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designated according to Article 29 of the Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment, www.eota.eu)

## European Technical Assessment

**ETA 18/0929**  
**of 12/12/2018**

**Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:** UL International (UK) Ltd

**Trade name of the construction product** Knauf FPM - fire protection mortar

**Product family to which the construction product belongs** Fire Stopping and Sealing Product:  
 • Penetration Seals

**Manufacturer** Knauf Sp. Z o.o.  
 ul. Światowa 25  
 02-229 Warsaw  
 Poland

**Manufacturing plant(s)** A/003

**This European Technical Assessment contains** 64 pages including 1 Annex which forms an integral part of this assessment.

**This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of** EAD 350454-00-1104, September 2017.

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## SPECIFIC PARTS OF THE EUROPEAN TECHNICAL ASSESSMENT

### **1 Technical description of the product**

- 1) Knauf FPM - fire protection mortar is a gypsum based mortar material, used to reinstate the fire resistance performance of wall and floor constructions where they have been provided with apertures for the penetrations of multiple services.
- 2) Knauf FPM - fire protection mortar is supplied as a dry material, and is mixed with water to the required ratio prior to installation.
- 3) Knauf FPM - fire protection mortar when mixed is self-supporting in a wall and floor orientation, and may be used with or without a permanent mineral fibre backing material depending upon the required application and classification (see Annex A).
- 4) Knauf Firewrap are required to be used in conjunction with Knauf FPM - fire protection mortar depending upon the required application and classification (see Annex A). Knauf Firewrap are the subject of ETA 18/0927.
- 5) The applicant submitted a written declaration that Knauf FPM - fire protection mortar does not contain substances which have to be classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the EGDS  
- taking into account the installation conditions of the construction product and the release scenarios resulting from there.  
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.
- 6) The use category of Knauf FPM - fire protection mortar in relation to BWR 3 (Hygiene, health and environment) is IA1, S/W3

### **2 Specification of the intended uses of the product in accordance with the applicable European Assessment Document (Hereinafter EAD): EAD 350454-00-1104**

Detailed information and data is given in Annex A.

- 1) The intended use of Knauf FPM - fire protection mortar is to reinstate the fire resistance performance of flexible wall, rigid wall and floor constructions where they are penetrated by various cables, trays and metallic, plastic and composite pipes.
- 2) The specific elements of construction that the system Knauf FPM - fire protection mortar may be used to provide a penetration seal in, are as follows:
  - a. Flexible walls: The wall must have a minimum thickness of 100 mm and comprise steel studs or timber studs\* lined on both faces with minimum 2 layers of 12.5 mm thick boards.
  - b. Rigid walls: The wall must have a minimum thickness of 100 mm and comprise concrete, aerated concrete or masonry, with a minimum density of 650 kg/m<sup>3</sup>.

- c. Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of 650 kg/m<sup>3</sup>.

\* no part of the penetration seal may be closer than 100 mm to a stud, the cavity must be closed between the penetration seal and the stud, and minimum 100 mm of insulation of class A1 or A2 according to EN 13501-1 must be provided within the cavity between the penetration seal and the stud.

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

- 3) The System Knauf FPM - fire protection mortar may be used to provide a penetration seal with cables, cable trays, plastic pipes, composite pipes and metallic pipes with and without insulation, with mixed services in the same seal/aperture (for details see Annex A).
- 4) The system Knauf FPM - fire protection mortar may be used to seal apertures in the separating element up to 2400mm wide by 1200mm high in a wall, and 2400mm by 1200 mm in a floor. The minimum permitted separation between adjacent seals/apertures is 200mm. Services within the system Knauf FPM - fire protection mortar seal do not require a minimum separation, except where specifically detailed in Annex A.
- 5) Services in floors shall be supported at 250mm and 400mm from the top face. Services in walls shall be supported at 270mm and 470mm from both faces of the wall.
- 6) The provisions made in this European Technical Assessment are based on an assumed working life of the Knauf FPM - fire protection mortar of 30 years, provided that the conditions laid down in sections 4.2/5.1/5.2 for the packaging/transport/ storage/installation/use/repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.
- 7) Type Z<sub>2</sub>: Intended for uses in internal conditions with humidity lower than 85 % RH excluding temperatures below 0°C, without exposure to rain or UV.

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

Product-type: Mortar		Intended use: Penetration Seal
Assessment method	Essential characteristic	Product performance
<b>BWR 2 Safety in case of fire</b>		
EN 13501-1	Reaction to fire	Class 'A1'
EN 13501-2	Resistance to fire	Annex A
<b>BWR 3 Hygiene, health and environment</b>		
EN 1026	Air permeability	No performance determined
EAD 350454-00-1104, Annex C	Water permeability	No performance determined
Declaration of manufacturer & EN 16516	Content, emission and/or release of dangerous substances	Use categories: IA1, S/W3 Declaration of manufacturer
<b>BWR 4 Safety in use</b>		
EOTA TR 001:2003	Mechanical resistance and stability	Suitable for use in walls and floors in Zone Types I, II, III & IV*
EOTA TR 001:2003	Resistance to impact/movement	
EOTA TR 001:2003	Adhesion	
EAD 350454-00-1104, Clause 2.2.9	Durability	Z <sub>2</sub>
<b>BWR 5 Protection against noise</b>		
EN 10140-1,2,4,5/ EN ISO 717-1	Airborne sound insulation	No performance determined
<b>BWR 6 Energy economy and heat retention</b>		
EN 12664, EN 12667, EN 12939, EN ISO 8990, EN ISO 6946, EN ISO 14683, EN ISO 10211, EN ISO 10456	Thermal properties	No performance determined
EN ISO 12572, EN 12086, EN ISO 10456	Water vapour permeability	No performance determined

\*At dimensions up to those given in 2.4) and with soft and hard body impact

**4 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (HEREINAFTER AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE**

According to the decision 1999/454/EC – Commission Decision of date 22nd June 1999 on the procedure for attesting the conformity of construction products pursuant to Article 20(2) of Council Directive 89/106/EEC as regards fire stopping, fire sealing and fire protective products, published in the Official Journal of the European Union (OJEU) L178/52 of 14/07/1999, see <http://eur-lex.europa.eu/JOIndex.do> of the European Commission<sup>1</sup>, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table(s) applies (apply).

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire stopping and Fire Sealing Products	For fire compartmentation and/or fire protection or fire performance	Any	1

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

Tasks of the manufacturer:

Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European technical Assessment.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European Technical Assessment.

The factory production control shall be in accordance with the Control Plan of 8<sup>th</sup> April 2013 relating to the European Technical Assessment ETA 18/0929 issued on 12/12/2018 which is part of the technical documentation of this European Technical Assessment. The "Control Plan" is laid down in the context of the factory production control system operated by the manufacturer and deposited at UL International (UK) Ltd.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the Control Plan.

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<sup>1</sup> Official Journal of the European Communities L178/52 of 14/7/1999

Other tasks of the manufacturer

Additional information

The manufacturer shall provide a technical data sheet and an installation instruction with the following minimum information:

(a) Technical data sheet:

- Field of application:
- Building elements for which the linear joint seal or penetration seal is suitable, type and properties of the building elements like minimum thickness, density, and - in case of lightweight constructions – the construction requirements.
- Limits in size, minimum thickness etc. of the joint or penetration seal
- Construction of the linear joint seal or penetration seal including the necessary components and additional products (e.g. backfilling material) with clear indication whether they are generic or specific.
- Services which the penetration seal is suitable, type and properties of the services like material, diameter, thickness etc. in case of pipes including insulation materials; necessary/allowed supports/fixings (e.g. cable trays)

(b) Installation instruction:

- Steps to be followed
- Procedure in case of retrofitting
- Stipulations on maintenance, repair and replacement

**6 Issued on:**

**12<sup>th</sup> December 2018**

Report by:



D. Yates  
Project Engineer  
Building and Life Safety Technologies

Reviewed by:



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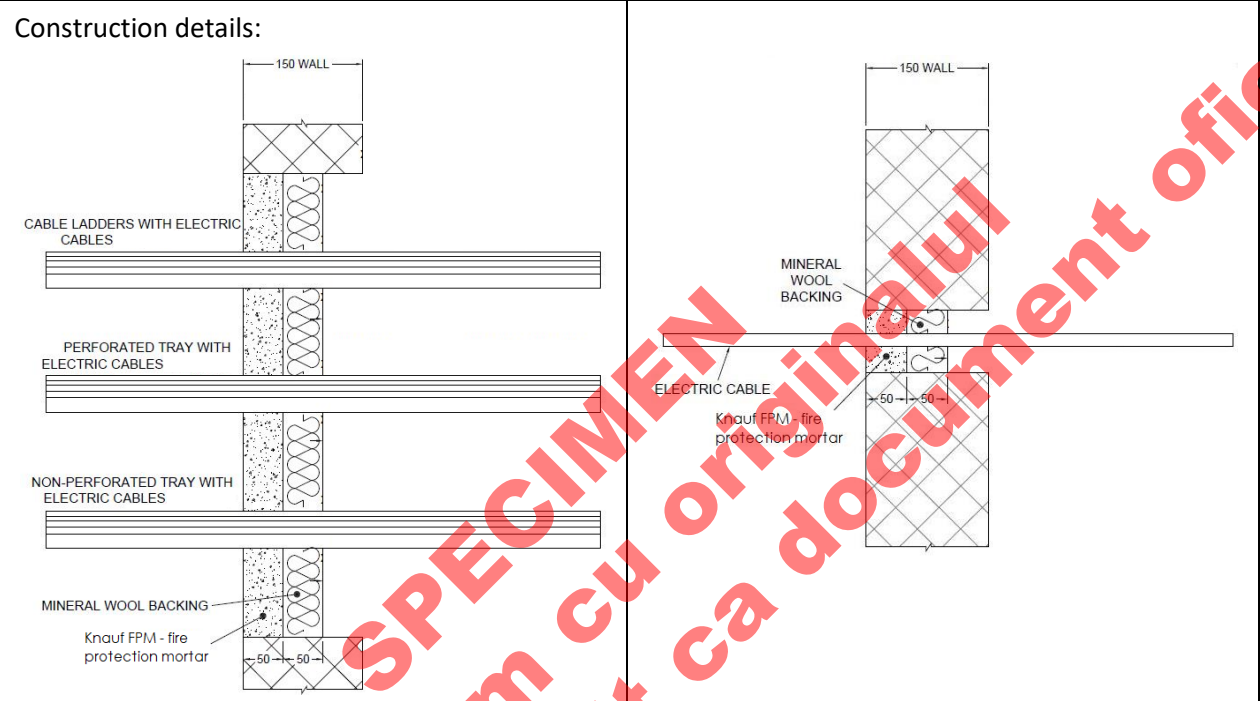
**For and on behalf of UL International (UK) Ltd.**

# ANNEX A – Resistance to Fire Classification – Knauf FPM - fire protection mortar

## A.1 Rigid wall constructions according to 1.2.1 with wall thickness of minimum 150 mm

### A.1.1 Cable penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 25 mm from seal edges), with 50 mm Knauf FPM - fire protection mortar to either side of the wall (or at any position in between), backed with 50 mm stone wool board 150 kg/m<sup>3</sup>.





### A.1.1.1 Single side penetration seal with cables

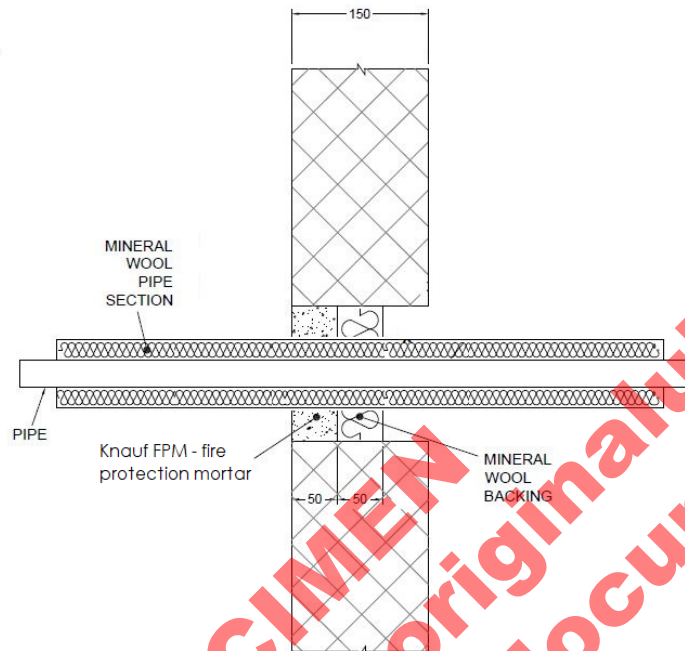
Services	Maximum aperture	Classification
None (blank)	2400 mm wide x 1200 mm high	E 180, EI 120
Single electrical cables up to 21 mm $\varnothing$		E 180, EI 60
Single electrical cables up to 21 mm $\varnothing$	80 x 80 mm	E 240, EI 60
Electrical cables up to 21 mm $\varnothing$ (single, bundled and on trays)	2400 mm wide x 1200 mm high	E 180, EI 60
Electrical cables up to 50 mm $\varnothing$ (single, bundled and on trays)		E 180, EI 45
Electrical cables up to 80 mm $\varnothing$ (single, bundled and on trays)		E 120, EI 45
Telecommunication cables up to 21 mm $\varnothing$ (single or bundles up to 100 mm $\varnothing$ )		E 180, EI 90
Steel cable trays & ladders		E 180, EI 60
Non-sheathed wires up to 17 mm $\varnothing$		E 180, EI 45
Non-sheathed wires up to 24 mm $\varnothing$		E 180, EI 30
Copper conduit up to 16 mm $\varnothing$		E 180 C/U, EI 30 C/U
Steel conduit up to 16 mm $\varnothing$		E 180 C/U, EI 60 C/U
PVC conduit up to 16 mm $\varnothing$		E 180 C/U, E 180 C/C, EI 60 C/U, EI 60 C/C

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**A.1.2 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board**

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges, with 50 mm Knauf FPM - fire protection mortar to either sides of the wall (or any position in between), backed with 50 mm stone wool 150 kg/m<sup>3</sup>).

Construction details:



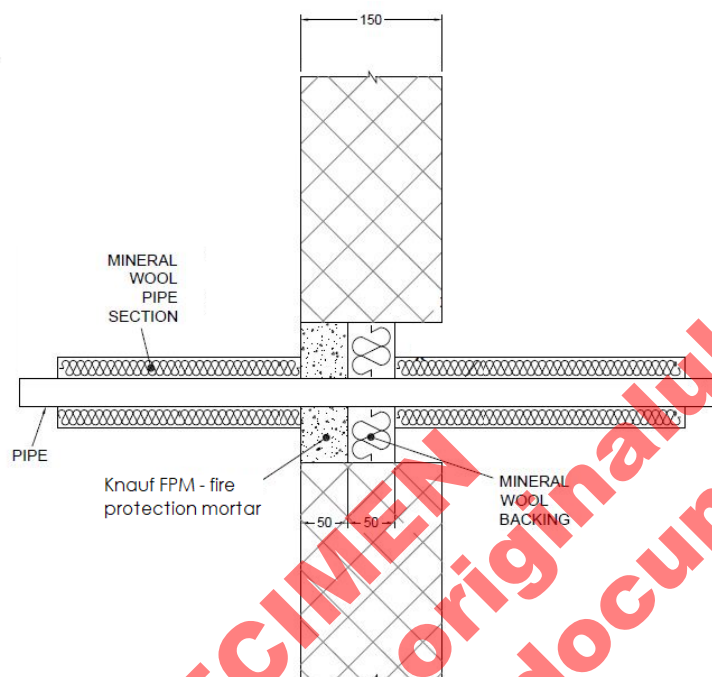
**A.1.2.1 Single side penetration seal with pipes**

Services	Maximum aperture	Insulation	Classification
Steel pipe 219 diameter/ 5-14.2 mm wall	2400 mm wide x 1200 mm high	30 mm stone wool 80 kg/m <sup>3</sup>	E 120 C/U, EI 90 C/U

### A.1.3 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board

**Penetration Seal:** LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic and composite pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges, with 50 mm Knauf FPM - fire protection mortar to either sides of the wall (or any position in between), backed with 50 mm stone wool 150 kg/m<sup>3</sup>.

Construction details:

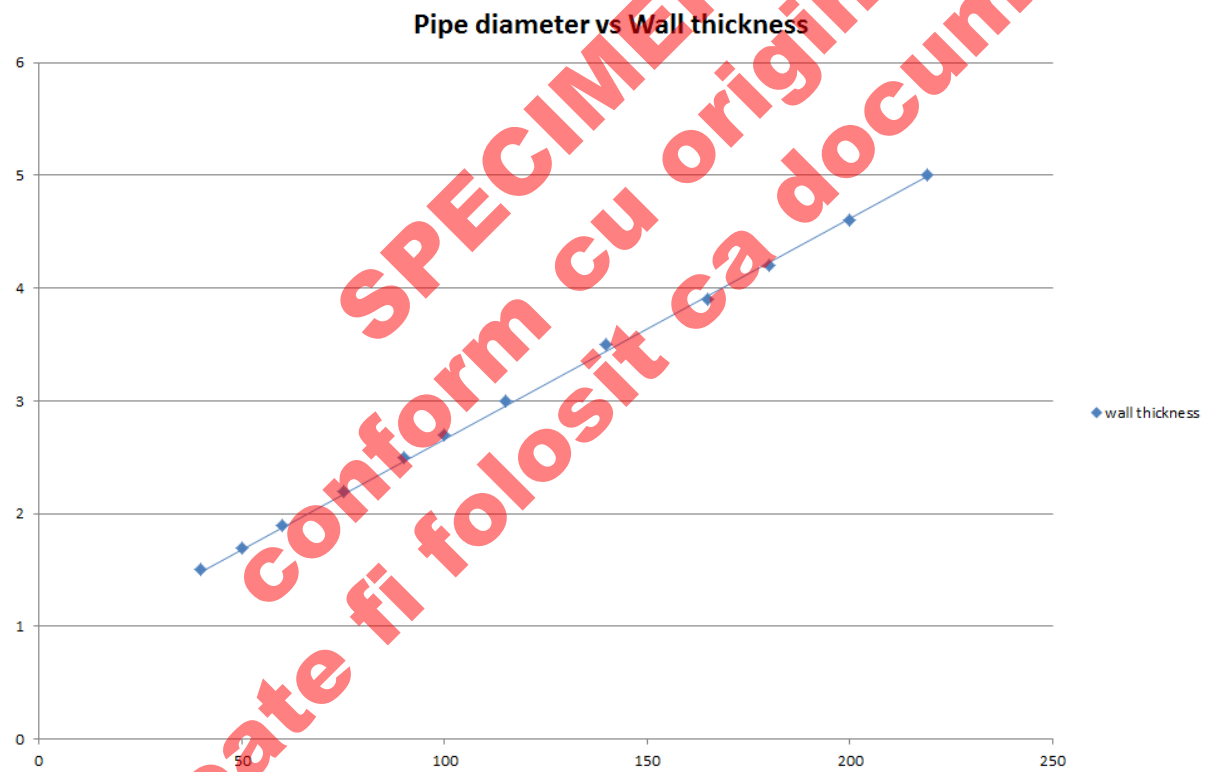


#### A.1.3.1 Single side penetration seal with pipes

Services	Maximum aperture	Insulation	Classification
Copper pipe up to 12 mm diameter/ 0.9-5 mm wall	70 x 70 mm	1000 mm long, 20 mm stone wool 80 kg/m <sup>3</sup>	EI 240 C/C
Copper pipe up to 54 mm diameter/ 1-14.2 mm wall	115 x 115 mm	1000 mm long, 20 mm stone wool 80 kg/m <sup>3</sup>	E 240 C/C, EI 120 C/C
Copper pipe up to 54 mm diameter/ 1-14.2 mm wall	2400 mm wide x 1200 mm high	1000 mm long, 20 mm stone wool 80 kg/m <sup>3</sup>	E 180 C/C, EI 120 C/C
75 mm Alupex composite pipe with 7.5 mm wall		600 mm long, 32 mm Elastomeric insulation minimum class B-s3,d0	EI 60 C/C

Services	Maximum aperture	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1.5-14.2 mm wall*	100 x 100 mm	1000 mm long, 20 mm Stone wool insulation 80 kg/m <sup>3</sup>	EI 240 C/U
40 mm diameter/1.5-14.2 mm wall*	2400 mm wide x 1200 mm high		1000 mm long, 30 mm Stone wool insulation 80 kg/m <sup>3</sup>
40 mm diameter/1.5-14.2 mm wall*		E 120 C/U, EI 90 C/U	
50 mm diameter/1.7-14.2 mm wall*			
60 mm diameter/1.9-14.2 mm wall*			
75 mm diameter/2.2-14.2 mm wall*			
90 mm diameter/2.5-14.2 mm wall*			
100 mm diameter/2.7-14.2 mm wall*			
115 mm diameter/3-14.2 mm wall*			
140 mm diameter/3.5-14.2 mm wall*			
165 mm diameter/ 3.9-14.2 mm wall*			
180 mm diameter/ 4.2-14.2 mm wall*			
200 mm diameter/ 4.6-14.2 mm wall*			
219 mm diameter/ 5.0-14.2 mm wall*			

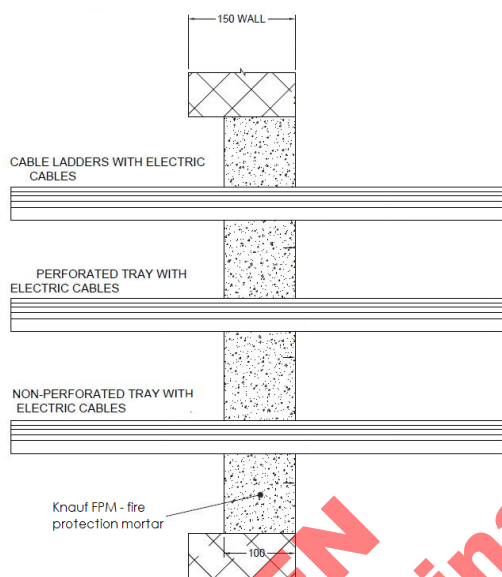
\* Typical pipe diameters shown, see below graph for intermediate sizes



#### A.1.4 Cable penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 25 mm from seal edges), with 100 mm Knauf FPM - fire protection mortar to either side of the wall (or at any position in between).

Construction details:



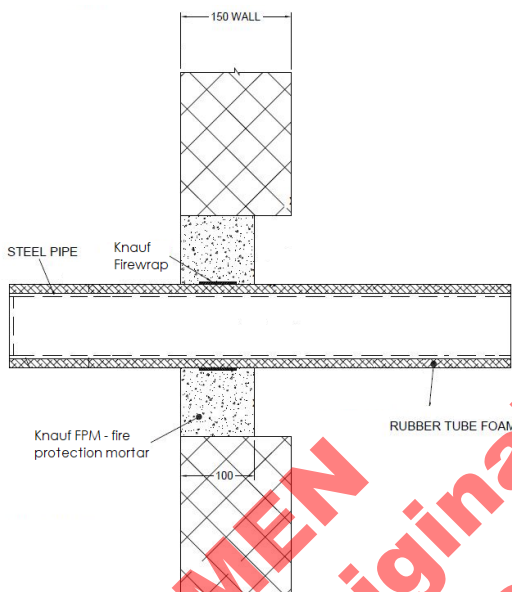
##### A.1.4.1 Single side penetration seal with cables

Services	Maximum aperture	Classification
None (blank)	2400 mm wide x 1200 mm high	EI 240
Electrical cables up to 21 mm $\varnothing$ (single, bundled and on trays)		E 240, EI 60
Electrical cables up to 80 mm $\varnothing$ (single, bundled and on trays)		EI 120
Cables up to 21mm $\varnothing$ in tied bundles up to 100mm $\varnothing$		E 120, EI 60
Steel cable trays & ladders		E 180 C/U, EI 30 C/U
Non-sheathed cables up to 24 mm $\varnothing$		E 180 C/U, EI 60 C/U
Copper conduit up to 16 mm $\varnothing$		EI 240 C/U, EI 240 C/C
Steel conduit up to 16 mm $\varnothing$		
PVC conduit up to 16 mm $\varnothing$		

### A.1.5 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 10 mm from seal edges), with 100 mm Knauf FPM - fire protection mortar to either side of the wall. Knauf Firewrap are required to be centrally within the seal for pipes with combustible insulation. Maximum seal size 2400 mm wide x 1200 mm high

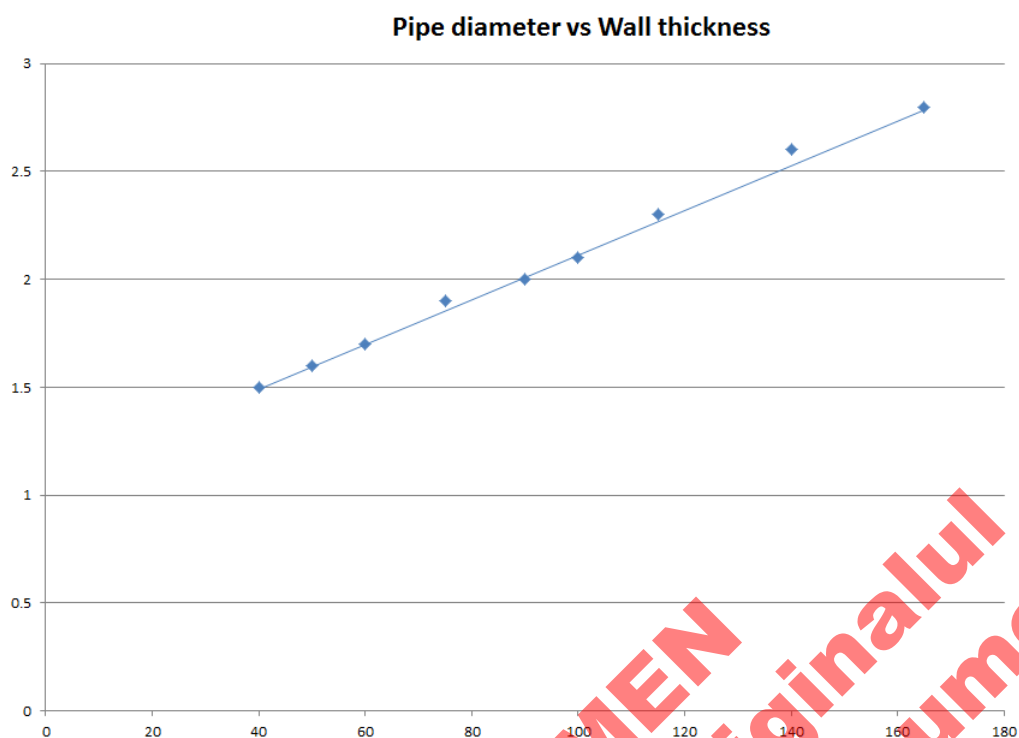
Construction details:



#### A.1.5.1 Single side penetration seal with pipes

Services	Wrap	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1.5-14.2 mm wall	1 off 50 x 3.6mm Knauf Firewrap, fitted central	13 mm Elastomeric insulation minimum class B-s3,d0	EI 240 C/U
165 mm diameter/4.5-14.2 mm wall		9 mm Elastomeric insulation minimum class B-s3,d0	E 240 C/U, EI 30 C/U
40 mm diameter/1.5-14.2 mm wall*	1 off 50 x 1.8mm Knauf Firewrap, fitted central	13 -19 mm Elastomeric insulation minimum class B-s3,d0	E 240 C/U, EI 60 C/U
50 mm diameter/1.6-14.2 mm wall*			
60 mm diameter/1.7-14.2 mm wall*			
75 mm diameter/1.9-14.2 mm wall*			
90 mm diameter/2-14.2 mm wall*			
100 mm diameter/2.1-14.2 mm wall*			
115 mm diameter/2.3-14.2 mm wall*			
140 mm diameter/2.6-14.2 mm wall*			
165 mm diameter/2.8-14.2 mm wall*			

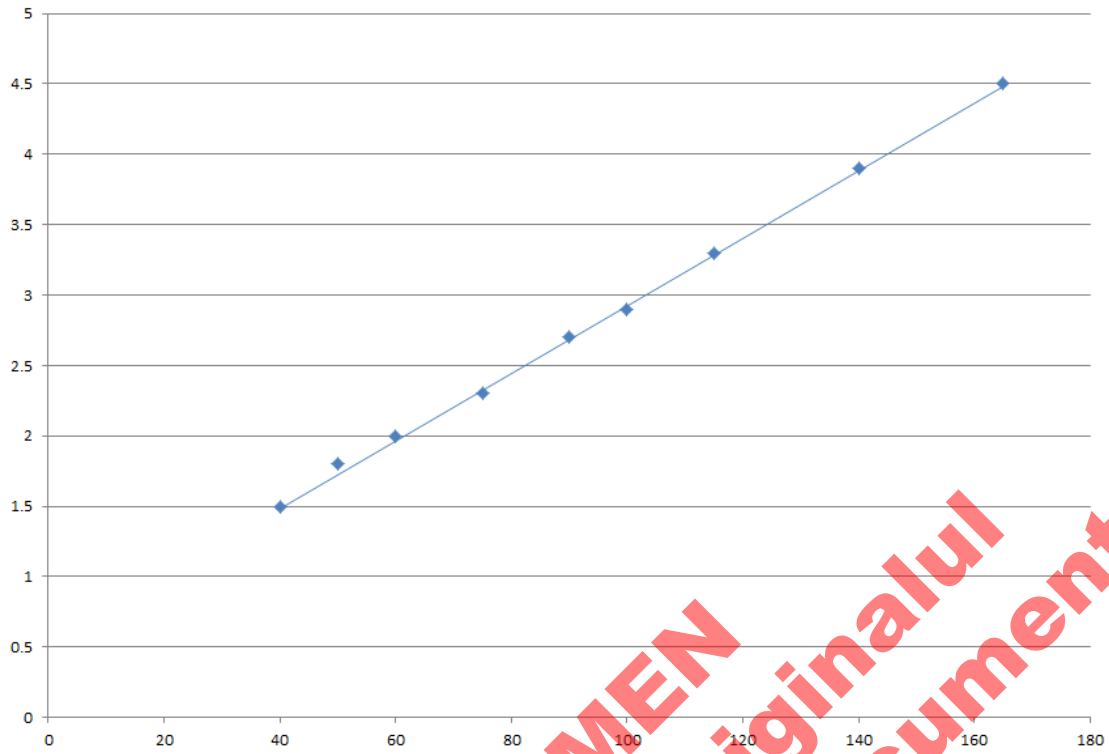
\* Typical pipe diameters shown, see below graph for intermediate sizes



Services	Wrap	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1.5-14.2 mm wall*	1 off 50 x 3.6mm Knauf Firewrap, fitted central	13-25 mm Elastomeric insulation minimum class B- s3,d0	<b>E 180 C/U, EI 60 C/U</b>
50 mm diameter/1.8-14.2 mm wall*			
60 mm diameter/2-14.2 mm wall*			
75 mm diameter/2.3-14.2 mm wall*			
90 mm diameter/2.7-14.2 mm wall*			
100 mm diameter/2.9-14.2 mm wall*			
115 mm diameter/3.3-14.2 mm wall*			
140 mm diameter/3.9-14.2 mm wall*			
165 mm diameter/4.5-14.2 mm wall*			

\* Typical pipe diameters shown, see below graph for intermediate sizes

Pipe diameter vs Wall thickness



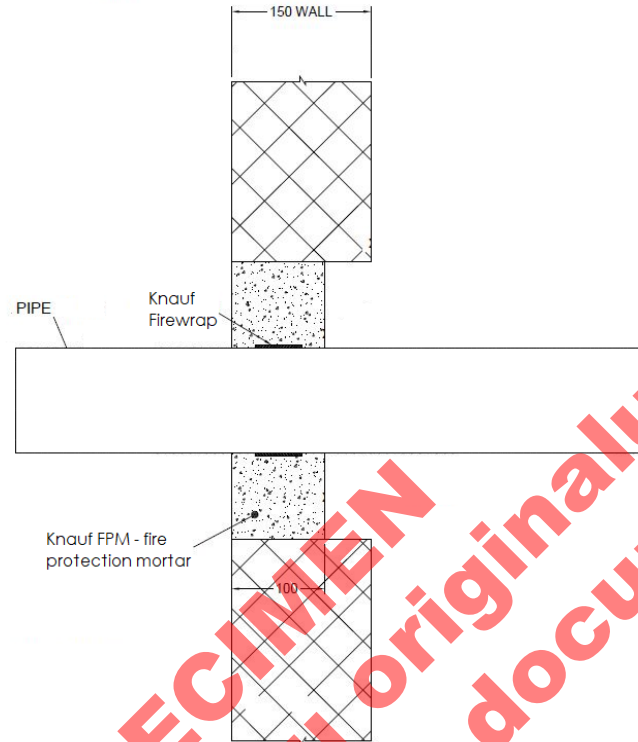
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### A.1.6 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** plastic pipes fitted at any position within the aperture (min. separation 10 mm from seal edges), with 100 mm Knauf FPM - fire protection mortar to either side of the wall. Knauf Firewrap are required to be centrally within the seal. Maximum seal size 2400 mm wide x 1200 mm high

Construction details:



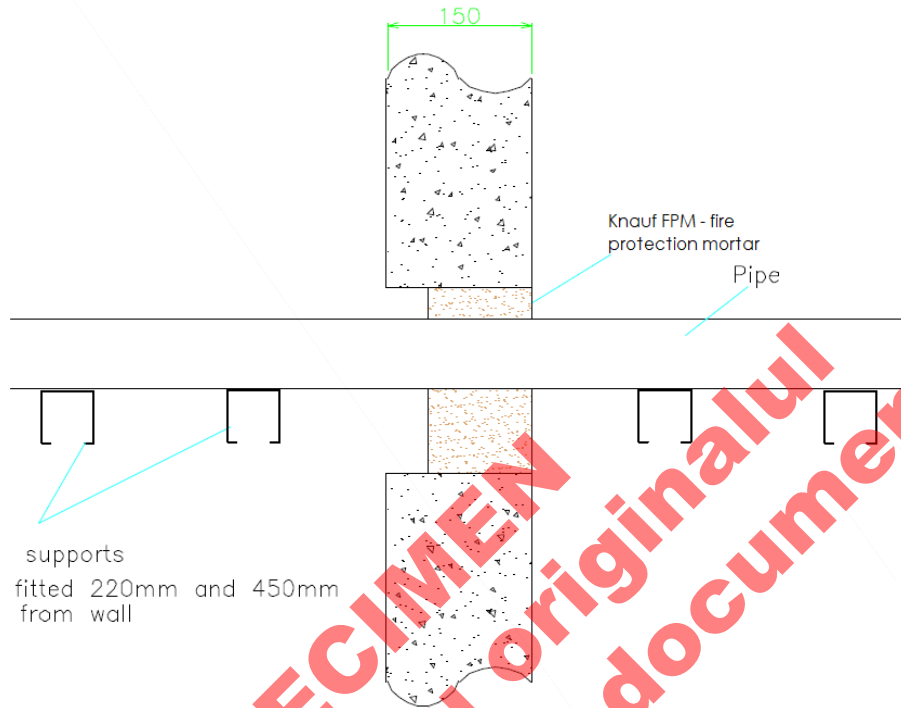
#### A.1.6.1 Single side penetration seal with pipes

Services	Wrap	Insulation	Classification
PVC-U pipe according to EN 1329-1, EN 1452-2 and EN 1453-1, PVC-C according to EN 1566-1			
315 mm diameter/9.2 mm wall	1 off 75 x 18 mm Knauf Firewrap, fitted central	None	EI 120 C/C

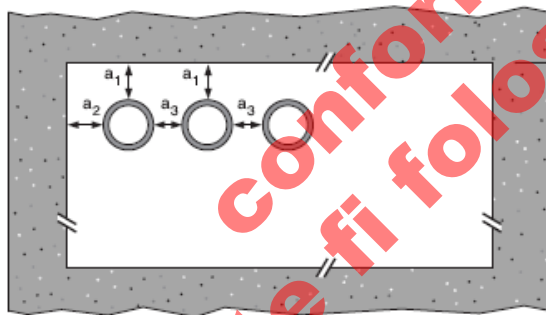
### A.1.7 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Combustible pipes sealed with Knauf FPM - fire protection mortar, to either side of the wall. Minimum separation between pipes of 30 mm ( $a_3$ ) and from seal edges 30 mm ( $a_1$  &  $a_2$ ). Maximum seal size 2400 mm wide x 1200 mm high.

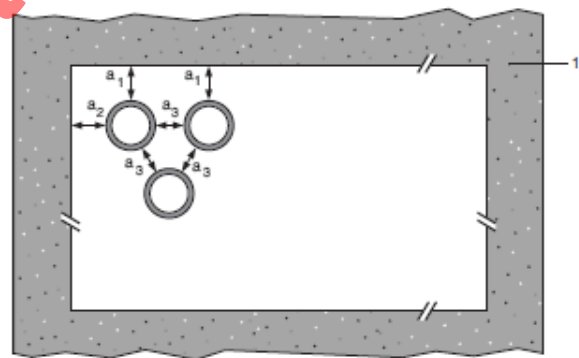
Construction details:



**Configuration 1**



**Configuration 2**



**Key**

- 1 Supporting construction
- a1 Pipe / top edge of seal separation
- a2 Pipe / side edge of seal separation
- a3 Pipe / pipe separation

### A.1.7.1 Single side penetration seal with pipes

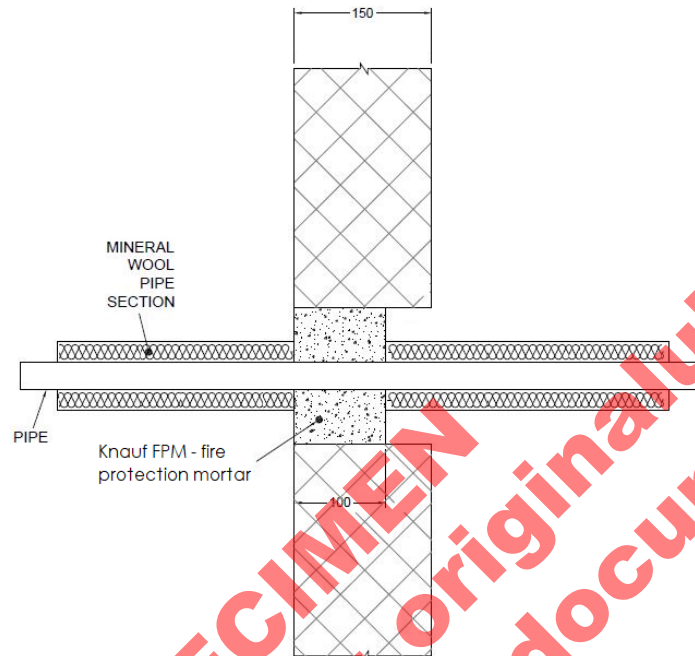
Services	Seal Depth	Permitted configuration for seal separation	Classification
PVC-U pipe according to EN 1329-1, EN 1452-2 and EN 1453-1^, PVC-C according to EN 1566-1			
Diameter up to 32 mm, wall thickness 1.6 – 2.4 mm	100 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C
PE pipe according to EN 1519-1, EN 12201-2 and EN 12006-1 <sup>s</sup> , ABS according to EN 1455-1 and pipes made from SAN+PVC according to EN 1565-1			
Diameter up to 32 mm, wall thickness 1.8 – 3.0 mm	100 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C
PP pipe according to EN 1852-1: 2009			
Diameter up to 32 mm, wall thickness 1.9 – 4.4 mm	100 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C

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### A.1.8 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** 1000 mm (min.) LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic pipes (single) fitted at any position within the aperture (min. separation 20 mm from seal edges, with 100 mm Knauf FPM - fire protection mortar to either sides of the wall (or any position in between))

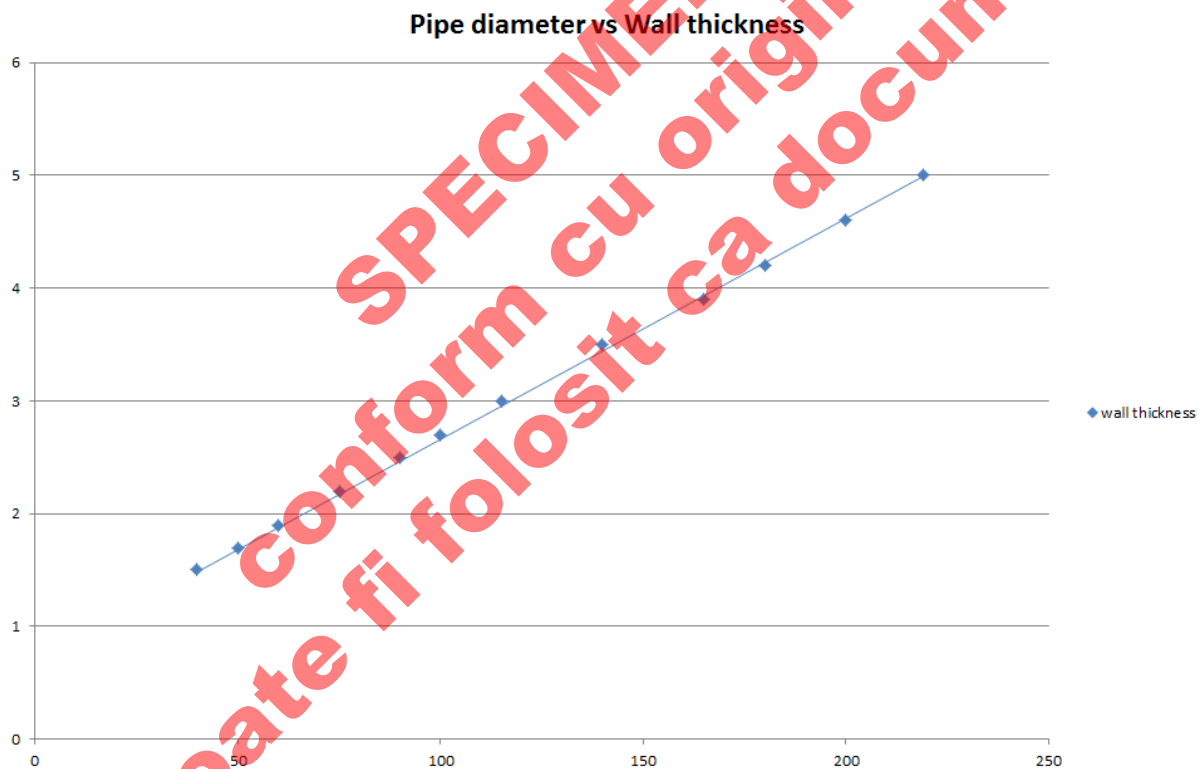
Construction details:



### A.1.8.1 Single side penetration seal with pipes

Services	Maximum aperture	Insulation	Classification
Mild or stainless steel pipe	2400 mm wide x 1200 mm high	20 mm Stone wool insulation 80 kg/m <sup>3</sup>	EI 240 C/U
40 mm diameter/1.5-14.2 mm wall*			
40 mm diameter/1.5-14.2 mm wall*		30 mm Stone wool insulation 80 kg/m <sup>3</sup>	E 240 C/U, EI 120 C/U
50 mm diameter/1.7-14.2 mm wall*			
60 mm diameter/1.9-14.2 mm wall*			
75 mm diameter/2.2-14.2 mm wall*			
90 mm diameter/2.5-14.2 mm wall*			
100 mm diameter/2.7-14.2 mm wall*			
115 mm diameter/3-14.2 mm wall*			
140 mm diameter/3.5-14.2 mm wall*			
165 mm diameter/ 3.9-14.2 mm wall*			
180 mm diameter/ 4.2-14.2 mm wall*			
200 mm diameter/ 4.6-14.2 mm wall*			
219 mm diameter/ 5.0-14.2 mm wall*			

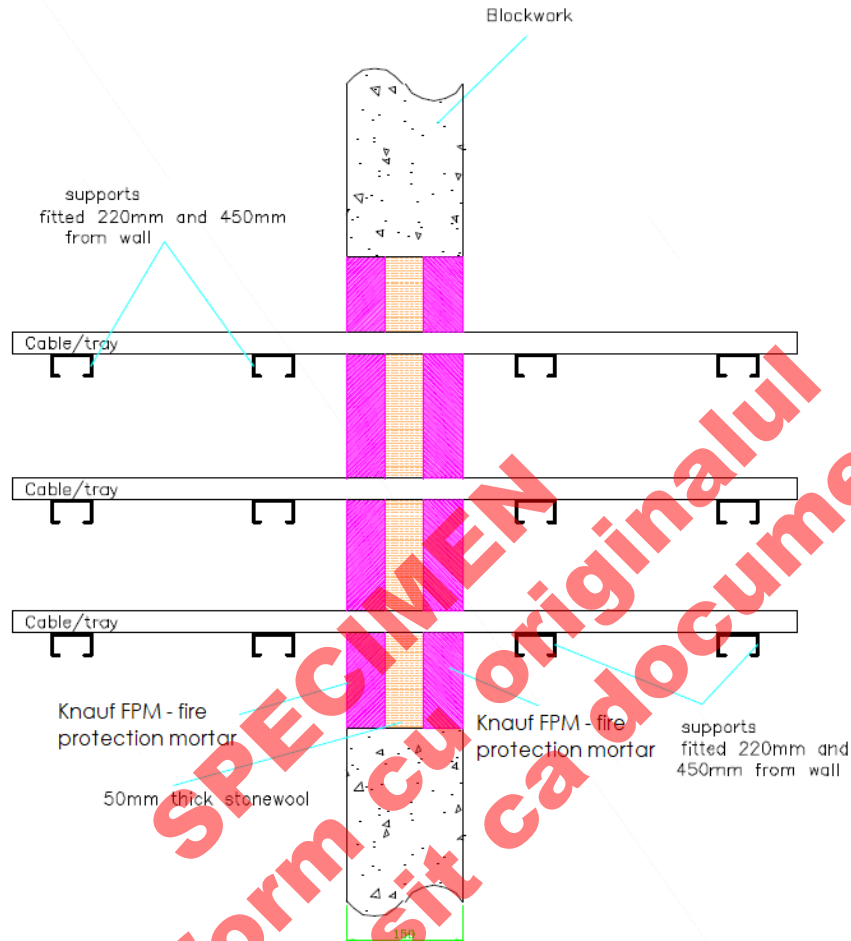
\* Typical pipe diameters shown, see below graph for intermediate sizes



### A.1.9 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar to both faces

**Penetration Seal:** Cables fitted with Knauf FPM - fire protection mortar to both sides of the wall, backed with stone wool insulation board 150kg/m<sup>3</sup>. Maximum seal size of 2400 mm wide x 1200 mm high and minimum separation between cables and the edge of the seal of 30 mm.

Construction details:



#### A.1.9.1 Single side penetration seal with pipes

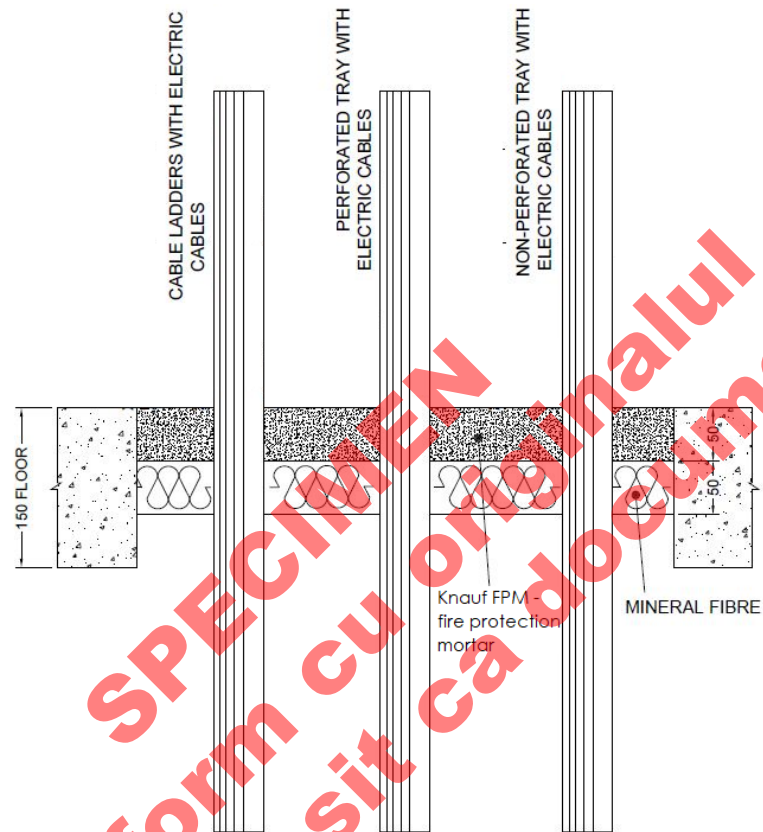
Services	Mortar depth	Backing	Insulation	Classification
Blank seals	50 mm	50 mm Stone wool 150 kg/m <sup>3</sup>	None	EI 240
Electric cables up to 80 mm diameter, single or in a bundle.				E 240 EI 60
Steel cable trays and ladders up to 500 mm wide				EI 60
Telecoms cables up to 21 mm diameter, single or in a bundle up to 100 mm diameter				E 240 EI 120
Unsheathed wire up to 24 mm diameter				

**A.2 Rigid floor constructions according to 1.2.1 with floor thickness of minimum 150 mm**

**A.2.1 Cable penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board**

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 30 mm from seal edges), with 50 mm Knauf FPM - fire protection mortar flush with the top of the floor, backed with 50 mm stone wool 150 kg/m<sup>3</sup>

Construction details:



### A.2.1.1 Single side penetration seal with cables

Services	Maximum aperture	Classification
None (blank)	2400 mm x 1200 mm	EI 180
Single* electrical cables up to 21 mm $\varnothing$		E 180, EI 90
Electrical cables up to 21 mm $\varnothing$ (single, bundled and on trays)		E 180, EI 60
Electrical cables up to 80 mm $\varnothing$ (single, bundled and on trays)		E 90, EI 45
Cables up to 21mm $\varnothing$ in tied bundles up to 100mm $\varnothing$		EI 180
Steel cable trays & ladders		E 90, EI 60
Non-sheathed wires up to 17 mm $\varnothing$		E 180, EI 60
Non-sheathed wires up to 24 mm $\varnothing$		E 180, EI 30
PVC conduit up to 16 mm $\varnothing$		EI 180 C/U, EI 180 C/C

\* To be separated by at least 30 mm

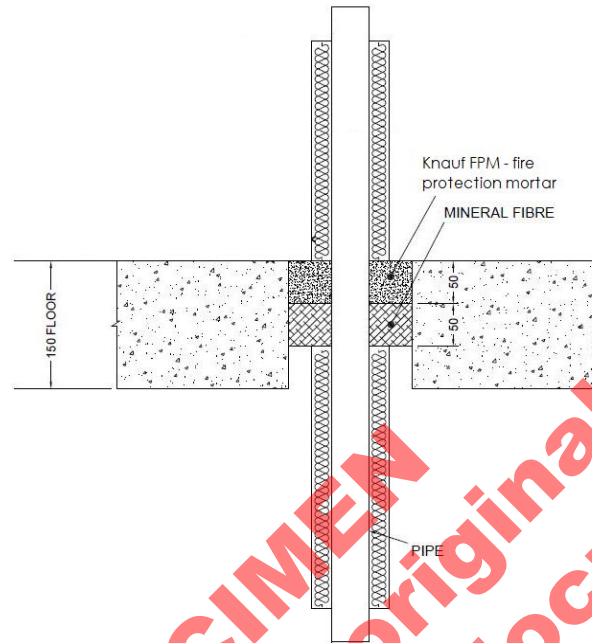
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**A.2.2 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board**

**Penetration Seal:** 1000 mm (min.) LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges, with 50 mm Knauf FPM - fire protection mortar flush with the top of floor, backed with 50 mm stone wool 150 kg/m<sup>3</sup>)

Construction details:



**A.2.2.1 Single side penetration seal with pipes**

Services	Maximum aperture	Insulation	Classification
Copper pipe up to 12 mm diameter/ 1-5 mm wall	70 x 70 mm	20 mm stone wool 80 kg/m <sup>3</sup>	EI 240 C/C
Copper pipe up to 54 mm diameter/ 1-14.2 mm wall	115 x 115 mm		E 240 C/C, EI 180 C/C
Copper pipe up to 54 mm diameter/ 1-14.2 mm wall	2400 mm wide x 1200 mm high		EI 180 C/C

Services	Maximum aperture	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1-14.2 mm wall*	280 x 280 mm	20 mm Stone wool insulation 80 kg/m <sup>3</sup>	EI 240 C/U
40 mm diameter/1-14.2 mm wall*			
50 mm diameter/1.2-14.2 mm wall*			
60 mm diameter/1.4-14.2 mm wall*			
75 mm diameter/1.7-14.2 mm wall*			
90 mm diameter/2-14.2 mm wall*			
100 mm diameter/2.2-14.2 mm wall*			
115 mm diameter/2.5-14.2 mm wall*			
140 mm diameter/3-14.2 mm wall*			
165 mm diameter/3.5-14.2 mm wall*			
180 mm diameter/3.8-14.2 mm wall*			
200 mm diameter/4.2-14.2 mm wall*			
219 mm diameter/4.5-14.2 mm wall*			E 240 C/U, EI 90 C/U

\* Typical pipe diameters shown, see below graph for intermediate sizes



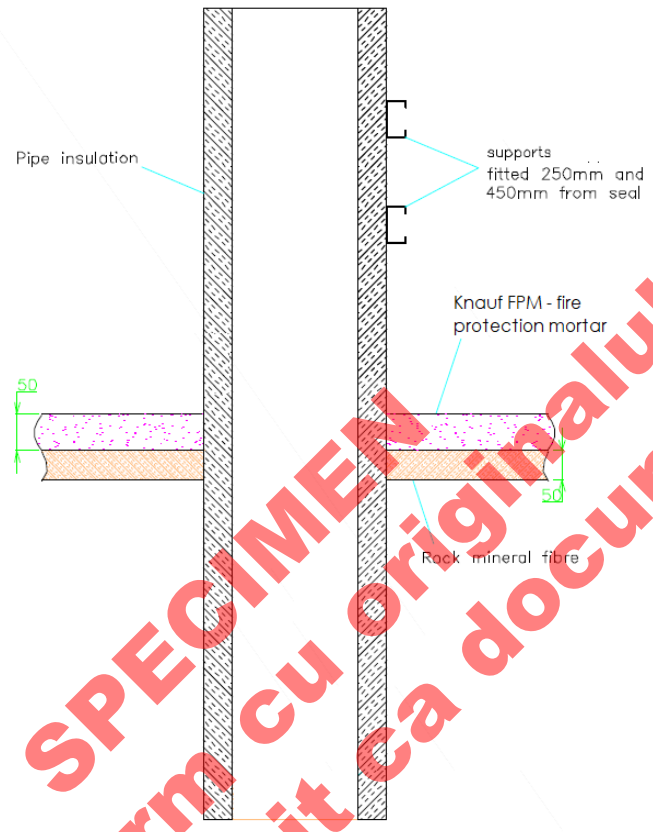
Services	Maximum aperture	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1-14.2 mm wall*	2400 mm x 1200 mm	20 mm Stone wool insulation 80 kg/m <sup>3</sup>	EI 180 C/U
40 mm diameter/1-14.2 mm wall*		30 mm Stone wool insulation 80 kg/m <sup>3</sup>	E 180 C/U, EI 90 C/U
50 mm diameter/1.2-14.2 mm wall*			
60 mm diameter/1.4-14.2 mm wall*			
75 mm diameter/1.7-14.2 mm wall*			
90 mm diameter/2-14.2 mm wall*			
100 mm diameter/2.2-14.2 mm wall*			
115 mm diameter/2.5-14.2 mm wall*			
140 mm diameter/3-14.2 mm wall*			
165 mm diameter/3.5-14.2 mm wall*			
180 mm diameter/3.8-14.2 mm wall*			
200 mm diameter/4.2-14.2 mm wall*			
219 mm diameter/4.5-14.2 mm wall*			



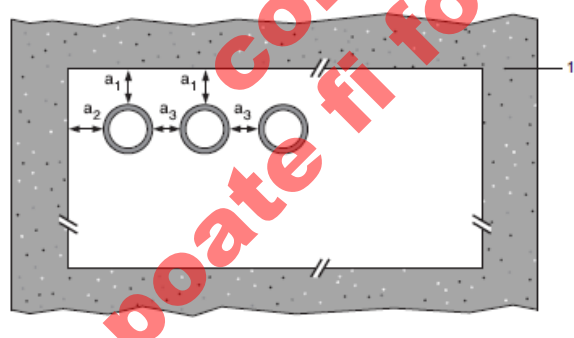
**A.2.3 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar backed with mineral fibre board**

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture, with 50 mm Knauf FPM - fire protection mortar, backed with 50 mm stone wool 140 kg/m<sup>3</sup> positioned at any height within the depth of the floor. Minimum separation between penetration seals and seal edges of 30 mm (configuration 1 & 2). Maximum aperture size 1200 x 2400 mm.

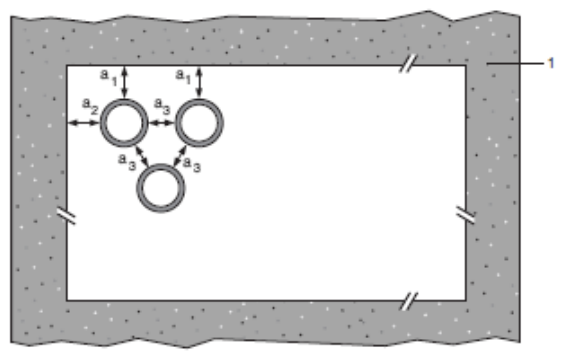
Construction details:



**Configuration 1**



**Configuration 2**

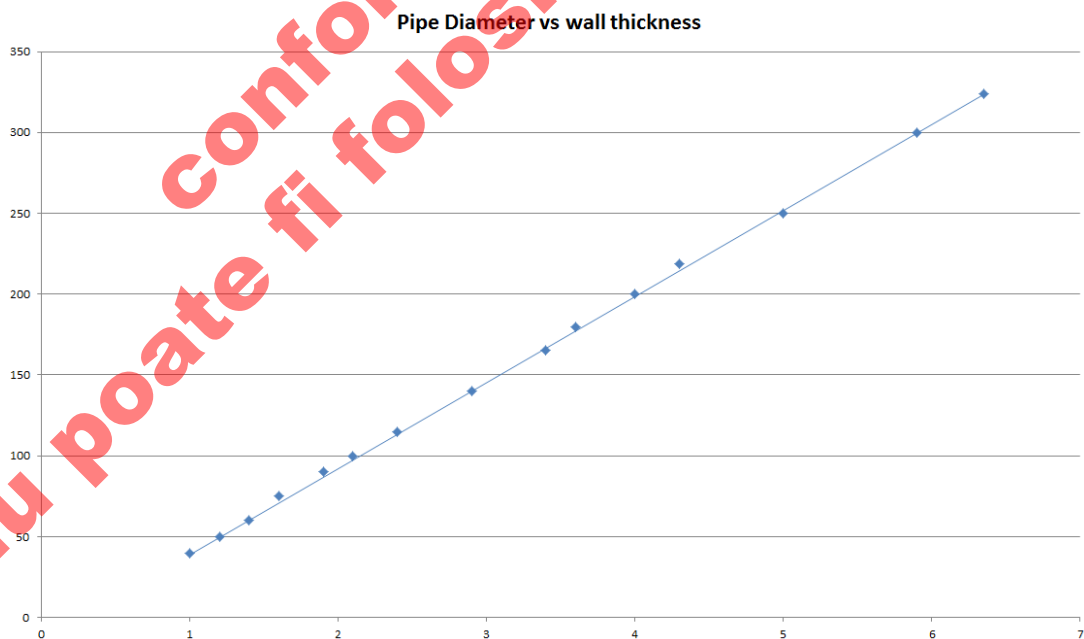


- Key**
- 1 Supporting construction
  - a1 Pipe / top edge of seal separation
  - a2 Pipe / side edge of seal separation
  - a3 Pipe / pipe separation

### A.2.3.1

Mild or stainless steel pipe	Insulation	Classification
40 mm diameter/1-14.2 mm wall	20 mm thick stone, mineral wool min. 80 kg/m <sup>3</sup>	EI 180 C/U (EI 240 C/U)*
40 mm diameter/1-14.2 mm wall*	30-80 mm thick stone, mineral wool min. 80 kg/m <sup>3</sup>	
50 mm diameter/1.2-14.2 mm wall*		
60 mm diameter/1.4-14.2 mm wall*		
75 mm diameter/1.6-14.2 mm wall*		
90 mm diameter/1.9-14.2 mm wall*		
100 mm diameter/2.1-14.2 mm wall*		
115 mm diameter/2.4-14.2 mm wall*		
140 mm diameter/2.9-14.2 mm wall*		
165 mm diameter/ 3.4-14.2 mm wall*		
180 mm diameter/ 3.6-14.2 mm wall*		
200 mm diameter/ 4.0-14.2 mm wall*		
219 mm diameter/ 4.3-14.2 mm wall*		
250 mm diameter/ 5.0-14.2 mm wall*		
300 mm diameter/ 5.9-14.2 mm wall*		
324 mm diameter/ 6.35-14.2 mm wall*		
PEX pipe in pipe system	Insulation	Classification
15 mm diameter x 2.5 mm wall inner /25mm diameter outer	None	EI 180 C/C (EI 240 C/C)*

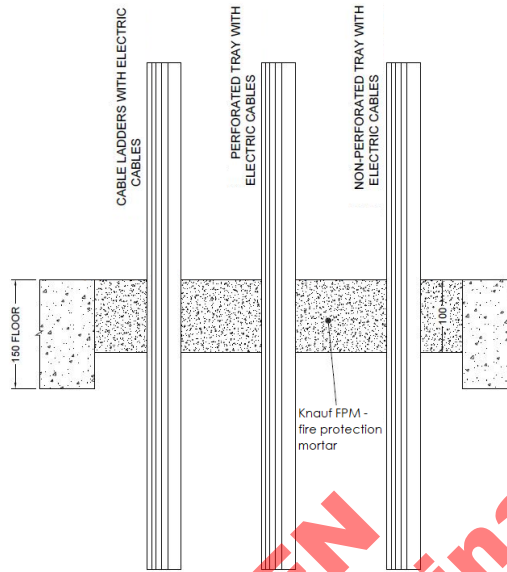
\* EI 240 in apertures up to a maximum of 550 x 1100 mm



#### A.2.4 Cable penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 30 mm from seal edges), with 100 mm Knauf FPM - fire protection mortar flush with the top of the floor

Construction details:



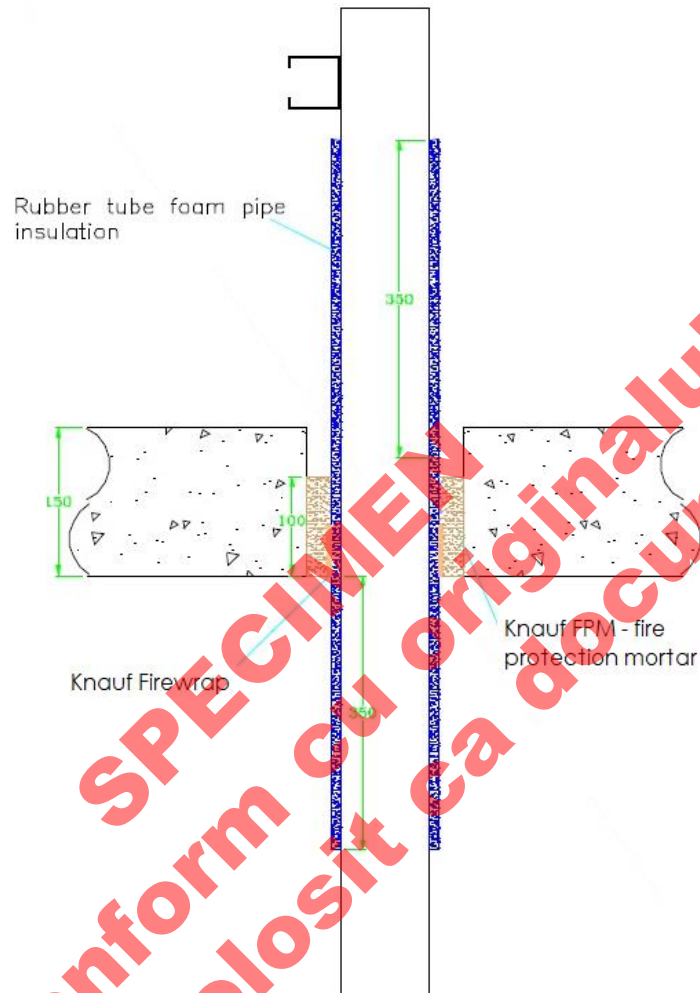
##### A.2.4.1 Single side penetration seal with cables

Services	Maximum aperture	Classification
None (blank)	2400 mm x 1200 mm	EI 240
Electrical cables up to 50 mm Ø (single, bundled and on trays)		E 180, EI 60
Electrical cables up to 80 mm Ø (single, bundled and on trays)		E 120, EI 60
Cables up to 21mm Ø in tied bundles up to 100mm Ø		E 180, EI 120
Steel cable trays & ladders		E 120, EI 60
Non-sheathed cables up to 17 mm Ø		E 180, EI 90
Non-sheathed cables up to 24 mm Ø		E 180, EI 20
PVC conduit up to 16 mm Ø		EI 180 C/U, EI 180 C/C

### A.2.5 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 25 mm from seal edges and 30 mm from other services), with 100 mm Knauf FPM - fire protection mortar at any position within the floor. Knauf Firewraps are required to be fitted around combustible pipe insulation. Maximum seal size 1200 x 2400 mm.

Construction details:



### A.2.5.1 Single side penetration seal with pipes

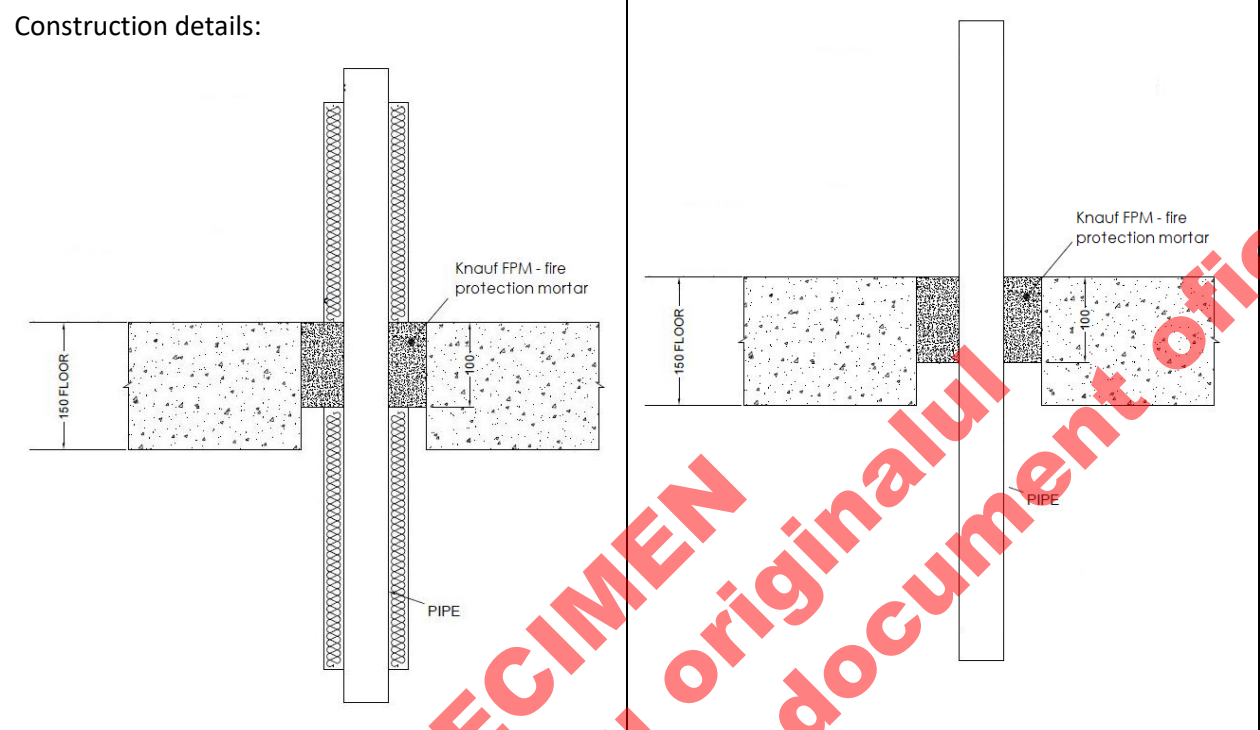
Services	Wrap	Insulation	Classification
Copper pipe			
12 mm diameter/1 mm wall	50 x 3.6 mm Knauf Firewrap fitted to the soffit	9 mm Elastomeric insulation minimum class B-s3,d0	EI 240 C/C
12-54 mm diameter/1-1.2 mm wall		13-25 mm Elastomeric insulation minimum class B-s3,d0	E 240 C/C, EI 60 C/C
Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD pipe)			
16 mm diameter/2.25 mm wall	50 x 3.6 mm Knauf Firewrap fitted to the soffit	9 mm Elastomeric insulation minimum class B-s3,d0	EI 240 C/C
16 mm diameter/2.25 mm wall		9-13 mm Elastomeric insulation minimum class B-s3,d0	E 240 C/C, EI 90 C/C
20 mm diameter/2.5 mm wall			
26 mm diameter/3 mm wall			
32 mm diameter/3 mm wall			
40 mm diameter/3.5 mm wall			
50 mm diameter/4 mm wall			
63 mm diameter/4.5 mm wall		13-25 mm Elastomeric insulation minimum class B-s3,d0	E 180 C/C, EI 90 C/C
75 mm diameter/4.7 mm wall			
16 mm diameter/2.25 mm wall			
20 mm diameter/2.5 mm wall			
26 mm diameter/3 mm wall			
32 mm diameter/3 mm wall			
40 mm diameter/3.5 mm wall			
50 mm diameter/4 mm wall			
63 mm diameter/4.5 mm wall			
75 mm diameter/4.7 mm wall			

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### A.2.6 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** 1000 mm (min.)\* LI (Local Interrupted) or CI (Continuous Interrupted) insulated and non-insulated metallic and composite pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges), with 100 mm Knauf FPM - fire protection mortar flush with the top of the floor



#### A.2.6.1 Single side penetration seal with pipes

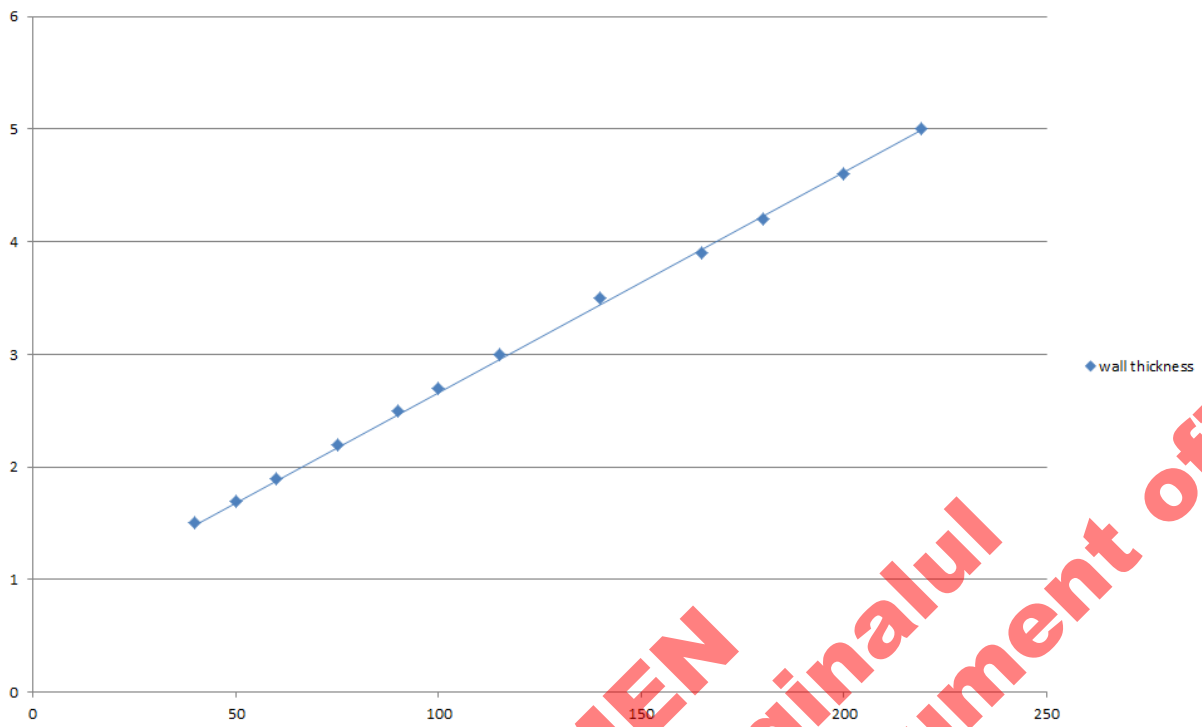
Services	Maximum Aperture	Insulation	Classification
Up to 16 mm diameter steel pipe 1.5-7 mm wall	2400 mm x 1200 mm	None	E 240 C/C, EI 120 C/C
Up to 54 mm diameter Copper pipe 1.5-14.2 mm wall			E 120 C/C, EI 20 C/C
75 mm Alupex composite pipe with 4.6 mm wall		None	E 240 U/C, EI 20 U/C

Services	Maximum Aperture	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1.5-14.2 mm wall*	2400 mm wide by 1200 mm high	20 mm Stone wool insulation 80 kg/m <sup>3</sup>	EI 240 C/U
40 mm diameter/1.5-14.2 mm wall*		30 mm Stone wool insulation 80 kg/m <sup>3</sup>	E 240 C/U, EI 120 C/U
50 mm diameter/1.7-14.2 mm wall*			
60 mm diameter/1.8-14.2 mm wall*			
75 mm diameter/2.1-14.2 mm wall*			
90 mm diameter/2.3-14.2 mm wall*			
100 mm diameter/2.5-14.2 mm wall*			
115 mm diameter/2.8-14.2 mm wall*			
140 mm diameter/3.2-14.2 mm wall*			
165 mm diameter/ 3.6-14.2 mm wall*			
180 mm diameter/ 3.9-14.2 mm wall*			
200 mm diameter/ 4.2-14.2 mm wall*			
219 mm diameter/ 4.5-14.2 mm wall*			

\* Typical pipe diameters shown, see below graph for intermediate sizes

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Pipe diameter vs Wall thickness

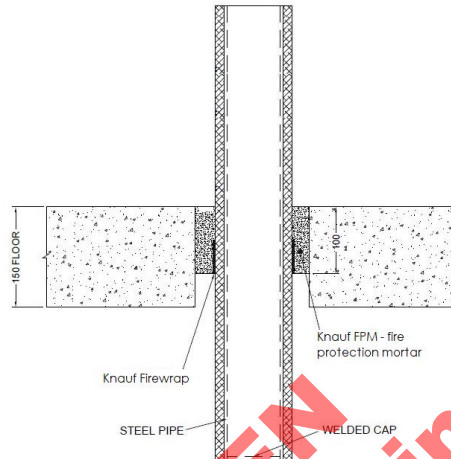


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### A.2.7 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges and 30 mm from other services), with 100 mm Knauf FPM - fire protection mortar to the top surface of the floor. Knauf Firewraps are required to be fitted around combustible pipe insulation. Maximum seal size 2400 mm x 1200 mm.

Construction details:



#### A.2.7.1 Single side penetration seal with cables

Services	Wrap	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/-14.2 mm wall		13 mm Elastomeric insulation minimum class B-s3,d0	<b>EI 180 C/U</b>
40 mm diameter/1.5-14.2 mm wall*	1 off 50 x 1.8 mm Knauf Firewrap, fitted at soffit	13 -19 mm Elastomeric insulation minimum class B-s3,d0	<b>E 180 C/U, EI 120 C/U</b>
50 mm diameter/1.6-14.2 mm wall*			
60 mm diameter/1.7-14.2 mm wall*			
75 mm diameter/1.9-14.2 mm wall*			
90 mm diameter/2-14.2 mm wall*			
100 mm diameter/2.1-14.2 mm wall*			
115 mm diameter/2.3-14.2 mm wall*			
140 mm diameter/2.6-14.2 mm wall*			
165 mm diameter/2.8-14.2 mm wall*			

\* Typical pipe diameters shown, see below graph for intermediate sizes

Pipe diameter vs Wall thickness

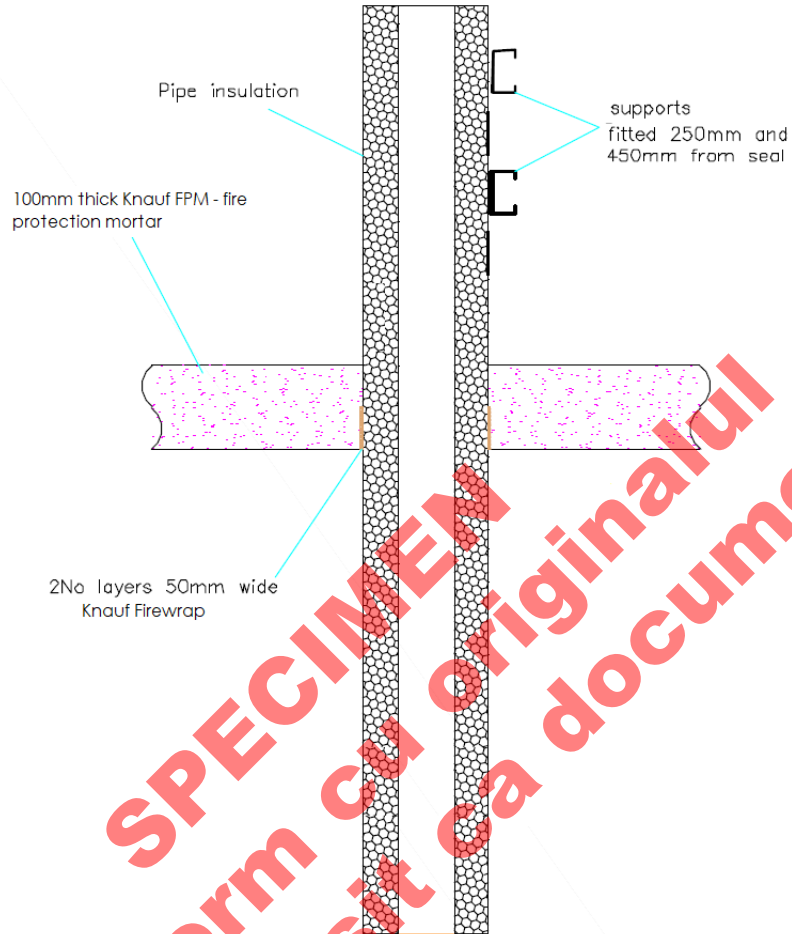


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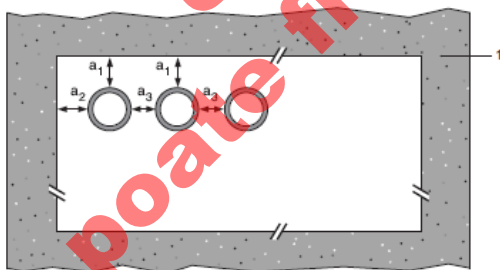
### A.2.8 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes sealed with Knauf Firewraps, fitted at any position within the aperture, with 100 mm Knauf FPM - fire protection mortar Seal. Minimum separation between penetration seals and seal edges of 30 mm (Configuration 1 & 2).

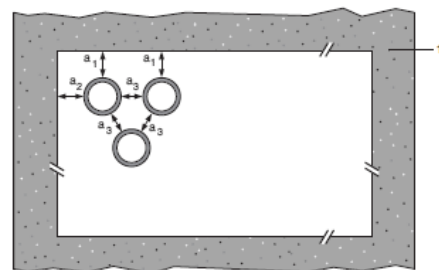
Construction details:



**Configuration 1**



**Configuration 2**



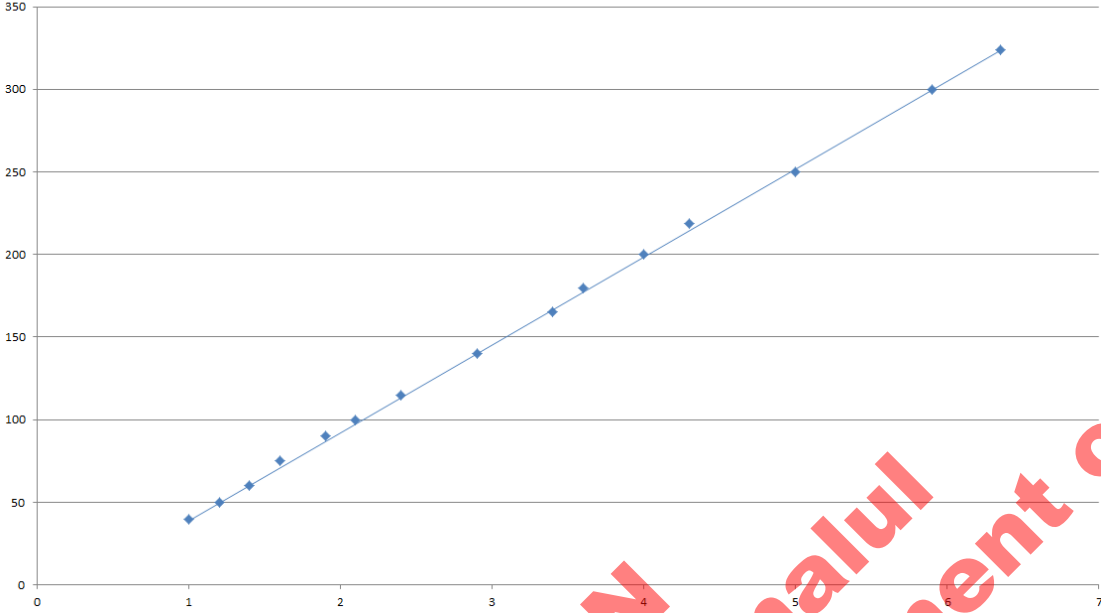
**Key**

- 1 Supporting construction
- a1 Pipe / top edge of seal separation
- a2 Pipe / side edge of seal separation
- a3 Pipe / pipe separation

**A.2.8.1**

Mild or stainless steel pipe	Insulation	Knauf Firewrap	Classification	
40 mm diameter/1-14.2 mm wall	25 mm thick Elastomeric insulation minimum class B-s3,d0	50 x 3.6 mm (2 x 1.8 layer)	EI 240 C/U	
40 mm diameter/1-14.2 mm wall*	25mm thick Elastomeric insulation minimum class B-s3,d0		50 x 3.6 mm (2 x 1.8 layer)	E 240 C/U EI 120 C/U
50 mm diameter/1.2-14.2 mm wall*				
60 mm diameter/1.4-14.2 mm wall*				
75 mm diameter/1.6-14.2 mm wall*				
90 mm diameter/1.9-14.2 mm wall*				
100 mm diameter/2.1-14.2 mm wall*				
115 mm diameter/2.4-14.2 mm wall*				
140 mm diameter/2.9-14.2 mm wall*				
165 mm diameter/ 3.4-14.2 mm wall*				
180 mm diameter/ 3.6-14.2 mm wall*				
200 mm diameter/ 4.0-14.2 mm wall*				
219 mm diameter/ 4.3-14.2 mm wall*				
250 mm diameter/ 5.0-14.2 mm wall*				
300 mm diameter/ 5.9-14.2 mm wall*				
324 mm diameter/ 6.35-14.2 mm wall*		25-50mm thick Elastomeric insulation minimum class B-s3,d0		
40 mm diameter/1-14.2 mm wall*				
50 mm diameter/1.2-14.2 mm wall*				
60 mm diameter/1.4-14.2 mm wall*				
75 mm diameter/1.6-14.2 mm wall*				
90 mm diameter/1.9-14.2 mm wall*				
100 mm diameter/2.1-14.2 mm wall*				
115 mm diameter/2.4-14.2 mm wall*				
140 mm diameter/2.9-14.2 mm wall*				
165 mm diameter/ 3.4-14.2 mm wall*				
180 mm diameter/ 3.6-14.2 mm wall*				
200 mm diameter/ 4.0-14.2 mm wall*				
219 mm diameter/ 4.3-14.2 mm wall*				
250 mm diameter/ 5.0-14.2 mm wall*				
300 mm diameter/ 5.9-14.2 mm wall*				
324 mm diameter/ 6.35-14.2 mm wall*				

Pipe Diameter vs wall thickness



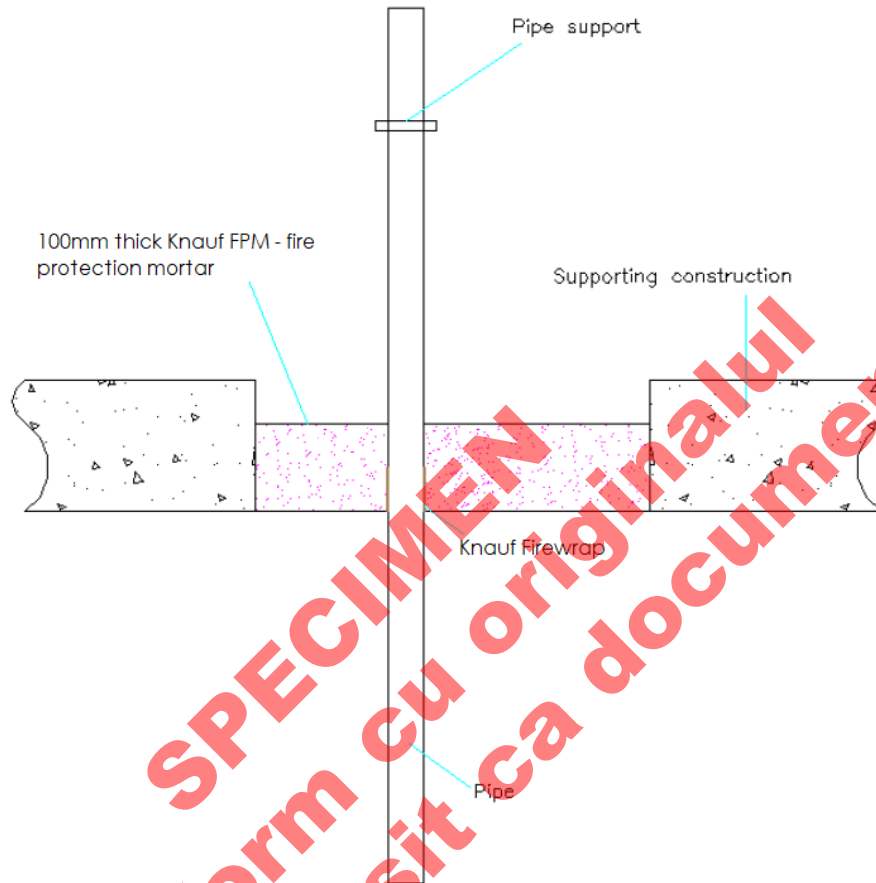
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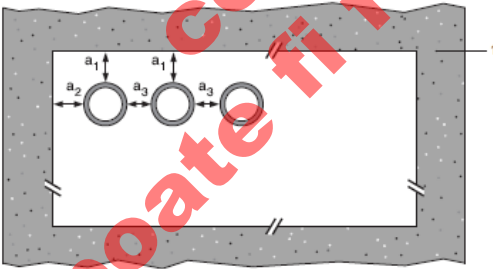
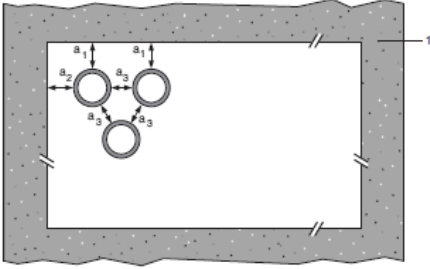
### A.2.9 Pipe penetration seal with 100 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Plastic pipes fitted at any position within the aperture, with 100 mm Knauf FPM - fire protection mortar to the either surface of the floor or anywhere between. Knauf Firewrap are required to be fitted to the bottom of the seal, as indicated below. Minimum separation between penetration seals and seal edges of 30 mm (Configuration 1 & 2).

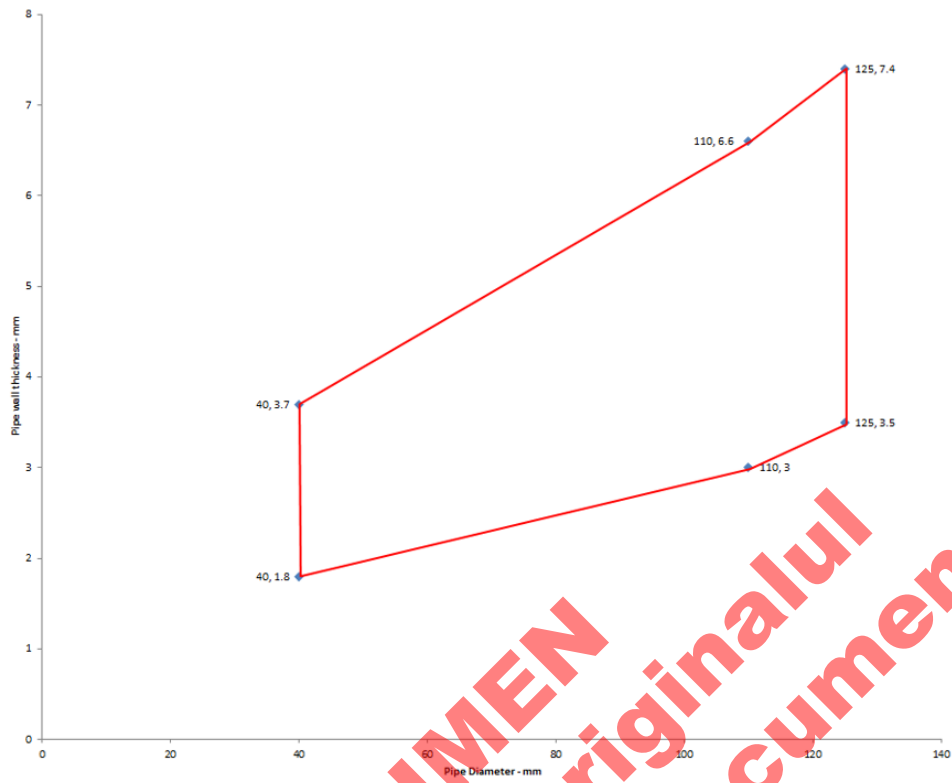
Construction details:



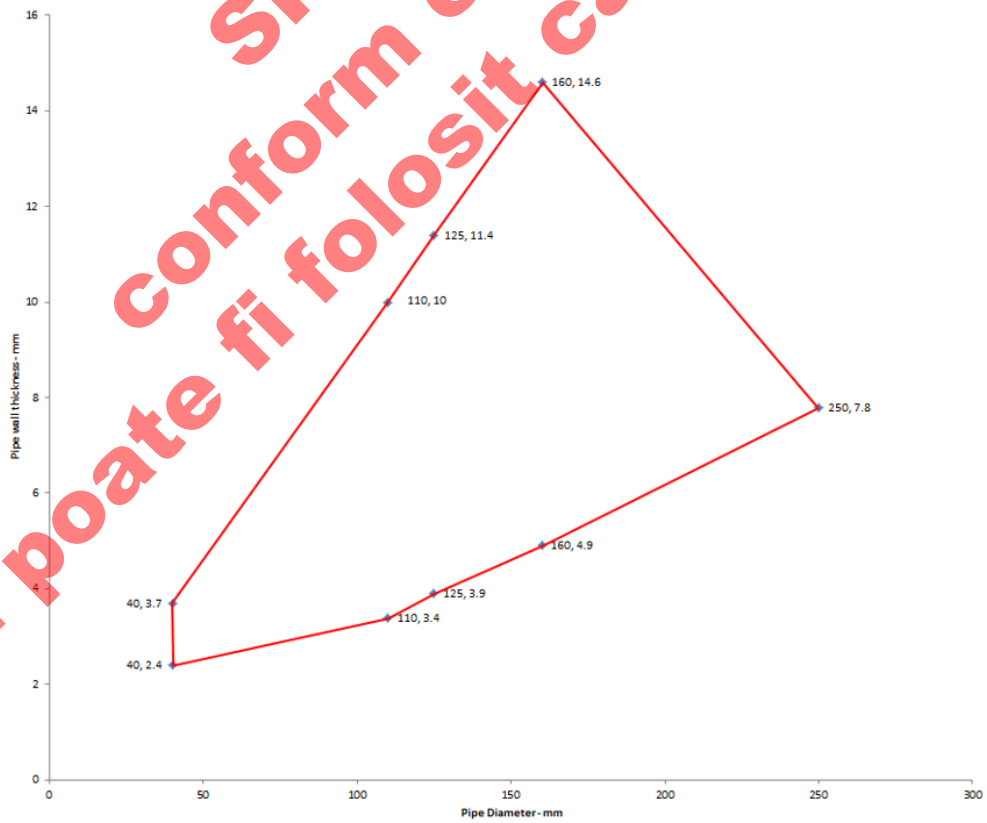
### A.2.9.1 Single side penetration seal with pipes

Services	Wrap	Maximum aperture	Classification
<b>PVC-U pipe according to EN 1329-1, EN 1452-1 and EN 1453-1, PVC-C according to EN 1566-1</b>			
Up to 40 mm diameter / 1.8-3.7 mm wall	50 x 1.8 mm	2400 x 1200 mm	E 180 U/U, EI 120 U/U
Up to 110 mm diameter / 3.0-6.6 mm wall	50 x 3.6 mm		EI 240 U/C
Up to 125 mm diameter / 3.5-7.4 mm wall	50 x 7.2 mm		EI 120 U/C
Up to 160 mm diameter / 4.5 mm wall	50 x 10.8 mm		EI 240 C/C
Up to 110 mm diameter / 2.7-6.6 mm wall, containing up to 90mm Ø bundle of up to 14 mm Ø telecom cables	50 x 3.6 mm		EI 120 U/C
<b>PP pipe according to EN 1451-1</b>			
Up to 40 mm diameter / 1.8-4.4 mm wall	None	2400 x 1200 mm	EI 120 U/C
Up to 40 mm diameter / 1.8-5.5 mm wall	50 x 1.8 mm		EI 120 U/U
Up to 50 mm diameter / 2.5-5.5 mm wall	50 x 3.6 mm		EI 240 C/C
Up to 75 mm diameter / 3.5-5.5 mm wall	50 x 3.6 mm		EI 240 C/C
Up to 110 mm diameter / 2.7-6.3 mm wall	50 x 3.6 mm		EI 240 U/C
Up to 125 mm diameter / 3.4-11.4 mm wall	50 x 7.2 mm		EI 240 U/C
Up to 160 mm diameter / 4.9-14.6 mm wall	50 x 10.8 mm		EI 240 U/C
Up to 110 mm diameter / 3.4-6.3 mm wall, containing up to 90mm Ø bundle of up to 14 mm Ø telecom cables	50 x 3.6 mm		EI 60 U/C
<b>PE pipe according to EN 1519-1, EN 12201-2 and EN 12666-1, ABS according to EN 1455-1 and pipes made from SAN+PVC according to EN 1565-1</b>			
Up to 40 mm diameter / 2.0-4.4 mm wall	None	2400 x 1200 mm	EI 120 U/C
Up to 40 mm diameter / 2.4-3.7 mm wall	50 x 1.8 mm		EI 240 U/U
Up to 110 mm diameter / 3.4-10.0 mm wall	50 x 3.6 mm		EI 120 U/C
Up to 125 mm diameter / 3.9-11.4 mm wall	50 x 7.2 mm		EI 240 U/C
Up to 160 mm diameter / 4.9-14.6 mm wall	50 x 10.8 mm		EI 120 U/C
Up to 250 mm diameter / 7.8 mm wall	75 x 12.6 mm		EI 180 C/C
Up to 110 mm diameter / 2.7-10.0 mm wall, containing up to 90mm Ø bundle of up to 14 mm Ø telecom cables	50 x 3.6 mm		E 120 U/C, EI 60 U/C
<b>Configuration 1</b>		<b>Configuration 2</b>	
			
<b>Key</b> 1 Supporting construction a1 Pipe / top edge of seal separation a2 Pipe / side edge of seal separation a3 Pipe / pipe separation			

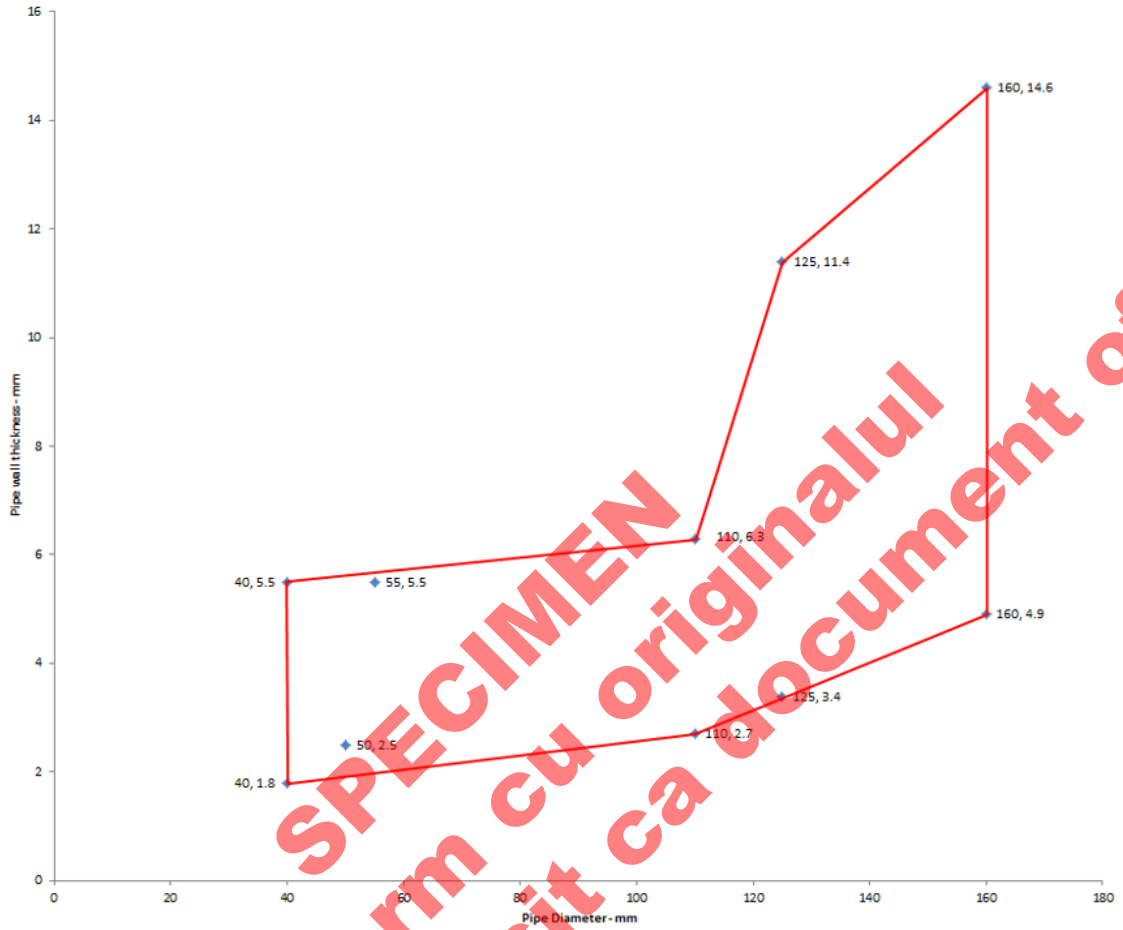
PVC-U pipes U/C with Knauf Firewrap - EI 120 U/C



PE pipes U/C with Knauf Firewrap - EI 120 U/C



PP pipes U/C with Knauf Firewrap - EI 120 U/C

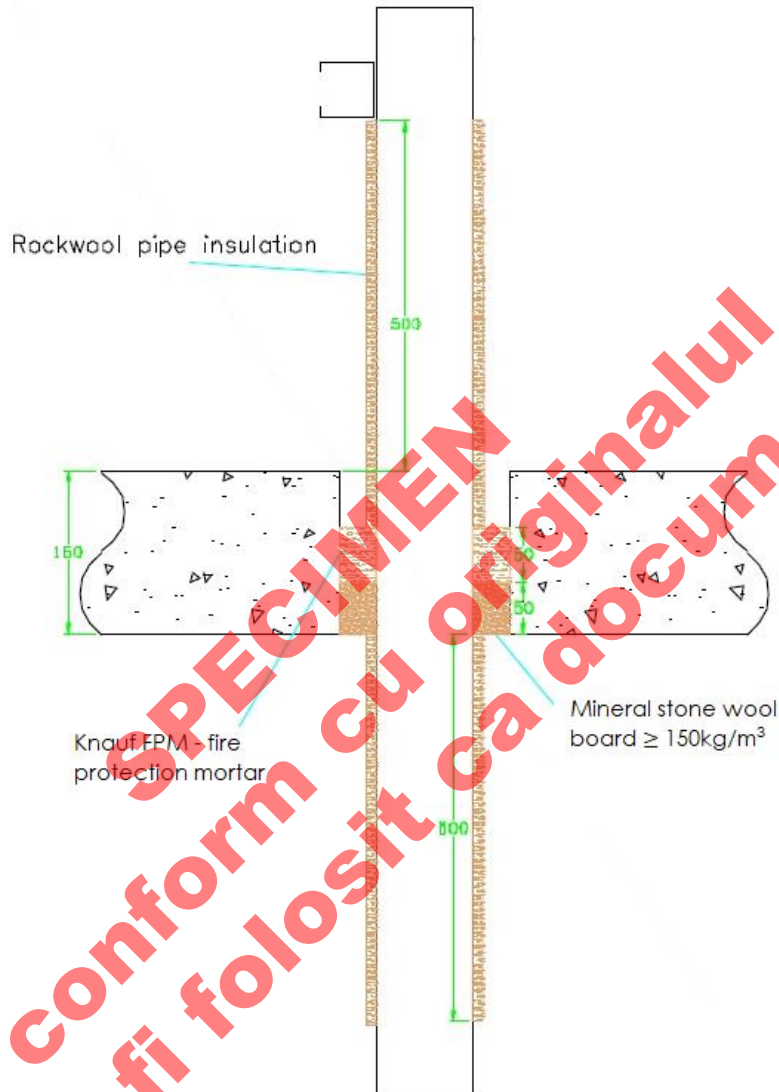


**Specimen**  
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### A.2.10 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CI (Continuous Interrupted) or LI (Local Interrupted) insulated composite pipes (single) fitted at any position within the aperture (min. separation 10 mm from seal edges, with 50 mm Knauf FPM - fire protection mortar flush with the top of floor, backed with 50 mm stone wool 150 kg/m<sup>3</sup>)

Construction details:



### A.2.10.1 Single side penetration seal with pipes

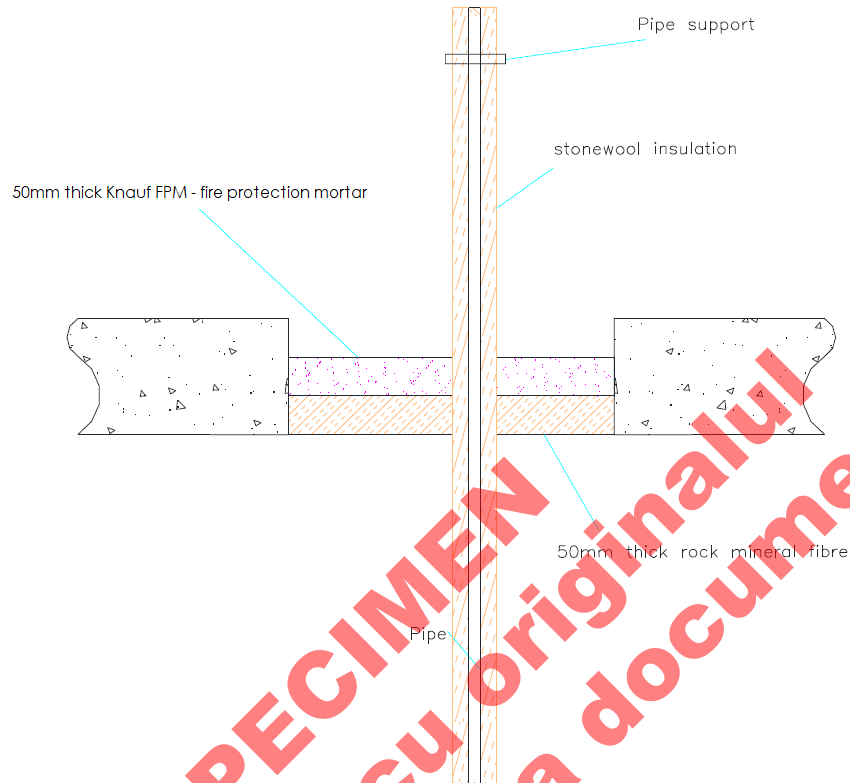
Services	Maximum Aperture	Insulation	Classification
Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD pipe)			
16 mm diameter/2.25 mm wall	135 x 135 mm	500 mm long, minimum 20 mm Stone wool insulation minimum 80 kg/m <sup>3</sup>	EI 240 C/C
16 mm diameter/2.25 mm wall			E 240 C/C, EI 180 C/C
20 mm diameter/2.5 mm wall			
26 mm diameter/3 mm wall			
32 mm diameter/3 mm wall			
40 mm diameter/3.5 mm wall			
50 mm diameter/4 mm wall			
63 mm diameter/4.5 mm wall			
75 mm diameter/4.7 mm wall			
16 mm diameter/2.25 mm wall	2400 mm x 1200 mm	500 mm long, minimum 20 mm Stone wool insulation minimum 80 kg/m <sup>3</sup>	EI 180 C/C
20 mm diameter/2.5 mm wall			
26 mm diameter/3 mm wall			
32 mm diameter/3 mm wall			
40 mm diameter/3.5 mm wall			
50 mm diameter/4 mm wall			
63 mm diameter/4.5 mm wall			
75 mm diameter/4.7 mm wall			

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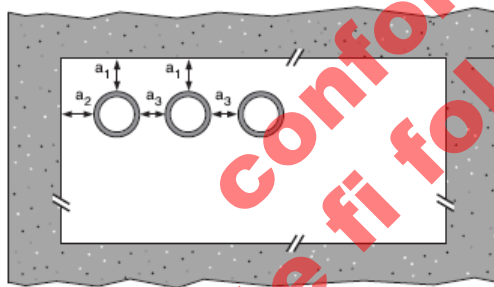
### A.2.11 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metal pipes, uninsulated metal pipes and composite with Knauf FPM - fire protection mortar, to either side of the floor, backed with stone wool board 150 kg/m<sup>3</sup>. Minimum separation from pipes to seal edges of 30 mm (a1 & a2). Maximum seal size 2400 x 1200 mm.

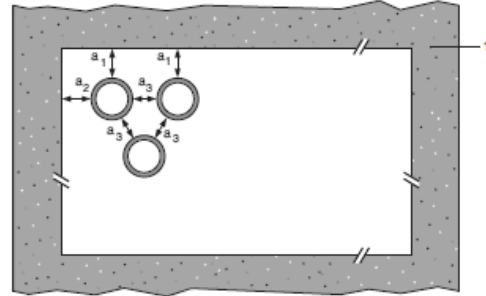
Construction details:



**Configuration 1**



**Configuration 2**



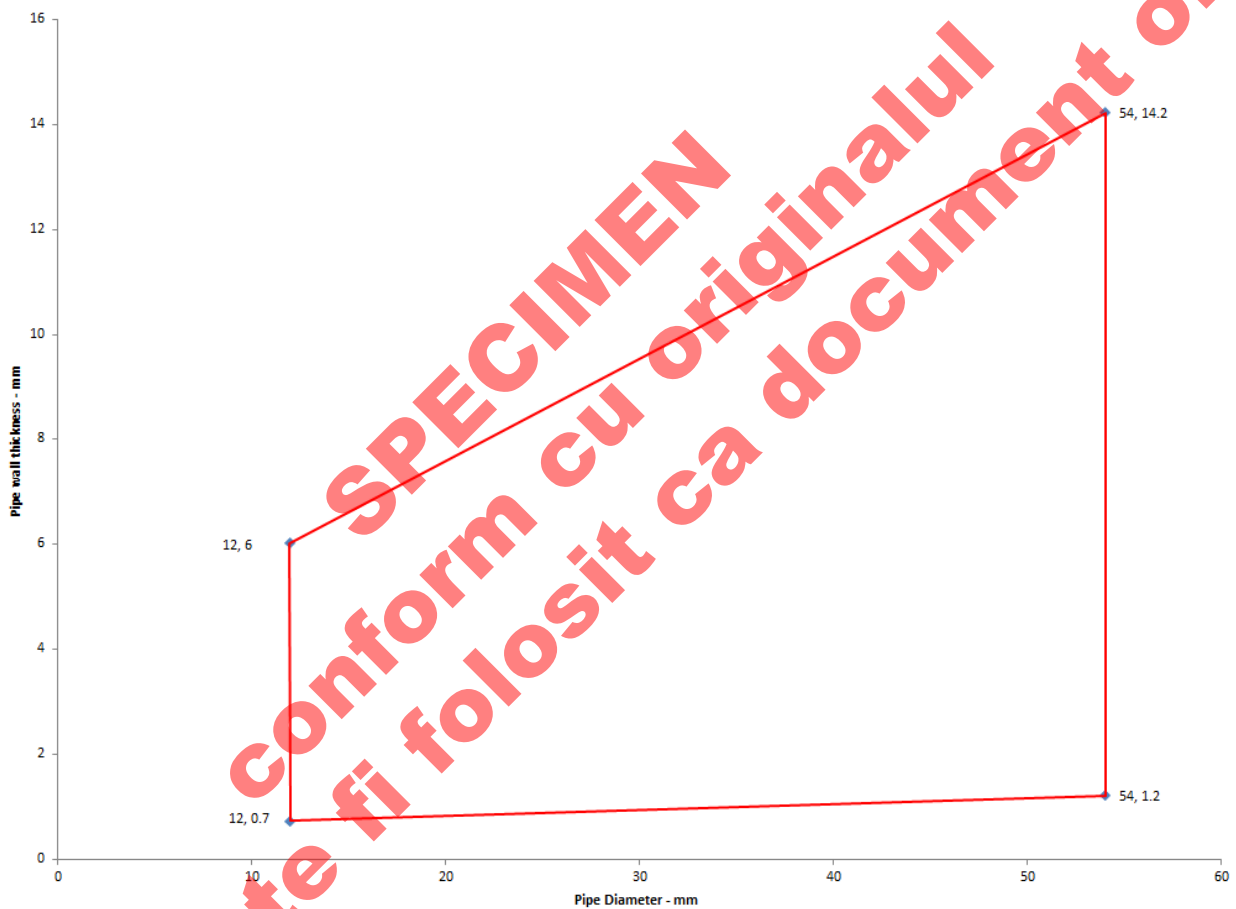
**Key**

- 1 Supporting construction
- a1 Pipe / top edge of seal separation
- a2 Pipe / side edge of seal separation
- a3 Pipe / pipe separation

### A.2.11.1 Single side penetration seal with pipes

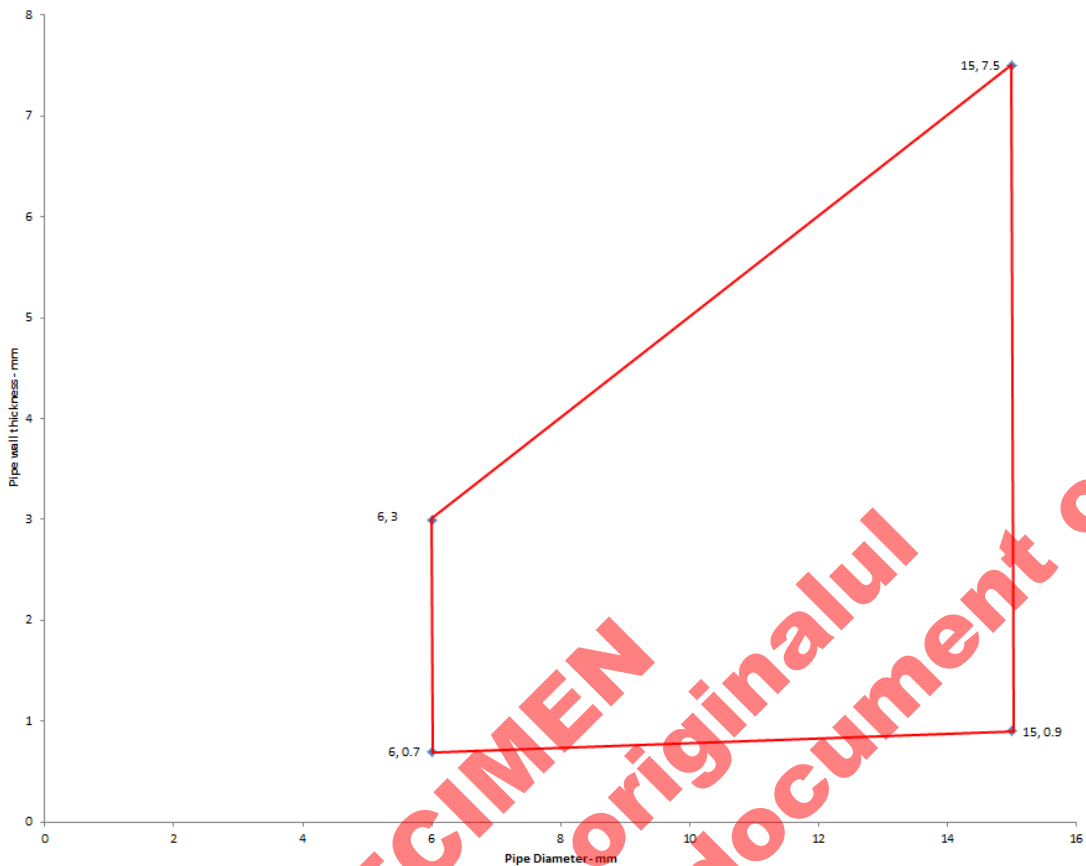
Services	Maximum Aperture	Insulation	Classification
Copper or steel pipe	2400 mm x 1200 mm	Minimum 20-80 mm Stone wool insulation minimum 80 kg/m <sup>3</sup>	E 180 C/C, EI 120 C/C
12 -54 mm diameter/0.7-14.2 mm wall			E 180 C/C, EI 120 C/C
6 mm diameter/0.7-3 mm wall		None	E 180 C/C, EI 30 C/C
7-15 mm diameter/0.9-7.5 mm wall		None	EI 180 C/U
Steel pipe			
4-16 mm diameter/1.0-8.0 mm wall			
Alupex Pipe		None	EI 180 C/C
16-20 mm diameter/2.0 mm wall			

Copper & Steel pipes with Stonewool Insulation CS

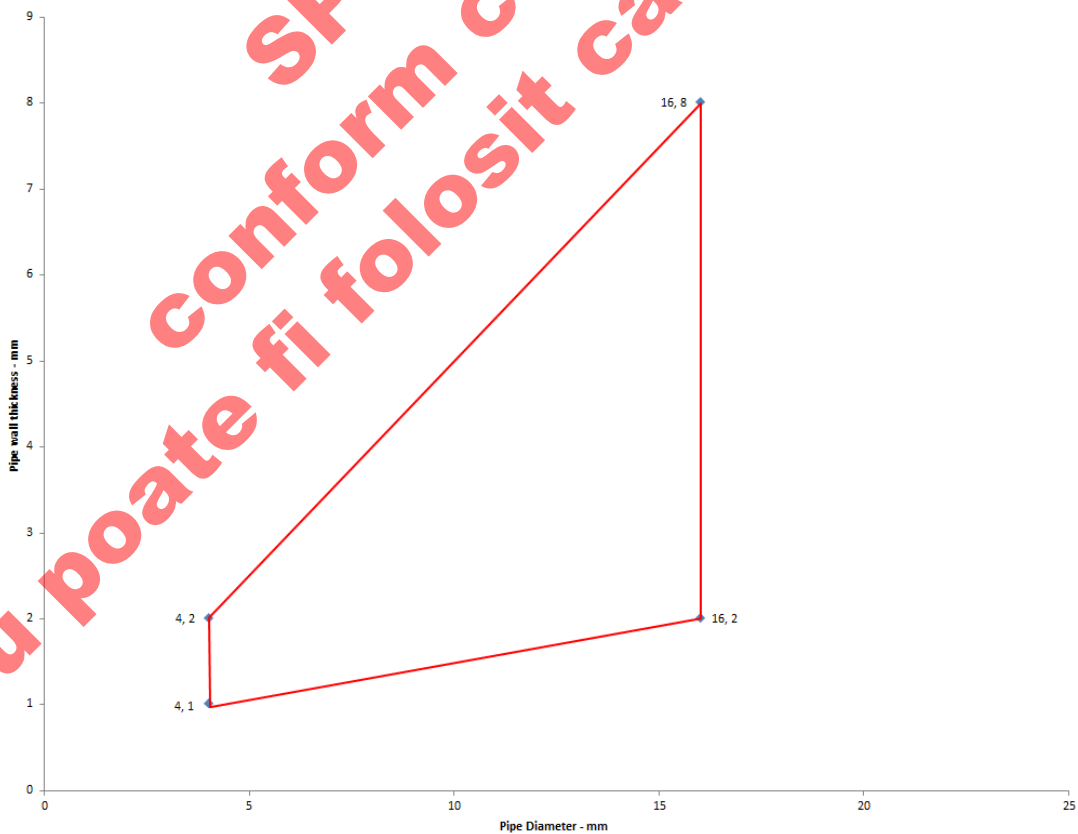




Copper and Steel pipes without Insulation



Steel pipes without Insulation



### A.2.12 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Plastic pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges and 30 mm from other services), with 50 mm Knauf FPM - fire protection mortar flush with the top of floor, backed with 50 mm stone wool 150 kg/m<sup>3</sup>

Construction details:



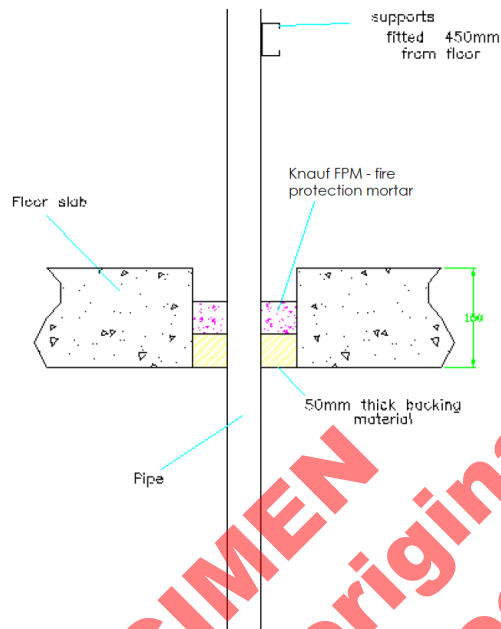
#### A.2.12.1 Single side penetration seal with cables

Services	Wrap	Maximum aperture	Classification
40 mm diameter /3 mm wall PP pipe according to EN 1451-1	None	2400 x 1200 mm	EI 120 C/C
40 mm diameter /4 mm wall PE pipe according to EN 1519-1, EN 12201-2 and EN 12006-1\$, ABS according to EN 1455-1 and pipes made from SAN+PVC according to EN 1565-1			
110 mm diameter /4,3 mm wall PE pipe according to EN 1519-1, EN 12201-2 and EN 12006-1\$, ABS according to EN 1455-1 and pipes made from SAN+PVC according to EN 1565-1	50 x 2 mm		EI 60 C/C

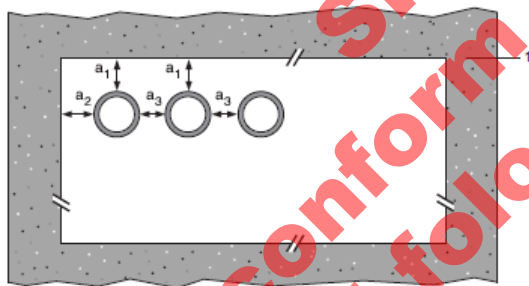
### A.2.13 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Combustible pipes sealed with Knauf FPM - fire protection mortar, to either side of the floor, backed with stone wool board 150 kg/m<sup>3</sup>. Minimum separation between pipes of 30 mm ( $a_3$ ) and from seal edges 30 mm ( $a_1$  &  $a_2$ ). Maximum seal size 2400 x 1200 mm.

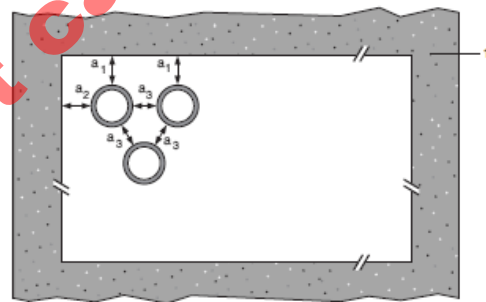
Construction details:



Configuration 1



Configuration 2



**Key**

- 1 Supporting construction
- a1 Pipe / top edge of seal separation
- a2 Pipe / side edge of seal separation
- a3 Pipe / pipe separation

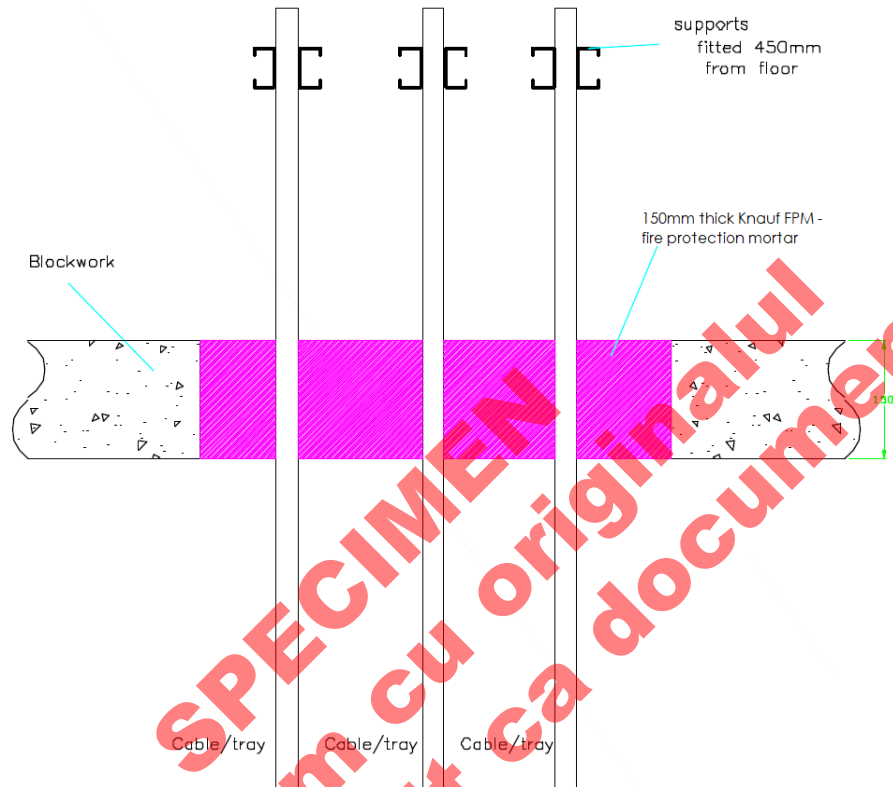
#### A.2.13.1 Single side penetration seal with cables

Services	Seal Depth	Permitted configuration for seal separation	Classification
PVC-U pipe according to EN 1329-1, EN 1452-2 and EN 1453-1 <sup>^</sup> , PVC-C according to EN 1566-1			
Diameter 16 mm, wall thickness 1.6 – 3.4 mm, to diameter 40 mm, wall thickness 1.9-3.0 mm	50 mm	1 & 2 between all specified pipes	EI 120 U/C, CC

#### A.2.14 Cable penetration seal with 150 mm deep Knauf FPM - fire protection mortar

**Penetration Seal:** Cables fitted with Knauf FPM - fire protection mortar to either side of floor. Maximum seal size of 1200 x 2400 mm and minimum separation between cables and the edge of the seal of 30 mm.

Construction details:



##### A.2.14.1 Single side penetration seal with cables

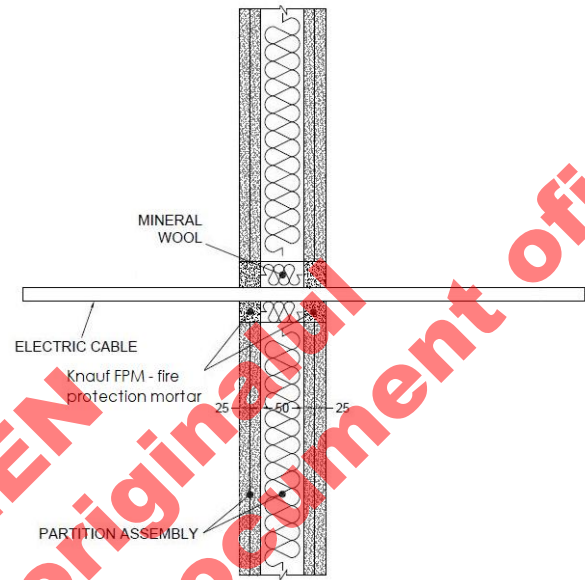
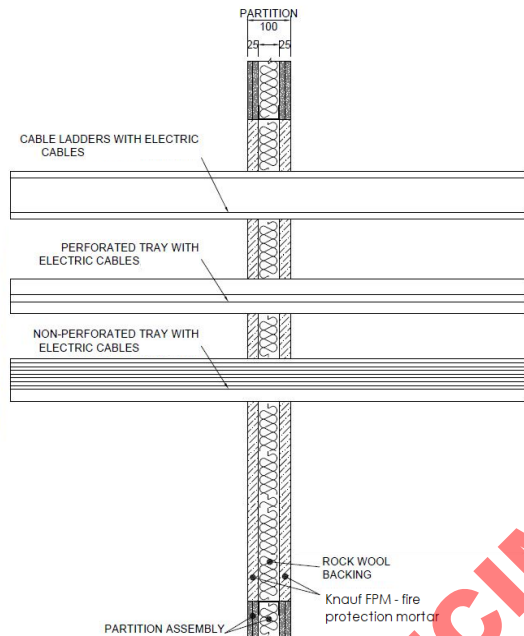
Services	Mortar depth	Backing	Insulation	Classification
Blank seals	150 mm	None	None	E 240 EI 180
Electric cables up to 21 mm diameter, single or in a bundle.				E 240 EI 120
Steel cable trays and ladders up to 500 mm wide				E 240 EI 90
Electric cables 22-50 mm diameter, single or in a bundle.				E 90 EI 60
Electric cables 51-80 mm diameter, single or in a bundle.				EI 120
Cables up to 21mm $\varnothing$ in tied bundles up to 100mm $\varnothing$				
Unsheathed wire up to 24 mm diameter				

**A.3 Flexible wall constructions according to 1.2.1 with wall thickness of minimum 100 mm**

**A.3.1 Cable penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 25 mm from seal edges), with 25 mm Knauf FPM - fire protection mortar to both sides of the wall, backed with 50 mm stone wool board 150 kg/m<sup>3</sup>.

Construction details:



**A.3.1.1 Double side penetration seal with cables**

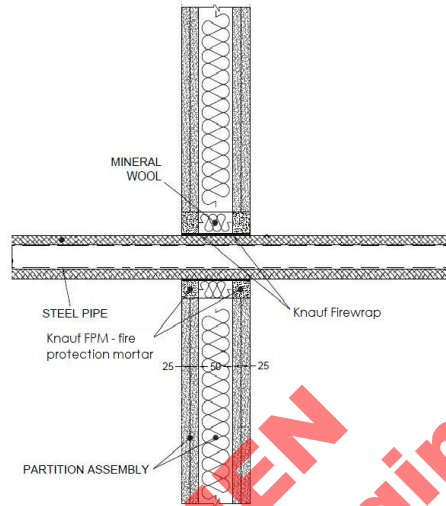
Services	Maximum aperture	Classification
None (blank)	2400 mm wide x 1200 mm high	EI 120
Single electrical cables up to 21 mm Ø (min.100 separation from other services)		E 120, EI 90
Electrical cables up to 80 mm Ø (single, bundled and on trays)		E 120, EI 60
Cables up to 21mm Ø in tied bundles up to 100mm Ø		
Steel cable trays & ladders		E 120 C/U, EI 60 C/U
Steel conduit up to 16 mm Ø		
copper conduit up to 16 mm Ø		E 120 C/U, EI 45 C/U
Unsheathed wires up to 24 mm Ø		E 120, EI 45
PVC conduit up to 16 mm Ø		EI 120 C/U, EI 120 C/C

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**A.3.2 Pipe penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges), with 25 mm Knauf FPM - fire protection mortar to both sides of the wall, backed with 50 mm stone wool board 150 kg/m<sup>3</sup> or 50 mm Knauf FPM - fire protection mortar to both sides of the wall without backing\*. Knauf Firewrap are required to be fitted to both faces of the seal.

Construction details:

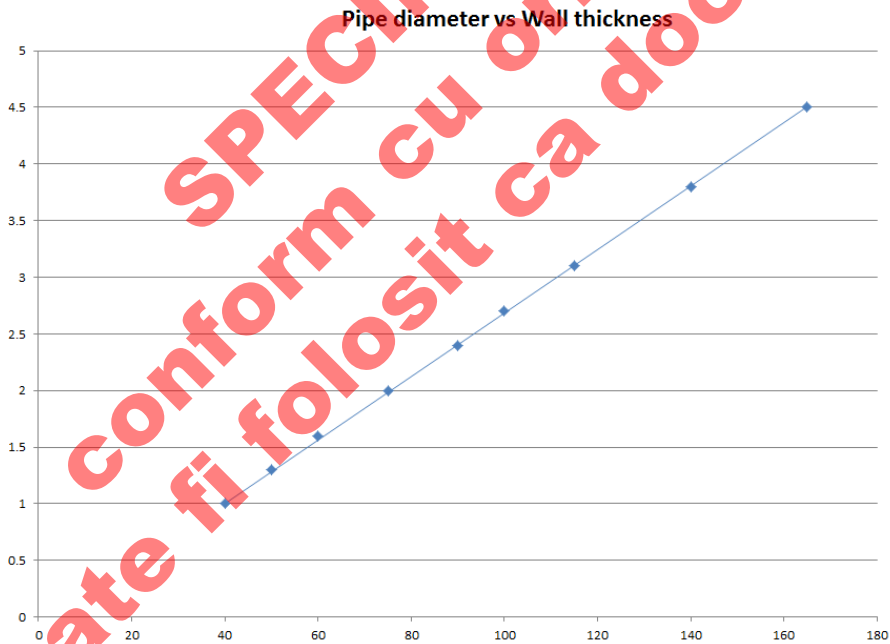


\* Maximum seal size of 2400 mm wide x 1200 mm high

### A.3.2.1 Double side penetration seal with pipes

Services	Wrap	Insulation	Classification
Mild or stainless steel pipe			
40 mm diameter/1-14.2 mm wall	2 off 50 x 1.8 mm Knauf Firewrap, one fitted flush to each face of seal		EI 120 C/U
40 mm diameter/1-14.2 mm wall*			
50 mm diameter/1.3-14.2 mm wall*			
60 mm diameter/1.6-14.2 mm wall*			
75 mm diameter/2-14.2 mm wall*			
90 mm diameter/2.4-14.2 mm wall*	2 off 50 x 3.6 mm Knauf Firewrap, one fitted flush to each face of seal	13 mm Elastomeric insulation minimum class B-s3,d0	E 120 C/U, EI 60 C/U
100 mm diameter/2.7-14.2 mm wall*			
115 mm diameter/3.1-14.2 mm wall*			
140 mm diameter/3.8-14.2 mm wall*			
165 mm diameter/ 4.5-14.2 mm wall*			

\* Typical pipe diameters shown, see below graph for intermediate sizes

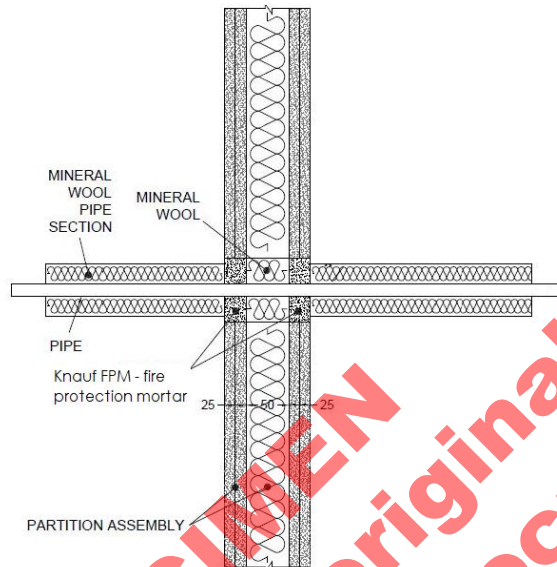




**A.3.3 Pipe penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

**Penetration Seal:** 500 mm (min.)\* LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic ( and composite) pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges and from other services), with 25 mm Knauf FPM - fire protection mortar to both sides of the wall backed with 50 mm stone wool board 150 kg/m<sup>3</sup>. Maximum seal size 2400 mm wide x 1200 mm high

Construction details:



\* Minimum 600 mm long insulation required for Alupex pipe.

**A.3.3.1 Double side penetration seal with pipes**

Services	Insulation	Classification
Copper pipe up to 54 mm diameter/1-14.2 mm wall	20 mm stone wool 80 kg/m <sup>3</sup>	EI 120 C/C
Alupex composite pipe 75 mm diameter/7.5 mm wall	600 mm length of 25 mm AES Fibre ≥ 128kg/m <sup>3</sup>	EI 60 U/U, EI 60 U/C, EI 60 C/U. EI 60 C/C

Services	Insulation	Classification
Mild or stainless steel pipe		
40 mm diameter/1-14.2 mm wall	20 mm stone wool 80 kg/m <sup>3</sup>	EI 120 C/U
40 mm diameter/1-14.2 mm wall*	30 mm stone wool 80 kg/m <sup>3</sup>	E 120 C/U, EI 90 C/U
50 mm diameter/1.2-14.2 mm wall*		
60 mm diameter/1.4-14.2 mm wall*		
75 mm diameter/1.7-14.2 mm wall*		
90 mm diameter/2-14.2 mm wall*		
100 mm diameter/2.2-14.2 mm wall*		
115 mm diameter/2.5-14.2 mm wall*		
140 mm diameter/3-14.2 mm wall*		
165 mm diameter/3.5-14.2 mm wall*		
180 mm diameter/3.8-14.2 mm wall*		
200 mm diameter/4.2-14.2 mm wall*		
219 mm diameter/4.5-14.2 mm wall*		

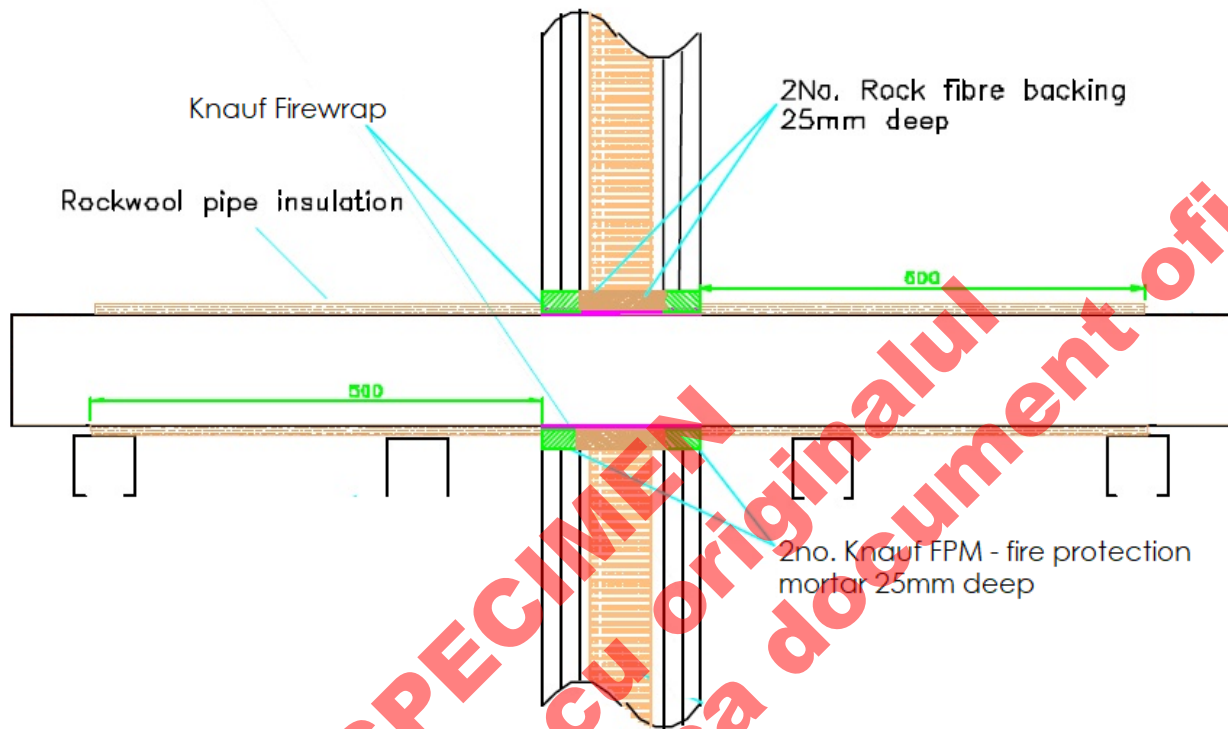
\* Typical pipe diameters shown, see below graph for intermediate sizes



**A.3.4 Pipe penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

Penetration Seal: 500 mm (min.)\* LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic ( and composite) pipes (single) fitted at any position within the aperture (min. separation 30 mm from seal edges and from other services), with 25 mm Knauf FPM - fire protection mortar to both sides of the wall backed with 50 mm stone wool board 150 kg/m<sup>3</sup>. Maximum seal size 2400 mm wide x 1200 mm high

Construction details:



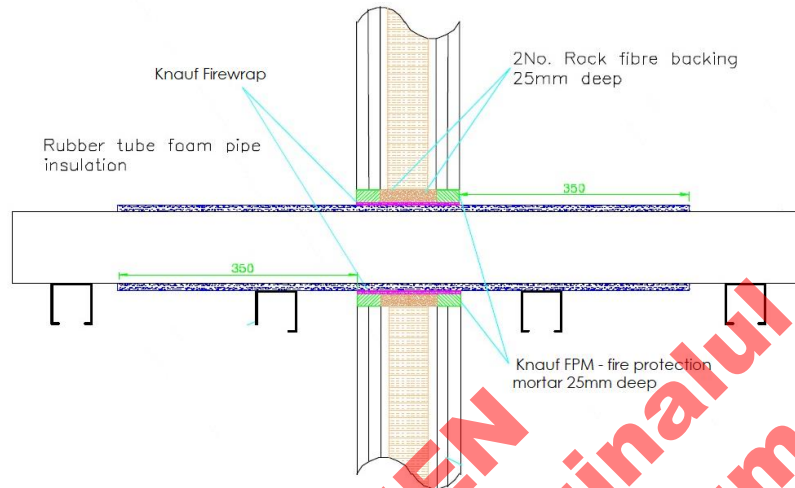
**A.3.4.1 Double side penetration seal with pipes**

Services	Insulation	Classification
Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD) pipe	Minimum 20 mm stone wool, minimum 80 kg/m <sup>3</sup>	EI 120 C/C
16 mm diameter/2.25 mm wall		
20 mm diameter/2.5 mm wall		
26 mm diameter/3 mm wall		
32 mm diameter/3 mm wall		
40 mm diameter/3.5 mm wall		
50 mm diameter/4 mm wall		
63 mm diameter/4.5 mm wall		
75 mm diameter/4.7 mm wall		

**A.3.5 Pipe penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

Penetration Seal: CS (Continuous Sustained) insulated metallic and composite pipes fitted at any position within the aperture (min. separation 25 mm from seal edges), with 25 mm Knauf FPM - fire protection mortar to both sides of the wall, backed with 25 mm stone wool 150 kg/m<sup>3</sup>\*. Knauf Firewrap are required to be fitted to both faces of the seal. Maximum seal size 2400 mm wide x 1200 mm long

Construction details:



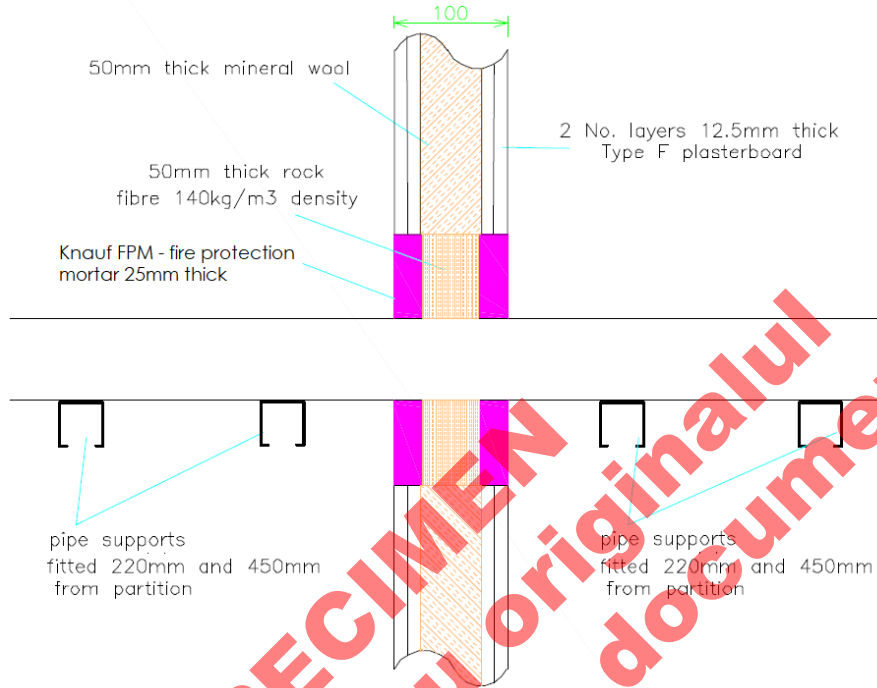
**A.3.5.1 Double side penetration seal with pipes**

Services	Wrap	Insulation	Classification
Copper pipe			
12-54 mm diameter/1-1.2 mm wall	50 x 3.6 mm Knauf Firewrap fitted to both sides of the seal	9-25 mm Elastomeric insulation minimum class B-s3,d0	EI 120 C/C
Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD pipe)			
16 mm diameter/2.25 mm wall	50 x 3.6 mm Knauf Firewrap fitted to both sides of the seal	9-25 mm Elastomeric insulation minimum class B-s3,d0	EI 120 C/C
20 mm diameter/2.5 mm wall			
26 mm diameter/3 mm wall			
32 mm diameter/3 mm wall			
40 mm diameter/3.5 mm wall			
50 mm diameter/4 mm wall			
63 mm diameter/4.5 mm wall			
75 mm diameter/4.7 mm wall			

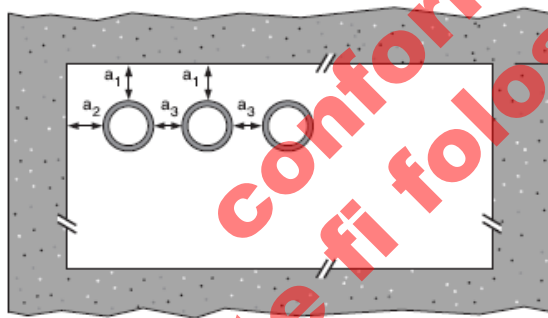
**A.3.6 Pipe penetration seal with 25 mm deep Knauf FPM - fire protection mortar to both faces backed with 50 mm mineral fibre board**

**Penetration Seal:** Combustible pipes sealed with Knauf FPM - fire protection mortar, to both sides of the wall, backed with stone wool board 140 kg/m<sup>3</sup>. Minimum separation between pipes of 30 mm (a<sub>3</sub>) and from seal edges 30 mm (a<sub>1</sub> & a<sub>2</sub>). Maximum seal size 2400 mm wide x 1200 mm high.

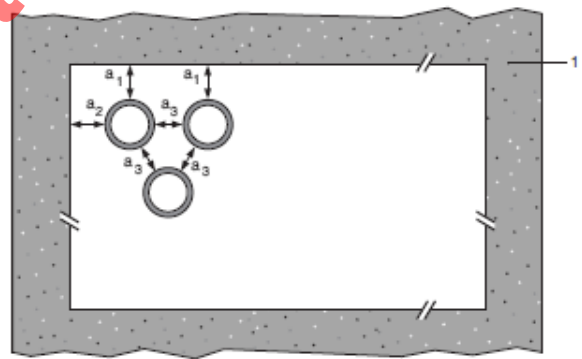
Construction details:



**Configuration 1**



**Configuration 2**



**Key**

- 1 Supporting construction
- a1 Pipe / top edge of seal separation
- a2 Pipe / side edge of seal separation
- a3 Pipe / pipe separation

### A.3.6.1 Double side penetration seal with pipes

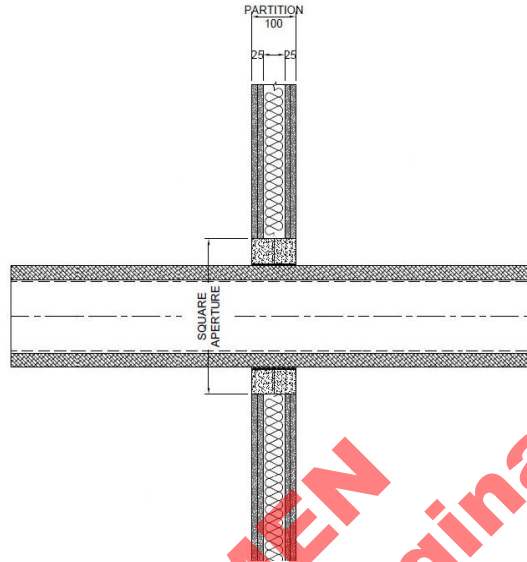
Services	Seal Depth	Permitted configuration for seal separation	Classification
PVC-U pipe according to EN 1329-1, EN 1452-2 and EN 1453-1, PVC-C according to EN 1566-1			
Diameter up to 32 mm, wall thickness 1.6 – 2.4 mm	25 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C
PE pipe according to EN 1519-1, EN 12201-2 and EN 12006-1, ABS according to EN 1455-1 and pipes made from SAN+PVC according to EN 1565-1			
Diameter up to 32 mm, wall thickness 1.8 – 3.0 mm	25 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C
PP pipe according to EN 1852-1: 2009			
Diameter up to 32 mm, wall thickness 1.9 – 4.4 mm	25 mm	1 & 2 between all specified pipes	EI 120 U/C, C/C

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### A.3.7 Pipe penetration seal with 50 mm deep Knauf FPM - fire protection mortar to both faces

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges), 50 mm Knauf FPM - fire protection mortar to both sides of the wall without backing\*. Knauf Firewrap are required to be fitted to both faces of the seal.

Construction details:



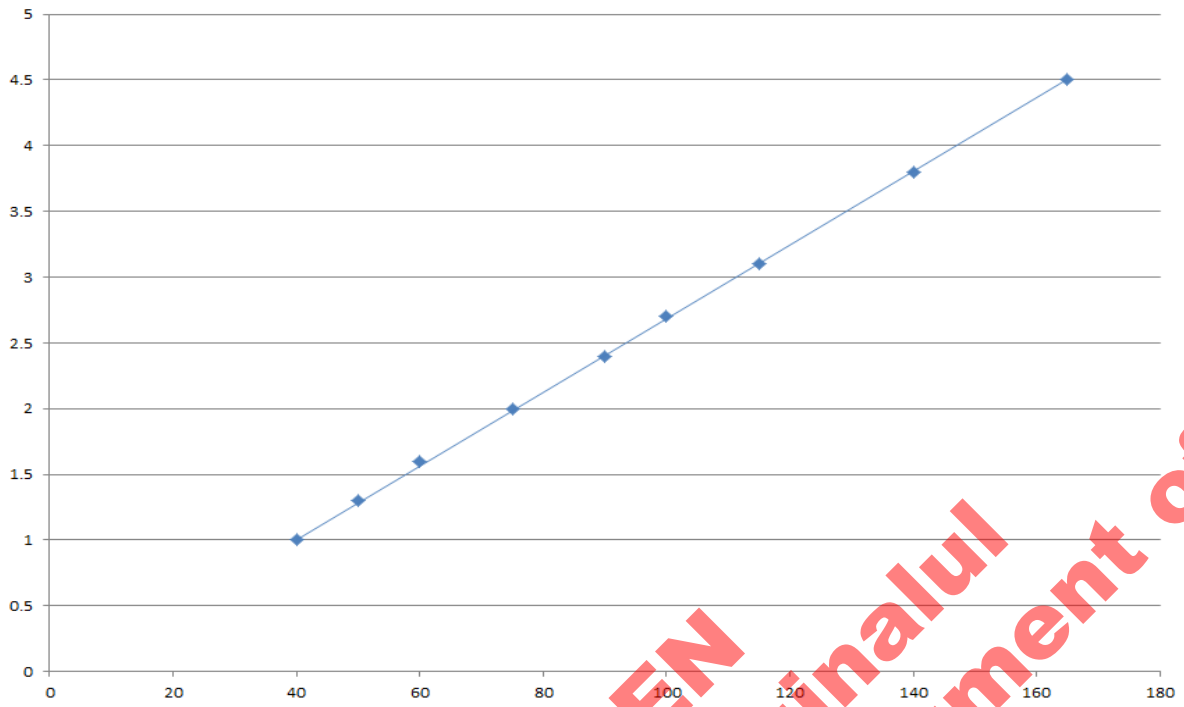
\* Maximum seal size of 2400 mm wide x 1200 mm high

#### A.3.7.1 Double side penetration seal with pipes

Services	Wrap	Insulation	Classification
Mild or stainless steel pipe	2 off 50 x 3.6 mm Knauf Firewrap, one fitted flush to each face of seal	13 -32 mm Elastomeric insulation minimum class B-s3,d0	E 120 C/U, EI 60 C/U
40 mm diameter/1-14.2 mm wall*			
50 mm diameter/1.3-14.2 mm wall*			
60 mm diameter/1.6-14.2 mm wall*			
75 mm diameter/2-14.2 mm wall*			
90 mm diameter/2.4-14.2 mm wall*			
100 mm diameter/2.7-14.2 mm wall*			
115 mm diameter/3.1-14.2 mm wall*			
140 mm diameter/3.8-14.2 mm wall*			
165 mm diameter/ 4.5-14.2 mm wall*			

\* Typical pipe diameters shown, see below graph for intermediate sizes

Pipe diameter vs Wall thickness



**Specimen**  
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