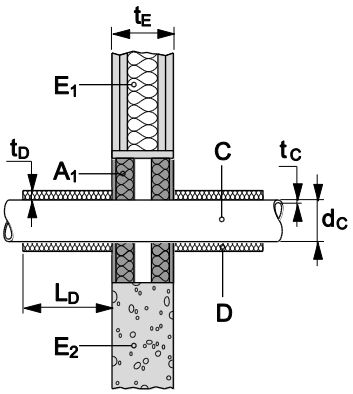
Continued insulation, interrupted (CI)



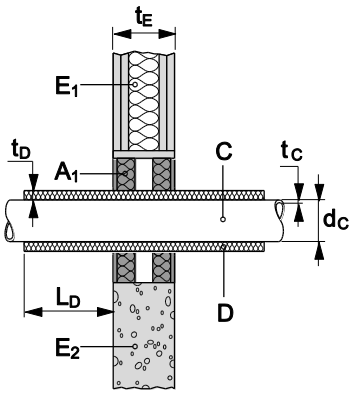
Continued insulation, sustained (CS)



Local insulation, interrupted (LI)



Local insulation, sustained (LS)



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
≥ 20	34	4.0 - 14.2	EI 120-C/U
≥ 30	34 - 114.3	3.6 - 14.2	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]	
20	≥ 500	34	4.0 - 14.2	EI 120-C/U
30	≥ 500	114.3	3.6 - 14.2	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, NrCr and NiMo alloys)

Copper pipes (C) with continued insulation (D) – interrupted

Insulation thickness (t_D) [mm]	Pipe diameter (d_C) [mm]	Pipe wall thickness (t_C) [mm]	Classification
≥ 20	42	1.5 - 14.2	EI 120-C/U

Copper 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]	
20	≥ 500	42	1.5 - 14.2	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.1.4.2 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B

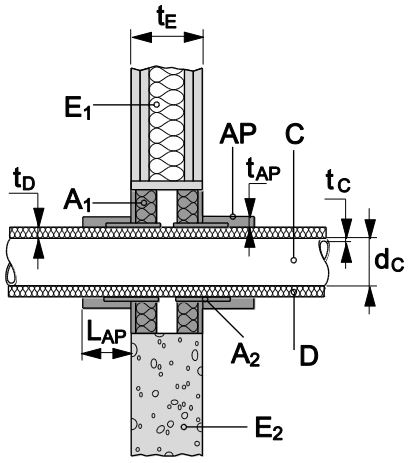
Construction details (for symbols and abbreviations see Annex A.3):

For specification of Armaflex AF see Table D.4.

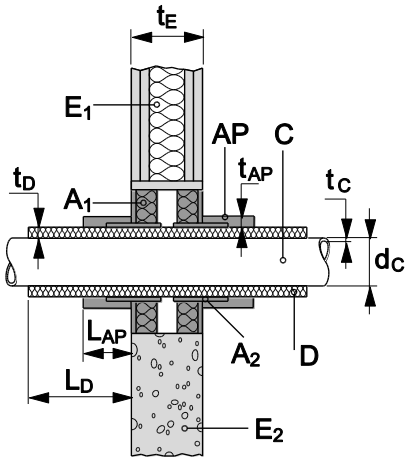
Two layers of Firestop Bandage CFS-B (A_2) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fixed with wire.

Over of the bandage/pipe insulation additional protection AP_6 according to 1.1.2.7 is installed: Armaflex AF19 pipe insulation wrapped around the bandage/pipe insulation on each side of the seal, fixed with wire, length (L_{AP}) = 300 mm on each side, thickness (t_{AP}) = 19 mm.

Continued insulation, sustained (CS)



Local insulation, sustained (LS)



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
21.5 - 39	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	60.3 - 114.3	3.6 - 14.2	EI 60-C/U
43	114.3	3.6 - 14.2	EI 90-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]	
21.5 - 39	≥ 500	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	≥ 500	60.3 - 114.3	3.6 - 14.2	EI 60-C/U
43	≥ 500	114.3	3.6 - 14.2	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, NrCr and NiMo alloys)

Stainless 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
21.5 - 39	60.3	2.0 - 14.2	EI 120-C/U

Stainless 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]	
21.5 - 39	≥ 500	60.3	2.0 - 14.2	EI 120-C/U

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 - 35	28	1.0 - 14.2	EI 120-C/U

Copper pipes (C) with local insulation (D) – sustained

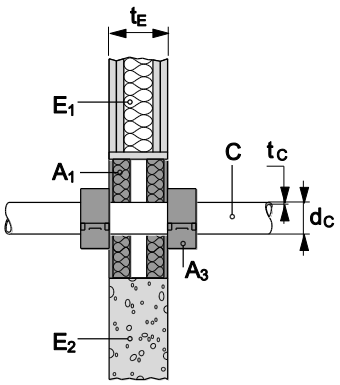
Insulation		Pipe		Classification
thickness (t_D) [mm]	length (L_D) [mm]	diameter (d_C) [mm]	wall thickness (t_C) [mm]	
19 - 35	≥ 500	28	1.0 - 14.2	EI 120-C/U

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.1.5 Plastic pipes with Hilti Firestop Collar CFS-C

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

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 B.8.



PVC-U pipes (C) according to EN ISO 1452-2, EN ISO 15493 and DIN 8061/8062				
Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Collar size (A_1)	No. of hooks	Classification
90	4.5	CFS-C 90/3”	3	EI 120-U/C
The results are also valid for PVC-U pipes according EN 1329-1[10] and EN 1453-1[10].				
PE pipes (C) 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
90	2.2 - 8.2	CFS-C 90/3”	3	EI 120-U/C

C.1.6 Composite pipes Geberit Mepla (PE-Xb/Al/PE-HD) with Armaflex AF insulation and Hilti Firestop Bandage CFS-B

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

Pipes: “Geberit Mepla” composite pipes of Geberit Vertriebs AG, a company of the Geberit Group

Insulation: for specification of Armaflex AF see Table D.4.

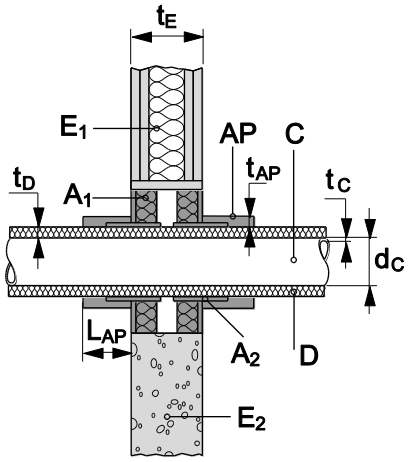
Two layers of Firestop Bandage CFS-B (A_2) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fixed with wire.

Over of the bandage/pipe insulation additional protection AP_6 or AP_7 according to 1.1.2.7 is installed:

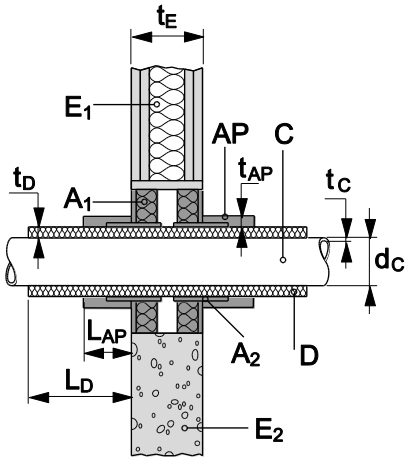
AP_6: Armaflex AF19 pipe insulation wrapped around the bandage/pipe insulation on each side of the seal, fixed with wire, length (L_{AP}) = 300 mm on each side, thickness (t_{AP}) = 19 mm.

AP_7: Mineral wool mat according to Table D.2, wrapped around the bandage/pipe insulation on each side of the seal, fixed with wire, length (L_{AP}) = 300 mm, thickness (t_{AP}) = 20 mm.

Continued insulation, sustained (CS)



Local insulation, sustained (LS)



[10] In Germany the pipes have additionally to comply with DIN 19531-10

Pipes (C) with continued insulation (D) – sustained				
Insulation thickness (t_D) [mm]	Additional protection	Pipe diameter (d_C) [mm]	Pipe wall thickness (t_C) [mm]	Classification
10 - 32	AP_6	16	2.25	EI 120-U/C
10 - 32	AP_6	26 - 63	3.0 - 4.5	EI 120-U/C
10 - 32	AP_7	16	2.25	EI 90-U/C
10 - 32	AP_7	32	3.0	EI 90-U/C
10 - 32	AP_7	40 - 63	3.5 - 4.5	EI 120-U/C
32	AP_7	32	3.0	EI 120-U/C

Pipes (C) with local insulation (D) – sustained					
Insulation thickness (t_D) [mm]	Insulation length (L_D) [mm]	Additional protection	Pipe diameter (d_C) [mm]	Pipe wall thickness (t_C) [mm]	Classification
10 - 32	≥ 450	AP_6	16	2.25	EI 120-U/C
10 - 32	≥ 450	AP_6	26 - 63	3.0 - 4.5	EI 120-U/C
10 - 32	≥ 450	AP_7	16	2.25	EI 90-U/C
10 - 32	≥ 450	AP_7	32	3.0	EI 90-U/C
10 - 32	≥ 450	AP_7	40 - 63	3.5 - 4.5	EI 120-U/C
32	≥ 450	AP_7	32	3.0	EI 120-U/C

C.2 Flexible walls according to 1.2.1 and rigid walls according to 1.2.1 b), minimum thickness 135 mm

Penetration seal:

Two 50 mm mineral wool boards according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A_1), dry thickness of coating 1 mm on the outer side[11], 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 boards have to be positioned flush to the surface of the building element on each side of the wall.

Maximum distance for 1st service support: 150 mm.

Maximum seal size: 1200 x 1200 mm (width x height).

Minimum distances in mm (for illustration see C.1):

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

$s_8 = 0$ (distance between metal pipes)

$s_9 = 15$ (distance between plastic pipes/pipe closure devices and seal edge)

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

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

$s_{13} = 96$ (distance between cables/cable supports and metal pipes)

$s_{14} = 69$ (distance between cables/cable supports and plastic pipes/pipe closure devices)

Penetrating services (single, multiple or mixed with cables):

In addition to the services referred to in C.1 the following services with the classifications given below are covered:

[11] The board may also be coated on both faces

C.2.1 Metal pipes

C.2.1.1 Metal pipes with mineral wool insulation according to Table D.3

Construction details: see C.1.4.1

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
≥ 30	32 -168.3	2.6 - 14.2	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]	
30	≥ 500	32	2.6 - 14.2	EI 120-C/U
30	≥ 800	32 -168.3	2.6 - 14.2	EI 120-C/U
30 – 40	≥ 1000	168.3	4.0 - 14.2	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, NrCr 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
≥ 40	88,9	1.8 - 14.2	EI 120-C/U

Copper 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]	
40	≥ 800	88.9	1.8 - 14.2	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.2.1.2 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B

Construction details: see C.1.4.2

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
21.5 - 39	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	60.3 - 114.3	3.6 - 14.2	EI 60-C/U
43	114.3	3.6 - 14.2	EI 90-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]	
21.5 - 39	≥ 500	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	≥ 500	60.3 - 114.3	3.6 - 14.2	EI 60-C/U
43	≥ 500	114.3	3.6 - 14.2	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, NrCr and NiMo alloys)				

Stainless 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
21.5 - 39	60.3	2.0 - 14.2	EI 120-C/U

Stainless 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]	
21.5 - 39	≥ 500	60.3	2.0 - 14.2	EI 120-C/U

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 - 35	28	1.0 - 14.2	EI 120-C/U

Copper 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 - 35	≥ 500	28	1.0 - 14.2	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.2.2 Plastic pipes with Hilti Firestop Collar CFS-C				
Construction details: see C.1.5				
PVC-U pipes (C) according to EN ISO 1452-2, EN ISO 15493 and DIN 8061/8062				
Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Collar size (A_1)	No. of hooks	Classification
90	4.5	CFS-C 90/3”	3	EI 120-U/C
The results are also valid for PVC-U pipes according EN 1329-1[12] and EN 1453-1[12].				

[12] In Germany the pipes have additionally to comply with DIN 19531-10

PE pipes (C) 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
90	2.2 - 8.2	CFS-C 90/3”	3	EI 120-U/C

C.3 Rigid walls according to 1.2.1 c), minimum thickness 150 mm
Penetration seal: Two 50 mm Hilti Firestop Boards CFS-CT B 1S[13] (A_1) or mineral wool boards according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A_1), dry thickness of coating 0.7 mm on the outer side[14], 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 boards have to be positioned flush to the surface of the building element on each side of the wall. Maximum distance for 1st service support: 275 mm. Maximum seal size: 1200 x 1200 mm (width x height). Minimum distances in mm (for illustration see C.1): s_1 = 0 (distance between cables/cable supports and seal edge s_2 = 0 (distance between cable supports) s_3 = 45 (distance between cables and upper seal edge) s_6 = 30 (distance between metal pipes and seal edge) s_8 = 0 (distance between metal pipes) s_9 = 55 (distance between plastic pipes/pipe closure devices and seal edge) s_{11} = 0 (distance between plastic pipes/pipe closure devices) s_{12} = 68 (distance between metal pipes and plastic pipes/pipe closure devices) s_{13} = 76 (distance between cables/cable supports and metal pipes) s_{14} = 45 (distance between cables/cable supports and plastic pipes/pipe closure devices)
Penetrating services (single, multiple or mixed):

C.3.1 Cables	
Construction details: see drawings in C.1.2; additional protection AP_1 according to 1.1.2.6	Classification
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:	EI 60
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 90
Tied cable bundle, maximum diameter of 100 mm, maximum diameter of single cable 21 mm, with or without cable supports	EI 60

C.3.2 Small conduits and tubes	
Construction details: see drawings in C.1.2; additional protection AP_1 according to 1.1.2.6	
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports	Classification
Plastic conduits and tubes	EI 120-U/C
Steel conduits and tubes	EI 120-C/U

[13] Hilti Firestop Boards CFS-CT B 2S (coated on both faces) may also be used

[14] The board may also be coated on both faces

C.3.3 Metal pipes with mineral wool insulation according to Table D.3

Construction details: see C.1.4.1

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
≥ 20	32	4.0 - 14.2	EI 120-C/U
≥ 30	32 - 114.3	3.6 - 14.2	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]	
20	≥ 500	32	4.0 - 14.2	EI 120-C/U
30	≥ 500	114.3	3.6 - 14.2	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, NrCr 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
≥ 20	42	1.5 - 14.2	EI 120-C/U

Copper 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]	
40	≥ 500	42	1.5 - 14.2	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

Construction details: see C.1.5

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

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Collar size (A_1)	No. of hooks	Classification
32	1.9	CFS-C 50/1.5"	2	EI 120-U/C
110	2.2 – 8.2	CFS-C 110/4"	4	EI 120-U/C

The results are also valid for PVC-U pipes according EN 1329-1[15] and EN 1453-1[15].

[15] In Germany the pipes have additionally to comply with DIN 19531-10

C.4 Rigid walls according to 1.2.1 d), minimum thickness 150 mm

Penetration seal:

Two 50 mm Hilti Firestop Boards CFS-CT B 1S[16] (A_1) or mineral wool boards according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A_1), dry thickness of coating 0.7 mm on the outer side[17], 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 boards have to be positioned flush to the surface of the building element on each side of the wall.

Maximum distance for 1st service support: 250 mm.

Maximum seal size: 1200 x 1200 mm (width x height).

Minimum distances in mm metal pipe penetration seal:

s_6, s_9 = 0 (distance between pipes and lateral seal edge
s_7, s_{10} = 45 (distance between pipes and upper seal edge)
s_8, s_{11}, s_{12} = 30 (distance between pipes)

Minimum distances in mm cable penetration seal:
s_1 = 10 (distance between cables/cable supports and seal edge)
s_2 = 70 (distance between cable supports)
s_3 = 48 (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)

For illustration of distances see C.1

Penetrating services (single or multiple):

In addition to the services referred to in C.1 and C.2 the following services with the classifications given below are covered:

C.4.1 Cables

Construction details: see C.1.2

	Classification	
Additional protection according to 1.1.2.6:	AP_3	AP_4
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 21 mm	EI 120	EI 120
21 ≤ Ø ≤ 50 mm	EI 60	EI 90
50 ≤ Ø ≤ 80 mm	EI 60	EI 90
Non-sheathed cables (wires) currently and commonly used in building practice in Europe, with or without cable supports, with a diameter of:		
Maximum Ø 17 mm	EI 45	-
Maximum Ø 24 mm	EI 45	-
Tied cable bundle, maximum diameter of single cable 21 mm, with or without cable supports		
Maximum Ø 100 mm	EI 90	EI 120

[16] Hilti Firestop Boards CFS-CT B 2S (coated on both faces) may also be used

[17] The board may also be coated on both faces

C.4.2 Small conduits and tubes		
Construction details: see C.1.2		
	Classification	
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports		
Additional protection according to 1.1.2.6:	AP_3	AP_4
Plastic conduits and tubes	EI 120-U/C	EI 120-U/C
Steel conduits and tubes	EI 120-C/U	EI 120-C/U

C.4.3 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B

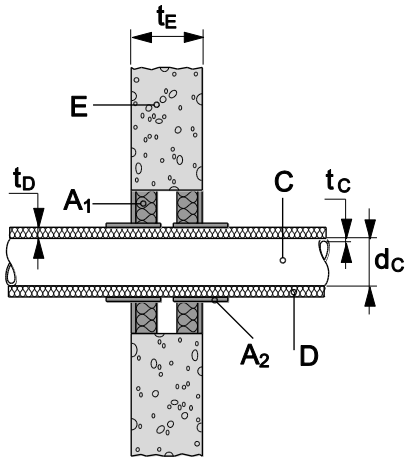
Construction details (for symbols and abbreviations see Annex A.3):

For specification of Armaflex AF see Table D.4.

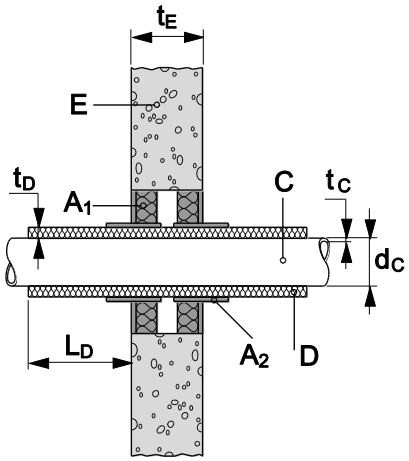
Two layers of Firestop Bandage CFS-B (A_2) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fixed with wire.

No additional protection.

Continued insulation, sustained (CS)



Local insulation, sustained (LS)



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
21.5 - 39	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	60.3 - 114.3	3.6 - 14.2	EI 60-C/U
39	60.3	3.65 - 14.2	EI 120-C/U
43	114.3	3.6 - 14.2	EI 90-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]	
21.5 - 39	≥ 500	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	≥ 500	60.3 - 114,3	3.6 - 14.2	EI 60-C/U
39	≥ 500	60,3	3.65 - 14.2	EI 120-C/U
43	≥ 500	114.3	3.6 - 14.2	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, NrCr and NiMo alloys)				

Stainless 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
21.5 - 39	60.3	2.0 - 14.2	EI 90-C/U
39	60.3	2.0 - 14.2	EI 120-C/U

Stainless 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]	
21.5 - 39	≥ 500	60.3	2.0 - 14.2	EI 90-C/U
39	≥ 500	60.3	2.0 - 14.2	EI 120-C/U

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 - 35	28	1.0 - 14.2	EI 60-C/U
35	28	1.0 - 14.2	EI 120-C/U

Copper 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 - 35	≥ 500	28	1.0 - 14.2	EI 60-C/U
35	≥ 500	28	1.0 - 14.2	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.5 Rigid floors according to 1.2.1 e), minimum thickness 150 mm

Penetration seal:

Two 50 mm Hilti Firestop Boards CFS-CT B 1S[18] (A_1) or mineral wool boards according to Table D.1 coated with Hilti Firestop Coating CFS-CT (A_1), dry thickness of coating 0.7 mm on the outer side[19], 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.

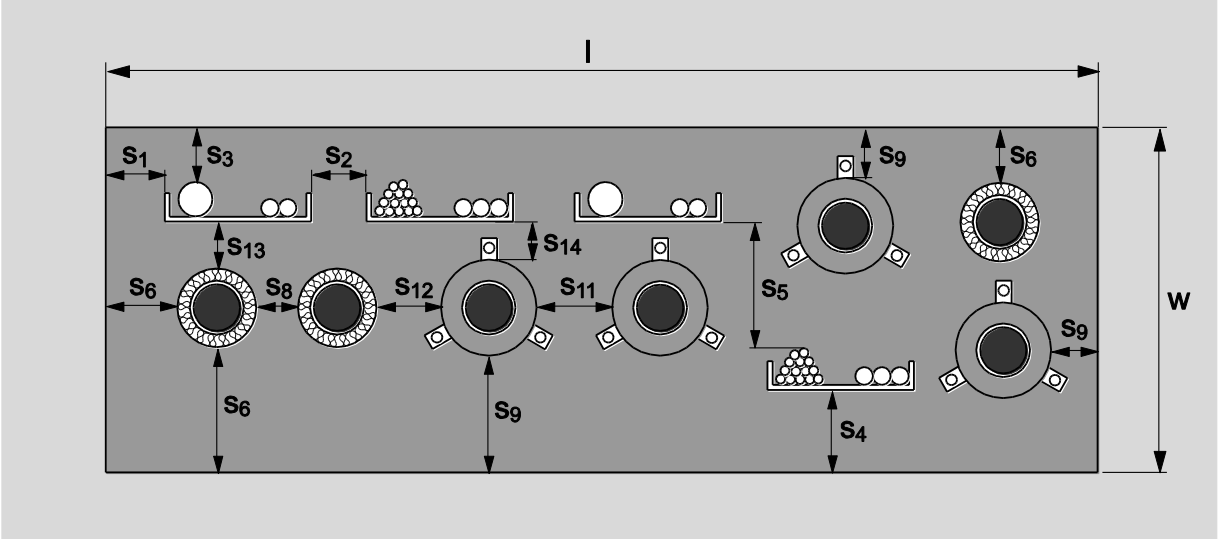
The boards have to be positioned flush to the surface of the building element on each side of the wall.

Maximum distance for 1st service support: 100 mm.

Maximum seal size: see Figure below.

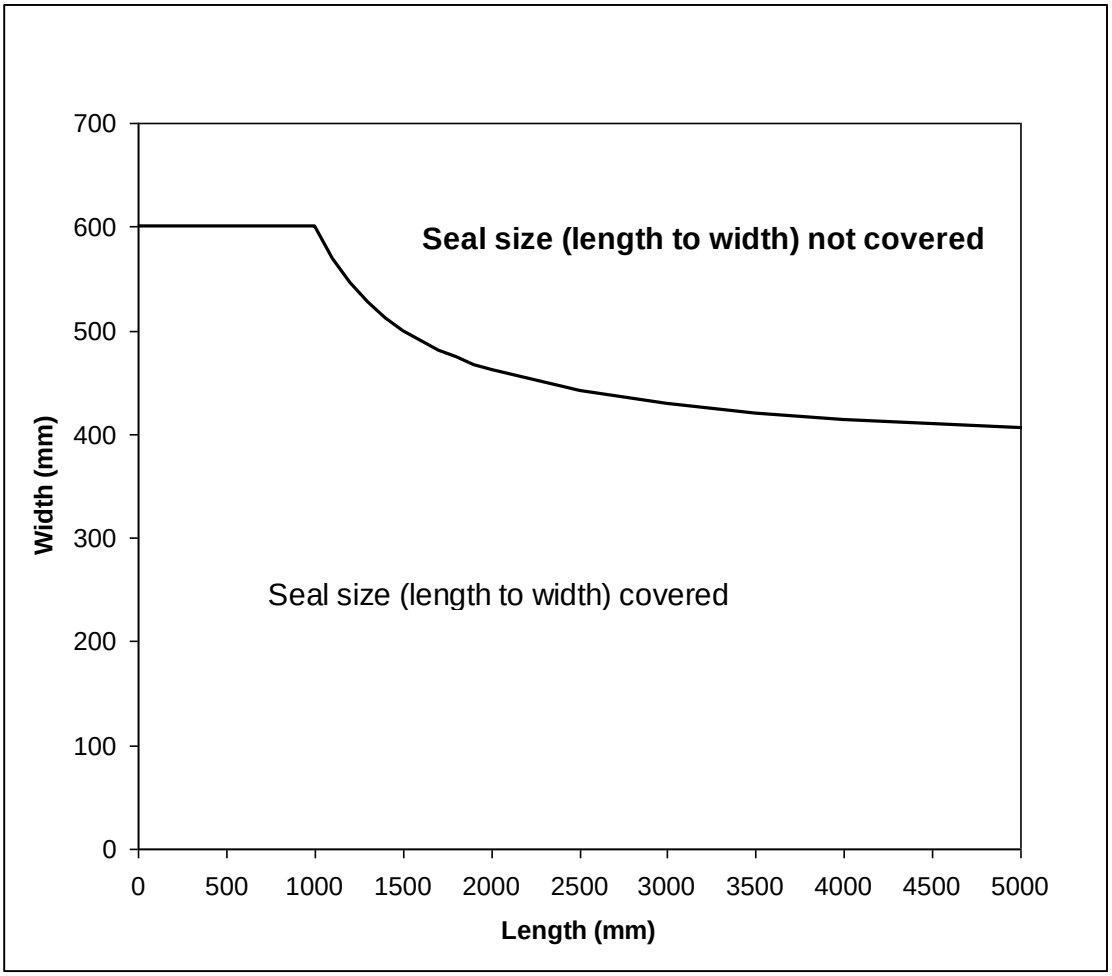
Minimum distances in mm (for illustration see C.1):

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 = 57 (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} = 45 (distance between cables/cable supports and metal pipes)
s_{14} = 32 (distance between cables/cable supports and plastic pipes/pipe closure devices)

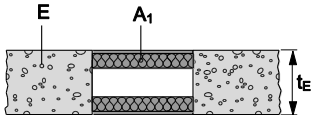
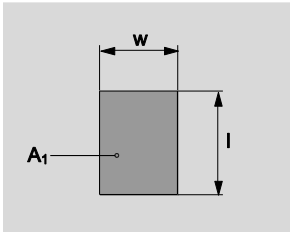


[18] Hilti Firestop Boards CFS-CT B 2S (coated on both faces) may also be used

[19] The board may also be coated on both faces



Seal sizes covered in floor application (length x width)

Penetrating services (single, multiple or mixed):	
C.5.1 Blank seal (no services) *	
Construction details (for symbols and abbreviations see Annex A.3):  * 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 180

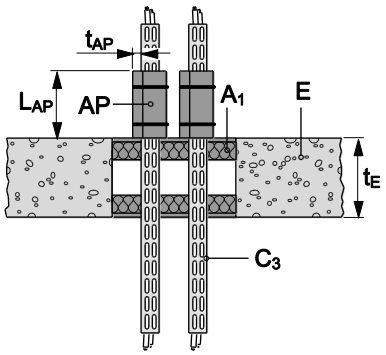
C.5.2 Cables

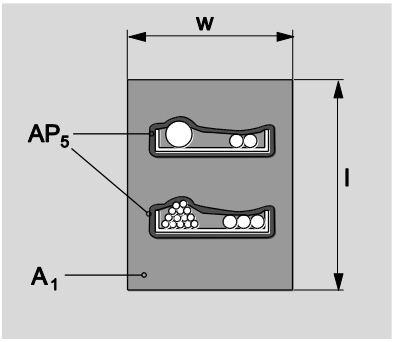
Construction details (for symbols and abbreviations see Annex A.3):

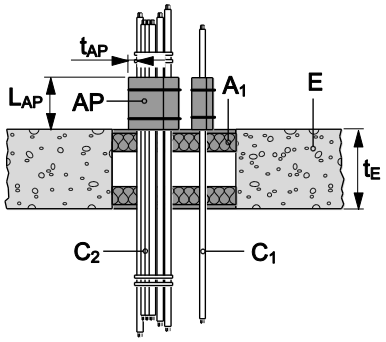
Additional protection AP_2 or AP_5 according to 1.1.2.6 may be used. AP_5 is illustrated below.

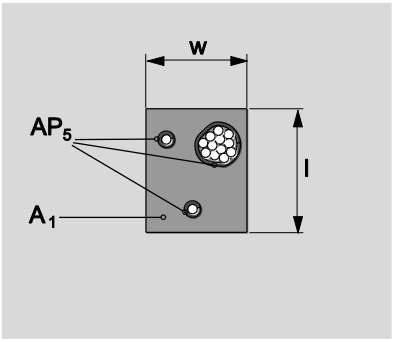
AP_2: cables/small conduits coated with Hilti Firestop Coating CFS-CT over a length of the cables/small conduits of 200 mm from the surface of the seal, thickness 1 mm.

AP_5: Mineral wool mat according to Table D.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_2	AP_5
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:		
	with cable support (C_3)	without cable support (C_1, C_2)	with or without cable support
Maximum Ø 21 mm	EI 90	EI 120	EI 120
21 ≤ Ø ≤ 50 mm	EI 60	EI 60	EI 120
50 ≤ Ø ≤ 80 mm	EI 60	EI 60	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 Ø 24 mm	EI 60	EI 60	-
Tied cable bundle, maximum diameter of single cable 21 mm, with or without cable supports			
Maximum Ø 100 mm	EI 90	EI 120	EI 120

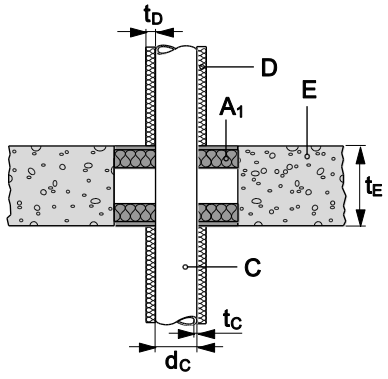
C.5.3 Small conduits and tubes			
Construction details: see C.5.2			
	Classification		
Additional protection:	AP_2		AP_5
Ø ≤ 16 mm, wall thickness ≥ 1 mm, arranged linear, with or without cables, with or without cable supports			
	with cable support (C_3)	without cable support (C_1, C_2)	with or without cable support
Plastic conduits and tubes	EI 90-U/C	EI 120-U/C	EI 90-U/C
Steel conduits and tubes	EI 90-C/U	EI 120-C/U	EI 90-C/U

C.5.4 Metal pipes

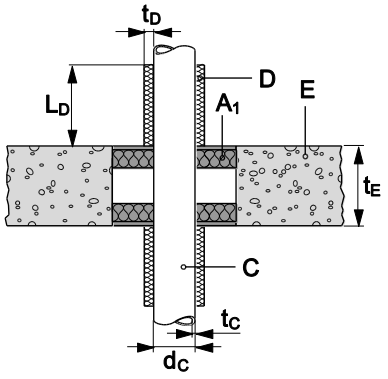
C.5.4.1 Metal pipes with mineral wool insulation according to Table D.3

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

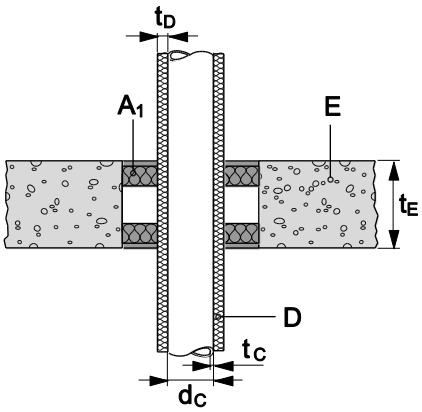
Continued insulation, interrupted (CI)



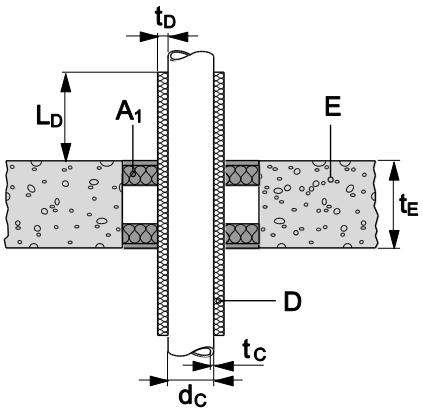
Local insulation, interrupted (LI)



Continued insulation, sustained (CS)



Local insulation, sustained (LS)



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
≥ 20	32	4.0 - 14.2	EI 120-C/U
≥ 30	34 - 168.3	2.6 - 14.2	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]	
20	≥ 500	32	4.0 - 14.2	EI 120-C/U
30	≥ 500	32 - 114.3	2.6 - 14.2	EI 120-C/U
30	≥ 800	32 - 168.3	2.6 - 14.2	EI 120-C/U
30 - 40	≥ 1000	168.3	4.0 - 14.2	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, NrCr and NiMo alloys)				

Copper pipes (C) with continued insulation (D)			
Insulation thickness (t_D) [mm]	Pipe diameter (d_C) [mm]	Pipe wall thickness (t_C) [mm]	Classification
≥ 20 (interrupted)	42	1.5 - 14.2	EI 120-C/U
≥ 40 (sustained)	88.9	1.8 - 14.2	EI 120-C/U

Copper pipes (C) with local insulation (D)				
Insulation		Pipe		Classification
thickness (t_D) [mm]	length (L_D) [mm]	diameter (d_C) [mm]	wall thickness (t_C) [mm]	
20 (interrupted)	≥ 500	42	1.5 - 14.2	EI 120-C/U
40 (sustained)	≥ 800	88.9	1.8 - 14.2	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.5.4.2 Metal pipes with Armaflex AF insulation and Hilti Firestop Bandage CFS-B

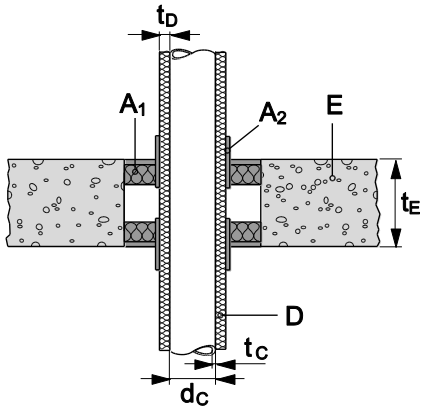
Construction details (for symbols and abbreviations see Annex A.3):

For specification of Armaflex AF see Table D.4.

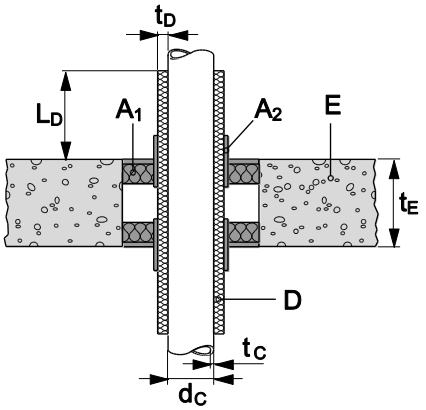
Two layers of Firestop Bandage CFS-B (A_2) wrapped around the pipe insulation, on each side of the seal. The bandage is positioned with half of its width (62.5 mm) within the seal (central marking line at the surface of the seal) and outside the seal fixed with wire.

No additional protection.

Continued insulation, sustained (CS)



Local insulation, sustained (LS)



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
21.5 - 39	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	60.3 - 114.3	3.6 - 14.2	EI 90-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]	
21.5 - 39	≥ 500	60.3	3.65 - 14.2	EI 90-C/U
21.5 - 39	≥ 500	60.3 - 114.3	3.6 - 14.2	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, NrCr and NiMo alloys)				

Stainless 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
21.5 - 39	60.3	2.0 - 14.2	EI 90-C/U
39	60.3	2.0 - 14.2	EI 120-C/U

Stainless 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]	
21.5 - 39	≥ 500	60,3	2.0 - 14.2	EI 90-C/U
39	≥ 500	60,3	2.0 - 14.2	EI 120-C/U

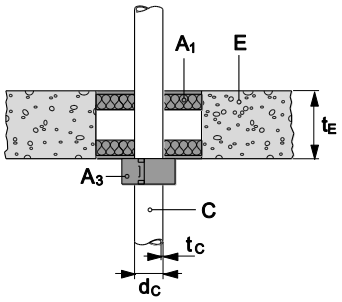
Copper pipes (C) with continued insulation (D) – sustained			
Insulation thickness (t_D) [mm]	Pipe diameter (d_C) [mm]	Pipe wall thickness (t_C) [mm]	Classification
19 - 35	28	1.0 - 14.2	EI 60-C/U
35	28	1.0 - 14.2	EI 90-C/U

Copper 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 - 35	≥ 500	28	1.0 - 14.2	EI 60-C/U
35	≥ 500	28	1.0 - 14.2	EI 90-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.5.5 Plastic pipes with Hilti Firestop Collar CFS-C and CFS-C P, respectively

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

Hilti Firestop Collars CFS-C are installed on the underside of the seal, fixed by threaded rods, washers and nuts as specified in Annex B.8.



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

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Collar size (A_1)	No. of hooks	Classification
32	1.9	CFS-C 50/1.5"	2	EI 120-U/C
110	2.2 – 8.2	CFS-C 110/4"	4	EI 120-U/C
160	1.8 – 11.9	CFS-C P 160/6"	6	EI 120-U/C

The results are also valid for PVC-U pipes according EN 1329-1[20] and EN 1453-1[20].

PE pipes (C) 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
160	14.6	CFS-C P 160/6"	6	EI 120-U/C

[20] In Germany the pipes have additionally to comply with DIN 19531-10

ANNEX D

SPECIFICATION OF MINERAL WOOL BOARDS AND AUXILIARY COMPONENTS

Table D.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
Rockwool	RP-XV
Rockwool	RPB-15

Table D.2: Specification for mineral wool products suitable for being used as additional protection for cables/cable supports according to 1.1.2.6 and 1.1.2.7

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^3
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.3: 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 13501-2, Al-faced

Sustained insulation	
Manufacturer	**Product designation**
Isover	Coquilla AT-LR
Isover	Protect BSR 90 alu
Paroc	Section AluCoat T
Rockwool	Conlit Pipe sections
Rockwool	Klimarock
Rockwool	RS 800 pipe sections

Table D.4: 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)