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Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA

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European Technical Assessment

ETA 16/0771 of 04.09.2023

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	**AF MULTICOLLAR**
Product family to which the construction product belongs	Fire stopping and fire sealing products. Penetration seals.
Manufacturer	**AF SYSTEMS SPA** Via Edward Jenner 41-43 IT26837 Mulazzano Italy
Manufacturing plant(s)	According to Annex N kept by ITeC.
This European Technical Assessment contains	60 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	European Assessment Document EAD 350454-00-1104.
This version replaces	ETA 16/0771, issued on 30.07.2019.

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

AF MULTICOLLAR is a service closure device used as fire penetration seal, consisting of a fire protective inlay made of intumescent material contained in a collar housing of stainless steel with flanges for fixing to the constructive element.

AF MULTICOLLAR is supplied in one size only and cut to a length to suit the external diameter of the service to be protected.

AF MULTICOLLAR is made of the components described in table 1. The intumescent strip is manufactured at a nominal thickness of 4 mm and the total intumescent thickness of every collar size (see b in table B.2) is achieved by adding the required number of intumescent strip layers.

Table 1: Components of AF MULTICOLLAR.

Part	Material	Dimensions
Collar housing	Stainless steel AISI 430 (1.4016) According to EN 10088-1	Thickness: 0,6 mm Length: 3000 mm Width: 50 mm
Inlay	Intumescent material	Thickness: 4 mm Length: 8600 mm Width: 50 mm

The collar housing sheet has transversal slots to allow the cutting to size according to the service diameter and the necessary length for wrapping around, as well as fixing flanges to install the collar. Dimensions of the collar housing are giving in figure 1.

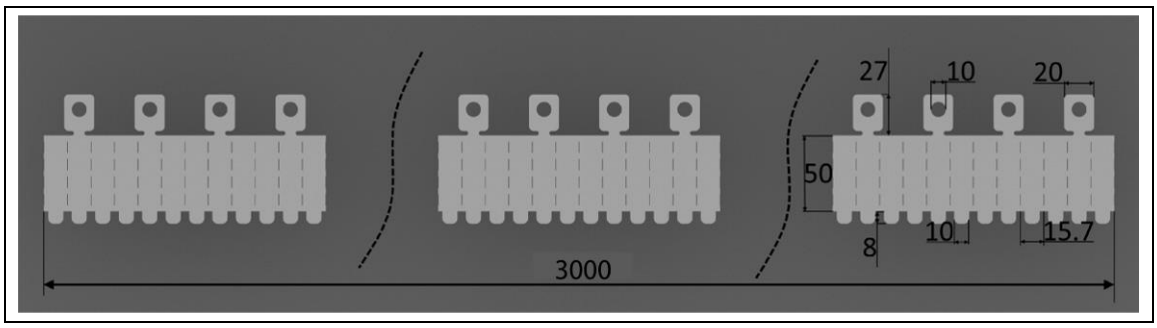


Figure 1: Collar housing sheet.

The detailed description of AF MULTICOLLAR installation procedure is given in Annex B.

Assembled penetration seals require additional components as described in the annexes of this ETA. These components cannot be CE marked based on this ETA.

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

AF MULTICOLLAR is used to reinstate the resistance to fire performance of a constructive element where it is penetrated by the following services:

- plastic pipes,
- insulated steel pipes,
- multilayer composite pipes,
- cable bundles.

The detailed specification of the services that may be protected with AF MULTICOLLAR are given in Annex A.

The constructive elements where AF MULTICOLLAR may be installed to provide a penetration seal are as follows (detailed specification in Annex B):

- Rigid walls (B.2.1):
  - Rigid walls of thickness 150 mm with resistance to fire EI 180 (B.2.1.1).
  - Rigid walls of thickness 200 mm with resistance to fire EI 240 (B.2.1.2).
- Flexible walls (B.2.2):
  - Flexible walls of thickness 80 mm with resistance to fire EI 60 (B.2.2.1).
  - Flexible walls of thickness 100 mm with resistance to fire EI 120 (B.2.2.2).
  - Flexible walls of thickness 120 mm with resistance to fire EI 120 (B.2.2.3).
  - Flexible walls of thickness 125 mm with resistance to fire EI 120 (B.2.2.4).
  - Flexible walls of thickness 135 mm with resistance to fire EI 120 (B.2.2.5).
- Lining walls (B.2.3):
  - Lining walls of thickness 30 mm with resistance to fire EI 60 (B.2.3.1).
  - Lining walls of thickness 50 mm with resistance to fire EI 120 (B.2.3.2).
- Sandwich panels walls of thickness 100 mm with resistance to fire EI 120 (B.2.4).
- Timber walls of thickness 137 mm with resistance to fire EI 120 (B.2.5).
- Rigid floors of thickness from 150 mm to 200 mm and resistance to fire EI 180 to EI 240 (B.3.1).
- Timber floors of thickness 158 mm with resistance to fire EI 120 (B.3.2).
- False ceiling of thickness 50 mm with resistance to fire EI 120 (B.3.3).

The constructive element where the penetration seal is installed must be classified in accordance with EN 13501-2 [1] for the required fire resistance period.

AF MULTICOLLAR is intended for environmental conditions as defined for use category Type Y_1 according to EAD 350454-00-1104: intended for semi-exposed use at temperatures below 0°C, with exposure to UV but not to rain. Type Y_1 includes lower use categories (i.e., Type Y_2, Type Z_1 and Type Z_2).

The provisions made in this ETA are based on a working life of AF MULTICOLLAR of at least 25 years, provided that the conditions laid down in the manufacturer's instructions for the installation, use 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 AF MULTICOLLAR has been performed in accordance with EAD 350454-00-1104 for *Penetration Seals (September 2017)*.

Table 2: Performance of the product.

Product: AF MULTICOLLAR		**Intended use:** Fire penetration seal
Basic requirement	**Essential characteristic**	**Performance**
BWR 2 Safety in case of fire	Reaction to fire – Inlay material	E
	Reaction to fire – Steel housing	A1
	Resistance to fire	See Annex A
BWR 4 Safety and accessibility in use	Durability	Type Y_1

The rest of characteristics included in EAD 350454-00-1104 have not been assessed in this ETA.

[1] EN 13501-2 Fire classification of construction products and building elements. Part 2: Classification using data from fire resistance tests, excluding ventilation services.

3.2 Methods used for the assessment

3.2.1 Reaction to fire

The performance of the inlay material of AF MULTICOLLAR has been tested according to EN ISO 11925-2 [2] and determined according to EN 13501-1[3] and Regulation (EU) 2016/364.

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

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 and is given in Annex A.

3.2.3 Durability

AF MULTICOLLAR has been tested and assessed for the environmental use category Type Y_1 in accordance with section 2.2.9 of EAD 350454-00-1104 and the EOTA Technical Report 024 [5], section 4.2.4 (for a 25-year working life).

Stainless steel in accordance with EN 10088-1[6] is intended for use category Type Y_1.

[2] EN ISO 11925-2 Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Part 2: Single-flame source test.

[3] EN 13501-1 Fire classification of construction products and building elements. Part 1: Classification using data from reaction to fire tests.

[4] EN 1366-3 Fire resistance tests for service installations. Part 3: Penetration seals (2009).

[5] EOTA TR 024 Characterisation, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products, Edition July 2009.

[6] EN 10088-1 Stainless steels. Part 1: List of stainless steels.

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 Europ0ean 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 3: 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

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

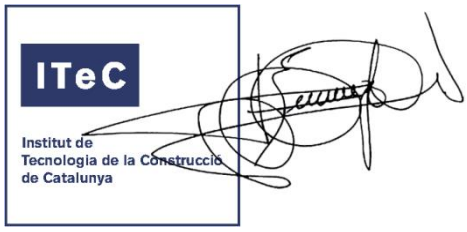
All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC and agreed in accordance with EAD 350454-00-1104, section 3.

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 4 September 2023

by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart

Technical Director, ITeC

ANNEX A. Resistance to fire performance

A.1. General

The technical services sealed with AF MULTICOLLAR that have been assessed in walls are shown in:

- Table A.1: Plastic pipes assessed in walls.
- Table A.2: Special plastic pipes with acoustic insulation performance assessed in walls.
- Table A.3: Plastic pipes in a corner assessed in walls.
- Table A.4: Curved (90º) plastic pipes assessed in walls.
- Table A.5: Plastic pipes (passing through AF PANEL seal) assessed in walls.
- Table A.6: Plastic pipes (passing through AF BRICK seal) assessed in walls.
- Table A.7: Insulated steel pipes assessed in walls.
- Table A.8: Insulated steel pipes (passing through AF PANEL seal) assessed in walls.
- Table A.9: Multilayer composite pipes assessed in walls.
- Table A.10: Cable bundles assessed in walls.
- Table A.11: Cable bundles (passing through AF PANEL seal) assessed in walls.

Note: All resistance to fire classifications given for flexible walls can be applied to rigid walls of at least the same thickness and resistance to fire.

The technical services sealed with AF MULTICOLLAR that have been assessed in floors are shown in:

- Table A.12: Plastic pipes assessed in floors.
- Table A.13: Special plastic pipes with acoustic insulation performance assessed in floors.
- Table A.14: Plastic pipes in a corner assessed in floors.
- Table A.15: Curved (90º) plastic pipes assessed in floors.
- Table A.16: Plastic pipes (passing through AF PANEL seal) assessed in floors.
- Table A.17: Plastic pipes (passing through AF BRICK seal) assessed in floors.
- Table A.18: Insulated steel pipes assessed in floors.
- Table A.19: Multilayer composite pipes assessed in floors.
- Table A.20: Cable bundles assessed in floors.
- Table A.21: Cable bundles (passing through AF PANEL seal) assessed in floors.
- Table A.22: Plastic pipes assessed in false ceilings.
- Table A.23: Insulated steel pipes assessed in false ceilings.
- Table A.24: Cable bundles assessed in false ceilings.

The rules for the field of direct application of the test results given in EN 1366-3 can be applied.

The additional components that make up the penetration seal, referred to in this annex (e.g., steel pipes, insulation for pipes, cables, AF PANEL, AF BRICK or AF SEAL W), shall meet the specification given in table B.3, except if otherwise specified in tables A.1 to A.24.

A.2. Resistance to fire performance in walls

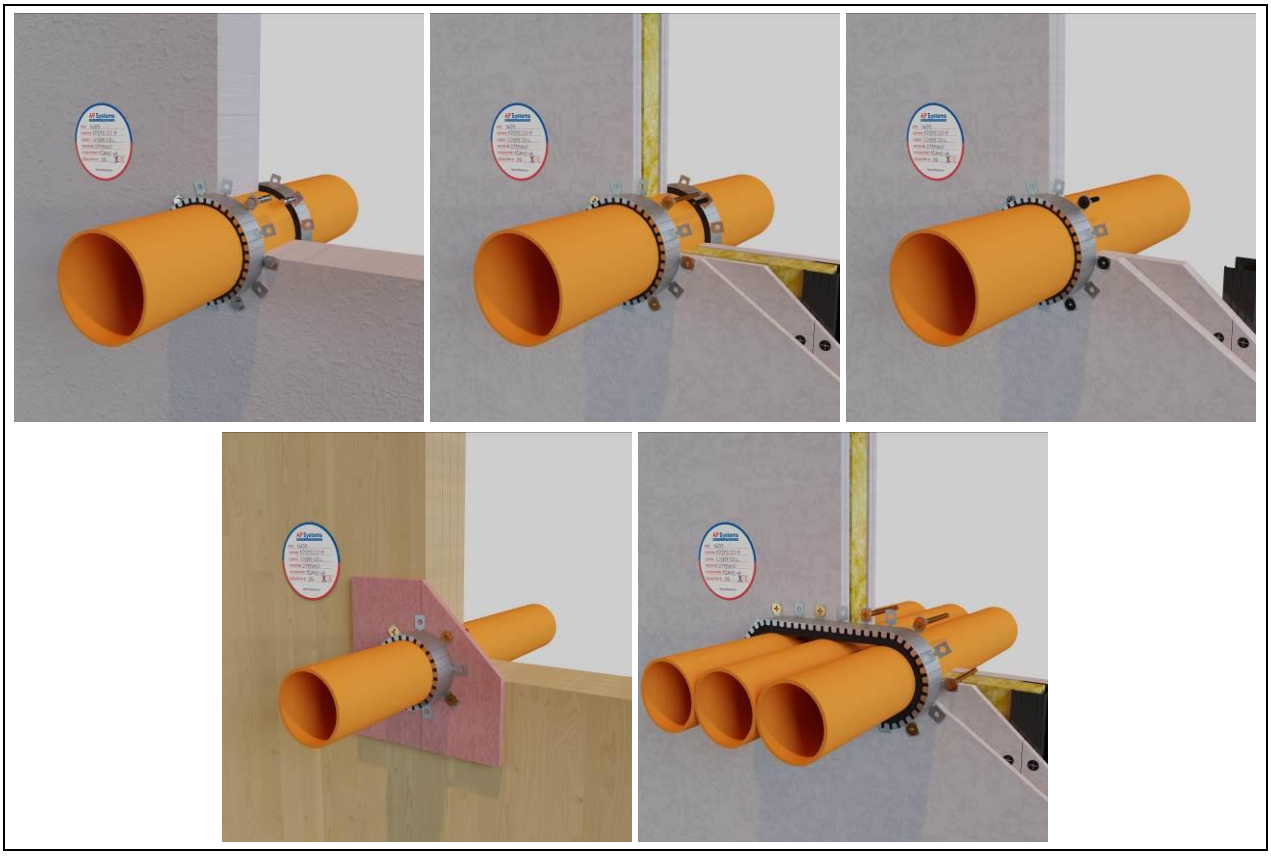


Figure A.1: Examples of plastic pipe seal in walls.

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
PVC pipes	$Ø_{ext}$ = 63 mm t = 3,0 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.4	--	--
	$Ø_{ext}$ = 110 mm t = 2,7 mm	--	EI 60 U/C Section B.2.2.1	--	--
	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 180 U/C Section B.2.1.1	EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 3,2 mm AF MULTICOLLAR at the fire exposed side only.	--	--	--	EI 120 U/C Section B.2.5

[7] $Ø_{ext}$: pipe external diameter; t: pipe wall thickness.

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
PVC pipes	$Ø_{ext}$ = 110 mm t = 6,6 mm	--	EI 120 U/U Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 6,6 mm 1 layer of 20 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 180 U/C Section B.2.1.1 ——— EI 240 U/C Section B.2.1.2	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 8,1 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1 ——— EI 120 U/C Section B.2.3.2	EI 120 U/C Section B.2.5
	$Ø_{ext}$ = 160 mm t = 3,2 mm	EI 180 U/C Section B.2.1.1	EI 60 U/C Section B.2.2.1	--	--
	$Ø_{ext}$ = 160 mm t = 9,5 mm	--	EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 160 mm t = 9,5 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1	--
	$Ø_{ext}$ = 160 mm t = 11,0 mm	EI 180 U/C Section B.2.1.1	--	--	--
	$Ø_{ext}$ = 160 mm t = 11,8 mm	EI 240 U/C Section B.2.1.2	--	--	--
	$Ø_{ext}$ = 160 mm t = 11,8 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 120 U/C Section B.2.3.2	--
	$Ø_{ext}$ = 250 mm t = 6,2 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 250 mm t = 18,4 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 315 mm t = 23,2 mm	--	EI 120 U/C Section B.2.2.3	--	--

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
PP pipes	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 180 U/C Section B.2.1.1	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 2,7 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.4	--	--
	$Ø_{ext}$ = 110 mm t = 3,0 mm AF MULTICOLLAR at the fire exposed side only.	EI 120 U/U Section B.2.1.1 ——— EI 180 U/C Section B.2.1.2	--	--	--
	$Ø_{ext}$ = 110 mm t = 3,4 mm AF MULTICOLLAR at the fire exposed side only.	--	--	--	EI 120 U/C Section B.2.5
	$Ø_{ext}$ = 110 mm t = 4,2 mm	--	EI 120 U/U Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 4,5 mm 1 layer of 20 mm thick insulation.	--	EI 120 U/U Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 6,6 mm 1 layer of 20 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 12,3 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1	--
	$Ø_{ext}$ = 110 mm t = 15,1 mm	EI 240 U/C Section B.2.1.2	EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 16,1 mm	EI 180 U/C Section B.2.1.1	--	--	--
	$Ø_{ext}$ = 110 mm t = 18,3 mm	--	EI 60 U/C Section B.2.2.1	--	--

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
PP pipes	$Ø_{ext}$ = 160 mm t = 3,9 mm	EI 180 U/C Section B.2.1.1	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 160 mm t = 4,0 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.4	--	--
	$Ø_{ext}$ = 160 mm t = 14,6 mm	EI 180 U/C Section B.2.1.1 ——— EI 240 U/C Section B.2.1.2	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 250 mm t = 7,7 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 250 mm t = 16,0 mm AF MULTICOLLAR 250 with length (H) 50 mm.	--	EI 120 U/C Section B.2.2.2	--	--
HDPE pipes	$Ø_{ext}$ = 50 mm t = 3,0 mm	--	EI 120 C/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 50 mm t = 3,0 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 C/C Section B.2.2.3	--	--
	$Ø_{ext}$ = 63 mm t = 8,6 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 4,2 mm	EI 180 U/C Section B.2.1.1 ——— EI 240 U/C Section B.2.1.2	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 4,2 mm AF MULTICOLLAR at the fire exposed side only.	--	--	--	EI 120 U/C Section B.2.5
	$Ø_{ext}$ = 110 mm t = 6,0 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 9,3 mm	--	EI 120 U/C Section B.2.2.2	--	--

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
HDPE pipes	$Ø_{ext}$ = 110 mm t = 9,3 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 12,3 mm	EI 180 U/C Section B.2.1.1	EI 120 U/C Section B.2.2.2 ——— EI 120 U/U Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 12,3 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1	--
	$Ø_{ext}$ = 110 mm t = 15,1 mm	--	EI 60 U/C Section B.2.2.1	--	--
	$Ø_{ext}$ = 160 mm t = 6,2 mm	EI 180 U/C Section B.2.1.1	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 160 mm t = 14,6 mm	EI 240 U/C Section B.2.1.2	--	--	--
	$Ø_{ext}$ = 160 mm t = 16,0 mm	EI 180 U/C Section B.2.1.1	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 250 mm t = 7,7 mm	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 250 mm t = 22,7 mm AF MULTICOLLAR 250 with length (H) 50 mm.	--	EI 120 U/C Section B.2.2.2	--	--
PP-R pipes	$Ø_{ext}$ = 63 mm t = 10,5 mm 1 layer of 21,5 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	--	--	EI 120 U/C Section B.2.5
	$Ø_{ext}$ = 110 mm t = 6,8 mm 1 layer of 19 mm thick insulation.	--	EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 6,8 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.3	--	--
	$Ø_{ext}$ = 110 mm t = 14,9 mm	EI 240 U/C Section B.2.1.2	--	--	--

Table A.1: Plastic pipes assessed in walls.

Service [7]		**Rigid walls**	**Flexible walls**	**Lining wall**	**Timber wall**
PP-R pipes	$Ø_{ext}$ = 110 mm t = 15,1 mm	--	EI 60 U/C Section B.2.2.1 ——— EI 120 U/C Section B.2.2.2	--	--
	$Ø_{ext}$ = 110 mm t = 15,1 mm AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1	--
Group of 3* parallel, adjacent pipes (centres aligned, no gap between services): • PVC pipe $Ø_{ext}$ = 110 mm t = 3,2 mm • PP pipe $Ø_{ext}$ = 110 mm t = 2,7 mm • HDPE pipe $Ø_{ext}$ = 110 mm t = 9,3 mm AF MULTICOLLAR with H = 50 mm, b = 20 mm, 5 layers of intumescent strip, 8 fixings. * The pipes number can be reduced if AF MULTICOLLAR is installed closely fitted around the pipes.		--	EI 120 U/C Section B.2.2.2	--	--
		--	EI 120 U/U Section B.2.2.3	--	--
		--	EI 120 U/C Section B.2.2.3 (AF MULTICOLLAR at the fire exposed side only)	--	--

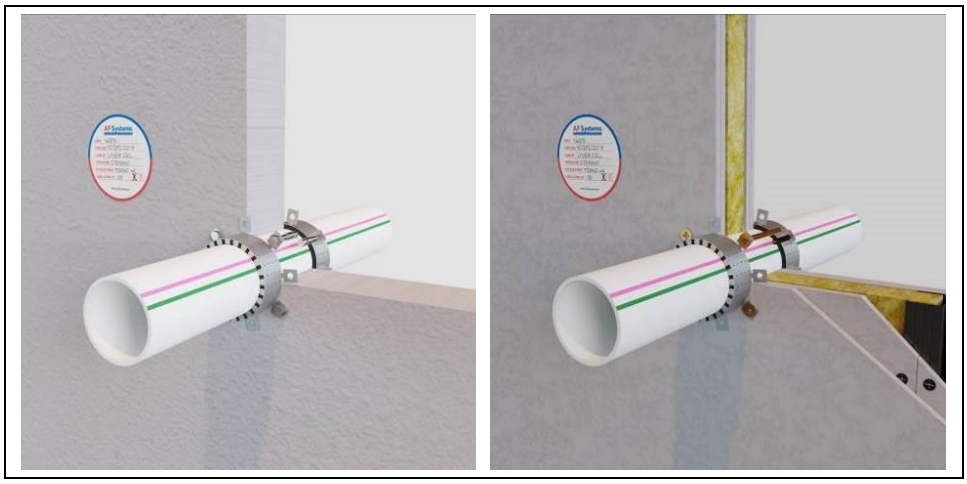


Figure A.2: Examples of acoustic plastic pipe seal in walls.

Table A.2: Special plastic pipes with acoustic insulation performance assessed in walls.

Service	**Flexible walls**
PEX-a pipe type AQUA of Uponor $Ø_{ext}$ = 63 mm t = 8,7 mm	EI 120 U/C Section B.2.2.2
PVC-U pipe type FRIAPHON of Girpi $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 120 U/C Section B.2.2.2
Mineral reinforced PP-MD pipe type SiTech+ of Wavin $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 120 U/C Section B.2.2.2
Mineral reinforced PP-MD pipe type RAUPIANO PLUS of Rehau $Ø_{ext}$ = 110 mm t = 2,5 mm	EI 120 U/C Section B.2.2.2
Mineral reinforced PE-S2 pipe type Silent-db20 of Geberit $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 120 U/C Section B.2.2.2
Mineral reinforced PP pipe type ASTO of Wavin $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 120 U/C Section B.2.2.2
Mineral reinforced PP-MX pipe type Silent-Pro of Geberit $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type PhoNoFire of Coes Company $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type POLO-KAL NG of Poloplast $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type POLO-KAL 3S of Poloplast $Ø_{ext}$ = 110 mm t = 4,8 mm	EI 120 U/C Section B.2.2.3

Table A.2: Special plastic pipes with acoustic insulation performance assessed in walls.

Service	**Flexible walls**
PP-R pipe type Decibel of Uponor $Ø_{ext}$ = 110 mm t = 3,8 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type Silenta of GF Hakan Plastik $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type aquatherm blue - SDR 11 MF of Aquatherm $Ø_{ext}$ = 110 mm t = 10,0 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type aquatherm green - SDR 9 MF-RP of Aquatherm $Ø_{ext}$ = 110 mm t = 12,3 mm	EI 120 U/C Section B.2.2.2
PP-R pipe type aquatherm red - SDR 7,4 MF of Aquatherm $Ø_{ext}$ = 110 mm t = 15,1 mm	EI 120 U/C Section B.2.2.2
MDPP pipe type SEA4 Master 3 Plus of Pipelife $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 120 U/C Section B.2.2.2

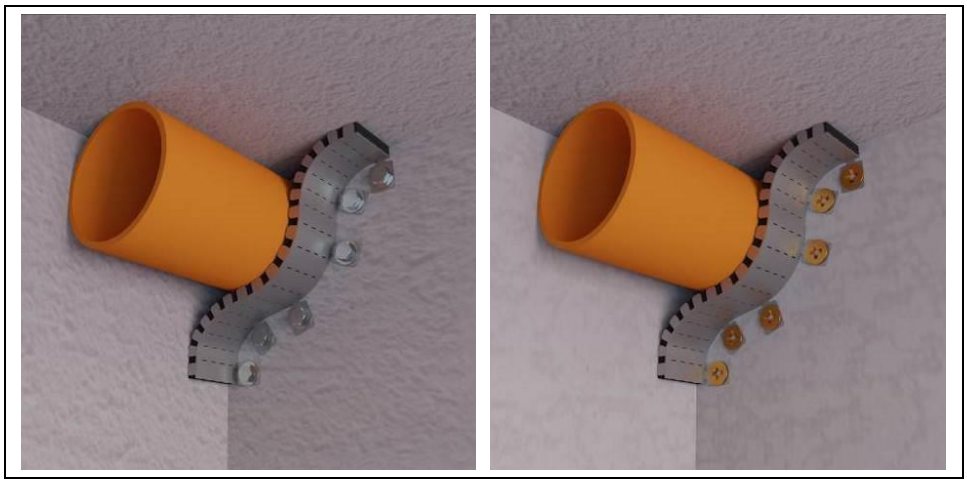


Figure A.3: Example of plastic pipe in a corner seal in walls.

Table A.3: Plastic pipes in a corner assessed in walls.

Service		**Flexible walls**
HDPE pipes	$Ø_{ext}$ = 110 mm t = 9,3 mm AF MULTICOLLAR at the fire exposed side only. AF MULTICOLLAR with b = 8 mm, 2 layers of intumescent strip, 6 fixings.	EI 120 U/C Section B.2.2.3
Installation conditions: - The pipe shall be in contact with the constructive elements forming the corner (floor and wall). - AF MULTICOLLAR will be fixed to the wall in such a position that it is in direct contact with the pipe along a minimum angle arch of 120º. - AF MULTICOLLAR steel housing length and inlay strip length will fully close the space with the constructive elements forming the corner (floor and wall).		

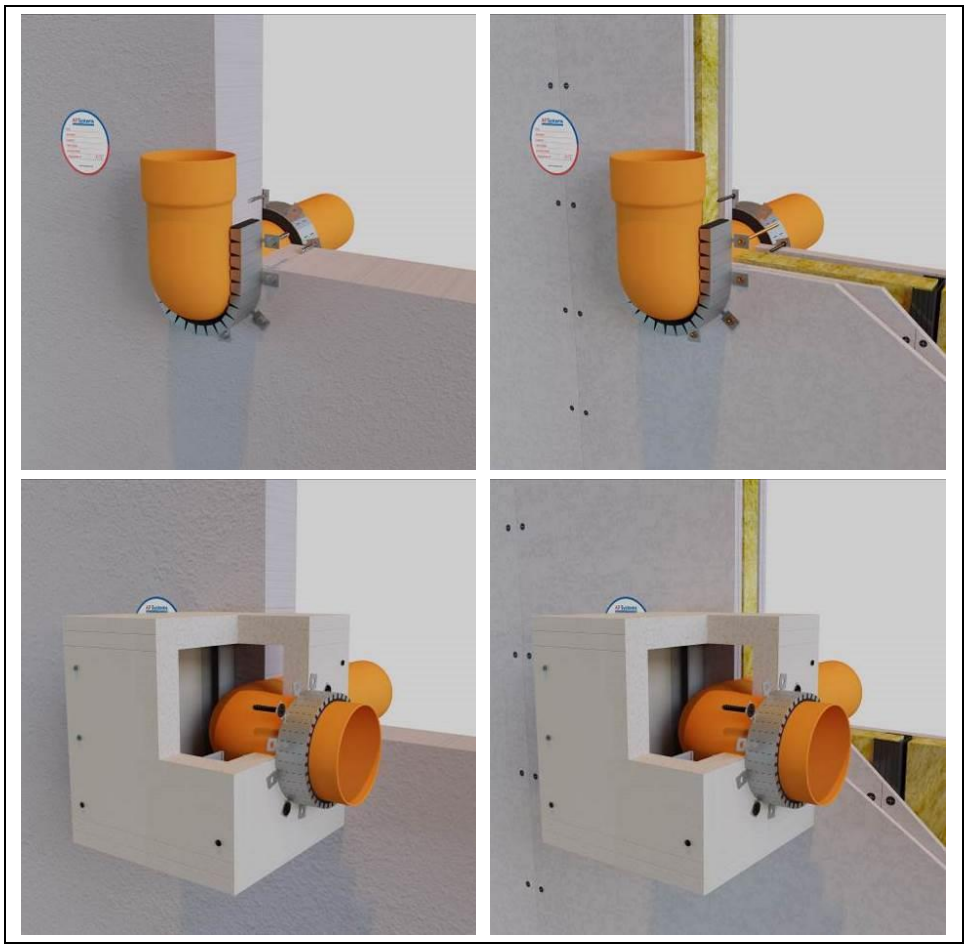


Figure A.4: Example of curved plastic pipe seal in walls.

Table A.4: Curved (90º) plastic pipes assessed in walls.

Service		**Flexible walls**
PVC pipes	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 120 U/C Section B.2.2.3
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 120 U/C Section B.2.2.3
PP pipes	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 120 U/C Section B.2.2.3
	$Ø_{ext}$ = 110 mm t = 15,1 mm	EI 120 U/C Section B.2.2.3
HDPE pipes	$Ø_{ext}$ = 110 mm t = 4,2 mm	EI 120 U/C Section B.2.2.3
	$Ø_{ext}$ = 110 mm t = 15,1 mm	EI 120 U/C Section B.2.2.3

Table A.4: Curved (90º) plastic pipes assessed in walls.

Service		**Flexible walls**
PP-R pipes	$Ø_{ext}$ = 110 mm t = 8,0 mm	EI 120 U/C Section B.2.2.3
Group of 2 parallel, boxed* pipes: • PVC pipe $Ø_{ext}$ = 160 mm t = 3,2 mm • PP pipe $Ø_{ext}$ = 110 mm t = 4,3 mm		EI 120 U/C Section B.2.2.3
Installation conditions: - Pipe curve at the fire exposed side. - At the fire exposed side, AF MULTICOLLAR is installed with U shape (open side at the direction of the pipe curve). AF MULTICOLLAR with H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 8 fixings. AF MULTICOLLAR is fixed to the wall in such a position that it is in direct contact with the pipe except at the open side. AF MULTICOLLAR steel housing length and inlay strip length will provide for at least 75 mm in excess from the pipe surface at the collar open side. - At the cold side, AF MULTICOLLAR is installed following the standard procedure described in section B.4.1.		
* Box for curved pipes (at the fire exposed side): - Installation of the box will be in accordance with the manufacturer's instructions. - The external dimensions of the box are 700 mm (horizontal) x 350 mm (vertical) x 300 mm (depth), and the internal dimensions are 600 mm x 250 mm x 250 mm. - The box is made of a double layer of 25 mm thick 'Type F' gypsum plasterboards coated with fiberglass, according to EN 15283-1, which are fixed with steel screws of Ø3,5 mm x 55 mm to an internal steel structure made of L-profiles of 30 mm x 30 mm x 1 mm, fixed to the wall with steel screws of Ø8 x 120 mm. The gypsum plasterboards fixed to each other with steel screws of Ø3,5 mm x 55 mm. - AF MULTICOLLAR is installed, following the standard procedure described in section B.4.1, around the pipe at the lateral sides of the box, fixed to the double layer of gypsum plasterboards with self-tapping steel screws Ø6 mm x 50 mm. - AF MULTICOLLAR is not required at the cold side of the wall.		

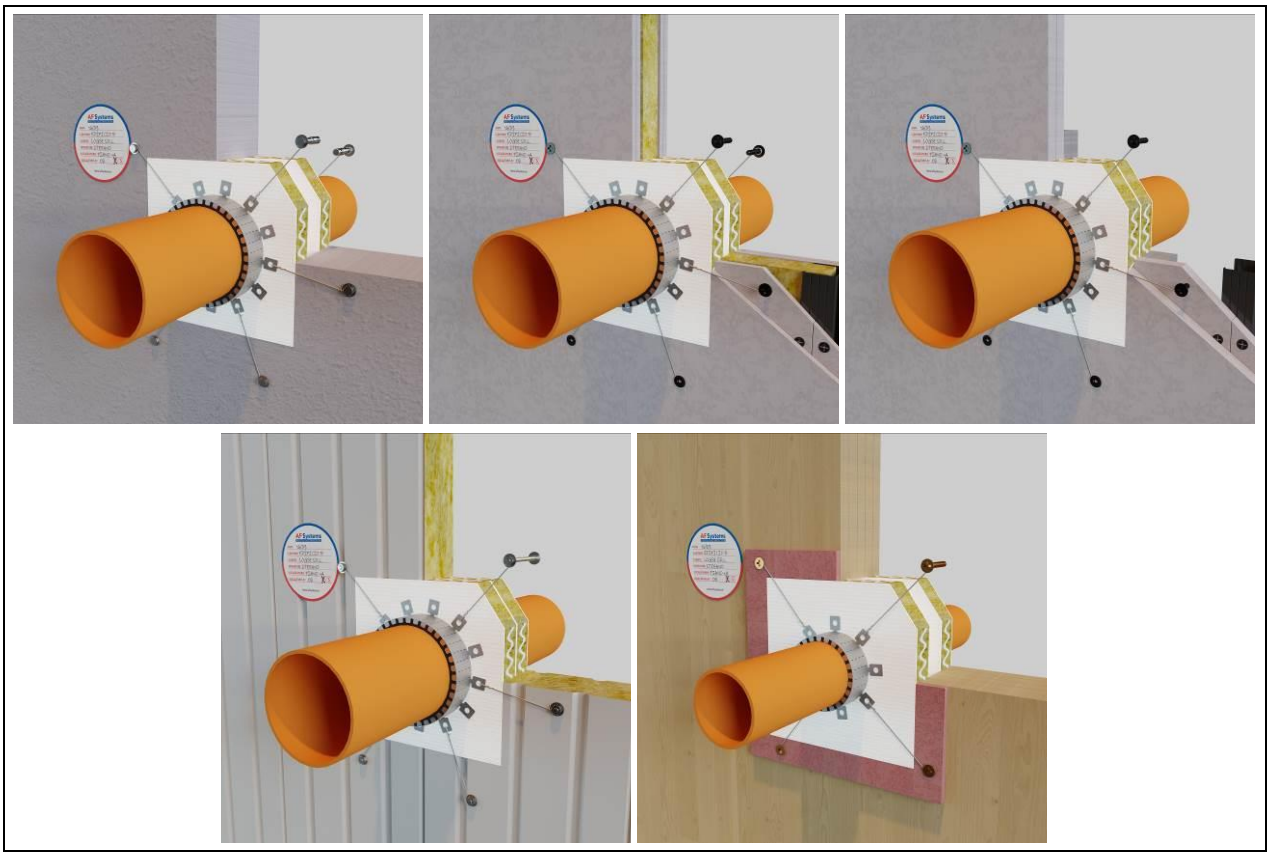


Figure A.5: Example of plastic pipe passing through AF PANEL seal in walls.

Table A.5: Plastic pipes (passing through AF PANEL seal) assessed in walls.

Service*		**Rigid walls**	**Flexible walls**	**Lining wall**	**Sandwich panels wall**	**Timber wall**
* The resistance to fire performance given in the table A.1 for plastic pipes (up to a pipe diameter of 250 mm), fire sealed with AF MULTICOLLAR, are also valid when the pipe penetrates an AF PANEL closing solution according to ETA 22/0853, which shuts an opening in the wall. The maximum size of the opening closed with AF PANEL is specified in section B.2 depending on the type of wall. Installation of AF MULTICOLLAR on AF PANEL closing solution will be in accordance with section B.4.2.						
PVC pipes	$Ø_{ext}$ = 110 mm t = 8,1 mm	--	--	--	EI 120 C/C Section B.2.4	--

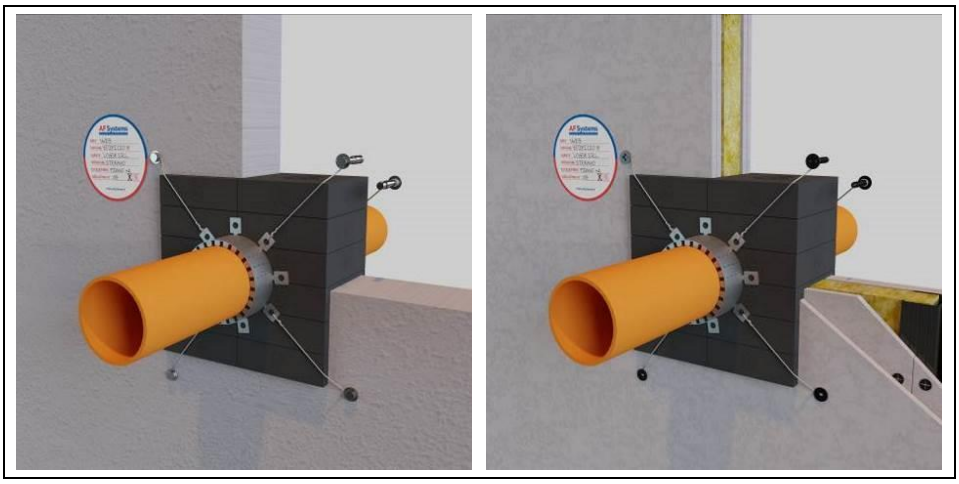


Figure A.6: Example of plastic pipe passing through AF BRICK seal in walls.

Table A.6: Plastic pipes (passing through AF BRICK seal) assessed in walls.

Service		**Flexible walls**
PVC pipes	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 120 U/C Section B.2.2.3
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 120 U/C Section B.2.2.3
Installation conditions: - AF BRICK closing solution, which shuts an opening in the wall, will be in accordance with ETA 21/0580. - AF BRICK (150 x 150 x 50) mm will be installed with the dimension of 150 mm along the wall depth. - Installation of AF MULTICOLLAR on AF BRICK closing solution will be in accordance with section B.4.3 of this ETA.		

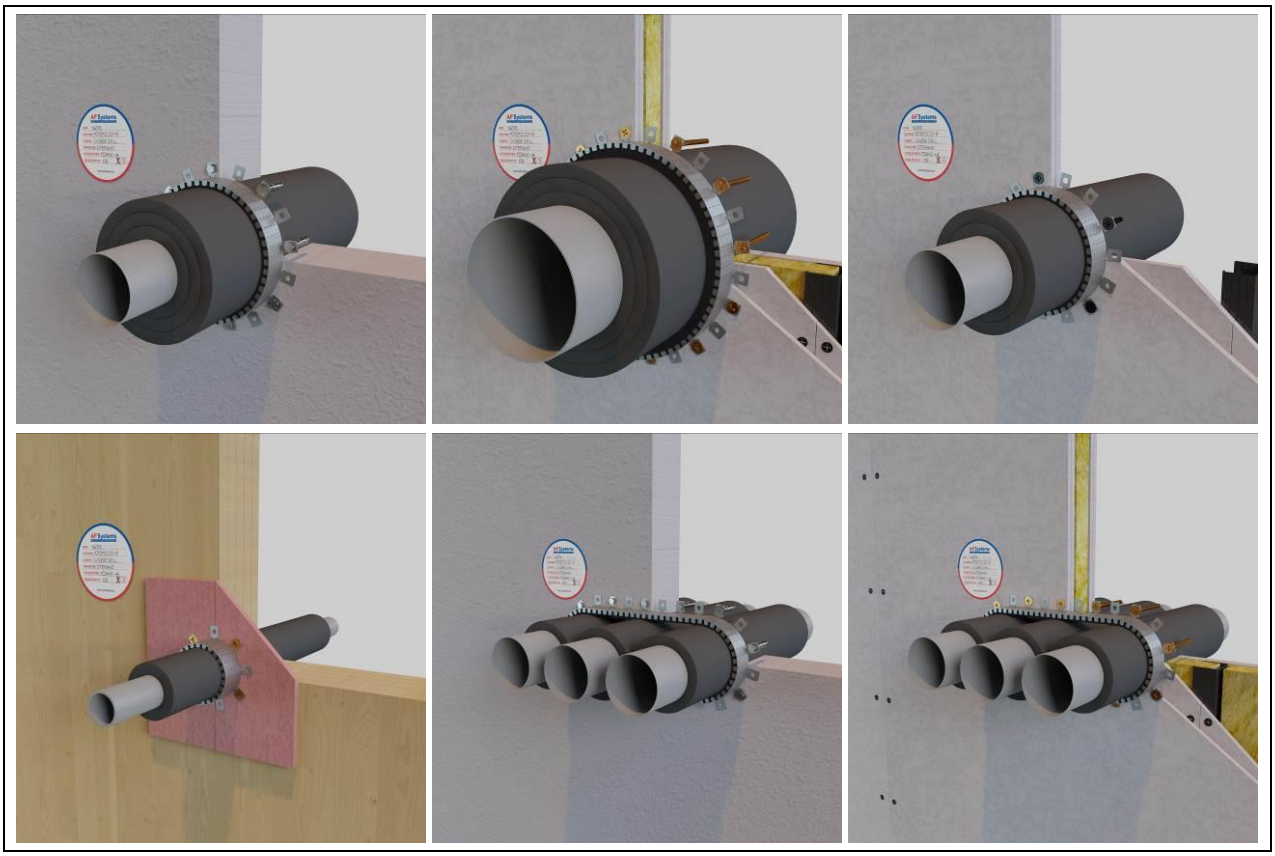


Figure A.7: Example of insulated steel pipes seal in walls.

Table A.7: Insulated steel pipes assessed in walls.

Service	Rigid walls	Flexible walls	Lining wall	Timber wall
$Ø_{ext}$ = 20 mm t = 1,0 mm 1 layer of 9 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (b = 4 mm, 1 layer of intumescent strip, 4 fixings).	--	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 20 mm t = 1,0 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 20 mm t = 6,0 mm 1 layer of 9 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (b = 4 mm, 1 layer of intumescent strip, 4 fixings).	--	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 20 mm t = 6,0 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 C/C Section B.2.2.2	--	--

Table A.7: Insulated steel pipes assessed in walls.

Service	Rigid walls	Flexible walls	Lining wall	Timber wall
$Ø_{ext}$ = 50 mm t = 1,5 mm 1 layer of 21 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	--	--	EI 120 U/C Section B.2.5
$Ø_{ext}$ = 50 mm t = 2,5 mm 2 layers of 20 mm thick insulation (total: 40 mm) covered with an aluminium foil 0,6 mm thick. AF MULTICOLLAR at the fire exposed side only.	EI 120 C/U Section B.2.1.1	--	--	--
$Ø_{ext}$ = 100 mm t = 4,0 mm 1 layer of 20 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (b = 8 mm, 2 layers of intumescent strip, 5 fixings).	EI 180 C/C Section B.2.1.1	--	--	--
$Ø_{ext}$ = 100 mm t = 4,0 mm 1 layer of 20 mm thick insulation covered with an aluminium foil 0,4 mm thick. AF MULTICOLLAR at the fire exposed side only (b = 8 mm, 2 layers of intumescent strip, 5 fixings).	EI 180 C/C Section B.2.1.1	--	--	--
$Ø_{ext}$ = 100 mm t = 4,0 mm 3 layers of 20 mm thick insulation (total: 60 mm). AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 6 fixings).	EI 180 C/C Section B.2.1.1	--	--	--
$Ø_{ext}$ = 108 mm t = 1,0 mm 1 layer of 40 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 5 fixings).	--	--	EI 60 U/C Section B.2.3.1	--
$Ø_{ext}$ = 160 mm t = 1,2 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 4 mm, 1 layer of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 200 mm t = 1,2 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 4 mm, 1 layer of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.2.3	--	--
$Ø_{ext}$ = 200 mm t = 1,2 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.2.3	--	--

Table A.7: Insulated steel pipes assessed in walls.

Service	Rigid walls	Flexible walls	Lining wall	Timber wall
$Ø_{ext}$ = 200 mm t = 9,0 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 4 mm, 1 layer of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.2.3	--	--
$Ø_{ext}$ = 200 mm t = 9,0 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.2.3	--	--
Group of 3* parallel, adjacent pipes with centres aligned (no gap between services), each of: $Ø_{ext}$ = 108 mm t = 4,0 mm 1 layer of 20 mm thick individual insulation. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 8 fixings). * The pipes number can be reduced if AF MULTICOLLAR is installed closely fitted around the pipes.	--	EI 120 C/C Section B.2.2.3	--	--

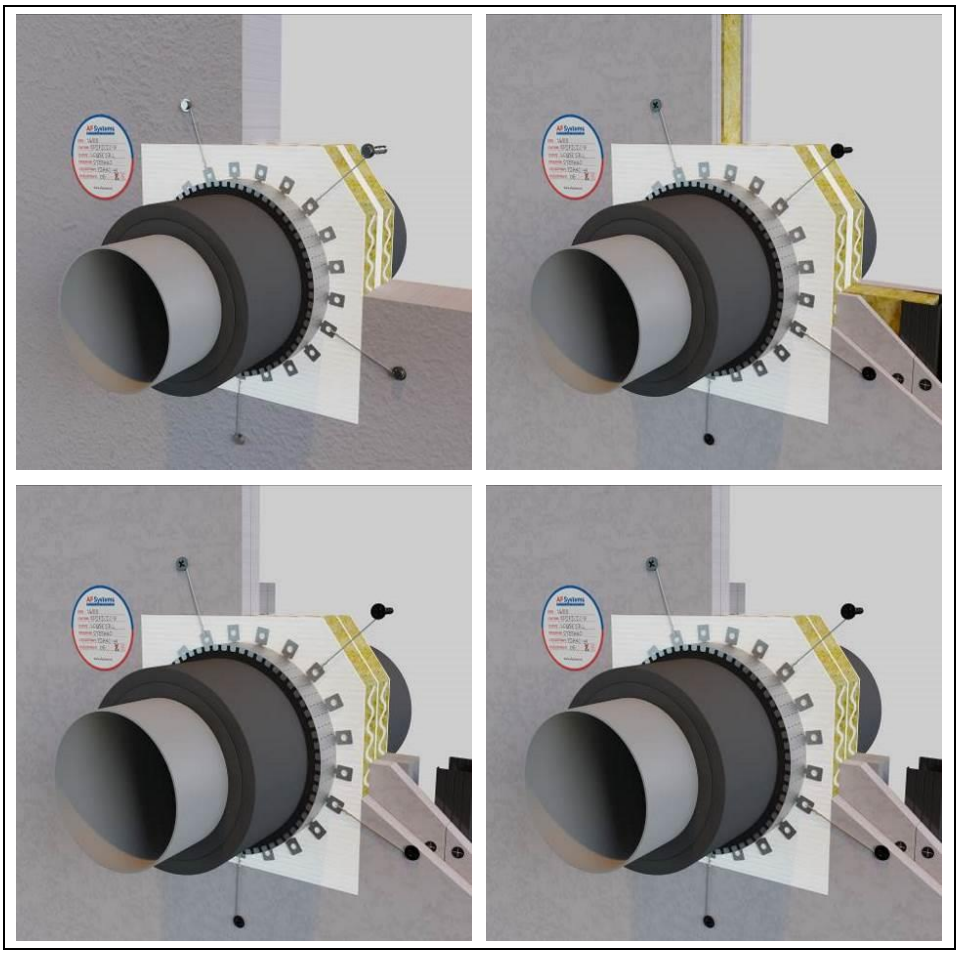


Figure A.8: Example of insulated steel pipes passing through AF PANEL seal in walls.

Table A.8: Insulated steel pipes (passing through AF PANEL seal) assessed in walls.

Service*	**Flexible walls**	**Lining wall**	**Sandwich panels wall**
* The resistance to fire performance given in the table A.7 for insulated steel pipes, fire sealed with AF MULTICOLLAR, are also valid when the pipe penetrates an AF PANEL closing solution according to ETA 22/0853, which shuts an opening in the wall. Note: the installation of a group of 3 adjacent pipes shown in table A.7 has not been assessed passing through AF PANEL seal. The maximum size of the opening closed with AF PANEL is specified in section B.2 depending on the type of wall. Installation of AF MULTICOLLAR on AF PANEL closing solution will be in accordance with section B.4.2.			
$Ø_{ext}$ = 160 mm t = 1,2 mm 2 layers of 20 mm thick insulation (total: 40 mm). AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 5 fixings).	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 160 mm t = 9,0 mm 2 layers of 9,5 mm thick insulation (total: 19 mm). AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 5 fixings).	EI 120 C/C Section B.2.2.2	--	--

Table A.8: Insulated steel pipes (passing through AF PANEL seal) assessed in walls.

Service*	**Flexible walls**	**Lining wall**	**Sandwich panels wall**
$Ø_{ext}$ = 180 mm t = 9,0 mm 2 layers of 20 mm thick insulation (total: 40 mm). AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 8 mm,2 layers of intumescent strip,5 fixings).	EI 120 C/C Section B.2.2.2	--	--
$Ø_{ext}$ = 200 mm t = 4,0 mm 2 layers of 20 mm thick insulation (total: 40 mm). AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 5 fixings).	--	EI 120 C/C Section B.2.3.2	EI 120 C/C Section B.2.4

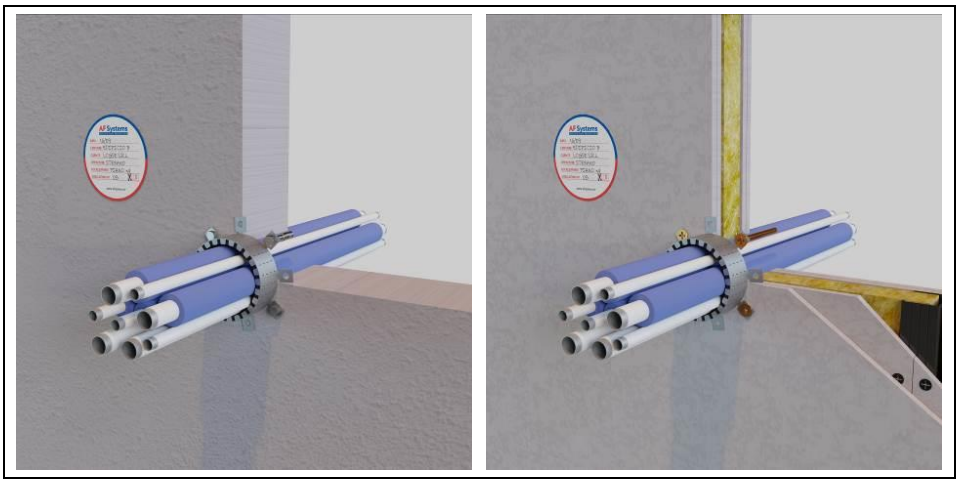


Figure A.9: Example of multilayer composite pipes seal in walls.

Table A.9: Multilayer composite pipes assessed in walls.

Service	**Rigid walls**	**Flexible walls**
PE-Xc/Al/PE pipe $Ø_{ext}$ = 25 mm t = 2,5 mm 1 layer of 9 mm thick PE insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
PE-Xc/Al/PE-RT pipe $Ø_{ext}$ = 26 mm t = 3,0 mm 1 layer of 9 mm thick PE insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
PE-Xa/Al/PE pipe type RAUTITAN flex of Rehau $Ø_{ext}$ = 63 mm t =8,6 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
PE-Xa/Al/PE pipe type RAUTITAN flex of Rehau $Ø_{ext}$ = 63 mm t =8,6 mm 1 layer of 20 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
Bundle (overall Ø 110 mm) consisting of: • 2 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 20 mm t = 3,0 mm • 8 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each pipe individually insulated with 7 mm thick PE. AF MULTICOLLAR at the fire exposed side only.	EI 180 U/C Section B.2.1.1	--

Table A.9: Multilayer composite pipes assessed in walls.

Service	Rigid walls	Flexible walls
Bundle (overall Ø 110 mm) consisting of: • 9 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 20 mm t = 3,0 mm Each pipe individually insulated with 6 mm thick PE. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
Bundle (overall Ø 110 mm) consisting of: • 4 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm • 3 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 26 mm t = 3,0 mm AF MULTICOLLAR at the fire exposed side only.	--	EI 60 U/C Section B.2.2.1
Bundle (overall Ø 110 mm) consisting of: • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each individually insulated with 6 mm thick PE. • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 25 mm t = 2,5 mm • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 25 mm t = 2,5 mm Each individually insulated with 9 mm thick PE. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2
Bundle (overall Ø 110 mm) consisting of: • 2 PE-Xc/Al/PE-RT pipes $Ø_{ext}$ = 16 mm t = 2,0 mm • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each individually insulated with 6 mm thick PE. • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 26 mm t = 3,0 mm • 2 PE-Xc/Al/PE pipes $Ø_{ext}$ = 26 mm t = 3,0 mm Each individually insulated with 9 mm thick PE. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2

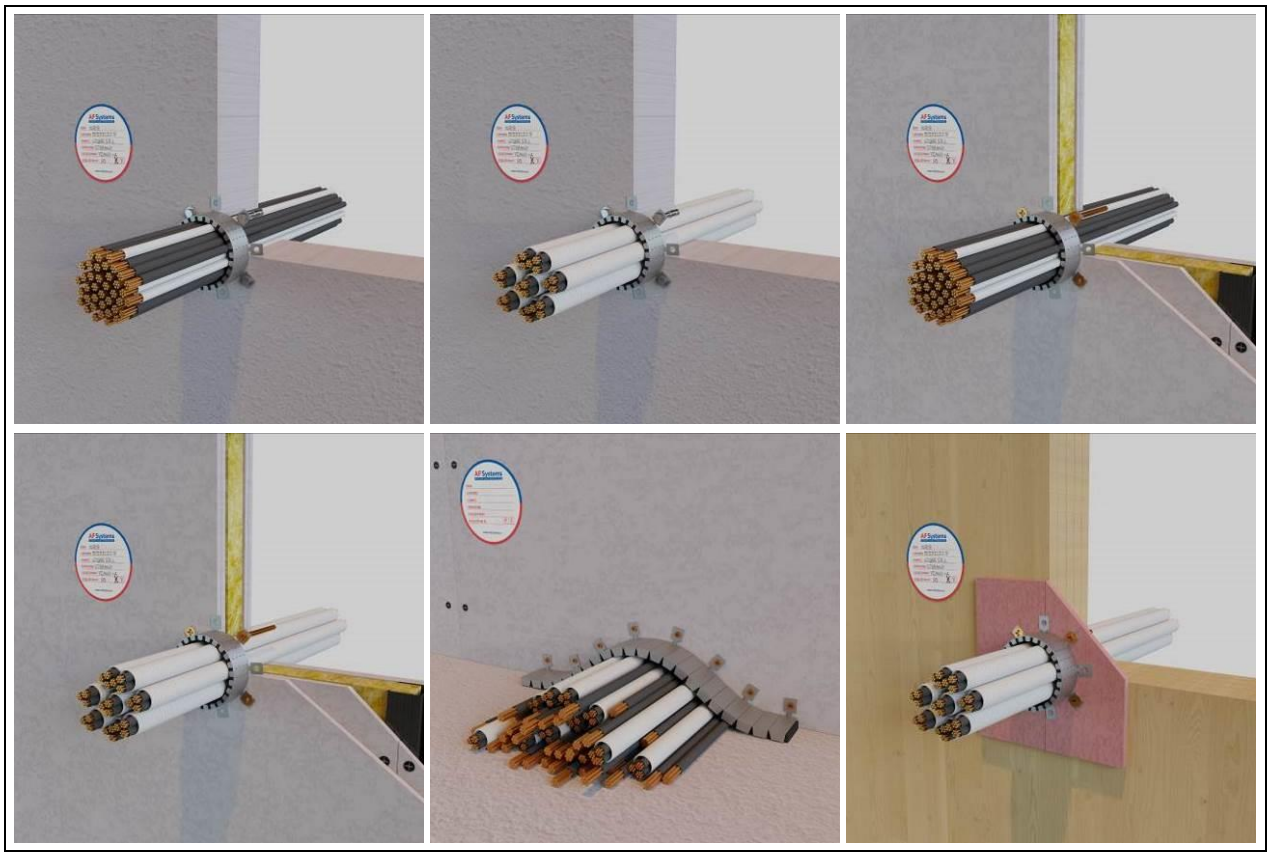


Figure A.10: Example of cable bundles seal in walls.

Table A.10: Cable bundles assessed in walls.

Service	**Rigid walls**	**Flexible walls**	**Timber wall**
Bundle (overall Ø 65 mm) consisting of: • 2 corrugated PVC pipes: $Ø_{ext}$ = 24 mm t = 2,0 mm Each with a cable type A2. • 1 PE-Xb/Al/PE-Xb pipe: $Ø_{ext}$ = 26 mm t = 3,0 mm 1 layer of 8,5 mm thick insulation. AF MULTICOLLAR at the fire exposed side only.	--	--	EI 120 U/C Section B.2.5
Bundle (overall Ø 82 mm) consisting of: • 7 corrugated PVC pipes: $Ø_{ext}$ = 24 mm t = 2,0 mm Each with a cable type A2. AF MULTICOLLAR at the fire exposed side only.	--	--	EI 120 U/C Section B.2.5

Table A.10: Cable bundles assessed in walls.

Service	Rigid walls	Flexible walls	Timber wall
Bundle (overall Ø110 mm) consisting of a group of small-sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B AF MULTICOLLAR at the fire exposed side only.	EI 180 Section B.2.1.1	EI 120 Section B.2.2.2	--
Bundle (overall Ø110 mm approx.) consisting of: • Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B • 4 corrugated PVC pipes (Ø22 mm) with cable type A1 (Ø15 mm) The bundle is supported on a fire protective board made of vermiculite (520 kg/m^3, λ = 0,145 W/m·K, thickness 45 mm) passing through the wall as a tray of 400 mm width. AF MULTICOLLAR at the fire exposed side only installed in U-shape with the bottom part open (b = 8 mm, 2 layers of intumescent strip, 5 fixings). See figure A.10.	--	EI 120 Section B.2.2.2	--
Bundle (overall Ø 110 mm) consisting of: • 5 corrugated PVC pipes $Ø_{ext}$ = 32 mm t = 2,0 mm Each with a cable type A1. • 4 corrugated PA pipes $Ø_{ext}$ = 24 mm t = 0,5 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	--	EI 60 U/C Section B.2.2.2	--
Bundle (overall Ø 110 mm) consisting of: • 2 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 26 mm t = 3,0 mm Each individually insulated (9 mm thickness). • 5 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each individually insulated (9 mm thickness). • 3 corrugated PA pipes $Ø_{ext}$ = 26 mm t = 0,5 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2	--
Bundle (overall Ø 110 mm) consisting of: • 8 corrugated PVC pipes: $Ø_{ext}$ = 32 mm t = 2,0 mm Each with a cable type A1, A2 or A3. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.2	--

Table A.10: Cable bundles assessed in walls.

Service	**Rigid walls**	**Flexible walls**	**Timber wall**
Bundle (overall Ø 125 mm) consisting of: • 1 PVC pipe $Ø_{ext}$ = 50 mm t = 2,0 mm • 18 corrugated PVC pipes $Ø_{ext}$ = 20 mm t = 2,0 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	--	EI 120 U/C Section B.2.2.4	--
Installation conditions: - All the gaps in the penetration are completely filled with AF SEAL W.			

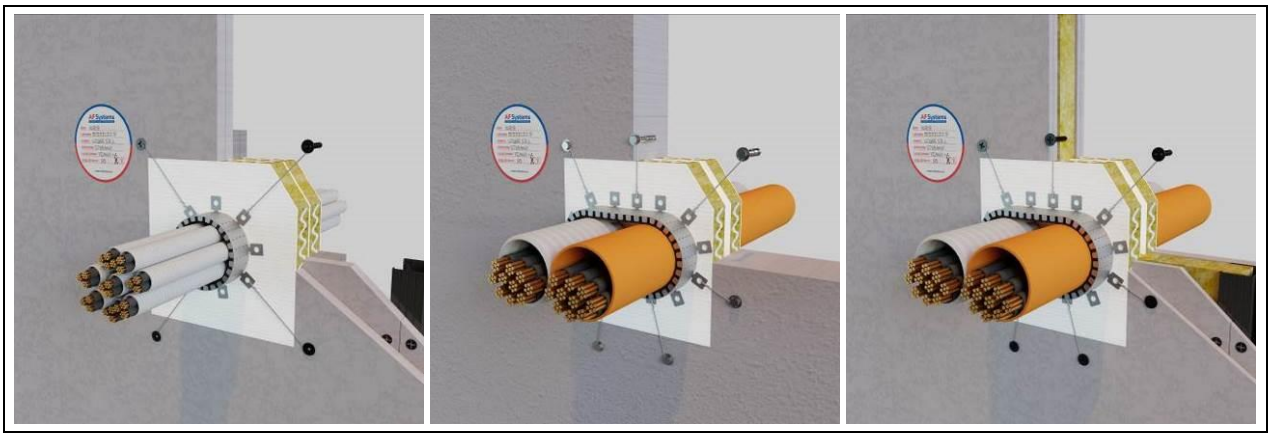


Figure A.11: Example of cable bundles passing through AF PANEL seal in walls.

Table A.11: Cable bundles (passing through AF PANEL seal) assessed in walls.

Service*	**Rigid walls**	**Flexible walls**	**Lining wall**
* The resistance to fire performance given in the table A.10 for cable bundles, fire sealed with AF MULTICOLLAR, are also valid when the bundle penetrates an AF PANEL closing solution according to ETA 22/0853, which shuts an opening in the wall. Note: the installation of a bundle supported on a fire protective board shown in table A.10 has not been assessed passing through AF PANEL seal. The maximum size of the opening closed with AF PANEL is specified in section B.2 depending on the type of wall. Installation of AF MULTICOLLAR on AF PANEL closing solution will be in accordance with section B.4.2.			
Bundle (overall Ø 80 mm) consisting of: • 3 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 20 mm t = 3,0 mm Each individually insulated with 6 mm thick PE. • 3 corrugated PVC pipes $Ø_{ext}$ = 26 mm t = 3,0 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	--	--	EI 120 C/C Section B.2.3.2
Bundle (overall Ø 110 mm) consisting of: • 5 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each individually insulated (9 mm thickness). • 10 corrugated PVC pipes $Ø_{ext}$ = 20 mm t = 2,0 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	--	--	EI 60 U/C Section B.2.3.1
Bundle (overall Ø 125 mm) consisting of: • 7 corrugated PVC pipes: $Ø_{ext}$ = 32 mm t = 2,0 mm Each with a cable type A1. AF MULTICOLLAR at the fire exposed side only.	EI 180 C/U Section B.2.1.1	--	--

Table A.11: Cable bundles (passing through AF PANEL seal) assessed in walls.

Service*	**Rigid walls**	**Flexible walls**	**Lining wall**
Group of 2 parallel, adjacent pipes: • 1 corrugated PVC pipe $Ø_{ext}$ = 125 mm t = 9,0 mm With 15 cables type A1. • 1 PP pipe $Ø_{ext}$ = 125 mm t = 3,2 mm With 15 cables type A1. AF MULTICOLLAR at the fire exposed side only (H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 8 fixings).	--	EI 120 U/C Section B.2.2.3	--
Installation conditions: - All the gaps in the penetration are completely filled with AF SEAL W.			

A.3. Resistance to fire performance in floors

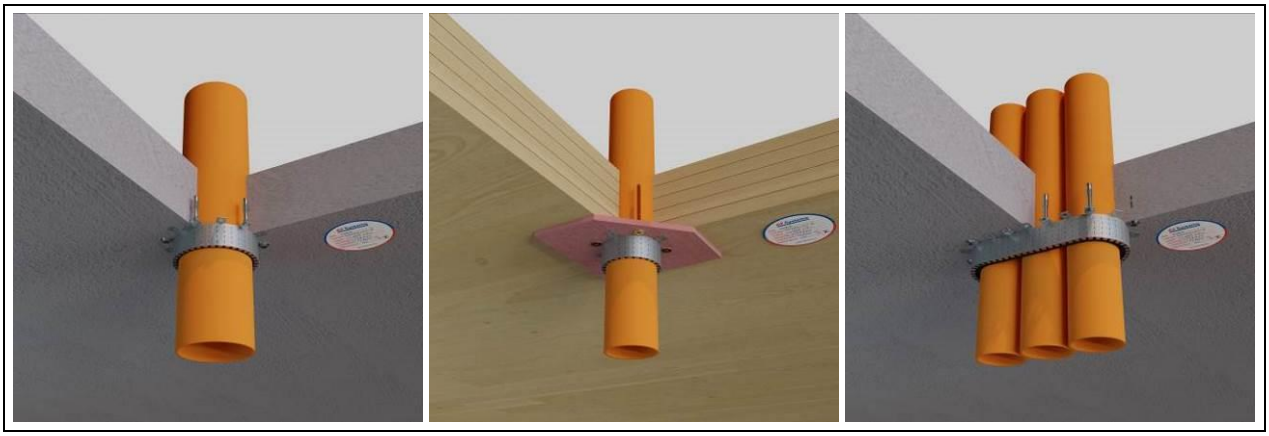


Figure A.12: Examples of plastic pipe seal in floors.

Table A.12: Plastic pipes assessed in floors.

Service		Rigid floor	Timber floor
PVC pipes	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 180 C/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 110 mm t = 6,6 mm	--	EI 120 U/C Section B.3.2
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 180 U/U Section B.3.1 (A) ——— EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 160 mm t = 2,7 mm	EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 160 mm t = 11,8 mm	EI 180 U/C Section B.3.1 (A) ——— EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 250 mm t = 6,2 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 250 mm t = 18,4 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 315 mm t = 23,2 mm	EI 180 U/C Section B.3.1 (A)	--
PP pipes	$Ø_{ext}$ = 63 mm t = 3,0 mm	EI 120 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 240 U/C Section B.3.1 (D)	--

Table A.12: Plastic pipes assessed in floors.

Service		Rigid floor	Timber floor
PP pipes	$Ø_{ext}$ = 110 mm t = 3,4 mm	--	EI 120 U/C Section B.3.2
	$Ø_{ext}$ = 110 mm t = 4,2 mm	EI 180 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 110 mm t = 7,2 mm	EI 180 C/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 110 mm t = 15,1 mm	EI 120 U/U Section B.3.1 (A)	--
	$Ø_{ext}$ = 160 mm t = 6,2 mm	EI 180 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 160 mm t = 14,6 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 200 mm t = 7,7 mm	EI 180 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 250 mm t = 8,8 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 250 mm t = 22,7 mm	EI 180 U/C Section B.3.1 (A)	--
HDPE pipes	$Ø_{ext}$ = 63 mm t = 5,8 mm	EI 120 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 110 mm t = 4,2 mm	--	EI 120 U/C Section B.3.2
	$Ø_{ext}$ = 110 mm t = 10,0 mm	EI 180 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 110 mm t = 15,1 mm	EI 180 U/U Section B.3.1 (A) ——— EI 240 U/C Section B.3.1 (D)	--
	$Ø_{ext}$ = 160 mm t = 14,6 mm	EI 180 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 160 mm t = 21,9 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 200 mm t = 18,2 mm	EI 120 U/C Section B.3.1 (C)	--
	$Ø_{ext}$ = 250 mm t = 8,2 mm	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 250 mm t = 22,7 mm	EI 180 U/C Section B.3.1 (A)	--

Table A.12: Plastic pipes assessed in floors.

Service		**Rigid floor**	**Timber floor**
PP-R pipes	$Ø_{ext}$ = 63 mm t = 10,5 mm 1 layer of 17 mm thick insulation.	--	EI 120 U/C Section B.3.2
	$Ø_{ext}$ = 75 mm t = 4,2 mm 1 layer of 19 mm thick insulation.	EI 180 U/C Section B.3.1 (A)	--
	$Ø_{ext}$ = 110 mm t = 4,8 mm 1 layer of 19 mm thick insulation.	EI 180 U/C Section B.3.1 (A)	--
Group of 3* parallel, adjacent pipes (centres aligned, no gap between services): • PVC pipe $Ø_{ext}$ = 110 mm t = 3,2 mm • PP pipe $Ø_{ext}$ = 110 mm t = 7,2 mm • HDPE pipe $Ø_{ext}$ = 110 mm t = 10,0 mm AF MULTICOLLAR with H = 50 mm, b = 20 mm, 5 layers of intumescent strip, 8 fixings. * The pipes number can be reduced if AF MULTICOLLAR is installed closely fitted around the pipes.		EI 180 U/C Section B.3.1 (A)	--
Group of 5* parallel, adjacent pipes with centres aligned (no gap between services): • PVC pipe $Ø_{ext}$ = 63 mm t = 2,7 mm • PVC pipe $Ø_{ext}$ = 63 mm t = 5,8 mm • PP pipe $Ø_{ext}$ = 63 mm t = 5,8 mm • HDPE pipe $Ø_{ext}$ = 63 mm t = 2,7 mm • HDPE pipe $Ø_{ext}$ = 63 mm t = 5,8 mm AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 6 fixings. * The pipes number can be reduced if AF MULTICOLLAR is installed closely fitted around the pipes.		EI 240 U/C Section B.3.1 (D)	--

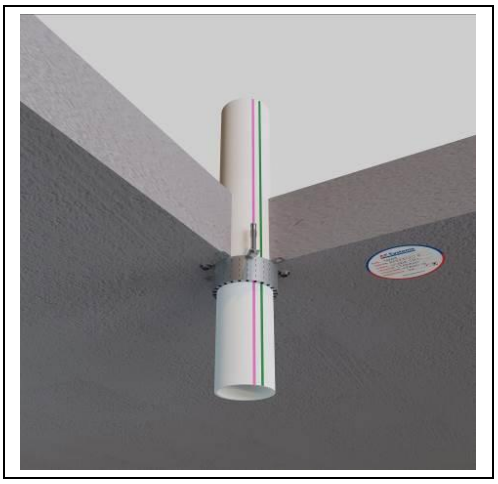


Figure A.13: Examples of acoustic plastic pipe seal in floors.

Table A.13: Special plastic pipes with acoustic insulation performance assessed in floors.

Service	**Rigid floor**
PVC-U pipe type FRIAPHON of Girpi $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 180 U/C Section B.3.1 (A)
Mineral reinforced PP pipe type SiTech+ of Wavin $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 180 U/C Section B.3.1 (A)
Mineral reinforced PP-MD pipe type RAUPIANO PLUS of Rehau $Ø_{ext}$ = 110 mm t = 2,5 mm	EI 180 U/C Section B.3.1 (A)
Mineral reinforced PE-S2 pipe type Silent-db20 of Geberit $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 180 U/C Section B.3.1 (A)
Mineral reinforced PP pipe type ASTO of Wavin $Ø_{ext}$ = 110 mm t = 5,3 mm	EI 180 U/C Section B.3.1 (A)
Mineral reinforced PP-MX pipe type Silent-Pro of Geberit $Ø_{ext}$ = 110 mm t = 4,2 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type PhoNoFire of Coes Company $Ø_{ext}$ = 110 mm t = 6,0 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type POLO-KAL NG of Poloplast $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type POLO-KAL 3S of Poloplast $Ø_{ext}$ = 110 mm t = 4,8 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type Decibel of Uponor $Ø_{ext}$ = 110 mm t = 3,8 mm	EI 180 U/C Section B.3.1 (A)

Table A.13: Special plastic pipes with acoustic insulation performance assessed in floors.

Service	**Rigid floor**
PP-R pipe type Silenta of GF Hakan Plastik $Ø_{ext}$ = 110 mm t = 3,4 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type aquatherm blue - SDR 11 MF of Aquatherm $Ø_{ext}$ = 110 mm t = 10,0 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type aquatherm green - SDR 9 MF-RP of Aquatherm $Ø_{ext}$ = 110 mm t = 12,3 mm	EI 180 U/C Section B.3.1 (A)
PP-R pipe type aquatherm red - SDR 7,4 MF of Aquatherm $Ø_{ext}$ = 110 mm t = 15,1 mm	EI 180 U/C Section B.3.1 (A)

Figure A.14: Example of plastic pipe in a corner seal in floors.

Table A.14: Plastic pipes in a corner assessed in floors.

Service		**Rigid floor**
HDPE pipes	$Ø_{ext}$ = 110 mm t = 8,1 mm AF MULTICOLLAR with b = 8 mm, 2 layers of intumescent strip, 6 fixings.	EI 180 U/C Section B.3.1 (A)
Installation conditions: - The pipe shall be in contact with the walls forming the corner. - AF MULTICOLLAR will be fixed to the floor in such a position that it is in direct contact with the pipe along a minimum angle arch of 120º. - AF MULTICOLLAR steel housing length and inlay strip length will fully close the space with the walls forming the corner.		

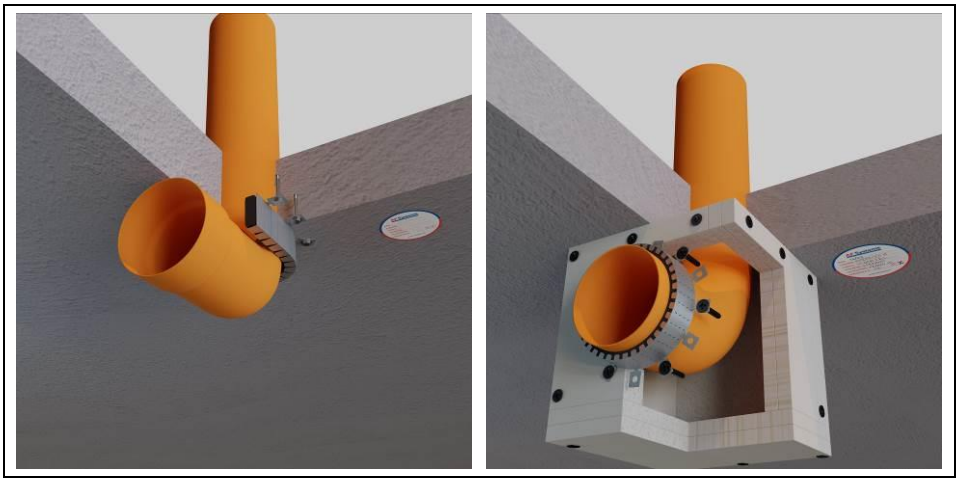


Figure A.15: Examples of curved plastic pipe seal in floors.

Table A.15: Curved (90º) plastic pipes assessed in floors.

Service		**Rigid floor**
PVC pipes	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 180 U/C Section B.3.1 (A)
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 180 U/C Section B.3.1 (A)
Group of 2 parallel, boxed* pipes: • PVC pipe $Ø_{ext}$ = 110 mm t = 3,2 mm • PVC pipe $Ø_{ext}$ = 160 mm t = 4,0 mm		EI 180 U/C Section B.3.1 (A)
Installation conditions: - Pipe curve at the bottom side of the floor. - At the bottom side (fire exposed side), AF MULTICOLLAR is installed with U shape (open side at the direction of the pipe curve). AF MULTICOLLAR with H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 8 fixings. AF MULTICOLLAR is fixed to the floor in such a position that it is in direct contact with the pipe except at the open side. AF MULTICOLLAR steel housing length and inlay strip length will provide for at least 100 mm in excess from the pipe surface at the collar open side.		
* Box for curved pipes (at the bottom side): - Installation of the box will be in accordance with the manufacturer's instructions. - The external dimensions of the box are 600 mm x 350 mm x 350 mm (height), and the internal dimensions are 500 mm x 250 mm x 300 mm. - The box is made of a double layer of 25 mm thick 'Type F' gypsum plasterboards coated with fiberglass, according to EN 15283-1, which are fixed with steel screws of Ø3,5 mm x 55 mm to an internal steel structure made of L-profiles of 30 mm x 30 mm x 1 mm fixed to the floor with steel anchors of Ø8 mm x 60 mm. The gypsum plasterboards fixed to each other with steel screws of Ø3,5 mm x 55 mm. - AF MULTICOLLAR is installed, following the standard procedure described in section B.4.1, around the pipe at the lateral sides of the box, fixed to the double layer of gypsum plasterboards with self-tapping steel screws Ø6 mm x 50 mm.		

Figure A.16: Examples of plastic pipe passing through AF PANEL seal in floors.

Table A.16: Plastic pipes (passing through AF PANEL seal) assessed in floors.

Service*	**Rigid floor**	**Timber floor**
* The resistance to fire performance given in the table A.12 for plastic pipes (up to a pipe diameter of 250 mm), fire sealed with AF MULTICOLLAR, are also valid when the pipe penetrates an AF PANEL closing solution according to ETA 22/0853, which shuts an opening in the floor. The maximum size of the opening closed with AF PANEL is specified in section B.3 depending on the type of floor. Installation of AF MULTICOLLAR on AF PANEL closing solution will be in accordance with section B.4.2.		

Figure A.17: Examples of plastic pipe passing through AF BRICK seal in floors.

Table A.17: Plastic pipes (passing through AF BRICK seal) assessed in floors.

Service		**Rigid floor**
PVC pipes	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 180 C/C Section B.3.1 (A)
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 180 C/C Section B.3.1 (A)
Installation conditions: - AF BRICK closing solution, which shuts an opening in the floor, will be in accordance with ETA 21/0580. - AF BRICK (150 x 150 x 50) mm will be installed with the dimension of 150 mm along the floor depth. - Installation of AF MULTICOLLAR on AF BRICK closing solution will be in accordance with section B.4.3 of this ETA.		

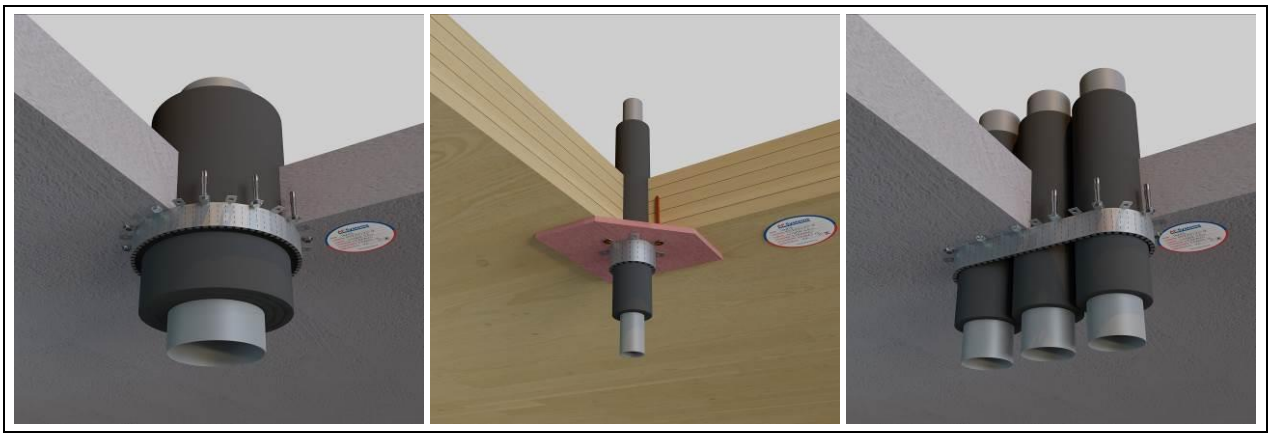


Figure A.18: Examples of insulated steel pipes seal in floors.

Table A.18: Insulated steel pipes assessed in floors.

Service	**Rigid floor**	**Timber floor**
$Ø_{ext}$ = 20 mm t = 1,0 mm 1 layer of 9 mm thick insulation. AF MULTICOLLAR with b = 4 mm, 1 layer of intumescent strip, 3 fixings.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 20 mm t = 1,0 mm 1 layer of 60 mm thick insulation.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 20 mm t = 3,0 mm 1 layer of 9 mm thick insulation. AF MULTICOLLAR with b = 4 mm, 1 layer of intumescent strip, 3 fixings.	EI 180 U/C Section B.3.1 (A)	--
$Ø_{ext}$ = 20 mm t = 6,0 mm 1 layer of 9 mm thick insulation. AF MULTICOLLAR with b = 4 mm, 1 layer of intumescent strip, 3 fixings.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 20 mm t = 6,0 mm 1 layer of 60 mm thick insulation.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 50 mm t = 1,25 mm 1 layer of 16,5 mm thick insulation. AF MULTICOLLAR with b = 4 mm, 1 layer of intumescent strip, 3 fixings.	--	EI 120 U/C Section B.3.2
$Ø_{ext}$ = 80 mm t = 3,5 mm 2 layers of 20 mm thick insulation (total: 40 mm) covered with an aluminium foil 0,5 mm thick.	EI 180 C/C Section B.3.1 (C)	--

Table A.18: Insulated steel pipes assessed in floors.

Service	Rigid floor	Timber floor
$Ø_{ext}$ = 200 mm t = 1,2 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR with H = 50 mm, b = 4 mm, 1 layer of intumescent strip, 5 fixings.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 200 mm t = 1,2 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 5 fixings.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 200 mm t = 6,0 mm 3 layers of 20 mm thick insulation (total: 60 mm). AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 6 fixings.	EI 180 U/C Section B.3.1 (A)	--
$Ø_{ext}$ = 200 mm t = 9,0 mm 1 layer of 19 mm thick insulation. AF MULTICOLLAR with H = 50 mm, b = 4 mm, 1 layer of intumescent strip, 5 fixings.	EI 180 C/C Section B.3.1 (A)	--
$Ø_{ext}$ = 200 mm t = 9,0 mm 1 layer of 60 mm thick insulation. AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 5 fixings.	EI 180 C/C Section B.3.1 (A)	--
Group of 3* parallel, adjacent pipes with centres aligned (no gap between services), each of: $Ø_{ext}$ = 108 mm t = 4,0 mm 1 layer of 20 mm thick individual insulation. AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 8 fixings. * The pipes number can be reduced if AF MULTICOLLAR is installed closely fitted around the pipes.	EI 180 C/C Section B.3.1 (A)	--

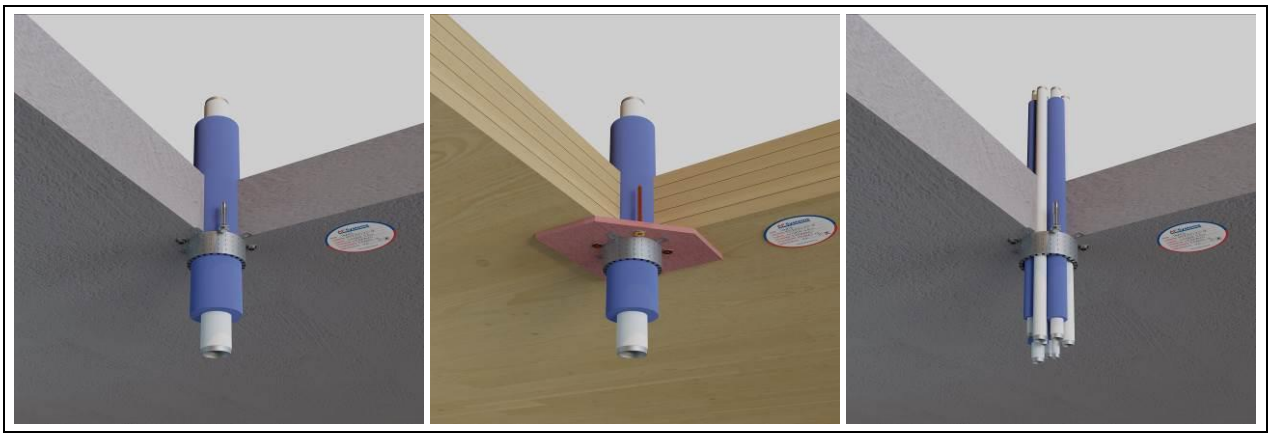


Figure A.19: Examples of multilayer composite pipes seal in floors.

Table A.19: Multilayer composite pipes assessed in floors.

Service	**Rigid floor**	**Timber floor**
PE-Xc/Al/HDPE pipe $Ø_{ext}$ = 63 mm t = 6,0 mm 1 layer of 17 mm thick insulation.	--	EI 120 U/C Section B.3.2
PE-Xa/Al/PE pipe $Ø_{ext}$ = 63 mm t =8,7 mm 1 layer of 19 mm thick insulation.	EI 180 U/C Section B.3.1 (A)	--
Bundle (overall Ø 110 mm) consisting of: • 9 PE-Xb/Al/HDPE pipes $Ø_{ext}$ = 20 mm t = 3,0 mm Each pipe individually insulated with 6 mm thick PE.	EI 180 U/C Section B.3.1 (A)	--

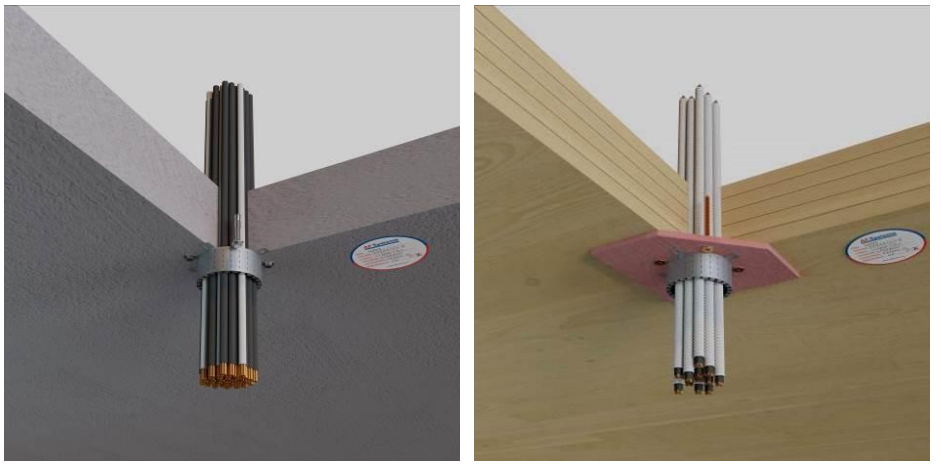


Figure A.20: Examples of cable bundles seal in floors.

Table A.20: Cable bundles assessed in floors.

Service	Rigid floor	Timber floor
Bundle (overall Ø 110 mm) consisting of: • 2 copper pipes $Ø_{ext}$ = 20 mm t = 2,0 mm Each individually insulated (20 mm thickness). • 1 PVC pipe $Ø_{ext}$ = 40 mm t = 3,7 mm • 1 corrugated PVC pipe ($Ø_{ext}$ = 21,2 mm) with a cable type A1	EI 180 C/C Section B.3.1 (A)	--
Bundle (overall Ø100 mm) consisting of a group of small-sheathed cables: 10 cables type A1 10 cables type A3	EI 180 Section B.3.1 (A)	--
Bundle (overall Ø110 mm) consisting of: • 20 corrugated PVC pipes ($Ø_{ext}$ = 20 mm), each with a cable type A3.	--	EI 120 Section B.3.2
Installation conditions: - All the gaps in the penetration are completely filled with AF SEAL W.		

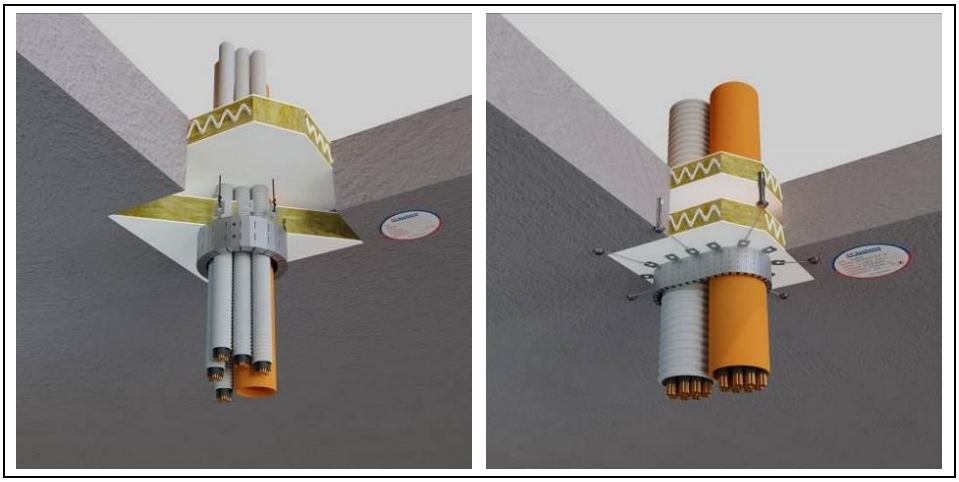


Figure A.21: Examples of cable bundles passing through AF PANEL seal in floors.

Table A.21: Cable bundles (passing through AF PANEL seal) assessed in floors.

Service	**Rigid floor**	**Timber floor**
* The resistance to fire performance given in the table A.20 for cable bundles, fire sealed with AF MULTICOLLAR, are also valid when the bundle penetrates an AF PANEL closing solution according to ETA 22/0853, which shuts an opening in the floor. The maximum size of the opening closed with AF PANEL is specified in section B.3 depending on the type of floor. Installation of AF MULTICOLLAR on AF PANEL closing solution will be in accordance with section B.4.2.		
Group of 2 parallel, adjacent pipes: • 1 corrugated PVC pipe $Ø_{ext}$ = 125 mm t = 9,0 mm With 10 cables type A1. • 1 PP pipe $Ø_{ext}$ = 125 mm t = 3,2 mm With 11 cables type A1. AF MULTICOLLAR with H = 50 mm, b = 12 mm, 3 layers of intumescent strip, 8 fixings.	EI 180 U/C Section B.3.1 (A)	--
Installation conditions: - All the gaps in the penetration are completely filled with AF SEAL W.		

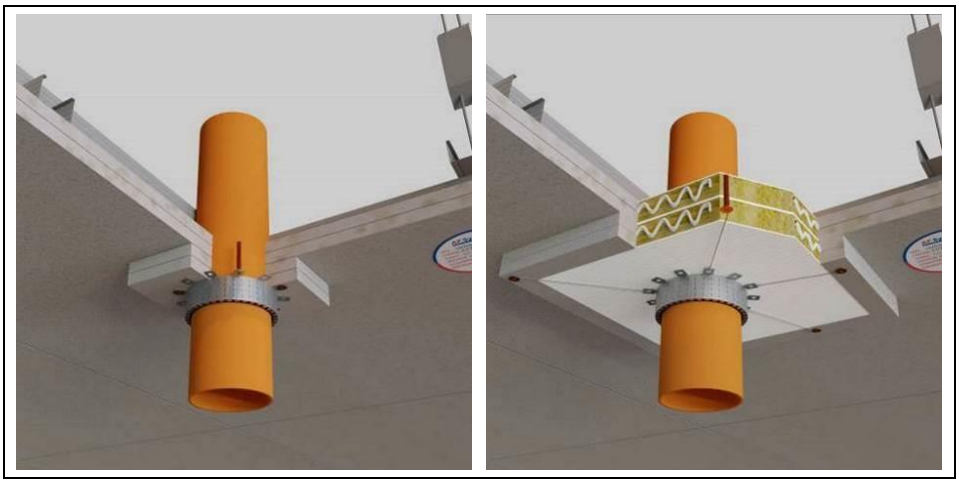


Figure A.22: Examples of plastic pipes seal in false ceilings.

Table A.22: Plastic pipes assessed in false ceilings.

Service		**False ceiling**
PVC pipes	$Ø_{ext}$ = 110 mm t = 3,2 mm	EI 120 U/C Section B.3.3
	$Ø_{ext}$ = 110 mm t = 8,1 mm	EI 120 U/C Section B.3.3
	$Ø_{ext}$ = 110 mm t = 8,1 mm Passing through AF PANEL	EI 120 C/C Section B.3.3
PP pipes	$Ø_{ext}$ = 110 mm t = 2,7 mm	EI 120 U/C Section B.3.3
	$Ø_{ext}$ = 110 mm t = 18,2 mm	EI 120 U/C Section B.3.3
HDPE pipes	$Ø_{ext}$ = 110 mm t = 4,2 mm	EI 120 U/C Section B.3.3
	$Ø_{ext}$ = 110 mm t = 12,3 mm	EI 120 U/C Section B.3.3
	$Ø_{ext}$ = 250 mm t = 18,4 mm	EI 120 U/C Section B.3.3

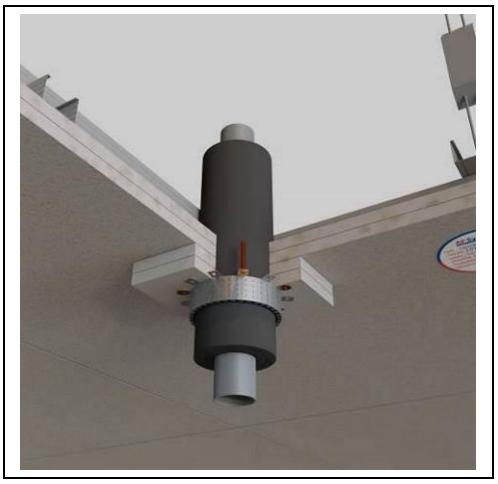


Figure A.23: Examples of insulated steel pipes seal in false ceilings.

Table A.23: Insulated steel pipes assessed in false ceilings.

Service	**False ceiling**
$Ø_{ext}$ = 108 mm t = 4,0 mm 1 layer of 20 mm thick insulation. AF MULTICOLLAR with b = 8 mm, 2 layers of intumescent strip, 5 fixings.	EI 120 C/C Section B.3.3
$Ø_{ext}$ = 108 mm t = 4,0 mm 1 layer of 40 mm thick insulation. AF MULTICOLLAR with H = 50 mm, b = 8 mm, 2 layers of intumescent strip, 5 fixings.	EI 120 C/C Section B.3.3

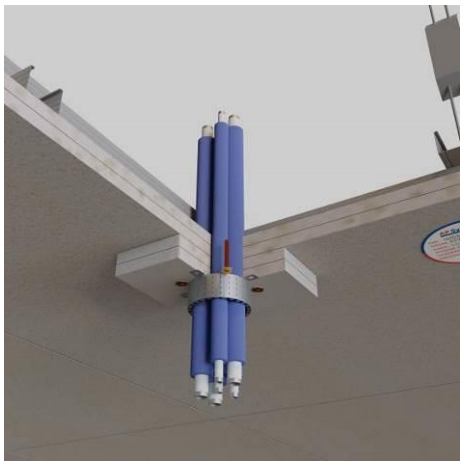


Figure A.24: Examples of cable bundles seal in false ceilings.

Table A.24: Cable bundles assessed in false ceilings.

Service	**False ceiling**
Bundle (overall Ø 110 mm) consisting of: • 2 PE-Xc/Al/PE-RT pipes $Ø_{ext}$ = 26 mm t = 3,0 mm Each individually insulated with 9 mm thick PE. • 2 PE-Xc/Al/PE-RT pipes $Ø_{ext}$ = 16 mm t = 2,0 mm Each individually insulated with 6 mm thick PE. • 2 corrugated PVC pipes ($Ø_{ext}$ = 21 mm), each with a cable type A1	EI 120 U/C Section B.3.3
Installation conditions: - All the gaps in the penetration are completely filled with AF SEAL W.	

ANNEX B. Supporting constructive elements and installation criteria

B.1. General

The constructive elements where AF MULTICOLLAR may be installed are specified in this annex, together with the relevant installation conditions, to reach the resistance to fire performance given in Annex A:

- Rigid walls: section B.2.1.
- Flexible walls: section B.2.2.
- Lining walls: section B.2.3.
- Sandwich panels walls: section B.2.4.
- Timber walls: section B.2.5.
- Rigid floors: section B.3.1.
- Timber floors: section B.3.2.
- False ceilings: section B.3.3.

The constructive element where the penetration seal is installed must be classified in accordance with EN 13501-2 for the required fire resistance period.

The installation of AF MULTICOLLAR shall follow the procedure described in section B.4, except if otherwise specified in tables A.1 to A.24.

The additional components that make up the penetration seal, generically referred to in tables A.1 to A.24, shall meet the specification given in table B.3.

B.2. Specification of the supporting walls

B.2.1. Rigid walls

B.2.1.1 Rigid wall with resistance to fire EI 180

Concrete or masonry walls with a minimum thickness of 150 mm, minimum density of 550 kg/m^3 and resistance to fire EI 180.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. The maximum size of the opening is 1800 mm x 650 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.1.2 Rigid wall with resistance to fire EI 240

Concrete or masonry walls with a minimum thickness of 200 mm, minimum density of 550 kg/m^3 and resistance to fire EI 240.

When an opening in the wall is closed with AF PANEL, three layers are installed with the external panels levelled to the surface at both sides of the wall. The maximum size of the opening is 600 mm x 250 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.2. Flexible walls[8]

B.2.2.1 Flexible wall of thickness 80 mm

Walls with a minimum thickness of 80 mm and resistance to fire EI 60.

When an opening in the wall is closed with AF PANEL, one layer is installed levelled to the surface at the fire exposed side of the wall. The maximum size of the opening is 550 mm x 600 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.2.2 Flexible wall of thickness 100 mm

Walls with a minimum thickness of 100 mm and resistance to fire EI 120.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. The maximum size of the opening is 550 mm x 600 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.2.3 Flexible wall of thickness 120 mm

Walls with a minimum thickness of 120 mm and resistance to fire EI 120.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.2.4 Flexible wall of thickness 125 mm

Walls with a minimum thickness of 125 mm and resistance to fire EI 120.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.2.5 Flexible wall of thickness 135 mm

Walls with a minimum thickness of 135 mm and resistance to fire EI 120.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

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[8] The flexible walls 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 520. 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 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.

B.2.3. Lining walls

B.2.3.1 Lining wall of thickness 30 mm

Walls with a minimum thickness of 30 mm (boards only) and resistance to fire EI 60, which comprise a steel frame of a minimum thickness 50 mm (studs of 50 mm x 49 mm x 0,6 mm), lined at one side only with minimum two layers of 15 mm thick 'Type F' gypsum plasterboards according to EN 520.

When an opening in the wall is closed with AF PANEL, one layer is installed. A frame is installed around the opening, fixed to the wall plasterboards with self-tapping steel screws Ø 3,5 mm every 200 mm, made of strips (50 mm width and 15 mm thick) of 'Type F' gypsum plasterboards according to EN 520. The maximum size of the opening is 500 mm x 1060 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.3.2 Lining wall of thickness 50 mm

Walls with a minimum thickness of 50 mm (boards only) and resistance to fire EI 120, which comprise a steel frame of a minimum thickness 75 mm (studs of 75 mm x 50 mm x 0,6 mm), lined at one side only with minimum two layers of 25 mm thick 'Type GM-F' gypsum and vermiculite plasterboards, coated with fiberglass, according to EN 520.

When an opening in the wall is closed with AF PANEL, two layers are installed. A frame is installed around the opening, fixed to the wall plasterboards with self-tapping steel screws Ø 4 mm every 200 mm, made of strips (50 mm width and 25 mm thick, two layers) of 'Type GM-F' gypsum and vermiculite plasterboards, coated with fiberglass, according to EN 520. The maximum size of the opening is 550 mm x 1050 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.4. Self-supporting sandwich panels wall

Walls with a minimum thickness of 100 mm and resistance to fire EI 120, made of self-supporting sandwich panels with rock wool insulation core of density 100 kg/m^3 faced at both sides with two corrugated galvanised steel sheets of thickness 0,5 mm. The sandwich panels have tongue and groove joint and are fixed to each other with steel rivets Ø3,5 mm x 14 mm, and to the rigid floors with steel L-profiles and steel anchors.

The opening in the sandwich panels wall is closed with two layers of AF PANEL. The maximum size of the opening is 600 mm x 1000 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.2.5. Timber wall

Walls with a minimum thickness of 137 mm and resistance to fire EI 120, made of cross laminated timber boards (X-LAM panels according to ETA 12/0347 or equivalent in accordance with EN 1366-3).

A plate of dimensions 300 mm x 300 mm, made of 12,5 mm thick 'Type F' gypsum plasterboards according to EN 520, is installed with the service axis in the centre as a support for AF MULTICOLLAR fixing.

When an opening in the wall is closed with AF PANEL, two layers are installed levelled to the surface at both sides of the wall. A frame is installed around the opening, fixed to the wall timber boards with self-tapping steel screws Ø6 mm every 200 mm, made of strips (100 mm width and 12,5 mm thick) of 'Type F' gypsum plasterboards according to EN 520. The maximum size of the opening is 600 mm x 600 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.3. Specification of the supporting floors

B.3.1. Rigid floors

Concrete or other type of rigid floors with the following characteristics in relation to the assessed technical services as given in tables A.12 to A.24.

Table B.1: Assessed rigid floors.

Rigid floor		**(A)**	**(B)**	**(C)**	**(D)**
Minimum thickness (mm)		150	170	200	200
Density (kg/m^3)		1600	2200	1600	650 (i)
Resistance to fire		EI 180	EI 180	EI 180	EI 240
AF PANEL closure (when relevant)	Technical solution (ii)	2 layers of AF PANEL, levelled to the surface at both sides of the floor			3 layers of AF PANEL, with the external panels levelled to the surface at both sides of the floor
	Opening maximum size	1000 mm x 500 mm (iii)			1360 mm x 200 mm

(i) Reinforced aerated concrete.

(ii) AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

(iii) Maximum size can be enlarged up to 2000 mm x 1000 mm when supporting profiles are installed beneath the panels. Steel slotted profiles (30 mm width and 1 mm thick) placed under the panel's splices at maximum 500 mm, fixed to the floor at both profile's ends with expansion anchors Ø60 mm x 8 mm.

B.3.2. Timber floor

Floors with a minimum thickness of 158 mm and resistance to fire EI 120, made of cross laminated timber boards (X-LAM panels according to ETA 12/0347 or equivalent in accordance with EN 1366-3).

A plate of dimensions 300 mm x 300 mm, made of 12,5 mm thick 'Type F' gypsum plasterboards according to EN 520, is installed with the service axis in the centre as a support for AF MULTICOLLAR fixing.

When an opening in the floor is closed with AF PANEL, two layers of AF PANEL are installed levelled to the surface at both sides of the floor. A frame is installed around the opening, fixed to the floor timber boards with self-tapping steel screws Ø 5 mm approximately every 175 mm, made of strips (110 mm width and 12,5 mm thick) of 'Type F' gypsum plasterboards according to EN 520. The maximum size of the opening is 700 mm x 500 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.3.3. False ceiling

False ceiling with a minimum thickness of 50 mm (boards only) and resistance to fire EI 120 (a ← b), which comprise a steel frame lined at the bottom side with minimum two layers of 25 mm thick 'Type F' gypsum plasterboards according to EN 520.

For passing services with a diameter up to 200 mm, a plate made of 2 layers of 25 mm thick 'Type F' gypsum plasterboards according to EN 520 is installed with the service axis in the centre as a support for AF MULTICOLLAR fixing (Ø8 mm x 100 mm self-tapping steel screws). For passing services with a higher diameter, the plate is made of 3 layers of 25 mm thick 'Type F' gypsum plasterboards and AF MULTICOLLAR is fixed with Ø8 mm x 125 mm self-tapping steel screws.

When an opening in the false ceiling is closed with AF PANEL, a frame made of strips (50 mm width and 25 mm thick, two layers for a total thickness of 50 mm) of 'Type GM-F' gypsum plasterboards coated with fiberglass, according to EN 15283-1, is installed around the opening in the false ceiling, fixed to the gypsum plasterboards with self-tapping steel screws approximately every 100 mm. The opening is closed with two layers of AF PANEL. The maximum size of the opening is 400 mm x 250 mm. AF MULTICOLLAR is installed on AF PANEL according to section B.4.2.

B.4. Installation AF MULTICOLLAR

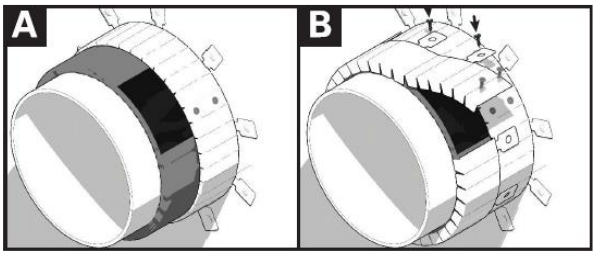
B.4.1. General

AF MULTICOLLAR will be installed in accordance with the manufacturer instructions, which shall conform to the assessment carried out, and the provisions established in this section and in Annex A. The sequence of installation is described in figure B.4.

Installation instructions

For a given service diameter, the intumescent strip shall be cut to size according to the required length, wrapped around the service at the penetration of the constructive element, and attached by the ends with an adhesive tape. The collar housing sheet shall then be torn off at the required length depending on the service diameter and the fixing flanges bent outward. The collar housing sheet shall be placed fit around the intumescent strip and retained with at least 2 self-drilling steel screws Ø3,8 mm x 9 mm. Then, holes will be drilled in the wall/floor coincident with the fixing flanges (number of holes according to table B.2).

For a service diameter higher than 160 mm, two adjacent AF MULTICOLLAR are installed as shown below. The second collar is fixed to the first one with self-drilling steel screws Ø3,8 mm x 9 mm at the flanges (8 screws up to a service diameter of 250 mm, 9 screws up to 315 mm).



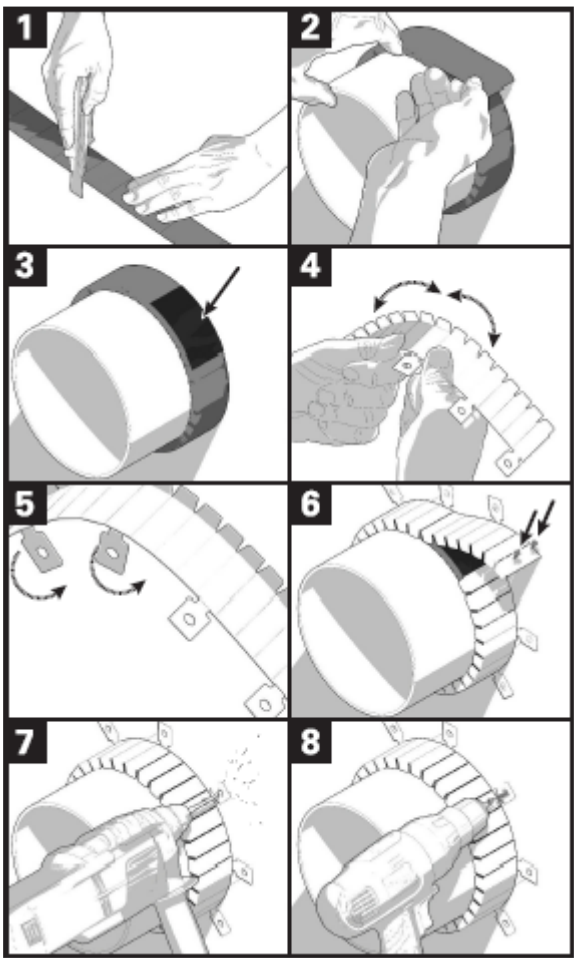


Figure B.4: Sequence of AF MULTICOLLAR installation.

AF MULTICOLLAR is cut to suit the external diameter of the service to be protected (d in table B.2). The dimensions of AF MULTICOLLAR will be selected as given in table B.2 according to the external diameter of the service (including insulation thickness, when relevant), which will match parameter “d” in table B.2, except if otherwise specified in tables A.1 to A.24. Table B.2 is a non-exhaustive list for reference and not all service sizes are shown: the relevant information on the collar parameters (H, b, strip layers, fixings) is given in tables A.1 to A.24 for those cases not considered in table B.2.

Table B.2: Dimensions of AF MULTICOLLAR (installed).

Type	d (mm)	D (mm)	H (mm)	b (mm)	Nº of strip layers	Nº of fixings
AF MULTICOLLAR 30	30	47	50	8	2	4
AF MULTICOLLAR 40	40	67	50	8	2	4
AF MULTICOLLAR 50	50	77	50	8	2	4
AF MULTICOLLAR 63	63	80	50	8	2	4
AF MULTICOLLAR 80	80	97	50	8	2	4
AF MULTICOLLAR 90	90	107	50	8	2	4
AF MULTICOLLAR 100	100	117	50	8	2	4
AF MULTICOLLAR 110	110	127	50	8	2	4
AF MULTICOLLAR 125	125	150	50	12	3	5
AF MULTICOLLAR 140	140	165	50	12	3	5
AF MULTICOLLAR 150	150	175	50	12	3	5
AF MULTICOLLAR 160	160	185	50	12	3	5
AF MULTICOLLAR 200	200	241	100 (2 x 50)	20	5	5
AF MULTICOLLAR 250	250	291	100 (2 x 50)	20	5	5
AF MULTICOLLAR 315	315	364	100 (2 x 50)	24	6	6

Notes:

- d, D, H and b refer to the dimensions of the collar once installed (see figure B.5).
- Housing length and inlay strip length refer to the dimensions of the components to be cut for installation.
- For a service diameter higher than 160 mm, two adjacent AF MULTICOLLAR are installed as described in figure B.4 for a total length (H) of 100 mm, except if otherwise specified in tables A.1 to A.24.
- For service diameters not given in this table, other sizes of AF MULTICOLLAR can be used according to the service diameter given in the relevant table of Annex A, provided that the collar parameters (H, b, strip layers, fixings) are kept in accordance with the next greater size of AF MULTICOLLAR as showed in this table (except for those cases explicitly specified in tables A.1 to A.24).

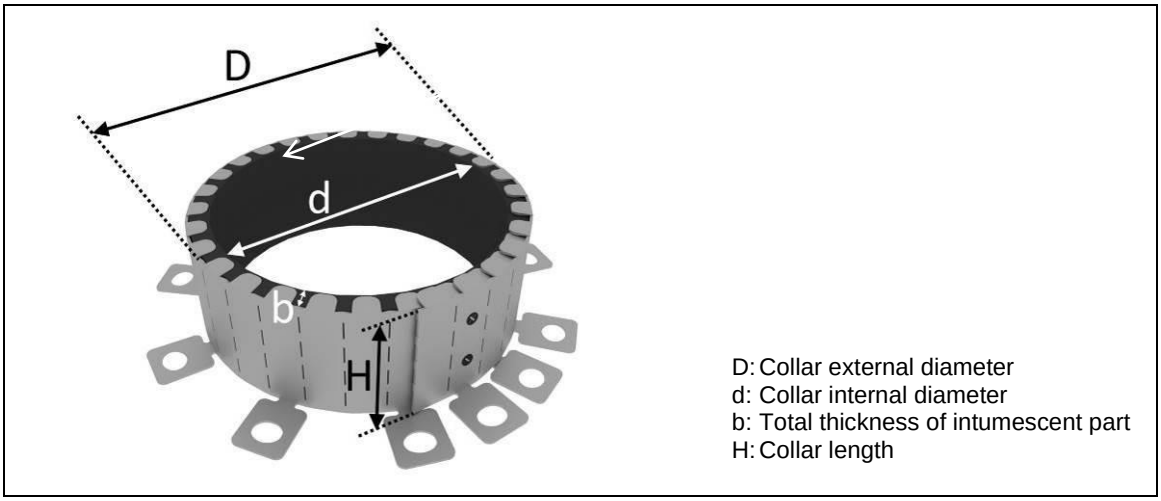


Figure B.5: Dimensions of AF MULTICOLLAR (installed).

In walls, AF MULTICOLLAR is installed at both sides of the constructive element except if otherwise specified in tables A.1 to A.12. In floors, AF MULTICOLLAR is installed at bottom side.

AF MULTICOLLAR shall be fixed to the constructive element as follows:

- In flexible walls, lining walls, timber walls and timber floors, by means of self-tapping galvanised steel screws of Ø8 mm and length depending on the wall thickness and collar size, according to the manufacturer's instructions.
- In sandwich panels walls, AF MULTICOLLAR is only assessed when installed on AF PANEL closing solution, fixed with Ø6 mm passing threaded steel bars, closed with nuts and washers.
- In rigid walls and rigid floors, by means of Ø8 mm x 60 mm galvanised steel class 8.8 expansion anchors.

The number of fixings will be in accordance with table B.2 or in the relevant table of Annex A. The number of fixing flanges of the collar housing may be different from the required number of fixings. Fixings will be installed every other flange.

All gaps between penetrations and constructive elements will not be greater than 5 mm and 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.

The minimum distance between services penetrating the wall/floor, as well as the minimum distance between services and the constructive element edge, is generally 200 mm, except if otherwise specified in tables A.1 to A.24 (e.g., groups of pipes) or in the manufacturer’s instructions, or when services pass through AF PANEL closing solution (see section B.4.2).

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.

B.4.2. AF MULTICOLLAR installation on AF PANEL

AF PANEL closing solution will be installed in the constructive element in accordance with the provisions given in ETA 22/0853, section A.2, and the manufacturer's instructions.

The maximum size of the opening shut with AF PANEL is given in Annex B of this ETA in relation to the supporting construction. In the case of walls, the given maximum size can be increased up to either 25 % in height or 25 % in width or 25 % in area in accordance with table A.3 in EN 15882-3[9]. If a blank seal (opening shut with AF PANEL without passing services) is installed, splices within the seal area have not been assessed.

More than one service can be installed passing through the panels provided that the total amount of services cross sections (including insulation when relevant) does not exceed the 60 % of the opening area.

The minimum distance from services to the edge of AF PANEL closure area is generally 100 mm, except if otherwise specified or in the manufacturer's instructions.

When AF MULTICOLLAR is installed on AF PANEL closing solution in walls, it is fixed with steel wires of minimum diameter 1 mm from the collar flanges to the wall, where the wires are fixed by the means described in section B.4.1 depending on the type of constructive element. The minimum number of wires to fix the collar shall be in accordance with the number of fixings given in table B.2. In the case of AF PANEL closing solution in a sandwich panels wall, AF MULTICOLLAR is fixed at the flanges with Ø6 mm passing threaded steel bars, closed with nuts and washers.

When AF MULTICOLLAR is installed on AF PANEL closing solution in floors, it is held at the bottom side with steel wires of minimum diameter 1 mm from the collar flanges, passing through AF PANEL and fixed to a protected supporting structure at the upper side of the floor.

AF SEAL W acrylic sealant is applied at an approximate dry thickness of 2 mm over the fire exposed surface of AF PANEL, completely covering the steel wires and their fixing to the constructive element.

B.4.3. AF MULTICOLLAR installation on AF BRICK

AF BRICK closing solution will be installed in the constructive element in accordance with the provisions given in ETA 21/0580, section A.2, and the manufacturer's instructions.

AF BRICK is placed inside the opening in the constructive element, orienting the brick side of 150 mm parallel to the thickness of the support, up to the complete obstruction of the opening. Small gaps between services and AF BRICK can be filled with AF GRAPHIT FOAM, particularly if they are greater than 5 mm.

The maximum seal size of the AF BRICK closing solution will be 0,6 m^2. If a blank seal (opening shut with AF BRICK without passing services) is installed, a reinforcement net made of 1 mm diameter steel cable is installed at the fire exposed side of the constructive element, supporting the AF BRICK blank seal (see ETA 21/0580, section A.2.2 for rigid and flexible walls and section A.2.3 for rigid floors). In the case of floors, a reinforcement net of 1 mm diameter steel cable is always installed below the seal in openings bigger than 0,4 m^2, also when services pass through (see ETA 21/0580, section A.2.3).

[9] EN 15882-3 Extended applications of results from fire resistance tests for service installations. Part 3: Penetration seals.

More than one service can be installed passing through AF BRICK provided that the total amount of services cross sections does not exceed the 60 % of the opening area.

The minimum distance from services to the edge of AF BRICK closure area is generally 100 mm, except if otherwise specified or in the manufacturer's instructions.

When AF MULTICOLLAR is installed on AF BRICK closing solution in walls, it is fixed with steel wires of minimum diameter 1 mm from the collar flanges to the wall, where the wires are fixed by the means described in section B.4.1 depending on the type of constructive element. The minimum number of wires to fix the collar shall be in accordance with the number of fixings given in table B.2.

When AF MULTICOLLAR is installed on AF BRICK closing solution in floors, it is held at the bottom side with steel wires of minimum diameter 1 mm from the collar flanges to the floor, where the wires are fixed by means of Ø8 mm x 60 mm galvanised steel expansion anchors.

B.5. Additional components of the fire penetration seal

The additional components, generically referred to in tables A.1 to A.24, shall meet the following specification.

Table B.3: Specification of the fire penetration seal additional components.

Component	Specification
Steel pipes	The steel pipes will be made of steel with a minimum melting point of 1450 ºC and a maximum thermal conductivity of 52 W/(m·K).
Insulation material for pipes (unless otherwise specified in tables A.1 to A.24)	Foamed elastomeric insulation material: • Continuous insulation. • Reaction to fire: from B_L-s1,d0 to D_L-s3,d0. • Maximum thermal conductivity (23 ºC): λ ≤ 0,043 W/(m·K). • Assessed types of foamed elastomeric insulation material: Armaflex. • Fixed around the pipe with a steel wire of diameter 1 mm.
Small-sheathed cables	Cables type group 1 according to Annex A of EN 1366-3: • Cables type A1 model "5×1,5 mm^2 Cl 1 PVC/PVC 600/1000V NYYJ". • Cables type A2 model "5×1,5 mm^2 Cl 5 Cu EPR/PCP 450/750V H07RN-F". • Cables type A3 model "5×1,5 mm^2 Cl 1 Cu XLPE/LSZH 600/1000V N2XH-J". • Cables type B model "1×95 mm^2 Cl 2 PVC/PVC 600/1000V NYY0".
AF PANEL	AF PANEL is CE marked based on ETA 21/0853, with which product and installation conditions of AF PANEL shall conform.
AF BRICK	AF BRICK is CE marked based on ETA 21/0580, with which product and installation conditions of AF BRICK shall conform.
AF SEAL W	Water-based, ablative acrylic sealant with specific gravity 1,4 ± 0,1 kg/l. AF SEAL W is assessed for the environmental use category Type Y_1 in accordance with EOTA Technical Report 024, section 2.2.4 (for a 25-year working life).