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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-15/0237 of 01/06/2016

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	FLAMRO BS-MK Schott mixed penetration seal
Product family to which the above construction product belongs:	Fire Stopping and Sealing coated mineral wool slabs used in penetration seals
Manufacturer:	FLAMRO Brandschutz- Systeme GmbH Am Sportplatz 2 DE-56291 Leiningen Tel. + 49 6746 9410 - 0 Fax +49 6746 9410 - 10 Internet www.flamro.de
Manufacturing plant:	FLAMRO Brandschutz- Systeme GmbH Am Sportplatz 2 DE-56291 Leiningen
This European Technical Assessment contains:	31 pages including 5 annexes which form an integral part of the document.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	Guideline for European technical approval of "Fire Stopping and Fire Sealing Products", ETAG 026 Part 2: "Penetration Seals", used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.
This version replaces:	The ETA with the same number issued on 2015-06-08

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
The FLAMRO BS-MK Schott penetration seal is a 60 mm thick mineral wool panel with a density of approx. 150 kg/m^3. The Rockwool RPI 15 panels are approx. 1000 mm long and 625 mm wide. The panels are classified as Euroclass A1 in accordance with EN 13501-1 and have a melting point ≥ 1000°C. The Rockwool RPI 15 panels are factory coated with FLAMRO BMA coating and an average thickness of 2 mm (dry film) on both sides is necessary. They are installed in openings in fire classified walls around cables and pipes through walls made from concrete, aerated concrete, masonry or light weight partition structures, and solid floors made of concrete or aerated concrete, thickness ≥ 150 mm. The joint between the panels and the connection to the surrounding structure is sealed with FLAMRO BMA or FLAMRO BMS. Additionally, the area around the penetration is covered with 2 mm thick layer of FLAMRO BMA or FLAMRO BMS with a width of minimum 20 mm over the joint.

In some application the FLAMRO Variant N IIA collar according to ETA-13/0922 or the FLAMRO Universal fire protection strip, FLAMRO UBB, is used.

Detailed specifications for identification and performance criteria relevant for fire safety with regard to the construction products are given in Annex 1.

Specification of the intended use in accordance with the applicable European Assessment Document
The construction product FLAMRO BS-MK Schott is intended for use as components with a fire protection effect in walls made from concrete, aerated concrete, masonry or light weight partition structures, and solid floors made of concrete or aerated concrete, thickness ≥ 150 mm, that are subject to requirements related to fire protection. Their fire resistant capability prevents heat transmission and fire spreading in the event of fire.
Within the scope of this ETA, the fire resistance was demonstrated for cables (single or bundled) and pipes which consisted of the components listed in table 1. Cable penetration seals are used to seal off openings in fire resistant walls and floors, which are penetrated by cables, pipes and conduits (mixed penetration seal), and serves to preserve the walls and floors fire resistance in the area of the penetrations.

Table 1 – components of the verified penetration seals

Product type	Trade name
Ablative sealant	FLAMRO BMA or FLAMRO BMS The sealant FLAMRO BMS is delivered in buckets. The same sealant is also delivered in cartridges and is designated FLAMRO BMK
Mineral wool board	Rockwool RPI 15
Collar	FLAMRO Variant N II A
Strip	FLAMRO UBB

Detailed information and data on the verified penetration seals are given in Annexes 1 to 3.

The performances given in Section 3 exclusively relate to this penetration seals (e.g. with respect to the design and arrangement of the components of the penetration seals and the type and position of the services).

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of at least 10 years for FLAMRO BS-MK Schott.

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

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

Characteristic	Assessment of characteristic
3.2 Safety in case of fire (BWR 2)	
Reaction to fire	The mineral wool board, Rockwool RPI 15 is classified as **Euroclass A1** in accordance with EN 13501-1 The FLAMRO BMA coating for mineral wool board is classified as **Euroclass E** in accordance with EN 13501-1. The FLAMRO BMS and FLAMRO BMK sealant is classified as **Euroclass E** in accordance with EN 13501-1. The FLAMRO UBB (without self-adhesive layer) strip is classified as **Euroclass E** in accordance with EN 13501-1.
Resistance to fire	The FLAMRO BS-MK Schott used in penetrations seals as described in annex 4 in at least 100 mm thick walls made from concrete, aerated concrete, masonry or light weight partition structures is classified as **described in annex 3** in accordance with EN 13501-2
3.3 Hygiene, health and the environment (BWR 3)	
Release of dangerous substance	The product does not contain/release dangerous substances specified in TR 034, dated October 2015
3.7 Sustainable use of natural resources (BWR 7)	No Performance Determined

In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 General aspects

The verification of durability is part of testing the essential characteristics. The FLAMRO BS-MK Schott may be used in end-use applications according to the provisions for use category Y_2 (temperatures below 0 °C, but no exposure to rain or UV) without expecting significant changes of the characteristics relevant for fire protection. Since the requirements for Type Y_2 are met, also the requirements for Type Z_1 and Z_2 are fulfilled.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 1999/454/EC of the European Commission, as amended by 2001/596/EC, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 1.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark

Issued in Copenhagen on 2016-06-01 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex 1
Product details and definitions

Product and performance of the FLAMRO BS-MK Schott and accessory components:

Product and performance of the mineral wool board Rockwool RPI-15, documentation according to ETA-13/0756:

Property	Parameter	Method
Density	Mean 160 kg/m^3	EN 13162
Melting point	Minimum 1000 °C	EN 13162
Dimensional tolerances	Thickness 58 – 62 mm	EN 13162
Dimensions	Approx. 1000 mm long, 625 mm wide and 60 mm thick	EN 13162

Product and performance of the FLAMRO BMA or FLAMRO BMS documentation according to ETA-13/0756:

Property	Parameter	Method
Density	1550 kg/m^3 ± 70 kg/m^3	EN ISO 2811
Content of non-volatile components	66 - 76 %	EN ISO 3251
Weight loss on heating FLAMRO BMA	31 – 41 %	EN 3451-1
Weight loss on heating FLAMRO BMS/FLAMRO BMK	32 – 42 %	EN 3451-1
Flexibility	≤ 6 mm mandrel	EN ISO 1519

Product and performance of the FLAMRO Variant N II A:

Manufacturer	Description
FLAMRO Brandschutz- Systeme GmbH Am Sportplatz 2 DE-56291 Leiningen	According to ETA-13/0922

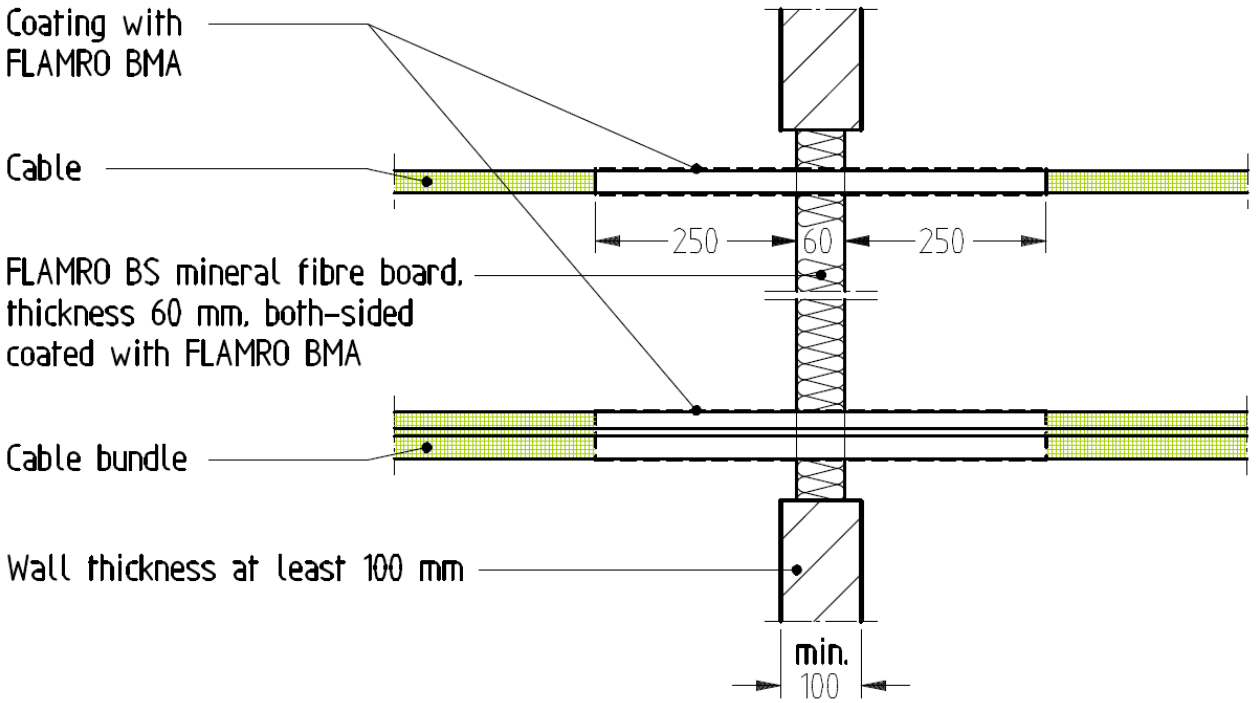
Product and performance of the FLAMRO UBB, documentation according to ETA-13/0756:

Manufacturer	Description
FLAMRO Brandschutz- Systeme GmbH Am Sportplatz 2 DE-56291 Leiningen	Intumescent material in accordance with data sheet: Content of non-volatile components 97% - 100% EN ISO 3251 Weight loss on heating 52% - 62% EN ISO 3451-1 Dimensions(thickness of the sheet) 1,8mm - 2,2mm ETAG 026-2 clause B 10.1 Weight per unit area 1,7kg/m² - 2,3kg/m² TR 024 clause 3.1.5 Expansion ratio 10 - 20 times TR 024 clause 3.1.11 Expansion pressure 1N/mm² - 2N/mm² TR 024 clause 3.1.12, Test procedure: B

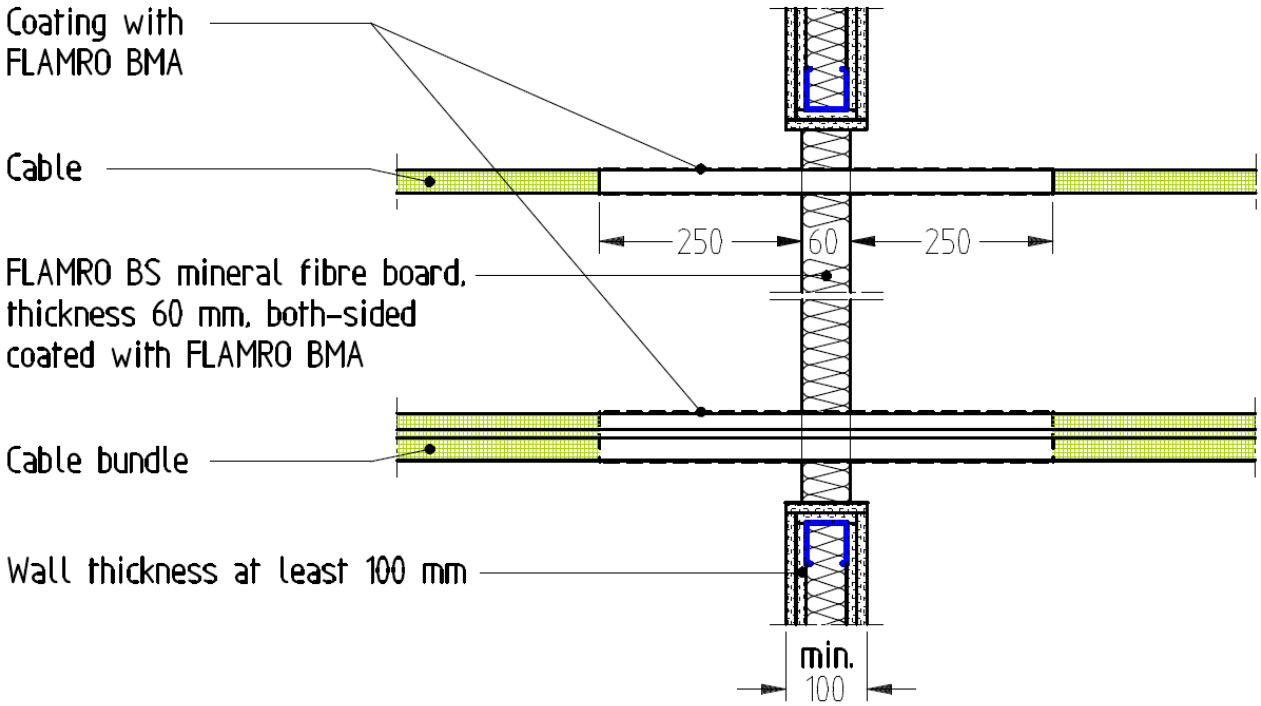
Annex 2
Detailed information for the confirmation of fire resistance

Use as part of a penetration seal for cables (single or bundled), cable carriers, e.g. cable trays, ladders, baskets;
Wall installation - section view

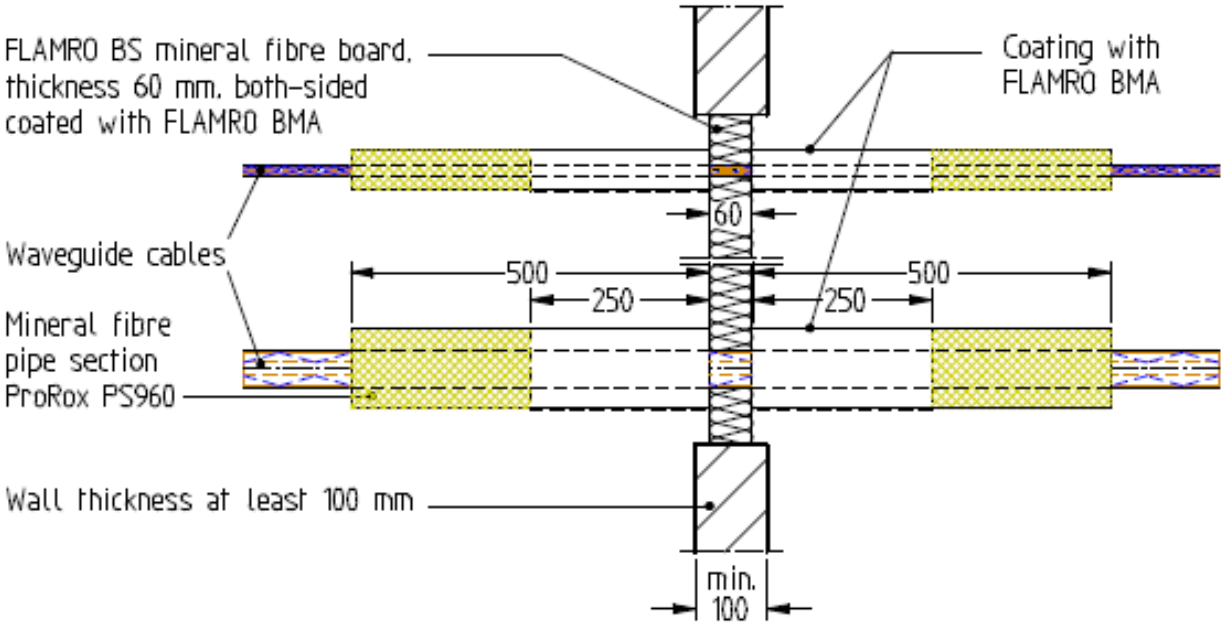
Penetration of cables and cable bundles, rigid wall



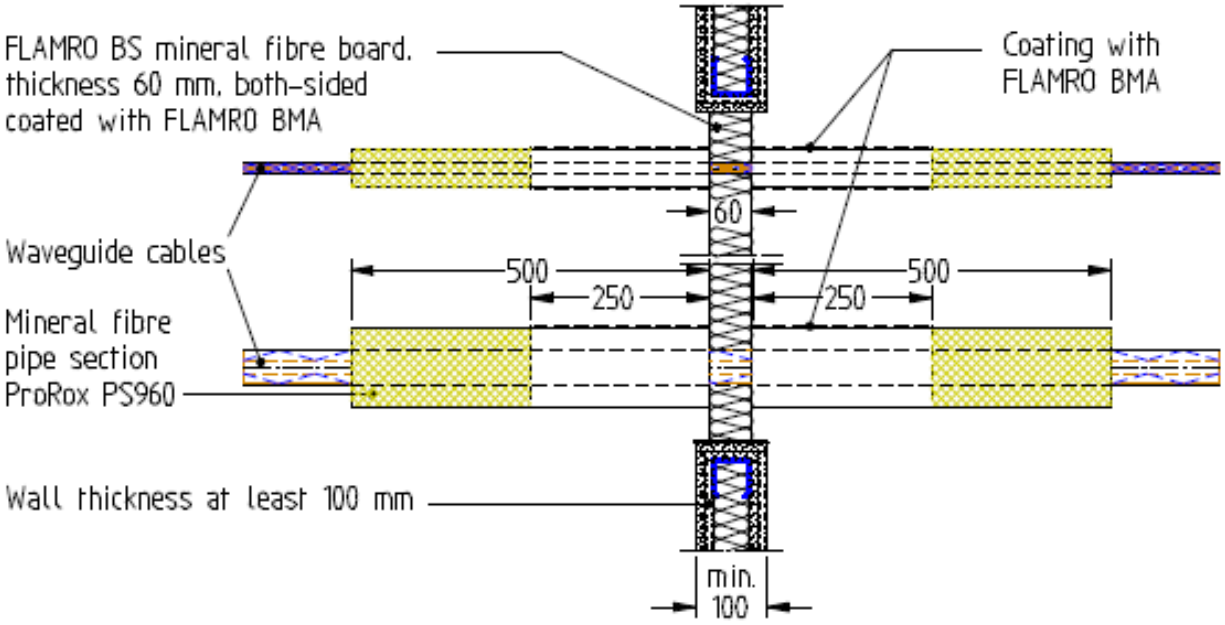
Penetration of cables and cable bundles, flexible wall



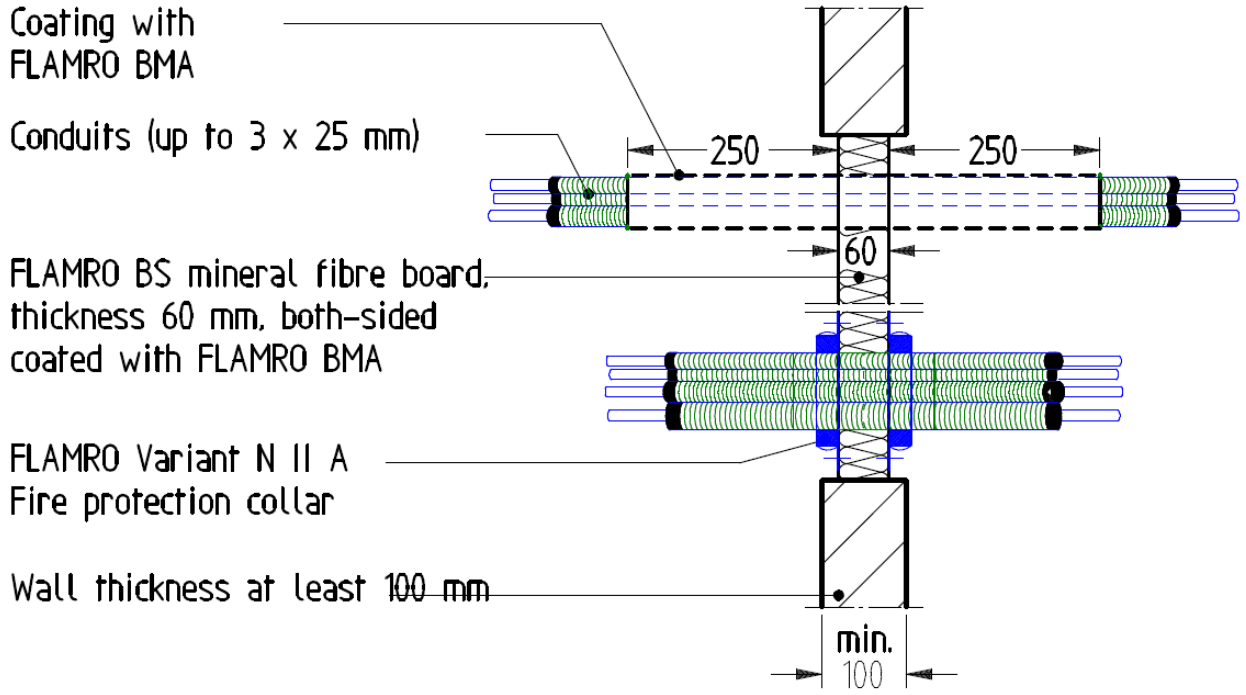
Penetration of waveguide cables, rigid wall



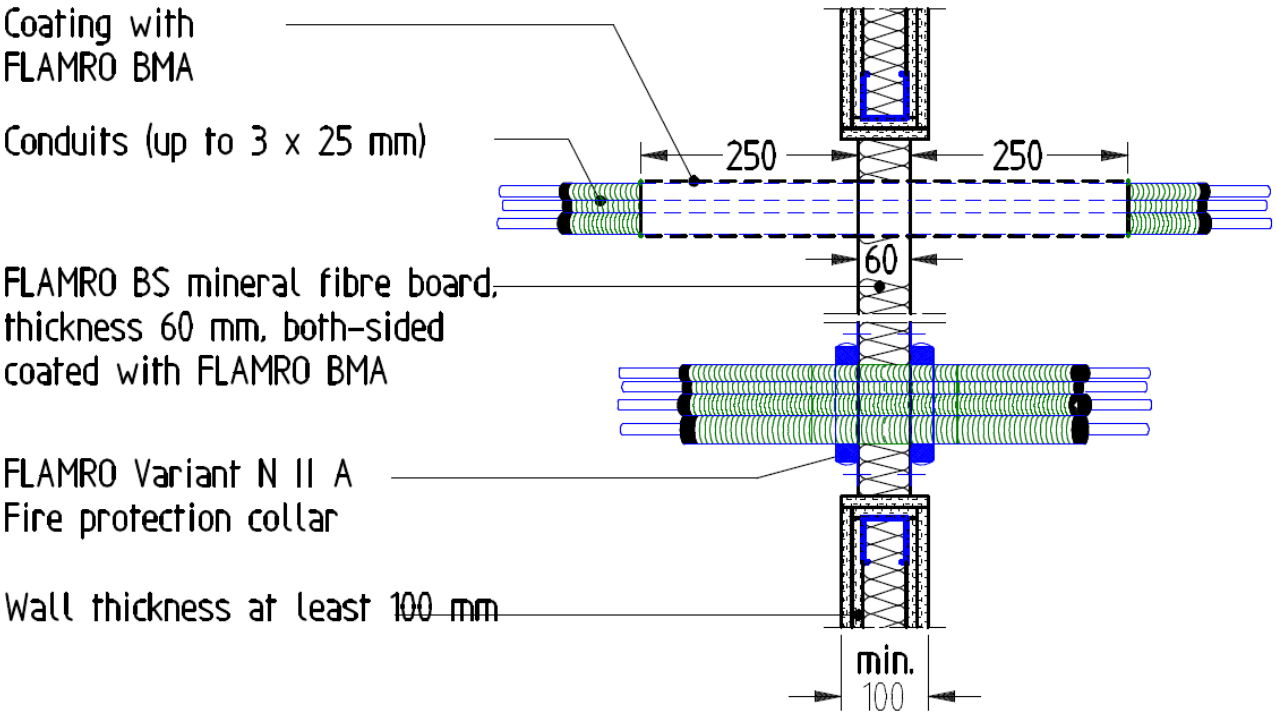
Penetration of waveguide cables, flexible wall



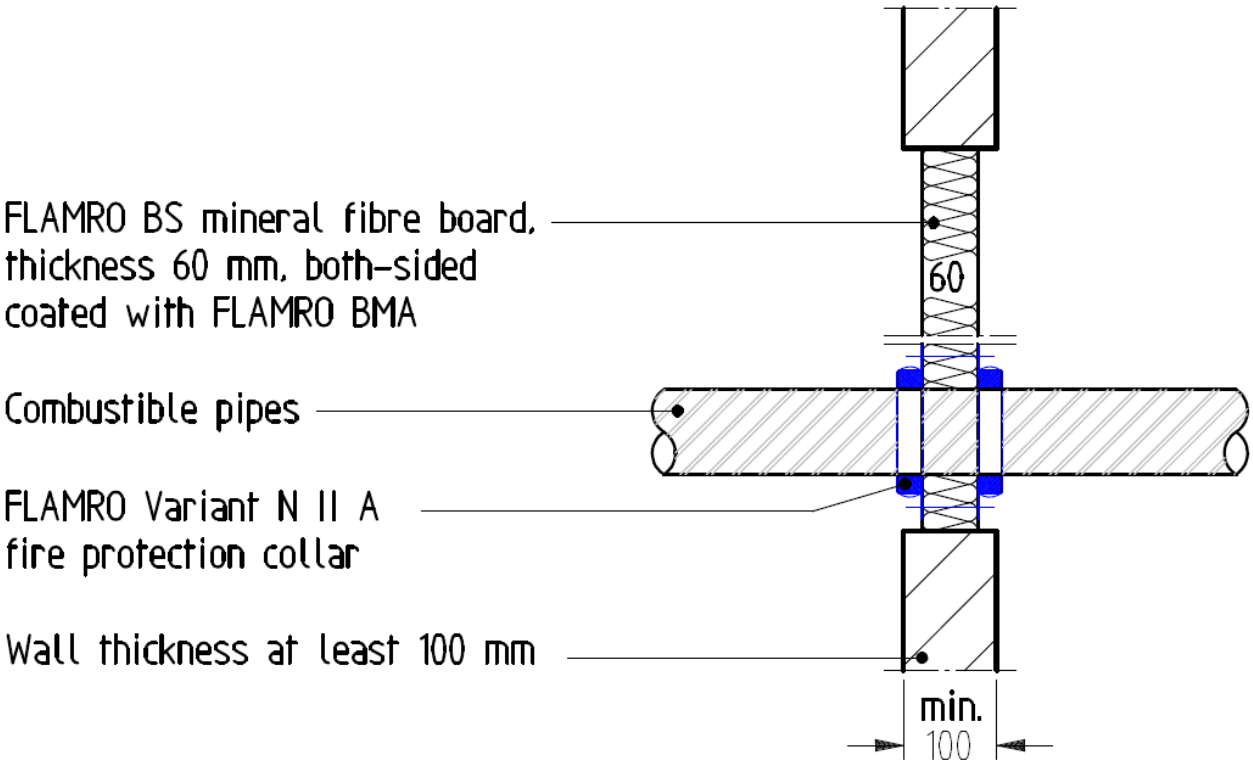
Penetration of conduits, rigid wall



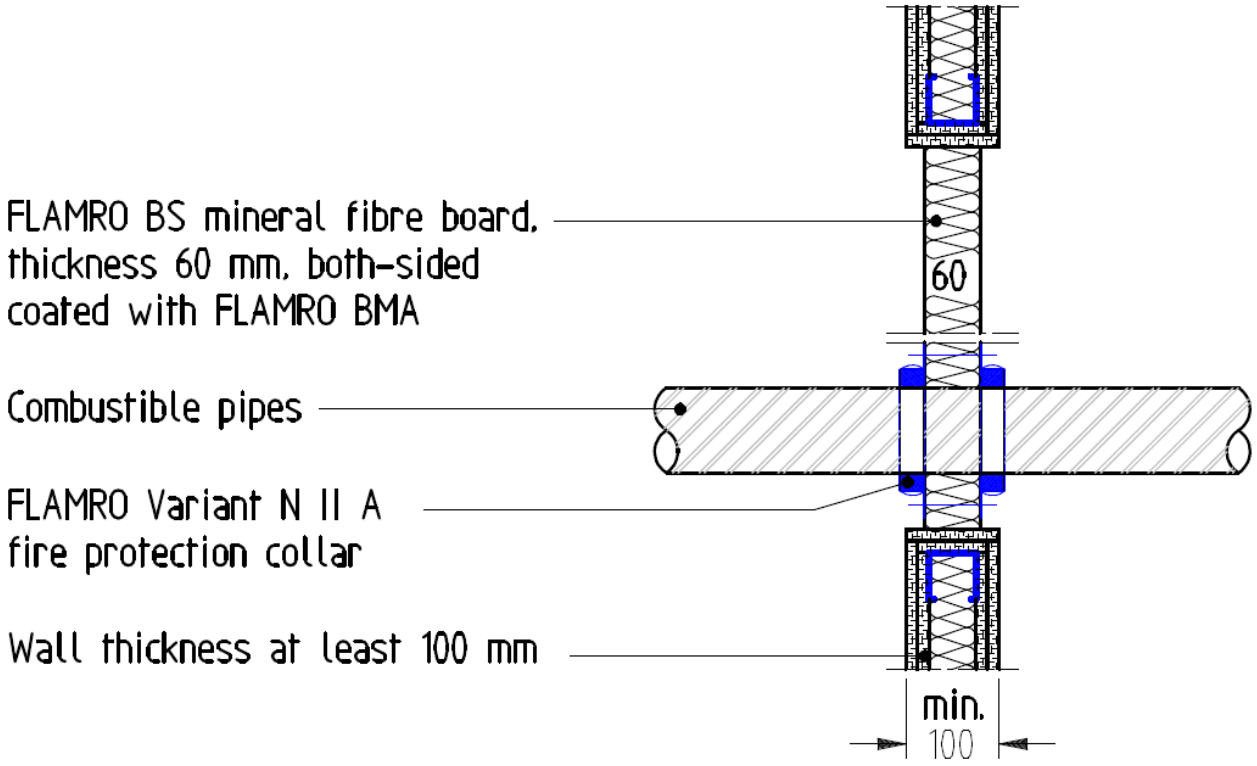
Penetration of conduits, flexible wall



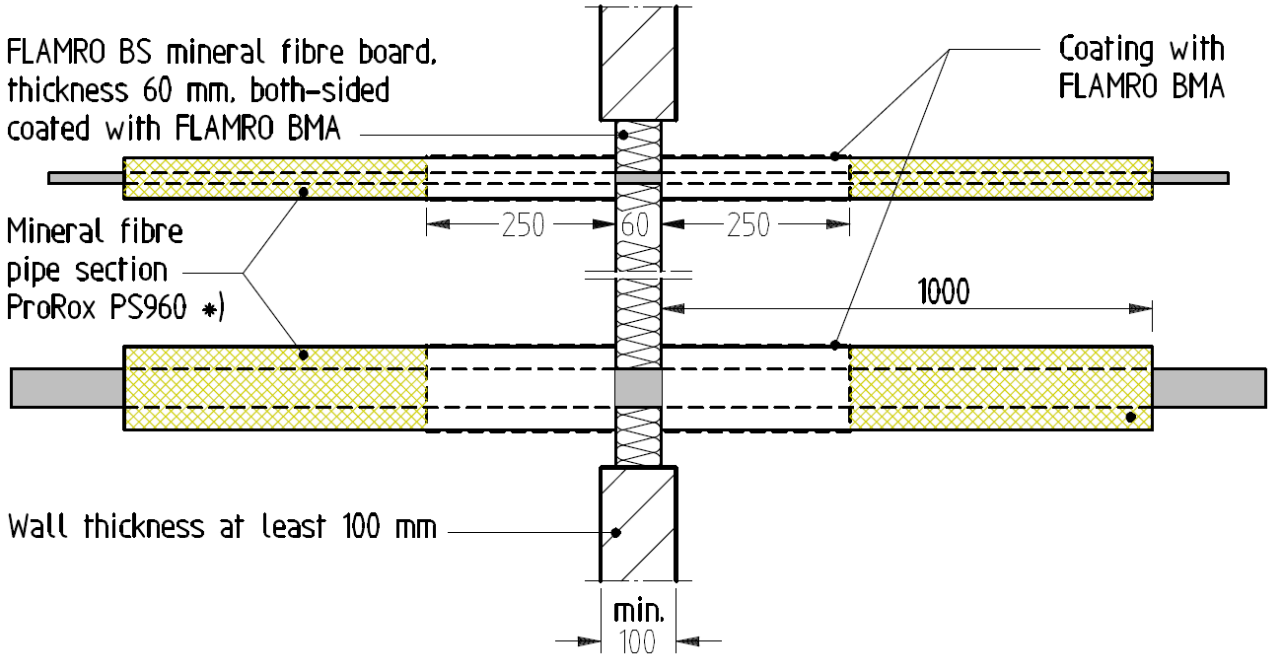
Penetration of combustible pipes, rigid wall



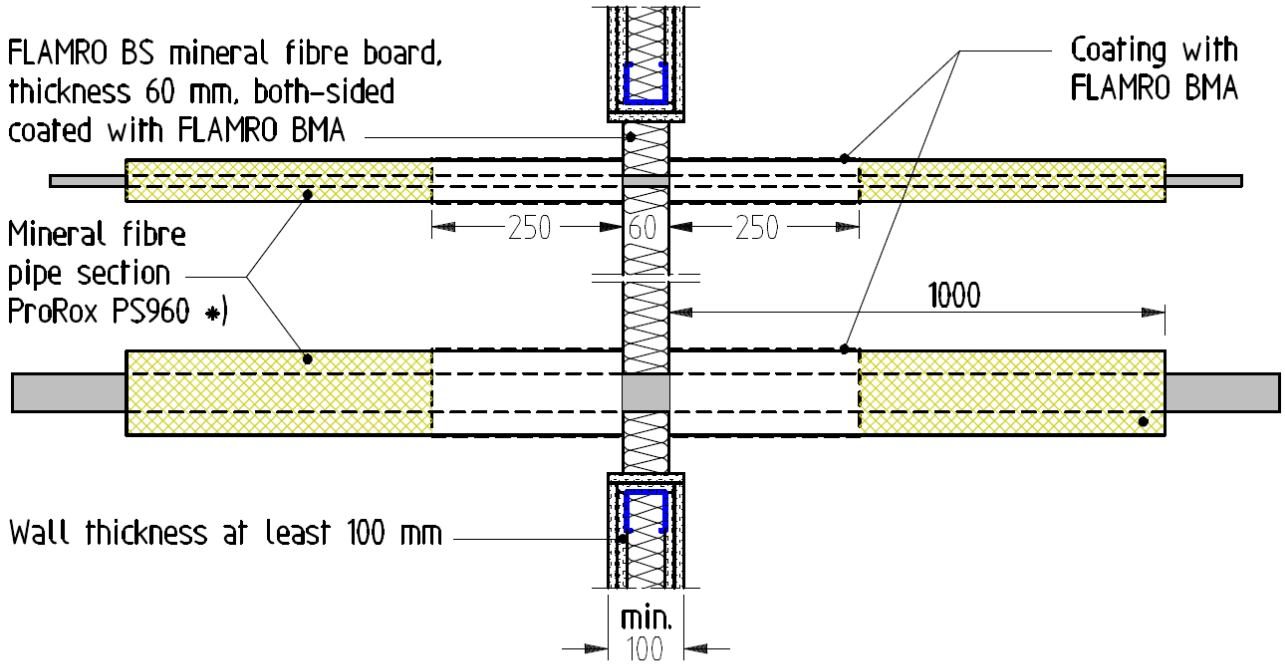
Penetration of combustible pipes, flexible wall



Penetration of non-combustible pipes, rigid wall

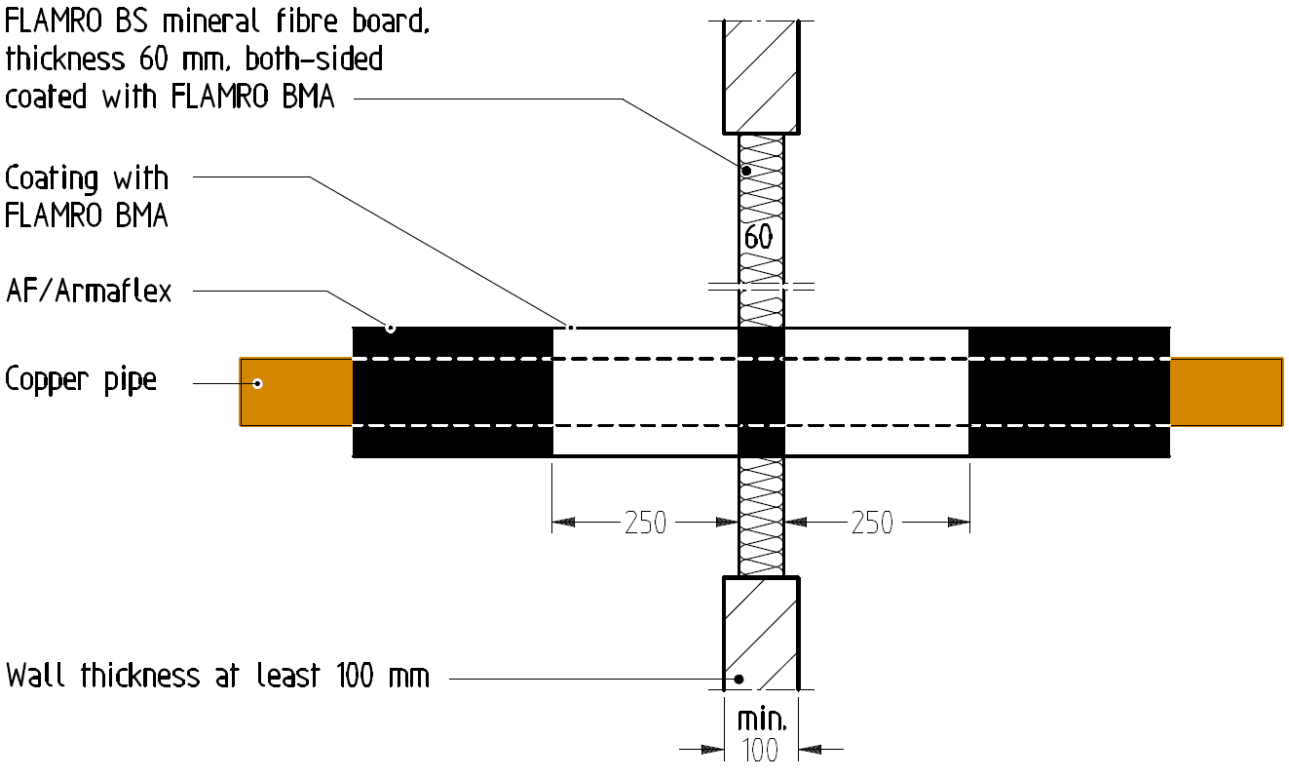


Penetration of non-combustible pipes, flexible wall

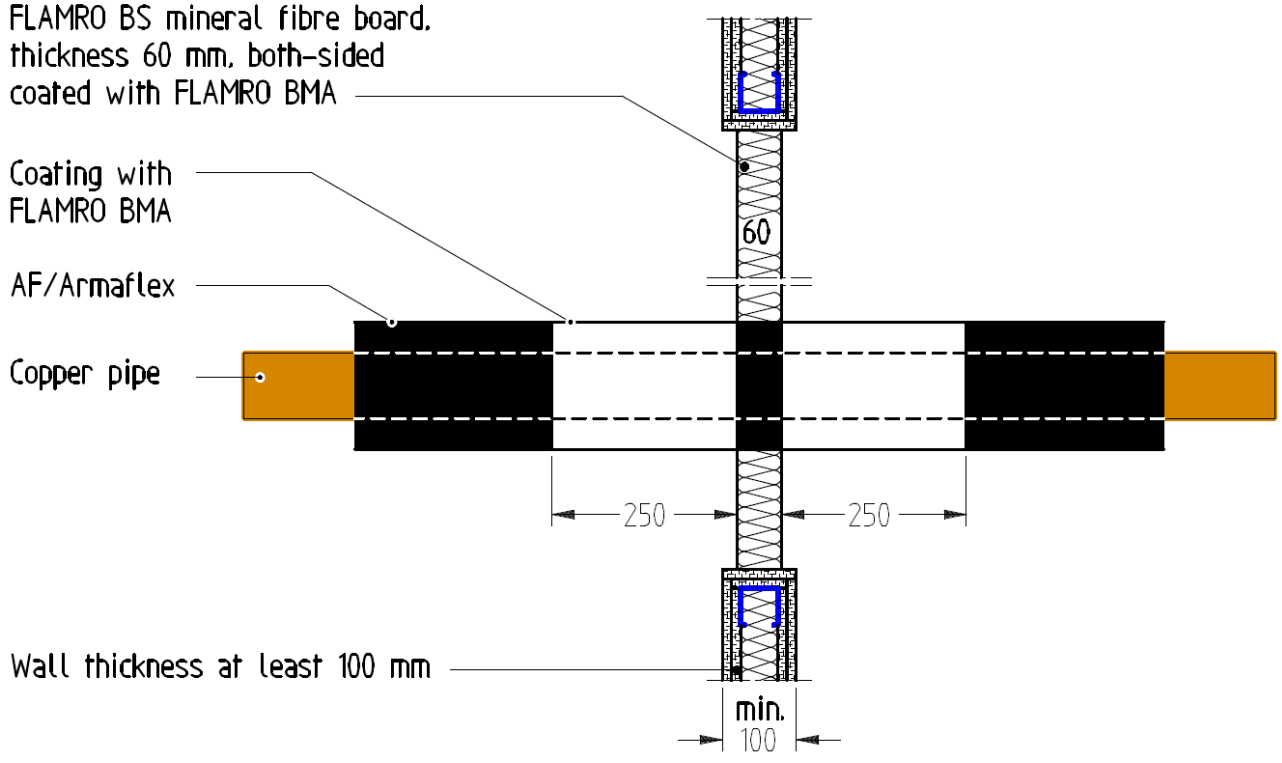


*) mineral fibre pipe section butt-jointed to the penetration seal board (not sustained)

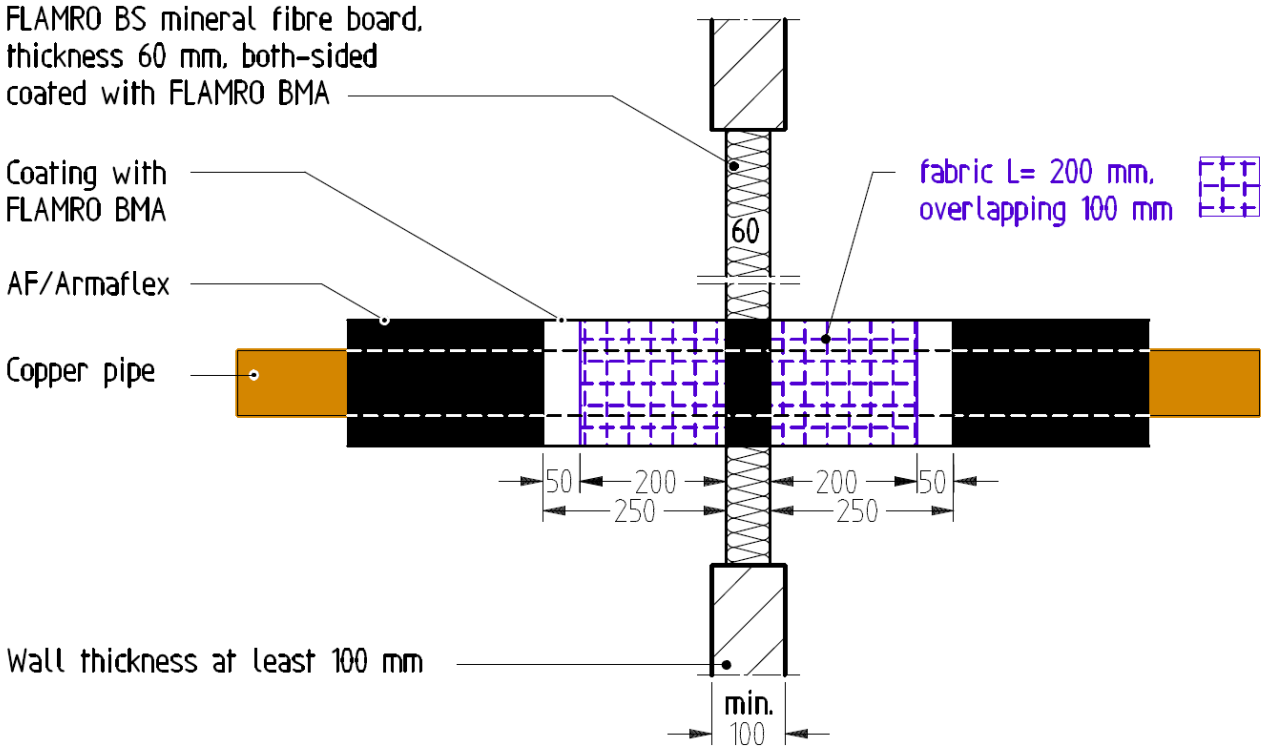
Penetration of copper pipes with AF/Armaflex and FLAMRO BMA, rigid wall



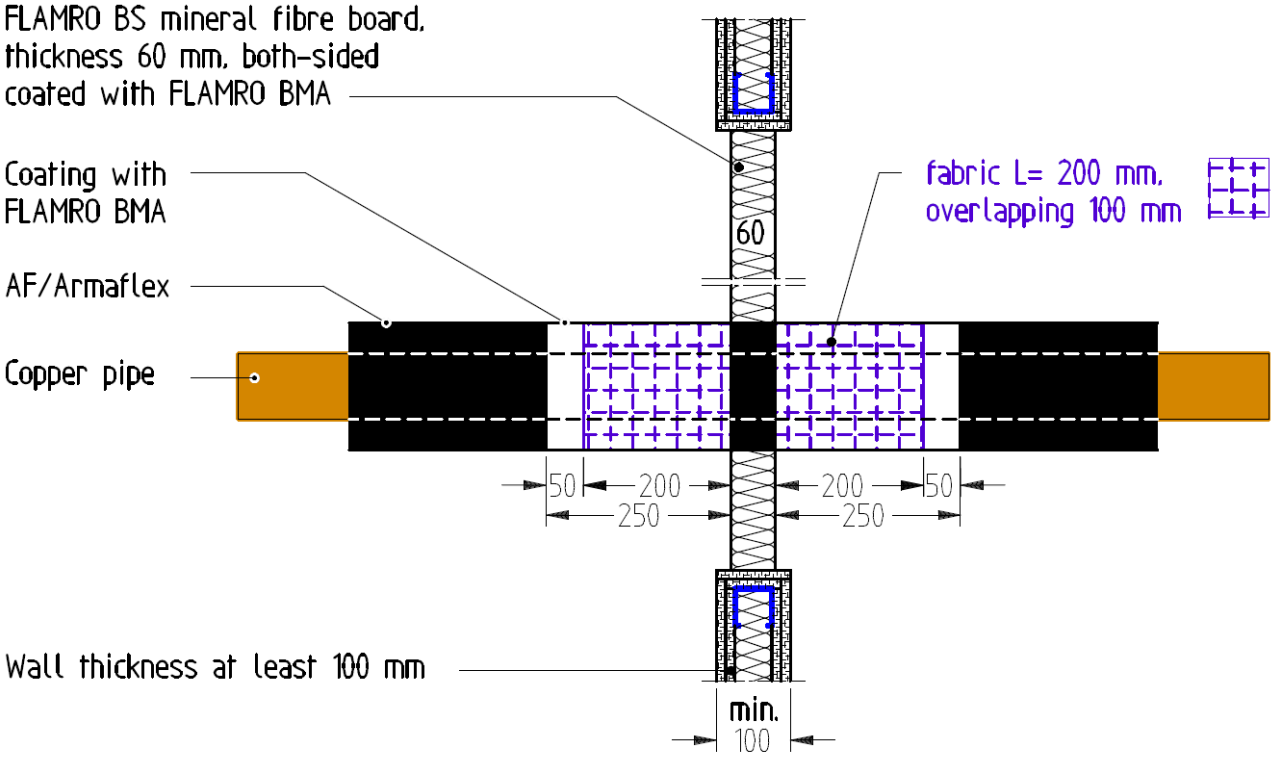
Penetration of copper pipes with AF/Armaflex and FLAMRO BMA, flexible wall



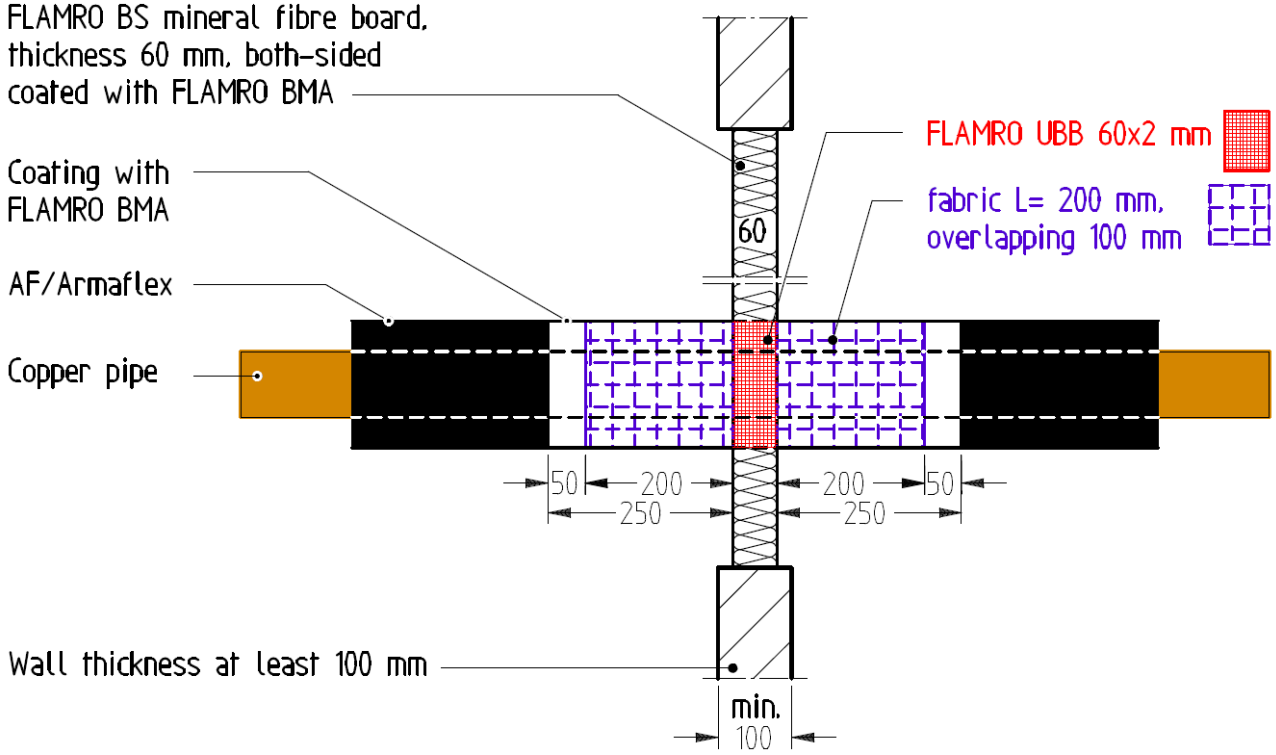
Penetration of copper pipes with AF/Armaflex, rigid wall



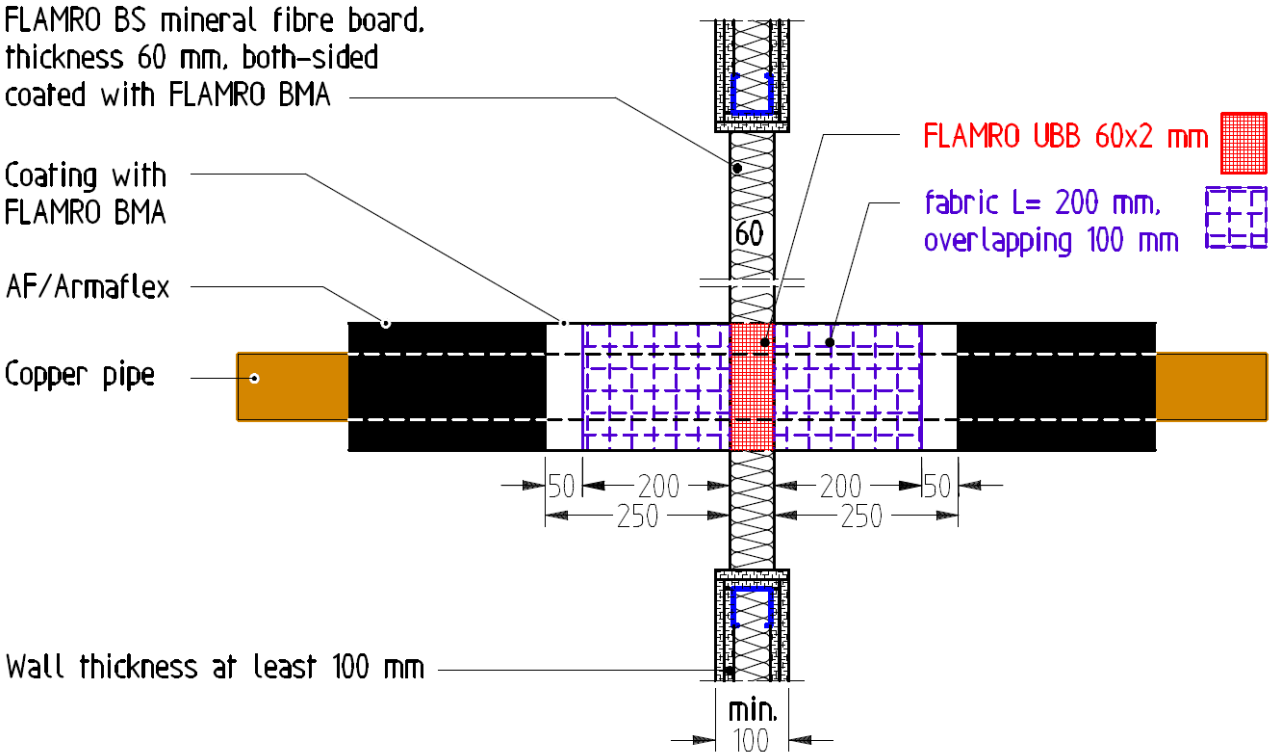
Penetration of copper pipes with AF/Armaflex, flexible wall



Penetration of copper pipes with AF/Armaflex and FLAMRO UBB, rigid wall



Penetration of copper pipes with AF/Armaflex and FLAMRO UBB, flexible wall



Annex 3
Description of the installations for the confirmation of fire resistance

The below applies to seals in at least 100 mm thick walls made from concrete, aerated concrete, masonry or light weight partition structures.

Classification EI 120/ E120

<table>
<tr><th>Type of installation</th><th>Description</th></tr>
<tr><td>Cables</td><td>

Single cables with diameter up to 21 mm without support construction
Waveguide cables of type Heliflex HCA 158-XX J
The cables are insulated with Rockwool ProRox PS 960 with a length of 500 mm on both sides of the penetration as a local interrupted insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration.
<table>
<tr><th>Type</th><th>Diameter Ø, mm</th><th>Insulation thickness, mm</th></tr>
<tr><td>≤ Heliflex 158-50 J</td><td>50,4</td><td>30</td></tr>
<tr><td>≤ Heliflex 158-38 J</td><td>14,3</td><td>20</td></tr>
</table>

Up to three bundled conduits made out of steel (flexible or rigid), with or without cables. All conduits shall have a maximum outer diameter of 25 mm.
Up to three bundled conduits made out polyolefin or PVC (flexible and rigid). All conduits shall have a maximum outer diameter of 16 mm.
Up to three bundled conduits made out of polyolefin or PVC (flexible and rigid), with or without cables wrapped with a single layer of FLAMRO UBB strip. All conduits shall have a maximum outer diameter of 25 mm, filled or not filled with cables.
Flexible conduits up to a diameter of 32 mm and rigid conduits of polyolefin or PVC up to diameter 25 mm with or without cables/bundles of conduits with diameter up to 115 mm sealed with FLAMRO Variant N II A collar.
All conduits not sealed with FLAMRO Variant N II A collar shall be coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration

</td></tr>
<tr><td>Plastic pipes</td><td>
PE-HD pipes according to EN 1519-1 and EN ISO 15494
Pipe installed with FLAMRO Variant N II A on each side of the penetration
<table>
<tr><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Collar lining, mm</th></tr>
<tr><td>≤ 50</td><td>1,8</td><td>6,4 × 25,4</td></tr>
<tr><td>≤ 110</td><td>10,0</td><td>19,2 × 25,4</td></tr>
</table>
Pipe end configurations: U/U, C/U, U/C and C/C
Classification also valid for PE pipes according to EN 12201-2, EN 1519-1 and EN 1266-1, and for ABS pipes according to EN 1455-1 and SAN+ PVC pipes according to EN 1565-1
</td></tr>
</table>

<table>
<tr><td>Metal pipes</td><td>The metal pipes are insulated with Rockwool ProRox PS 960 with a length of 1000 mm on both sides of the penetration as a local interrupted insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration.
<table>
<tr><th>Pipe material</th><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Insulation thickness, mm</th></tr>
<tr><td>Copper
Steel
Cast iron
Stainless steel</td><td>≤ 30</td><td>1,0 – 14,3</td><td>20</td></tr>
<tr><td>Steel
Cast iron
Stainless steel</td><td>≤ 108</td><td>2,9 – 14-3</td><td>40</td></tr>
</table>
Pipe end configurations: C/U and C/C</td></tr>
</table>

The classification is declared under the following conditions:

Field of application (Chapter 5.1 classification report)	Installation in walls: At least 100 mm thick walls made out of masonry, concrete or aerated concrete or lightweight partition wall with steel or timber studs. The light weight partition shall have at least two boards on each side and the total thickness of the boards shall be at least 25 mm on each side. For partitions with timber studs, no part of the penetrations seal may be closer to the studs than 100 mm. The gap between the penetration seal and the stud is closed by using 100 mm insulation with classification A1 or A2 according to EN 13501-1. The first suspension of the service support for the cables, plastic pipes and bundle of conduits shall be arranged at a distance of maximum 250 mm from the penetration seal surface. The first suspension of the service support of metal pipes shall be arranged in a distance of maximum 300 mm from the penetration seal surface.
Thickness of the penetration seal	60 mm
Maximum size of the penetration seal	1000mm width x 600mm height and 1000mm height x 600mm width
Distances	Lateral distance between the cable trays to seal edge: 0 mm, Sideways distance between two adjoining cable trays: min. 0 mm Distance below cable trays to seal edge: 0 mm Distance of the cables to the upper seal edge: min. 50 mm Vertical distance between cable trays: min. 50 mm

Classification EI 90/E 120

The below installations fulfil the requirements for the above classification unless another is given specifically in the tables

<table>
<tr><th>Type of installation</th><th>Description</th></tr>
<tr><td>Cables</td><td>

Single or bundled electrical lines and cables (fibre optic cables, also) up to a maximum diameter of 80 mm for a single cable.
Cable bundle up to a maximum diameter of 100 mm with maximum 21 mm for the individual cables.
Up to three bundled conduits, flexible or rigid, with or without cables made out of steel. All conduits shall have a maximum outer diameter of 25 mm.
Up to three bundled conduits, with or without cables made out of polyolefin or PVC (flexible and rigid). All conduits shall have a maximum outer diameter of 16 mm.
Up to three bundled conduits, with or without cables made out of polyolefin or PVC (flexible and rigid) wrapped with a single layer of FLAMRO UBB strip. All conduits shall have a maximum outer diameter of 25 mm.
Flexible conduits up to a diameter of 32 mm and rigid conduits made out of polyolefin or PVC up to diameter 25 mm with or without cables/bundles of conduits with diameter up to 115 mm sealed with FLAMRO Variant N II A collar.
Single core lines with diameter up to 24 mm

All conduits not sealed with FLAMRO Variant N II A collar shall be coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration
</td></tr>
<tr><td>Plastic pipes</td><td>
PVC-U pipes according to EN 1452-1, EN 1329-1, EN 1453-1, EN 1452-1 and EN ISO 15493
Pipe installed with FLAMRO Variant N II A on each side of the penetration
<table>
<tr><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Collar lining, mm</th></tr>
<tr><td>≤ 50</td><td>1,8 – 5,6</td><td>6,4 × 25,4</td></tr>
<tr><td>≤ 75</td><td>> 1,8 - < 8,1</td><td>12,8 × 25,4</td></tr>
<tr><td>≤ 90</td><td>> 1,8 - < 8,1</td><td>17,1 × 25,4</td></tr>
<tr><td>≤ 110</td><td>> 1,8 - < 8,1</td><td>19,2 × 25,4</td></tr>
</table>
Pipe end configurations: U/U, C/U, U/C and C/C
Classification also valid for PVC-C pipes according to EN 1566-1

PE-HD pipes according to EN 1519-1 and EN ISO 15494
Pipe installed with FLAMRO Variant N II A on each side of the penetration
<table>
<tr><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Collar lining, mm</th></tr>
<tr><td rowspan="2">≤ 50</td><td>1,8</td><td rowspan="2">6,4 × 25,4</td></tr>
<tr><td>> 1,8 – 4,6</td></tr>
<tr><td>≤ 75</td><td>1,9 – 10,0</td><td>12,8 × 25,4</td></tr>
<tr><td>≤ 90</td><td>2,7 – 10,0</td><td>17,1 × 25,4</td></tr>
<tr><td rowspan="2">≤ 110</td><td>2,7 - < 10,0</td><td rowspan="2">19,2 × 25,4</td></tr>
<tr><td>10,0</td></tr>
</table>
Pipe end configurations: U/U, C/U, U/C and C/C
Classification also valid for PE pipes according to EN 12201-2, EN 1519-1 and EN 1266-1, and for ABS pipes according to EN 1455-1 and SAN+ PVC pipes according to EN 1565-1
</td></tr>
<tr><td>Metal pipes</td><td>The metal pipes are insulated with Rockwool ProRox PS 960 with a length of 1000 mm on both sides of the penetration as a local interrupted insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration.</td></tr>
</table>

	<table><tr><th>Pipe material</th><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Insulation thickness, mm</th></tr><tr><td rowspan="3">Copper Steel Cast iron Stainless steel</td><td>≤ 30</td><td>1,0 – 14,3</td><td>20</td></tr><tr><td>≤ 42</td><td>1,0 – 14,3</td><td>30</td></tr><tr><td>≤ 89</td><td>2,0 – 14-3</td><td>40</td></tr><tr><td>Steel Cast iron Stainless steel</td><td>≤ 108</td><td>2,9 – 14-3</td><td>40</td></tr></table> Pipe end configurations: C/U and C/C

The classification is declared under the following conditions:

Field of application (Chapter 5.1 classification report)	Installation in walls: At least 100 mm thick walls made out of masonry, concrete or aerated concrete or lightweight partition wall with steel or timber studs. The light weight partition shall have at least two boards on each side and the total thickness of the boards shall be at least 25 mm on each side. For partitions with timber studs, no part of the penetrations seal may be closer to the studs than 100 mm. The gap between the penetration seal and the stud is closed by using 100 mm insulation with classification A1 or A2 according to EN 13501-1. The first suspension of the service support for the cables, plastic pipes and bundle of conduits shall be arranged at a distance of maximum 250 mm from the penetration seal surface. The first suspension of the service support of metal pipes shall be arranged in a distance of maximum 300 mm from the penetration seal surface.
Thickness of the penetration seal	60 mm
Maximum size of the penetration seal	1000mm width x 600mm height and 1000mm height x 600mm width
Distances	Lateral distance between the cable trays to seal edge: 0 mm, Sideways distance between two adjoining cable trays: min. 0 mm Distance below cable trays to seal edge: 0 mm Distance of the cables to the upper seal edge: min. 50 mm Vertical distance between cable trays:: min. 50 mm

Classification of metal pipes with AF/Armaflex rubber based pipe insulation

<table>
<tr><td>Type of installation</td><td>Description</td></tr>
<tr><td>Metal pipes</td><td>
The metal pipes are insulated with AF/Armaflex with a length of minimum 470 mm for Ø ≤ 42 mm pipes and minimum 970 mm for ≤ 89 mm pipes on both sides of the penetration as a local sustained insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration.
<table>
<tr><th>Pipe material</th><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Insulation thickness, mm</th><th>Classification</th></tr>
<tr><td rowspan="3">Copper
Steel
Cast iron
Stainless steel</td><td>≤ 12</td><td>≥ 0,5</td><td>15</td><td>EI 60/E 90</td></tr>
<tr><td>≤ 42</td><td>≥ 1,0</td><td>36,5</td><td>EI 60/E 60</td></tr>
<tr><td>≤ 89</td><td>2,0 – 14-3</td><td>41,5</td><td>EI 45/E 90</td></tr>
</table>
Pipe end configurations: C/U and C/C

The metal pipes are insulated with AF/Armaflex with a length of minimum 470 mm for Ø ≤ 42 mm pipes and minimum 970 mm for ≤ 89 mm pipes on both sides of the penetration as a local sustained insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration. A 200 mm long glass fibre mesh is embedded in the coating
<table>
<tr><th>Pipe material</th><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Insulation thickness, mm</th><th>Classification</th></tr>
<tr><td rowspan="3">Copper
Steel
Cast iron
Stainless steel</td><td>≤ 12</td><td>≥ 0,5</td><td>15</td><td>EI 60/E 120</td></tr>
<tr><td>≤ 42</td><td>≥ 1,0</td><td>36,5</td><td>EI 60/E 120</td></tr>
<tr><td>≤ 89</td><td>2,0 – 14-3</td><td>41,5</td><td>EI 45/E 90</td></tr>
</table>
Pipe end configurations: C/U and C/C

The metal pipes are insulated with AF/Armaflex with a length of minimum 470 mm for Ø ≤ 42 mm pipes and minimum 970 mm for ≤ 89 mm pipes on both sides of the penetration as a local sustained insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration. A 200 mm long glass fibre mesh is embedded in the coating and the FLAMRO UBB strip(60 × 2 mm) is wrapped around the insulation in the centre of the penetration.

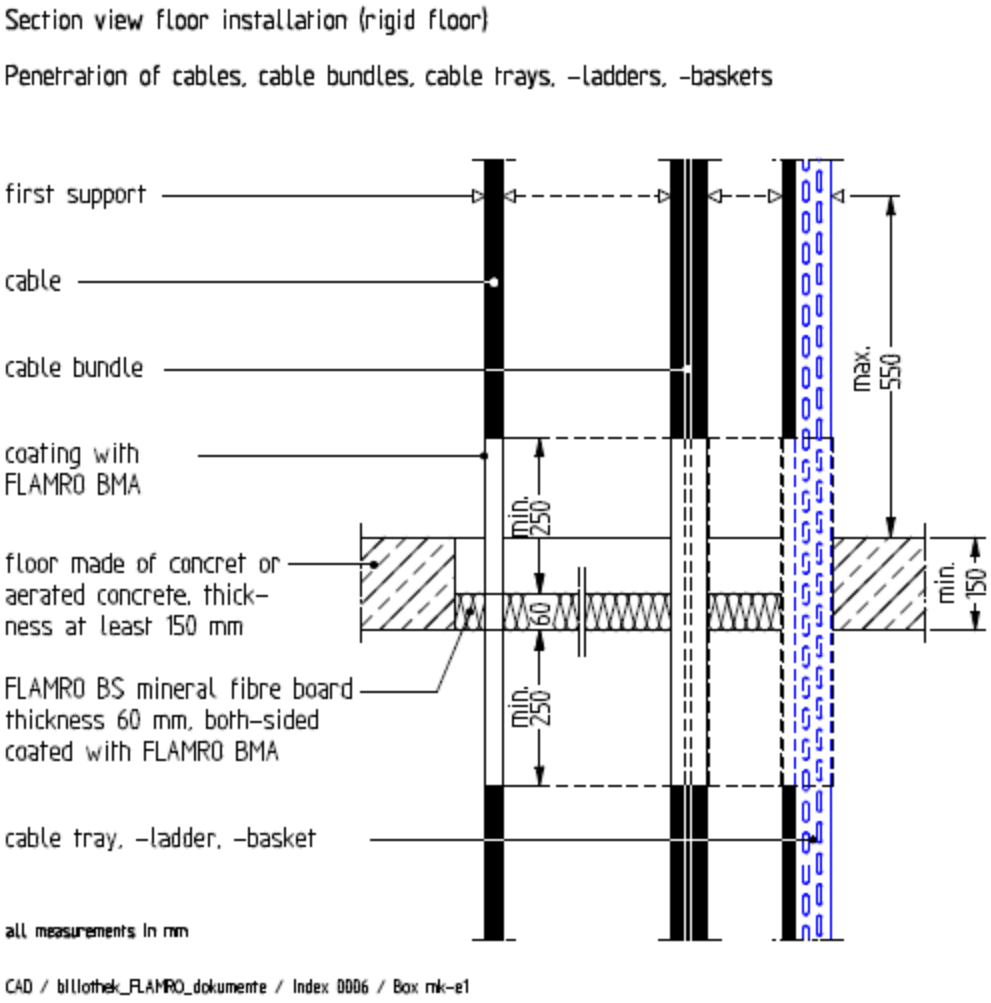
The FLAMRO UBB thickness is 1 × 60 mm × 2,0 mm for Ø ≤ 42 mm pipes and 2 × 60 mm × 2,0 mm for for Ø ≤ 89 mm pipes
<table>
<tr><th>Pipe material</th><th>Pipe Ø, mm</th><th>Wall thickness, mm</th><th>Insulation thickness, mm</th><th>Classification</th></tr>
<tr><td rowspan="3">Copper
Steel
Cast iron
Stainless steel</td><td>≤ 12</td><td>≥ 0,5</td><td>15</td><td>EI 90/E 120</td></tr>
<tr><td>≤ 42</td><td>≥ 1,0</td><td>36,5</td><td>EI 90/E 120</td></tr>
<tr><td>≤ 89</td><td>2,0 – 14-3</td><td>41,5</td><td>EI 60/E 120</td></tr>
</table>
Pipe end configurations: C/U and C/C
</td></tr>
</table>

The classification is declared under the following conditions:

Field of application (Chapter 5.1 classification report)	Installation in walls: At least 100 mm thick walls made out of masonry, concrete or aerated concrete or lightweight partition wall with steel or timber studs. The light weight partition shall have at least two boards on each side and the total thickness of the boards shall be at least 25 mm on each side. For partitions with timber studs, no part of the penetrations seal may be closer to the studs than 100 mm. The gap between the penetration seal and the stud is closed by using 100 mm insulation with classification A1 or A2 according to EN 13501-1. The first support for the metal pipes shall be arranged at a distance of maximum 300 mm from the penetration seal surface.
Thickness of the penetration seal	60 mm
Maximum size of the penetration seal	1000mm width x 600mm height and 1000mm height x 600mm width
Distances	Distance between the cable trays: 40 mm, Distance to each other: min. 0 mm Distance of the pipes to seal edge: min. 0 mm Distance to other installations: min. 40 mm

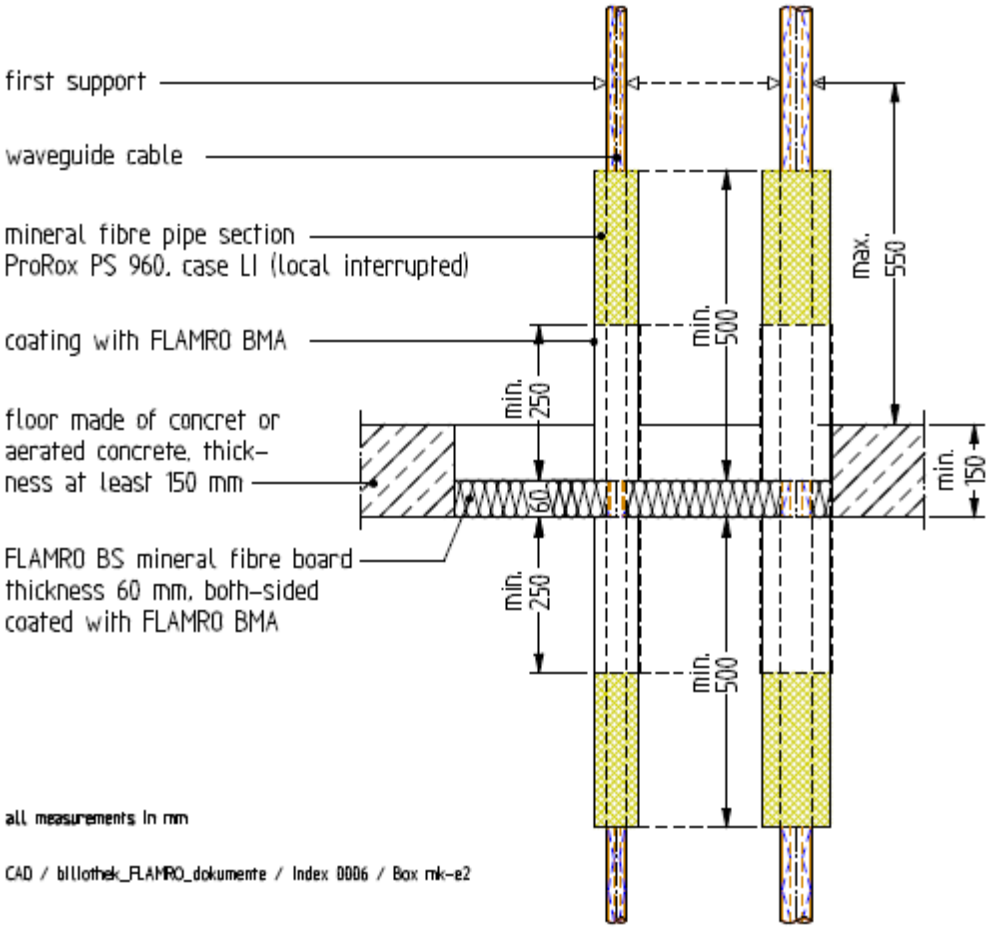
Annex 4
Detailed information for the confirmation of fire resistance

Use as part of a penetration seal for cables (single or bundled), cable carriers, e.g. cable trays, ladders, baskets;
Floor installation - section view



Section view floor installation (rigid floor)

Penetration of waveguide cables

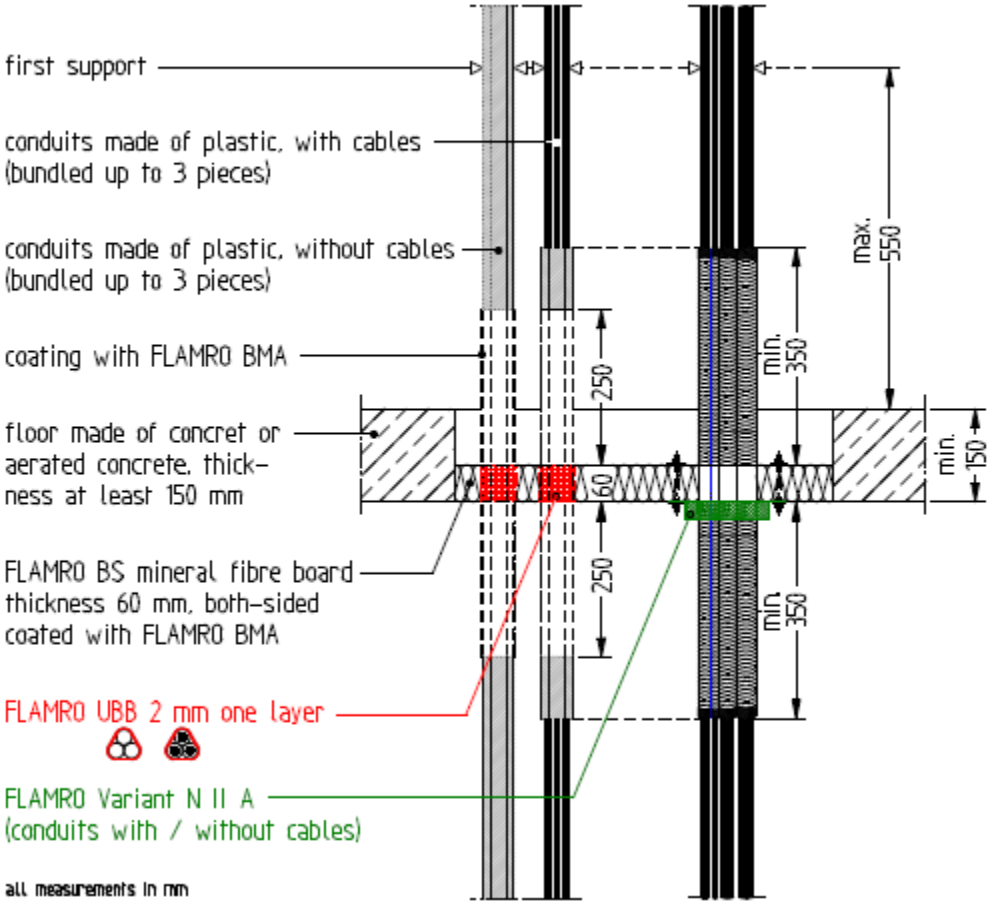


all measurements in mm

CAD / bibliothek_FLAMRO_dokumente / Index 0006 / Box mk-e2

Section view floor installation (rigid floor)

Penetration of conduits made of plastic (with and without cables)

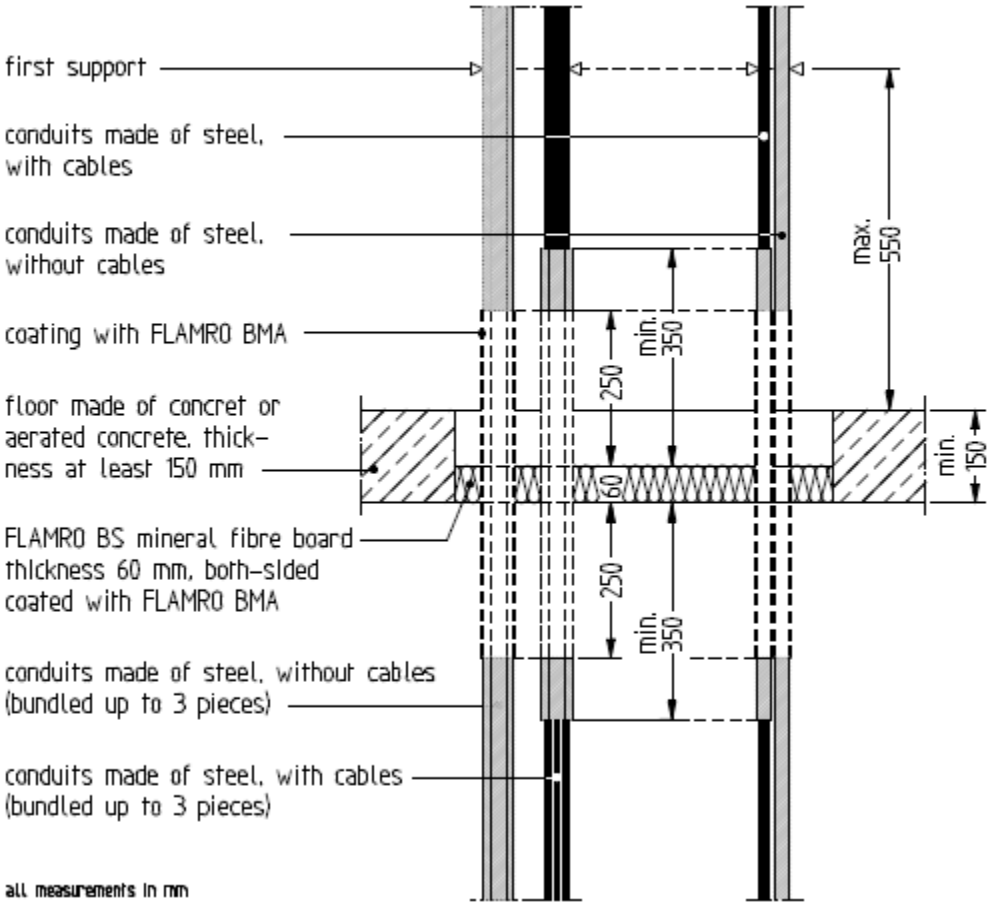


all measurements in mm

CAD / bibliothek_FLAMRO_dokumente / Index 0006 / Box mk-e3

Section view floor installation (rigid floor)

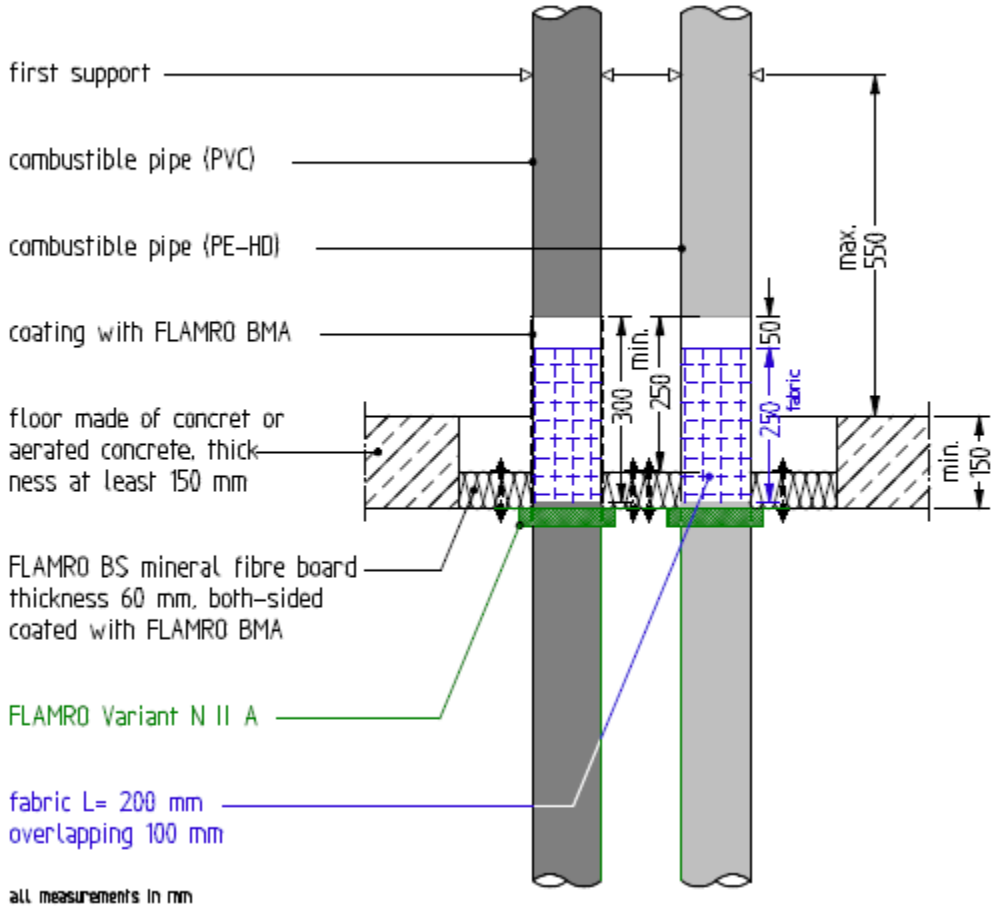
Penetration of conduits made of steel (with and without cables)



CAD / bibliothek_FLAMRO_dokumente / Index 0006 / Box mk-e4

Section view floor installation (rigid floor)

Penetration of combustible pipes

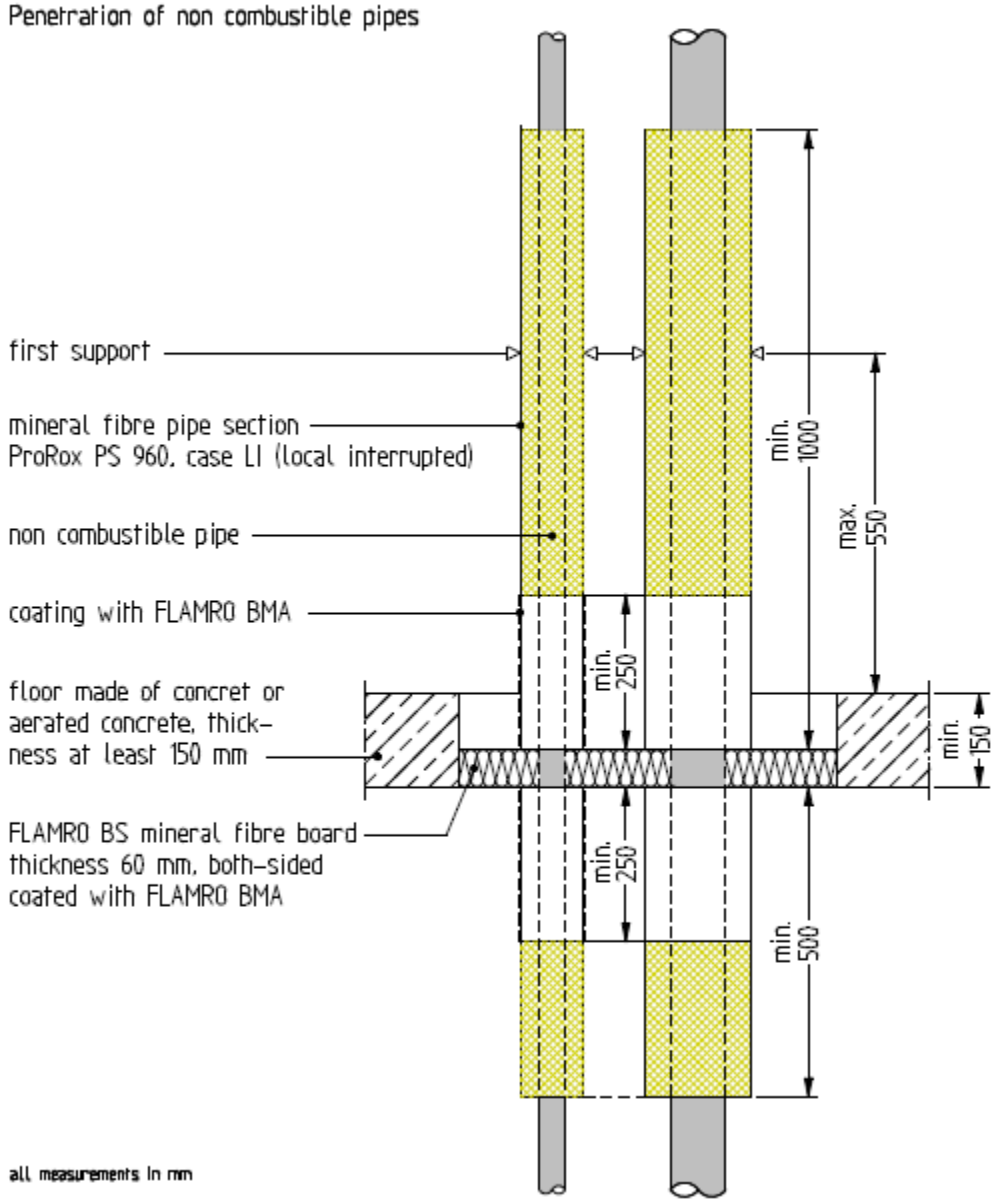


all measurements in mm

CAD / bilIothek_FLAMRO_dokumente / Index 0006 / Box mk-e5

Section view floor installation (rigid floor)

Penetration of non combustible pipes

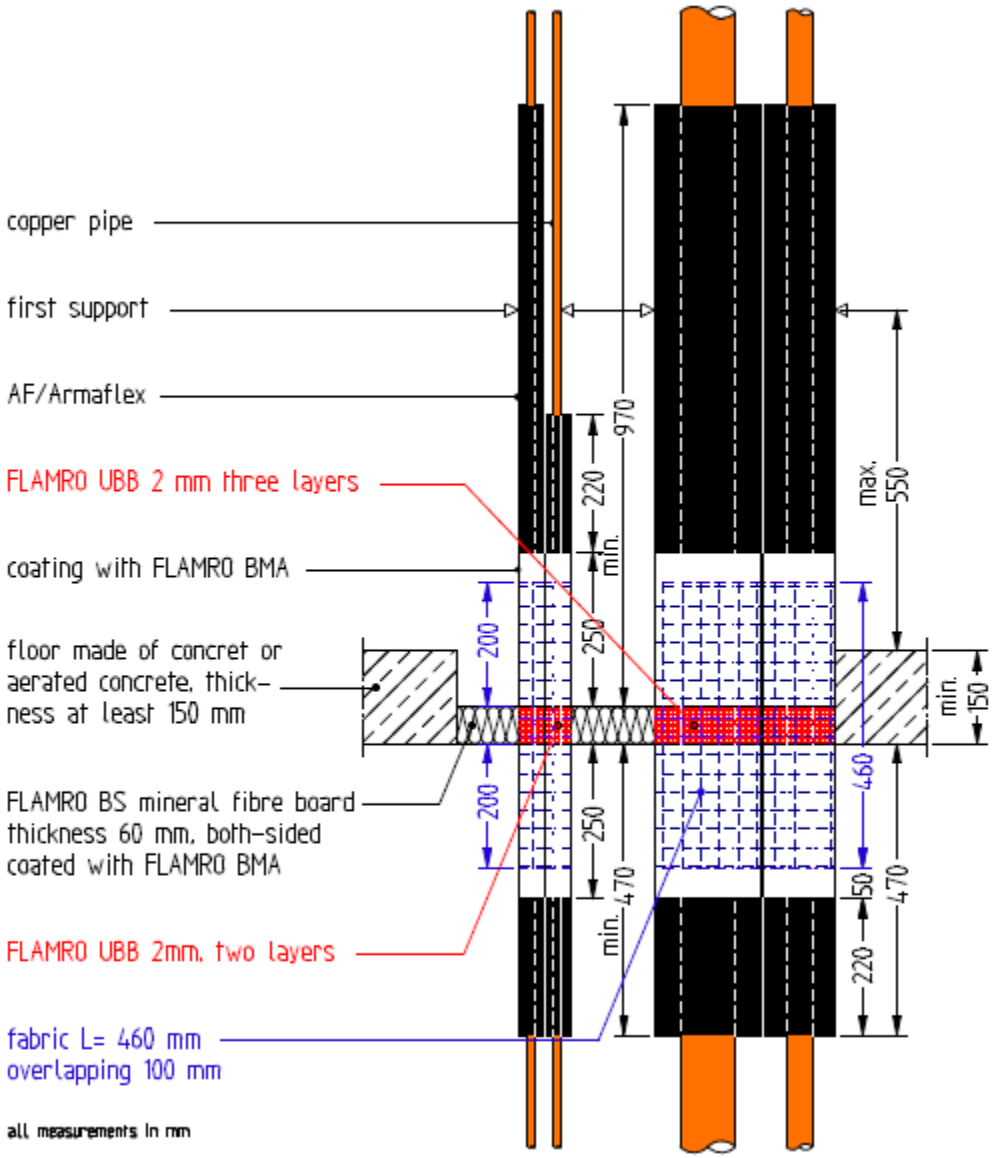


all measurements in mm

CAD / bilIothek_FLAMRO_dokumente / Index 0006 / Box mk-e6

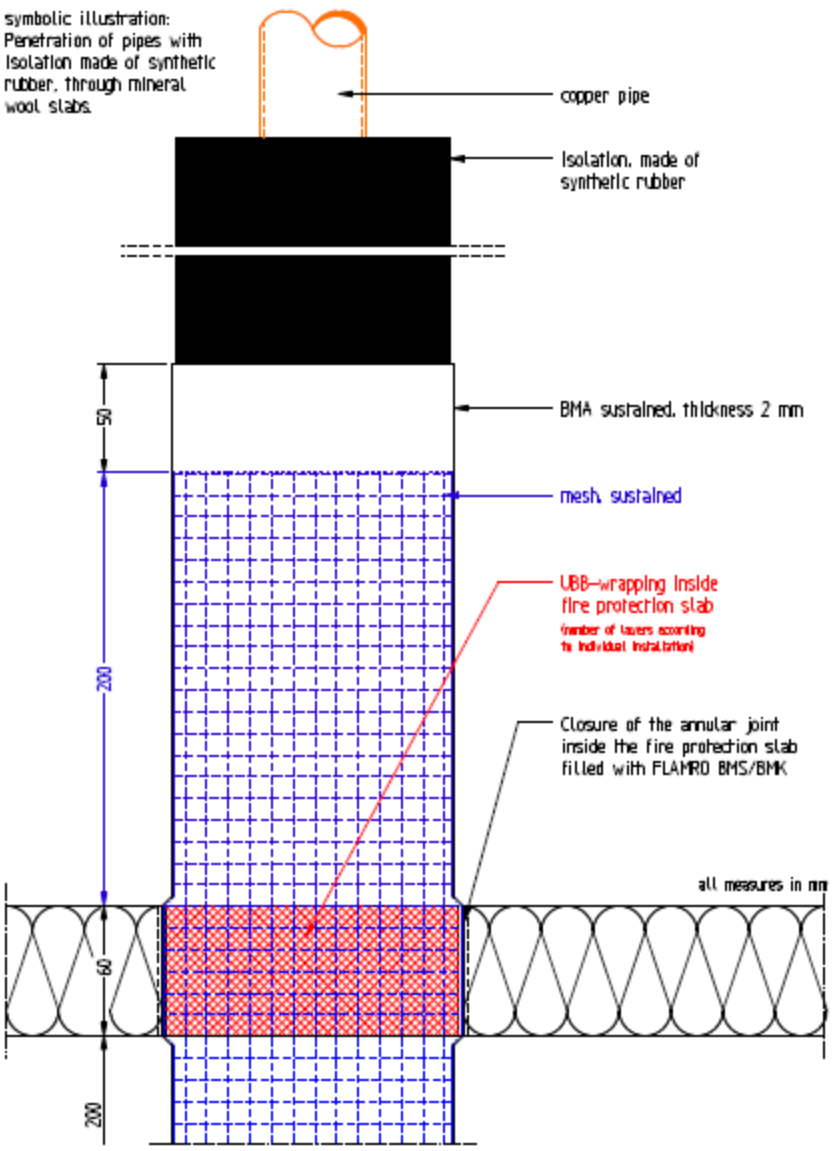
Section view floor installation (rigid floor)

Penetration of copper pipes with AF/Armaflex



all measurements in mm

CAD / bilIothek_FLAMRO_dokumente / Index 0006 / Box mk-e7


symbolic illustration:
Penetration of pipes with
isolation made of synthetic
rubber, through mineral
wool slabs
copper pipe
Isolation, made of
synthetic rubber
50
BMA sustained, thickness 2 mm
mesh, sustained
UBB-wrapping inside
fire protection slab
(number of layers according
to individual installation)
200
Closure of the annular joint
inside the fire protection slab
filled with FLAMRO BMS/BMK
all measures in mm
60
200

Annex 5
Description of the installations for the confirmation of fire resistance

The below applies to seals in at least solid construction floor. The floor must be ≥ 150 mm thick and have a density ≥ 500 kg/m^3. Brick and concrete floors are thus covered.

Type of installation	Description
Cables	**<u>Cable penetrations EI60 / E120</u>** • Cables up to max. diameter of 80 mm, except tied cable bundles, waveguides and single-core lines subject to the following regulations. • Optical fibre cables are covered • Tied bundles with a diameter ≤ 100 mm provided that the diameter of the single cable is not more than 21 mm. • Empty conduits made of steel or steel pipes up to a diameter of 25 mm single. In groups without distance side by side or as bundle (max. 3 pieces) filled or not with cables. • Empty conduits made of plastic with a diameter up to 16 mm. • Flexible and rigid conduits up to a diameter of 25 mm filled or not with or without cables, wrapped single-layer with the intumescent bandage FLAMRO UBB single or in groups ≤ 3 pieces without distance to each other. • Flexible conduits up to a diameter of 32 mm and rigid conduits made of plastic up to a diameter of 25 mm filled or not with cables as bundle with a diameter of ≤ 115 mm sealed with the penetration seal system (collar) FLAMRO Variant N II A. • No sheated cables with a diameter ≤ 24 mm The minimum distance which have to be kept are: • a1 lateral distance cable ladder / cable tray to the seal edge ≥ 25 mm. • a2 distance between two adjoining cable ladders/cable trays ≥ 0 mm. • a3 distance below cable ladders / cable trays to the seal edge ≥ 0mm. • a4 distance of the cables to the seal edge ≥ 25 mm, with cable ladder / cable tray which is put in between ≥ 0 mm. • a5 Distance of the cables to a further parallel arranged cable ladder/cable tray ≥ 100 mm. All conduits not sealed with FLAMRO Variant N II A collar shall be coated on both sides of the penetration seal surface with FLAMRO BMA out to a distance of ≥ 250 mm from the surface of the penetration
Penetrations	**<u>Cable penetrations EI 120 / E120</u>** • Insulation material: Rockwool ProRox PS 960. Insulation length on both sides of the penetration seal ≥ 500 mm as local interrupted insulation (case LI) with a two-sidded coating FLAMRO BMA 2 mm thick and 250 mm long from the penetration seal surface. • Waveguide cables ≤ Heliflex HCA 158-50J (Ø 50,4 mm) with 30 mm ProRox PS 960 insulation and • Waveguide cables ≤ Heliflex HCA 158-38J (Ø 14,3 mm) with 20 mm ProRox PS 960 insulation • The first service support has to be arranged in a distance of ≤ 25 cm on both sides of the penetration seal.

The minimum distance which have to be kept are:

- a1 distance to other installation ≥ 50 mm.
- a2 distance of the cable to the seal ≥ 0mm.
- a3 distance of the cables to another parallel arranged cable ≥ 0 mm

Plastic pipes

PVC-U pipes according to EN 1452-1, EN 1329-1, EN 1453-1, EN 1452-1 and EN ISO 15493

Pipe installed with FLAMRO Variant N II A below the penetration

Pipe Ø, mm	Wall thickness, mm	Collar lining, mm	Max achived classification
≤ 50	1,8 – 5,6	6,4 × 25,4	EI 120/E 120
≤ 75	> 1,8 - < 8,1	12,8 × 25,4	EI 90/E 120
≤ 90	> 1,8 - < 8,1	17,1 × 25,4	EI 90/E 120
≤ 110	> 1,8 - < 8,1	19,2 × 25,4	EI 90/E 120
≤ 110	8,1	19,2 × 25,4	EI 120/E 120

Pipe end configurations: U/U, C/U, U/C and C/C

Classification also valid for PVC-C pipes according to EN 1566-1

PE-HD pipes according to EN 1519-1 and EN ISO 15494

Pipe installed with FLAMRO Variant N II A below the penetration

Pipe Ø, mm	Wall thickness, mm	Collar lining, mm	Max achieved classification
≤ 50	1,8 – 4,6	6,4 × 25,4	EI 120/E 120
≤ 75	1,9 – 10,0	12,8 × 25,4	EI 120/E 120
≤ 90	2,7 – 10,0	17,1 × 25,4	EI 120/E 120
≤ 110	2,7 - 10,0	19,2 × 25,4	EI 120/E 120

Pipe end configurations: U/U, C/U, U/C and C/C

Classification also valid for PE pipes according to EN 12201-2, EN 1519-1 and EN 1266-1, and for ABS pipes according to EN 1455-1 and SAN+ PVC pipes according to EN 1565-1

Bundles of conduits with a conduit single Ø ≤ 32 mm, bundle Ø ≤ 115 mm

Closure system collar "FLAMRO Variant N II A"

Conduits made of plastic filled or not filled with cables

Pipe Ø, mm	Wall thickness, mm	Collar lining, mm	Max achieved classification
≤ 50	--	6,4 × 25,4	EI 90/E 120
≤ 75	--	12,8 × 25,4	EI 90/E 120
≤ 90	--	17,1 × 25,4	EI 90/E 120
≤ 114	--	19,2 × 25,4	EI 90/E 120

Pipe end configurations: U/U, C/U, U/C and C/C

Metal pipes

The metal pipes are insulated with Rockwool ProRox PS 960 with a length of 1000 mm on both sides of the penetration as a local interrupted insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration.

Pipe material	Pipe Ø, mm	Wall thickness, mm	Insulation thickness, mm	Max achieved classification
Copper Steel Cast iron Stainless steel	≤ 30	1,0 – 14,3	20	EI 120/E 120
	≤ 42	1,0 – 14,3	30	EI 120/E 120
	≤ 89	2,0 – 14,3	40	EI 120/E 120
Steel Cast iron	≤ 108	2,9 – 14,3	40	EI 120/E 120

	Stainless steel | | | | | Pipe end configurations: C/U and C/C Distance to the seal edge ≥ 0 mm Distance to each other ≥ 0 mm Distance to other installation ≥ 40 mm Distance below cable ladders/trays ≥ 40 mm
	The metal pipes are insulated with AF/Armaflex with a length of minimum 470 mm for Ø ≤ 42 mm pipes and minimum 970 mm for ≤ 89 mm pipes on both sides of the penetration as a local sustained insulation. The insulation is coated with a 2 mm thick layer of FLAMRO BMA out to a distance of 250 mm from the surface of the penetration. FLAMRO UBB strip(60 × 2 mm) is wrapped around the insulation in the centre of the penetration. A 460 mm long glass fibre mesh is embedded in the coating

Pipe material	Pipe Ø, mm	Wall thickness, mm	Insulation thickness, mm	Intumesent bandage Flamro UBB (2mm x 60 mm)	Classification
Copper Steel Cast iron Stainless steel	≤ 12	≥ 0,5	15	Two layer	EI 120/E 120
	≤ 42	≥ 1,0	36,5	Two layer	EI 90/E 120
	≤ 89	2,0 – 14,3	41,5	Three layer	EI 60/E 120

Pipe end configurations: C/U and C/C
Distance to the seal edge ≥ 0 mm
Distance to each other ≥ 0 mm
Distance to other installation ≥ 40 mm
Distance below cable ladders/trays ≥ 40 mm

The classification is declared under the following conditions:

Field of application (Chapter 5.2 classification report)	Installation in floors of solid construction floor. The floor must be ≥ 150 mm thick and have a density ≥ 500 kg/m^3. Brick and concrete floors are thus covered.