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European Technical Assessment

ETA 23/0267
of 24/09/2023

General Part

Technical Assessment Body issuing the European Technical Assessment:

RISE Research Institutes of Sweden AB

Trade name of the construction product

Hilti Firestop Board High Density CFS-CT HDB

Product family to which the construction product belongs

Fire stopping and fire sealing products-Penetration seals “

Manufacturer

Hilti AG, Feldkirchenstrasse 100, 9494 Schaan, Liechtenstein, www.Hilti.com

Manufacturing plant(s)

Hilti plant 17 and Hilti plant 31

This European Technical Assessment contains

163 pages including 5 Annexes 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

EAD 350454-00-1104, edition September 2017 - Fire stopping and fire sealing products – penetration seals

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1 Technical description of the product

Hilti Firestop Board High Density CFS-CT HDB is a penetration seal. The product consists of a high density mineral wool board with both sides Pre-coated with Hilti Firesop Coating CFS-CT For further information, see section 7 (Annex B) of the ETA.

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

2.1 Intended use

Hilti Firestop Board High Density CFS-CT HDB is intended to form a penetration seal, which is used to maintain the fire resistance of a separating element (wall or floor) when and where services pass through as further detailed in section 7 and 8 (Annex B and C)

2.2 Use category

The different use categories as described in European Assessment Document 350454-00-1104, edition September 2017, are the following:

Type X: intended for use in conditions exposed to weathering Type Y1: intended for use at temperatures below 0 °C with exposure to UV but no exposure to rain

Type Y2: intended for use at temperatures below 0 °C, but with no exposure to rain no UV

Type Z1: intended for use in internal conditions with humidity equal to or higher than 85% RH excluding temperatures below 0 °C, without exposure to rain or UV

Type Z2: intended for use in internal conditions with humidity lower than 85% RH excluding temperatures below 0 °C, without exposure to rain or UV

Hilti Firestop Board High Density CFS-CT HDB fulfils the requirements of use condition Y2. Products that meet requirements for type Y2 also meet the requirements for type Z1 and Z2.

2.3 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the product for the intended use of 25 years when installed in the works provided that the product is subject to appropriate installation, use and maintenance. These provisions are based upon the current state of the art and the available knowledge and experience.

The indication given as to the workinglife of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when issuing the EAD nor by the Technical Assessment Body (RISE Research Institutes of Sweden AB), but are regarded only as s means for expressing the expected economically reasonable working life of the product

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

3.1 Essential characteristics and their performance

Basic requirement	Essential characteristic	Performance
BWR 1 - Mechanical resistance and stability	None	Not relevant, no performance assessed (NPA)
BWR 2 - Safety in case of fire	Reaction to fire	See 3.2 of the ETA
	Resistance to fire	See 3.3 of the ETA
BWR 3 - Hygiene, health and the environment	Air permeability (material property)	No performance assessed (NPA)
	Water permeability (material property)	No performance assessed (NPA)
	Content and/or release of dangerous substances	See 3.4 of the ETA
BWR 4 - Safety in use	Mechanical resistance and stability	No performance assessed (NPA)
	Resistance to impact / movement	No performance assessed (NPA)
	Adhesion	No performance assessed (NPA)
	Durability	See 3.6 of the ETA
BWR 5 - Protection against noise	Airborne sound insulation	No performance assessed (NPA)
BWR 6 - Energy economy and heat retention	Thermal properties	No performance assessed (NPA)
	Water vapor permeability	No performance assessed (NPA)
BWR 7- Sustainable use of natural resources	None	Not relevant, no performance assessed (NPA)

3.2 Reaction to fire

Hilti Firestop Board High Density CFS-CT HDB has been classified according to EN 13501-1, class E.

3.3 Resistance to fire

The resistance to fire performance according to EN 13501-2 of penetration seals incorporating Hilti Firestop Board High Density CFS-CT HDB is given in section 8 (Annex C) of the ETA.

Information on ancillary products which were tested within the framework of this ETA for evaluating resistance to fire is given in section 7 (Annex B) of the ETA.

Other Penetrants than given in section 8 (Annex C) of the ETA must not penetrate the seal. Other support construction named in section 8 (Annex C) of the ETA should not be used for reaching an approved system using Hilti Firestop Board High Density CFS-CT HDB as seal. Provisions shall be taken such that floor penetration seals cannot be stepped on or are not subjected to significant forces.

3.4 Emission of dangerous substances or radiation

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.

The release of semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC) has been determined according to EAD 350454-00-1104 clause 2.2.5.1 and prEN 16516:2015. The loading factor used for emission testing was $0,05\text{m}^2/\text{m}^3$. An additional VOC-test according to DIN EN 16516: 2018-01 has been performed.

The total emission of SVOC of "Hilti Firestop Board High Density CFS-CT HDB" after 3 days is less than $0,005\text{ mg}/\text{m}^3$.

The total emission of SVOC of "Hilti Firestop Board High Density CFS-CT HDB" after 28 days is $0,005\text{ mg}/\text{m}^3$.

The total emission of VOC of "Hilti Firestop Board High Density CFS-CT HDB" after 3 days is $820\text{ mg}/\text{m}^3$.

The total emission of VOC of "Hilti Firestop Board High Density CFS-CT HDB" after 28 days is $290\text{ mg}/\text{m}^3$.

3.5 Durability

Hilti Firestop Board High Density CFS-CT HDB fulfils the requirements of use category Y_2 in accordance with EAD 350454-00-1104, September 2017, Section 2.2.9.

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 $+70^\circ\text{C}$, 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 .
- Type Z_2 : Products intended for uses at internal conditions with humidity classes other than Z_1 , excluding temperatures below 0°C .

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 - Commission decision of date 22 June 1999, published in the Official Journal of the European Union (OJEU) L178 of 14/07/1999, amended by decision 2001/596/EC - Commission decision of date 8 January 2001, published in the Official Journal of the European Union (OJEU) L209 of 02/08/2001, of the European Commission the systems of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) given in the following table apply:

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire Stopping and Fire Sealing Products	For fire compartmentation and/or fire protection or fire performance	any	1
	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 at RISE.

Issued in Borås on 24.09.2023
By RISE Research Institutes of Sweden AB



Martin Tillander
Director, Product certification

6 ANNEX A - REFERENCE DOCUMENTS

6.1 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
EN 1026	Windows and doors – Air permeability – Test method
EN 1366-3:2009	Fire resistance tests for service installations - Part 3: Penetration seals
EN 1519	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polyethylene (PE)
EN 13238	Reaction to fire tests for building products: Conditioning procedures and general rules for selection of substrates
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 13823:2002	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item
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 11925-2 Reaction to fire tests – Ignitability of building products subjected to direct impingement of flame – Part 2: Single-flame source test
- 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
- HD 22.4 Cables of rated voltages up to and including 450/750 V and having crosslinked insulation – Part 4: Cords and flexible cables
- HD 640.5 0.6/1kV Power cables with special fire performance for use in power stations – Part 5: single core and multicore halogen-free cables

6.2 Other reference documents

EAD 350454-00-1104: Sept.2017 Fire Stopping and Fire Sealing Products – Penetration Seals

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 Foam CFS-F FX

7 ANNEX B – The Product CFS-CT HDB

7.1 Description of the product and Ancillary Product(s)

7.1.1 Hilti Firestop Board High Density CFS-CT HDB

CFS-CT HDB is a double side coated, high-density mineral wool board.

A detailed specification of the product is contained in document “Identification / Product Specification relating to the European Technical Assessment ETA 23/0267 - Hilti Firestop Board High Density CFS-CT HDB” 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 23/0267 - Hilti Firestop Board High Density CFS-CT HDB” which is a non-public part of this ETA.

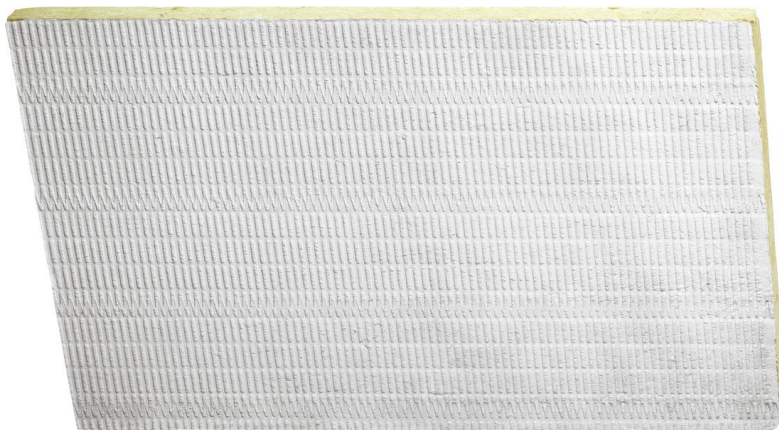


Figure 1: Hilti CFS-CT HDB

7.1.2 Hilti Firestop Acrylic Sealant CFS-S ACR

- One component, water based acrylic sealant
- Available in cartridges, foil bags and pails
- CFS-S ACR is fully described in ETA-10/0389



Figure 2: CFS-S ACR cartridge

7.1.3 Hilti Intumescent Sealant CFS-IS

- One-component, water based acrylic sealant
- Available in cartridges
- CFS-IS is fully described in ETA-10/0406



Figure 3: CFS-IS cartridge

7.1.4 Hilti Intumescent Sealant CFS-FIL

- One-component water based intumescent acrylic sealant
- Available in cartridges, foil bags and pails
- CFS-FIL is fully described in ETA-21/0256



Figure 4: CFS-FIL cartridge

7.1.5 Hilti Firestop Bandage CFS-B

- One component intumescent bandage
- Delivered as a coil
- CFS-B is fully described in ETA-20/0993



Figure 5: CFS-B

7.1.6 Hilti Firestop Cable Disc CFS-D25

- One-component, ready to use cable penetration seal
- Delivered as preformed small discs
- CFS-D25 is fully described in ETA-16/0050



Figure 6: CFS-D25 – product as delivered and installed around cables

7.1.7 Hilti Firestop Collar CFS-C P

- Pipe-sealing device
- Available in several sizes
- CFS-C P is fully described in ETA – 10/0404

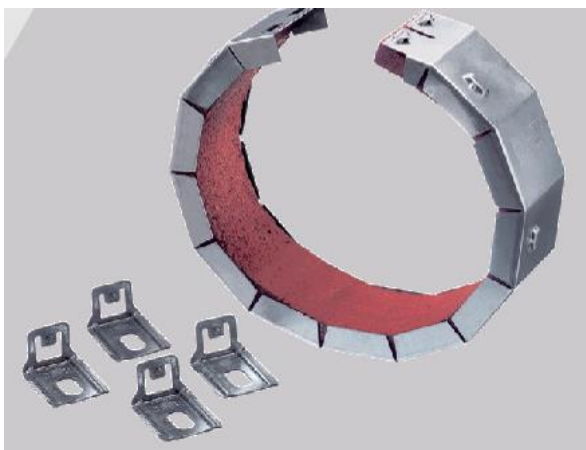


Figure 7: CFS-C P collar with hooks

7.1.8 Hilti Firestop Collar Endless CFS-C EL

- Pipe-sealing device
- Available as an endless coil to be cut to the recommended length
- CFS-C EL is fully described in ETA – 14/0085



Figure 8: CFS-C EL as delivered with closure plates and hooks

7.1.9 Hilti Firestop Foam Flexible CFS-F FX

- Two component polyurethane soft foam
- Applying the foam into the opening request using an appropriate dispenser and mixer
- CFS-F FX is fully described in ETA – 10/0109



Figure 9: CFS-F FX unit with mounted plastix mixer

7.1.10 Hilti Firestop coating CFS-CT

- One-component, water based, ablative paint
- White color, delivered in pails
- To be applied by brush, airless spraying, or industrial spraying equipment
- CFS-CT is fully described in ETA-11/0429



Figure 10: CFS-CT

7.1.11 Technical product literature

- Technical Product Information CFS-CT HDB – see www.hilti.group
- Instruction for Use (see sec. 9)
- Material Safety Data Sheet (MSDS)

8 ANNEX C - Resistance to fire classification of Hilti Firestop Board High Density CFS-CT HDB

8.1 Intended Use of Penetrants and Reference to Relevant Sections

Intended use of penetrations and reference to relevant section (list not exhaustive, other uses of pipes may be possible)			
Application	Penetration material	Flexible & rigid wall $t_E \geq 100$ mm	Rigid floor $t_E \geq 150$ mm
Cables	Sheathed Cables, glass fibre Tied cable bundles Cable support systems	8.3.2.1, 8.3.2.2, 8.3.2.3	8.4.2.1, 8.4.2.2
Electrical conduits	PVC, PO, PE	8.3.2.17	8.4.2.13
Cable trunking	Sheathed Cables, glass fibre	8.3.2.19	Not available
Heating pipes Potable water pipes	Copper Steel, stainless	8.3.2.10, 8.3.2.14, 8.3.2.16	8.4.2.9, 8.4.2.11, 8.4.2.12
	Al-composite	8.3.2.9	8.4.2.8
Chilled water pipes	PE, PVC, PP, ABS, SAN-PVC	8.3.2.4, 8.3.2.5, 8.3.2.6, 8.3.2.7, 8.3.2.8	8.4.2.3, 8.4.2.4, 8.4.2.5, 8.4.2.6, 8.4.2.7, 8.4.2.10
Air condition	Clima Split pipe bundles (HVAC supply bundle)	8.3.2.18	8.4.2.14
Plastic exhaust channels	PVC, rectangular form	8.3.2.20	Not relevant

Table 1: Overview about penetrants and relevant section within this ETA

8.2 General Information Hilti Firestop Board High Density CFS-CT HDB

The following information is identical for wall and floor application.

8.2.1 Penetration seal, board position and penetrant orientation

- Single penetration seal if not other indicated
- Board thickness t_{A1} in most cases less than wall/floor thickness t_E .
- For recess design/board position in wall and floor see section 8.3.1.3 and 8.4.1.1
- Penetrants penetrate the wall/floor seal in perpendicular situation only

8.2.2 Suitable building structures, where CFS-CT HDB may be used

- CFS-CT HDB to be used to seal penetration in flexible/ rigid walls and in rigid floors

For details refer to section 8.3.1 and 8.4.1.

8.2.3 Seal Thickness increase / Aperture framing and beading

- No Seal- thickness increasing measurements necessary in wall/floor application
- Aperture framing (circumferential) necessary in flexible wall application only
- Aperture framing to be done by one layer gypsum board acc. EN 520
- Minimum layer thickness: 12,5mm
- Aperture framing to be fixed by screws to studs, sealed in the edges/gaps with CFS-S ACR

8.2.4 Seal Size

For the approved seal size and E/I-rating in wall and floor (empty and penetrated seal) refer to section 8.3.1.4 and 8.4.1.2.

8.2.5 Gap seal

- Board to be positioned by friction fit into the aperture
- Remaining gap to be sealed with CFS-S ACR

8.2.6 First support for pipe penetrants

- ≥ 250 mm

8.2.7 Foamed elastomeric insulation products for pipe insulation (FEF)

The following types of foamed elastomeric insulation products may be used as pipe insulation:

Manufacturer	Product designation
Armacell International GmbH	Armaflex AF,SH, Ultima, XG, NH, HT
nmc Insultube	H-Plus
Kaimann GmbH	Kaiflex KK plus, Kaiflex KK , EPDM Plus, HF plus
L'Isolante	K-Flex ECO, K-Flex ST Frigo,
Aeroflex	HF
Conel	Flex HT
Eurobatex Union Foam	HF
ISIDEM	Coolflex AF
3i	Isopipe HT
ODE Insulation	R-Flex RPM
Würth	Flexen Kälteschlauch

Table 2: Overview about approved FEF-products and manufacturer

If a protect insulation (DP) based on flexible elastomeric foams (FEF) is requested in combination with an insulation (D), it should be made from the same elastomeric material as the thermal pipe insulation itself.

8.2.8 Metal pipes

- Ratings, given for pipes made of copper are valid too for pipes made of steel, stainless steel, iron, cast iron
- Ratings, given for pipes made of steel are valid too for pipes made of stainless steel, iron, cast iron

8.2.9 Non-regulated PP-pipes

The following pipe brands are covered as non-regulated PP-pipes:

Manufacrurer / supplier	Pipe brand
Aliaxis Poland	dBlue
Coes	Blue Power
Coes	PhoNoFire
Conel	Drain Hausabflußrohr
Geberit	Silent PP
Geberit	Silent Pro
KeKelit	PhonEx AS
Marley	Silent
Ostendorf	Skolan dB
Ostendorf	Skolan Safe
Pipelife	Master 3
Pipelife	Master 3 Plus
Poloplast	PoloKal NG
Poloplast	PoloKal XS
Poloplast	PoloKal 3S
Rehau	Raupiano Plus
Silenta	Premium
Uponor	S&W Decibel
Valsir	TriPlus
Valsir	Silere
Wavin	Sitech
Wavin	Sitech +
Wavin	AS

Table 3: List of approved non-regulated PP-pipes (brands and manufacturer)

8.2.10 General rules for penetrating items

The following prerequisites should be taken:

- Seals may be penetrated by the services described in section 8 (Annex C) only
- The installations are fixed to the adjacent building elements (not to the seal) in accordance with the relevant regulations in such a way that, in case of fire, no additional mechanical load is imposed on the seal
- For tied cable bundles the space between the cables needs not be sealed.
- The function of the pipe seal in case of pneumatic dispatch systems, pressurized 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 installation of the penetration seal does not affect the stability of the adjacent building elements – even in case of fire
- The support of the installations is maintained for the classification period required

8.2.11 CPVC or C-PVC-pipes, not to be sealed with CFS-CT HDB or other Hilti Firestop Systems

If Hilti CFS-CT HDB is intended to be used in combination with CPVC or C-PVC pipes please check before installation - beside the Resistance to Fire annex in this ETA - also the system compatibility via the Lubrizol FBC™ System Compatible Program.

Consider for testing not only the Hilti components in direct contact to those pipes, but all involved components of the proposed Hilti fire sealing system.

Only listed and Lubrizol FBC™-labelled construction products must be used together.

See: (<https://www.lubrizol.com/CPVC/FBC-System-Compatible-Program/System-Compatible-Product-Finder>)

8.3 Flexible and rigid walls with seals made of Hilti CFS-CT HDB board

8.3.1 Specific characteristics for flexible and rigid walls with $t_E \geq 100$ mm

8.3.1.1 Flexible walls

- Minimum thickness of ($t_E \geq 100$ mm)
- Comprise timber or steel studs
- Lined on both faces with minimum 2 layers of minimum 12,5 mm thick boards
- Wall construction has to be set up according to requirements given in EN 1366-3:2009
- Construction itself has been classified according to EN 13501-2.
- Aperture framing is requested, refer to section 8.2.3

Additionally for flexible wall with timber studs:

- Minimum distance of 100 mm between seal to any stud
- There must be a cavity between studs
- Minimum 100 mm insulation of Class A1 or A2 (in accordance with EN 13501-1) must remain in the cavity between stud and seal.

Additionally for flexible wall with metal studs:

- Space between linings has not to be completely filled with insulation material

A higher number of board layers is accepted if the overall board layer thickness is equal or bigger than tested. A higher overall board layer thickness is accepted, if the number of board layers is equal or bigger than tested.

- Boards are according to EN 520 type F or according to the specification of the tested and approved flexible wall construction system according to EN 13501-2

8.3.1.2 Rigid walls

- Wall must comprise concrete, aerated concrete, brickwork or masonry
- Minimum density of 350 kg/m³
- Wall thickness ($t_E \geq 100$ mm)

8.3.1.3 Position of CFS-CT HDB in wall openings

Construction details:

- Hilti Firestop Board CFS-CT HDB (A_1) of thickness t_{A1} tightly to fit into the opening of the wall (E) - friction fit
- CFS-CT HDB might be placed in any position within the wall
- CFS-CT HDB to be installed vertical into the opening
- Contact phase between board (A_1) and support construction (E) should be covered by a thin film of CFS-S ACR (A_2), flush with both sides of (A_1), width $w_{A1} = (1-5)$ mm

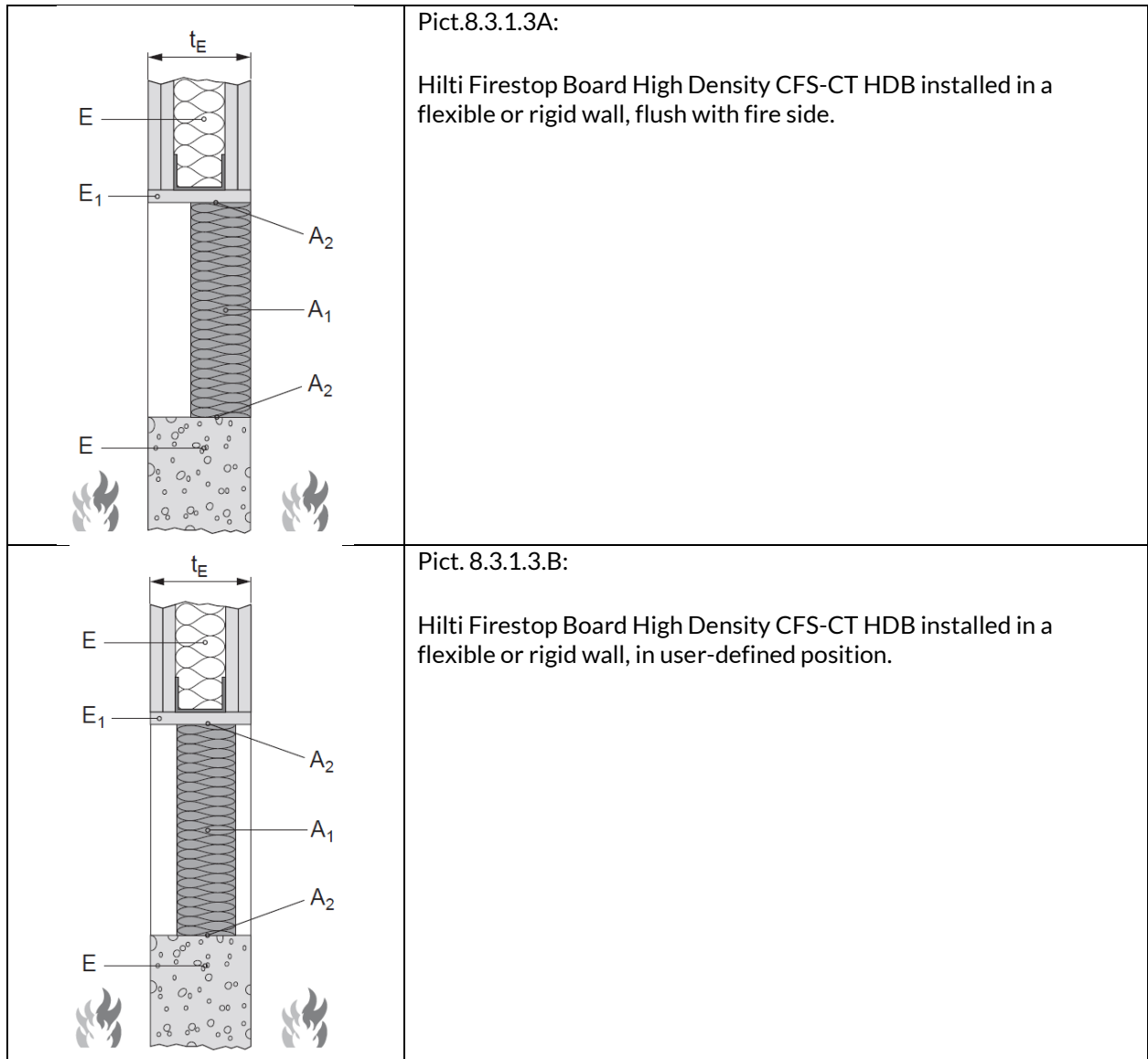


Figure 11: Possible Position of CFS-CT HDB in flexible or rigid wall

For symbols and abbreviations refer to section 10 within this document.

8.3.1.4 Maximum seal size and blank seal size in wall

Classification maximum seal size/blank seal size:

	Max.Seal size: w x h (mm x mm)	Classification
Wall penetrations	$\leq 1000 \times 1200$	EI 60

Figure 12: Classification for maximum seal in maximum seal size in wall

8.3.1.5 Minimum distances for penetrants and seals in walls

- Minimum distance between two CFS-CT HDB-seals is ≥ 100 mm
- Minimum distance between CFS-CT HDB-seal and other fire rated seals (fire doors, dampers, etc.) is ≥ 200 mm
- For distances of several penetrants within one CFS-CT HDB seal refer to Figure 13
- Some specific distances might vary from Figure 13, will be even smaller. For detailed information check the appropriate chapter in section 8.
- The distances are valid for single, multiple and mixed penetrations in flexible/rigid walls. For distances in rigid floors refer to section 8.4.1.3

Minimum distance (mm) in between:	Cables	Cable support	Tied cable bundle	Conduit < Ø 16 mm	Conduit ≥ Ø 16 mm	Tied conduit bundle	Metal pipe with combustible insulation	Metal pipe with non-combustible insulation	Plastic pipe	Al-comp. pipe, non-insulated	Al-comp. Pipe with combustible insulation	Al-comp. Pipe with non-combustible insulation	plastic exhaust channels	Cable trunking, metal	Clima Split bundle (HVAC supply)	Side seal edge	Upper seal edge	Bottom seal edge
Cables	0	0	0	0	0	50	50	50	50	50	50	50	100	100	50	0	0	0
Cable support		0	0	50	50	50	50	50	50	50	50	50	100	100	50	0	0	0
Tied cable bundle			0	0	0	50	50	50	50	50	50	50	100	100	50	0	0	0
Conduit < Ø 16 mm				0	0	50	50	50	50	50	50	50	100	100	50	50	50	50
Conduit ≥ Ø 16 mm					0	50	50	50	50	50	50	50	100	100	50	50	50	50
Tied conduit bundle						50	50	50	50	50	50	50	100	100	50	50	50	50
Metal pipe with combustible insulation							50	50	50	50	50	50	100	100	50	50	50	50
Metal pipe with non-combustible insulation								50	50	50	50	50	100	100	50	50	50	50
Plastic pipe									50	50	50	50	100	100	50	50	50	50
Al-comp. pipe, non-insulated										50	50	50	100	100	50	50	50	50
Al-comp. pipe with combustible insulation											50	50	100	100	50	50	50	50
Al-comp. Pipe with non-combustible insulation												50	100	100	50	50	50	50
plastic exhaust channels													100	100	100	100	100	100
Cable trunking, metal														100	100	100	100	100
Clima Split bundle (HVAC-bundle)															50	50	50	50

Figure 13 :Minimum distances of several penetrants within one CFS-CT HDB seal in wall

8.3.2 Resistance to Fire Classification for penetrants in flexible and rigid wall

8.3.2.1 Cable seal – single cables without insulation, sealed with CFS-D25

Construction details:

- Single cable penetration

Cables:

- Sheathed cables only
- No insulation
- No cable supports penetrating the seal

Cable closure

- Max. opening size in coated board: 25 mm x 25 mm or circular openings $d \leq 28$ mm

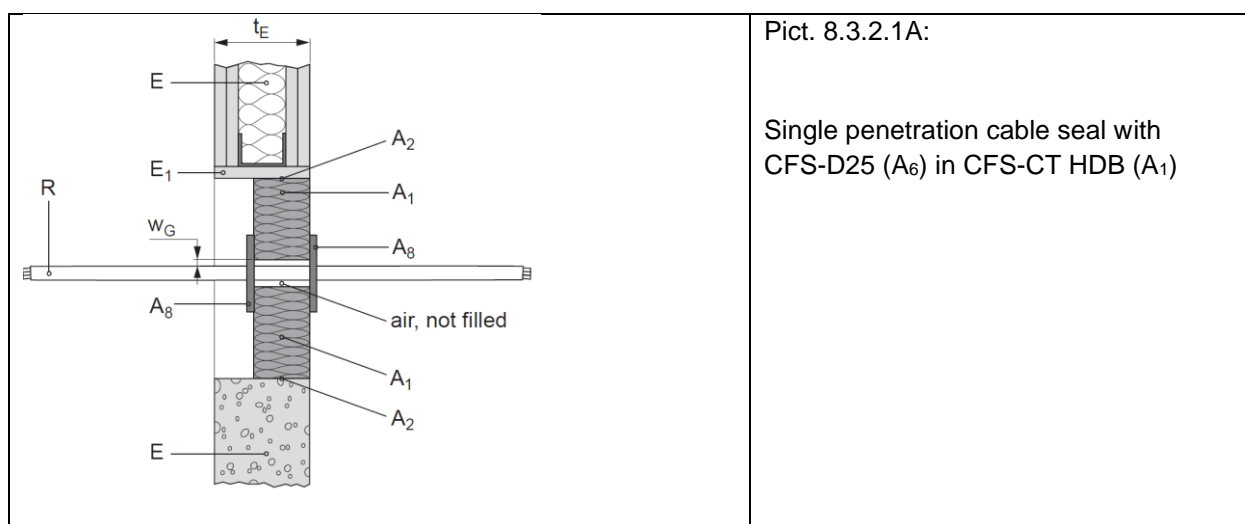


Figure 14: Single Cable seal with CFS-D25 in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

Type of penetrant	Specifics	Classification
Single cables, $d_R \leq 14$ mm,	cable conductor section $\leq 7,5$ mm ² (eg: 5x 1,5 mm ²)	EI 60
Single cables, $d_R \leq 19$ mm	cable conductor section ≤ 95 mm ²	EI 30, E 60

Figure 15: Classification for smallest cables, sealed with CFS-D 25 in CFS-CT HDB

8.3.2.2 Cable seal – cables with mineral wool insulation

Construction details:

Cables:

- Multiple cable penetration
- Cable diameter $d_R \leq 80$ mm, all types commonly used in building practice in Europe
- Non-sheathed cables and waveguides not covered
- For coaxial cables only: Cable diameter $d_R \leq 28$ mm
- Tied cable bundle $d_{RB} \leq 100$ mm for normal cables $d_R \leq 21$ mm

Insulation:

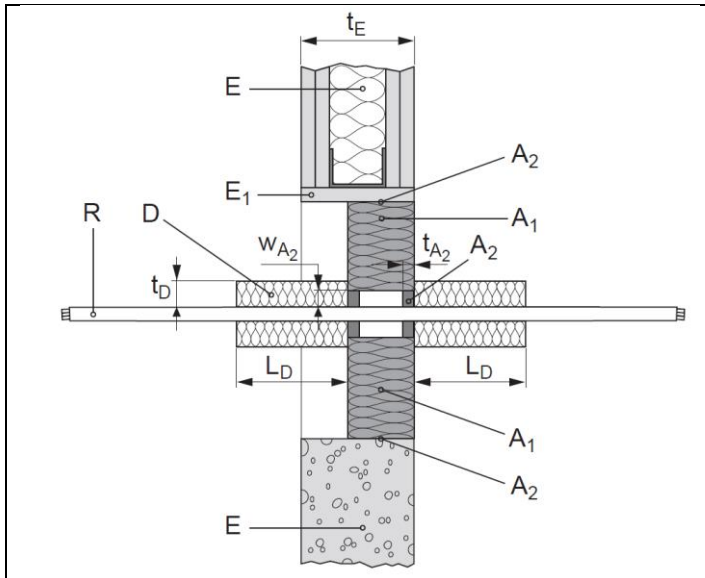
- Insulation on cables and supports requested
- Insulation on cables to be done with mineral wool, type Rockwool Klimarock
- Insulation type LI, length $L_D \geq 200$ mm, thickness $t_D \geq 30$ mm

Cable support:

- Can penetrate the seal (tray, basket and ladder)
- Material steel, perforated and non-perforated
- All dimensions of metal cable carries covered

Gap closure:

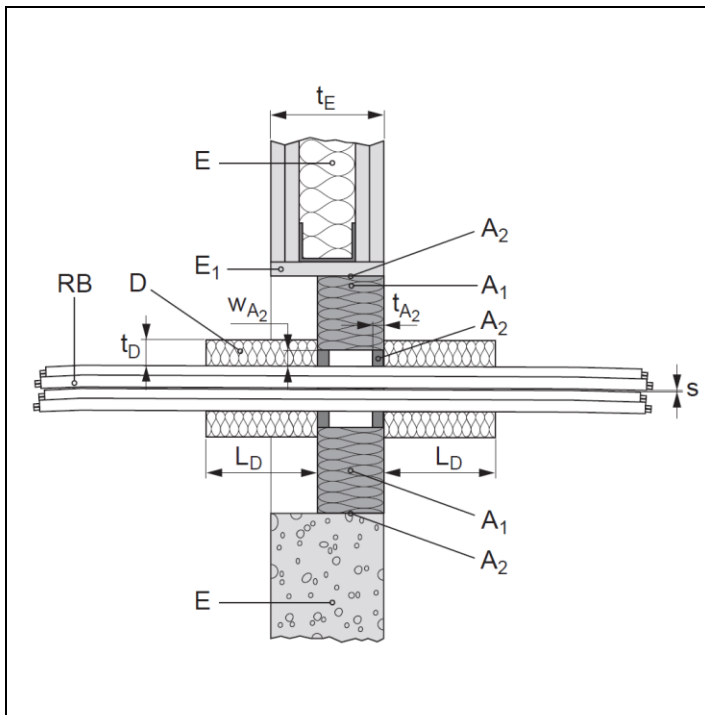
- Penetrants to be sealed with CFS-S ACR (A₂), $w_{A2} = (1-5)$ mm, $t_{A2} = 10$ mm



Pict.8.3.2.2A:

Single penetration cable seal with local insulation (D), sealed with CFS-S ACR (A₂) in CFS-CT HDB (A₁)

Figure 16: Single cable seal with CFS-S ACR in CFS-CT HDB



Pict. 8.3.2.2B:

Multiple penetration cable seal /tied cable bundle with local insulation (D), sealed with CFS-S ACR (A₂) in CFS-CT HDB (A₁).

Distance $s \geq 0$ mm between cables

Figure 17: Multiple cable /cable bundle seal with CFS-S ACR in CFS-CT HDB

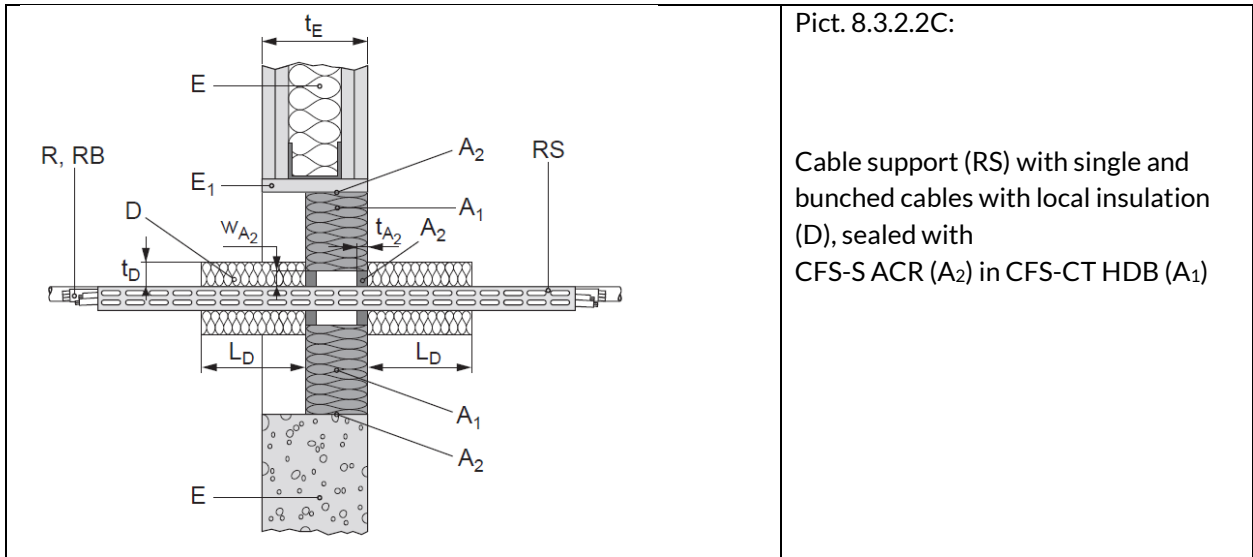


Figure 18: Cables and cable bundles on cable support, sealed with with CFS-S ACR in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

Type of penetrant	Classification
Single cables	EI 60, E 90
Single coaxial cables	EI 60, E 90
Tied cable bundle	EI 60, E 90
Cable support	EI 60, E 90

Figure 19: Classification for cables/carriers/bundle, sealed in CFS-CT HDB by CFS-S ACR

8.3.2.3 Cable seal– single cables with CFS-CT insulation

Construction details:

Cables:

- Multiple cable penetration Cable diameter $d_R \leq 80$ mm, all types commonly used in building practice in Europe
- Waveguides not covered
- For coaxial cables only: Cable diameter $d_R \leq 28$ mm
- Tied cable bundle $d_{RB} \leq 100$ mm for single cables $d_R \leq 21$ mm
- Non-sheathed cables diameter $d_R \leq 24$ mm, all types commonly used in building practice in Europe

Insulation:

- Insulation on cables and supports requested
- Insulation to be done with Hilti Firestop coating CFS-CT
- Insulation type LI, length $L_D \geq 200$ mm, thickness $t_D \geq 1,0$ mm

Cable support:

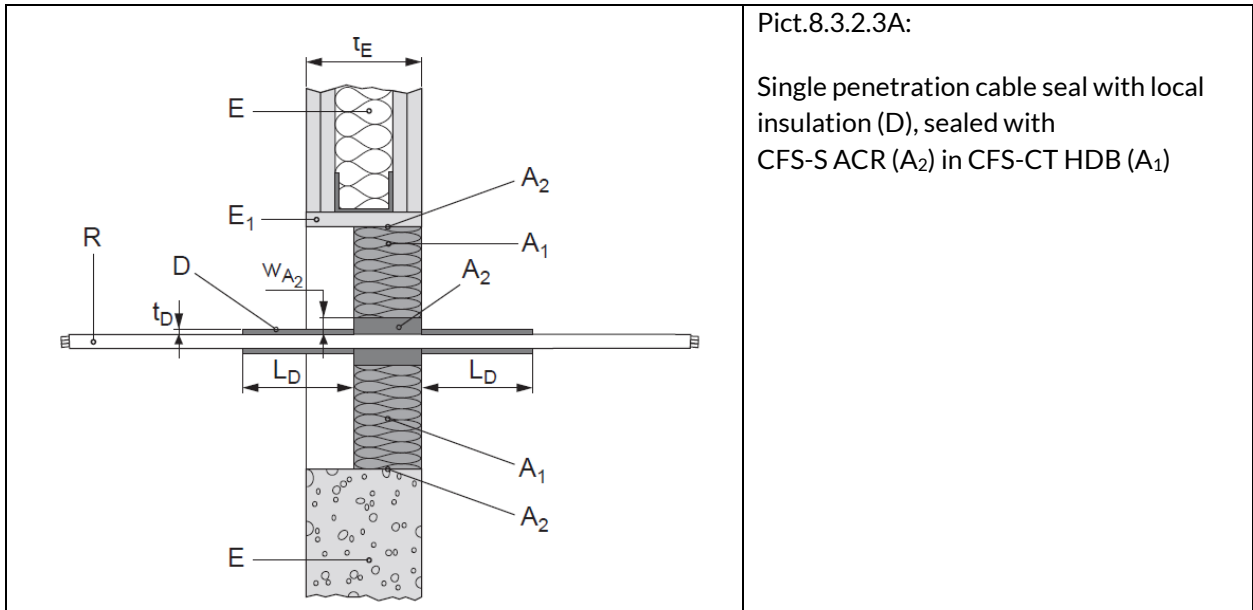
- Can penetrate the seal (tray, basket and ladder)
- Material: steel, perforated and non-perforated
- All dimensions of metal cable carriers covered

Gap closure:

- Penetrants to be sealed with CFS-S ACR (A_2), $w_{A2} = (1-5)$ mm, over entire board thickness

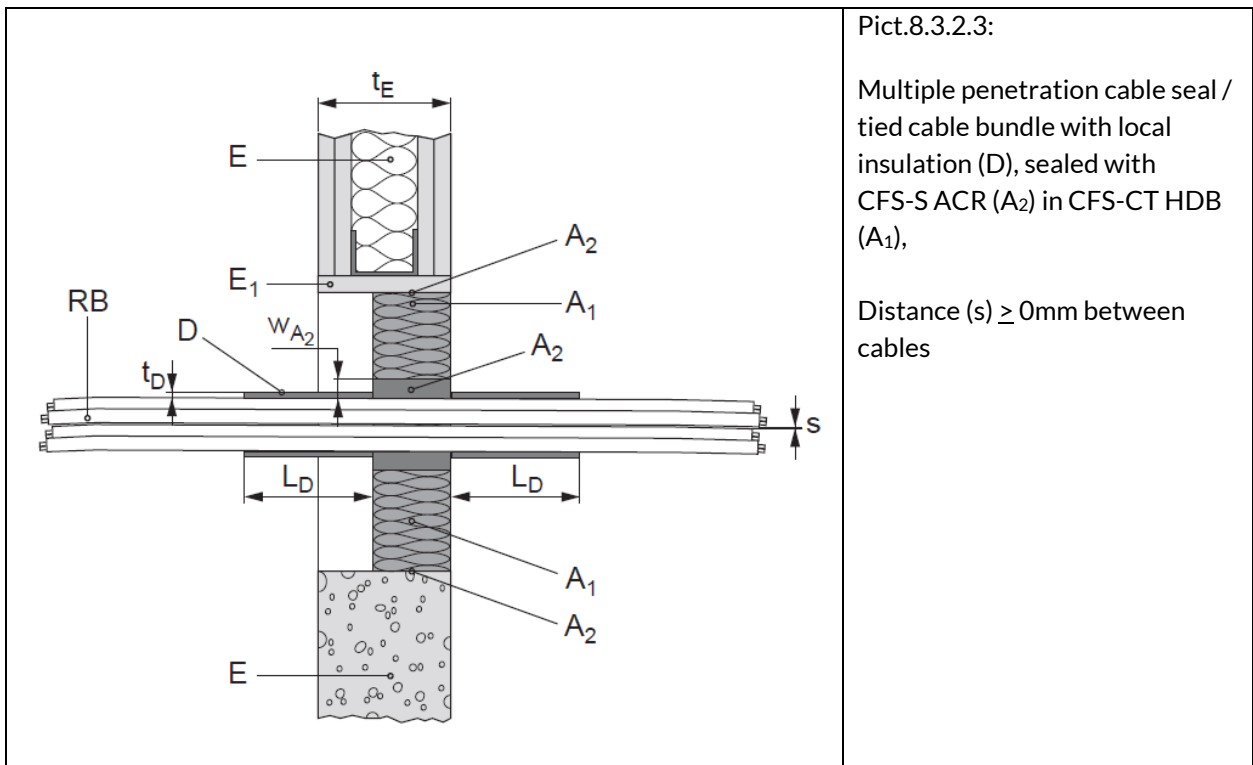
Type of penetrant	Classification
Single cables	EI 30, E 60
Single coaxial cables	EI 30, E 60
Tied cable bundle	EI 30, E 60
Cable support	EI 30, E 60
Non-sheathed cables	EI 20, E 60

Figure 20: Classification for coated cables/bundles/carriers in CFS-CT HDB board, sealed with CFS-S ACR



Pict.8.3.2.3A:
Single penetration cable seal with local insulation (D), sealed with CFS-S ACR (A₂) in CFS-CT HDB (A₁)

Figure 21: Single cable seal with CFS-S ACR in CFS-CT HDB



Pict.8.3.2.3:
Multiple penetration cable seal / tied cable bundle with local insulation (D), sealed with CFS-S ACR (A₂) in CFS-CT HDB (A₁),
Distance (s) ≥ 0mm between cables

Figure 22: Multiple cable / cable bundle seal with CFS-S ACR in CFS-CT HDB

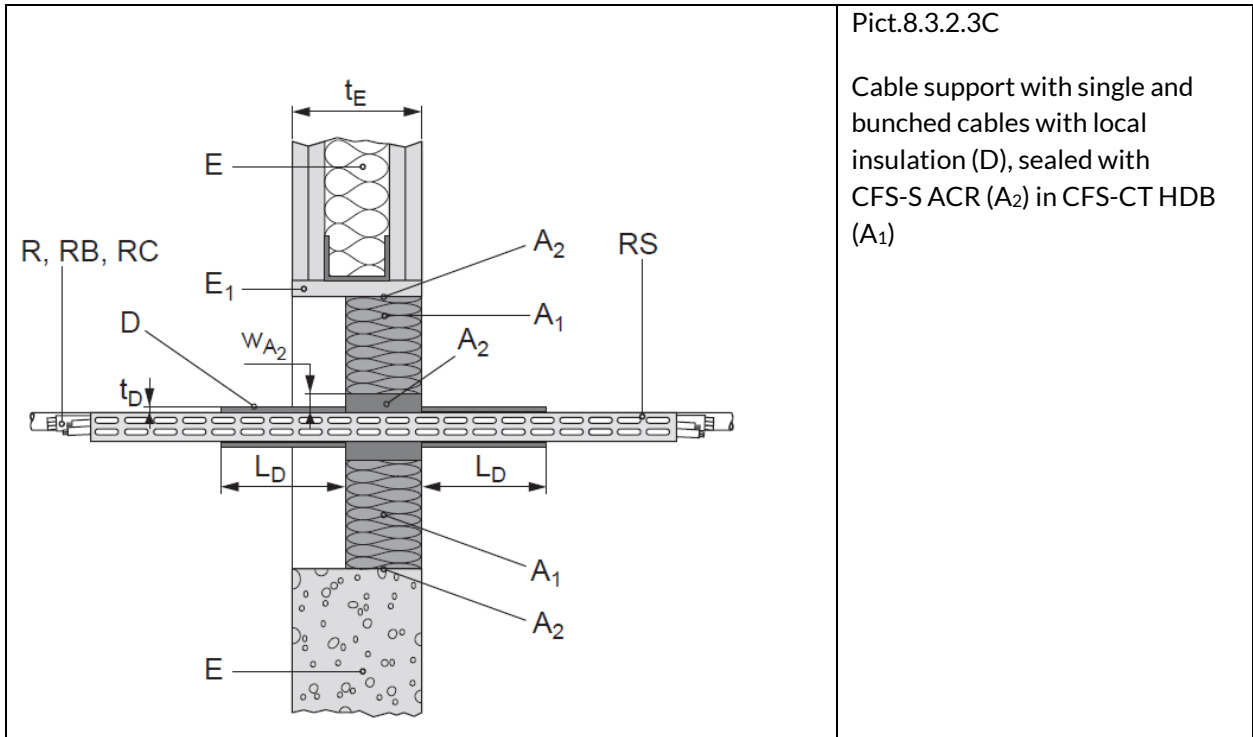


Figure 23: Cables and cable bundles on cable support, sealed with with CFS-S ACR in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.4 Plastic pipe seal with CFS-C EL in CFS-CT HDB

Construction details:

Pipes:

- Single pipe penetration

Insulation:

- No thermal insulation
- No acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with CFS-C EL collar
- Construction Group 1 (just one collar on each side) - refer to ETA-14/0085
- Number and positioning of hooks F: refer to ETA-14/0085
- Collar fixing with threaded rod M6 or M8 with nut and washer, penetrating the board A₁

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A₂), $w_{A_2} = (1-5)$ mm, $t_{A_2} = 10$ mm

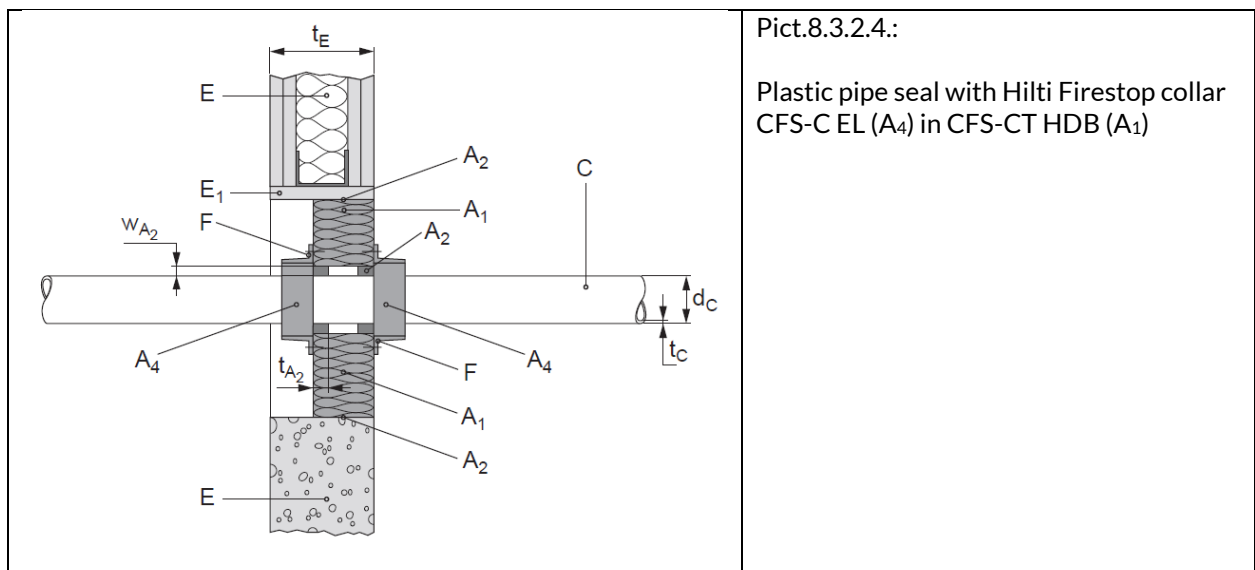


Figure 24: Plastic pipe seal with CFS-C EL in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.4.1 Plastic pipe seal for pipes made from PE, PE-X, ABS, SAN+PVC, sealed with CFS-C EL

Classification shown in Figure 25 is valid for pipes made from:

- PE according to EN 1519-1, EN 12666-1, EN 12201-2 or EN 15494
- PE-X according to EN ISO 15875
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to EN 1565-1
- No limitation for brands/producer.

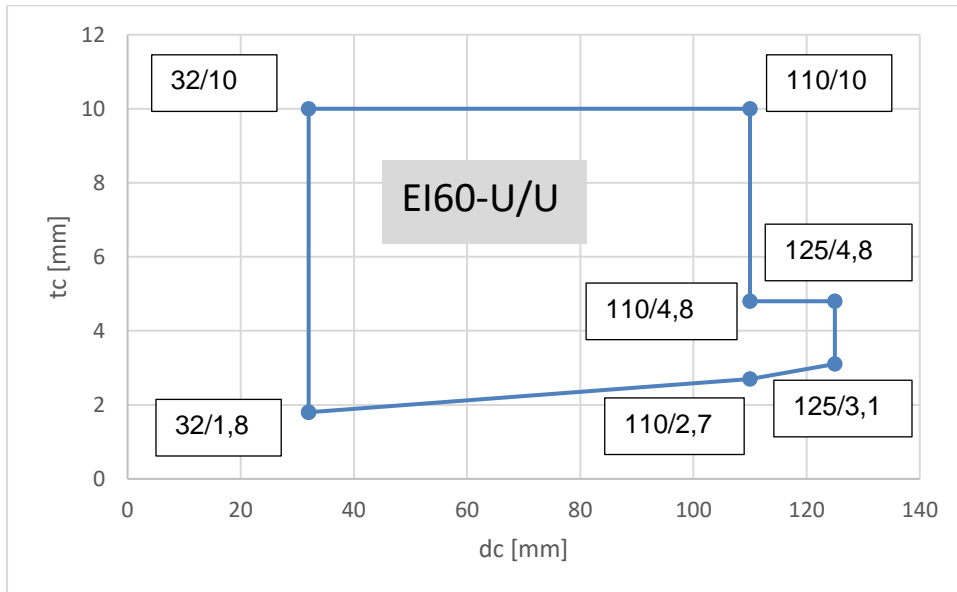


Figure 25: Classified pipe range for pipes made of PE, PE-X, ABS, SAN+PVC

8.3.2.4.2 Plastic pipe seal for Geberit Silent dB20 pipes, sealed with CFS-C EL

Classification shown in Figure 26 is valid for Geberit Silent dB20 pipes only.

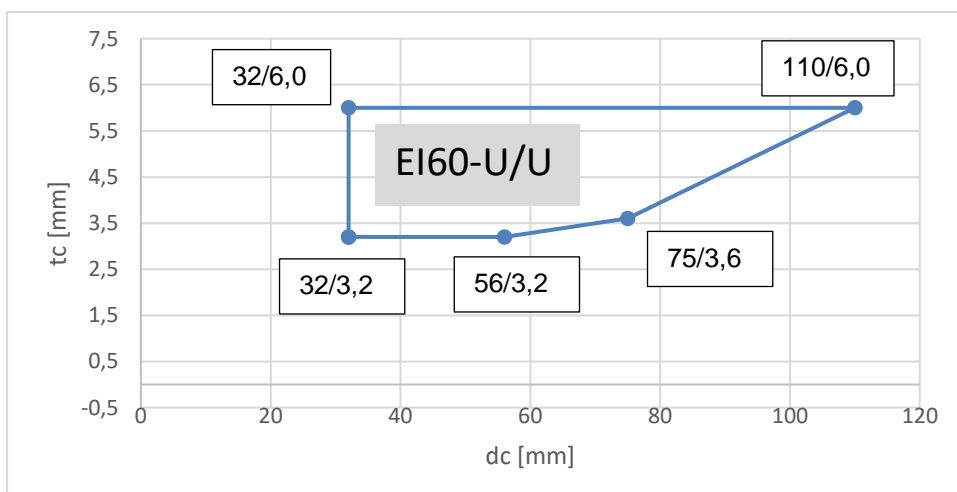


Figure 26: Classified pipe range for Geberit Silent dB20

8.3.2.4.3 Plastic pipe seal for single layer PVC-pipes, sealed with CFS-C EL

Classification shown in Figure 27, Figure 28, Figure 29 is valid for:

- PVC-U pipes : acc.to EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2, EN 1566-1, EN ISO 15493 and EN ISO 15877-2.

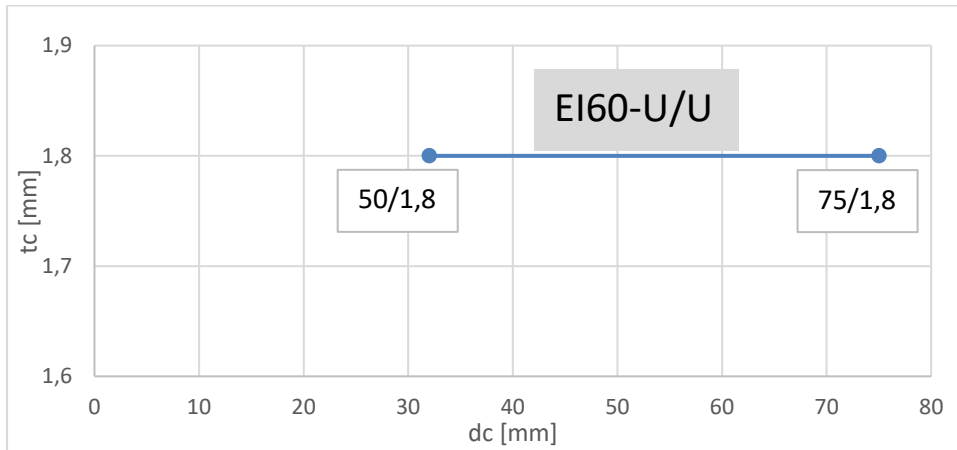


Figure 27: Classified pipe range for PVC-pipes acc. EN 1452-2- EI 60-U/U

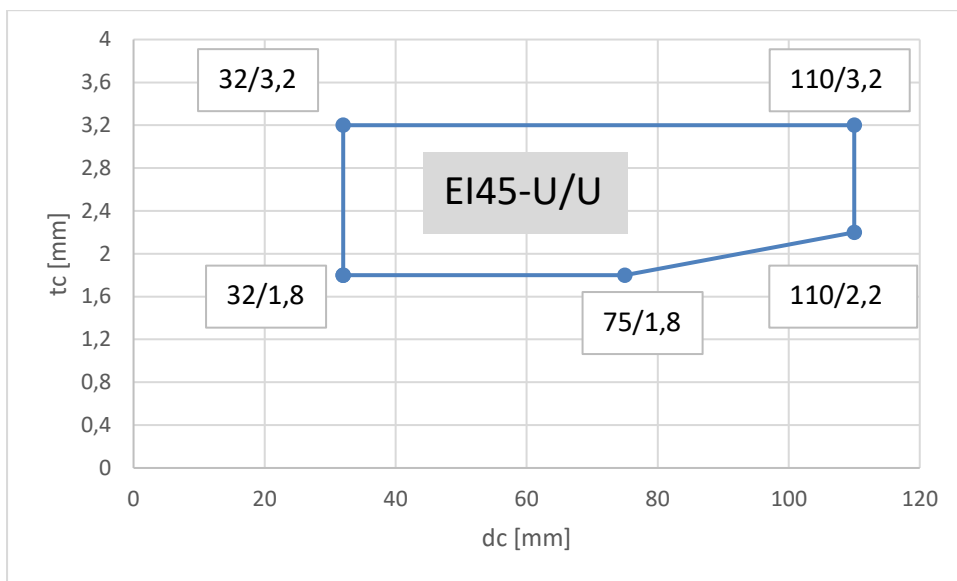


Figure 28: Classified pipe range for PVC-pipes acc. EN 1452-2- EI 45-U/U

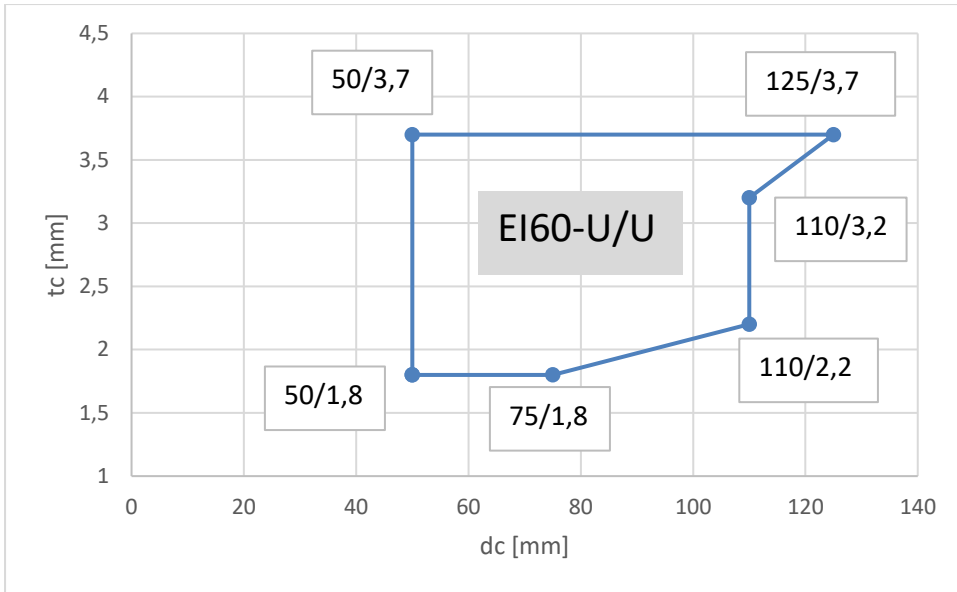


Figure 29: Classified pipe range for PVC-pipes acc. EN 1452-2- EI 60-U/U

Please consider the disclaimer mentioned in 8.2.11 before use of CPVC and C-PVC pipes

8.3.2.4.4 Plastic pipe seal for non-regulated PP-pipes, sealed with CFS-C EL

Classification shown in Figure 30 is valid for non-regulated pipes made of Polypropylen. For pipe brands/manufacturer refer to 8.2.9

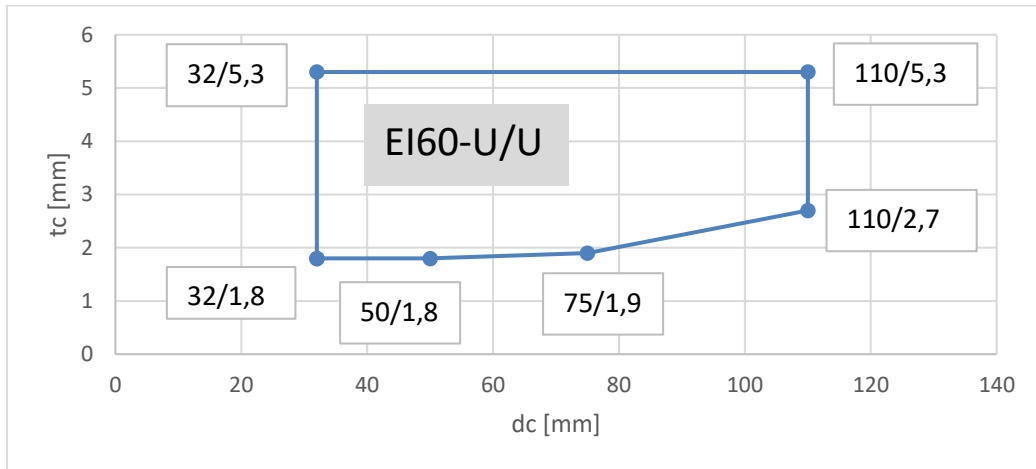


Figure 30: Classified pipe range for non-regulated PP-pipes,

8.3.2.4.5 Plastic pipe seal for PP-pipes, sealed with CFS-C EL

Classification shown in Figure 31 is valid for regulated pipes made of Polypropylen according EN 1451-1. No limitation for brands/producer.

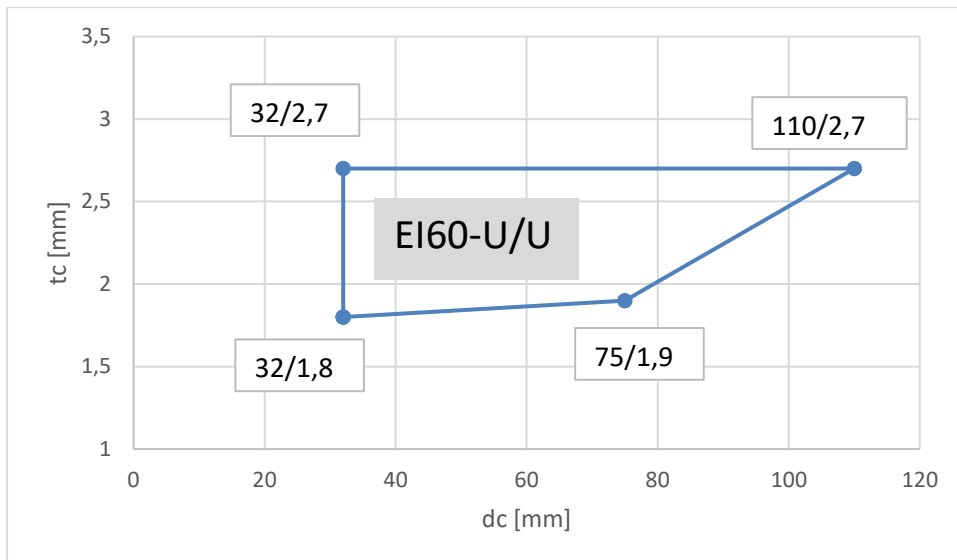


Figure 31: Classified pipe range for PP-pipes acc. EN 1451-1

8.3.2.5 Plastic pipe seal with CFS-C P in CFS-CT HDB in wall

Construction details:

Pipe:

- Single pipe penetration

Insulation:

- No thermal insulation
- No acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with CFS-C P collar
- For Construction group: refer to ETA-10/0404
- Number and positioning of hooks F: refer to ETA-10/0404
- Collar fixing with threaded rod M8 with nut and washer, penetrating the board A₁

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A₂), $w_{A_2} = (1-5)$ mm, $t_{A_2} = 10$ mm

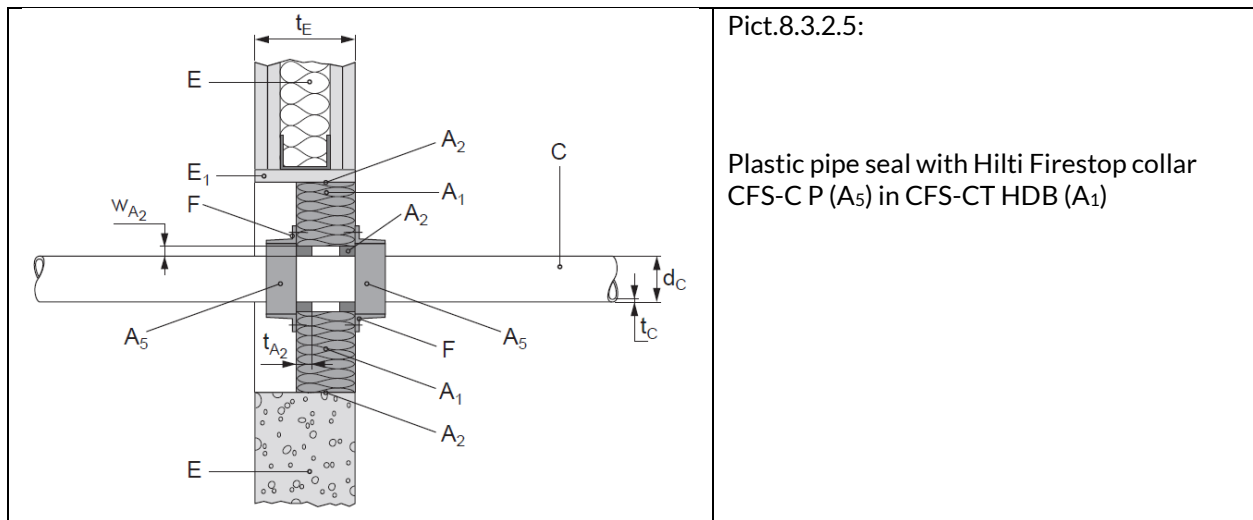


Figure 32: Plastic pipe seal, using CFS-C P in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.5.1 Plastic pipe seal for pipes made from PE, PE-X, ABS, SAN+PVC, sealed with CFS-C P

Classification shown in Figure 33 is valid for pipes made from

- PE according to EN 1519-1, EN 12666-1, EN 12201-2 or EN 15494
- PE-X according to EN ISO 15875
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to EN 1565-1

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
125	4,8	CFS-C P 125/5"	EI 60-U/U, E 90-U/U
160	6,2	CFS-C P 160/6"	EI 60-U/U

Figure 33: Classification for pipe seal made by CFS-C P for pipes made of PE, PE-X, ABS, SAN+PVC

8.3.2.5.2 Plastic pipe seal for Geberit Silent dB20 pipes, sealed with CFS-C P

Classification:

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
135	6,0	CFS-C P 160/6"	EI 20-U/U
160	7,0	CFS-C P 160/6"	EI 60-U/U

Figure 34: Classified pipe range for Geberit Silent dB20-pipes, sealed with CFS-C P

8.3.2.5.3 Plastic pipe seal for single layer PVC-pipes, sealed with CFS-C P

Classification shown in Figure 35 is valid for pipes made from

- PVC-U pipes acc. EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
160	3,2	CFS-C P 160/6"	EI 60-U/U

Figure 35: Classified pipe range for PVC-pipes, sealed with CFS-C P

Please consider before use of CPVC and C-PVC pipes the disclaimer mentioned in 8.2.111

8.3.2.5.4 Plastic pipe seal for non-regulated PP-pipes, sealed with CFS-C P

Classification shown in Figure 36 is valid for pipe brands and manufacturer – refer to 8.2.9

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	CFS-C P collar size	Classification
125	3,1	CFS-C P 125/5"	EI 60-U/U E 90-U/U
160	3,9	CFS-C P 160/6"	EI 60-U/U

Figure 36: Classified pipe range for non-reg. PP-pipes, sealed with CFS-C P

8.3.2.6 Plastic pipe seal with CFS-IS in CFS-CT HDB in wall

Construction details:

Pipe:

- Single pipe penetration

Insulation:

- No thermal insulation
- No acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure

- Penetrant gap seal with CFS-IS (A_3), $w_{A_3} = (15)$ mm, depth = over entire thickness A_1

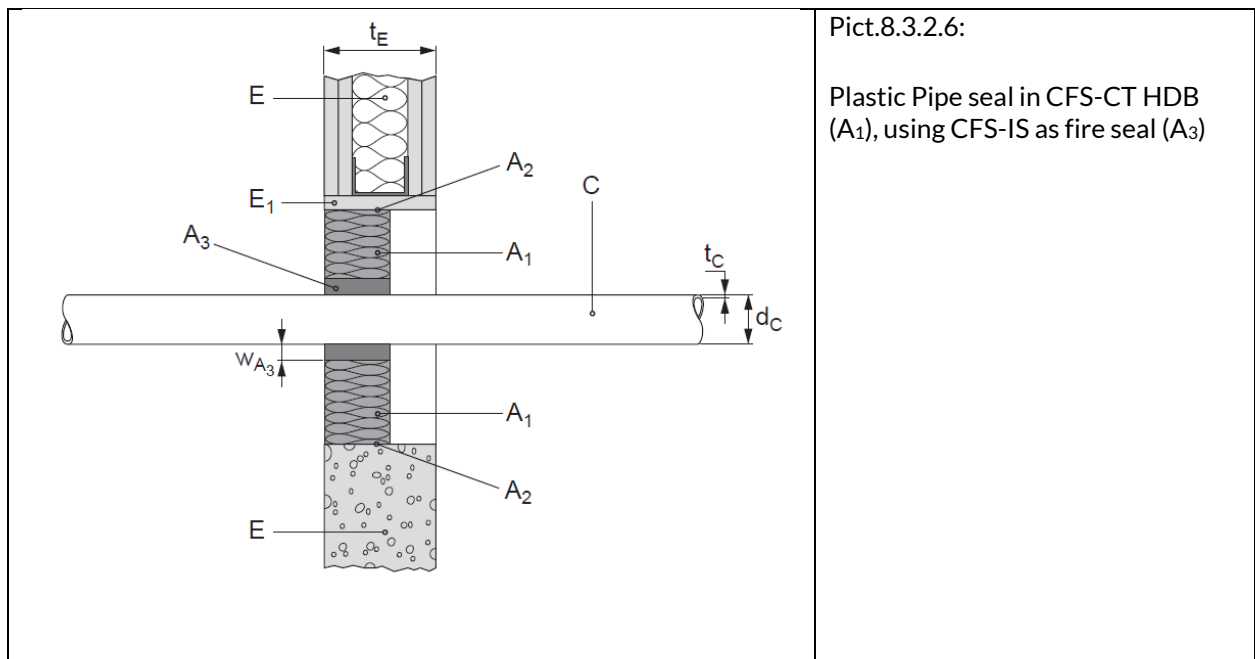


Figure 37: Pipe, sealed with CFS-IS in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.6.1 Plastic pipe seal for PE-, PE-X-, ABS, SAN+PVC-pipes, sealed with CFS-IS

Classification shown in Figure 38 is valid for:

Pipe:

- PE according to EN 1519-1, EN 12666-1, EN 12201-2 or EN 15494
- PE-X according to EN ISO 15875
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to EN 1565-1

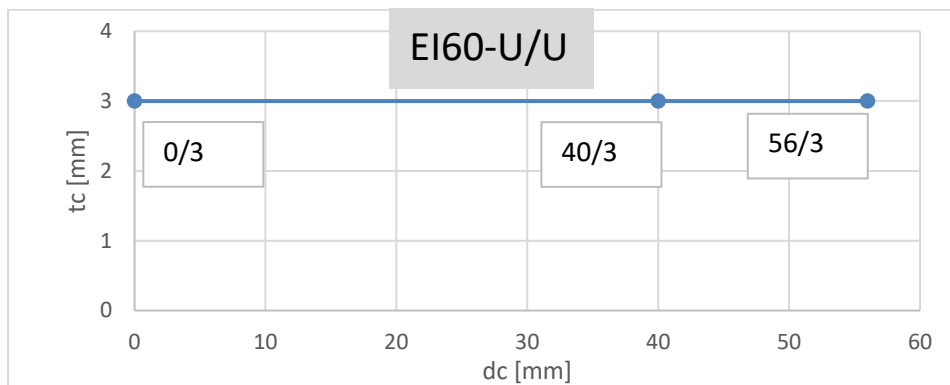


Figure 38: Classified pipe range for PE, PE-X,ABS,SAN-PVC-pipes, sealed with CFS-IS

For applicatin details refer to pict.8.3.2.6

8.3.2.6.2 Plastic pipe seal for PVC-pipes, sealed with CFS-IS

Classification shown in Figure 39 is valid for:

Pipe:

- PVC-U pipes acc. EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2
- For dimension refer to Figure 39
- Carefully consider the disclaimer mentioned in section 8.2.11

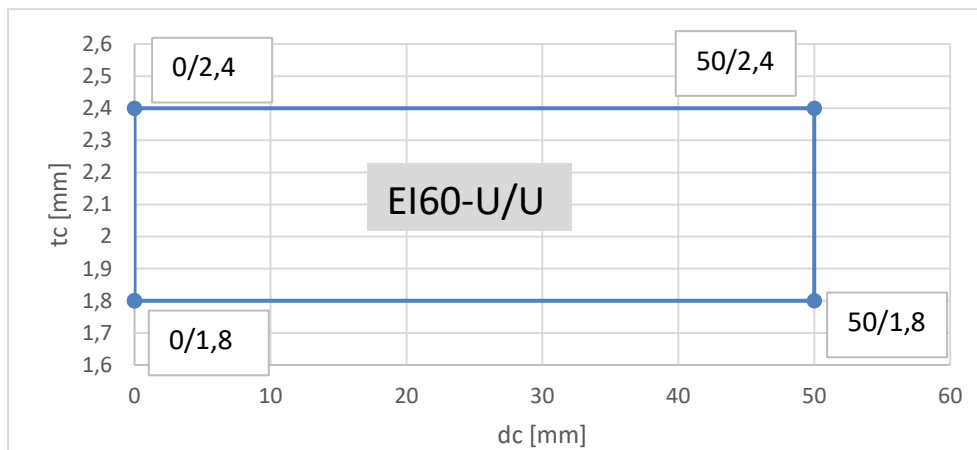


Figure 39: Classified pipe range for PVC-pipes, sealed with CFS-IS

For applicatin details refer to pict.8.3.2.6

8.3.2.6.3 Plastic pipe seal for PP-RCT-pipes, sealed with CFS-IS

Classification shown in Figure 40 is valid for

Pipe:

- PP-RCT-pipes according to standard EN ISO 15874
- For dimension refer to Figure 40

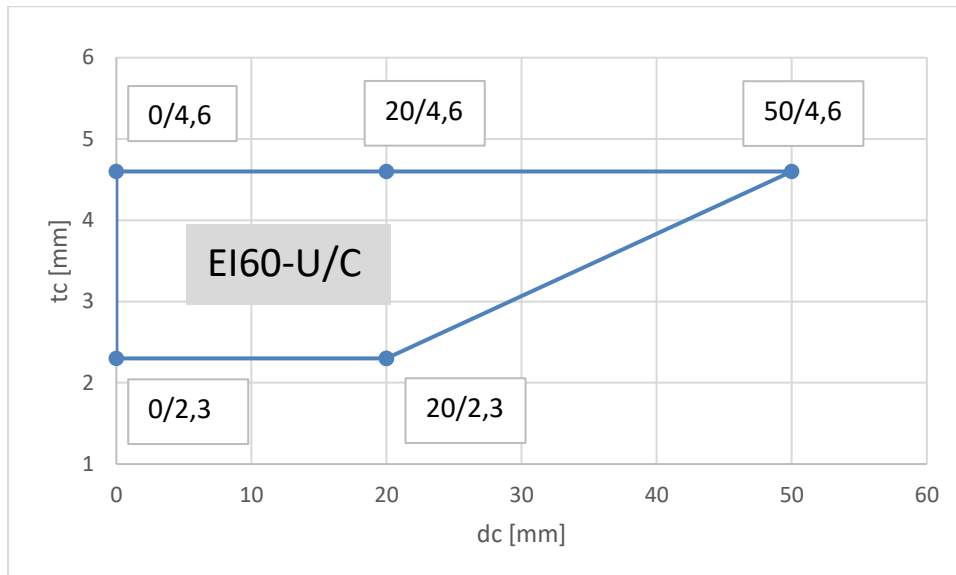


Figure 40: Classified pipe range of PP-RCT-pipes, sealed with CFS-IS

For application details refer to pict.8.3.2.6

8.3.2.7.1 Insulated PE-Xa-pipes, sealed with CFS-S ACR in CFS-CT HDB

Classification given in Figure 42 is valid for:

Pipe:

- material: PE-Xa
- Pipe brand/manufacturer: Rehau Rautitan flex
- For dimension refer to Figure 42

Insulation:

- Insulated (LS) with mineral wool insulation, Rockwool Klimarock
- Insulated length $L_D \geq 220\text{mm}$
- Insulated thickness $t_D : 20\text{mm}$

For application details refer to pict.8.3.2.7

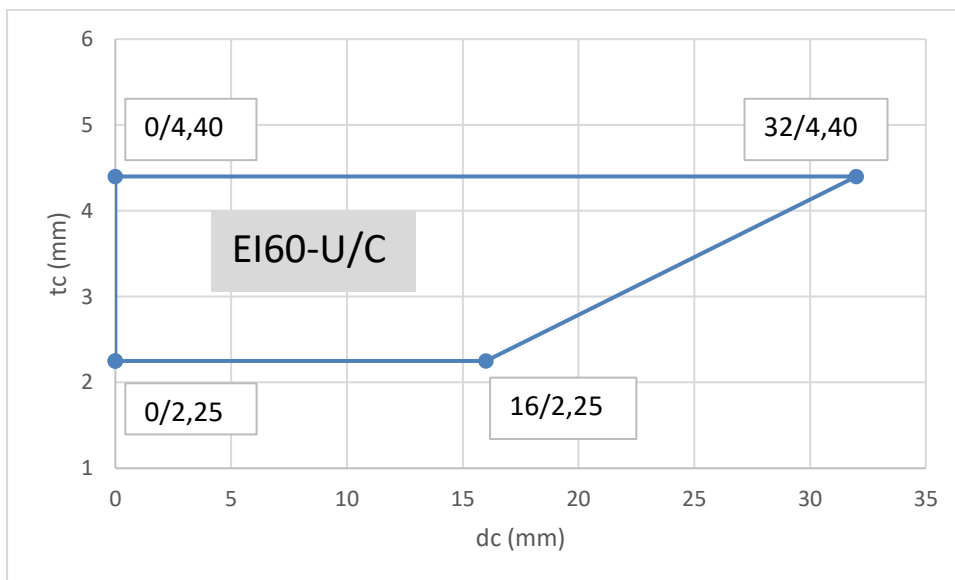


Figure 42: Classified range for insulated PE-Xa-pipes, penetrating CFS-CT HDB, sealed by CFS-IS

8.3.2.8 Plastic pipes, non-insulated, sealed with CFS-B in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration

Insulation:

- No thermal insulation
- No acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with CFS-B (A_7)
- One device per seal
- Number of layers: 2

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A_2), $w_{A_2} = (1-5)$ mm, depth = over entire thickness A_1

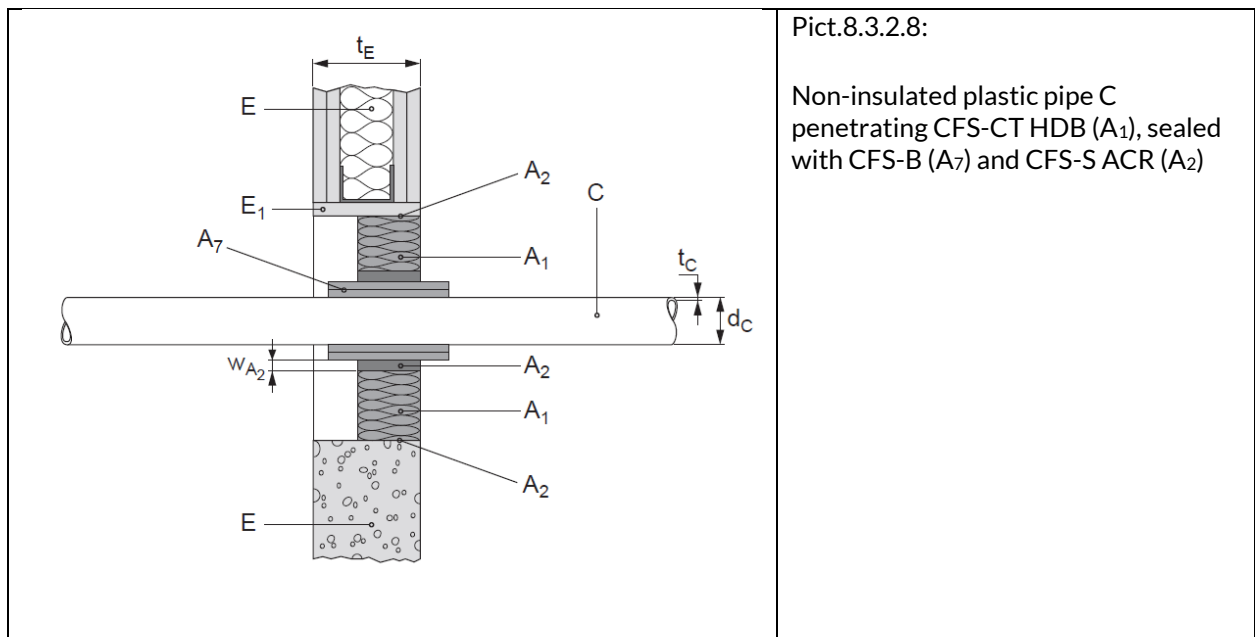


Figure 43: Non-insulated plastic pipe, penetrating CFS-CT HDB, sealed with CFS-B and CFS-S ACR

For symbols and abbreviations refer to section 10 within this document.

8.3.2.8.1 PE- pipes, sealed with CFS-B in CFS-CT HDB

Classification given in Figure 44 is valid for:

Pipe:

- PE acc. EN 1519-1
- For dimension refer to Figure 44

For application details refer to pict.8.3.2.8

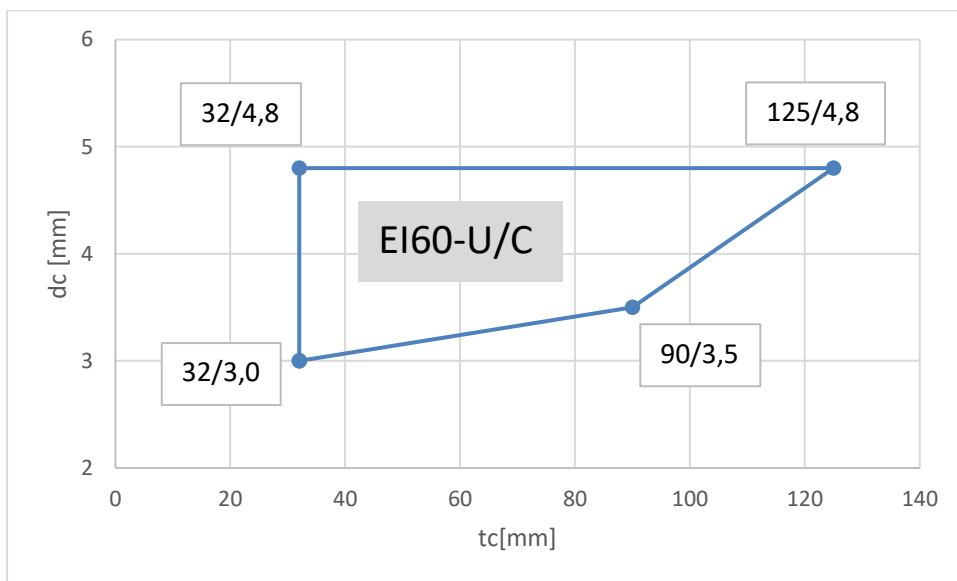


Figure 44: Classified range for PE-pipes, sealed with CFS-B in CFS-CT HDB

8.3.2.8.2 PVC-pipes acc. EN 1452-2, sealed with CFS-B in CFS-CT HDB

Classification given in Figure 45 is valid for:

Pipe:

- PVC acc. EN 1452-2, PVC-U acc. EN 1329-1, EN 1453-1, EN ISO 15493 and PVC-C-pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2
- For dimension refer to Figure 45
- Carefully consider the disclaimer in section 8.2.11

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 32	$= 1,6$	EI 30-U/C, E 60-U/C

Figure 45: Classified range for PVC-pipes, sealed with CFS-B in CFS-CT HDB

For application details refer to pict.8.3.2.8

8.3.2.8.3 PVC-pipes acc. DIN 8061/8062, sealed with CFS-B in CFS-CT HDB

Classification given in Figure 46 is valid for:

Pipe:

- PVC acc. DIN 8061/8062, Dekadur, GF
- For dimension refer Figure 46
- Carefully consider the disclaimer in section 8.2.11

For application details refer to pict.8.3.2.8

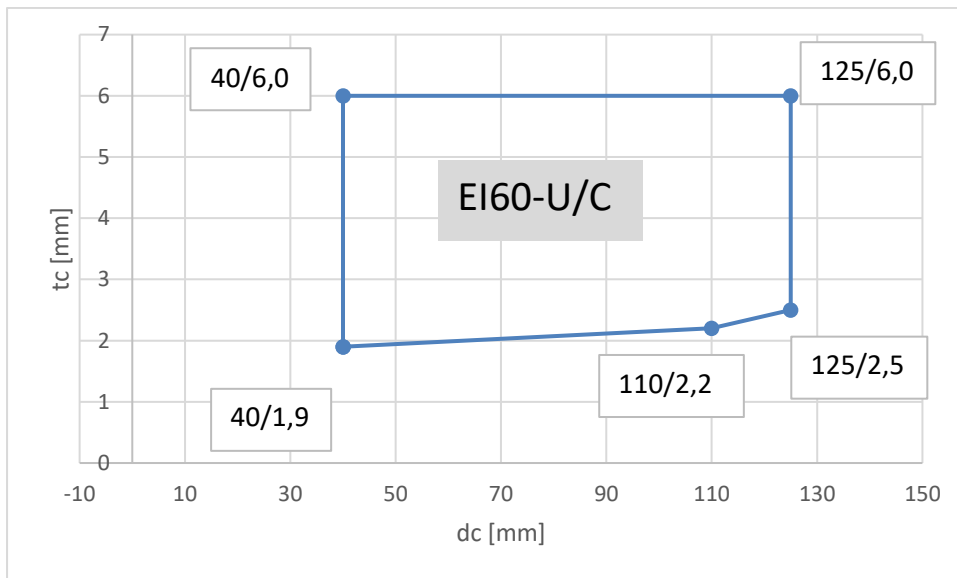


Figure 46: Classified range for PVC-pipes acc. DIN 8061/8062, sealed with CFS-B in CFS-CT HDB

8.3.2.8.4 PP-pipes acc. EN1451-1, sealed with CFS-B in CFS-CT HDB

Classification given in Figure 47 is valid for:

Pipe:

- PP acc. EN 1451-1, EN ISO 15874 and EN ISO 15494
- For dimension refer to Figure 47

For application details refer to pict.8.3.2.8

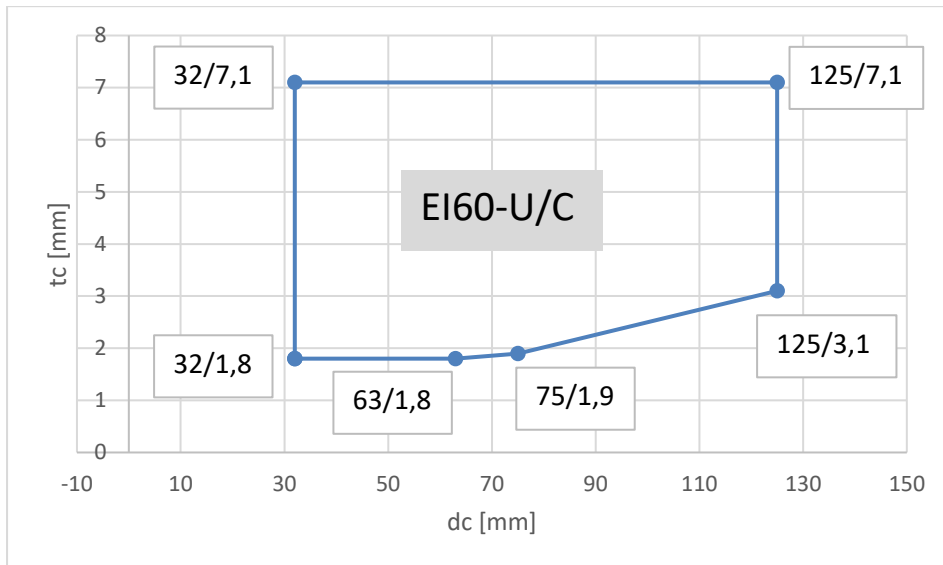


Figure 47: Classified range for PP-pipes, sealed with CFS-B in CFS-CT HDB

Additional classification for EI 60 – U/C:

Pipe:

- Pipe: material: PP acc. EN 1451-1, EN ISO 15874 and EN ISO 15494
- Pipe diameter $d_c \leq 25$ mm, pipe wall thickness $t_c = 3,5$ mm

Insulation:

- Insulated, PE-foam Tubex Standard, thickness $t_D = (6 - 10)$ mm
- For application details refer to pict.8.3.2.8

8.3.2.8.5 PP-RCT pipes, insulated, sealed with CFS-B in CFS-CT HDB

Classification given in Figure 48 is valid for:

Pipe:

- Pipe: material: PP acc. EN 1451-1, EN ISO 15874 and EN ISO 15494
- For dimension refer to Figure 48

Insulation:

- Insulated, PE-foam Tubex Standard, thickness $t_D = (10-15)$ mm
- For application details refer to pict.8.3.2.8

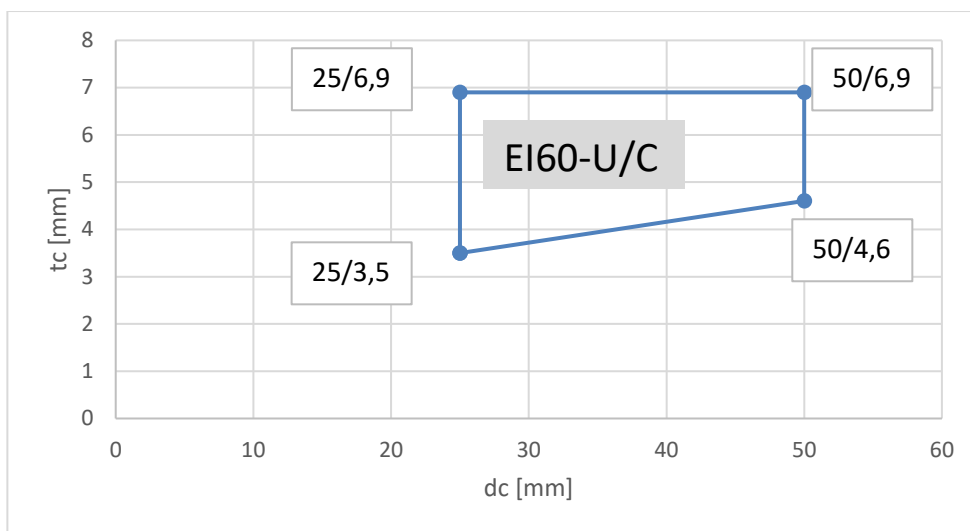


Figure 48: Classified range for PP-RCT pipes, sealed with CFS-B in CFS-CT HDB

8.3.2.9 Aluminium-Composite pipes (MLC) sealed with CFS-IS in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration

Insulation:

- with and without insulation on pipe – for details refer to following classification sections
- Insulated (CS) with flexible elastomeric foam (FEF) or PE-foam
- For brand and manufacturer refer to section 8.2.7

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3), Width $w_{A3} = 15$ mm, depth = over entire thickness A_1

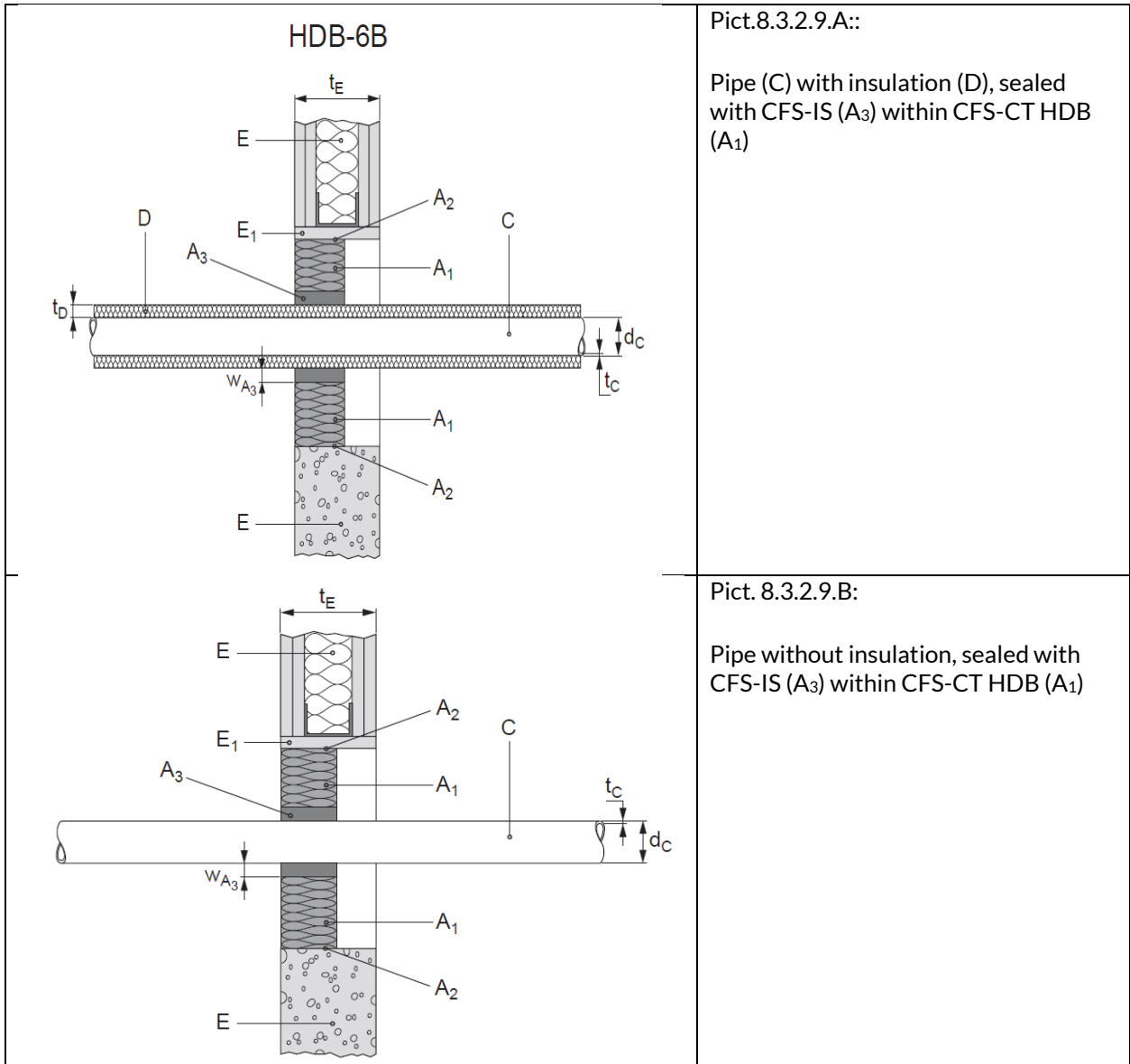


Figure 49: Sealing of an insulated MLC- pipes (CS or LS) in CFS-CT HDB, using CFS-IS

For symbols and abbreviations refer to section 10 within this document.

8.3.2.9.1 MLC-pipe Geberit Mepla, FEF- insulated, sealed with CFS-IS in CFS-CT HDB

Classification given in Figure 50 is valid for:

Pipe:

- Geberit Mepla pipes
- For dimension refer to Figure 50

Insulation:

- Only FEF-insulation approved
- For brand refer to 8.2.7
- Insulation thickness : AF1 – AF4 (8,0mm – 20,5mm)
- For application details refer to pict.8.3.2.9.A

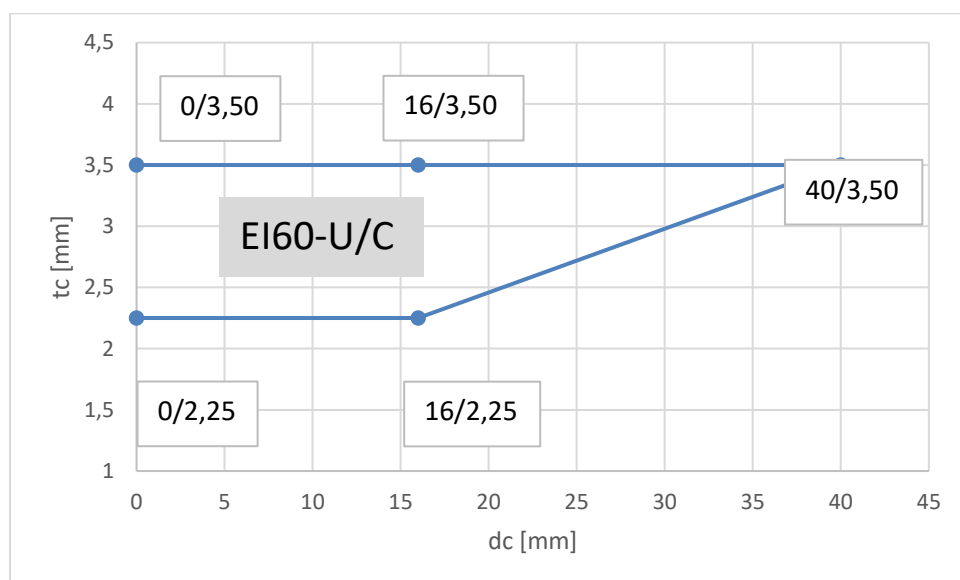


Figure 50: Classified range for insulated Geberit Mepla pipes, sealed with CFS-IS in CFS-CT HDB

Additional classification:

No.	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation class (FEF)	Insulation thickness (mm)	Classification
1	16	2,25	AF5	25	EI 60-U/C
2	20	2,5	≤ AF6	≤ 35	EI 60-U/C
3	32	3	AF5	25	EI 60-U/C
4	40	3,5	AF5	27	EI 60-U/C
5	50	4,5	AF1 – AF5	9 – 28,5	EI 60-U/C

Table 4: Additional Classification for FEF-insulated Uponor MLC-pipes

8.3.2.9.2 MLC-pipe Uponor Unipipe Plus, FEF-insulated, sealed with CFS-IS in CFS-CT HDB

Classification given in Figure 51 is valid for:

Pipe:

- Uponor Unipipe Plus pipes and Uni Pipe MLCP
- For dimension refer to Figure 51

Insulation:

- Only FEF Insulation approved
- For brand refer to 8.2.7
- Insulation thickness : AF1 – AF4 (8,0mm – 19,0mm)
- For application details refer to pict.8.3.2.9.A

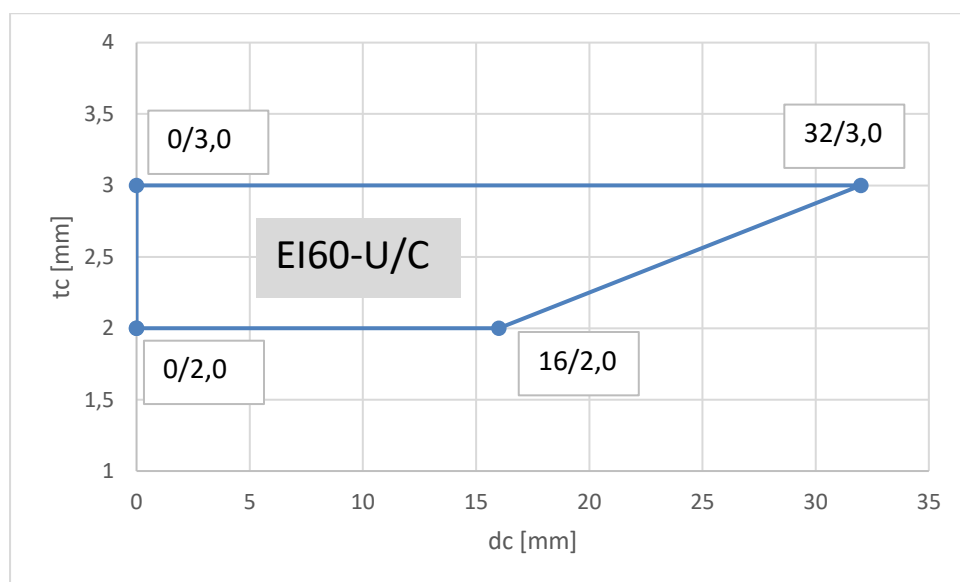


Figure 51: Classified range for insulated Uponor Unipipe plus, sealed with CFS-IS in CFS-CT HDB

Additional classification:

No.	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation class (FEF)	Insulation thickness (mm)	Classification
1	16	2	AF5	25	EI 60-U/C
2	20	2,25	AF1 – AF5	8,5 – 25	EI 60-U/C
3	25	2,5	AF1 – AF5	8,5 – 25	EI45-U/C
4	25	2,5	AF5	25	EI 60-U/C
5	32	3	AF5	25	EI 60-U/C
6	40	4	AF1 – AF5	9 – 27	EI 60-U/C
7	50	4,5	AF1 – AF5	9 – 28,5	EI 60-U/C

Table 5: Additional Classification for FEF-insulated Uponor-MLC-pipes

8.3.2.9.3 MLC-pipe Uponor Unipipe Plus, PE- insulated, sealed with CFS-IS in CFS-CT HDB

Classification given in Table 6 is valid for:

Pipe:

- Brand: Uponor Uni Pipe MLCP
- For dimension refer to Table 6

Insulation

- Only PE Insulation approved
- Insulation thickness : see Table 6
- For application details refer to pict.8.3.2.9.A

No.	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness (mm)	Classification
1	40	4	4 - 13	EI45-U/C E 60-U/C
2	40	4	13	EI 60-U/C
3	50	4,5	4 - 13	EI 30-U/C E 60-U/C
4	50	4,5	13	EI 60-U/C

Table 6: Classification for PE-foam insulated Uponor MLC-pipes

8.3.2.9.4 MLC-pipe Uponor Unipipe Plus, non-insulated, sealed with CFS-IS in CFS-CT HDB

Classification given in Table 7 is valid for:

Pipe:

- Brand: Uponor Uni Pipe Pluse and Uni Pipe MLCP
- For dimension refer to Table 7

Insulation:

- No insulation
- For application details refer to pict.8.3.2.9.B

No.	Pipe diameter (mm)	Pipe wall thickness (mm)	Classification
1	16	2	EI 60 - U/C
2	20	2,25	EI 60 - U/C
3	25	2,5	EI 60 - U/C
4	32	3	EI 30 - U/C E 60 - U/C
5	40	4	EI 30 - U/C E 60 - U/C
6	50	4,5	EI 60 - U/C

Table 7: Classification for non- insulated Uponor MLC-pipes

8.3.2.10 Metal pipes, insulated, sealed with CFS-IS in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: refer to relevant classification and section 8.2.8

Insulation:

- with insulation on pipe – for details refer to following classification sections
- insulation case CS or LS – for details refer to following classification sections

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3), Width $w_{A_3} = 15$ mm, depth = over entire thickness A_1

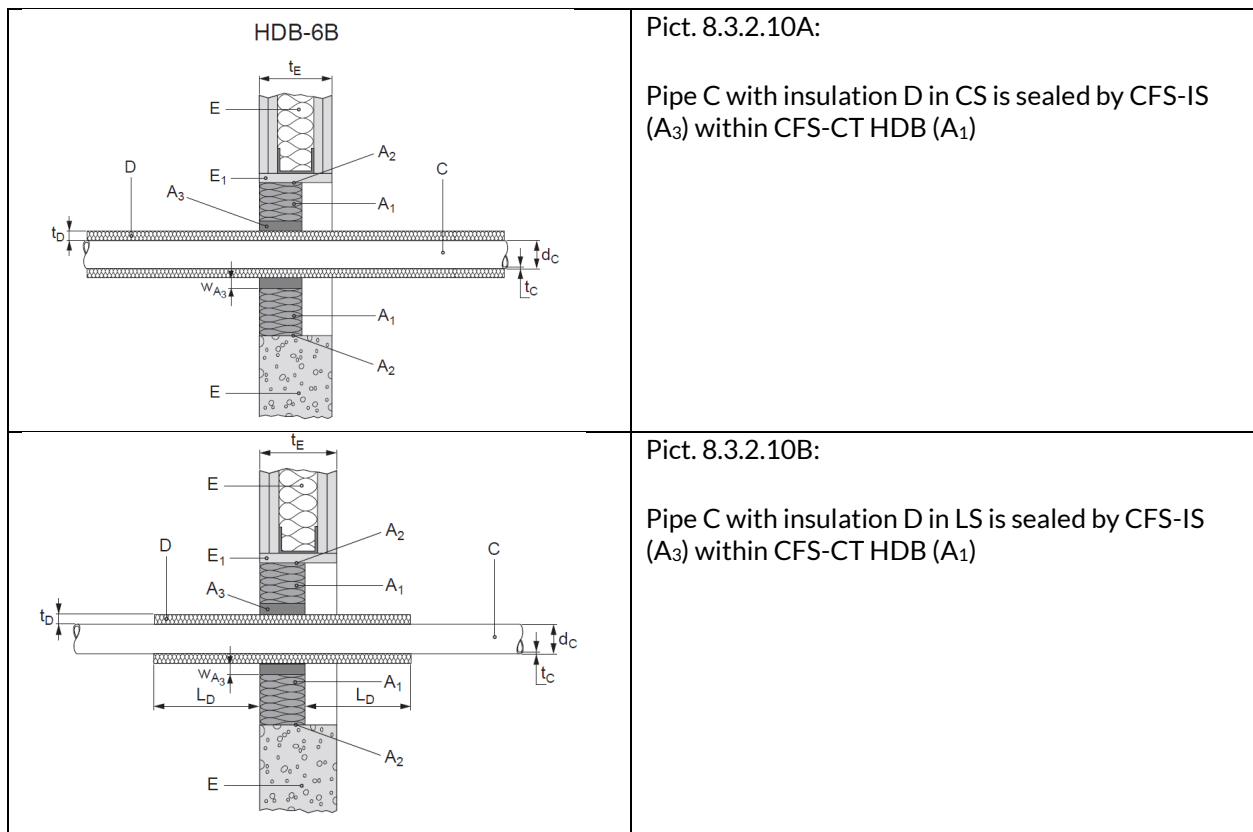


Figure 52: Sealing of an insulated metal pipe (CS or LS) in CFS-CT HDB, using CFS-IS

For symbols and abbreviations refer to section 10 within this document.

8.3.2.10.1 Metal pipes, insulated with elastomeric foamed insulation, sealed with CFS-IS

Classification given in Figure 53 is valid for:

Pipe:

- Copper pipes and other metal pipes – for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: see Figure 53

Insulation:

- Insulated (CS) with elastomeric foam
- For insulation brand and manufacturer refer to section 8.2.7
- Insulation thickness : AF1 – AF4 (8,0 mm – 20,5 mm)
- For application details refer to pict.8.3.2.10 A

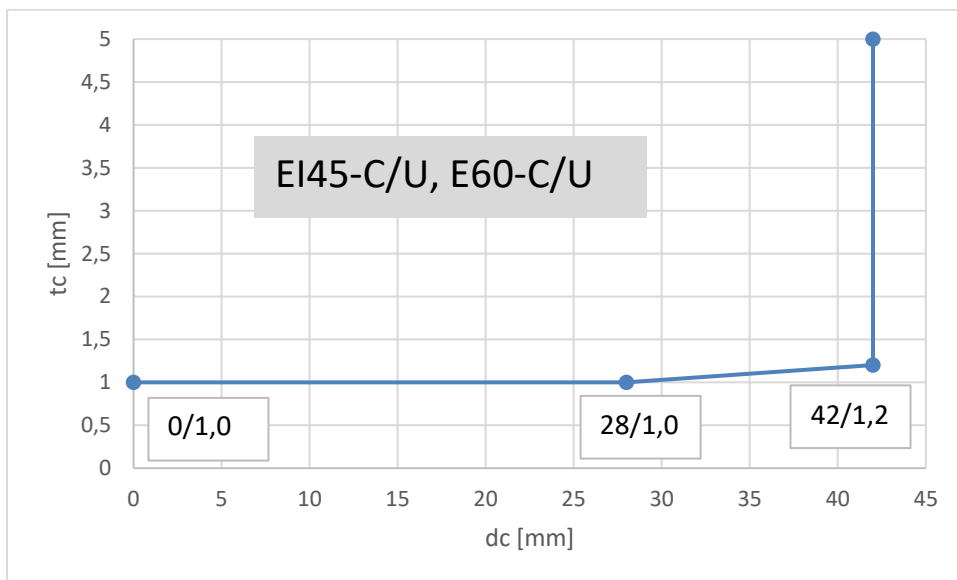


Figure 53: Classified range for insulated metal pipes, sealed with CFS-IS in CFS-CT HDB

8.3.2.10.2 Metal pipes, insulated with glass wool insulation, sealed with CFS-IS

Classification given in Figure 54 is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: see Figure 54

Insulation:

- Insulated LS and CS with glass wool, type: Isover Climacover lamella
- Insulated length L_D on both sides : ≥ 470 mm
- Insulation thickness t_D : ≥ 30 mm
- For application details refer to pict.8.3.2.10 A and B

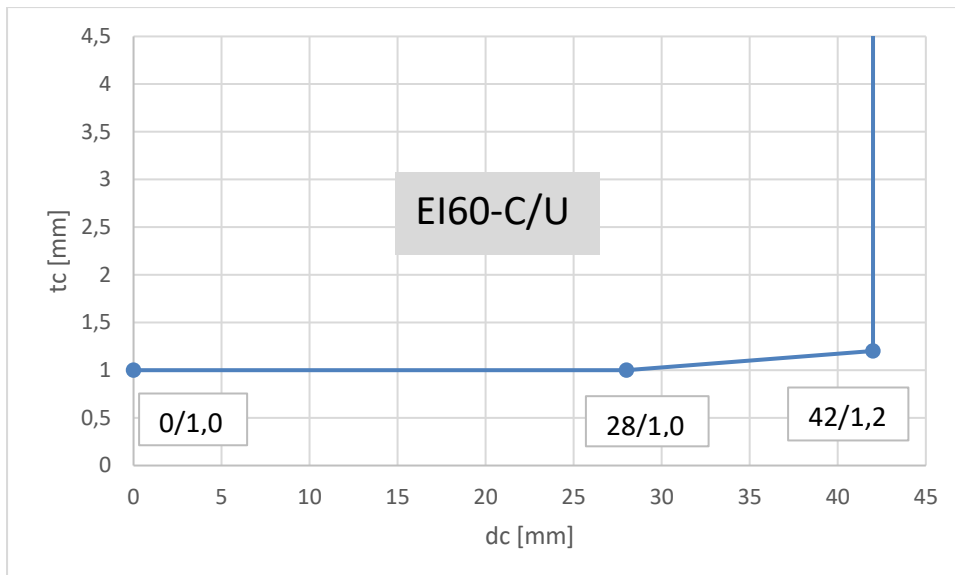


Figure 54: Classified pipe range for glass-wool insulated metal pipes, sealed with CFS-IS in CFS-CT HDB

8.3.2.11 Metal pipes, with FEF – insulation and protect insulation, sealed with CFS-IS

Construction details:

Pipes:

- Single pipe penetration
- For pipe material: copper and others, refer to relevant classification and section 8.2.8

Insulation:

- with insulation on pipe, case CS – for details refer to following classification sections
- with additional protect insulation on insulated pipe, case LI – for details refer to following classification sections

Pipe Closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3), Width $w_{A3} = 15$ mm, depth = over entire thickness A_1

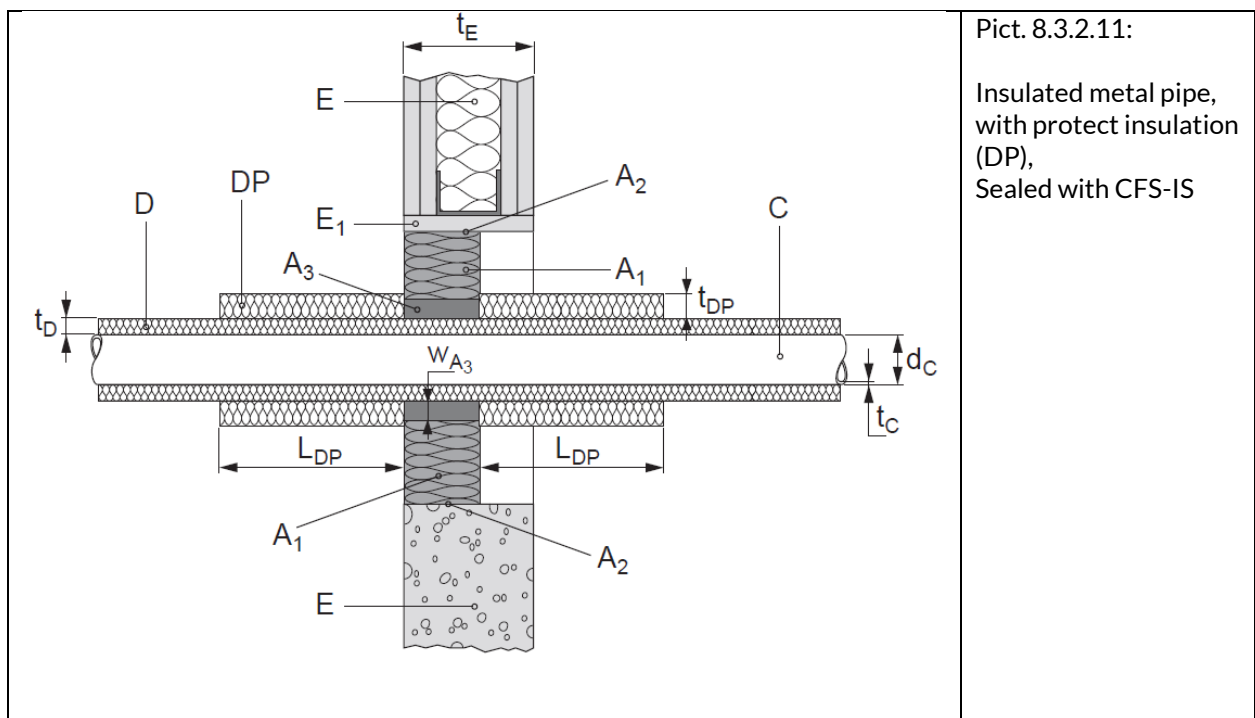


Figure 55: Insulated metal pipe with protect insulation, sealed with CFS-IS

For symbols and abbreviations refer to section 10 within this document.

8.3.2.11.1 Metal pipes, with insulation and protect insulation, sealed with CFS-IS

Classification given in Figure 56 is valid for:

Pipes:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: refer to Figure 56

Insulation:

- Pipe insulation with FEF, case CS, for brand refer to 8.2.7
- Insulation thickness t_D : (AF1 – AF5) = (8 < t_D < 31,5) mm

Protect insulation:

- Protect insulation (DP) with mineral wool, case LI, brand: Rockwool DuctWrap
- Insulated length L_{DP} on both sides : ≥ 250 mm
- Insulation thickness t_{DP} : = 25 mm
- For application details refer to pict.8.3.2.11

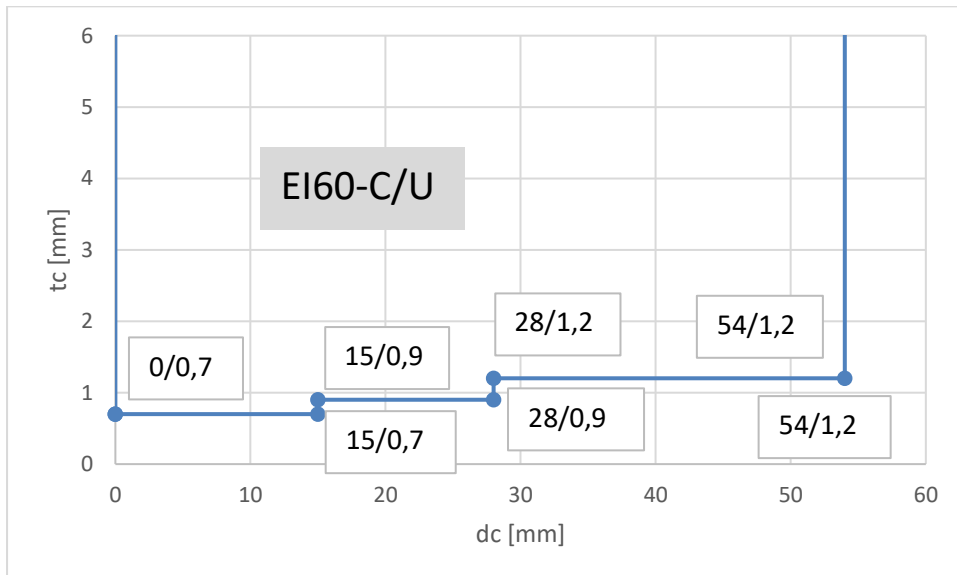


Figure 56: Classification range for insulated metal pipes with protect insulation

Additional classification:

No.	Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness (mm)	Insulation class	Classification
1	Copper and others	≤ 15	$\geq 0,7$	32	AF6	EI 60-C/U

Table 8: Additional Classification for insulated metal pipes with protect insulation

8.3.2.11.2 Steel pipes, with insulation and protect insulation, sealed with CFS-IS

Classification given in Table 9 is valid for:

Pipes:

- Steel pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: refer to Table 9

Insulation:

- Pipe insulation with FEF, case CS, for brand refer to 8.2.7
- Insulation thickness t_D : (AF3 – AF5) = (18,5 < t_D < 31,5) mm

Protect Insulation:

- Protect insulation (DP) with mineral wool, case LI, brand: Rockwool DuctWrap
- Insulated length L_{DP} on both sides : ≥ 250 mm
- Insulation thickness t_{DP} : = 25 mm
- For application details refer to pict.8.3.2.11

No.	Pipe diameter t_c (mm)	Pipe wall thickness t_D (mm)	Classification
1	$\leq 114,3$	≥ 2	EI 60-C/U

Table 9: Classification for insulated steel pipes with protect insulation

8.3.2.12 Metal pipes, with phenolic – insulation and protect insulation, sealed with CFS-IS

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: copper and others, refer to relevant classification and section 8.2.8

Insulation:

- with insulation on pipe, case CS – for details refer to following classification sections
- with additional protect insulation on insulated pipe, case LI – for details refer to following classification sections

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3), Width $w_{A_3} = 15$ mm, depth = over entire thickness A_1

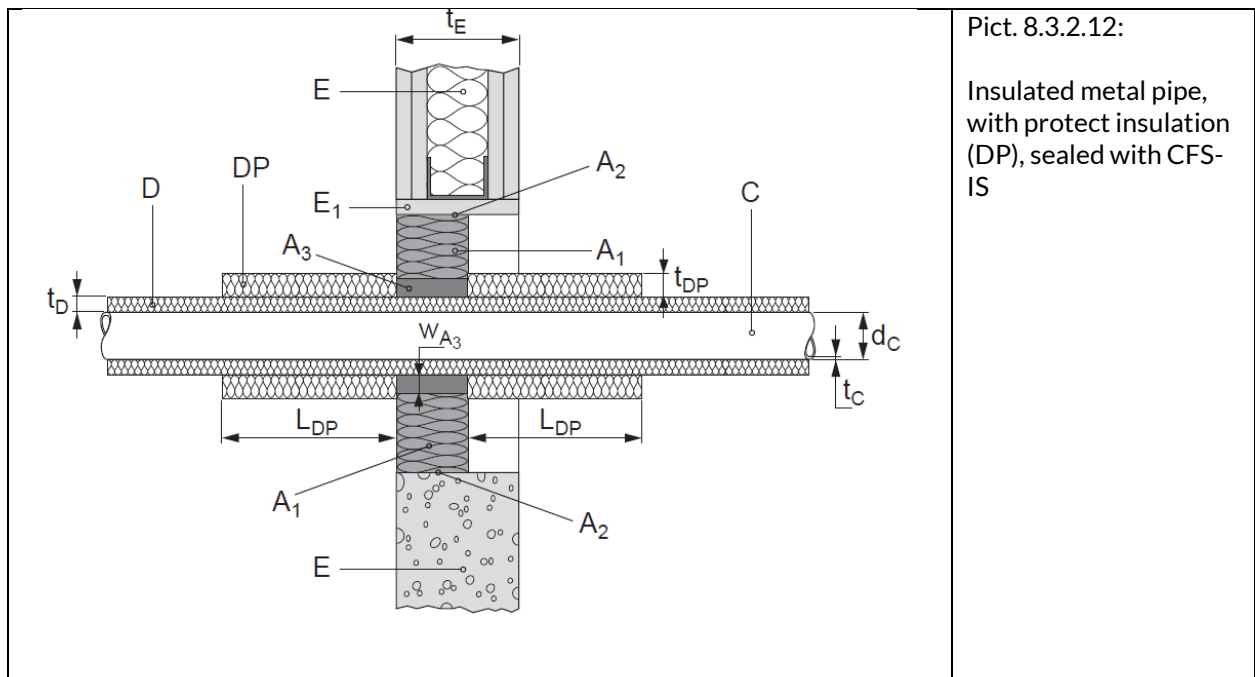


Figure 57: Insulated metal pipe with protect insulation, sealed with CFS-IS

For symbols and abbreviations refer to section 10 within this document.

8.3.2.12.1 Metal pipes, with phenolic-insulation and protect insulation, sealed with CFS-IS

Classification given in Figure 58 is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: refer to Figure 58

Insulation:

- Pipe insulation with phenolic foam, case CS, brand: Kingspan Kooltherm
- Insulation thickness t_D : ($15 < t_D < 25$) mm

Protect insulation:

- Protect insulation (DP) with mineral wool, case LI, brand: Rockwool DuctWrap
- Insulation thickness t_{DP} : = 25 mm
- Insulated length L_{DP} on both sides: ≥ 250 mm
- For application details refer to pict. 8.3.2.12

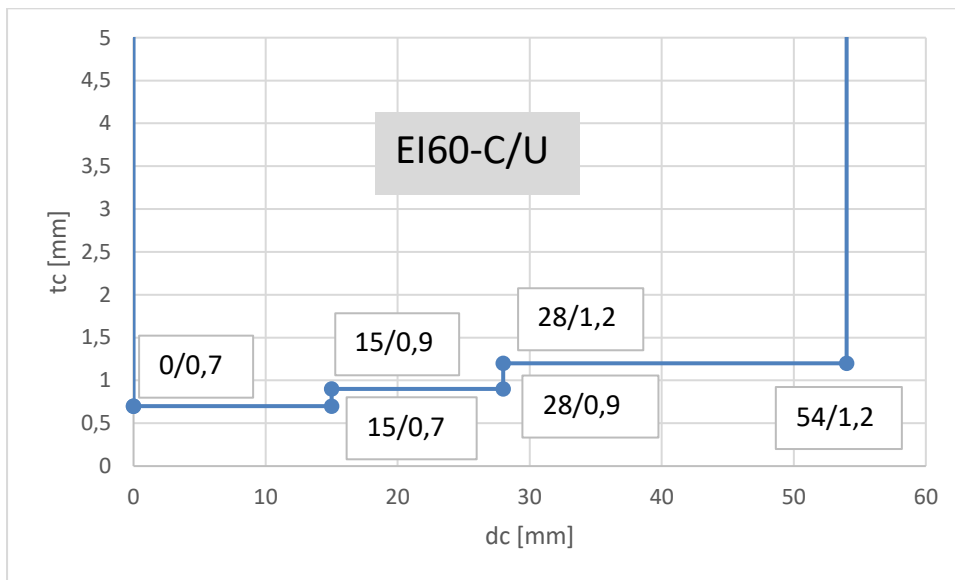


Figure 58: Classification range for phenolic-insulated metal pipes with protect insulation

8.3.2.13 Metal pipes, insulated, in Zero-distance to each other, sealed with CFS-IS in CFS-CT HDB

Construction details:

Pipes:

- Multiple pipe penetration
- For pipe material: copper and others, refer to relevant classification and section 8.2.8
- Minimum distance (s) between insulated pipes
- Linear arrangement (horizontal or vertical) or cluster arrangement of pipes
- Unlimited number of pipes in each arrangement

Insulation:

- FEF- insulation on pipe in CS – for details refer to following classification sections
- Additional protect insulation (DP) in case LI – for details refer to following classification sections

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A₃), Width $w_{A3} = 15$ mm, depth = over entire thickness A_1

	<p>Pict.8.3.2.13A:</p> <p>Insulated metal pipes, close to each other, sealed with CFS-IS (A₃), bearing an local protect insulation (DP).</p> <p>Distance (s) between insulated metal pipes: ≥ 0 mm</p>
	<p>Pict.8.3.2.13B:</p> <p>Insulated metal pipes, close to each other, sealed with CFS-IS (A₃), bearing an local protect insulation (DP).</p> <p>Linear arrangement, horizontal position</p> <p>Distance (s) between insulated metal pipes: ≥ 0 mm</p>

Figure 59: Insulated metal pipes close to each other, sealed with CFS-IS in CFS-CT HDB

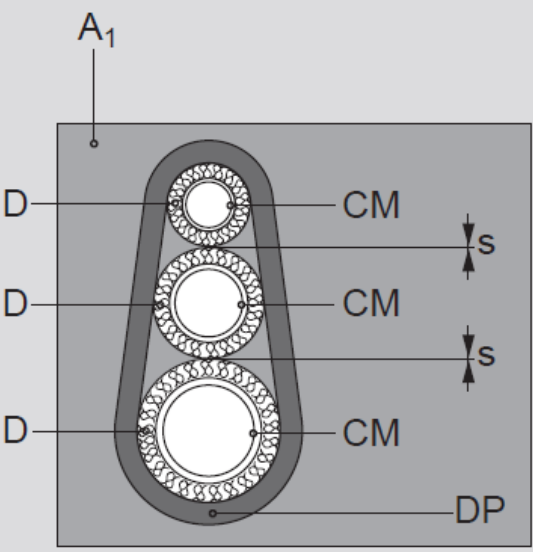
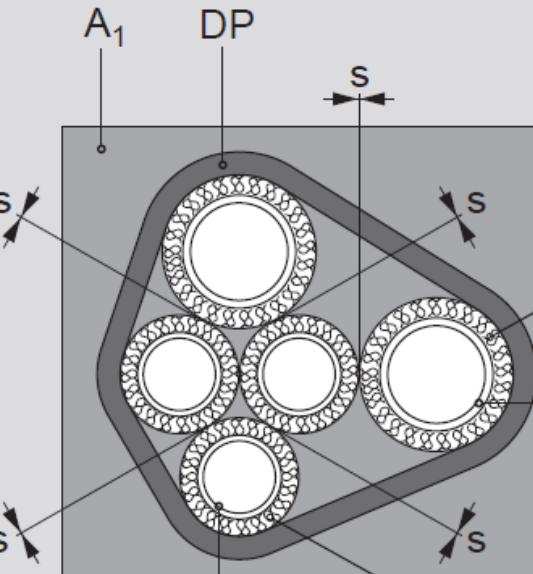
<p>E</p> 	<p>Pict.8.3.2.13A:</p> <p>Insulated metal pipes, close to each other, sealed with CFS-IS (A₃), bearing an local protect insulation (DP).</p> <p>Linear arrangement, vertical position</p> <p>Distance (s) between insulated metal pipes: ≥ 0 mm</p>
<p>E</p> 	<p>Pict.8.3.2.13A:</p> <p>Insulated metal pipes, close to each other, sealed with CFS-IS (A₃), bearing an local protect insulation (DP).</p> <p>Cluster position</p> <p>Distance (s) between insulated metal pipes: ≥ 0 mm</p>

Figure 60: Insulated metal pipes close to each other, sealed with CFS-IS in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.13.1 Metal pipes, insulated, in Zero-distance to each other, sealed with CFS-IS

Classification given in Figure 61 is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness :see Figure 61

Insulation:

- Insulation with FEF-material, for brand refer to 8.2.7
- Insulation thickness t_D : ($8,0 < t_D < 8,5$) mm

Protect Insulation:

- Protect Insulation (DP) mineral wool- brand: Rockwool DuctWrap
- Length of Protect Insulation (L_{DP}) on both sides: ≥ 250 mm, , thickness $t_{DP} = 25$ mm
- For a pplication details refer to pict.8.3.2.13 A,B,C,D

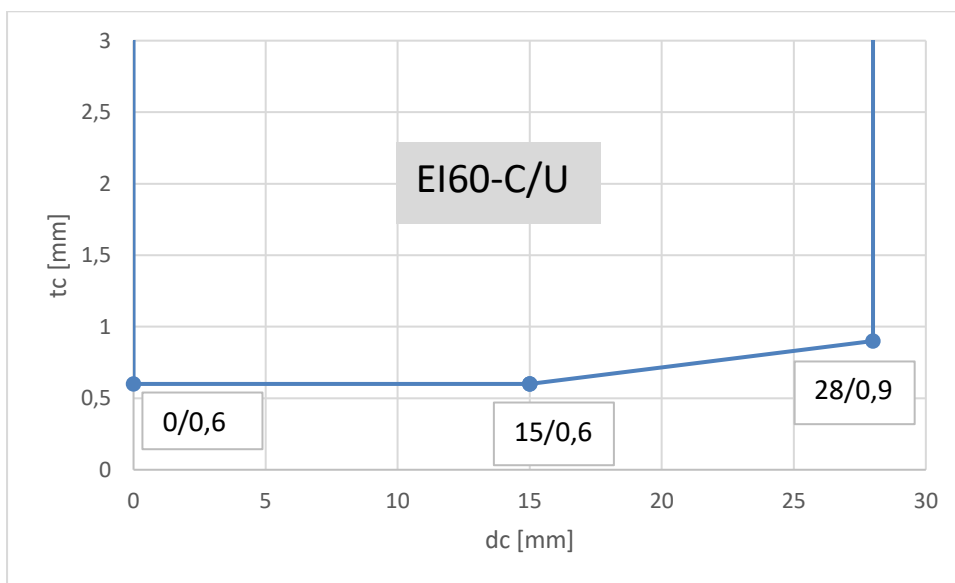


Figure 61: Classified pipe range for FEF- insulated metal pipes in zero distance to each other

8.3.2.14 Metal pipes, insulated, sealed with CFS-S ACR in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: refer to relevant classification and section 8.2.8

Insulation:

- with insulation on pipe – for details refer to following classification sections
- insulation case CS or LS – for details refer to following classification sections

Pipe closure:

- Pipe seal with CFS-S ACR intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A_2), Width $w_{A_2} = (1 - 5)$ mm, depth $t_{A_2} = 10$ mm from both sides

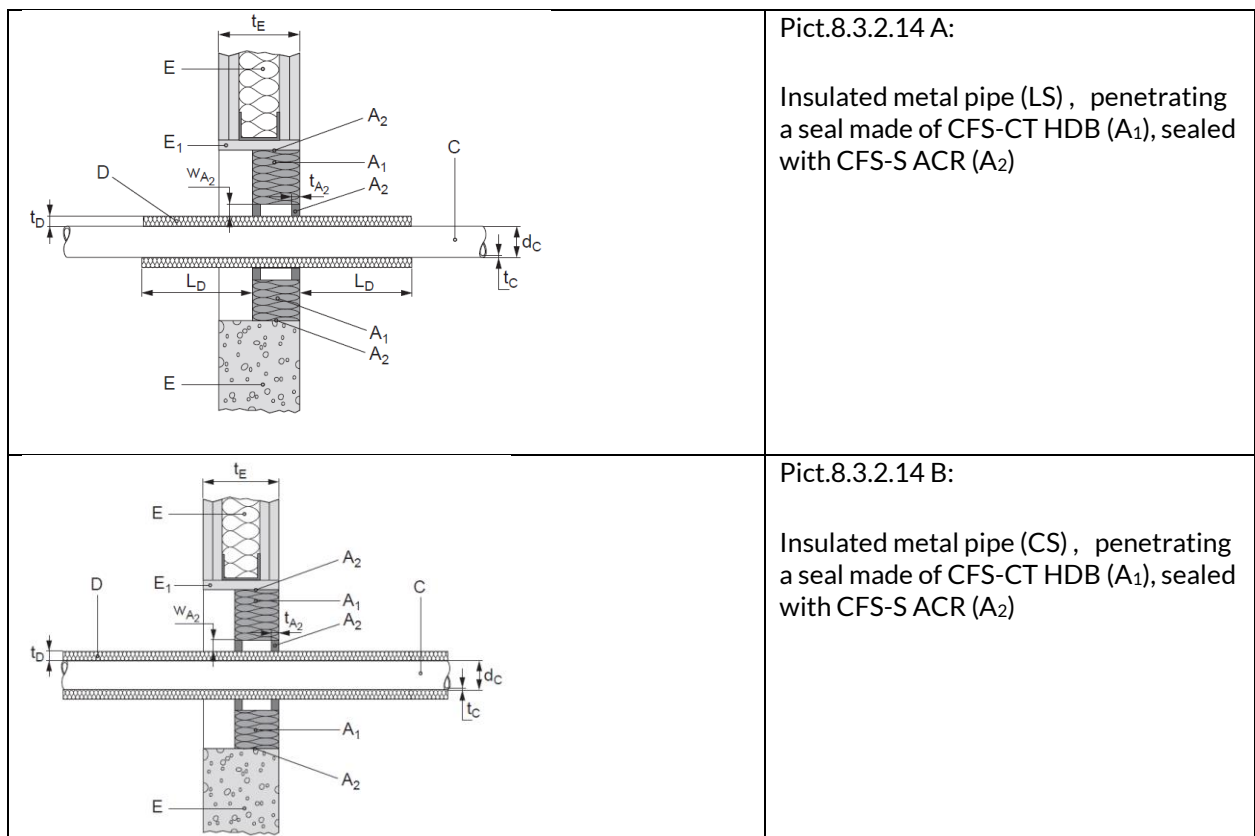


Figure 62: Sealing of insulated metal pipes in CFS-CT HDB, using CFS-S ACR

For symbols and abbreviations refer to section 10 within this document.

8.3.2.14.1 Metal pipes (copper and others), insulated with mineral wool, sealed with CFS-S ACR in CFS-CT HDB

Classification given in Figure 63 is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and minimum pipe wall thickness: see Figure 63.

Insulation:

- Insulated (LS) and (CS) with mineral wool, type: Rockwool Klimarock
- For application details refer to pict.8.3.2.14 A,B

For EI 45-C/U, E 60-C/U:

- Insulated length L_D on both sides : ≥ 970 mm
- Insulation thickness t_D : ≥ 20 mm

For EI 60-C/U:

- Insulated length L_D on both sides : ≥ 470 mm
- Insulation thickness t_D : ≥ 30 mm

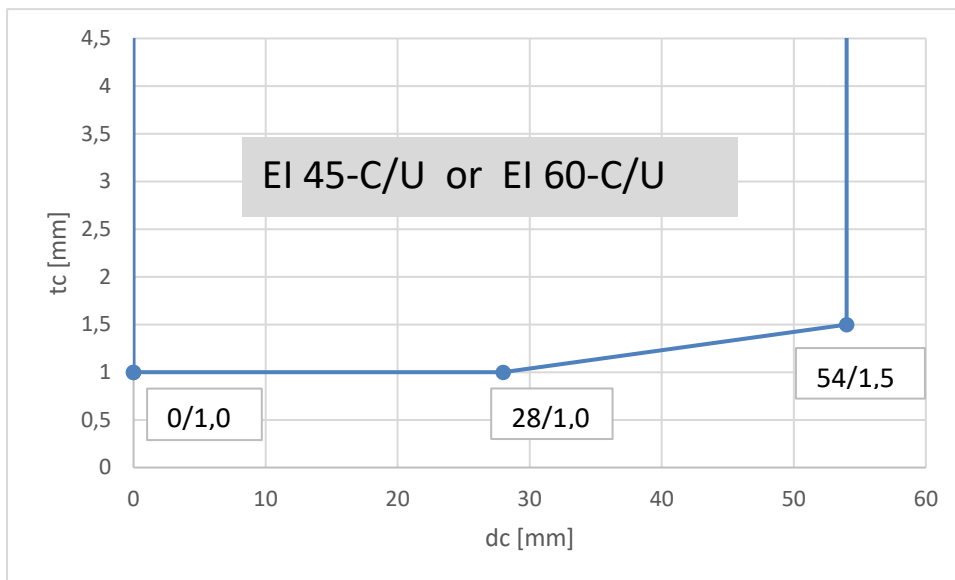


Figure 63: Classification for insulated metal pipes, sealed with CFS-S ACR in CFS-CT HDB

8.3.2.14.2 Metal pipes (steel and others), insulated with mineral wool, sealed with CFS-S ACR in CFS-CT HDB

Classification EI 60-C/U , E 90-C/U is valid for:

Pipe:

- Steel pipes and other metal pipes, excluded copper, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 114,3$ mm,
- Pipe wall thickness $t_c \geq 1,8$ mm,

Insulation:

- Insulated (CS) with mineral wool, type: Rockwool Klimarock
- Insulation thickness $t_D: \geq 20$ mm

And:

Pipe:

- Steel pipes and other metal pipes, excluded copper, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 114,3$ mm,
- Pipe wall thickness $t_c \geq 3,2$ mm

Insulation:

- Insulated (LS or CS) with mineral wool, type: Isover ORStech LSP-40
- Insulated length L_D on both sides : ≥ 700 mm
- Insulation thickness $t_D: \geq 30$ mm

For application details refer to pict.8.3.2.14B

8.3.2.15 Metal pipes, corrugated, sleeved, sealed with CFS-FIL in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: steel and others, refer to relevant classification and section 8.2.8

Insulation:

- with insulation on pipe – for details refer to following classification sections
- insulation case LI or CI – for details refer to following classification sections

Pipe closure:

- metal pipe seal in board with sleeve, made of PE, coming out 5mm on both sides of the board, for sleeve dimension refer to Classification chapter
- Pipe seal inside the sleeve with CFS-FIL intumescent sealant, Width $w_{A6} = (5 - 10 \text{ mm})$, depth $t_{A6} = 20 \text{ mm}$ from both sides

Gap closure

- Sleeve seal to board with CFS-S ACR, Width $w_{A2} = (1 - 5) \text{ mm}$, depth $t_{A2} = 10 \text{ mm}$ from both sides
- Penetrant gap seal to be done with CFS-S ACR (A_2), Width $w_{A2} = (1 - 5) \text{ mm}$, depth $t_{A2} = 10 \text{ mm}$ from both sides

	<p>Pict.8.3.2.15A:</p> <p>Corrugated metal pipe (C) with insulation (D), sealed in sleeve (V) with CFS-FIL (A₆) and CFS-S ACR (A₂)</p>
	<p>Pict.8.3.2.15 B:</p> <p>Corrugated metal pipe (C) with insulation (D), sealed in sleeve (V) with CFS-FIL (A₆) and CFS-S ACR (A₂)</p> <p>(Front view - with removed insulation for demonstration purpose)</p>

Figure 64: Corrugated metal pipes in sleeve, sealed with CFS-FIL and CFS-S ACR in CFS-CT HDB

For symbols and abbreviations refer to section 10 within this document.

8.3.2.15.1 Metal pipes, corrugated, sleeved, sealed with CFS-FIL in CFS-CT HDB

Classification EI 60-C/U is valid for:

- Steel pipes and other metal pipes, excluded copper, for material refer to section 8.2.8
- Pipe brand: TracPipe by Omegaflex
- Insulated with mineral wool, type: Rockwool DuctWrap
- Insulation thickness t_D : = 25 mm

No.	Pipe diameter d_c (mm)	Pipe wave high (mm)	Pipe wall thickness (mm)	Sleeve diameter (mm)	Sleeve wall thickness (mm)
1	28	3,5	0,25	40	3
2	32	2,5	0,25	50	3
3	42	4,5	0,3	56	3
4	48	4,5	0,3	63	3

Table 10: Classified pipe range for corrugated metal pipes in PE-sleeve in CFS-CT HDB board.

8.3.2.16 Metal pipes (copper and others), insulated, sealed with CFS-B in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: refer to relevant classification and section 8.2.8

Insulation:

- with FEF insulation on pipe – for brand and manufacturer refer to section 8.2.7
- insulation case CS – for details refer to following classification sections
- with or without addition protect insulation DP

Pipe closure:

- Pipe seal with CFS-B, for number of layers refer to following classification sections
- One device per seal

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A_2), Width $w_{A2} = (1 - 5 \text{ mm})$, depth t_{A2} over entire thickness t_{A1}

	<p>Pict.8.3.2.16A:</p> <p>Metal pipe C, insulated with insulation D, penetrating CFS-CT HDB (A₁), sealed with CFS-B (A₇) and CFS-S ACR (A₂)</p>
	<p>Pict.8.3.2.16B:</p> <p>Metal pipe C insulated with insulation D in CS, penetrating CFS-CT HDB (A₁), sealed with CFS-B (A₇) and CFS-S ACR (A₂).</p> <p>An addition protect insulation DP is applied on both sides on top of insulation D.</p>

Figure 65: Insulated metal pipes, penetrating CFS-CT HDB, sealed with CFS-B and CFS-S ACR

For symbols and abbreviations refer to section 10 within this document.

8.3.2.16.1 Metal pipes (copper and others), insulated with FEF, sealed with CFS-B in CFS-CT HDB

Classification EI 30-C/U and E 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 18$ mm,
- Pipe wall thickness $t_c \geq 1,0$ mm

Insulation:

- Insulated (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($7,5$ mm $\leq t_D \leq 33,5$ mm)

Pipe closure:

- Sealed with CFS-B, two layers
- For application details refer to pict.8.3.2.16A

Classification EI 30-C/U and E 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 28$ mm,
- Pipe wall thickness $t_c \geq 1,0$ mm

Insulation:

- Insulated (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($12,5$ mm $\leq t_D \leq 35,5$ mm)

Pipe closure:

- Sealed with CFS-B, two layers
- For application details refer to pict.8.3.2.16A

Classification EI 30-C/U and E 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 54$ mm,
- Pipe wall thickness $t_c \geq 2,0$ mm

Insulation:

- Insulated (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($17,0$ mm $\leq t_D \leq 38,0$ mm)

Pipe closure:

- Sealed with CFS-B, two layers
- For application details refer to pict.8.3.2.16A

Classification EI 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter and Pipe wall thickness – refer to Figure 66

Insulation:

- Insulated (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($7,5$ mm $\leq t_D \leq 8,5$ mm)

Protect insulation:

- Additional protect insulation (DP) on both sides in (LI)
- $L_{DP} = > 250$ mm, $w_{DP} = 25$ mm
- Material (DP): mineral wool, Rockwool, Ductwrap

Pipe closure:

- Sealed with CFS-B, two layers
- For application details refer to pict.8.3.2.16B

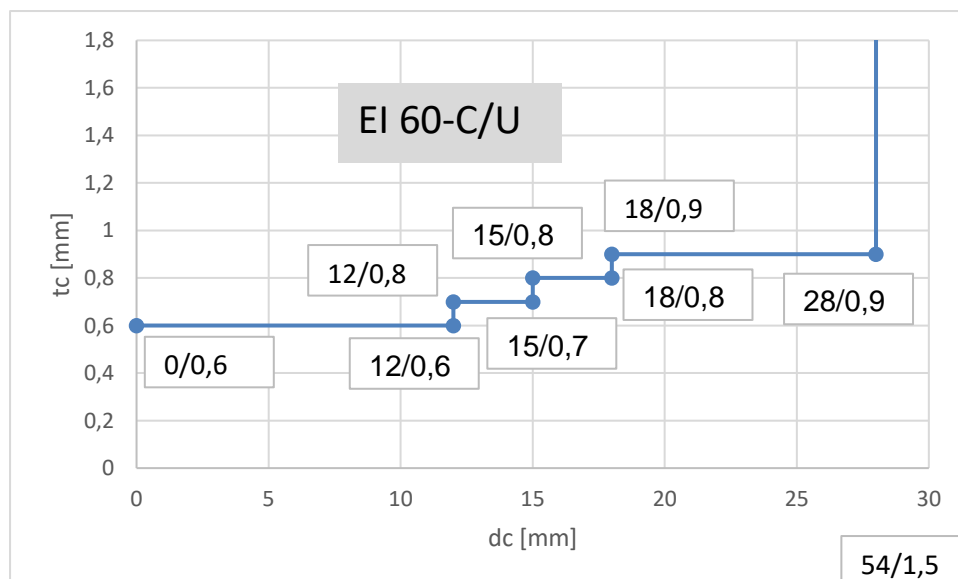


Figure 66: FEF-insulated copper pipes, sealed with CFS-B in CFS-CT HDB

8.3.2.16.2 Metal pipes (copper and others) , insulated with FEF and additional protect insulation, sealed with CFS-B in CFS-CT HDB

Classification EI 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 10$ mm,
- Pipe wall thickness $t_c \geq 1,0$ mm

Insulation:

- Insulated in (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($7,5$ mm $\leq t_D \leq 15,5$ mm)

Protect Insulation:

- Additional protect insulation DP in (LI) made of glass wool ML-3 by Isover
- Thickness $t_{DP} = 30$ mm, Length $L_{DP} \geq 30$ mm

Pipe closure:

- Sealed with CFS-B – one layer
- For application details refer to pict.8.3.2.16B

Classification EI 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 18$ mm,
- Pipe wall thickness $t_c \geq 1,0$ mm

Insulation:

- Insulated in (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : 8,0 mm

Protect insulation:

- Additional protect insulation DP in (LI) made of glass wool ML-3 by Isover
- Thickness $t_{DP} = 30$ mm, Length $L_{DP} \geq 30$ mm

Pipe closure:

- Sealed with CFS-B – one layer
- For application details refer to pict.8.3.2.16B

Classification EI 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 28$ mm,
- Pipe wall thickness $t_c \geq 1,0$ mm

Insulation:

- Insulated in (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($12,5$ mm $\leq t_D \leq 35,0$ mm)

Protect insulation:

- Additional protect insulation DP in (LI) made of glass wool ML-3 by Isover
- Thickness $t_{DP} = 30$ mm, Length $L_{DP} \geq 30$ mm

Pipe closure:

- Sealed with CFS-B – one layer
- For application details refer to pict.8.3.2.16B

Classification EI 60-C/U is valid for:

Pipe:

- Copper pipes and other metal pipes, for material refer to section 8.2.8
- Pipe diameter $d_c \leq 54$ mm,
- Pipe wall thickness $t_c \geq 1,5$ mm

Insulation:

- Insulated in (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($17,0$ mm $\leq t_D \leq 38,0$ mm)

Protect insulation:

- Additional protect insulation DP in (LI) made of glass wool ML-3 by Isover
- Thickness $t_{DP} = 30$ mm, Length $L_{DP} \geq 30$ mm

Pipe closure:

- Sealed with CFS-B – one layer
- For application details refer to pict.8.3.2.16B

Classification EI 30-C/U and E 60-U/C is valid for:

Pipe:

- Steel pipes and other metal pipes, (copper excluded), for material refer to section 8.2.8
- Pipe diameter $d_c \leq 114,3$ mm,
- Pipe wall thickness $t_c \geq 2,0$ mm

Insulation:

- Insulated in (CS) with foamed elastomeric insulation (FEF)
- For brand and manufacturer of FEF – refer to section 8.2.7
- Insulation thickness t_D : ($18,5$ mm $\leq t_D \leq 43,0$ mm)

Protect insulation:

- Additional protect insulation DP in (LI) made of glass wool ML-3 by Isover
- Thickness $t_{DP} = 30$ mm, Length $L_{DP} \geq 30$ mm

Pipe closure:

- Sealed with CFS-B – one layer
- For application details refer to pict.8.3.2.16B

8.3.2.17 Conduits with and without cables penetrating CFS-CT HDB, sealed with CFS-B

Construction details:

Conduit:

- Single and multiple penetration, single and bunched conduits
- For Flexibility type: refer to classification section
- For conduit material: any plastic material of same flexibility type
- Projecting length L_{PRC} on both sides from coated board seal A_1 : refer to classification section
- Conduit end configuration: U/U or U/C
- Max. diameter of single conduit RC: refer to classification section
- Max. wall thickness/wave high of single conduit RC: refer to classification section
- Max. diameter of conduit bundle RCB: refer to classification section
- Max. dimension of single conduit RC in bundle RCB: refer to classification section

Cable infil:

- With and without cable infil
- All cables currently and commonly used in building practice in Europe, fitting into the conduit, including optical fibre cables
- Coaxial cables with diameter : refer to classification section
- Non-sheated cables (blank wires) and cable support are excluded

Insulation:

- Situation: LI and CI
- Material: mineral wool
- Brand and producer: Ductwrap by Rockwool
- Length L_D : refer to classification section
- Thickness t_D : 25 mm

Penetrant closure:

- Penetrant seal with one device CFS-B
- Number of layers: two
- Positioned in a central position in (A_1)
- Identical protruding length on both sides of the seal

Gap closure:

- CFS-S ACR (A_2)
- Width $w_{A_2} = (1 - 5 \text{ mm})$
- Depth $t_{A_2} - 10 \text{ mm}$ from both sides

<p style="text-align: center;">HDB-11E</p>	<p>Pict.8.3.2.17A:</p> <p>Single conduits (RC) and/or conduit bundles (RCB), with and without cables, penetrating a CFS-CT HDB – board seal (A₁)</p> <p>Annular gap sealed about entire board thickness</p> <p>Sealed by two layers of CFS-B (A₇)</p> <p>Distance (s) between conduits $s \geq 0\text{mm}$</p>
<p style="text-align: center;">HDB-11F</p>	<p>Pict.8.3.2.17B:</p> <p>Single conduits (RC) and/or conduit bundles (RCB), with and without cables, penetrating a CFS-CT HDB – board seal (A₁)</p> <p>Annular gap sealed about entire board thickness</p> <p>Sealed by one layer of CFS-B (A₇)</p> <p>Distance (s) between conduits $s \geq 0\text{mm}$</p>

Figure 67: Conduit sealing with CFS-B in CFS-CT HDB board

For symbols and abbreviations refer to section 10 within this document.

8.3.2.17.1 Conduits with and without cables, sealed with CFS-B

Classification is valid for:

Conduit:

- Rigid conduits
- Max. diameter of single conduit RC: $d_{RC} \leq 40$ mm, wall thickness $t_{RC} \leq 2,0$ mm
- Max. diameter of conduit bundle RCB: $d_{RCB} \leq 100$ mm
- Projecting length L_{PRC} on both sides: ≥ 250 mm

Cables:

- Coaxial cables with diameter: ≤ 28 mm

Insulation:

- Length $L_D \geq 250$ mm

Penetrant closure:

- Two layers of CFS-B

Gap closure

- For application details refer to pict.8.3.2.17B

Penetrant	Classification
Conduits	EI 60-U/U
Conduit bundle	EI 60-U/U

Figure 68: Rigid conduits up to 40mm and bundle

Classification is valid for:

Conduit:

- Flexible/pliable conduits
- Max. diameter of single conduit RC: $d_{RC} \leq 40$ mm, wave high $t_{RC} \leq 4,25$ mm
- Max. diameter of conduit bundle RCB: $d_{RCB} \leq 100$ mm
- Projecting length L_{PRC} on both sides: ≥ 150 mm

Cables:

- Coaxial cables with diameter: ≤ 28 mm

Insulation:

- Length $L_D \geq 150$ mm

Penetrant closure:

- One layer or two layers of CFS-B

Gap closure

- For application details refer to pict.8.3.2.17B

Penetrant	Classification
Conduits	EI 60-U/U
Conduit bundle	EI 60-U/U

Figure 69: Flexible/pliable conduits up to 40mm and bundle

8.3.2.18 HVAC-supply bundle (Klimasplit), sealed with CFS-B in CFS-CT HDB

Construction details:

Penetrants:

- Mixed seal penetration
- Always a non-insulated plastic pipe (C) together with two insulated (D) copper pipes (CM) and two small scale cables (R) in zero distance to each other
- Distance s between penetrants ≥ 0 mm

Pipe:

- Plastic pipe in U/U or U/C end configuration, metal pipes always C/U
- For plastic and metal pipe dimension refer to classification chapter

Cable:

- Max.cable size: $d_R \leq 14$ mm

Insulation:

- For insulation dimension refer to classification chapter
- For insulation brand and manufacturer refer to section 8.2.7

Protect insulation:

- With or without protect insulation, refer to classification section
- For dimension of protect insulation refer to classification section

Penetrant closure:

- Pipe seal with one device CFS-B, one layer, positioned in a central position in (A_1), identical projecting length on both sides of the seal

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A_2), Width $w_{A_2} = (1 - 5$ mm)
- For depth t_{A_2} refer to classification section

	<p>Pict.8.3.2.18A</p> <p>HVAC- supply bundle, penetrating a CFS-CT HDB board (A_1), sealed with CFS-B (A_7) and CFS-SACR (A_2)</p>
	<p>Pict.8.3.2.18B</p> <p>HVAC- supply bundle, penetrating a CFS-CT HDB board (A_1), sealed with CFS-B (A_7) and CFS-SACR (A_2). Protect insulation DP covers parts of the penetrants on both sides of the wall.</p>
	<p>Pict.8.3.2.18C</p> <p>HVAC- supply bundle, penetrating a CFS-CT HDB board (A_1), sealed with CFS-B (A_7) and CFS-SACR (A_2)</p>

Figure 70: HVAC-supply bundle, penetrating CFS-CT HDB board, sealed with CFS-B

For symbols and abbreviations refer to section 10 within this document.

8.3.2.18.1 HVAC-supply bundle, sealed with CFS-B

Classification EI 60 is valid for:

Penetrants:

- HVAC-supply bundles, for penetrant details refer to section 8.3.2.18

Metal pipes:

- Metal pipes (CM) material: copper and others, refer to 8.2.8
- Metal pipes diameter: $d_{CM} \leq 10$ mm, wall thickness $t_{CM} \geq 1$ mm
- Metal pipe with insulation (D)

Plastic pipes:

- Plastic pipe (C) , material: PVC
- Plastic pipe (C), pipe diameter $d_C \leq 20$ mm, wall thickness $t_C < 1,5$ mm
- Plastic pipe without insulation

Insulation:

- Material FEF, for brands and manufacturer refer to 8.2.7
- Insulation thickness (t_D) = 9mm
- Insulation in CS-situation

Protect Insulation:

- Without protect insulation

Gap closure:

- Gap filler depth t_{A2} : over entire thickness
- For application details refer to pict.8.3.2.18A,C

Classification EI 30 and E 60 is valid for:

Penetrants:

- HVAC-supply bundles, for penetrant details refer to section 8.3.2.18

Metal Pipes:

- Metal pipes (CM) material: copper and others, refer to 8.2.8
- Metal pipes diameter: $d_{CM} \leq 18$ mm, wall thickness $t_{CM} \geq 1$ mm
- Metal pipe with insulation (D)

Plastic pipe:

- Plastic pipe (C) , material: PVC
- Plastic pipe (C), pipe diameter $d_C < 20$ mm, wall thickness $t_C < 1,5$ mm
- Plastic pipe without insulation

Insulation:

- Material: FEF, for brands and manufacturer refer to 8.2.7
- Insulation thickness (t_D) = 8mm
- Insulation in CS-situation
- For application details refer to pict.8.3.2.18A,B

Protect Insulation:

- Without protect insulation

Gap closure:

- Gap filler depth t_{A2} : over entire thickness
- For application details refer to pict.8.3.2.18A,C

Classification EI 60 is valid for:

Penetrants:

- HVAC-supply bundles, for penetrant details refer to section 8.3.2.18

Metal Pipes:

- Metal pipes (CM) material: copper and others, refer to 8.2.8
- Metal pipes diameter: $d_{CM} \leq 28$ mm, wall thickness $t_{CM} \geq 0,9$ mm
- Metal pipe with insulation (D)

Plastic pipe:

- Plastic pipe (C), material: PVC
- Plastic pipe (C), pipe diameter $d_C < 20$ mm, wall thickness $t_C < 1,5$ mm
- Plastic pipe without insulation

Insulation:

- Material: FEF, for brands and manufacturer refer to 8.2.7
- Insulation thickness (t_D) = 8,5 mm
- Insulation in CS-situation
- For application details refer to pict.8.3.2.18A,B,C

Protect Insulation:

- With protect insulation
- Insulation situation: LI
- Material: mineral wool, Rockwool ductwrap
- Length: $L_{DP} \geq 150$ mm
- Thickness: $t_{DP} = 25$ mm

Gap closure:

- Gap filler depth t_{A2} : 10mm on both sides
- For application details refer to pict.8.3.2.18B, C

8.3.2.19 Metal trunkings, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Construction details:

Penetration

- Multiple seal penetration

Trunking:

- Material: steel or others refer to section 8.2.8, copper excluded
- Dimension: high $h_T \leq 105\text{mm}$, width $w_T \leq 118\text{mm}$, wall thickness $t_T \geq 1,1\text{ mm}$
- In U/U or U/C or C/U end configuration
- With and without cable
- Projecting length $\geq 500\text{ mm}$ on both sides
- With insulation

Cables:

- All cables up to 80mm diameter
- Including optical fibre cables
- Non-sheathed cables up to diameter 24 mm covered
- Distance s between cables $\geq 0\text{ mm}$
- Distance s between cables and trunking $\geq 0\text{ mm}$
- No insulation

Insulation:

- Trunking insulated on both sides in LI or CI position
- Material: mineral wool, type Ductwrap by Rockwool
- Length: $L_D \geq 420\text{ mm}$
- Thickness: $t_D: \geq 25\text{ mm}$,

Cable closure:

- Within trunking sealed in intersection area of board A_1 by CFS-F FX (A_9)

Gap closure:

- Metal trunking gap seal to be done with CFS-S ACR (A_2)
- Width $w_{A2} = 2,5\text{ mm}$
- Depth $t_{A2} \geq 10\text{mm}$ from both sides

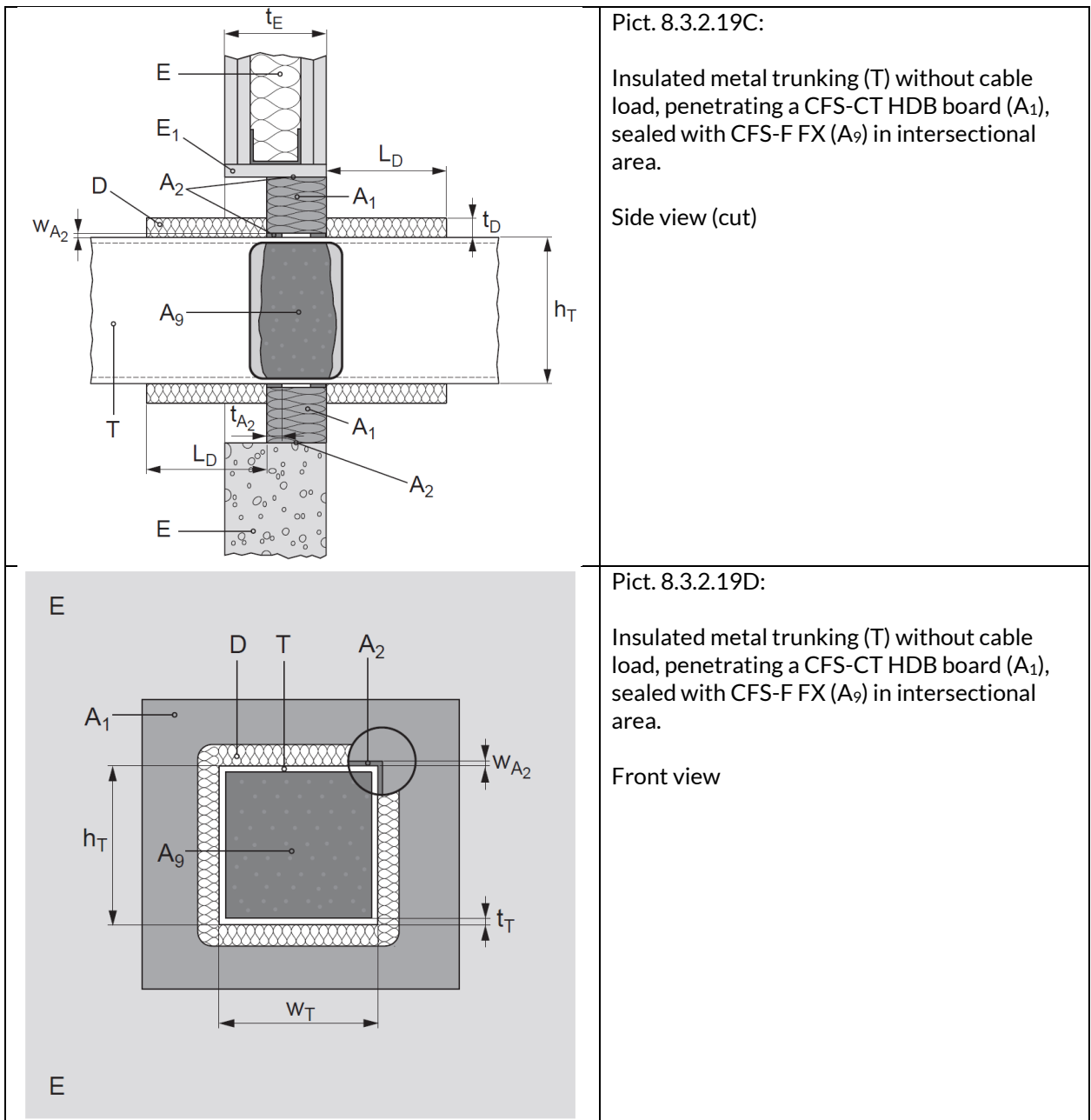


Figure 72: Insulated metal trunking without cable load, penetrating a CFS-CT HDB seal.

For symbols and abbreviations refer to section 10 within this document.

8.3.2.19.1 Metal trunkings, penetrating a CFS-CT HDB seal

Classification

Penetrant	Classification
Empty and filled metal trunking according 8.3.2.19	EI 60

Figure 73: Leertabelle für kommende trunking-Ergebnisse

8.3.2.20 Plastic channel, penetrating a CFS-CT HDB board

Construction details:

- Single penetration seal

Plastic channel:

- Material: PVC
- Empty
- In U/U or U/C end configuration
- Rectangular form
- Width: $w_G \leq 220$ mm
- High: $h_G \leq 90$ mm
- Wall thickness: $t_G \leq 1,9$ mm
- Non-insulated

Channel closure

- To be sealed on both sides with CFS-C EL
- One layer, construction group 1
- CFS-C EL to be fixed in CFS-CT HDB using threaded rod M8 with nut and washer

Gap closure:

- Plastic channel gap seal to be done with CFS-S ACR (A₂)
- Width $w_{A2} = 3$ mm
- depth $t_{A2} = 10$ mm from both sides

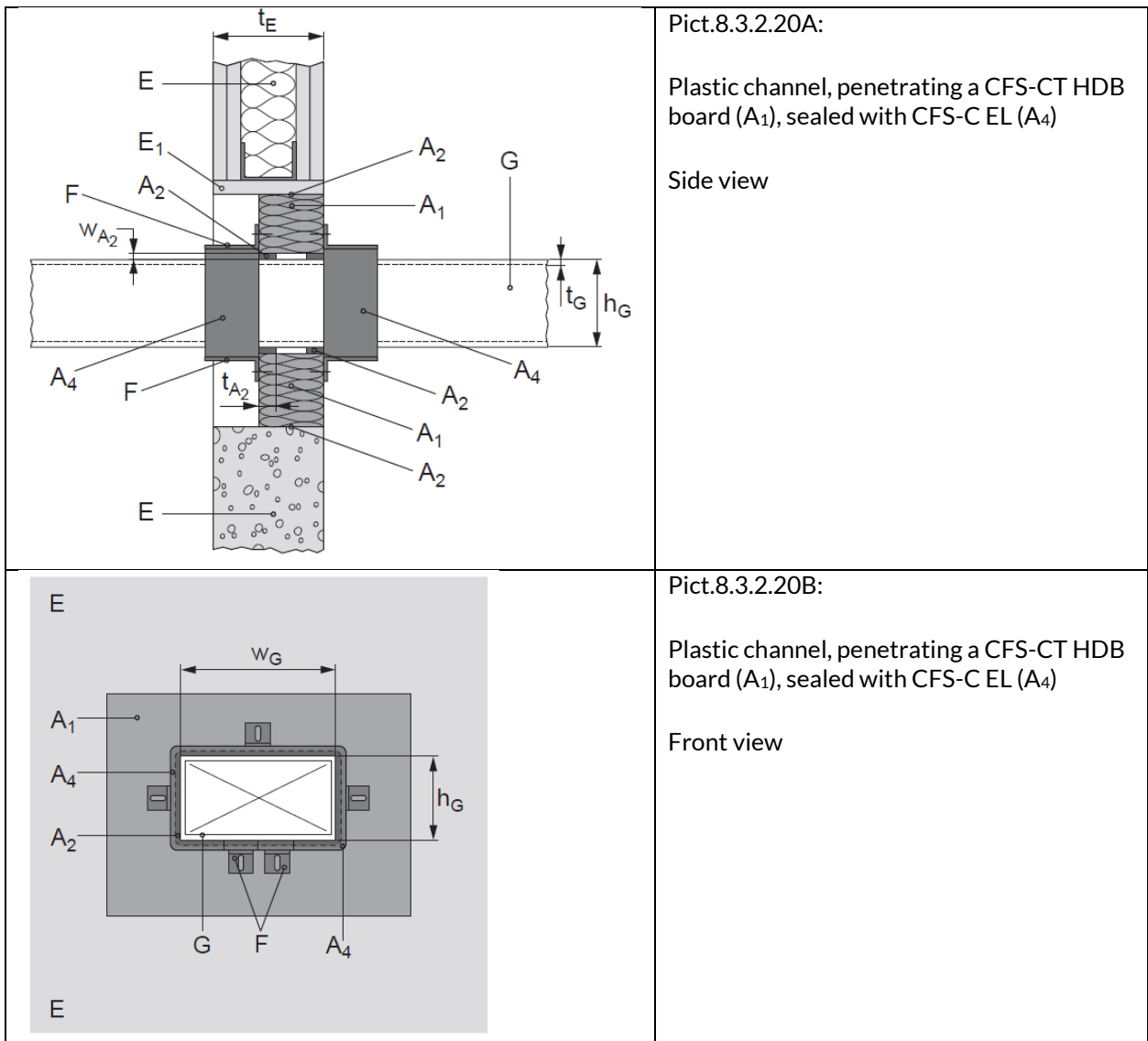


Figure 74: Plastic channel, penetrating a CFS-CT HDB board, sealed with CFS-C EL

For symbols and abbreviations refer to section 10 within this document.

8.3.2.20.1 Plastic channel, penetrating a CFS-CT HDB board, sealed with CFS-C EL

Classification

Penetrant	Classification
Plastic channel according 8.3.2.20	EI 60-U/U

Figure 75: Classification for sealed plastic channel in CFS-CT HDB-board

8.4 Rigid floor seals made of Hilti CFS-CT HDB board

All classification is valid for seals made in rigid floor if:

- Thickness of support construction $t_E \geq 150$ mm and
- Density of support construction $\rho_E \geq 550$ kg/m³
- Floor is made of concrete, aerated concrete or masonry

8.4.1 Specific characteristics for seals made of CFS-CT in rigid floors

8.4.1.1 Position of CFS-CT HDB board in floor opening

Construction details:

- Hilti Firestop Board CFS-CT HDB (A₁) of thickness t_{A1} tightly to fit into the opening of the floor (E).
- CFS-CT HDB to be installed in any horizontal position, refer to Figure 76
- Contact phase between board (A₁) and support construction (E) should be covered by a thin film of CFS-S ACR, flush with both sides of (A₁), width $w_{A1} = (1-5)$ mm

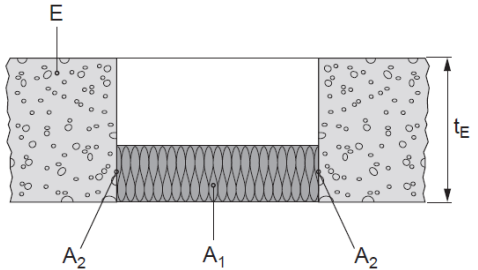
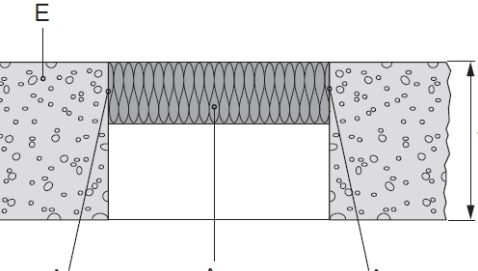
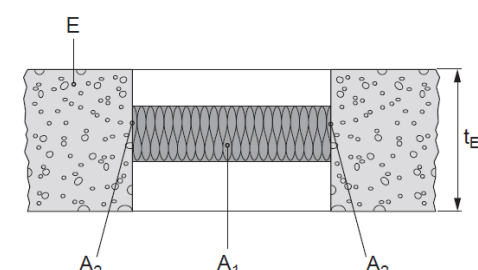
	<p>Pict. 8.4.1.1.A: CFS-CT HDB (A₁) installation in rigid floor</p>
	<p>Pict. 8.4.1.1.B: CFS-CT HDB (A₁) installation in rigid floor</p>
	<p>Pict. 8.4.1.1.C: CFS-CT HDB (A₁) installation in rigid floor</p>

Figure 76: Position of CFS-CT HDB board seal in rigid floors

8.4.1.2 Maximum seal size and blank seal size in rigid floors

Maximum seal size:

	Classification seal:	Max.seal size: w x h (mm x mm)
Floor penetrations	EI 60	1000 x 800

Figure 77: Classification for maximum seal size CFS-CT HDB in floors

8.4.1.3 Minimum distances for penetrants and seals in floors

- Minimum distance between two CFS-CT HDB-seals is $\geq 100\text{mm}$
- Minimum distance between CFS-CT HDB-seal and other fire rated seals (fire doors, dampers, etc) is $\geq 200\text{mm}$
- For distances of several penetrants within one CFS-CT HDB seal refer to Figure 78.

The distances are valid for single, multiple, and mixed penetrations in rigid floor. Some specific distances might vary, will be even smaller. For detailed information check the appropriate chapter in section 8.

Minimum distance (mm) in between:	Cables	Cable support	Tied cable bundle	Conduit $\lt; \varnothing 16 \text{ mm}$	Conduit >math>\geq \varnothing 16 \text{ mm}</math>	Tied conduit bundle	Metal pipe with combustible insulation	Metal pipe with non-combustible insulation	Plastic pipe	Al-comp. pipe, non-insulated	Al-comp. Pipe with combustible insulation	Al-comp. Pipe with non-combustible insulation	Clima Split bundle (HVAC supply)	Side seal edge
Cables	0	0	0	0	0	50	50	50	50	50	50	50	50	0
Cable support		0	0	50	50	50	50	50	50	50	50	50	50	0
Tied cable bundle			0	0	0	50	50	50	50	50	50	50	50	0
Conduit $\lt; \varnothing 16 \text{ mm}$				0	0	50	50	50	50	50	50	50	50	50
Conduit >math>\geq \varnothing 16 \text{ mm}</math>					0	50	50	50	50	50	50	50	50	50
Tied conduit bundle						50	50	50	50	50	50	50	50	50
Metal pipe with combustible insulation							50	50	50	50	50	50	50	50
Metal pipe with non-combustible insulation								50	50	50	50	50	50	50
Plastic pipe									50	50	50	50	50	50
Al-comp. pipe, non-insulated										50	50	50	50	50
Al-comp. pipe with combustible insulation											50	50	50	50
Al-comp. Pipe with non-combustible insulation												50	50	50
Clima Split bundle (HVAC-bundle)													50	50

Figure 78: Minimum distances for penetrants in CFS-CT HDB in floor application

8.4.2 Resistance to fire classification for penetrants in rigid floor

8.4.2.1 Cable seal – cables with mineral wool insulation

Construction details:

- Multiple cable penetration

Cables:

- All types commonly used in building practice in Europe,
- Glass fibre cables included
- Cable diameter $d_R \leq 80$ mm,
- For coaxial cables only: Cable diameter $d_R \leq 28$ mm
- Non-sheated cables and waveguides up to diameter $d_R \leq 24$ mm
- Tied cable bundle $d_{RB} \leq 100$ mm for max. cables diameter $d_R \leq 21$ mm
- Insulation requested

Conduits:

- Rigid plastic and metal conduits diameter $d_{RC} \leq 16$ mm
- For metal conduits: C/U-end configuration
- For plastic conduits : U/C-end configuration
- Insulation requested

Cable support:

- Material steel, perforated and non-perforated, with and without organic coating
- Covered types: tray, basket and ladder
- Dimension: no limitation
- Insulation requested

Insulation

- To be done with mineral wool, type Rockwool Klimarock
- Insulation type LI,
- Length $L_D \geq 200$ mm,
- Thickness $t_D \geq 30$ mm

Gap closure:

- Penetrants to be sealed with CFS-S ACR (A₂), $w_{A2} = (1-5)$ mm, $t_{A2} = 10$ mm
- Required

<p>The diagram shows a vertical cable (R) passing through a horizontal concrete slab (E). The cable is surrounded by local insulation (D) with thickness t_D. The insulation is sealed with CFS-SACR (A2) in CFS-CT HDB (A1). The seal has a length L_D and a width w_{A2}. The concrete slab has a thickness t_E. The seal is shown in two cross-sections: one showing the cable (R) and the seal (A2) in the concrete (A1), and another showing the seal (A2) in the concrete (A1) without the cable.</p>	<p>Pict.8.4.2.1 A: Single penetration cable seal (R) with local insulation (D), sealed with CFS-SACR (A₂) in CFS-CT HDB (A₁)</p>
<p>The diagram shows a vertical cable bundle (RB) passing through a horizontal concrete slab (E). The cable bundle is surrounded by local insulation (D) with thickness t_D. The insulation is sealed with CFS-SACR (A2) in CFS-CT HDB (A1). The seal has a length L_D and a width w_{A2}. The concrete slab has a thickness t_E. The seal is shown in two cross-sections: one showing the cable bundle (RB) and the seal (A2) in the concrete (A1), and another showing the seal (A2) in the concrete (A1) without the cable bundle.</p>	<p>Pict. 8.4.2.1 B: Cable seal / tied cable bundle (RB) with local insulation (D), sealed with CFS-SACR (A₂) in CFS-CT HDB (A₁)</p>

Figure 79: Cable and bundle seal, insulated with mineral wool in CFS-CT HDB board

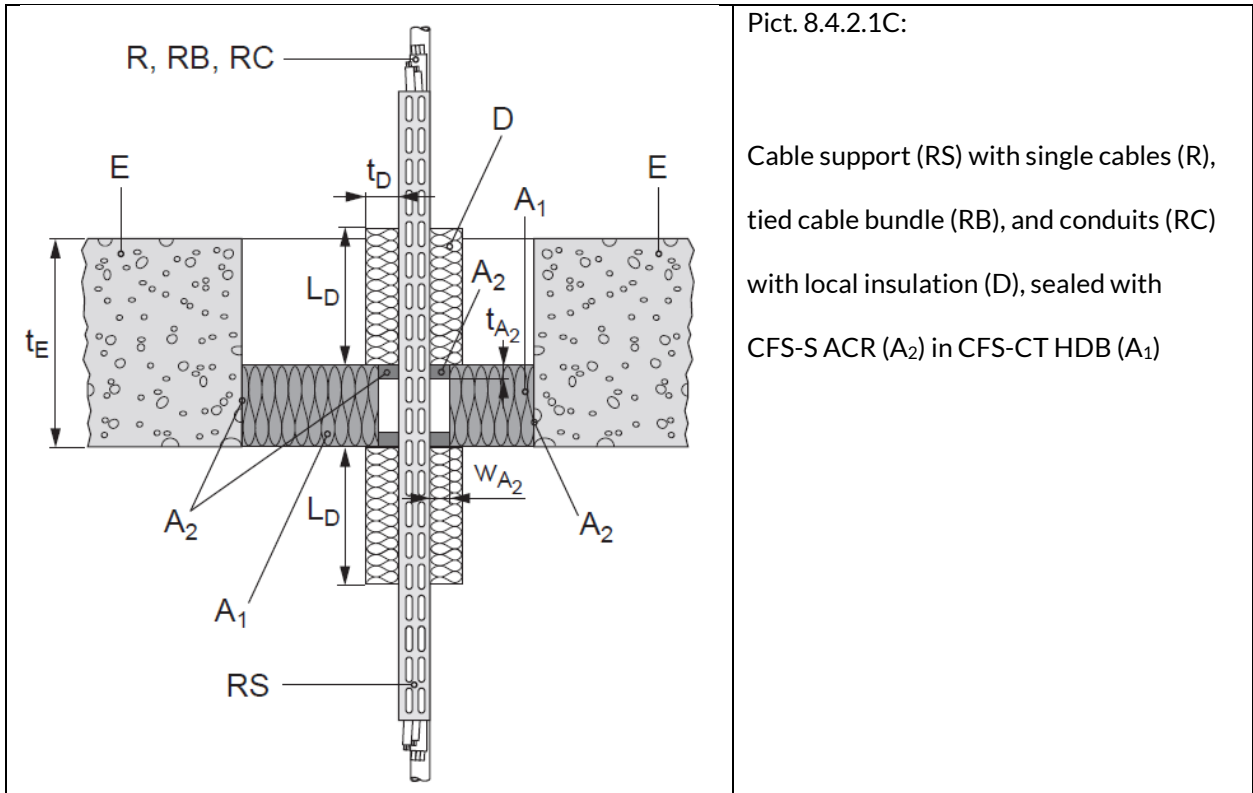


Figure 80: : Cable support with cables,bundle and conduits, insulated with mineral wool in CFS-CT HDB board

For symbols and abbreviations refer to section 10 within this document.

Type of penetrant	Classification
Single cables	EI 60
Single coaxial cables	EI 60
Cable carrier	EI 60
Cable bundle, Rigid plastic/metal conduits Non-sheathed cables (wires)	EI 30, E 60

Figure 81: Classification for cables/carriers/tied bundles/conduits in CFS-CT HDB board

8.4.2.2 Cable seal with CFS-CT insulation in CFS-CT HDB

Construction details:

- Multiple cable penetration

Cables:

- Cable all types commonly used in building practice in Europe, for diameter d_R see classification below
- For coaxial cables only: Cable diameter $d_R \leq 28$ mm
- Non-sheathed cables diameter $d_R \leq 24$ mm
- Waveguides not covered
- Tied cable bundle $d_{RB} \leq 100$ mm for single cables $d_R \leq 21$ mm
- Insulation requested

Conduits:

- Rigid plastic and metal conduits diameter $d_{RC} \leq 16$ mm
- End-configuration for metal conduits: C/U,
- End-configuration for plastic conduits: U/C
- Insulation requested

Cable support:

- Can penetrate the seal
- Covered types: tray, basket and ladder
- Material steel, perforated and non-perforated, with and without organic coating
- Dimension: no limitation
- Insulation requested

Insulation:

- To be done with Hilti Firestop coating CFS-CT
- Insulation type LI, length $L_D \geq 350$ mm, thickness $t_D \geq 1,0$ mm

Gap closure:

- Penetrants to be sealed with CFS-S ACR (A_2), $w_{A2} = (1-5)$ mm, $t_{A2} = 10$ mm

Type of penetrant	Classification
Single cables up to diameter $d_R \leq 21$ mm	EI 60
Single cables up to diameter d_R ($21 \text{ mm} < d_R \leq 80$ mm)	EI45, E 60
Single coaxial cables	EI45, E 60
Cable bundle	EI45, E 60
Rigid plastic and metal conduits	EI 30, E 60
Cable support	EI 60
Non-sheathed cables	EI45, E 60

Figure 82: Classification for cables/bundles/carriers/conduits penetrating a CFS-CT HDB board

	<p>Pict.8.4.2.2A:8.3.2.3</p> <p>Single penetration cable seal with local insulation (D), sealed with CFS-S ACR (A2) in CFS-CT HDB (A1)</p>
	<p>Pict.8.4.2.2.B:</p> <p>Cable (R) seal / tied cable bundle (RB) with local insulation (D), sealed with CFS-S ACR (A2) in CFS-CT HDB (A1),</p> <p>Distance $s \geq 0$mm between cables</p>

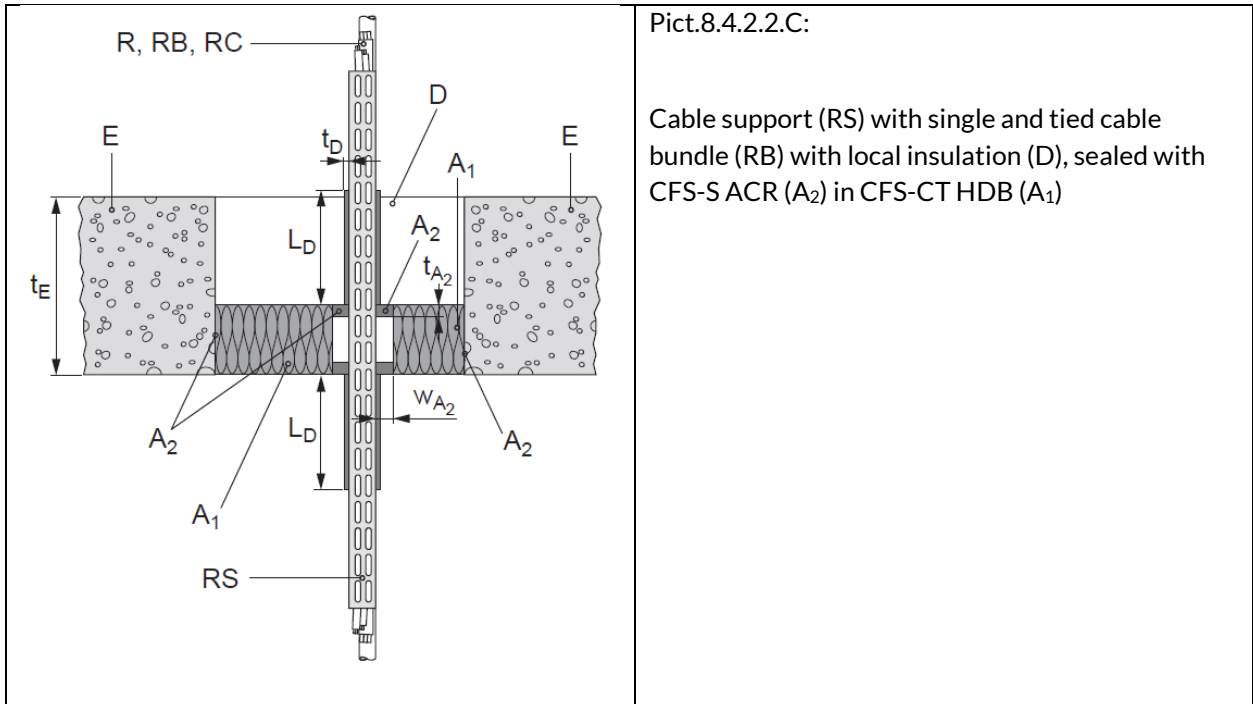


Figure 83: Cable seal, insulated with CFS-CT in CFS-CT HDB board

For symbols and abbreviations refer to section 10 within this document.

8.4.2.3.1 Plastic pipe seal for PE-pipes, sealed with CFS-C EL in CFS-CT HDB

Classification shown in Figure 85 is valid for pipes made from:

- PE according to EN 1519-1, EN 12666-1, EN 12201-2 or EN 15494
- PE-X according to EN ISO 15875-2
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to EN 1565-1

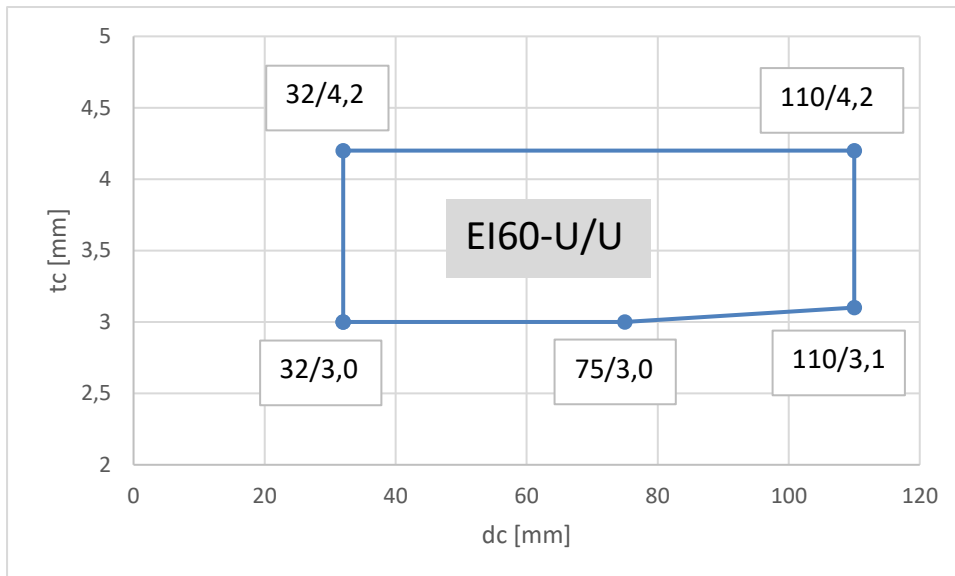


Figure 85: Classified pipe range for pipes made of PE, sealed with CFS-C EL in CFS-CT HDB

For installation details refer to Pict. 8.4.2.3.

8.4.2.3.2 Plastic pipe seal for Geberit Silent dB 20 pipes, sealed with CFS-C EL in CFS-CT HDB

Classification shown in Figure 86 is valid for Geberit Silent dB20 pipes only.

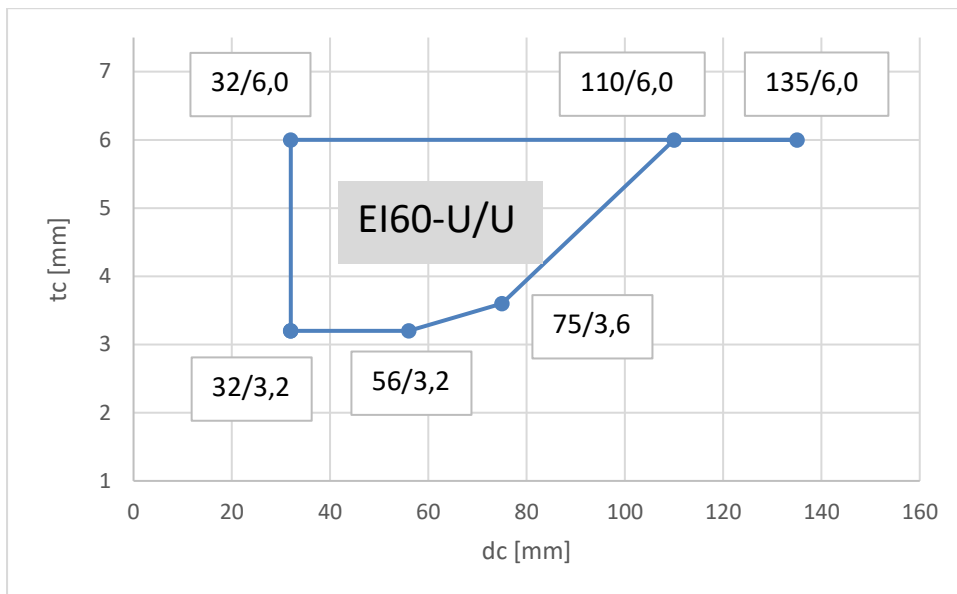


Figure 86: Classified pipe range for Geberit Silent dB20, sealed with CFS-C EL in CFS-CT HDB

For installation details refer to Pict. 8.4.2.3.

8.4.2.3.3 Plastic pipe seal for single layer PVC pipes

Classification shown in Figure 87 is valid for :

- PVC-U pipes acc. EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2.
- Carefully consider disclaimer in section 8.2.11

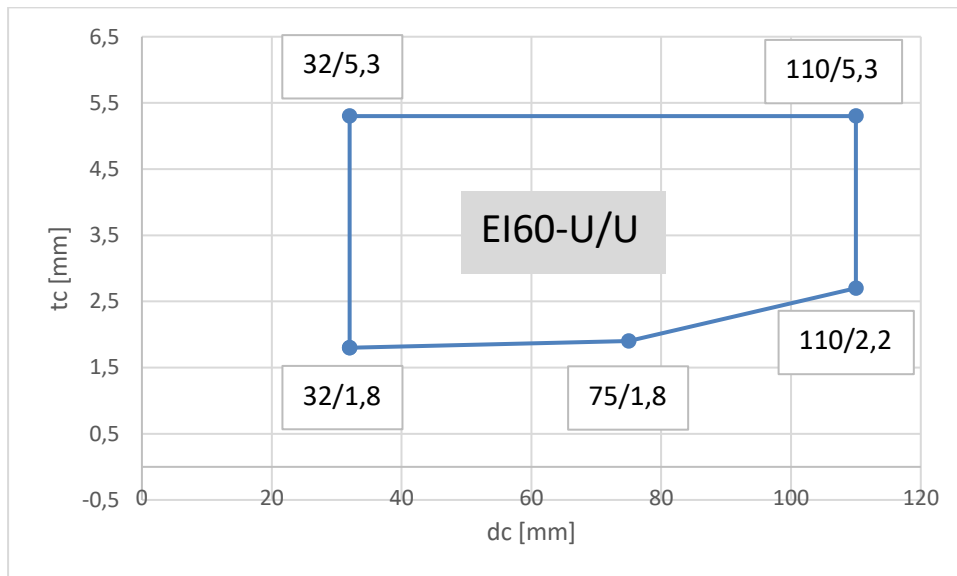


Figure 87: Classified pipe range for PVC-pipes, sealed with CFS-C EL in CFS-CT HDB

For installation details refer to Pict. 8.4.2.3.

8.4.2.3.4 Plastic pipe seal for single layer PP-pipes

Classification shown in Figure 88 is valid for single layer PP pipes acc. EN 1451-1, EN ISO 15874 and EN ISO 15494.

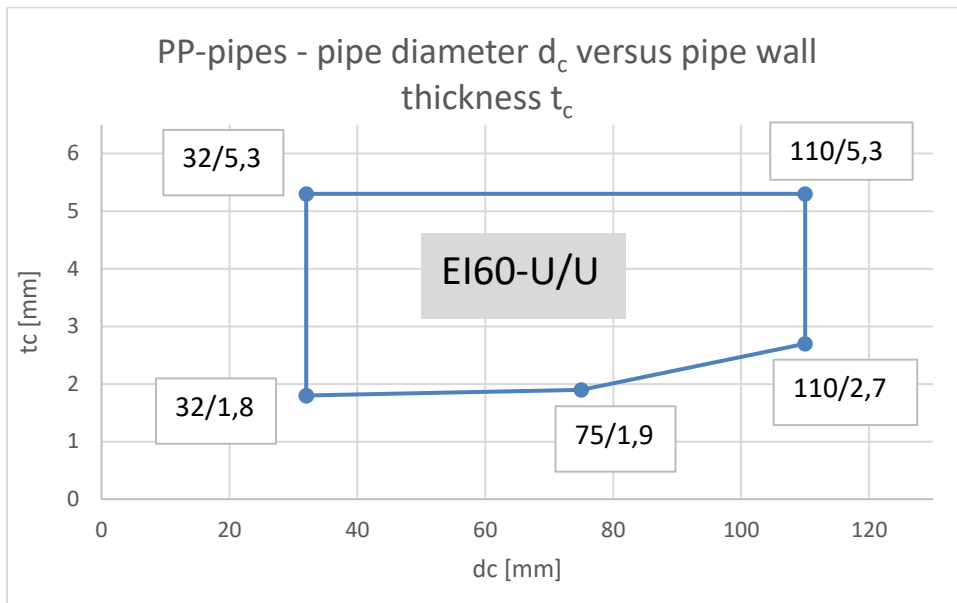


Figure 88: Classified pipe range for PP-pipes, sealed with CFS-C EL in CFS-CT HDB

For installation details refer to Pict. 8.4.2.3.

8.4.2.3.5 Plastic pipe seal for multi layer PP-pipes

Classification shown in Figure 89 is valid for multi layer PP pipes (non-regulated). For brands and manufacturer refer to 8.2.9.

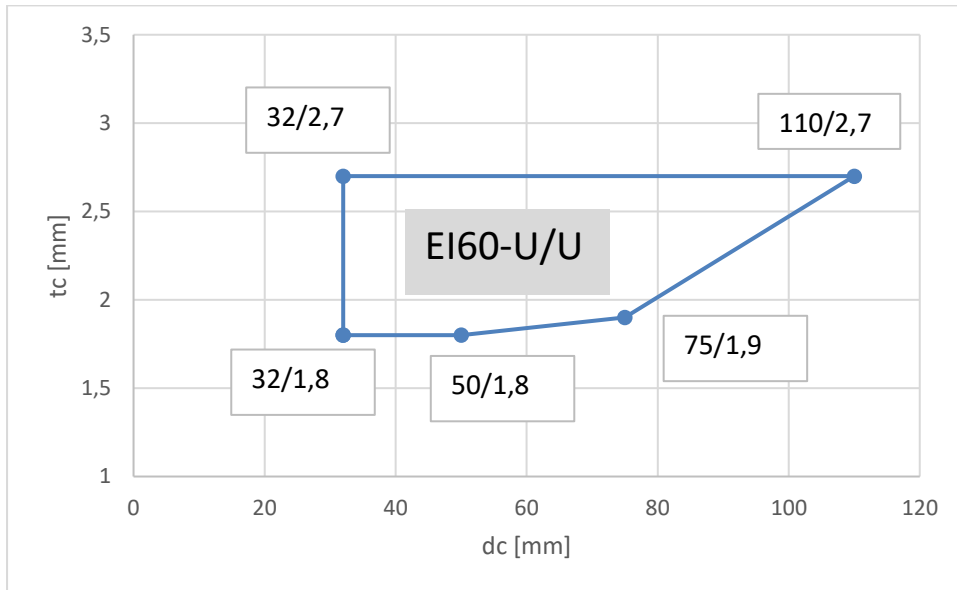


Figure 89: Classified pipe range for multi-layer PP-pipes, sealed with CFS-C EL in CFS-CT HDB

For installation details refer to Pict. 8.4.2.3.

8.4.2.4 Plastic pipe seal with CFS-C P in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration

Insulation:

- No insulation, no acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with one collar CFS-C P,
- Construction group (collar size) according to penetrating pipe, refer to refer to ETA-10/0404
- Collar to be mounted only on soffit, below floor
- Number and positioning of hooks F: refer to ETA-10/00404
- Collar fixing with threaded rod M6 with nut and washer, penetrating the board A₁

Gap closure:

- Penetrant gap seal to be done with CFS-S ACR (A₂), $w_{A_2} = (1-5)$ mm, $t_{A_2} = 10$ mm

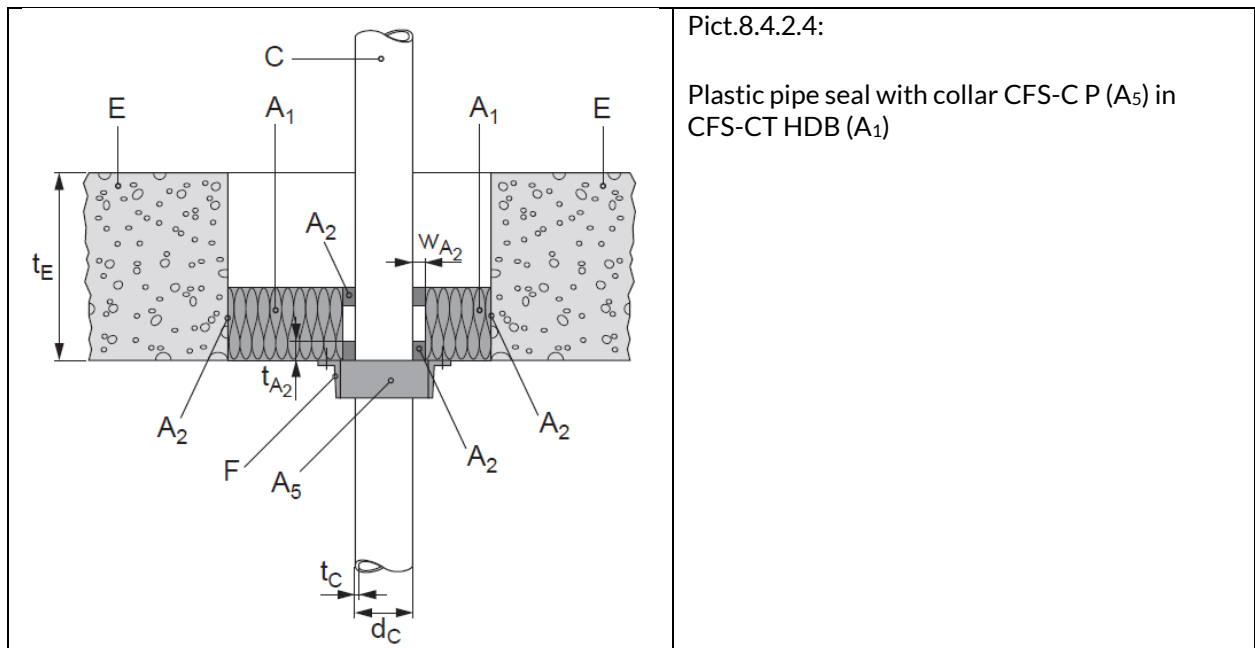


Figure 90: Plastic pipe seal with CFS-C P in CFS-CT HDB in floor application

For symbols and abbreviations refer to section 10 within this document.

8.4.2.4.1 PE-pipes sealed with CFS-C P

Classification shown in Figure 91 valid for single layer

- PE-pipes according to EN 1519-1, EN 12666-1 and EN ISO 15494
- PE-X-pipes according to EN ISO 15875-2
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to ISO 19220

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
110	4,3	CFS-C P 110/4"	EI 60-U/U
125	4,82	CFS-C P 125/5"	EI 30-U/U

Figure 91: Classified PE, PE-X, ABS,SAN+PVC-pipes, sealed by CFS-C P in CFS-CT HDB

8.4.2.4.2 Single layer PVC-pipes, sealed with CFS-C P in CFS-CT HDB

Classification shown in Figure 92 is valid for

- PVC-U pipes acc.EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2.

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
160	3,2	CFS-C P 160/6"	EI 30-U/U

Figure 92: Classified pipe range for PVC-pipes, sealed with CFS-C P

Carefully consider the disclaimer mentioned in section 8.2.11

8.4.2.4.3 Multi-layer PP -pipes, sealed with CFS-C P in CFS-CT HDB

Classification shown in Figure 93 is valid for non-regulated PP-pipes

- For pipe brands and manufacturer refer to section 8.2.9

Pipe diameter	Pipe wall thickness	CFS-C P collar	Classification
d _c (mm)	t _c (mm)	size	
125	3,1 - 5,3	CFS-C P 160/6"	EI 60-U/U
160	3,9	CFS-C P 160/6"	EI 60-U/U

Figure 93: Classified pipe range formMulti-layer PP -pipes, sealed with CFS-C P in CFS-CT HDB

For installation details refer to Pict.8.4.2.4

8.4.2.5 Plastic pipe seal with CFS-IS in CFS-CT HDB

Construction details:

Pipe:

- Single and multiple pipe penetration

Insulation:

- No insulation, no acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant
- For dimension see relevant classification chapter

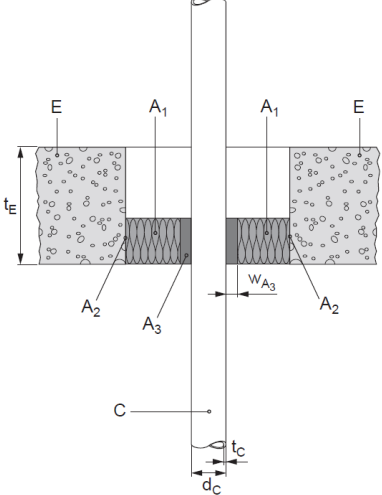
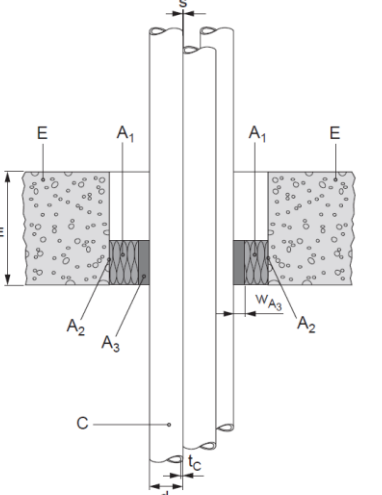
	<p>Pict.8.4.2.5.A:</p> <p>Plastic pipe seal with CFS-IS (A_3) in CFS-CT HDB (A_1)</p>
	<p>Pict.8.4.2.5.B:</p> <p>Bundle of plastic pipes, sealed with CFS-IS (A_3) in CFS-CT HDB (A_1)</p> <p>Distance s between the pipes in bundle $\geq 0\text{mm}$</p>

Figure 94: Plastic pipe seal with CFS-IS in CFS-CT HDB in rigid floor

For symbols and abbreviations refer to section 10 within this document.

8.4.2.5.1 PE-pipe seal with CFS-IS in CFS-CT HDB

Classification shown in Figure 95 is valid for pipes made from :

- PE according to EN 1519-1, EN 12666-1, EN 12201-2 or EN 15494
- PE-X according to EN ISO 15875-2
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to EN 1565-1
- Penetrant gap seal to be done with CFS-IS (A_3), $w_{A3} = 15\text{mm}$, depth = over entire thickness A_1

Pipe diameter	Pipe wall thickness	Classification
d_c (mm)	t_c (mm)	
≤ 40	3,0	EI 60-U/U
≤ 50	3,0	EI 60-U/C

Figure 95: Classified pipe range for PE-pipe seal with CFS-IS in CFS-CT HDB

8.4.2.5.2 Single layer PVC-pipe seal with CFS-IS in CFS-CT HDB

Classification shown in Figure 96 is valid for:

- PVC-U pipes acc. EN 1452-2, EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes acc. EN 1566-1, EN ISO 15493 and EN ISO 15877-2.
- Penetrant gap seal to be done with CFS-IS (A_3), $w_{A3} = 15\text{mm}$, depth = over entire thickness A_1
- Carefully consider the disclaimer in section 8.2.11

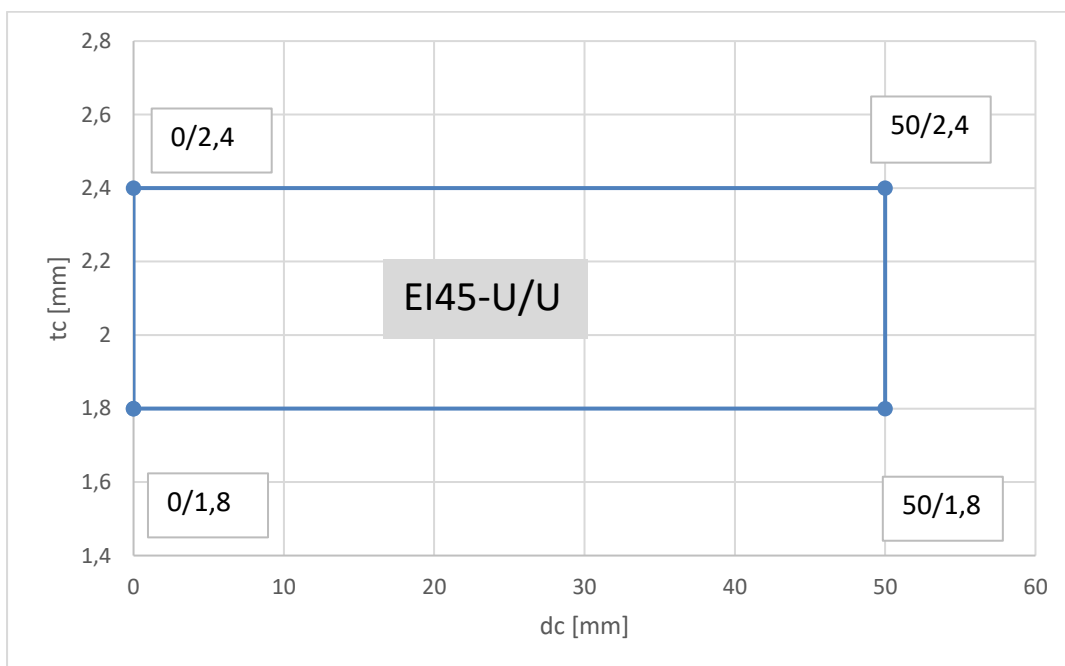


Figure 96: Classified pipe range for single layer PVC-pipe seal with CFS-IS in CFS-CT HDB

For installation details refer to Pict.8.4.2.5.A

8.4.2.5.3 Single-layer PP-RCT pipe seal with CFS-IS in CFS-CT HDB

Classification shown in Figure 97 is valid for:

- PP-RCT pipes according to EN ISO 15874
- Brand: Type Uni, FV-Plast
- Penetrant gap seal to be done with CFS-IS (A_3), $w_{A3} = (7-8)$ mm, depth = over entire thickness A_1

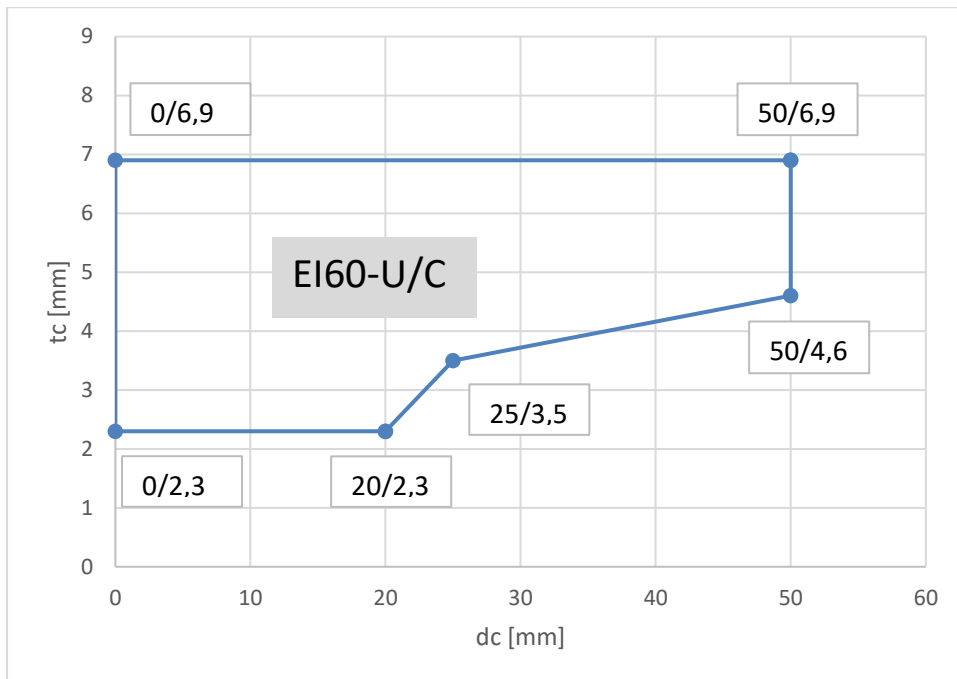


Figure 97: Classified pipe range for PP-RCT pipes according to EN ISO 15874

For installation details refer to Pict.8.4.2.5.A

8.4.2.5.4 Bundle of PP-RCT pipe seal with CFS-IS in CFS-CT HDB

Classification shown in Figure 98 is valid for:

- PP-RCT pipes according to EN ISO 15874
- Brand: Type Uni and Type Hot, FV Plast
- Outside bundle diameter: $\leq 80\text{mm}$
- Bundle might consist of either identical approved pipes, or mixtures of them

Penetrant gap seal to be done with CFS-IS (A₃), $w_{A3} = (7-8)$ mm, depth = over entire thickness A₁

Pipe diameter	Pipe wall thickness	Classification
d_c (mm)	t_c (mm)	
≤ 20	2,3	EI 60-U/C
≤ 25	3,5	EI 60-U/C
≤ 50	4,6	EI 60-U/C

Figure 98: Classified pipe range for PE-pipe seal with CFS-IS in CFS-CT HDB

For installation details refer to Pict.8.4.2.5.B

8.4.2.6 Plastic pipes, penetrating a CFS-CT HDB board, sealed with CFS-B

Construction details:

Pipe:

- Single pipe penetration
- For pipe material and pipe-end configuration see classification section

Insulation:

- No insulation, no acoustic pipe decoupling on pipe

Pipe closure:

- Pipe seal with two layers of CFS-B

Gap closure

- Penetrant gap seal with CFS-S ACR
- Gap seal width (w_{A2}): (1 – 5) mm, depth (t_{A2}): 10 mm from both sides

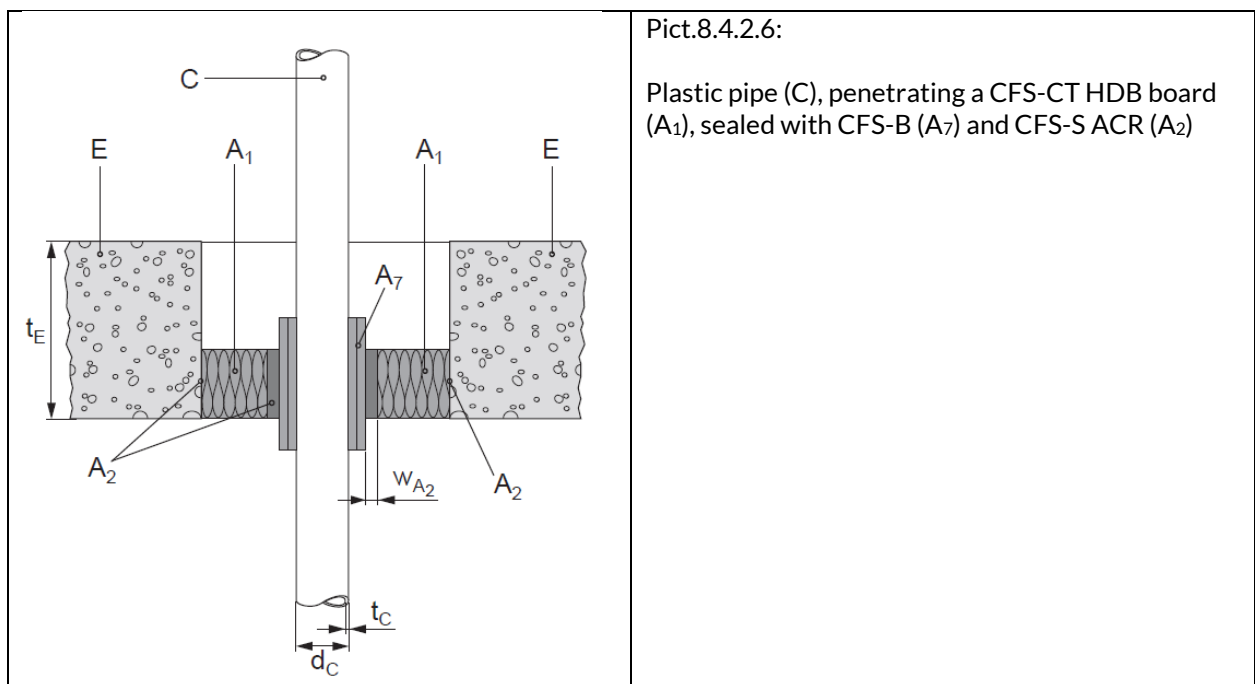


Figure 99: Plastic pipe, penetrating a CFS-CT HDB board, sealed with CFS-B

For symbols and abbreviations refer to section 10 within this document.

8.4.2.6.1 PE, PE-X, ABS, SAN+PVC-pipes sealed with CFS-B in CFS-CT HDB board

Classification shown in Figure 100 is valid for:

- PE-pipes according to EN 1519-1, EN 12666-1, EN 12201-2, EN ISO 15494
- PE-X pipes according to EN ISO 15875-2
- ABS-pipes according to EN 1455-1 and EN ISO 15493
- SAN+PVC-pipes according to ISO 19220
- Pipe-end configuration: U/C

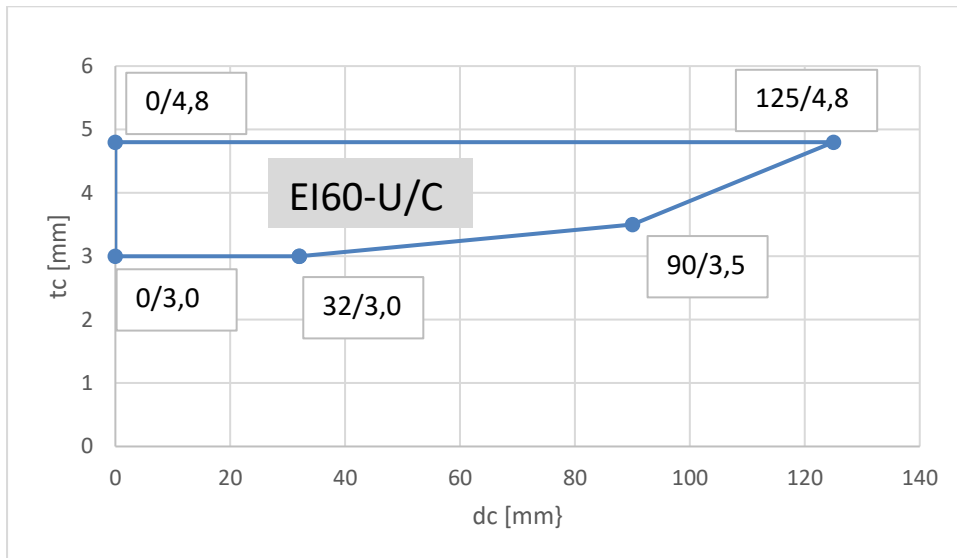


Figure 100: Classified range for Plastic pipe seal (PE, PE-X, ABS, SAN+PVC) with CFS-B in CFS-CT HDB

For installation details refer to Pict.8.4.2.6

8.4.2.6.2 PVC-pipes sealed with CFS-B in CFS-CT HDB board

Classification shown in Figure 101 is valid for:

- PVC-U pipes according to EN 1329-1, EN 1453-1, EN ISO 15493, EN ISO 1452-2
- PVC-C pipes according to EN 1566-1, EN ISO 15493, EN ISO 15877-2
- Carefully consider disclaimer in section 8.2.11
- Pipe-end configuration: U/C

Pipe diameter	Pipe wall thickness	Classification
d_c (mm)	t_c (mm)	
≤ 32	1,6	EI 60-U/C

Figure 101: PVC-pipes, sealed with CFS-B in CFS-CT HDB

Classification shown in Figure 102 is valid for:

- PVC-U pipes according to DIN 8061 and DIN 8062
- PVC-C brand and manufacturer: Dekadur by Georg Fischer
- Carefully consider disclaimer in section 8.2.11
- Pipe-end configuration: U/C

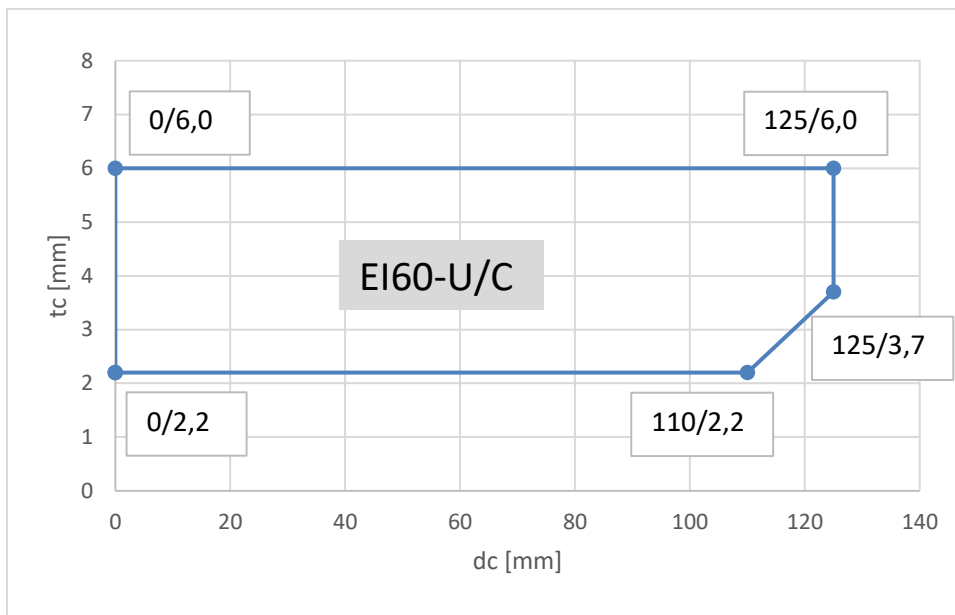


Figure 102: Clasified range for PVC-pipes, sealed with CFS-B in CFS-CT HDB

For installation details refer to Pict.8.4.2.6

8.4.2.6.3 PP-pipes, sealed with CFS-B in CFS-CT HDB board

Classification shown in Figure 103 is valid for:

- PP-pipes according to EN 1451-1, EN ISO 15874 and EN ISO 15494
- Pipe-end configuration: U/C

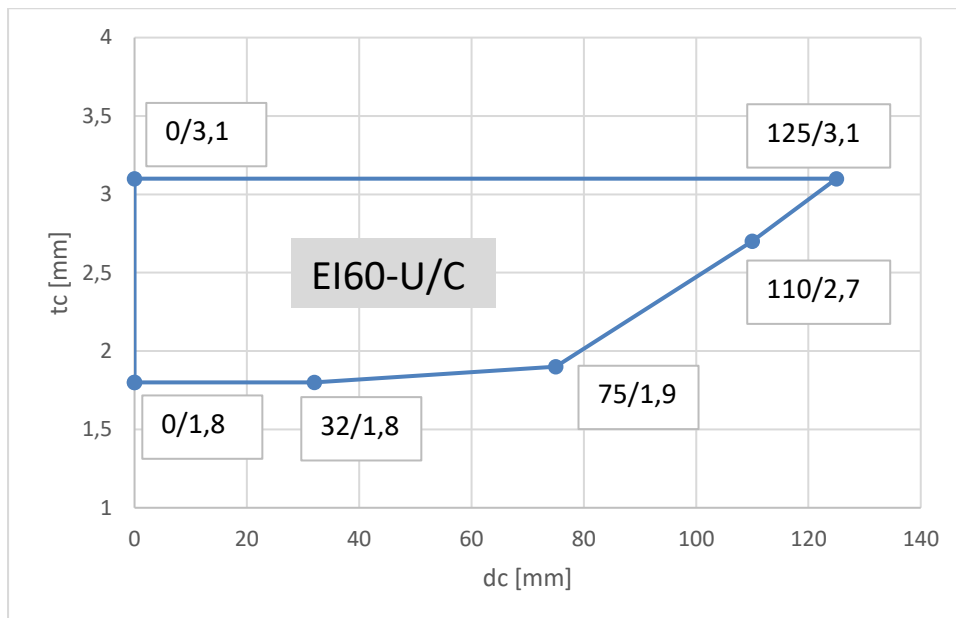


Figure 103: Classified range for PP-Pipes, sealed by CFS-B in CFS-CT HDB

For installation details refer to Pict.8.4.2.6

8.4.2.7 Plastic pipes, insulated, penetrating a CFS-CT HDB board, sealed with CFS-B

Construction details:

Pipe:

- Single pipe penetration
- For pipe material and pipe-end configuration see classification section

Insulation:

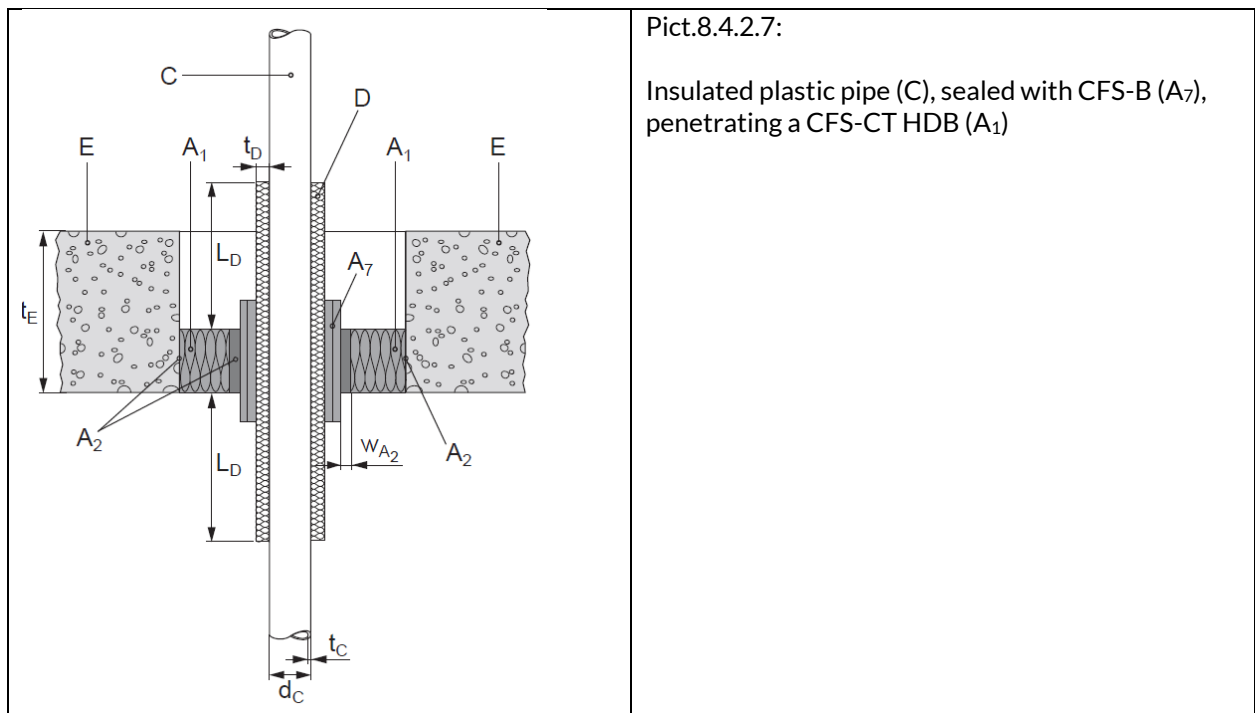
- With insulation in LS situation
- For insulation material and insulation thickness refer to classification section

Pipe closure:

- Pipe seal with two layers of CFS-B

Gap closure:

- Penetrant gap seal with CFS-S ACR
- Gap seal width (w_{A2}): (1 – 5) mm, depth (t_{A2}): over entire thickness A_1



Pict.8.4.2.7:

Insulated plastic pipe (C), sealed with CFS-B (A7), penetrating a CFS-CT HDB (A1)

Figure 104: Insulated plastic pipes, penetrating a CFS-CT HDB board, sealed with CFS-B

For symbols and abbreviations refer to section 10 within this document.

8.4.2.7.1 PP-RCT pipes, insulated, sealed with CFS-B in CFS-CT HDB board

Classification shown in Figure 105 is valid for:

Pipe:

- PP-RCT pipes according to EN ISO 15874
- Brand and manufacturer: FV Plast, Type Hot and Uni
- Pipe-end configuration: U/U

Insulation:

- Material: foamed polyethylene (PE), type Tubex Standard
- Thickness: ($6 \leq t_D \leq 10$) mm
- Insulation case: LS
- Length: $L_D \geq 220$ mm on both sides of the seal

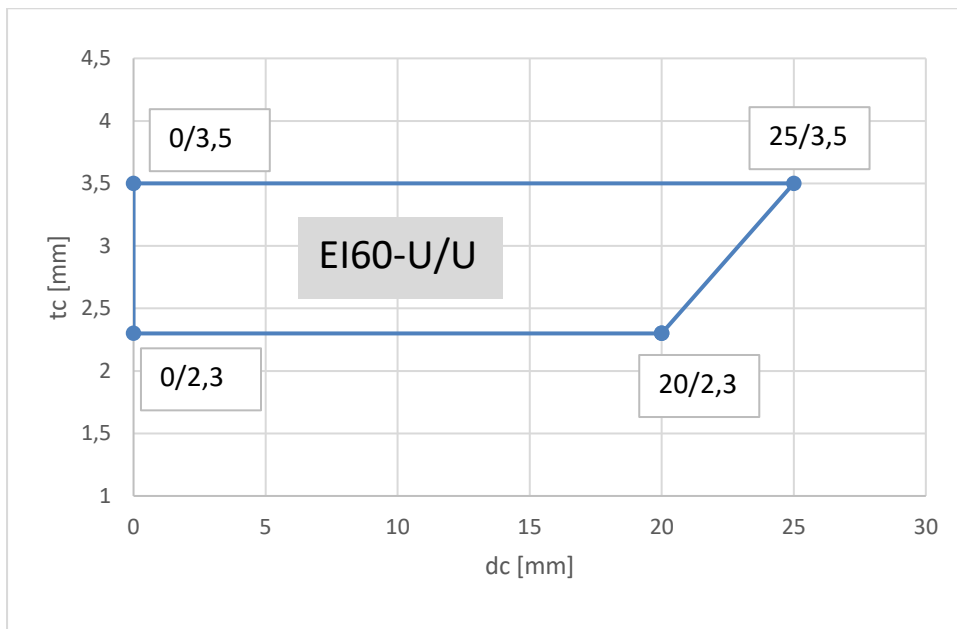


Figure 105: Classified range for insulated PP-RCT-pipes, penetrating a CFS-CT HDB board, sealed with CFS-B

For installation details refer to Pict.8.4.2.7

Classification shown in Figure 106 is valid for:

Pipe:

- PP-RCT pipes according to EN ISO 15874
- Brand and manufacturer: FV Plast, Type Hot and Uni
- Pipe-end configuration: U/U

Insulation:

- Material: foamed polyethylene (PE), type Tubex Standard
- Thickness: ($t_D \cong 10$) mm
- Insulation case: LS
- Length: $L_D \geq 220$ mm on both sides of the seal

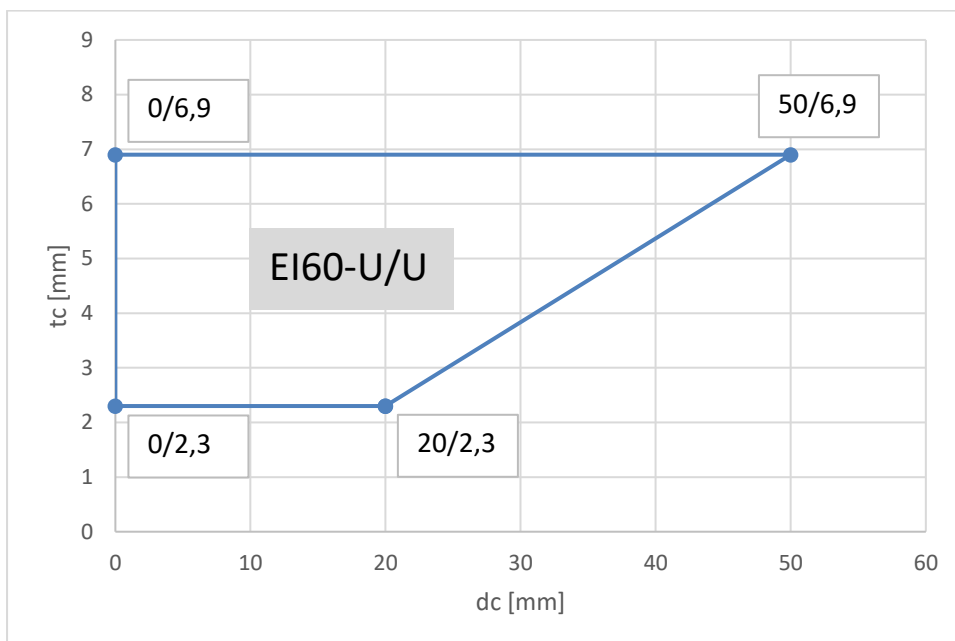


Figure 106: Classified range for insulated PP-RCT-pipes, sealed by CFS-B in CFS-CT HDB

For installation details refer to Pict.8.4.2.7

Classification shown in Figure 107 is valid for:

Pipe:

- PP-RCT pipes according to EN ISO 15874
- Brand and manufacturer: FV Plast, Type Hot and Uni
- Pipe-end configuration: U/U

Insulation:

- Material: foamed polyethylene (PE), type Tubex Standard
- Thickness: $t_D = (10-15)$ mm
- Insulation case: LS
- Length: $L_D \geq 220$ mm on both sides of the seal

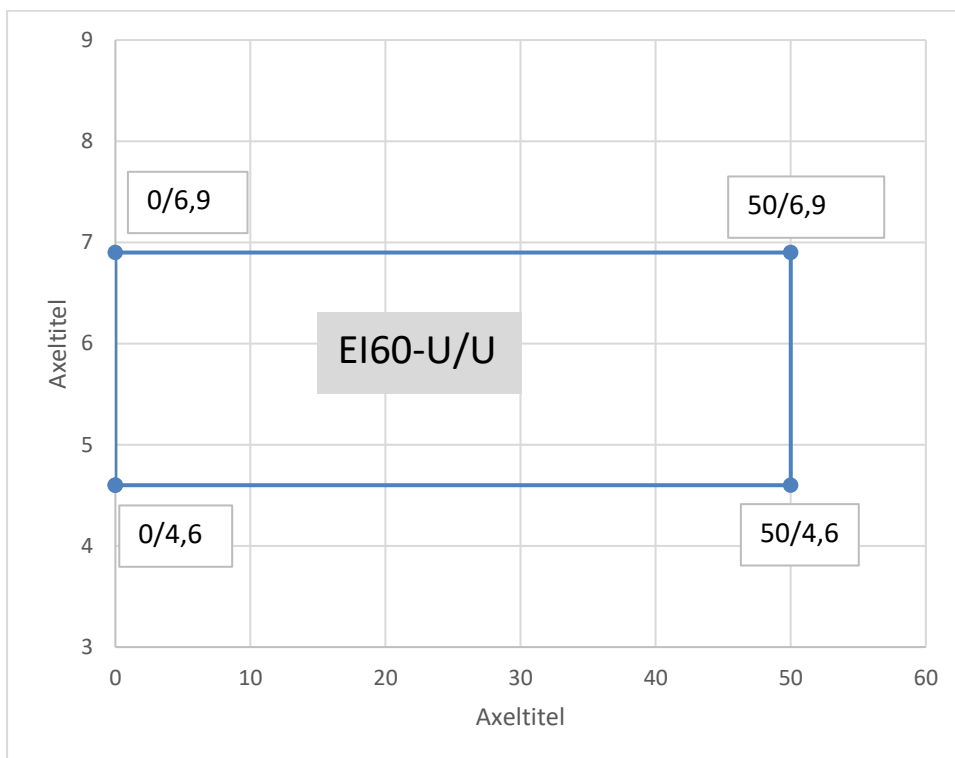


Figure 107: Classified range for insulated PP-RCT-pipes, sealed by CFS-B in CFS-CT HDB

For installation details refer to Pict.8.4.2.7

8.4.2.8 Aluminum composite pipes (MLC), sealed with CFS-IS in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- Pipe end configuration: U/C
- Insulated pipes

Insulation:

- CS situation
- Material: FEF (flexible elastomeric foam)
- Material: for brand and manufacturer refer to section 8.2.7
- For thickness t_D refer to relevant classification section

Pipe closure:

- Pipe seal with CFS-IS intumescent sealant

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3), $w_{A_3} = (1-5)$ mm, t_{A_3} over entire seal thickness A_1

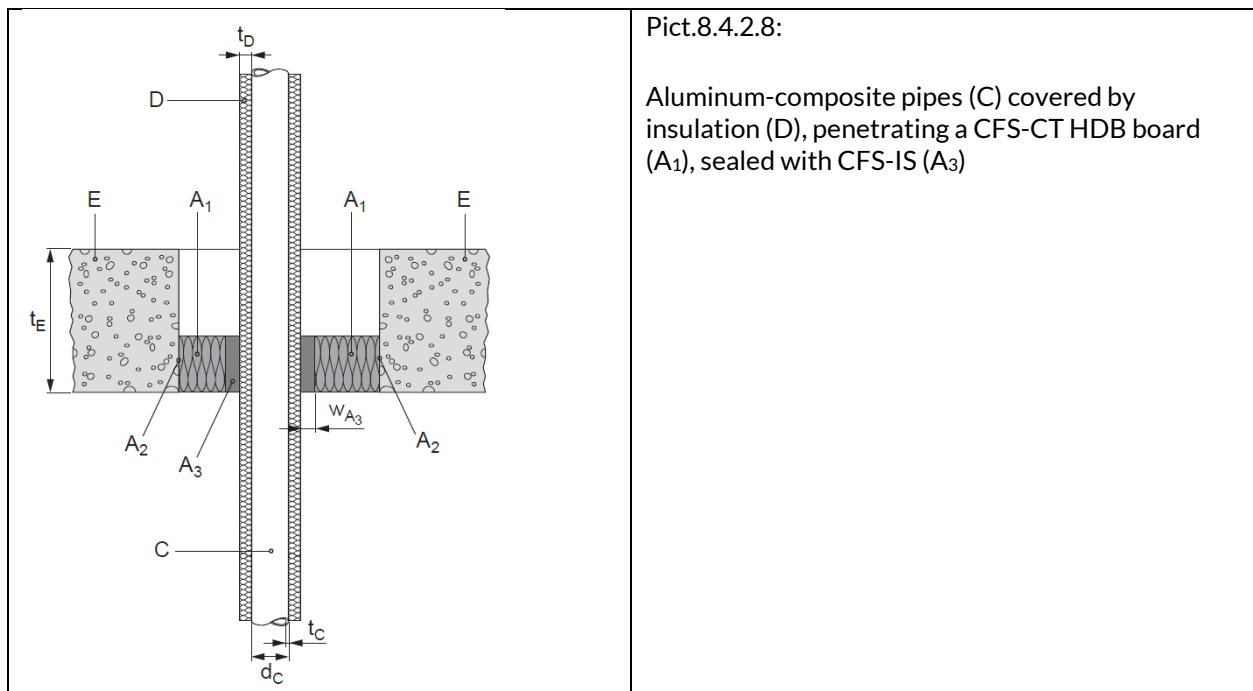


Figure 108: Aluminum composite pipes (MLC), sealed with CFS-IS in CFS-CT HDB in floor

For symbols and abbreviations refer to section 10 within this document.

8.4.2.8.1 Geberit Mepla pipes (MLC), sealed with CFS-IS in CFS-CT HDB

Classification shown in Figure 109 is valid for:

Pipe:

- Geberit Mepla aluminum composite pipes

Insulation:

- Insulation thickness (AF1 - AF4) = (8,0 - 20,5) mm

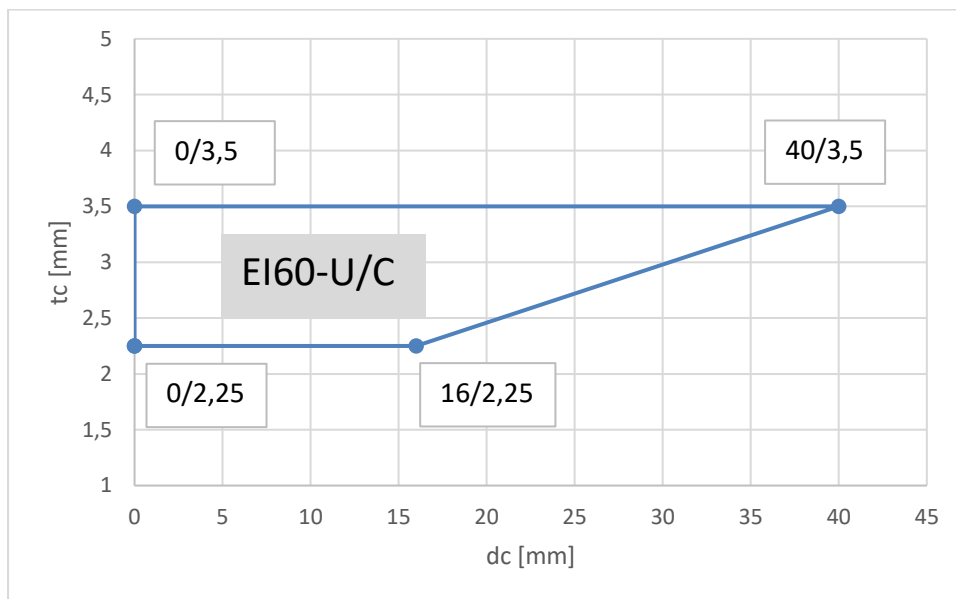


Figure 109: Classified pipe range for insulated Geberit Mepla pipes , sealed with CFS-IS in CFS-CT HDB

For installation details refer to Pict.8.4.2.8

8.4.2.8.2 Uponor Unipipe plus - pipes (MLC), sealed with CFS-IS in CFS-CT HDB

Classification shown in Figure 110 is valid for:

Pipe:

- Uponor Unipipe Plus aluminum composite pipes

Insulation:

- Insulation thickness AF1 - AF4 (8,0 - 19) mm

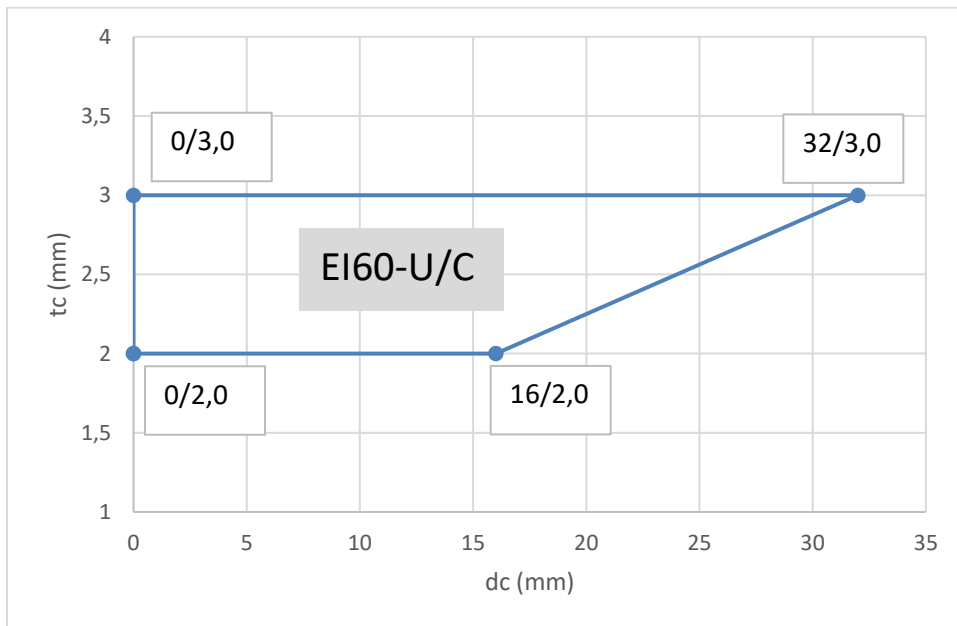


Figure 110: Classified pipe range for insulated Uponor Unipipe pipes , sealed with CFS-IS in CFS-CT HDB

For installation details refer to Pict.8.4.2.8

8.4.2.9 Metal pipes, insulated, penetrating a CFS-CT HDB board, sealed by CFS-IS

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: copper and others, refer to relevant classification and section 8.2.8
- Pipe end configuration: C/U
- Insulated pipes

Insulation:

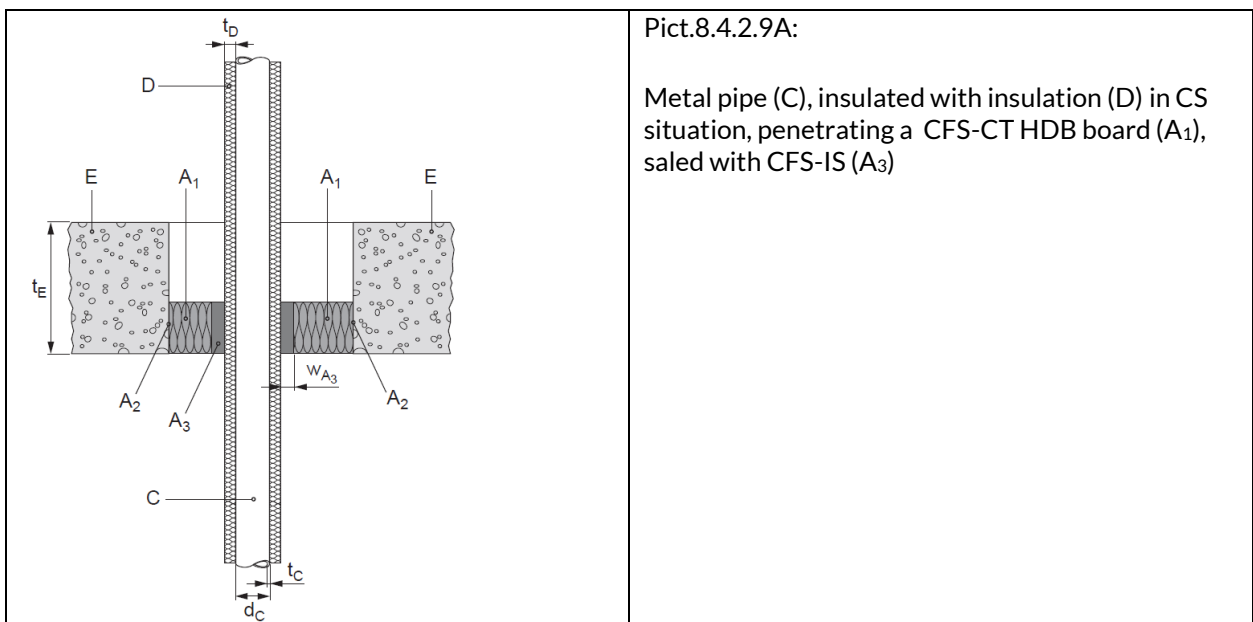
- Insulation case and dimension – for details refer to following classification sections

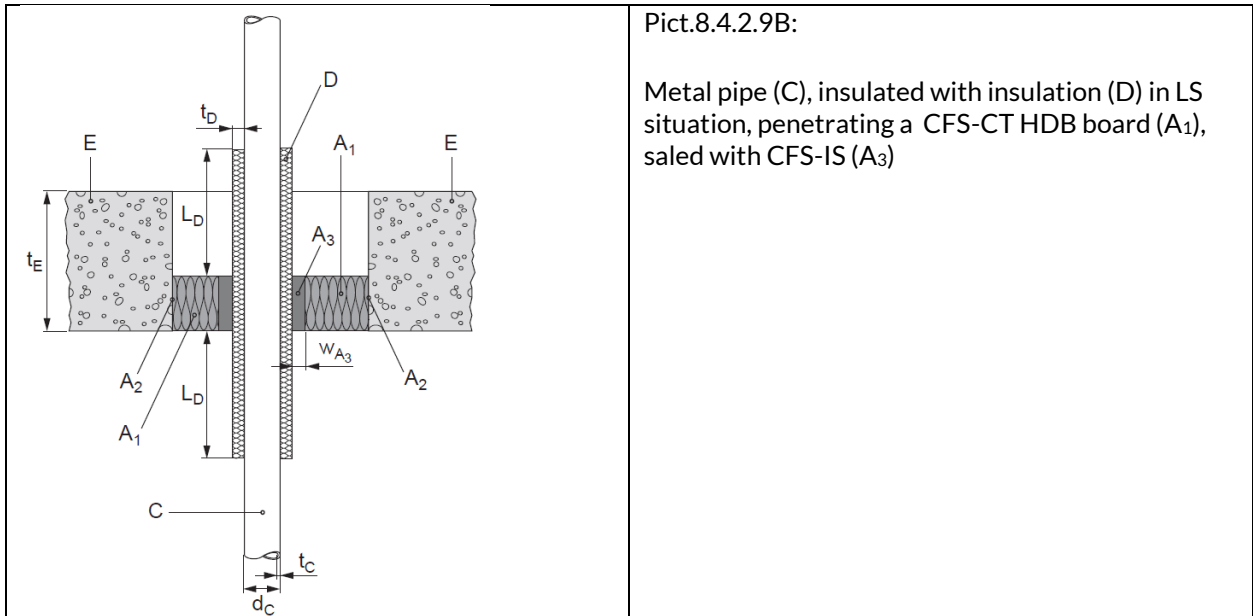
Pipe closure:

- CFS-IS

Gap closure:

- Penetrant gap seal to be done with CFS-IS (A_3),
- Width $w_{A3} = (15)$ mm
- depth t_{A3} over entire thickness t_{A1}





Pict.8.4.2.9B:

Metal pipe (C), insulated with insulation (D) in LS situation, penetrating a CFS-CT HDB board (A1), sealed with CFS-IS (A3)

Figure 111: Insulated metal pipes, penetrating a CFS-CT HDB board, sealed with CFS-IS

For symbols and abbreviations refer to section 10 within this document.

8.4.2.9.1 Copper pipes, FEF insulated, penetrating a CFS-CT HDB board, sealed by CFS-IS

Classification shown in Figure 112 is valid for:

Pipe:

- For dimension refer to Figure 112
- Maximum metal pipe wall thickness t_c : unlimited

Insulation:

- Situation: CS
- Material: FEF insulation on pipe
- Brand and manufacturer refer to section 8.2.7
- Thickness: (AF1 - AF4) = (8 - 20,5) mm

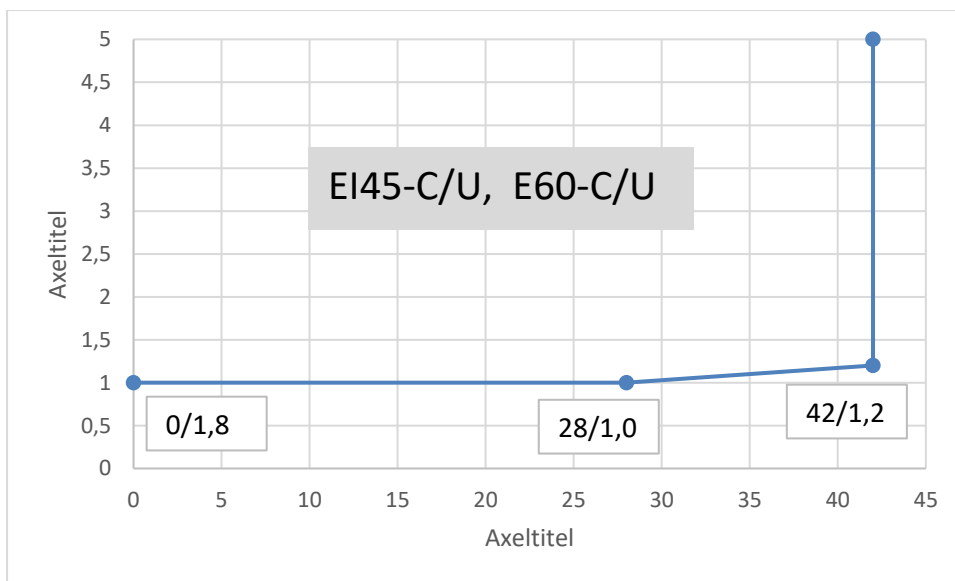


Figure 112: Metal pipes, FEF insulated, penetrating CFS-CT HDB, sealed with CFS-IS

For installation details refer to Pict.8.4.2.9.A.

Classification shown in Figure 113 is valid for:

Pipe:

- Dimension: refer to Figure 113
- Maximum metal pipe wall thickness t_c : unlimited

Insulation:

- CS situation
- Material: FEF- for brand and manufacturer refer to section 8.2.7
- insulation thickness: AF4 (20,5) mm

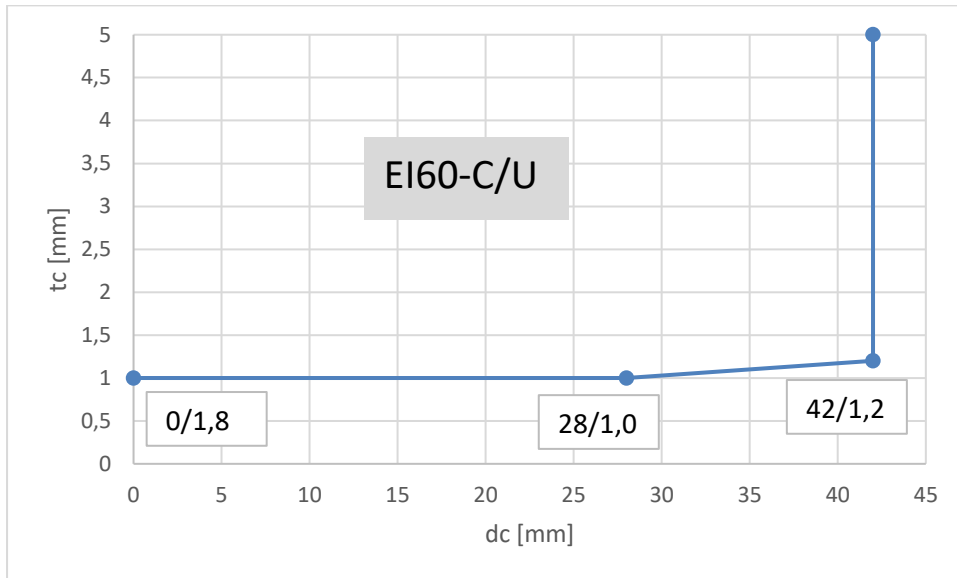


Figure 113: Classified range for metal pipes, FEF insulated, penetrating CFS-CT HDB, sealed with CFS-IS

For installation details refer to Pict.8.4.2.98.4.2.9A.

8.4.2.9.2 Copper pipes, glass wool insulated, penetrating a CFS-CT HDB board, sealed with CFS-IS

Classification shown in Figure 114 is valid for:

Pipes:

- Insulated metal pipes in LS and CS situation
- Dimension: refer to Figure 12
- Maximum metal pipe wall thickness (t_c): unlimited

Insulation:

- For LS – situation: insulated length (L_D) on both sides of the wall ≥ 470 mm
- Material: glass wool
- Brand and manufacturer: Isover Climacover lamella
- Thickness: $t_D \geq 20$ mm

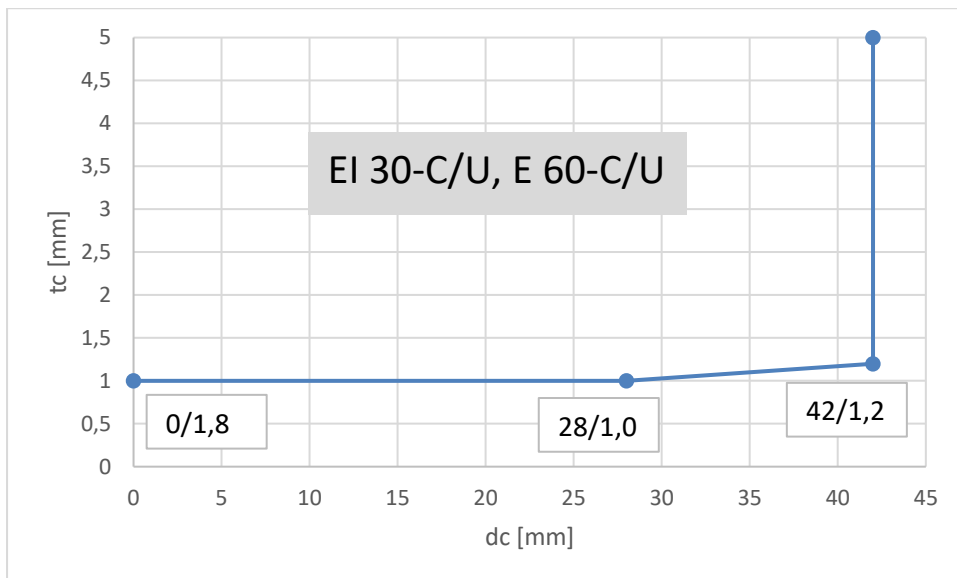


Figure 114: Classified range for metal pipes, glass wool insulated, penetrating CFS-CT HDB, sealed with CFS-IS

For installation details refer to Pict.8.4.2.9 A and B.

8.4.2.10 Plastic pipes, insulated, sealed with CFS-S ACR in a CFS-CT HDB board

Construction details:

Pipe:

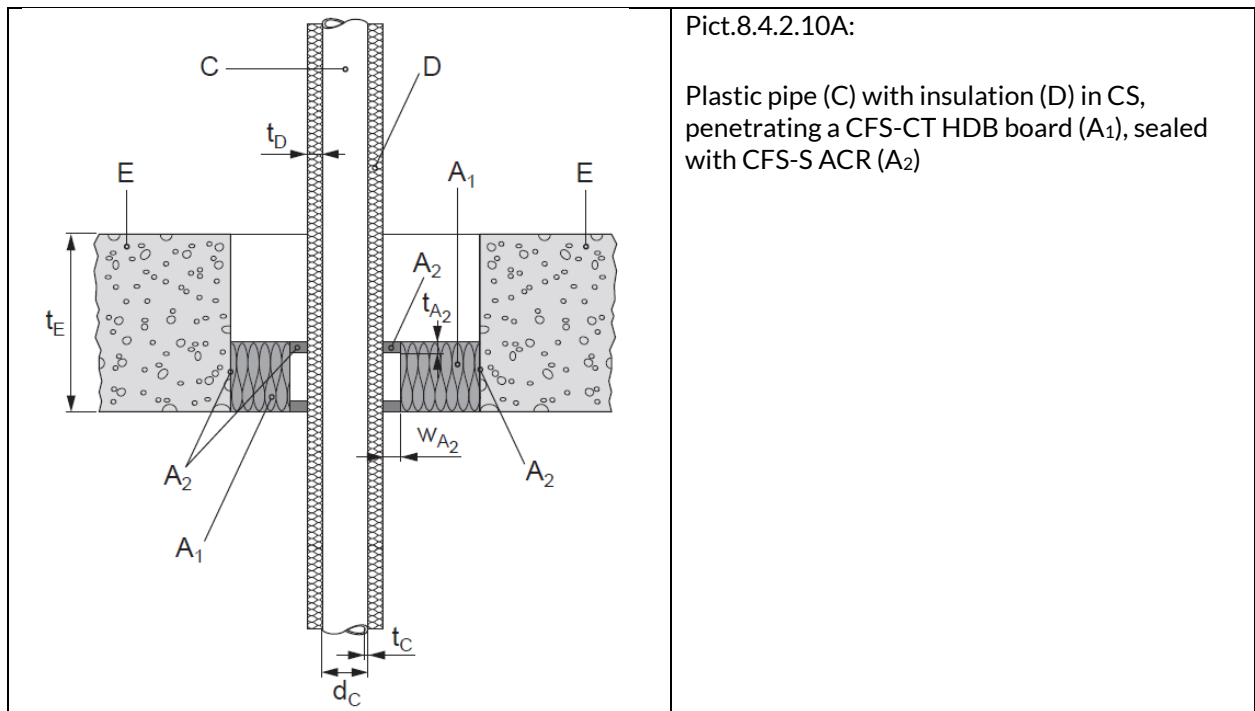
- Single pipe penetration
- Material: PE-Xa
- Brand and manufacturer: Rehau Rautitan flex
- Pipe end configuration: U/C
- Insulated pipe

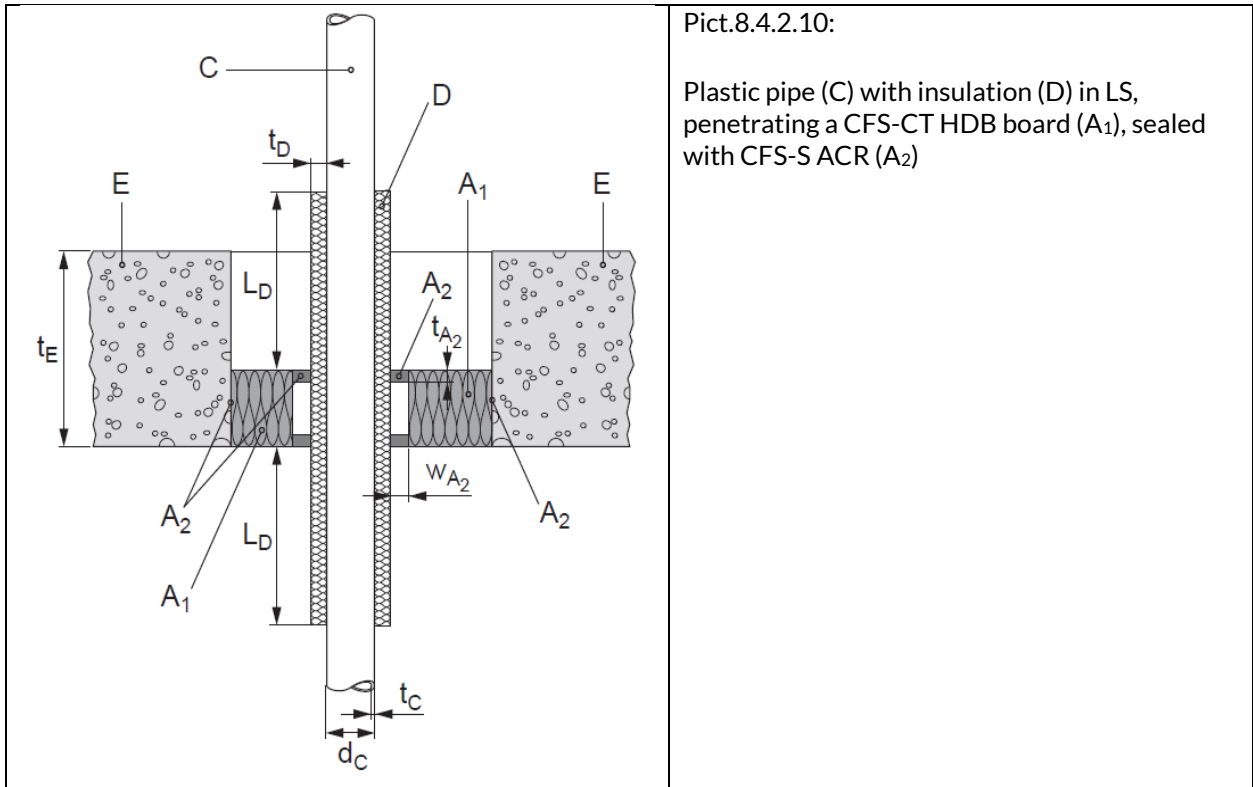
Insulation:

- Case LS or CS
- Material: mineral wool
- Brand and manufacturer: Rockwool Klimarock
- Length (L_D): ≥ 220 mm on each side
- Thickness (t_D) ≥ 20 mm

Pipe closure:

- to be done with CFS-S ACR (A_2)
- Width $w_{A3} = (1 - 5)$ mm
- Depth $t_{A2} = 10$ mm from both sides





Pict.8.4.2.10:
 Plastic pipe (C) with insulation (D) in LS,
 penetrating a CFS-CT HDB board (A₁), sealed
 with CFS-S ACR (A₂)

Figure 115: Insulated plastic pipes, sealed with CFS-S ACR in a CFS-CT HDB board in floor

For symbols and abbreviations refer to section 10 within this document.

8.4.2.10.1 Insulated PE-Xa-pipes, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Classification shown in Figure 116 is valid for:

- Insulated Rehau Rautitan flex pipes

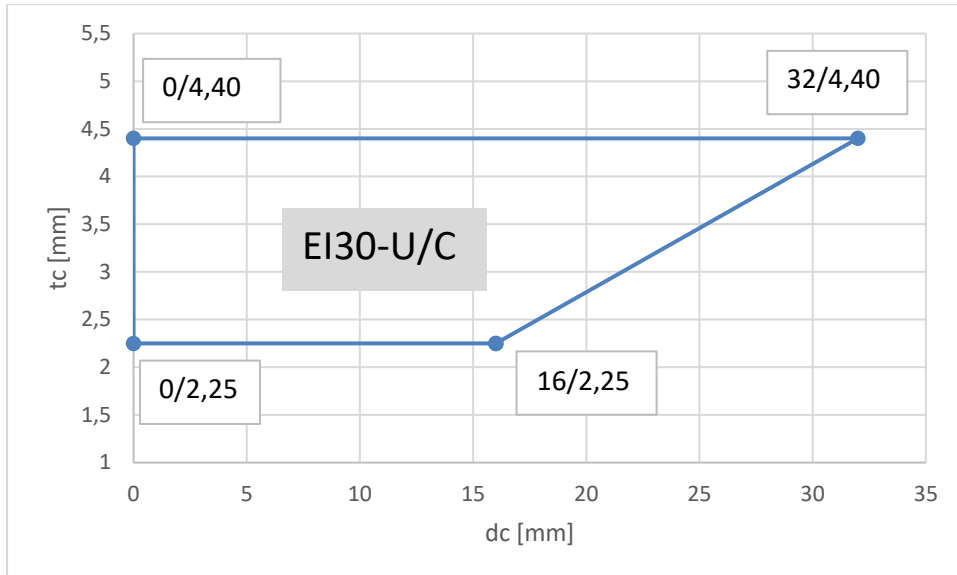


Figure 116: Classified range for Insulated PE-Xa-pipes, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

For installation details refer to Pict.8.4.2.10

8.4.2.11 Metal pipes, insulated, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: metal, for details refer to classification section

Insulation:

- Insulation case LS and /or CS, for details refer to classification section
- Material: mineral wool
- Brand and manufacturer: Rockwool Klimarock
- Length (L_D): refer to classification section
- Thickness (t_D): refer to classification section

Pipe closure:

- CFS-S ACR

Gap closure:

- CFS-S ACR (A_2),
- Width $w_{A_2} = (1 - 5)$ mm
- Depth $t_{A_2} = 10$ mm from both sides

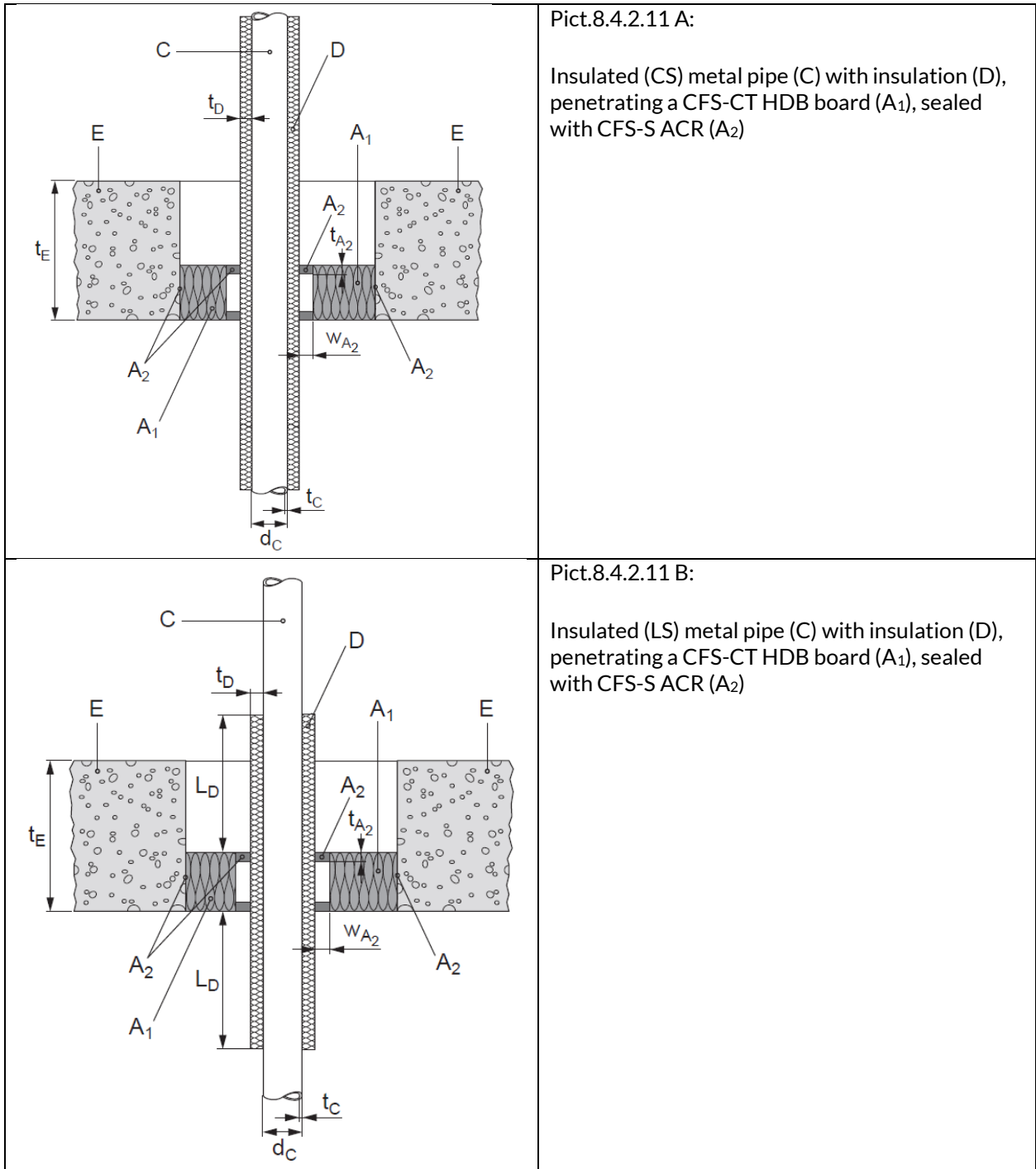


Figure 117: Insulated metal pipes, penetrating a CFS-CT HDB board, sealed by CFS-S ACR

For symbols and abbreviations refer to section 10 within this document.

8.4.2.11.1 Copper pipes, insulated, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Classification shown in Figure 118 is valid for:

Pipe:

- Metal pipes in C/U
- Pipe material: copper and others, refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- LS and CS situation
- Material: mineral wool
- Brand and manufacturer : Rockwool Klimarock
- For LS – situation: insulated length (L_D) on both sides of the wall ≥ 470 mm
- Insulation thickness (t_D): ≥ 30 mm

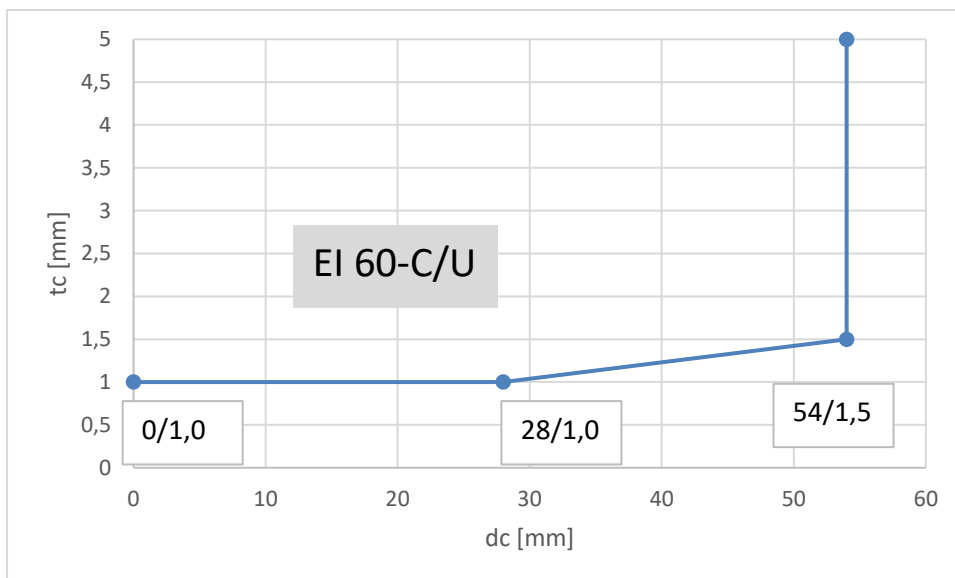


Figure 118: Classified pipe range for insulated metal pipes, penetrating a CFS-CT HDB seal

For installation details refer to Pict.8.4.2.11

Classification shown in Figure 119 is valid for:

Pipe:

- Metal pipes (C/U)
- Material: copper and other metals, refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- With insulation

Insulation:

- LS and CS situation
- Material: mineral wool
- Brand and manufacturer: Rockwool Klimarock
- For LS – situation: insulated length (L_D) on both sides of the wall ≥ 970 mm
- Insulation thickness (t_D): ≥ 20 mm

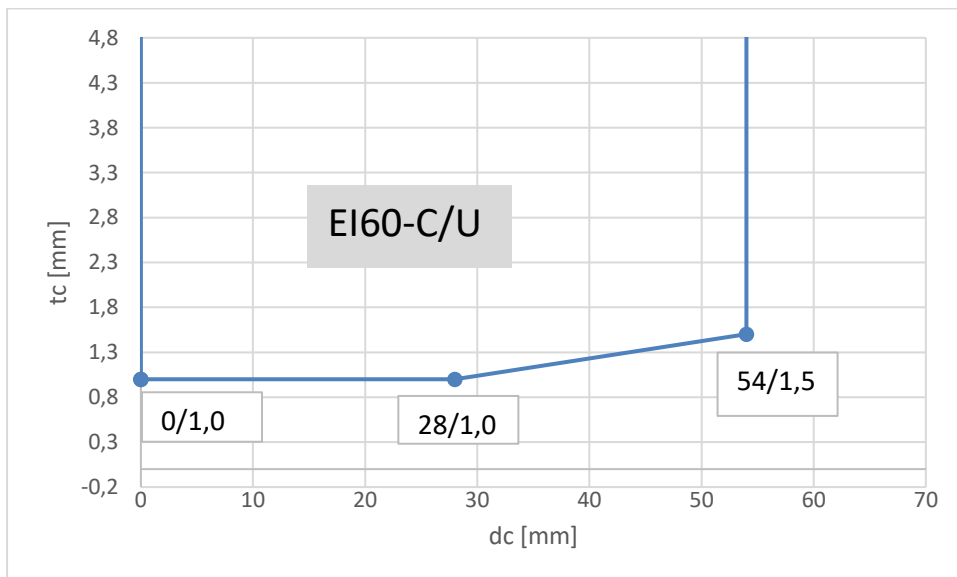


Figure 119: Classified pipe range for insulated metal pipes, penetrating a CFS-CT HDB seal

For installation details refer to Pict.8.4.2.11

8.4.2.11.2 Steel pipes, mineral wool insulated, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Classification shown in Figure 120 is valid for:

Pipe:

- Metal pipes (C/U)
- Material: steel and others, refer to section 8.2.8, copper excluded
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- CS situation
- Material: mineral wool
- Brand and manufacturer: Rockwool Klimarock
- Insulation thickness (t_D): ≥ 20 mm

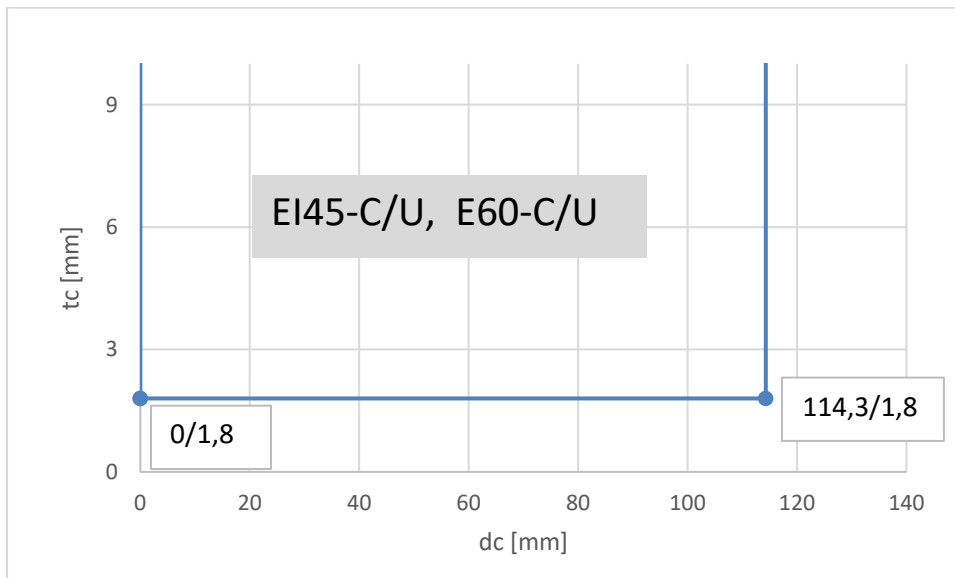


Figure 120: Insulated steel pipes, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

For installation details refer to Pict.8.4.2.11

Classification shown in Figure 121 is valid for:

Pipe

- Metal pipe (C/U)
- Pipe material: steel and others, refer to section 8.2.8, copper excluded
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- In LS and CS situation
- With mineral wool insulation
- Brand and manufacturer : Rockwool Klimarock
- For LS - situation: insulated length (L_D) on both sides of the wall ≥ 970 mm
- Thickness (t_D): ≥ 30 mm

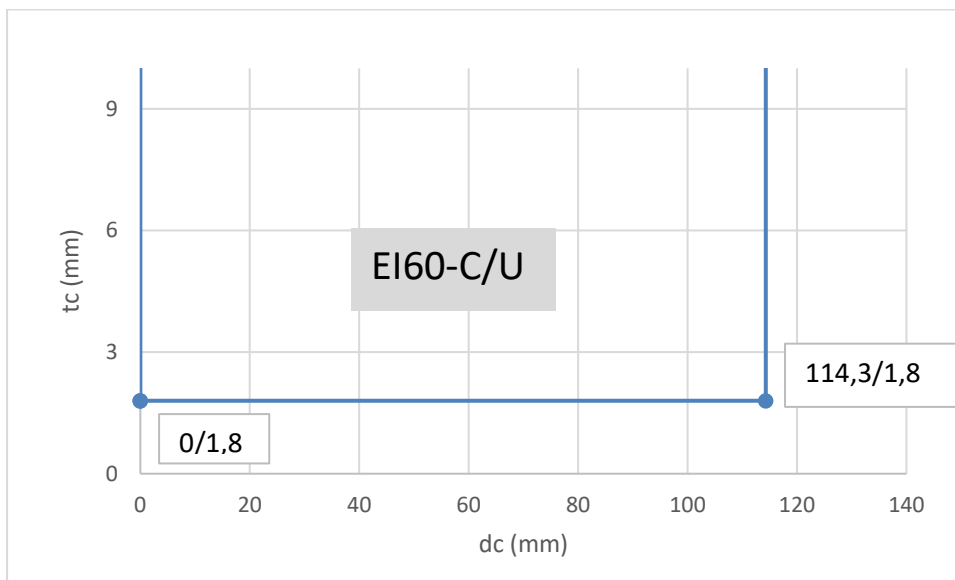


Figure 121: Insulated steel pipes, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

For installation details refer to Pict.8.4.2.11

Classification shown in Figure 122 is valid for:

Pipe:

- Metal pipes
- Pipe material: steel and others, refer to section 8.2.8, copper excluded
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation

- In LS and CS situation
- With mineral wool insulation on pipe
- Insulation brand and manufacturer: Isover OTStech LSP-40
- For LS - situation: insulated length (L_D) on both sides of the wall ≥ 970 mm
- Insulation thickness (t_D): ≥ 30 mm

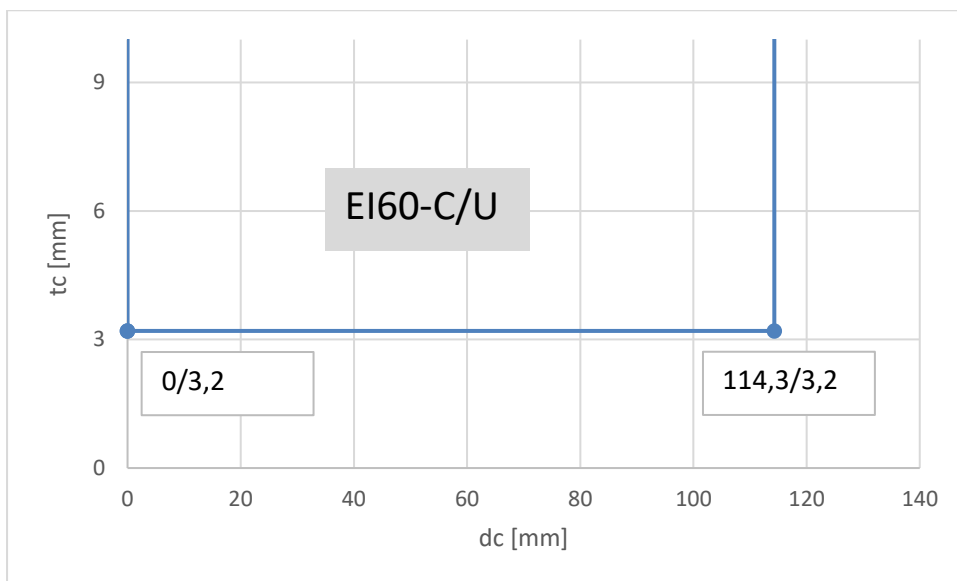


Figure 122: Steel pipes, insulated, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

For installation details refer to Pict.8.4.2.11

8.4.2.11.3 Steel pipes, CFS-CT insulated, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

Classification shown in Figure 123 is valid for:

Pipes:

- Metal pipes (C/U)
- Pipe material: steel and others, refer to section 8.2.8, copper excluded
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- With CFS-CT coating as insulation on pipe
- Material: organic coating
- Brand and manufacturer : Hilti CFS-CT
- In LS situation
- For LS - situation: insulated length (L_D) on both sides of the wall ≥ 350 mm
- Insulation thickness (t_D): = 1 mm

Penetrant	Classification
Metal pipes, $d_C < 17,2$ mm	EI 30-C/U, E 60-C/U

Figure 123: CFS-CT coated metal pipes, penetrating a CFS-CT HDB board, sealed with CFS-S ACR

For installation details refer to Pict.8.4.2.11

8.4.2.12 Metal pipes, insulated, sealed with CFS-B in CFS-CT HDB

Construction details:

Pipe:

- Single pipe penetration
- For pipe material: copper and other metals, for details refer to section 8.2.8
- Pipe-end configuration: C/U
- Insulated pipes

Insulation:

- Insulation case CS
- Material: FEF
- Brand / manufacturer: refer to section 8.2.7
- Insulation thickness (t_D): refer to classification section

Protect insulation:

- With/without protect insulation (DP) – for details refer to classification section
- For material and dimension refer to classification section

Pipe closure:

- Sealed with CFS-B
- For number of layers - refer to classification section

Gap closure

- CFS-S ACR (A_2)
- Width $w_{A2} = (1 - 5)$ mm
- Depth $t_{A2} =$ over entire thickness A_1

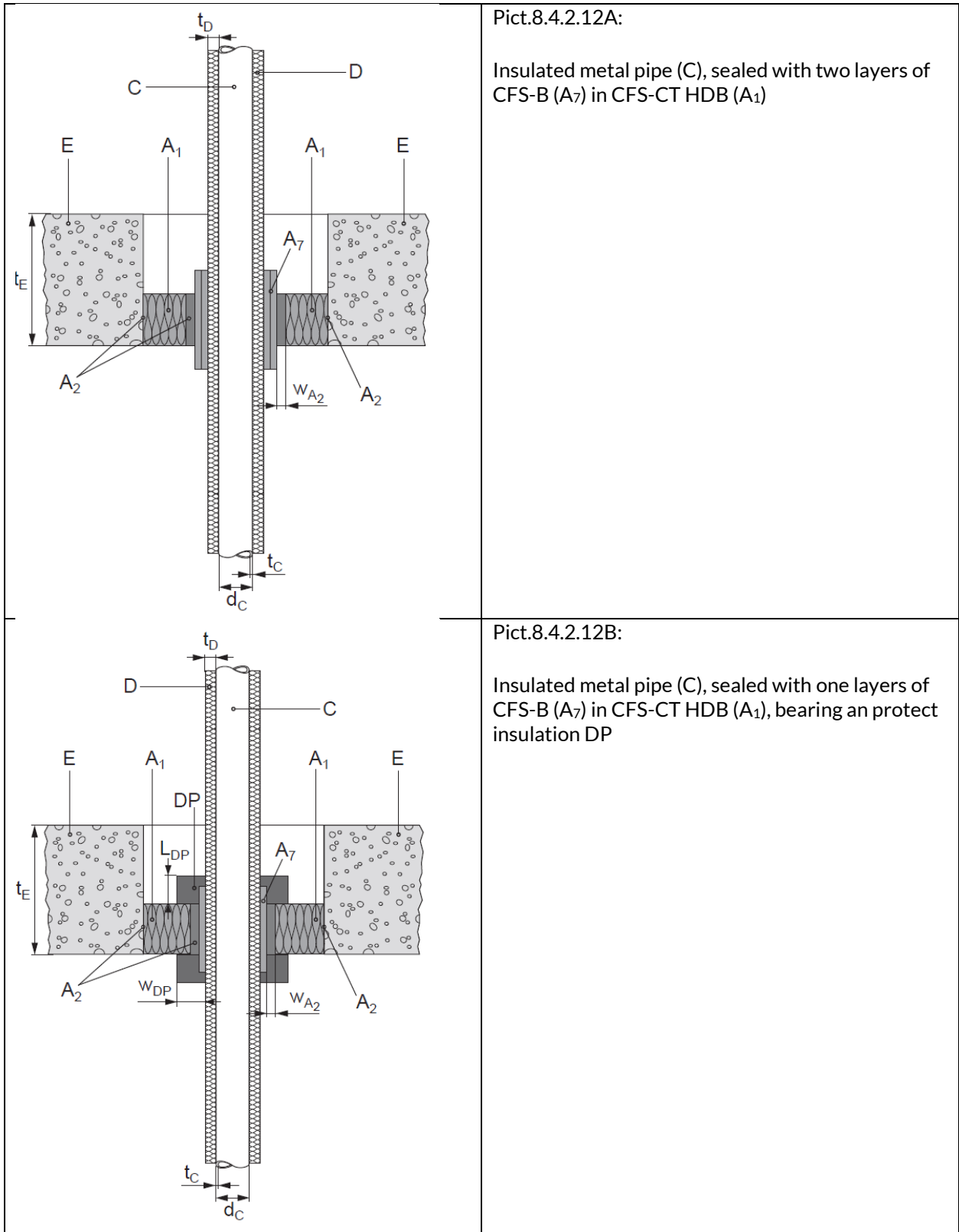


Figure 124: Insulated metal pipes, sealed with CFS-B in CFS-CT HDB in floor

For symbols and abbreviations refer to section 10 within this document.

8.4.2.12.1 Copper pipes, insulated, sealed with two layers of CFS-B in CFS-CT HDB

Classification shown in Figure 125 is valid for:

Pipe:

- Metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- Material: FEF
- Insulation thickness (t_D): AF1 – AF4 = $(7,5 \leq t_D \leq 15,5)$ mm

Protect insulation:

- No additional protect insulation requested

Pipe closure:

- CFS-B: two layers
- For installation details refer to Pict.8.4.2.12A

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 10	$\geq 1,0$	EI 60-C/U

Figure 125: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

Classification shown in Figure 126 is valid for:

Pipe

- Metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- Insulation thickness (t_D): AF1 – AF6 = $(8,5 \leq t_D \leq 33,5)$ mm

Protect insulation:

- No additional protect insulation requested

Pipe closure:

- CFS-B: two layers
- For installation details refer to Pict.8.4.2.12A

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 18	$\geq 1,0$	EI 30-C/U, E 60-C/U

Figure 126: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

Classification shown in Figure 127 is valid for:

Pipes

- Metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated metal pipe

Insulation:

- Insulation thickness (t_D): AF2 - AF6 = $(12,5 \leq t_D \leq 35,0)$ _mm

Protect Insulation:

- No additional protect insulation requested

Pipe closure

- CFS-B: two layers
- For installation details refer to Pict.8.4.2.12A

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 28	$\geq 1,0$	EI 30-C/U, E 60-C/U

Figure 127: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

Classification shown in Figure 128 is valid for:

Pipe:

- Metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- Insulation thickness (t_D): AF3 - AF6 = $(17,0 \leq t_D \leq 38,0)$ _mm

Protect insulation:

- No additional protect insulation requested

Pipe closure:

- CFS-B: two layers
- For installation details refer to Pict.8.4.2.12A

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 54	$\geq 2,0$	EI 30-C/U, E 60-C/U

Figure 128: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

8.4.2.12.2 Copper pipes, insulated, sealed with one layer of CFS-B in CFS-CT HDB in floor

Classification shown in Figure 129 is valid for:

Pipes:

- Metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- Insulation thickness (t_D): AF6 = 38,0 mm

Protect insulation:

- No additional protect insulation requested

Pipe closure:

- CFS-B: one layers
- For installation details refer to Pict.8.4.2.12A

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 54	$\geq 1,5$	EI 60-C/U

Figure 129: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

Classification shown in Figure 130 is valid for:

Pipe:

- Insulated metal pipes
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipe

Insulation:

- Insulation thickness (t_D): AF1 - AF4 = ($7,5 \leq t_D \leq 15,5$) mm

Protect insulation:

- Material: Isover ML-3
- Thickness $t_{AP} = 30$ mm
- Length $L_{AP} \geq 30$ mm

Pipe closure:

- CFS-B: one layer
- For installation details refer to Pict.8.4.2.12B

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 10	$\geq 1,0$	EI 30-C/U, E 60-C/U

Figure 130: Classified pipe range for insulated metal pipes, sealed with one layer CFS-B in CFS-CT HDB

Classification shown in Figure 131 is valid for:

Pipes:

- Metal pipes (C/U)
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- Insulation thickness (t_D): AF1 – AF6 = ($8,5 \leq t_D \leq 33,5$) mm

Protect insulation:

- Material: Isover ML-3
- Thickness $t_{AP} = 30$ mm
- Length $L_{AP} \geq 30$ mm

Pipe closure

- CFS-B: one layer
- For installation details refer to Pict.8.4.2.12B

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 18	$\geq 1,0$	EI 30-C/U, E 60-C/U

Figure 131: Classified pipe range for insulated metal pipes, sealed with one layer CFS-B in CFS-CT HDB

Classification shown in Figure 132 is valid for:

Pipes:

- Metal pipes (C/U)
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- Insulation thickness (t_D): AF2 – AF6 = ($12,5 \leq t_D \leq 35,0$) mm

Protect insulation

- Material: Isover ML-3
- Thickness $t_{AP} = 30$ mm
- Length $L_{AP} \geq 30$ mm

Pipe closure:

- CFS-B: one layer
- For installation details refer to Pict.8.4.2.12B

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 28	$\geq 1,0$	EI 60-C/U

Figure 132: Classified pipe range for insulated metal pipes, sealed with one layer CFS-B in CFS-CT HDB

Classification shown in Figure 133 is valid for:

Pipes:

- Metal pipes (C/U)
- Material: copper and others - refer to section 8.2.8
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- Insulation thickness (t_D): (AF3 – AF6) = ($17,0 \leq t_D \leq 38,0$) mm

Protect insulation:

- Material: Isover ML-3
- Thickness $t_{AP} = 30$ mm
- Length $L_{AP} \geq 30$ mm

Pipe closure:

- CFS-B: one layer
- For installation details refer to Pict.8.4.2.12B

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
≤ 54	$\geq 1,5$	EI 60-C/U

Figure 133: Classified pipe range for insulated metal pipes, sealed with one layer CFS-B in CFS-CT HDB

8.4.2.12.3 Steel pipes, insulated, sealed with two layers of CFS-B in CFS-CT HDB in floor

Classification shown in Figure 134 is valid for:

Pipes:

- Metal pipes (C/U)
- Material: steel and others - refer to section 8.2.8, copper excluded
- Maximum metal pipe wall thickness (t_c): unlimited
- Insulated pipes

Insulation:

- Insulation thickness (t_D): AF6 = 43,0 mm

Protect insulation:

- Material: Isover ML-3
- Thickness $t_{AP} = 30$ mm
- Length $L_{AP} \geq 30$ mm

Pipe closure:

- CFS-B: one layer
- For installation details refer to Pict.8.4.2.12B

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Classification
$\leq 114,3$	$\geq 2,0$	EI 30-C/U, E 60-C/U

Figure 134: Classified pipe range for insulated metal pipes, sealed with two layers CFS-B in CFS-CT HDB

8.4.2.13 Conduits with and without cables penetrating CFS-CT HDB, sealed with CFS-B

Construction details:

- Single and multiple penetration

Conduits:

- Single and bunched conduits
- Flexibility type: flexible or pliable or mixtures of them
- Material: any plastic material of same flexibility type
- Projecting length (L_{PRC}) on both sides from coated board seal A_1 : $L_{PRC} \geq 350$ mm
- Conduit end configuration: U/U or U/C
- Max. diameter of single conduit (RC): $d_{RC} \leq 40$ mm, wave high $t_{RC} \leq 4,95$ mm
- Max. diameter of tied conduit bundle (RCB): $d_{RCB} \leq 100$ mm
- Max. dimension of single conduit (RC) in tied bundle (RCB): $d_{RC} \leq 40$ mm, $t_{RC} \leq 4,95$ mm

Cable:

- With and without cable infill
- All cables currently and commonly used in building practice in Europe, fitting into the conduit, including optical fibre cables
- Coaxial cables with diameter $d_R \leq 28$ mm
- Non-sheathed cables (blank wires) and cable support are excluded

Insulation:

- No insulation

Penetrant closure:

- One device CFS-B per seal
- One or two layers CFS-B
- Positioned in a central position in (A_1),
- Identical projecting length (L_{PRC}) on both sides of the seal

Gap closure:

- CFS-S ACR (A_2),
- Width $w_{A2} = (1 - 5)$ mm
- Depth t_{A2} over entire thickness t_{A1}

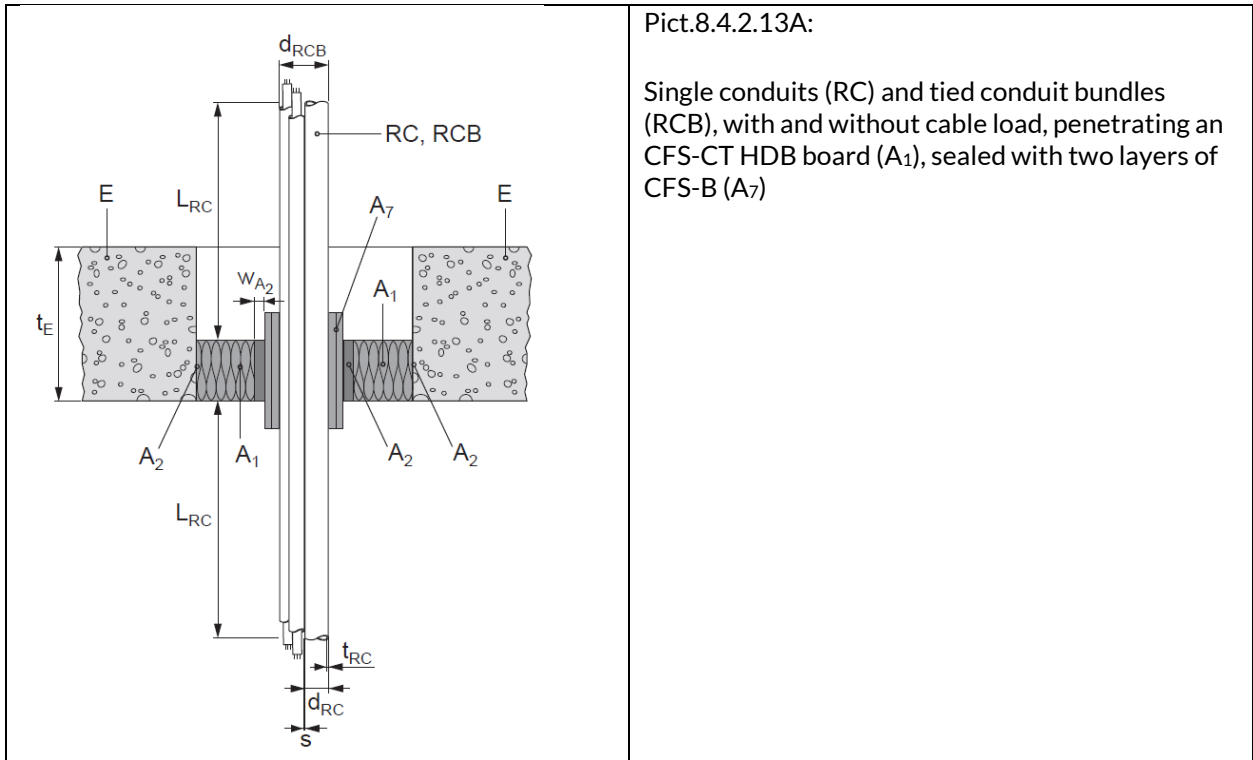


Figure 135: Conduits and conduit bundles, penetrating a CFS-CT HDB board, sealed with two layers CFS-B

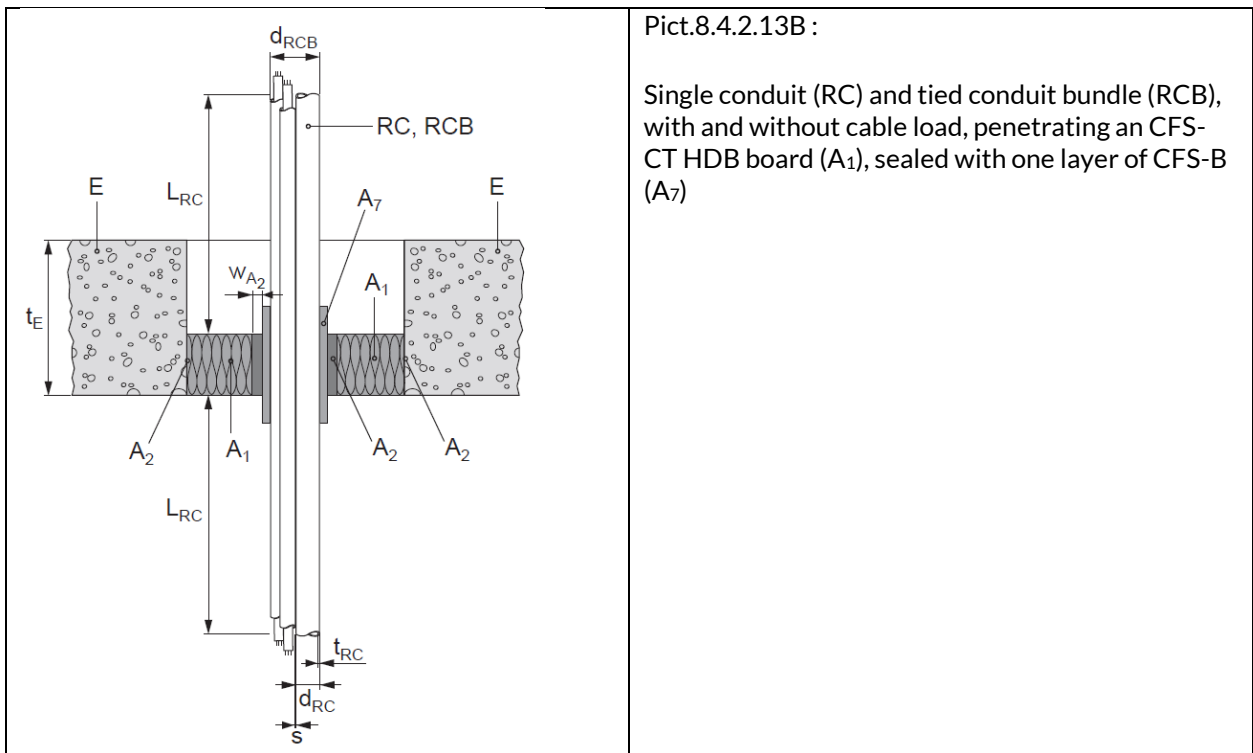


Figure 136: Conduits and conduit bundles, penetrating a CFS-CT HDB board, sealed with one layers CFS-B

For symbols and abbreviations refer to section 10 within this document.

8.4.2.13.1 Conduits with and without cables, sealed with two layers CFS-B

Classification shown in Figure 137 is valid for:

- Single and bunched conduits in floor
- For application details refer to pict.8.4.2.13

Type of penetrant	Classification
Single conduits	EI 60-U/U
Conduit bundle	EI 60-U/U

Figure 137: Classified range for conduits and conduit bundles, penetrating a CFS-CT HDB board, sealed with two layers CFS-B

8.4.2.14 HVAC-supply bundle (Klimasplit), sealed with CFS-B in CFS-CT HDB

Construction details:

- Mixed seal penetration
- Always a non-insulated plastic pipe (C) together with two FEF-insulated (D) copper pipes (CM) and two small scale cables (R) in zero distance to each other
- Distance (s) between penetrants ≥ 0 mm

Cables:

- Sheathed cables only, non-sheathed cables excluded
- Max.cable size: $d_R \leq 14$ mm
- Coaxial cables and cable support excluded.

Pipes:

- Plastic pipe in U/U or U/C end configuration, metal pipes always C/U
- For plastic and metal pipe dimension refer to classification chapter

Insulation:

- Material: FEF
- For dimension refer to classification chapter
- For brand and manufacturer refer to section 8.2.7

Penetrant closure:

- Penetrant seal with CFS-B
- One device CFS-B per seal
- Number of layers CFS-B - refer to classification chapter
- Positioned in a central position in (A_1)
- Identical projecting length on both sides of the seal

Gap closure:

- CFS-S ACR (A_2)
- Width $w_{A2} = (1 - 5)$ mm
- Depth t_{A2} over entire thickness t_{A1}

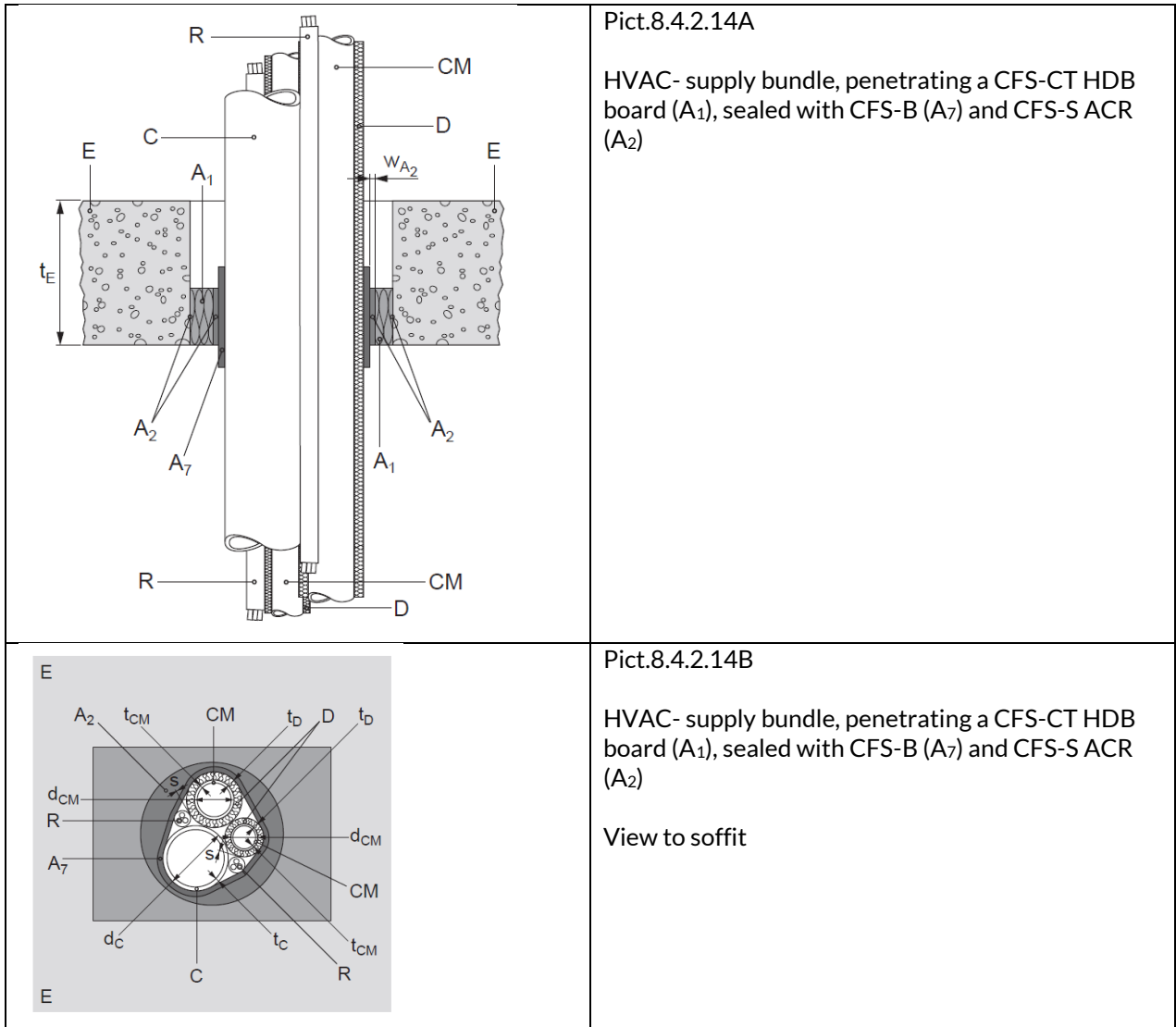


Figure 138: HVAC-supply bundle, penetrating CFS-CT HDB board, sealed with CFS-B

For symbols and abbreviations refer to section 10 within this document.

8.4.2.14.1 HVAC-supply bundle, sealed with one layer CFS-B

Classification is valid for:

- HVAC-supply bundles, for penetrant details refer to section 8.4.2.14

Cables:

- For type and dimension refer to section 8.4.2.14

Plastic pipe:

- Material: PVC-U
- Diameter $d_C \leq 20$ mm
- Wall thickness $t_C = 1,5$ mm

Metal pipes:

- Material: copper and others, refer to 8.2.8
- Diameter: $d_{CM} \leq 18$ mm,
- Wall thickness $t_{CM} \geq 1$ mm
- Pipe with insulation

Insulation:

- On metal pipes only
- Insulation in CS-situation
- Material: FEF,
- Brands and manufacturer refer to 8.2.7
- Thickness (t_D) = AF1 = (7,0 - 8,0) mm
- For application details refer to pict.8.4.2.14

Application	Classification
HVAC-supply bundles, for penetrant details refer to section 8.4.2.14	EI 60

Figure 139: Classification for HVAC supply bundle, sealed with CFS-B

9 ANNEX D – Installation of the Product (Instruction for use)

The application (appropriate installation) of Hilti Firestop Board High Density CFS-CT HDB is described and illustrated in chapter 8 – Annex C.

The folder *Instruction for use* is available at Hilti's website: www.hilti.goup

For safe handling the provisions of the Material Safety Data Sheet for the product shall be followed.

10 ANNEX E - ABBREVIATIONS

Abbreviations used in drawings.

Abbreviation	Description
A ₁	Hilti Firestop High-Density Board CFS-CT HDB
A ₂	Annular gap seal with Hilti Firestop Acrylic Sealant CFS-S ACR
A ₃	Annular gap seal with Hilti CFS-IS
A ₄	Hilti Firestop Collar Endless CFS-C EL
A ₅	Hilti Firestop Collar CFS-C P
A ₆	Annular gap seal with Hilti CFS-FIL
A ₇	Hilti Firestop Bandage CFS-B
A ₈	Hilti Firestop Cable Disc CFS-D25
A ₉	Hilti Firestop Foam Flexible CFS-F FX
B	Backfilling material (mineral wool)
C	Plastic Pipe
CR ₁	Sound decoupling insulation
D	Pipe insulation
DP	Protect insulation, added normally for defined length on top of basic insulation D
DR _W	Pipe insulation, incombustible, based on mineral wool
DR _E	Pipe insulation, combustible, based on elastomeric foamed material
DR _P	Pipe insulation - Protect insulation
d _A	Aperture diameter in supporting construction E
d _C	Pipe diameter (nominal outside diameter) for plastic pipes
d _{RC}	Pipe diameter (nominal outside diameter) for Cable conduits
E	Building element (wall, floor)
E ₁	Aperture framing / beading / additional framing
F	Hooks (long or short) for fixing of the collar
FEF	Flexible Elastomeric Foam
G	Channel
h	High
h _{E1}	High of aperture framing / beading / additional framing
h _G	High of channel
h _T	High of trunkings
L	Length
L _D	Length of Insulation
L _{DP}	Length of Protect Insulation
L _P	Projecting length
L _{PV}	Projecting length sleeve
L _{PRC}	Projecting Length for electric conduits, filled or unfilled
n	amount, number of pieces
n.a.	Not applicable
n.r.	Not relevant
PG	Pipe group

R	Electric Cables, optical cables
RC	Conduit for electric/optical cables
RB	Bundle of electric/optical cables
RS	Cable support system
s	Distance
s ₁	Minimum distance between single penetration seals
s ₂	Minimum distance between clustered pipes or other penetrants within one penetration
s ₃	Minimum distance between penetrating pipe and building element
T	Trunking for cables
t _A	Total seal thickness
t _E	Total thickness of supporting construction
t _{A1}	Thickness of Hilti Firestop Board High Density CFS-CT HDB
t _{A2}	Thickness of Hilti Firestop Acrylic Sealant CFS-S ACR
t _{A3}	Thickness of Hilti CFS-IS
t _{ACP}	Aluminum composite pipe wall thickness
t _C	Plastic Pipe wall thickness
t _{C1}	Thickness of acoustic sound decoupling insulation
t _D	Insulation thickness
t _E	Thickness of the building element
t _{E1}	Thickness aperture framing of the building element
t _G	Wall thickness of plastic channels
t _I	Thickness of individual layer thickness within cross-laminated timber constructions
t _{DP}	Thickness of Additional Protect Insulation
t _M	Metal Pipe wall thickness
t _{RC}	Wall thickness / Wave high for electric conduits
t _T	Wall thickness trunking
V	Sleeve
w	Width
w _{E1}	Width of aperture framing / beading / additional framing
w _G	Width of channel
w _T	Width of trunking
ρ _E	Density of the building element

Standard abbreviation used in EN 1366-3:2021 (as U/U, CS) are considered as common knowledge.