

## European Technical Assessment

**ETA 22/0853**  
of 27.03.2023



### 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 PANEL**

**Product family to which the construction product belongs**

Fire stopping and fire sealing products.  
Penetration seals.

**Manufacturer**

**AF SYSTEMS SRL**  
Via Edward Jenner 41-43  
IT-26837 Mulazzano  
Italy

**Manufacturing plant(s)**

According to Annex N kept by ITeC.

**This European Technical Assessment contains**

38 pages including 1 annex which forms 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 ETA is a corrigendum (1) of**

ETA 22/0853 issued on 27.03.2023.

**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 PANEL is a rock wool panel coated on both faces with the acrylic ablative coating AF SEAL T, with the characteristics given in the next table.

**Table 1:** Characteristics of AF PANEL.

	<b>Characteristic</b>	<b>Nominal value</b>
	Width	500 mm
	Length	1000 mm
Thickness	Rock wool panel	50 mm
	AF SEAL T (each face)	1 mm
	AF PANEL	52 mm
Density	Rock wool panel	150 kg/m <sup>3</sup>
	AF SEAL T	1340 kg/m <sup>3</sup>

The tolerance level of the rock wool panel thickness is class T3 according to EN 13162<sup>1</sup>. The rest of tolerances are established in the Control Plan.

The description of the installation procedure is given in Annex A. Assembled penetration seals require additional components as described in Annex A. These components cannot be CE marked based on this ETA.

<sup>1</sup> EN 13162 Thermal insulation products for buildings - Factory made mineral wool (MW) products – Specification.

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

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

- plastic pipes,
- insulated and non-insulated metal pipes,
- multilayer composite pipes,
- cables and cables trays.

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

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

- flexible and rigid walls, lining walls, sandwich panel walls and timber walls,
- rigid floors, timber floors and false ceilings.

The constructive element where AF PANEL is installed must be classified in accordance with EN 13501-2<sup>2</sup> for the required fire resistance period.

AF PANEL is intended for the environmental conditions as defined for use category Type Y<sub>1</sub> 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<sub>1</sub> includes lower use categories (i.e. Type Y<sub>2</sub>, Type Z<sub>1</sub> and Type Z<sub>2</sub>).

The provisions made in this ETA are based on a working life of AF PANEL 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.

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<sup>2</sup> EN 13501-2 Fire classification of construction products and building elements. Part 2: Classification using data from fire resistance tests, excluding ventilation services.

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

#### 3.1 Performance of the product

The assessment of AF PANEL has been performed in accordance with EAD 350454-00-1104 for *Fire stopping and fire sealing products - Penetration seals (September 2017)*.

**Table 2:** Performance of the product.

Product: AF PANEL		Intended use: Fire penetration seal
Basic requirement	Essential characteristic	Performance
BWR 2 Safety in case of fire	Reaction to fire	NPA <sup>3</sup>
	Resistance to fire	See Annex A
BWR 4 Safety and accessibility in use	Durability	Type Y <sub>1</sub>

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

#### 3.2 Methods used for the assessment

##### 3.2.1 Fire resistance

The performance of AF PANEL has been tested and assessed according to EN 1366-3<sup>4</sup>. The classification of the resistance to fire has been determined according to EN 13501-2 and is given in Annex A.

##### 3.2.2 Durability

AF PANEL has been tested and assessed for the environmental use category Type Y<sub>1</sub> (for a 25-year working life) in accordance with section 2.2.9 of EAD 350454-00-1104. The rock wool panel has been tested and assessed in accordance with section 2.2.9.2.7 of EAD 350454-00-1104 and AF SEAL T has been tested and assessed in accordance with EOTA Technical Report 024<sup>5</sup>, section 4.2.4.

<sup>3</sup> NPA: No Performance Assessed.

<sup>4</sup> EN 1366-3 Fire resistance tests for service installations. Part 3: Penetration seals (2009).

<sup>5</sup> EOTA TR 024 Technical description and assessment of reactive products effective in case of fire, Edition August 2019.

#### 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 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 27 March 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 assessed when installed through the AF PANEL seal in walls are shown in:

- Table A.1: Plastic pipes.
- Table A.2: Insulated metal pipes.
- Table A.3: Non-insulated metal pipes.
- Table A.4: Multilayer composite pipes.
- Table A.5: Electric cables.

The technical services assessed when installed through the AF PANEL seal in floors are shown in:

- Table A.6: Plastic pipes.
- Table A.7: Insulated metal pipes.
- Table A.8: Non-insulated metal pipes.
- Table A.9: Multilayer composite pipes.
- Table A.10: Electric cables.
- Table A.11: Penetration seals in false ceilings.

The procedure for AF PANEL installation is described in section A.2. The specification of the additional components of the penetration seal and the associated installation provisions is given in table A.12.

The specification of the supporting construction and the technical solution for AF PANEL seal is given in section A.3 for walls:

- A.3.1: Rigid walls.
  - A.3.1.1: Rigid walls of thickness 150 mm (EI 180).
  - A.3.1.2: Rigid walls of thickness 200 mm (EI 240).
- A.3.2: Flexible walls.
  - A.3.2.1: Flexible walls of thickness 80 mm (EI 60).
  - A.3.2.2: Flexible walls of thickness 100 mm (EI 120).
  - A.3.2.3: Flexible walls of thickness 120 mm (EI 120).
  - A.3.2.4: Flexible walls of thickness 125 mm (EI 120).
  - A.3.2.5: Flexible walls of thickness 135 mm (EI 120).
- A.3.3: Lining walls.
  - A.3.3.1: Lining walls of thickness 30 mm (EI 60).
  - A.3.3.2: Lining walls of thickness 50 mm (EI 120).
- A.3.4: Sandwich panels walls of thickness 100 mm (EI 120).
- A.3.5: Timber walls of thickness 137 mm (EI 120).

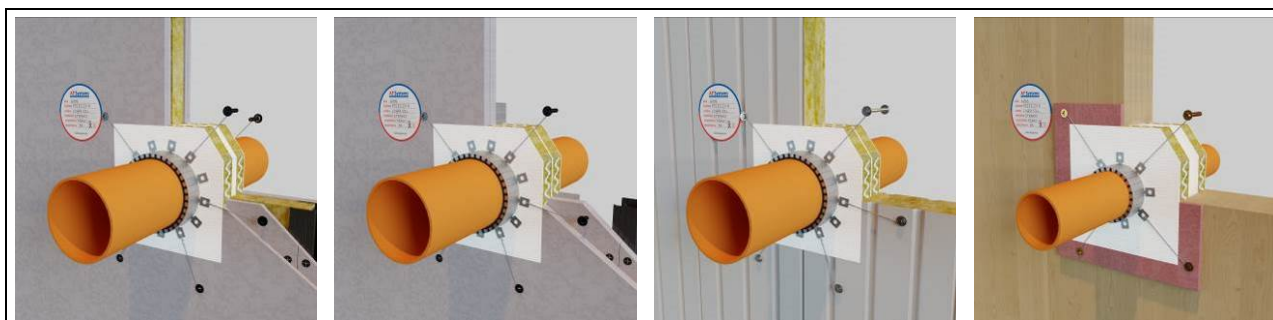
All resistance to fire classifications given for flexible walls can be applied to rigid walls of at least the same thickness and resistance to fire.

The specification of the supporting construction and the technical solution for AF PANEL seal is given in section A.4 for floors:

- A.4.1: Rigid floors with thickness from 150 mm to 200 mm (EI 180 and EI 240).
- A.4.2: Timber floors of thickness 158 mm (EI 120).
- A.4.3: False ceiling of thickness 50 mm (EI 120).

**Table A.1a:** Plastic pipes (protected with AF MULTICOLLAR) assessed in walls.

Service <sup>(i)</sup>	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
<sup>(i)</sup> For rigid and flexible walls, see also the fire penetration seals of plastic pipes covered in ETA 16/0771 (AF MULTICOLLAR), section B.2.3, and ETA 16/0689 (AF COLLAR), section B.2.3.						
PVC pipe Ø <sub>ext</sub> = 110 mm t = 3,2 mm <sup>6</sup>	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip) At the fire exposed side only	--	--	--	--	EI 120 U/C Section A.3.5
PVC pipe Ø <sub>ext</sub> = 110 mm t = 8,1 mm	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip) At the fire exposed side only	--	EI 60 C/C Section A.3.2.1	EI 60 U/C Section A.3.3.1 EI 120 C/C Section A.3.3.2	--	--
	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip)	--	--	--	EI 120 C/C Section A.3.4	--
PVC pipe Ø <sub>ext</sub> = 160 mm t = 9,5 mm	AF MULTICOLLAR (Ø 160 mm, 3 layers of intumescent strip) At the fire exposed side only	--	--	EI 60 U/C Section A.3.3.1	--	--
PVC pipe Ø <sub>ext</sub> = 160 mm t = 11,8 mm	AF MULTICOLLAR (Ø 160 mm, 3 layers of intumescent strip) At the fire exposed side only	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.4	--
PP pipe Ø <sub>ext</sub> = 110 mm t = 15,1 mm	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip)	--	EI 120 U/C Section A.3.2.2	--	--	--
HDPE pipe Ø <sub>ext</sub> = 110 mm t = 12,3 mm	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip)	--	EI 120 U/C Section A.3.2.2	--	--	--

**Figure A.1.1a:** Example of plastic pipes seal (with AF MULTICOLLAR) in walls.<sup>6</sup> t: pipe wall thickness.



**Table A.1b:** Plastic pipes (protected with AF SLEEVE) assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
PVC pipe Øext = 110 mm t = 8,1 mm	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 60 U/C Section A.3.2.1	--	--	--
HDPE pipe Øext = 110 mm t = 10,5 mm	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 60 U/C Section A.3.2.1	--	--	--
PP pipe Øext = 110 mm t = 7,5 mm	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 60 U/C Section A.3.2.1	--	--	--
PPR pipe Øext = 110 mm t = 15,1 mm	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 60 U/C Section A.3.2.1	--	--	--

**Figure A.1.1b:** Example of plastic pipes seal (with AF SLEEVE) in walls.

**Table A.2a:** Insulated<sup>7</sup> metal pipes (protected with AF SLEEVE) assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall	
Steel pipes	$\varnothing_{\text{ext}} = 20 \text{ mm}$ $t = 1,5 \text{ mm to } 3,0 \text{ mm}$ 1 layer of 9 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.2	--	--	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 240 U/C Section A.3.1.2	EI 60 C/C Section A.3.2.1	--	--	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,5 \text{ mm}$ 1 layer of 21 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	--	EI 120 C/U Section A.3.5
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.4	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/U Section A.3.1.1	EI 120 C/U Section A.3.2.4	--	--	--
				EI 120 U/C Section A.3.2.5			
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	EI 180 C/U Section A.3.1.1	EI 120 U/C Section A.3.2.5	--	--	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 3 layers of 20 mm thick insulation (total thickness 60 mm)	AF SLEEVE Length: 50 mm Thickness: 12 mm (3 layers of 4 mm each)	--	EI 120 U/C Section A.3.2.5	--	--	--
	$\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	EI 120 C/C Section A.3.4	--
	$\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4,0 \text{ mm}$ 1 layer of 30 mm thick rock wool insulation (LS) of density 80 kg/m <sup>3</sup>	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
$\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4,0 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	--	--	EI 120 C/C Section A.3.4	--	

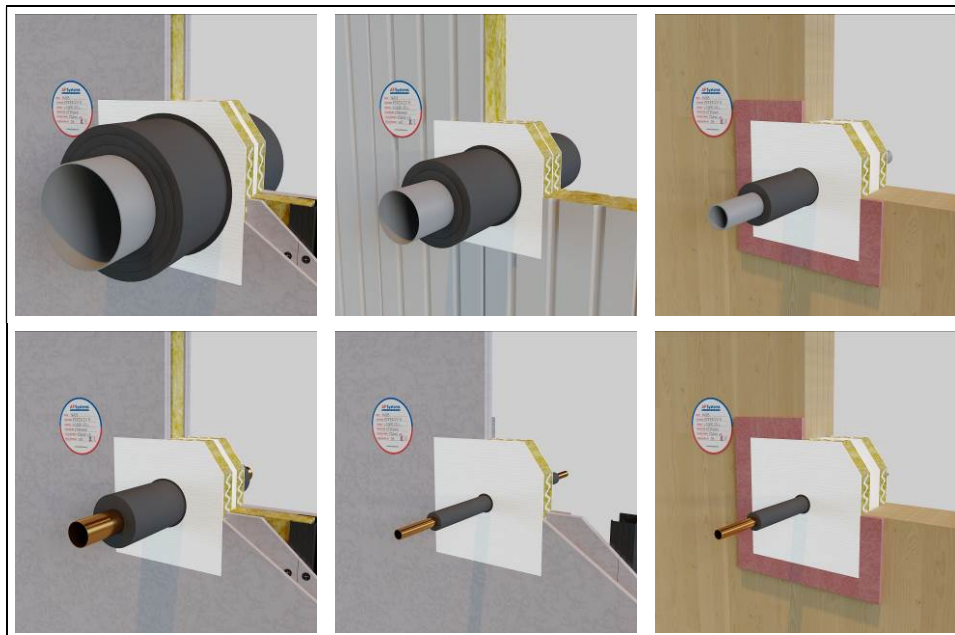
<sup>7</sup> Insulation specification according to table A.12 unless otherwise specified in tables A.1 to A.11.

**Table A.2a:** Insulated<sup>7</sup> metal pipes (protected with AF SLEEVE) assessed in walls.

Service		Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
Steel pipes	$\varnothing_{\text{ext}} = 108 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 40 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 120 C/C Section A.3.2.2	EI 60 U/C Section A.3.3.1	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 1,0 \text{ mm}$ 3 layers of 20 mm thick insulation (total thickness 60 mm)	AF SLEEVE Length: 50 mm Thickness: 12 mm (3 layers of 4 mm each)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 4,5 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/U Section A.3.1.1	--	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 4,5 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 120 C/U Section A.3.2.4	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 6,0 \text{ mm}$ 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 6,0 \text{ mm}$ 3 layers of 20 mm thick insulation (total thickness 60 mm)	AF SLEEVE Length: 50 mm Thickness: 12 mm (3 layers of 4 mm each)	--	EI 120 C/C Section A.3.2.3	--	--	--
Copper pipes	$\varnothing_{\text{ext}} = 5 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.4	--
	$\varnothing_{\text{ext}} = 12 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{\text{ext}} = 20 \text{ mm}$ $t = 2,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.4	--
	$\varnothing_{\text{ext}} = 21 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 9 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	EI 60 U/C Section A.3.3.1	--	--

**Table A.2a:** Insulated<sup>7</sup> metal pipes (protected with AF SLEEVE) assessed in walls.

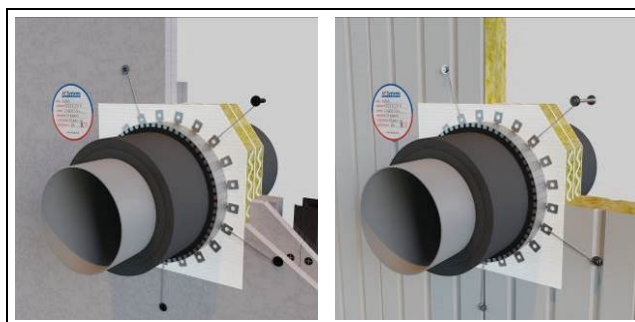
Service		Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
Copper pipes	$\varnothing_{ext} = 22 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 8,5 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	--	EI 45 C/U Section A.3.5
	$\varnothing_{ext} = 22 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{ext} = 50 \text{ mm}$ $t = 4,0 \text{ mm}$ 1 layer of 30 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
	Bundle (overall $\varnothing 75 \text{ mm}$ ) of 4 pipes: $\varnothing_{ext} = 20 \text{ mm}$ $t = 2,0 \text{ mm}$ 6 mm PE insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	EI 120 C/C Section A.3.4	--



**Figure A.1.2a:** Example of insulated metal pipes seal (with AF SLEEVE) in walls.

**Table A.2b:** Insulated metal pipes (protected with AF MULTICOLLAR) assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall	
Steel pipes	$\varnothing_{\text{ext}} = 108 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 40 mm thick insulation	AF MULTICOLLAR ( $\varnothing 188 \text{ mm}$ , 2 layers of intumescent strip) At the fire exposed side only.	--	--	EI 60 U/C Section A.3.3.1	--	--
	$\varnothing_{\text{ext}} = 160 \text{ mm}$ $t = 1,2 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF MULTICOLLAR ( $\varnothing 240 \text{ mm}$ , 2 layers of intumescent strip) At the fire exposed side only.	--	EI 120 C/C Section A.3.2.2	--	--	--
	$\varnothing_{\text{ext}} = 160 \text{ mm}$ $t = 9,0 \text{ mm}$ 2 layers of 9,5 mm thick insulation (total thickness 19 mm)	AF MULTICOLLAR ( $\varnothing 198 \text{ mm}$ , 2 layers of intumescent strip) At the fire exposed side only.	--	EI 120 C/C Section A.3.2.2	--	--	--
	$\varnothing_{\text{ext}} = 180 \text{ mm}$ $t = 9,0 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF MULTICOLLAR ( $\varnothing 260 \text{ mm}$ , 2 layers of intumescent strip) At the fire exposed side only.	--	EI 120 C/C Section A.3.2.2	--	--	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 4,0 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF MULTICOLLAR ( $\varnothing 280 \text{ mm}$ , 2 layers of intumescent strip) At the fire exposed side only.	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.4	--

**Figure A.1.2b:** Example of insulated metal pipes seal (with AF MULTICOLLAR) in walls.

**Table A.3:** Non-insulated metal pipes assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall	
Steel pipes	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 7 mm (1 layer)	--	EI 120 C/C Section A.3.2.2	EI 60 U/C Section A.3.3.1	--	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,5 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 14 mm (2 layers of 7 mm each)	--	--	--	--	EI 120 C/U Section A.3.5
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 14 mm (2 layers of 7 mm each)	--	--	--	EI 120 C/C Section A.3.4	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 4,5 \text{ mm}$	AF PIPEGUARD Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 7 mm (1 layer)	--	EI 120 C/U Section A.3.2.4	--	--	--
	Group of 2 parallel, adjacent pipes, each of: $\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4 \text{ mm}$	AF PIPEGUARD (wrapping both pipes) Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 7 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--
Copper pipes	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 4,0 \text{ mm}$	AF PIPEGUARD Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 21 mm (3 layers of 7 mm each)	--	EI 120 C/C Section A.3.2.3	--	--	--
	Group of 2 parallel, adjacent pipes: • $\varnothing_{\text{ext}} = 6 \text{ mm}$ $t = 1,0 \text{ mm}$ • $\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 4,0 \text{ mm}$	AF PIPEGUARD (wrapping both pipes) Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 21 mm (3 layers of 7 mm each)	--	EI 120 C/C Section A.3.2.3	--	--	--
Aluminium pipes	$\varnothing_{\text{ext}} = 30 \text{ mm}$ $t = 2,0 \text{ mm}$	--- (*)	--	EI 120 C/C Section A.3.2.3	--	--	--
	$\varnothing_{\text{ext}} = 60 \text{ mm}$ $t = 3,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 7 mm (1 layer)	--	EI 120 C/C Section A.3.2.3	--	--	--

(\*) No additional fire protective element required. AF PANEL is cut following the shape of the passing elements (maximum gap of 3 mm). The gap is filled with AF SEAL W.

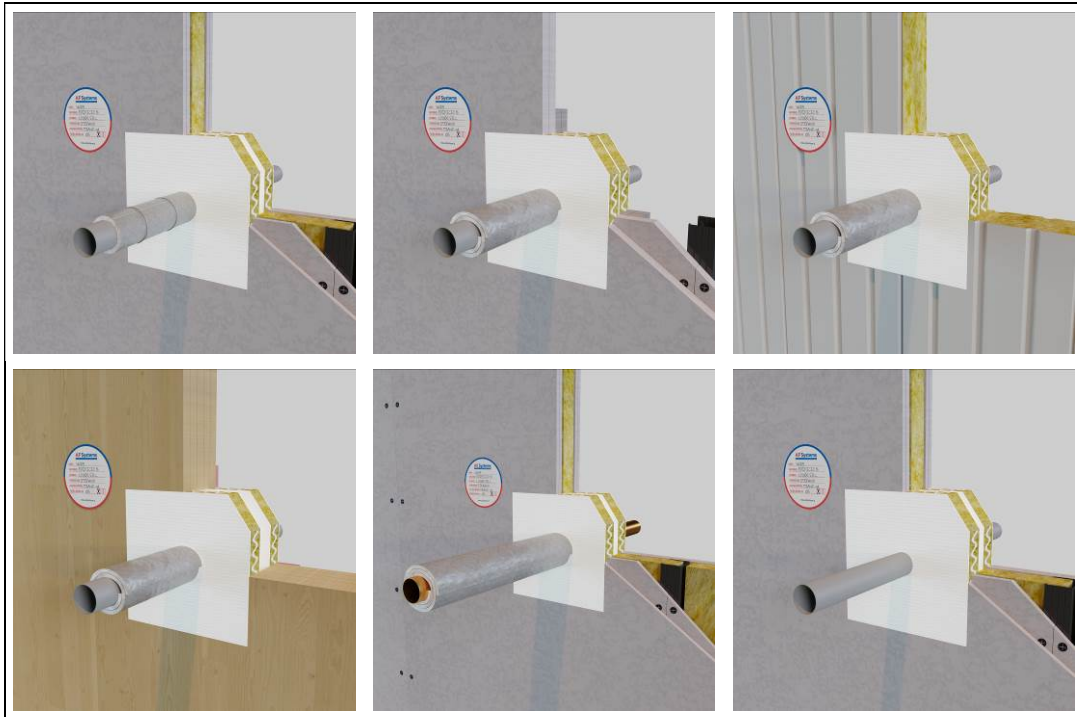


Figure A.1.3: Example of non-insulated metal pipes seal in walls.

Table A.4: Multilayer composite pipes assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
PE-Xb/Al/HDPE pipe: Ø <sub>ext</sub> = 32 mm t = 3,0 mm 1 layer of 10 mm thick insulation	AF COLLAR 50 (In accordance with ETA 16/0689, section B.2.3.5)	--	EI 120 U/C Section A.2.3.4	--	--	--
Bundle (overall Ø85mm) of 5 PE-Xb/Al/HDPE pipes: Ø <sub>ext</sub> = 20 mm t = 3,0 mm 6 mm PE insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	EI 120 C/C Section A.3.4	--

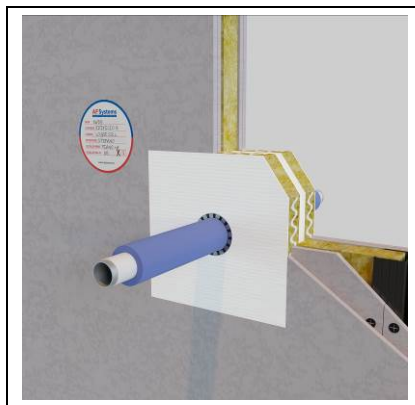


Figure A.1.4: Example of multilayer composite pipes seal in walls.

**Table A.5:** Electric cables assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
<b>Cable trays</b>						
Steel tray (300 x 75 x 1) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables<sup>8</sup>: <ul style="list-style-type: none"> <li>10 cables type A1</li> <li>10 cables type A2</li> <li>10 cables type A3</li> <li>2 cables type B</li> </ul> </li> </ul>	-- (*)	--	--	EI 120 Section A.3.3.2	EI 120 Section A.3.4	--
Steel tray (500 x 80 x 1) mm <ul style="list-style-type: none"> <li>30 cables type A1 distributed on the tray</li> <li>2 corrugated plastic pipes (Ø22 mm) with a cable type A1</li> </ul>	--- (*)	--	EI 120 Section A.3.2.3	--	--	--
Steel tray (200 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>8 cables type A1</li> <li>4 cables type A1</li> <li>2 corrugated plastic pipes (Ø22 mm) with a cable type A1</li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.4	--	--	--
PVC tray (200 x 75 x 2,8) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: <ul style="list-style-type: none"> <li>3 cables type A1</li> <li>3 cables type A2</li> <li>3 cables type A3</li> </ul> </li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.3	--	--	--
Steel tray (300 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: <ul style="list-style-type: none"> <li>10 cables type A1</li> <li>10 cables type A2</li> <li>10 cables type A3</li> <li>2 cables type B</li> </ul> </li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.2	--	--	--
Steel tray (300 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: <ul style="list-style-type: none"> <li>10 cables type A1</li> <li>10 cables type A2</li> <li>10 cables type A3</li> <li>2 cables type B</li> </ul> </li> <li>1 corrugated plastic pipe (Ø20 mm) with a cable type A1</li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.4	EI 60 Section A.3.3.1	--	--

<sup>8</sup> See specification of small sheathed cables in table A.12.

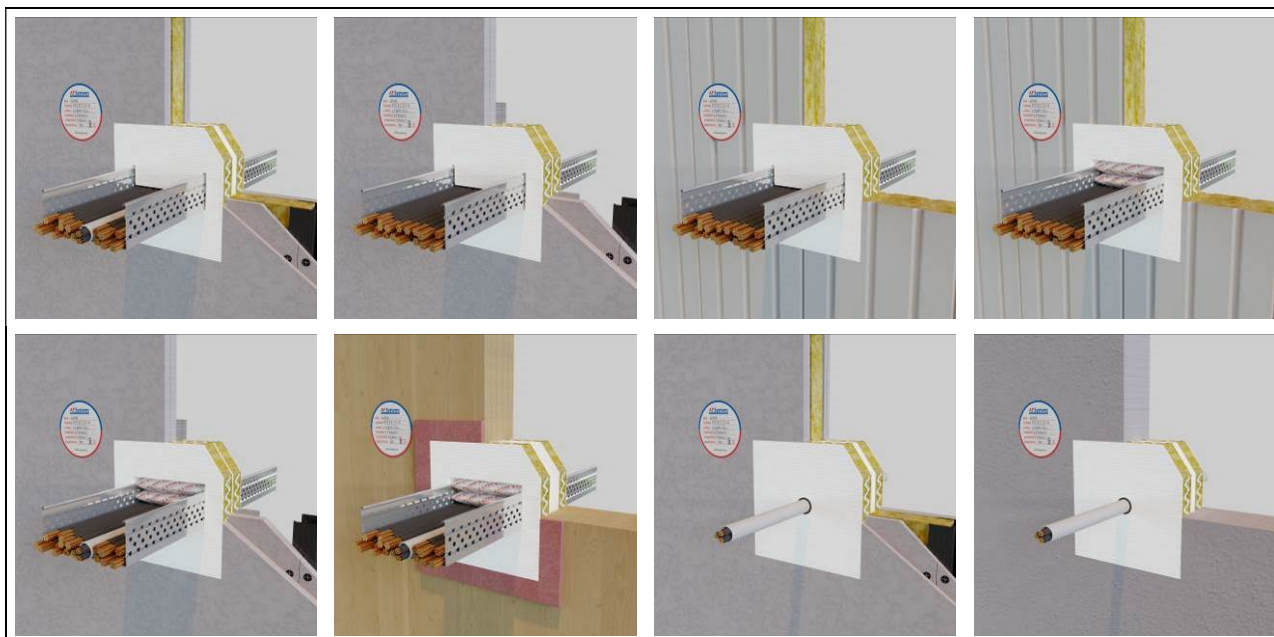


**Table A.5:** Electric cables assessed in walls.

Service	Fire protection	Rigid walls	Flexible walls	Lining wall	Sandwich panels wall	Timber wall
Wire mesh steel tray (500 x 54) mm, wire diameter 3 mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B</li> <li>1 corrugated plastic pipe (Ø32 mm) with a cable type A1</li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.4	--	--	--
Steel tray (500 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B</li> <li>1 corrugated plastic pipe (Ø32 mm) with a cable type A1</li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	EI 180 Section A.3.1.1	EI 60 Section A.3.2.1	--	--	--
Steel tray (500 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B</li> <li>1 corrugated plastic pipe (Ø20 mm) with a cable type A1 of 5x1,5 mm<sup>2</sup></li> </ul>	AF BAGS (200x120x30) mm Dimension 200 mm along the wall depth	EI 240 Section A.3.1.2	--	--	--	--
Steel tray (500 x 80 x 1,5) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B</li> </ul>	AF BAGS (120x100x25) mm (120x300x35) mm	--	EI 120 Section A.3.2.3	--	--	EI 120 Section A.3.5
<b>Cables in corrugated plastic pipes</b>						
Corrugated plastic pipe (Ø32 mm) with a cable type A1	AF SLEEVE B3 Length: 30 mm Thickness: 2 mm (1 layer)	--	EI 120 Section A.3.2.2	--	--	--
			EI 60 Section A.3.2.1			
Corrugated plastic pipe (Ø32mm) with two cables type A1	AF SLEEVE B3 Length: 30 mm Thickness: 2 mm (1 layer)	--	EI 120 Section A.3.2.3	--	--	--

<b>Cables bundles</b>						
Bundle (overall Ø110 mm) of: <ul style="list-style-type: none"> <li>• 10 corrugated plastic pipes (Ø20 mm) with a cable type A1</li> <li>• 5 multilayer pipes (Ø16 mm, t = 2 mm) individually insulated (thickness 9 mm)</li> </ul>	AF MULTICOLLAR (Ø 110 mm, 2 layers of intumescent strip) At the fire exposed side only	--	--	EI 60 U/C Section A.3.3.1	--	--
Group of 2 parallel, adjacent pipes (each with 15 cables type A1 of 5x1,5 mm <sup>2</sup> ): <ul style="list-style-type: none"> <li>• Corrugated PVC (Ø125 mm / t = 9 mm)</li> <li>• PP pipe (Ø125 mm / t = 3,2 mm)</li> </ul>	AF MULTICOLLAR (2 layers of intumescent strip wrapping both pipes) At the fire exposed side only	--	EI 120 Section A.3.2.3	--	--	--
Bundle (overall Ø80 mm) of: <ul style="list-style-type: none"> <li>• 3 corrugated plastic pipes (Ø20 mm) with a cable type A1 of 5x1,5mm<sup>2</sup></li> <li>• 3 multilayer composite pipes PE-Xb/Al/HDPE (Ø20 mm / t = 3 mm), sheathed with 6 mm PE insulation</li> </ul>	AF MULTICOLLAR (Ø 80 mm, 2 layers of intumescent strip) At the fire exposed side only	--	--	EI 120 C/C Section A.3.3.2	EI 120 C/C Section A.3.3.2	--
Bundle (overall Ø100 mm) of: <ul style="list-style-type: none"> <li>• 7 corrugated plastic pipes (Ø32 mm) with cables type A1</li> </ul>	AF COLLAR 125 At the fire exposed side only	EI 180 Section A.3.1.1	--	--	--	--
Bundle (overall Ø55 mm) of: <ul style="list-style-type: none"> <li>• 5 corrugated plastic pipes (Ø20 mm) with a cable type A1 of 5x1,5mm<sup>2</sup></li> </ul>	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	EI 120 Section A.3.4	--
Bundle (overall Ø80 mm) of cables type A1	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 Section A.3.2.4	--	--	--
Bundle (overall Ø75 mm) of <ul style="list-style-type: none"> <li>• 7 corrugated PVC pipes (Ø24 mm) with a cable type A2 of 5x1,5mm<sup>2</sup></li> </ul>	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	--	--	--	EI 120 Section A.3.5
<b>Other electric components</b>						
Bus bar (160 A / 400 V) in a steel sheet housing (200 x 80) mm	AF PIPEGUARD Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 7 mm (1 layer)	--	EI 120 Section A.3.2.3	--	--	--

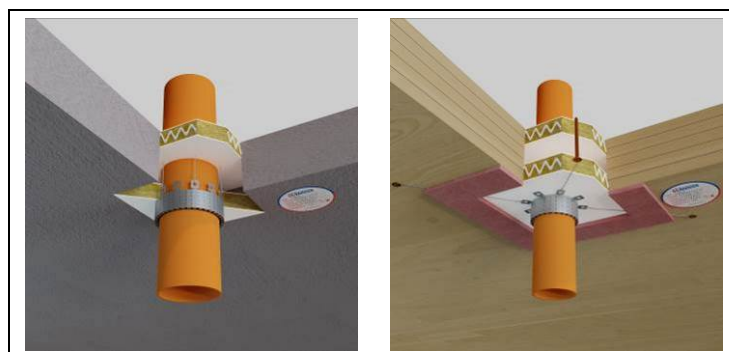
(\*) No additional fire protective element required. AF PANEL is cut following the shape of the passing elements (maximum gap of 3 mm). The gap is filled with AF SEAL W.



**Figure A.1.5:** Example of electric cables seal in walls.

**Table A.6:** Plastic pipes assessed in floors.

Service <sup>(i)</sup>	Fire protection	Rigid floor	Timber floor
<sup>(i)</sup> For rigid floors, see also the fire penetration seals of plastic pipes covered in ETA 16/0771 (AF MULTICOLLAR), section B.2.3, and ETA 16/0689 (AF COLLAR), section B.2.3.			
PVC pipe $\varnothing_{\text{ext}} = 110 \text{ mm}$ $t = 2,7 \text{ mm}$	AF MULTICOLLAR ( $\varnothing 110 \text{ mm}$ , 2 layers of intumescent strip)	EI 240 U/C Section A.4.1 (D)	--
PVC pipe $\varnothing_{\text{ext}} = 110 \text{ mm}$ $t = 6,6 \text{ mm}$	AF MULTICOLLAR ( $\varnothing 110 \text{ mm}$ , 2 layers of intumescent strip)	--	EI 120 U/C Section A.4.2
Group of 5 parallel, adjacent pipes: PVC $\varnothing_{\text{ext}} = 63 \text{ mm} / t = 2,7 \text{ mm}$ PVC $\varnothing_{\text{ext}} = 63 \text{ mm} / t = 5,8 \text{ mm}$ PP $\varnothing_{\text{ext}} = 63 \text{ mm} / t = 5,8 \text{ mm}$ HDPE $\varnothing_{\text{ext}} = 63 \text{ mm} / t = 2,7 \text{ mm}$ HDPE $\varnothing_{\text{ext}} = 63 \text{ mm} / t = 5,8 \text{ mm}$	AF MULTICOLLAR (3 layers of intumescent strip, wrapping all pipes)	EI 240 U/C Section A.4.1 (D)	--

**Figure A.1.6:** Example of plastic pipes seal in floors.**Table A.7:** Insulated metal pipes (protected with AF SLEEVE) assessed in floors.

Service	Fire protection	Rigid floor	Timber floor	
Steel pipes	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 240 U/C Section A.4.1 (D)	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,25 \text{ mm}$ (galvanised steel) 1 layer of 16,5 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 U/C Section A.4.2
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/C Section A.4.1 (B)	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 2 layers of 20 mm thick insulation (total thickness 40 mm)	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	EI 180 C/C Section A.4.1 (B)	--

**Table A.7:** Insulated metal pipes (protected with AF SLEEVE) assessed in floors.

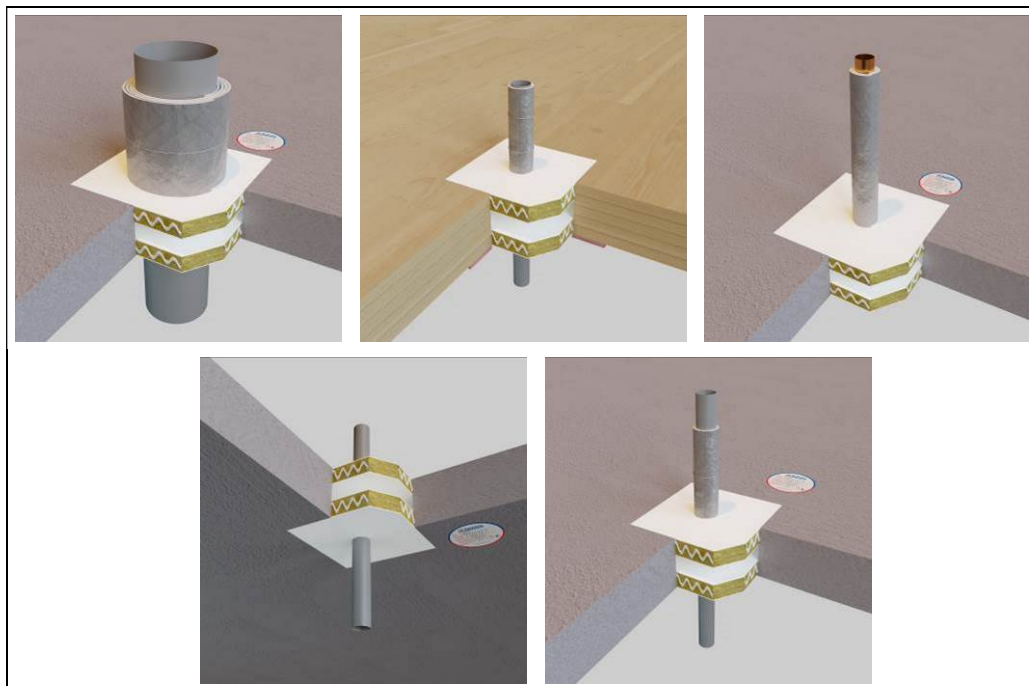
Service		Fire protection	Rigid floor	Timber floor
Steel pipes	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$ 3 layers of 20 mm thick insulation (total thickness 60 mm)	AF SLEEVE Length: 50 mm Thickness: 12 mm (3 layers of 4 mm each)	EI 180 C/C Section A.4.1 (B)	--
	$\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4,0 \text{ mm}$ 1 layer of 20 mm thick insulation (LS)	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 100 \text{ mm}$ $t = 4,0 \text{ mm}$ 1 layer of 30 mm thick rock wool insulation (LS) of density 80 kg/m <sup>3</sup>	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 1,0 \text{ mm}$ 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 U/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 200 \text{ mm}$ $t = 4,5 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 180 C/U Section A.4.1 (C)	--

**Figure A.1.7:** Example of insulated metal pipes seal in floors.

**Table A.8:** Non-insulated metal pipes assessed in floors.

Service		Fire protection	Rigid floor	Timber floor
Steel pipes	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 7 mm (1 layer)	EI 180 U/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 28 mm (4 layers of 7 mm each)	EI 240 U/C Section A.4.1 (D)	--
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 1,25 \text{ mm}$ (galvanised steel)	AF PIPEGUARD Length: 240 mm Thickness: 7 mm (1 layer)	--	EI 120 U/C Section A.4.2
	$\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,5 \text{ mm}$	--- (*)	EI 180 C/C Section A.4.1 (B)	--
	$\varnothing_{\text{ext}} = 108 \text{ mm}$ $t = 1,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 14 mm (2 layers of 7 mm each)	EI 180 U/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 300 \text{ mm}$ $t = 1,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 28 mm (4 layers of 7 mm each)	EI 180 U/C Section A.4.1 (A)	--
	Group of 2 parallel, adjacent pipes, each of: $\varnothing_{\text{ext}} = 108 \text{ mm}$ $t = 4 \text{ mm}$	AF PIPEGUARD (wrapping both pipes) Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 7 mm (1 layer)	EI 180 C/C Section A.4.1 (A)	--
Copper pipes	$\varnothing_{\text{ext}} = 54 \text{ mm}$ $t = 1,5 \text{ mm}$	AF PIPEGUARD Length: 480 mm (2 adjacent strips of 240 mm each) Thickness: 14 mm (2 layers of 7 mm each)	EI 180 U/C Section A.4.1 (A)	--
Aluminium pipes	$\varnothing_{\text{ext}} = 30 \text{ mm}$ $t = 2,0 \text{ mm}$	--- (*)	EI 180 C/C Section A.4.1 (A)	--
	$\varnothing_{\text{ext}} = 60 \text{ mm}$ $t = 3,0 \text{ mm}$	AF PIPEGUARD Length: 240 mm Thickness: 7 mm (1 layer)	EI 180 C/C Section A.4.1 (A)	--

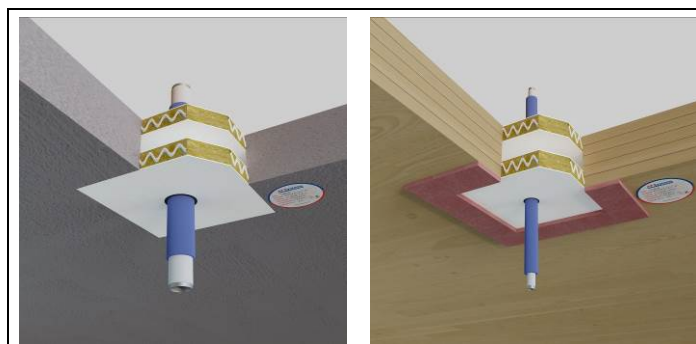
(\*) No additional fire protective element required. AF PANEL is cut following the shape of the passing elements (maximum gap of 3 mm). The gap is filled with AF SEAL W.



**Figure A.1.8:** Example of non-insulated metal pipes seal in floors.

**Table A.9:** Multilayer composite pipes assessed in floors.

Service	Fire protection	Rigid floor	Timber floor
Multilayer composite pipe PE-Xb/Al/HDPE ( $\varnothing_{ext} = 20 \text{ mm}$ / $t = 2,25 \text{ mm}$ ) 1 layer of 8 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	--	EI 120 U/C Section A.4.2
Multilayer composite pipe PE-Xc/Al/HDPE ( $\varnothing_{ext} = 63 \text{ mm}$ / $t = 4 \text{ mm}$ to $6 \text{ mm}$ ) 1 layer of 19 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	EI 180 U/C Section A.4.1 (A)	--



**Figure A.1.9:** Example of multilayer composite pipes seal in floors.

**Table A.10:** Electric cables assessed in floors.

Service	Fire protection	Rigid floor	Timber floor
<b>Cable trays</b>			
PVC tray (200 x 75 x 2,8) mm • 8 cables type A1	--- (*)	EI 180 Section A.4.1 (A)	--
Steel tray (300 x 75 x 1) mm • Group of small sheathed cables <sup>8</sup> : 5 cables type A1 5 cables type A2 5 cables type A3	--- (*)	EI 180 Section A.4.1 (A)	--
Steel tray (500 x 80 x 1,5) mm • Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B	--- (*)	EI 180 Section A.4.1 (A)	--
Steel tray (200 x 80 x 1,5) mm • Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B	AF BAGS (120x100x25) mm (120x300x35) mm Volume generated by the tray in the floor completely filled with AF BAGS. A grid of Ø1mm metal wires installed to close the gap at both sides.	EI 240 Section A.4.1 (D)	--
Steel tray (500 x 80 x 1,5) mm • Group of small sheathed cables: 10 cables type A1 10 cables type A2 10 cables type A3 2 cables type B • 1 corrugated PVC pipe (Ø20 mm) with a cable type A1	AF BAGS (150x120x30) mm	--	EI 120 Section A.4.2
Steel tray (500 x 80 x 1) mm • 20 cables type A1 • 2 corrugated plastic pipes (Ø20 mm) each with a cable type A1	AF BAGS (120x100x25) mm (120x300x35) mm	EI 180 Section A.4.1 (C)	--
<b>Cables bundles</b>			
Group of 2 parallel, adjacent pipes with small sheathed cables inside: • Corrugated double-wall plastic pipe (Ø125 mm / t = 9 mm) • PVC pipe (Ø125 mm / t = 9 mm)	AF MULTICOLLAR (3 layers of intumescent strip, wrapping both pipes)	EI 180 Section A.4.1 (A)	--
Bundle (overall Ø80 mm) of 5 PVC corrugated pipes (Ø20 mm), each with a cable type A1	AF SLEEVE Length: 50 mm Thickness: 8 mm (2 layers of 4 mm each)	--	EI 120 Section A.4.2
<b>Other electric components</b>			
Bus bar (160 A / 400 V) in a steel sheet housing (200 x 80) mm	AF PIPEGUARD Length: 240 mm Thickness: 21 mm (3 layers of 7 mm each)	EI 180 Section A.4.1 (A)	--



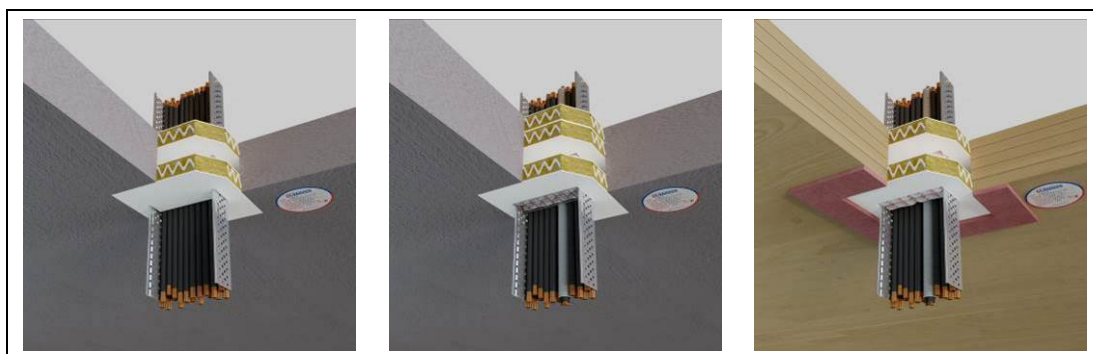
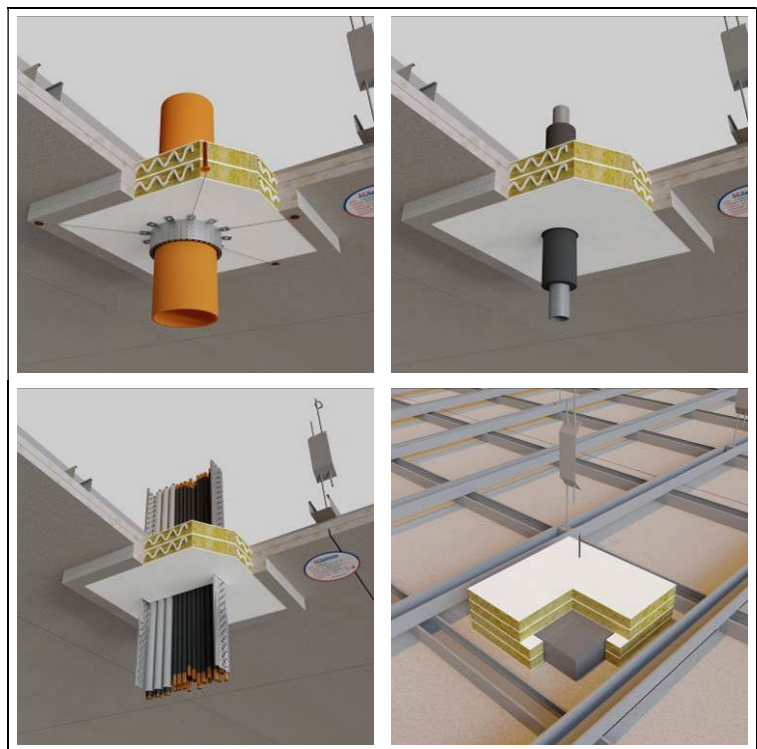


Figure A.1.10: Example of electric cables seal in floors.

Table A.11: Assessed penetration seals in false ceilings.

Service	Fire protection	False ceiling (section A.4.3)
<b>Plastic pipes</b>		
PVC pipe $\varnothing_{\text{ext}} = 110 \text{ mm}$ $t = 8,1 \text{ mm}$	AF MULTICOLLAR ( $\varnothing 110 \text{ mm}$ , 2 layers of intumescent strip)	EI 120 C/C
<b>Insulated metal pipes</b>		
Steel pipe $\varnothing_{\text{ext}} = 50 \text{ mm}$ $t = 2,0 \text{ mm}$ 1 layer of 20 mm thick insulation	AF SLEEVE Length: 50 mm Thickness: 4 mm (1 layer)	EI 120 C/C
<b>Cables</b>		
Steel tray (300 x 75 x 1) mm <ul style="list-style-type: none"> <li>Group of small sheathed cables: <ul style="list-style-type: none"> <li>10 cables type A1</li> <li>10 cables type A2</li> <li>10 cables type A3</li> <li>2 cables type B</li> </ul> </li> <li>1 corrugated PVC pipe (<math>\varnothing 21 \text{ mm}</math>) with a cable type A1</li> </ul>	--- (*)	EI 120
Cable type A1 $\varnothing 11 \text{ mm}$ for lightning fixture of maximum (600 x 600 x 104) mm	AF PANEL box	EI 120

(\*) No additional fire protective element required. AF PANEL is cut following the shape of the passing elements (maximum gap of 3 mm). The gap is filled with AF SEAL W.



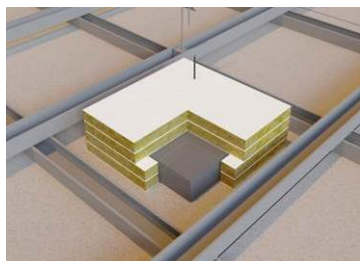
**Figure A.1.11:** Example of penetration seals in false ceilings.

**Table A.12:** 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 °C and a maximum thermal conductivity of 52 W/(m·K).
Metal pipes	Copper pipes The copper pipes will be made of copper with a minimum melting point of 1085 °C and a maximum thermal conductivity of 390 W/(m·K). Resistance to fire classifications given for copper pipes are also valid for steel pipes.
	Aluminium pipes The aluminium pipes will be made of aluminium with a minimum melting point of 660 °C and a maximum thermal conductivity of 204 W/(m·K).
Insulation material for pipes (unless otherwise specified in tables A.1 to A.11)	Foamed elastomeric insulation material: <ul style="list-style-type: none"> <li>• Continuous insulation.</li> <li>• Reaction to fire: from B<sub>L</sub>-s1,d0 to D<sub>L</sub>-s3,d0.</li> <li>• Maximum thermal conductivity (23 °C): <math>\lambda \leq 0,043 \text{ W/(m}\cdot\text{K)}</math>.</li> <li>• Assessed types of foamed elastomeric insulation material: Armaflex.</li> <li>• Fixed around the pipe with a steel wire of diameter 1 mm.</li> </ul>

**Table A.12:** Specification of the fire penetration seal additional components.

Component	Specification
Small sheathed cables	<p>Cables type group 1 according to Annex A of EN 1366-3:</p> <ul style="list-style-type: none"> <li>• Cables type A1 model "5×1,5 mm<sup>2</sup> CI 1 PVC/PVC 600/1000V NYYJ".</li> <li>• Cables type A2 model "5×1,5 mm<sup>2</sup> CI 5 Cu EP/PCP 450/750V H07RN-F".</li> <li>• Cables type A3 model "5×1,5 mm<sup>2</sup> CI 1 Cu XLPE/LSZH 600/1000V N2XH-J".</li> <li>• Cables type B model "1×95 mm<sup>2</sup> CI 2 PVC/PVC 600/1000V NYY0".</li> </ul>
AF COLLAR	<p>AF COLLAR is CE marked based on ETA 16/0689.</p> <p>Unless otherwise specified in tables A.1 to A.5, AF COLLAR will be installed at both sides of the wall. Installation conditions of AF COLLAR will be in accordance with ETA 16/0689.</p>
AF MULTICOLLAR	<p>AF MULTICOLLAR is CE marked based on ETA 16/0771.</p> <p>Unless otherwise specified in tables A.1 to A.5, AF MULTICOLLAR will be installed at both sides of the wall. Installation conditions of AF MULTICOLLAR will be in accordance with ETA 16/0771.</p>
AF SLEEVE	<p>AF SLEEVE is CE marked based on ETA 19/0664.</p> <p>AF SLEEVE is fitted into the AF PANEL around the technical service, at the fire exposed side of the constructive element, levelled at the surface.</p>
AF BAGS	<p>AF BAGS are CE marked based on ETA 16/0733.</p> <p>AF BAGS are installed to close the gap of the cables tray section, with the dimension of 120 mm along the constructive element depth (except otherwise described in tables A.1 to A.11).</p>
AF PIPEGUARD	<p>AF PIPEGUARD is installed at the fire non-exposed side of the constructive element, fixed with steel wires Ø1 mm.</p>
AF PANEL BOX	<p>Technical solution for installation of lightning fixture in false ceilings according to the manufacturer instructions.</p> <p>Maximum dimensions:</p> <ul style="list-style-type: none"> <li>• 800 mm x 800 mm (external)</li> <li>• 600 mm x 600 mm (internal)</li> </ul> <p>Perimeter frame consisting of a double layer of AF PANEL strips of minimum width 100 mm, completely closed with two layers of AF PANEL on top.</p> <p>Maximum gap of 2 mm between the cable and the AF PANEL hole filled with AF SEAL W.</p>

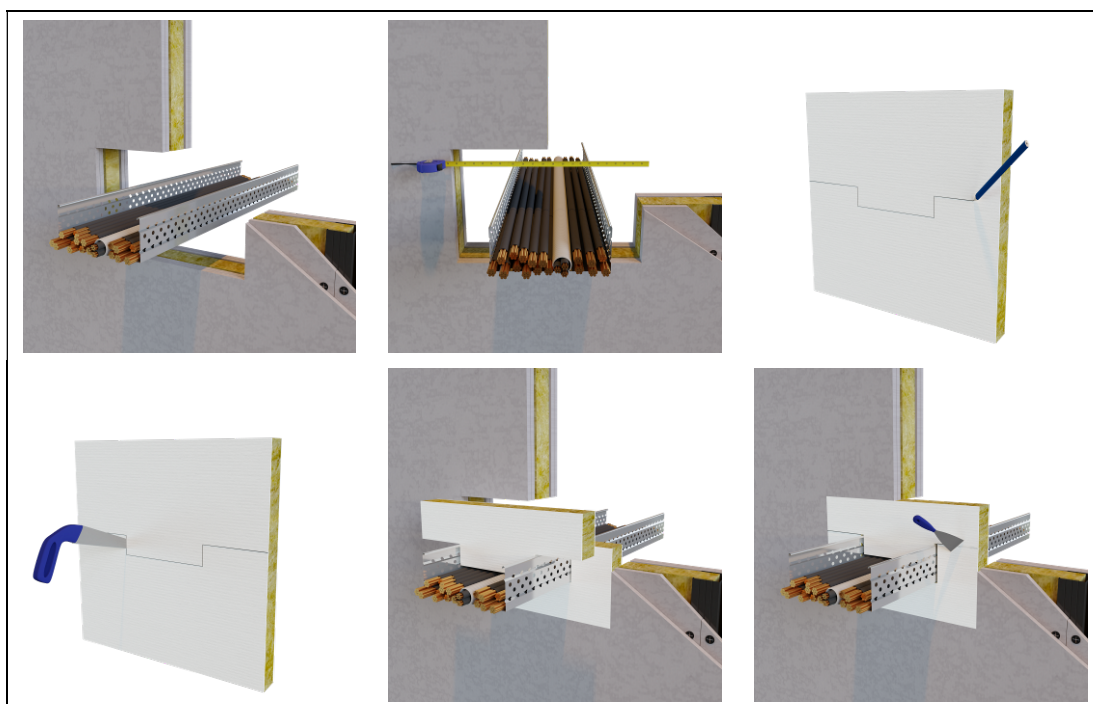


## A.2. Installation description of AF PANEL

AF PANEL will be installed in accordance with the provisions in this annex and the manufacturer's instructions, which shall conform to the assessment carried out in this ETA.

AF PANEL is cut to size according to the dimensions of the opening to be sealed in the constructive element (with a slightly larger template than the opening size). Acrylic sealant AF SEAL W<sup>9</sup> is spread on the AF PANEL template sides or directly on the opening inner edge. The AF PANEL template is inserted in the opening tightly fitted. 1, 2 or 3 layers of AF PANEL are installed depending on the constructive element and the resistance to fire under consideration (as described in the next sections).

AF SEAL W sealant is applied over the perimeter joints and smoothed with a trowel. All the gaps between AF PANEL and passing services or service supporting elements are filled with AF SEAL W to seal the joints. All joints are sealed as described with acrylic sealant AF SEAL W at both sides of the constructive element.



**Figure A.2.1:** Installation of AF PANEL.

The maximum size of the opening shut with AF PANEL is given in the next sections in relation to the supporting construction and the seal technical solution. 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<sup>10</sup>. If a blank seal (opening shut with AF PANEL without passing services) is installed, no splices are allowed within the seal area.

<sup>9</sup> Although AF SEAL W is not the object of this ETA, it has been tested and assessed for the environmental use category Type Y<sub>1</sub> in accordance with EOTA Technical Report 024, section 2.2.4 (for a 25-year working life).

<sup>10</sup> 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 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 between passing elements is generally 25 mm, except if otherwise specified in tables A.1 to A.11 (e.g., groups of pipes) or in the manufacturer's instructions.

The minimum distance from services to the edge of AF PANEL closure area is generally 25 mm, except if otherwise specified or in the manufacturer's instructions.

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.

### A.3. Specification of the supporting walls and the AF PANEL seal

#### A.3.1. Rigid walls

##### A.3.1.1 Rigid wall with resistance to fire EI 180

Concrete or masonry walls with a minimum thickness of 150 mm, minimum density of 2300 kg/m<sup>3</sup> and resistance to fire EI 180. The opening is closed with two layers of AF PANEL, levelled to the surface at both sides of the wall. The maximum size of the opening is 1800 mm x 650 mm.

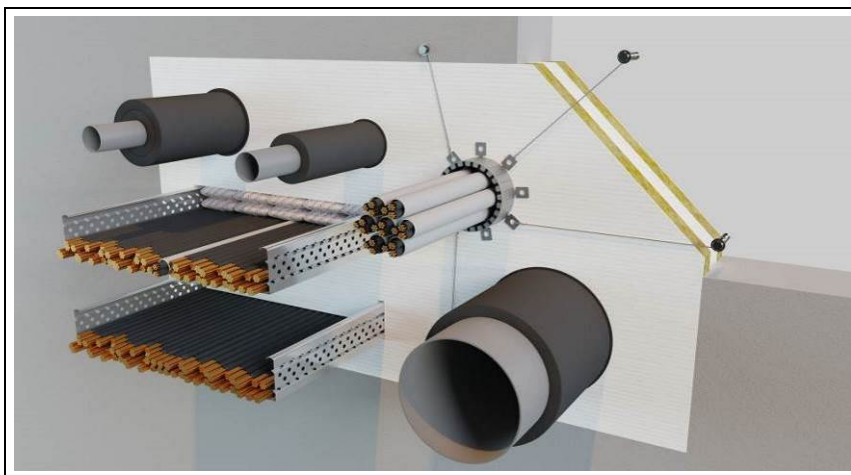


Figure A.3.1.1: Example of AF PANEL seal in a rigid wall EI 180.

##### A.3.1.2 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<sup>3</sup> and resistance to fire EI 240. The opening is closed with three layers of AF PANEL, 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.

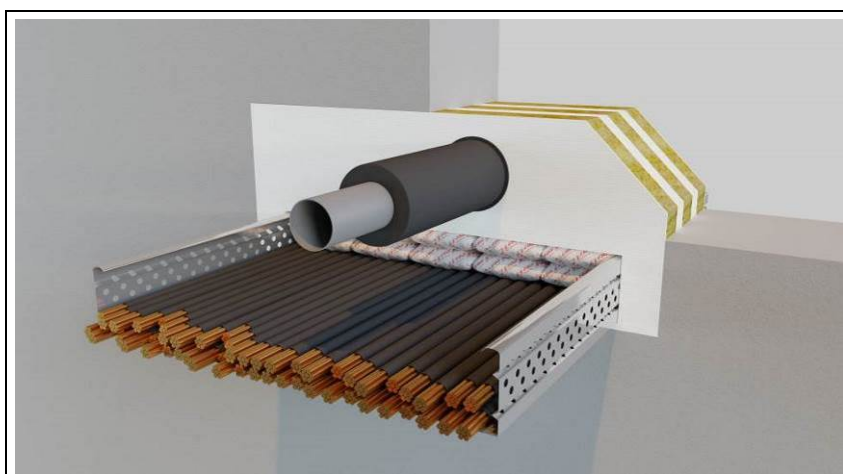


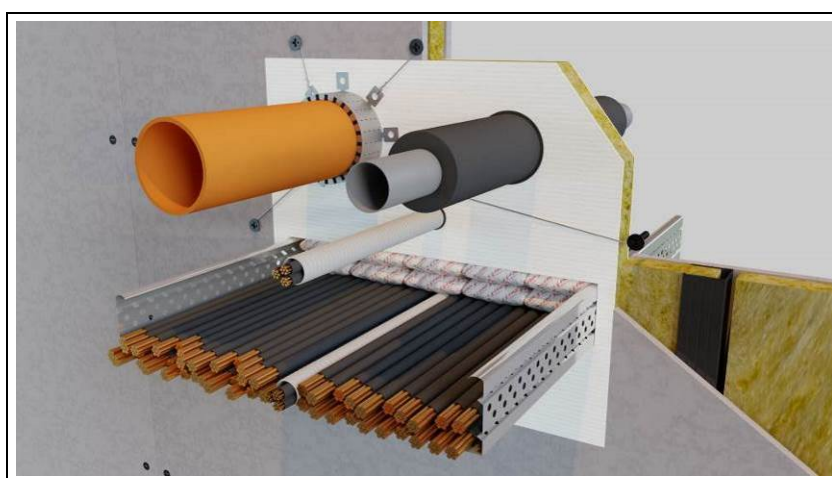
Figure A.3.1.2: Example of AF PANEL seal in a rigid wall EI 240.

### A.3.2. Flexible walls

#### A.3.2.1 Flexible wall of thickness 80 mm

Walls with a minimum thickness of 80 mm and resistance to fire EI 60, 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 520 <sup>11</sup>. 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.

The opening is closed with one layer of AF PANEL, levelled to the surface at the fire exposed side of the wall. The maximum size of the opening is 550 mm x 600 mm.



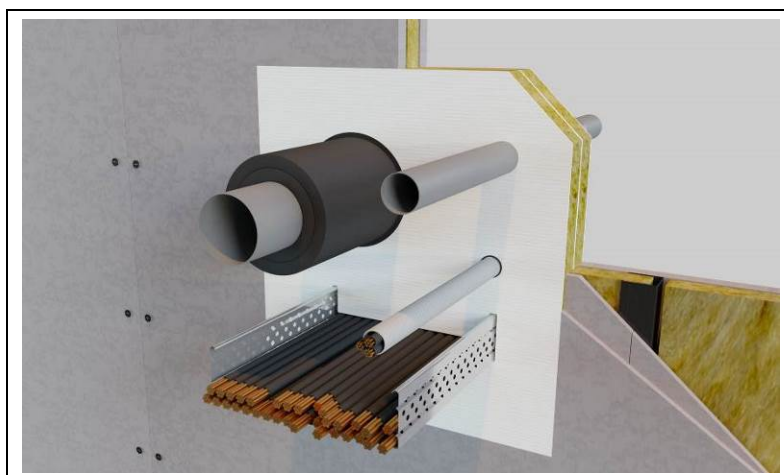
**Figure A.3.2.1:** Example of AF PANEL seal in a flexible wall EI 60.

#### A.3.2.2 Flexible wall of thickness 100 mm

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

The opening is closed with two layers of AF PANEL, levelled to the surface at both sides of the wall. The maximum size of the opening is 550 mm x 600 mm.

<sup>11</sup> EN 520 Gypsum plasterboards. Definitions, requirements and test methods.



**Figure A.3.2.2:** Example of AF PANEL seal in a flexible wall EI 120.

#### A.3.2.3 Flexible wall of thickness 120 mm

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

The opening is closed with two layers of AF PANEL, levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm.

#### A.3.2.4 Flexible wall of thickness 125 mm

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

The opening is closed with 2 layers of AF PANEL, levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm.

#### A.3.2.5 Flexible wall of thickness 135 mm

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

The opening is closed with two layers of AF PANEL, levelled to the surface at both sides of the wall. The maximum size of the opening is 1750 mm x 1000 mm.

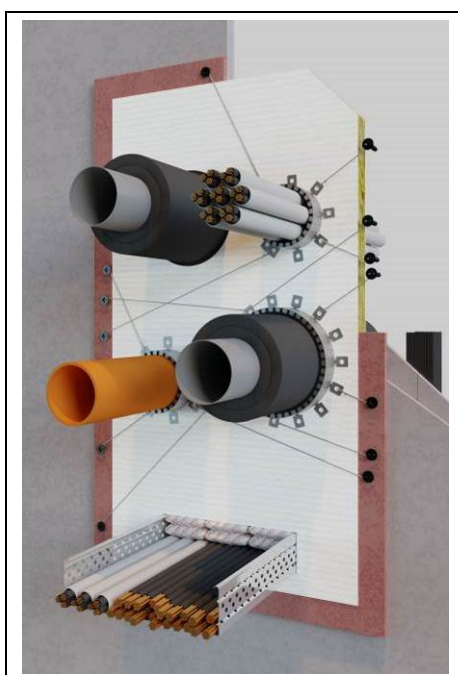


### A.3.3. Lining walls

#### A.3.3.1 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.

The opening is closed with one layer of AF PANEL. A frame is installed around the opening, fixed to the wall plasterboards with self-tapping steel screws  $\varnothing$  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.

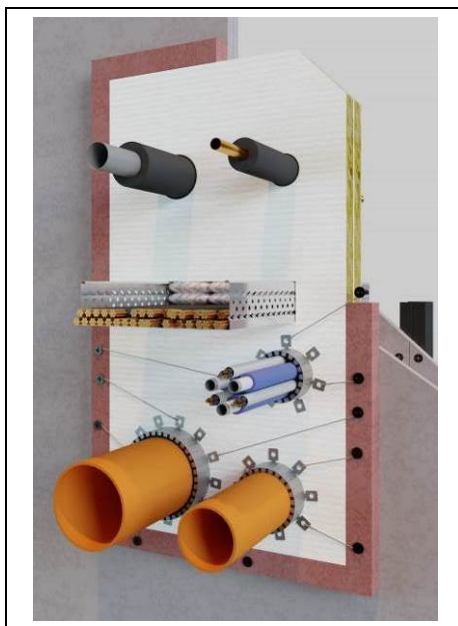


**Figure A.3.3.1:** Example of AF PANEL seal in a lining wall EI 60.

#### A.3.3.2 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.

The opening is closed with two layers of AF PANEL. A frame is installed around the opening, fixed to the wall plasterboards with self-tapping steel screws  $\varnothing$  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.



**Figure A.3.3.2:** Example of AF PANEL seal in a lining wall EI 120.

#### **A.3.4. 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<sup>3</sup> 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 metal anchors.

The opening is closed with two layers of AF PANEL. The maximum size of the opening is 600 mm x 1000 mm.

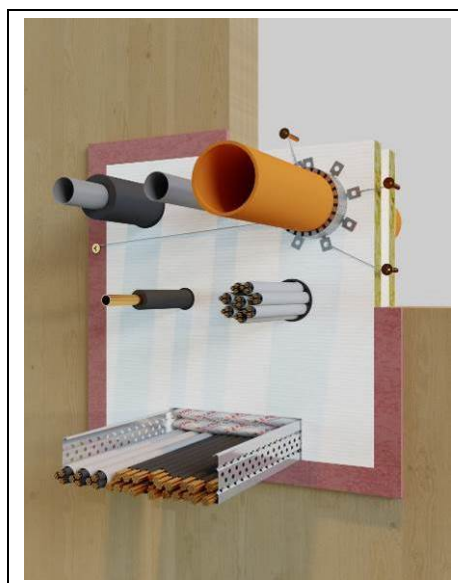


**Figure A.3.4.1:** Example of AF PANEL seal in a sandwich panels wall EI 120.

### A.3.5. 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).

The opening is closed with two layers of AF PANEL, 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  $\varnothing 6$  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.



**Figure A.3.5.1:** Example of AF PANEL seal in a timber wall EI 120.

## A.4. Specification of the supporting floors and the AF PANEL seal

### A.4.1. Rigid floors

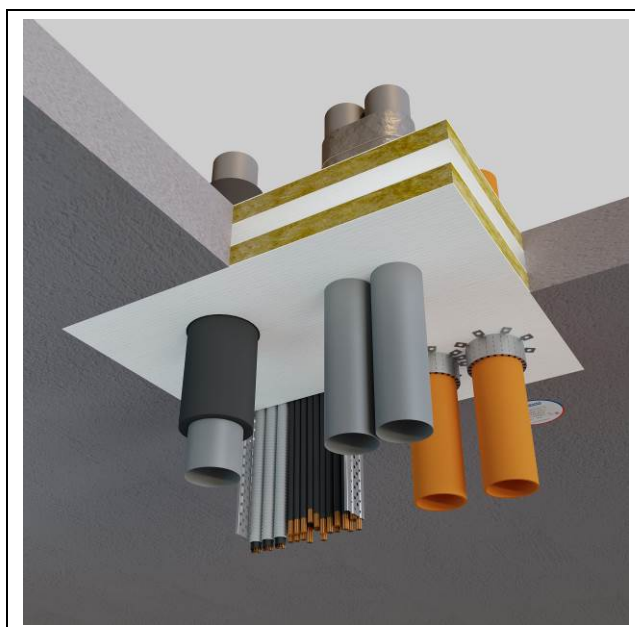
Concrete or other type of rigid floors with the following characteristics in relation to the assessed technical services as given in tables A.6 to A.10.

**Table A.13:** Assessed rigid floors.

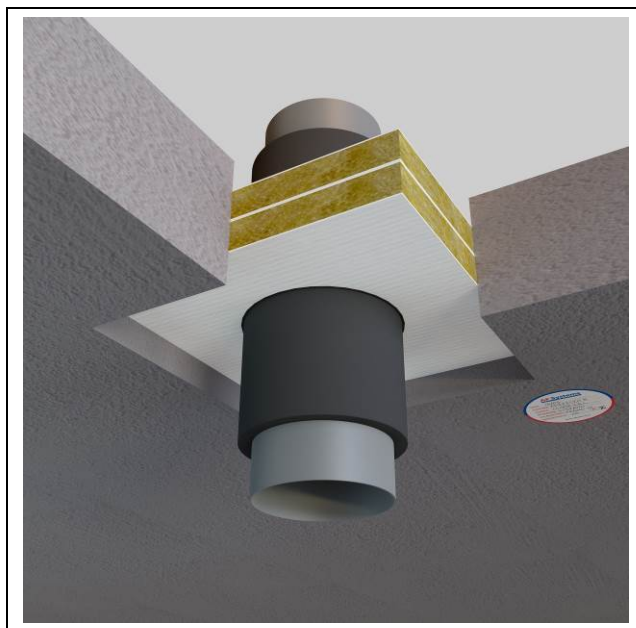
Rigid floor	(A)	(B)	(C)	(D)
Minimum thickness (mm)	150	170	200	200
Density (kg/m <sup>3</sup> )	1600	2200	1600	650 <sup>(i)</sup>
Resistance to fire	EI 180	EI 180	EI 180	EI 240
AF PANEL closure	2 layers of AF PANEL, levelled to the surface at both sides of the floor		2 layers of AF PANEL centred at mid floor depth	3 layers of AF PANEL, with the external panels levelled to the surface at both sides of the floor
Opening maximum size (mm)	1000 x 500 <sup>(ii)</sup>			1360 x 200
Figure	A.4.1.1		A.4.1.2	A.4.1.3

<sup>(i)</sup> Reinforced aerated concrete.

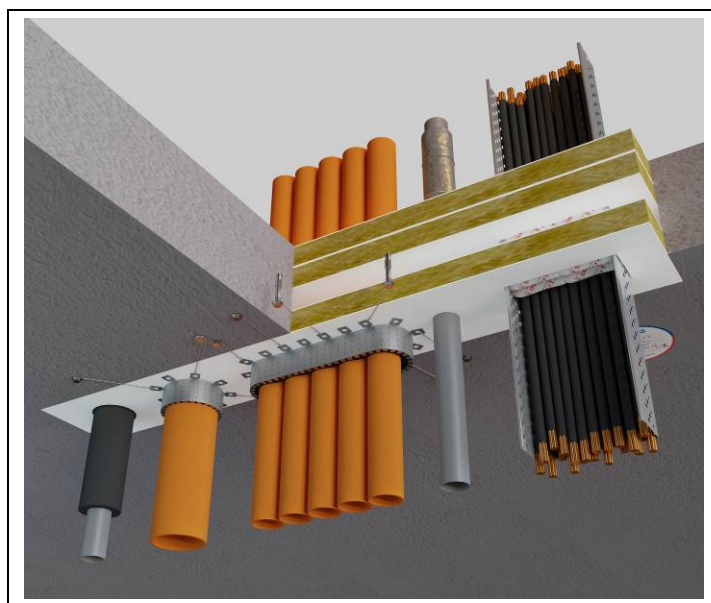
<sup>(ii)</sup> Maximum size can be enlarged up to (2000 x 1000) mm when supporting profiles are installed beneath the panels. Steel slotted profiles (30 mm width and 1 mm thick) placed under the panel's splices at maximum 500 mm, fixed to the floor at both profile's ends with expansion anchors Ø60 mm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



**Figure A.4.1.1:** Example of AF PANEL seal in a rigid floor (A) or (B).



**Figure A.4.1.2:** Example of AF PANEL seal in a rigid floor (C).



**Figure A.4.1.3:** Example of AF PANEL seal in a rigid floor (D).

**A.4.2. 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).

The opening is closed with two layers of AF PANEL, 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.

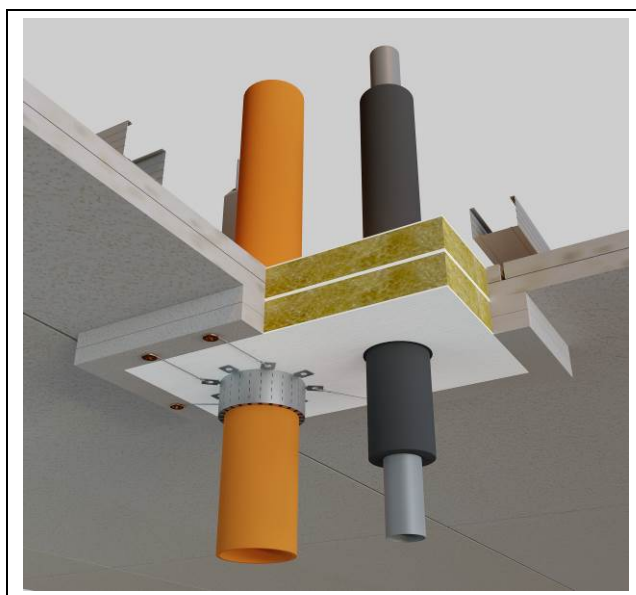


**Figure A.4.2.1:** Example of AF PANEL seal in a timber floor.

#### **A.4.3. 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.

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.



**Figure A.4.3.1:** Example of AF PANEL seal in false ceiling EI 120.