



European Technical Assessment

ETA 17/0617
of 13.09.2017



General part

Technical Assessment Body issuing the ETA: ITeC

ITeC has been designated according to Article 29 of Regulation (EU) No 305/2011 and is member of EOTA (European Organisation for Technical Assessment).

Trade name of the construction product

KF-Collar

Product family to which the construction product belongs

Fire stopping and fire sealing products.
Penetration seals.

Manufacturer

KNAUF di Knauf Srl sas
Via Livornese 20
Castellina Marittima
IT-56040
Italy

Manufacturing plant(s)

According to Annex N kept by ITeC.

This European Technical Assessment contains

24 pages including 2 annexes which form an integral part of this assessment

and

Annex N, which contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available.

This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of

ETAG 026, Part 1 edition April 2013 and Part 2 edition August 2011, used as European Assessment Document (EAD).

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential annex(es)).

Specific parts of the European Technical Assessment

1 Technical description of the product

KF-Collar is a pipe closure device used as pipe penetration seal consisting of a fire protective inlay made of intumescent material contained in a stainless steel pipe collar housing, incorporating a hinge and toggle latch for collar closing and flanges for fixing.

KF-Collar is supplied in different sizes depending on the pipe diameter to be protected. Detailed technical specification is given in Annex A.

Assembled penetration seals may require additional components as described in Annex B. These components are not covered by this ETA and cannot be CE marked on its basis.

Description of the installation procedure is given in Annex A.

2 Specification of the intended use(s) in accordance with the applicable EAD

KF-Collar is used to reinstate the resistance to fire performance of rigid floor and flexible or rigid wall constructions where they are penetrated by combustible pipes and insulated metal pipes. The specification of the services that may be protected with KF-Collar are given in Annex B.

The specific elements of construction where the KF-Collar may be used to provide a penetration seal in, are as follows:

- Rigid floors: Concrete floors with a minimum thickness of 150 mm and a minimum density of 500 kg/m³.
- Flexible walls: Walls with a minimum thickness of 120 mm, which comprise timber or steel studs lined on both faces with minimum two layers of 12,5 mm thick 'Type F' or 'Type DF' gypsum plasterboards according to EN 520¹. In timber stud walls, no part of the penetration shall be closer than 100 mm to a stud, the cavity must be closed between the penetration seal and the stud and a minimum 100 mm of insulation of reaction to fire class A1 or A2, according to EN 13501-1, is provided within the cavity between the penetration seal and the stud.
- Rigid walls: Concrete or masonry walls with a minimum thickness of 120 mm.

Additional specific elements of construction that have been assessed in this ETA are described in Annex B where relevant.

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

KF-Collar is intended for environmental conditions as defined for use category Type Y_{2,(-20/70)°C} according to ETAG 026-2: intended for semi-exposed use at temperatures below 0°C, but with no exposure to rain nor UV. Type Y_{2,(-20/70)°C} includes lower use categories (i.e. Type Z₁ and Type Z₂).

The provisions made in this ETA are based on a working life of KF-Collar of at least 10 years, provided that the conditions laid down in the manufacturer's instructions for the installation, use

¹ EN 520. Gypsum plasterboards. Definitions, requirements and test methods.

and maintenance are met. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given as to the working life of the product cannot be interpreted as a guarantee, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

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

3.1 Performance of the product

The assessment of KF-Collar considering the basic requirements for construction works 2 and 3 was performed following the ETAG 026 for *Fire Stopping and Fire Sealing Products, Part 1: General (April 2013)* and *Part 2: Penetration Seals (August 2011)*, used as EAD.

Table 1: Performance of the product.

Product: KF-Collar		Intended use: Fire penetration seal	
Basic requirement	Essential characteristic		Performance
BWR 2 Safety in case of fire	Reaction to fire	Inlay material	E
		Steel housing	A1
	Resistance to fire		See Annex B
BWR 3 Hygiene, health and the environment	Release of dangerous substances		See 3.2.3
General aspects relating to the performance of the product	Durability		Type Y _{2,(-20/70)°C}

The rest of characteristics included in ETAG 026-2 has not been assessed in this ETA.

3.2 Methods used for the assessment

3.2.1 Reaction to fire

The performance of the inlay material of KF-Collar has been tested according to EN ISO 11925-2² and determined according to EN 13501-1³.

The pipe collar housing made of stainless steel has a class A1 according to Decision 96/603/EC and Decision 2000/605/EC.

² EN ISO 11925-2:2010/AC:2011. *Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Part 2: Single-flame source test.*

³ EN 13501-1:2007+A1:2009. *Fire classification of construction products and building elements. Part 1: Classification using data from reaction to fire tests.*

3.2.2 Fire resistance

Tested and assessed according to EN 1366-3 ⁴, the fire resistance classification has been determined according to EN 13501-2 ⁵ and is given in Annex B.

3.2.3 Release of dangerous substances

According to the manufacturer's declaration, the specification of KF-Collar has been compared with the substances listed in Annex VI to Regulation (EC) No 1272/2008 and in EOTA Technical Report 034 ⁶, to verify that the product does not contain such substances.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope. In order to meet the provisions of the EU Construction Products Regulation, these requirements need also be complied with, when and where they apply.

3.2.4 General aspects relating to the performance of the product

KF-Collar has been tested and assessed for the environmental use category Type Y_{2,(-20/70)°C} in accordance with ETAG 026-2, section 2.4.12, and the EOTA Technical Report 024 ⁷, section 4.2.5, table 4.1.

Stainless steel in accordance with EN 10088-1 ⁸ is intended for use category Type Y_{2,(-20/70)°C}.

The ETA is issued for the products on the basis of agreed data/information, deposited with the ITeC, in accordance with ETAG 026-2, section 5.

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

According to the Decision 1999/454/EC of the European Commission, the system of AVCP (see EC delegated Regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 2: AVCP System.

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

⁴ EN 1366-3:2009. *Fire resistance tests for service installations. Part 3: Penetration seals.*

⁵ EN 13501-2:2007+A1:2009. *Fire classification of construction products and building elements. Part 2: Classification using data from fire resistance tests, excluding ventilation services.*

⁶ TR 034 *General ER 3 Checklist for ETAGs/CUAPs/ETAs-Content and/or release of dangerous substances in products/kits*, Edition October 2015.

⁷ TR 024 *Characterisation, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products*, Edition July 2009.

⁸ EN 10088-1:2014. *Stainless steels. Part 1: List of stainless steels.*

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

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC and agreed in accordance with ETAG 026-2, section 3.2.1.

The *Control Plan* is a confidential part of the ETA and only handed over to the notified product certification body involved in the assessment and verification of constancy of performance.

The factory production control operated by the manufacturer shall be in accordance with the above mentioned *Control Plan*.

Issued in Barcelona on 13 September 2017

by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart
Technical Director, ITeC

ANNEX A. Description of the product and installation process

A.1. KF-Collar components

KF-Collar is made of the components described in table A.1 and sizes in accordance with table A.2. Two different thicknesses of the steel collar housing are used. The intumescent strip is manufactured at a nominal thickness of 4 mm and the total intumescent thickness of every collar size (b in table A.2) is achieved by adding the required number of intumescent strip layers. The intumescent strip is manufactured at different widths according to the specified collar length (H in table A.2).

Table A.1: Components of KF-Collar.

Part	Material	Dimensions	
Collar housing	Stainless steel AISI 430 (1.4016) According to EN 10088-1	Thickness	0,6 mm (KF-Collar 30 to KF-Collar 160)
			0,8 mm (KF-Collar 200 to KF-Collar 315)
		Other dimensions according to collar size (see table A.2)	
Inlay strip	Intumescent material	Thickness	4 mm (all sizes of KF-Collar)
			Width
		70 mm (KF-Collar 125 to KF-Collar 160)	
		100 mm (KF-Collar 200 and KF-Collar 250)	
		2 x 100 mm (KF-Collar 315)	

A.2. KF-Collar dimensions

KF-Collar is manufactured in different sizes depending on the service to be protected. The corresponding resistance to fire performance is given in Annex B, depending on the construction elements penetrated by the service and the penetration characteristics.

The KF-Collar types covered by this ETA are given in table A.2 and made from the components described in table A.1.

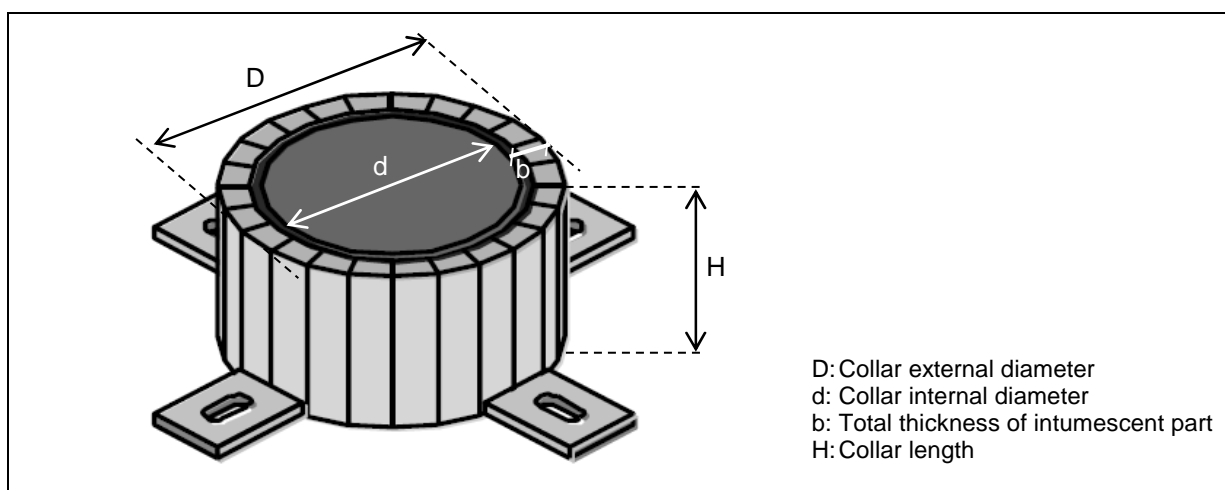


Figure A.1: Dimensions of KF-Collar.

Table A.2: Dimensions of KF-Collar.

Type	d (mm)	D (mm)	H (mm)	b (mm)	Nº of strip layers	Nº of fixing flanges
KF-Collar 30	35	52	50	8	2	4
KF-Collar 40	45	62	50	8	2	4
KF-Collar 50	55	72	50	8	2	4
KF-Collar 63	68	85	50	8	2	4
KF-Collar 80	85	102	50	8	2	4
KF-Collar 90	95	112	50	8	2	4
KF-Collar 100	105	122	50	8	2	4
KF-Collar 110	115	132	50	8	2	4
KF-Collar 125	130	155	70	12	3	5
KF-Collar 140	145	170	70	12	3	5
KF-Collar 160	165	190	70	12	3	5
KF-Collar 200	210	252	100	20	5	5
KF-Collar 250	260	302	100	20	5	5
KF-Collar 315	325	375	200	24	6	5

A.3. KF-Collar installation

KF-Collar will be installed in accordance with the manufacturer instructions and the provisions established in this section and in the relevant sections of Annex B.

KF-Collar shall be fixed depending on the intended use as follows:

- In floors, at the bottom side by means of Ø8 x 60 mm galvanised steel class 8.8 expansion anchors (one fixing in every flange).
- In flexible walls, by means of Ø8 x 140 mm stainless steel screws at the fire exposed side and Ø8 x 50 mm stainless steel screws at the cold side (one fixing in every flange).

Note: in flexible walls, KF-Collar 200 to KF-Collar 315 are fixed with two screws in every flange.

- In rigid walls, by means of Ø8 x 60 mm galvanised steel class 8.8 expansion anchors at both sides (one fixing in every flange).
- For KF-Collar to be installed in combination with AF Panel, a 1 mm diameter steel wire rope is used with minimum tensile strength of 500 N/mm² and a flemish eye splice at both ends (see Annex B where relevant).

All gaps between penetrations and constructive elements (not greater than 5 mm) shall be filled in with mortar (floors and rigid walls) or gypsum paste (flexible walls), also spread over the constructive element surface around the collar base.

Installed penetration seals may require additional components, depending on the particular use, that are specified in the relevant sections of Annex B.

The minimum distance between services penetrating the wall/floor, as well as the minimum distance between services and the constructive element edge, is 200 mm.

The maximum distance from the constructive element to the adequate service support is 500 mm in case of walls (cold side) and floors (upper side).

The following installation provisions will be noted:

- The installation of the penetration seal will not have an effect on the stability of the adjacent building element, even in the event of fire.
- The structural elements related to the wall/floor in which the penetration seal is incorporated will be designed and fire protected in such a way that no additional mechanical load is imposed on the penetration seal.
- The thermal movements of the pipework will be accommodated in such a way that no resulting load is imposed on the penetration seal.
- The services are fixed to the building element in such a way that no additional mechanical load is imposed on the penetration seal in the event of fire.
- The support of the services is maintained during the required period of resistance to fire.
- Pneumatic dispatch systems, compressed air systems, etc. are switched off in the event of fire.

ANNEX B. Resistance to fire performance

B.1. General

The following intended uses are included in this annex:

- B.2. Plastic pipe penetration seal in a flexible or rigid wall.
- B.3. Plastic pipe penetration seal in a flexible or rigid wall with an opening shut by a double layer of AF Panel.
- B.4. Plastic pipe penetration seal in a rigid floor.
- B.5. Plastic pipe penetration seal in a rigid floor with an opening shut by a double layer of AF Panel.
- B.6. Specific cases of penetration seal.

Regarding the material specification of those services included in this Annex B, pipes will be made from:

- PVC-U according to EN 1329-1⁹, EN 1453-1¹⁰ and EN ISO 1452-1¹¹.
- PVC-C according to EN 1566-1¹².
- PP according to EN 1451-1¹³.
- HDPE according to EN 1519-1¹⁴ or EN 12666-1¹⁵.
- PE according to EN 12201-2¹⁶, EN 1519-1 and EN 12666-1.
- ABS according to EN 1455-1¹⁷.
- SAN+PVC according EN 1565-1¹⁸.
- Metal according to section B.6.2.

KF-Collar installation procedure shall fully meet the requirements in Annex A.

⁹ EN 1329-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized poly(vinyl chloride) (PVC-U). Part 1: Specifications for pipes, fittings and the system.*

¹⁰ EN 1453-1. *Plastics piping systems with structured wall-pipes for soil and waste discharge (low and high temperature) inside buildings. Unplasticized poly(vinyl chloride) (PVC-U). Part 1: Specifications for pipes and the system.*

¹¹ EN ISO 1452-1. *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure. Unplasticized poly(vinyl chloride) (PVC-U). Part 1: General (ISO 1452-1:2009).*

¹² EN 1566-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly(vinyl chloride) (PVC-C). Part 1: Specifications for pipes, fittings and the system.*

¹³ EN 1451-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Polypropylene (PP). Part 1: Specifications for pipes, fittings and the system.*

¹⁴ EN 1519-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Polyethylene (PE). Part 1: Specifications for pipes, fittings and the system.*

¹⁵ EN 12666-1. *Plastics piping systems for non-pressure underground drainage and sewerage. Polyethylene (PE). Part 1: Specifications for pipes, fittings and the system.*

¹⁶ EN 12201-2. *Plastics piping systems for water supply, and for drainage and sewerage under pressure. Polyethylene (PE). Part 2: Pipes.*

¹⁷ EN 1455-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Acrylonitrile-butadiene-styrene (ABS). Part 1: Requirements for pipes, fittings and the system.*

¹⁸ EN 1565-1. *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Styrene copolymer blends (SAN+PVC). Part 1: Specifications for pipes, fittings and the system.*

B.2. Resistance to fire classification of plastic pipe penetration seal in a flexible or rigid wall

The flexible wall shall meet the specification given in section 2 of this ETA to achieve the resistance to fire performance given in tables B.2.1 to B.2.3.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in tables B.2.1 to B.2.3. KF-Collar will be installed at both sides of the flexible wall as shown in Figure B.2.1.

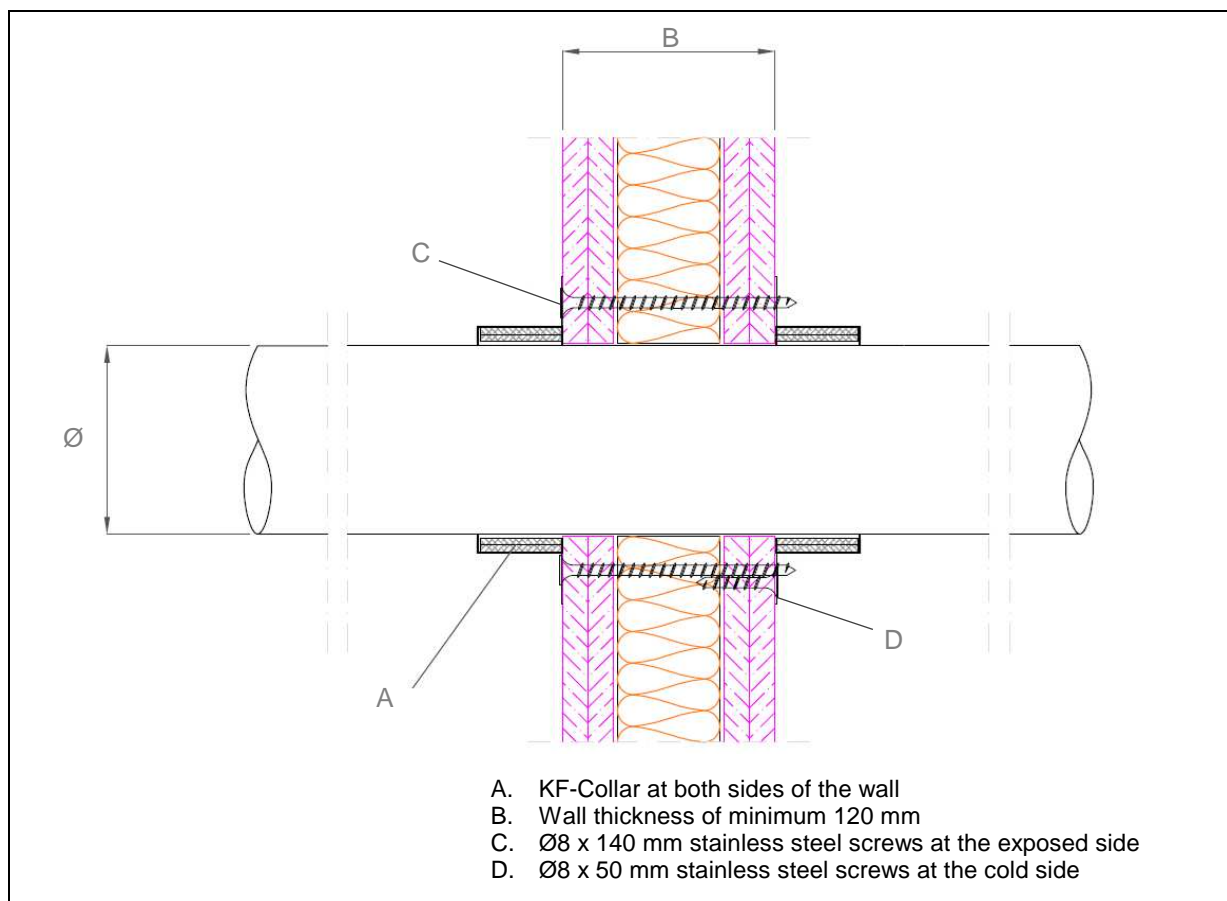


Figure B.2.1: Plastic pipe penetration seal in a flexible wall.

The resistance to fire classification of the wall construction penetrated by combustible pipes is given in tables B.2.1 to B.2.3.

The given resistance to fire performance is also valid for rigid concrete or masonry walls with an overall minimum thickness of 120 mm. In this case, KF-Collar will be fixed by means of Ø8 x 60 mm steel expansion anchors at both sides of the wall (see section A.3).

The classification given for a pipe end configuration U/U is also valid for any other pipe end configuration (C/U, U/C and C/C). The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

Table B.2.1: PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 160	30 to 160	3,2	EI 120 U/U
KF-Collar 200 to 250	200 to 250	6,2	EI 120 U/C
KF-Collar 315	315	7,7	EI 90 U/C

Table B.2.2: PP pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	2,7	EI 120 U/U
KF-Collar 125 to 160	125 to 160	3,9	EI 120 U/C
KF-Collar 200 to 250	200 to 250	9,6	

Table B.2.3: HDPE, PE, ABS and SAN+PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	6,0	EI 120 U/U
KF-Collar 125 to 160	125 to 160	6,2	EI 120 U/C
KF-Collar 200 to 250	200 to 250	7,7	
KF-Collar 315	315	11,0	EI 90 U/C

B.3. Resistance to fire classification of plastic pipe penetration seal in a flexible or rigid wall with an opening shut by a double layer of AF Panel

The flexible wall shall meet the specification given in section 2 of this ETA to achieve the resistance to fire performance given in tables B.3.1 to B.3.2.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in tables B.3.1 to B.3.2. KF-Collar will be installed integrated in a double layer of AF Panel at the exposed side of the flexible wall as shown in Figure B.3.1.

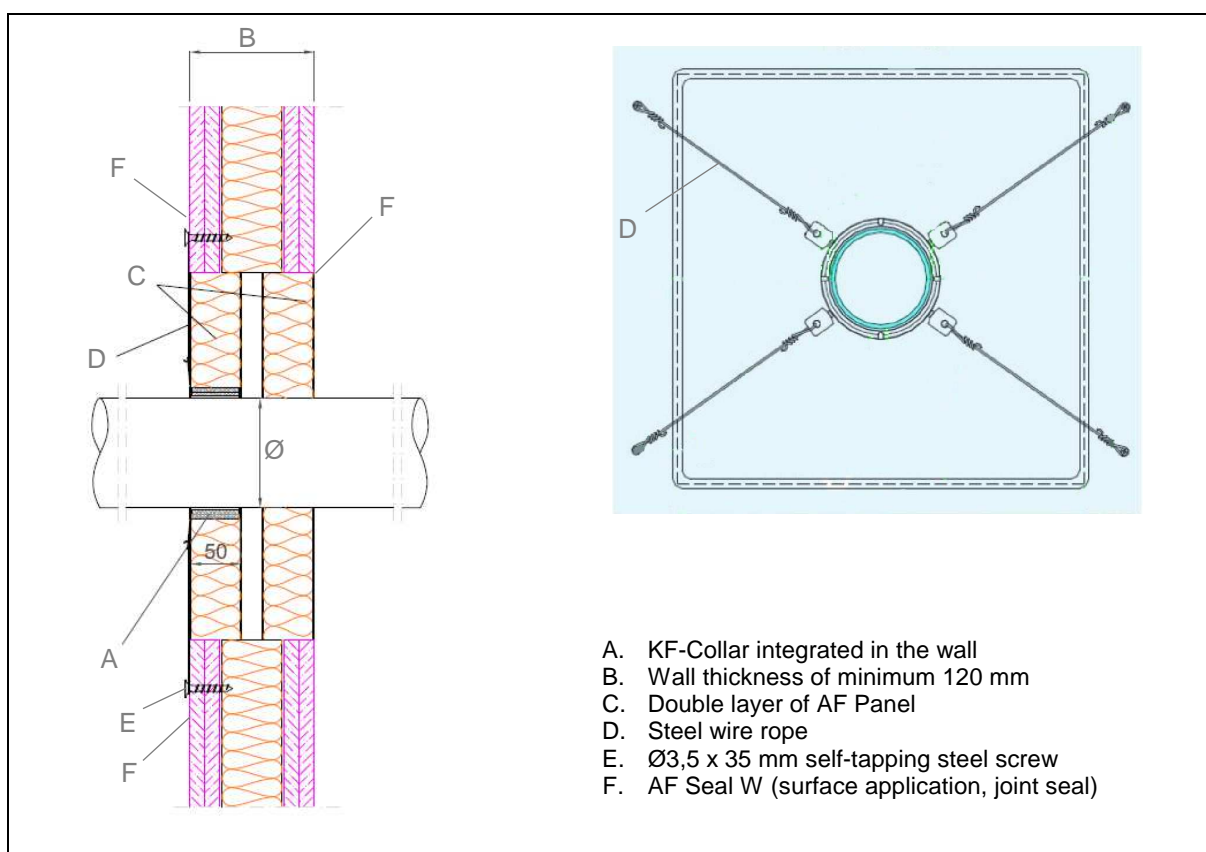


Figure B.3.1: Plastic pipe penetration seal in a flexible wall with an opening shut by a double layer of AF Panel.

AF Panel consists of a mineral wool board with thickness of 50 mm and density of 150 kg/m³, coated on both faces with 1 mm of ablative paint AF Seal T. The maximum size of the opening in which the double layer of AF Panel is fitted will be 450 mm x 450 mm. AF Panel is installed by pressure with AF Seal W acrylic sealant at the edges. No splice can be included. Only one penetration is allowed, placed in the centre of the AF Panel seal.

KF-Collar is incorporated between the pipe and AF Panel and held in every flange with a 1 mm steel wire rope which is fixed to the wall with Ø3,5 x 35 mm self-tapping galvanised steel screws. AF Seal W acrylic sealant shall be applied on the surface of the AF Panel and the wall to entirely cover the wires and screws at an approximate thickness of 2 mm and, at the cold side, AF Seal W acrylic sealant shall be applied over the AF Panel perimeter joint.

The resistance to fire classification of the wall construction with an opening shut by a double layer of AF Panel penetrated by combustible pipes is given in tables B.3.1 to B.3.2.

The given resistance to fire performance is also valid for rigid concrete or masonry walls with an overall minimum thickness of 120 mm. In this case, the steel wire rope will be fixed by means of Ø8 x 60 mm galvanised steel expansion anchors at both sides of the wall (see section A.3).

For pipe closure devices positioned within the building element, when the overall thickness of such an element is greater than the minimum specified (120 mm), the length of the collar will be increased accordingly and kept levelled at the wall surface.

The classification given for a pipe end configuration U/U is also valid for any other pipe end configuration (C/U, U/C and C/C). The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

Table B.3.1: PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	3,2	EI 120 U/U

Table B.3.2: PP pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	2,7	EI 120 U/U
KF-Collar 125 to 160	125 to 160	3,9	EI 120 U/C

B.4. Resistance to fire classification of plastic pipe penetration seal in a rigid floor

The rigid floor shall meet the specification given in section 2 of this ETA to achieve the resistance to fire performance given in tables B.4.1 to B.4.3.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in tables B.4.1 to B.4.3. KF-Collar will be installed at the bottom side of the floor as shown in Figure B.4.1.

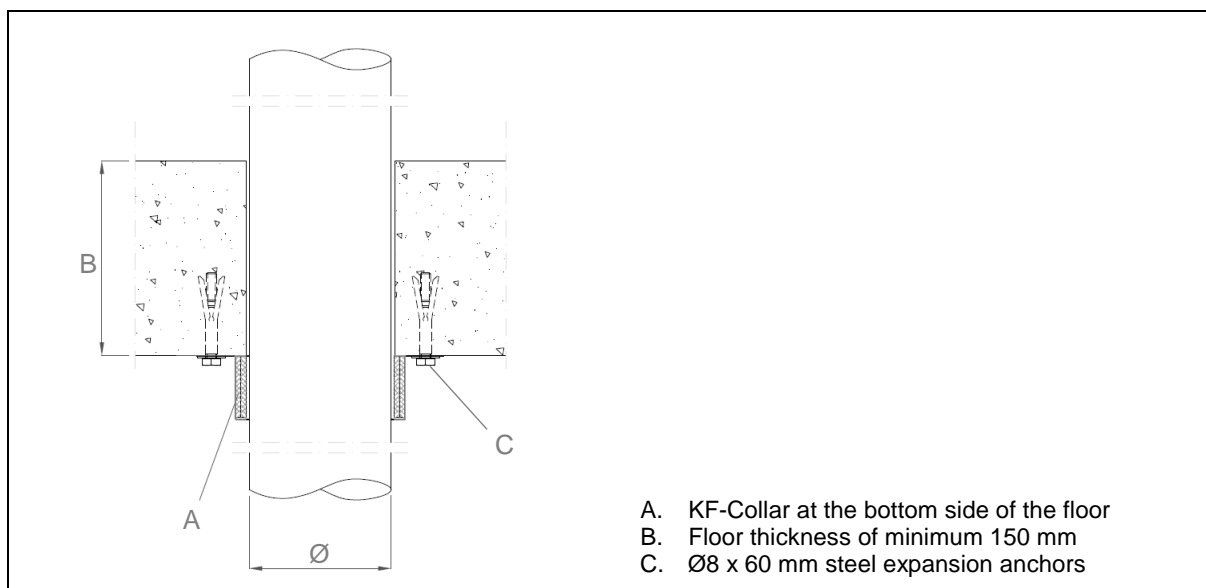


Figure B.4.1: Plastic pipe penetration seal in a rigid floor.

The resistance to fire classification of the rigid floor construction penetrated by combustible pipes is given in tables B.4.1 to B.4.3.

The classification given for a pipe end configuration U/U is also valid for any other pipe end configuration (C/U, U/C and C/C). The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

Table B.4.1: PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	3,2	EI 180 U/U
KF-Collar 125 to 160	125 to 160		EI 120 U/U
KF-Collar 200 to 250	200 to 250	8,2	EI 180 U/C
KF-Collar 315	315	7,7	EI 120 U/C

Table B.4.2: PP pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	2,7	EI 180 U/U
KF-Collar 125 to 160	125 to 160	3,9	EI 180 U/C
KF-Collar 200 to 250	200 to 250	16,0	EI 90 U/C

Table B.4.3: HDPE, PE, ABS and SAN+PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	6,5	EI 180 U/U
KF-Collar 125 to 160	125 to 160	10,0	
KF-Collar 200 to 250	200 to 250	7,7	EI 180 U/C
KF-Collar 315	315	9,0	

B.5. Resistance to fire classification of plastic pipe penetration seal in a rigid floor with an opening shut by a double layer of AF Panel

The rigid floor shall meet the specification given in section 2 of this ETA to achieve the resistance to fire performance given in tables B.5.1 to B.5.3.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in tables B.5.1 to B.5.3. KF-Collar will be installed at the bottom of a double layer of AF Panel integrated in the floor as shown in Figure B.5.1.

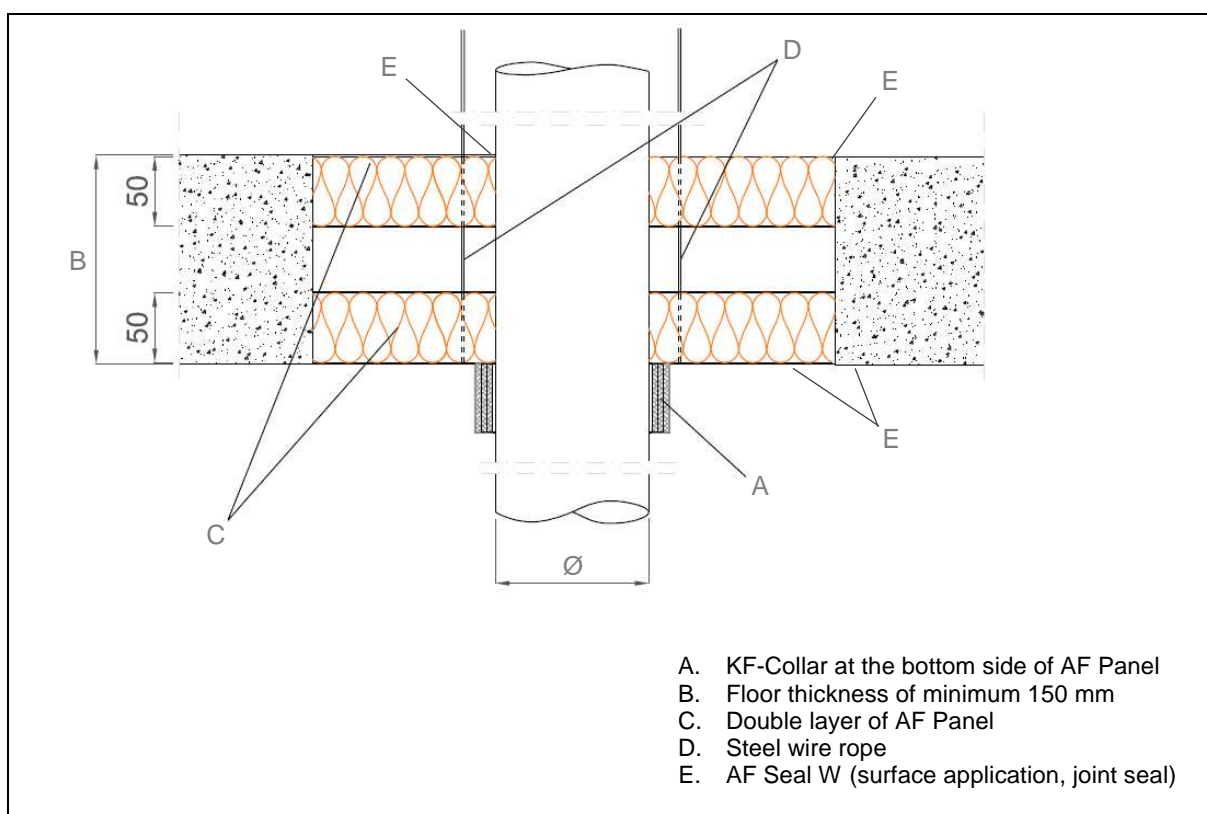


Figure B.5.1: Plastic pipe penetration seal in a rigid floor with an opening shut by a double layer of AF Panel.

AF Panel consists of a mineral wool board with thickness of 50 mm and density of 150 kg/m³, coated on both faces with 1 mm of ablative paint AF Seal T. The maximum size of the opening in which the double layer of AF Panel is fitted will be 450 mm x 450 mm. AF Panel is installed by pressure with AF Seal W acrylic sealant at the edges. No splice can be included. Only one penetration is allowed, placed in the centre of the AF Panel seal.

KF-Collar is placed below AF Panel and held in every flange with a 1 mm diameter steel wire rope which is fixed to a protected supporting structure at the upper side of the floor, passing through the double layer of AF Panel. AF Seal W acrylic sealant shall be applied at the bottom side of the floor on the surface of AF Panel at an approximate thickness of 2 mm, covering the steel wire and the collar fixing flanges, and extending beyond the panel perimeter on the floor. AF Seal W acrylic sealant shall be applied at the upper side of the floor over the joint between the panel and the floor, as well as between the panel and the service.

The resistance to fire classification of the rigid floor construction with an opening shut by a double layer of AF Panel penetrated by combustible pipes is given in tables B.5.1 to B.5.3.

The classification given for a pipe end configuration U/U is also valid for any other pipe end configuration (C/U, U/C and C/C). The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

Table B.5.1: PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	3,2	EI 120 U/U
KF-Collar 125 to 160	125 to 160		EI 180 U/U
KF-Collar 200 to 250	200 to 250	6,2	EI 180 U/C

Table B.5.2: PP pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	2,7	EI 120 U/U
KF-Collar 125 to 160	125 to 160	3,9	EI 180 U/C

Table B.5.3: HDPE, PE, ABS and SAN+PVC pipes.

KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
KF-Collar 30 to 110	30 to 110	4,2	EI 180 U/U
KF-Collar 125 to 160	125 to 160	6,2	EI 180 U/C
KF-Collar 200 to 250	200 to 250	7,7	

B.6. Resistance to fire classification of specific cases of penetration seal

B.6.1. Double plastic pipe penetration seal in a rigid floor with an opening shut by a double layer of AF Panel

The concrete floor will have a minimum thickness of 200 mm and a minimum density of 1600 kg/m³ with a minimum resistance to fire performance as given in table B.6.1.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in table B.6.1. Two KF-Collar will be installed at the bottom of a double layer of AF Panel integrated in the floor as shown in Figure B.6.1.

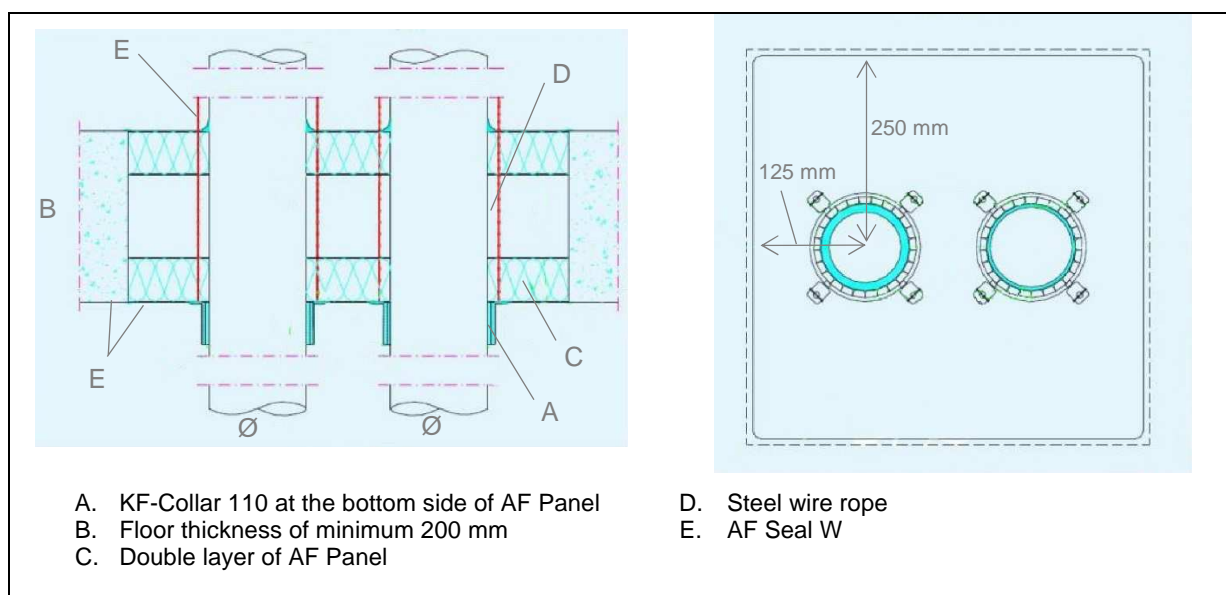


Figure B.6.1: Double plastic pipe penetration seal in a rigid floor with an opening shut by a double layer of AF Panel.

AF Panel consists of a mineral wool board with thickness of 50 mm and density of 150 kg/m³, coated on both faces with 1 mm of ablative paint AF Seal T. The maximum size of the opening in which the double layer of AF Panel is fitted will be 500 mm x 500 mm. AF Panel is installed by pressure with AF Seal W acrylic sealant at the edges. No splice can be included. A maximum of two penetrations (one PP pipe and one HDPE pipe) are allowed. The distance from the centre of both penetrations to the AF Panel edges shall be as shown in Figure B.6.1.

KF-Collar is placed below AF Panel and held in every flange with a 1 mm diameter steel wire ropes which is fixed to a protected supporting structure at the upper side of the floor, passing through the double layer of AF Panel. AF Seal W acrylic sealant shall be applied at the bottom side of the floor on the surface of AF Panel at an approximate thickness of 2 mm, covering the steel wire and the collar fixing flanges, and extending beyond the panel perimeter on the floor. AF Seal W acrylic sealant shall be applied at the upper side of the floor over the joint between the panel and the floor, as well as between the panel and the services.

The resistance to fire classification of the rigid floor construction with an opening shut by a double layer of AF Panel penetrated by two combustible pipes is given in table B.6.1.

The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

Table B.6.1: Resistance to fire.

Pipe material	KF-Collar type	External pipe diameter \varnothing (mm)	Pipe wall thickness (mm)	Resistance to fire class
PP	KF-Collar 30 to 110	30 to 110	4,2	EI 180 U/C
HDPE			10,0	

B.6.2. Metal pipe penetration seal in rigid floor

The concrete floor will have a minimum thickness of 200 mm and a minimum density of 1600 kg/m³ with a minimum resistance to fire performance as given in table B.6.2.2. KF-Collar 160 will be installed in accordance with Annex A, at the bottom side of the floor as shown in Figure B.6.2.

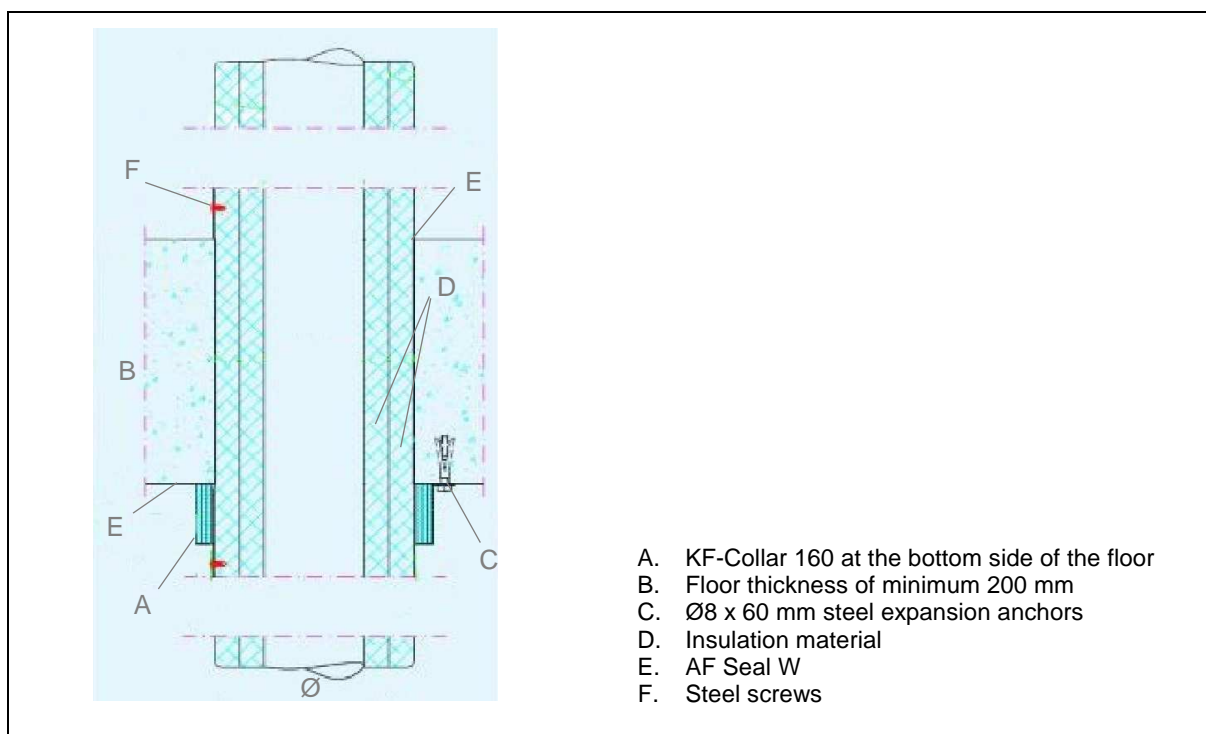


Figure B.6.2: Metal pipe penetration seal in rigid floor.

The metal pipe will be made of mild steel with a minimum melting point of 1538 °C. Two continuous sheaths of elastomeric insulation material ARMAFLEX ACE, as specified in table B.6.2.1, are installed around the metal pipe and wrapped by an external 0,5 mm aluminium sheet along the complete length of ARMAFLEX ACE, fixed with galvanised steel screws of $\varnothing 4,2 \times 13$ mm every 300 mm.

Table B.6.2.1: ARMAFLEX ACE specification.

Characteristic	Specification
Thickness	20 mm (each layer)
Density	50 kg/m ³
Reaction to fire	D _L -s3,d0
Minimum length	1200 mm (500 mm out of the floor thickness at both sides of the element)

The resistance to fire classification of the rigid floor construction penetrated by the insulated metal pipe is given in table B.6.2.2. The classification given for a pipe end configuration C/C is only valid for a pipe end configuration C/C.

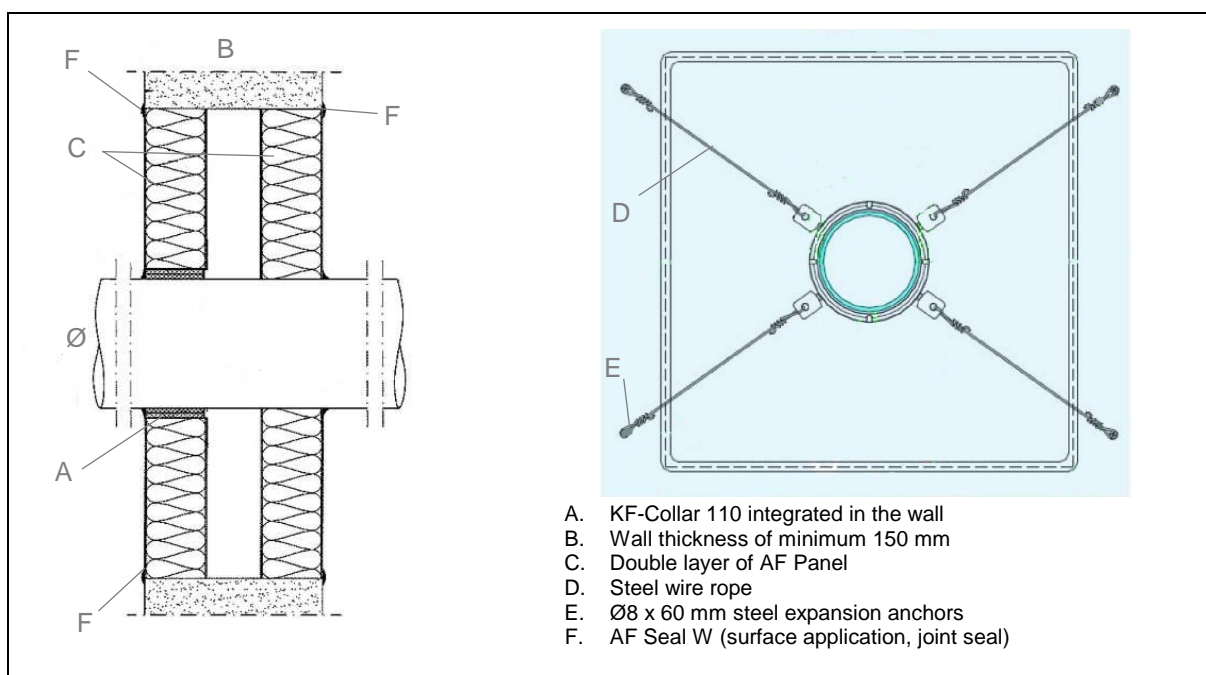
Table B.6.2.2: Resistance to fire.

Pipe material	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
Steel	80	3,5	EI 180 C/C

B.6.3. Plastic pipe penetration seal in rigid wall with an opening shut by a double layer of AF Panel

The concrete wall will have a minimum thickness of 150 mm and a minimum density of 500 kg/m³ with a minimum resistance to fire performance as given in table B.6.3.

The relevant size of KF-Collar will be installed in accordance with Annex A and the pipe diameter specified in tables B.6.3. KF-Collar will be installed integrated in a double layer of AF Panel at the exposed side of the wall as shown in Figure B.6.3.

**Figure B.6.3:** Plastic pipe penetration seal in rigid wall with an opening shut by a double layer of AF Panel.

AF Panel consists of a mineral wool board with thickness of 50 mm and density of 150 kg/m³, coated on both faces with 1 mm of ablative paint AF Seal T. The maximum size of the opening in which the double layer of AF Panel is fitted will be 400 mm x 400 mm. AF Panel is installed by pressure with AF Seal W acrylic sealant at the edges. No splice can be included. Only one penetration is allowed, placed in the centre of the AF Panel seal.

KF-Collar is incorporated between the pipe and AF Panel and held in every flange with a 1 mm steel wire rope which is fixed to the wall with Ø8 x 60 mm galvanised steel expansion anchors (see section A.3). AF Seal W acrylic sealant shall be applied on the surface of the AF Panel and the wall to entirely cover the wires and anchors at an approximate thickness of 2 mm and, at the cold side, AF Seal W acrylic sealant shall be applied to cover the AF Panel perimeter joint.

The resistance to fire classification of the rigid wall construction with an opening shut by a double layer of AF Panel penetrated by combustible pipes is given in table B.6.3. The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

For pipe closure devices positioned within the building element, when the overall thickness of such an element is greater than the minimum specified (150 mm), the length of the collar will be increased accordingly and kept levelled at the wall surface.

Table B.6.3: Resistance to fire.

Pipe material	KF-Collar type	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
PP	KF-Collar 30 to 110	30 to 110	3,0	EI 180 U/C

B.6.4. Double plastic pipe penetration seal in a flexible or rigid wall with an opening shut by a double layer of AF Panel

The flexible wall shall meet the specification given in section 2 of this ETA, but with a minimum thickness of 125 mm, to achieve the resistance to fire performance given in table B.6.4.2.

The relevant size of KF-Collar will be installed in accordance with Annex A, integrated in a double layer of AF Panel at the exposed side of the wall as shown in Figure B.6.4.

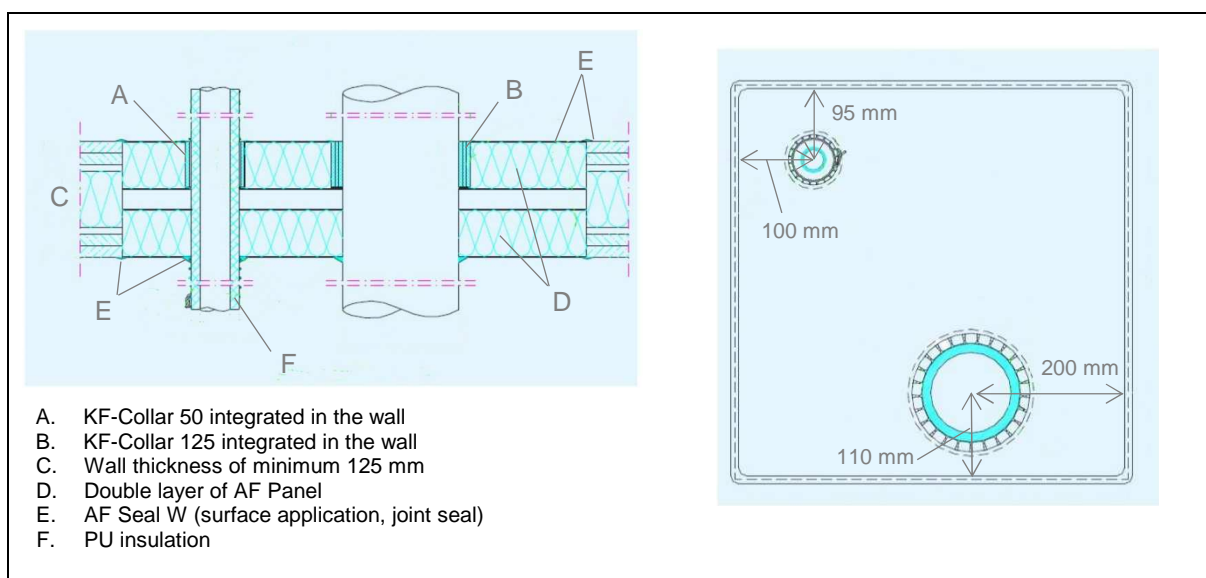


Figure B.6.4: Double plastic pipe penetration seal in a flexible wall with an opening shut by a double layer of AF Panel.

AF Panel consists of a mineral wool board with thickness of 50 mm and density of 150 kg/m³, coated on both faces with 1 mm of ablative paint AF Seal T. The maximum size of the opening in which the double layer of AF Panel is fitted will be 500 mm x 500 mm. AF Panel is installed by pressure with AF Seal W acrylic sealant at the edges. No splice can be included. A maximum of two penetrations are allowed. The distance from the centre of the services to the AF Panel edges shall be as shown in figure B.6.4.

KF-Collar 125 is incorporated between an HDPE pipe and the AF Panel and KF-Collar 50 is incorporated between an insulated PE-Xb/Al/HDPE multilayer pipe and the AF Panel. KF-Collar is installed with the fixing flanges in the inner side of the panel. The PE-Xb/Al/HDPE multilayer pipe will be insulated by a continuous sheath of expanded PU, as specified in table B.6.4.1, held with a steel wire rope.

Table B.6.4.1: Expanded PU insulation specification.

Characteristic	Specification
Thickness	10 mm
Density	50 kg/m ³
Reaction to fire	D _L -s3,d0
Minimum length	1125 mm (500 mm out of the wall thickness at both sides of the element)

The resistance to fire classification of the wall construction with an opening shut by a double layer of AF Panel penetrated by the combustible pipes is given in table B.6.4.2. The classification given for a pipe end configuration U/C is also valid for a pipe end configuration C/C.

The given resistance to fire performance is also valid for rigid concrete or masonry walls with an overall minimum thickness of 125 mm.

For pipe closure devices positioned within the building element, when the overall thickness of such an element is greater than the minimum specified (125 mm), the length of the collar will be increased accordingly and kept levelled at the wall surface.

Table B.6.4.2: Resistance to fire.

Pipe material	External pipe diameter Ø (mm)	Pipe wall thickness (mm)	Resistance to fire class
PE-Xb/Al/HDPE	32	3,0*	EI 120 U/C
HDPE	125	11,5	

* PE-Xb: 0,8 mm / Al: 0,7 mm / HDPE: 1,5 mm.