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European Technical Assessment

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General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	Mulcol® Multifoam Stone System
Product family to which the construction product belongs	Fire Stopping and Fire Sealing Products: Penetration Seals
Manufacturer	Mulcol International B.V. Arnesteinweg 18 4338 PD Middelburg NETHERLANDS
Manufacturing plant	A/002
This European Technical Assessment contains	34 pages including Annexes A-1 to J-1 which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Assessment Document EAD 350454-00-1104 „Fire stopping and fire sealing products – Penetration seals”

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Specific parts

1 Technical description of the product

"Mulcol® Multifoam Stone System" is a kit to be used as a mixed penetration seal based on the following components and additional insulations.

Components of "Mulcol® Multifoam Stone System"	**Characteristics**
Mulcol® Multifoam Stone	Block-shaped intumescent elastic product (can be vacuum-packed) on the basis of polyurethane with intumescent fire protection additives
Mulcol® Multifoam Mastic	Intumescent pasty, brushable mastic on the basis of acrylate with intumescent fire protection additives
Mulcol® Multifoam Wrap	Intumescent wrap on the basis of butyl rubber with intumescent fire protection additives and glass fabric reinforcement
Mulcol® Multifoam 2K	Product in cartridges on the basis of polyurethane with intumescent fire protection additives. After application it reacts and increases its volume

Insulations (additional components)	**Characteristics**
Prefabricated pipe shells	Prefabricated pipe shells according to EN 14303 made from stone wool with classification $A2_L$-s1,d0 or $A1_L$ according to EN 13501-1, a minimum density of 90 kg/m³ and a melting point > 1000 °C according to DIN 4102-17 (e.g. "Rockwool 800" from manufacturer "Deutsche Rockwool Mineralwoll GmbH & Co. OHG")
AF/Armaflex	Closed cell, flexible elastomeric foam (FEF) insulation in form of (slotted) tubes (can be provided with a self-adhesive device) with classification B_L-s3,d0 – including "Armaflex 520" – according to EN 13501-1 from manufacturer "Armacell GmbH"
AF/Armaflex Band selbstklebend (AF/Armaflex self-adhesive tape)	Closed cell, flexible elastomeric foam (FEF) insulation in form of tapes with a self-adhesive device with classification B-s3,d0 according to EN 13501-1 from manufacturer "Armacell GmbH"
Armaflex 520	Polychlorene-based adhesive, free from aromatic compounds (special adhesive for processing of all flexible Armaflex insulating material – except "HT/Armaflex") from manufacturer "Armacell GmbH"

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

2.1 Intended use

"Mulcol® Multifoam Stone System" is intended to be used as a mixed penetration seal to temporarily or permanently reinstate the fire resistance performance of flexible wall constructions, rigid wall constructions and rigid floor constructions where they have been provided with apertures which are penetrated by various cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions (perforated or non-perforated steel cable trays and steel ladders).

The thickness of the penetration seal has to be 144 mm or 200 mm (depending on the fire resistance classification; see Annex J-1 of the ETA).

The minimum perimeter length to seal area ratio of the penetration seal in rigid floors is – according to clause 13.5.2 of EN 1366-3:2009 – 5,333 m/m², resp. 0,005333 mm/mm² (for penetration seals with a nominal thickness of 144 mm) – or 4,857 m/m², resp. 0,004857 mm/mm² (for penetration seals with a nominal thickness of 200 mm).

The maximum opening size of the penetration seal has to comply with the dimensions as specified in the following table.

Blank penetration seals with maximum opening sizes as specified in the following table have been tested.

"Mulcol® Multifoam Stone System" can be installed only in the types of separating elements as specified in the following table.

Separating element	Construction	Maximum opening size of the penetration seal (width x height)
Flexible walls	> Steel studs or timber studs lined on both faces with minimum 2 layer of boards (minimum thickness 12,5 mm), or minimum one layer of boards (minimum thickness 25 mm) > For timber stud walls there shall be a minimum distance of 100 mm of the penetration seal to any timber stud. The cavity between the penetration seal and the timber stud has to be closed with minimum 100 mm of insulation with classification A1 or A2 according to EN 13501-1 > Minimum thickness 94 mm > Classification according to EN 13501-2: ≥ EI 60 > This European Technical Assessment does not cover sandwich panel constructions and flexible walls were the lining does not cover studs on both sides. Penetrations in such constructions shall be tested on a case by case basis	600 mm x 1000 mm or 1000 mm x 600 mm

Separating element	Construction	Maximum opening size of the penetration seal (width x height)
Rigid walls	> Aerated concrete, concrete, reinforced concrete masonry > Minimum density 450 kg/m³ > Minimum thickness 100 mm > The rigid wall shall be classified in accordance with EN 13501-2 for the required fire resistance period	600 mm x 1000 mm or 1000 mm x 600 mm
Rigid floors	> Aerated concrete, concrete, reinforced concrete > Minimum density 450 kg/m³ > Minimum thickness 150 mm > The rigid floor shall be classified in accordance with EN 13501-2 for the required fire resistance period	see Annex C-1 to C-3 of the ETA

"Mulcol® Multifoam Stone System" can only be configured as specified in the following tables. Other parts or service support constructions shall not penetrate the penetration seal.

Penetrating element	Construction characteristics of the penetrating element in "Mulcol® Multifoam Stone System" in flexible walls, rigid walls and rigid floors
Cables	> All types of sheathed cables[1] (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 80 mm > Tied bundles[2] up to 100 mm overall diameter containing sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 21 mm > Non-sheathed electrical cables with a diameter ≤ 24 mm
Conduits / Tubes	> Steel conduits / tubes, Ø ≤ 16 mm, wall thickness minimum 1,5 mm (with / without cables): steel conduits according to EN 61386-21 > Plastic conduits, Ø ≤ 16 mm, wall thickness 1,0 mm to 3,0 mm (with / without cables) according to EN 61386-21 or EN 61386-22 > Plastic conduits, Ø ≤ 40 mm, wall thickness 1,0 mm to 3,0 mm (with / without cables) according to EN 61386-21 or EN 61386-22 > Bundles with a maximum Ø of 80 mm consisting of plastic conduits, Ø ≤ 40 mm, wall thickness 1,0 mm to 3,0 mm (with / without cables) according to EN 61386-21 or EN 61386-22

[1] Single or multicore cable with individual insulation of the cores and an additional protective covering of the assembly
[2] Several cables running in the same direction, densely packed and bound tightly together by mechanical means

Penetrating element	Construction characteristics of the penetrating element in "Mulcol® Multifoam Stone System" in flexible walls, rigid walls and rigid floors
Plastic pipes	> PVC-U pipes according to EN ISO 1452-1 and DIN 8061 / DIN 8062 with diameters and wall thicknesses as defined in Annex E-2 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-2 of the ETA. > PE-HD pipes according to EN 1519-1 and DIN 8074 / DIN 8075 with diameters and wall thicknesses as defined in Annex E-2 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-2 of the ETA.
Metal pipes	> Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than copper (945 °C for EI 60; 1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than copper with diameters and wall thicknesses as defined in Annex E-1 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-1 of the ETA. > Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than steel (945 °C for EI 60; 1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than steel with diameters and wall thicknesses as defined in Annex E-1 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-1 of the ETA.
Cable support constructions	> Steel cable trays (perforated or non-perforated) > Steel ladders > Steel cable trays (perforated or non-perforated) and steel ladders with organic coatings shall at least be classified A2-s1,d0 according to EN 13501-1

2.2 Use condition

"Mulcol® Multifoam Stone System" is intended for internal use with humidity equal to or higher than 85 % RH, excluding temperatures below 0 °C[3], without exposure to rain or UV, and can therefore – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Z_1. Since the requirements for Type Z_1 are met, also the requirements for Type Z_2 are fulfilled.

Although a penetration seal is intended for indoor applications only, the construction process may result in it being subjected to more exposed conditions for a period before the building envelope is closed. For this case provisions shall be made to protect temporarily exposed penetration seals according to the ETA-holder's installation instructions.

2.3 Working life

The provisions made in this European Technical Assessment are based on an assumed working life of "Mulcol® Multifoam Stone System" of 10 years, provided the conditions laid down in the technical literature of the manufacturer relating to packaging, transport, storage, installation, use and repair are met.

[3] These uses apply for internal humidity class 5 in accordance with EN ISO 13788

The indications given on the intended working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, but are to be regarded only as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

The real working life might be, in normal use conditions, considerably longer without major degradation affecting the Basic requirements for construction works.

2.4 General assumptions

2.4.1 It is assumed that

- damages to the penetration seal are repaired accordingly,
- the installation of the penetration seal does not effect the stability of the adjacent building element – even in case of fire,
- the lintel or floor above the penetration seal is designed structurally and in terms of fire protection such that no additional mechanical load (other than its own weight) is imposed on the penetration seal,
- the aperture lining within a flexible wall is supported by the studs (transoms and mullions) in such a way that the mechanical load imposed to the aperture lining by the penetration seal does not affect the stability of the aperture lining and the flexible wall,
- the thermal movement in the pipe work will be accommodated in such way that it does not impose a load on the penetration seal,
- the installations are fixed to the adjacent building element (not to the penetration seal) in accordance with the relevant regulations in such a way that, in case of fire, no additional mechanical load is imposed to the penetration seal,
- the support of the installations is maintained for the required period of fire resistance and
- pneumatic dispatch systems, compressed air systems, etc. are switched off by additional means in case of fire (for sealing off plastic pipes).

2.4.2 This European Technical Assessment does not address any risks associated with the emission of dangerous liquids or gases caused by failure of the pipe(s) in case of fire nor does it prove the prevention of the transmission of fire through heat transfer via the medium in the pipes.

2.4.3 This European Technical Assessment does not verify the prevention of destruction of adjacent building elements with fire separating function or of the pipes themselves due to distortion forces caused by extreme temperatures. These risks shall be accounted for by taking appropriate measures when designing or installing the pipe work.

The mounting or hanging of the pipes or the layout of the pipe work shall be implemented in such a way that the pipes and the fire resistant building elements shall remain functional within a period of time which corresponds to the fire resistance period required.

2.4.4 The risk of downward spread of fire caused by burning material which drips through a pipe to floors below, is not considered in this European Technical Assessment (see EN 1366-3:2009, clause 1).

2.4.5 The durability assessment does not take account of the possible effect on the penetration seal of substances permeating through the pipe walls.

2.4.6 The assessment does not cover the avoidance of destruction of the penetration seal or of the adjacent building element(s) by forces caused by temperature changes in case of fire. This has to be considered when designing the piping system.

2.5 Manufacturing

The European Technical Assessment is issued for the product on the basis of agreed data / information, deposited with the Österreichisches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data / information being incorrect, should be notified to the Österreichisches Institut für Bautechnik before the changes are introduced.

The Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European Technical Assessment and consequently the validity of the CE marking on the basis of the European Technical Assessment and if so whether further assessment or alterations to the European Technical Assessment, shall be necessary.

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

Basic requirements for construction works	Essential characteristic	Method of verification	Performance
BWR 2	Reaction to fire	EN 13501-1	Clause 3.1.1 of the ETA
	Resistance to fire	EN 13501-2: 2007+A1:2009	Clause 3.1.2 of the ETA and Annex J-1 of the ETA
BWR 3	Air permeability	EN 1026:2016	Clause 3.2.1 of the ETA
	Water permeability	No performance assessed	
	Content, emission and/or release of dangerous substances	No performance assessed	
BWR 4	Mechanical resistance and stability	No performance assessed	
	Resistance to impact / movement	No performance assessed	
	Adhesion	No performance assessed	
	Durability	EAD 350454-00-1104 clause 2.2.9	Clause 3.3.4 of the ETA
BWR 5	Airborne sound insulation	EN ISO 10140-2: 2010	Clause 3.4.1 of the ETA
BWR 6	Thermal properties	EN 12667:2001	Clause 3.5.1 of the ETA
	Water vapour permeability	No performance assessed	

3.1 Safety in case of fire (BWR 2)

3.1.1 Reaction to fire

The components of "Mulcol® Multifoam Stone System" were assessed according to EAD 350454-00-1104 clause 2.2.1 and classified according to EN 13501-1:2007+A1:2009.

Component	Class according to EN 13501-1:2007+A1:2009
Mulcol® Multifoam Stone	**E**
Mulcol® Multifoam Mastic	**E**
Mulcol® Multifoam Wrap	**E**
Mulcol® Multifoam 2K	**E**

3.1.2 Resistance to fire

"Mulcol® Multifoam Stone System" was tested according to EAD 350454-00-1104 clause 2.2.2, prEN 1366-3.2:N185:2007-07 and EN 1366-3:2009 in conjunction with EN 1363-1:1999.

Based upon the gained test results and the field of application specified within prEN 1366-3.2:N185:2007-07 and EN 1366-3:2009 "Mulcol® Multifoam Stone System" has been classified according to EN 13501-2:2007+A1:2009. The individual fire resistance classes are listed in Annex J-1 of the ETA.

The maximum fire resistance class of the penetration seal in vertical or horizontal separating element depends on the fire resistance class of the penetrating elements. The fire resistance class of the penetration seal is reduced to the fire resistance class of the penetrating element with the lowest fire resistance classification.

The resistance to fire classification listed in Annex J-1 of the ETA is only valid if "Mulcol® Multifoam Stone System" is installed according to Annex A-1 to A-5 of the ETA.

3.2 Hygiene, health and the environment (BWR 3)

3.2.1 Air permeability

The air permeability of "Mulcol® Multifoam Stone" with a thickness of 144 mm was tested according to EN 1026:2016 in a flexible wall with a thickness of 100 mm. The aperture was lined with 1 layer of ≥ 20 mm thick calcium silicate boards (classification A1 according to EN 13501-1) with a width of 144 mm. The opening size was 560 mm x 360 mm (width x height), resp. 0,202 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.3.

The components "Mulcol® Multifoam Mastic", "Mulcol® Multifoam Wrap" and "Mulcol® Multifoam 2K" were not included in these tests. The measurement accuracy was 0,01 m³/h.

The values given in the following table are the mean values from the pressure- and suction tests.

Δp in Pa	**50**	**100**	**150**	**200**	**250**	**300**	**450**	**600**
q/A in m³/(h*m²)	1,12	1,79	2,38	2,92	3,79	4,42	5,98	7,65

The air permeability of "Mulcol® Multifoam Stone" with a thickness of 200 mm was tested according to EN 1026:2016 in a flexible wall with a thickness of 100 mm. The aperture was lined with 1 layer of ≥ 20 mm thick calcium silicate boards (classification A1 according to EN 13501-1) with a width of 200 mm. The opening size was 355 mm x 550 mm (width x height), resp. 0,195 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.3.

The components "Mulcol® Multifoam Mastic", "Mulcol® Multifoam Wrap" and "Mulcol® Multifoam 2K" were not included in these tests. The measurement accuracy was 0,01 m³/h.

The values given in the following table are the mean values from the pressure- and suction tests.

Δp in Pa	**50**	**100**	**150**	**200**	**250**	**300**	**450**	**600**
q/A in m³/(h*m²)	0,82	1,43	1,74	2,28	3,07	3,74	4,97	6,61

The air permeability of "Mulcol® Multifoam 2K" with a thickness of 144 mm was tested according to EN 1026:2016 in a flexible wall with a thickness of 100 mm. The aperture was lined with 1 layer of ≥ 20 mm thick calcium silicate boards (classification A1 according to EN 13501-1) with a width of 144 mm. The opening size was 360 mm x 360 mm (width x height), resp. 0,130 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.3.

The components "Mulcol® Multifoam Stone", "Mulcol® Multifoam Mastic" and "Mulcol® Multifoam Wrap" were not included in these tests.

The values given in the following table are the mean values from the pressure- and suction tests.

Δp in Pa	**50**	**100**	**150**	**200**	**250**	**300**	**450**	**600**
q/A in m³/(h*m²)	0,39	0,73	1,18	1,58	1,89	2,12	3,24	4,09

The air permeability of "Mulcol® Multifoam 2K" with a thickness of 200 mm was tested according to EN 1026:2016 in a flexible wall with a thickness of 100 mm. The aperture was lined with 1 layer of ≥ 20 mm thick type calcium silicate boards (classification A1 according to EN 13501-1) with a width of 200 mm. The opening size was 350 mm x 350 mm (width x height), resp. 0,123 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.3.

The components "Mulcol® Multifoam Stone", "Mulcol® Multifoam Mastic" and "Mulcol® Multifoam Wrap" were not included in these tests.

Up to a pressure difference of 600 Pa no air permeability was measured. The measurement accuracy of the test facility was 0,01 m³/h, so that the air permeability at Δ p = 600 Pa is less than 0,08 m³/(h*m²).

3.2.2 Water permeability

No performance assessed.

3.2.3 Content, emission and/or release of dangerous substances

No performance assessed.

3.3 Safety and accessibility in use (BWR 4)

3.3.1 Mechanical resistance and stability

No performance assessed.

3.3.2 Resistance to impact / movement

No performance assessed.

Provisions shall be taken to prevent a person from stepping onto a horizontal penetration seal or falling against a vertical penetration seal (e.g. by covering with a wire mesh).

3.3.3 Adhesion

No performance assessed.

3.3.4 Durability

All components of "Mulcol® Multifoam Stone System" fulfil the requirements for the intended use condition.

"Mulcol® Multifoam Stone System" is therefore appropriate for internal use with humidity equal to or higher than 85 % RH, excluding temperatures below 0 °C[4], without exposure to rain or UV, and can – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Z_1. Since the requirements for Type Z_1 are met, also the requirements for Type Z_2 are fulfilled.

3.4 Protection against noise (BWR 5)

3.4.1 Airborne sound insulation

The airborne sound insulation of "Mulcol® Multifoam Stone" was tested according to EN ISO 10140-2:2010 in a flexible wall with a thickness of 200 mm. The aperture was lined with 1 layer of ≥ 20 mm thick type calcium silicate boards (classification A1 according to EN 13501-1) with a width of 200 mm. The opening size was 360 mm x 360 mm (width x height), resp. 0,130 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.10.

The components "Mulcol® Multifoam Mastic", "Mulcol® Multifoam Wrap" and "Mulcol® Multifoam 2K" were not included in these tests.

The reached values for the airborne sound insulation in accordance with EN ISO 717-1:2013 are given in the following table.

$D_{n,e,w}$ in dB	C in dB	C_{tr} in dB	R_w in dB	C in dB	C_{tr} in dB
68	-4	-11	49	-4	-11

[4] These uses apply for internal humidity class 5 in accordance with EN ISO 13788

The airborne sound insulation of "Mulcol® Multifoam 2K" was tested according to EN ISO 10140-2:2010 in a flexible wall with a thickness of 200 mm. The aperture was lined with 1 layers of ≥ 20 mm thick calcium silicate boards (classification A1 according to EN 13501-1) with a width of 200 mm. The opening size was 360 mm x 360 mm (width x height), resp. 0,130 m².

"Mulcol® Multifoam Stone System" was tested as blank penetration seal according to EAD 350454-00-1104 clause 2.2.10.

The components "Mulcol® Multifoam Stone", "Mulcol® Multifoam Mastic" and "Mulcol® Multifoam Wrap" were not included in these tests.

The reached values for the airborne sound insulation in accordance with EN ISO 717-1:2013 are given in the following table.

$D_{n,e,w}$ in dB	C in dB	C_{tr} in dB	R_w in dB	C in dB	C_{tr} in dB
66	-1	-6	47	-1	-6

3.5 Energy economy and heat retention (BWR 6)

3.5.1 Thermal properties

The thermal properties of "Mulcol® Multifoam Stone" and "Mulcol® Multifoam 2K" were tested according to EN 12667:2001.

Component	$\lambda_{10,23/50}$ in W/(m*K)
Mulcol® Multifoam Stone	0,103
Mulcol® Multifoam 2K	0,088

3.5.2 Water vapour permeability

No performance assessed.

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

4.1 AVCP system

According to the Decision 1999/454/EC[5], amended by Decision 2001/596/EC[6] of the European Commission the system of assessment and verification of constancy of performance (see Annex V of Regulation (EU) No 305/2011) is given in the following table.

Product(s)	**Intended use(s)**	**Level(s) or class(es)** (resistance to fire)	**System** of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	for fire compartmentation and/or fire protection or fire performance	any	1

In addition, according to the Decision 1999/454/EC, amended by Decision 2001/596/EC of the European Commission the system(s) of assessment and verification of constancy of performance, with regard to reaction to fire, is given in the following table.

Product(s)	**Intended use(s)**	**Level(s) or class(es)** (reaction to fire)	**System** of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	for uses subject to regulations on reaction to fire	A1*, A2*, B*, C*	1
		A1**, A2**, B**, C**, D, E	3
		(A1 to E)***, F	4

* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material)

** Products/materials not covered by footnote (*)

*** Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of class A1 according to Commission Decision 96/603/EC, as amended)

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the Technical Assessment Body Österreichisches Institut für Bautechnik.

The notified product certification body shall visit the factory at least twice a year for surveillance of the manufacturer.

Issued in Vienna on 06.06.2018
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits
Managing Director

[5] Official Journal of the European Communities no. L 178, 14.7.1999, p. 52
[6] Official Journal of the European Communities no. L 209, 2.8.2001, p. 33

1 General

> "Mulcol® Multifoam Stone System" can be used in apertures in walls (vertical separating element) and floors (horizontal separating element) according to clause 2.1 of the ETA.

> The penetration of cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions according to clause 2.1 of the ETA is allowed.

> The total cross section of the installations (including insulation and cable support constructions) must not be more than 60 % of the opening size of the penetration seal.

> Metal pipes with an outer diameter > 18 mm have to be insulated with prefabricated pipe shells (e.g. "Rockwool 800") according to clause 1 of the ETA or "AF/Armaflex".

> Metal pipes with an outer diameter ≤ 18 mm can be insulated with prefabricated pipe shells (e.g. "Rockwool 800") according to clause 1 of the ETA or "AF/Armaflex".

> Metal pipes insulated with prefabricated pipe shells (e.g. "Rockwool 800") according to clause 1 of the ETA can be cladded with sheet steel with a thickness of 0,4 mm to 1,0 mm or plastic with a thickness of 0,35 mm to 1,0 mm.

1.1 Pipe end configuration

> For plastic pipes classified with pipe end configuration U/C the pipe end configuration can be U/C and C/C.

> For metal pipes classified with pipe end configuration C/U the pipe end configuration can be C/U and C/C.

> Plastic conduits were tested U/C.

> Steel conduits / tubes were tested U/C.

1.2 Orientation of the penetrating elements

> Conduits / tubes, metal pipes and plastic pipes have to be installed perpendicular to the surface of the penetration seal.

> Metal pipes insulated with prefabricated pipe shells (e.g. "Rockwool 800") according to clause 1 of the ETA can be installed in all angles between 90° and 45°.

1.3 Service support constructions

> All types of cables, conduits / tubes, metal pipes and plastic pipes – in flexible walls and rigid walls – have to be supported on both side of the separating element by steel cable trays (perforated or non-perforated), steel ladders or alternative service support constructions (e.g. pipe hangers) made of metal with a melting or decomposition point greater or equal than 945 °C for EI 60, or 1006 °C for EI 90, or 1049 °C for EI 120 (e.g. stainless steel or galvanized steel) according to the ETA-holder's installation instructions.

Mulcol® Multifoam Stone System **- Details for installation -**	**ANNEX A-1**

> All types of cables, conduits / tubes, metal pipes and plastic pipes – in rigid floors – have to be supported at least on the top side of the separating element by steel cable trays (perforated or non-perforated), steel ladders or alternative service support constructions (e.g. pipe hangers) made of metal with a melting or decomposition point greater or equal than 945 °C for EI 60, or 1006 °C for EI 90, or 1049 °C for EI 120 (e.g. stainless steel or galvanized steel) according to the ETA-holder's installation instructions.

> Steel cable trays (perforated or non-perforated) or steel ladders can pass through or end at the surface of the penetration seal.

> Lidded cable trays / trunkings must not pass through the penetration seal.

> The first support (service support construction) for cables and conduits / tubes in flexible walls and rigid walls has to be at maximum 200 mm (measured from the surface of the penetration seal).

> The first support (service support construction) for cables and conduits / tubes in rigid floors has to be at maximum 250 mm (measured from the surface of the penetration seal).

> The first support (service support construction) for plastic pipes and metal pipes in flexible walls and rigid walls has to be at maximum 750 mm (measured from the surface of the penetration seal).

> The first support (service support construction) for plastic pipes and metal pipes in rigid floors has to be at maximum 1200 mm (measured from the surface of the penetration seal).

> All types of cables, conduits / tubes, metal pipes and plastic pipes have to be fixed according to the ETA-holder's installation instructions to the service support construction.

> Conduit bundles have to be fixed (bound together) on both sides of the penetration seal with at least one winding of e.g. steel wire (minimum diameter 1 mm) at maximum 200 mm (measured from the surface of the penetration seal).

2 Details for installation of "Mulcol® Multifoam Stone System" (see Annex B-1 to C-3 of the ETA)

> "Mulcol® Multifoam Stone System" has to be installed according to the ETA-holder's installation instructions.

> "Mulcol® Multifoam Stone System" will be formed by fitting "Mulcol® Multifoam Stone" tightly in the opening of the separating element so that all interstices and voids are carefully sealed.

> Open joints (≤ 5 mm) and joints between the cables, conduits / pipes, cable support constructions and the penetration seal have to be filled according to the ETA-holder's installation instructions with "Mulcol® Multifoam Mastic" to a depth of minimum 20 mm.

> If the opening size is maximum 270 mm x 270 mm (width x height) and if there are no open joints or joints between the cables, conduits / pipes, cable support constructions and the penetration seal "Mulcol® Multifoam Mastic" needs not to be applied.

Mulcol® Multifoam Stone System **- Details for installation -**	**ANNEX A-2**

> It is allowed to close areas within the mixed penetration seal "Mulcol® Multifoam Stone System" alternatively to "Mulcol® Multifoam Stone" completely with "Mulcol® Multifoam 2K". In this case the maximum area which can be closed with "Mulcol® Multifoam 2K" is 450 mm x 500 mm (width x height) or 0,225 m². For details see Annex I-1 of the ETA.

> It is also allowed to fill open joints between "Mulcol® Multifoam Stone" and the aperture with "Mulcol® Multifoam 2K". For details see Annex I-1 of the ETA.

> Joints between "Mulcol® Multifoam Stone" need not be filled with "Mulcol® Multifoam Mastic" or "Mulcol® Multifoam 2K".

> Joints between "Mulcol® Multifoam Stone" and the aperture need not be filled with "Mulcol® Multifoam Mastic" or "Mulcol® Multifoam 2K".

> For tied cable bundles (see clause 2.1 of the ETA) the space between the cables needs not be filled with "Mulcol® Multifoam Mastic" or "Mulcol® Multifoam 2K".

> In some cases (see Annex J-1 of the ETA) – for fire resistance class EI 90 – cables and conduits / tubes have to be coated at a length of minimum 30 mm (measured from the surface of the penetration seal) with "Mulcol® Multifoam Mastic" with a minimum thickness of 5 mm on both sides of the penetration seal according to the ETA-holder's installation instructions.

> In some cases (see Annex J-1 of the ETA) – for fire resistance class EI 90 (as an alternative for the above described coating with "Mulcol® Multifoam Mastic") and fire resistance class EI 120 – "Mulcol® Multifoam Wrap" has to be wrapped on both sides of the penetration seal according to the ETA-holder's installation instructions around the cables, conduits / tubes and cable support constructions (see Annex H-1 of the ETA).

2.1 Details for installation in flexible wall constructions (see Annex B-1 and B-2 of the ETA)

> The aperture within the wall has to be lined with steel studs with a thickness of minimum 0,6 mm (steel studs are not required for apertures of dimension ≤ 320 mm x 320 mm; construction and installation according to the ETA-holder's installation instructions) and minimum 2 layers of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ and a minimum thickness of 25 mm. The boards shall be at least 144 mm or 200 mm (depending on the fire resistance classification; see Annex B-1 and J-1 of the ETA) wide. The boards have to be installed and fixed according to the ETA-holder's installation instructions.

Mulcol® Multifoam Stone System **- Details for installation -**	**ANNEX A-3**

> Alternatively the thickness of the wall can be increased to at least 144 mm or 200 mm (depending on the fire resistance classification; see Annex J-1 of the ETA) by fitting a board frame, minimum 50 mm wide, around the opening (see Annex B-2 of the ETA). Minimum 1 layer of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ can be used. The aperture within the wall has to be lined with steel studs with a thickness of minimum 0,6 mm (construction and installation according to the ETA-holder's installation instructions).The board frame has to be installed and fixed according to the ETA-holder's installation instructions.

> Joints between the aperture lining and the aperture have to be filled with "Mulcol® Multifoam Mastic" or gypsum joint filler (non-combustible material with classification A2-s1,d0 or A1 according to EN 13501-1 which is dimensionally stable) on both sides of the penetration seal according to the ETA-holder's installation instructions.

2.2 Details for installation in rigid walls (see Annex B-3 to B-5 of the ETA)

> For walls thinner than the minimum thickness of the penetration seal (144 mm or 200 mm; depending on the fire resistance classification, see Annex J-1 of the ETA) the opening shall be lined with minimum 2 layers of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ and a minimum thickness of 25 mm. The boards shall be at least 144 mm or 200 mm (depending on the fire resistance classification; see Annex B-4 and J-1 of the ETA) wide. The boards have to be installed and fixed according to the ETA-holder's installation instructions.

> Alternatively the thickness of the wall can be increased to at least 144 mm or 200 mm (depending on the fire resistance classification; see Annex J-1 of the ETA) by fitting a board frame, minimum 50 mm wide, around the opening (see Annex B-5 of the ETA). Minimum 1 layer of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ can be used. The board frame has to be installed and fixed according to the ETA-holder's installation instructions.

> Joints between the aperture lining and the aperture have to be filled with "Mulcol® Multifoam Mastic", or gypsum joint filler or mineral mortar (non-combustible material with classification A2-s1,d0 or A1 according to EN 13501-1 which is dimensionally stable) on both sides of the penetration seal according to the ETA-holder's installation instructions.

2.3 Details for installation in rigid floors (see Annex C-1 to C-3 of the ETA)

> For floors thinner than penetration seals with a nominal thickness of 200 mm the opening shall be lined with minimum 2 layers of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ and a minimum thickness of 25 mm. The boards shall be at least 200 mm wide (see Annex C-2 of the ETA). The boards have to be installed and fixed according to the ETA-holder's installation instructions.

Mulcol® Multifoam Stone System **- Details for installation -**	**ANNEX A-4**

> Alternatively the thickness of the floor can be increased to at least 200 mm by fitting a board frame, minimum 50 mm wide, around the opening (see Annex C-3 of the ETA). Minimum 1 layer of ≥ 12,5 mm thick type F gypsum boards according to EN 520 (classification A2-s1,d0 according to EN 13501-1) or silicate- or calcium silicate boards (classification A1 according to EN 13501-1) with a minimum density of 450 kg/m³ can be used. The board frame has to be installed and fixed according to the ETA-holder's installation instructions.

> Joints between the aperture lining and the aperture have to be filled with "Mulcol® Multifoam Mastic", or gypsum joint filler or mineral mortar (non-combustible material with classification A2-s1,d0 or A1 according to EN 13501-1 which is dimensionally stable) on both sides of the penetration seal according to the ETA-holder's installation instructions.

3 Minimum working clearances

> The minimum working clearances (a1, a2, a3; for pipes only linear arrangement is allowed, no clusters) and the minimum clearance between the penetration seals are specified in Annex D-1 of the ETA.

4 Subsequent addition (retrofitting) and removal

> Subsequent addition (retrofitting) and removal of cables, conduits / tubes, pipes and cable support constructions according to the ETA holder's installation instructions is allowed.

> Retrofitting and removal without addition of cables, conduits / tubes, pipes and cable support constructions shall be done according to the ETA holder's installation instructions and the regulations of Annex A-2 of the ETA.

5 Transport and storage

> The indications of the manufacturer regarding transport and storage (minimum and maximum storing temperature, maximum duration of storage) have to be followed.

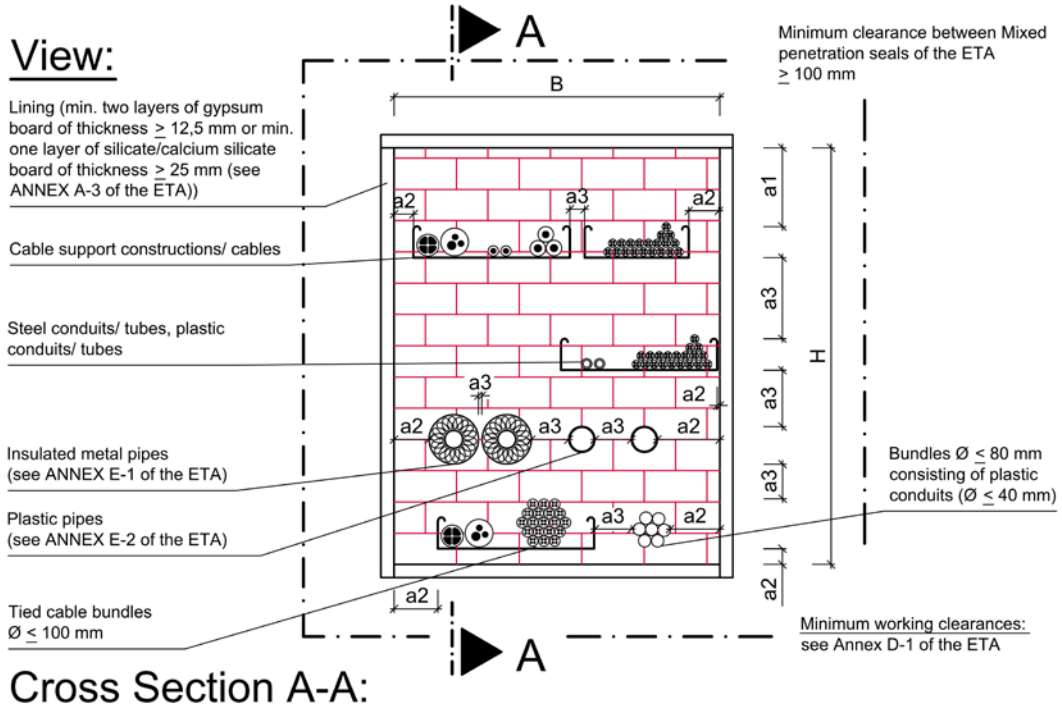
6 Use, maintenance and repair

> The fire resistance of the penetration seal shall not be negatively affected by future changes to buildings or building elements.

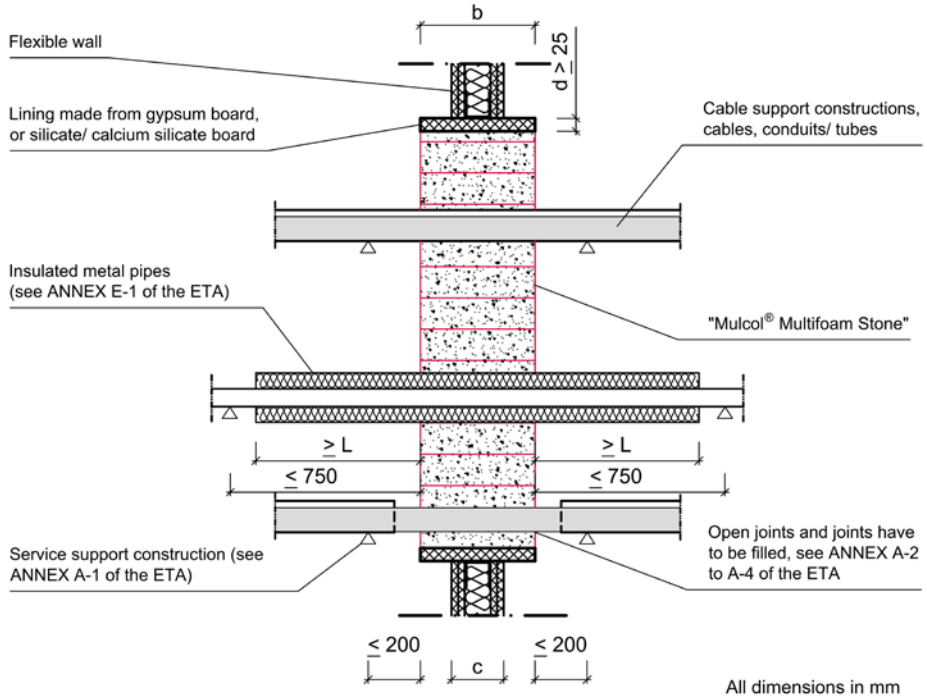
> The assessment of the fitness for use is based on the assumption that necessary maintenance and repair if required is carried out in accordance with the manufacturer's instructions during the assumed intended working life.

Mulcol® Multifoam Stone System **- Details for installation -**	**ANNEX A-5**

View:



Cross Section A-A:



All dimensions in mm

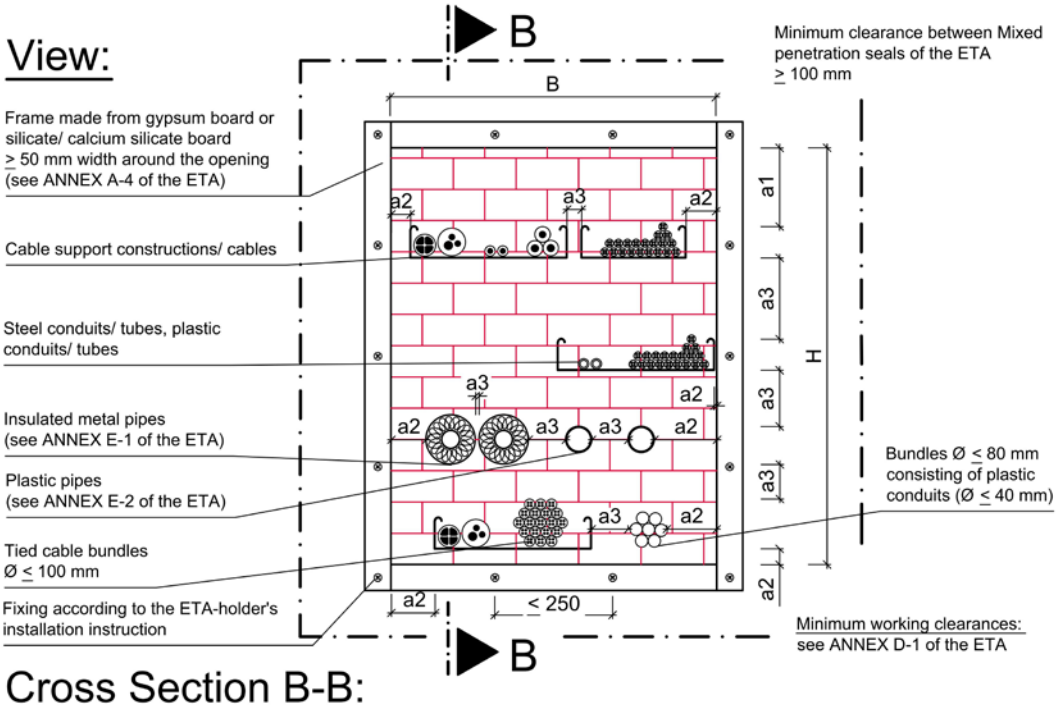
Separating element	Fire resistance classification	Wall thickness c [mm]	Max. opening size H [mm]	Max. opening size B [mm]	Thickness of penetration seal b [mm]
Flexible wall	see ANNEX J-1 of the ETA	≥ 94	≤ 1000	≤ 600	see ANNEX J-1 of the ETA
			≤ 600	≤ 1000	

Mulcol® Multifoam Stone System

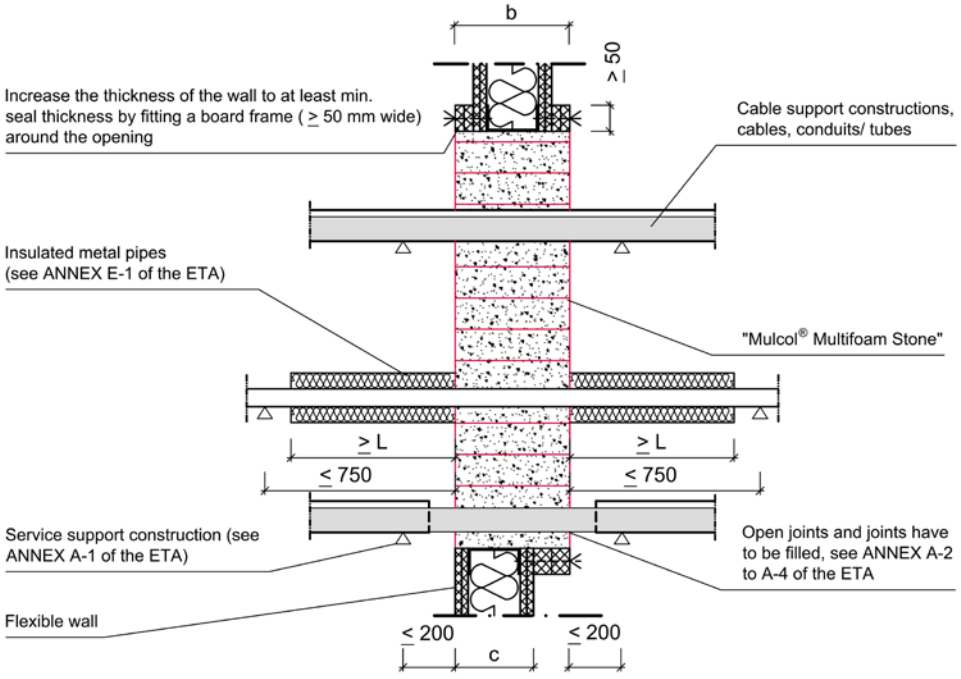
- Installation in flexible wall, thickness c ≥ 94 mm -

ANNEX B-1

View:



Cross Section B-B:



All dimensions in mm

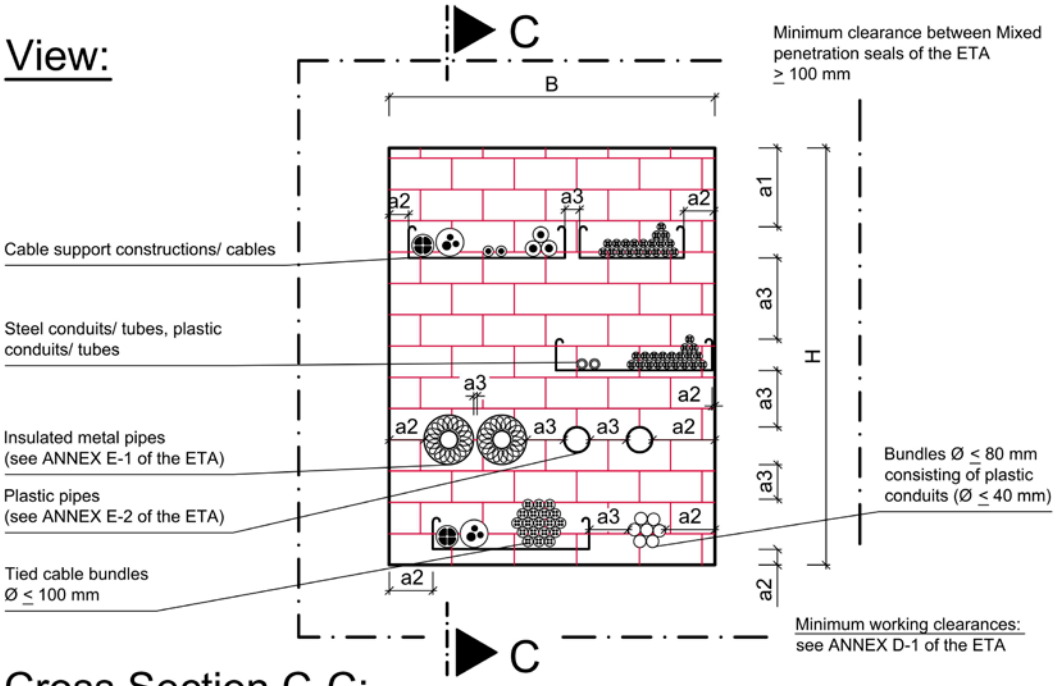
Separating element	Fire resistance classification	Wall thickness c [mm]	Max. opening size H [mm]	Max. opening size B [mm]	Thickness of penetration seal b [mm]
Flexible wall	see ANNEX J-1 of the ETA	≥ 94	≤ 1000	≤ 600	see ANNEX J-1 of the ETA
			≤ 600	≤ 1000	

Mulcol® Multifoam Stone System

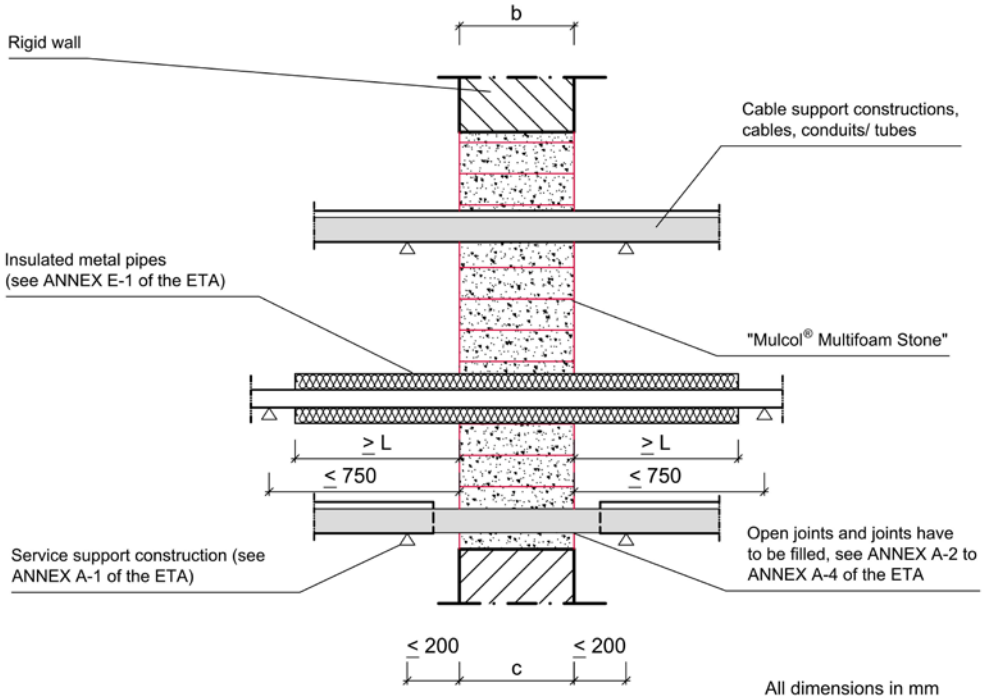
- Installation in flexible wall, thickness c ≥ 94 mm -

ANNEX B-2

View:



Cross Section C-C:



All dimensions in mm

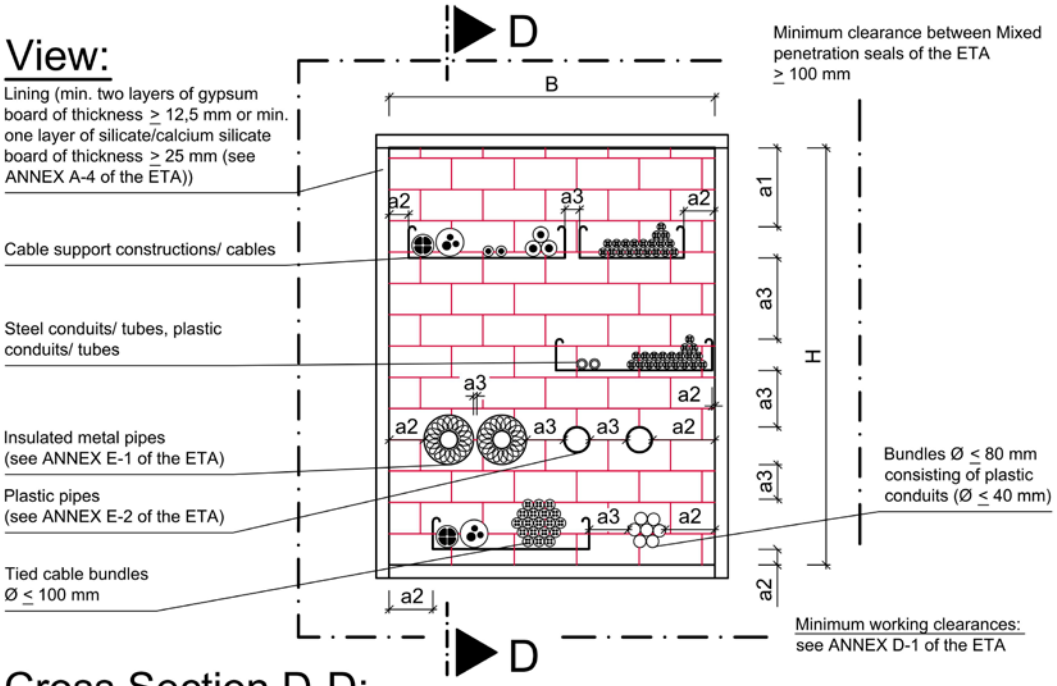
Separating element	Fire resistance classification	Wall thickness c [mm]	Max. opening size H [mm]	Max. opening size B [mm]	Thickness of penetration seal b [mm]
Rigid wall	see ANNEX J-1 of the ETA	≥ b	≤ 1000	≤ 600	see ANNEX J-1 of the ETA
			≤ 600	≤ 1000	

Mulcol® Multifoam Stone System

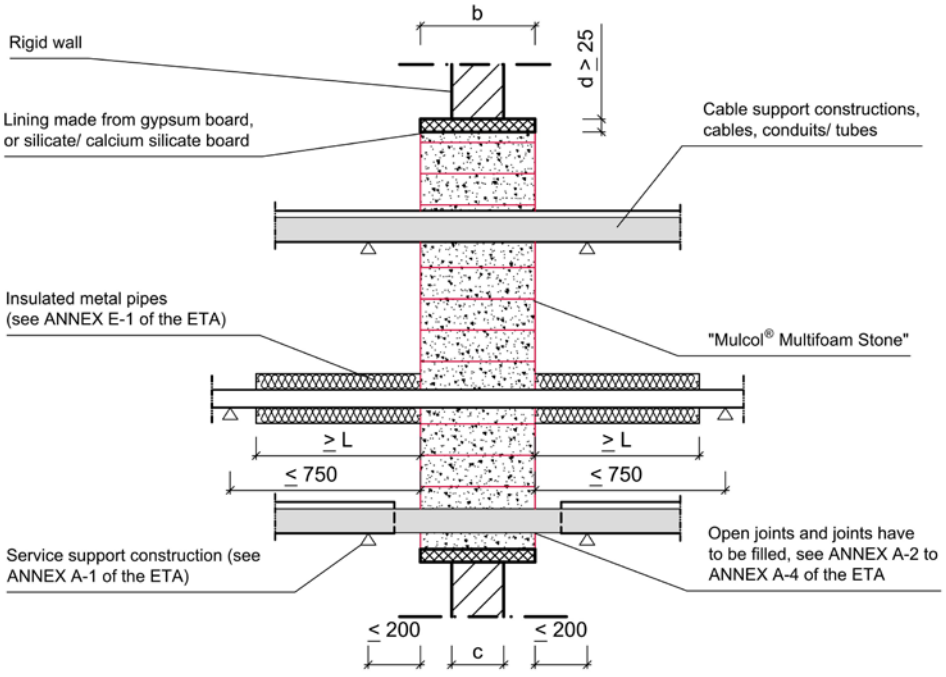
- Installation in rigid wall, thickness c ≥ b -

ANNEX B-3

View:



Cross Section D-D:



All dimensions in mm

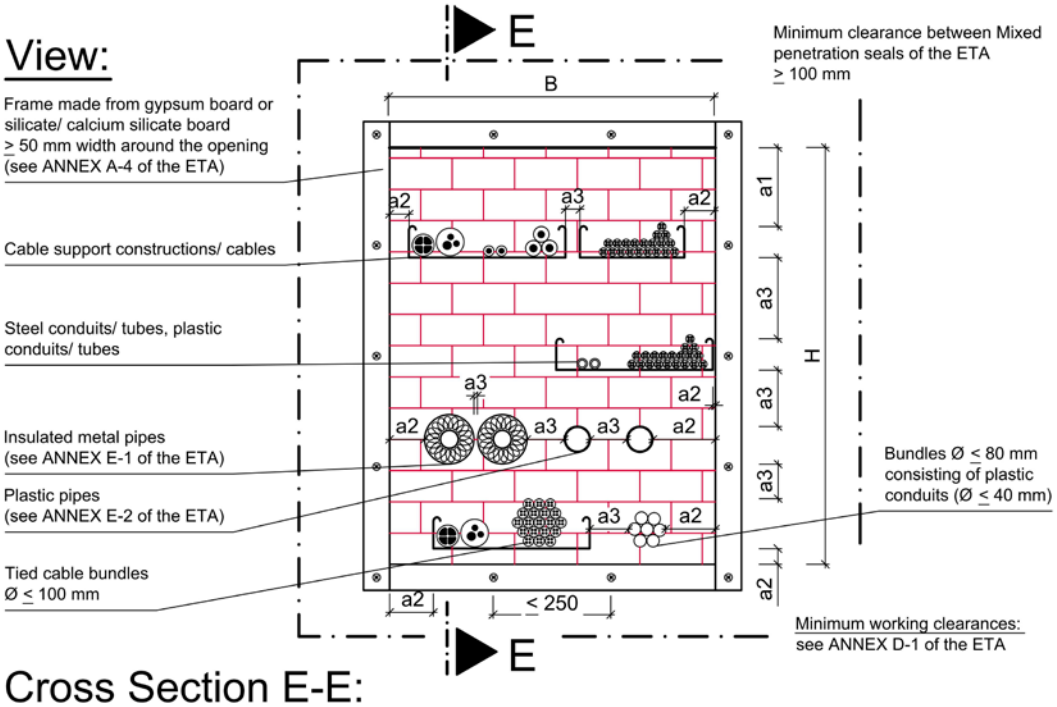
Separating element	Fire resistance classification	Wall thickness c [mm]	Max. opening size H [mm]	Max. opening size B [mm]	Thickness of penetration seal b [mm]
Rigid wall	see ANNEX J-1 of the ETA	100 mm ≤ c < b	≤ 1000	≤ 600	see ANNEX J-1 of the ETA
			≤ 600	≤ 1000	

Mulcol® Multifoam Stone System

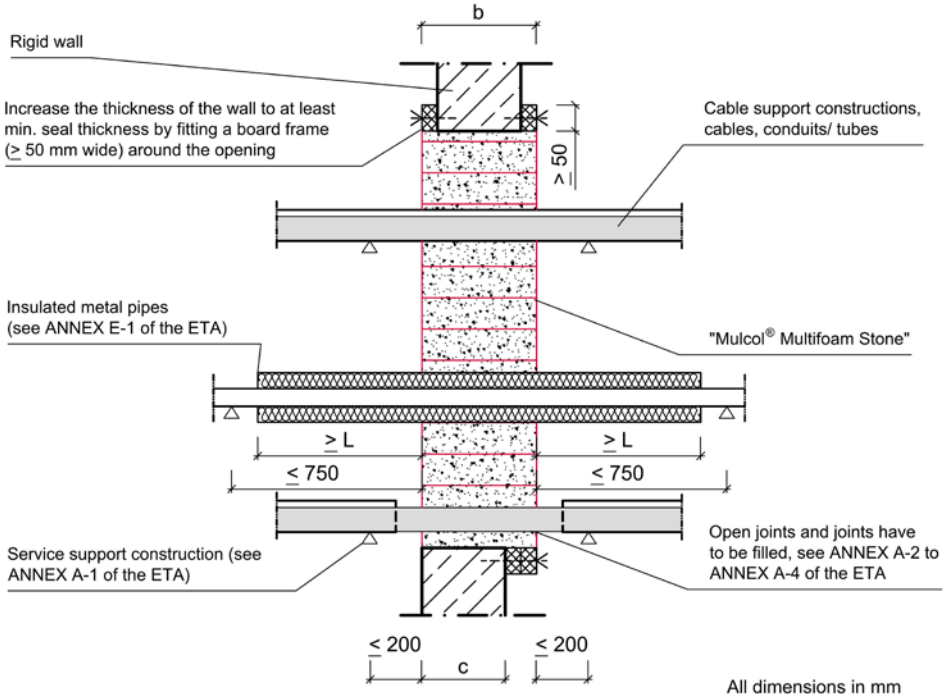
- Installation in rigid wall, thickness 100 mm ≤ c < b -

ANNEX B-4

View:



Cross Section E-E:



All dimensions in mm

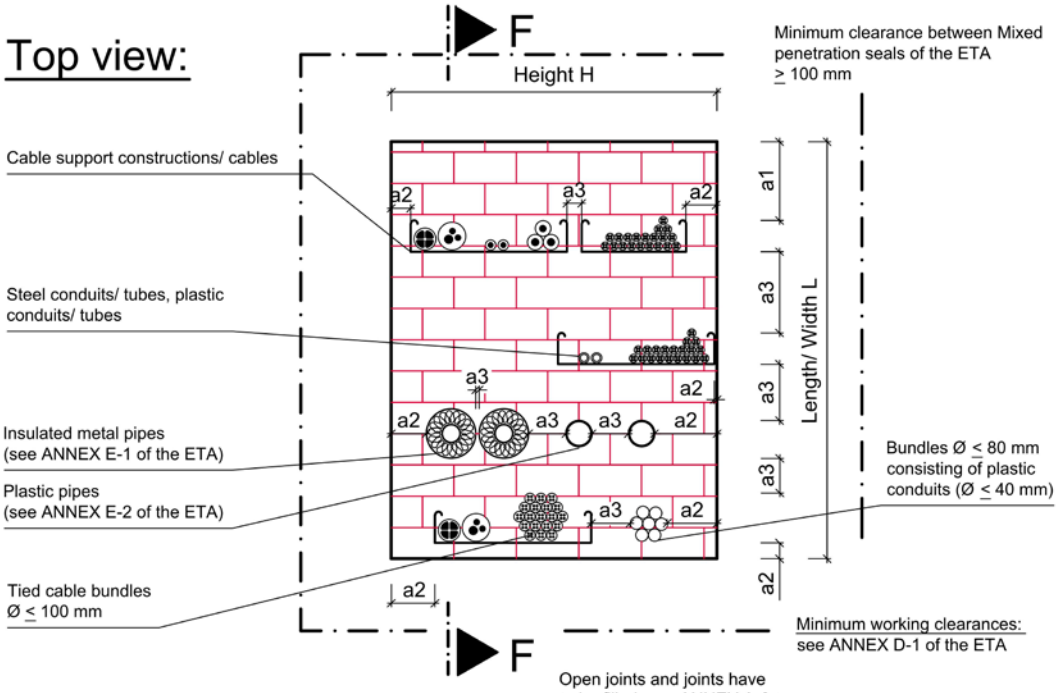
Separating element	Fire resistance classification	Wall thickness c [mm]	Max. opening size H [mm]	Max. opening size B [mm]	Thickness of penetration seal b [mm]
Rigid wall	see ANNEX J-1 of the ETA	100 mm ≤ c < b	≤ 1000	≤ 600	see ANNEX J-1 of the ETA
			≤ 600	≤ 1000	

Mulcol® Multifoam Stone System

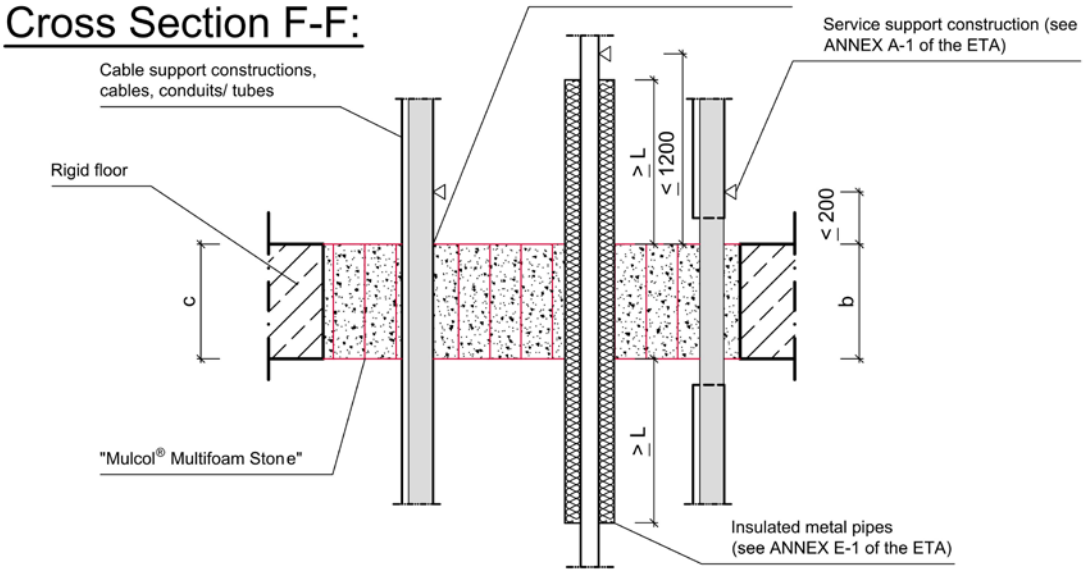
- Installation in rigid wall, thickness 100 mm ≤ c < b -

ANNEX B-5

Top view:



Cross Section F-F:



All dimensions in mm

Separating element	Fire resistance classification	Floor Thickness c [mm]	Max. opening size *) Length/Width L [mm] b = 144 mm	Max. opening size *) Length/Width L [mm] b = 200 mm	Max. opening size *) Height H [mm]	Thickness of penetration seal b [mm]
Rigid floor	see ANNEX J-1 of the ETA	≥ b (min. 150 mm)	unlimited	unlimited	≤ 375	see ANNEX J-1 of the ETA
			6000	unlimited	400	
			2250	4800	450	
			1000	1300	600	
			---	1000	700	

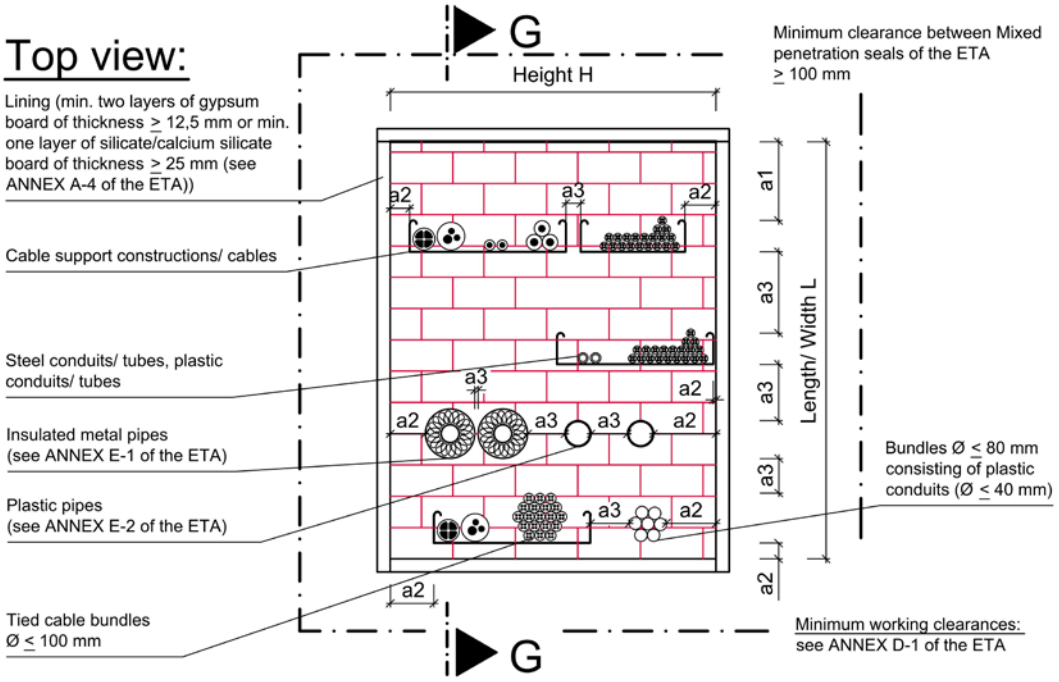
*) The maximum length/width L depends on the height H of the penetration seal. For other combinations see ANNEX G-1 of the ETA.

Mulcol® Multifoam Stone System

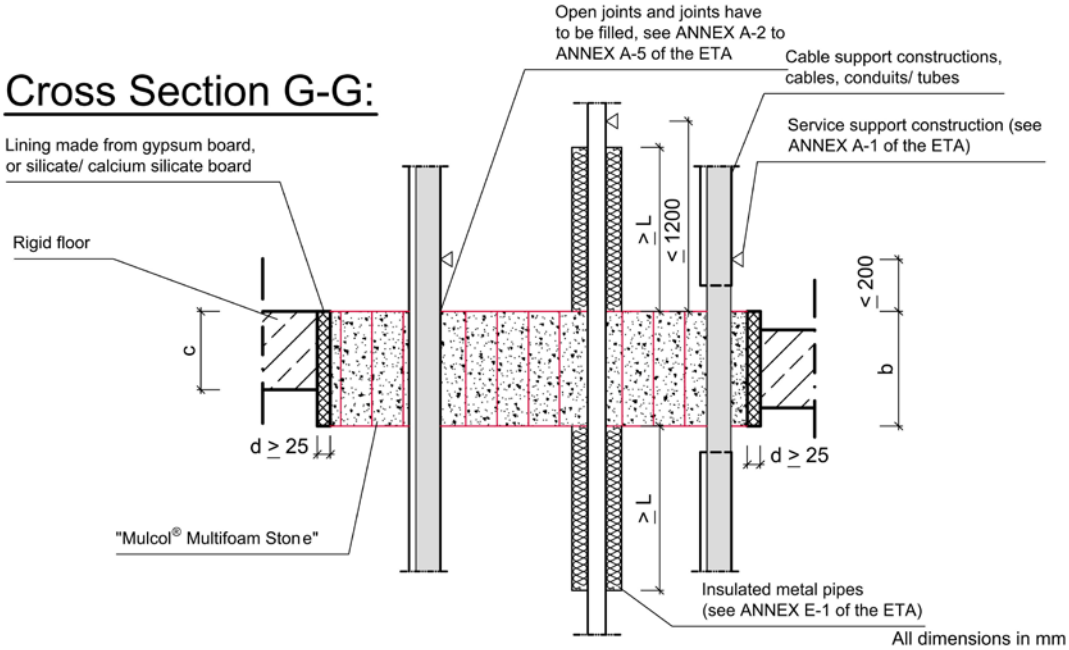
- Installation in rigid floor, thickness c ≥ b -

ANNEX C-1

Top view:



Cross Section G-G:



All dimensions in mm

Separating element	Fire resistance classification	Floor Thickness c [mm]	Max. opening size *) Length/Width L [mm] b = 200 mm	Max. opening size *) Height H [mm]	Thickness of penetration seal b [mm]
Rigid floor	see ANNEX J-1 of the ETA	150 ≤ c < 200 mm	unlimited	≤ 375	see ANNEX J-1 of the ETA
			unlimited	400	
			4800	450	
			1300	600	
			1000	700	

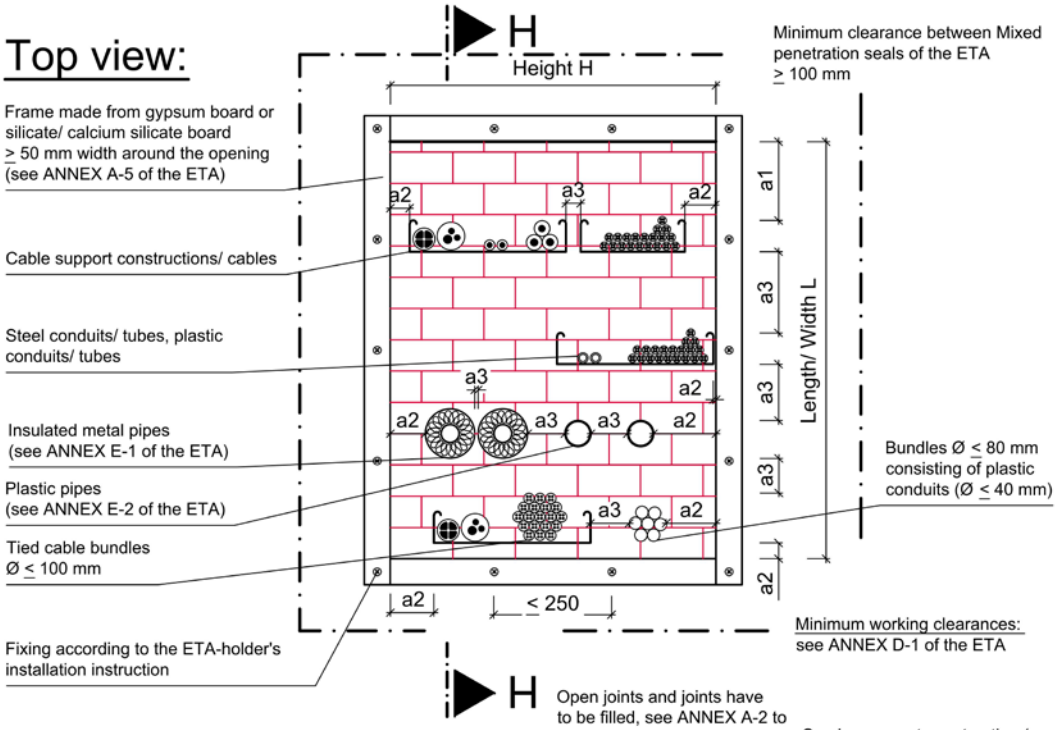
*) The maximum length/width L depends on the height H of the penetration seal. For other combinations see ANNEX G-1 of the ETA.

Mulcol® Multifoam Stone System

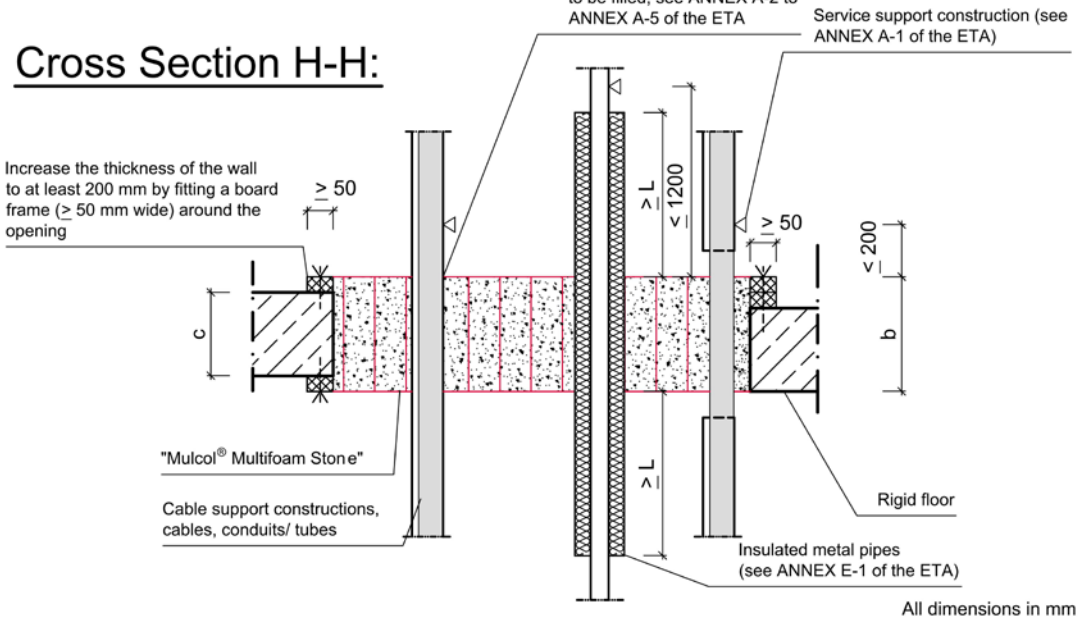
- Installation in rigid floor, thickness 150 mm ≤ c < 200 mm -

ANNEX C-2

Top view:



Cross Section H-H:



All dimensions in mm

Separating element	Fire resistance classification	Floor Thickness c [mm]	Max. opening size *) Length/Width L [mm] b = 200 mm	Max. opening size *) Height H [mm]	Thickness of penetration seal b [mm]
Rigid floor	see ANNEX J-1 of the ETA	150 ≤ c < 200 mm	unlimited	≤ 375	see ANNEX J-1 of the ETA
			unlimited	400	
			4800	450	
			1300	600	
			1000	700	

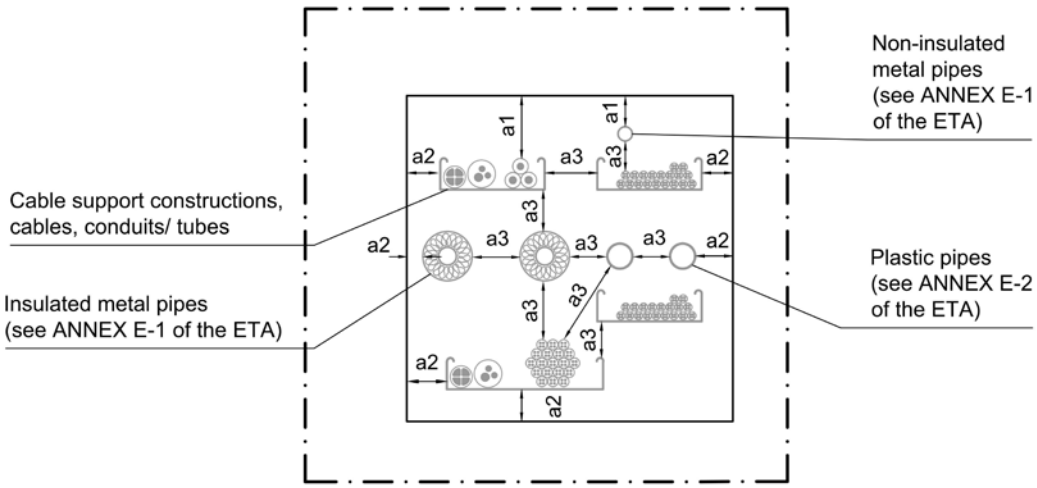
*) The maximum length/width L depends on the height H of the penetration seal. For other combinations see ANNEX G-1 of the ETA.

Mulcol® Multifoam Stone System

- Installation in rigid floor, thickness 150 mm ≤ c < 200 mm -

ANNEX C-3

View:



Min. working clearance:
a1: Penetrating element / top edge of penetration seal
a2: Penetrating element / side or lower edge of penetration seal
a3: Penetrating element / Penetrating element

Minimum clearance between Mixed penetration seals of the ETA ≥ 100 mm

Minimum working clearance			
Penetrating element	**a1**	**a2**	**a3**
Cables/ Cable trays/ Conduits	50 mm	0 mm	• Cables/ Cable trays/ Conduits, horizontal 0 mm • Cables/ Cable trays/ Conduits, vertical 50 mm • Non-insulated metal pipes 60 mm • Other penetrating elements 50 mm
Mineral wool (see clause 1 of the ETA) insulated metal pipes	0 mm	0 mm	• Mineral wool insulated metal pipes 0 mm • Non-insulated metal pipes 60 mm • Other penetrating elements 50 mm
AF/Armaflex insulated metal pipes	35 mm	35 mm	• AF/Armaflex (thickness > 9 mm) insulated metal pipes 35 mm • AF/Armaflex (thickness 9 mm) insulated metal pipes 50 mm • Non-insulated metal pipes 60 mm • Other penetrating elements 50 mm
Non-insulated metal pipes	35 mm	35 mm	• Non-insulated metal pipes 60 mm • Other penetrating elements 60 mm
Plastic pipes	50 mm	50 mm	• Plastic pipes 50 mm • Non-insulated metal pipes 60 mm • Other penetrating elements 50 mm

Mulcol® Multifoam Stone System

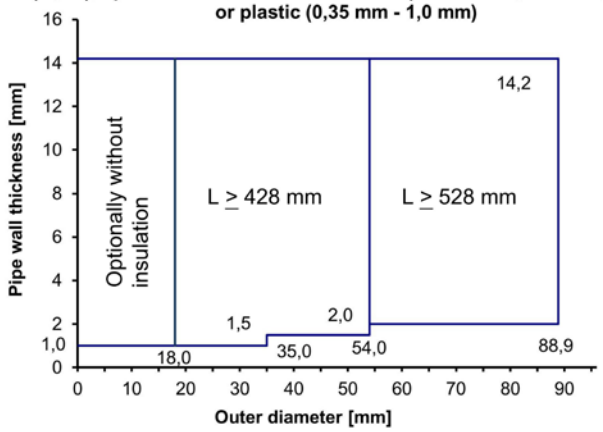
- Minimum working clearances -

ANNEX D-1

Field of application of metal pipes

Mineral wool (acc. to clause 1 of the ETA) insulated metal pipes acc. to clause 2.1 of the ETA (C/U) and (C/C)

Metal pipes made of copper, steel, stainless steel, cast iron insulated with mineral wool, insulation optional sustained (LS, CS) or interrupted (LI, CI), optional cladded with sheet steel (thickness 0,4 mm - 1,0 mm) or plastic (0,35 mm - 1,0 mm)

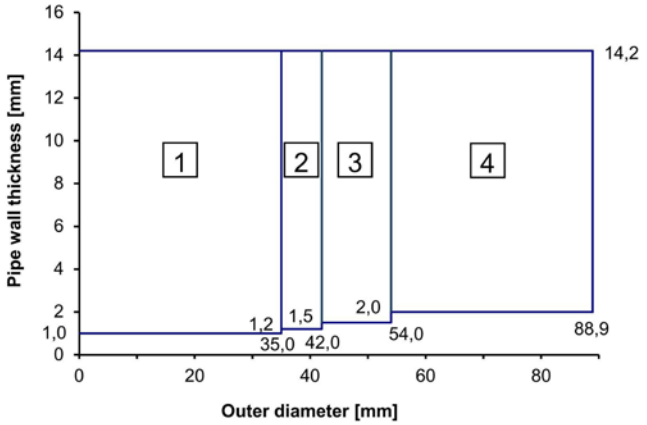


L measured from the surface of the penetration seal see ANNEX B-1 to C-3 of the ETA.

Case	Density of mineral wool	Thickness of mineral wool
LI (local-interrrupted)	≥ 90 kg/m³	30 mm
LS (local-sustained)		30 mm
CI (continued-interrupted)		≥ 30 mm
CS (continued-sustained)		≥ 30 mm

AF/Armaflex insulated metal pipes (C/U) and (C/C)

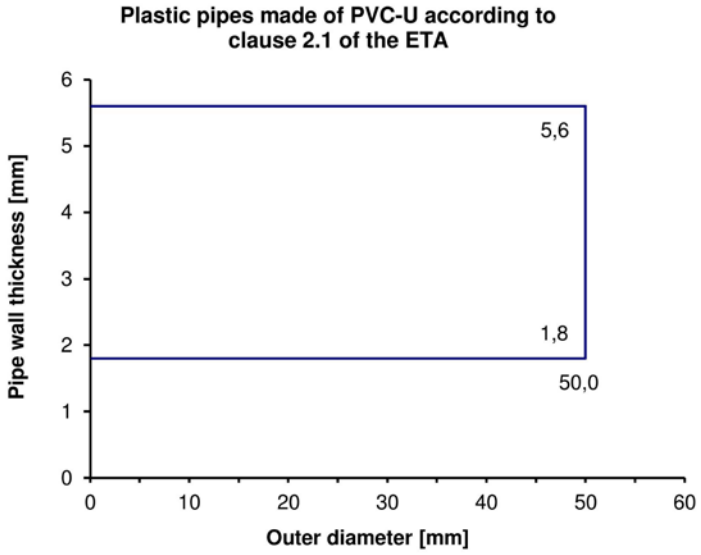
Metal pipes made of copper, steel, stainless steel, cast iron insulated with AF/Armaflex, insulation sustained (LS or CS), minimum length 500 mm on both sides of mixed penetration seal

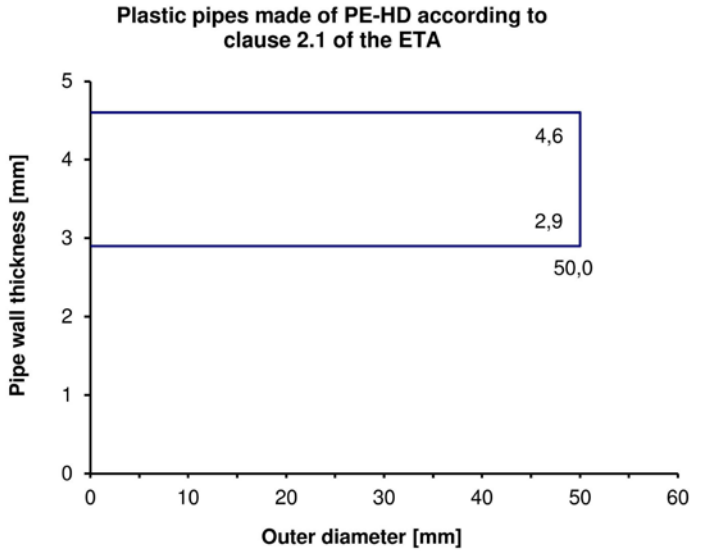


1 Insulation thickness 9,0 mm to 35,0 mm, L ≥ 500 mm
2 Insulation thickness 9,0 mm to 36,5 mm, L ≥ 500 mm
3 Insulation thickness 9,0 mm to 38,0 mm, L ≥ 500 mm
4 Insulation thickness 41,5 mm, L ≥ 500 mm

Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in flexible walls, rigid walls and rigid floors	**ANNEX E-1**

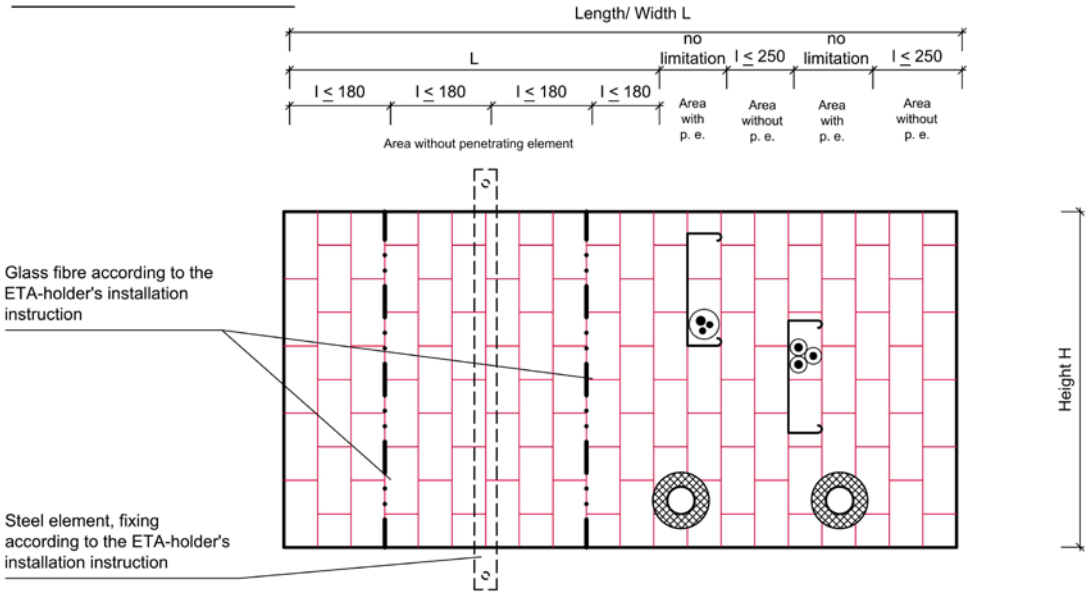
Field of application of plastic pipes (U/C), (C/C):



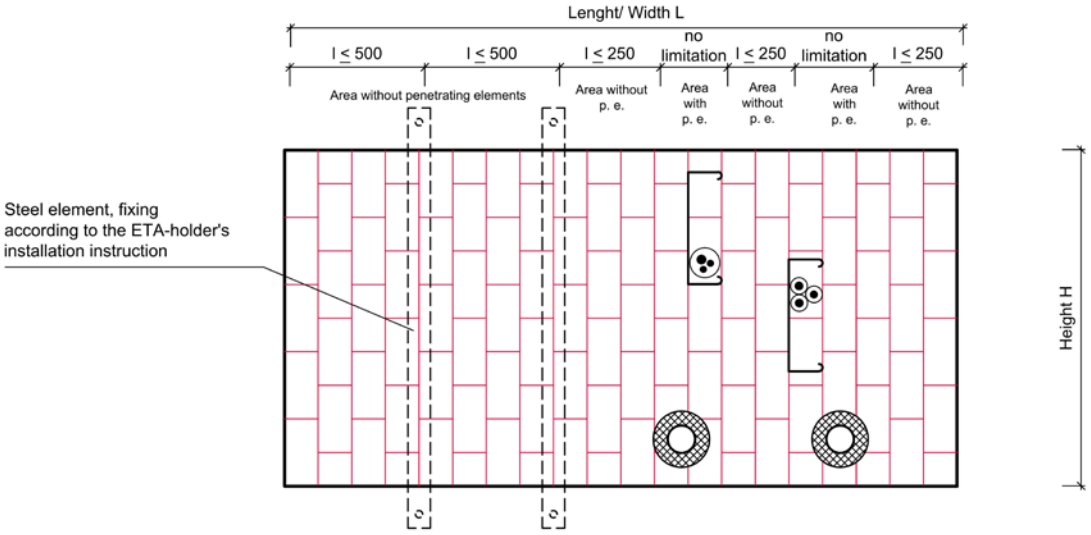


Interpolation between pipe diameters and wall thicknesses for plastic pipes according to clause 2.1 of the ETA in flexible walls, rigid walls and rigid floors	**ANNEX E-2**

Top view: Installation of glass fabric or steel element for b = 144 mm



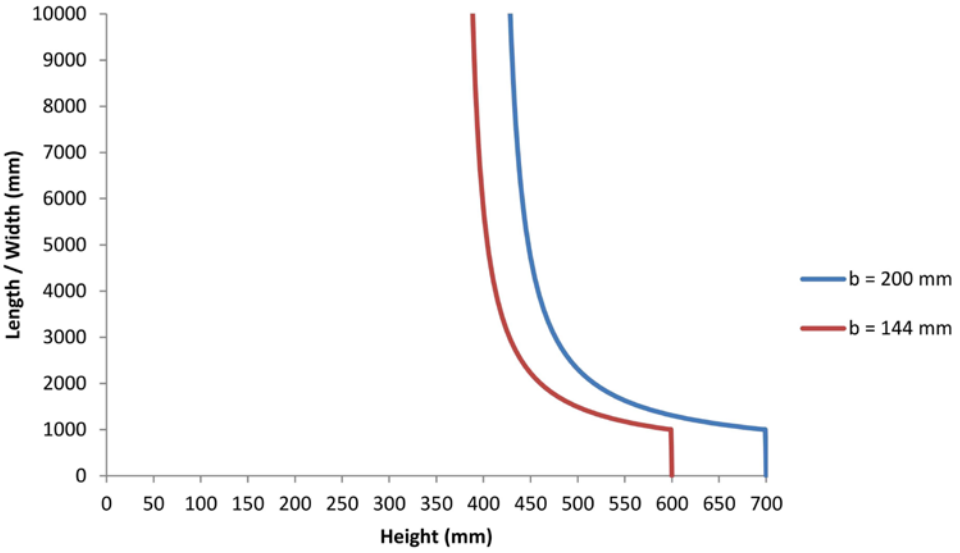
Top view: Installation of steel elements for b = 200 mm



In case of installation in floor openings, free areas (without any elements penetrating the penetration seal) have to be supported with steel elements (minimum width of 40 mm and minimum thickness of 2 mm) on the bottom side of the floor. Alternatively it is possible to install a glass fabric according to the ETA-holder's installation instruction every 180 mm between "Mulcol® Multifoam Stone" (width of glass fabric ≥ b). Areas with elements penetrating the penetration seal are not subject to any limitations.

Mulcol® Multifoam Stone System **- Rigid floors: Installation of glass fibre / steel elements -**	**ANNEX F-1**

Maximum dimensions of "Mulcol® Multifoam Stone System" in rigid floors



The maximum length (width) of the seal in rigid floors has to be calculated as follows:

$$length\ (width) = \frac{height}{(((c_{tested}/2) * height) - 1)}$$

	Seal thickness b = 144 mm	Seal thickness b = 200 mm
Maximum height	600 mm	700 mm
Minimum perimeter length to seal area ratio (c_{tested})	0,005333 mm / mm²	0,004857 mm / mm²
length (width)	$\frac{height}{(((0{,}005333 mm/mm^2/2) * height) - 1)}$ ex.: H = 500 mm → L = 1500 mm	$\frac{height}{(((0{,}004857 mm/mm^2/2) * height) - 1)}$ ex.: H = 500 mm → L = 2333 mm

The area on the left side of the graph gives an overview of all possible combinations of length (width) and height where the minimum perimeter length to seal area ratio is ≥ c_{tested}.

For a height smaller than 375 mm (b = 144 mm) and 412 mm (b = 200 mm) no limitation of length (width) is required.

Note: The dimensions of the graph are not true to scale.

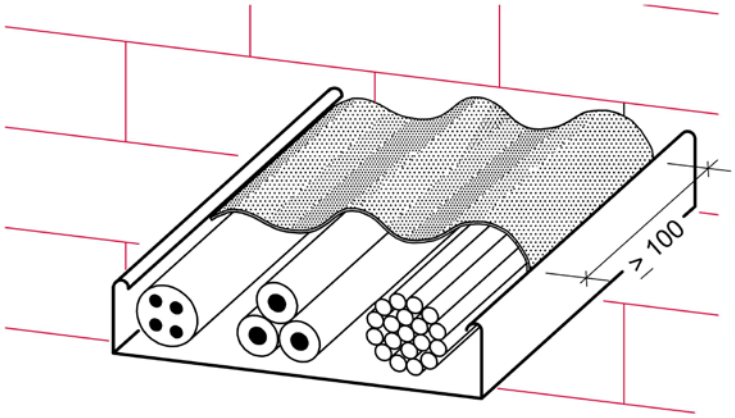
Mulcol® Multifoam Stone System

- Installation in rigid floor – perimeter length to seal area ratio -

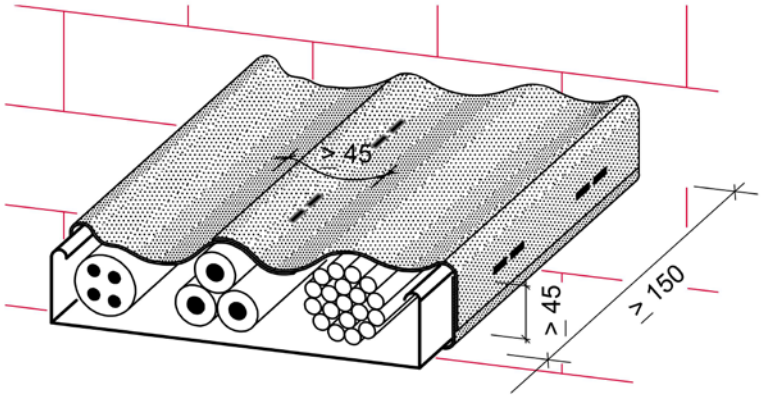
ANNEX G-1

Arrangement of "Mulcol® Multifoam Wrap" for fire resistance classification EI 90 / EI 120 (s. ANNEX J-1 of the ETA):

Step 1: Place a strip of min. 100 mm width of "Mulcol ® Multifoam Wrap" on top



Step 2: Wrap the cables/ cable bundles and cable trays with "Mulcol ® Multifoam Wrap"



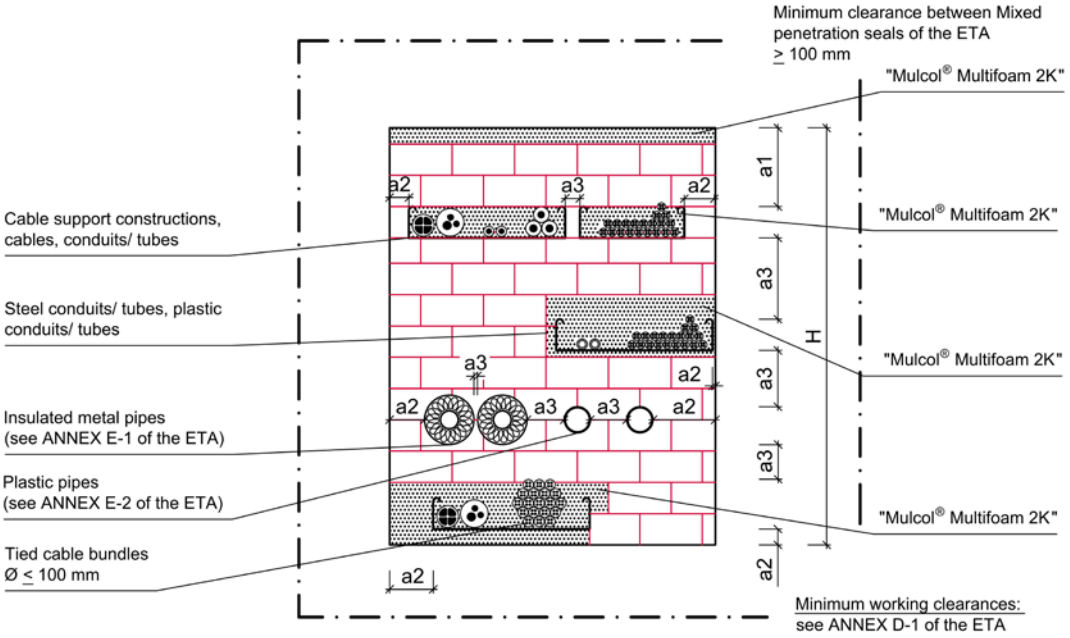
Step 1, only for EI 120: On both sides of the Mixed penetration seal a strip of "Mulcol ® Multifoam Wrap" of at least 100 mm width has to be placed on top of the cables.
Step 2, for EI 90 and EI120: The cables or cable trays have to be wrapped with strips of "Mulcol® Multifoam Wrap" of at least 150 mm width on both sides.
The glass fabric reinforcement fixed to one side of the wrap has to be on the outside. The ends of the wrap have to be fixed with two steel clips or steel wire according to the ETA-holder's installation instruction.
Strips have to overlap each other at least 45 mm.

All dimensions in mm

Mulcol® Multifoam Stone System **- Arrangement of "Mulcol® Multifoam Wrap" -**	**ANNEX H-1**

Application of "Mulcol® Multifoam 2K":

View:



Max. area to be closed with "Mulcol® Multifoam 2K" is 450 mm x 500 mm (width x height) or 0,225 m² (see ANNEX A-2 to A-5 of the ETA).

All dimensions in mm

Separating element	Fire resistance classification	Wall/ Floor thickness c [mm]	Max. opening size	Thickness of penetration seal b [mm]
Flexible/ Rigid wall and Rigid floor	see ANNEX J-1 of the ETA	see ANNEX B-1 to C-3 of the ETA	see ANNEX B-1 to C-3 of the ETA	see Annex J-1 of the ETA

Mulcol® Multifoam Stone System

- Application of "Mulcol® Multifoam 2K" -

ANNEX I-1

Fire resistance classifications: Installation in flexible walls of at least 94 mm, rigid walls of at least 100 mm or rigid floors of at least 150 mm thickness

Penetrating element	Min. thickness of Mixed penetration seal	
	b = 144 mm	b = 200 mm
Sheathed electrical / telecommunication / optical fibre cables up to a maximum diameter of 21 mm	E 60 EI 60	E 120 EI 90 / EI 120[2)]
Sheathed electrical / telecommunication / optical fibre cables with diameter 21 mm < D ≤ 50 mm	E 60 EI 60	E 120 wall: EI 90 / EI 120[2)] floor: EI 90[1) or 2)] / EI 120[2)]
Sheathed electrical / telecommunication / optical fibre cables with diameter 50 mm < D ≤ 80 mm	E 60 EI 60	E 120 EI 90[1) or 2)] / EI 120[2)]
Tied bundles up to 100 mm overall diameter containing sheathed electrical / telecommunication / optical fibre cables of a max. diameter up to 21 mm	E 60 EI 60	E 120 EI 90 / EI 120[2)]
Non-sheathed cables up to a maximum outer diameter of 24 mm	E 60 wall: EI 45 floor: EI 60	E 120 EI 60
Steel conduits/ tubes up to Ø 16 mm with/ without cables	E 60-U/C EI 60-U/C	E 120-U/C EI 120-U/C
Plastic conduits/ tubes up to Ø 40 mm and bundles up to 80 mm consisting of plastic conduits (Ø ≤ 40 mm) with/ without cables	E 60-U/C EI 60-U/C	E 120-U/C EI 120-U/C
Non-insulated metal pipes up to a max. outer diameter of 18 mm	E 60-C/U EI 60-C/U	E 120-C/U EI 60-C/U
Mineral wool insulated metal pipes up to a max. outer diameter of 88,9 mm	E 60-C/U EI 60-C/U	E 120-C/U wall: EI 90-C/U floor: EI 120-C/U
AF/Armaflex (thickness ≥ 9 mm) insulated metal pipes up to a max. outer diameter of 88,9 mm*	E 60-C/U EI 60-C/U	E 120-C/U EI 90-C/U
Plastic pipes up to a max. outer diameter of 50 mm	E 60-U/C EI 60-U/C	E 120-U/C EI 120-U/C

* For permitted insulation see ANNEX E-1 of the ETA

1) Cables and conduits / tubes have to be coated at a length of minimum 30 mm (measured from the surface of the penetration seal) with "Mulcol® Multifoam Mastic" with a minimum thickness of 5 mm on both sides of the penetration seal.
2) "Mulcol® Multifoam Wrap" (see ANNEX H-1 of the ETA) has to be wrapped around the penetrating element on both sides of the penetration seal.

Mulcol® Multifoam Stone System

- Fire resistance classification -

ANNEX J-1