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

MEMBER OF EOTA

# European Technical Assessment ETA-21/0028 2022/09/12

I General Part

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

| | |
|---|---|
| **Trade name of the construction product:** | Astro PFP FR EX Mortar |
| **Product family to which the above construction product belongs:** | Fire Stopping and Sealing Product:<br>• Penetration Seals |
| **Manufacturer:** | Astroflame Fireseals Ltd<br>Intumescent House,<br>Unit 8 The IO Centre,<br>Stephenson Road,<br>Segensworth,<br>Fareham,<br>Hampshire<br>PO15 5RU |
| **Manufacturing plant:** | A/003 |
| **This European Technical Assessment contains:** | 99 pages including 1 annex which form an integral part of the document |
| **This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:** | EAD 350454-00-1104 |
| **This version replaces:** | The ETA with the same number issued on 2021-01-03 |

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# I. SPECIFIC PARTS OF THE EUROPEAN TECHNICAL ASSESSMENT

## 1 Technical description of the product

1) Astro PFP FR EX 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) Astro PFP FR EX Mortar is supplied as a dry material and is mixed with water to the required ratio prior to installation.

3) Astro PFP FR EX 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 require application and classification (see Annex A).

4) Astro PFP FR Pipe Wraps are required to be used in conjunction with Astro PFP FR EX Mortar depending upon the required application and classification (see Annex A). Astro PFP FR Pipe Wraps are the subject of ETA-21/0027.

5) The applicant has submitted a written declaration that Astro PFP FR EX 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 catagory of Astro PFP FR EX Mortar in relation to BWR 3 (Hygiene, health and environment) is IA1, S/W2

## 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 Astro PFP FR EX 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 Astro PFP FR EX 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/$m^3$.

   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/$m^3$.

   * 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.

   Astroflame Fire Protection Systems which involve services penetrating both sides of a flexible wall may also be used in the situation where the services penetrates one side of the wall only and the remaining side of the wall is not penetrated at the same point (i.e. the services continues on the inside of the wall). All fire integrity and thermal insulation ratings for such single-sided penetrations remain the same as for the equivalent double-sided penetration.

3) The System Astro PFP FR EX 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 Astro PFP FR EX Mortar may be used to seal apertures in the separating element up to 2400 mm wide by 1200 mm high in a wall, and 2400 mm by 1200 mm in a floor. The additional sizes that are permitted in floors are:

| Width (mm) | Length (mm) |
|---|---|
| 1100 | 2900 |
| 1000 | 4000 |
| 900 | 7000 |
| ≤ 800 | ∞ (infinite) |

The minimum permitted separation between adjacent seals/apertures is 200mm. Services within the system Astro PFP FR EX 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 Astro PFP FR EX Mortar of 30 years, provided that the conditions laid down in the manufacturers specifications concerning 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 or the Technical Assessment Body 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 $Z_2$: 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 |
|---|---|---|
| | Essential characteristic | Product Performance |
| **BWR 2 Safety in case of fire** | | |
| | Reaction to fire | Class 'A1' |
| | Resistance to fire | Annex A |
| **BWR 3 Hygiene, health and environment** | | |
| | Air permeability | No performance assessed |
| | Water permeability | No performance assessed |
| | Content, emission and/or release of dangerous substances | Use categories: IA1, S/W3<br>Declaration of manufacturer |
| **BWR 4 Safety in use** | | |
| | Mechanical resistance and stability | Suitable for use in walls and floors in Zone Types I, II, III & IV* |
| | Resistance to impact/movement | |
| | Adhesion | |
| | Durability | $Z_2$ |
| **BWR 5 Protection against noise** | | |
| | Airborne sound insulation | Rw 48 (-1;-3) dB |
| **BWR 6 Energy economy and heat retention** | | |
| | Thermal properties | No performance assessed |
| | Water vapour permeability | No performance assessed |

*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[1], 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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark A/S prior to CE marking

Issued in Copenhagen on 2022-09-012 by

Thomas Bruun

Managing Director, ETA-Danmark

[1] Official Journal of the European Communities L178/52 of 14/7/1999

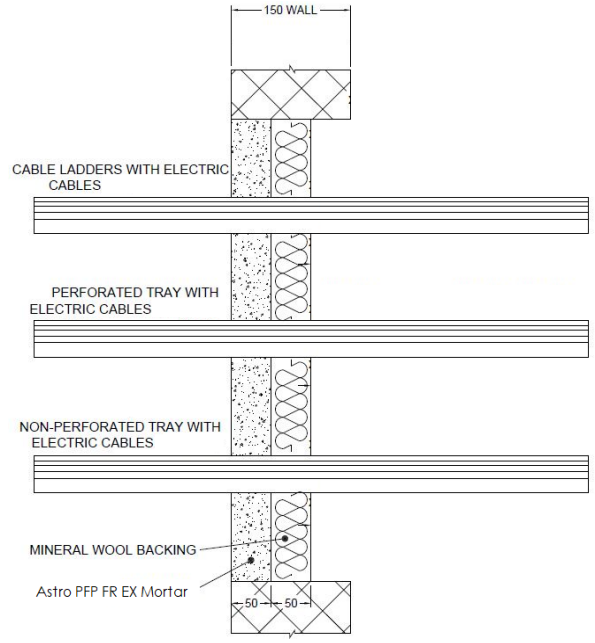
# ANNEX A – Resistance to Fire Classification – Astro PFP FR EX Mortar

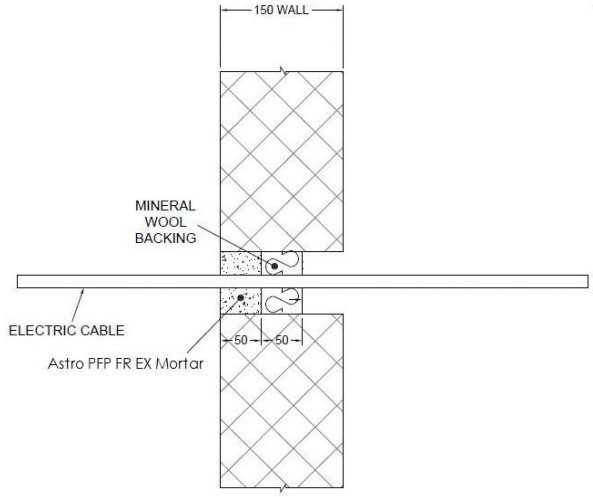
## A.1 Rigid wall constructions according to 1.2.1 with wall thickness of minimum 150 mm

### A.1.1 Cable penetration seal with 50 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar to either side of the wall (or at any position in between), backed with 50 mm stone wool board 150 kg/m³.

Construction details:



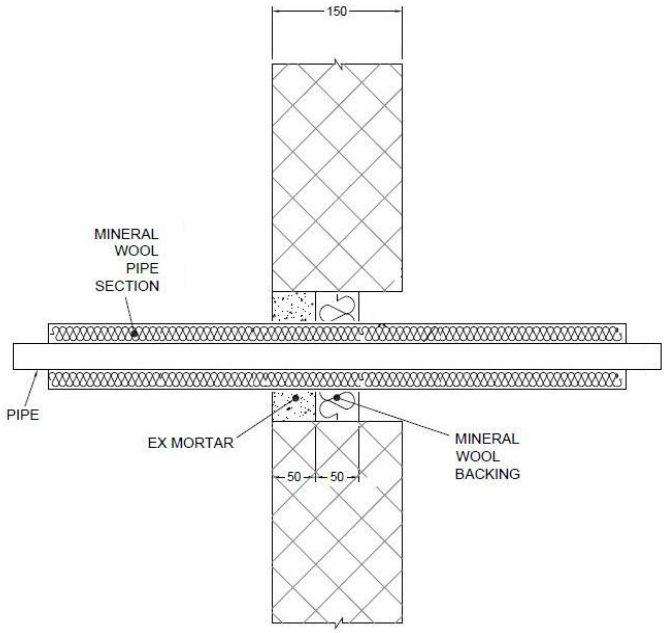

#### A.1.1.1 Single side penetration seal with cables

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

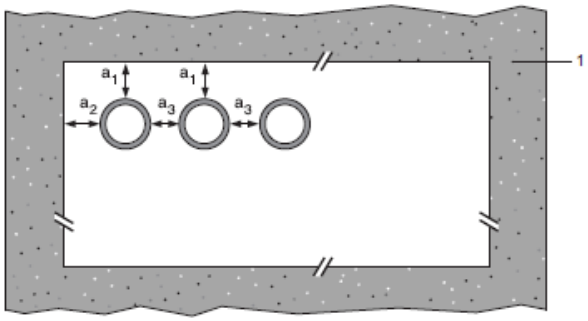
### A.1.2 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar backed with mineral fibre board

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges, with min. 50 mm Astro PFP FR EX Mortar to either sides of the wall (or any position in between), backed with min. 50 mm stone wool min. 150 kg/m$^3$.

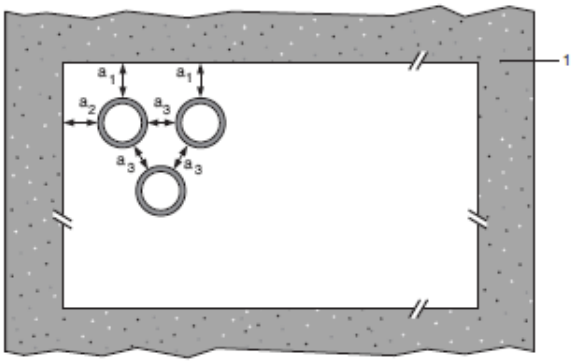
Construction details:




**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

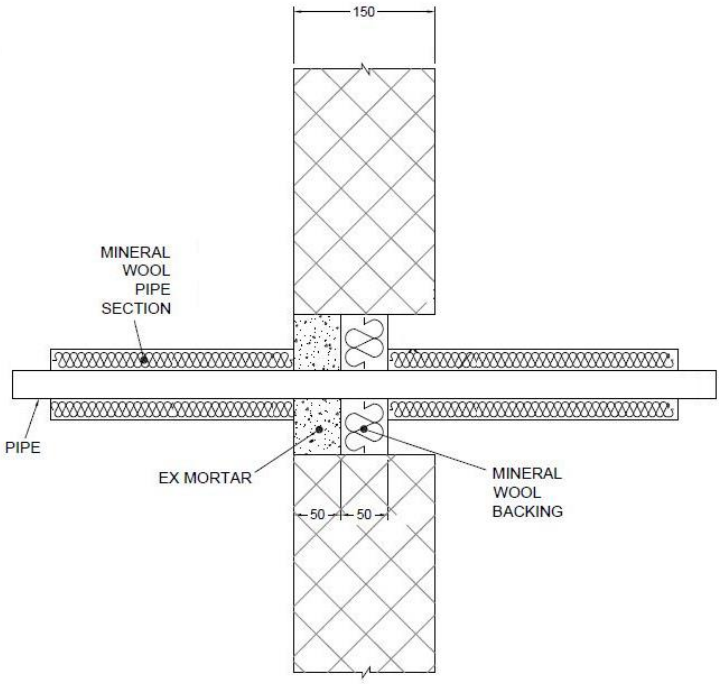
#### A.1.2.1 Single side penetration seal with pipes

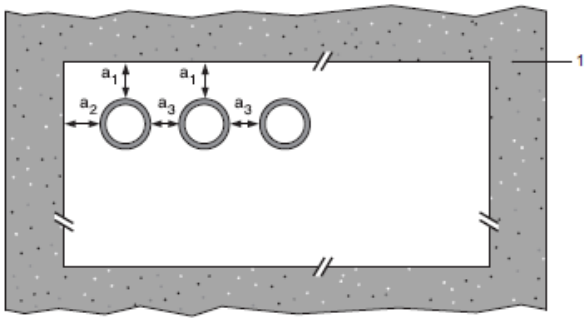
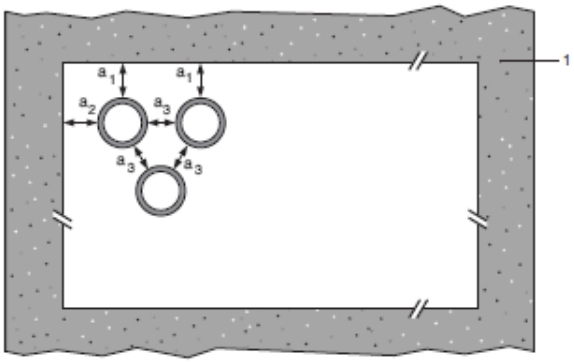
| Services | Maximum aperture | Insulation | Classification |
|---|---|---|---|
| Steel pipe 219 diameter/ 5-14.2 mm wall | As section 2.4) | 30 mm stone wool 80 kg/m$^3$ | **E 120 C/U, EI 90 C/U** |

### A.1.3 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar backed with mineral fibre board

**Penetration Seal:** LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic and composite pipes fitted at any position within the aperture (min. separation 30 mm from seal edges, with min. 50 mm Astro PFP FR EX Mortar to either sides of the wall (or any position in between), backed with min. 50 mm stone wool min. 150 kg/m$^3$.

Construction details:




| Configuration 1 | Configuration 2 |
|---|---|
|  |  |



**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

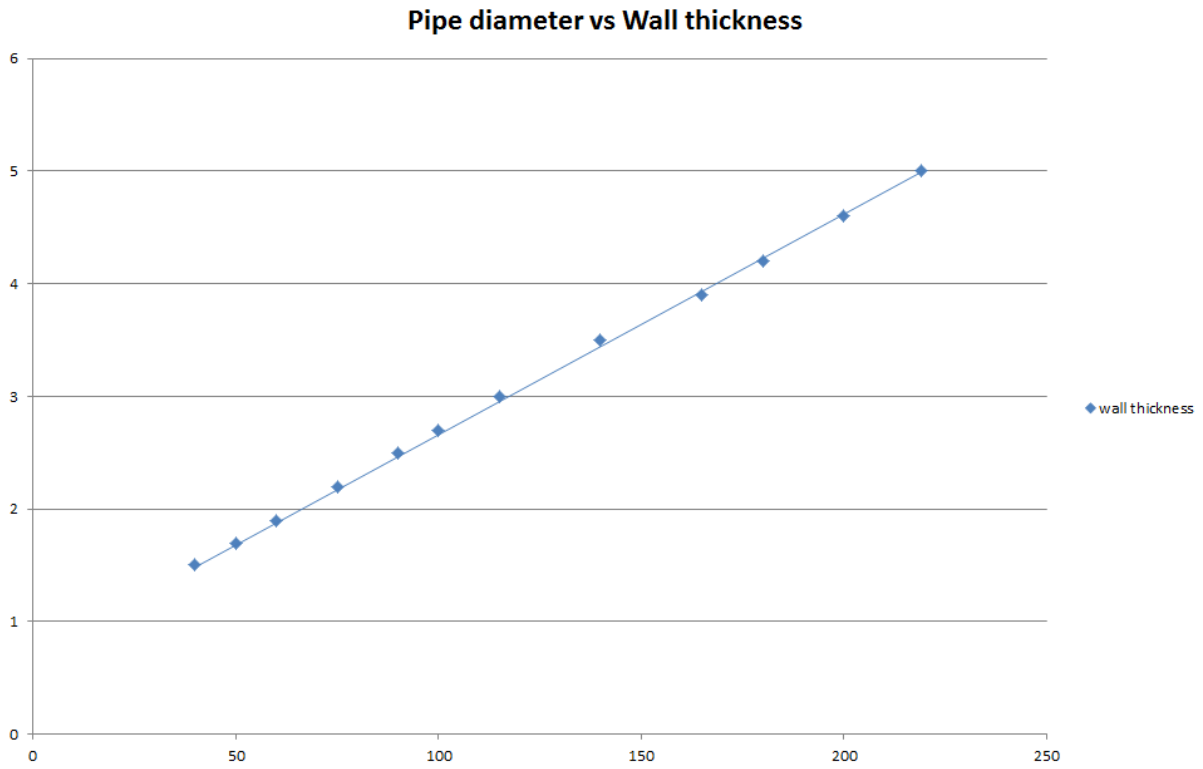
a3 Pipe / pipe separation

### A.1.3.1 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$^3$ | **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$^3$ | **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$^3$ | **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$^3$ | **EI 240 C/U** |
| 40 mm diameter/1.5-14.2 mm wall* | 2400 mm wide x 1200 mm high | | **E 180 C/U, EI 120 C/U** |
| 40 mm diameter/1.5-14.2 mm wall* | | 1000 mm long, 30 mm Stone wool insulation 80 kg/m$^3$ | **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* | | | |

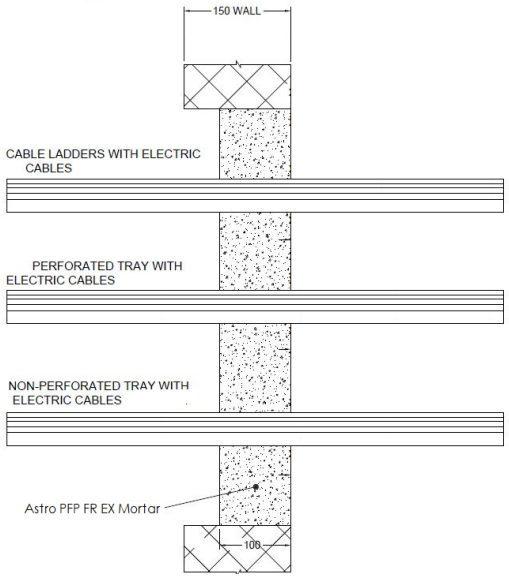
* Typical pipe diameters shown, see below graph for intermediate sizes


Pipe diameter vs Wall thickness
6
5
4
3
2
1
0
0
50
100
150
200
250
wall thickness

### A.1.4 Cable penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 25 mm from seal edges), with 100 mm Astro PFP FR EX Mortar to either side of the wall (or at any position in between).

Construction details:



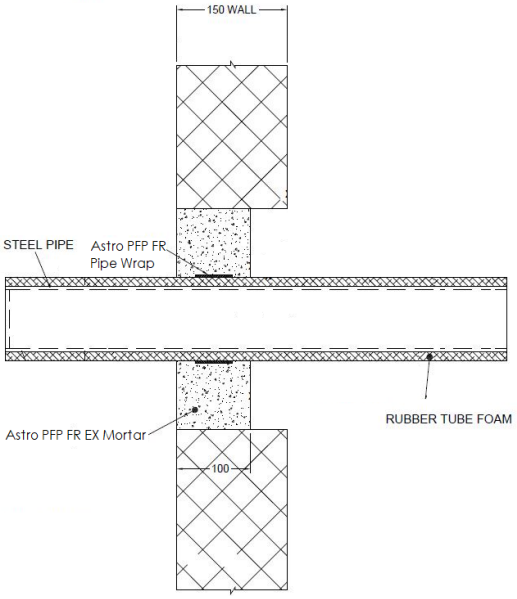

#### A.1.4.1 Single side penetration seal with cables

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

### A.1.5 Pipe penetration seal with 100 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar to either side of the wall. Astro PFP FR Pipe Wraps are required to be centrally within the seal for pipes with combustible insulation. Maximum seal size 2400 mm wide x 1200 mm high

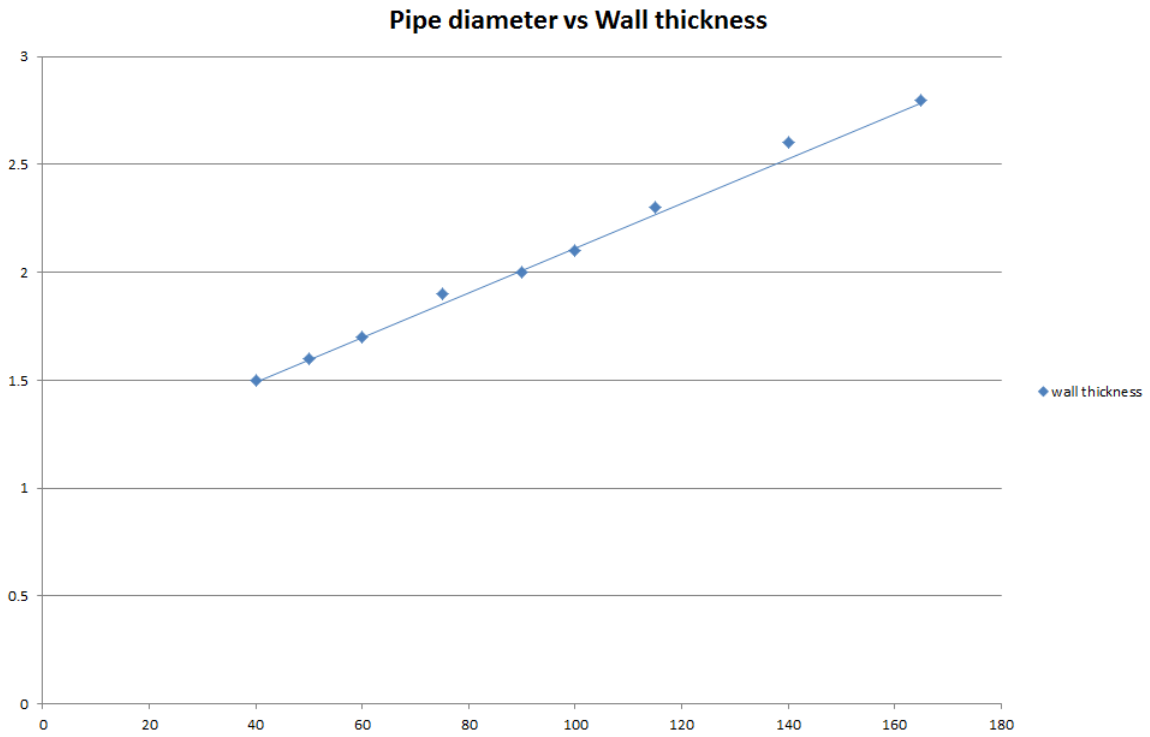
Construction details:




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

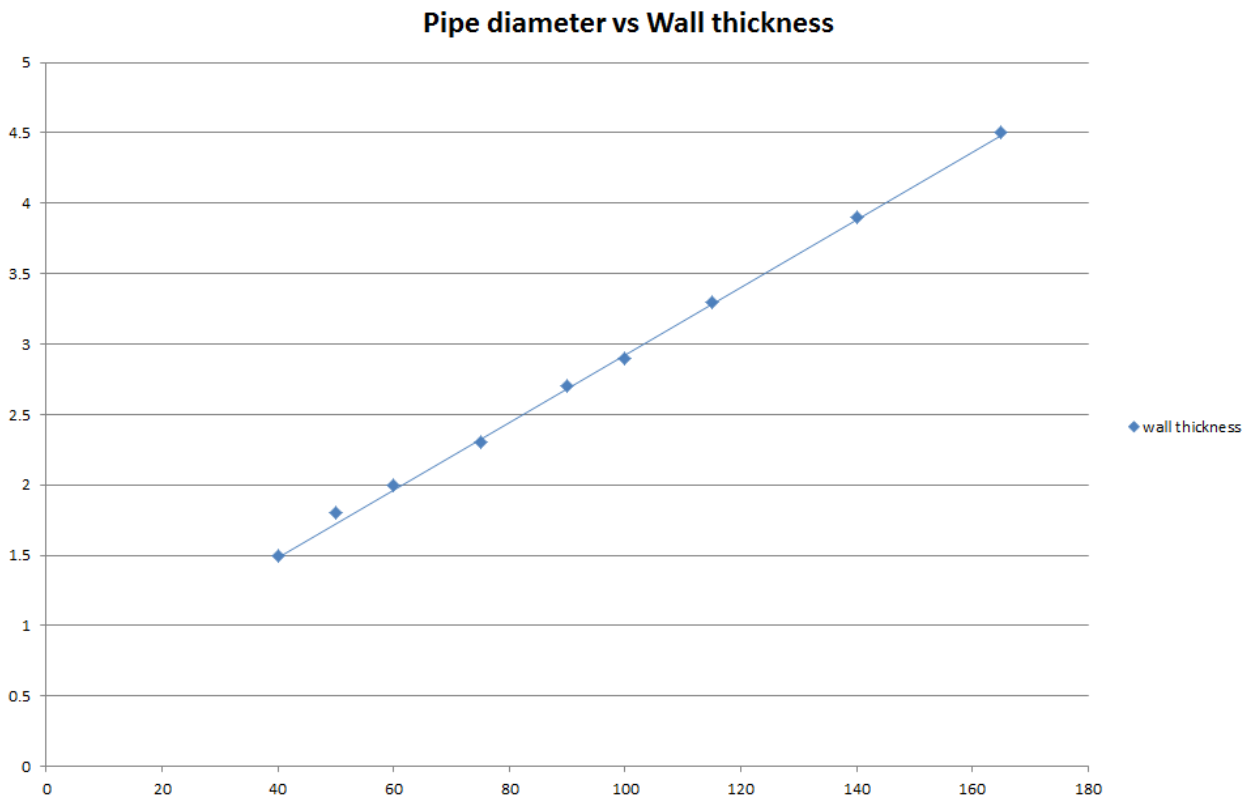
| Services | Wrap | Insulation | Classification |
|---|---|---|---|
| Mild or stainless steel pipe | | | |
| 40 mm diameter/1.5-14.2 mm wall | 1 off 50 x 3.6mm Astro PFP FR Pipe Wrap, fitted central | 13 mm Elastomeric insulation minimum class B-s3,d0 | **EI 240 C/U** |
| 165 mm diameter/4.5-14.2 mm 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 Astro PFP FR Pipe Wrap, 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 Astro PFP FR Pipe Wrap, fitted central | 13-25 mm Elastomeric insulation minimum class B-s3,d0 | **E 180 C/U, EI 60 C/U** |
| 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* | | | |

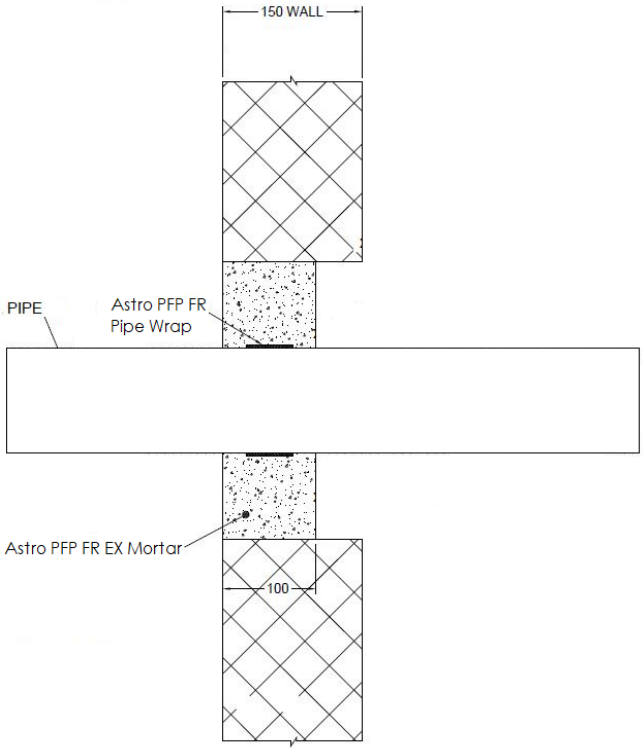
* Typical pipe diameters shown, see below graph for intermediate sizes


Pipe diameter vs Wall thickness
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
wall thickness

### A.1.6 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** plastic pipes fitted at any position within the aperture (min. separation 10 mm from seal edges), with 100 mm Astro PFP FR EX Mortar to either side of the wall. Astro PFP FR Pipe Wraps are required to be centrally within the seal. Maximum seal size 2400 mm wide x 1200 mm high

Construction details:



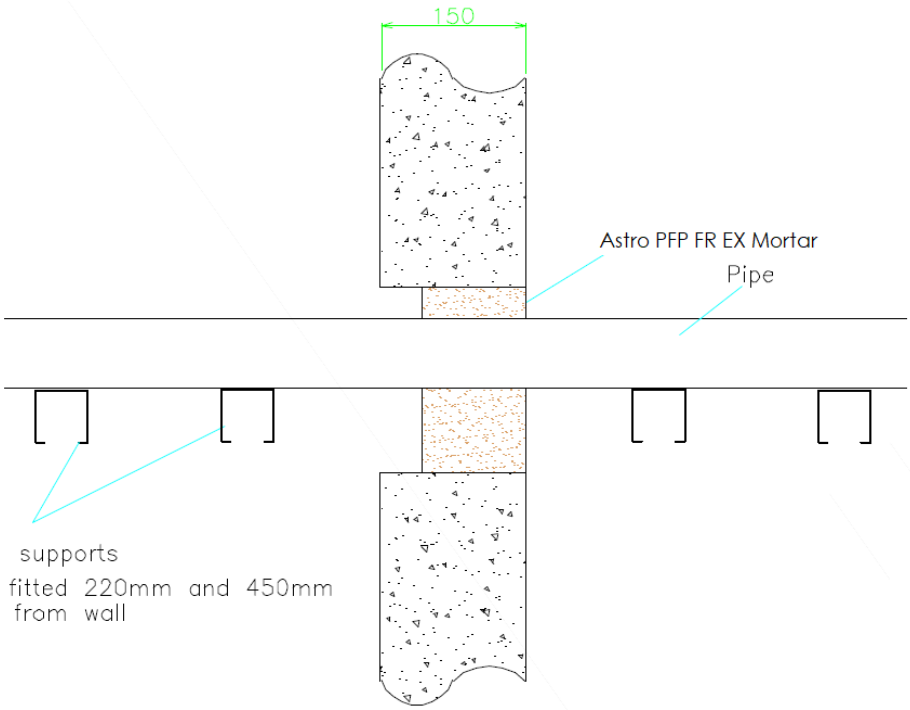

#### A.1.6.1 Single side penetration seal with pipes

| 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 Astro PFP FR Pipe Wrap, fitted central | None | **EI 120 C/C** |

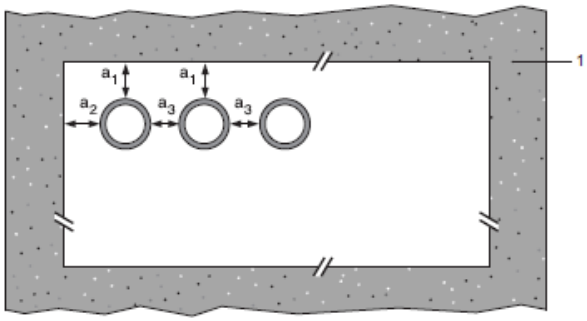
### A.1.7 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Combustible pipes sealed with Astro PFP FR EX 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.

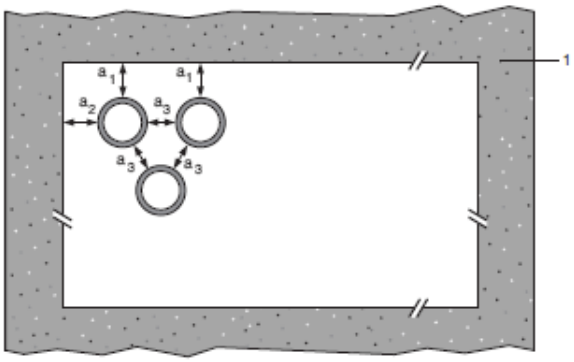
Construction details:




**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

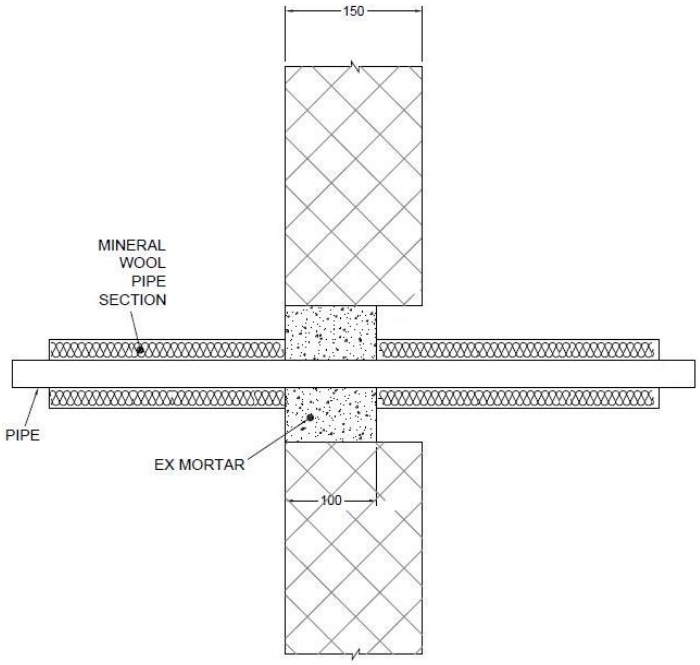
### A.1.7.1 Single side penetration seal with pipes

| 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$^{\$}$, 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** |

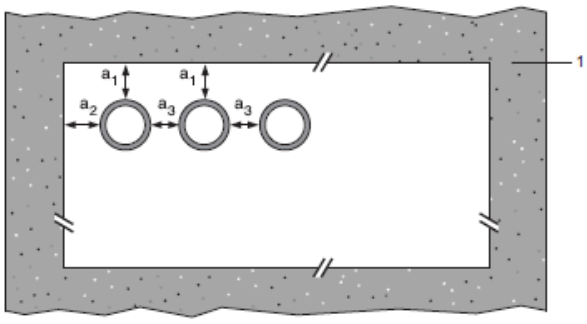
### A.1.8 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** 1000 mm (min.) LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic pipes fitted at any position within the aperture (min. separation 20 mm from seal edges, with min. 100 mm Astro PFP FR EX Mortar to either sides of the wall (or any position in between)

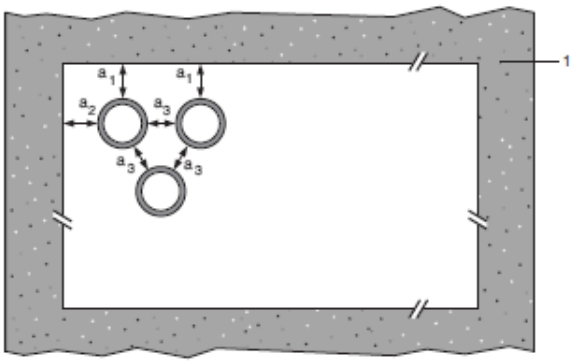
Construction details:




**Configuration 1**




**Configuration 2**




**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

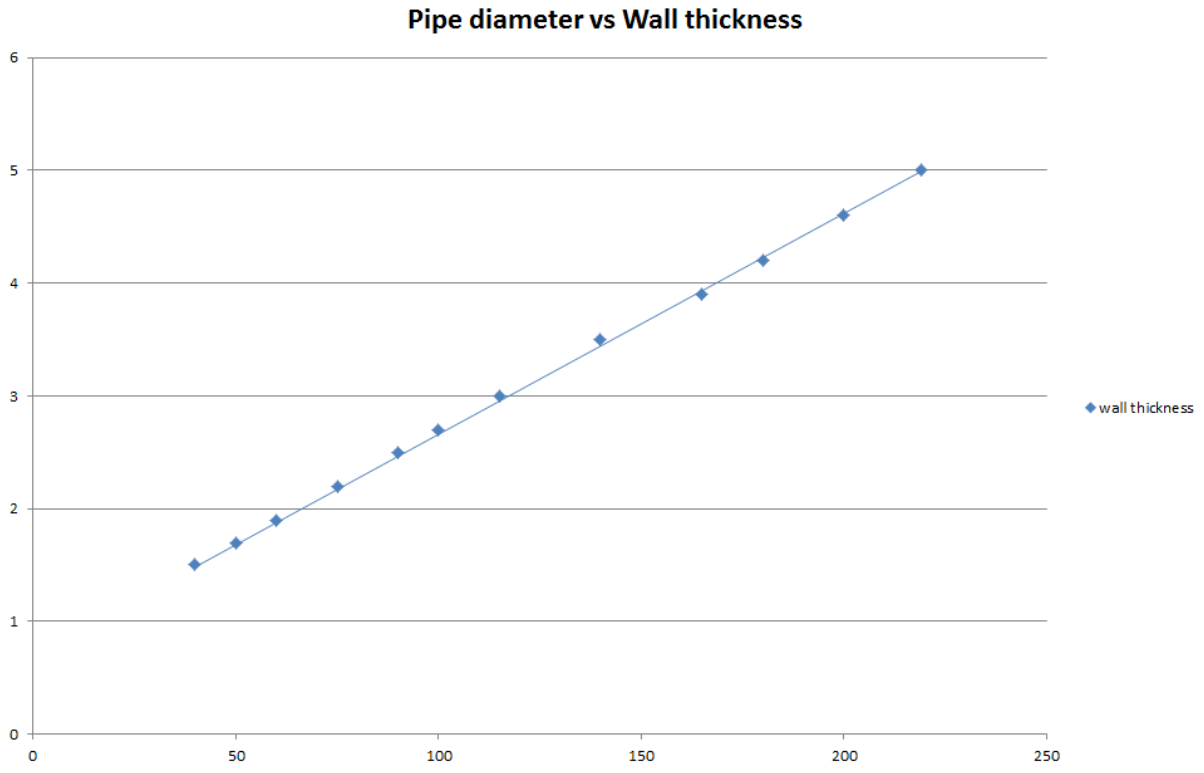
a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

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

| Services<br>Mild or stainless steel pipe | Maximum aperture | Insulation | Classification |
|---|---|---|---|
| 40 mm diameter/1.5-14.2 mm wall* | 2400 mm wide x 1200 mm high | 20 mm Stone wool insulation 80 kg/m$^3$ | **EI 240 C/U** |
| 40 mm diameter/1.5-14.2 mm wall* | | 30 mm Stone wool insulation 80 kg/m$^3$ | **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* | | | |

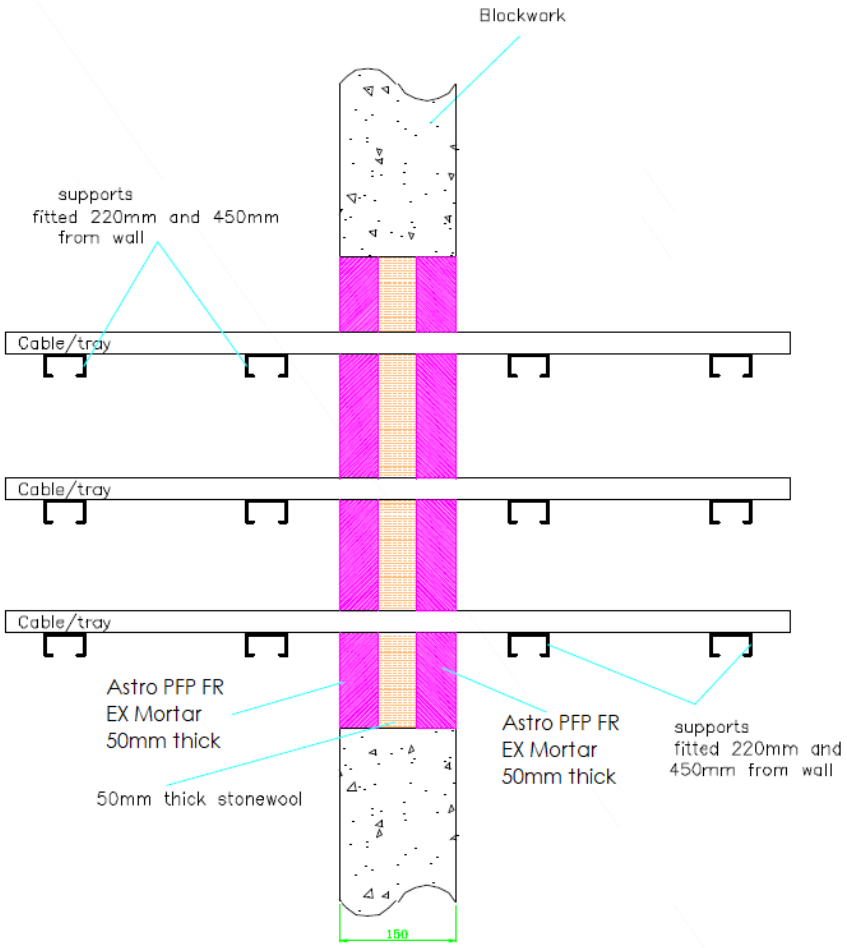
* Typical pipe diameters shown, see below graph for intermediate sizes



### A.1.9 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar to both faces

**Penetration Seal:** Cables fitted with Astro PFP FR EX Mortar to both sides of the wall, backed with stone wool insulation board 150kg/m$^3$. 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

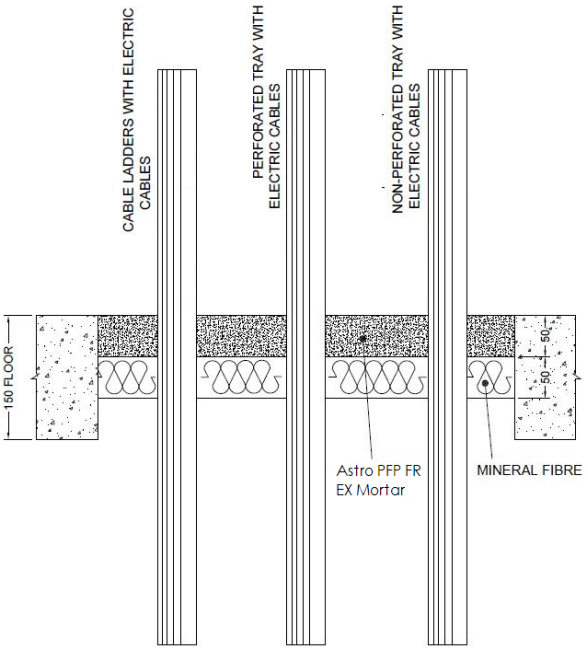
| Services | Mortar depth | Backing | Insulation | Classification |
|---|---|---|---|---|
| Blank seals | 50 mm | 50 mm Stone wool 150 kg/m$^3$ | None | **EI 240** |
| Electric cables up to 80 mm diameter, single or in a bundle. | | | | **E 240 EI 60** |
| Steel cable trays and ladders up to 500 mm wide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

## 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 Astro PFP FR EX 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 Astro PFP FR EX Mortar flush with the top of the floor, backed with 50 mm stone wool 150 kg/m³

Construction details:




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

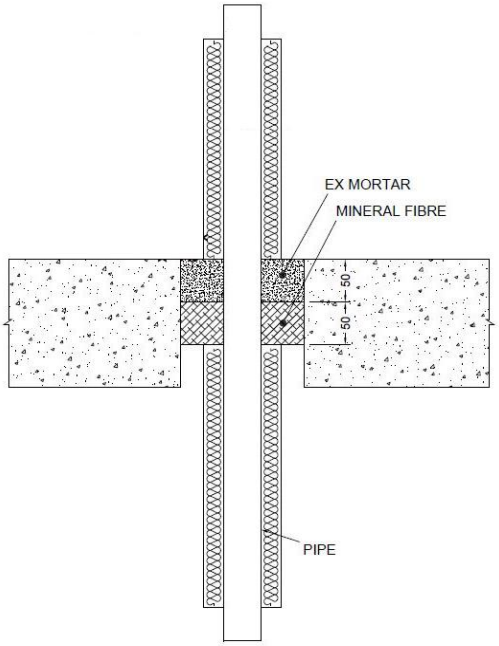
| Services | Maximum aperture | Classification |
|---|---|---|
| None (blank) | 2400 mm x 1200 mm | **EI 180** |
| Single* electrical cables up to 21 mm Ø | | **E 180, EI 90** |
| Electrical cables up to 21 mm Ø (single, bundled and on trays) | | **E 180, EI 60** |
| Electrical cables up to 80 mm Ø (single,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

* To be separated by at least 30 mm

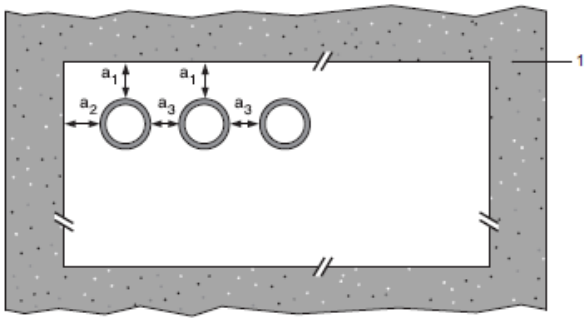
### A.2.2 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar backed with mineral fibre board

**Penetration Seal:** 1000 mm (min.) LI (Local Interrupted) or CI (Continuous Interrupted) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges, with min. 50 mm Astro PFP FR EX Mortar flush with the top of floor, backed with min. 50 mm stone wool min. 150 kg/m$^3$

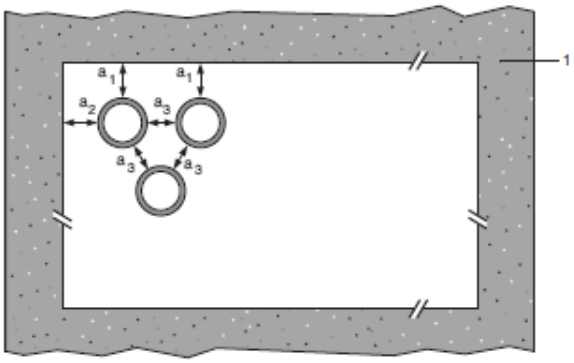
Construction details:




**Configuration 1**




**Configuration 2**




**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

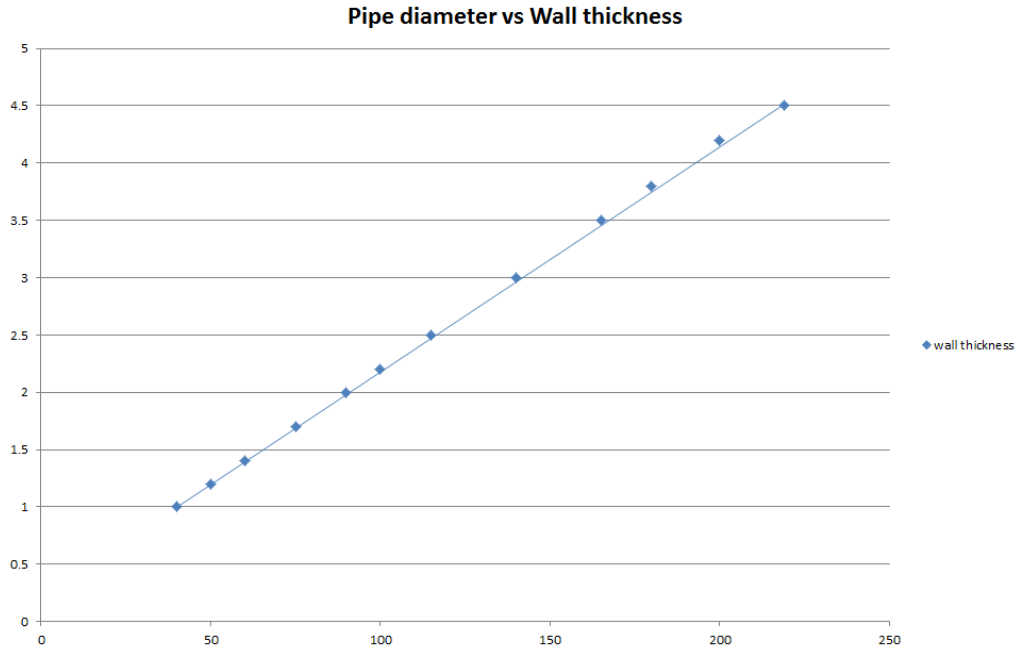
a3 Pipe / pipe separation

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

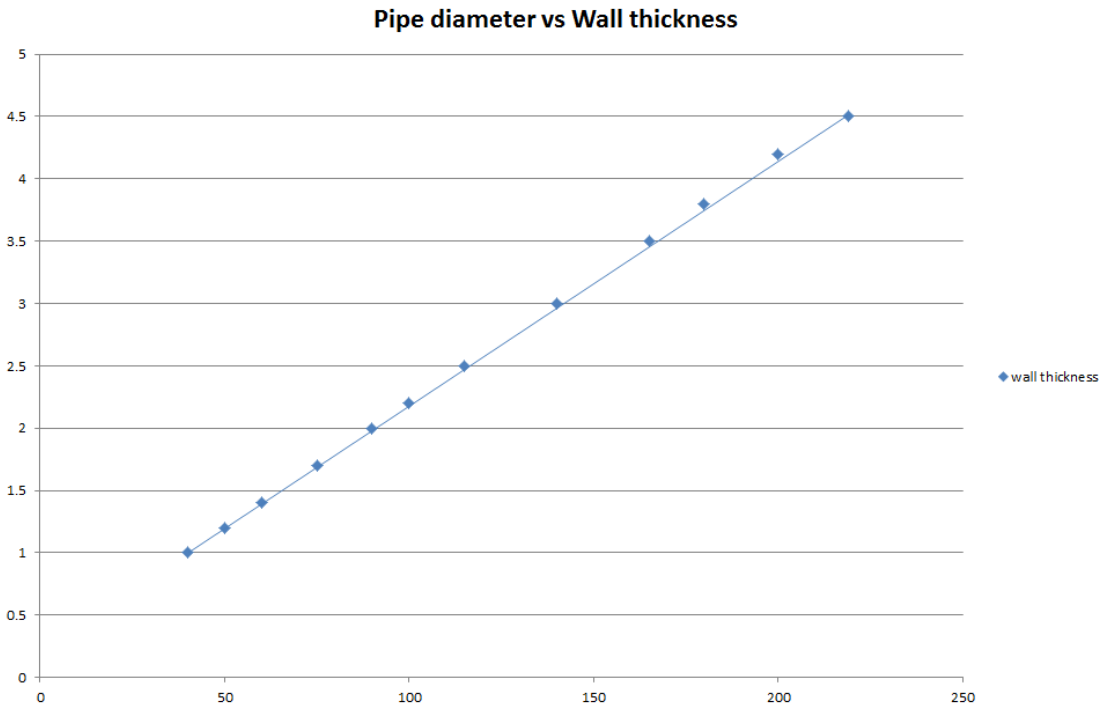
| Services | Maximum aperture | Insulation | Classification |
|---|---|---|---|
| Copper pipe up to 12 mm diameter/ 1-5 mm wall | 70 x 70 mm | 20 mm stone wool 80 kg/m$^3$ | **EI 240 C/C** |
| Copper pipe up to 54 mm diameter/ 1-14.2 mm wall | 115 x 115 mm | | **E 240 C/C, EI 180 C/C** |
| Copper pipe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

| Services<br>Mild or stainless steel pipe | Maximum aperture | Insulation | Classification |
|---|---|---|---|
| 40 mm diameter/1-14.2 mm wall* | 280 x 280 mm | 20 mm Stone wool insulation 80 kg/m$^3$ | **EI 240 C/U** |
| 40 mm diameter/1-14.2 mm wall* | | 30 mm Stone wool insulation 80 kg/m$^3$ | **E 240 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



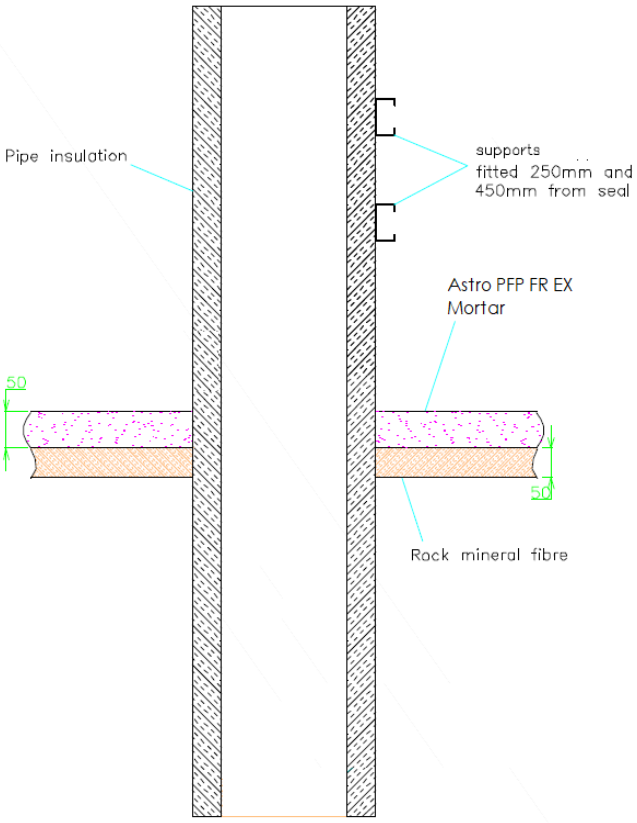
| Services<br>Mild or stainless steel pipe | Maximum aperture | Insulation | Classification |
|---|---|---|---|
| 40 mm diameter/1-14.2 mm wall* | 2400 mm x 1200 mm | 20 mm Stone wool insulation 80 kg/m$^3$ | **EI 180 C/U** |
| 40 mm diameter/1-14.2 mm wall* | | 30 mm Stone wool insulation 80 kg/m$^3$ | **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* | | | |



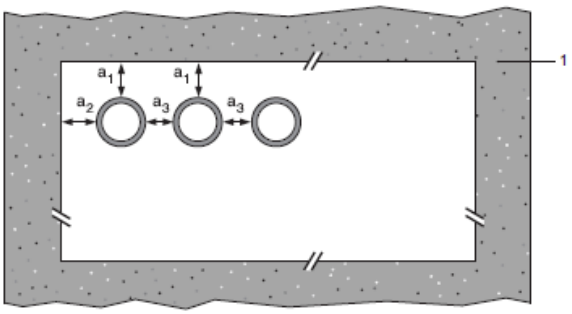
### A.2.3 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar backed with mineral fibre board

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture, with 50 mm Astro PFP FR EX Mortar, backed with 50 mm stone wool 140 kg/m$^3$ 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.

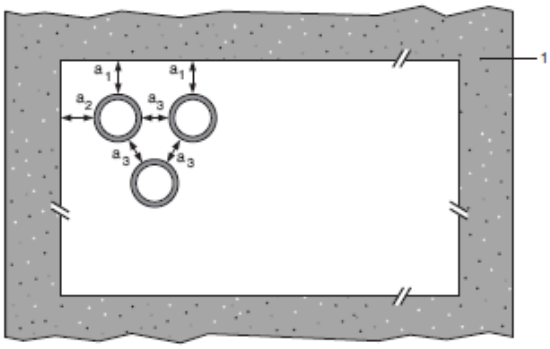
Construction details:




**Configuration 1**




**Configuration 2**




**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

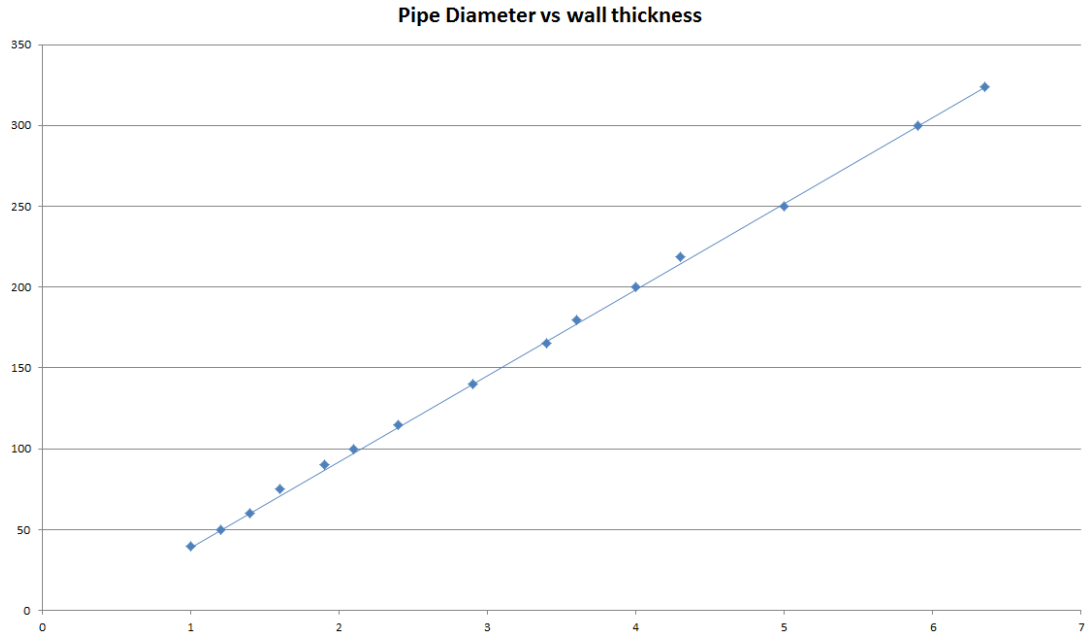
a2 Pipe / side edge of seal separation

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$^3$ | **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$^3$ | |
| 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)*** |

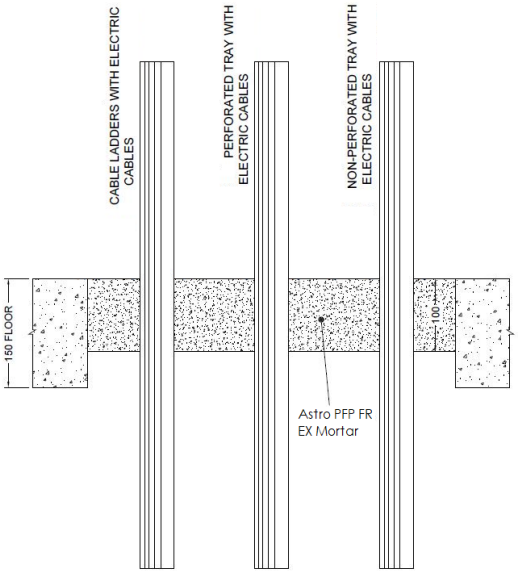
* EI 240 in apertures up to a maximum of 550 x 1100 mm



### A.2.4 Cable penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Cables fitted at any position within the aperture (min. separation 30 mm from seal edges), with 100 mm Astro PFP FR EX Mortar flush with the top of the floor

Construction details:



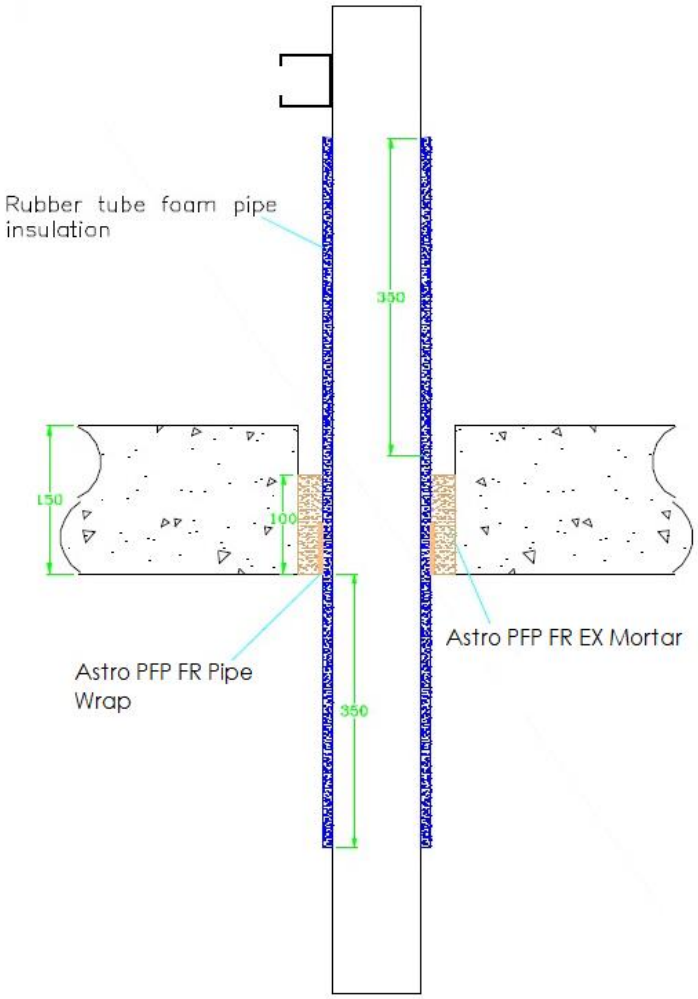

### A.2.4.1 Single side penetration seal with cables

| 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 Astro PFP FR EX 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 Astro PFP FR EX Mortar at any position within the floor. Astro PFP FR Pipe Wraps are required to be fitted around combustible pipe insulation. Maximum seal size 1200 x 2400 mm.

Construction details:



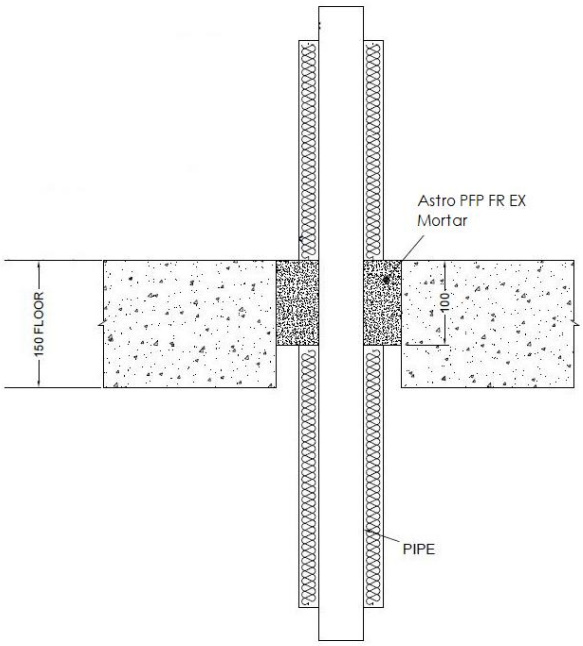
### A.2.5.1 Single side penetration seal with pipes

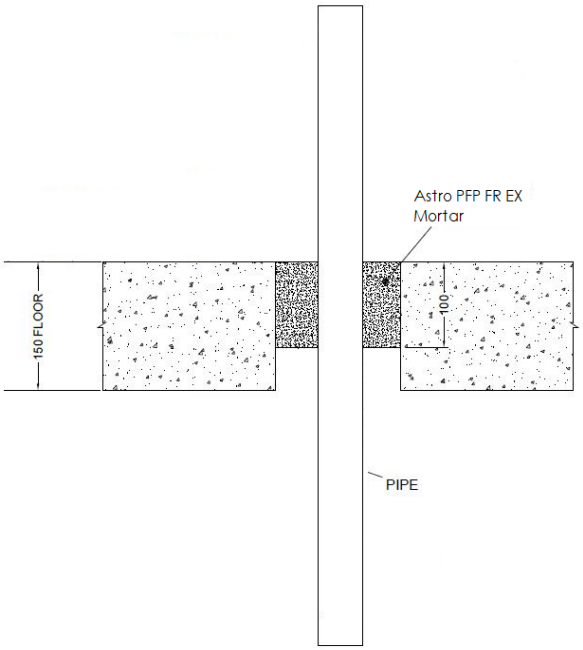
| Services | Wrap | Insulation | Classification |
|---|---|---|---|
| Copper pipe | | | |
| 12 mm diameter/1 mm wall | 50 x 3.6 mm Astro PFP FR Pipe Wrap fitted to the soffit | 9 mm Elastomeric insulation minimum class B-s3,d0 | **EI 240 C/C** |
| 12-54 mm diameter/1-1.2 mm wall | | 13-25 mm Elastomeric 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 Astro PFP FR Pipe Wrap 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 | | | |
| 75 mm diameter/4.7 mm wall | | | |
| 16 mm diameter/2.25 mm wall | | 13-25 mm Elastomeric insulation minimum class B-s3,d0 | **E 180 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 | | | |
| 75 mm diameter/4.7 mm wall | | | |

### A.2.6 Pipe penetration seal with 100 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar flush with the top of the floor

Construction details:



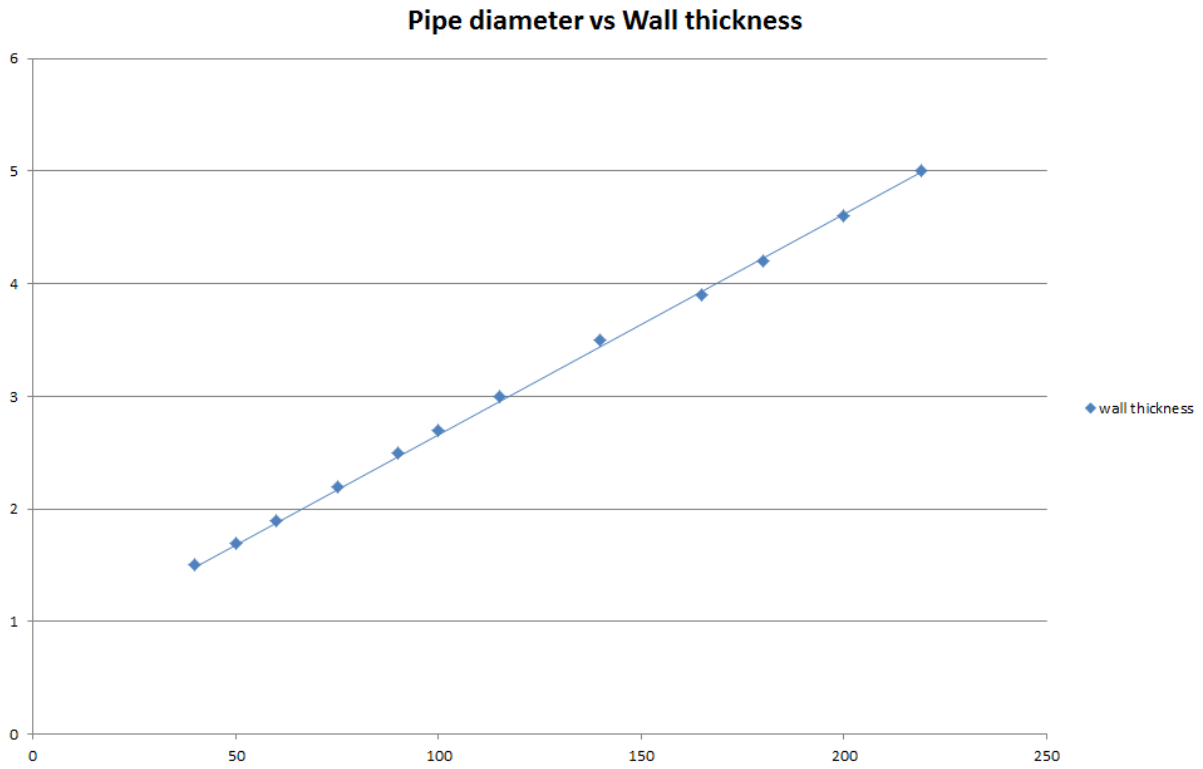




#### A.2.6.1 Single side penetration seal with pipes

| 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<br>Mild or stainless steel pipe | Maximum Aperture | Insulation | Classification |
|---|---|---|---|
| 40 mm diameter/1.5-14.2 mm wall* | 2400 mm wide by 1200 mm high | 20 mm Stone wool insulation 80 kg/m$^3$ | **EI 240 C/U** |
| 40 mm diameter/1.5-14.2 mm wall* | | 30 mm Stone wool insulation 80 kg/m$^3$ | **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* | | | |

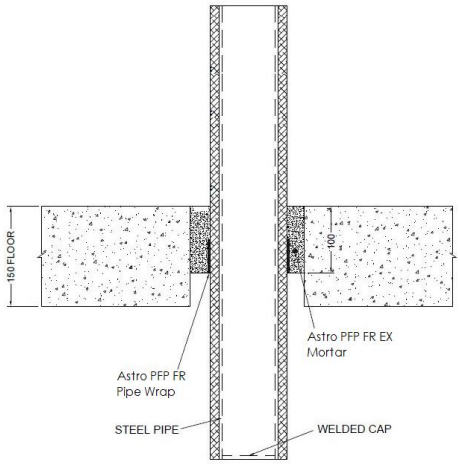
* Typical pipe diameters shown, see below graph for intermediate sizes


Pipe diameter vs Wall thickness
6
5
4
3
2
1
0
0
50
100
150
200
250
wall thickness

### A.2.7 Pipe penetration seal with 100 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar to the top surface of the floor. Astro PFP FR Pipe Wraps are required to be fitted around combustible pipe insulation. Maximum seal size 2400 mm x 1200 mm.

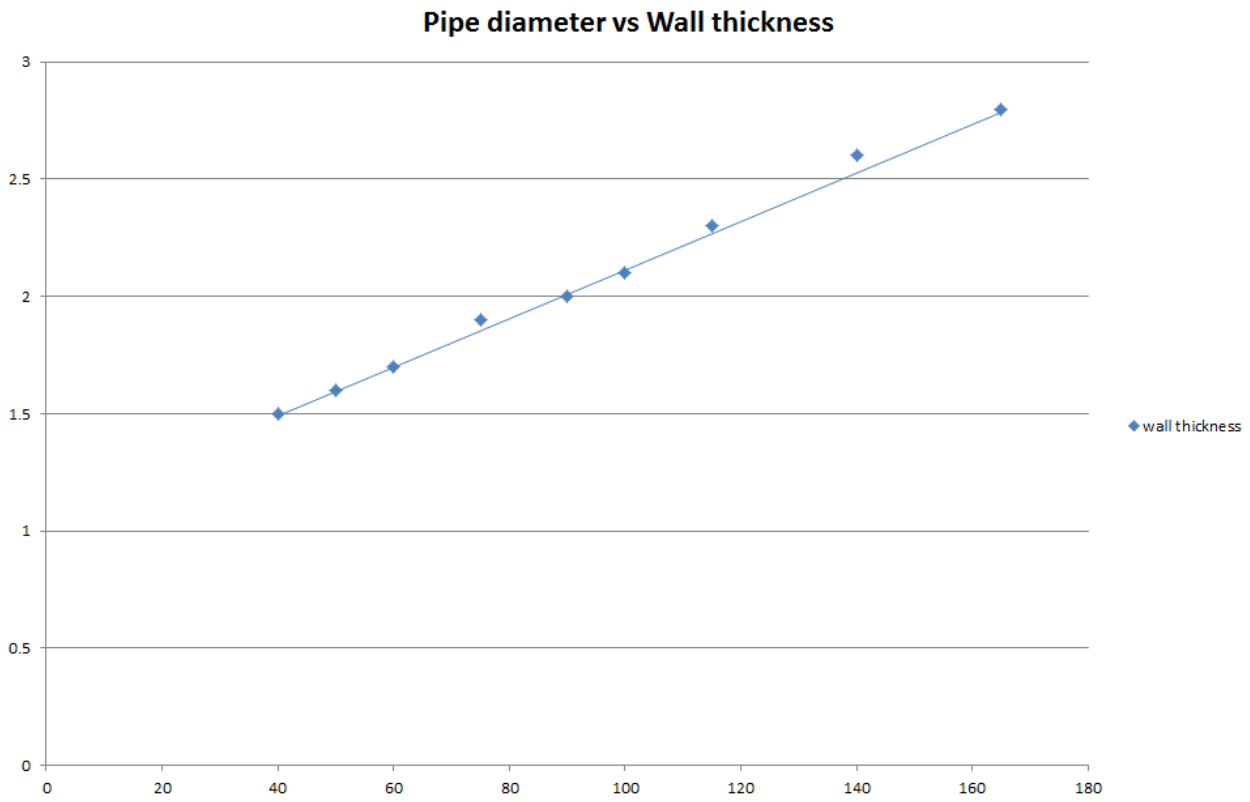
Construction details:




#### 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 | 1 off 50 x 1.8 mm Astro PFP FR Pipe Wrap, fitted at soffit | 13 mm Elastomeric insulation minimum class B-s3,d0 | **EI 180 C/U** |
| 40 mm diameter/1.5-14.2 mm wall* | | 13 -19 mm Elastomeric insulation minimum class B-s3,d0 | **E 180 C/U, EI 120 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* | | | |

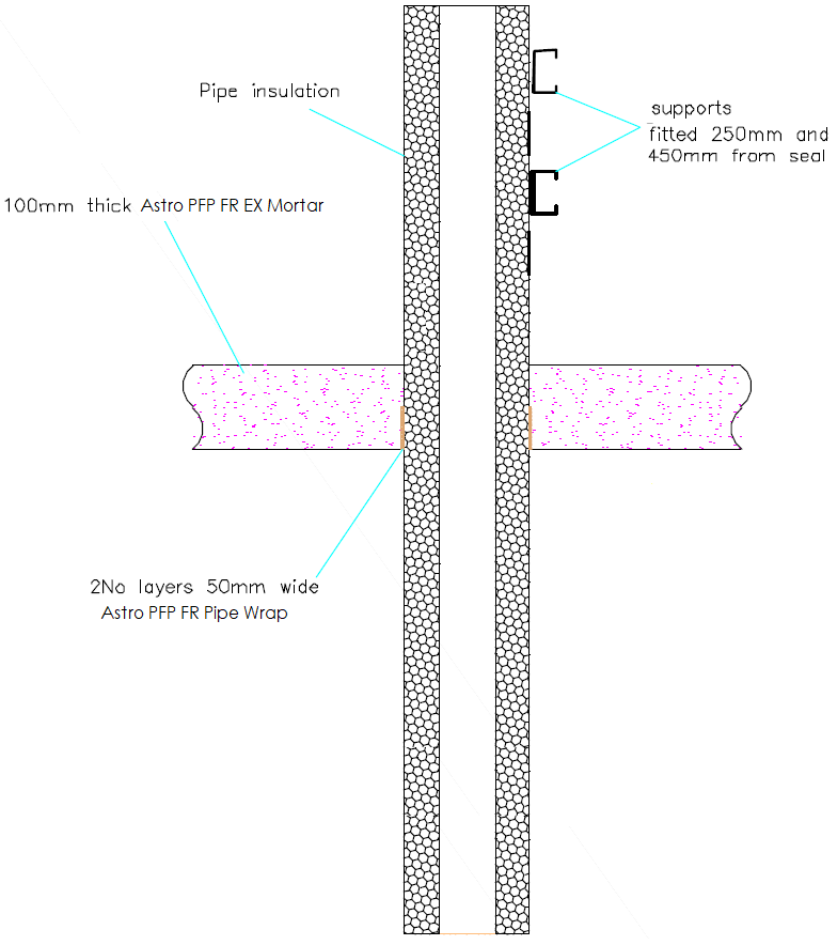
* Typical pipe diameters shown, see below graph for intermediate sizes

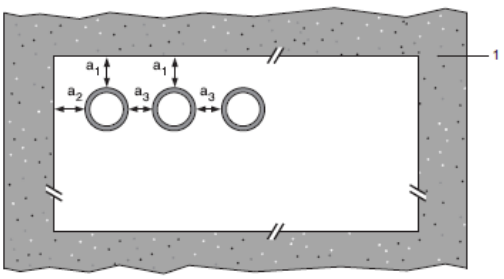
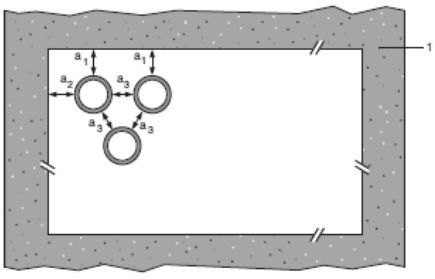

Pipe diameter vs Wall thickness
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
wall thickness

### A.2.8 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes sealed with Astro PFP FR Pipe Wraps, fitted at any position within the aperture, with 100 mm Astro PFP FR EX 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

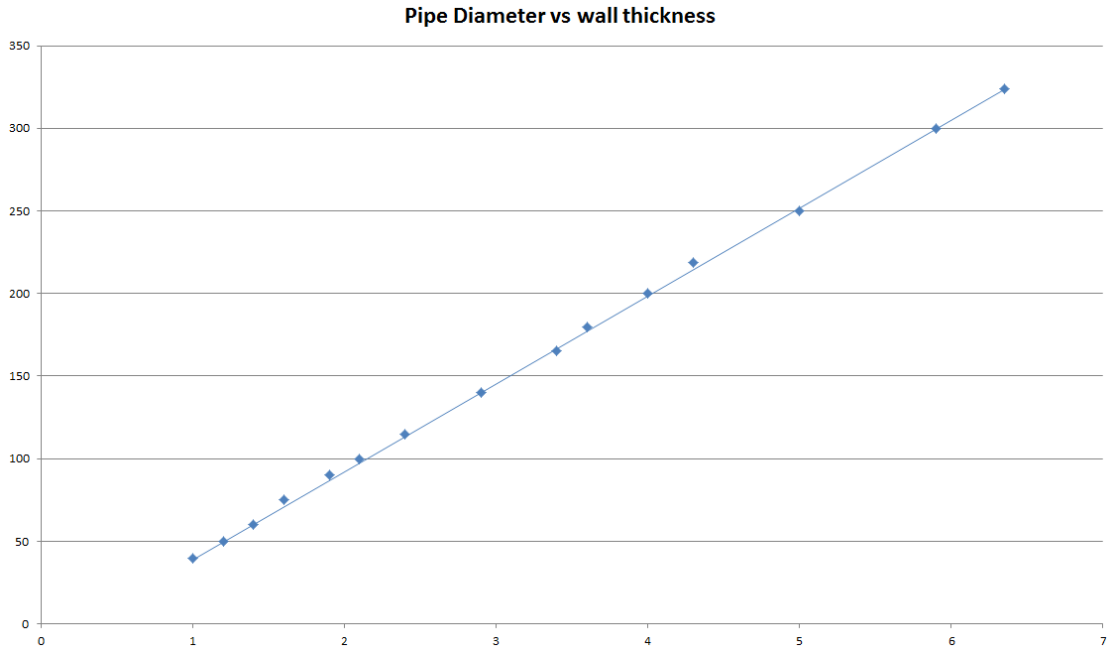
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

**A.2.8.1**

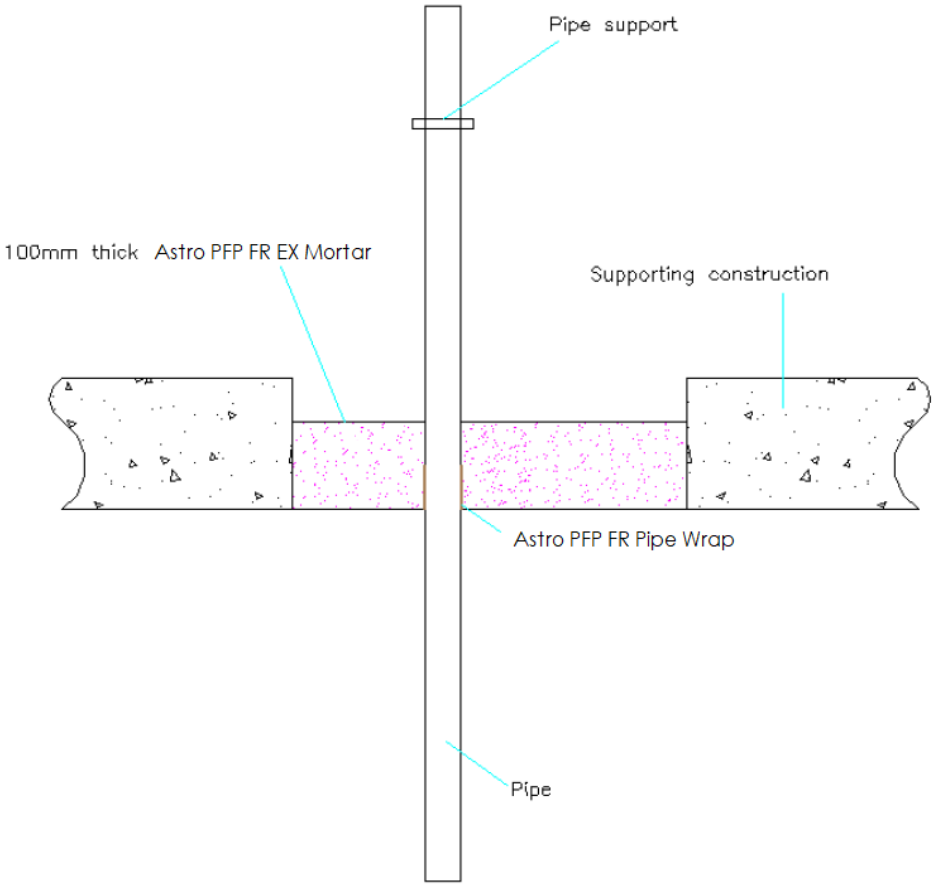
| Mild or stainless steel pipe | Insulation | Astro PFP FR Pipe Wrap | Classification |
|---|---|---|---|
| 40 mm diameter/1-14.2 mm wall | 25 mm thick Elastomeric insulation minimum class B-s3,d0 | 50 x 3.6 mm (2 x 1.8 layer) | **EI 240 C/U** |
| 40 mm diameter/1-14.2 mm wall* | 25mm thick Elastomeric insulation minimum class B-s3,d0 | | **E 240 C/U**<br>**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* | | | |
| 40 mm diameter/1-14.2 mm wall* | 25-50mm thick Elastomeric insulation minimum class B-s3,d0 | 50 x 5.4 mm (3 x 1.8 layer) | **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* | | | |


Pipe Diameter vs wall thickness
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7

### A.2.9 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

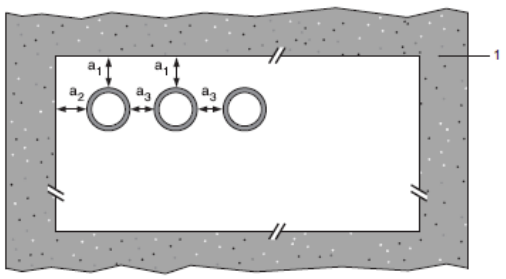
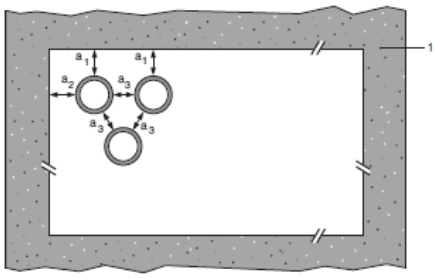
**Penetration Seal:** Plastic pipes fitted at any position within the aperture, with 100 mm Astro PFP FR EX Mortar to the either surface of the floor or anywhere between. Astro PFP FR Pipe Wraps are required to be fitted to the bottom of the seal, as indicated below. Minimum separation between penetration 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 |
|---|---|---|---|
| **PVC-U pipe according to EN 1329-1, EN 1452-1 and EN 1453-1, PVC-C according to EN 1566-1** | | | |
| 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** |
| **PP pipe according to EN 1451-1** | | | |
| 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** |
| **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** | | | |
| 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** |

| **Configuration 1** | **Configuration 2** |
|---|---|
|  |  |

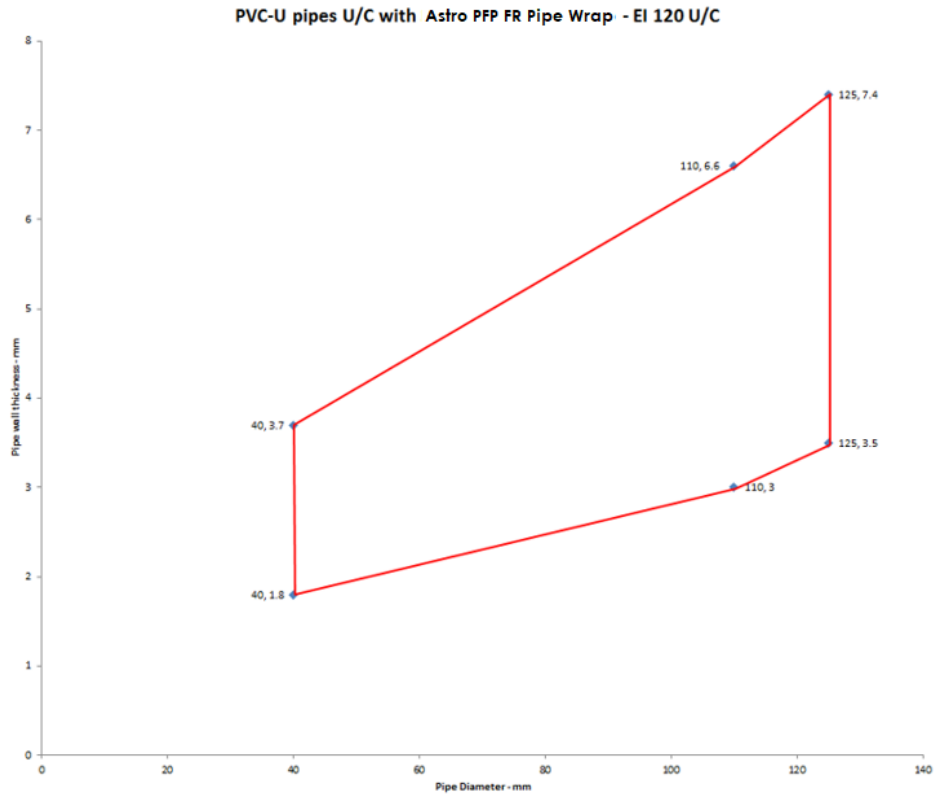
**Key**

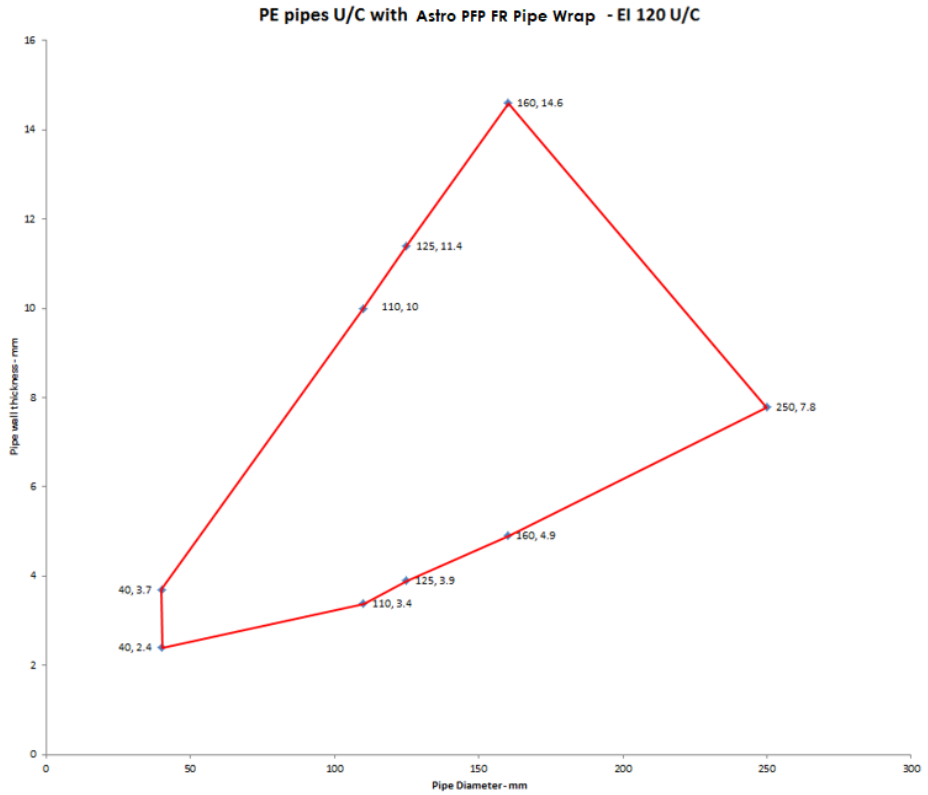
1 Supporting construction

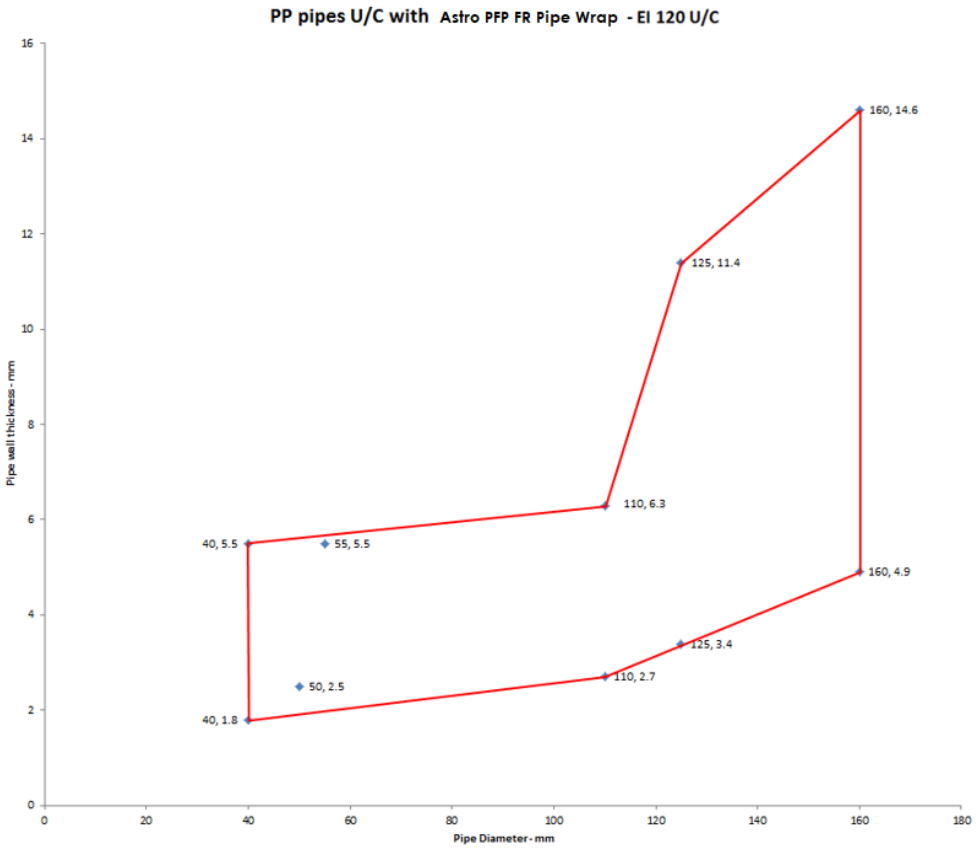
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation


PVC-U pipes U/C with Astro PFP FR Pipe Wrap - EI 120 U/C
Pipe wall thickness - mm
Pipe Diameter - mm
125, 7.4
110, 6.6
40, 3.7
125, 3.5
110, 3
40, 1.8
0
20
40
60
80
100
120
140
1
2
3
4
5
6
7
8

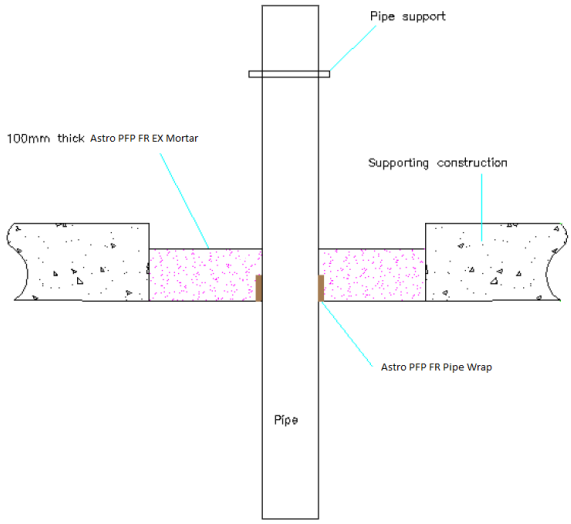

PE pipes U/C with Astro PFP FR Pipe Wrap - EI 120 U/C
Pipe wall thickness - mm
Pipe Diameter - mm
160, 14.6
125, 11.4
110, 10
250, 7.8
160, 4.9
125, 3.9
110, 3.4
40, 3.7
40, 2.4
0
50
100
150
200
250
300
2
4
6
8
10
12
14
16

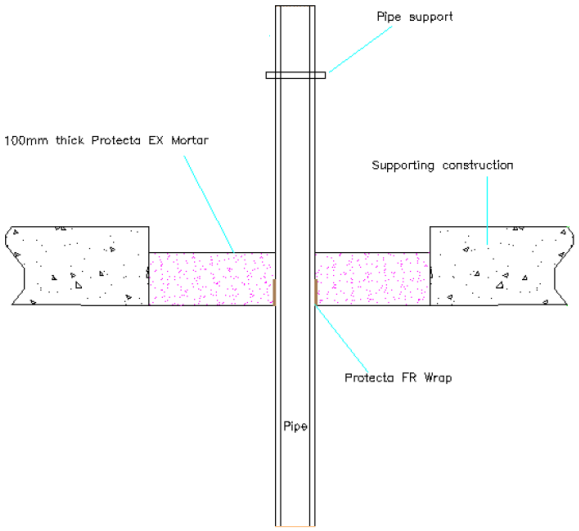

PP pipes U/C with Astro PFP FR Pipe Wrap - EI 120 U/C
Pipe wall thickness - mm
Pipe Diameter - mm
160, 14.6
125, 11.4
110, 6.3
40, 5.5
55, 5.5
160, 4.9
125, 3.4
110, 2.7
50, 2.5
40, 1.8

## A.2.10 Pipe penetration seal with 100 mm deep Astro PFP FR EX Mortar

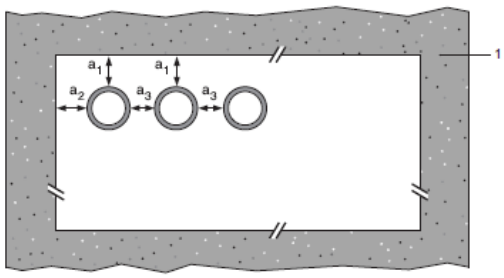
**Penetration Seal:** Plastic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges and from other services), with min. 100 mm Astro PFP FR EX Mortar to either surface of the floor or anywhere between. Astro PFP FR Pipe Wraps are required to be fitted to the bottom of the seal, as indicated below. Maximum seal size as section 2. 4).

Construction details:

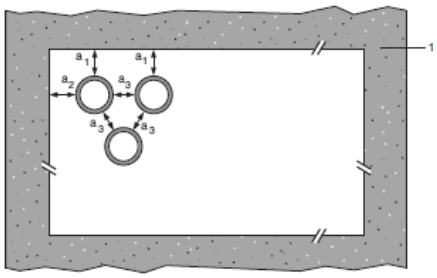



**Configuration 1**




**Configuration 2**




**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

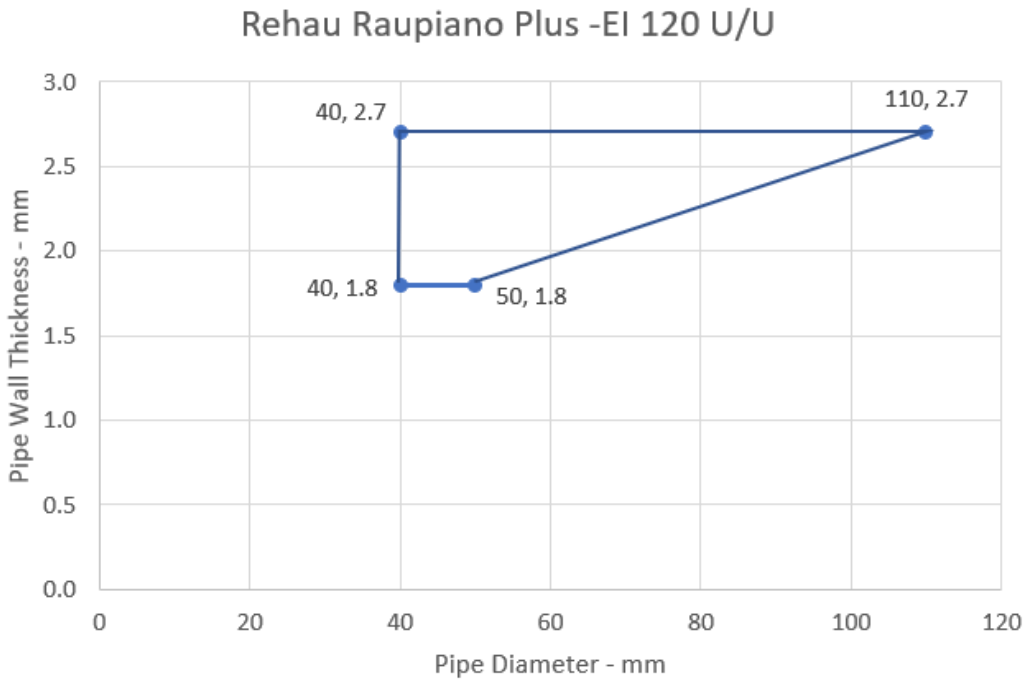
**A.2.10.1**

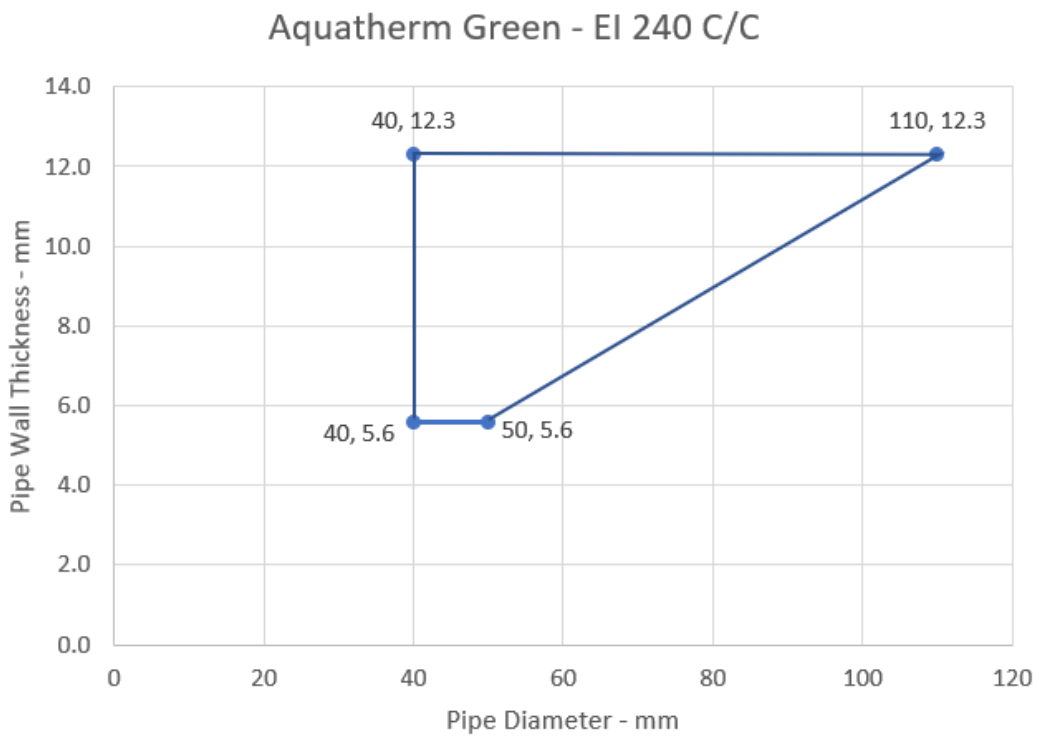
| Services | Wrap | Permitted configuration for seal separation | Classification |
|---|---|---|---|
| PVC-U pipes according to EN 1329-1, EN 1452-1 and EN 1453-1, PVC-C according to EN 1566-1 | | | |
| 160 mm diameter / 9.5 mm wall | 50 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | **EI 90 U/C** |
| PEX pipe in pipe systems according to ISO 15875 | | | |
| Maximum 54 mm diameter/0.4 mm wall thickness (outer pipe), 28 mm diameter/4.0 mm wall thickness (inner pipe) | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 C/C** |
| Rehau Raupiano Plus PP-DD according to DIN 4102 | | | |
| 40-50 mm diameter/1.8-2.7 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/U** |
| 75-110 mm diameter/2.7 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |
| 125 mm diameter/3.1 mm wall thickness | 50 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | **E 240 U/C, EI 120 U/C** |
| 160 mm diameter/3.9 mm wall thickness | 50 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |
| Polo-Kal NG Poloplast PP-MV according to DIN 4102 | | | |
| 32-110 mm diameter/3.4 mm wall thickness | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 180 U/C** |
| 125 mm diameter/3.9 mm wall thickness | 50 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | **EI 240 U/C** |
| 160 mm diameter/4.3 mm wall thickness | 50 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | **EI 240 U/C** |
| Aquatherm Green SDR9 MF PP-RP according to ISO 21003 | | | |
| 32 mm diameter/3.6 mm wall thickness | 50 x 1.8 mm (1 x 1.8 layer) | 1 & 2 | **EI 240 C/C** |
| 40-50 mm diameter/5.6-12.3 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 240 C/C** |
| 63-110 mm diameter/12.3 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 240 C/C** |
| Wavin SiTech + PP-M B according to EN 13501-1 | | | |
| 32-50 mm diameter/1.8-3.4 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/U** |
| 75-110 mm diameter/3.4 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |
| Gilbert Silent PP according to DIN 4102 | | | |
| 32-50 mm diameter/1.8-3.4 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/U** |
| 75-110 mm diameter/3.4 mm wall thickness* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |

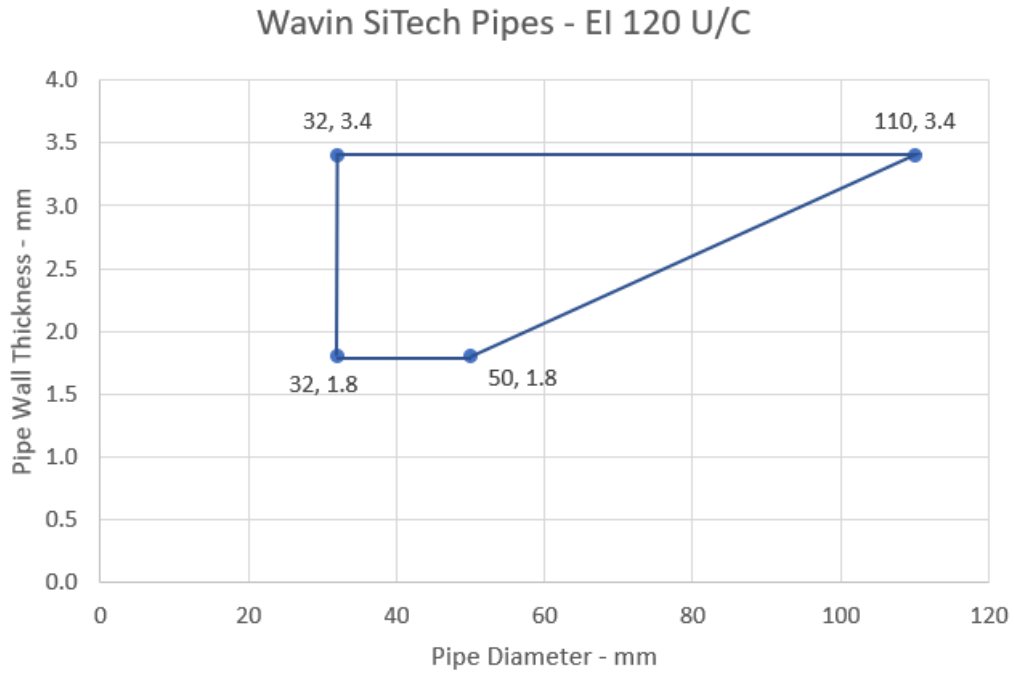
* Typical pipe diameters shown, see below graph for intermediate sizes

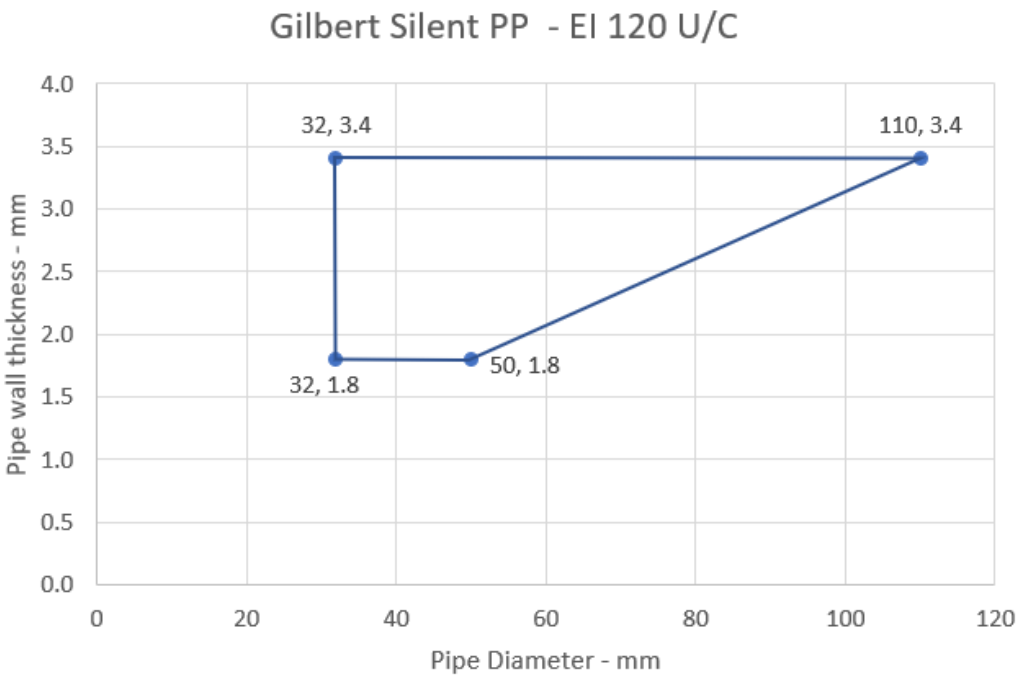
| Services | Wrap | Permitted configuration for seal separation | Classification |
|---|---|---|---|
| BluePower Multilayer pipes according to EN 1451-1 | | | |
| 32-50 mm diameter* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 240 U/U** |
| 75-110 mm diameter* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |
| 125 mm diameter/3.9 mm wall thickness* | 50 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |
| 160 mm diameter/4.9 mm wall thickness* | 50 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | **EI 240 U/C** |
| Uponor Decibel pipes according to EN 14366 | | | |
| 32-50 mm diameter* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/U** |
| 75-110 mm diameter* | 50 x 3.6 mm (2 x 1.8 layers) | 1 & 2 | **EI 120 U/C** |

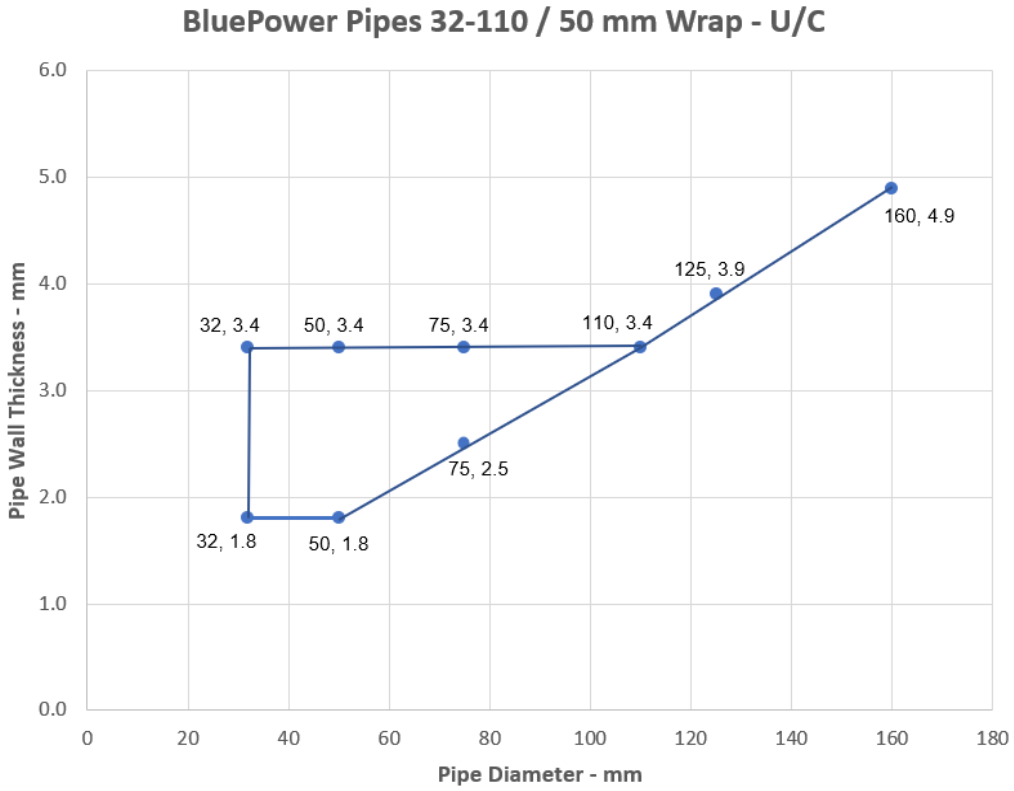
* Typical pipe diameters shown, see below graph for intermediate sizes

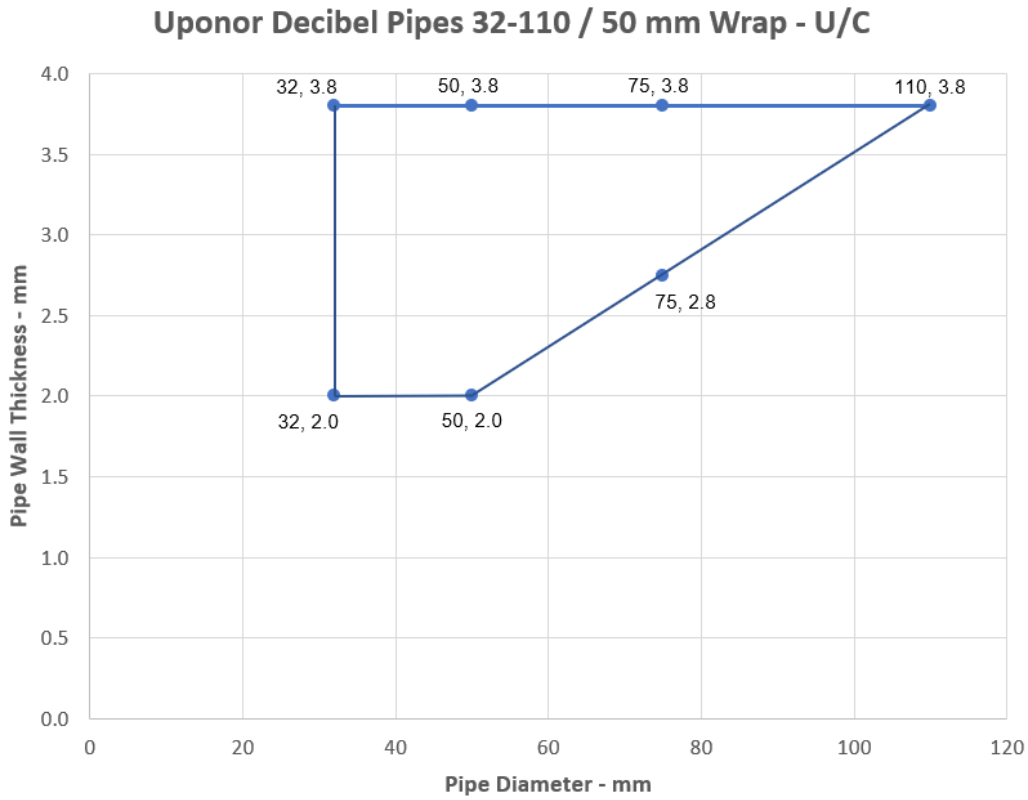



Aquatherm Green - EI 240 C/C
Pipe Wall Thickness - mm
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
20
40
60
80
100
120
Pipe Diameter - mm
40, 12.3
110, 12.3
40, 5.6
50, 5.6


Wavin SiTech Pipes - EI 120 U/C
Pipe Wall Thickness - mm
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
120
Pipe Diameter - mm
32, 3.4
110, 3.4
32, 1.8
50, 1.8


Gilbert Silent PP - EI 120 U/C
Pipe wall thickness - mm
Pipe Diameter - mm
32, 3.4
110, 3.4
50, 1.8
32, 1.8
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0
20
40
60
80
100
120

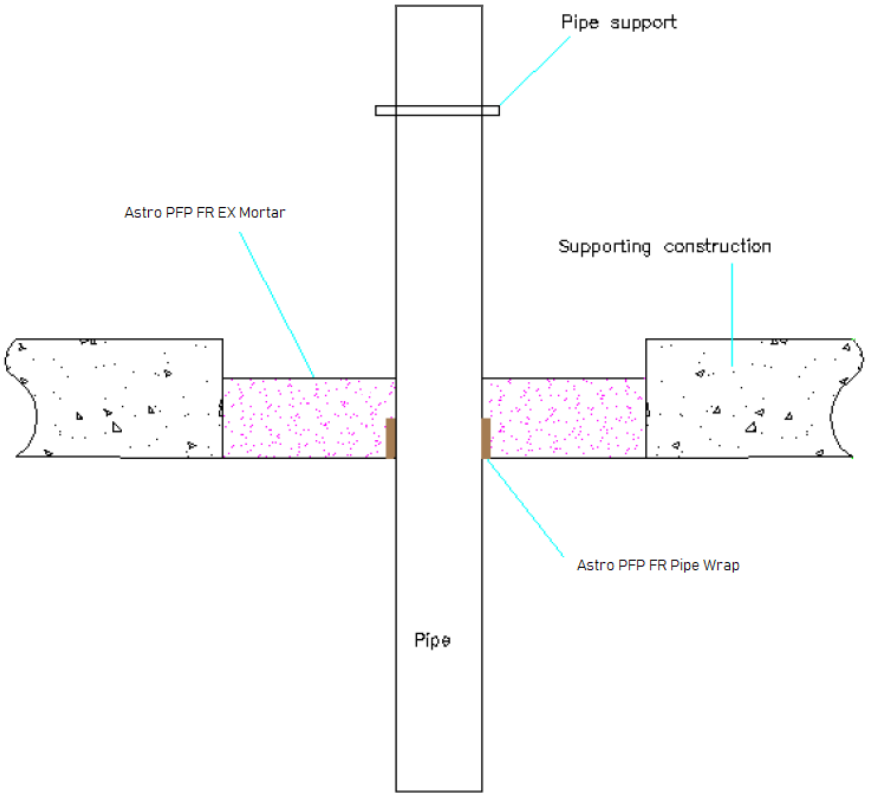

BluePower Pipes 32-110 / 50 mm Wrap - U/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
32, 3.4
50, 3.4
75, 3.4
110, 3.4
125, 3.9
160, 4.9
75, 2.5
32, 1.8
50, 1.8
0.0
1.0
2.0
3.0
4.0
5.0
6.0
0
20
40
60
80
100
120
140
160
180

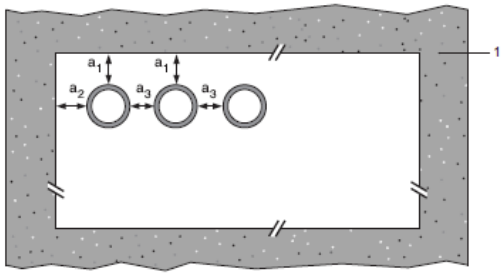
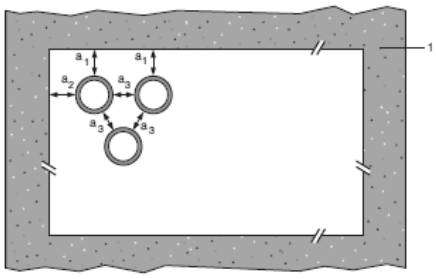

Uponor Decibel Pipes 32-110 / 50 mm Wrap - U/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
120
32, 3.8
50, 3.8
75, 3.8
110, 3.8
75, 2.8
32, 2.0
50, 2.0

## A.2.11 Pipe penetration seal with Astro PFP FR EX Mortar

**Penetration Seal:** Plastic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges and from other services), with Astro PFP FR EX Mortar to either surface of the floor or anywhere between Astro PFP FR Pipe Wraps are required to be fitted to the bottom of the seal, as indicated below. Maximum seal size as section 2. 4).

Construction details:




| Configuration 1 | Configuration 2 |
|---|---|
|  |  |

**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

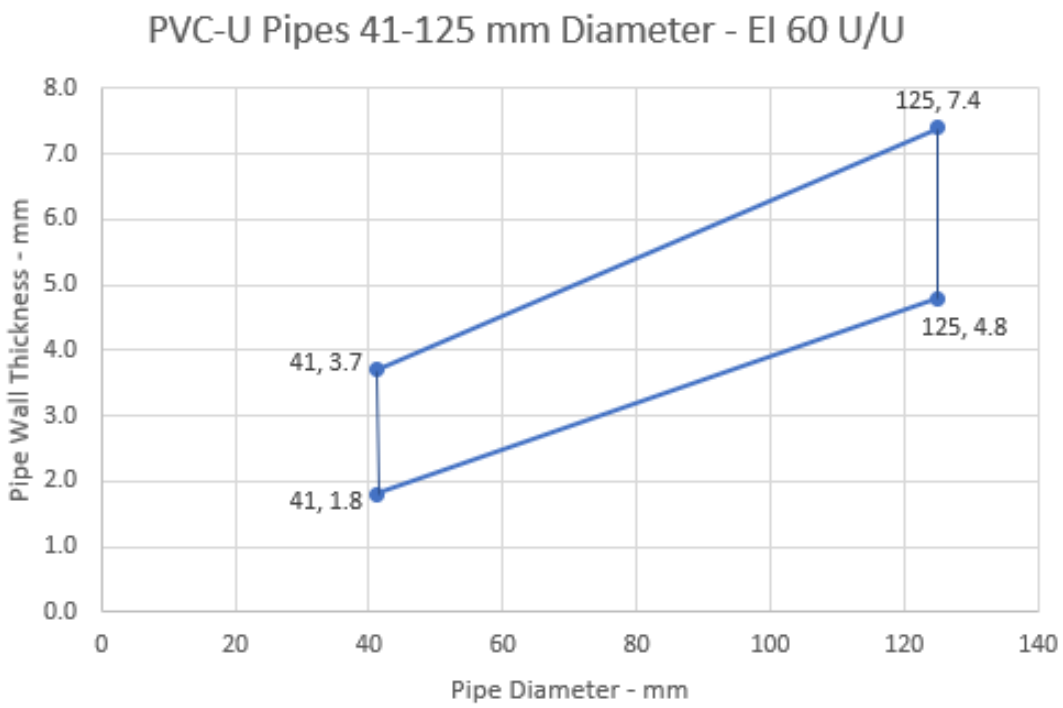
a2 Pipe / side edge of seal separation

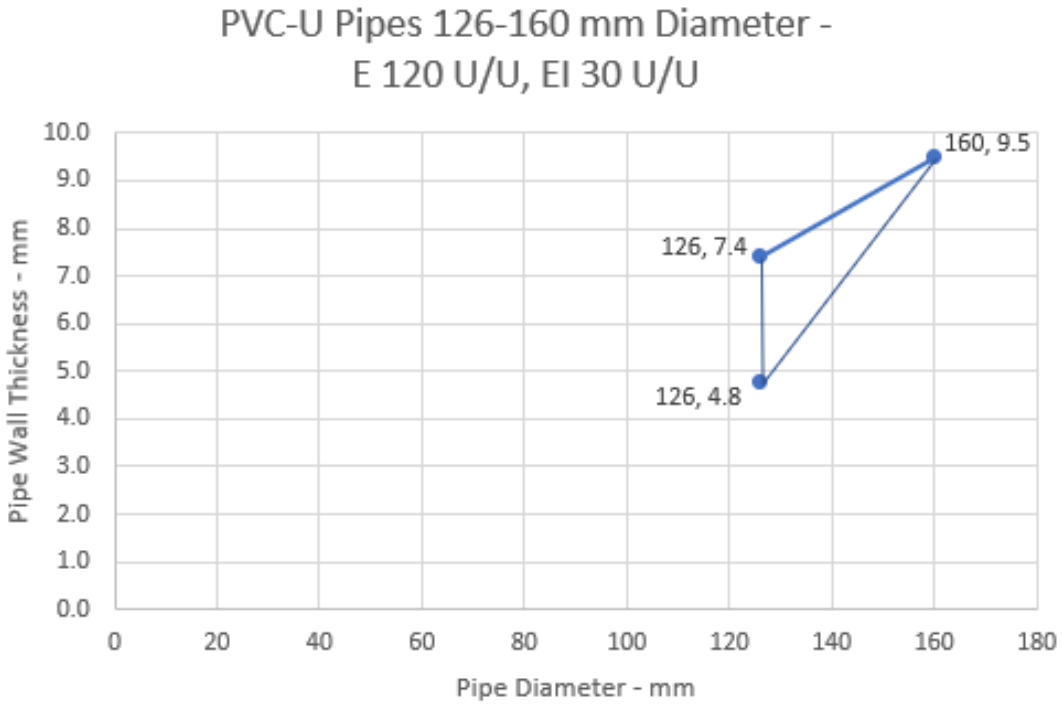
a3 Pipe / pipe separation

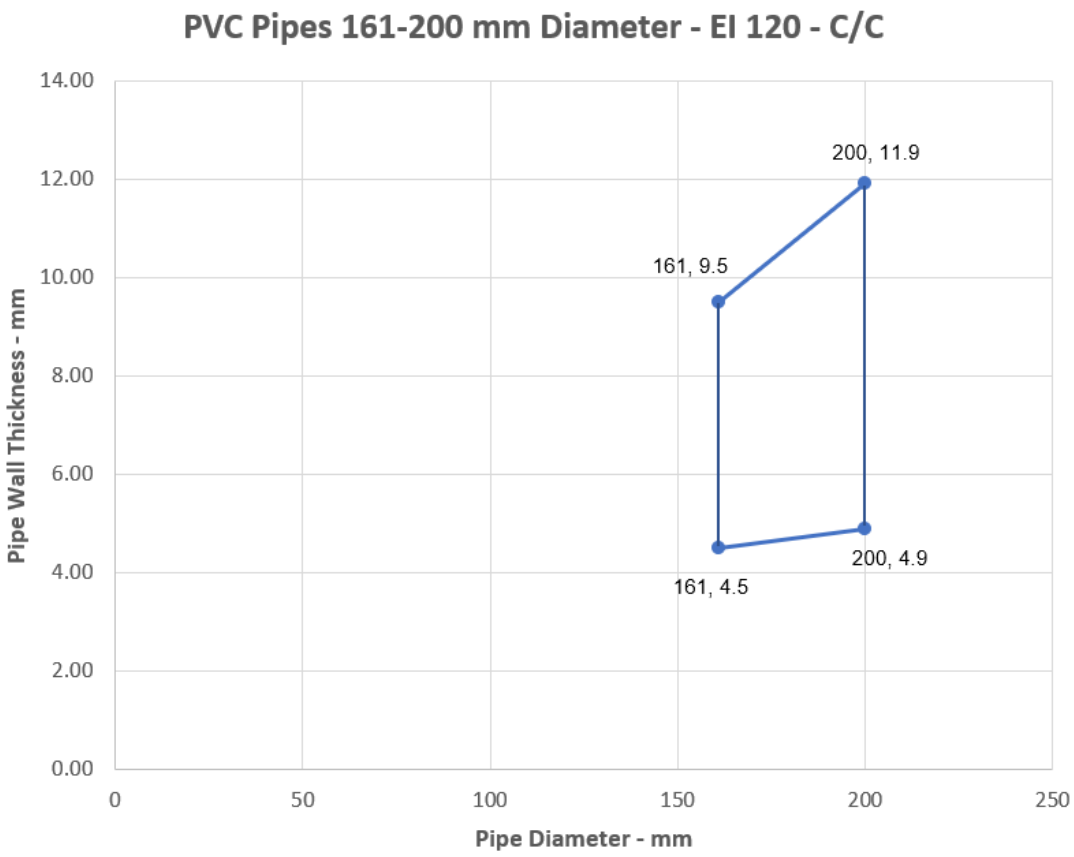
**A.2.11.1**

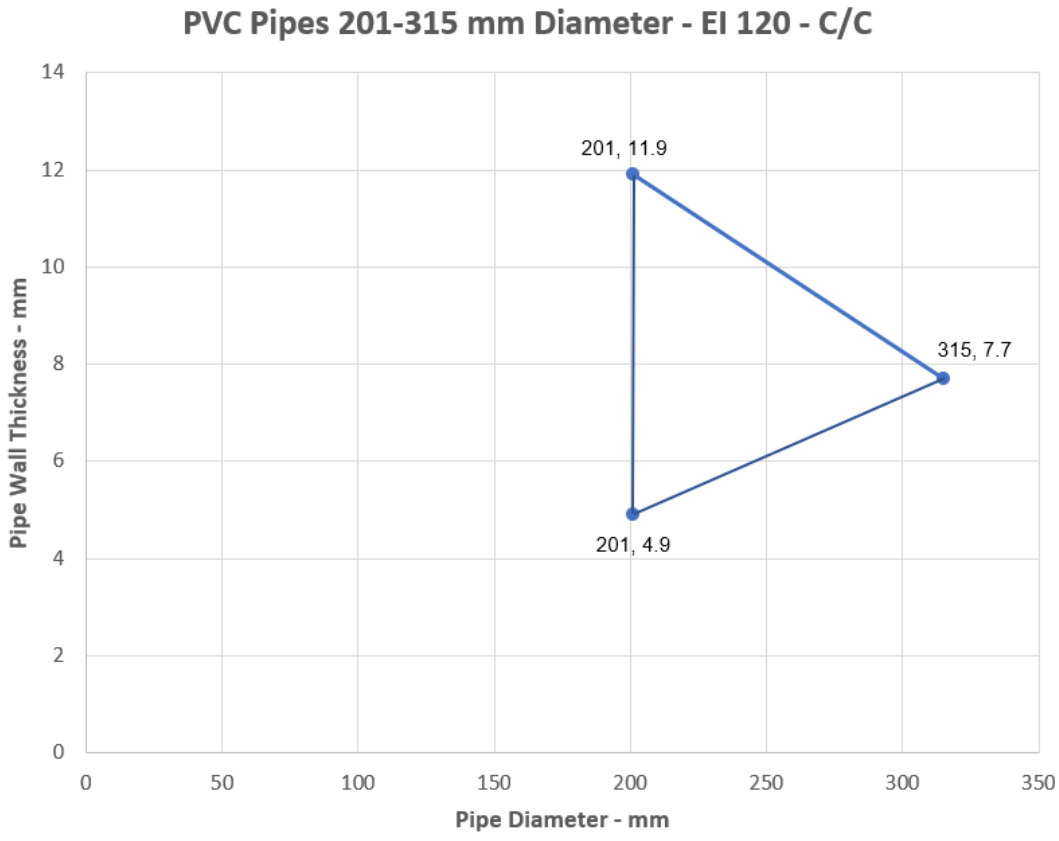
| Services | Wrap | Permitted configuration for seal separation | Min. mortar depth and floor thickness | Classification |
|---|---|---|---|---|
| **PVC-U pipes according to EN 1329-1, EN 1452-1 and EN 1453-1, PVC-C according to EN 1566-1** | | | | |
| Diameter 41 mm, wall thickness 1.8-3.7 mm to diameter 125 mm, wall thickness 4.8-7.4 mm* | 50 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | 150 mm | **EI 60 U/U** |
| 125 mm diameter / 7.4 mm wall | 50 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | 150 mm | **EI 120 U/U** |
| Diameter 126 mm, wall thickness 4.8-7.4 mm to diameter 160 mm, wall thickness 9.5 mm* | 75 x 10.8 mm (6 x 1.8 layers) | 1 | 150 mm | **E 120 U/U, EI 30 U/U** |
| 160 mm diameter / 9.5 mm wall | 75 x 7.2 mm (4 x 1.8 layers) | 1 | 150 mm | **E 120 U/U, EI 30 U/U** |
| 160 mm diameter / 4.5-9.5 mm wall thickness | 50 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 120 mm | **EI 120 U/C, EI 120 C/C** |
| Diameter 161 mm, wall thickness 4.5-9.5 mm to diameter 200 mm, wall thickness 4.9-11.9 mm* | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 120 mm | **EI 120 C/C** |
| 200 mm diameter / 4.9-11.9 mm wall thickness | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 120 mm | **EI 240 C/C** |
| Diameter 201 mm, wall thickness 4.9-11.9 mm to diameter 315 mm, wall thickness 7.7 mm* | 75 x 18 mm (10 x 1.8 layers) | 1 | 120 mm | **EI 120 C/C** |
| 315 mm diameter / 7.7 mm wall thickness | 75 x 18 mm (10 x 1.8 layers) | 1 | 120 mm | **EI 120 C/C** |
| Diameter 161 mm, wall thickness 4.5-9.5 mm to diameter 315 mm, wall thickness 7.7-12.1 mm* | 75 x 18 mm (10 x 1.8 layers) | 1 | 120 mm | **EI 90 C/C** |
| 315 mm diameter / 12.1 mm wall thickness | 75 x 18 mm (10 x 1.8 layers) | 1 | 120 mm | **EI 90 C/C** |
| Diameter 315 mm, wall thickness 7.7-12.1 mm to diameter 400 mm, wall thickness 15.3 mm* | 75 x 28.8 mm (16 x 1.8 layers) | 1 | 120 mm | **EI 60 C/C** |
| 400mm diameter / 15.3 mm wall thickness | 75 x 28.8 mm (16 x 1.8 layers) | 1 & 2 | 120 mm | **EI 60 C/C** |

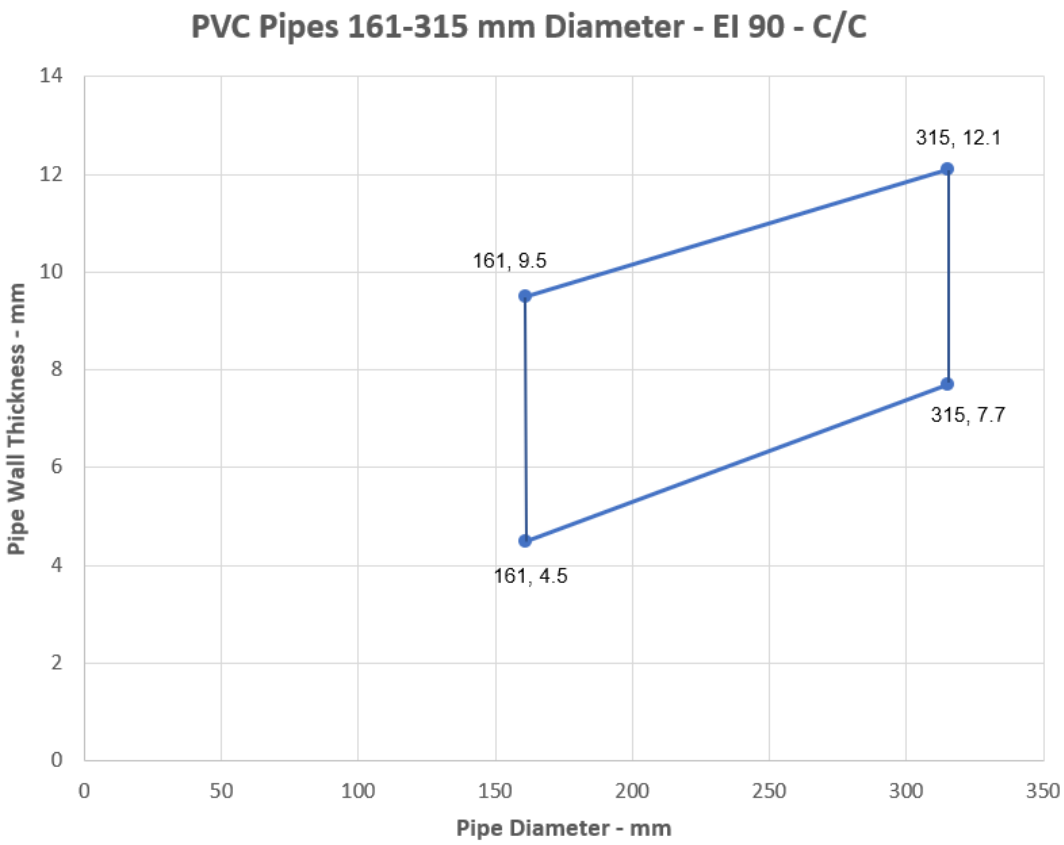
* Typical pipe diameters shown, see below graph for intermediate sizes

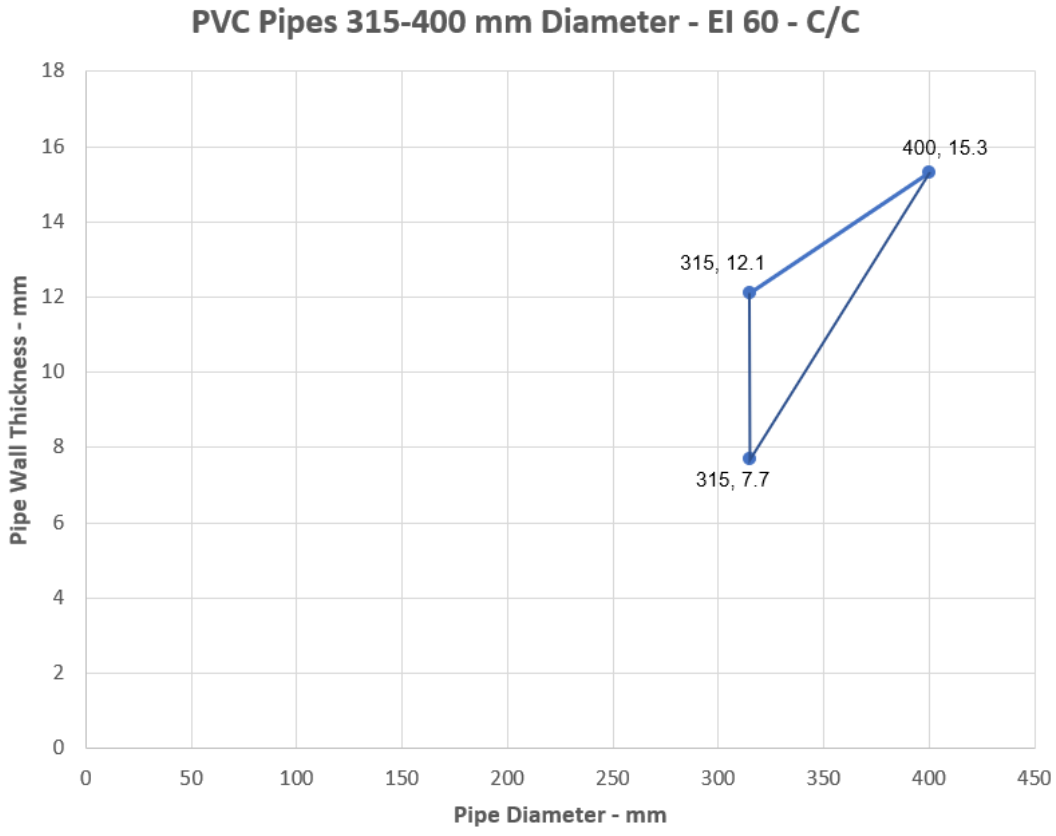

PVC-U Pipes 41-125 mm Diameter - EI 60 U/U
Pipe Wall Thickness - mm
Pipe Diameter - mm
125, 7.4
125, 4.8
41, 3.7
41, 1.8
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
0
20
40
60
80
100
120
140


PVC-U Pipes 126-160 mm Diameter -
E 120 U/U, EI 30 U/U
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 9.5
126, 7.4
126, 4.8
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
0
20
40
60
80
100
120
140
160
180


PVC Pipes 161-200 mm Diameter - EI 120 - C/C
Pipe Wall Thickness - mm
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
50
100
150
200
250
Pipe Diameter - mm
200, 11.9
161, 9.5
200, 4.9
161, 4.5

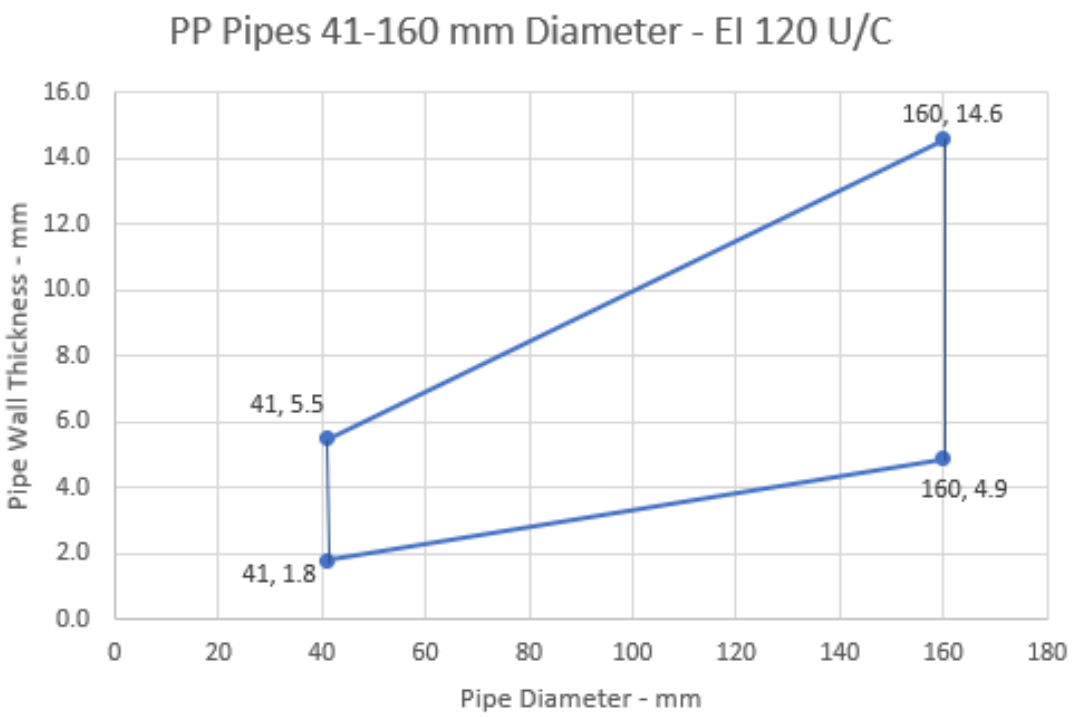

PVC Pipes 201-315 mm Diameter - EI 120 - C/C
Pipe Wall Thickness - mm
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
Pipe Diameter - mm
201, 11.9
315, 7.7
201, 4.9

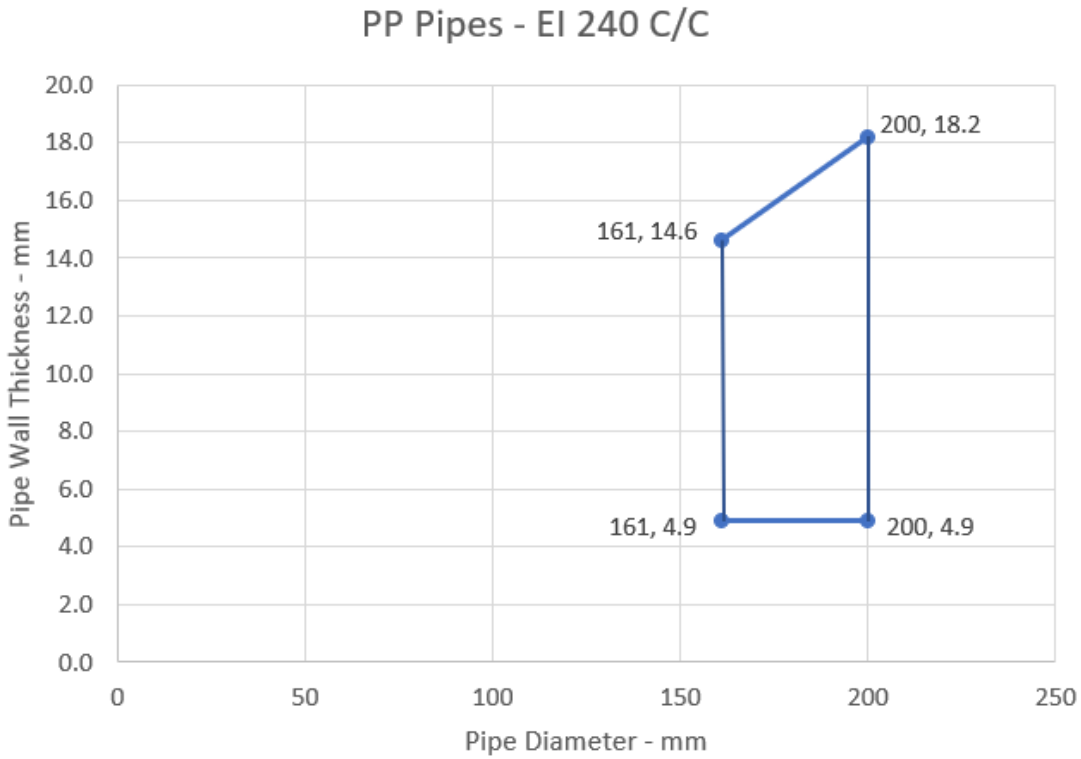

PVC Pipes 161-315 mm Diameter - EI 90 - C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
0
2
4
6
8
10
12
14
0
50
100
150
200
250
300
350
315, 12.1
161, 9.5
315, 7.7
161, 4.5

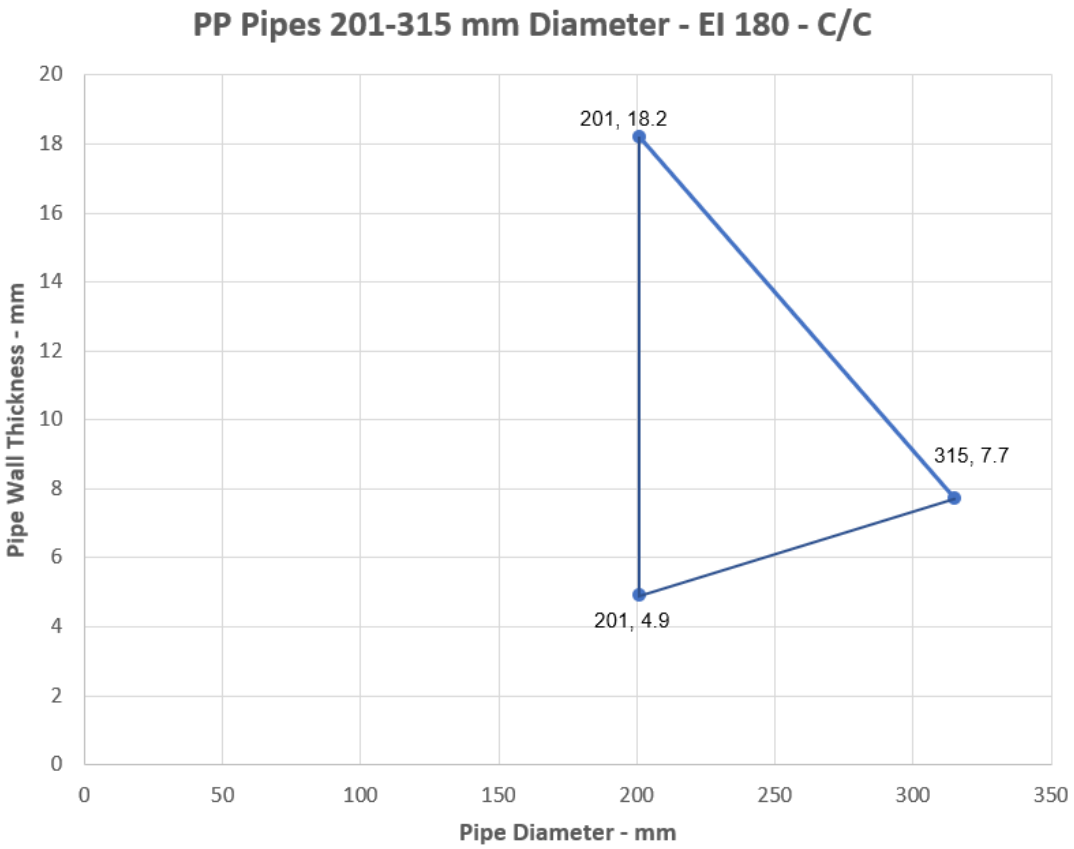

PVC Pipes 315-400 mm Diameter - EI 60 - C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
0
2
4
6
8
10
12
14
16
18
0
50
100
150
200
250
300
350
400
450
400, 15.3
315, 12.1
315, 7.7

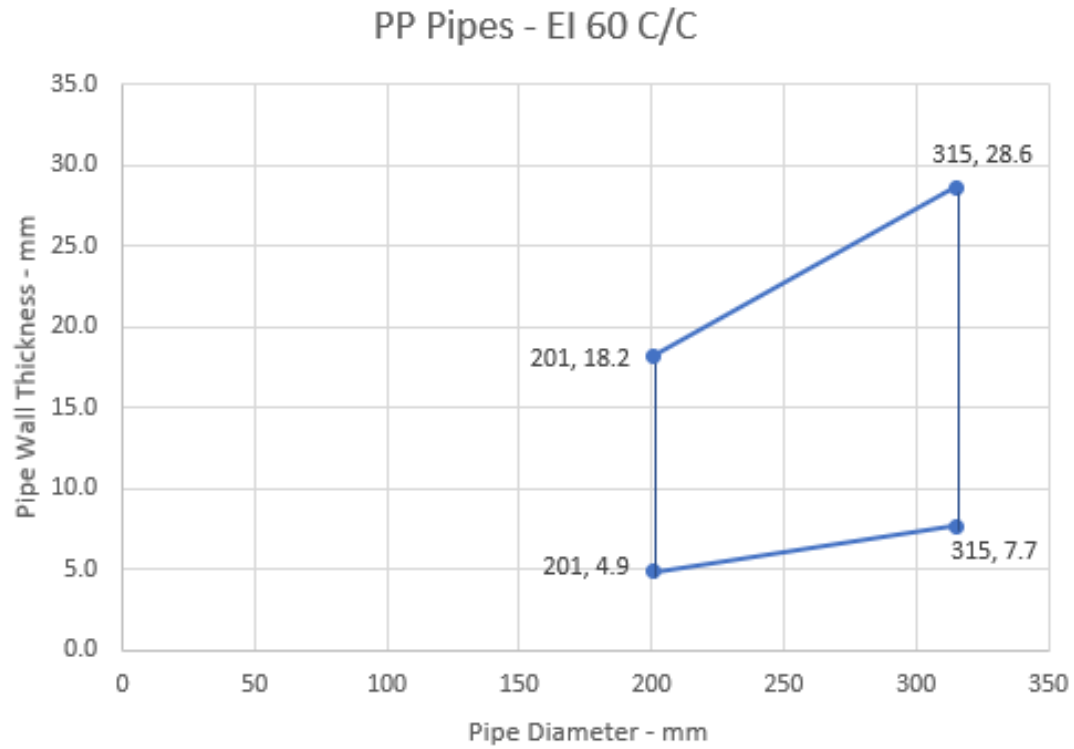
| Services | Wrap | Permitted configuration for seal separation | Min. mortar depth and floor thickness | Classification |
|---|---|---|---|---|
| **PP pipes according to EN 1451-1** | | | | |
| Diameter 41 mm, wall thickness 1.8-5.5 mm to diameter 160 mm, wall thickness 4.9-14.6 mm* | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 150 mm | **EI 120 U/C** |
| 160 mm diameter / 14.6 mm wall | 75 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | 150 mm | **EI 240 U/U** |
| Diameter 161 mm, wall thickness 4.9-14.6 mm to diameter 200 mm, wall thickness 4.9-18.2 mm* | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 120 mm | **EI 240 C/C** |
| Diameter 201 mm, wall thickness 4.9-18.2 mm to diameter 315 mm, wall thickness 7.7 mm* | 75 x 18 mm (10 x 1.8 layers) | N/A | 150 mm | **EI 180 C/C** |
| Diameter 201 mm, wall thickness 4.9-18.2 mm to diameter 315 mm, wall thickness 7.7-28.6 mm* | 75 x 18 mm (10 x 1.8 layers) | N/A | 150 mm | **EI 60 C/C** |
| 315 mm diameter / 7.7 mm wall | 75 x 18 mm (10 x 1.8 layers) | N/A | 150 mm | **EI 180 C/C** |
| 315 mm diameter / 7.7-28.6 mm wall | 75 x 18 mm (10 x 1.8 layers) | 1 | 150 mm | **EI 60 C/C** |
| Diameter 315 mm, wall thickness 7.7-28.6 mm to diameter 400 mm, wall thickness 22.7 mm* | 75 x 28.8 mm (16 x 1.8 layers) | 1 | 150 mm | **EI 60 C/C** |
| 400mm diameter / 22.7 mm wall thickness | 75 x 28.8 mm (16 x 1.8 layers) | 1 & 2 | 150 mm | **EI 60 C/C** |

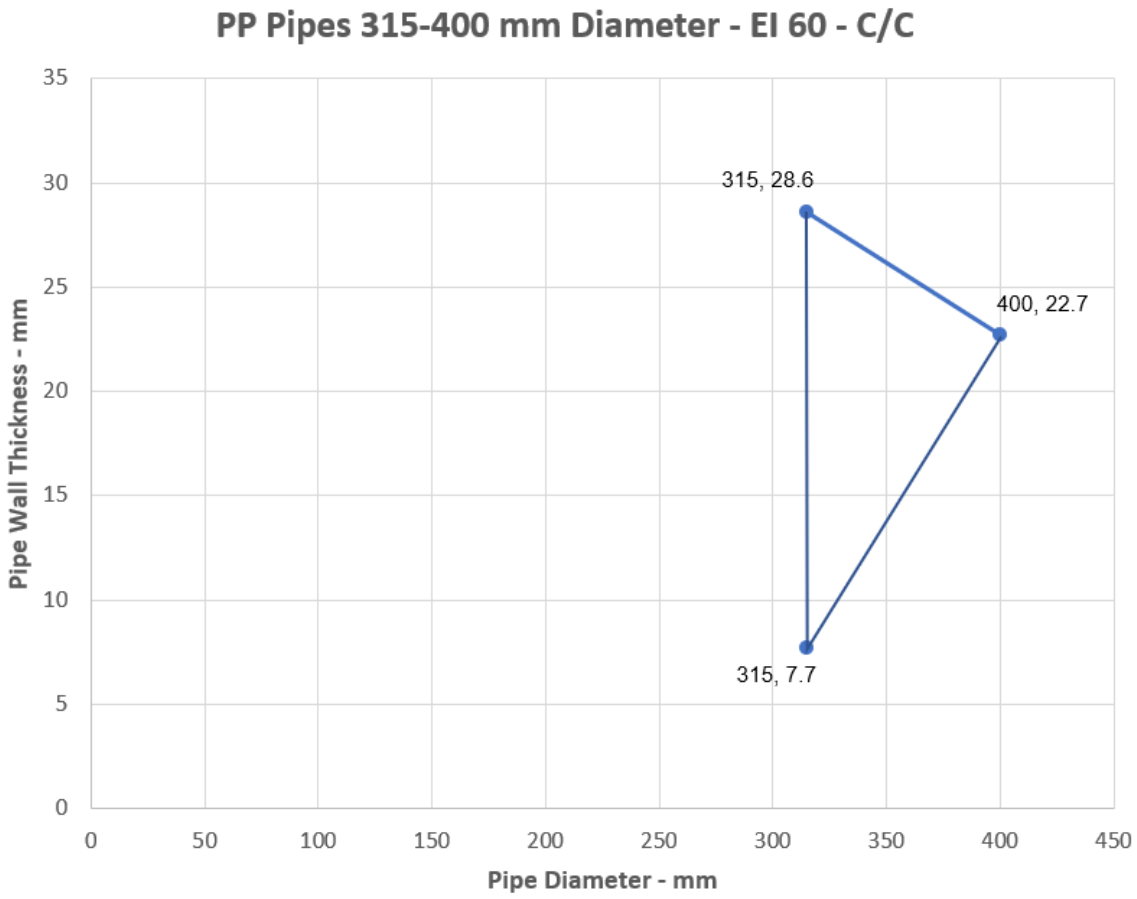
* Typical pipe diameters shown, see below graph for intermediate sizes


PP Pipes 41-160 mm Diameter - EI 120 U/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 14.6
160, 4.9
41, 5.5
41, 1.8
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
20
40
60
80
100
120
140
160
180


PP Pipes - EI 240 C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
200, 18.2
161, 14.6
161, 4.9
200, 4.9
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
50
100
150
200
250

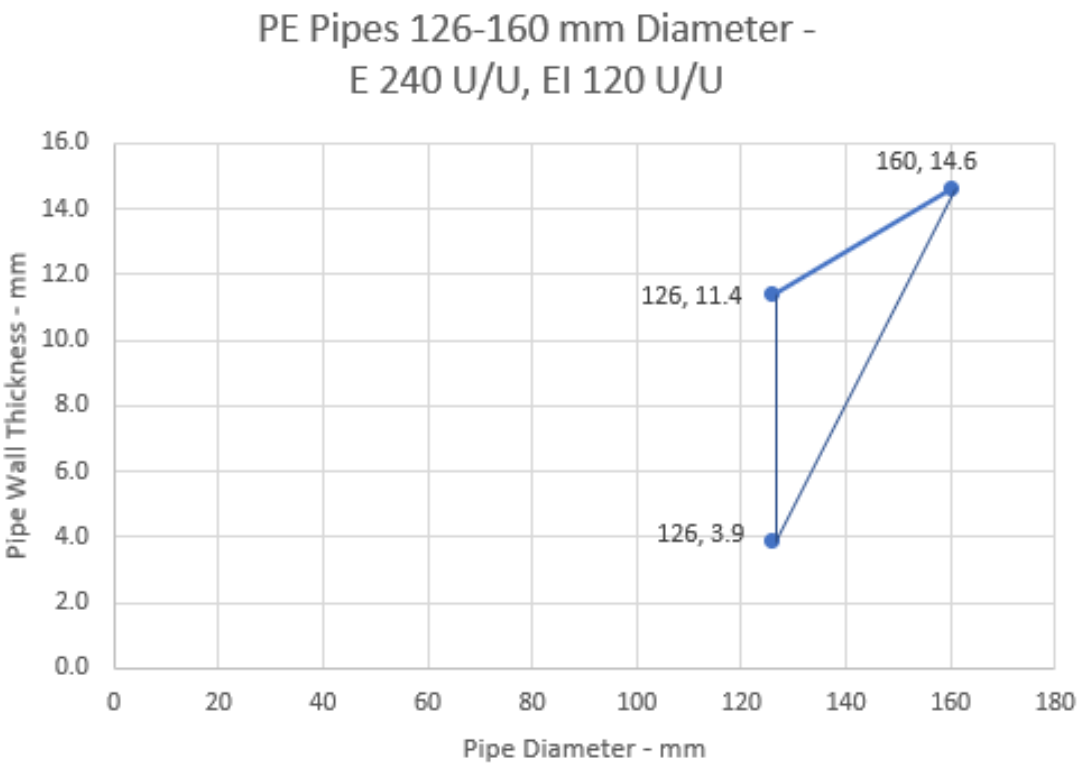

PP Pipes 201-315 mm Diameter - EI 180 - C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
201, 18.2
315, 7.7
201, 4.9
0
2
4
6
8
10
12
14
16
18
20
0
50
100
150
200
250
300
350

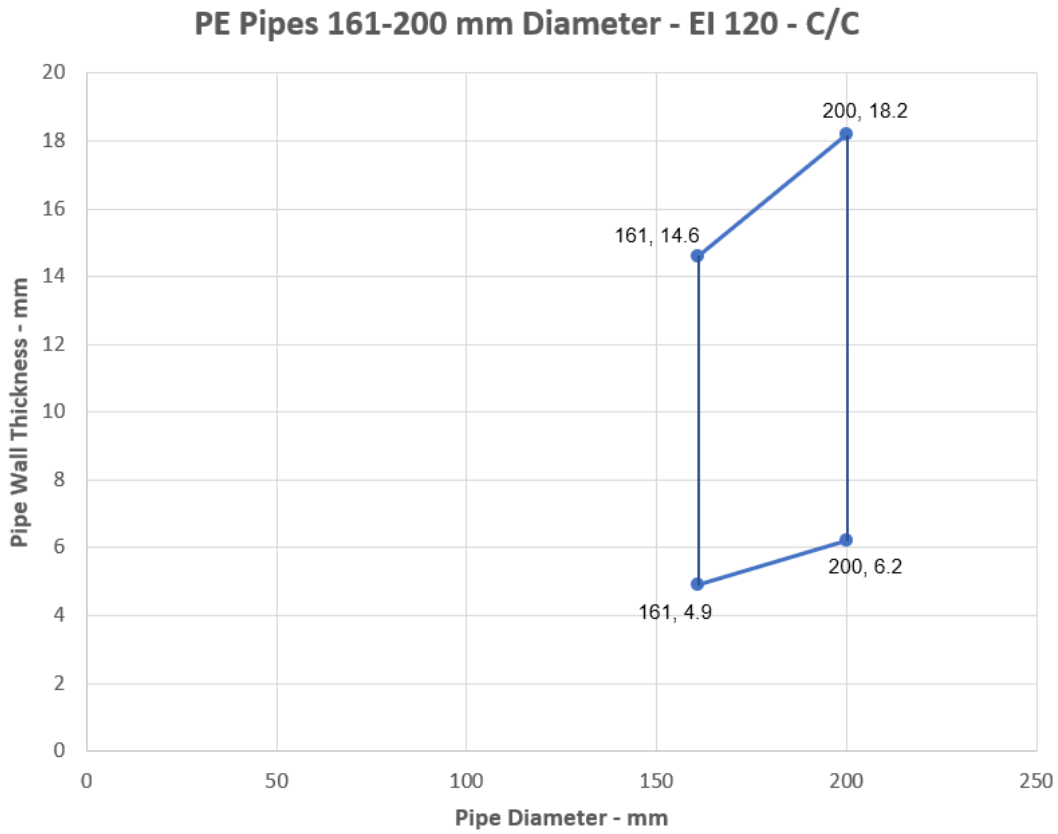

PP Pipes - EI 60 C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
315, 28.6
201, 18.2
201, 4.9
315, 7.7
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
0
50
100
150
200
250
300
350

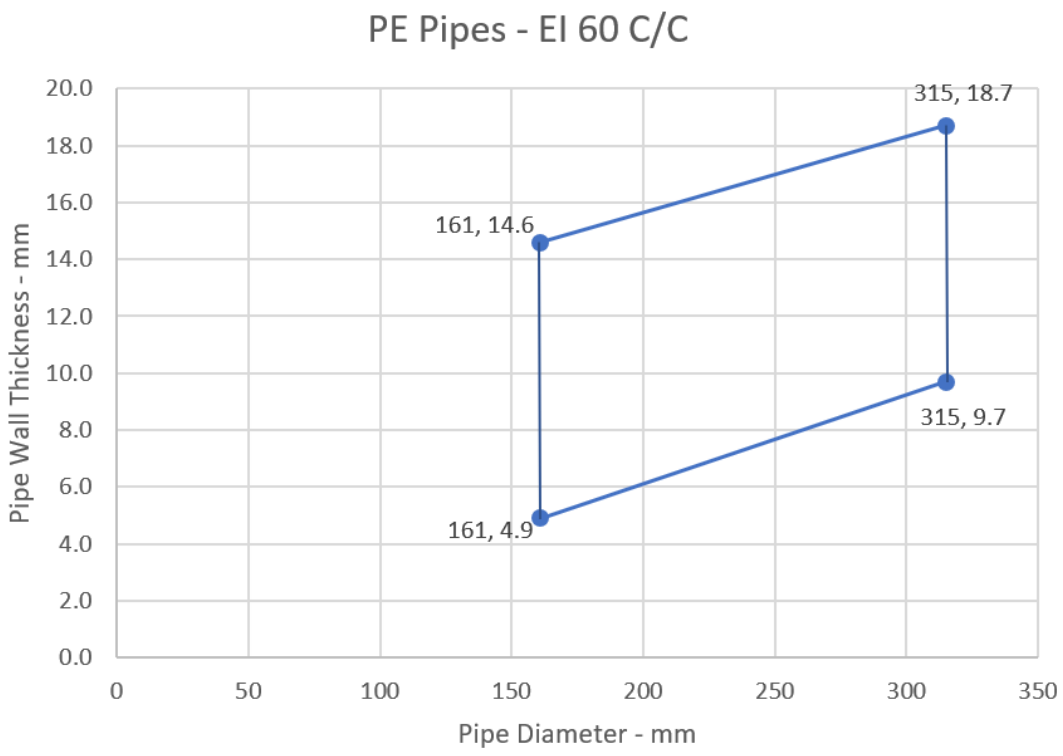

PP Pipes 315-400 mm Diameter - EI 60 - C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
315, 28.6
400, 22.7
315, 7.7
0
5
10
15
20
25
30
35
0
50
100
150
200
250
300
350
400
450

| Services | Wrap | Permitted configuration for seal separation | Min. mortar depth and floor thickness | Classification |
|---|---|---|---|---|
| **PE pipes 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** | | | | |
| Diameter 126 mm, wall thickness 3.9-11.4 mm to diameter 160 mm, wall thickness 14.6* | 75 x 18 mm (10 x 1.8 layers) | N/A | 150 mm | **E 240 U/U, EI 120 U/U** |
| 160 mm diameter / 14.6 mm wall | 75 x 7.2 mm (4 x 1.8 layers) | 1 & 2 | 150 mm | **E 240 U/U, EI 120 U/U** |
| Diameter 161 mm, wall thickness 4.9-14.6 mm to diameter 200 mm, wall thickness 6.2-18.2 mm* | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 150 mm | **EI 120 C/C** |
| 200 mm diameter / 6.2-18.2 mm wall thickness | 75 x 10.8 mm (6 x 1.8 layers) | 1 & 2 | 120 mm | **EI 240 C/C** |
| Diameter 161 mm, wall thickness 4.9-14.6 mm to diameter 315 mm, wall thickness 9.7-18.7 mm* | 75 x 18 mm (10 x 1.8 layers) | N/A | 150 mm | **EI 60 C/C** |

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


PE Pipes 126-160 mm Diameter -
E 240 U/U, EI 120 U/U
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 14.6
126, 11.4
126, 3.9
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
20
40
60
80
100
120
140
160
180

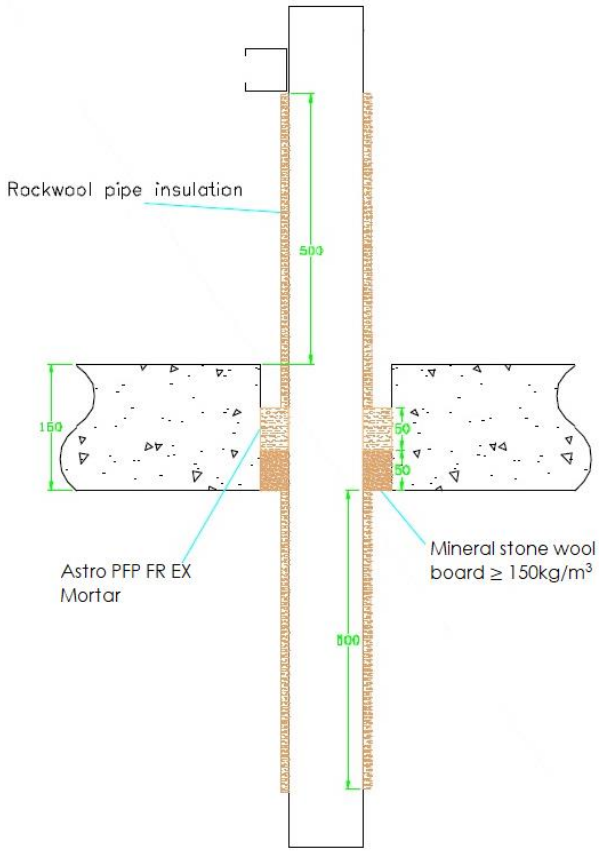

PE Pipes 161-200 mm Diameter - EI 120 - C/C
Pipe Wall Thickness - mm
Pipe Diameter - mm
200, 18.2
161, 14.6
200, 6.2
161, 4.9
20
18
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250

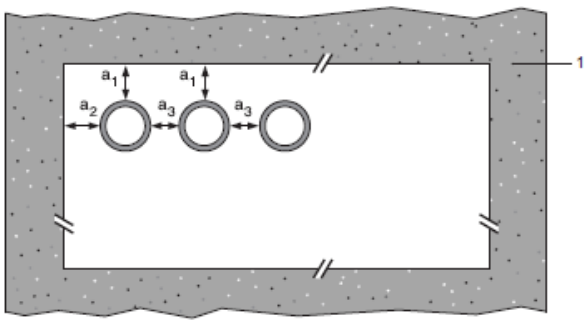
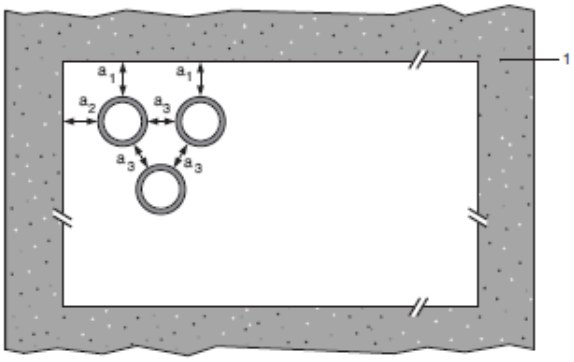

PE Pipes - EI 60 C/C
Pipe Wall Thickness - mm
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
50
100
150
200
250
300
350
Pipe Diameter - mm
315, 18.7
161, 14.6
315, 9.7
161, 4.9

### A.2.12 Pipe penetration seal with 50 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar flush with the top of floor, backed with 50 mm stone wool 150 kg/m$^3$

Construction details:




| Configuration 1 | Configuration 2 |
|---|---|
|  |  |



**Key**

1 Supporting construction

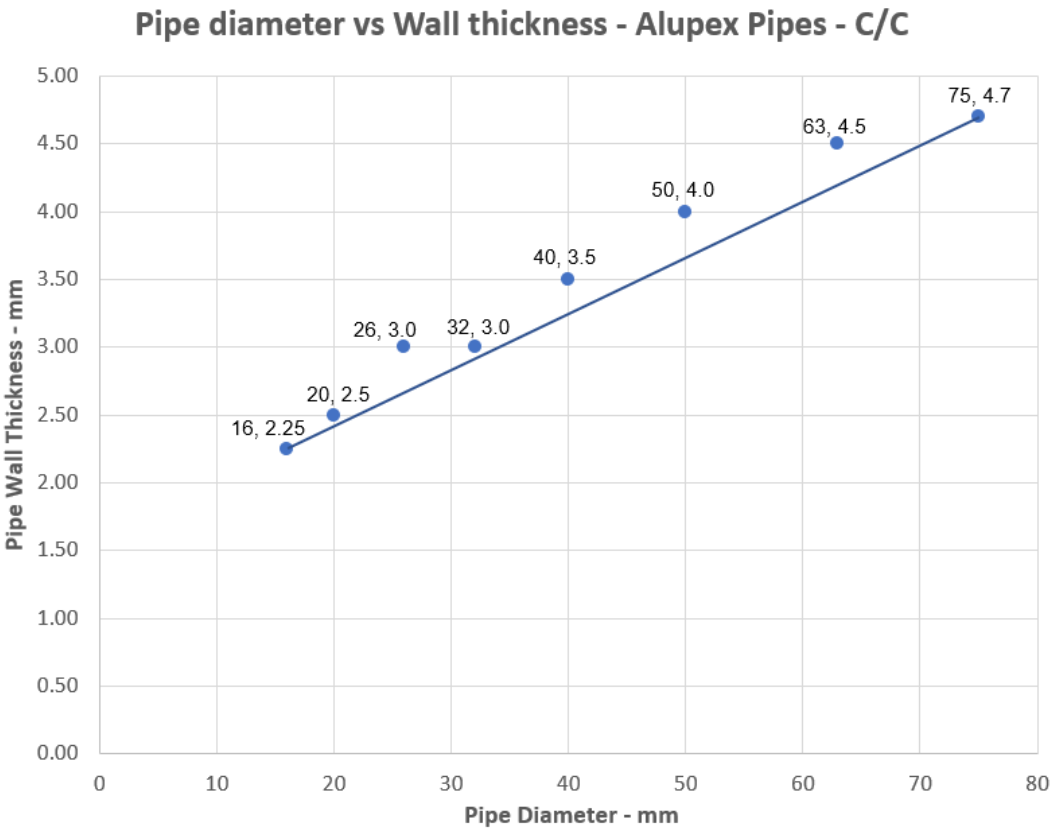
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

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

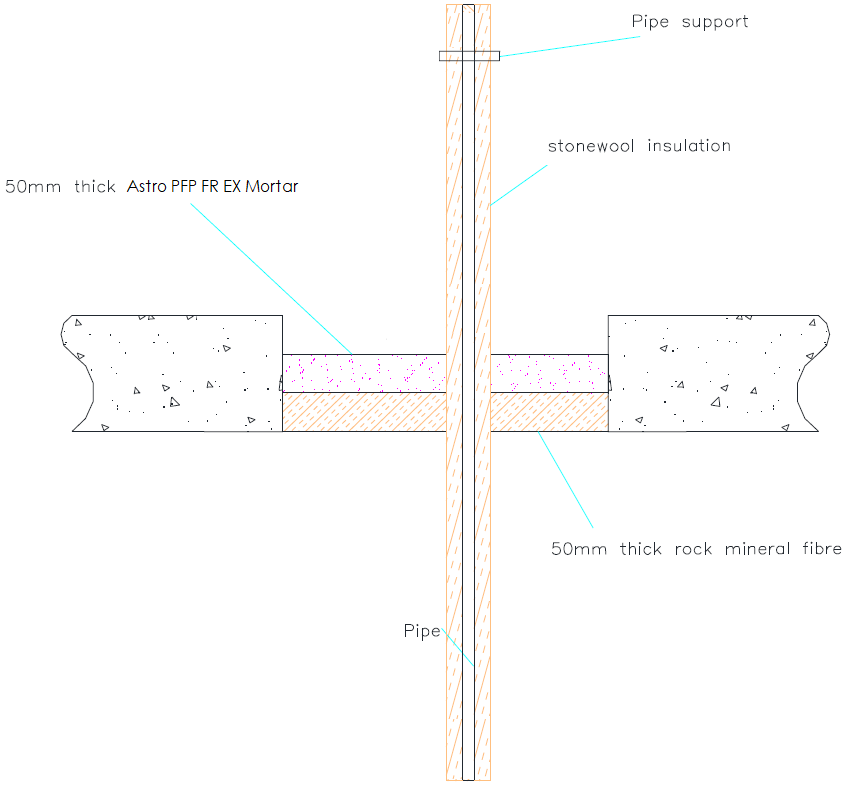
| Services<br>Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD pipe) | Maximum Aperture | Insulation | Classification |
|---|---|---|---|
| 16 mm diameter/2.25 mm wall | 135 x 135 mm | 500 mm long, minimum 20 mm Stone wool insulation minimum 80 kg/m$^3$ | **EI 240 C/C** |
| 16 mm diameter/2.25 mm wall | | | **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 | As per section 2.4) | | **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 | | | |

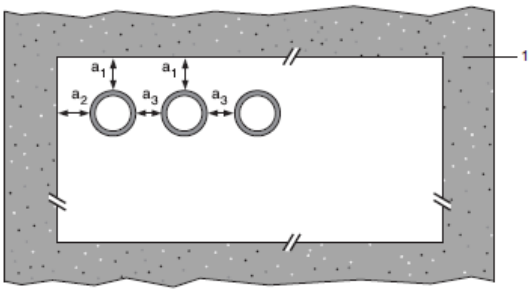
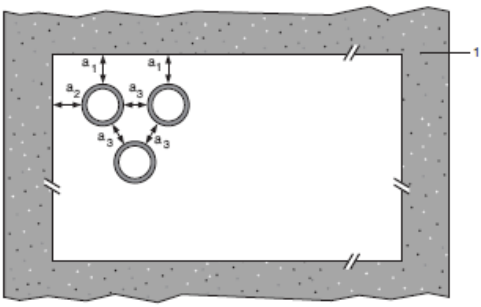


### A.2.13 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** CS (Continuous Sustained) insulated metal pipes, uninsulated metal pipes and composite with Astro PFP FR EX Mortar, to either side of the floor, backed with stone wool board 150 kg/m3. 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

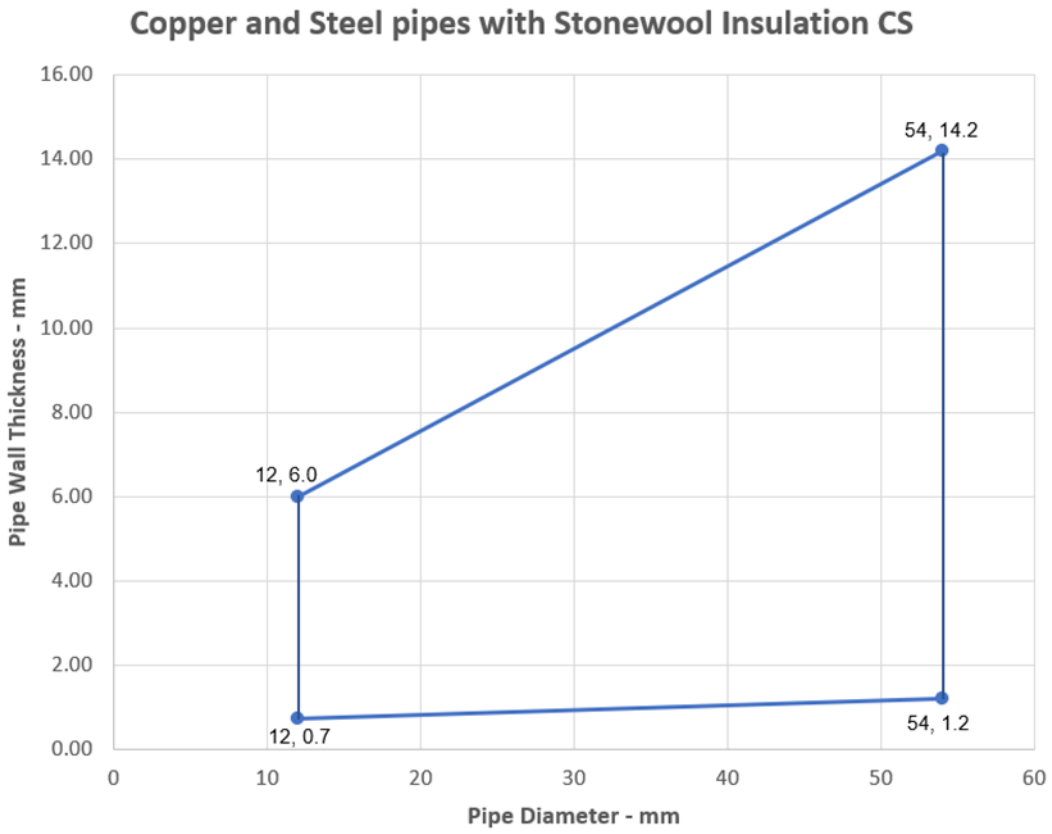
a1 Pipe / top edge of seal separation

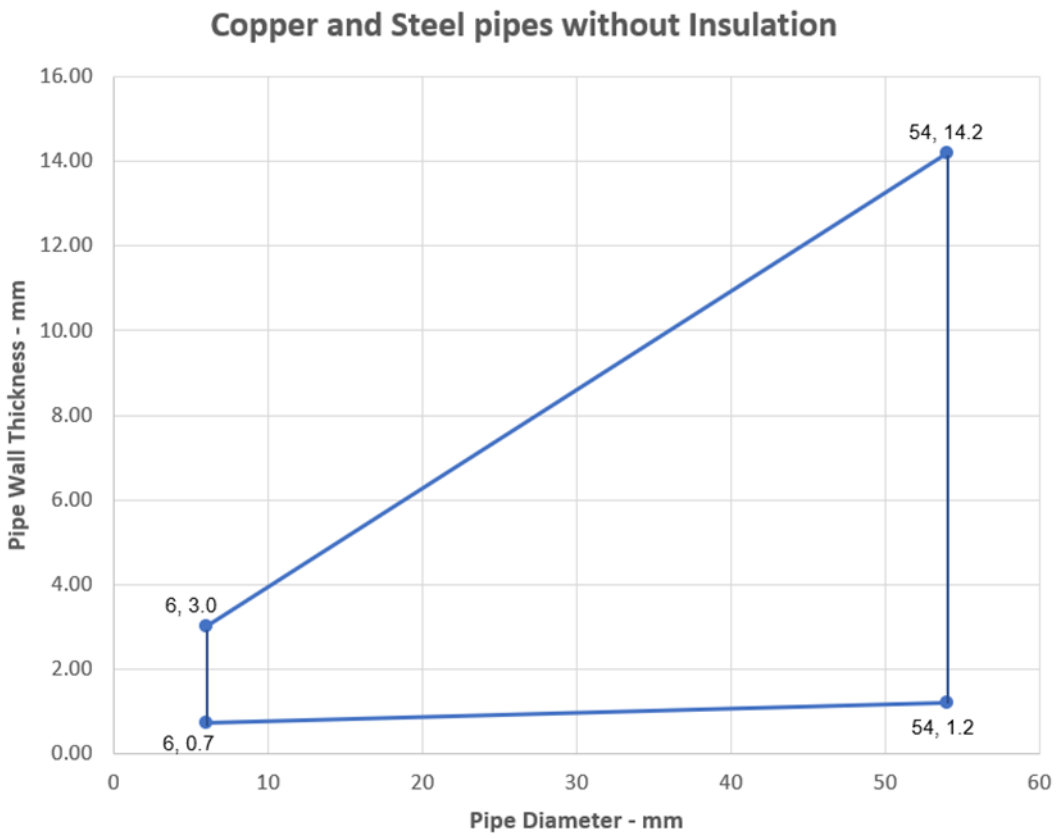
a2 Pipe / side edge of seal separation

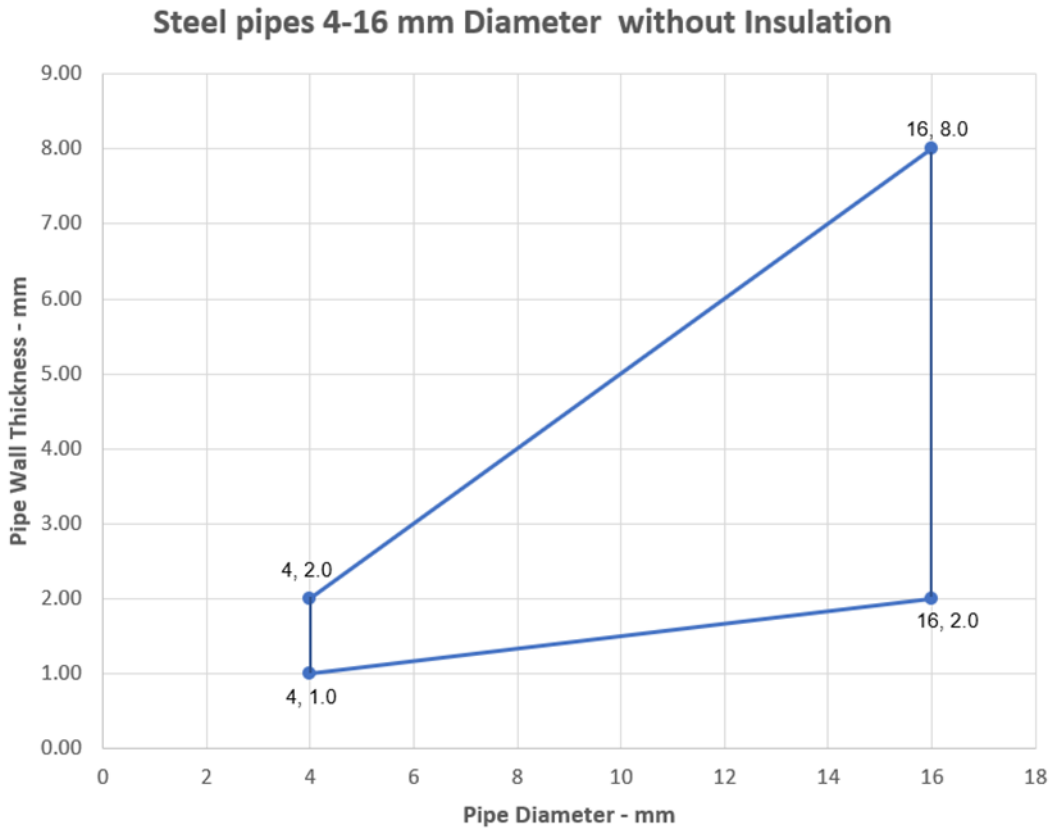
a3 Pipe / pipe separation

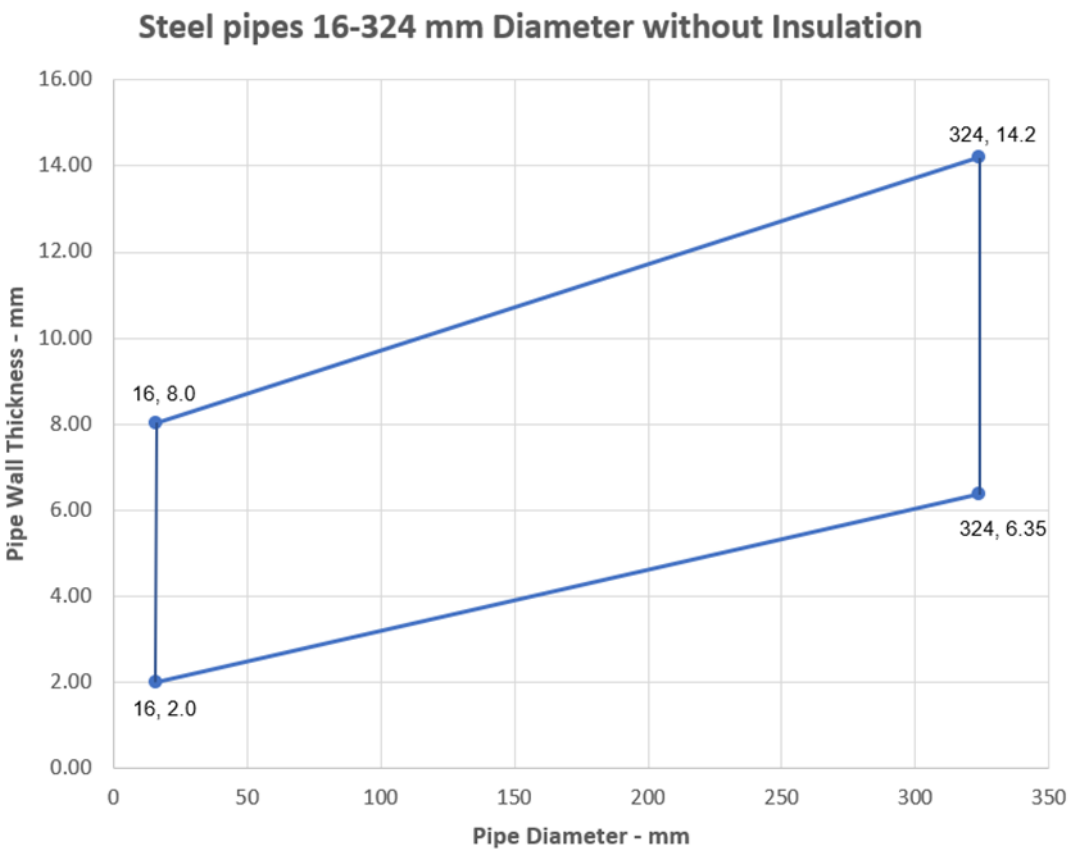
### A.2.13.1 Single side penetration seal with pipes

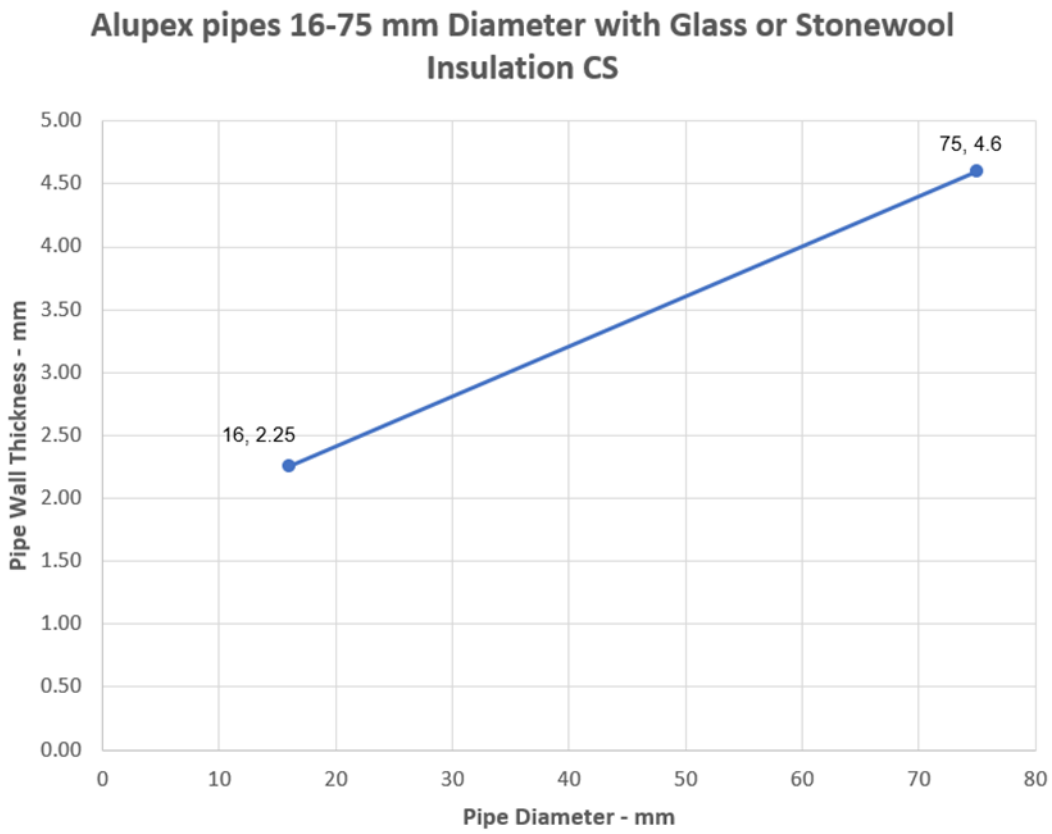
| Services | Maximum Aperture | Insulation | Classification |
|---|---|---|---|
| Copper or steel pipes | | | |
| 12 -54 mm diameter/0.7-14.2 mm wall* | As section 2. 4) | 20-80 mm Stone wool insulation minimum 80 kg/m$^3$ | **E 180 C/C, EI 120 C/C** |
| 6 mm diameter/0.7-3 mm wall* | | None | **E 180 C/C, EI 120 C/C** |
| 7-15 mm diameter/0.7-7.5 mm wall* | | | **E 180 C/C, EI 30 C/C** |
| 16-54mm diameter/1.2-14.2mm wall* | | | **E 180 C/C** |
| Steel pipes | | | |
| 4-16 mm diameter/1.0-8.0 mm wall* | | None | **EI 180 C/U** |
| 17-324 mm diameter/6.35-14.2 mm wall* | | | **E 180 C/U, EI 20 C/U** |
| Alupex Pipes | | | |
| 16-20 mm diameter/2.0 mm wall | | None | **EI 180 C/C** |
| 75mm diameter/4.6mm wall | | | **E 180 C/C, EI 30 C/C** |
| 16 mm diameter/2.25 mm wall | | 20 mm glass- or stone wool insulation minimum 75 kg/m$^3$ | **EI 180 C/C** |
| 16-75 mm diameter/2.25-4.6 wall* | | 25-50 mm glass- or stone wool insulation minimum 75 kg/m$^3$ | **EI 120 C/C** |




Copper and Steel pipes without Insulation
Pipe Wall Thickness - mm
Pipe Diameter - mm
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
10
20
30
40
50
60
54, 14.2
6, 3.0
6, 0.7
54, 1.2


Steel pipes 4-16 mm Diameter without Insulation
Pipe Wall Thickness - mm
Pipe Diameter - mm
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
2
4
6
8
10
12
14
16
18
16, 8.0
4, 2.0
16, 2.0
4, 1.0

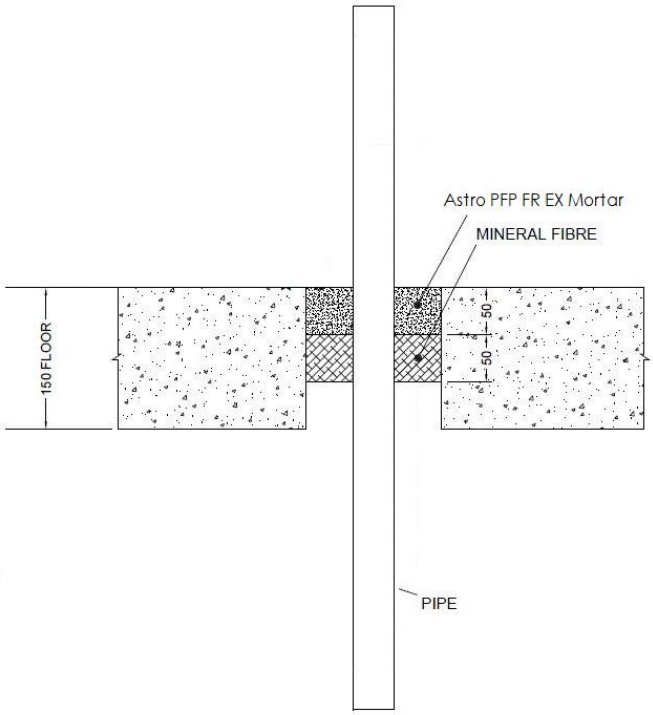

Steel pipes 16-324 mm Diameter without Insulation
Pipe Wall Thickness - mm
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
50
100
150
200
250
300
350
Pipe Diameter - mm
324, 14.2
16, 8.0
324, 6.35
16, 2.0

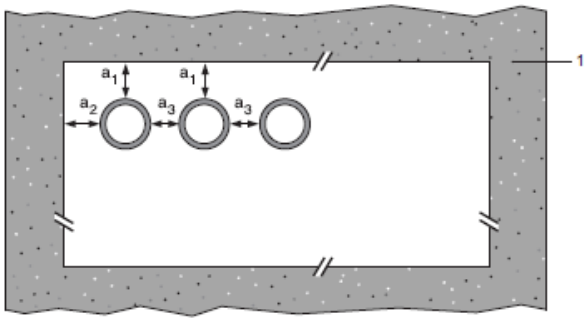
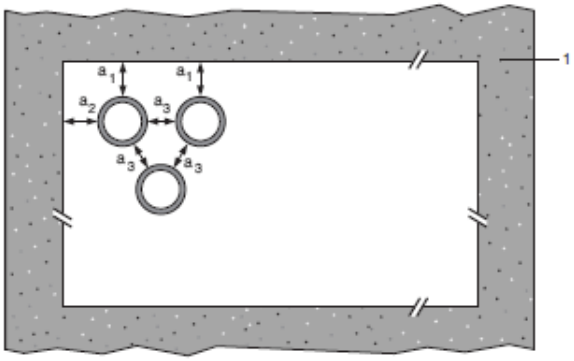

Alupex pipes 16-75 mm Diameter with Glass or Stonewool Insulation CS
Pipe Wall Thickness - mm
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
10
20
30
40
50
60
70
80
Pipe Diameter - mm
75, 4.6
16, 2.25

### A.2.14 Pipe penetration seal with 50 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar flush with the top of floor, backed with 50 mm stone wool 150 kg/m$^3$

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

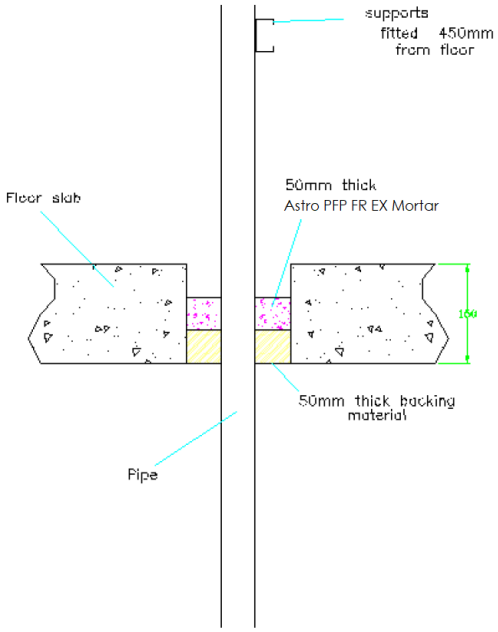
### A.2.14.1 Single side penetration seal with cables

| Services | Wrap | Maximum aperture | Classification |
|---|---|---|---|
| 40 mm diameter /3 mm wall PP pipe according to EN 1451-1 | None | As section 2.4) | **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** |

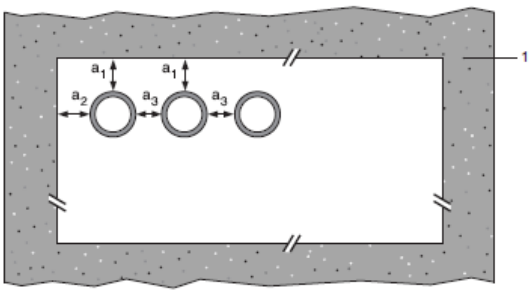
### A.2.15 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Combustible pipes sealed with Astro PFP FR EX Mortar, to either side of the floor, backed with stone wool board 150 kg/m³. 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.

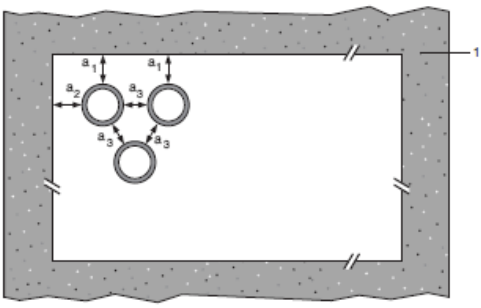
Construction details:




**Configuration 1**




**Configuration 2**




**Key**

1 Supporting construction

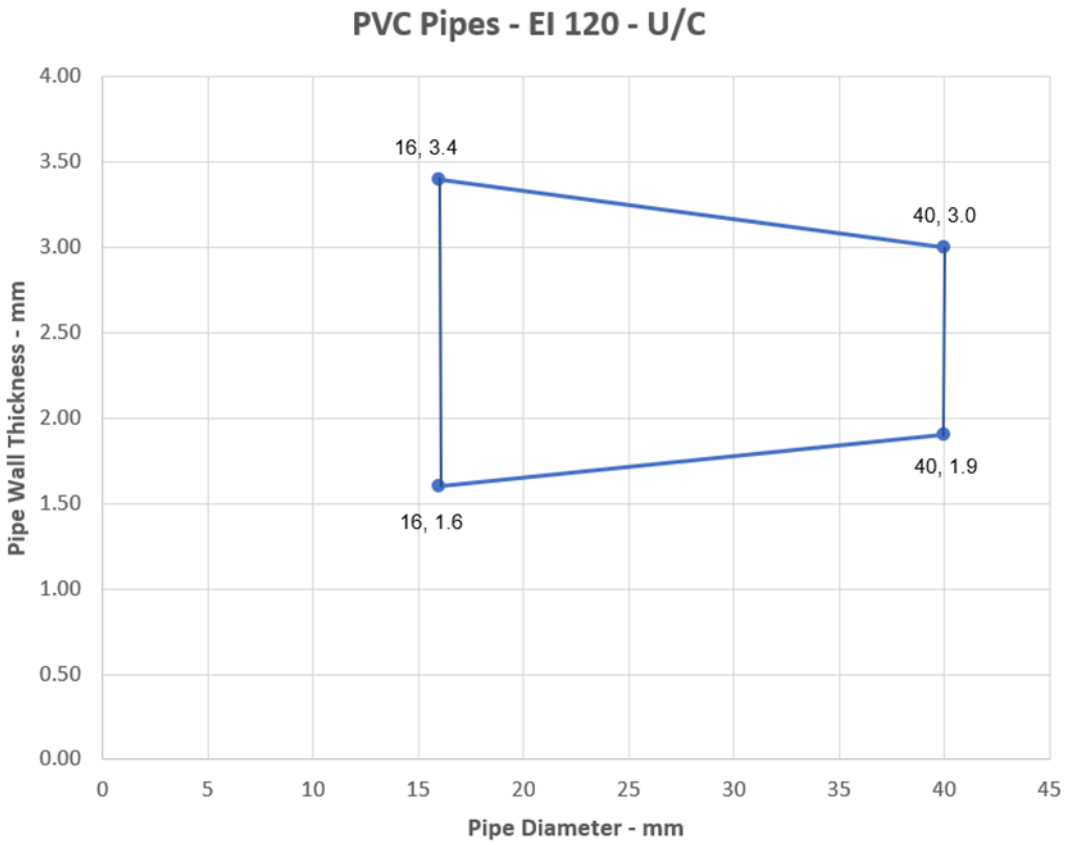
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

#### A.2.15.1 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^, 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** |

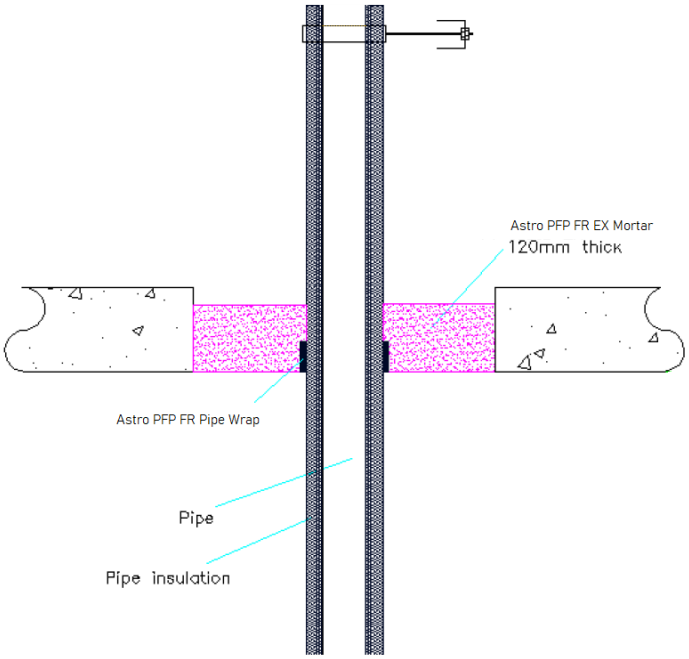

PVC Pipes - EI 120 - U/C
Pipe Wall Thickness - mm
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
5
10
15
20
25
30
35
40
45
Pipe Diameter - mm
16, 3.4
40, 3.0
40, 1.9
16, 1.6

## A.3 Rigid floor constructions according to 1.2.1 with floor thickness of minimum 120 mm

### A.3.1 Pipe penetration seal with 120 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** CS (Continuous Sustained) insulated plastic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges and 30 mm from other services), with min. 120 mm Astro PFP FR EX Mortar to either surface of the floor or anywhere between. Astro PFP FR Pipes Wraps are required to be fitted around combustible pipe insulation to the bottom of the seal, as indicated below. Maximum seal size as section 2. 4).

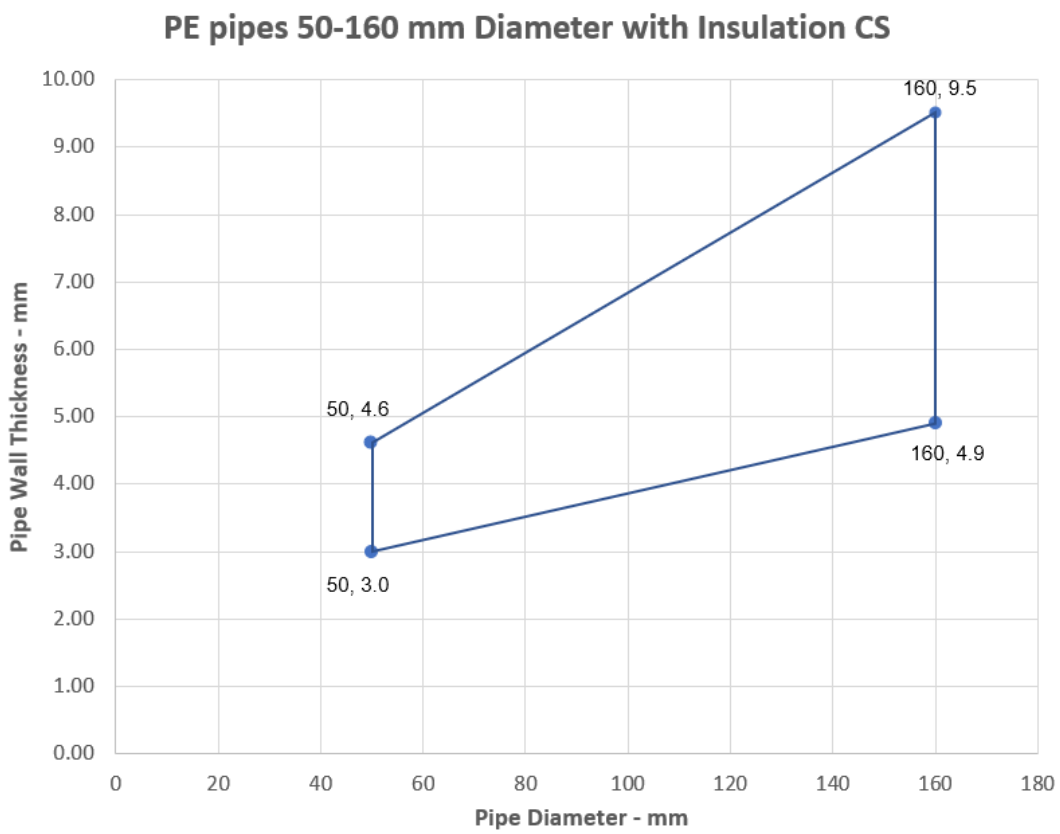
Construction details:

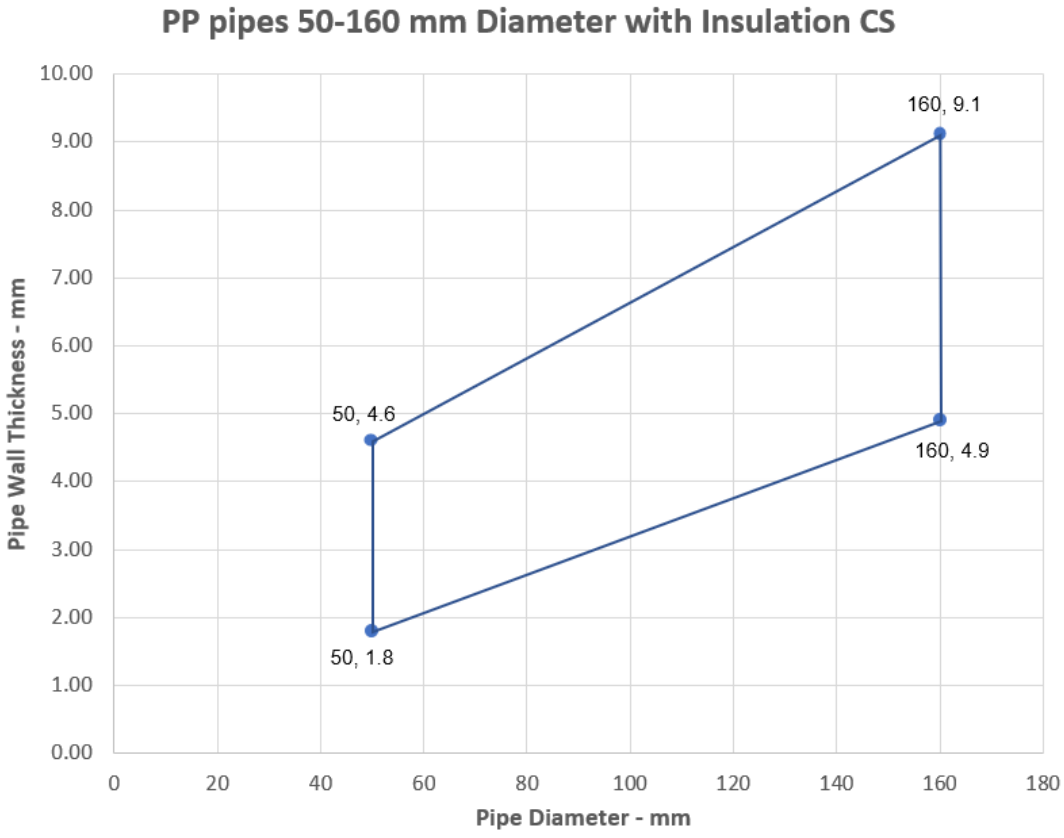



#### A.3.1.1 Single sided penetration seal with pipes

| Services | Outer diameter including insulation | Pipe wrap | Pipe insulation | Classification |
|---|---|---|---|---|
| PE pipes 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 | | | | |
| Maximum 160 mm diameter pipe* | Maximum 68 mm diameter | 50 x 3.6 mm (2 x 1.8 layers) | 9-50 mm Elastomeric insulation minimum class B-s3,d0 or foil faced phenolic foam insulation | **EI 240 C/C** |
| | Maximum 178 mm diameter | 75 x 10.8 mm (6 x 1.8 layers) | | |
| | Maximum 260 mm diameter | 75 x 18.0 mm (10 x 1.8 layers) | | **EI 120 C/C** |
| PP pipes according to EN 1852-1: 2009 | | | | |
| Maximum 160 mm diameter pipe* | Maximum 68 mm diameter | 50 x 3.6 mm (2 x 1.8 layers) | 9-50 mm Elastomeric insulation minimum class B-s3,d0 or foil faced phenolic foam insulation | **E 240 C/C, EI 180 C/C** |
| | Maximum 178 mm diameter | 75 x 10.8 mm (6 x 1.8 layers) | | **EI 240 C/C** |
| | Maximum 260 mm diameter | 75 x 18.0 mm (10 x 1.8 layers) | | **EI 120 C/C** |

*See below graph for interpolation pipe sizes


PE pipes 50-160 mm Diameter with Insulation CS
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 9.5
160, 4.9
50, 4.6
50, 3.0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
20
40
60
80
100
120
140
160
180

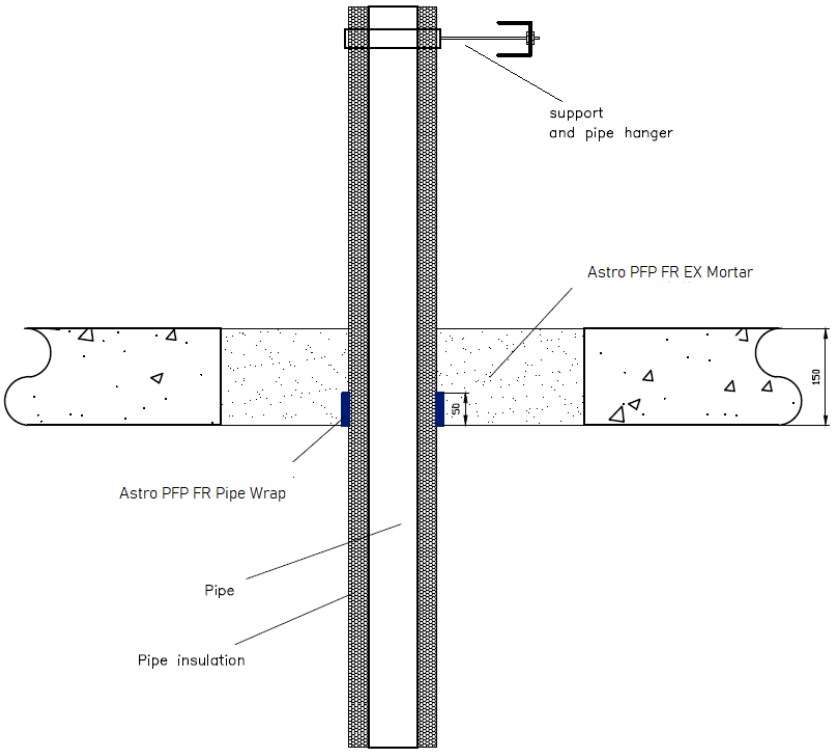

PP pipes 50-160 mm Diameter with Insulation CS
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 9.1
160, 4.9
50, 4.6
50, 1.8
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
20
40
60
80
100
120
140
160
180

## A.4 Rigid floor constructions according to 1.2.1 with floor thickness of minimum 150 mm

### A.4.1 Pipe penetration seal with 150 mm deep Astro PFP FR EX 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 min. 150 mm Astro PFP FR EX Mortar to either surface of the floor or anywhere between. Astro PFP FR Pipes Wraps are required to be fitted around combustible pipe insulation. Maximum seal size as section 2. 4).

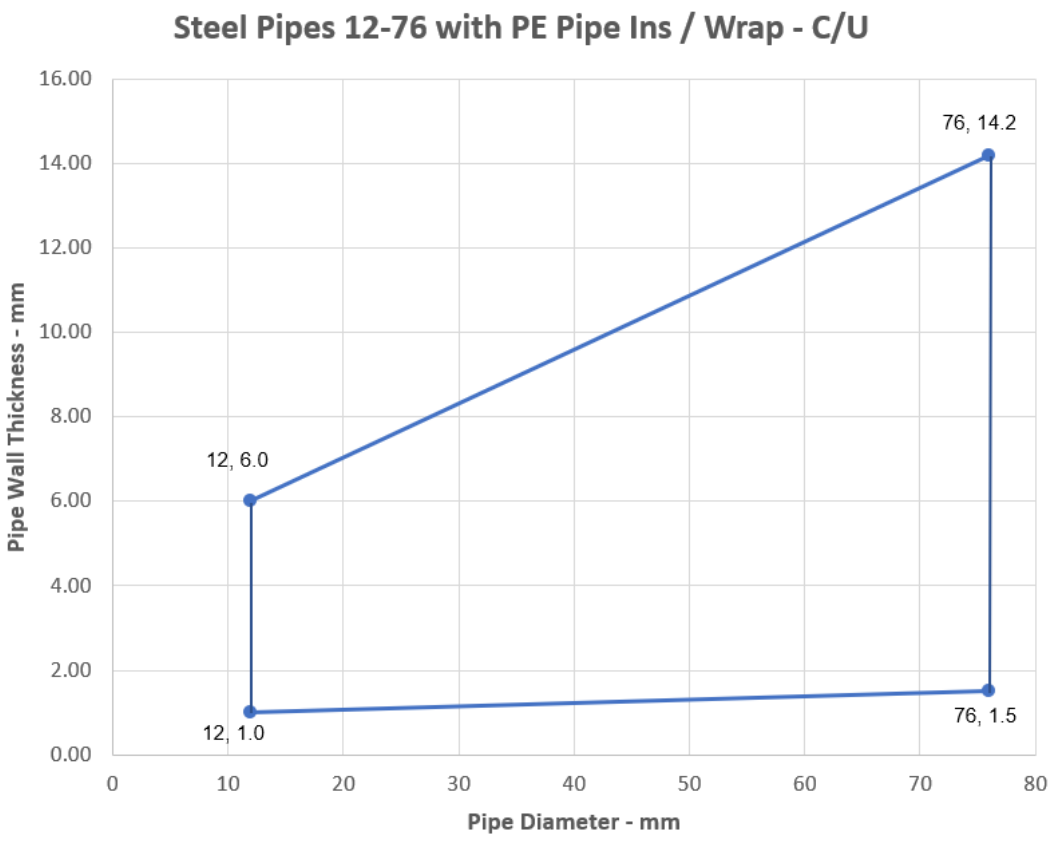
Construction details:




#### A.4.1.1 Single side penetration seal with pipes

| Services | Wrap | Insulation | Classification |
|---|---|---|---|
| Mild or stainless steel pipes | | | |
| 12 mm diameter/ 1.0 mm wall | 1 off 50 x 1.8 mm Astro PFP FR Pipe Wrap, fitted at soffit | 9 mm PE foam insulation | **EI 180 C/U** |
| Maximum 76 mm diameter/ 1.5-14.2 mm wall* | | | **E 180 C/U**<br>**EI 60 C/U** |
| | 2 off 50 x 1.8 mm Astro PFP FR Pipe Wrap, fitted at soffit | 9-30 mm PE foam insulation | |

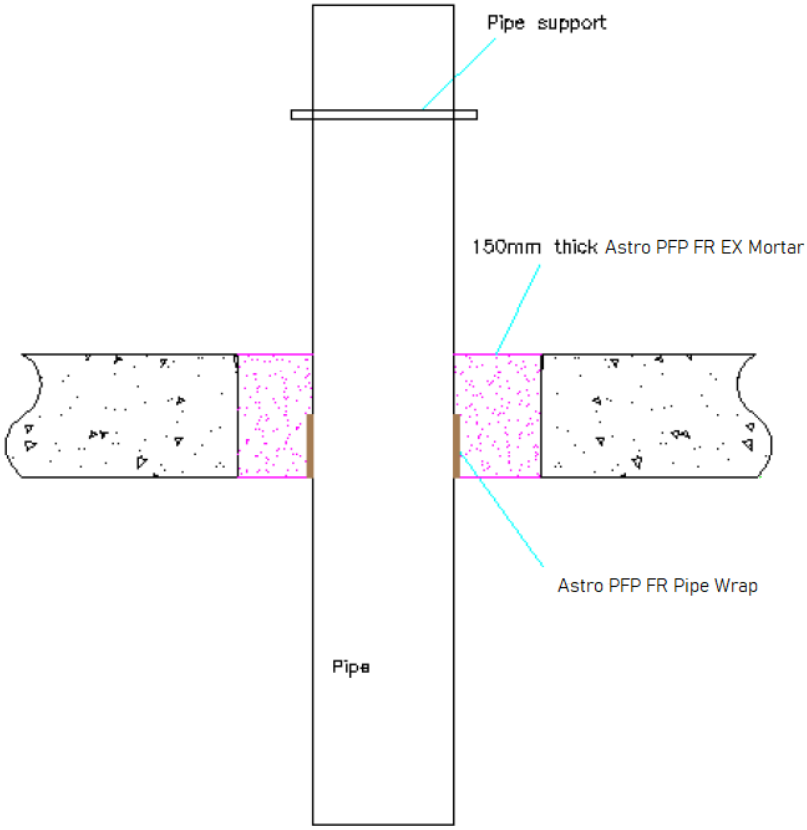
* See below graph for intermediate sizes

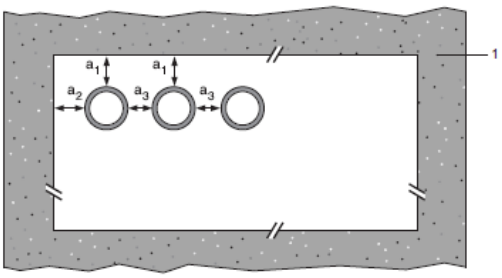
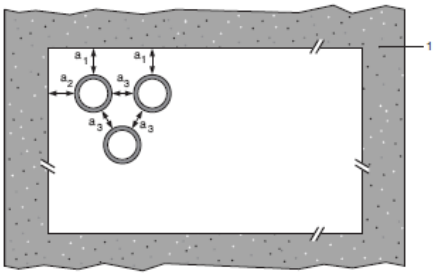

Steel Pipes 12-76 with PE Pipe Ins / Wrap - C/U
Pipe Wall Thickness - mm
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
10
20
30
40
50
60
70
80
Pipe Diameter - mm
76, 14.2
12, 6.0
12, 1.0
76, 1.5

### A.4.2 Pipe penetration seal with 150 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Plastic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges and from other services), with 150 mm Astro PFP FR EX Mortar to either surface of the floor or anywhere between. Astro PFP FR Pipe Wraps are required to be fitted to the bottom of the seal, as indicated below. Maximum seal size as section 2. 4).

Construction details:




| Configuration 1 | Configuration 2 |
|---|---|
|  |  |

**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

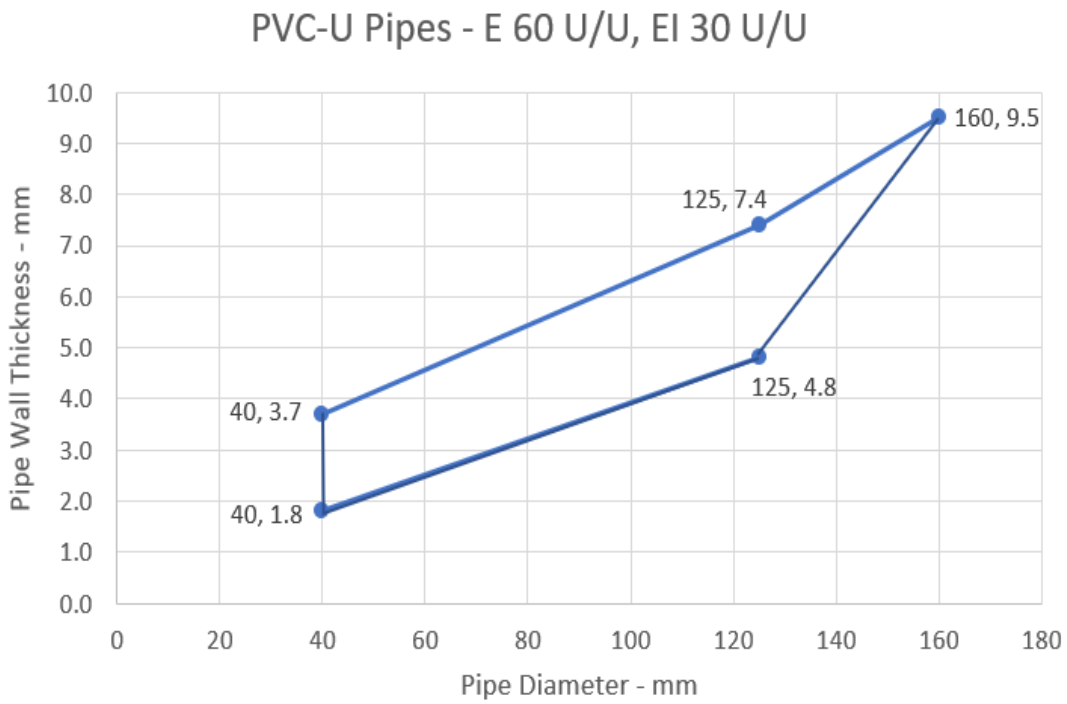
a2 Pipe / side edge of seal separation

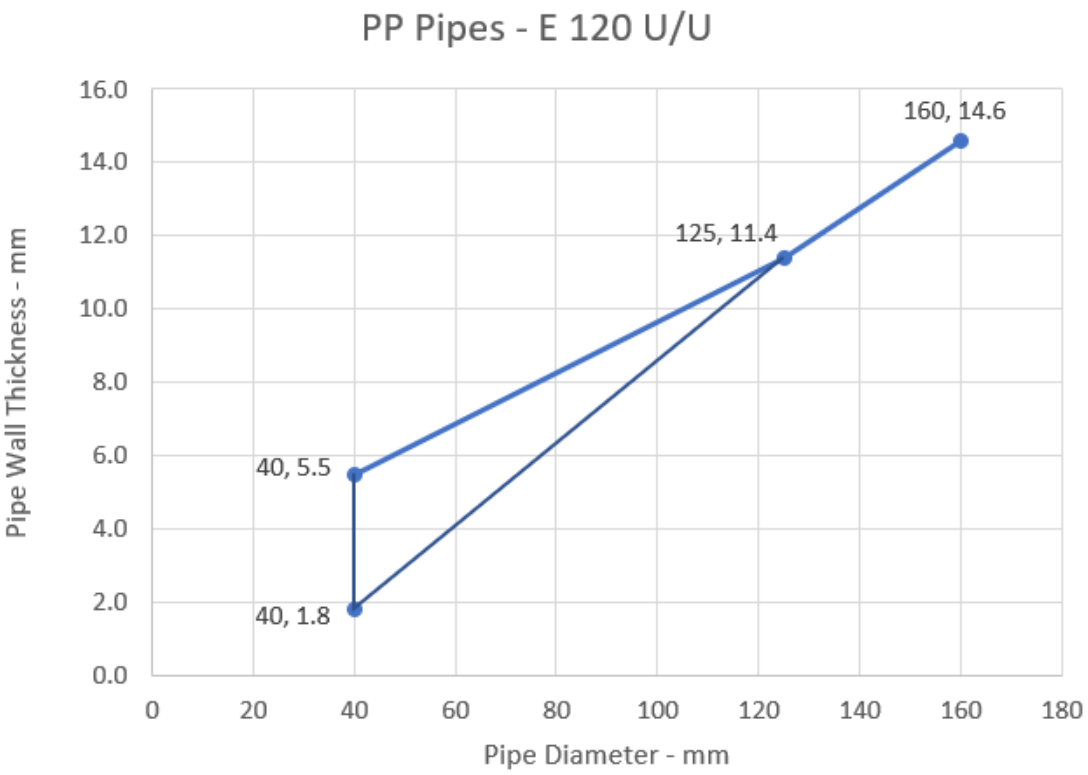
a3 Pipe / pipe separation

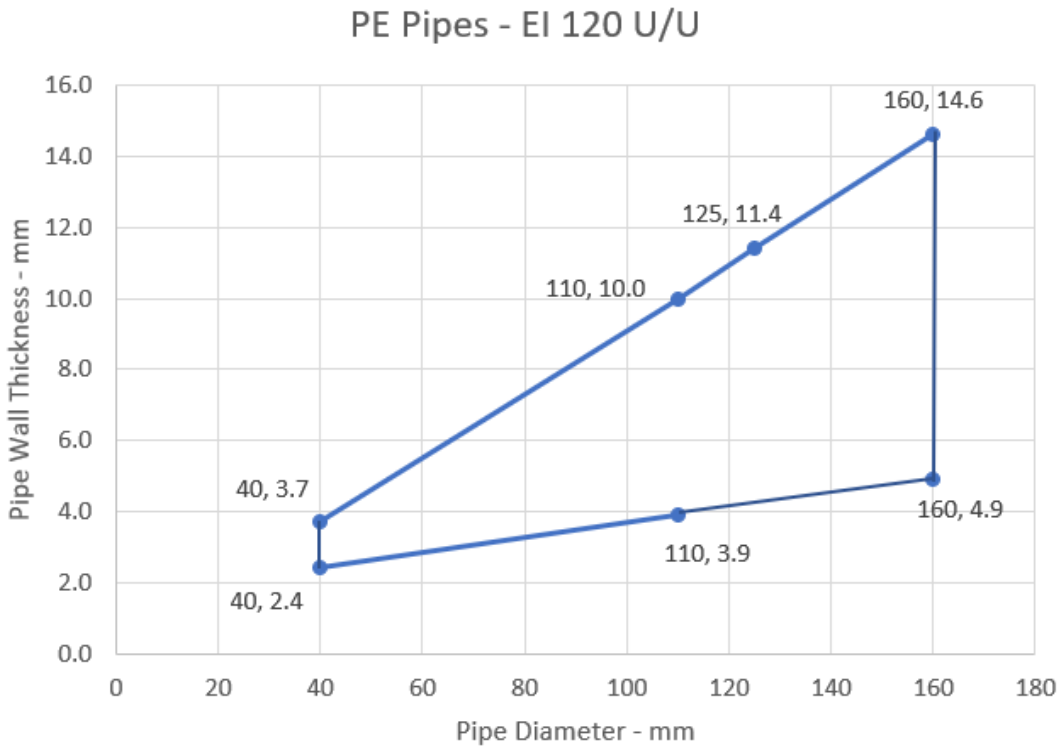
**A.4.2.1**

| Services | Wrap | Permitted configuration for seal separation | Classification |
|---|---|---|---|
| **PVC-U pipes according to EN 1329-1, EN 1452-1 and EN 1453-1, PVC-C according to EN 1566-1** | | | |
| Up to 40 mm diameter/1.8-3.7 mm wall* | 50 x 1.8 | 1 & 2 | **EI 120 U/U** |
| Up to 125 mm diameter / 4.8-7.4 mm wall* | 50 x 7.2 mm | | **EI 60 U/U** |
| Up to 160 mm diameter/9.5 mm wall* | 75 x 7.2 mm | | **E 120 U/U, EI 30 U/U** |
| **PP pipes according to EN 1451-1** | | | |
| Up to 40 mm diameter/1.8-5.5 mm wall* | 50 x 1.8 | 1 & 2 | **EI 120 U/U** |
| Up to 125 mm diameter / 11.4 mm wall* | 50 x 7.2 mm | | **EI 240 U/U** |
| Up to 160 mm diameter/14.6 mm wall* | 75 x 7.2 mm | | **EI 240 U/U** |
| **PE pipes 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** | | | |
| Up to 40 mm diameter/2.4-3.7 mm wall* | 50 x 1.8 mm | 1 & 2 | **EI 240 U/U** |
| Up to 110 mm diameter/3.4-10 mm wall* | 75 x 5.4 mm | | **EI 240 U/U** |
| Up to 125 mm diameter/11.4 mm wall* | 50 x 7.2 mm | | **EI 240 U/U** |
| Up to 160 mm diameter/4.9-14.6 mm wall* | 75 x 7.2 mm | | **EI 120 U/U** |

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



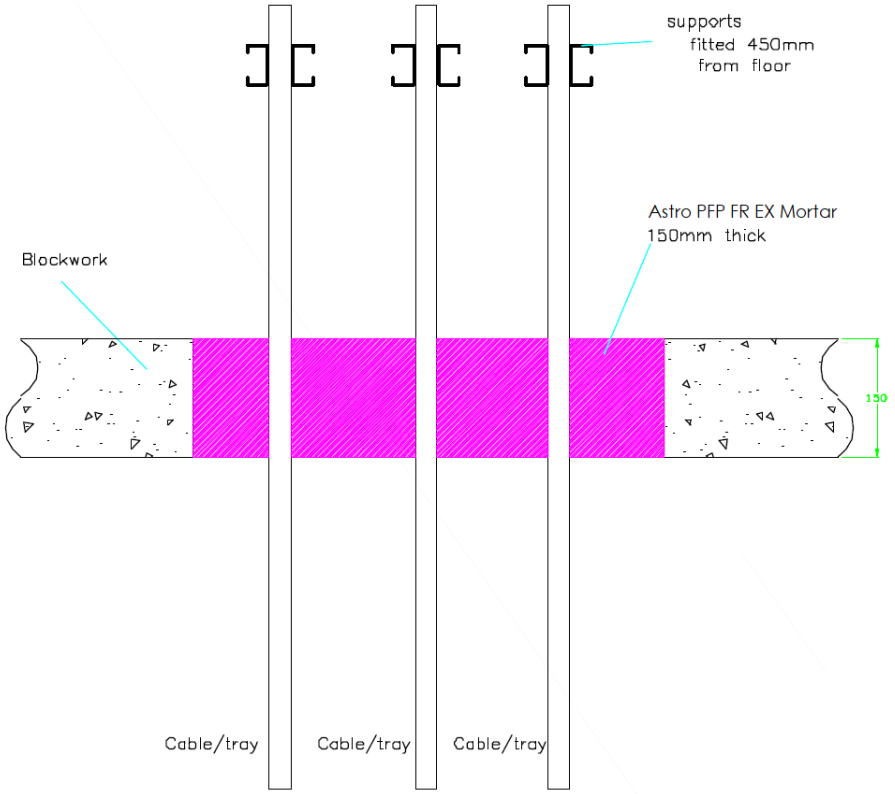

PP Pipes - E 120 U/U
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 14.6
125, 11.4
40, 5.5
40, 1.8
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
20
40
60
80
100
120
140
160
180


PE Pipes - EI 120 U/U
Pipe Wall Thickness - mm
Pipe Diameter - mm
160, 14.6
125, 11.4
110, 10.0
40, 3.7
160, 4.9
110, 3.9
40, 2.4
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
20
40
60
80
100
120
140
160
180

### A.4.3 Cable penetration seal with 150 mm deep Astro PFP FR EX Mortar

**Penetration Seal:** Cables fitted with Astro PFP FR EX 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.4.3.1 Single side penetration seal with cables

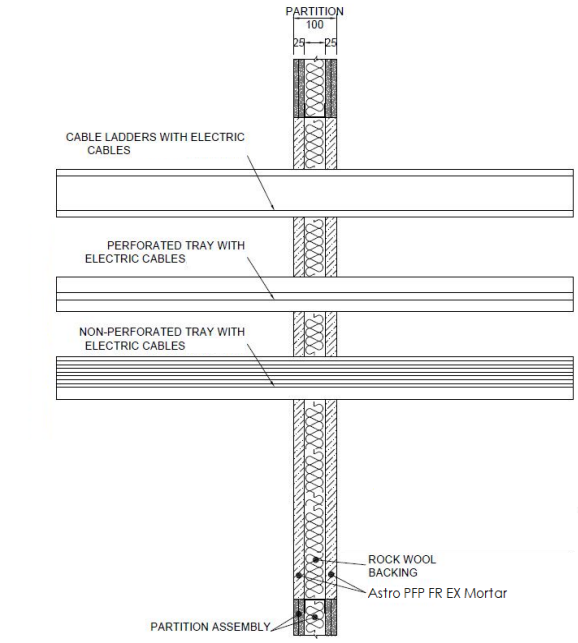
| Services | Mortar depth | Backing | Insulation | Classification |
|---|---|---|---|---|
| Blank seals | 150 mm | None | None | **E 240 EI 180** |
| Electric cables up to 21 mm diameter, single or in a bundle. | | | | **E 240 EI 120** |
| Steel cable trays and ladders up to 500 mm wide | | | | |
| Electric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

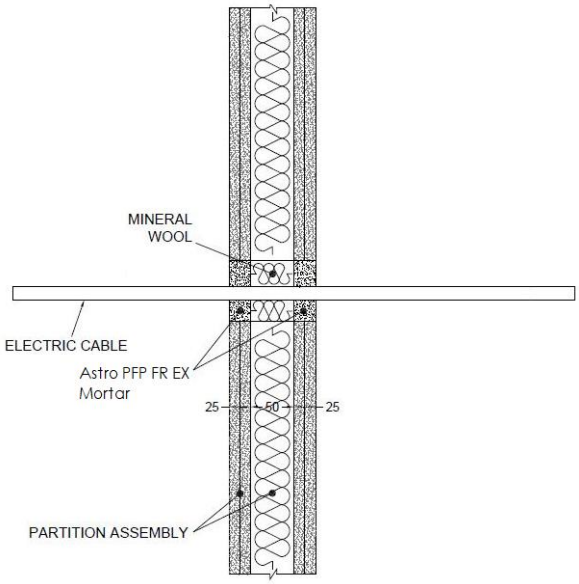
## A.5 Flexible wall constructions according to 1.2.1 with wall thickness of minimum 100 mm

### A.5.1 Cable penetration seal with 25 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar to both sides of the wall, backed with 50 mm stone wool board 150 kg/m³.

Construction details:



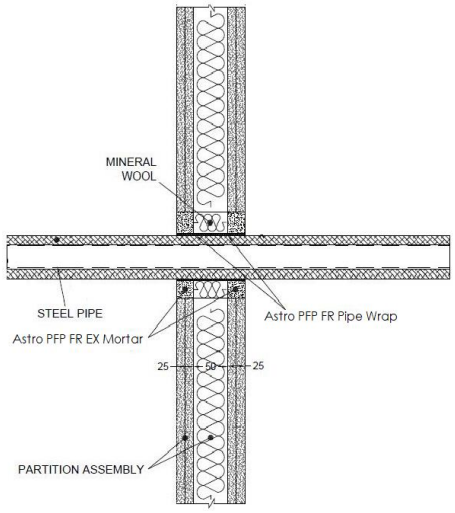

#### A.5.1.1 Double side penetration seal with cables

| 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 | | |
| Steel conduit up to 16 mm Ø | | **E 120 C/U, EI 60 C/U** |
| 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** |

### A.5.2 Pipe penetration seal with 25 mm deep Astro PFP FR EX 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 Astro PFP FR EX Mortar to both sides of the wall, backed with 50 mm stone wool board 150 kg/m$^3$ or 50 mm Astro PFP FR EX Mortar to both sides of the wall without backing*. Astro PFP FR Pipe Wraps are required to be fitted to both faces of the seal.

Construction details:

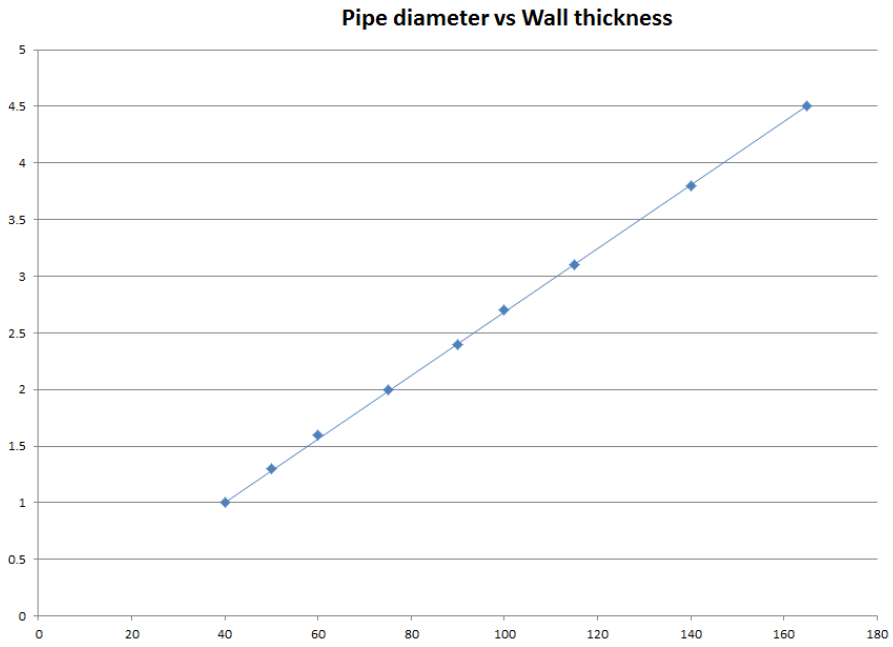



* Maximum seal size of 2400 mm wide x 1200 mm high

#### A.5.2.1 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 Astro PFP FR Pipe Wrap, one fitted flush to each face of seal | 13 mm Elastomeric insulation minimum class B-s3,d0 | **EI 120 C/U** |
| 40 mm diameter/1-14.2 mm wall* | 2 off 50 x 3.6 mm Astro PFP FR Pipe Wrap, one fitted flush to each face of seal | | **E 120 C/U, EI 60 C/U** |
| 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* | | | |

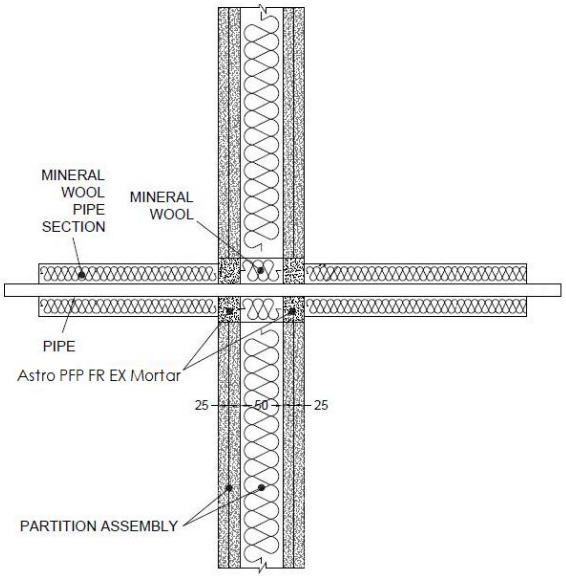
* Typical pipe diameters shown, see below graph for intermediate sizes


Pipe diameter vs Wall thickness
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180

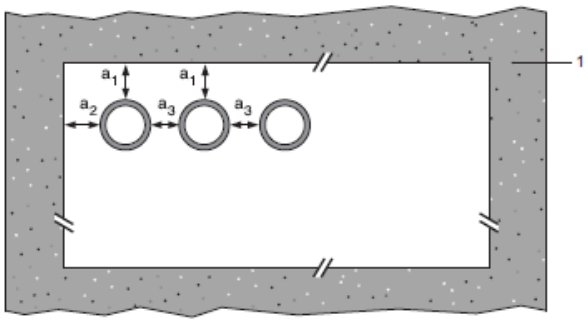
### A.5.3 Pipe penetration seal with 25 mm deep Astro PFP FR EX Mortar to both faces backed with 50 mm mineral fibre board

**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 Astro PFP FR EX Mortar to both sides of the wall backed with 50 mm stone wool board 150 kg/m$^3$. Maximum seal size 2400 mm wide x 1200 mm high

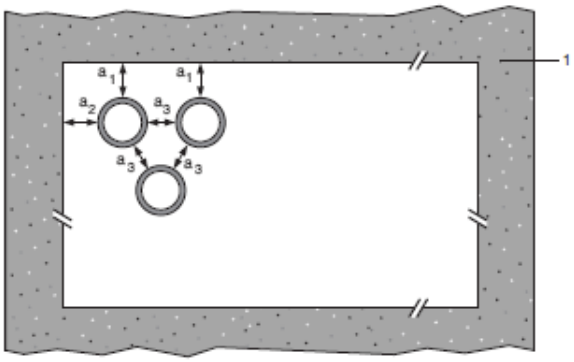
Construction details:




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

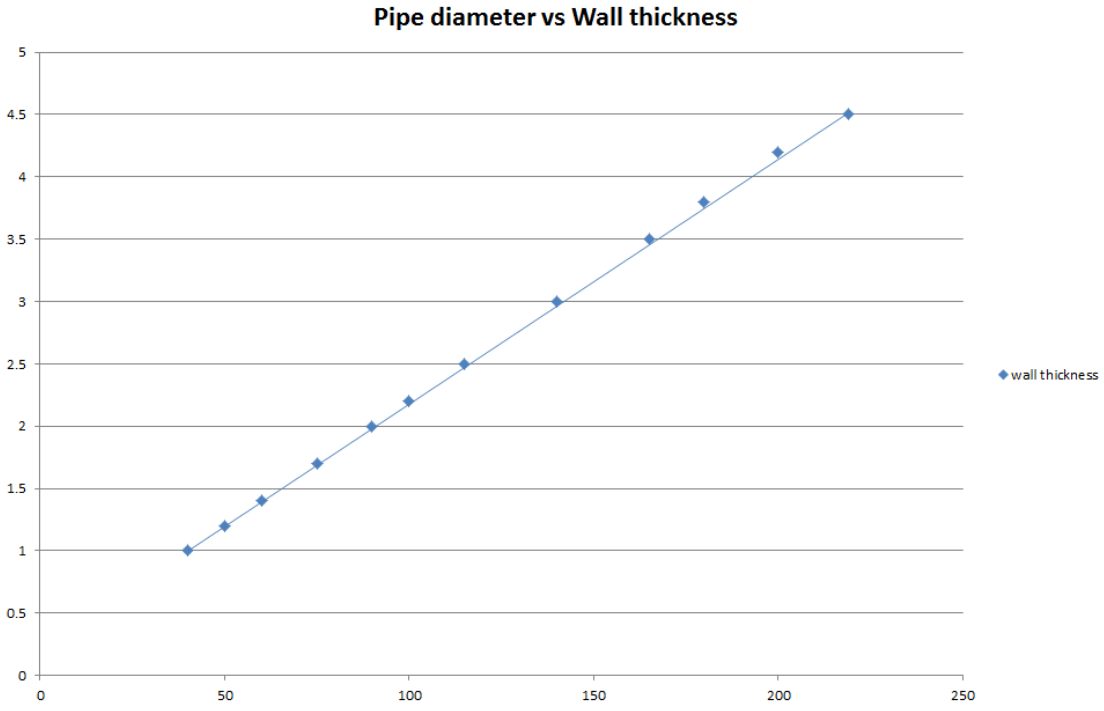
* Minimum 600 mm long insulation required for Alupex pipe.

### A.5.3.1 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$^3$ | **EI 120 C/C** |
| Alupex composite pipe 75 mm diameter/7.5 mm wall | 600 mm length of 25 mm AES Fibre ≥ 128kg/m$^3$ | **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$^3$ | **EI 120 C/U** |
| 40 mm diameter/1-14.2 mm wall* | 30 mm stone wool 80 kg/m$^3$ | **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* | | |

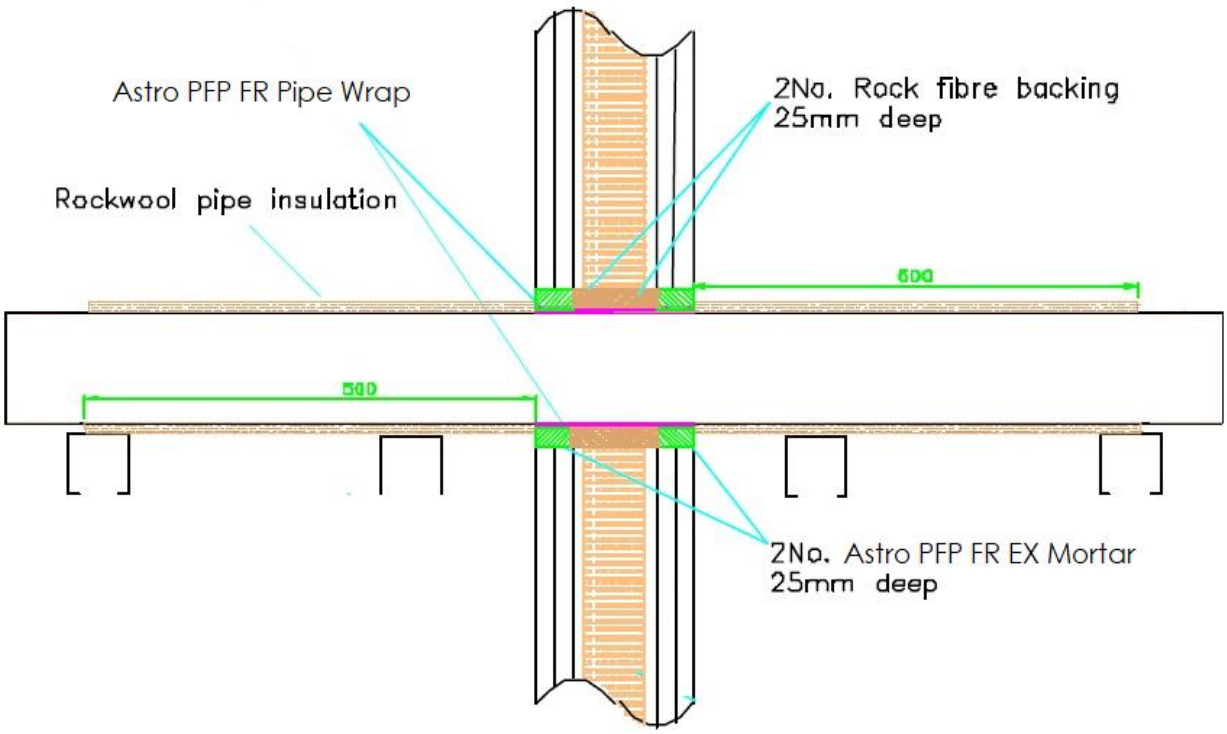
* Typical pipe diameters shown, see below graph for intermediate sizes



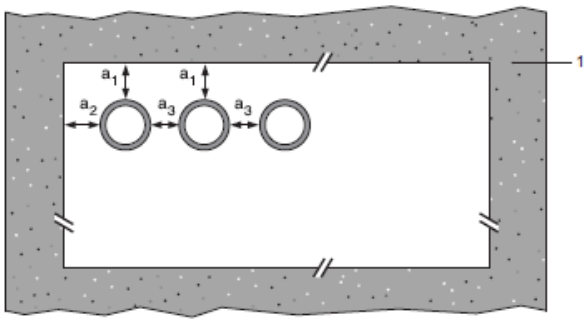
### A.5.4 Pipe penetration seal with 25 mm deep Astro PFP FR EX Mortar to both faces backed with 50 mm mineral fibre board

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 Astro PFP FR EX Mortar to both sides of the wall backed with 50 mm stone wool board 150 kg/m3. Maximum seal size 2400 mm wide x 1200 mm high

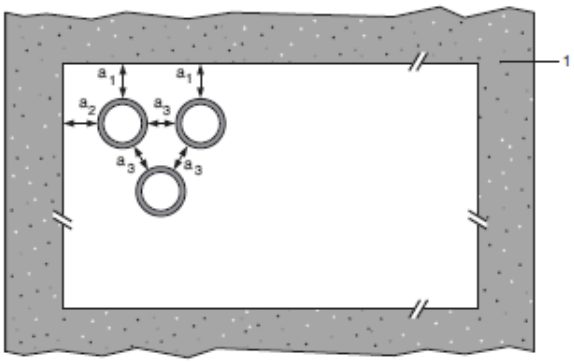
Construction details:




Configuration 1




Configuration 2




**Key**

1 Supporting construction

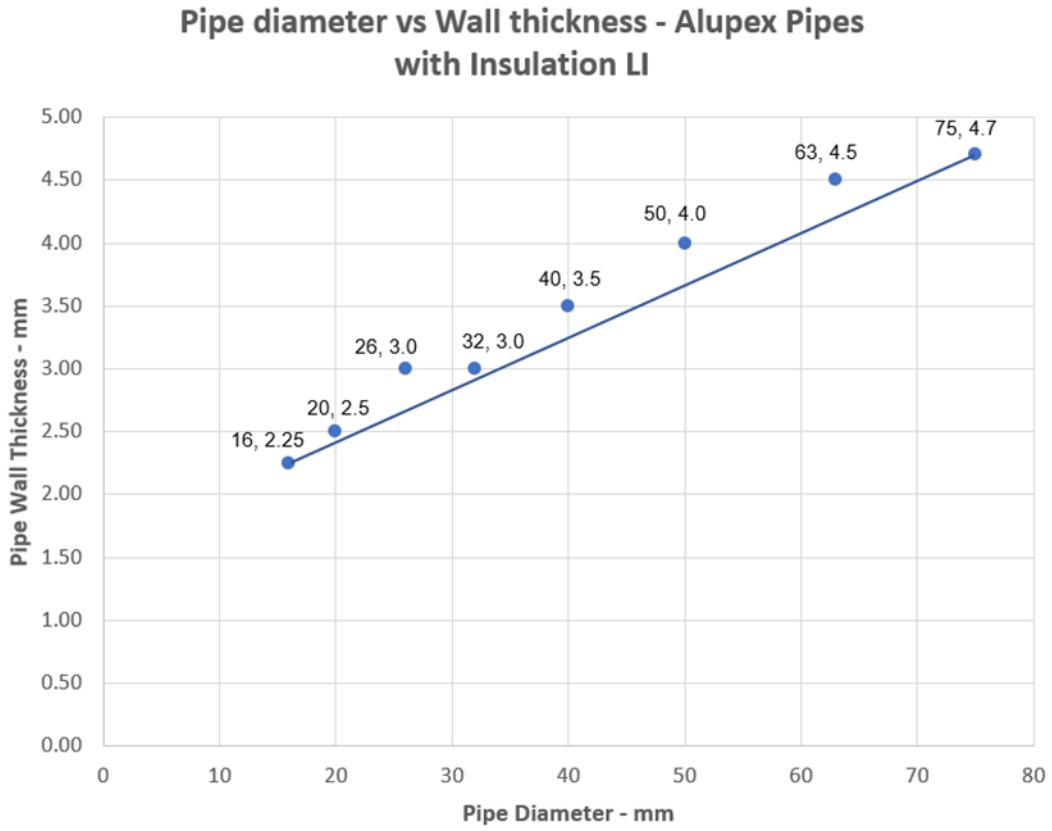
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

### A.5.4.1 Double side penetration seal with pipes

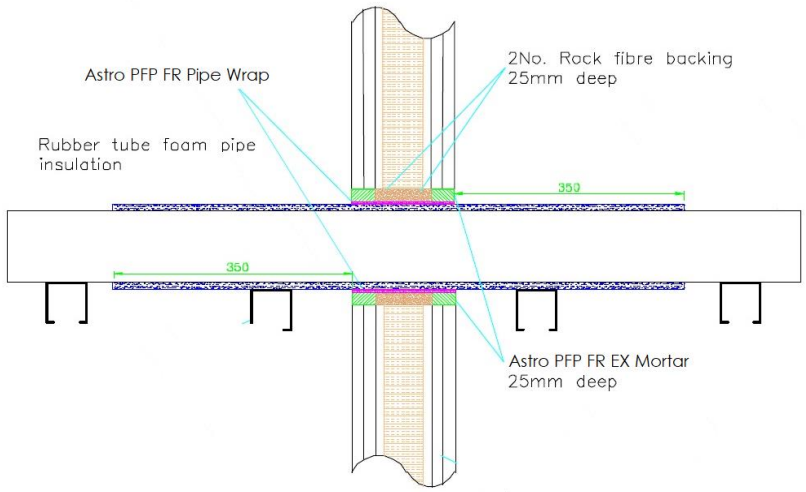
| Services | Insulation | Classification |
|---|---|---|
| Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD) pipe | | |
| 16 mm diameter/2.25 mm wall | Minimum 20 mm stone wool, minimum 80 kg/m$^3$ | **EI 120 C/C** |
| 20 mm diameter/2.5 mm wall | | |
| 26 mm diameter/3 mm wall | | |
| 32 mm diameter/3 mm wall | | |
| 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 | | |



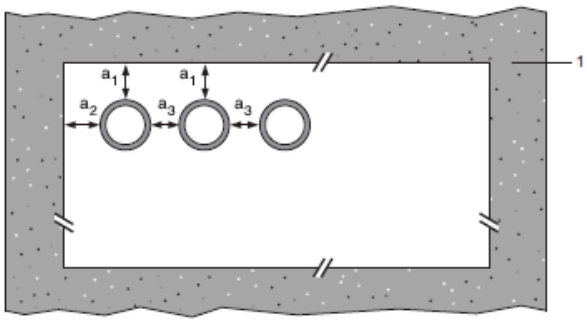
### A.5.5 Pipe penetration seal with 25 mm deep Astro PFP FR EX Mortar to both faces backed with 50 mm mineral fibre board

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 Astro PFP FR EX Mortar to both sides of the wall, backed with 25 mm stone wool 150 kg/m3*. Astro PFP FR Pipe Wraps are required to be fitted to both faces of the seal. Maximum seal size 2400 mm wide x 1200 mm long

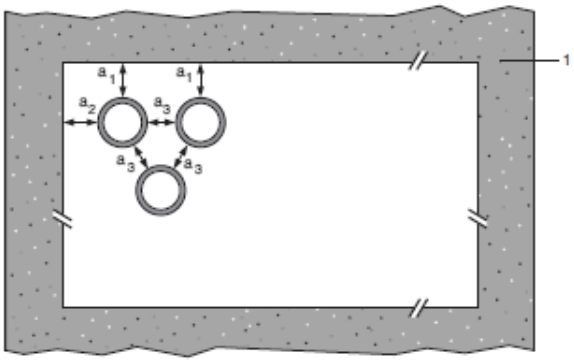
Construction details:




Configuration 1




Configuration 2




**Key**

1 Supporting construction

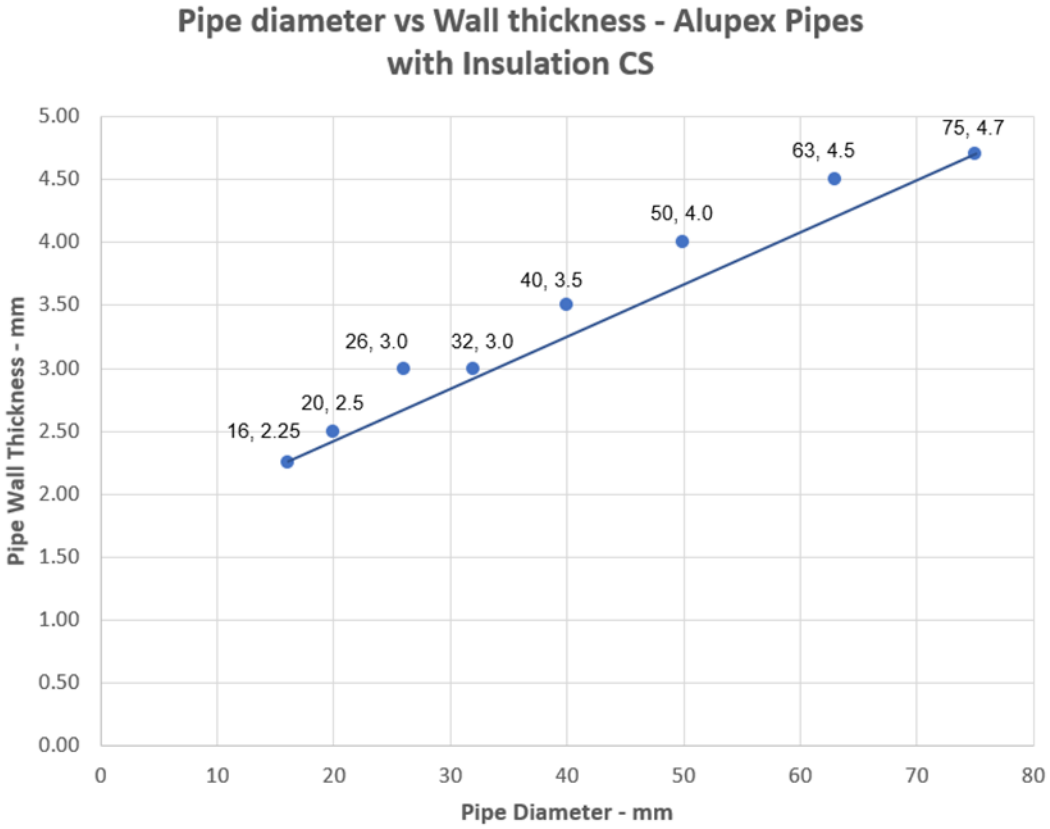
a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

a3 Pipe / pipe separation

### A.5.5.1 Double side penetration seal with pipes

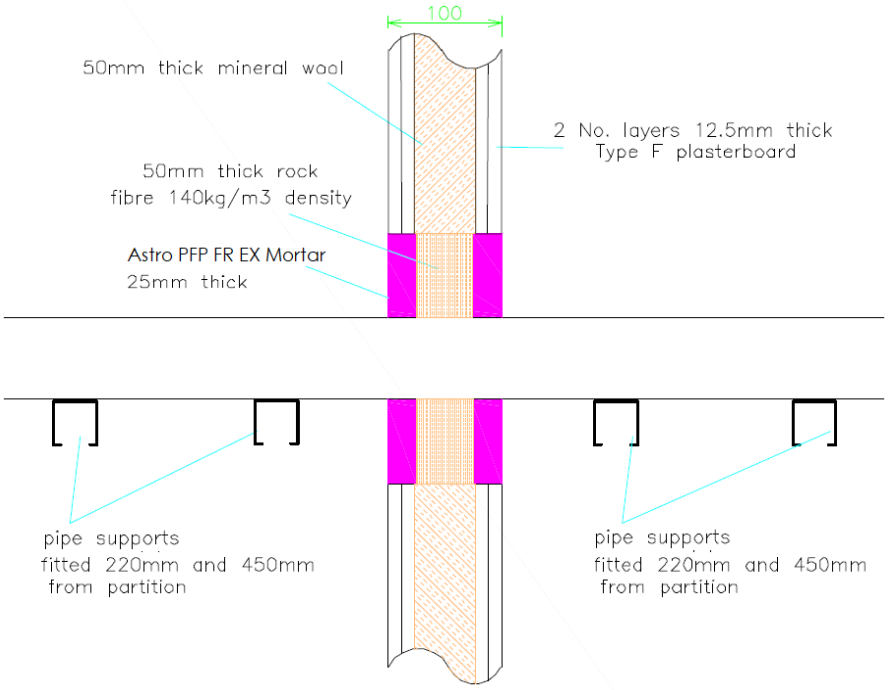
| Services | Wrap | Insulation | Classification |
|---|---|---|---|
| Copper pipe | | | |
| 12-54 mm diameter/1-1.2 mm wall | 50 x 3.6 mm Astro PFP FR Pipe Wrap fitted to both sides of the seal | 9-25 mm Elastomeric insulation minimum class B-s3,d0 | **EI 120 C/C** |
| Geberit Mepla MLC (PE-Xb/Aluminium/PE-HD pipe) | | | |
| 16 mm diameter/2.25 mm wall | 50 x 3.6 mm Astro PFP FR Pipe Wrap 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 | | | |



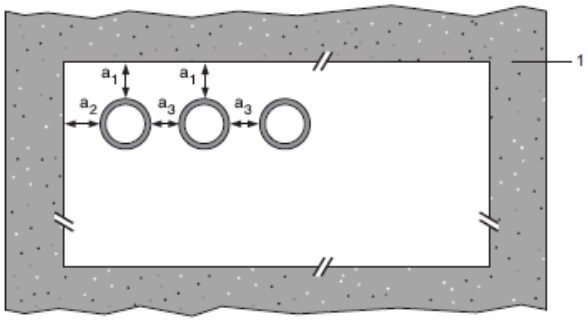
### A.5.6 Pipe penetration seal with 25 mm deep Astro PFP FR EX Mortar to both faces backed with 50 mm mineral fibre board

**Penetration Seal:** Combustible pipes sealed with Astro PFP FR EX Mortar, to both sides of the wall, backed with stone wool board 140 kg/m³. 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.

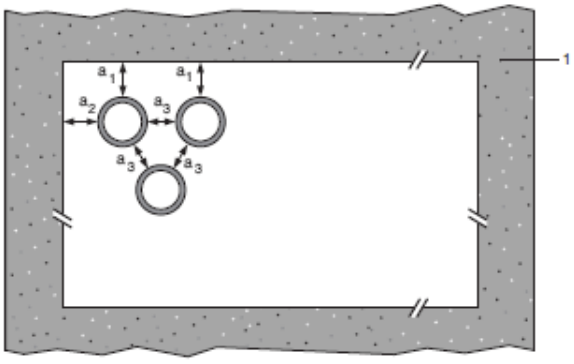
Construction details:




**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

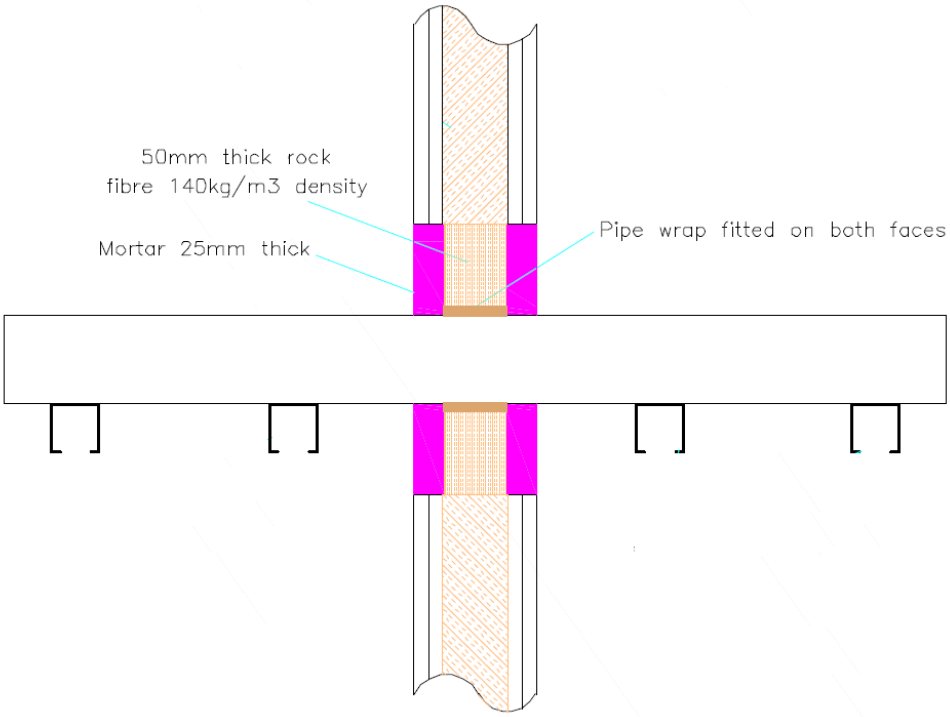
### A.5.6.1 Double side penetration seal with pipes

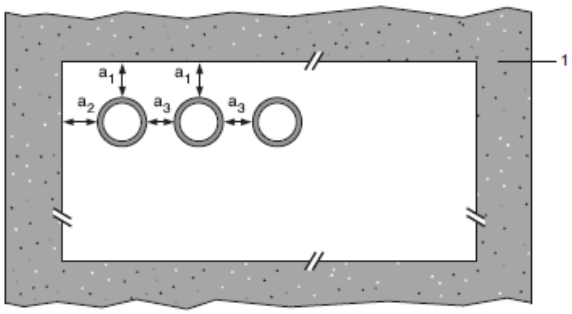
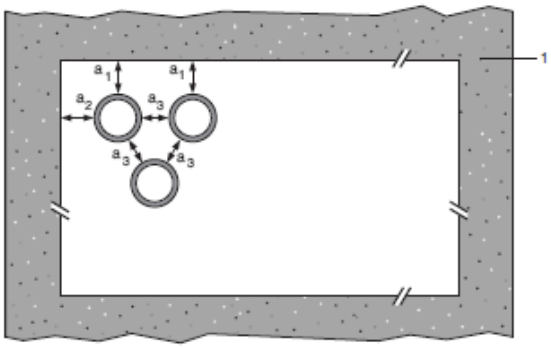
| Services | Seal Depth | Permitted configuration for seal separation | Classification |
|---|---|---|---|
| PVC-U pipe according to EN 1329-1, EN 1452-2 and EN 1453-1, PVC-C according to EN 1566-1 | | | |
| Diameter up to 32 mm, wall thickness 1.6 – 2.4 mm | 25 mm | 1 & 2 between all specified pipes | **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** |

### A.5.7 Pipe penetration seal with 25 mm deep Astro PFP FR EX Mortar to both faces backed with 50 mm mineral fibre board

**Penetration Seal:** Combustible pipes sealed with Astro PFP FR Pipe Wrap, installed into Astro PFP FR EX Mortar seals. Minimum separation between penetration seals and seal edges of 30 mm. Minimum seal size as section 2. 4).

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

* Partition wall must incorporate a full fill core insulation of Stonewool (35kg/m3 density)

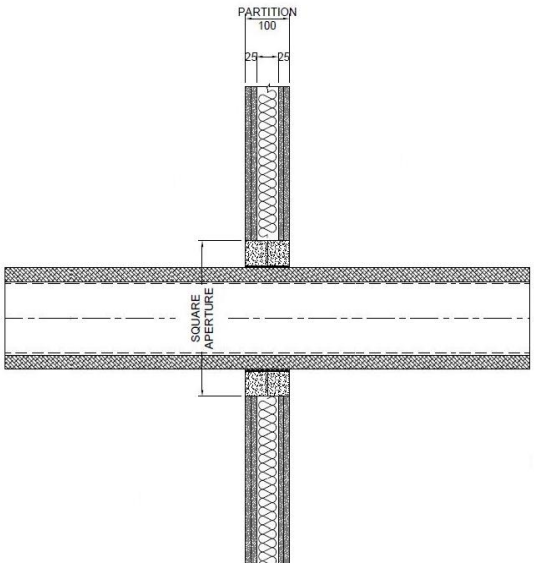
### A.5.7.1 Double side penetration seal with pipes

| Services | Wraps (both sides) | Permitted configuration for seal separation | Classification |
|---|---|---|---|
| PVC-U pipes according to EN 1329-1, EN 1452-2 and EN 1453-1 and PVC-C according to EN 1566-1 | | | |
| Diameter up to 40 mm, wall thickness 3.0 – 4.3 mm | 50 x 1.8 mm (1 layer) | 1 & 2 between PVC-U/PVC-C, PE/ABS/SAN+PVC and PP pipes in any combination | **E 120 U/C, E 120 C/U, EI 60 U/C, EI 60 C/C** |
| Diameter up to 110 mm, wall thickness 2.7 - 6.6 mm | 50 x 3.6 mm (2 x 1.8 layer) | | **E 120 U/C, E 120 C/C EI 90 U/C, EI 90 C/C** |
| Diameter up to 125 mm, wall thickness 3.7 – 7.4 mm | 50 x 5.4 mm (3 x 1.8 layer) | | **EI 120 U/C, EI 120 C/C** |
| Diameter up to 160 mm, wall thickness 3.2 - 9.5 mm | 50 x 7.2 mm (4 x 1.8 layer) | | **EI 60 U/C, EI 60 C/C** |
| PE pipes 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 40 mm, wall thickness 3.2 – 3.7 mm | 50 x 1.8 mm (1 layer) | 1 & 2 between PVC-U/PVC-C, PE/ABS/SAN+PVC and PP pipes in any combination | **EI 120 U/C, EI 120 C/C** |
| Diameter up to 110 mm, wall thickness 4.2 - 10 mm | 50 x 3.6 mm (2 x 1.8 layer) | | **EI 60 U/C, EI 60 C/C** |
| Diameter up to 125 mm, wall thickness 12 mm | 50 x 5.4 mm (3 x 1.8 layer) | | **EI 120 U/C, EI 120 C/C** |
| Diameter up to 160 mm, wall thickness 4.9 – 12.0 mm | 50 x 7.2 mm (4 x 1.8 layer) | | **E 120 U/C, E 120 C/C** |
| Diameter up to 160 mm, wall thickness 12.0 mm | | | **EI 90 U/C, EI 90 C/C** |
| PP pipes according to EN 1852-1: 2009 | | | |
| Diameter up to 40 mm, wall thickness 4.0 – 5.5 mm | 50 x 1.8 mm (1 layer) | 1 & 2 between PVC-U/PVC-C, PE/ABS/SAN+PVC and PP pipes in any combination | **EI 120 U/C, EI 120 C/C** |
| Diameter up to 110 mm, wall thickness 6.6 mm | 50 x 3.6 mm (2 x 1.8 layer) | | **E 120 U/C, E 120 C/C EI 90 U/C, EI 90 C/C** |
| Diameter up to 125 mm, wall thickness 17.1 mm | 50 x 5.4 mm (3 x 1.8 layer) | | **E 120 U/C, E 120 C/C EI 90 U/C, EI 90 C/C** |
| Diameter up to 160 mm, wall thickness 4.0 - 21.9 mm | 50 x 7.2 mm (4 x 1.8 layer) | | **E 120 U/C, E 120 C/C** |
| Diameter up to 160 mm, wall thickness 21.9 mm | | | **EI 60 U/C, EI 60 C/C** |

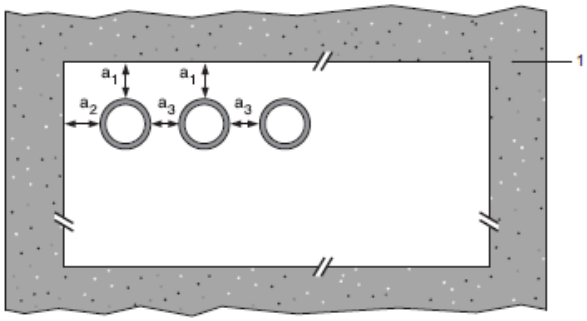
### A.5.8 Pipe penetration seal with 50 mm deep Astro PFP FR EX Mortar to both faces

**Penetration Seal:** CS (Continuous Sustained) insulated metallic pipes fitted at any position within the aperture (min. separation 30 mm from seal edges), 50 mm Astro PFP FR EX Mortar to both sides of the wall without backing*. Astro PFP FR Pipe Wraps are required to be fitted to both faces of the seal.

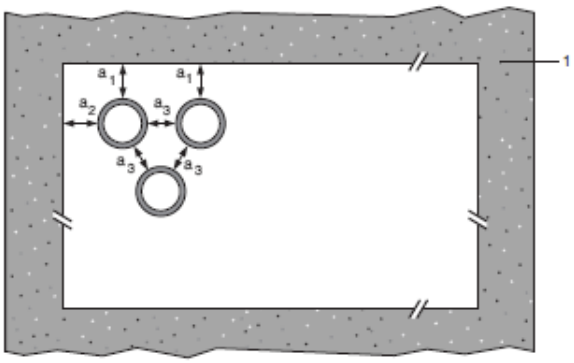
Construction details:




Configuration 1




Configuration 2




**Key**

1 Supporting construction

a1 Pipe / top edge of seal separation

a2 Pipe / side edge of seal separation

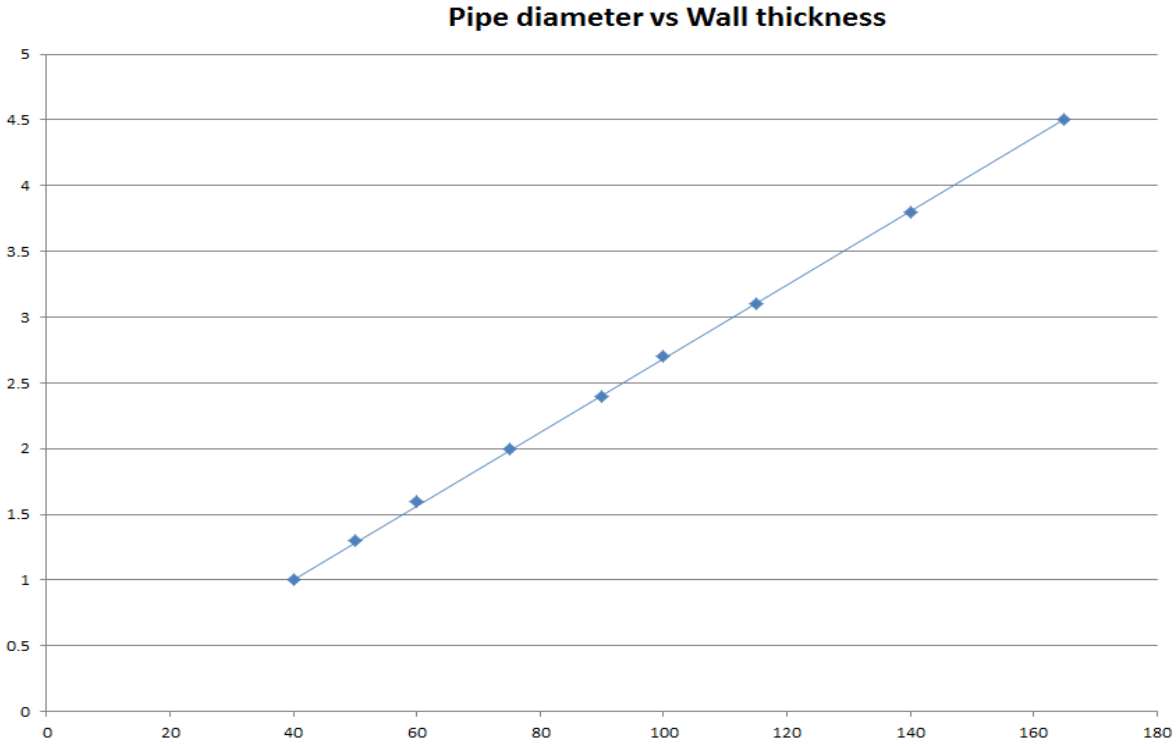
a3 Pipe / pipe separation

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

### A.5.8.1 Double side penetration seal with pipes

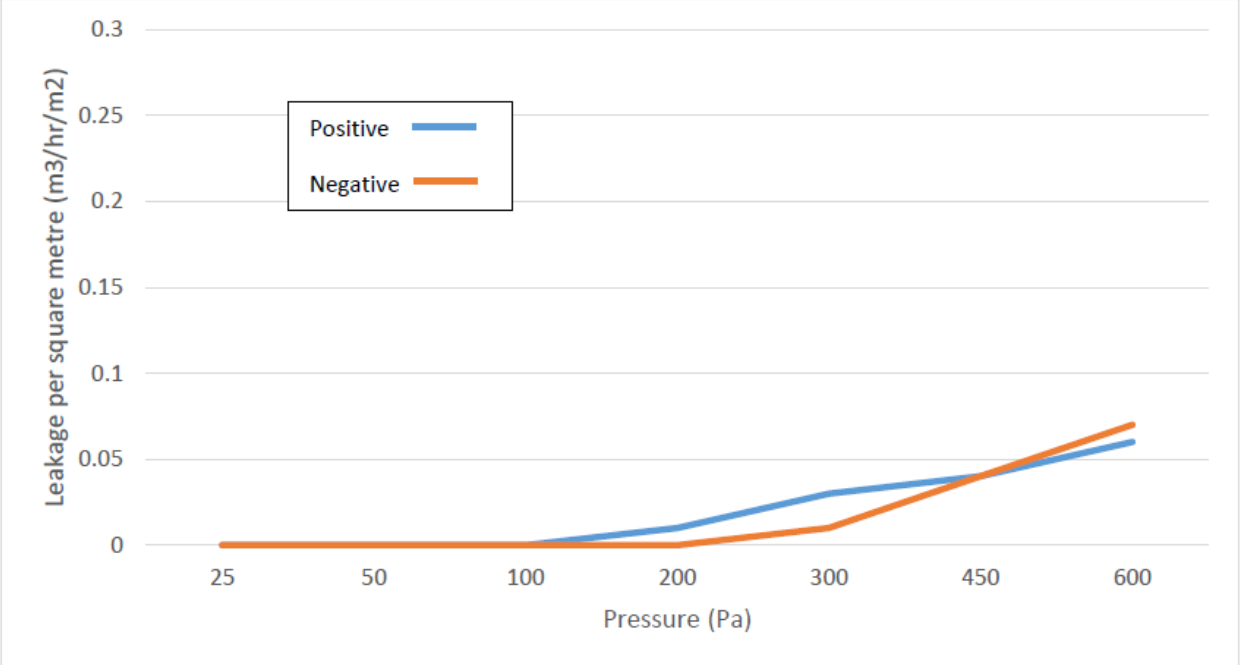
| Services<br>Mild or stainless steel pipe | Wrap | Insulation | Classification |
|---|---|---|---|
| 40 mm diameter/1-14.2 mm wall* | 2 off 50 x 3.6 mm Astro PFP FR Pipe Wrap, one fitted flush to each face of seal | 13 -32 mm Elastomeric insulation minimum class B-s3,d0 | **E 120 C/U, EI 60 C/U** |
| 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



# ANNEX B – Air Permeability – Astro PFP FR EX Mortar

| Product tested | 1200 mm high x 600 mm wide x 50 mm deep Astro PFP FR EX Mortar | | |
|---|---|---|---|
| Summary of testing procedure | | | Result |
| | Pressure (Pa) | Leakage ($m^3/h$) | Leakage ($m^3/m^2/h$) |
| Results under negative chamber pressure | 25 | 0.00 | 0.00 |
| | 50 | 0.00 | 0.00 |
| | 100 | 0.00 | 0.00 |
| | 200 | 0.00 | 0.00 |
| | 300 | 0.01 | 0.01 |
| | 450 | 0.03 | 0.04 |
| | 600 | 0.05 | 0.07 |
| Results under positive chamber pressure | 25 | 0.00 | 0.00 |
| | 50 | 0.00 | 0.00 |
| | 100 | 0.00 | 0.00 |
| | 200 | 0.01 | 0.01 |
| | 300 | 0.02 | 0.03 |
| | 450 | 0.03 | 0.04 |
| | 600 | 0.04 | 0.06 |



| Product tested | 600 mm high x 600 mm wide x 100 mm deep Astro PFP FR EX Mortar inc. 110 mm plastic pipe with 2no layers 50 mm x 1.8 mm Astro PFP FR Wrap cast to one face in centre of seal | | |
|---|---|---|---|
| Summary of testing procedure | | | Result |
| | Pressure (Pa) | Leakage ($m^3/h$) | Leakage ($m^3/m^2/h$) |
| Results under negative chamber pressure | 25 | 0.00 | 0.00 |
| | 50 | 0.00 | 0.00 |
| | 100 | 0.00 | 0.00 |
| | 200 | 0.00 | 0.00 |
| | 300 | 0.00 | 0.00 |
| | 450 | 0.01 | 0.01 |
| | 600 | 0.03 | 0.04 |
| Results under positive chamber pressure | 25 | 0.00 | 0.00 |
| | 50 | 0.00 | 0.00 |
| | 100 | 0.00 | 0.00 |
| | 200 | 0.00 | 0.00 |
| | 300 | 0.00 | 0.00 |
| | 450 | 0.01 | 0.01 |
| | 600 | 0.02 | 0.03 |

