PEUTZ

Laboratory for Fire Safety

Summary of the classification of the fire resistance in line with EN 13501-2:2016 concerning pipe and cable penetration seals fitted with the Mulcol® Multicollar Slim

Application in a flexible or rigid wall

Report number C 1744-1E-RA-010 dated 25 October 2017

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Application in a flexible or rigid wall

Client	Mulcol International
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Reference	JM/HL//C 1744-1E-RA-010
Representative	ir. J.J. Mertens
Author	ing. H.H.A. Leenders
	+31 24 3570784
	h.leenders@peutz.nl

peutz bv, postbus 66, 6585 zh mook, +31 24 357 07 07, info@peutz.nl, www.peutz.nl

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mook – zoetermeer – groningen – düsseldorf – dortmund – berlijn – leuven – parijs – lyon

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1 Introduction

On behalf of Mulcol International, several tests were performed with respect to the fire resistance of pipe and cable penetrations seals fitted with the Mulcol® Multicollar Slim.

The system was tested in the Peutz Laboratory for Fire Safety in Mook in accordance with EN 1366-3:2009 and assessed according to the following criteria:
- integrity (E);
- insulation (I).

The system was tested using the standard heating curve as defined in EN 1363-1:1999.

Based on the test results, the Mulcol® Multicollar Slim was classified to the appropriate combinations of performance parameters and classes in accordance with the procedures given in EN 13501-2:2016. This summary report[1] defines the fire resistance assigned to several pipe and cable penetration seals fitted with the Mulcol® Multicollar Slim by classification in analogy with EN 13501-2:2016. For clearance in expressing the performance parameters of the fire resistance, the systematics of the European classification standard EN 13501-2:2016 are used.

The fire resistance as presented in this report is mainly based on the available test- and classification reports. Furthermore the knowledge and the experience gained by Peutz performing fire resistance tests on pipe and cable penetration seals in its Laboratory for Fire Safety and the knowledge of the Mulcol® Multicollar Slim were used for defining the field of application and the expected fire resistance by expert judgement. The expected fire resistance of penetration seals determined by expert judgement is marked with "*".

1 The classified pipe and cable penetrations have an unlimited validity. The part of this summary by expert judgement is valid for 5 years. After expiry of that period, the validity may be extended if it is shown that the composition of the product has not been changed, also the direct and extended field of application in the relevant standards shall be not limited and no test results have become available that make an adjustment of the conclusions in this report necessary.

2 Normative references

This summary incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter in Table 2.1.

t2.1 Used publications

Reference	Summary of title
EN 13501-2:2016	Fire classification of construction products and building elements – classification using data from fire resistance tests
EN 1366-3:2009	Fire resistance tests for service installations – part 3: penetration seals
prEN 1366-3:2017	Fire resistance tests for service installations – part 3: penetration seals
EN 1329-1	Plastic piping systems for soil and waste discharge within the building structure – unplasticized poly (vynil chloride) PVC-U
EN 1451-1	Plastic piping systems for soil and waste discharge (low and high temperature) within the building structure - polypropylene (PP)
EN 1452-1	Plastic piping systems for drinking water within the building structure – unplasticized poly (vynil chloride) PVC-U
EN 1453-1	Plastic piping systems with structured-wall pipes inside buildings – unplasticized poly (vynil chloride) PVC-U
EN 1455-1	Plastic piping systems for soil and waste discharge within the building structure – acrylonitrile-butadiene-stryrene ABS
DIN 8061	Unplasticized polyvinyl chloride (PVC-U) pipes - general quality requirements and testing
DIN 8062	Unplasticized polyvinyl chloride (PVC-U) pipes – dimensions
DIN 8074	Polyethylene (PE) - pipes PE 80, PE 100 - dimensions
DIN 8075	Polyethylene (PE) pipes – PE 80, PE 100 - general quality requirements, testing
DIN 8077	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - dimensions
DIN 8078	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - general quality requirements and testing
EN 12449	Copper and copper alloys - Seamless, round tubes for general purposes
EN 1519-1	Plastic piping systems for soil and waste discharge within the building structure – polyethylene PE
EN 1565-1	Plastic piping systems for soil and waste discharge within the building structure – stryrene copolymer blends SAN+PVC
EN 1566-1	Plastic piping systems for soil and waste discharge within the building structure – chlorinated poly (vynil chloride) PVC-C
EN 10255	Non-alloy steel tubes suitable for welding or threading - technical delivery conditions
EN 12201-2	Plastic piping systems for water supply, and for drainage and sewerage under pressure – polyethylene PE
EN 12666-1	Plastic piping systems for non-pressure underground drainage and sewerage – polyethylene PE
EN 998-2	Specification for mortar for masonry - part 2: masonry mortar
EN ISO 15493	Plastic piping systems for industrial applications - acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) - specifications for components and the system - metric series
EN ISO 15494	Plastic piping systems for industrial applications - polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), polypropylene (PP)
EN 15874	Plastic pining systems for hot and cold water installations – polypropylene (PP)
EN 15874-2	Plastic piping systems for hot and cold water installations - polypropylene (PP)
EN 15874-2:2013	Plastic piping systems for hot an cold water installations polypropylene PP
DIN 16962	Pipe joints and elements for polypropylene pressure pipelines (PP)
DIN 19531-10	Pipes and fittings made of unplasticized polyvinyl chloride (PVC-U) socket for waste and soil discharge systems inside buildings
DIN 19535-10	High-density polyethylene (PE-HD) pipes and fittings for hot-water resistant waste and soil discharge systems (HT) inside buildings - Part 10: Fire behaviour, quality control and installation recommendations

3 List of the Mulcol® materials used

This summary incorporates many different Mulcol® materials. For clearance, the materials used are listed in Table 3.1. When available, the existing European Technical Approval (ETA) and the reaction to fire classification according to EN 13501-1 are given.

t3.1 Used Mulcol® materials and available information

Commercial name	Type of material	Number and date European Technical Approval (ETA)	Reaction to fire classification (EN 13501-1)
Mulcol® Multicollar Slim	Fire collar	N.a.	N.a.
Mulcol® Multiclip	Clip used for mounting the fire collar	N.a.	N.a.
Mulcol® Multiclip Large	Clip used for mounting two fire collars	N.a.	N.a.
Mulcol® Multiscrew 7.5 x 40 mm	Screw for rigid and flexible construction	N.a.	N.a.
Mulcol® Multiscrew FB 40	Pigtail screw for rock wool board system	N.a.	N.a.
Mulcol® Multisealant A	Acrylic sealant	ETA-16/0487 dated September 21, 2016	D-s1, d1
Mulcol® Multimastic FB1	Rock wool board seal system	ETA-16/0985 dated January 25, 2017	F (not determined)
Mulcol® Multimastic C	Coating penetration seal system	ETA-16/0563 dated August 23, 2016	F (not determined)
Mulcol® Multimastic SP	Acrylic sealant penetration seal system	ETA-16/0565 dated August 23, 2016	D-s1, d1
Mulcol® Multimortar	Mortar	ETA-16/0566 dated August 23, 2016	A1

4 Reports in support of this summary

An overview of the reports used is given in Table 4.1.

t4.1 Used reports

Name of body	Name of sponsor	Report reference number and date	Used methods	Test number
Peutz bv	Mulcol International	Test report Y 1518-1E-RA-005 dated February 7, 2017	EN 1363-1:1999 EN 1366-3:2009	1
Peutz bv	Mulcol International	Test report YA 1518-2E-RA-002 dated February 7, 2017	EN 1363-1:1999 EN 1366-3:2009	2
Peutz bv	Mulcol International	Test report YB 1518-2E-RA-001 dated February 7, 2017	EN 1363-1:1999 EN 1366-3:2009	3
Peutz bv	Mulcol International	Test report YC 1518-1E-RA-001 dated January 31, 2017	EN 1363-1:1999 EN 1366-3:2009	4
Peutz bv	Mulcol International	Test report Y 1732-1E-RA-001 dated January 31, 2017	EN 1363-1:1999 EN 1366-3:2009	5
Peutz bv	Mulcol International	Test report YA 1732-1E-RA dated February 7, 2017	EN 1363-1:1999 EN 1366-3:2009	6
Peutz bv	Mulcol International	Test report YB 1732-1E-RA dated February 7, 2017	EN 1363-1:1999 EN 1366-3:2009	7
Peutz bv	Mulcol International	Test report YC 1732-2E-RA-001 dated May 15, 2017	EN 1363-1:1999 EN 1366-3:2009	8
Peutz bv	Mulcol International	Extended application report YD1518-1E-RA dated October 20, 2017	EN 15882-3:2009 EN 15725:2010/AC:2012	1 to 8
Peutz bv	Mulcol International	Classification YE 1518-3E-RA-002 dated October 20, 2017	EN 13501-2:2016	1 to 8
Peutz bv	Mulcol International	Expert judgement C 1744-2E-RA-001 dated October 25, 2017	Various	1 to 8
UL International (UK) LTD.	Mulcol International	ETA-16/0566 Mulcol® Multimortar dated August 23, 2016	Various	N.a.
UL International (UK) LTD.	Mulcol International	ETA-16/0985 Mulcol® Multimastic FB1 penetration seal system dated January 25, 2017	Various	N.a.
UL International (UK) LTD.	Mulcol International	ETA-16/0563 Mulcol® Multimastic C dated August 23, 2016	Various	N.a.
UL International (UK) LTD.	Mulcol International	ETA-16/0487 Mulcol® Multisealant A dated September 21, 2016	Various	N.a.
UL International (UK) LTD.	Mulcol International	ETA-16/0565 Mulcol® Multimastic SP dated August 23, 2016	Various	N.a.

The client has stated that the provided reports may be used for this summary.

5 Fire resistance for wall applications

The conditions regarding the field of application are given in Paragraph 5.1.1 in which general conditions are given that apply to all penetration seals in this document. Additionally to the general conditions specific conditions that apply to different pipe materials and cables are given in Paragraphs 5.2 to 5.9.

5.1 General conditions

5.1.1 General conditions – reference to standards

Chapter 5 defines the fire resistance and field of application of pipe and cable penetration seals fitted with the Mulcol® Multicollar Slim. The fire resistance is mainly based on the available classifications in accordance with the European classification standard EN 13501-2:2016 and based on the direct field of application in accordance with EN 1366-3:2009.
On request of the client, the field of application of several penetration seals is assessed and widened by an expert judgement. These penetration seals including their field of application are marked with an "*" throughout this entire summary.

The fire resistance classes given in this Chapter also cover lower fire resistance classes with the same combinations of criteria (for example EI 90 also covers EI 60 and lower). The fire resistance classes given in this Chapter with the criteria E and I (EI) also covers the same fire resistance classes with only the criterion E (for example EI 90 also covers E 90).

5.1.2 General conditions – orientation

Except for plastic pipes placed under an angle (Paragraph 5.2.2), the fire resistance is valid for a pipe and cable penetration seals passing through perpendicular to a wall.

5.1.3 General conditions – rigid wall

The pipe penetrations may be applied in any type of wall of aerated concrete (600±200 kg/m^3, class G4/600 or heavier), concrete, block work or masonry with a minimum thickness of 100 mm. An exception is made for flue gas pipes through rigid walls where a wall thickness of at least 70 mm is necessary (Paragraph 5.7).

5.1.4 General conditions – flexible wall

The pipe and cable penetrations can be applied in any type of insulated or non insulated flexible wall construction (partition) provided that the following conditions are met.

The total thickness of the flexible wall (for example walls with wooden or steel framing) shall be at least 100 mm. The wall shall consist out of in total four board layers with a thickness of

12.5 mm each. A minimum distance of 100 mm to a stud shall be held. When wooden studs are used, at least 100 mm of insulation class A1 or A2 according to EN 13501-2 shall be present between the penetration seal and the stud(s).

Some penetrations seals mentioned in Paragraph 5.2.2 require rock wool insulation inside the wall.

It must be demonstrated that the flexible wall construction has a fire resistance classification that is the same or better than the fire resistance classification of the particular pipe or cable penetration seal. The flexible wall construction must be classified in accordance with EN 13501-2.

5.1.5 General conditions – distance metal strap collar to wall, corner or floor

Except for pipe penetrations placed at a zero distance to the floor and the pipe penetrations placed in a corner, a distance of at least 10 mm from the metal strap of the collar to a different wall, corner, floor or transfer to another type of wall (adjacent constructions) shall be taken into account to enable a proper working of the intumescent inlay.

5.1.6 General conditions – Mulcol® Multimastic FB1 (2 x 50 mm)

The aperture size in the wall may be up to 1200 mm high in a rigid wall with an unlimited length. In a flexible wall, uninterrupted separating studs are required at 2400 mm centres or less. An aperture frame is not mandatory but is allowed. The Mulcol® Multimastic FB1 board system has a total thickness of 100 mm (2 x 50 mm) with a coating Mulcol® Multimastic C. The coating is applied with a thickness of 1 mm on the outwards pointing faces of each panel (no coating between the boards). The coating shall also be applied circumferential over the opening of the rock wool with the adjacent construction (overlap minimal 25 mm). The joints between the different board elements and the aperture edge shall be glued together with Mulcol® Multimastic SP.

For further information regarding the placing instructions and the field of application of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system reference is made to the European Technical Assessment ETA 16/0985 dated January 25, 2017.

The use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended.

During the tests, several different penetration seal systems of other manufacturers were added to the test specimen. Added were Hensomastik® and Promastop® CC. When rock wool penetration seal systems of other manufacturers are used, the installation instructions of that typical manufacturer apply and at least a fire resistance and the field of application of the desired performance class in accordance with EN 13501-2 must be verified.

5.1.7 General conditions – means of fixing

The Mulcol® Multicollar Slim shall be attached to the wall or rock wool penetration seal system with Mulcol® Multiclips or Mulcol® Multiclips Large. In Table 5.1, the exact assembly instructions are given sorted by installation diameter of the collar (outer diameter of the pipe, cable or insulation).

For the pipe penetration seals mentioned in Paragraphs 5.2.6, 5.3.3, 5.3.4 and 5.6.1 to 5.6.8, a different number of Mulcol® Multiclips is applicable (see these Chapters for detailed information).

t5.1 Assembly instructions fixing

Outer diameter pipe, cable or insulation (mm)	Single collar	Double collar		Allowed fastenings		
	Number of Mulcol® Multiclips	First collar (Mulcol® Multiclips)	Second collar (Mulcol® Multiclips Large)	Rigid wall	Flexible wall	Rock wool board system
≤ 90	2	1*	2	Mulcol® Multiscrew 7.5 x 40 mm	Mulcol® Multiscrew 7.5 x 40 mm or threaded rod and bolts M6	Mulcol® Multiscrew FB 40 or threaded rod and bolts M6
> 90 and < 160	3	1*	3			
≥ 160 and ≤ 200	4	1*	4			
> 200 and ≤ 285	5	2	5			
> 285 and ≤ 315	6	2	6			

*Mechanical fixation to the wall is not necessary

5.1.8 General conditions – pipe end configuration

The fire resistance of plastic, aluminium composite and PP-R multilayer pipes applies to a certain pipe end configuration. In Table 5.2, the configuration to be tested versus intended use is given.

t5.2 Pipe end configuration versus intended use

Intended use	Plastic, aluminium composite and PP-R multilayer pipes	
	Uncapped / Uncapped (U/U)	Uncapped / capped (U/C)
Fluids	Allowed	Allowed
Gasses	Allowed	Allowed
Rainwater pipes	Allowed	Not allowed
Ventilated sewage pipes	Allowed	Not allowed
Unventilated sewage pipes	Allowed	Allowed

The fire resistance of metal pipes applies to a certain pipe end configuration. In Table 5.3, the configuration to be tested versus intended use is given.

t5.3 Pipe end configuration versus intended use

Intended use	Metal pipes	
	Capped / uncapped (C/U)	Uncapped / capped (U/C)
Fluids, supported by fire rated* suspension system	Allowed	Allowed
Fluids, supported by non fire rated suspension system	Not allowed	Allowed
Gasses, supported by fire rated* suspension system	Allowed	Allowed
Gasses, supported by non fire rated suspension system	Not allowed	Allowed

*Shown by test or calculation (e.g. Eurocodes)

5.1.9 General conditions – normative references

In this Chapter several different pipe materials are mentioned. In Table 5.4, the normative reference is given.

t5.4 Pipe materials

Generic material type	Specific material type	Normative reference (see also Chapter 2)
Plastic	PVC-U	DIN 8061 / DIN 8062 / DIN 19531-10 / EN 1329-1 / EN 1452-1 / EN 1453-1 / EN ISO 15493
	PVC-C	EN 1566-1 / EN ISO 15493
	PP	DIN 8077 / DIN 8078 / DIN 16962 / EN 1451-1 / EN 15874-2 / EN ISO 15494 / EN 15874 / EN 15874-2 / EN 15874-2:2013
	PE	DIN 8074 / DIN 8075 / EN 1519-1 / EN 12201-2 / EN 12666-1 / EN ISO 15494
	PE-HD	DIN 19535-10 / EN 1519-1 / EN 12666-1
	ABS	EN 1455-1 / EN ISO 15493
	SAN+PVC	EN 1565-1
Metal	Steel	EN 10255
	Copper	EN 12449
PP-R multilayer	PP	DIN 8077 / DIN 8078
Aluminium composite	Aluminium and PE	EN ISO 15494

5.1.10 General conditions – Mulcol® Multisealant A or Mulcol® Multimastic SP

Penetration seals mounted directly through round holes in walls and floors shall be sealed Mulcol® Multisealant A or Mulcol® Multimastic SP. Penetration seals through a Mulcol® Multimastic FB1 board penetration system shall be sealed with Mulcol® Multimastic SP.

5.2 Plastic pipes

In this Chapter the expected fire resistance and field of application of plastic pipes in several different applications is summarized.

5.2.1 Without insulation

Plastic pipes

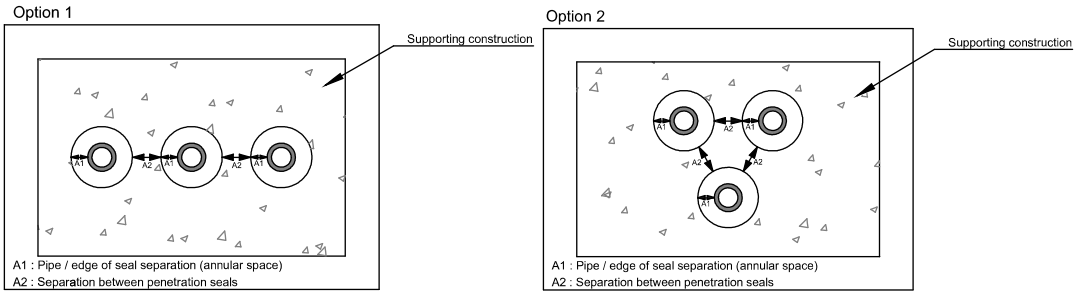
On the next pages, drawings FW-PP-10.0.10 and FW-PP-20.0.10 of the pipe penetration seals with plastic pipes without insulation are given for the pipes fitted with one or two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.5 the installation details regarding the field of application are given.

t5.5 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 1)		Allowed annular space (distance 'a' in drawing)	
		Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces		
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 1. The annular gap A_1 is also visible in this Figure.

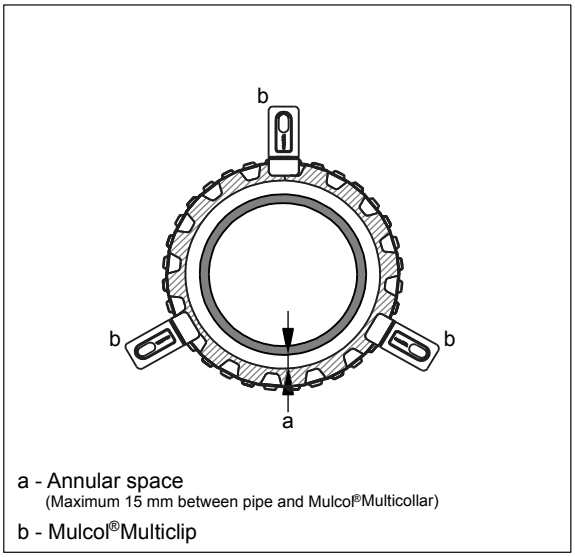
f1 Visualization single penetrations



Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

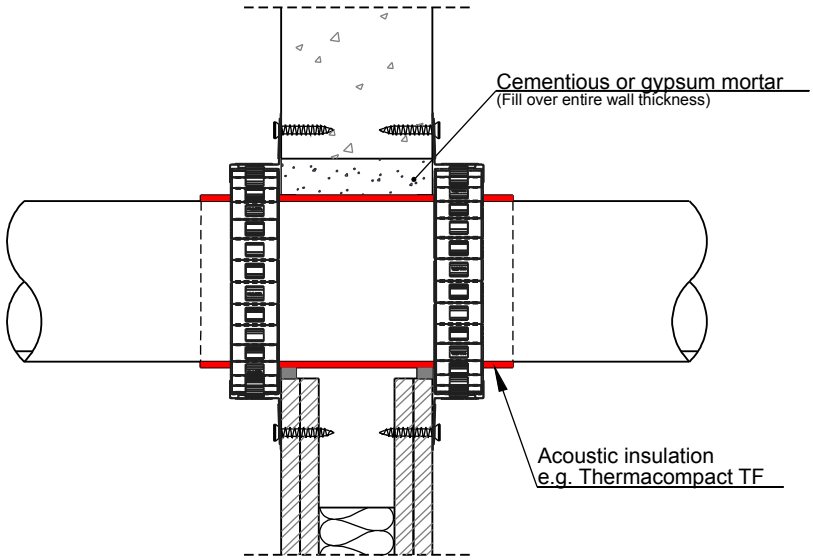
Front view

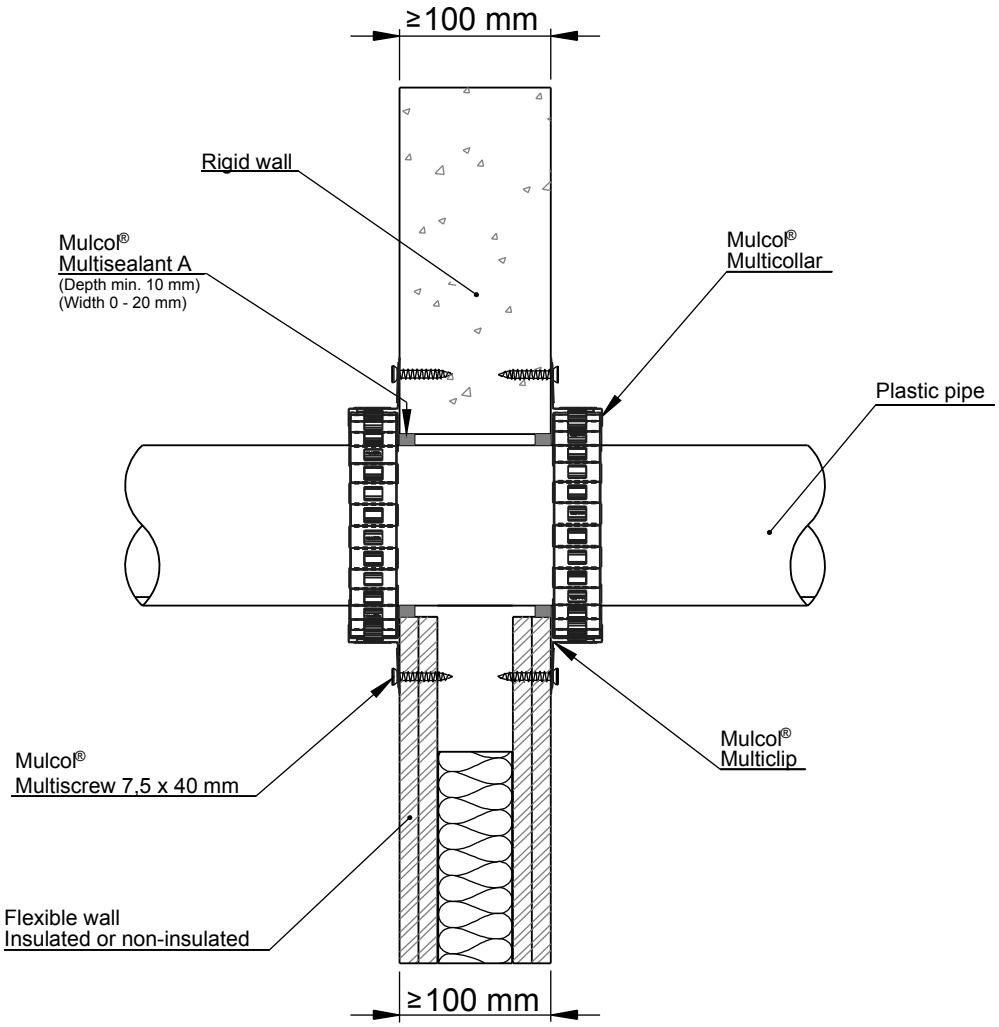


a - Annular space
(Maximum 15 mm between pipe and Mulcol®Multicollar)

b - Mulcol®Multiclip

Side view



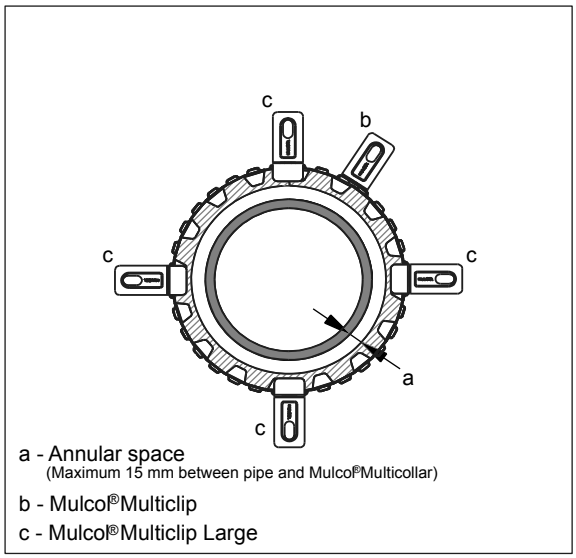


American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 30-11-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

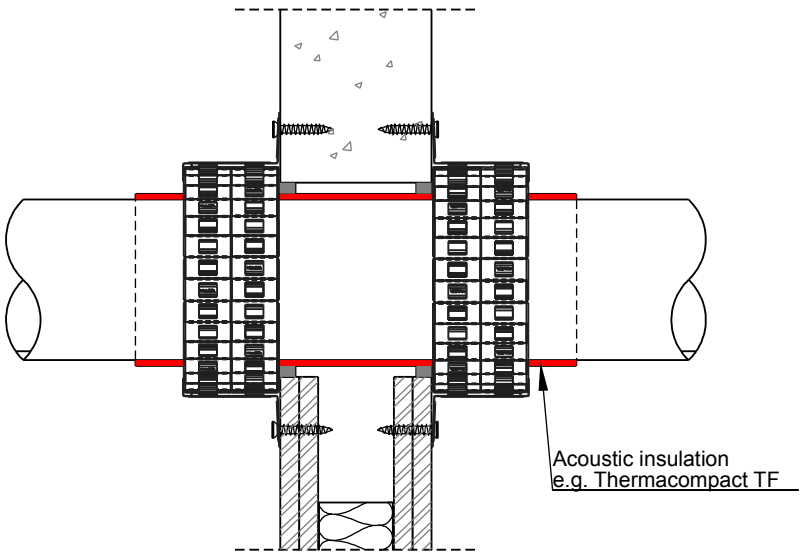
Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

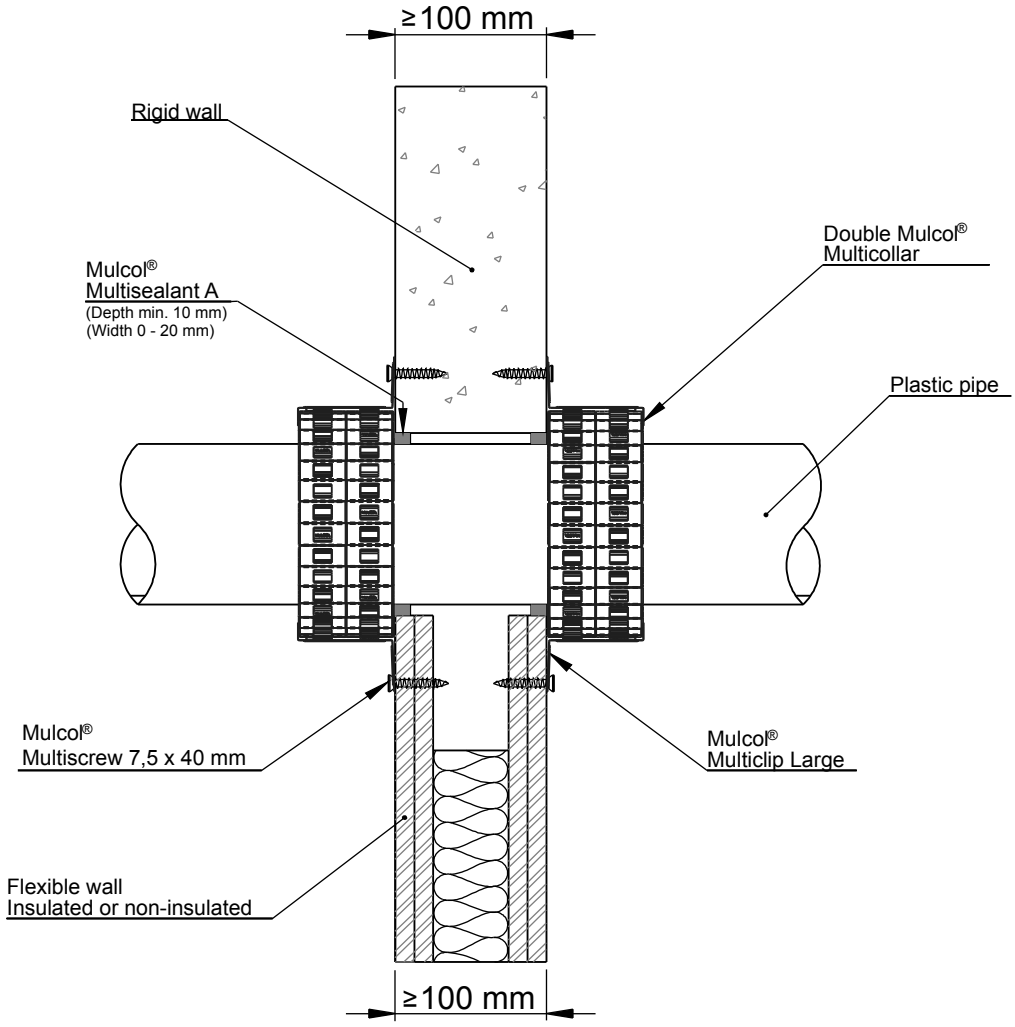
Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
c - Mulcol® Multiclip Large

Side view



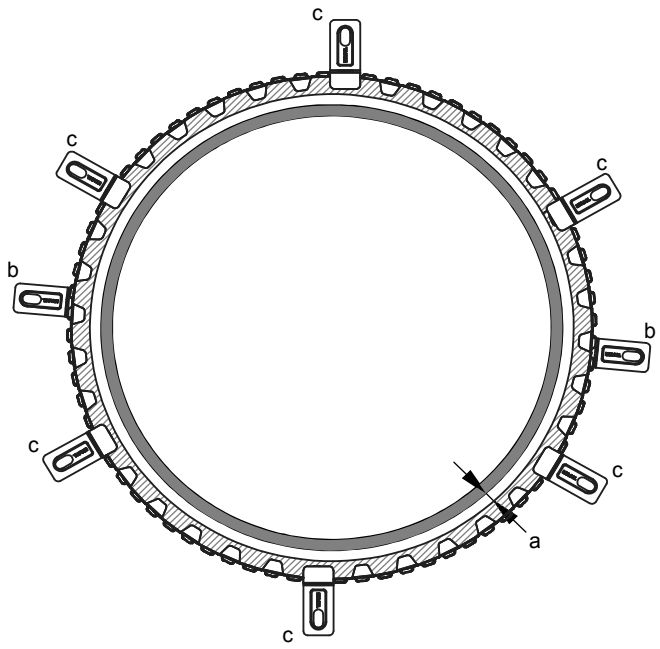


American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-20.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 29-7-2016	Draftsman : K.J.	

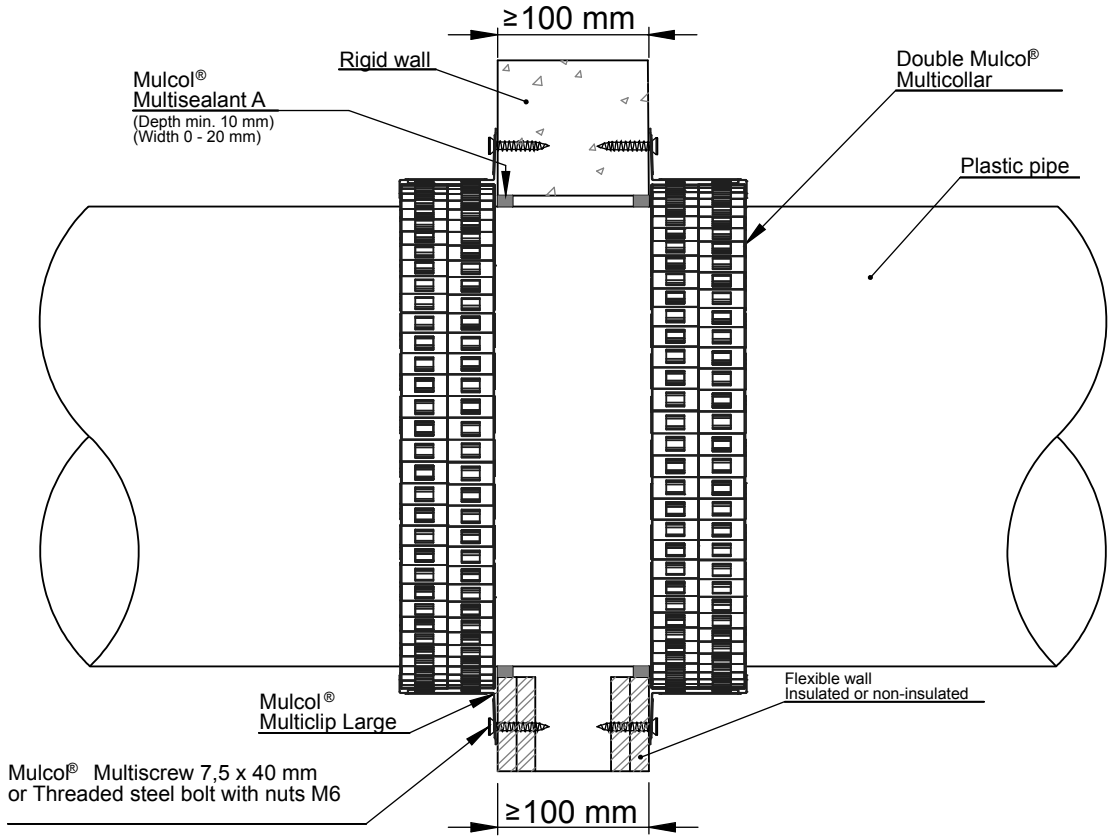
MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Front view



a - Annular space
(Maximum 5 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
c - Mulcol® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-20.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 14-11-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

PE-HD / PE / ABS / SAN+PVC pipes

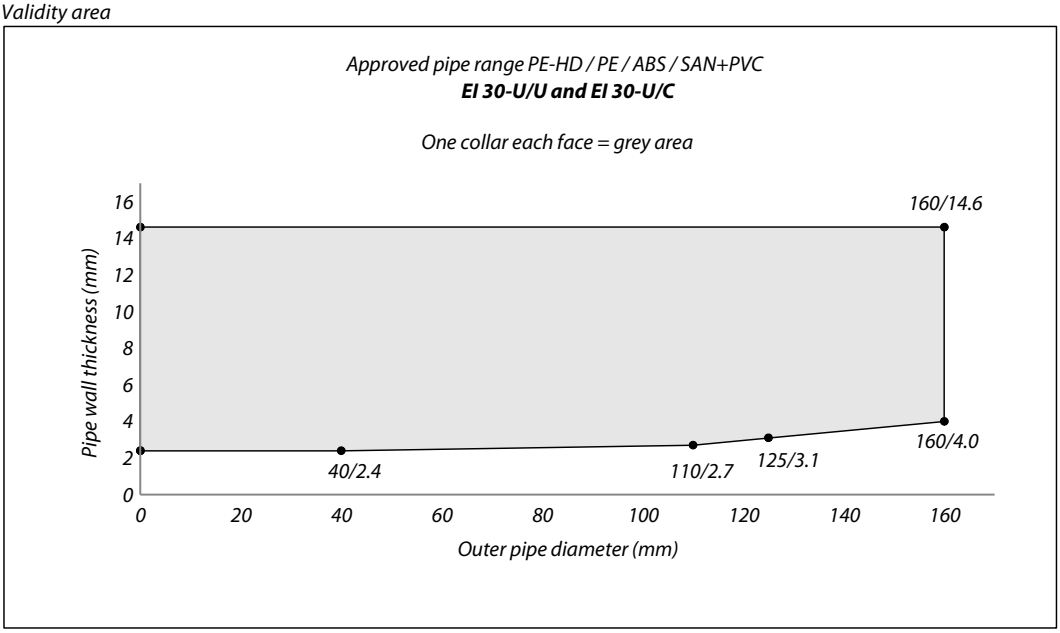
For this system given in drawings FW-PP-10.0.10 and FW-PP-20.0.10, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance One collar each face PE-HD / PE / ABS / SAN+PVC			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 40	2.4	EI 120–U/U* E 120–U/U*	EI 120–U/C* E 120–U/C*
≤ 40	2.4 to 4.6	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C
≤ 50	3.0 to 4.6	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 110	2.7 to 10.0	EI 60–U/U E 60–U/U	EI 60–U/C E 60–U/C
≤ 110	6.6	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 125	3.1 to 4.9	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 125	4.9 to 7.4	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C
≤ 125	11.4	EI 45–U/U E 45–U/U	EI 45–U/C E 45–U/C
≤ 160	4.0	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C
≤ 160	4.0 to 14.6	EI 30–U/U E 30–U/U	EI 90–U/C E 90–U/C

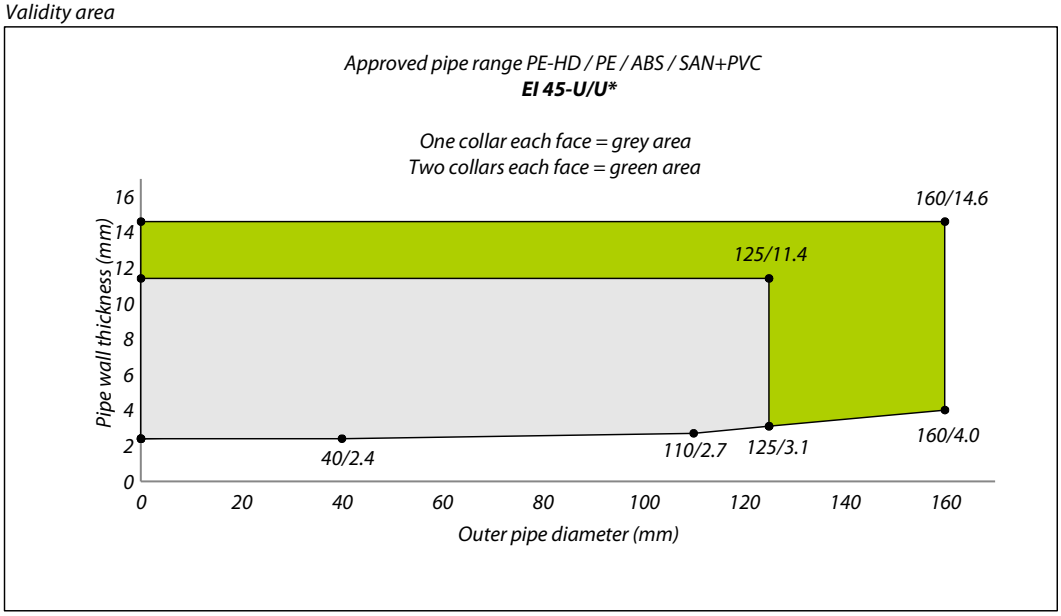
Fire resistance Two collars each face PE-HD / PE / ABS / SAN+PVC			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 160	4.0 to 9.5	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 160	4.0 to 14.6	EI 60–U/U E 60–U/U	EI 120–U/C E 120–U/C

A visualization of the validity area for the fire resistance for EI 30, EI 45, EI 60, EI 90 and EI 120 is given in the Figures hereafter.

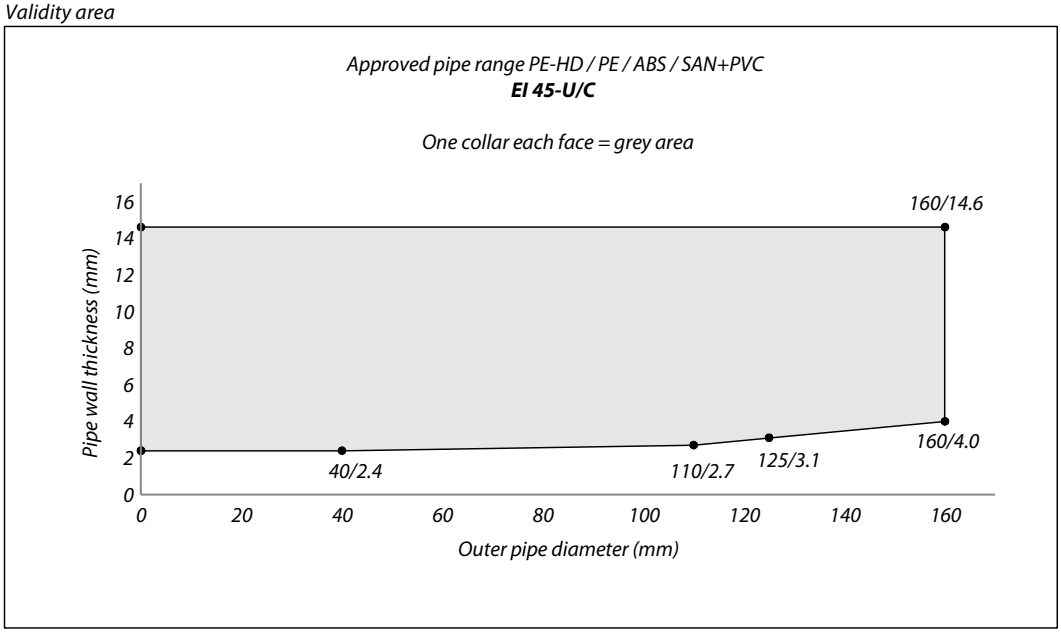
f2 *Validity area*



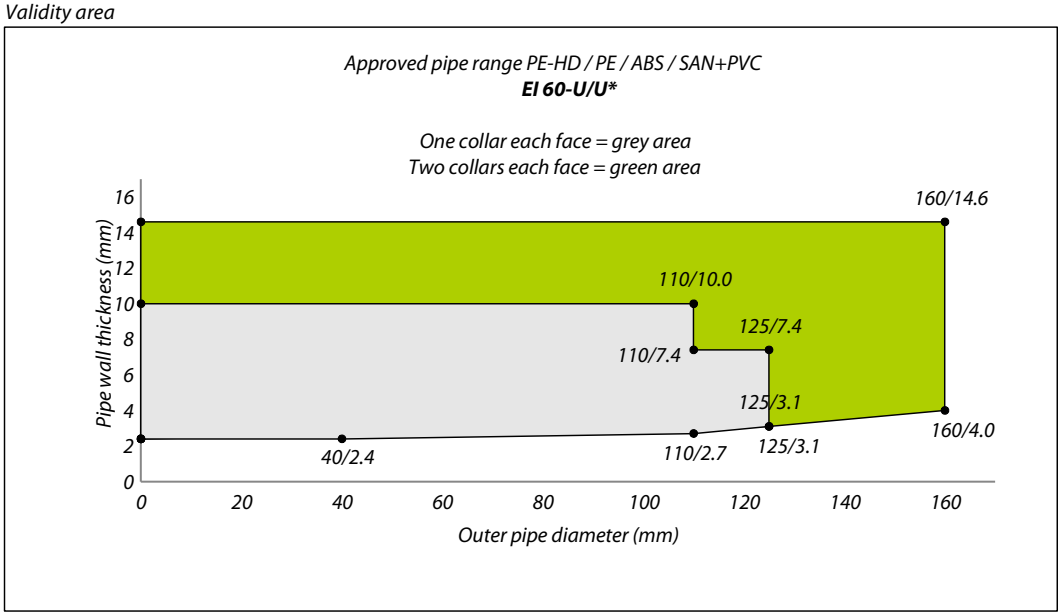
f3 *Validity area*



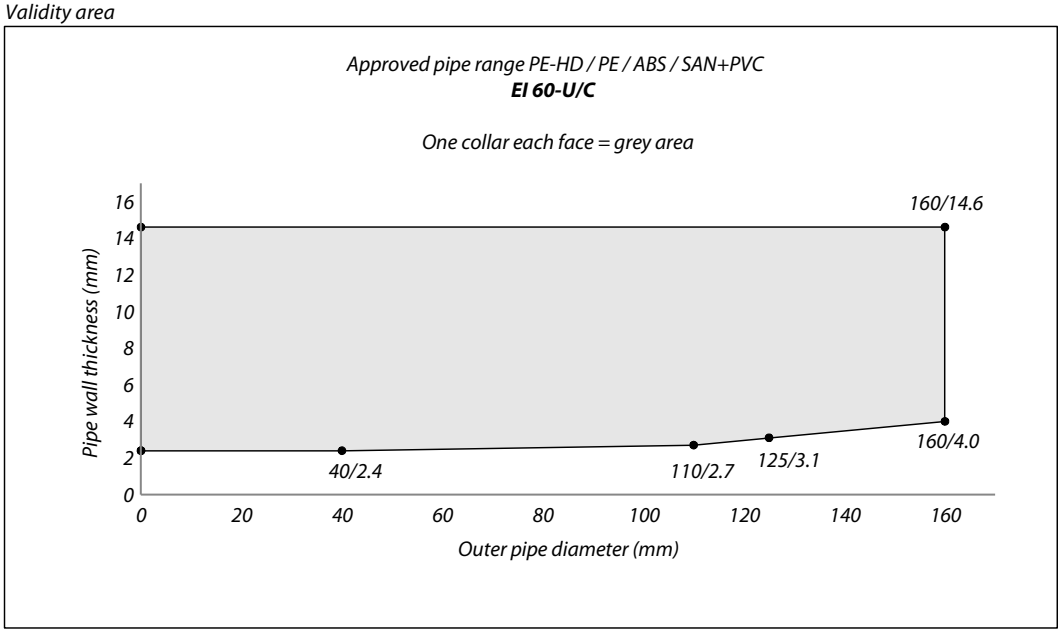
f4 *Validity area*



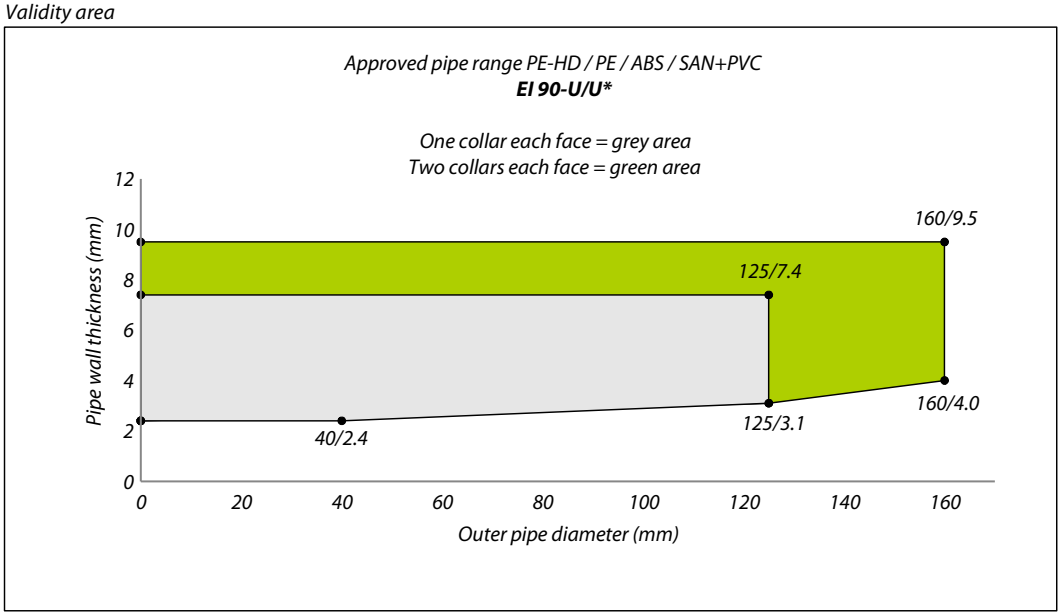
f5 *Validity area*



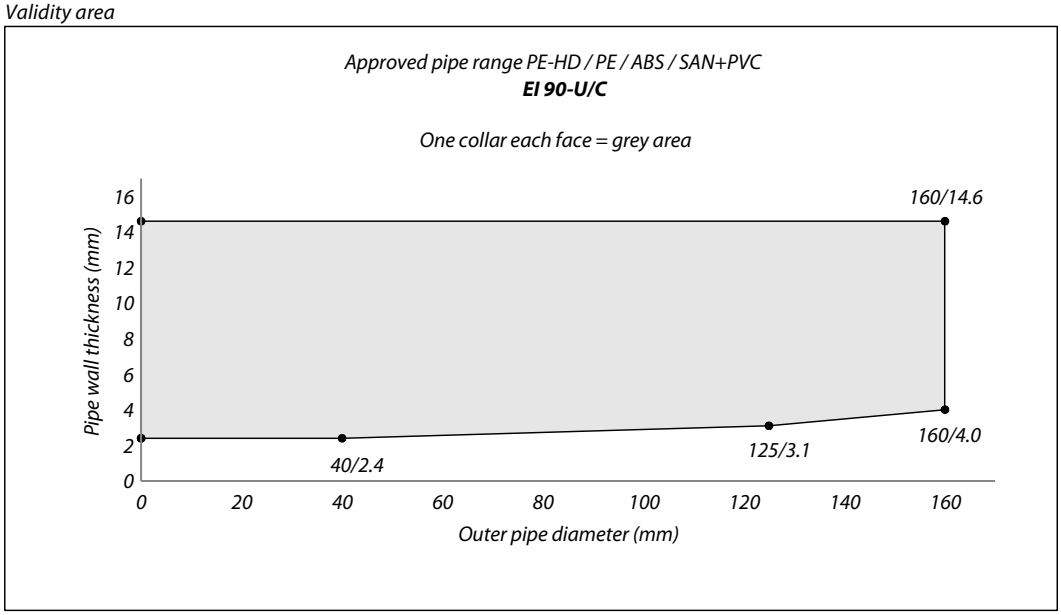
f6 *Validity area*



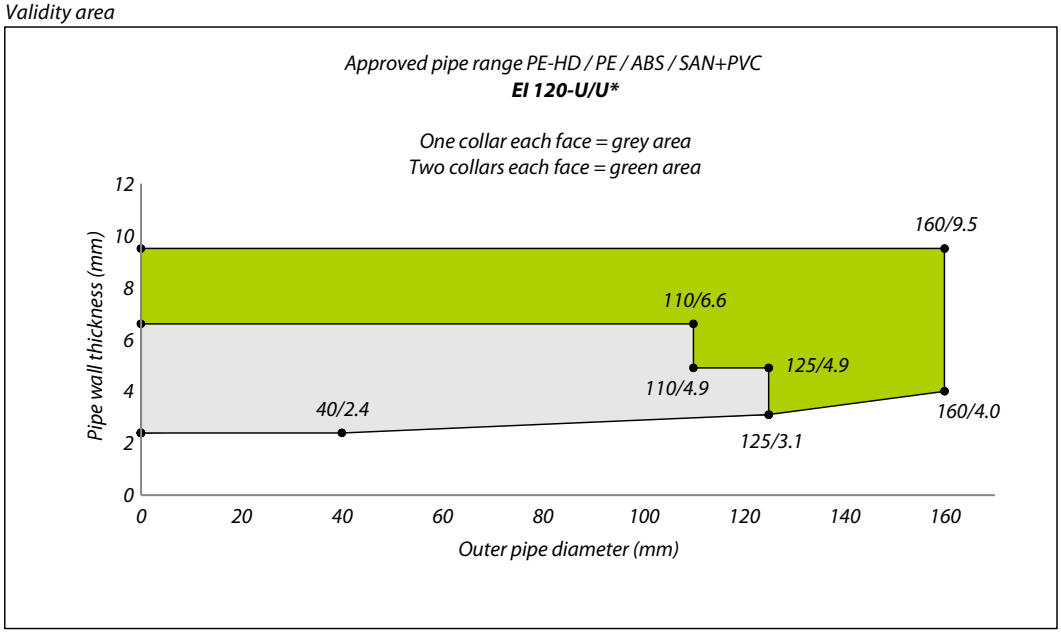
f7 *Validity area*



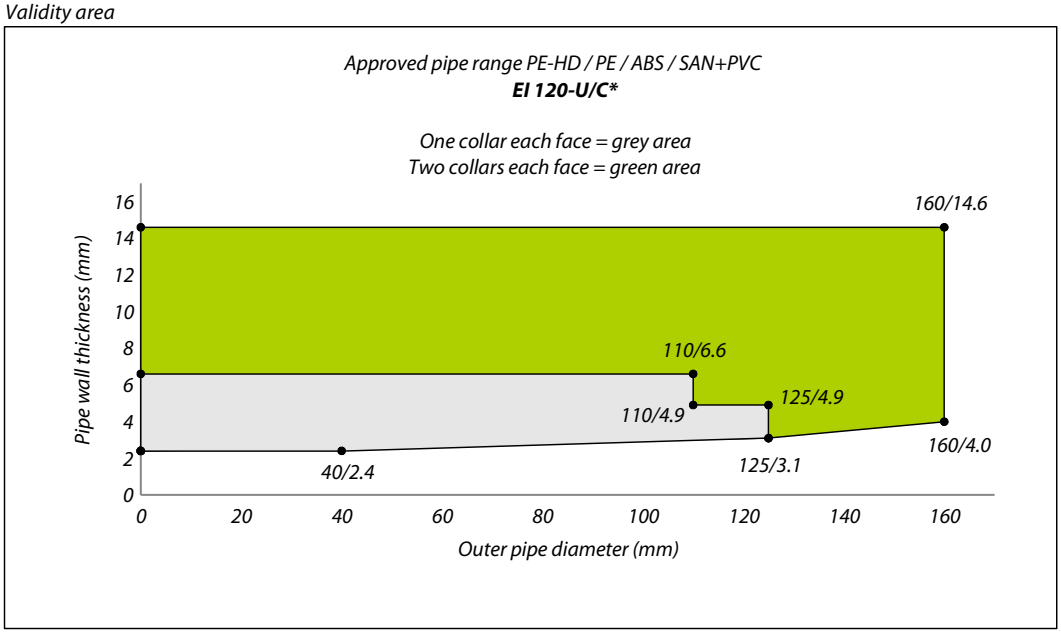
f8 *Validity area*



f9 *Validity area*



f10 Validity area



PP pipes

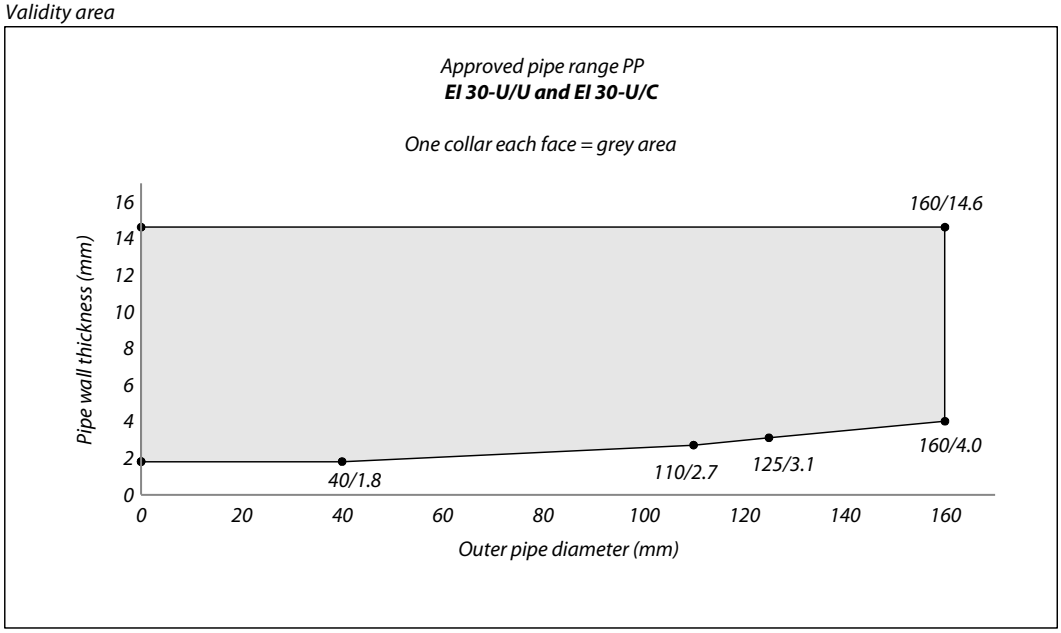
For this system given in drawings FW-PP-10.0.10 and FW-PP-20.0.10, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance One collar each face PP			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 40	1.8 to 5.5	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 110	2.7 to 6.3	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 125	3.1	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 125	3.1 to 7.1	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C
≤ 125	3.1 to 11.4	EI 30–U/U E 30–U/U	EI 30–U/C E 30–U/C
≤ 160	4.0	EI 90-U/U* E 120–U/U	EI 90-U/C* E 120–U/C
≤ 160	4.0 to 6.2	EI 45–U/U E 60–U/U	EI 45–U/C E 60–U/C
≤ 160	4.0 to 14.6	EI 30–U/U E 30–U/U	EI 30–U/C E 30–U/C
≤ 160	9.1	EI 120–U/C E 120–U/C	

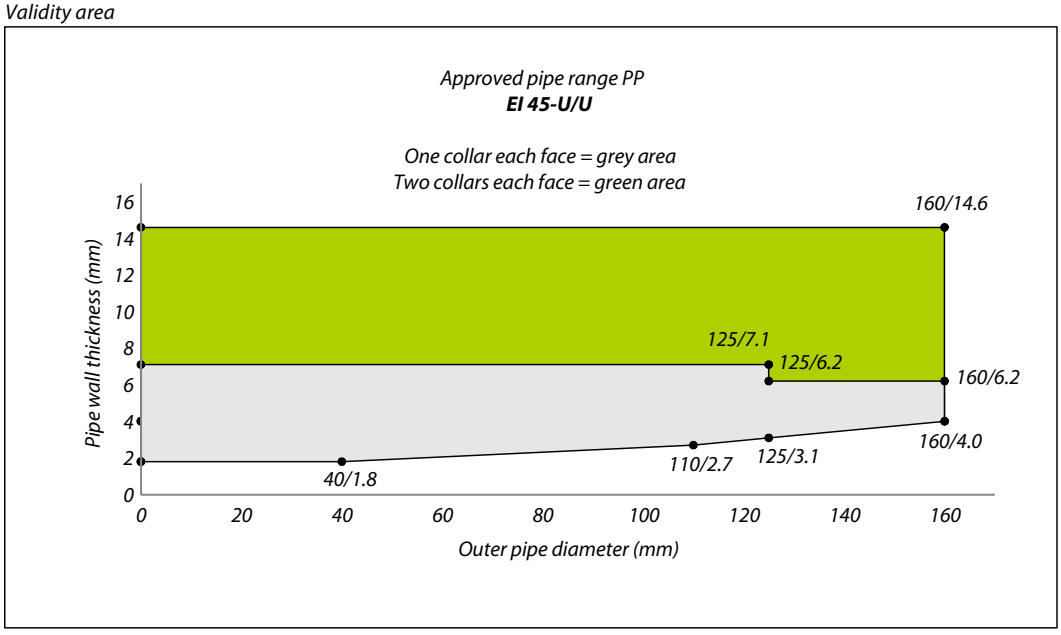
Fire resistance Two collars each face PP			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 160	4.0	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 160	4.0 to 9.1	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C
≤ 160	4.0 to 14.6	EI 60–U/U E 60–U/U	EI 120–U/C E 120–U/C

A visualization of the validity area for the fire resistance for EI 30, EI 45, EI 60, EI 90 and EI 120 is given in the Figures hereafter.

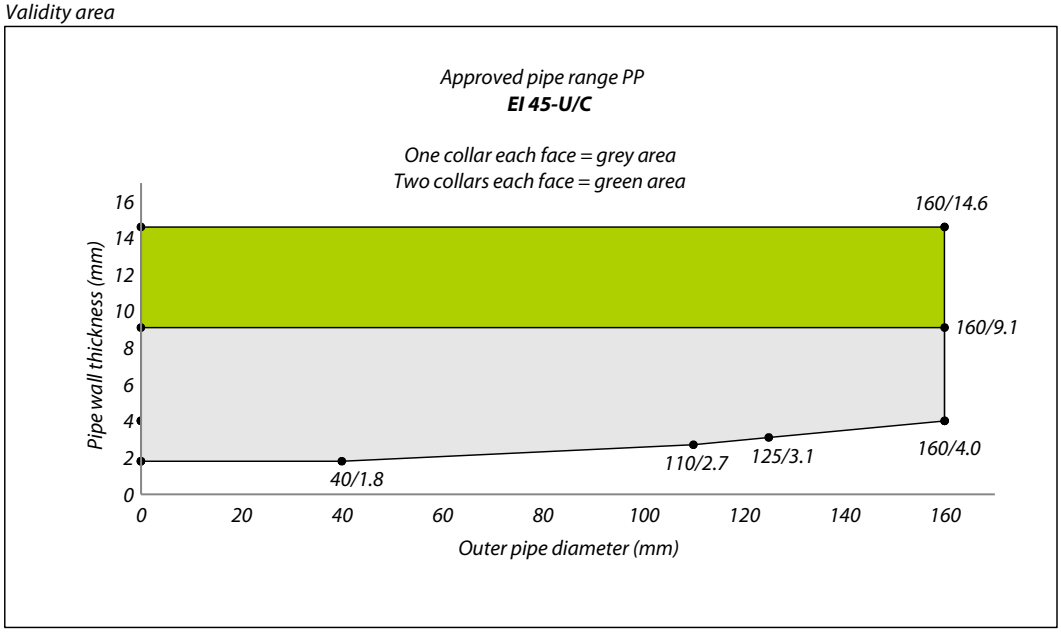
f11 Validity area



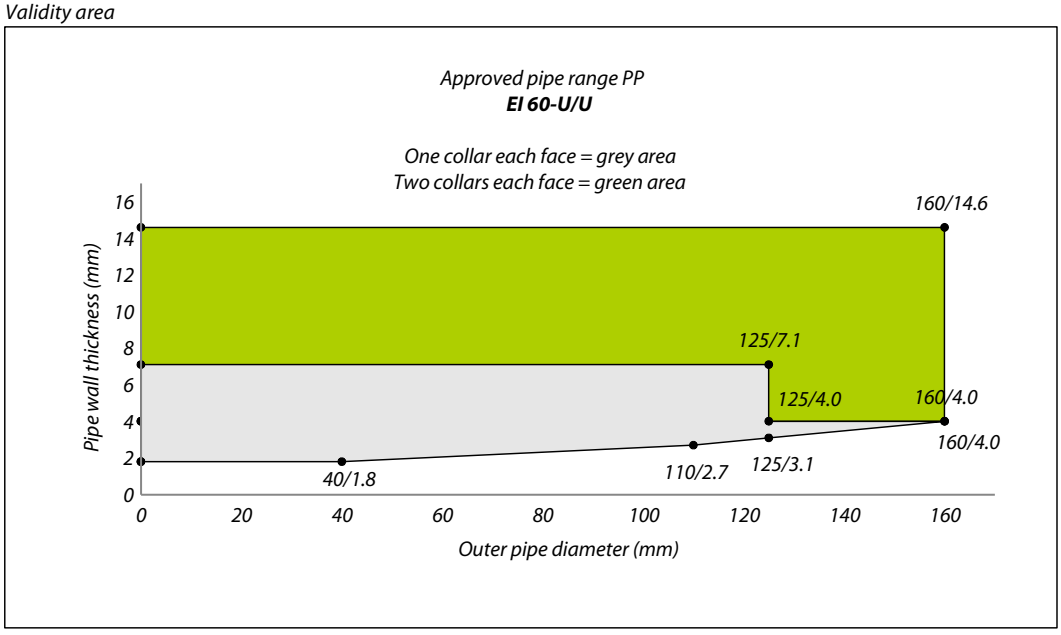
f12 Validity area



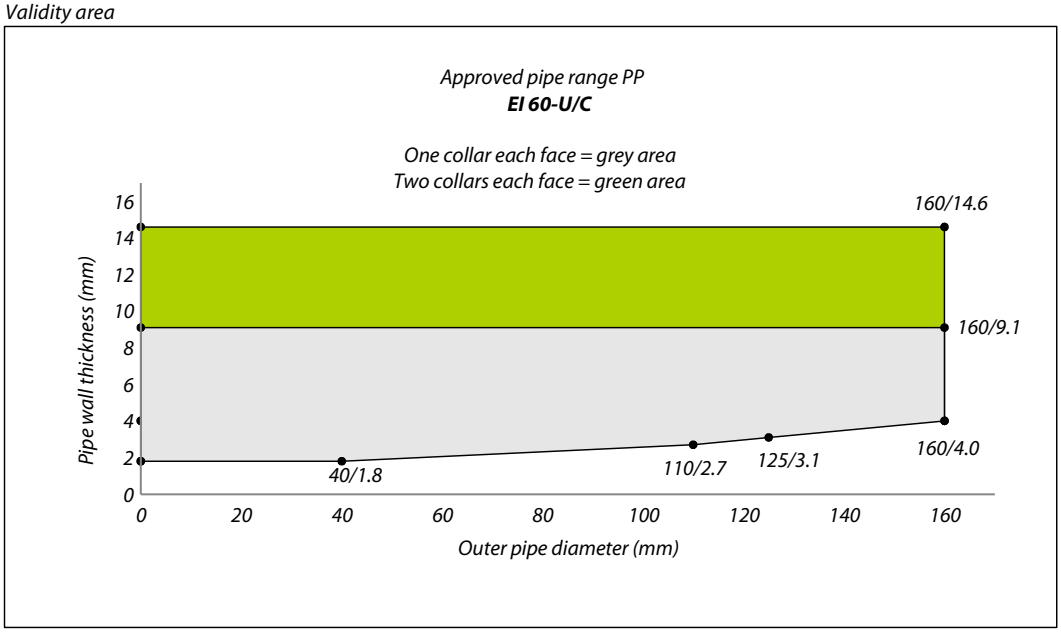
f13 Validity area



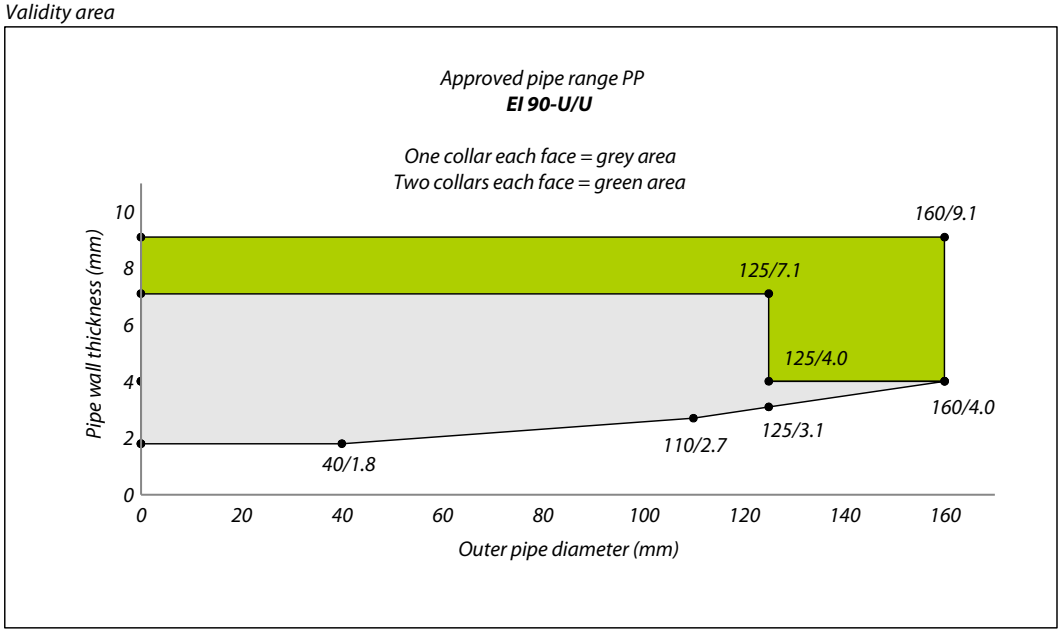
f14 Validity area



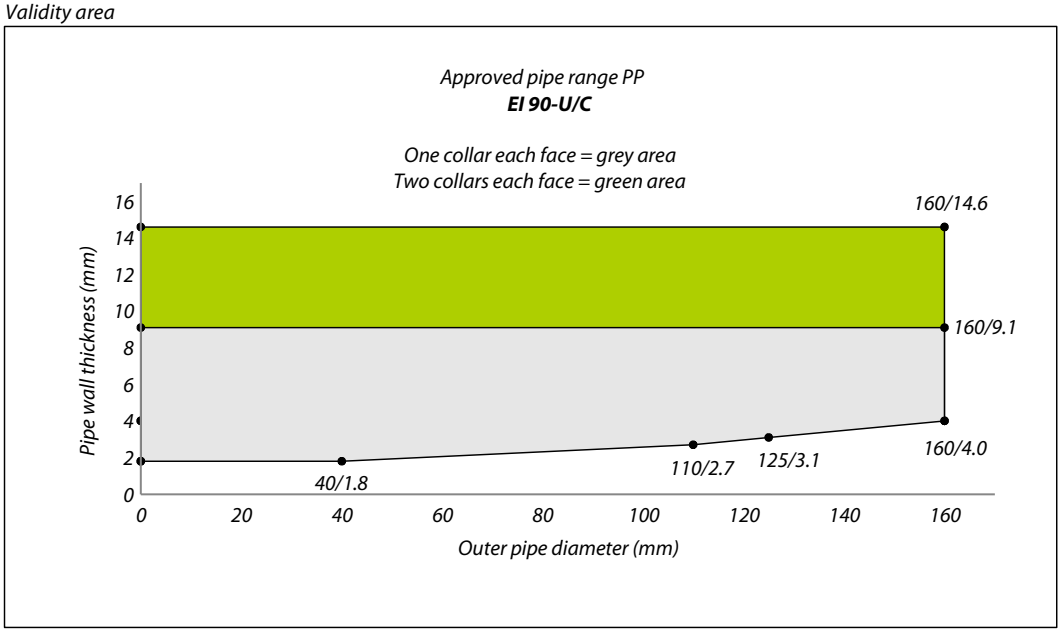
f15 *Validity area*



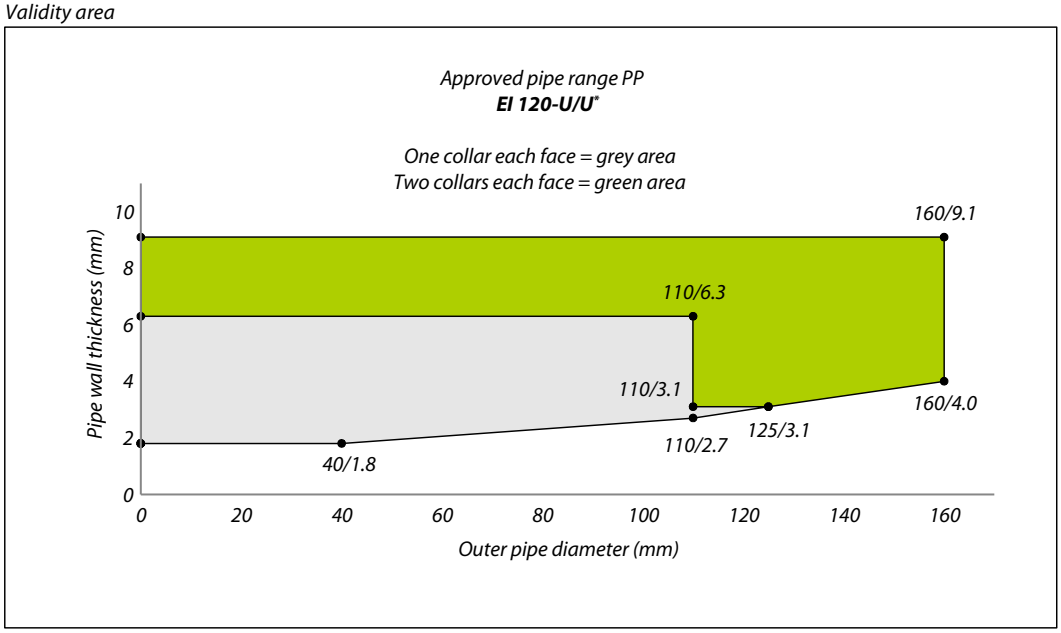
f16 *Validity area*



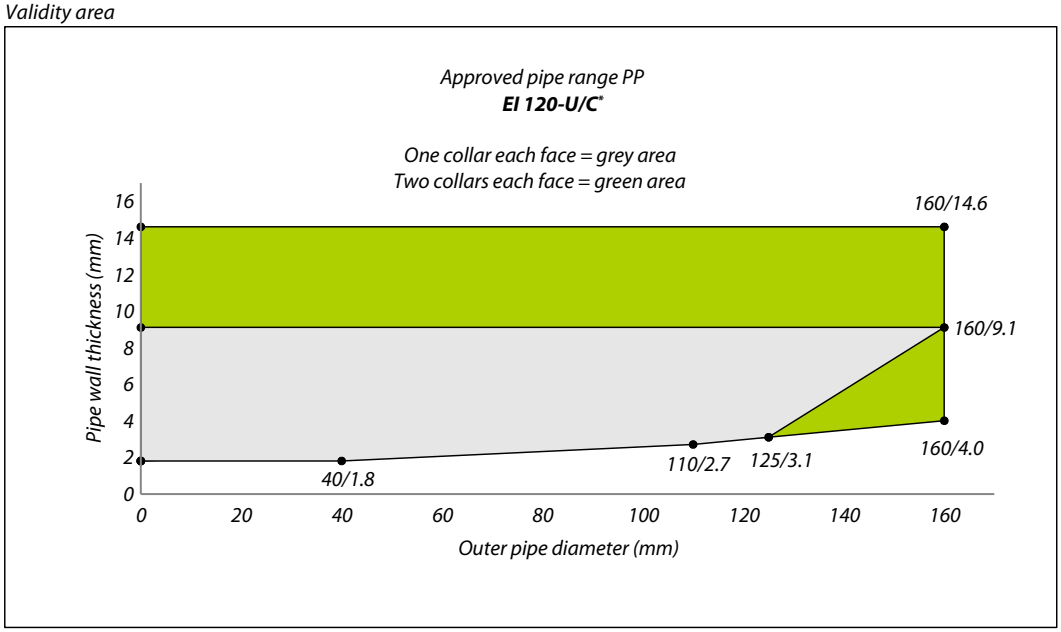
f17 Validity area



f18 Validity area



f19 *Validity area*



PVC-U / PVC-C pipes

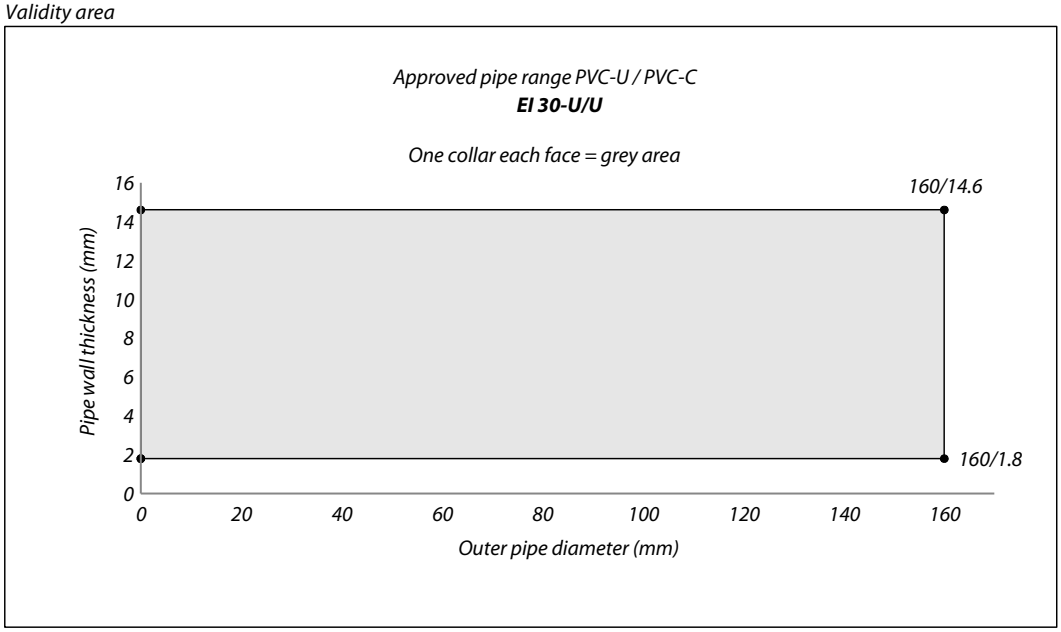
For this system given in drawings FW-PP-10.0.10 and FW-PP-20.0.10, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance One collar each face PVC-U / PVC-C			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 40	1.9 to 4.5	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 110	2.2	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 110	12.3	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C
≤ 125	2.5	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 125	9.3	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 160	1.8 to 11.8	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C
≤ 160	11.8 to 14.6	EI 30–U/U E 30–U/U	EI 30–U/C E 30–U/C

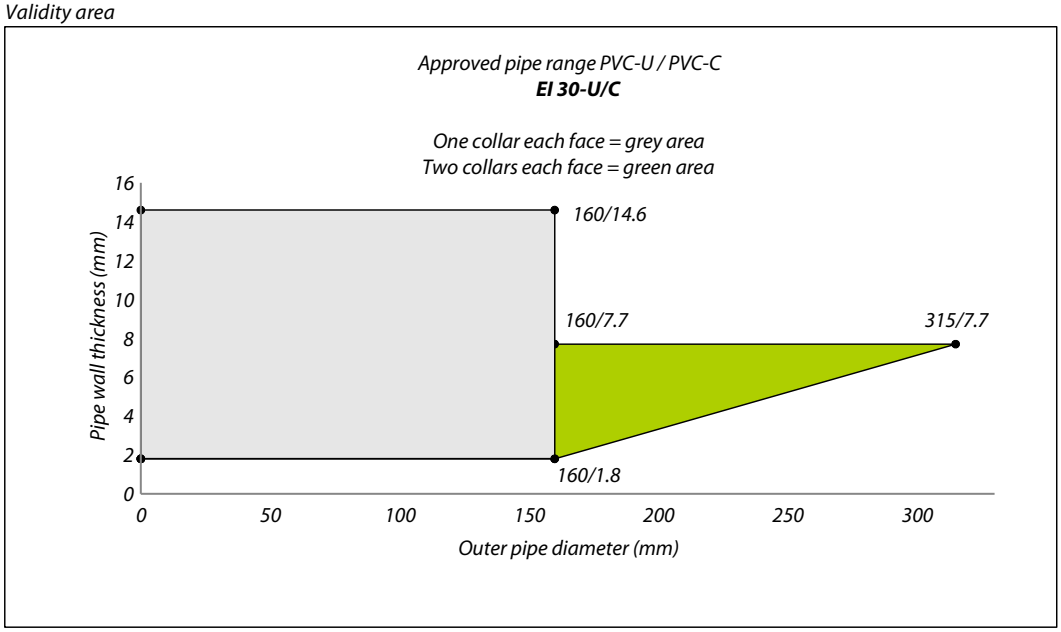
Fire resistance Two collars each face PVC–U / PVC–C			
Pipe dimensions (mm)		Performance class with pipe end configuration	
Outer diameter	Wall thickness		
≤ 160	1.8 to 11.8	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C
≤ 160	11.8 to 14.6	EI 60–U/U E 60–U/U	EI 120–U/C E 120–U/C
≤ 315	7.7	EI 90–U/C E 90–U/C	

A visualization of the validity area for the fire resistance for EI 30, EI 45, EI 60, EI 90 and EI 120 is given in the Figures hereafter.

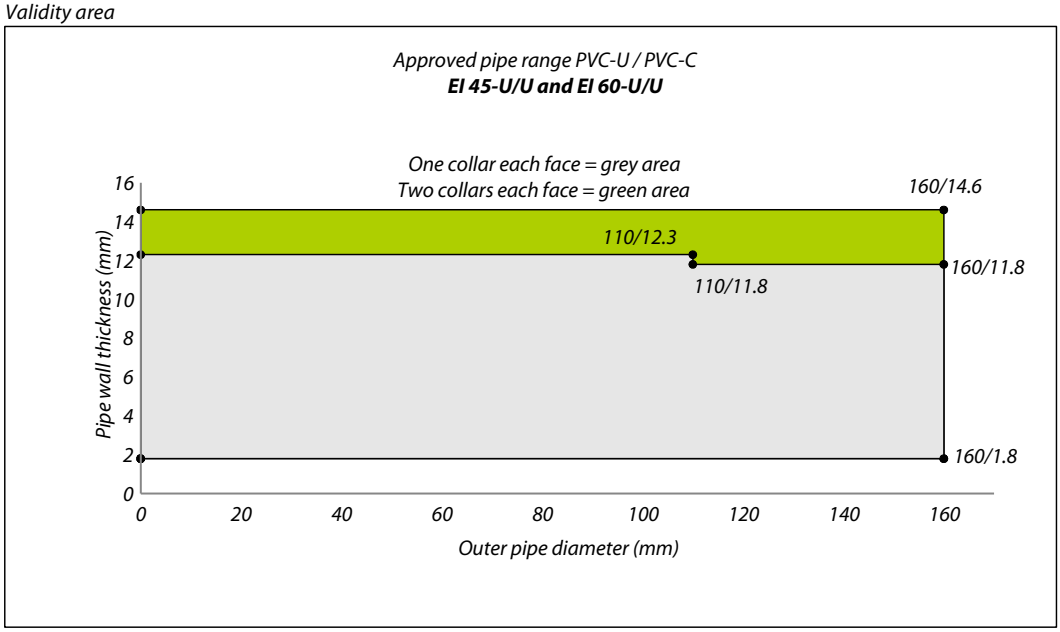
f20 Validity area



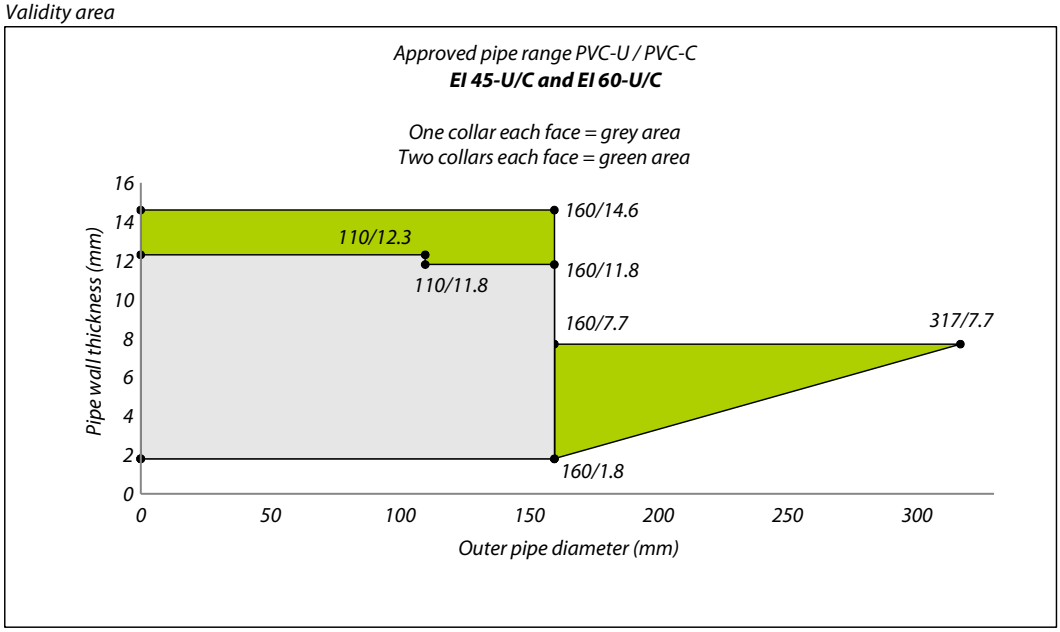
f21 Validity area



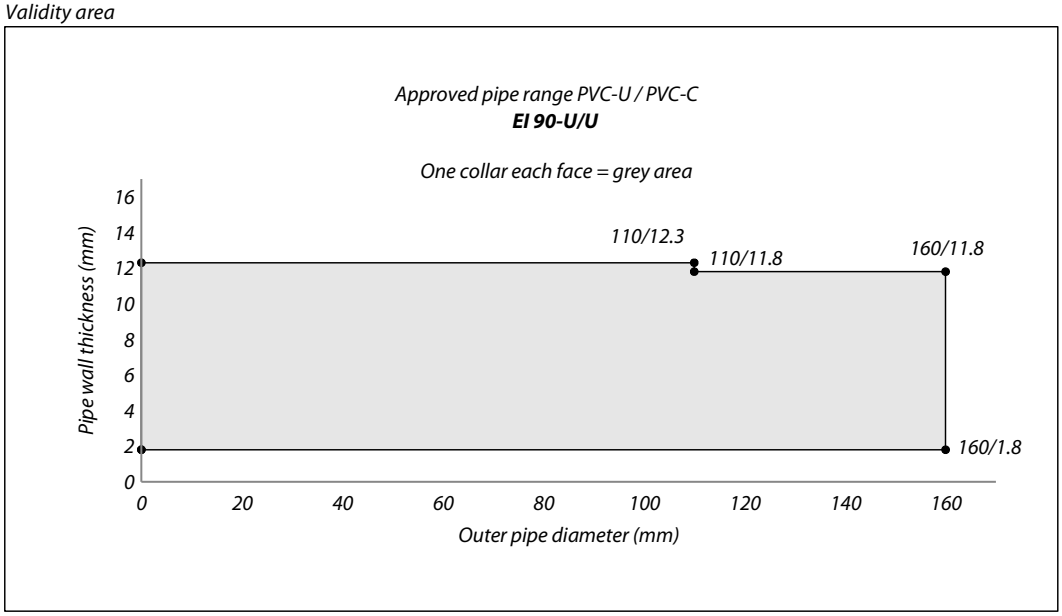
f22 *Validity area*



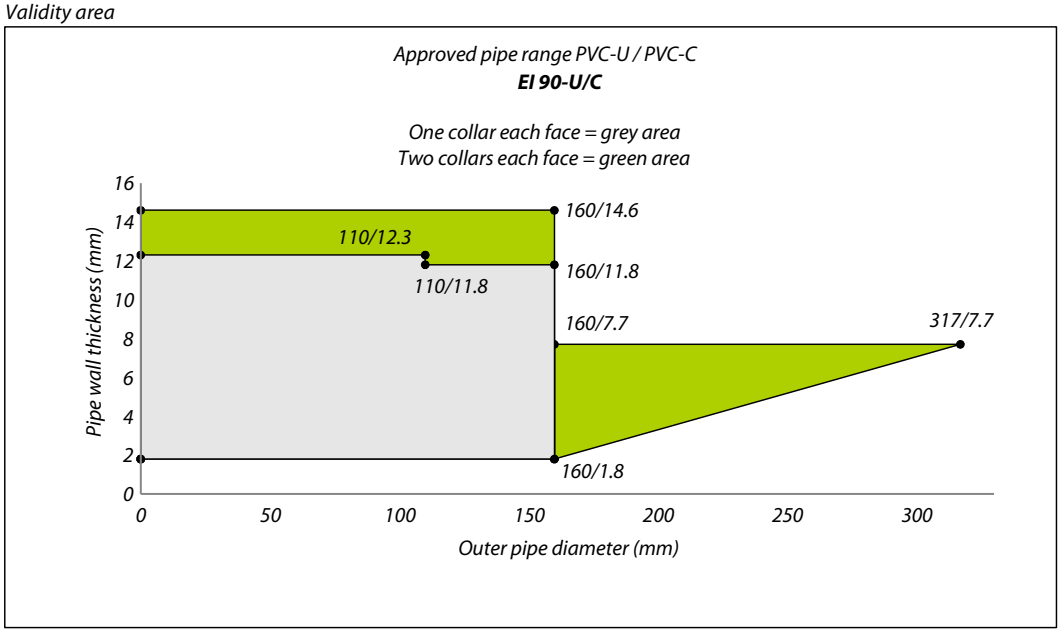
f23 *Validity area*



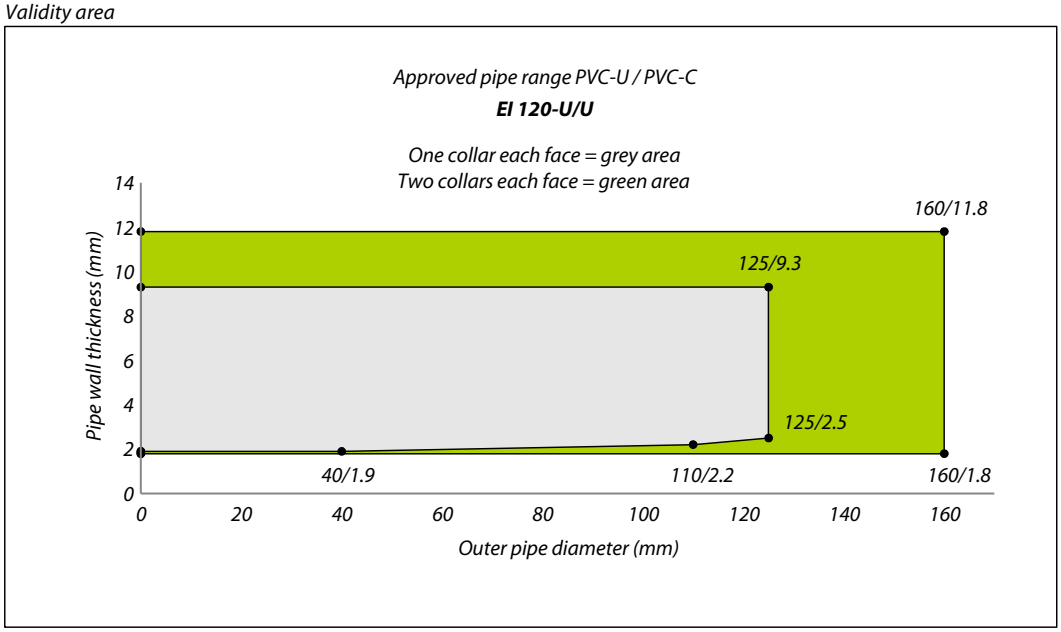
f24 Validity area



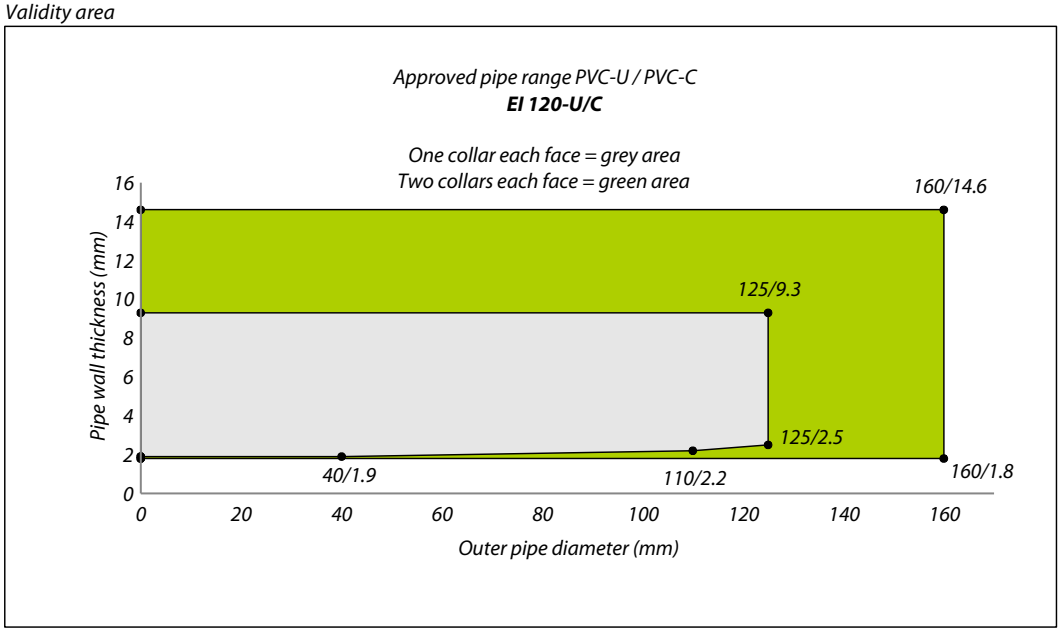
f25 Validity area



f26 *Validity area*



f27 *Validity area*



5.2.2 Without insulation under an angle of 45 degrees

Plastic pipes

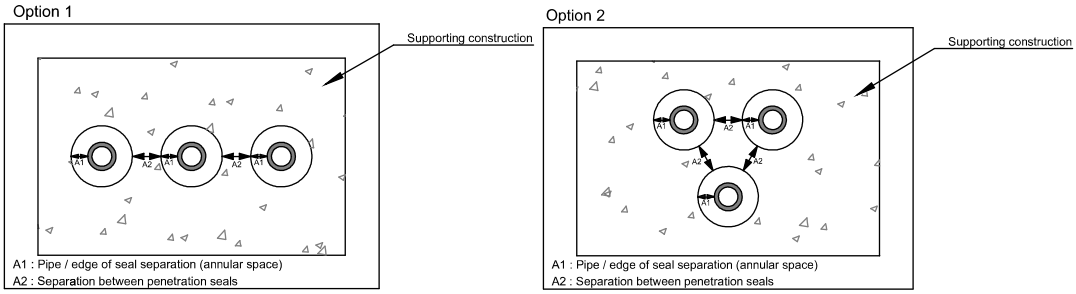
On the next pages, drawings FW-PP-10.1.10 and FW-PP-20.1.10 of the pipe penetration seals with plastic pipes without insulation placed under an angle are given for the pipes fitted with one or two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.6 the installation details regarding the field of application are given.

t5.6 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 28)		Allowed annular space (distance 'a' in drawing)
		Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm

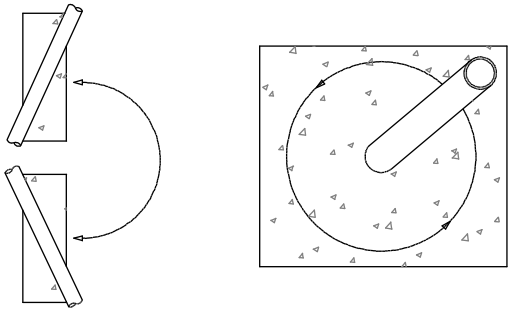
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 28. The annular gap A_1 is also visible in this Figure.

f28 Visualization single penetrations



The fire resistance is valid in both directions for pipe passing through the wall every angle and orientation with a maximum 45° to the perpendicular, for clearance see visualization of prEN 1366-3:2017 in Figure 29.

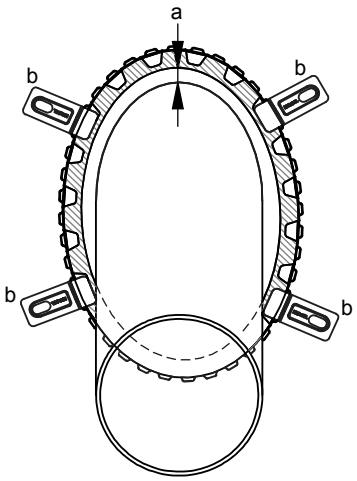
f29 Visualization of the allowed pipe orientation



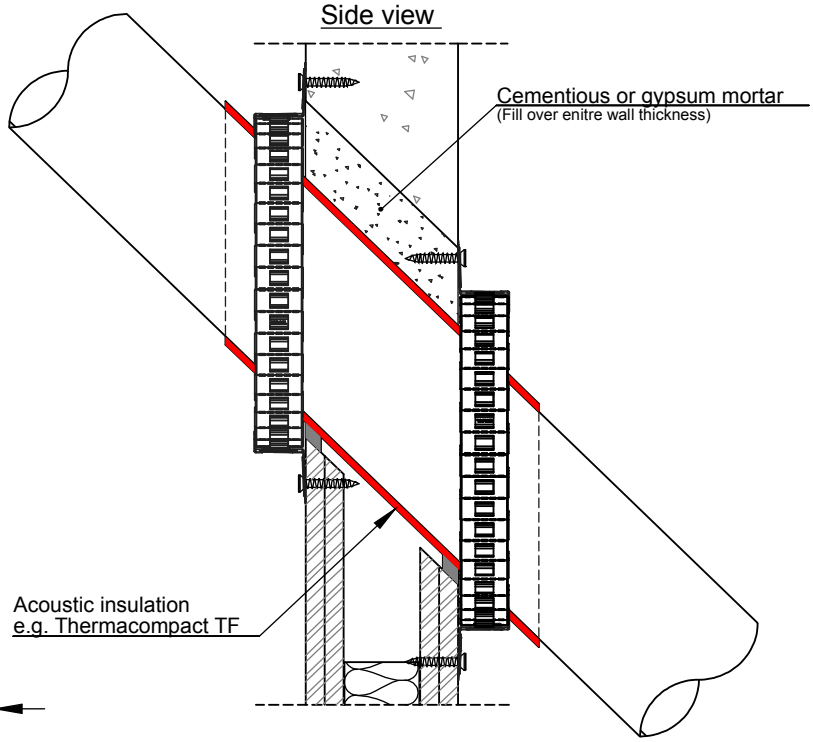
Front view

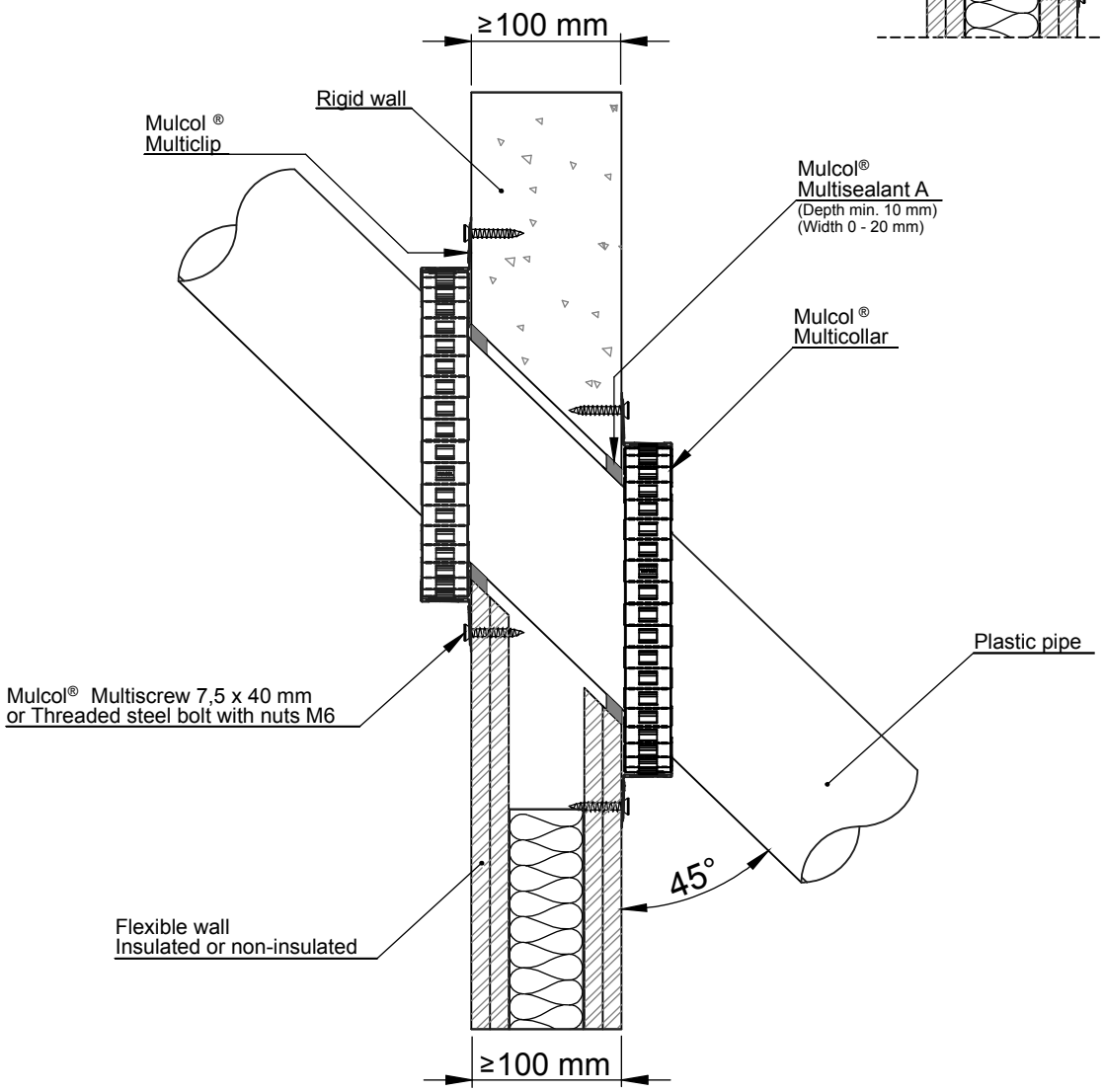
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

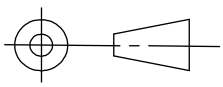
b - Mulcol® Multiclip



Side view





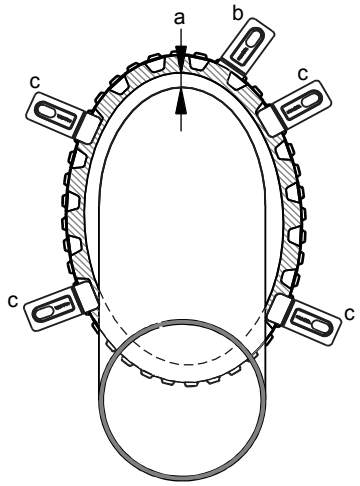
American projection 	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 30-11-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

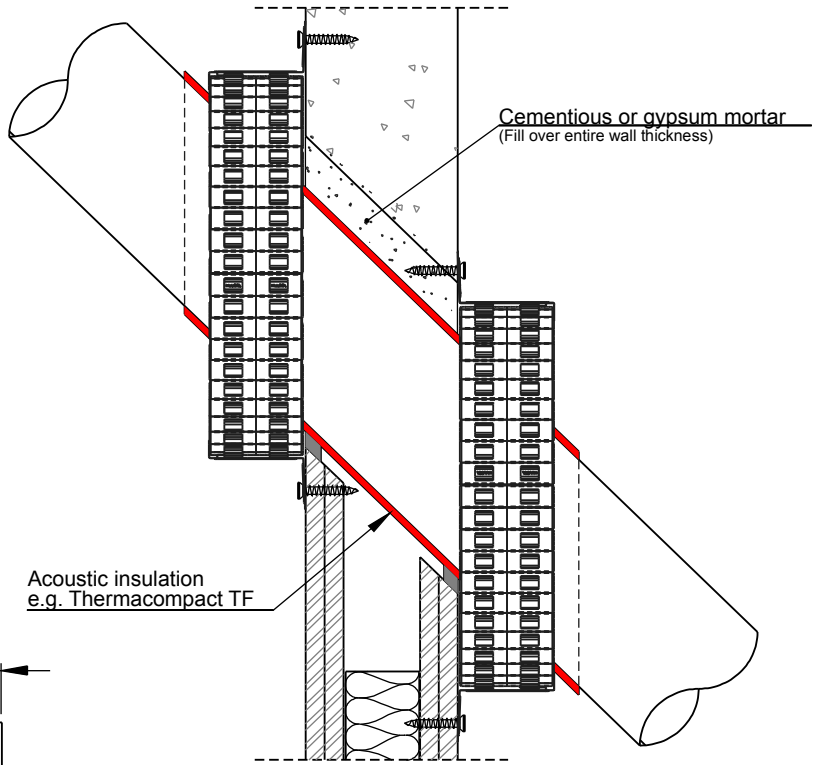
Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

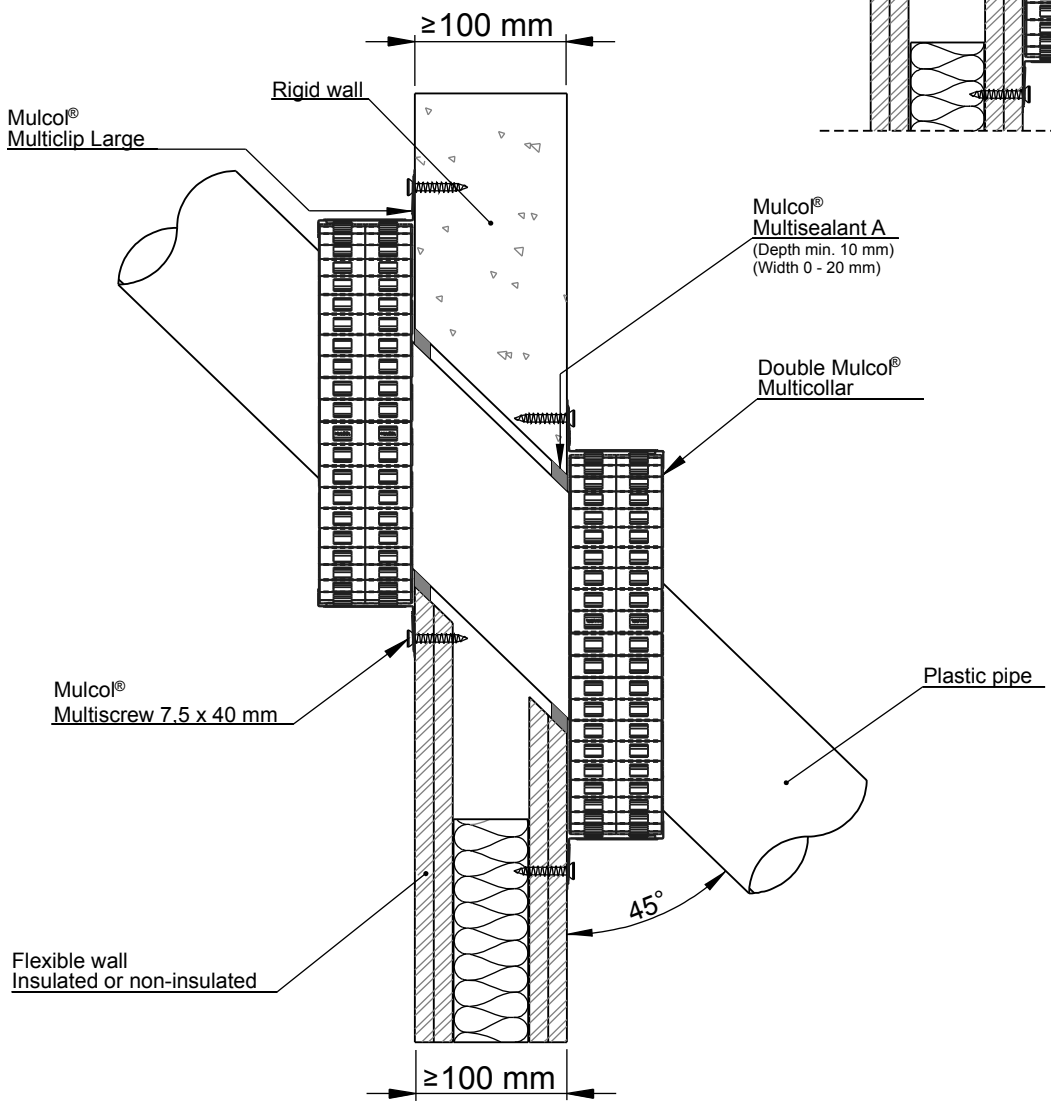
Front view

a - Annular space
(Maximum 15 mm between pipe and Mulcol®Multicollar)
b - Mulcol® Multiclip
c - Mulcol® Multiclip Large



Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-20.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 29-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

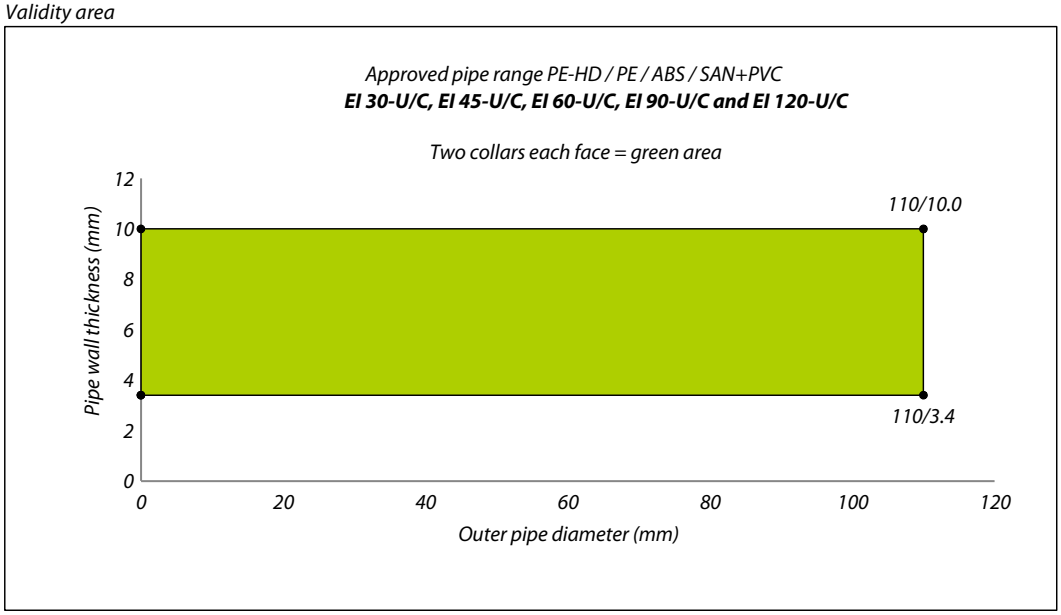
Fire resistance One collar each face				
Pipe dimensions (mm)		Performance class with pipe end configuration		Rock wool Insulation in wall
Outer diameter	Wall thickness			
PE-HD / PE / ABS / SAN+PVC				
≤ 110	2.7	EI 60–U/C E 60–U/C		Not required
PP				
≤ 110	2.7	EI 45–U/C E 60–U/C		Required
PVC–U / PVC–C				
≤ 110	2.7	EI 45–U/C E 60–U/C		Required
≤ 125	2.5	EI 30–U/U E 45–U/U	EI 30–U/C E 45–U/C	Not required

Fire resistance Two collars each face				
Pipe dimensions (mm)		Performance class with pipe end configuration	Rock wool Insulation in wall	See Figure
Outer diameter	Wall thickness			
PE-HD / PE / ABS / SAN+PVC				
≤ 110	3.4 to 10.0	EI 120–U/C E 120–U/C	Required	30
PP				
≤ 110	3.4	EI 120–U/C E 120–U/C	Required	N.a.
≤ 110	3.4 to 10.0	EI 60–U/C E 60–U/C	Required	31
PVC-U / PVC-C				
≤ 110	3.4	EI 120–U/C E 120–U/C	Required	N.a.
≤ 110	3.4 to 10.0	EI 60–U/C E 60–U/C	Required	32

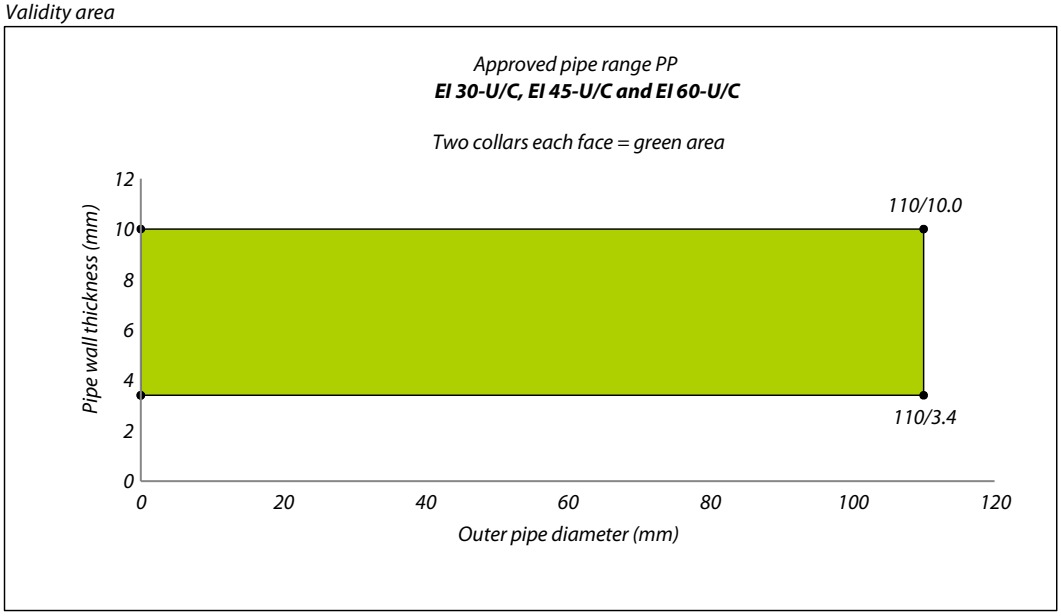
Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

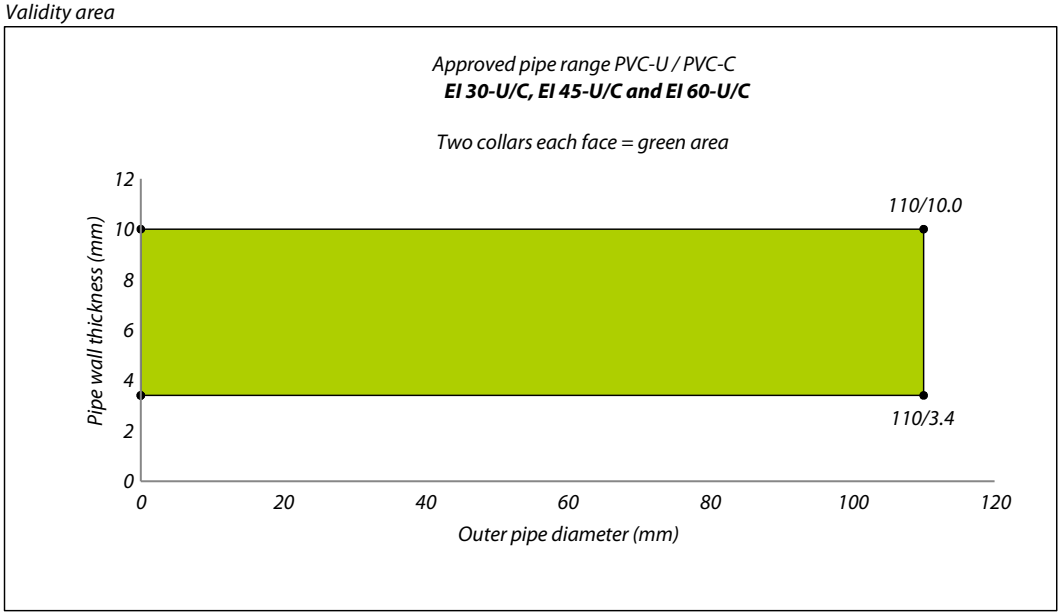
f30 *Validity area*



f31 *Validity area*



f32 *Validity area*



5.2.3 Without insulation with moulded socket

Plastic pipes

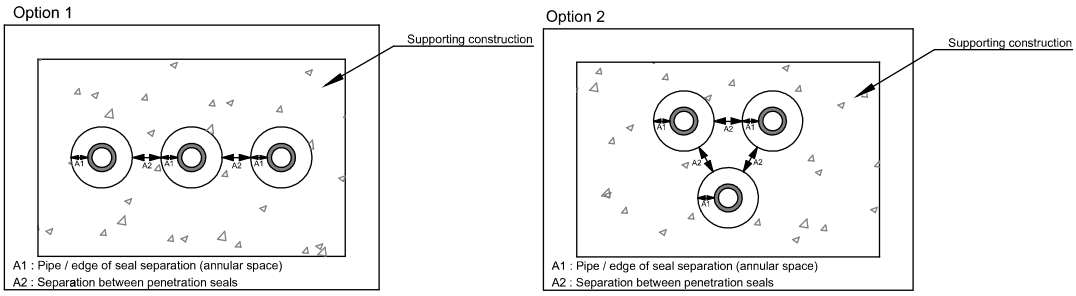
On the next page, drawing FW-PP-10.0.60 of the pipe penetration seals with plastic pipes with moulded socket is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.7 the installation details regarding the field of application are given.

t5.7 Installation details

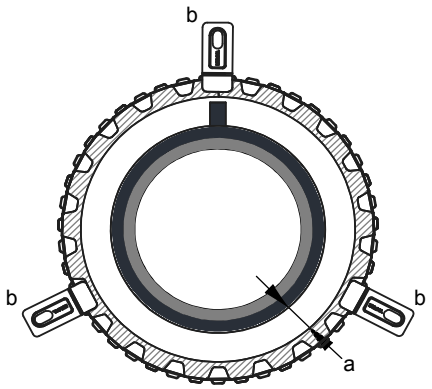
Distance to first pipe support (both faces)	Type of moulded socket allowed	Allowed filling of annular gap (distance A_1, see Figure 33) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Geberit PE Ø110 mm (type: 367.771.16.1) Geberit PE Ø125 mm (type: 368.771.16.1)	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 33. The annular gap A_1 is also visible in this Figure.

f33 Visualization single penetrations

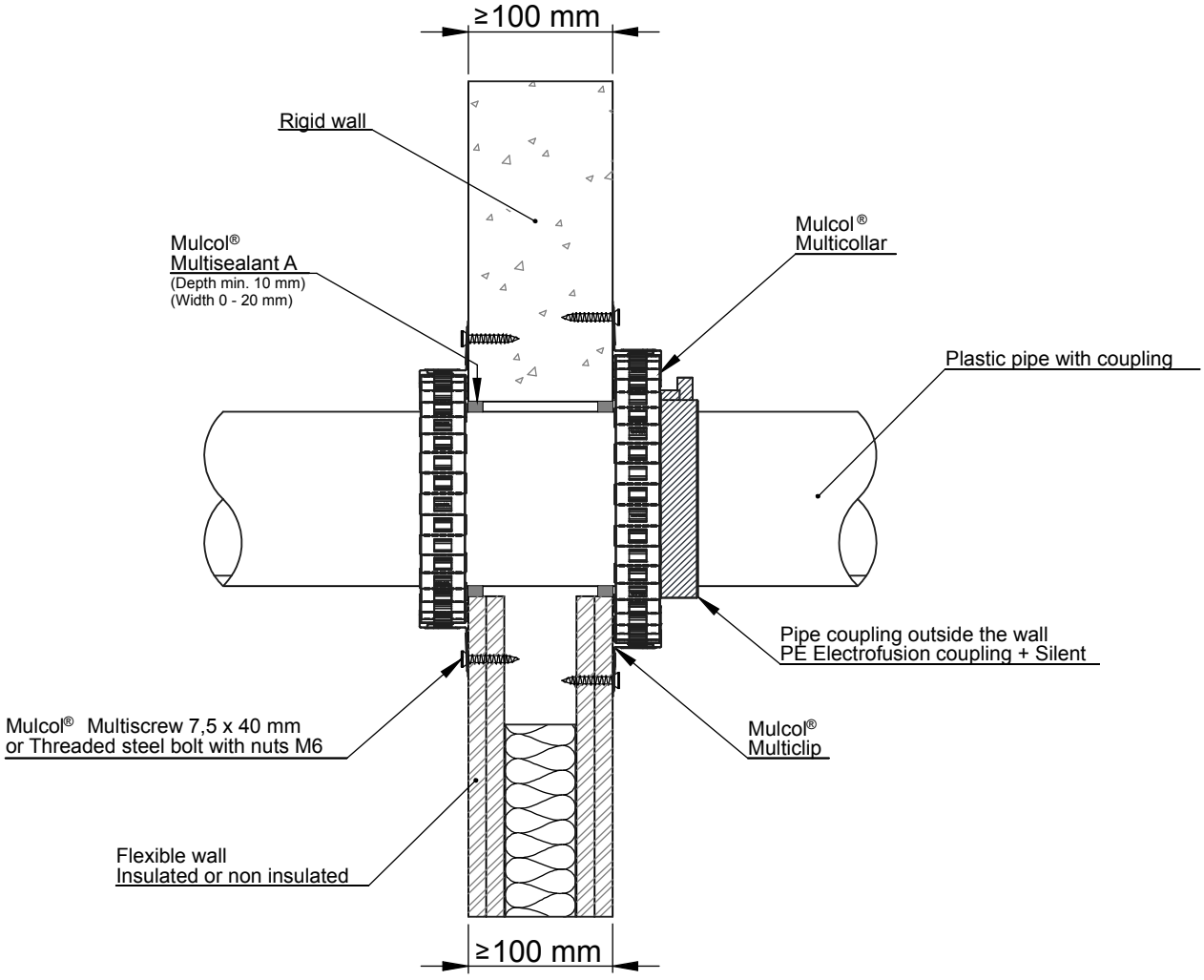


Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.0.60
	Unit of measure : mm	Department : Research & Development	
	Date : 30-11-2016	Draftsman : K.J.	A4

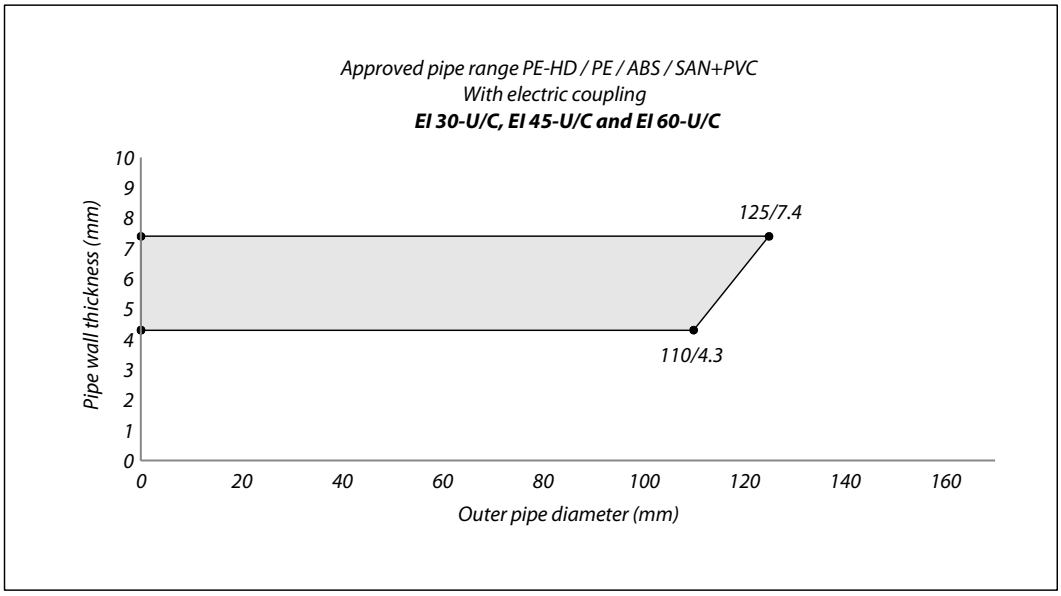
MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance PE-HD / PE / ABS / SAN+PVC with moulded socket Geberit			
Pipe dimensions (mm)		Performance class with pipe end configuration	See Figure
Outer diameter	Wall thickness		
≤ 110	4.3	EI 120–U/C E 120–U/C	34
≤ 125	7.4	EI 60–U/C E 90–U/C	

f34 Validity area



5.2.4 Without insulation with elbow and collar in a circular shape

Plastic pipes

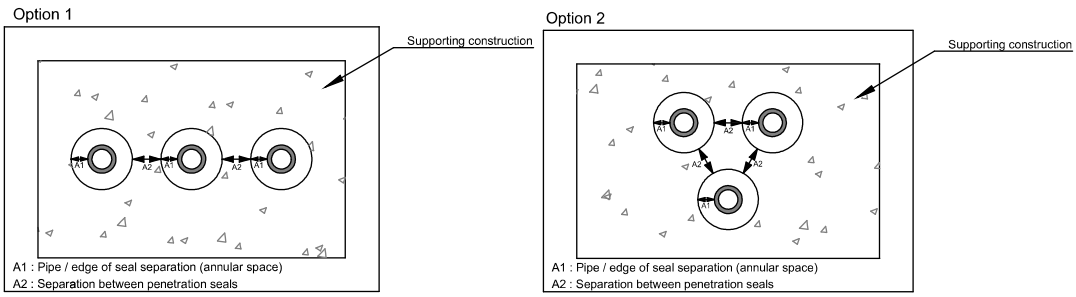
On the next page, drawing FW-PP-10.0.70 of the pipe penetration seals with plastic pipes without insulation with elbow is given for the pipes fitted with one Mulcol® Multicollar Slim placed with a circular shape placed at each face of the wall. In Table 5.8 the installation details regarding the field of application are given.

t5.8 Installation details

Distance to first pipe support (unexposed face)	Sound decoupling insulation allowed	Type of elbow allowed	Allowed filling of annular gap (distance A_1, see Figure 35)		Allowed annular space (distance 'a' in drawing)
			Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Wavix PP Ø125 mm x 88.5° (type: 341121009) Pipelife Ø125 mm x 90° EAN (type: 871260312054)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 35. The annular gap A_1 is also visible in this Figure.

f35 Visualization single penetrations



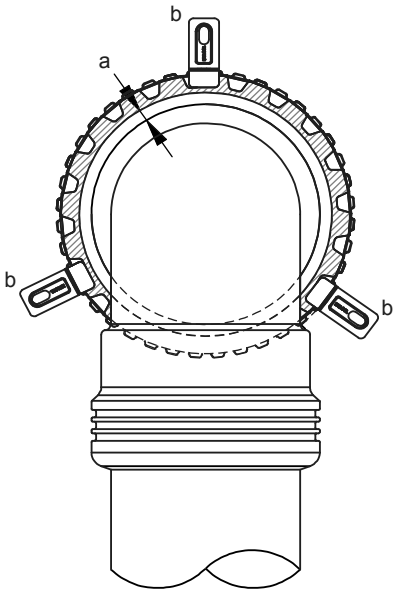
Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

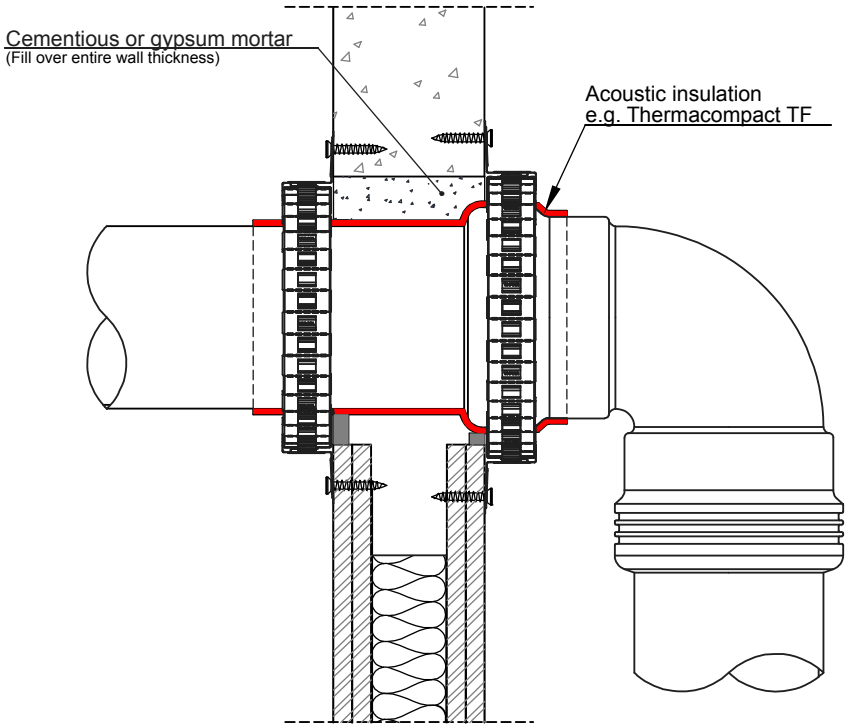
Front view

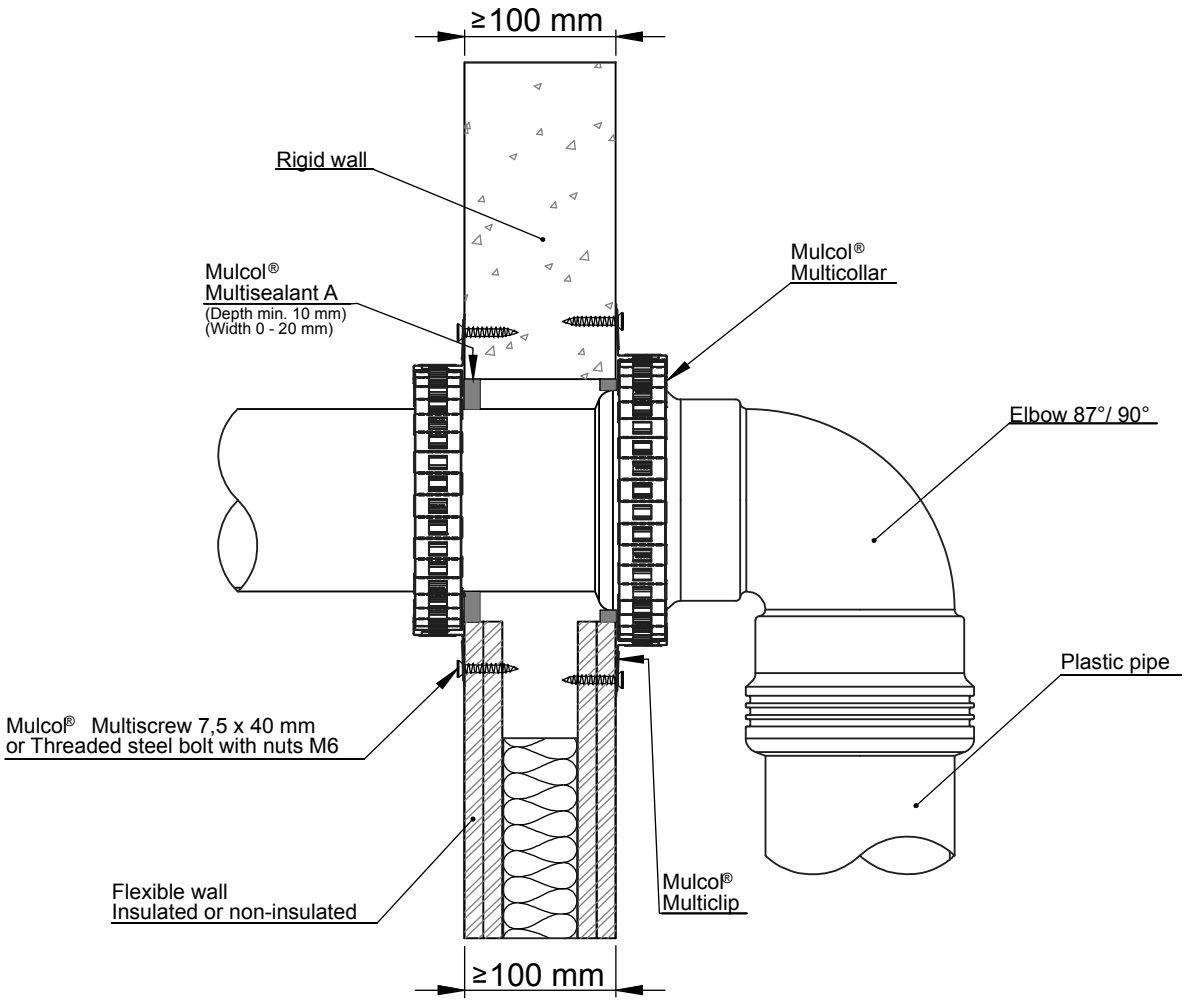
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol® Multiclip



Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.0.70
	Unit of measure : mm	Department : Research & Development	
	Date : 12-10-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance					
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material	Elbow
Outer diameter	Wall thickness				
≤ 125	3.1	EI 90–U/C E 90–U/C		PP	Wavix
≤ 125	2.5	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C	PVC-U / PVC-C	Pipelife

5.2.5 Without insulation with elbow and collar in a U-shape

Plastic pipes

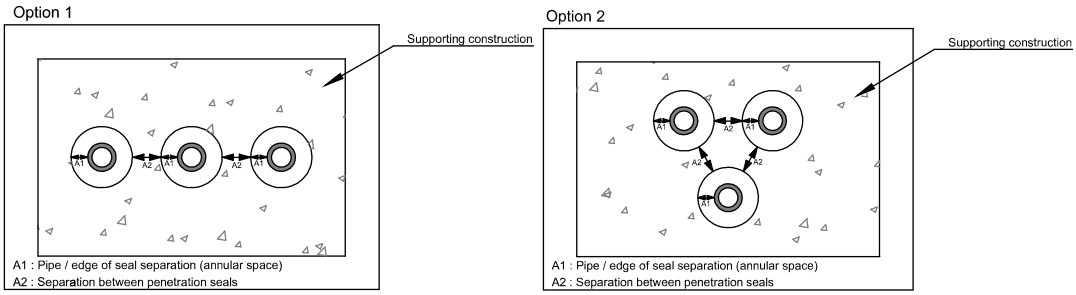
On the next page, drawing FW-PP-50.0.70 of the pipe penetration seals with plastic pipes without insulation with elbow is given for the pipes fitted with one Mulcol® Multicollar Slim placed with a U-shape placed at the exposed face of the wall. At the unexposed face of the wall, the collar has a circular shape. In Table 5.9 the installation details regarding the field of application are given.

t5.9 Installation details

Distance to first pipe support (unexposed face)	Sound decoupling insulation allowed	Type of elbow allowed	Allowed filling of annular gap (distance A_1, see Figure 36)		Distance between the wall and the pipe (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
			Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces		
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Wavin Ø110 mm x 90° (type: PE 100 PN16) Wafix PP Ø110 mm x 88.5° (type: ZW SN8 M/M)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 30 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

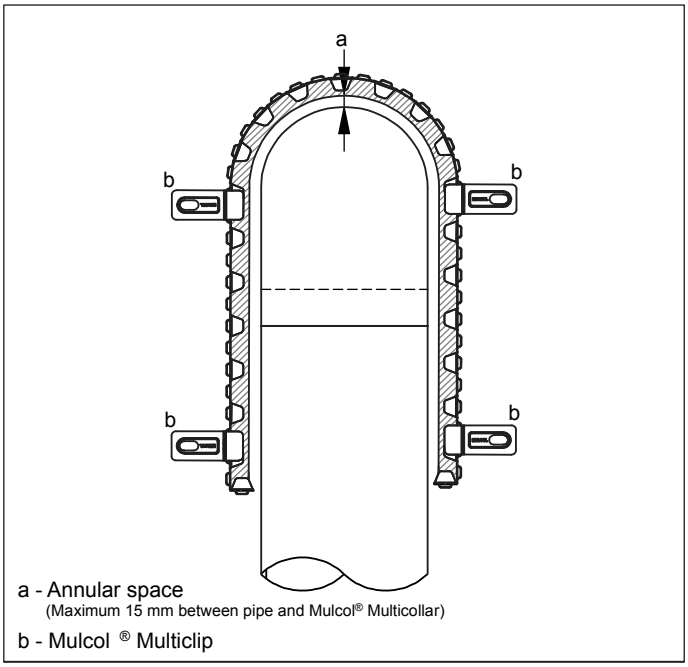
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 36. The annular gap A_1 is also visible in this Figure.

f36 Visualization single penetrations



The length of the U-shape must be at least two times the diameter of the pipes. The metal ends of the U-shape must be folded (see drawing). The fixing of the Mulcol® Multicollar Slim in a U-shape must be done by four Mulcol® Multiclips and may be placed at any orientation.

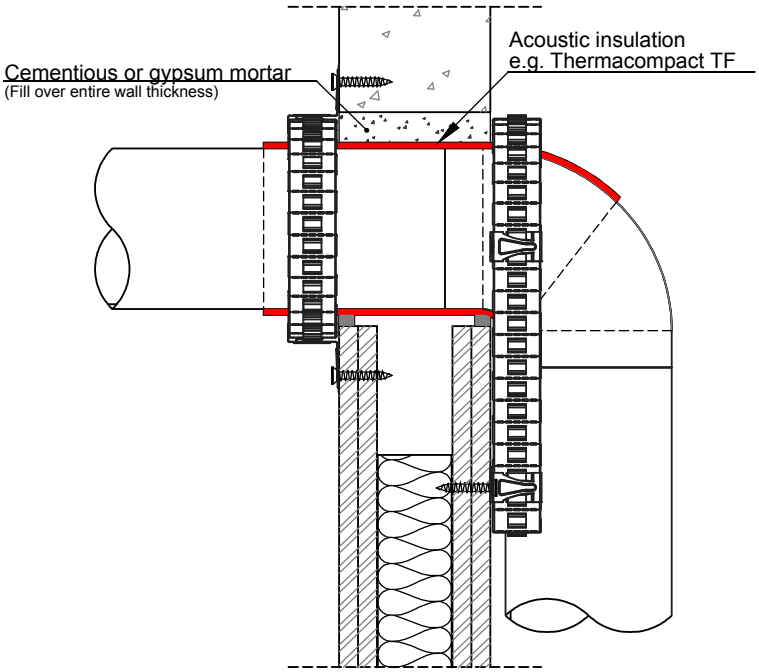
Front view

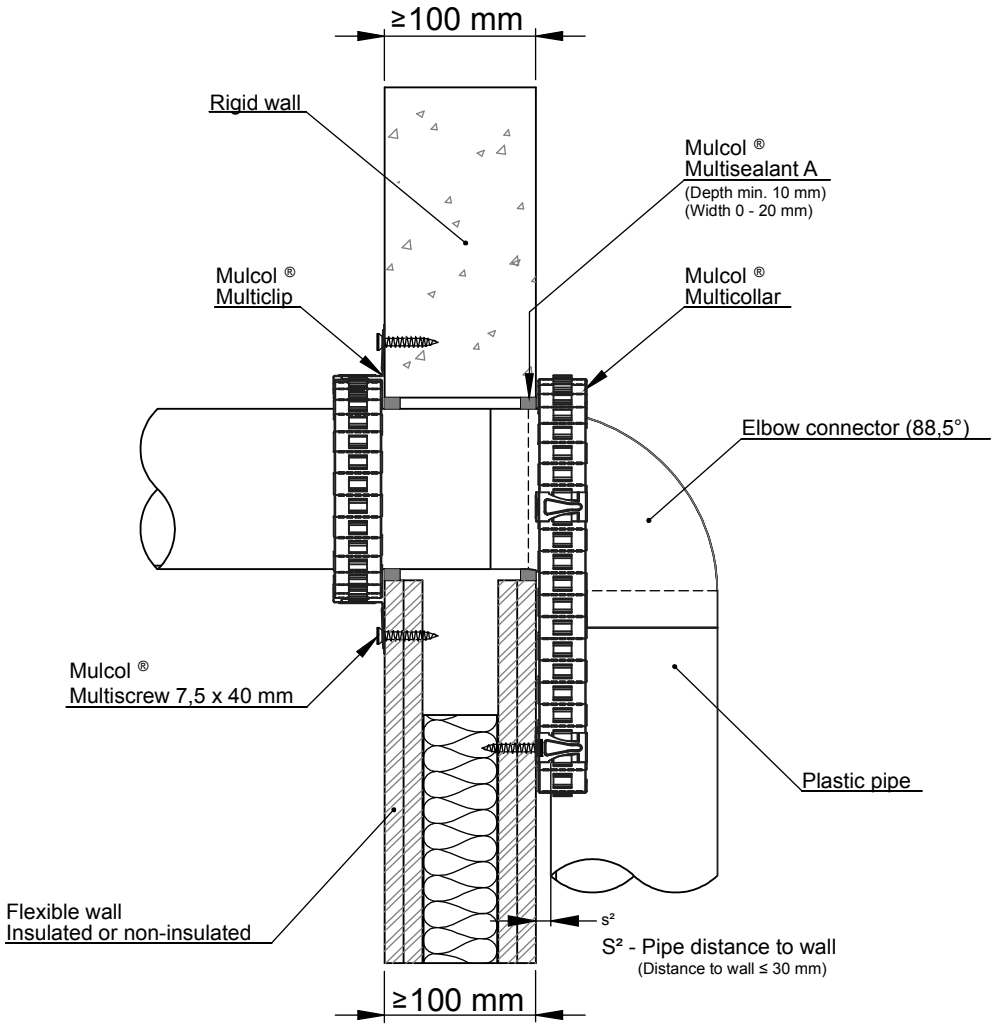


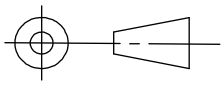
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

Side view





American projection 	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-50.0.70
	Unit of measure : mm	Department : Research & Development	
	Date : 29-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material and elbow
Outer diameter	Wall thickness		
≤ 110	3.4	EI 120–U/C E 120–U/C	PE-HD / PE / ABS / SAN+PVC
≤ 110	3.4	EI 120–U/C E 120–U/C	PP
≤ 110	3.4	EI 120–U/C E 120–U/C	PVC-U / PVC-C

5.2.6 Without insulation in corner (top or bottom)

Plastic pipes

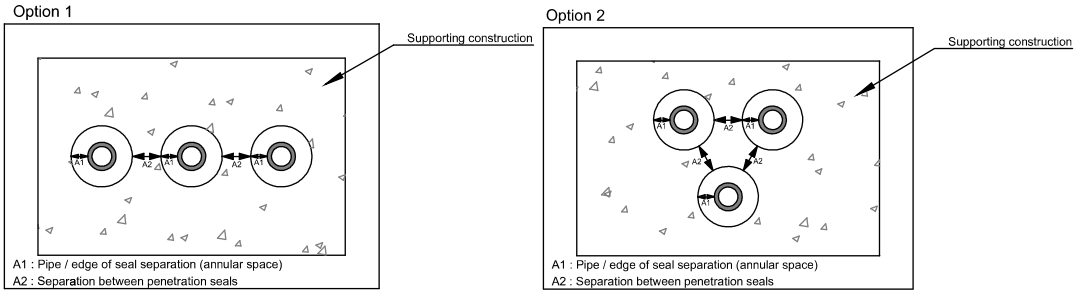
On the next page, drawing FW-PP-30.0.10 of the pipe penetration seals with plastic pipes without insulation placed in a corner is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.10 the installation details regarding the field of application are given.

t5.10 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 37) Mulcol® Multisealant A both faces	Allowed distance to element (distance s^1 or s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 37. The annular gap A_1 is also visible in this Figure.

f37 Visualization single penetrations

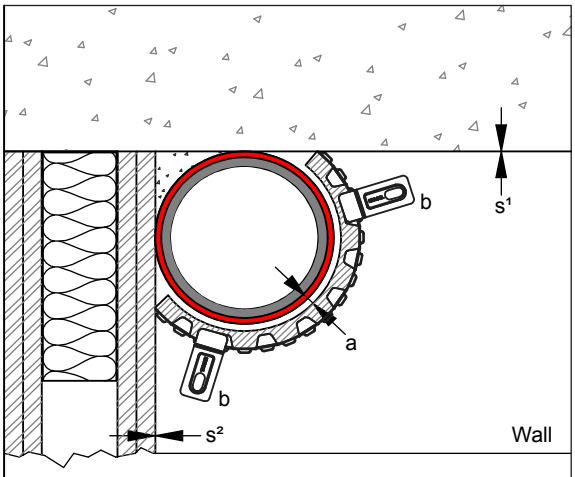


The fixing of the Mulcol® Multicollar Slim must be done by two Mulcol® Multiclips.

Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

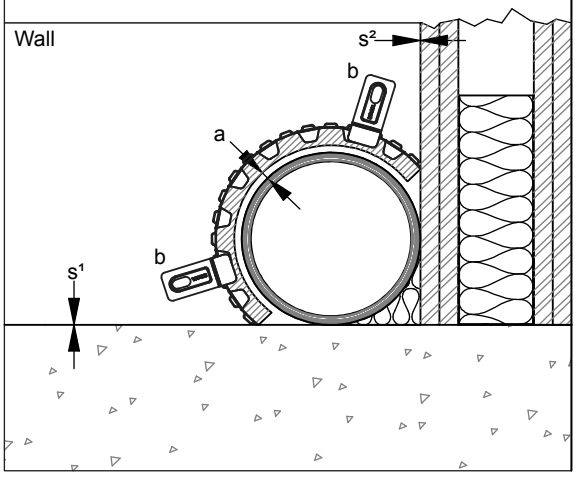
Front view (Top floor)

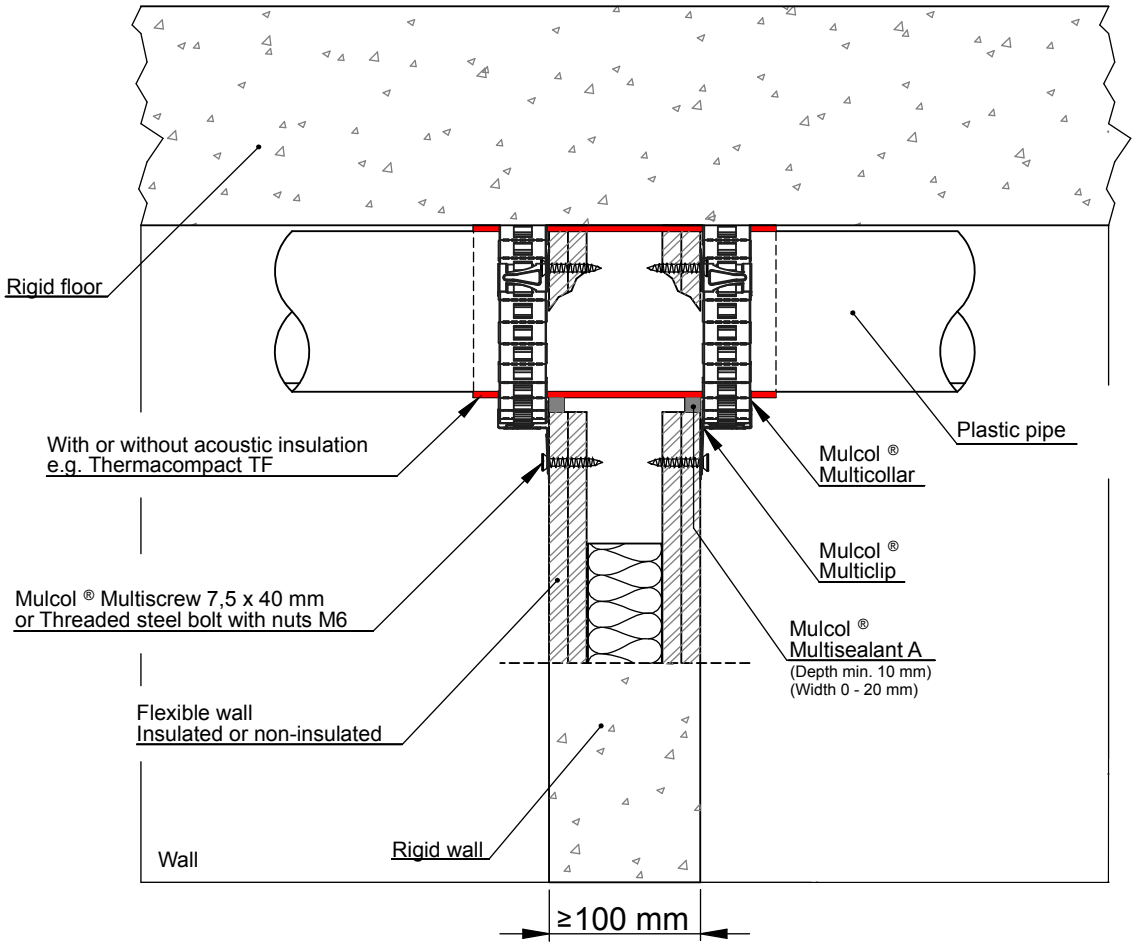


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol ® Multiclip
s¹ - Pipe distance to top floor
(Distance to top floor ≤ 5 mm)
s²- Pipe distance to wall
(Distance to wall ≤ 5 mm)

Front view (Floor basement)

a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol ® Multiclip
s¹ - Pipe distance to floor basement
(Distance to floor basement ≤ 5 mm)
s²- Pipe distance to wall
(Distance to wall ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-30.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 30-11-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance PVC-U / PVC-C				
Pipe dimensions (mm)		Performance class with pipe end configuration		Location
Outer diameter	Wall thickness			
≤ 110	2.2	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C	Floor (bottom)
≤ 110	3.2	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C	Ceiling (top)

5.2.7 Without insulation through a seal penetration system

Plastic pipes

On the next page, drawing PBfw-PP-10.0.10 of the pipe penetration seals with plastic pipes without insulation through a seal penetration system is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.11 the installation details regarding the field of application are given.

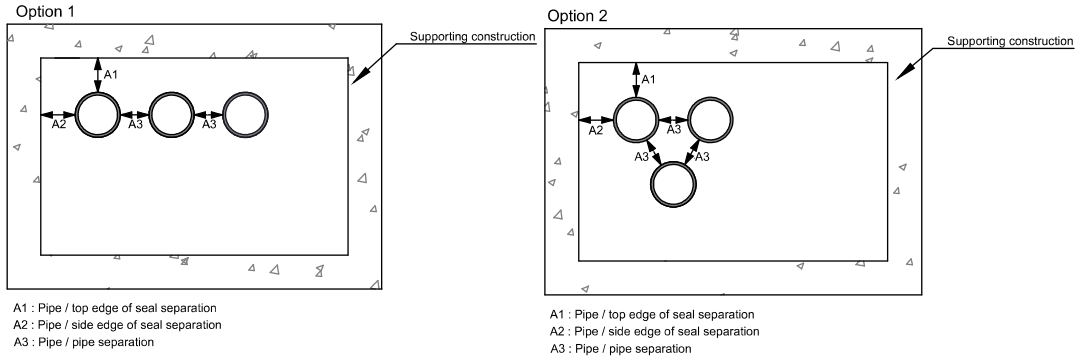
For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

t5.11 Installation details

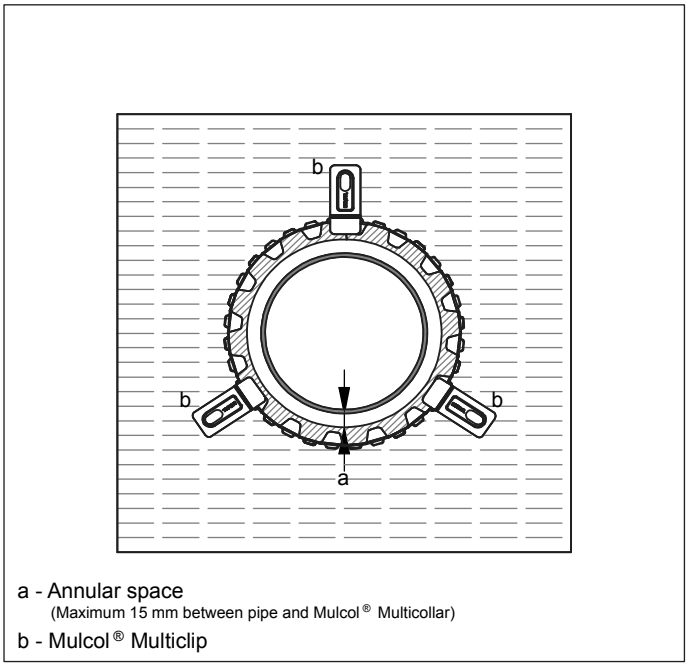
Distance to first pipe support (both faces)	Distance between pipes (A_1 to A_3, see Figure 38	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

If more pipe penetrations are placed in the penetration seal system, the minimum distance between the pipes is 100 mm, see Figure 38 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory).

f38 Visualization distance between pipes

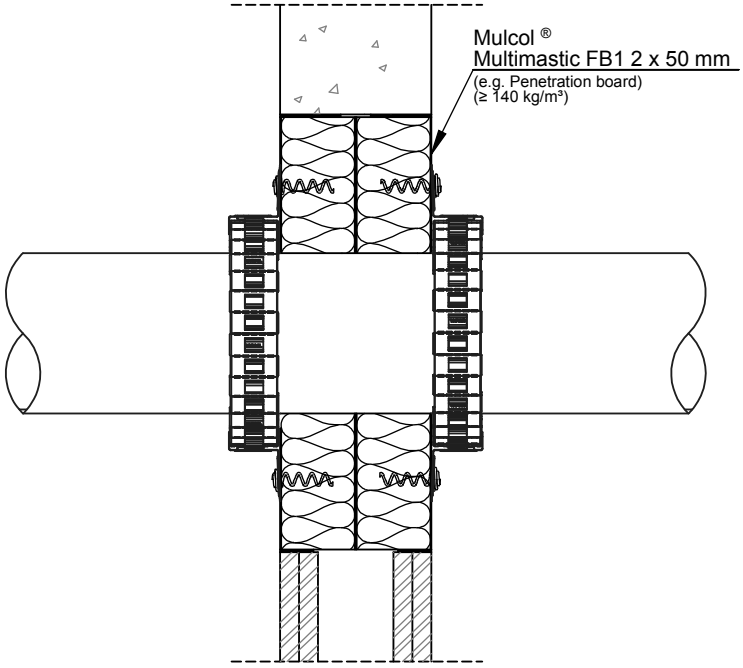


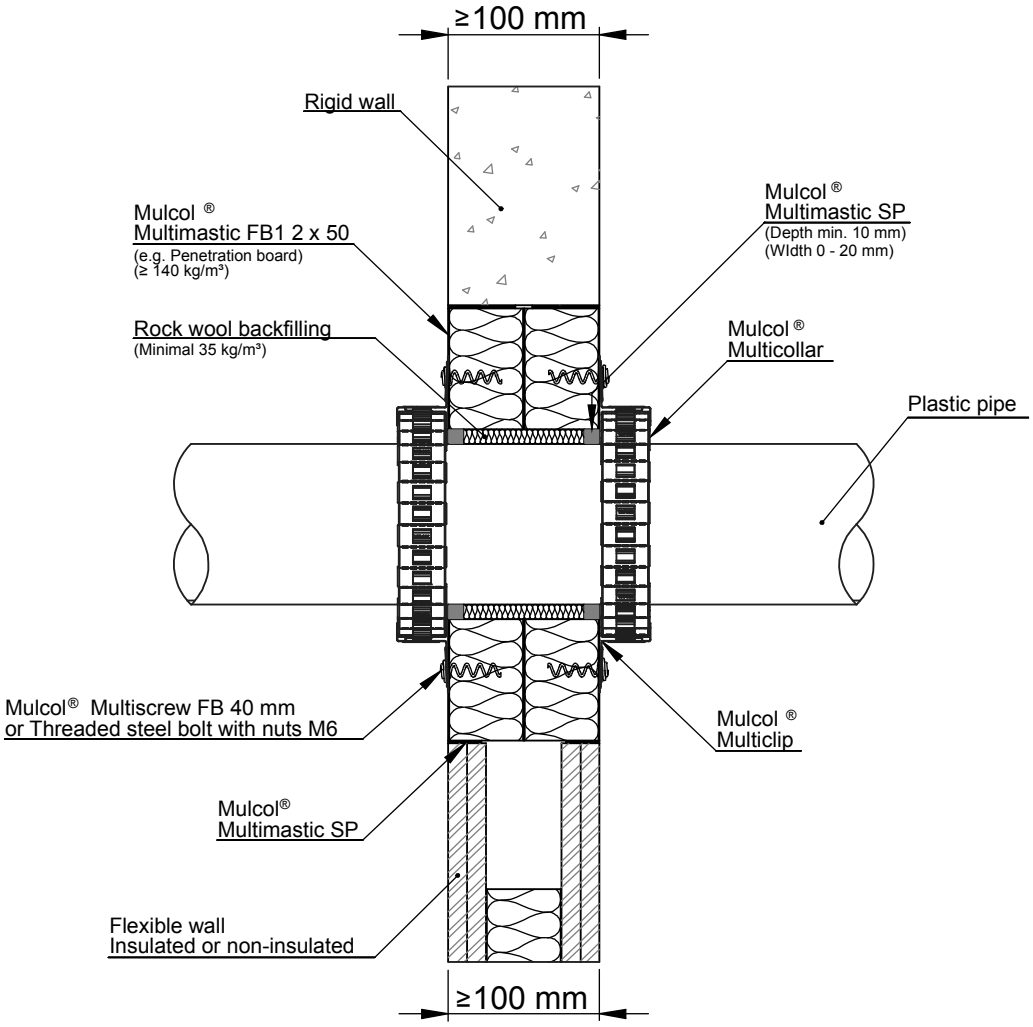
Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-PP-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 20-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance				
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material
Outer diameter	Wall thickness			
≤ 110	2.7	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	PE-HD / PE / ABS / SAN+PVC
≤ 110	2.7	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	PP
≤ 110	2.7	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	PVC-U / PVC-C

5.2.8 Without insulation at a zero distance to floor

Plastic pipes

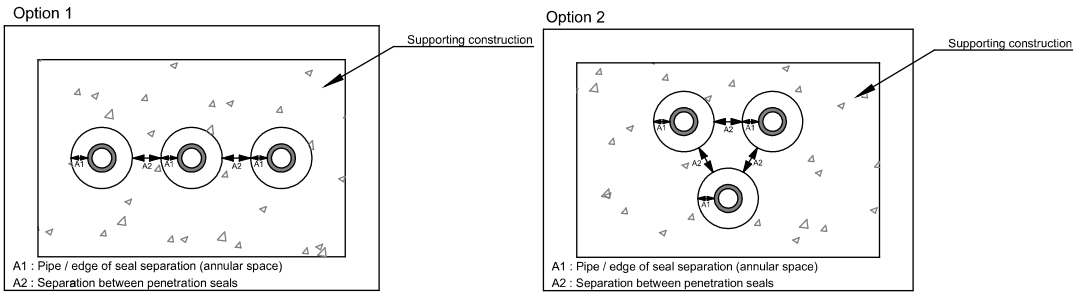
On the next page, drawing FW-PP-40.0.10 of the pipe penetration seals with plastic pipes without insulation placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.12 the installation details regarding the field of application are given.

t5.12 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 39) Mulcol® Multisealant A both faces	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 39. The annular gap A_1 is also visible in this Figure.

f39 Visualization single penetrations



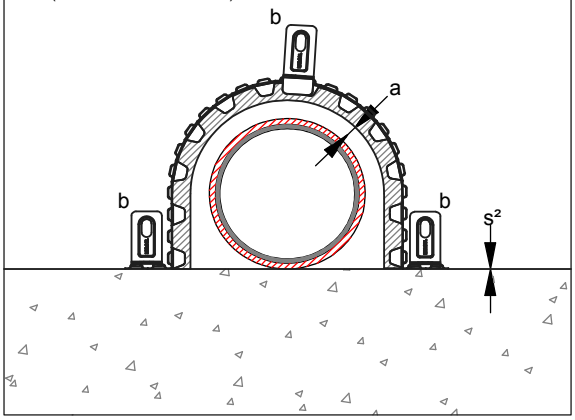
The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-PP-40.0.10.

Based upon an assessment concerning other sound decoupling materials it is expected that the fire resistances given in this chapter will also be met for penetration seals with pipes fitted with the following types of insulation:

- ABsound Sonocool Type PM;
- Jaco Massa Versterkt Alu, Jaco Massa Alu and Jaco Massa Zwart Alu;
- Merfisol Zilver ALU.

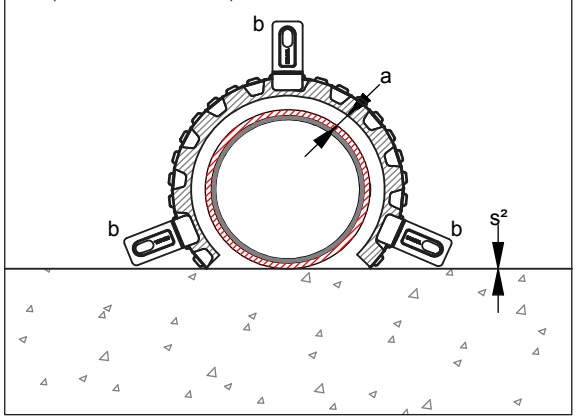
Front view

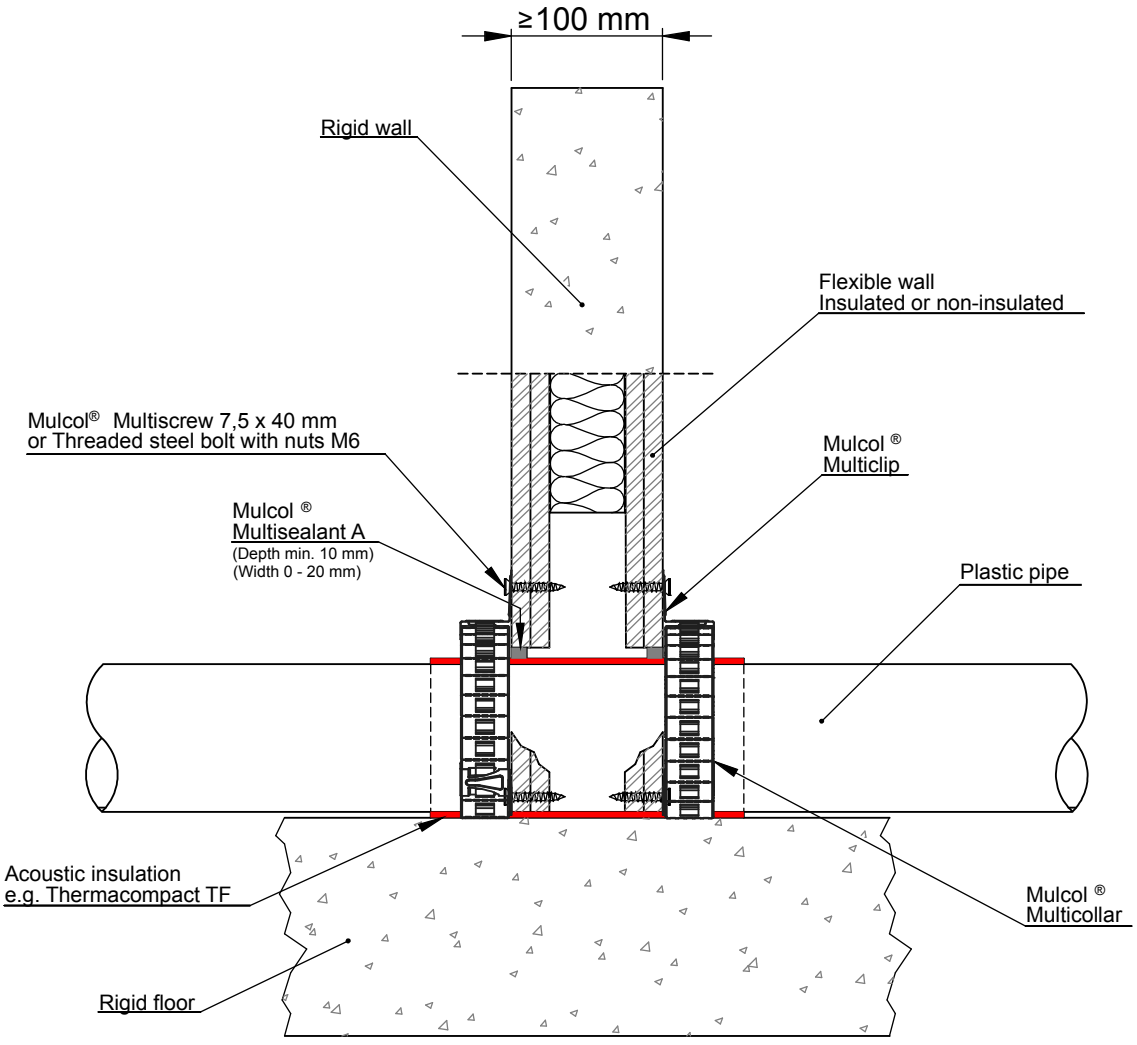
a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





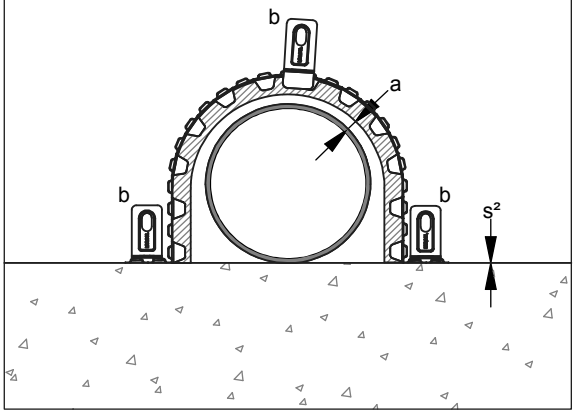
American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-40.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 11-8-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

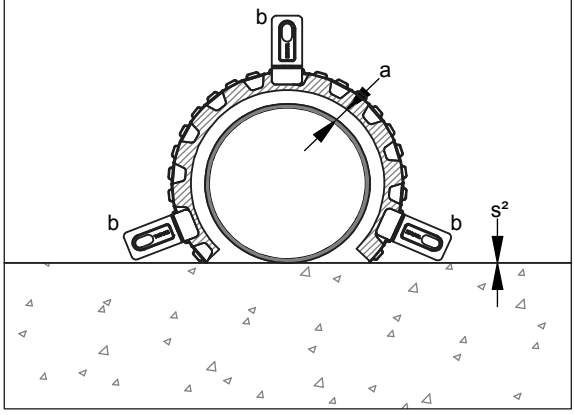
Front view

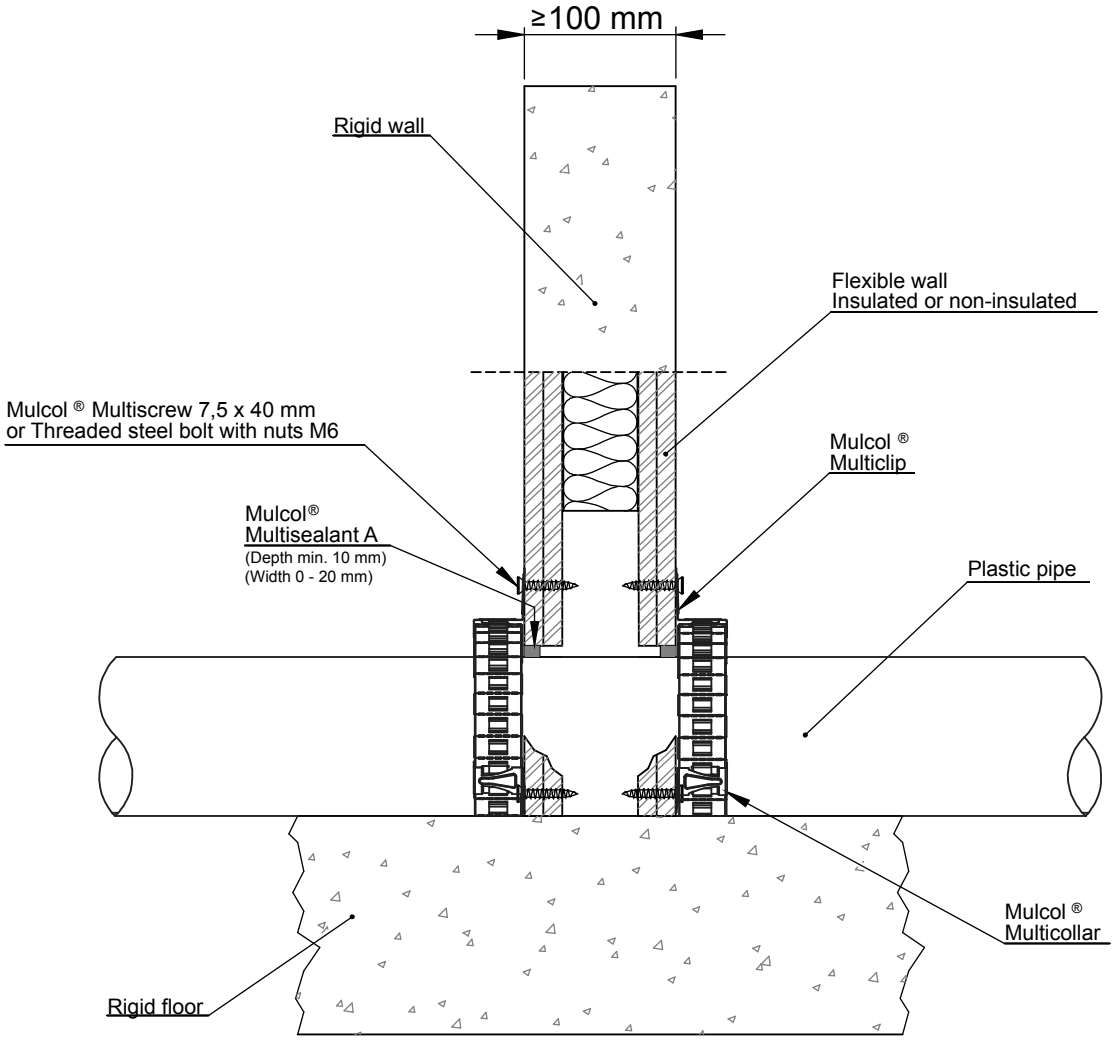
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between pipe and Mulcol ® Multicollar)
b - Mulcol ® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-40.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 11-8-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance		
Pipe dimensions (mm)		Performance class with pipe end configuration
Outer diameter	Wall thickness	
PE-HD / PE / ABS / SAN+PVC		
≤ 90	2.8	EI 90–U/U E 90–U/U
PVC–U / PVC–C		
≤ 110	2.2	EI 90–U/U E 90–U/U

5.2.9 With elastomeric thermal insulation (LI or CI)

Plastic pipes

On the next page, drawing FW-PP-20.0.22 of the pipe penetration seals with plastic pipes with elastomeric thermal is given for the pipes fitted with two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.13 the installation details regarding the field of application are given.

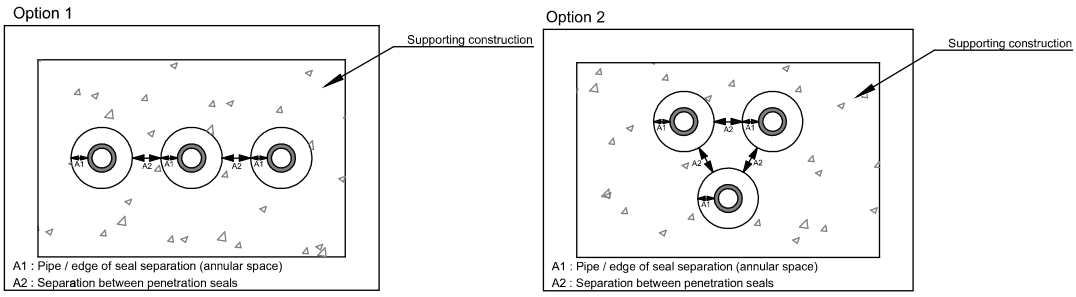
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be applied interrupted at the seal with a minimum distance of 450 mm on both sided from the point where the pipe emerges from the wall (LI in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CI).

t5.13 Installation details

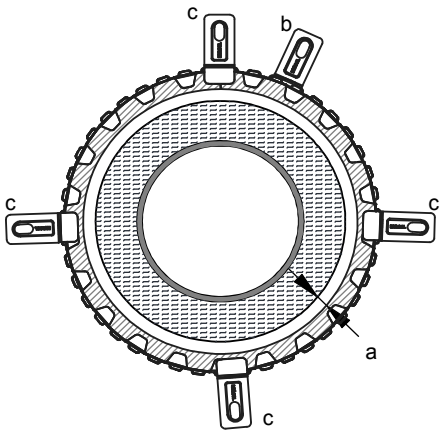
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 40) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 40. The annular gap A_1 is also visible in this Figure.

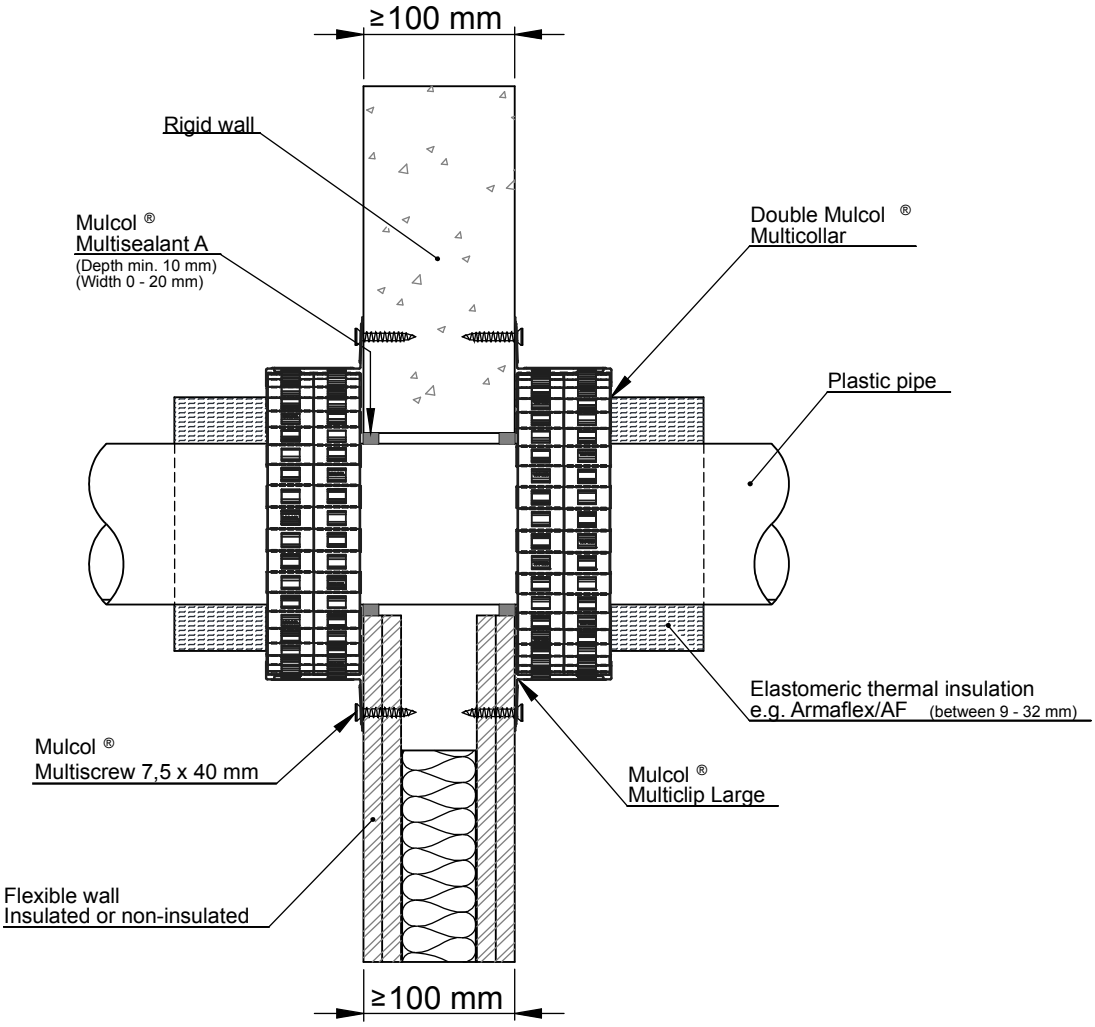
f40 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol ® Multicollar)
b - Mulcol ® Multiclip
c - Mulcol ® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-20.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 25-1-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance PVC-U / PVC-C				
Pipe dimensions (mm)		Performance class with pipe end configuration		Thickness insulation (mm)
Outer diameter	Wall thickness			
≤ 110	3.2	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	9* to 32

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.2.10 With elastomeric thermal insulation (LS, CS, LI or CI)

Plastic pipes

On the next page, drawing FW-PP-20.0.22 of the pipe penetration seals with plastic pipes with elastomeric thermal is given for the pipes fitted with two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.14 the installation details regarding the field of application are given.

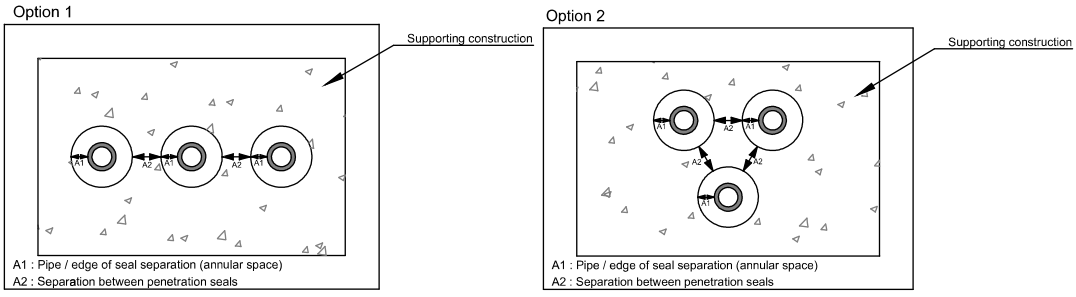
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 450 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.14 Installation details

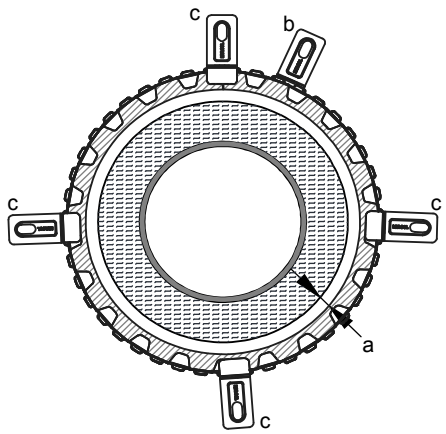
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 41) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥ 10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 41. The annular gap A_1 is also visible in this Figure.

f41 Visualization single penetrations



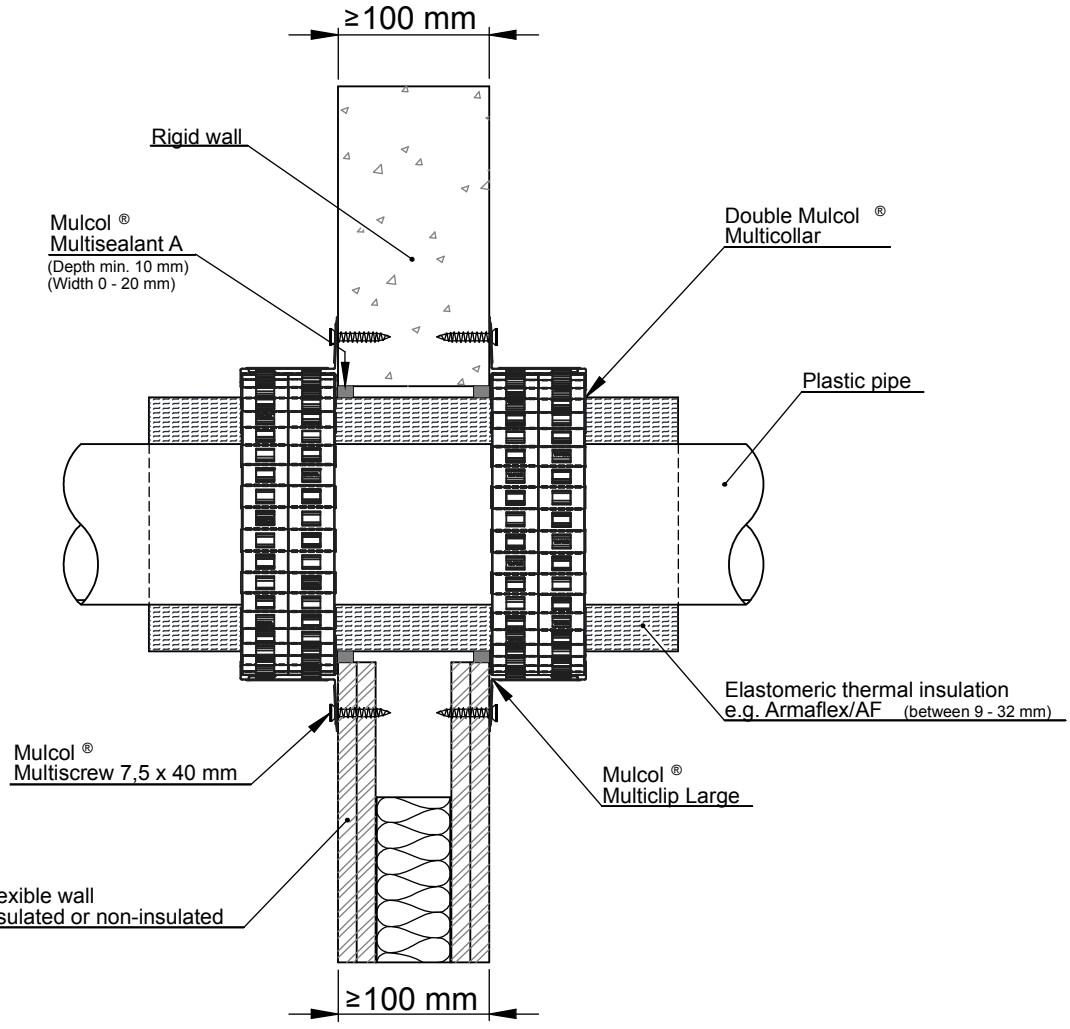
Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)

b - Mulcol ® Multiclip

c - Mulcol ® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-20.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 31-1-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Two collars each face PVC-U / PVC-C				
Pipe dimensions (mm)		Performance class with pipe end configuration		Thickness insulation (mm)
Outer diameter	Wall thickness			
≤ 110	3.2	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C	9* to 32

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.2.11 With PE-conduit insulation

Plastic pipes

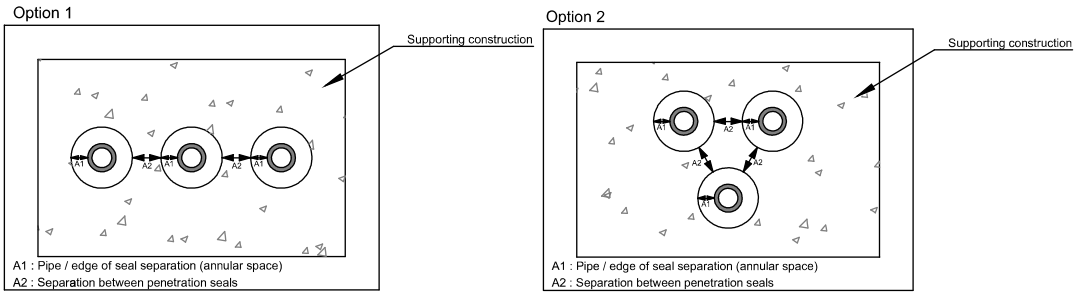
On the next page, drawing FW-PP-10.0.30 of the pipe penetration seals with Uponor Aqua PE-Xa pipes with PE conduit insulation (outer diameter Ø32 mm) is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.15 the installation details regarding the field of application are given.

t5.15 Installation details

Distance to first pipe support (both faces)	PE-conduit insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 42) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Outer diameter Ø32 mm minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤32 mm / 'a' ≤ 15 mm

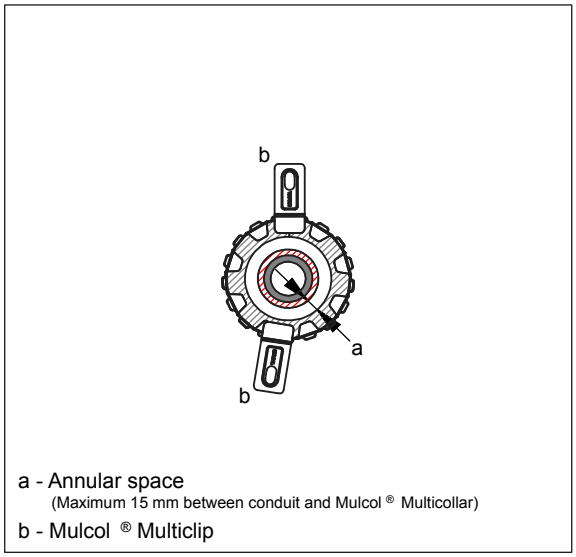
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 42. The annular gap A_1 is also visible in this Figure.

f42 Visualization single penetrations



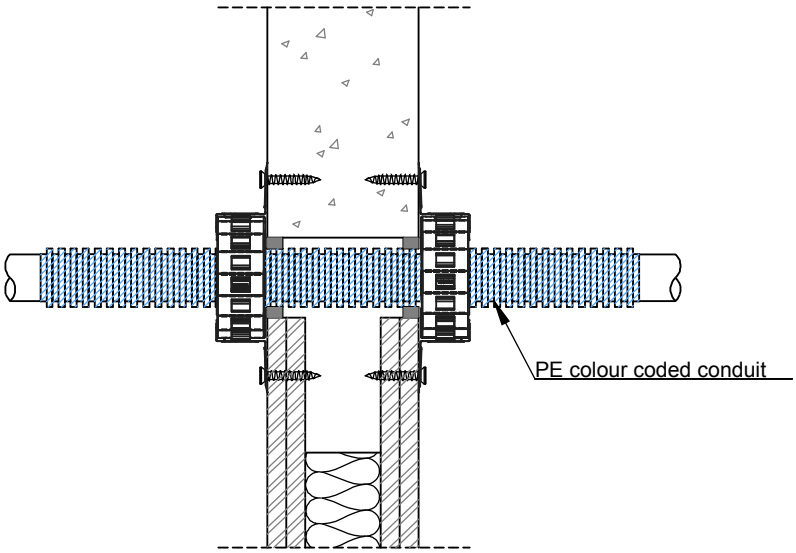
The fire resistance is valid for plastic pipes made out of an inner layer of polyethylene with a layer of cross-linked polyethylene on top (Uponor Aqua Pipe PE-Xa) or equal.

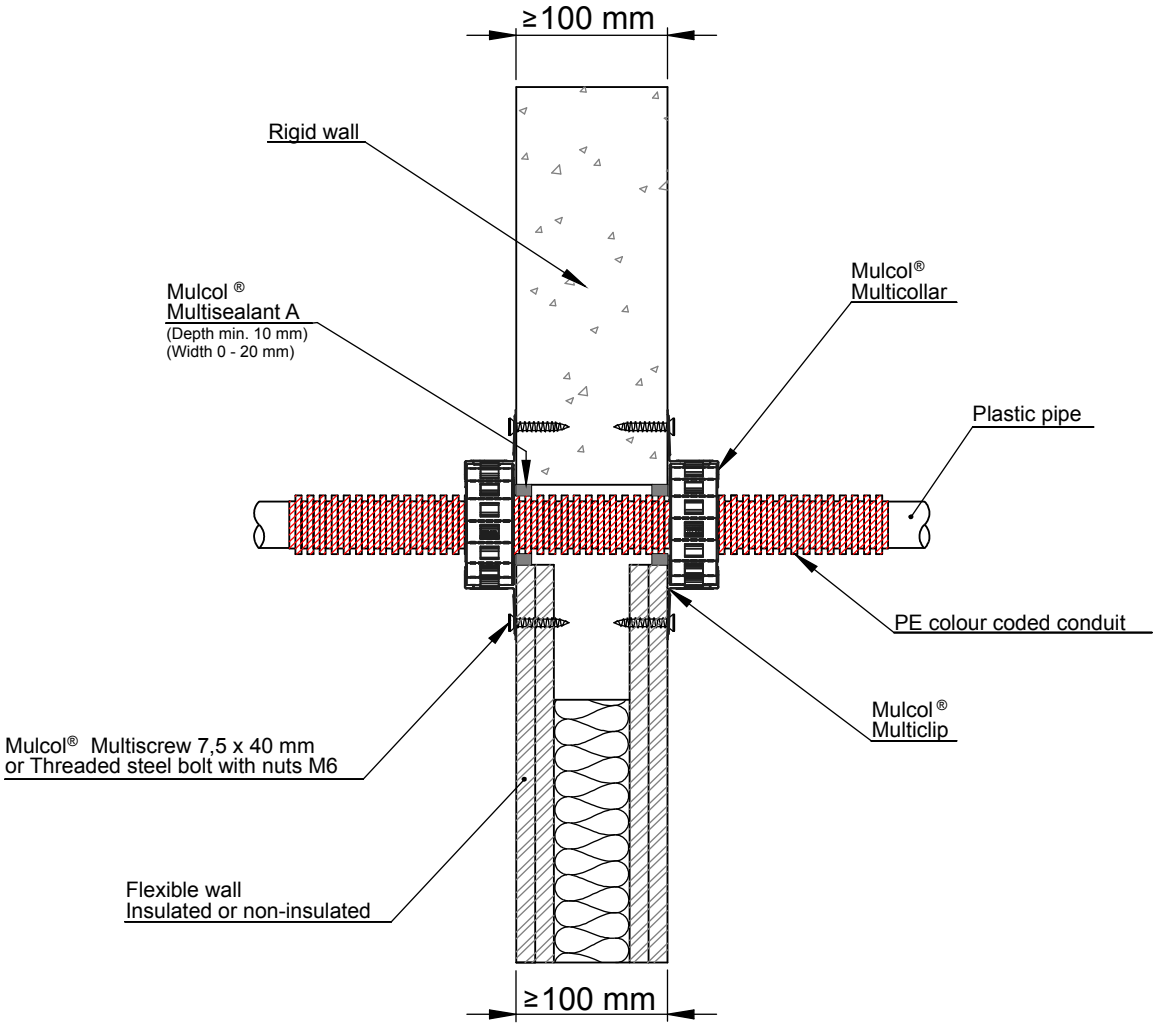
Front view



a - Annular space
(Maximum 15 mm between conduit and Mulcol ® Multicollar)
b - Mulcol ® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.0.30
	Unit of measure : mm	Department : Research & Development	A4
	Date : 11-8-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Uponor PE-Xa pipe (Aqua pipe) with Wavin flexible PE-conduit (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Outer diameter PE-conduit (mm)
Outer diameter	Wall thickness		
≤ 25	3.5	EI 90–U/C E 90–U/C	≤ 32

Based upon an assessment concerning different conduit materials is expected that the fire resistances given above will also be met for penetration seals with GEWA flexible HD-PE-conduits (the conduit dimensions shall correspond to the dimensions in the table).

5.2.12 With metal supporting shell insulation

Plastic pipes

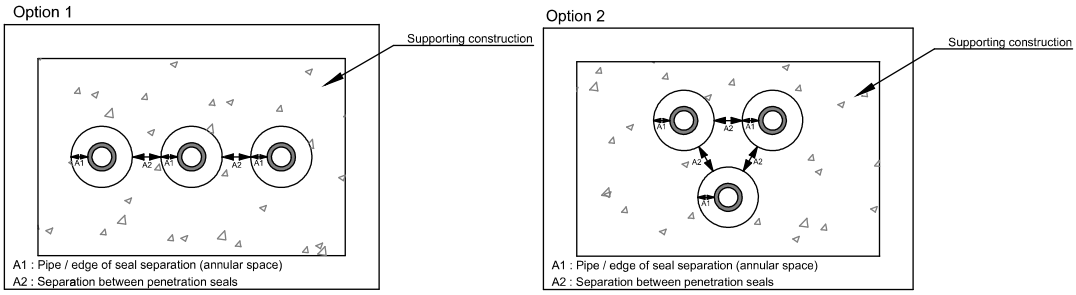
On the next page, drawing FW-PP-10.0.50 of the pipe penetration seals with plastic pipes without insulation with metal supporting shell is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.16 the installation details regarding the field of application are given.

t5.16 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 43) Mulcol® Multisealant A both faces	Thickness and installation length metal half shell	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Thickness ≤ 0.5 mm applied sustained and continued (CS)	Outer diameter ≤ 90 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 43. The annular gap A_1 is also visible in this Figure.

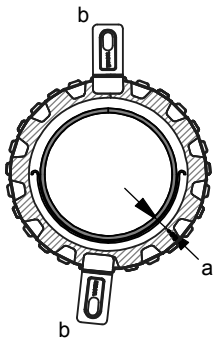
f43 Visualization single penetrations



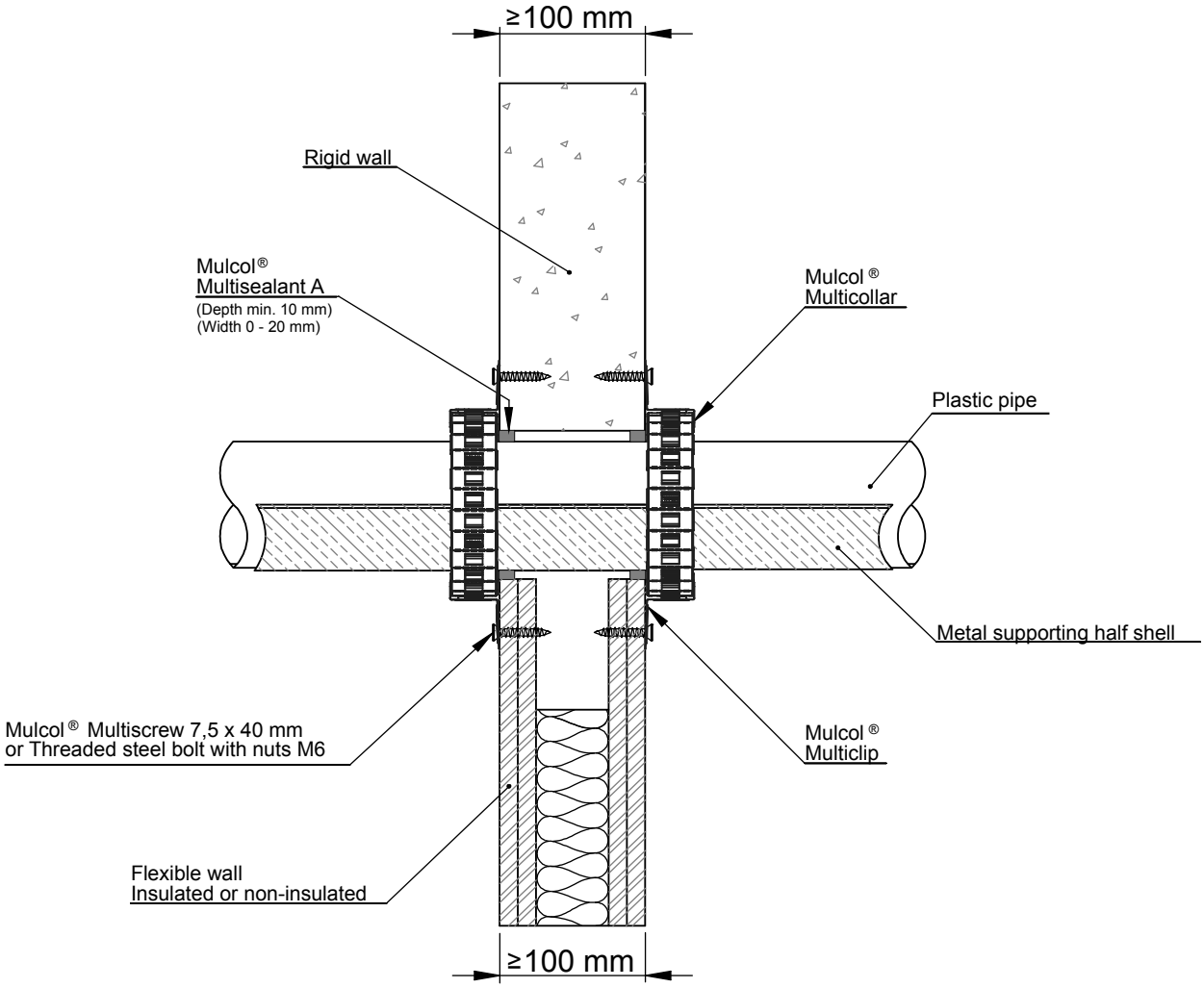
For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance PE-HD / PE / ABS / SAN+PVC		
Pipe dimensions (mm)		Performance class with pipe end configuration
Outer diameter	Wall thickness	
≤ 90	2.8	EI 90–U/C E 90–U/C

Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PP-10.0.50
	Unit of measure : mm	Department : Research & Development	A4
	Date : 11-8-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

5.3 Plastic pipes (silent)

In this Chapter the expected fire resistance and field of application of plastic pipes (silent) in several different applications is summarized.

5.3.1 Without insulation

Plastic pipes (silent)

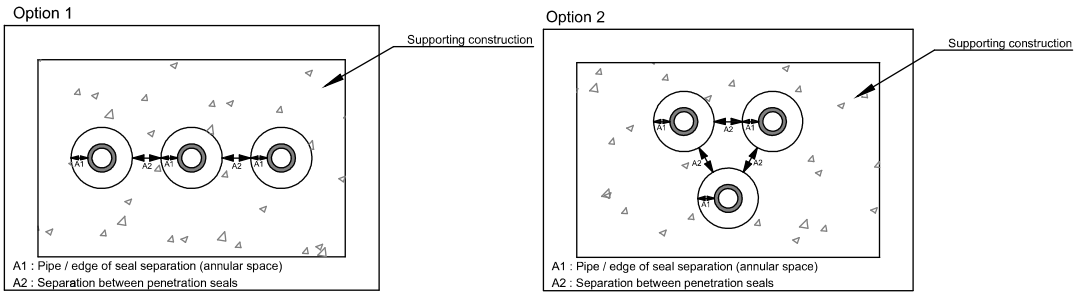
On the next pages, drawings FW-PPS-10.0.10 and FW-PPS-20.0.10 of the pipe penetration seals with plastic pipes (silent) without insulation are given for the pipes fitted with one or two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.17 the installation details regarding the field of application are given.

t5.17 Installation details

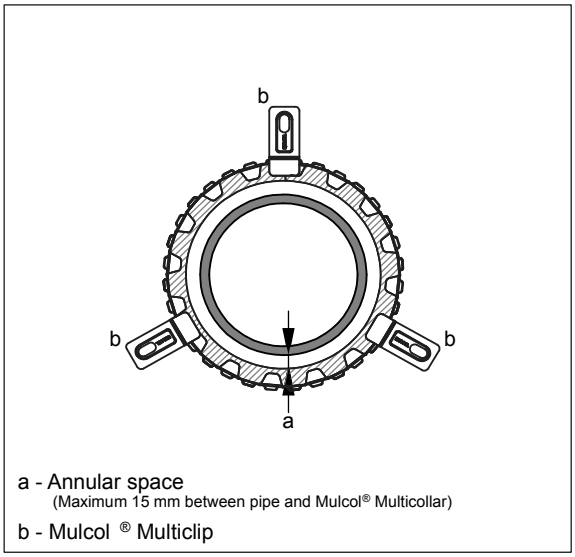
Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 44)		Allowed annular space (distance 'a' in drawing)	
		Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces		
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 44. The annular gap A_1 is also visible in this Figure.

f44 Visualization single penetrations



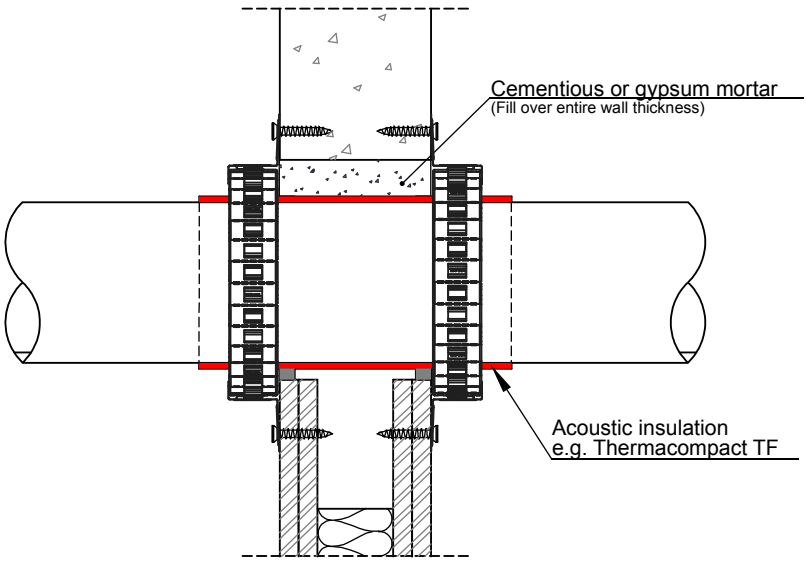
Front view

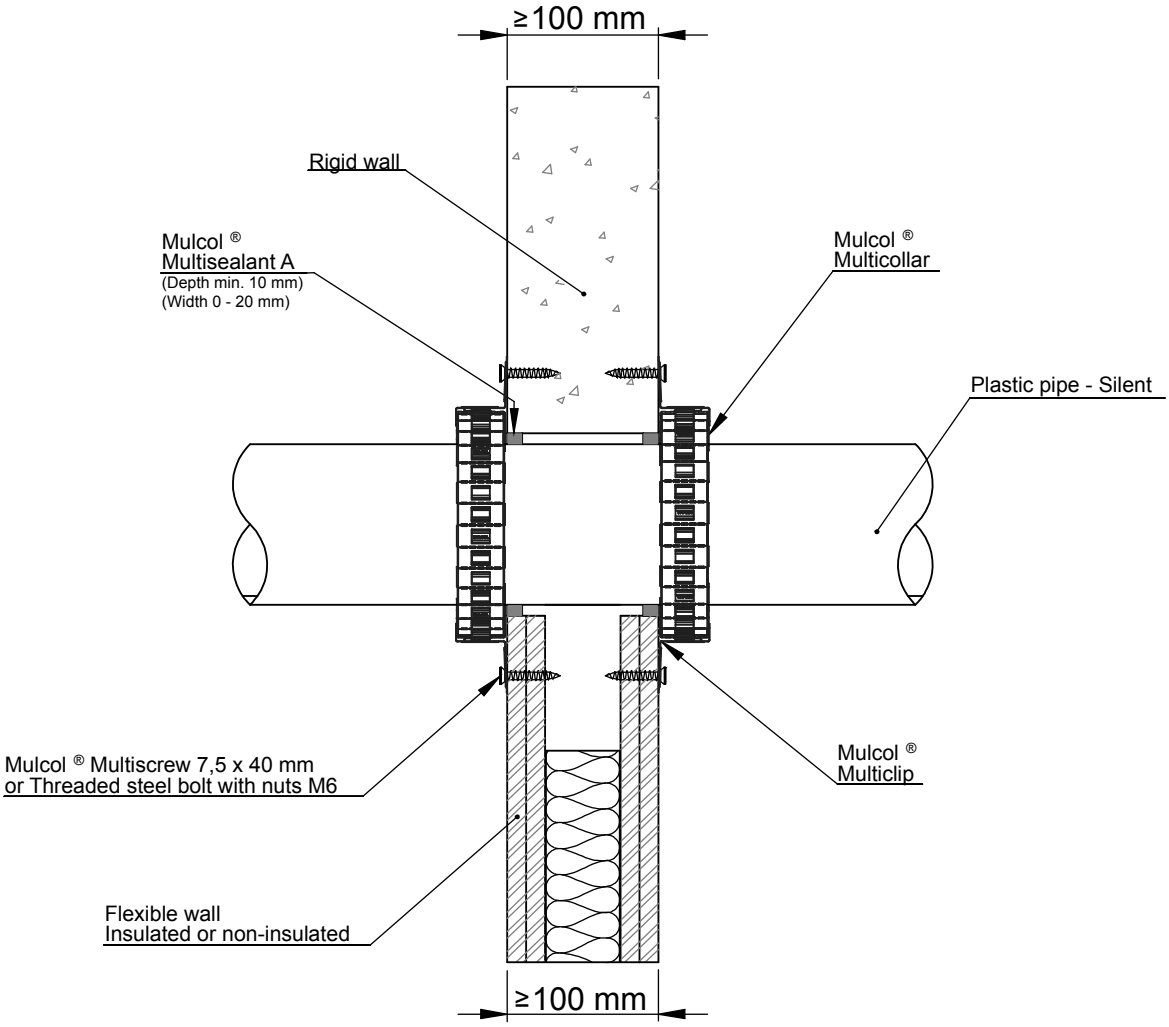


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

Side view



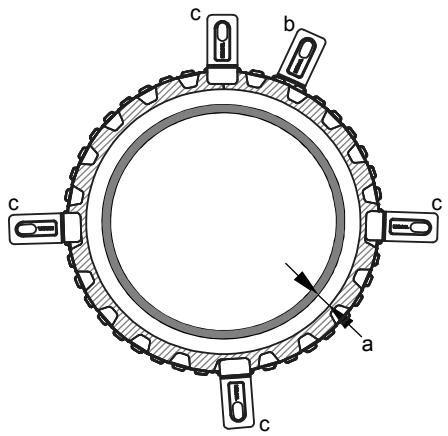


American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PPS-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 30-11-2016	Draftsman : K.J.	A4

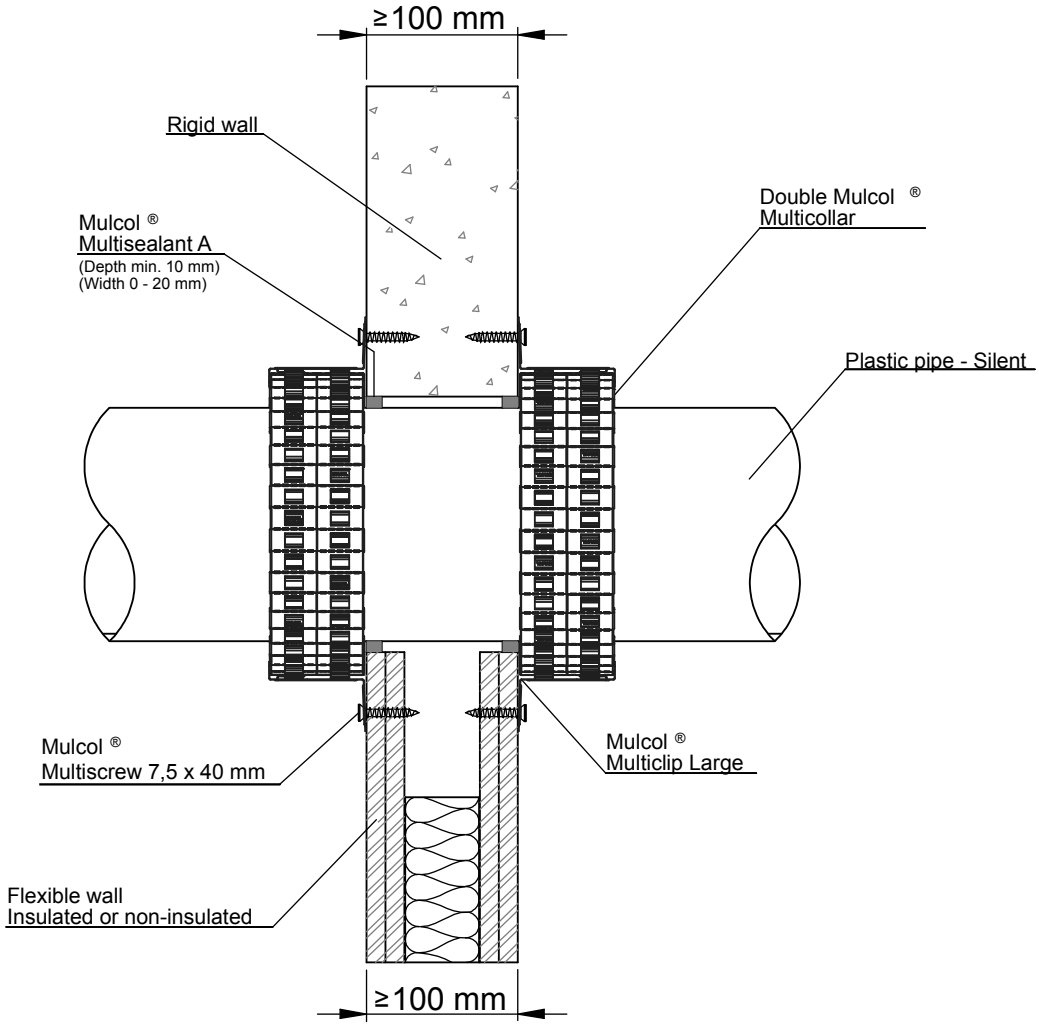
MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol ® Multiclip
c - Mulcol ® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PPS-20.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 28-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

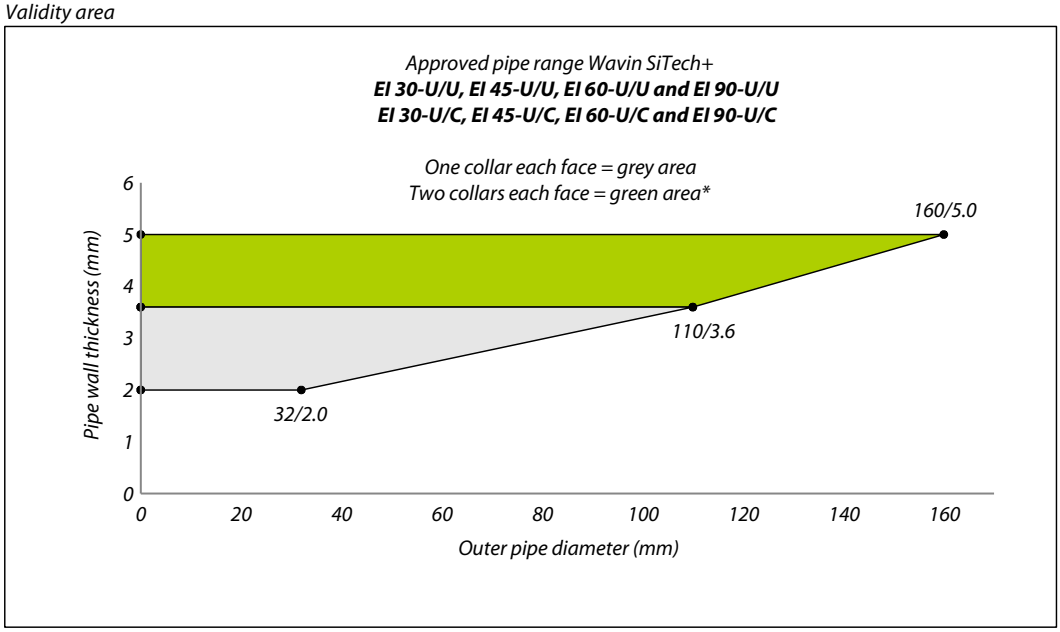
Fire resistance One collar each face					
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material (or equal)	See Figure
Outer diameter	Wall thickness				
≤ 32	2.0	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	Wavin SiTech+	45
≤ 110	3.6	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C		
≤ 110	6.0	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	Geberit Silent dB 20	N.a.

Fire resistance Two collar each face					
Pipe dimensions (mm)		Performance class with pipe end configuration		Material (or equal)	See Figure
Outer diameter	Wall thickness				
≤ 160	5.0	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C	Wavin SiTech+	45

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Coes PhoNoFire;
- Coestilen BluePower;
- Geberit Silent PP and Geberit Silent dB 20;;
- Girpi Friaphon;
- Marley Silent;
- Pipelife Master 3;
- PhonEX AS;
- Poloplast POLO-KAL NG and Poloplast POLO-KAL 3S;
- REHAU Raupiano Plus;
- Skolan dB;
- Valsir Triplus;
- Wavin SiTech+.

f45 *Validity area*



5.3.2 Without insulation with moulded socket

Plastic pipes (silent)

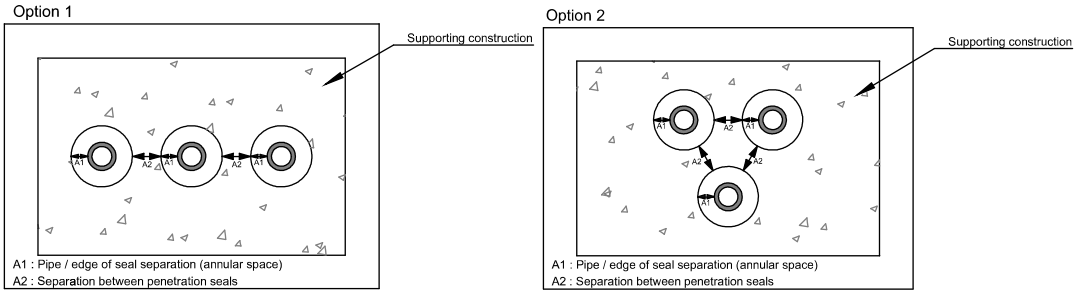
On the next page, drawing FW-PPS-10.0.60 of the pipe penetration seals with plastic pipes (silent) with moulded socket is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.18 the installation details regarding the field of application are given.

t5.18 Installation details

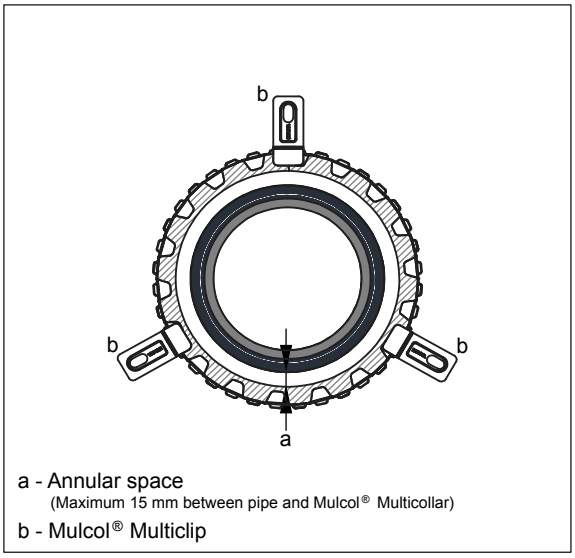
Distance to first pipe support (both faces)	Type of moulded socket allowed	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 44)		Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Raupiano Plus Ø110 mm (type: 120324-200)	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 46. The annular gap A_1 is also visible in this Figure.

f46 Visualization single penetrations

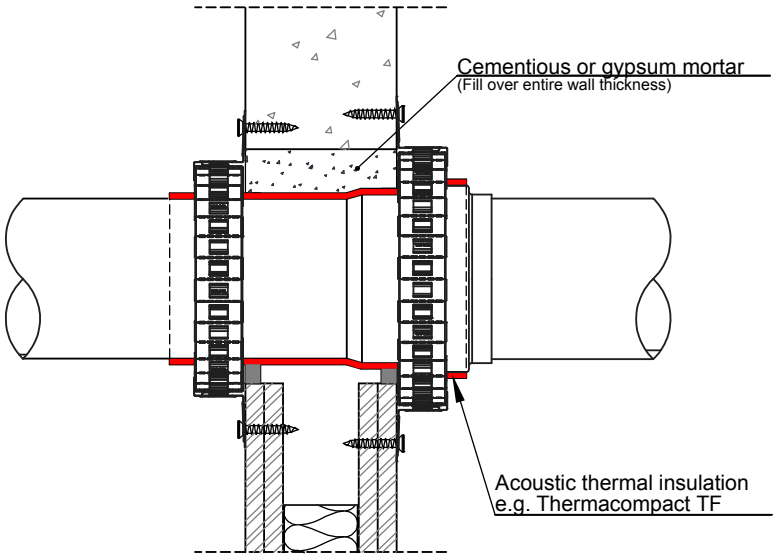


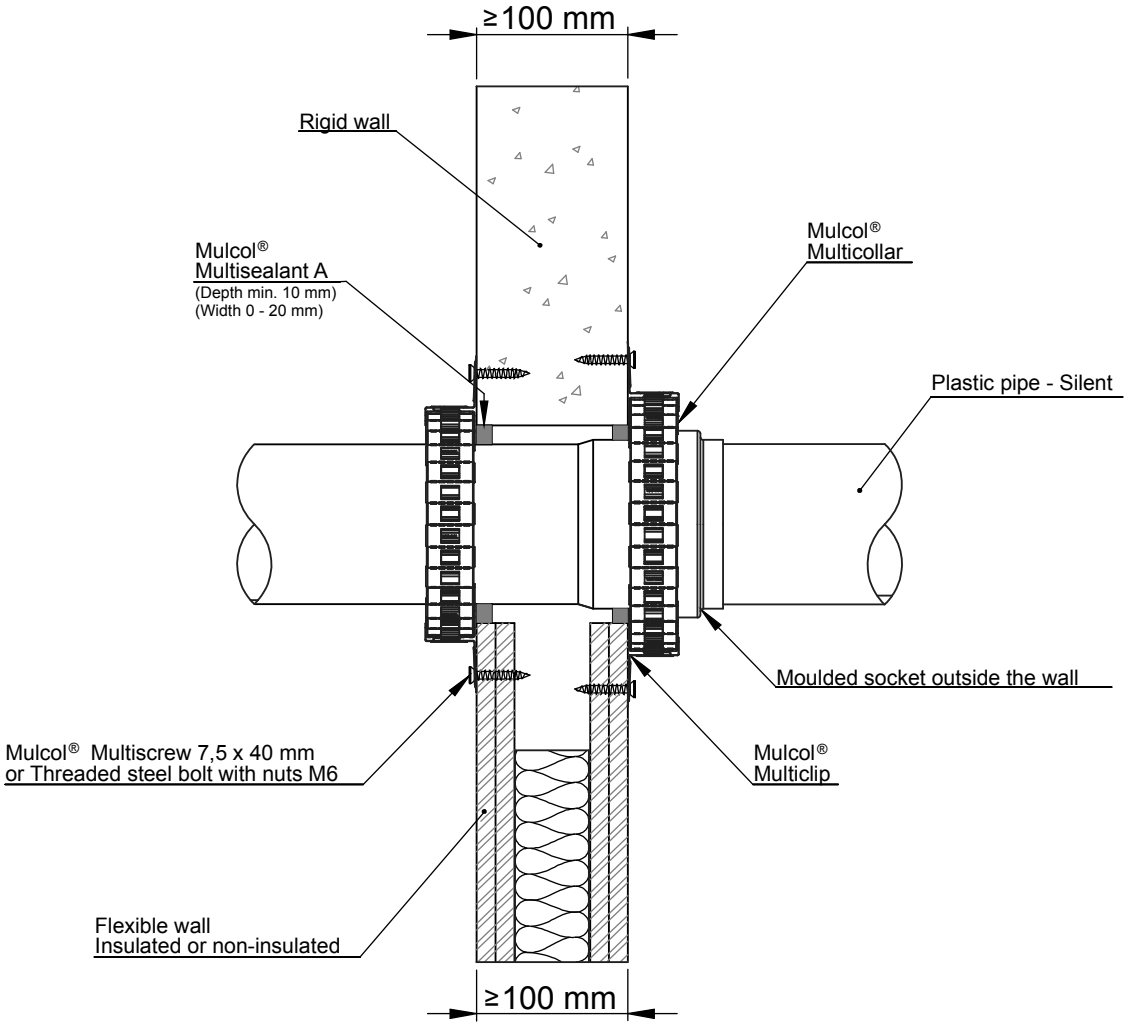
Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PPS-10.0.60
	Unit of measure : mm	Department : Research & Development	A4
	Date : 30-11-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material and coupling (or equal)
Outer diameter	Wall thickness		
≤ 110	2.7	EI 120–U/C E 120–U/C	Raupiano Plus

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Coes PhoNoFire;
- Coestilen BluePower;
- Geberit Silent dB 20 and Geberit Silent PP;
- Girpi Friaphon;
- Marley Silent;
- Pipelife Master 3;
- PhonEX AS;
- Poloplast POLO-KAL NG and Poloplast POLO-KAL 3S;
- Raupiano Plus;
- Skolan dB;
- Valsir Triplus;
- Wavin AS and Wavin SiTech+.

5.3.3 Without insulation with elbow in a U-shape collar

Plastic pipes (silent)

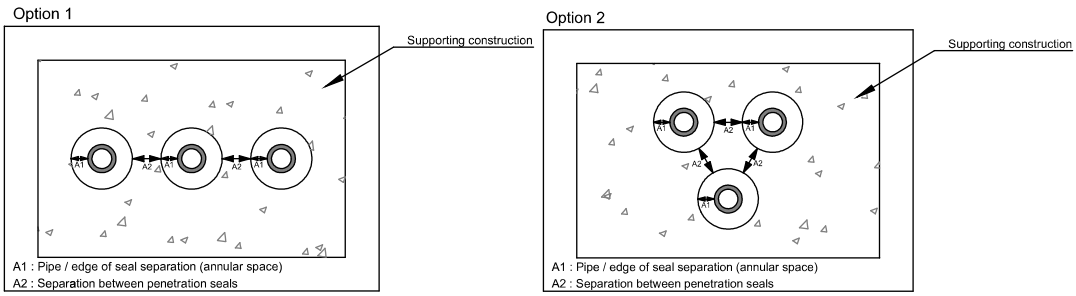
On the next page, drawing FW-PPS-50.0.80 of the pipe penetration seals with plastic pipes (silent) without insulation with elbow is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. On the exposed face, the collar has a U-shape. The length of the U-shape must be at least two times the diameter of the pipes. On the unexposed face, the collar has a circular shape. In Table 5.19 the installation details regarding the field of application are given.

t5.19 Installation details

Distance to first pipe support (unexposed face)	Sound decoupling insulation allowed	Type of elbow allowed	Allowed filling of annular gap (distance A_1, see Figure 47)		Allowed annular space (distance 'a' in drawing)
			Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Wavin SiTech+ Ø110 mm x 45° (type: 3441110004) Geberit Ø110 mm x 45° (type: 310.450.14.1)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 47. The annular gap A_1 is also visible in this Figure.

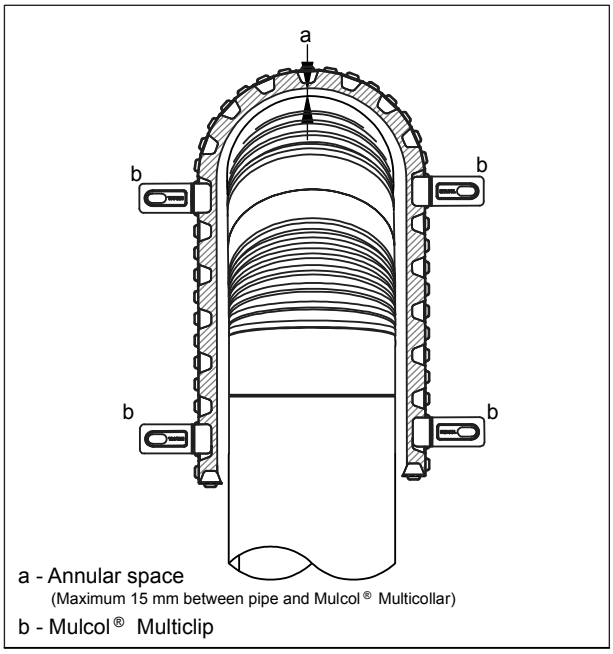
f47 Visualization single penetrations



The fixing of the Mulcol® Multicollar Slim in a U-shape must be done by four Mulcol® Multiclips and may be placed at any orientation.

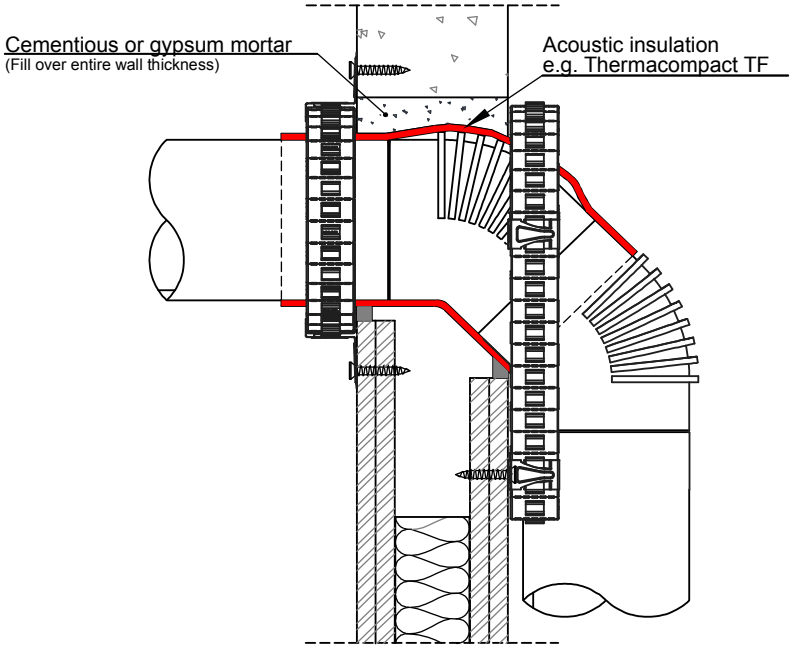
The distance from the wall to the pipe must be ≤ 30 mm (see distance s_2 in the drawing). The metal ends of the U-shape must be folded (see drawing).

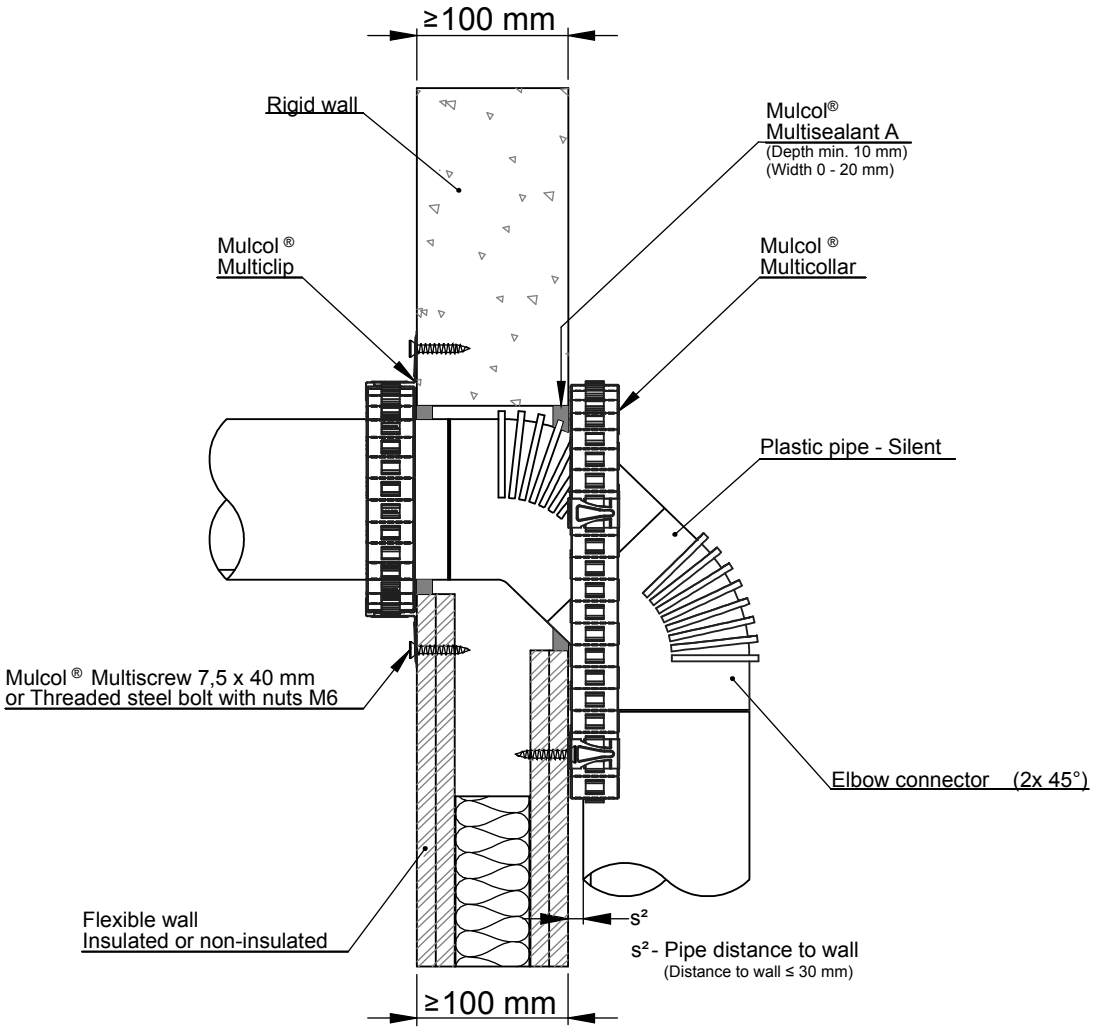
Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PPS-50.0.80
	Unit of measure : mm	Department : Research & Development	A4
	Date : 30-11-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance				
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material and elbow (or equal)
Outer diameter	Wall thickness			
≤ 110	3.6	EI 60–U/U E 60–U/U	EI 60–U/C E 60–U/C	Wavin SiTech+
≤ 110	6.0	EI 90–U/U E 120–U/U	EI 90–U/C E 120–U/C	Geberit Silent dB 20

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Coes PhoNoFire;
- Coestilen BluePower;
- Geberit Silent PP and Geberit Silent dB 20;
- Girpi Friaphon;
- Marley Silent;
- Pipelife Master 3;
- PhonEX AS;
- Poloplast POLO-KAL NG and Poloplast POLO-KAL 3S;
- REHAU Raupiano Plus;
- Skolan dB;
- Valsir Triplus;
- Wavin AS and Wavin SiTech+.

5.3.4 Without insulation in corner (top or bottom)

Plastic pipes (silent)

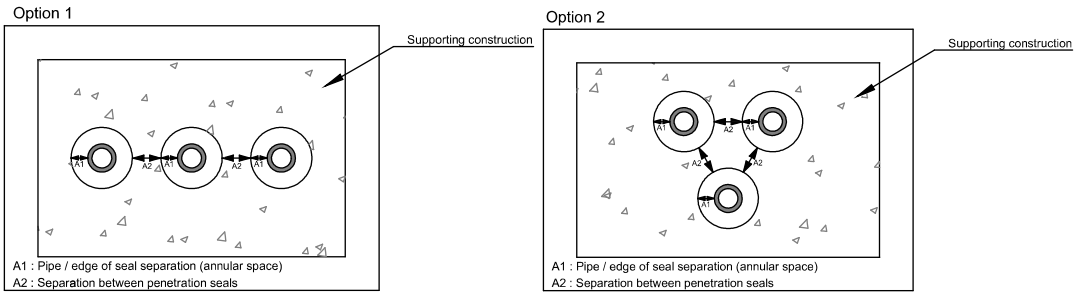
On the next page, drawing FW-PPS-30.0.10 of the pipe penetration seals with plastic pipes (silent) without insulation placed in a corner is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.20 the installation details regarding the field of application are given.

t5.20 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 48) Mulcol® Multisealant A both faces	Allowed distance to element (distance s^1 or s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Bottom not necessary Top ≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

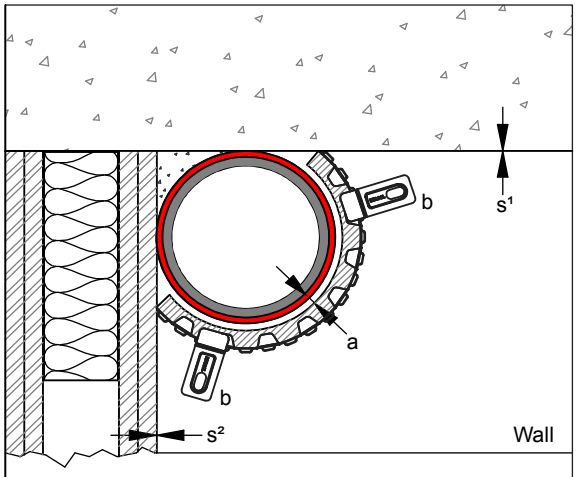
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 48. The annular gap A_1 is also visible in this Figure.

f48 Visualization single penetrations



The fixing of the Mulcol® Multicollar Slim must be done by two Mulcol® Multiclips.

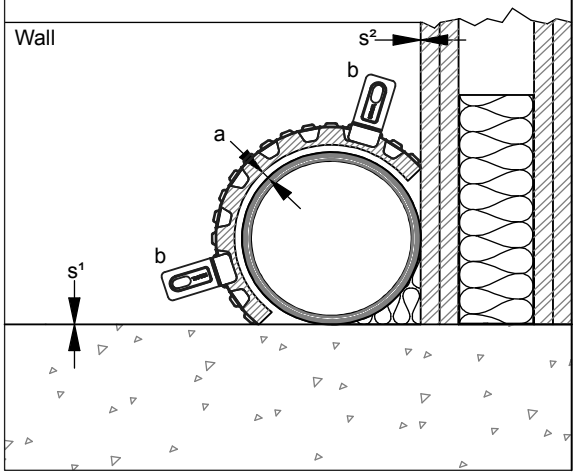
Front view (Top floor)

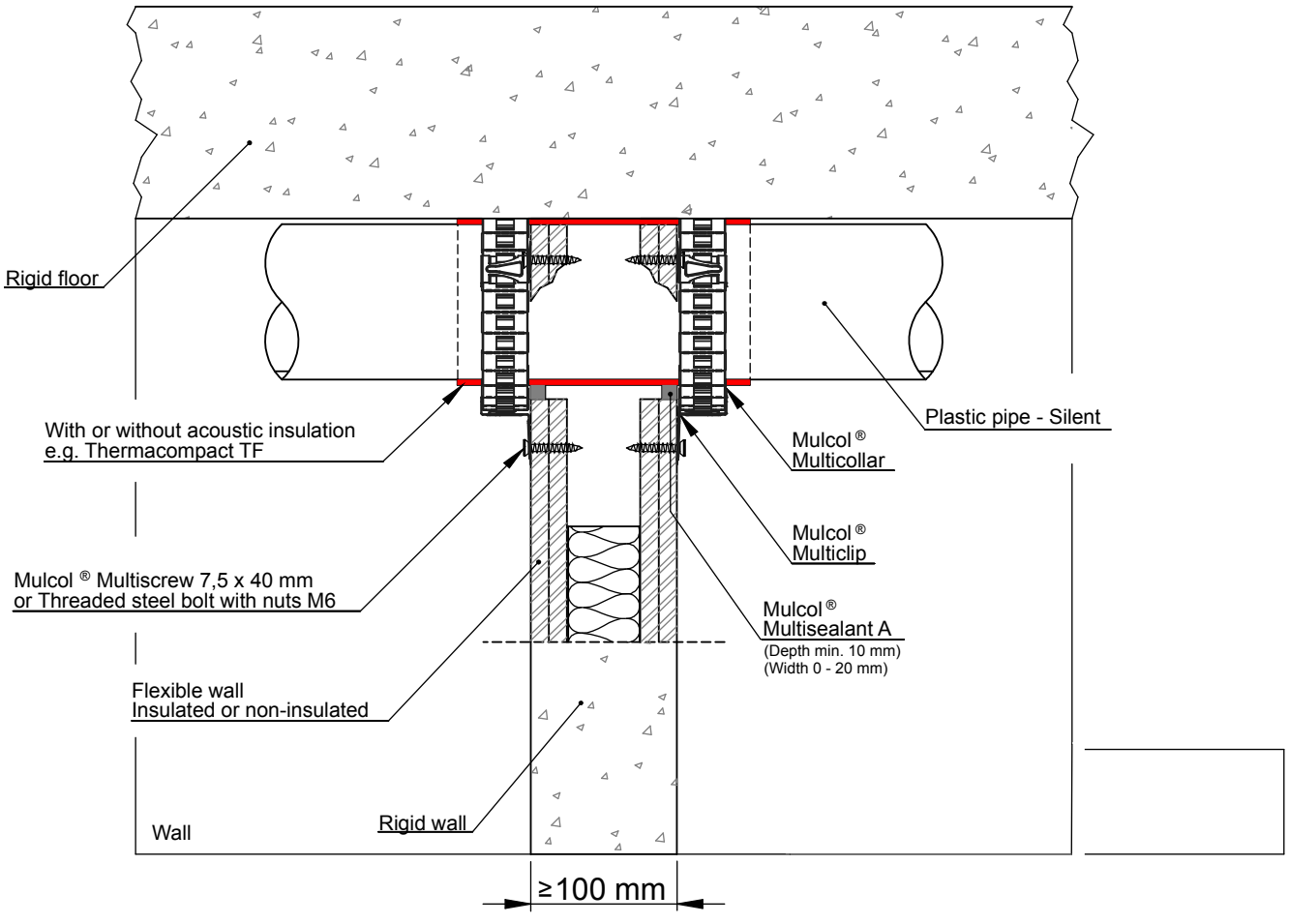


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Pipe distance to top floor
(Distance to top floor ≤ 5 mm)
s²- Pipe distance to wall
(Distance to wall ≤ 5 mm)

Front view (Floor basement)

a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Pipe distance to floor basement
(Distance to floor basement ≤ 5 mm)
s²- Pipe distance to wall
(Distance to wall ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-PPS-30.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 30-11-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Geberit Silent dB 20 (or equal)				
Pipe dimensions (mm)		Performance class with pipe end configuration		Location
Outer diameter	Wall thickness			
≤ 110	6.0	EI 120–U/U E 120–U/U	EI 120–U/C E 120–U/C	Floor (bottom)
≤ 110	6.0	EI 60–U/U E 60–U/U	EI 60–U/C E 60–U/C	Ceiling (top)

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Coes PhoNoFire;
- Coestilen BluePower;
- Geberit Silent PP and Geberit Silent dB 20;
- Girpi Friaphon;
- Marley Silent;
- Pipelife Master 3;
- PhonEX AS;
- Poloplast POLO-KAL NG and Poloplast POLO-KAL 3S;
- REHAU Raupiano Plus;
- Skolan dB;
- Valsir Triplus;
- Wavin AS and Wavin SiTech+.

5.4 PP-R multilayer pipes

In this Chapter the expected fire resistance and field of application of plastic pipes in several different applications is summarized.

5.4.1 Without insulation

PP-R multilayer pipes

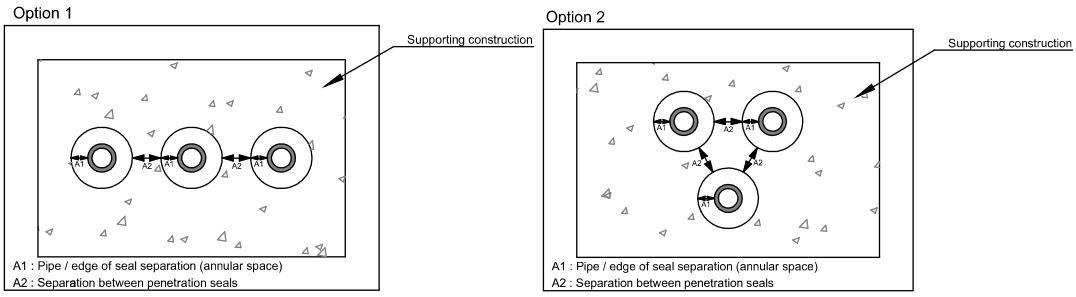
On the next page, drawing FW-MLF-10.0.10 of the pipe penetration seals with PP-R multilayer pipes without insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.21 the installation details regarding the field of application are given.

t5.21 Installation details

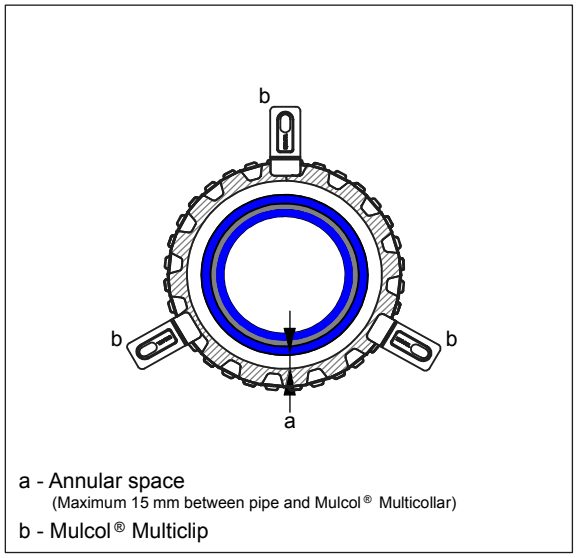
Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 49)		Allowed annular space (distance 'a' in drawing)	
		Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces		
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 49. The annular gap A_1 is also visible in this Figure.

f49 Visualization single penetrations

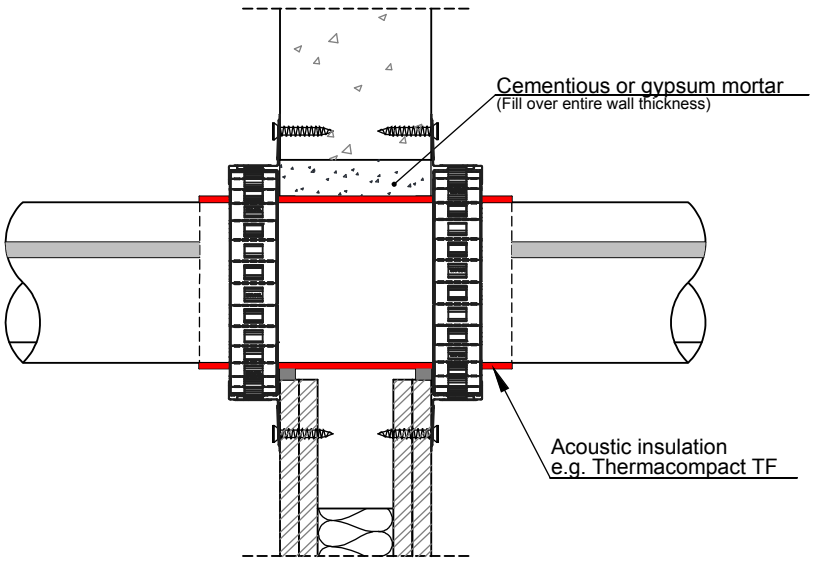


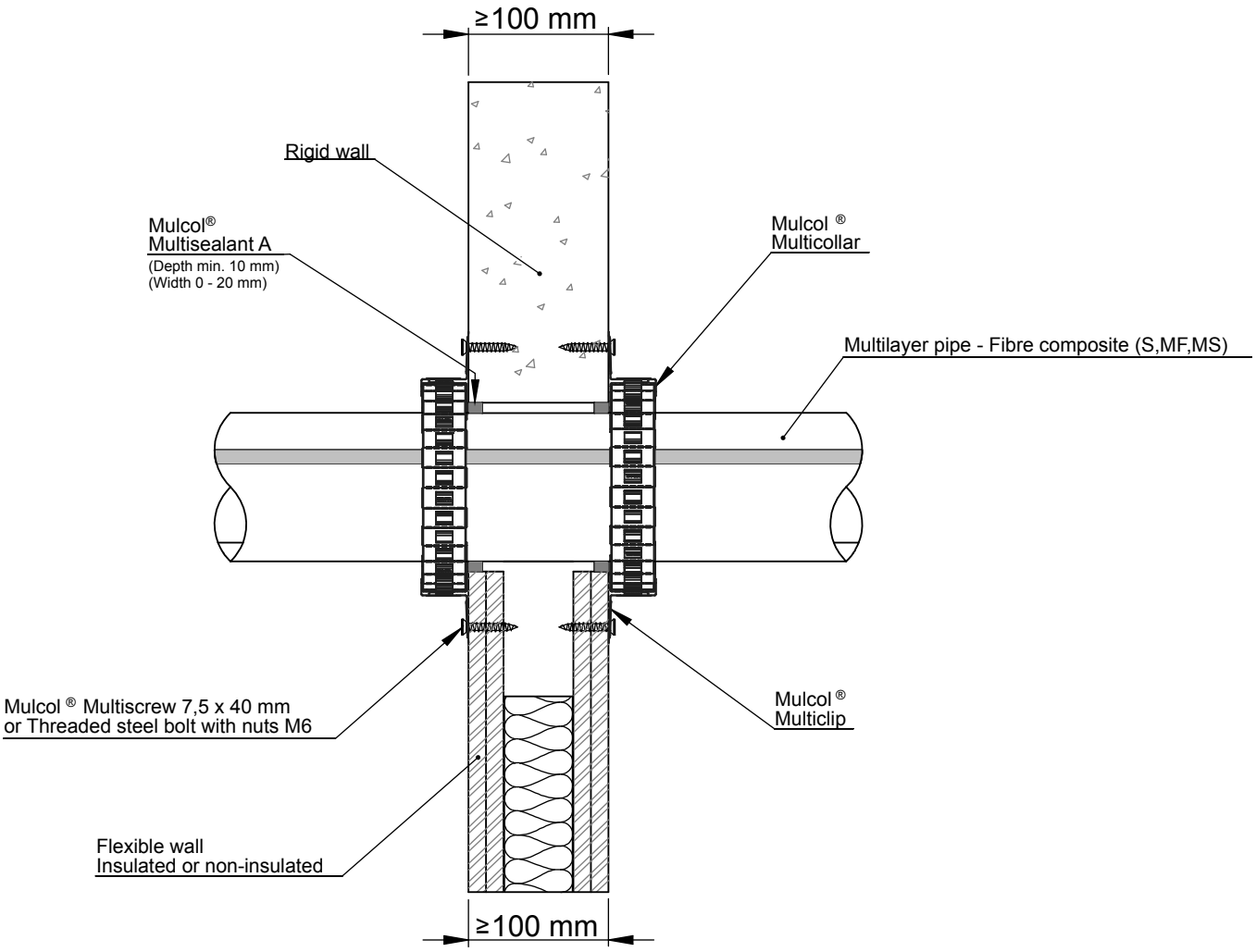
Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 7-10-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

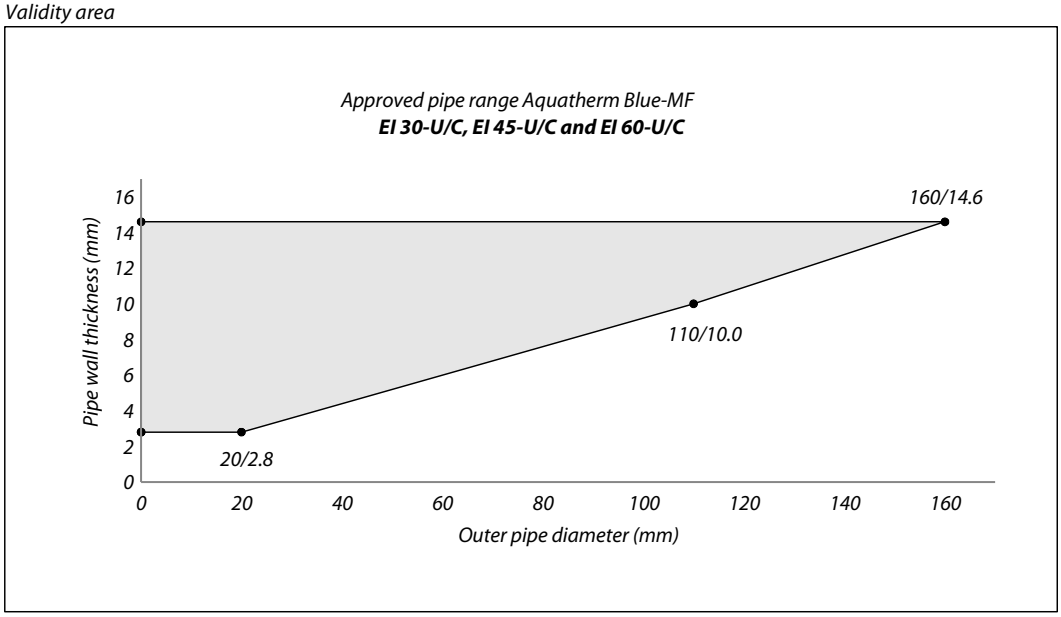
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance PP-R multilayer				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)	See Figure
Outer diameter	Wall thickness			
≤ 20	2.8	EI 90–U/C E 90–U/C	Aquatherm Blue-MF	50 and 51
≤ 110	10.0	EI 60–U/C E 60–U/C	Aquatherm Blue-MF	
≤ 160	14.6	EI 90–U/C E 90–U/C	Aquatherm Blue-MF	
≤ 110	15.1	EI 90–U/C E 90–U/C	Aquatherm Red-MF	N.a.

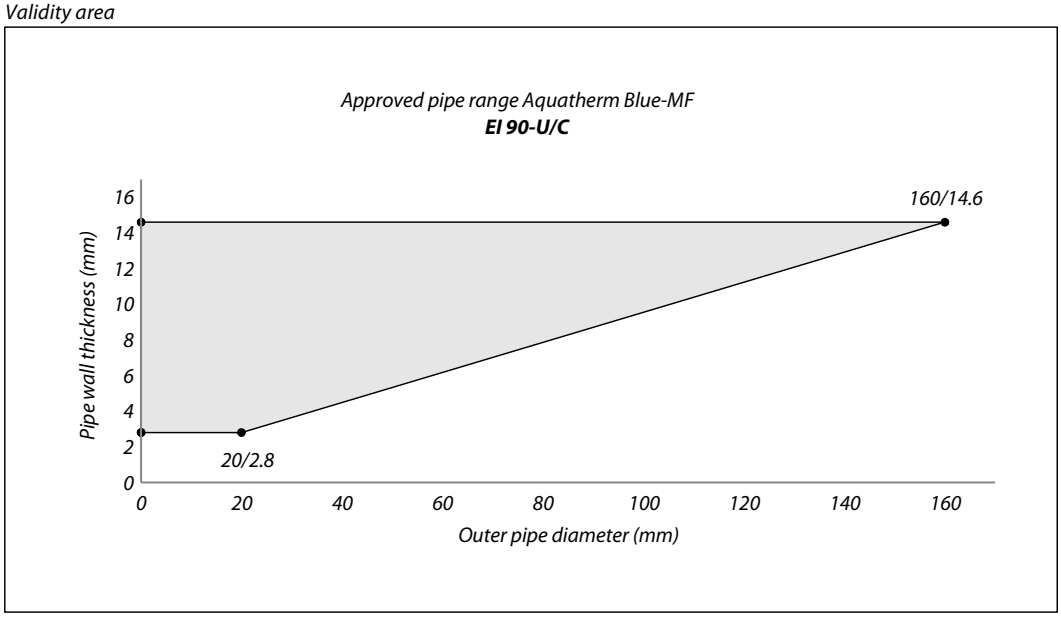
Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-S, Aquatherm Blue-M, Aquatherm Green-MF, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Red-MF Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

f50 Validity area



f51 Validity area



5.4.2 Without insulation at a zero distance to a floor

PP-R multilayer pipes

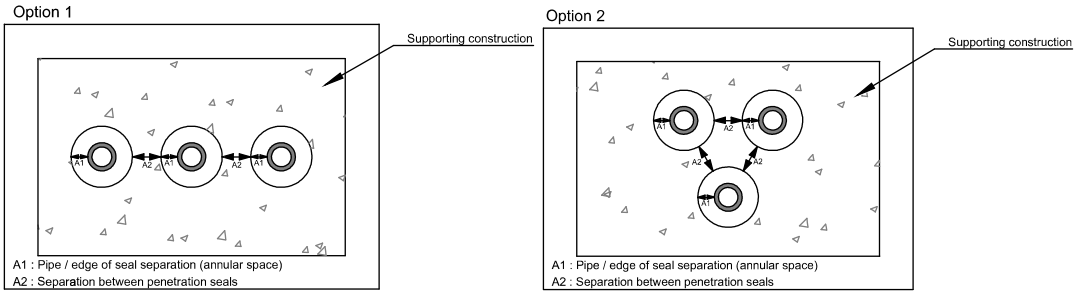
On the next page, drawing FW-MLF-40.0.10 of the pipe penetration seals with PP-R multilayer pipes without insulation placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.22 the installation details regarding the field of application are given.

t5.22 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 52) Mulcol® Multisealant A both faces	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 50 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 52. The annular gap A_1 is also visible in this Figure.

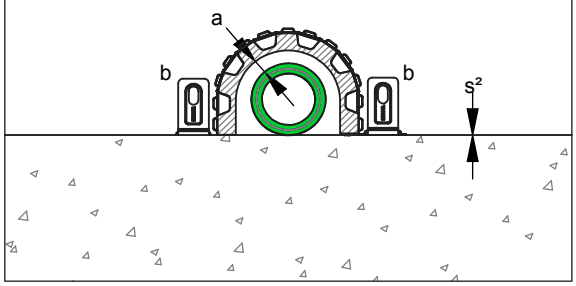
f52 Visualization single penetrations



The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-MLF-40.0.10.

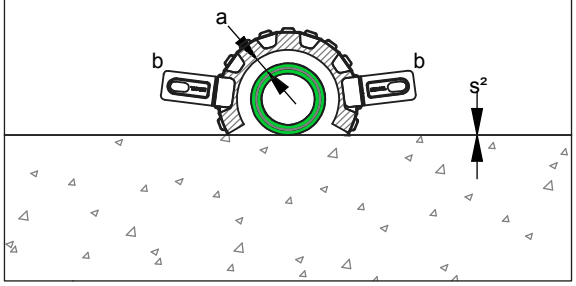
Front view

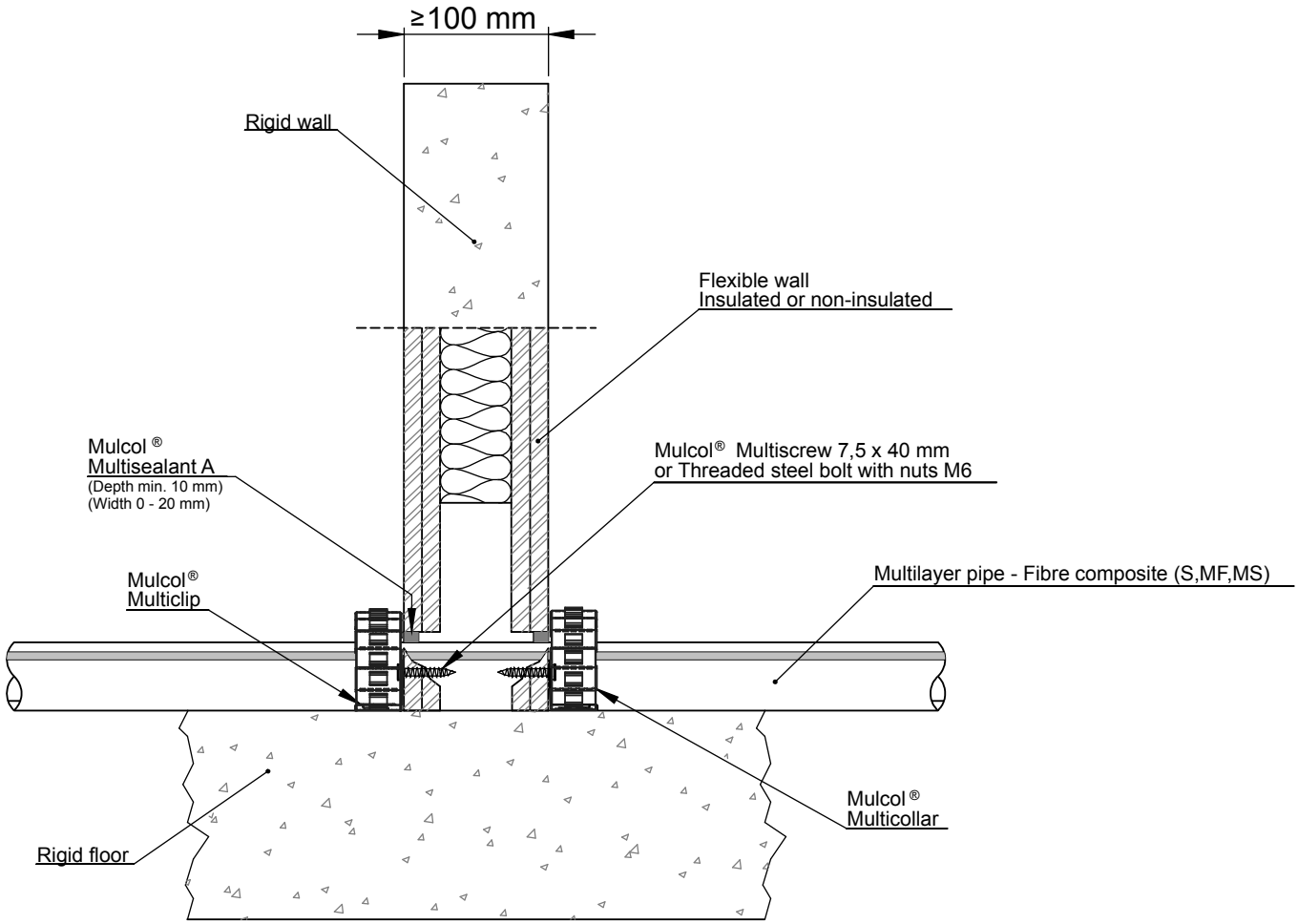
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-40.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-9-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Aquatherm Green-MF (or equal)		
Pipe dimensions (mm)		Performance class with pipe end configuration
Outer diameter	Wall thickness	
≤ 50	6.9	EI 90–U/C E 90–U/C

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-MF, Aquatherm Green-MS, Aquatherm Green-MF, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

5.4.3 Without insulation with elbow

PP-R multilayer pipes

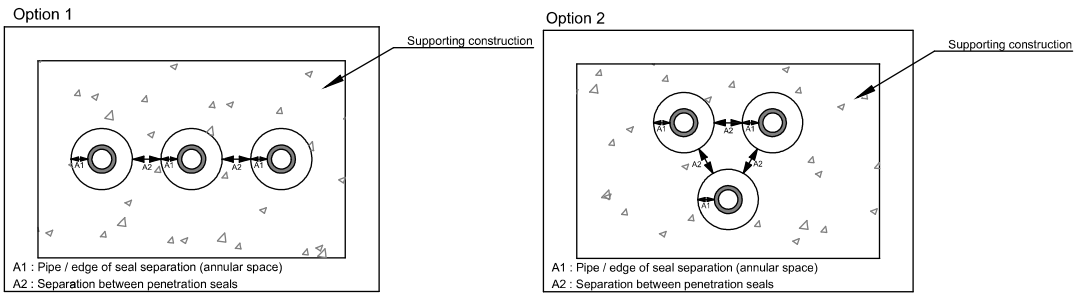
On the next page, drawing FW-MLF-10.0.70 of the pipe penetration seals with PP-R multilayer pipes without insulation with elbow is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.23 the installation details regarding the field of application are given.

t5.23 Installation details

Distance to first pipe support (unexposed face)	Sound decoupling insulation allowed	Type of elbow allowed	Allowed filling of annular gap (distance A_1, see Figure 53)		Allowed annular space (distance 'a' in drawing)
			Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	
≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Aquatherm PP-R Ø110 x 90°	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 110 mm / 'a' ≤ 15 mm

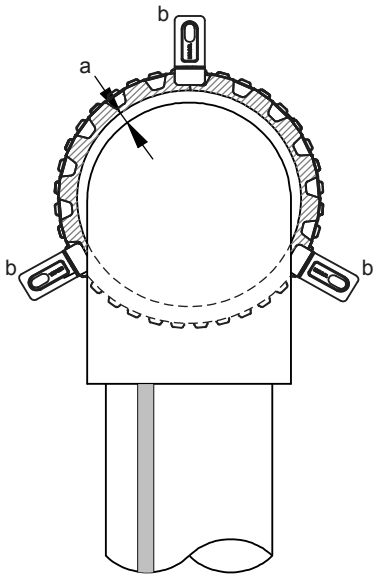
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 53. The annular gap A_1 is also visible in this Figure.

f53 Visualization single penetrations

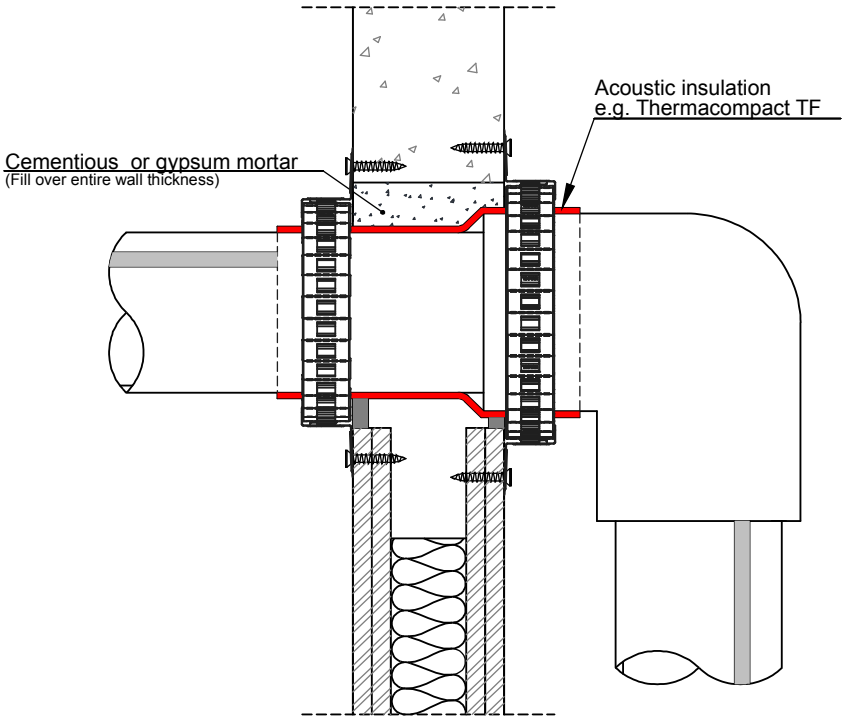


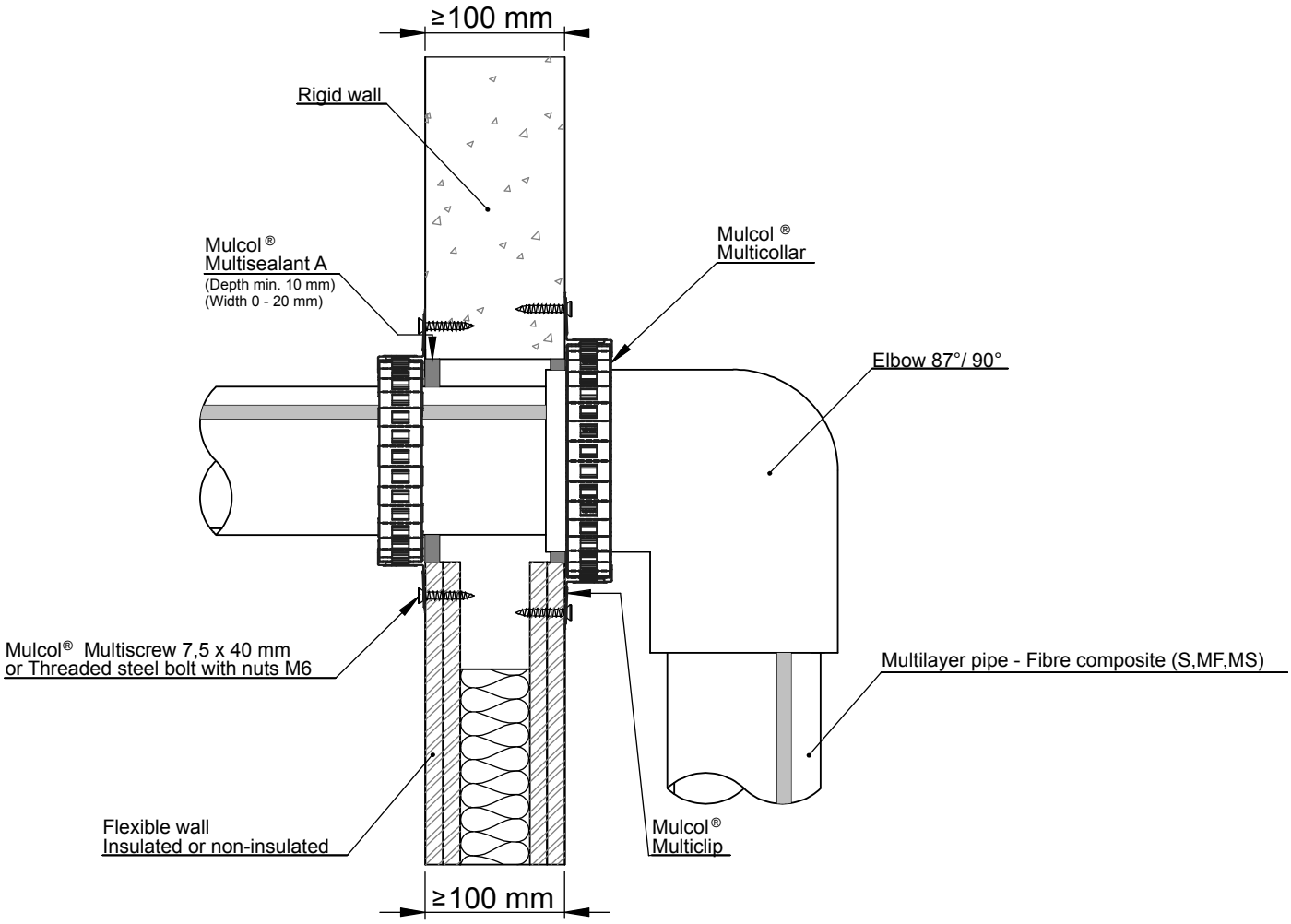
Front view

a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip



Side view





American projection	Scale	: 1:5	Company : Mulcol International B.V.	FW-MLF-10.0.70
	Unit of measure	: mm	Department : Research & Development	
	Date	: 2-12-2016	Draftsman : K.J.	A4

MULCOL
FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material and elbow (or equal)
Outer diameter	Wall thickness		
≤ 110	10.0	EI 90–U/C E 120–U/C	Aquatherm Blue-MF and elbow PP-R

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-S, Aquatherm Blue-MF, Aquatherm Red-MF, Aquatherm Green-MF, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

5.4.4 Without insulation through a seal penetration system

PP-R multilayer pipes

On the next page, drawing PBfw-MLF-10.0.10 of the pipe penetration seals with plastic PP-R multilayer pipes without insulation through a seal penetration system is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.24 the installation details regarding the field of application are given.

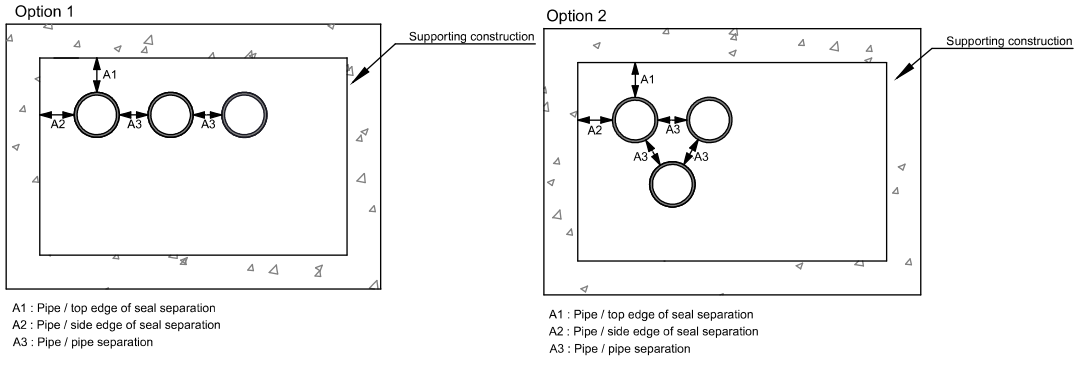
For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

t5.24 Installation details

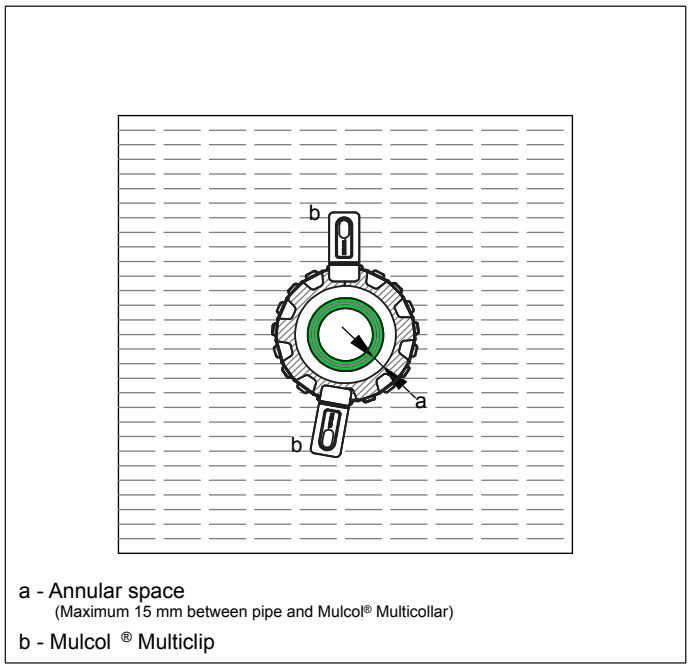
Distance to first pipe support (both faces)	Distance between pipes (A_1 to A_3, see Figure 54	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 50 mm / 'a' ≤ 15 mm

If more pipe penetrations are placed in the penetration seal system, the minimum distance between the pipes is 100 mm, see Figure 54 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory).

f54 Visualization distance between pipes



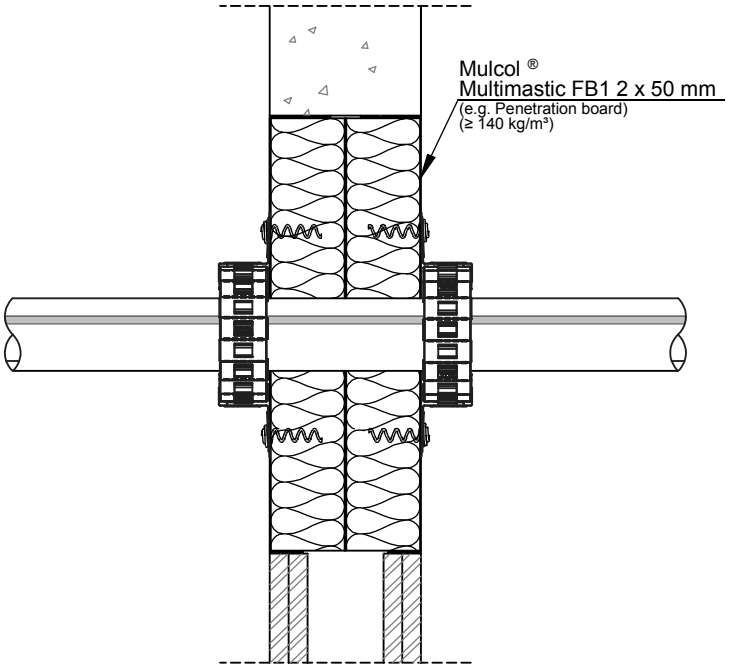
Front view

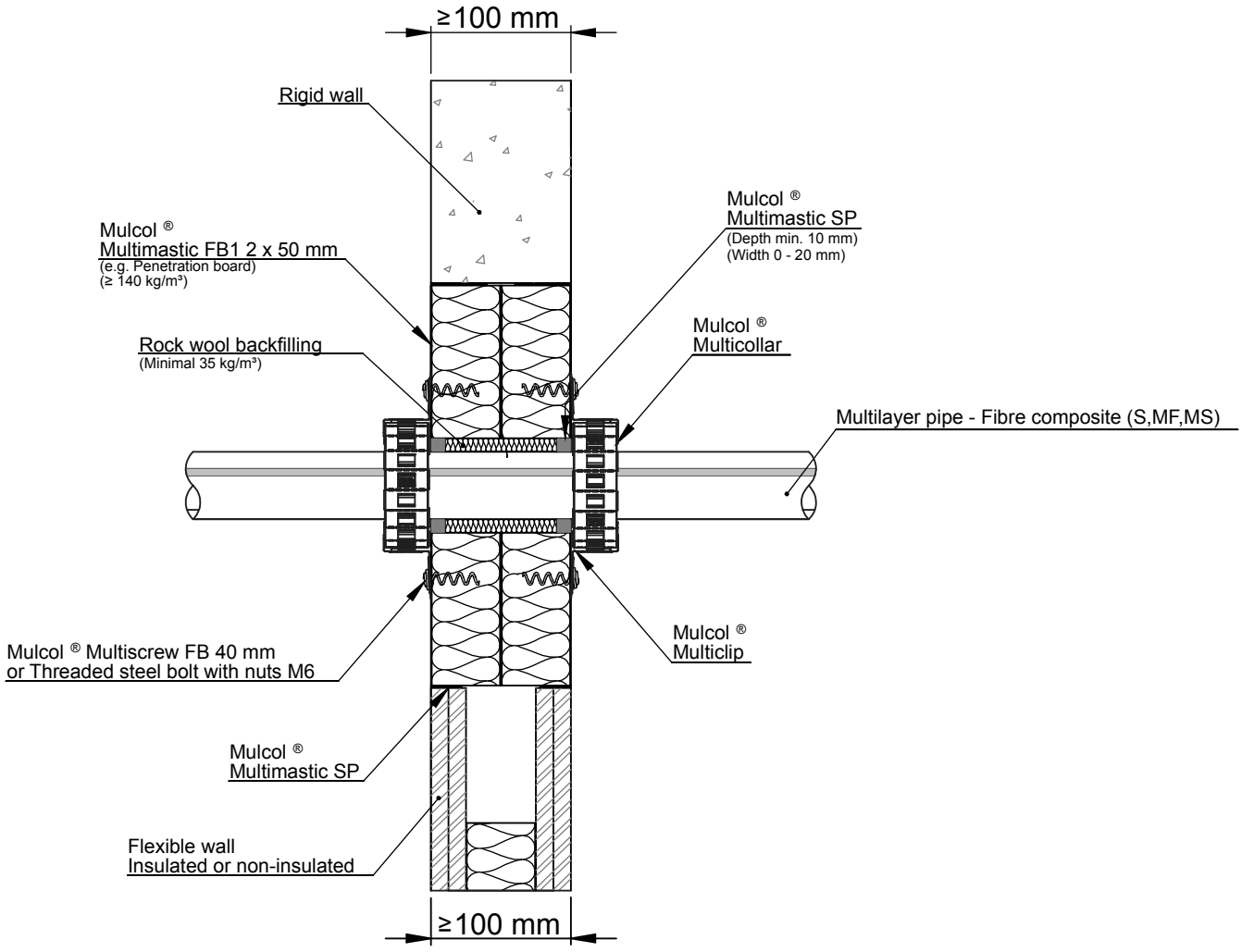


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLF-10.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 21-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

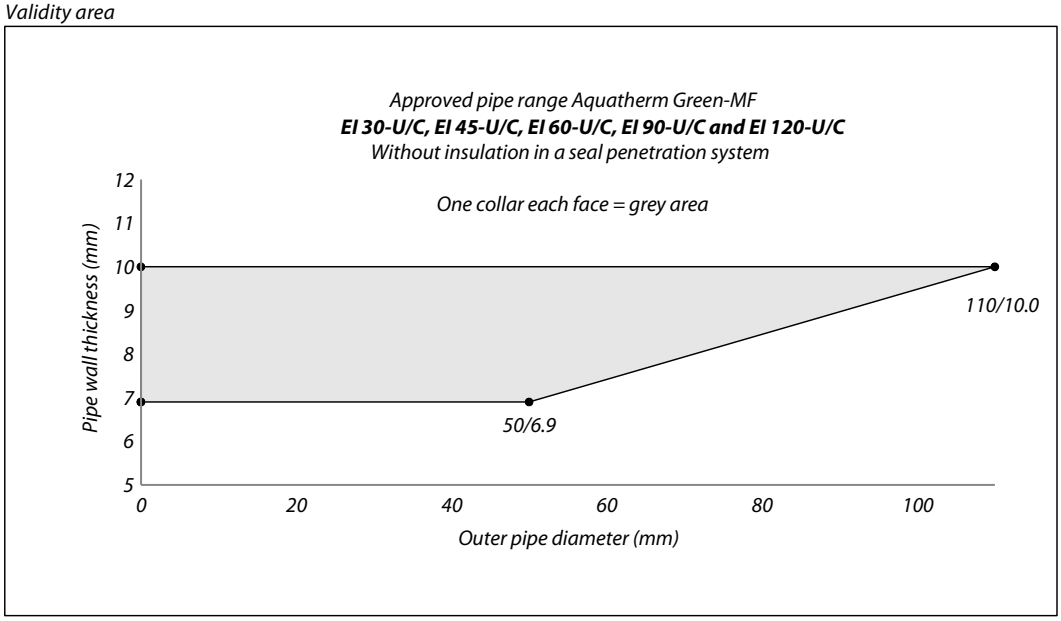
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)	See Figure
Outer diameter	Wall thickness			
≤ 50	6.9	EI 120–U/C E 120–U/C	Aquatherm Green-MF	55
≤ 110	10.0	EI 120–U/C* E 120–U/C*	Aquatherm Green-MF	

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-MF, Aquatherm Green-MF, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

f55 Validity area



5.4.5 With elastomeric thermal insulation (LS, CS, LI or CI)

PP-R multilayer pipes

On the next page, drawing FW-MLF-10.0.22 of the pipe penetration seals with PP-R multilayer pipes with elastomeric thermal is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.25 the installation details regarding the field of application are given.

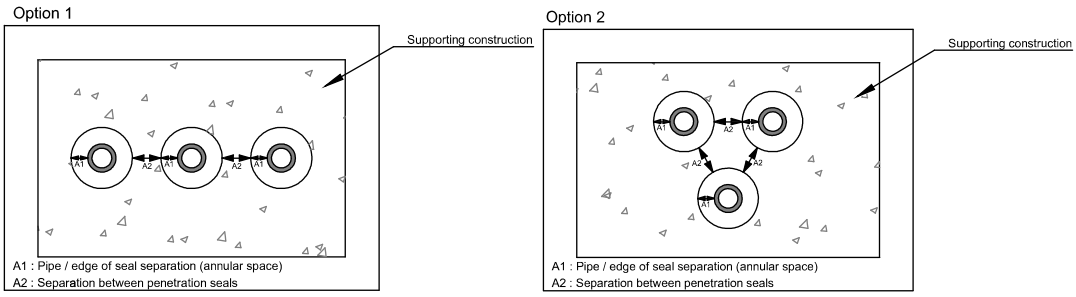
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 500 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.25 Installation details

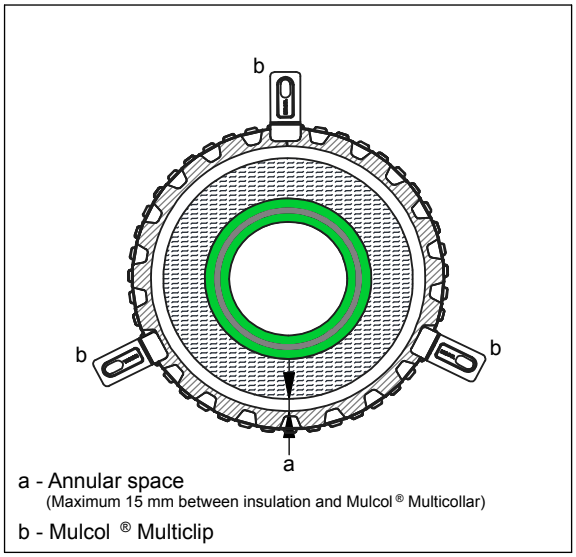
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 56) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 56. The annular gap A_1 is also visible in this Figure.

f56 Visualization single penetrations

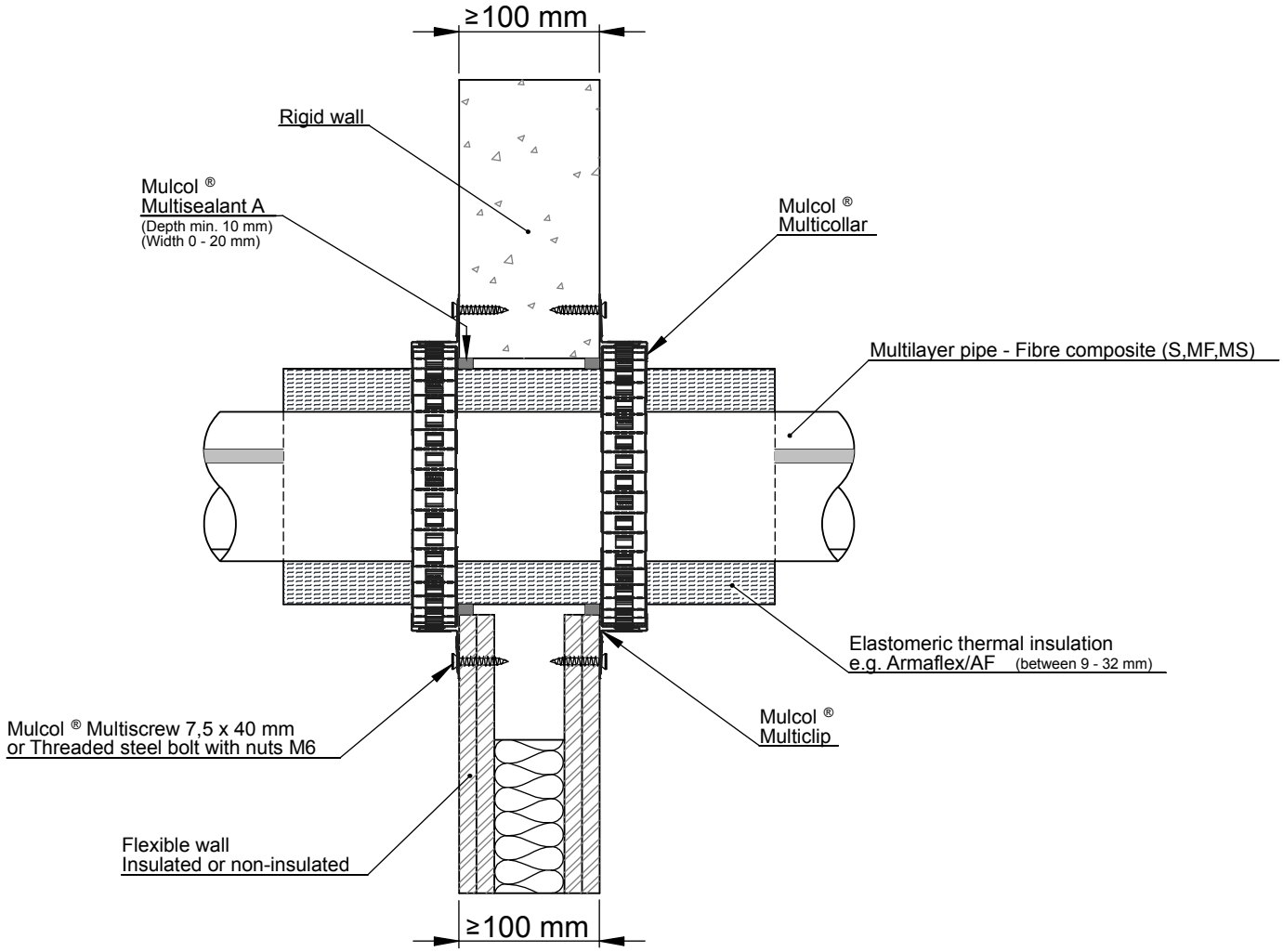


Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol ® Multicollar)

b - Mulcol ® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-10.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 22-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance				
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)	See Figure
Outer diameter	Wall thickness			
Aquatherm Green-S (or equal)				
≤ 110	18.3	EI 90–U/C* E 90–U/C*	9* to 32	57
Aquatherm Green-MS (or equal)				
≤ 110	15.2	EI 90–U/C E 90–U/C	9* to 32	57
Aquatherm Green-MF (or equal)				
≤ 110	15.1	EI 90–U/C E 90–U/C	9* to 32	57
Aquatherm Blue-MF (or equal)				
≤ 20	2.8	EI 120–U/C E 120–U/C	9* to 32	57
≤ 110	10.0	EI 90–U/C E 120–U/C	9	57
≤ 110	10.0	EI 60–U/C E 60–U/C	9 to 32	57

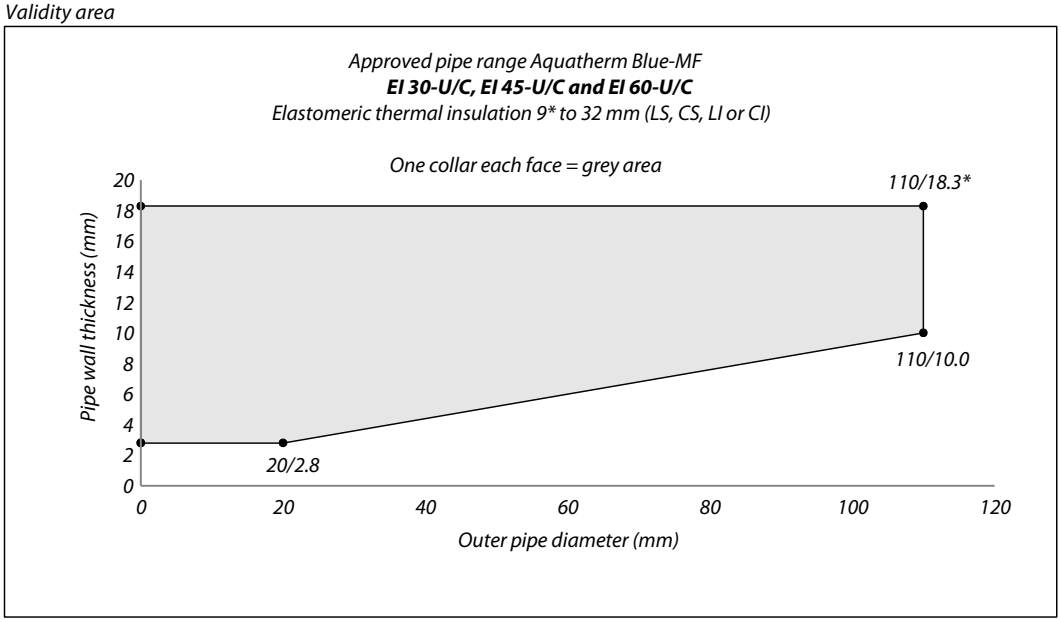
Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-S, Aquatherm Green-S, Aquatherm Green-MS, Aquatherm Green-MF, Aquatherm Blue-MF, Aquatherm Red-MF, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

f57 *Validity area*



5.4.6 With elastomeric thermal insulation (LI or CI)

PP-R multilayer pipes

On the next page, drawing FW-MLF-10.0.22 of the pipe penetration seals with PP-R multilayer pipes with elastomeric thermal is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.26 the installation details regarding the field of application are given.

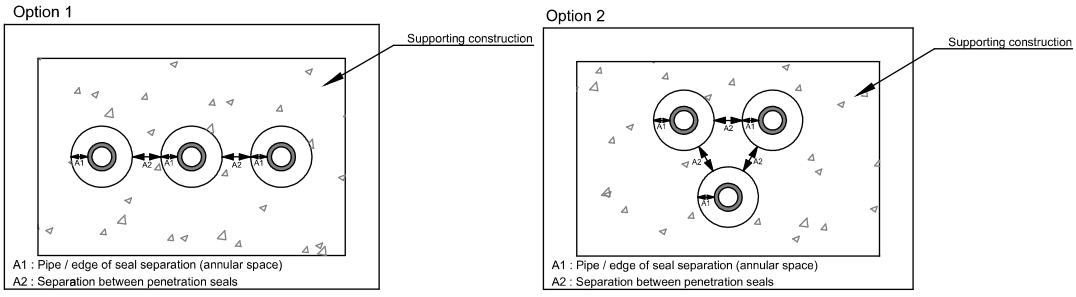
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3 or, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be applied interrupted at the seal with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LI in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CI).

t5.26 Installation details

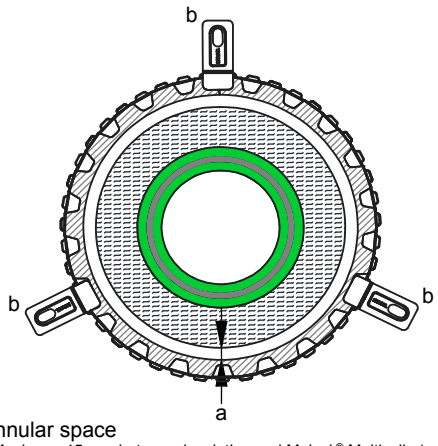
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 58) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 58. The annular gap A_1 is also visible in this Figure. The distance between the flexible elastomeric EPDM rubber foam will therefore be ≥ 36 mm.

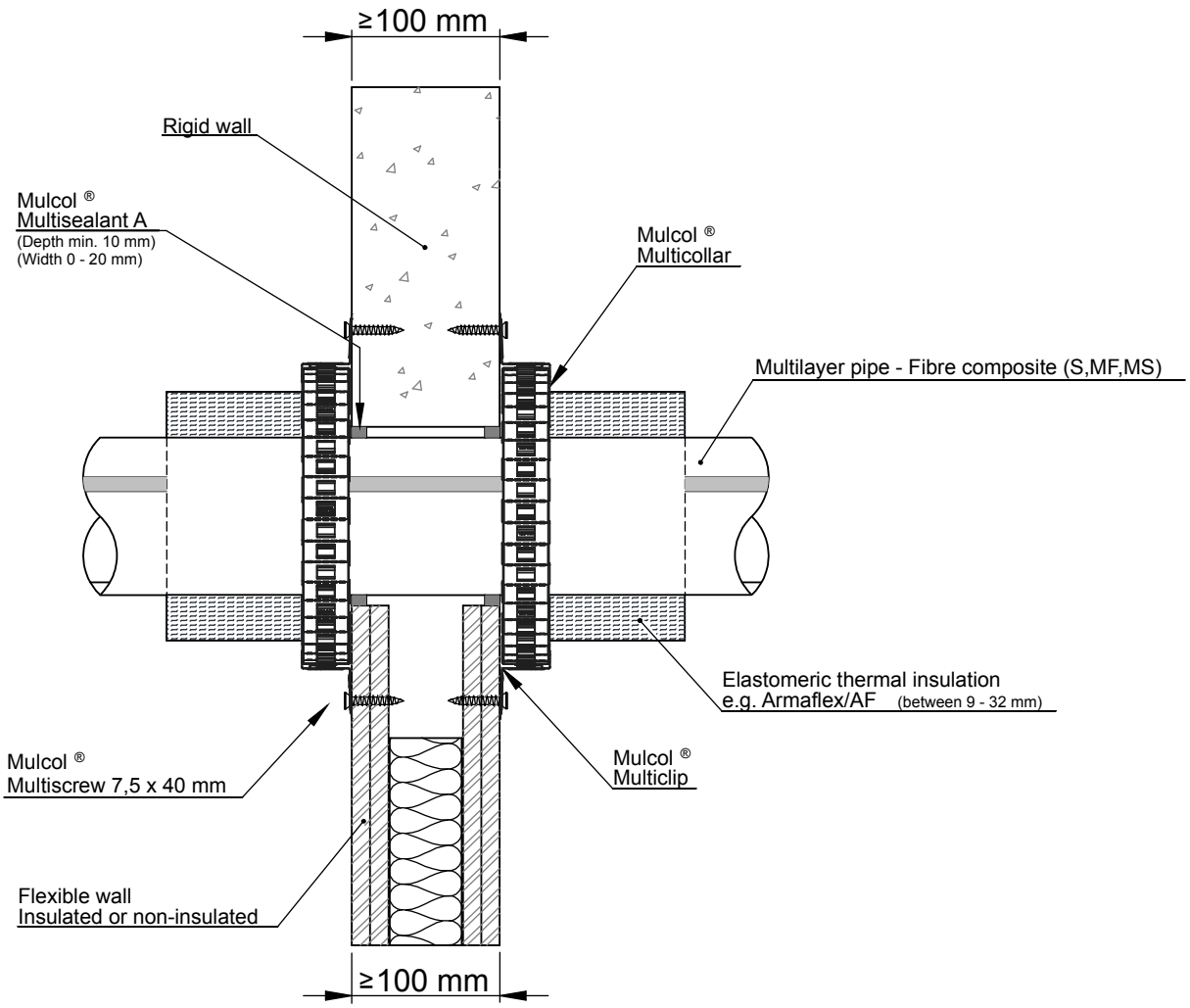
f58 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol ® Multicollar)
b - Mulcol ® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-10.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 25-1-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance				
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)	See Figure
Outer diameter	Wall thickness			
Aquatherm Blue-MF				
≤ 110	10.0	EI 90–U/C E 90–U/C	9* to 32	59
≤ 110	10.0	EI 120–U/C E 120–U/C	32	60
≤ 160	14.6	EI 90–U/C E 90–U/C	9* to 32	59
≤ 160	14.6	EI 120–U/C E 120–U/C	32	60

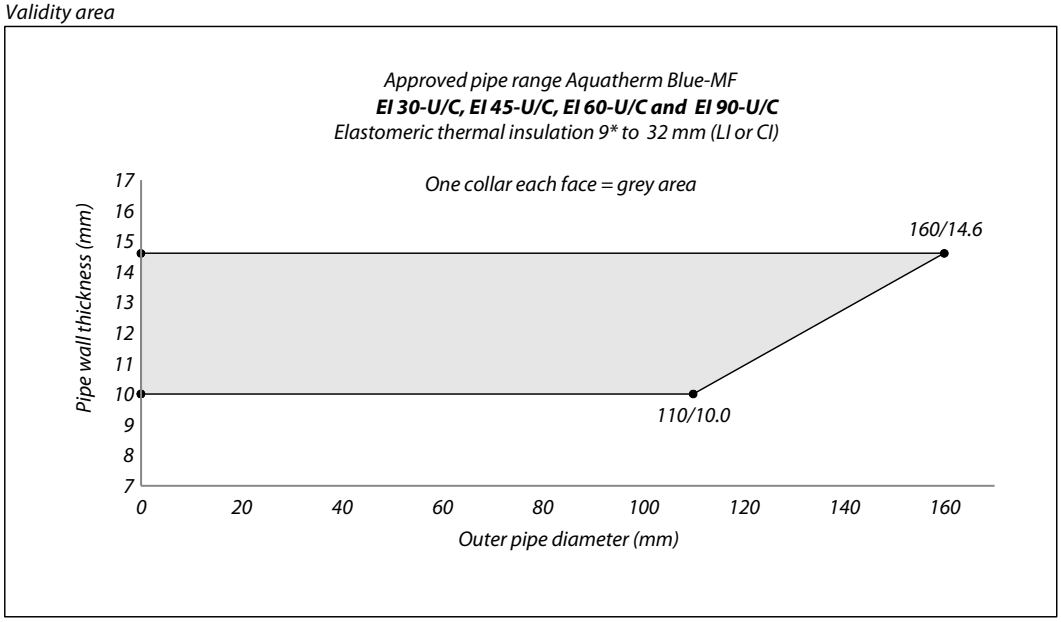
Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-S, Aquatherm Blue-MF, Aquatherm Red-MF, Aquatherm Green-MF, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

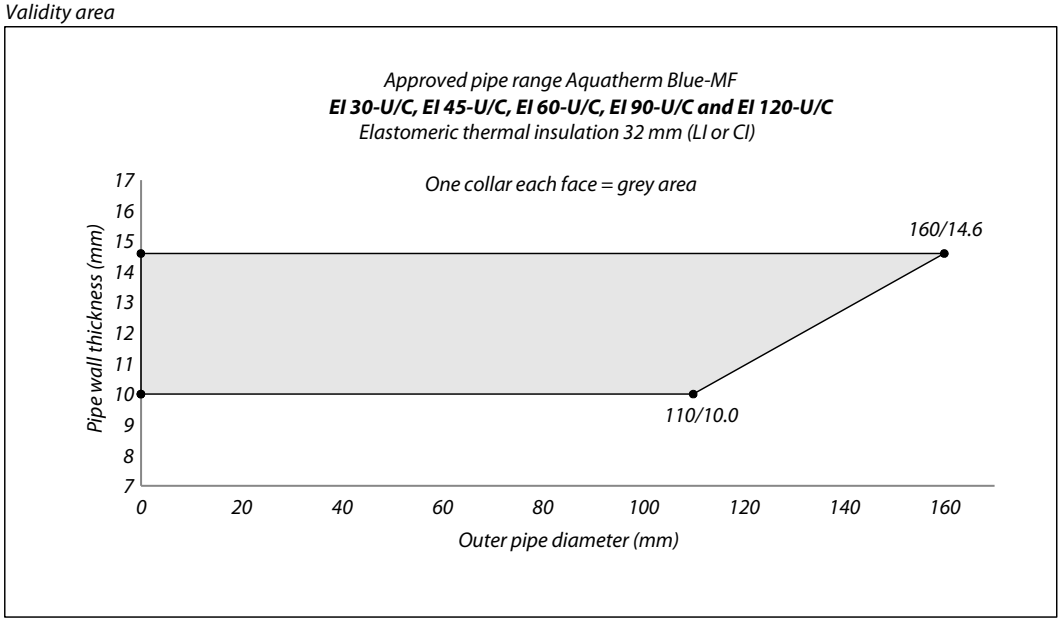
Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

f59 *Validity area*



f60 *Validity area*



5.4.7 With elastomeric thermal insulation through a seal system (LI or CI)

PP-R multilayer pipes

On the next page, drawing PBfw-MLF-10.0.22 of the pipe penetration seals with plastic PP-R multilayer pipes with elastomeric thermal insulation through a seal penetration system is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.27 the installation details regarding the field of application are given.

For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

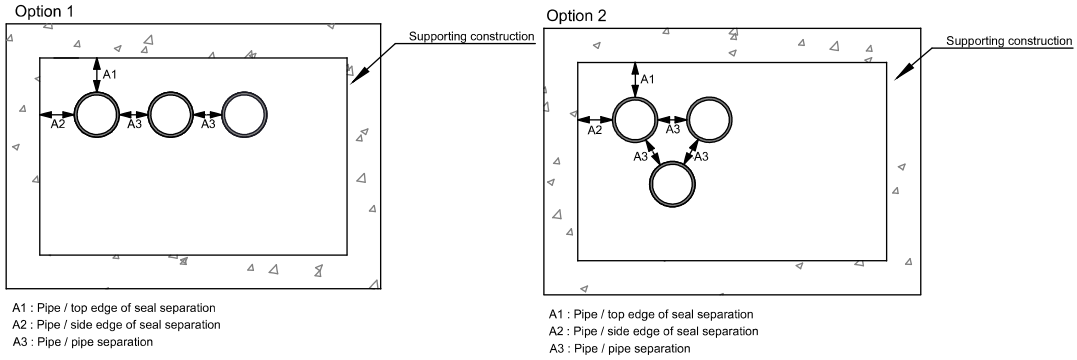
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3 or, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be applied interrupted at the seal with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LI in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CI).

t5.27 Installation details

Distance to first pipe support (both faces)	Distance between pipes (A_1 to A_3, see Figure 61)	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 50 mm / 'a' ≤ 114 mm

If more pipe penetrations are placed in the penetration seal system, the minimum distance between the pipes is 100 mm, see Figure 61 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory). The distance between the flexible elastomeric EPDM rubber foam will therefore be ≥ 36 mm.

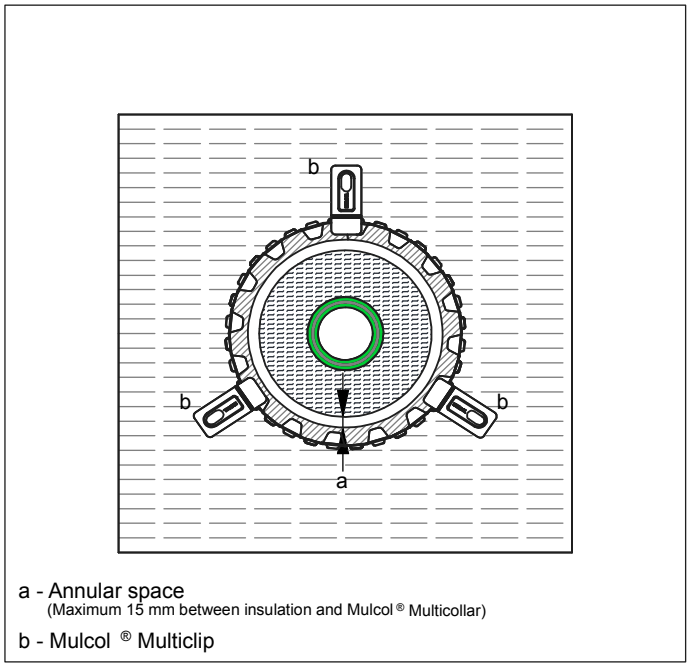
f61 Visualization distance between pipes



A1 : Pipe / top edge of seal separation
A2 : Pipe / side edge of seal separation
A3 : Pipe / pipe separation

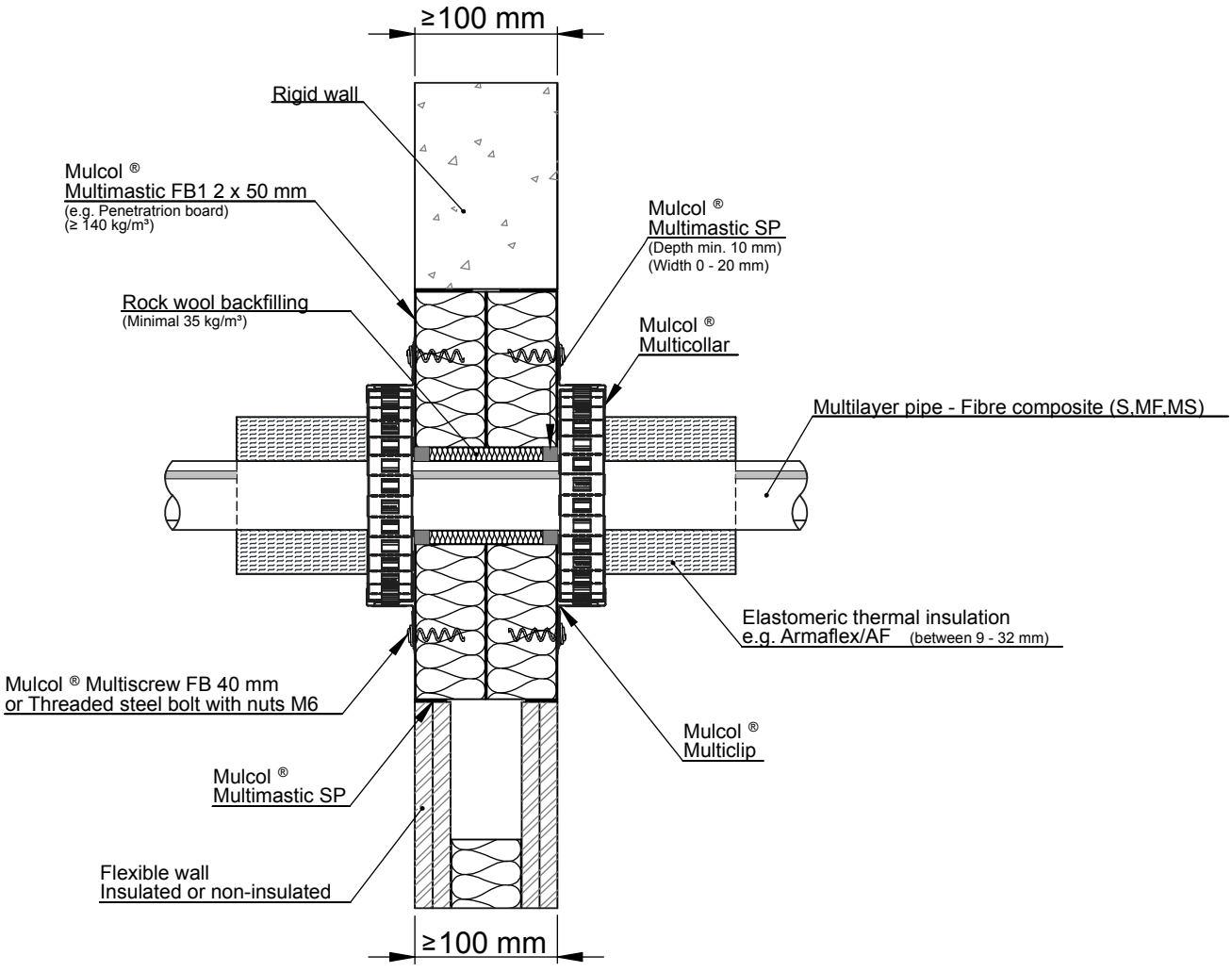
A1 : Pipe / top edge of seal separation
A2 : Pipe / side edge of seal separation
A3 : Pipe / pipe separation

Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol ® Multicollar)

b - Mulcol ® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLF-10.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 21-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Aquatherm Green-MF (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 50	6.9	EI 120–U/C E 120–U/C	9* to 32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-MF, Aquatherm Green-MS, Aquatherm Green-MF, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.4.8 With elastomeric thermal insulation at a zero distance to a floor

PP-R multilayer pipes

On the next page, drawing FW-MLF-40.0.22 of the pipe penetration seals with PP-R multilayer pipes with elastomeric thermal insulation placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.28 the installation details regarding the field of application are given.

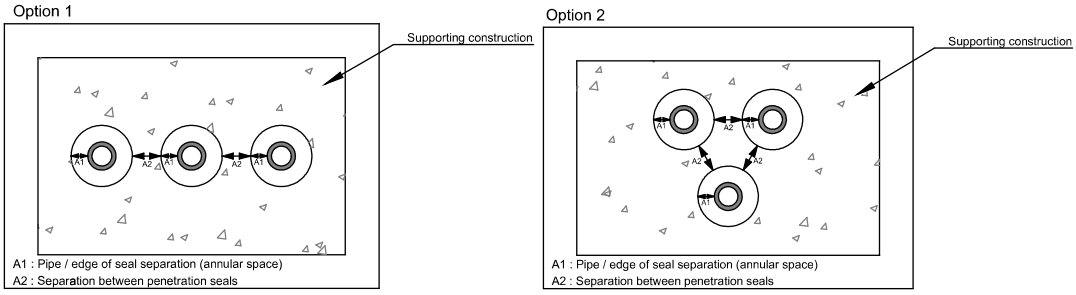
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.28 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 62) Mulcol® Multisealant A both faces	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 114 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 62. The annular gap A_1 is also visible in this Figure.

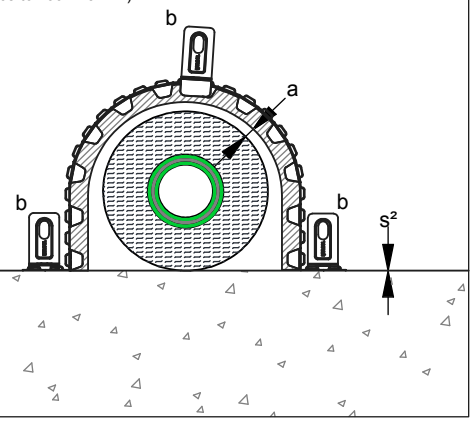
f62 Visualization single penetrations



The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-MLF-40.0.22.

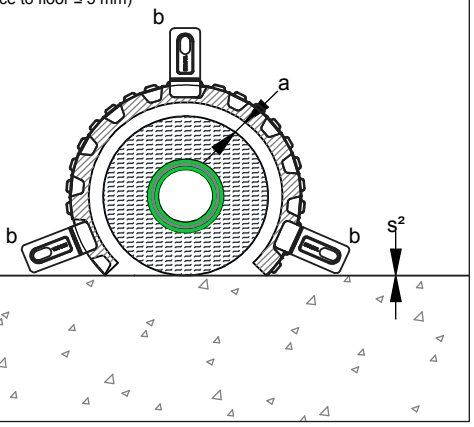
Front view

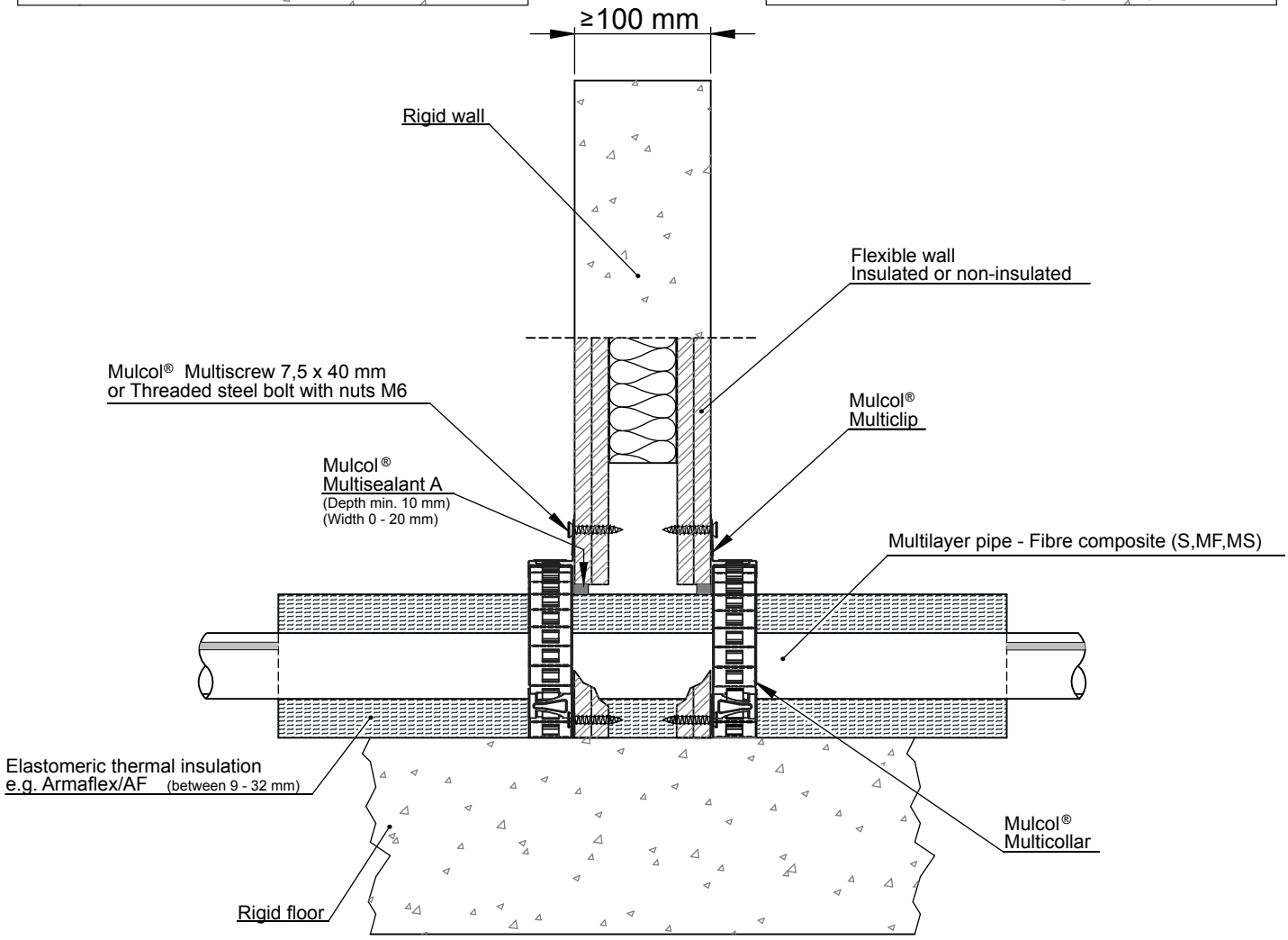
a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-40.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-9-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Aquatherm Green-MF			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 50	6.9	EI 90–U/C E 90–U/C	9 to 32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-MF, Aquatherm Green-MS, Aquatherm Green-MF, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.4.9 With insulation metal half supporting shell

PP-R multilayer pipes

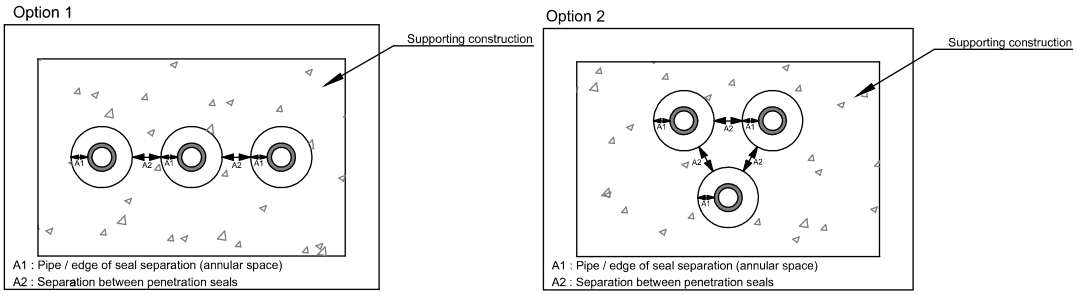
On the next page, drawing FW-MLF-10.0.50 of the pipe penetration seals with PP-R multilayer pipes with metal half supporting shell is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.29 the installation details regarding the field of application are given.

t5.29 Installation details

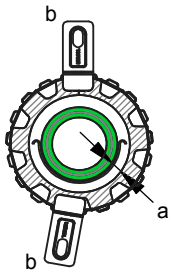
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 63) Mulcol® Multisealant A both faces	Thickness and installation length metal half shell	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Thickness ≤ 0.5 mm applied sustained and continued (CS)	Outer diameter ≤ 50 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 63. The annular gap A_1 is also visible in this Figure.

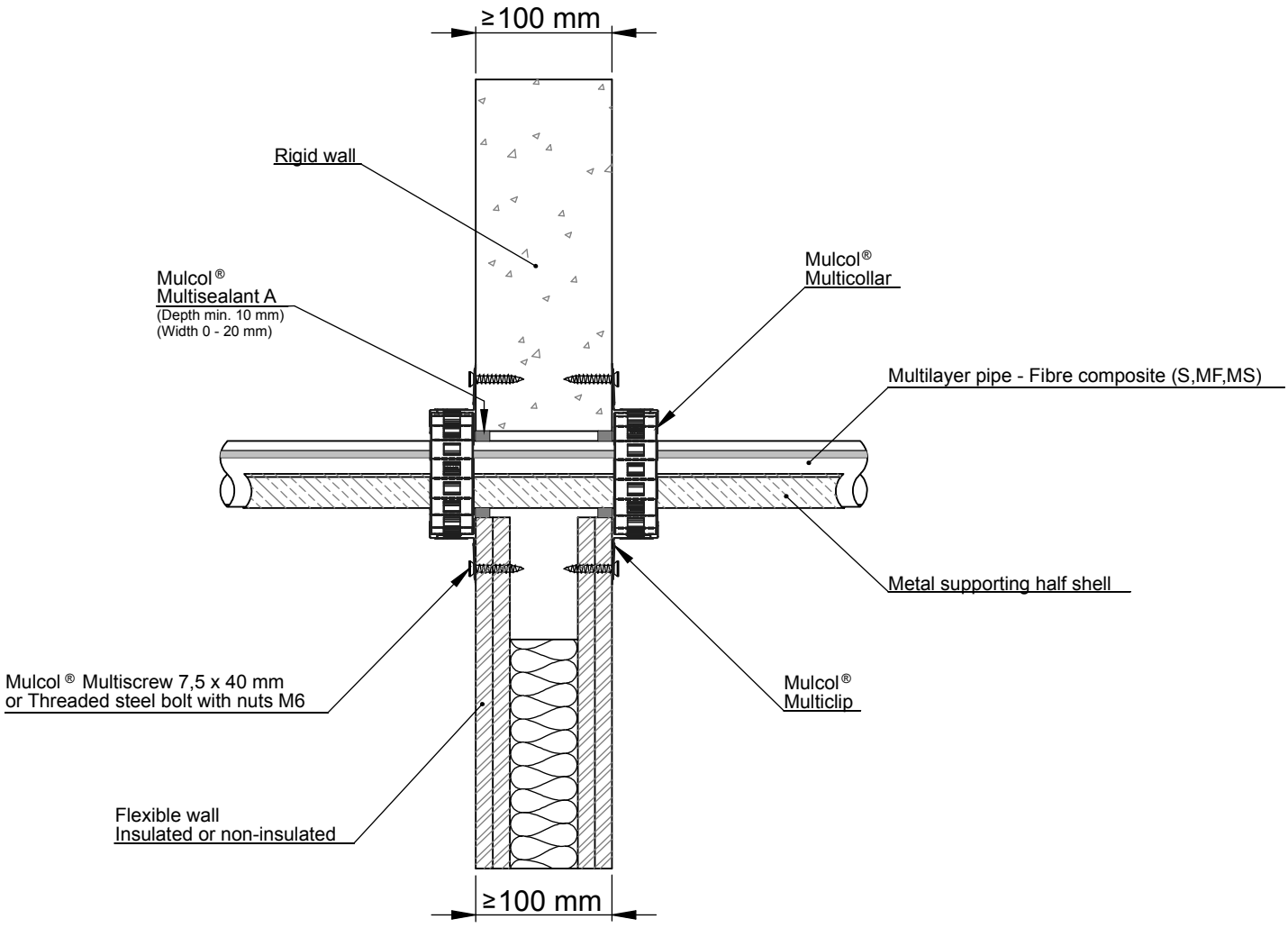
f63 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLF-10.0.50
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-9-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Aquatherm Green-MS (or equal)		
Pipe dimensions (mm)		Performance class with pipe end configuration
Outer diameter	Wall thickness	
≤ 50	6.9	EI 90–U/C E 90–U/C

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-MF, Aquatherm Green-MF, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

5.5 Aluminium composite pipes

5.5.1 Without insulation

Aluminium composite pipes

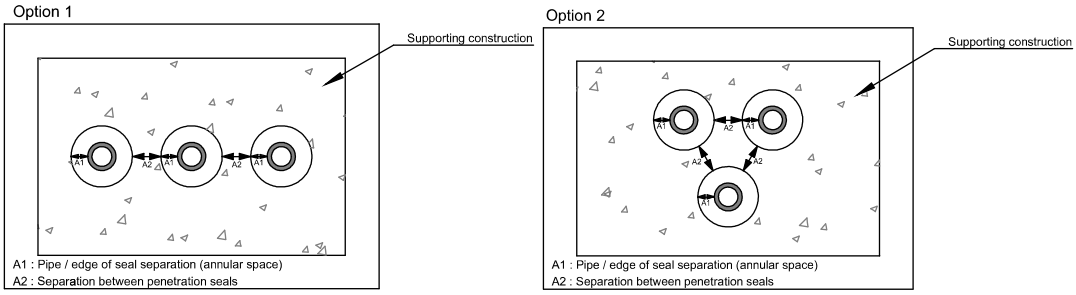
On the next pages, drawings FW-MLA-10.0.10 and FW-MLA-20.0.10 of the pipe penetration seals with aluminium composite pipes without insulation are given for the pipes fitted with one or two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.30 the installation details regarding the field of application are given.

t5.30 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 64)		Allowed annular space (distance 'a' in drawing)
		Mulcol® Multimortar or equal (mortar EN 13501-1: class A1)	Mulcol® Multisealant A both faces	
≤ 350 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≥ 10 mm / depth fully filled	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 75 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 64. The annular gap A_1 is also visible in this Figure.

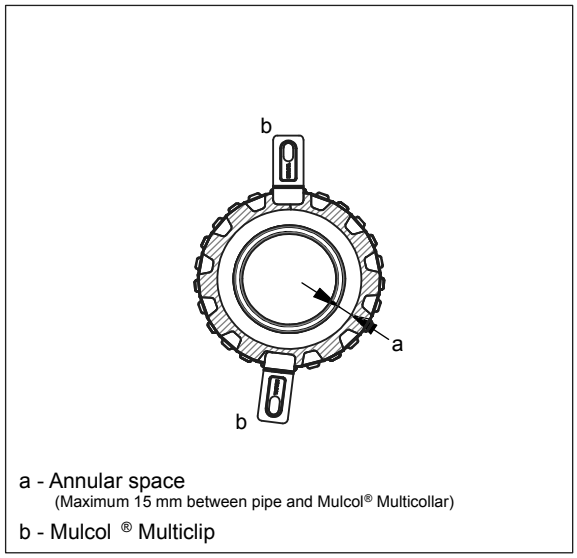
f64 Visualization single penetrations



The fire resistance is valid for the following aluminium composite pipes:

- inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc and Uponor PE-RT/AL/PE-RT);
- inner layer of polyethylene with a layer of cross-linked polyethylene on top (Uponor PE-Xa Aqua Pipe).

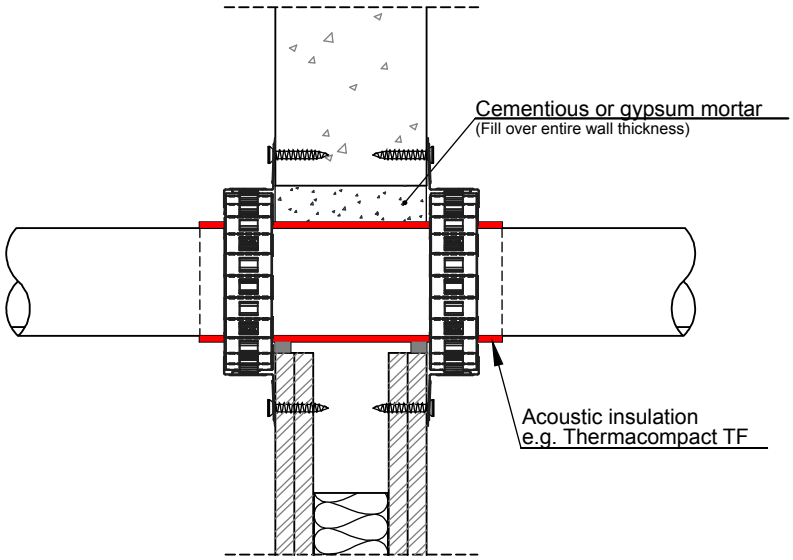
Front view

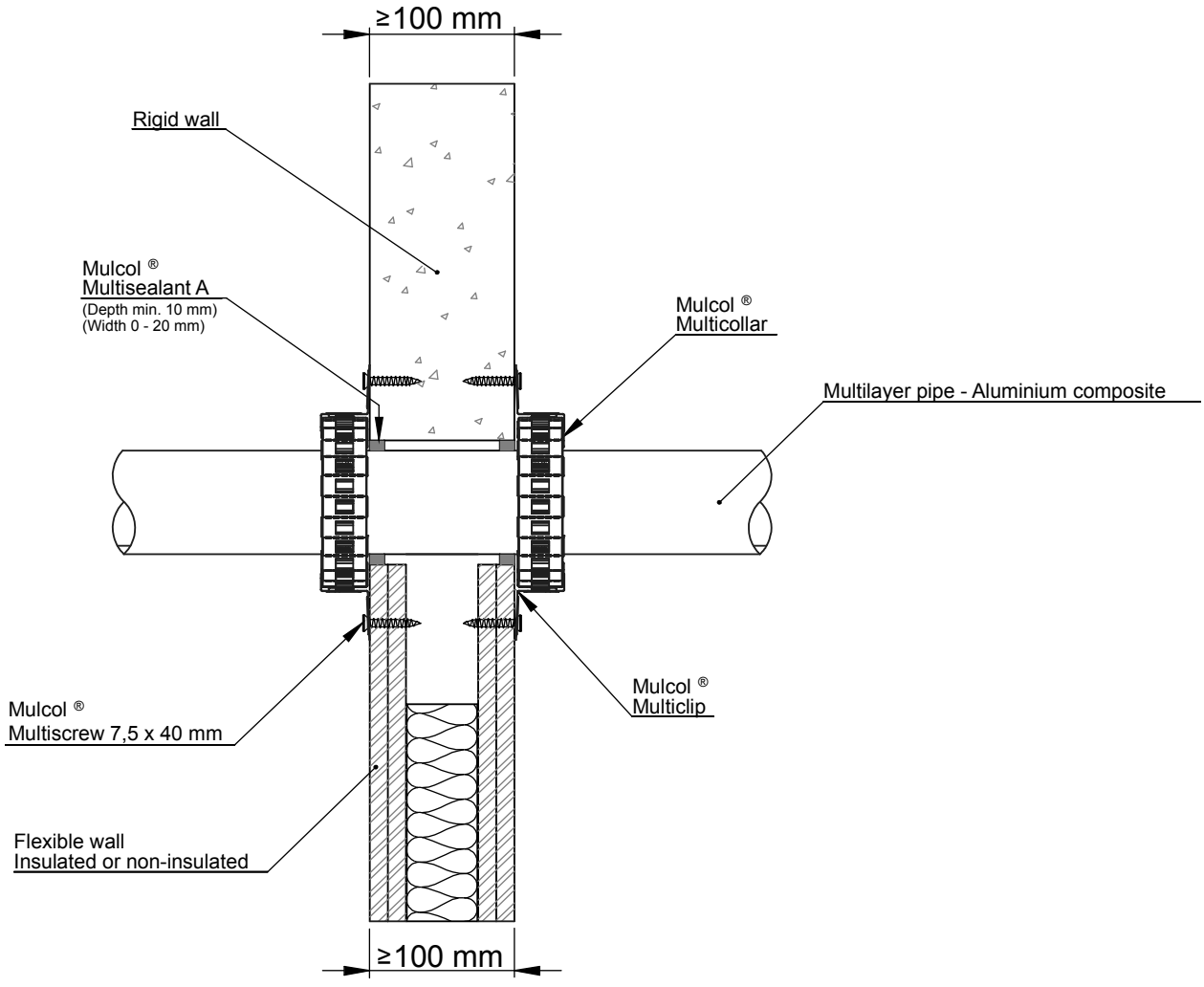


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

Side view



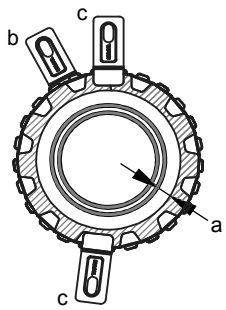


American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA-10.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 2-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Front view

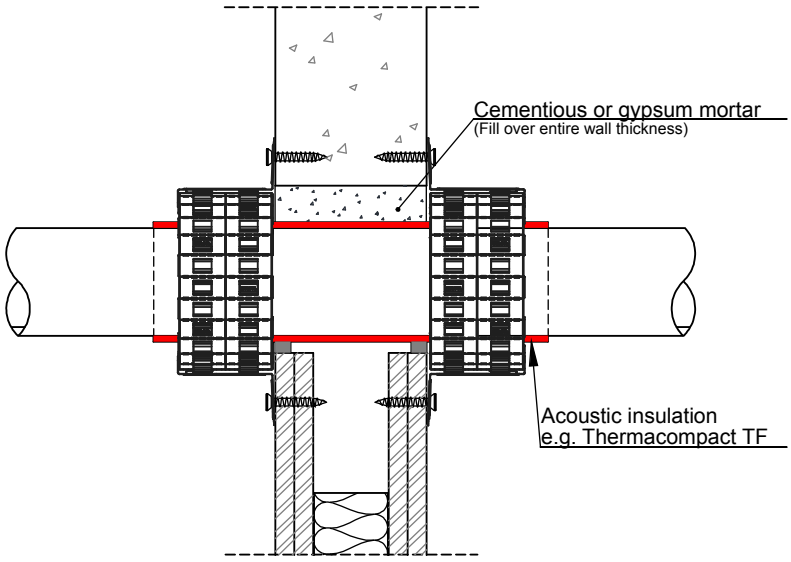


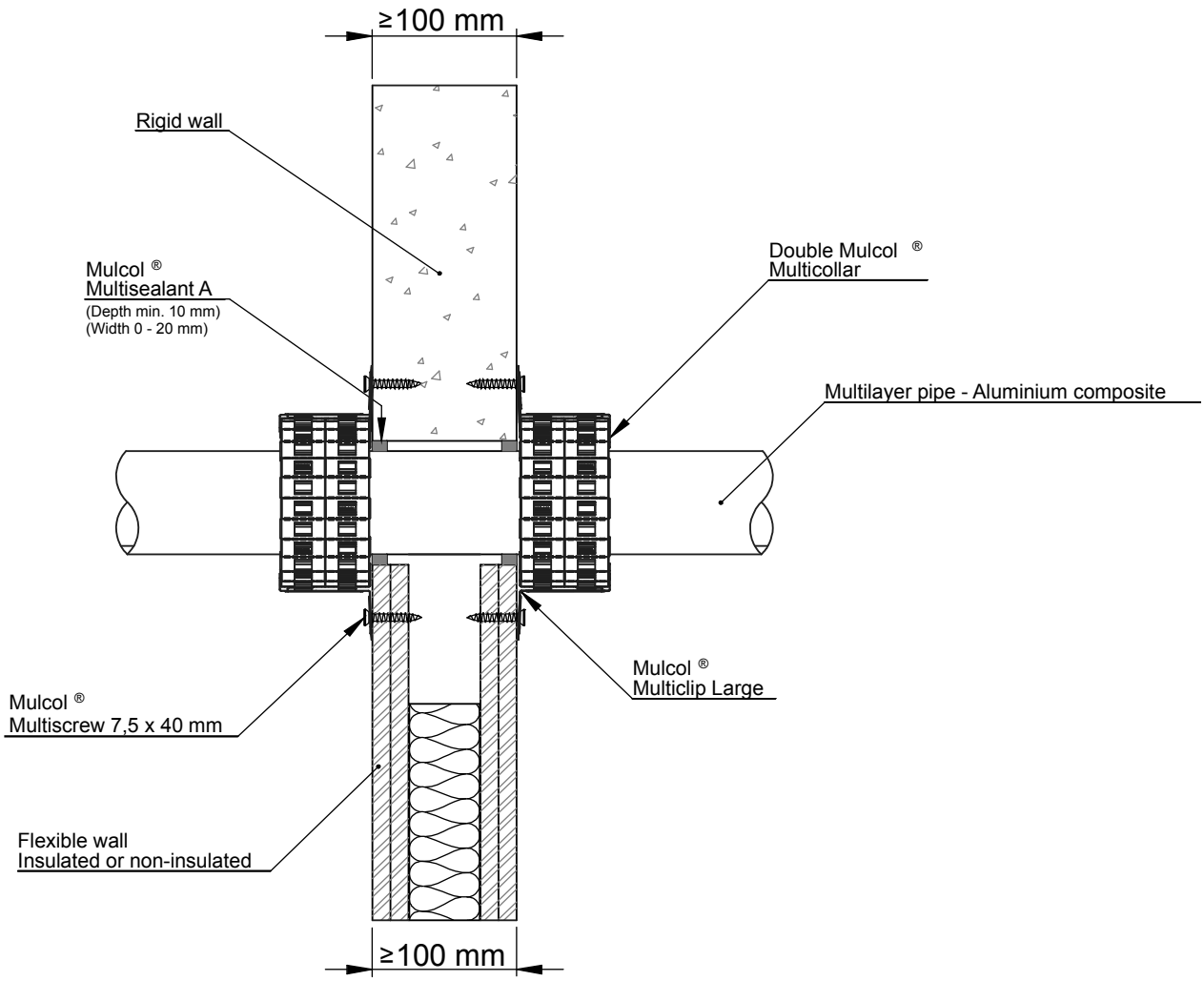
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

c - Mulcol ® Multiclip Large

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA-20.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 5-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance One collar each face			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)
Outer diameter	Wall thickness		
≤ 16 / ≤ 20*	2.0	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 25	3.5	EI 120–U/C* E 120–U/C*	Uponor PE-Xa Aqua Pipe
≤ 32	3.0	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 40	3.5	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 40	4.0	EI 120–U/C E 120–U/C	Uponor PE-RT/AL/PE-RT
≤ 50	4.0	EI 120–U/C E 120–U/C	Henco PE-Xc/AL/PE-Xc
≤ 63	4.5	EI 60–U/C E 90–U/C	Alpex Duo PE-Xb/AL/PE-Xb
≤ 75	6.0	EI 60–U/C E 90–U/C	Henco PE-Xc/AL/PE-Xc

Fire resistance Two collars each face			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)
Outer diameter	Wall thickness		
≤ 75	6.0	EI 90–U/C E 120–U/C	Henco PE-Xc/AL/PE-Xc

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Valsir Pexal, Valsir Mixal, Alpex Duo and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla (PE-RT/AL/PE-RT);
- Uponor (PE-Xa);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.5.2 Without insulation through a seal penetration system

Aluminium composite pipes

On the next pages, drawings PBfw-MLA-10.0.10 and PBfw-MLA-20.0.10 of the pipe penetration seals with aluminium composite pipes with elastomeric thermal insulation through a seal penetration system are given for the pipes fitted with one or two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.31 the installation details regarding the field of application are given.

For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

t5.31 Installation details

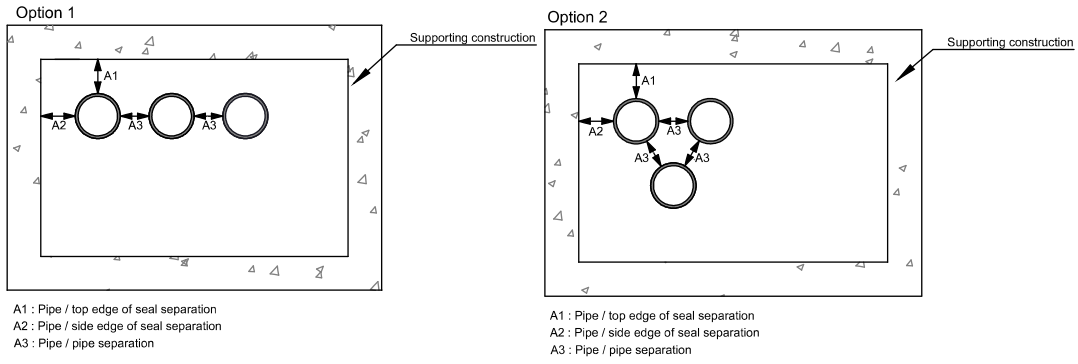
Distance to first pipe support (both faces)	Distance between pipes (A_3, see Figure 65)	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 75 mm / 'a' ≤ 15 mm

The fire resistance is valid for aluminium composite pipes with an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc PE-Xc/AL/PE-Xc).

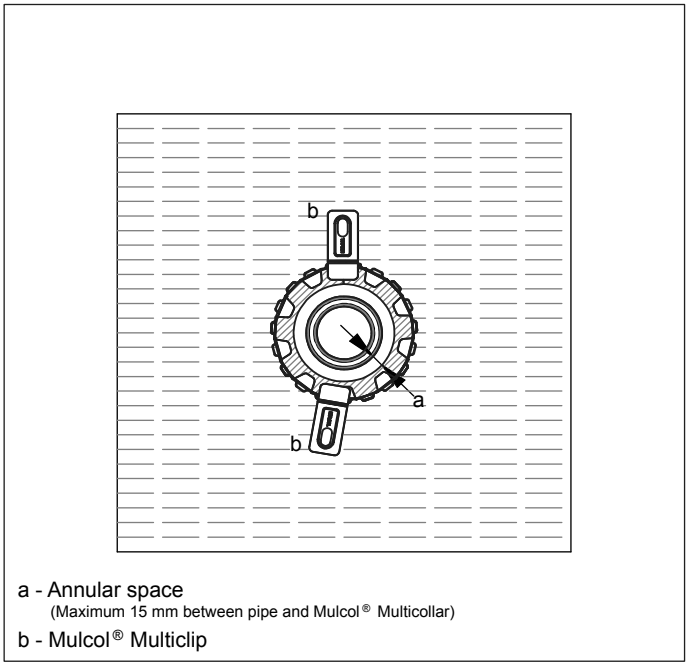
If more pipe penetrations are placed in the penetration seal system, the minimum distance between the pipes is 100 mm, see Figure 65 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory).

The pipes may be placed against the aperture edge (distance A_1 and A_2 is zero).

f65 Visualization distance between pipes

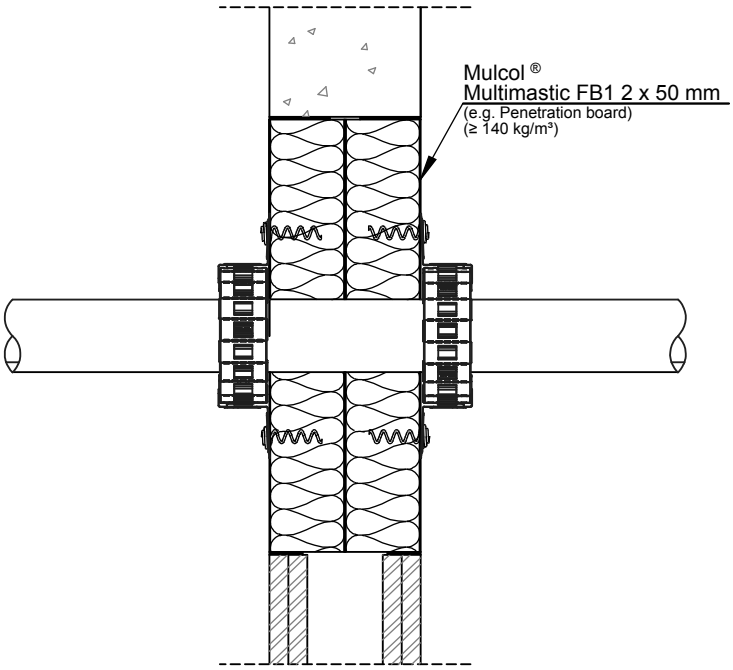


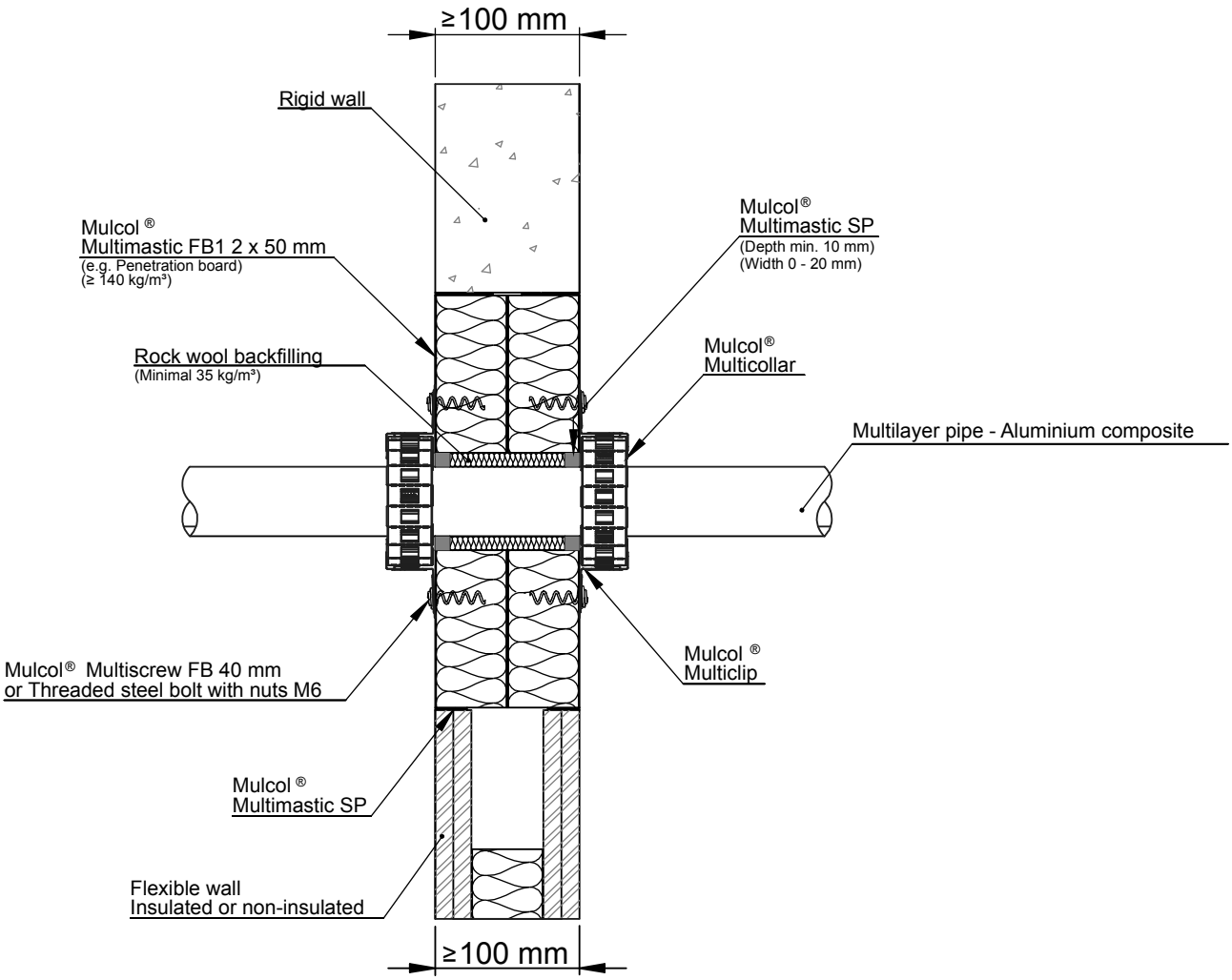
Front view

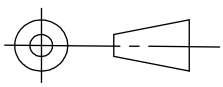


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip

Side view



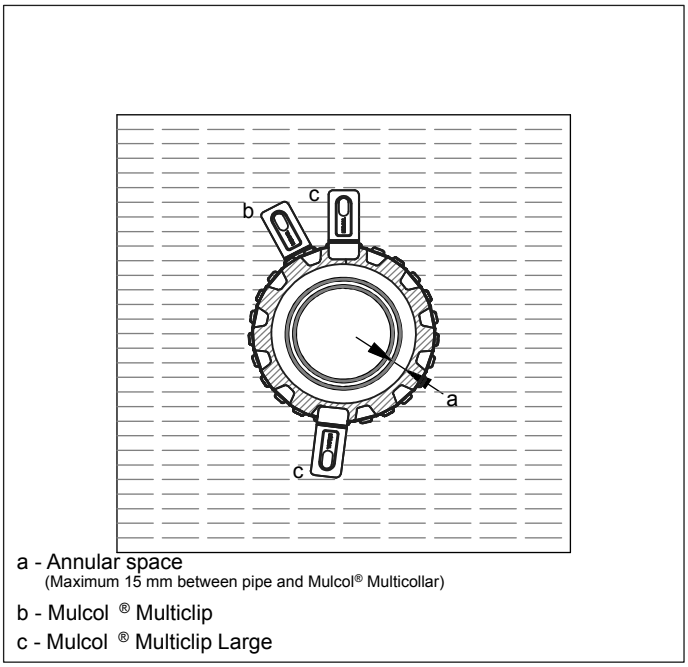


American projection 	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLA-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 21-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Front view

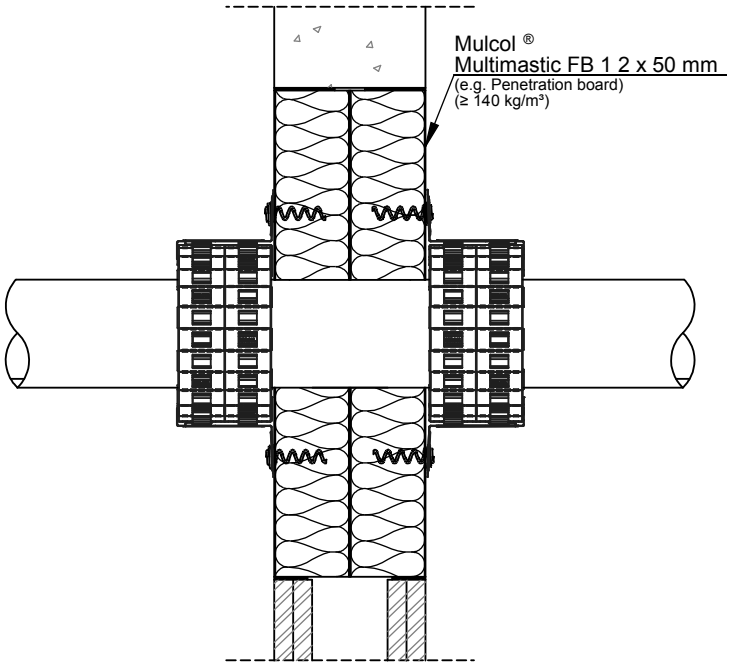


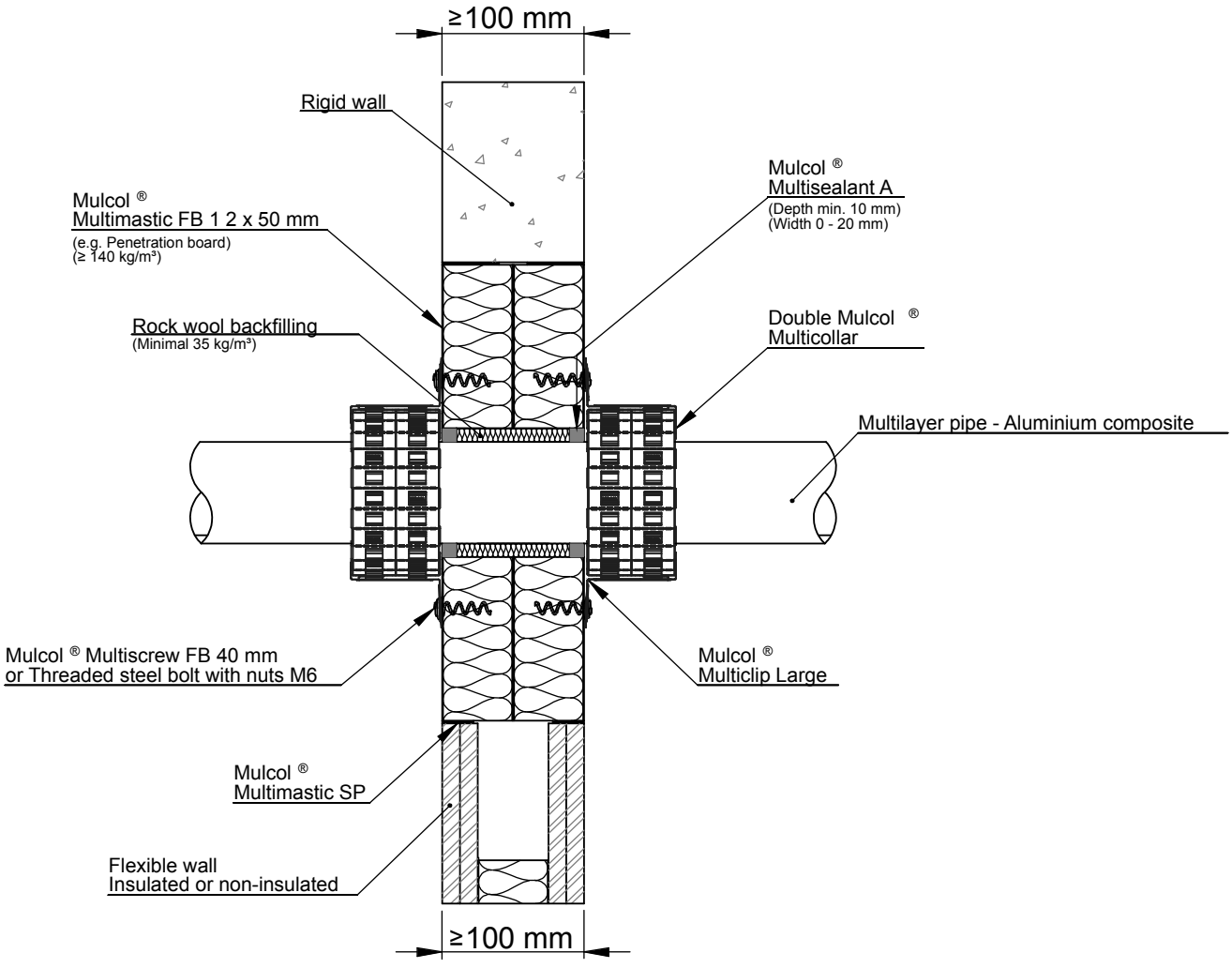
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

c - Mulcol ® Multiclip Large

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLA-20.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 30-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance One collar each face			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)
Outer diameter	Wall thickness		
≤ 16 / ≤ 20*	2.0	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 25	3.5	EI 120–U/C* E 120–U/C*	Uponor PE-Xa Aqua Pipe
≤ 32	3.0	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 40	3.5	EI 120–U/C* E 120–U/C*	Henco PE-Xc/AL/PE-Xc
≤ 40	4.0	EI 120–U/C* E 120–U/C*	Uponor PE-RT/AL/PE-RT
≤ 50	4.0	EI 120–U/C E 120–U/C	Henco PE-Xc/AL/PE-Xc
≤ 63	4.5	EI 90–U/C* E 120–U/C*	Alpex Duo PE-Xb/AL/PE-Xb

Fire resistance Two collars each face			
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)
Outer diameter	Wall thickness		
≤ 75	6.0	EI 90–U/C E 120–U/C	Henco PE-Xc/AL/PE-Xc

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Henco (PE-Xa);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.5.3 Without insulation at a zero distance to a floor

Aluminium composite pipes

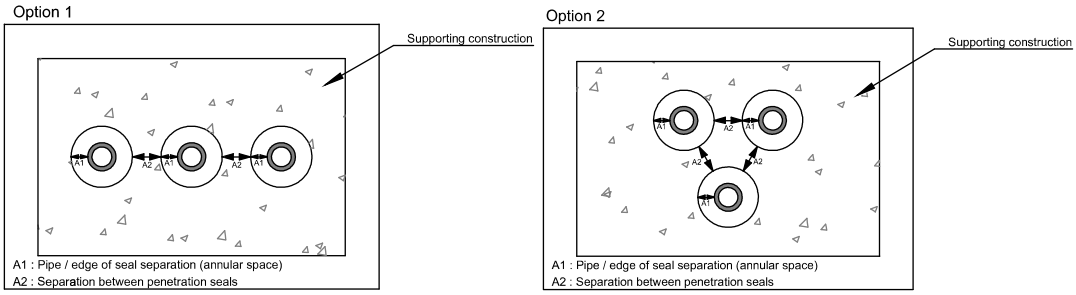
On the next page, drawing FW-MLA-40.0.10 of the pipe penetration seals with aluminium composite pipes without insulation placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.32 the installation details regarding the field of application are given.

t5.32 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 66) Mulcol® Multisealant A both faces	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 32 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 66. The annular gap A_1 is also visible in this Figure.

f66 Visualization single penetrations

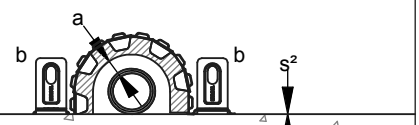


The fire resistance is valid for aluminium composite pipes with an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc)

The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-MLA-40.0.10.

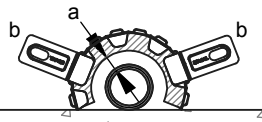
Front view

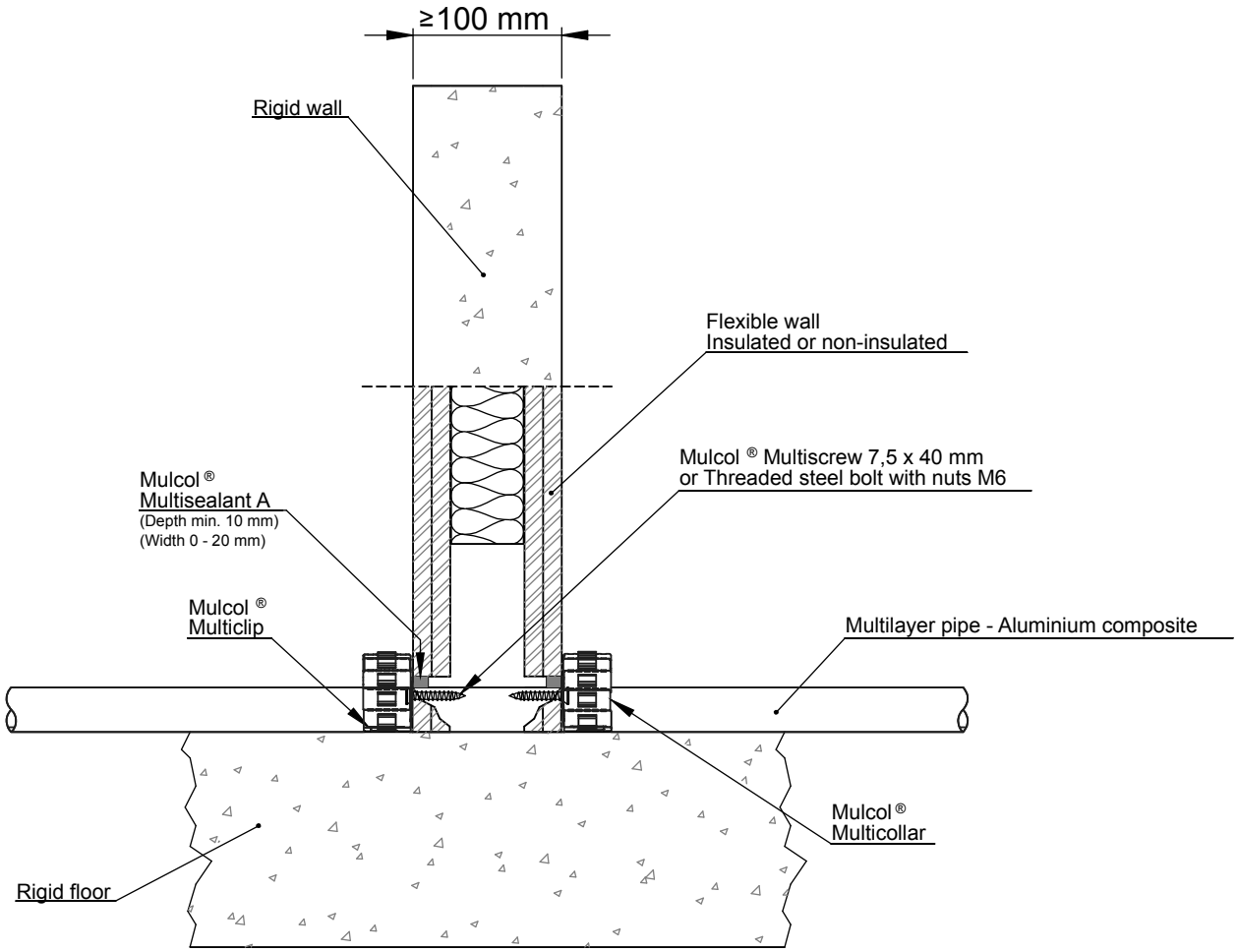
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA-40.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-9-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Henco PE-Xc/AL/PE-Xc (or equal)		
Pipe dimensions (mm)		Performance class with pipe end configuration
Outer diameter	Wall thickness	
≤ 32	3.0	EI 90–U/C E 90–U/C

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.5.4 With PE-foam insulation

Aluminium composite pipes

On the next page, drawing FW-MLA_pr-10.0.25 of the pipe penetration seals with aluminium composite pipes with PE-foam insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.33 the installation details regarding the field of application are given.

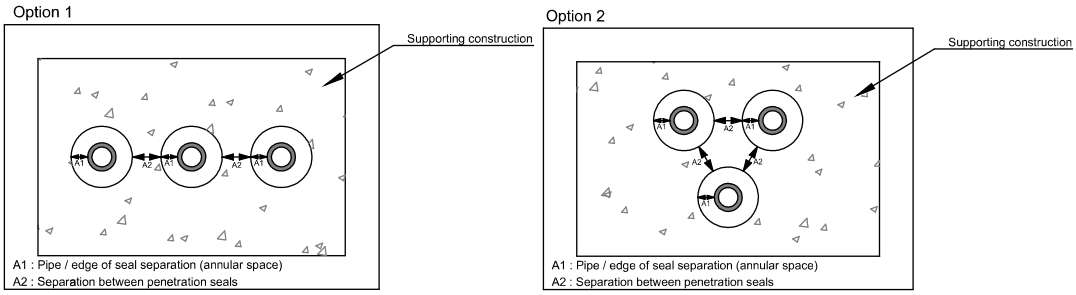
The fire resistance is valid for insulation PE-foam with a reaction to fire class C_L-s1-d0 in accordance with EN 13501-1 or equal and a thickness of ≤ 6 mm. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.33 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 67) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 44 mm / 'a' ≤ 15 mm

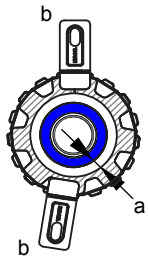
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 67. The annular gap A_1 is also visible in this Figure.

f67 Visualization single penetrations

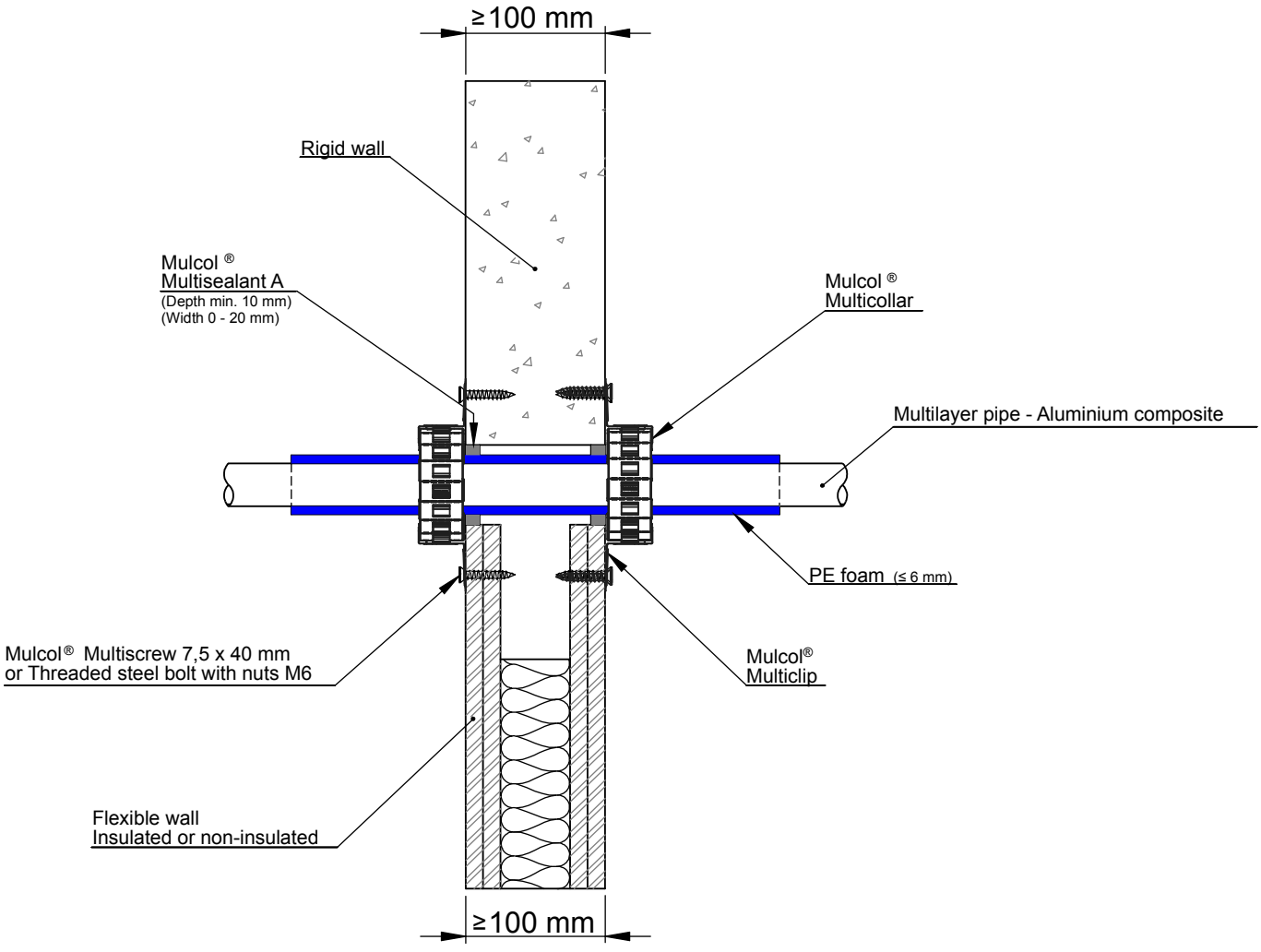


The fire resistance is valid for aluminium composite pipes with an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc)

Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA_pr-10.0.25
	Unit of measure : mm	Department : Research & Development	A4
	Date : 19-10-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Henco PE-Xc/AL/PE-Xc (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 16 / ≤ 20*	2.0	EI 120–U/C E 120–U/C	6
≤ 26	3.0	EI 120–U/C E 120–U/C	6
≤ 32	3.0	EI 120–U/C E 120–U/C	6

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.5.5 With elastomeric thermal insulation

Aluminium composite pipes

On the next page, drawing FW-MLA-10.0.22 of the pipe penetration seals with aluminium composite pipes with thermal elastomeric insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.34 the installation details regarding the field of application are given.

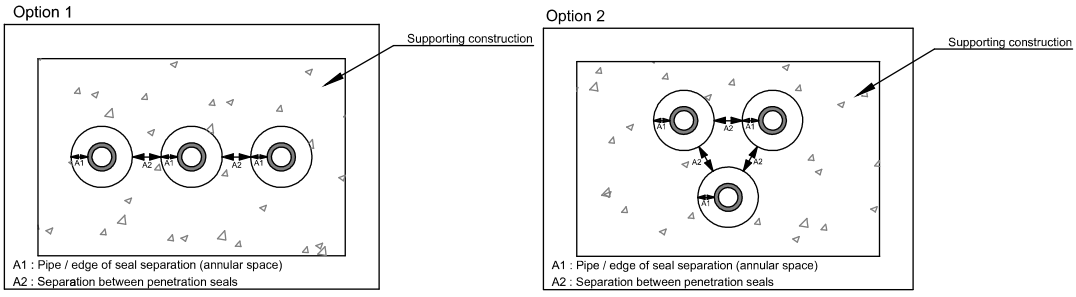
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 500 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.34 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 68) Mulcol® Multisealant A both faces	Length insulation (LS or CS)		Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 90 mm, LS ≥ 300 mm	Outer diameter > 90 mm, LS ≥ 500 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 68. The annular gap A_1 is also visible in this Figure.

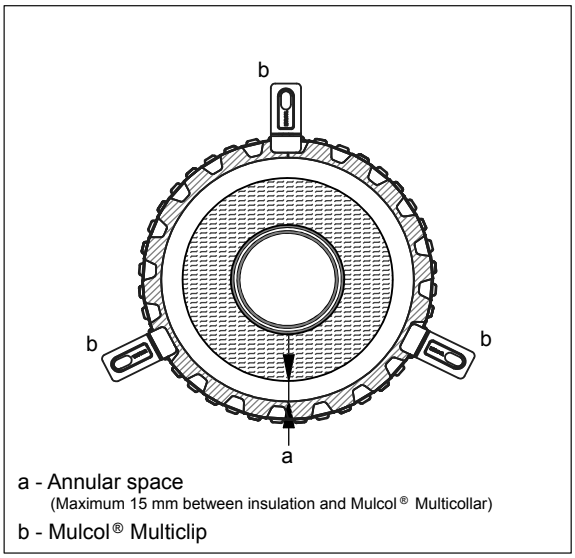
f68 Visualization single penetrations



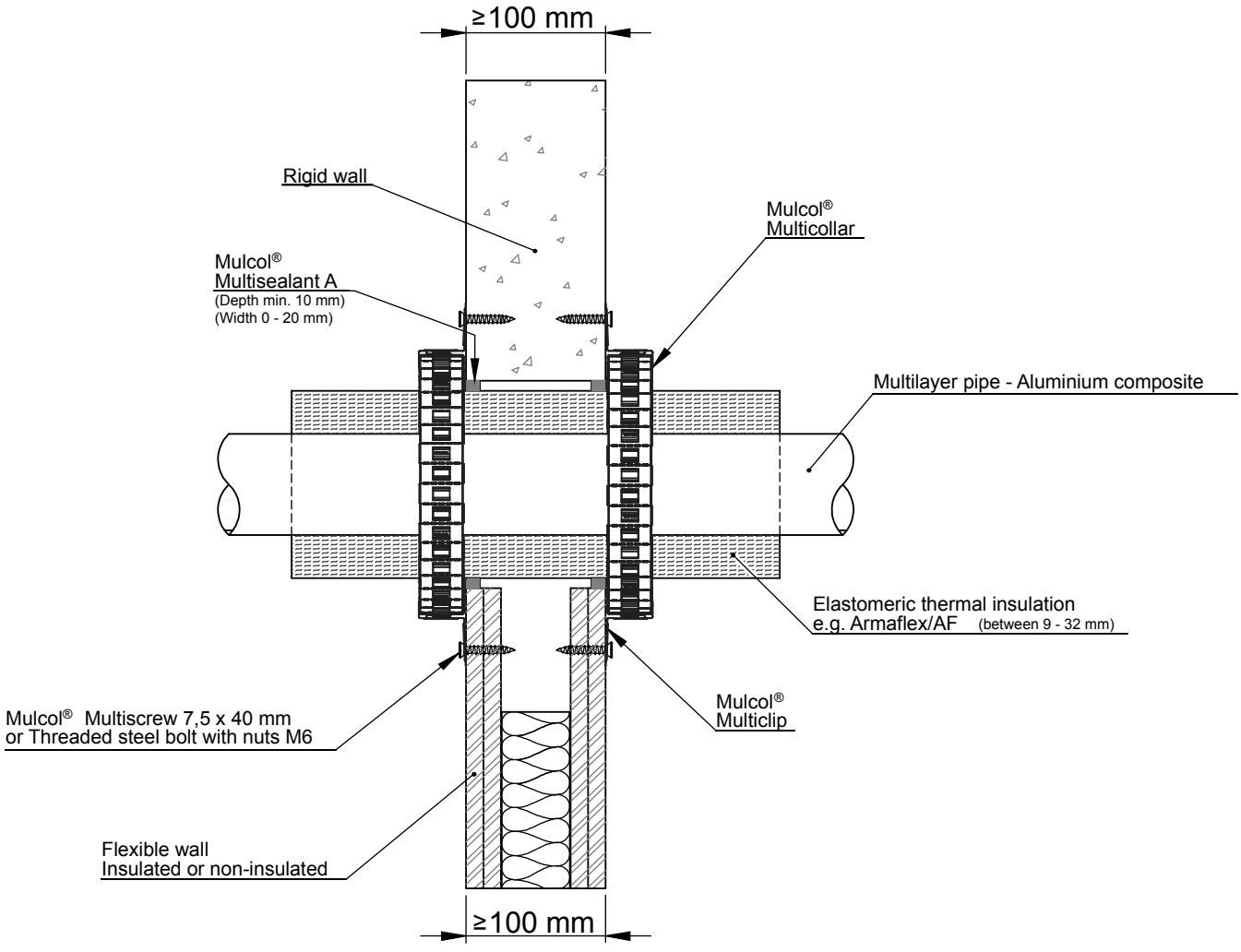
The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc, Uponor PE-RT/AL/PE-RT, Geberit Mepla PE-RT/AL/PE-RT, Wavin Tigris PE-X/AL/PE and Alpex Duo PE-Xb/AL/PE-Xb).

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA-10.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 29-7-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

Fire resistance			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
Henco PE-Xc/AL/PE-Xc (or equal)			
≤ 16 / ≤ 20*	2.0	EI 120–U/C E 120–U/C	9* to 32
≤ 26	3.0	EI 120–U/C E 120–U/C	9* to 32
≤ 32	3.0	EI 120–U/C E 120–U/C	9* to 32
≤ 40	3.5	EI 120–U/C* E 120–U/C*	9* to 32*
≤ 50	4.0	EI 120–U/C E 120–U/C	9 to 32
≤ 63	4.5	EI 120–U/C* E 120–U/C*	9* to 32*
≤ 75	6.0	EI 120–U/C E 120–U/C	9 to 32
≤ 75	7.5	EI 90–U/C E 90–U/C	9* to 32
≤ 90	7.0	EI 120–U/C E 120–U/C	9
≤ 90	7.0	EI 90–U/C E 90–U/C	9 to 32
Geberit Mepla PE-RT/AL/PE-RT (or equal)			
≤ 75	4.7	EI 90–U/C E 90–U/C	9 to 32
≤ 75	4.7	EI 90–U/C E 120–U/C	9
Wavin Tigris PE-X/AL/PE (or equal)			
≤ 75	7.5	EI 90–U/C* E 90–U/C*	9* to 32*
≤ 75	7.5	EI 120–U/C E 120–U/C	9
Alpex Duo PE-Xb/AL/PE-Xb (or equal)			
≤ 32	3.0	EI 90–U/C E 90–U/C	9* to 32
≤ 63	4.5	EI 60–U/C E 120–U/C	9 to 32
≤ 63	4.5	EI 90–U/C E 120–U/C	32
Uponor PE-RT/AL/PE-RT (or equal)			
≤ 40	4.0	EI 120–U/C E 120–U/C	9* to 32
≤ 110	10.0	EI 90–U/C E 90–U/C	9 to 32*
≤ 110	10.0	EI 120–U/C* E 120–U/C*	32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Valsir Pexal, Valsir Mixal, Alpex Duo and APE Plain (PE-Xb/AL/PE-Xb);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- Geberit Mepla (PE-RT/AL/PE-RT);
- Wavin Tigris and Uponor (PE-RT/AL/PE);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.5.6 With PE-conduit insulation

Aluminium composite pipes

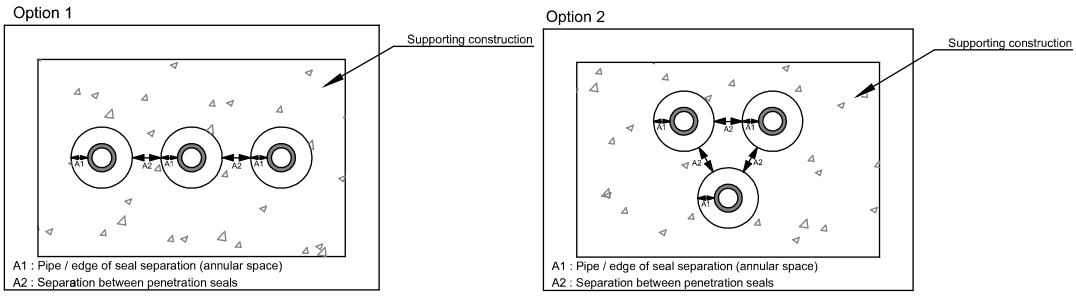
On the next page, drawing FW-MLA-10.0.30 of the pipe penetration seals with aluminium composite pipes with PE-conduit insulation (outer diameter Ø40 mm) is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.35 the installation details regarding the field of application are given.

t5.35 Installation details

Distance to first pipe support (both faces)	PE-conduit insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 69) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Outer diameter Ø40 mm minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤40 mm / 'a' ≤ 15 mm

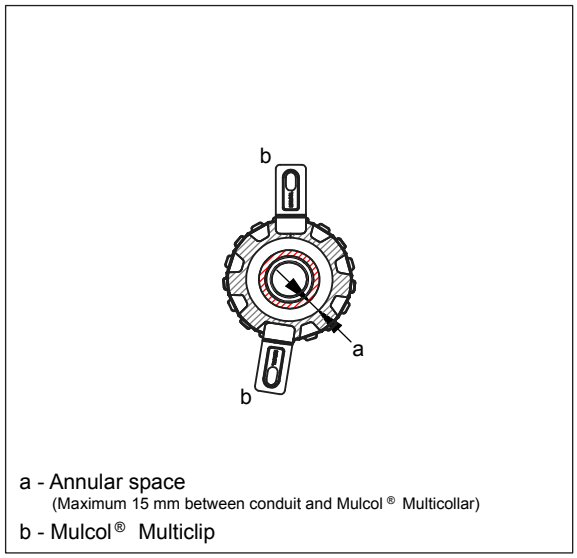
If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 69. The annular gap A_1 is also visible in this Figure.

f69 Visualization single penetrations



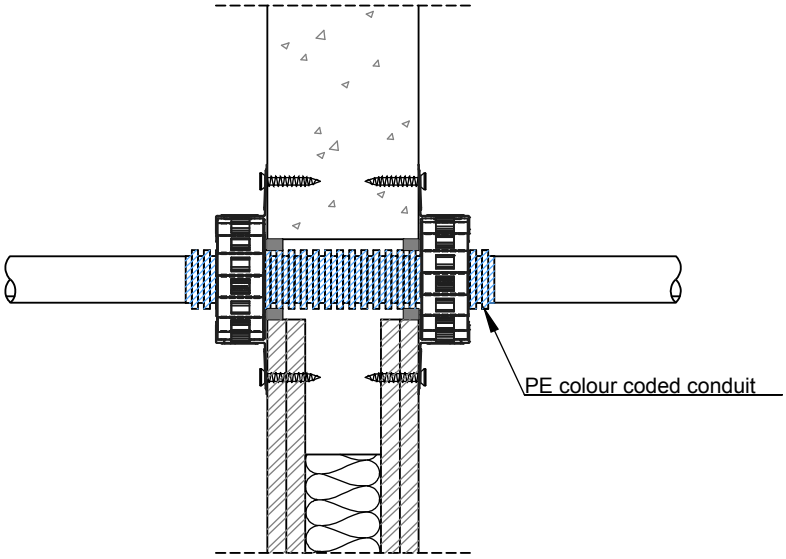
The fire resistance is valid for aluminium composite pipes with an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc)

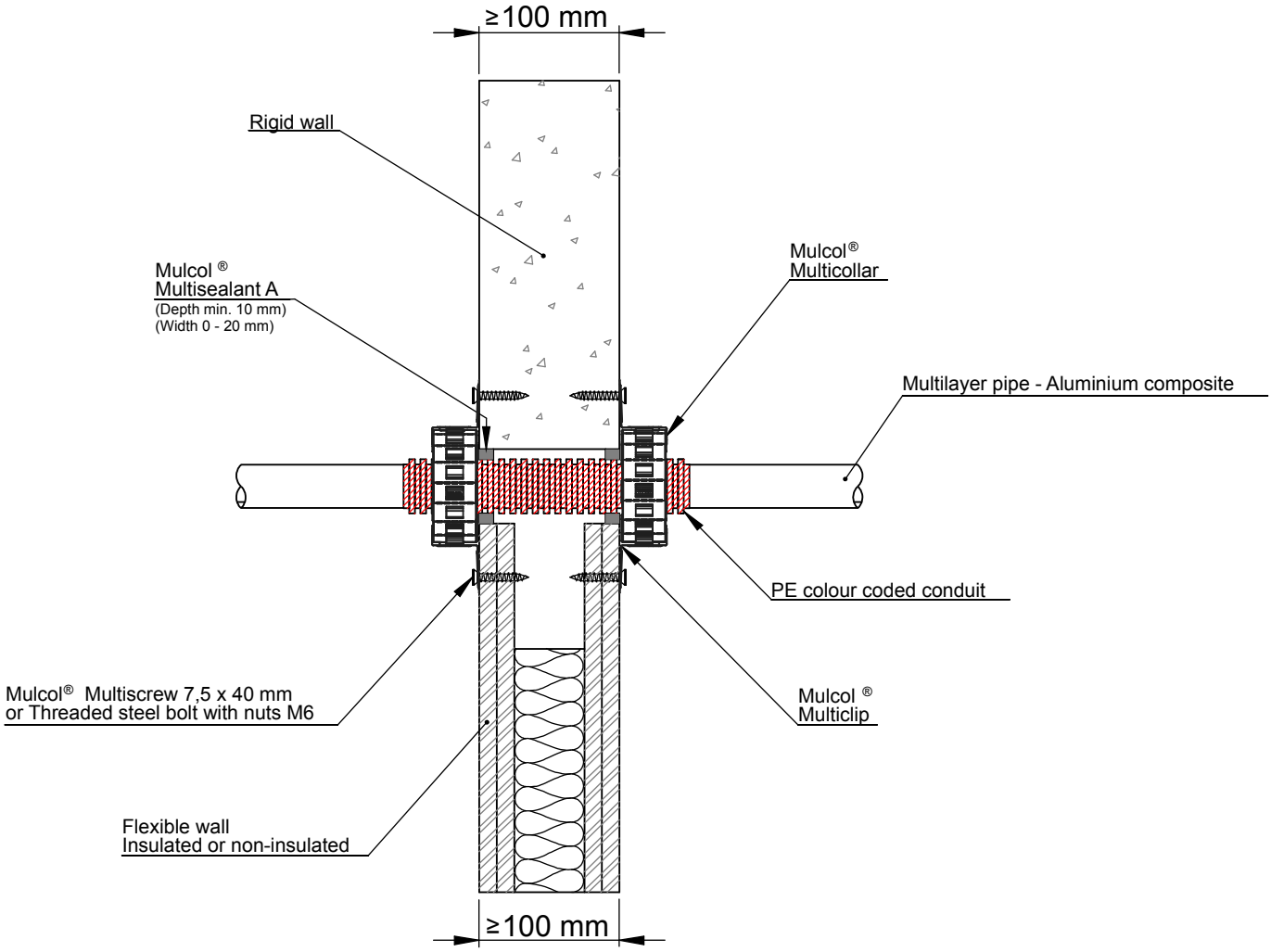
Front view



a - Annular space
(Maximum 15 mm between conduit and Mulcol ® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale	: 1:5	Company	: Mulcol International B.V.
	Unit of measure	: mm	Department	: Research & Development
	Date	: 26-9-2016	Draftsman	: K.J.

FW-MLA-10.0.30

A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Henco PE-Xc/AL/PE-Xc (or equal) with Wavin flexible PE-conduit (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Outer diameter PE-conduit (mm)
Outer diameter	Wall thickness		
≤ 32	3.0	EI 90–U/C E 90–U/C	≤ 40

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different conduit materials is expected that the fire resistances given above will also be met for penetration seals with GEWA flexible HD-PE-conduits (the conduit dimensions shall correspond to the dimensions in the table).

5.5.7 With elastomeric thermal insulation through a seal penetration system

Aluminium composite pipes

On the next page, drawing PBfw-MLA-10.0.22 of the pipe penetration seals with aluminium composite pipes with elastomeric thermal insulation through a seal penetration system is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.36 the installation details regarding the field of application are given.

For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

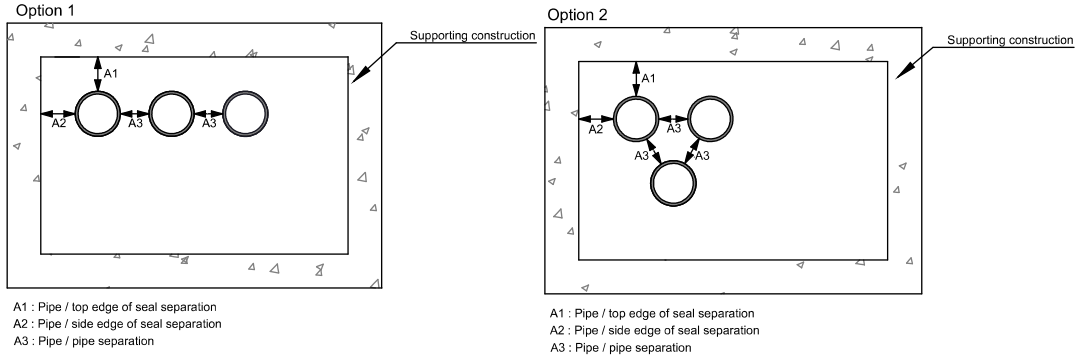
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3 or, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be applied interrupted at the seal with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LI in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CI).

t5.36 Installation details

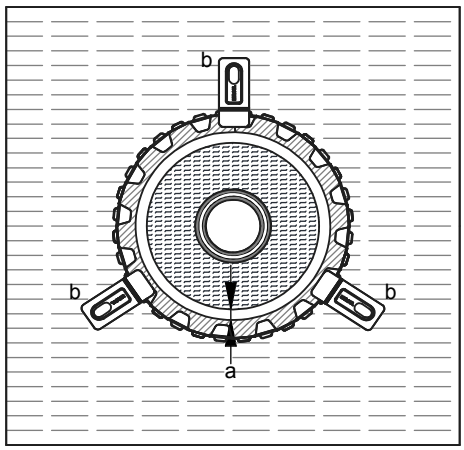
Distance to first pipe support (both faces)	Distance between pipes (A_1 to A_3, see Figure 70)	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 114 mm / 'a' ≤ 15 mm

If more pipe penetrations are placed in the penetration seal system, the minimum distance between the pipes is 100 mm, see Figure 70 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory). The distance between the flexible elastomeric EPDM rubber foam will therefore be ≥ 36 mm.

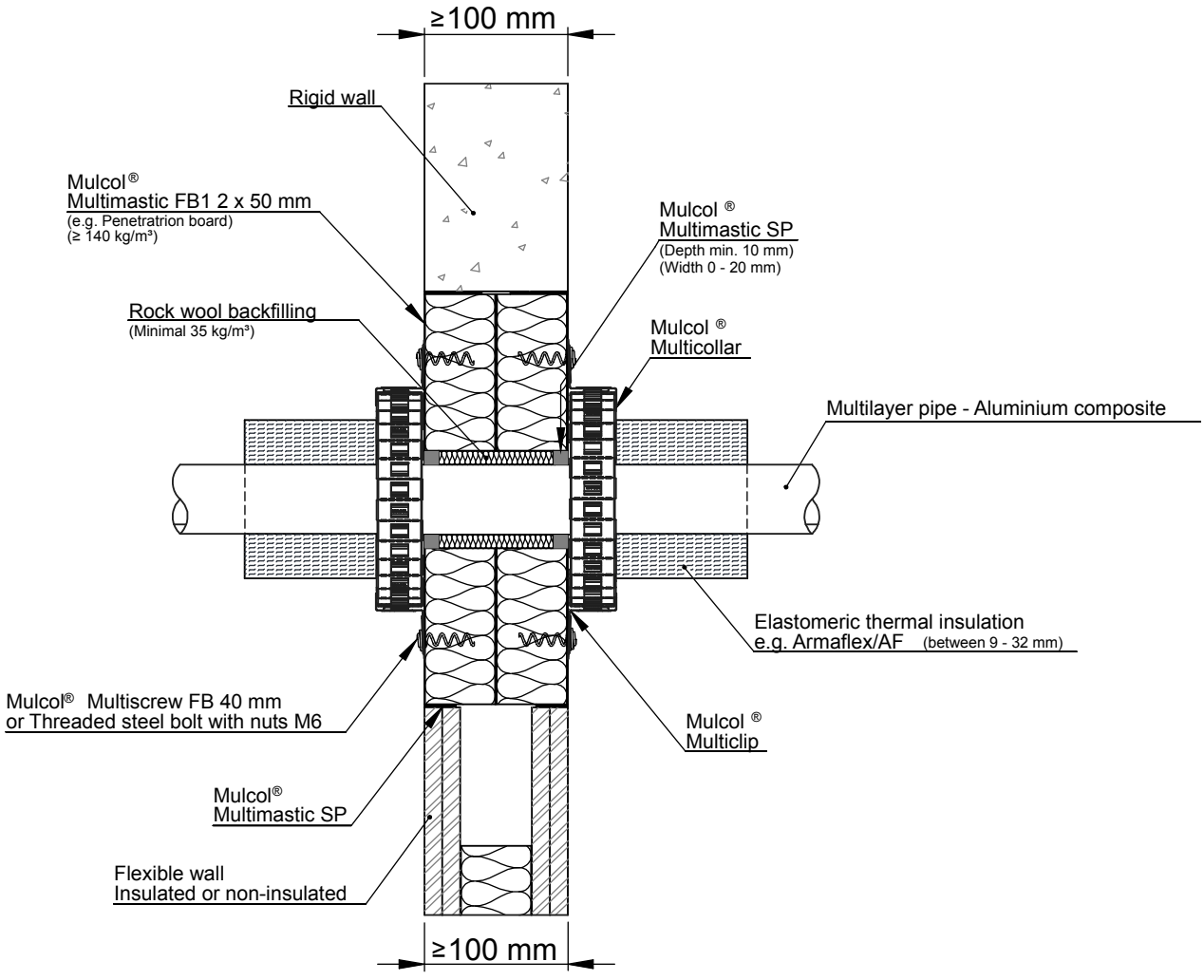
f70 Visualization distance between pipes



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLA-10.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 21-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

The fire resistance is valid for aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Henco PE-Xc/AL/PE-Xc (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 50	4.0	EI 120–U/C E 120–U/C	9* to 32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.5.8 With elastomeric thermal insulation at a zero distance to a floor

Aluminium composite pipes

On the next page, drawing FW-MLA-40.0.22 of the pipe penetration seals with aluminium composite pipes with elastomeric thermal insulation placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In In Table 5.37 the installation details regarding the field of application are given.

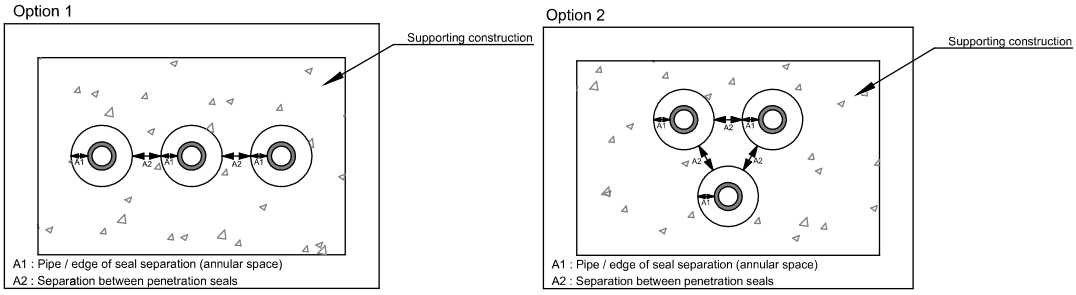
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.37 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 71) Mulcol® Multisealant A both faces	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 5 mm	Outer diameter ≤ 114 mm / 'a' ≤ 15 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 71. The annular gap A_1 is also visible in this Figure.

f71 Visualization single penetrations

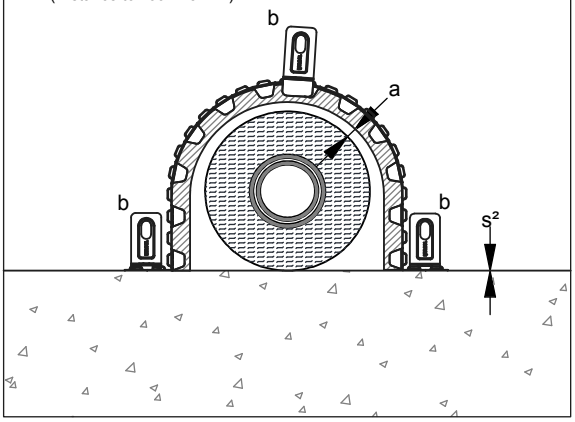


The fire resistance is valid for aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-MLA-40.0.22.

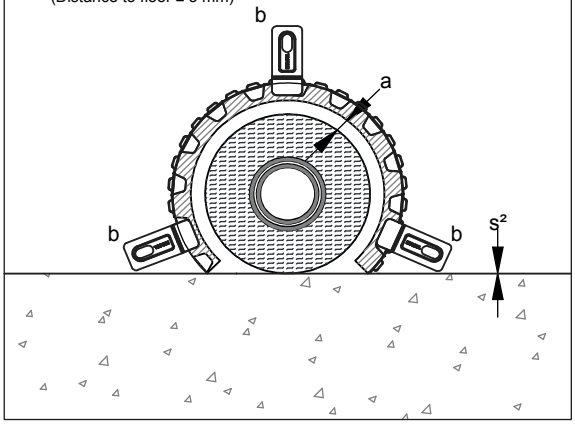
Front view

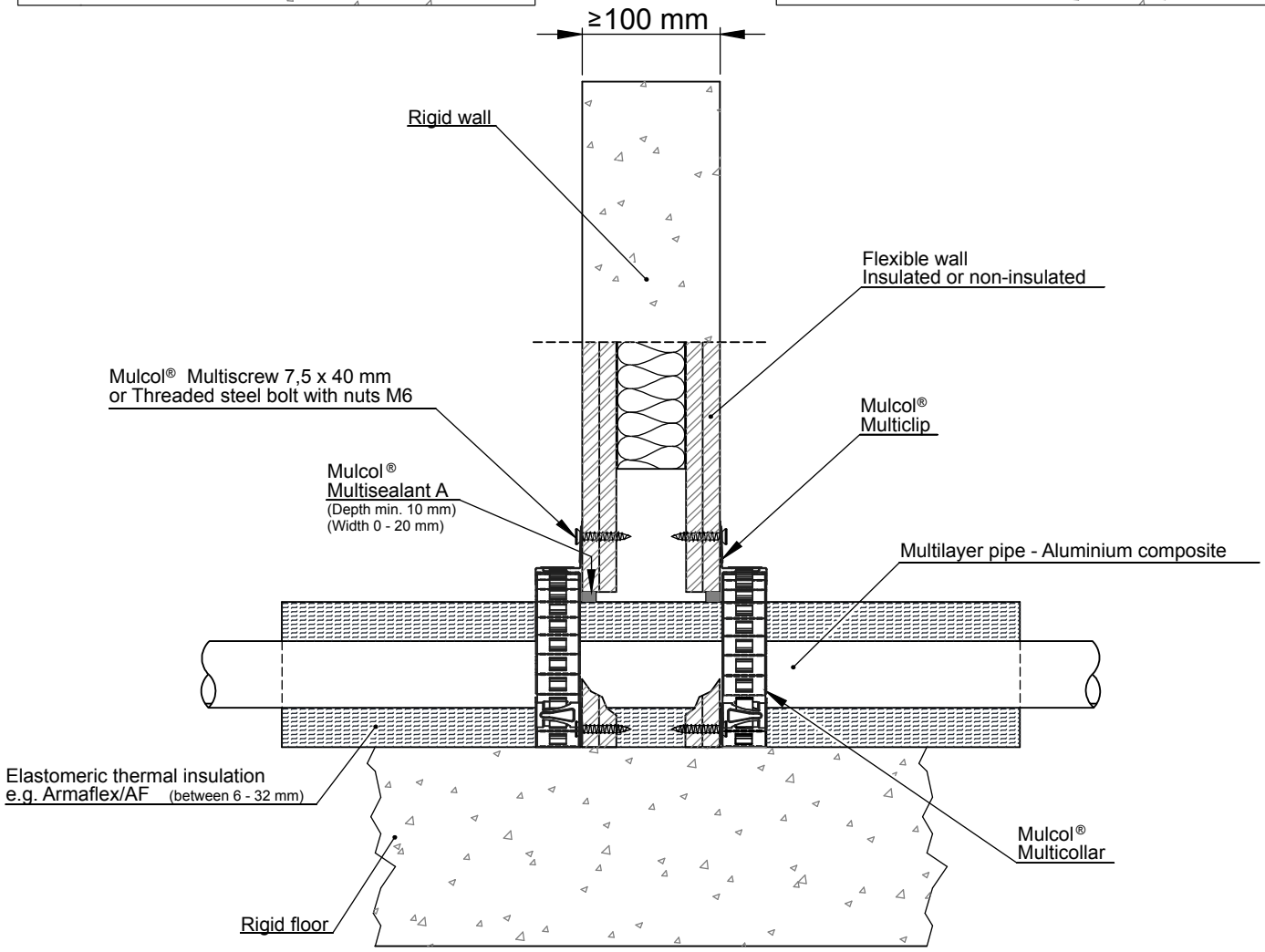
a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s² - Pipe distance to floor
(Distance to floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLA-40.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-9-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Henco PE-Xc/AL/PE-Xc (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 32	3.0	EI 90–U/C E 90–U/C	9 to 32*
≤ 50	4.0	EI 90–U/C E 90–U/C	9* to 32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.6 Several different pipes in a multiple penetration

In this Chapter the expected fire resistance and field of application of pipes in multiple penetrations in several different applications is summarized.

5.6.1 In a multiple penetration at a zero distance to a floor (2 pipes)

Several different pipes

On the next page, drawing FW-MLP2-40.0.40 of the multiple pipe penetration seals with aluminium composite pipes placed at a zero distance to a floor is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. One pipe is installed without insulation and one pipe is installed including elastomeric thermal insulation. In Table 5.38 the installation details regarding the field of application are given.

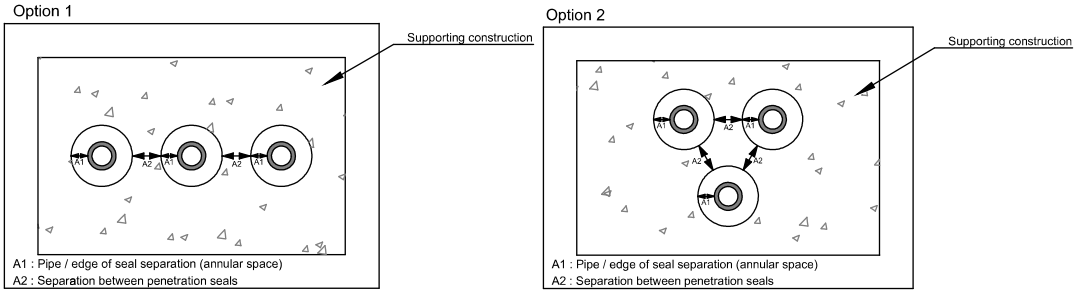
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.38 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 72) Mulcol® Multisealant A both faces	Distance between the pipes (distance s^1 in drawing)	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥ 10 mm	≤ 15 mm	≤ 5 mm	Outer diameter ≤ 96 mm / 'a' ≤ 15 mm

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 72. The annular gap A_1 is also visible in this Figure.

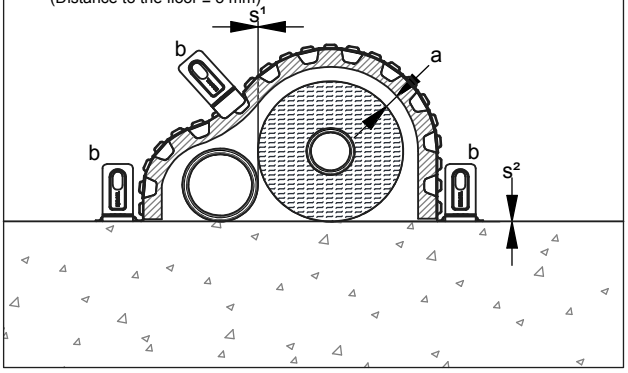
f72 Visualization single penetrations



The fire resistance is valid for aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

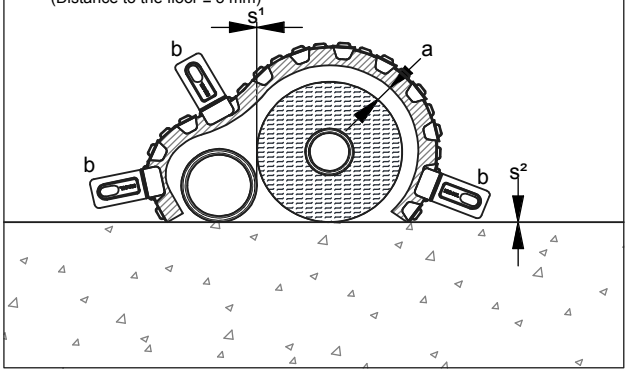
Front view

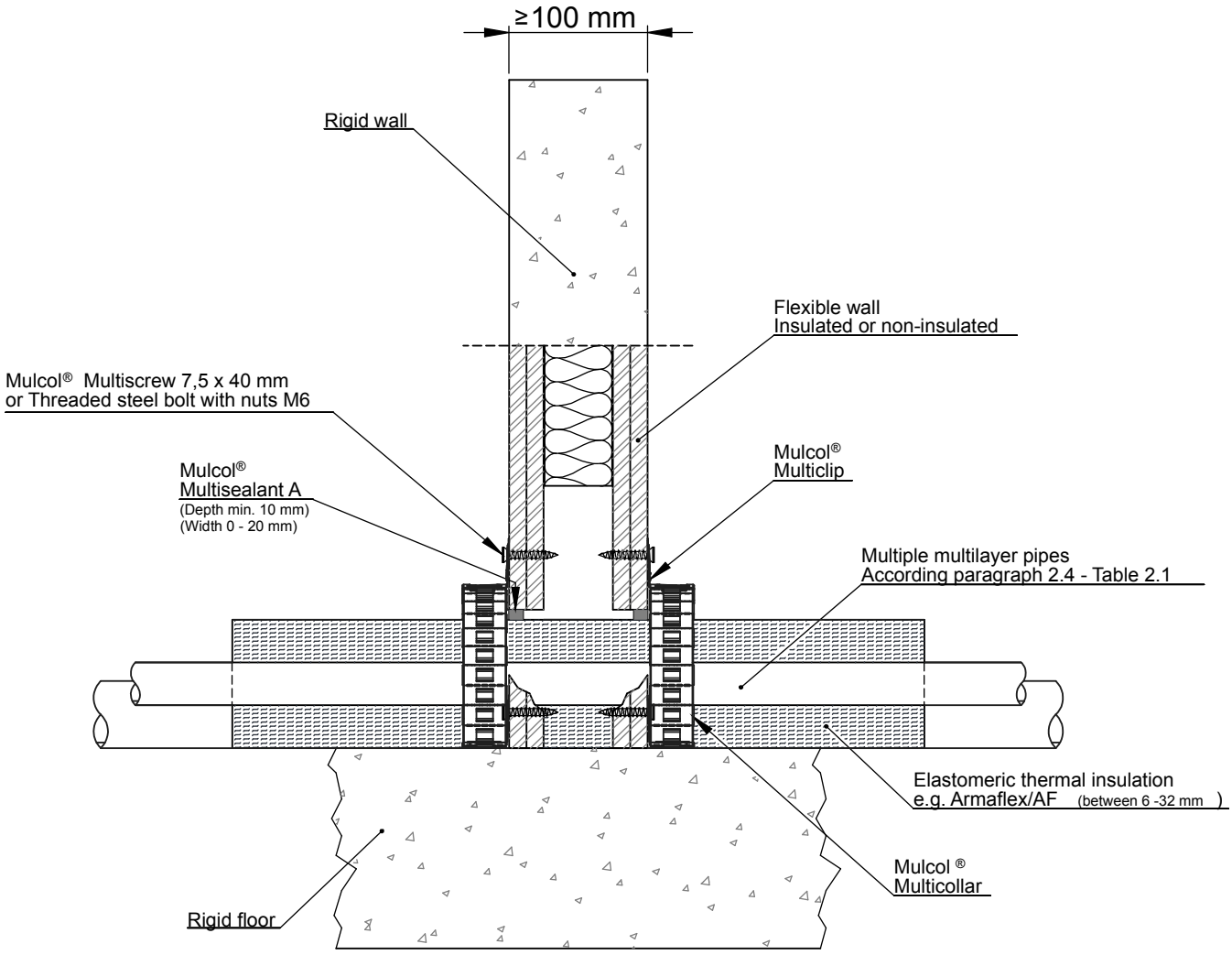
a - Annular space
(Maximum 15 mm between pipe or insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Side by side distance
(Maximum 15 mm between pipe or insulation)
s²- Pipe distance to floor
(Distance to the floor ≤ 5 mm)



Front view (Alternative application)

a - Annular space
(Maximum 15 mm between pipe or insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Side by side distance
(Maximum 15 mm between pipe or insulation)
s²- Pipe distance to floor
(Distance to the floor ≤ 5 mm)





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP2-40.0.40
	Unit of measure : mm	Department : Research & Development	A4
	Date : 13-8-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

The Mulcol® Multicollar Slim may be applied in two different variants. See "front view" or "front view alternative application" on drawing FW-MLP2-40.0.40.

The fixing of the Mulcol® Multicollar Slim must be done by three Mulcol® Multiclips.

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration Henco PE-Xc/AL/PE-Xc (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 50	4.0	EI 90–U/C	N.a.
≤ 32	3.0	E 90–U/C	9* to 32

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.6.2 In a multiple penetration at a zero distance to a floor (5 pipes)

Several different pipes

On the next page, drawing FW-MLP5-40.0.40 of the multiple pipe penetration seal with aluminium composite pipes with various insulations through a wall is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.39 the installation details regarding the field of application are given.

The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

The fire resistance is valid for insulation PE-foam with a reaction to fire class C_L-s1-d0 in accordance with EN 13501-1 or equal and a thickness of ≤ 6 mm. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

The PE-conduit insulation with an outer diameter of Ø40 mm may be applied sustained or interrupted through the aperture with a minimum distance of 50 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.39 Installation details

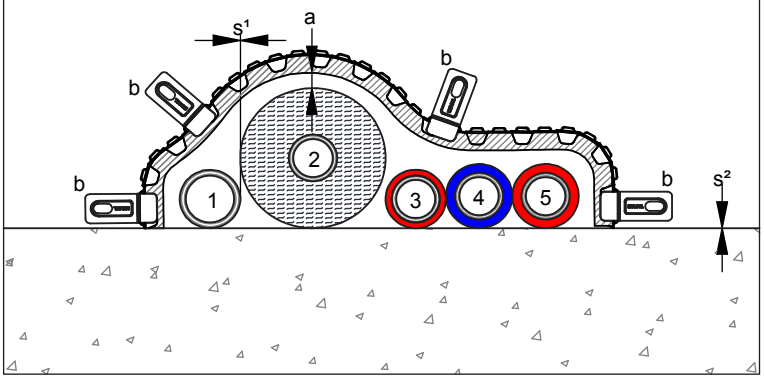
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 73) Mulcol® Multisealant A both faces	Distance between the pipes (distance s^1 in drawing)	Distance between the floor and the pipes or insulation (distance s^2 in drawing)	Allowed annular space (distance 'a' in drawing)
Not necessary	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	≤ 5 mm	Outer diameter ≤ 96 mm / 'a' ≤ 15 mm

The fixing of the Mulcol® Multicollar Slim must be done by four Mulcol® Multiclips.

The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc or Uponor PE-RT/AL/PE-RT).

Front view

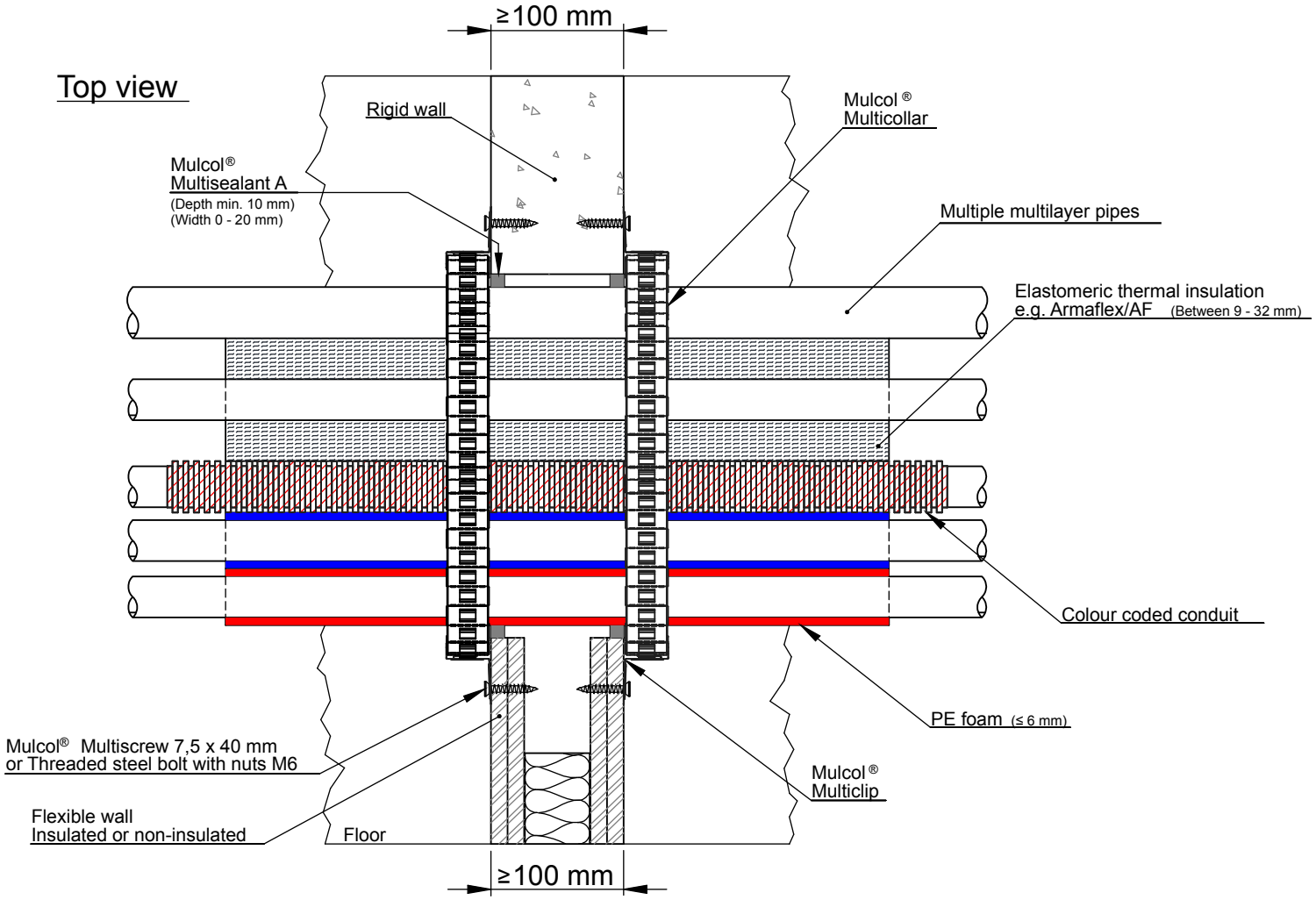
a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Side by side distance
(Maximum 15 mm between pipes or insulation)
s²- Pipe distance to floor
(Zero distance to the floor ≥ 0 mm)



Multiple pipe construction
consisting of the following pipes:

1 - Multilayer pipe - Aluminium composite
e.g. Uponor PE-RT/Al/PE-RT
2 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + Armaflex AF
3 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + Colour coded conduit
4 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + PE foam (Blue)
5 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + PE foam (Red)

Top view



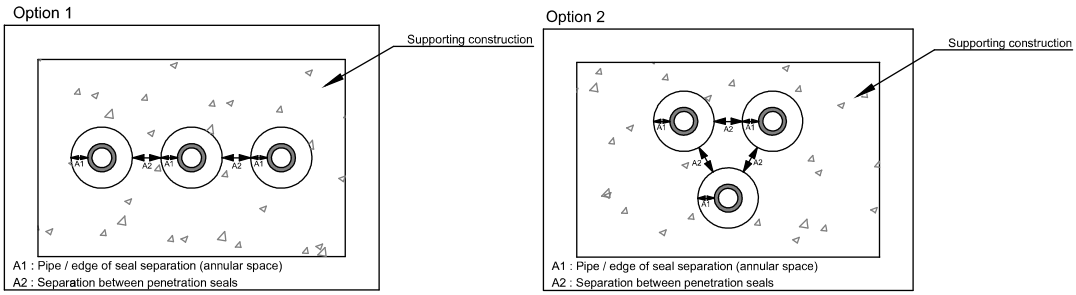
American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP5-40.0.40
	Unit of measure : mm	Department : Research & Development	
	Date : 5-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 73. The annular gap A_1 is also visible in this Figure.

f73 Visualization single penetrations



For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration with Wavin flexible PE-conduit (or equal)				
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)	Pipe material (or equal)
Outer diameter	Wall thickness			
≤ 40	4.0	EI 120–U/C E 120–U/C	N.a.	Uponor PE-RT/AL/PE-RT
≤ 32	3.0		9* to 32	Henco PE-Xc/AL/PE-Xc
≤ 32	3.0		4	
≤ 32	3.0		6	
≤ 32	3.0		6	

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Henco (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

Based upon an assessment concerning different conduit materials is expected that the fire resistances given above will also be met for penetration seals with GEWA flexible HD-PE-conduits (the conduit dimensions shall correspond to the dimensions in the table).

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.6.3 In a multiple penetration without insulation (3 different pipes)

Several different pipes

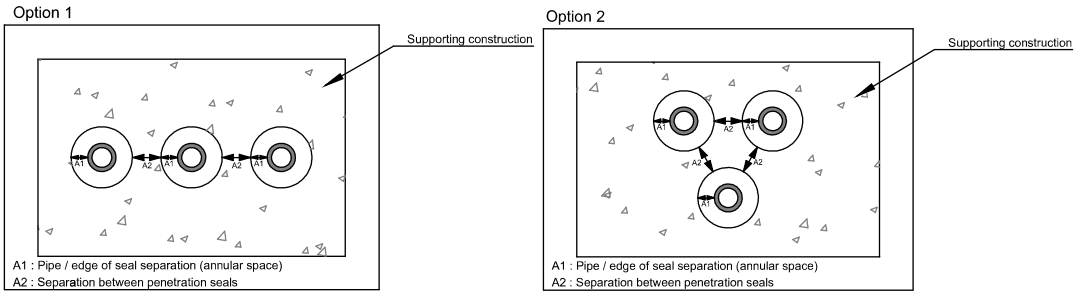
On the next page, drawing FW-MLP3-10.0.10 of the multiple pipe penetration seals without insulation with aluminium composite pipes, PP-R multilayer pipes, plastic pipes, electric cables and telecommunication cables fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.40 the installation details regarding the field of application are given.

t5.40 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 74) Mulcol® Multisealant A both faces	Distance between the pipes (distance s[1] in drawing)	Allowed annular space (distance 'a' in drawing)
PE-HD / PE / ABS / SAN+PVC / PP-R multilayer≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 90 mm / 'a' ≤ 15 mm
Aluminium composite ≤ 350 mm			

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 74. The annular gap A_1 is also visible in this Figure.

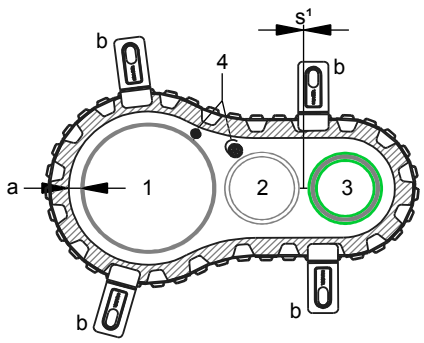
f74 Visualization single penetrations



The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

The fixing of the Mulcol® Multicollar Slim must be done by four Mulcol® Multiclips.

Front view

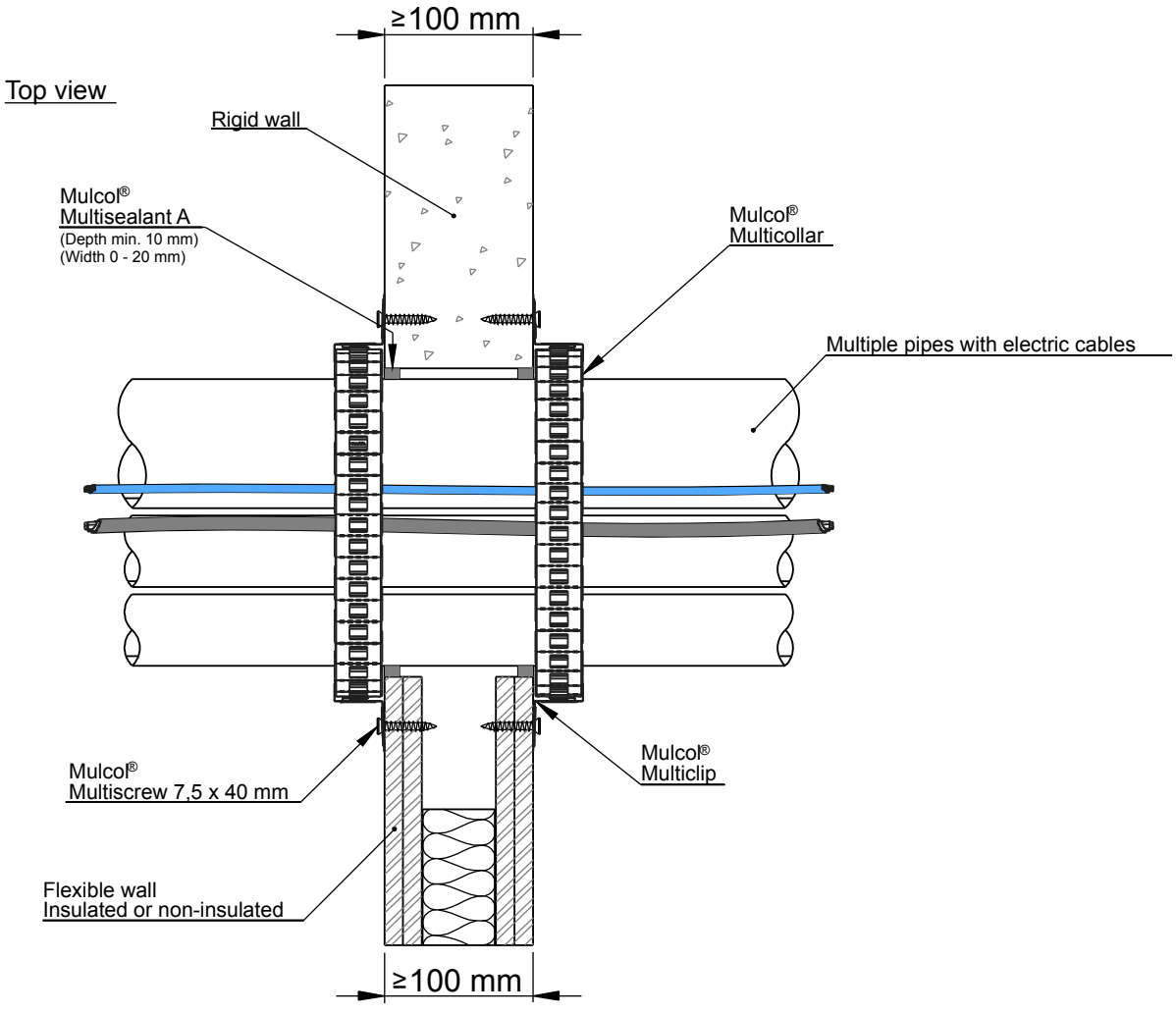


a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol® Multiclip
s¹ - Side by side distance
(Maximum 15 mm between pipes

Multiple pipe construction
consisting of the following pipes:

1 - Plastic pipe
e.g. Agru PE-HD
2 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc
3 - Multilayer pipe - Fibre composite
e.g. Aquatherm green pipe PP-R/GF7/E MF
4 - Electric cables
e.g. UTP Cable Cat. 5, UTP Cable Cat. 6, YMVK 3 x 2,5 mm,
YMVK Cable 5 x 1,5 mm or YMVK Cable 5 x 2,5 mm

Top view



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP3-10.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 1-2-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration				
Pipe dimensions (mm)		**Performance class with pipe end configuration**		**Material (or equal)**
Outer diameter	**Wall thickness**			
≤ 90	**2.8**	**EI 120–U/U** **E 120–U/U**	**EI 120–U/C** **E 120–U/C**	**PE-HD / PE / ABS / SAN+PVC**
≤ 50	**4.0**	**EI 90–U/C** **E 120–U/C**		**Henco PE-Xc/AL/PE-Xc**
≤ 50	**6.9**	**EI 120–U/C** **E 120–U/C**		**Aquatherm Green-MF**
Cable	**Amount**	**Performance class**		**Type**
Telecommunication	**1**	**EI 120** **E 120**		**UTP Cat. 5 or Cat. 6**
Sheathed cable	**1**			**YMVK 3 x 2.5 mm², YMVK 5 x 1.5 mm² or YMVK 5 x 2.5 mm²**

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

Aluminium composite:
- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

PP-R:
- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-M, Aquatherm Green-MS, Aquatherm Green-S, Aquatherm Green-MF, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

5.6.4 In a multiple penetration without insulation (3 equal pipes)

Several different pipes

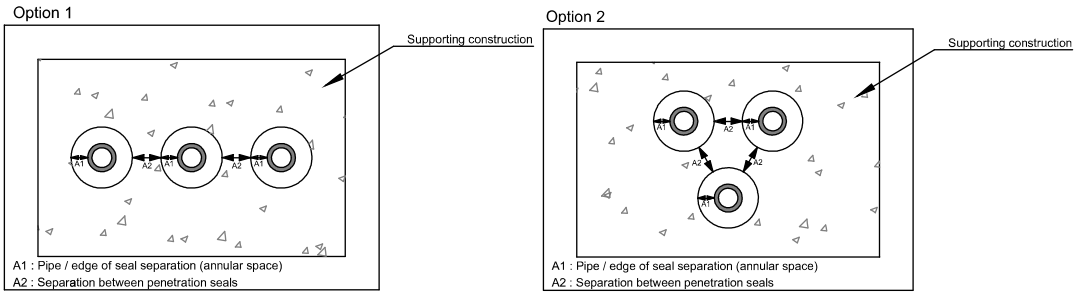
On the next page, drawing FW-MLP3-10.0.10 of the multiple pipe penetration seals without insulation with plastic pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.41 the installation details regarding the field of application are given.

t5.41 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 75) Mulcol® Multisealant A both faces	Distance between the pipes (distance s[1] in drawing)	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 75 mm / 'a' ≤ 15 mm

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 75. The annular gap A_1 is also visible in this Figure.

f75 Visualization single penetrations

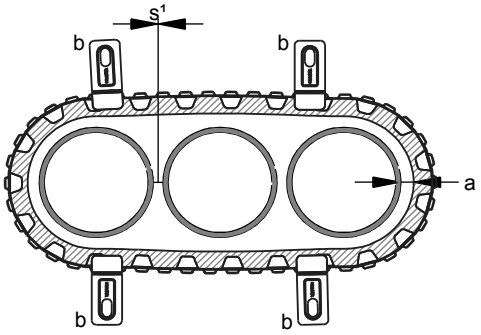


The fixing of the Mulcol® Multicollar Slim must be done by four Mulcol® Multiclips.

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

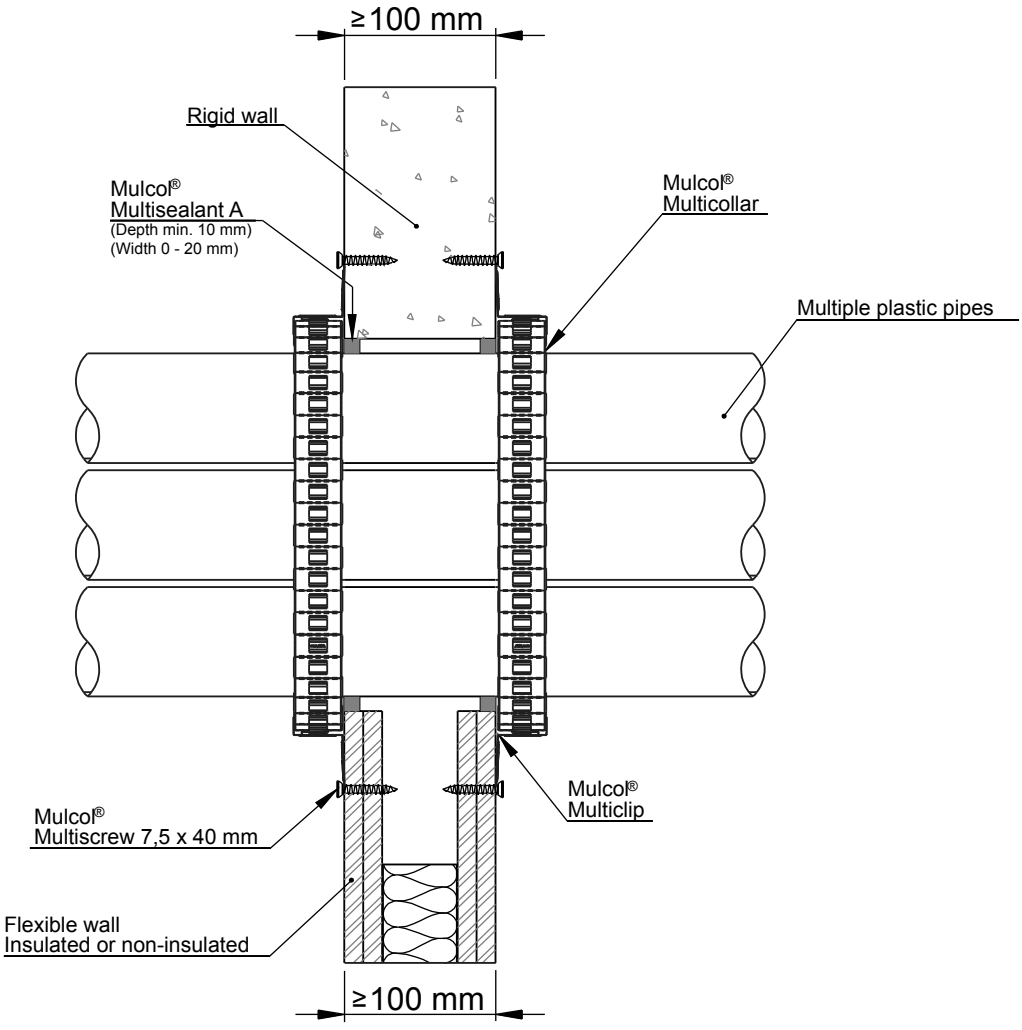
Fire resistance Multiple penetration			
Pipe dimensions (mm)		Performance class with pipe end configuration	Material
Outer diameter	Wall thickness		
≤ 75	3.0	EI 90–U/C E 120–U/C	PVC-U / PVC-C

Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)
b - Mulcol®Multiclip
s¹- Side by side distance
(Maximum 15 mm between pipes)

Top view



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP3-10.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 31-1-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

5.6.5 In a multiple penetration with insulation (3 pipes)

Several different pipes

On the next page, drawing FW-MLP3-10.0.40 of the multiple pipe penetration seal with insulation with aluminium composite pipes, PP-R multilayer pipes, plastic pipes, electric cables and telecommunication cables fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.42 the installation details regarding the field of application are given.

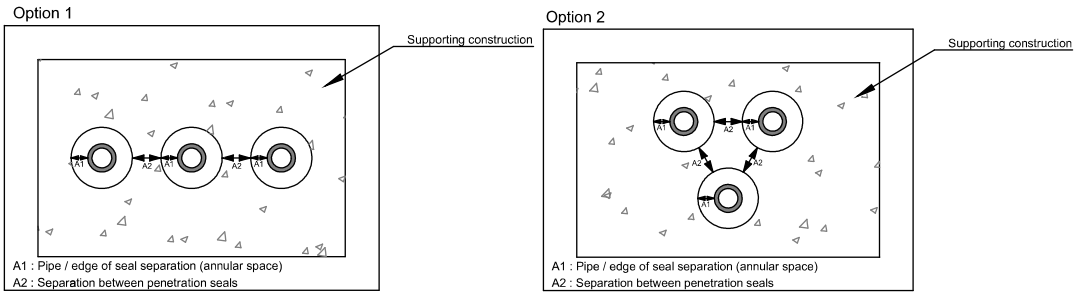
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.42 Installation details

Distance to first pipe support (both faces)	Sound decoupling insulation allowed	Allowed filling of annular gap (distance A_1, see Figure 76) Mulcol® Multisealant A both faces	Distance between the pipes (distance s^1 in drawing)	Allowed annular space (distance 'a' in drawing)
PE-HD / PE / ABS / SAN+PVC ≤ 450 mm	Thickness ≤ 4 mm / minimum insulation length 50 mm (LS/CS/LI/CI)	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 114 mm / 'a' ≤ 15 mm
Aluminium composite / PP-R multilayer ≤ 350 mm				

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 76. The annular gap A_1 is also visible in this Figure.

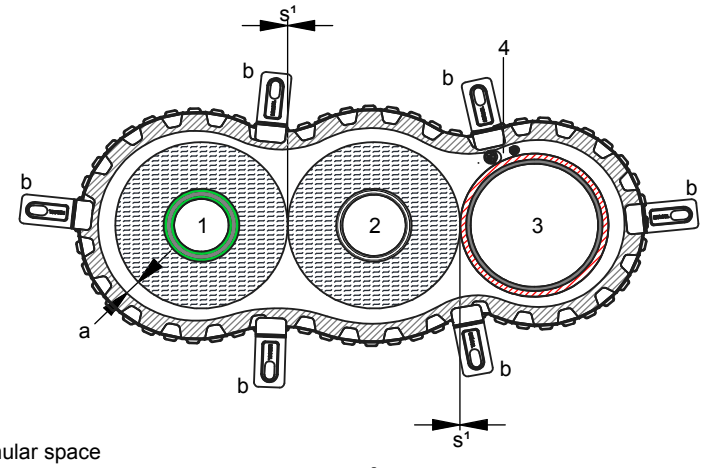
f76 Visualization single penetrations



The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

The fixing of the Mulcol® Multicollar Slim must be done by four Mulcol® Multiclips.

Front view



a - Annular space
(Maximum 15 mm between pipe or insulation and Mulcol® Multicollar)

b - Mulcol® Multiclip

s¹ - Side by side distance
(Maximum 15 mm between pipes or insulation)

Multiple pipe construction consisting of the following pipes:

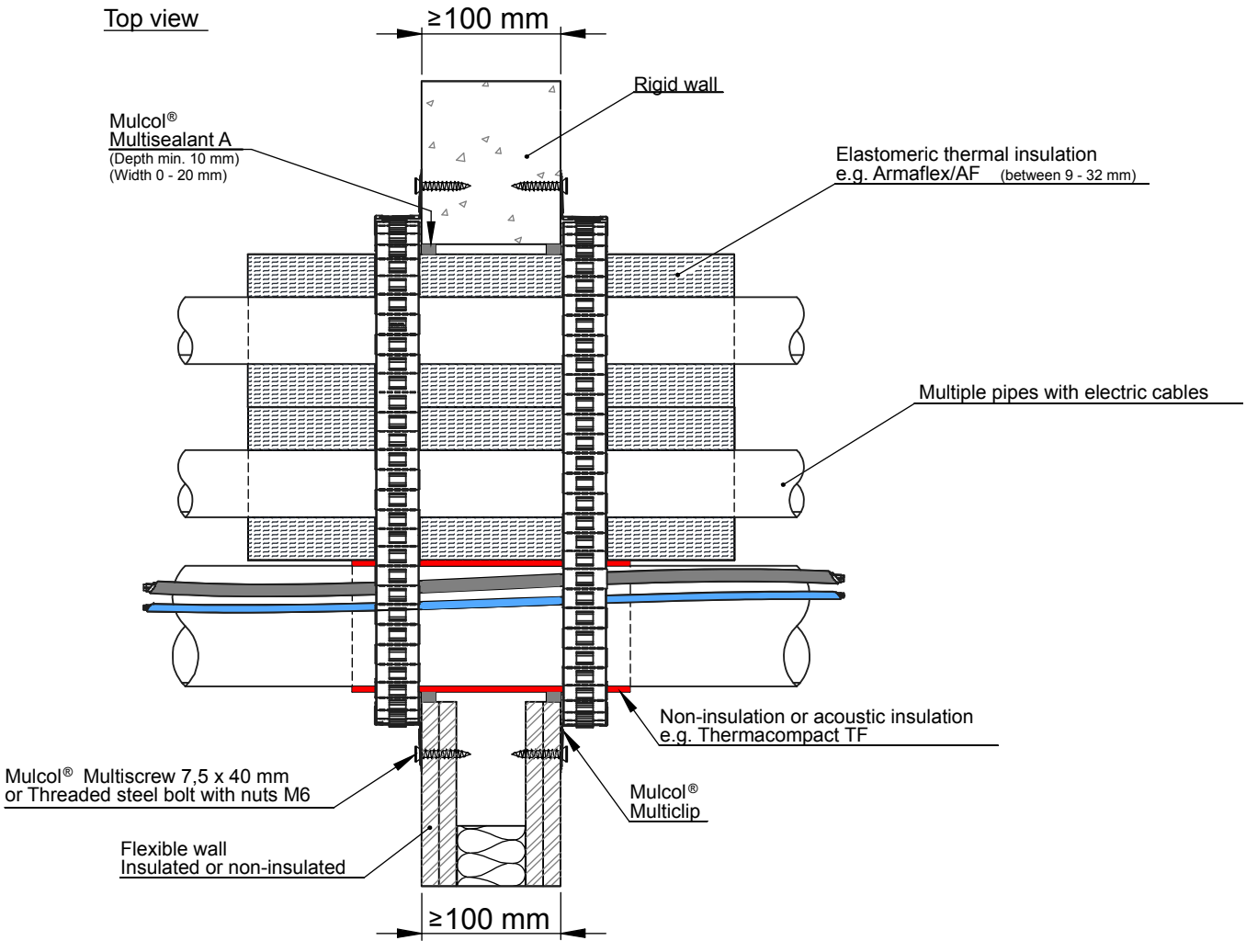
1 - Multilayer pipe - Fibre composite
e.g. Aquatherm green pipe PP-R/GF7/E MF

2 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc

3 - Plastic pipe
e.g. Agru PE-HD

4 - Electric cables
e.g. UTP Cat. 5, UTP Cat. 6, YMVK 3 x 2,5 mm, YMVK 5 x 1,5 mm or YMVK 5 x 2,5 mm

Top view



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP3-10.0.40
	Unit of measure : mm	Department : Research & Development	
	Date : 26-9-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)	Thickness insulation (mm)
Outer diameter	Wall thickness			
≤ 90	2.8	EI 60–U/C* E 60–U/C	PE-HD / PE / ABS / SAN+PVC	4
≤ 50	4.0		Henco PE-Xc/AL/PE-Xc	9* to 32
≤ 50	6.9		Aquatherm Green-MF	9* to 32
Cable	Amount		Type	
Telecommunication	1		UTP Cat. 5 or Cat. 6	
Sheathed cable	1		YMVK 3 x 2.5 mm^2, YMVK 5 x 1.5 mm^2 or YMVK 5 x 2.5 mm^2	

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

Aluminium composite:
- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

PP-R:
- Aquatechnik Fusio PP-R 80, Aquatechnik Fusio PP-RCT;
- Aquatherm Blue-MF, Aquatherm Blue-S, Aquatherm Red-M, Aquatherm Green-MS, Aquatherm Green-MF, Aquatherm Green-S, Aquatherm Lilac-S, Aquatherm Grey-MS and Aquatherm Orange M;
- Bänninger PP-R, Bänninger Climatec PP-RCT and Bänninger Watertec PP-RCT.

Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

5.6.6 In a multiple penetration with insulation (4 pipes)

Several different pipes

On the next page, drawing FW-MLP4-10.0.40 of the multiple pipe penetration seal with insulation with aluminium composite pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.43 the installation details regarding the field of application are given.

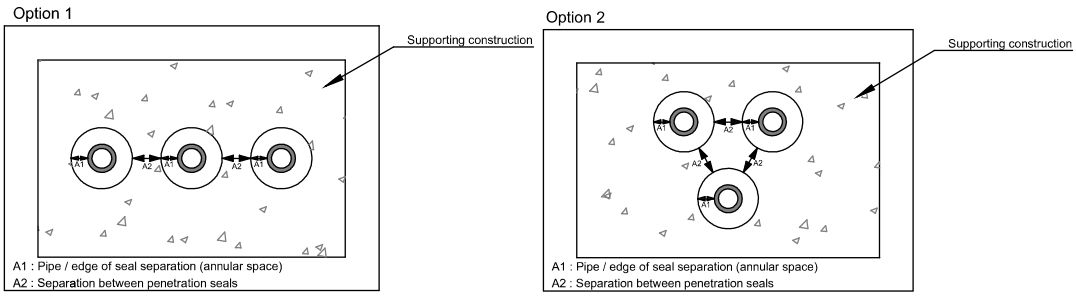
The fire resistance is valid for insulation PE-foam with a reaction to fire class C_L-s1-d0 in accordance with EN 13501-1 or equal and a thickness of ≤ 6 mm. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.43 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 77) Mulcol® Multisealant A both faces	Distance between the pipes (distance s[1] in drawing)	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 38 mm / 'a' ≤ 15 mm

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 77. The annular gap A_1 is also visible in this Figure.

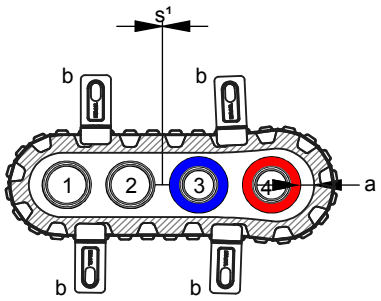
f77 Visualization single penetrations



The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

The fixing of the Mulcol® Multicollar Slim must be done by four Mulcol® Multiclips.

Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol® Multicollar)

b - Mulcol ® Multiclip

s¹- Side by side distance
(Maximum 15 mm between pipes or insulation)

Multiple pipe construction consisting of the following pipes:

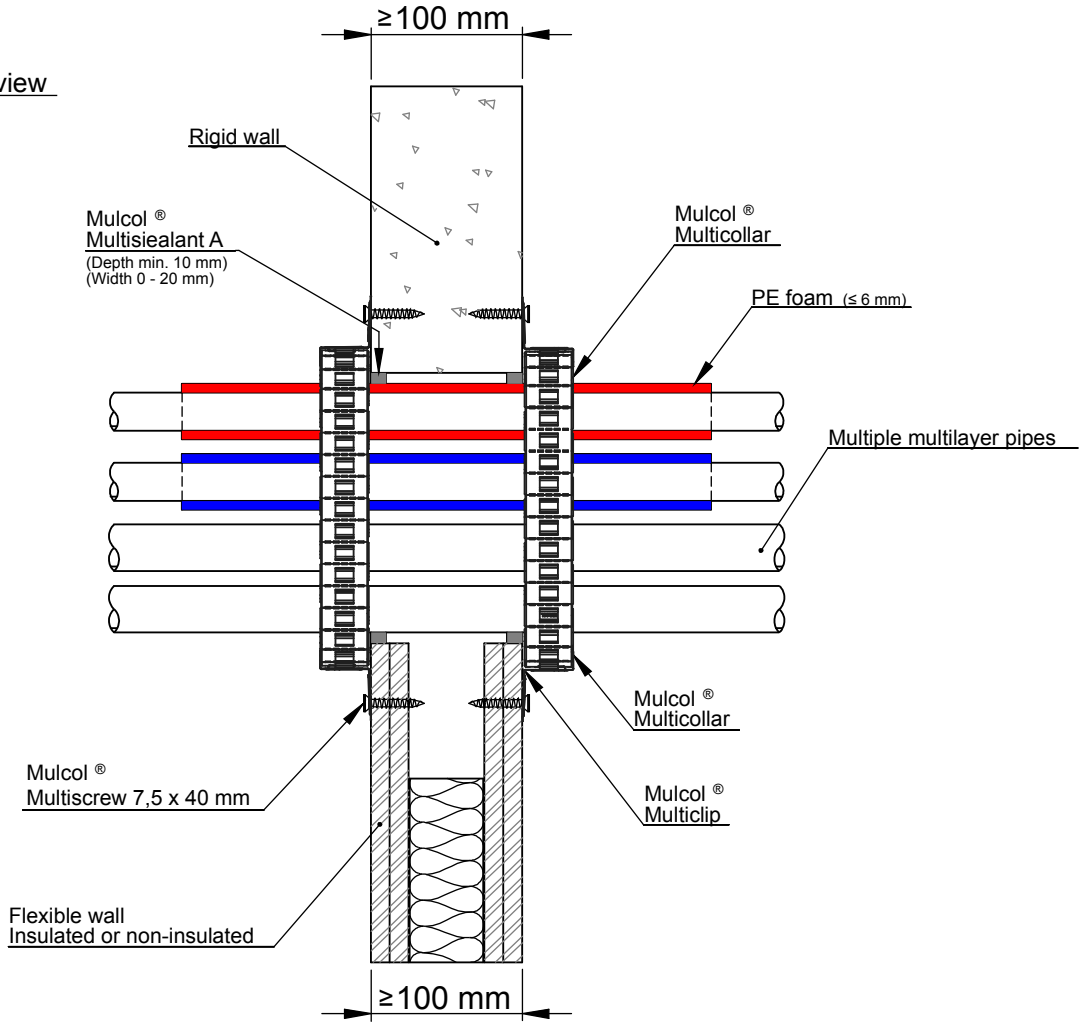
1 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc

2 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc

3 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + PE foam (Blue)

4 - Multilayer pipe - Aluminium composite
e.g. Henco PE-Xc/Al/PE-Xc + PE foam (Red)

Top view



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP4-10.0.40
	Unit of measure : mm	Department : Research & Development	A4
	Date : 25-1-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)	Thickness insulation (mm)
Outer diameter	Wall thickness			
≤ 26	3.0	EI 120–U/C*	Henco PE-Xc/AL/PE-Xc	6
≤ 32	3.0	E 120–U/C*		N.a.

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.6.7 In a multiple penetration with insulation (3 pipes and cables)

Several different pipes

On the next page, drawing FW-MLP5-10.0.40 of the multiple pipe penetration seal with copper pipes including PE-foam insulation, PVC-U / PVC-C pipes, electric cables and telecommunication cables fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.44 the installation details regarding the field of application are given.

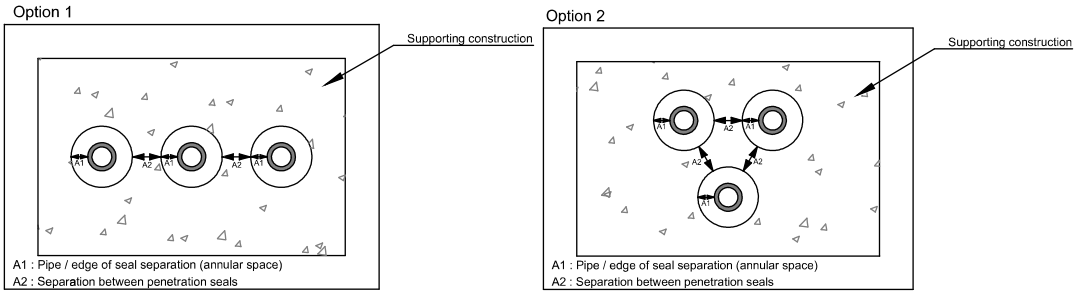
The fire resistance is valid for insulation PE-foam with a reaction to fire class E in accordance with EN 13501-1 or equal and a thickness of ≤ 6 mm. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

t5.44 Installation details

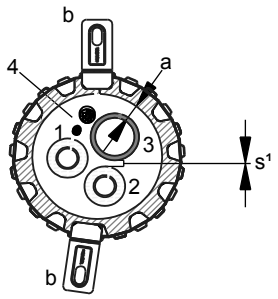
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 78) Mulcol® Multisealant A both faces	Distance between the pipes (distance s[1] in drawing)	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 90 mm / 'a' ≤ 15 mm

If more multiple pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 78. The annular gap A_1 is also visible in this Figure.

f78 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between pipe and Mulcol®Multicollar)

b - Mulcol®Multiclip

s¹- Side by side distance
(Maximum 15 mm between pipes or insulation)

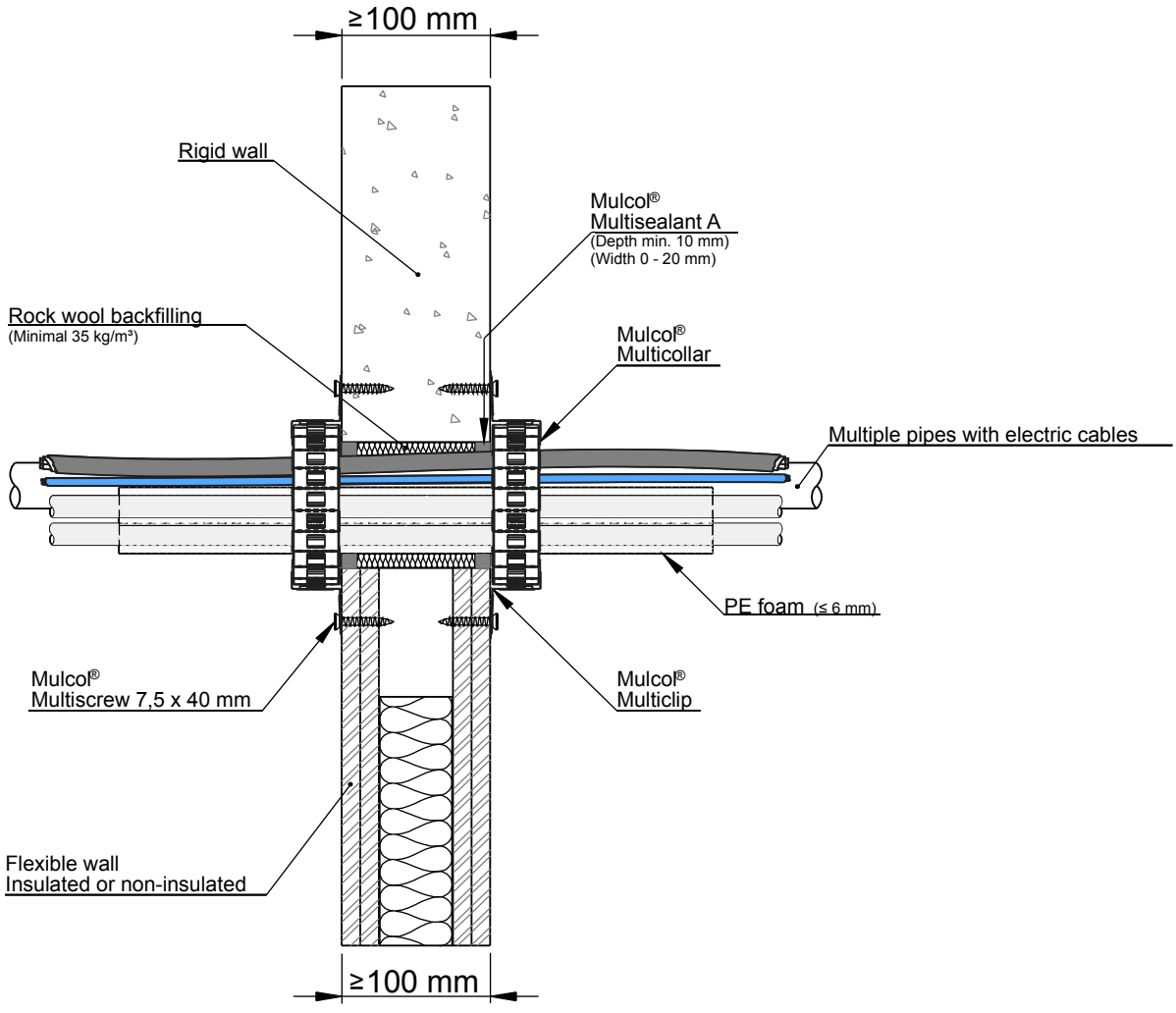
Multiple pipe construction consisting of the following pipes:

1 - Copper pipe + PE foam
e.g. WICU® Flex

2 - Copper pipe + PE foam
e.g. WICU® Flex

3 - Plastic pipe
e.g. PVC-U

4 - Electric cables
e.g. UTP Cable Cat. 5, UTP Cable Cat. 6, YMVK 3 x 2,5 mm, YMVK Cable 5 x 1,5 mm or YMVK Cable 5 x 2,5 mm



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-MLP5-10.0.40
	Unit of measure : mm	Department : Research & Development	A4
	Date : 2-2-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material (or equal)	Thickness insulation (mm)
Outer diameter	Wall thickness			
15	1.5	EI 60–C/U* E 60–C/U*	Copper with insulation Wicu Flex PE-foam	6
≤ 32	3.0	EI 120–U/U* EI 120–U/C* E 120–U/U* E 120–U/C*	PVC-U / PVC-C	N.a.
Cable	Amount	Performance class	Type	
Telecommunication	1	EI 120* E 120*	UTP Cat. 5 or Cat. 6	
Sheathed cable	1		YMVK 3 x 2.5 mm^2, YMVK 5 x 1.5 mm^2 or YMVK 5 x 2.5 mm^2	

5.6.8 In a multiple penetration through a seal penetration system (2 pipes)

Several different pipes

On the next page, drawing PBfw-MLP2-10.0.22 of the multiple pipe penetration seal with aluminium composite pipes with PE-foam insulation through a seal penetration system is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.45 the installation details regarding the field of application are given.

For multiple penetrations, the use of the Mulcol® Multimastic FB1 (2 x 50 mm) penetration seal system is recommended. The aperture size in the wall may be up to 2400 mm wide and 1200 mm high. No aperture frame is needed, but it is allowed. For further details see Paragraph 5.1.2.

The fire resistance is valid for insulation PE-foam with a reaction to fire class C_L-s1-d0 in accordance with EN 13501-1 or equal and a thickness of ≤ 6 mm. The insulation may be applied sustained or interrupted through the aperture with a minimum distance of 300 mm on both sided from the point where the pipe emerges from the wall (LS, CS, LI or CI in accordance with Table 1 of EN 1366-3:2009).

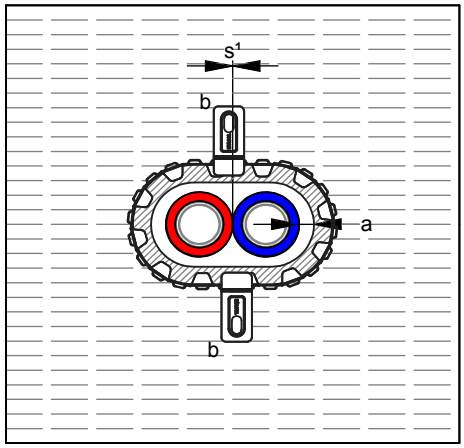
t5.45 Installation details

Distance to first pipe support (both faces)	Distance to other pipes (A_1 to A_3, see Figure 79)	Allowed filling of annular gap Mulcol® Multisealant SP with backing rock wool ≥ 35 kg/m³	Distance between the pipes (distance s[1] in drawing)	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	≥ 100 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ 15 mm	Outer diameter ≤ 44 mm / 'a' ≤ 15 mm

The fixing of the Mulcol® Multicollar Slim must be done by two Mulcol® Multiclips.

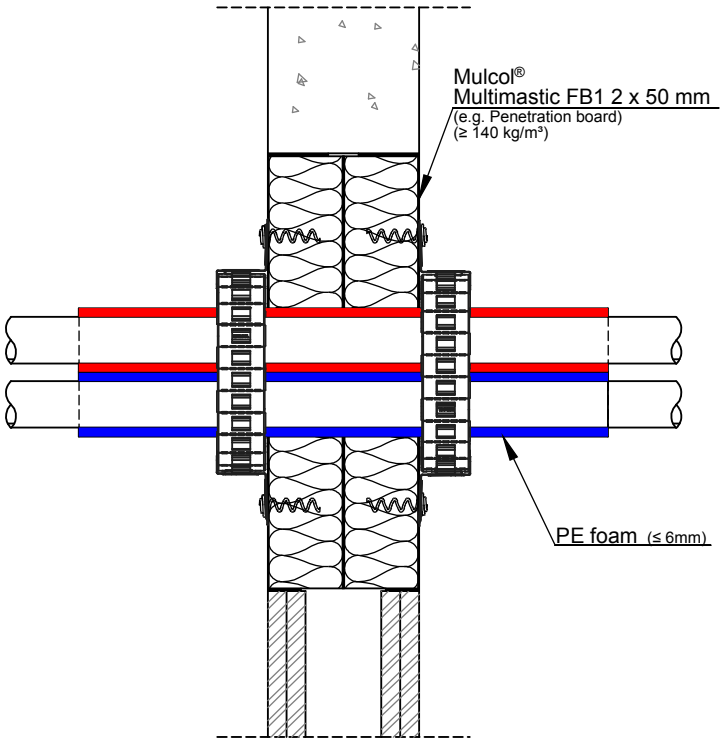
The fire resistance is valid aluminium composite pipes made out of an inner layer of cross-linked polyethylene, a layer aluminium in the middle and a layer of cross-linked polyethylene on top (Henco PE-Xc/AL/PE-Xc).

Front view

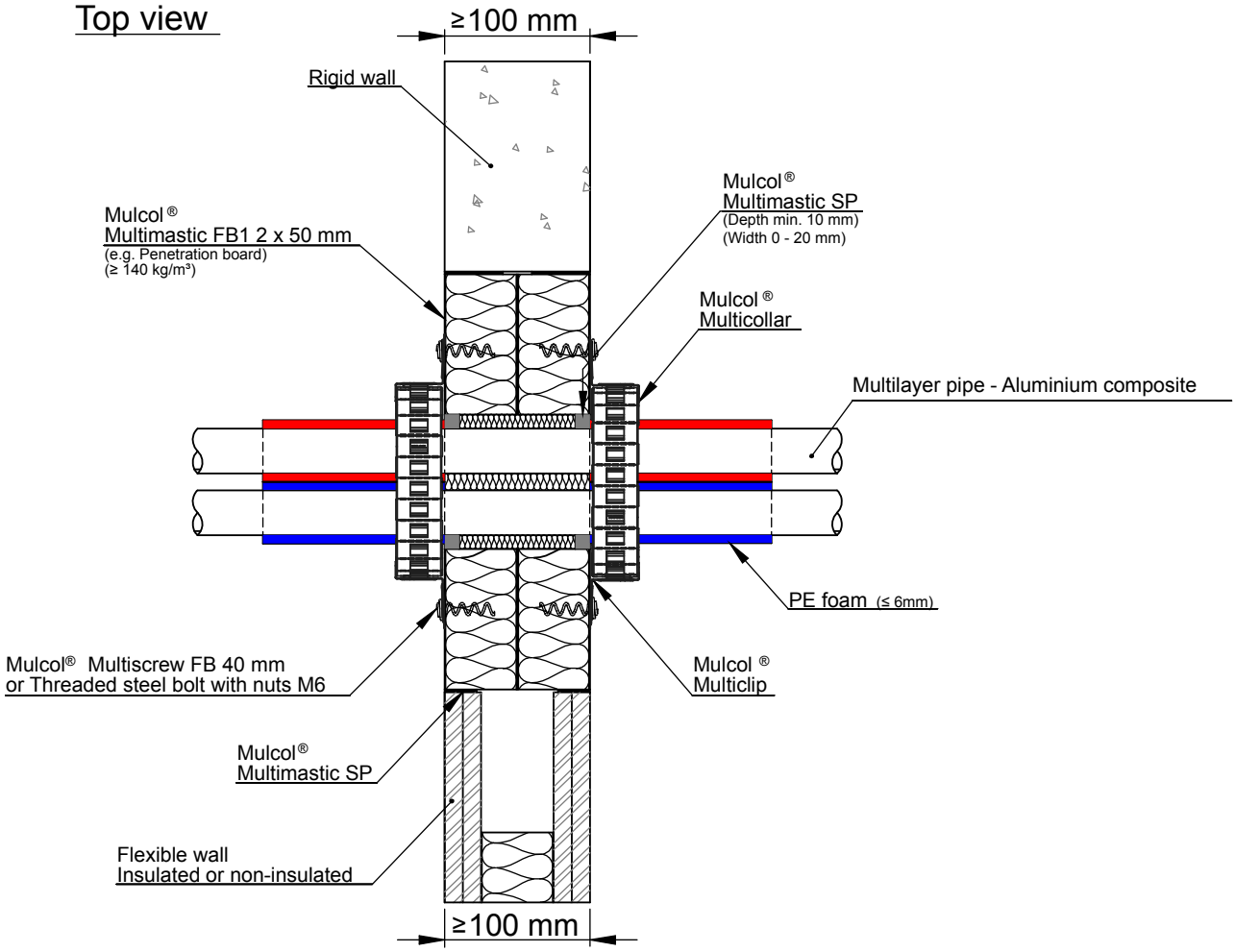


a - Annular space
(Maximum 15 mm between pipe and Mulcol ® Multicollar)
b - Mulcol ® Multiclip
s¹- Side by side distance
(Maximum 15 mm between pipe or insulation)

Top view



Top view



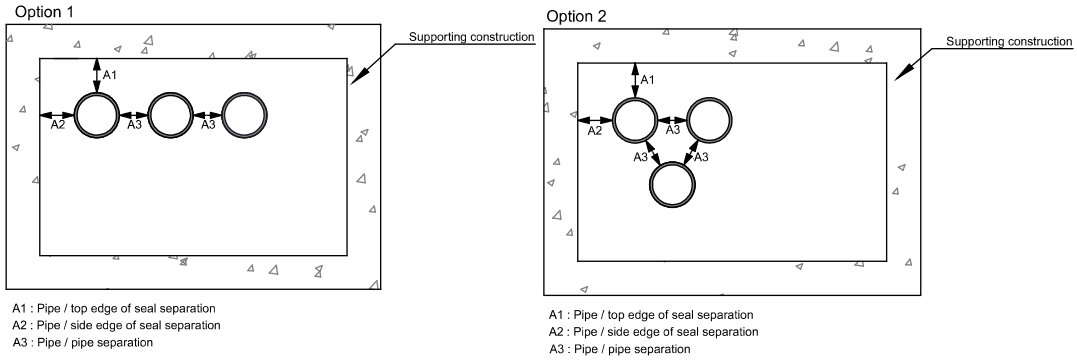
American projection	Scale : 1:5	Company : Mulcol International B.V.	PBfw-MLP2-10.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 21-12-2016	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

If more multiple pipe penetrations are placed in the penetration seal system, the minimum distance between the multiple penetration and other pipes is 100 mm, see Figure 79 (presence of ≥ 60 mm of rock wool Mulcol® Multimastic FB1 between the pipes is mandatory).

f79 Visualization distance between pipes



For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Multiple penetration Henco PE-Xc/AL/PE-Xc (or equal)			
Pipe dimensions (mm)		Performance class with pipe end configuration	Thickness insulation (mm)
Outer diameter	Wall thickness		
≤ 32	3.0	EI 120–U/C	6
≤ 32	3.0	E 120–U/C	6

Based upon an assessment concerning different pipe materials it is expected that the fire resistances given above will also be met for penetration seals with pipes of the following types (the pipe dimensions shall correspond to the dimensions in the table):

- Alpex DUO, Valsir Pexal, Valsir Mixal and APE Plain (PE-Xb/AL/PE-Xb);
- Geberit Mepla and Uponor Unipipe (PE-RT/AL/PE-RT);
- Uponor and Henco (PE-Xc/AL/PE-Xc);
- Uponor and REHAU (PE-Xa) and REHAU (PE-Xc);
- SP Superpipe and POLYGON PEX (PE-X/AL/PE-X);
- Valsir Pexal and Valsir Mixal (PE/AL/PE-Xb);
- Wavin Tigris, Protecta-Line System and Alpex F50 Profi (PE-X/AL/PE).

5.7 Flue gas pipes

In this Chapter the expected fire resistance and field of application of flue gas pipes in several different applications is summarized.

5.7.1 Aluminium

Flue gas pipes

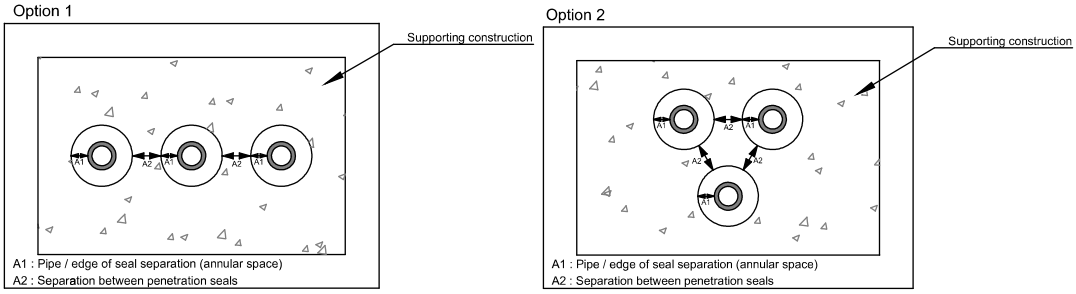
On the next page, drawing FW-RGA-21.0.10 of the pipe penetration seal with an aluminium flue gas pipe without insulation is given for the pipe fitted with two Mulcol® Multicollar Slim placed at the exposed face of the wall. In Table 5.46 the installation details regarding the field of application are given.

t5.46 Installation details

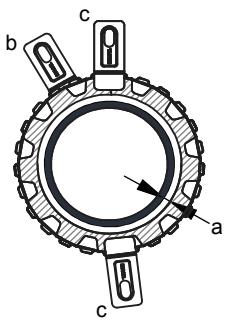
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 80) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 130 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 80. The annular gap A_1 is also visible in this Figure.

f80 Visualization single penetrations

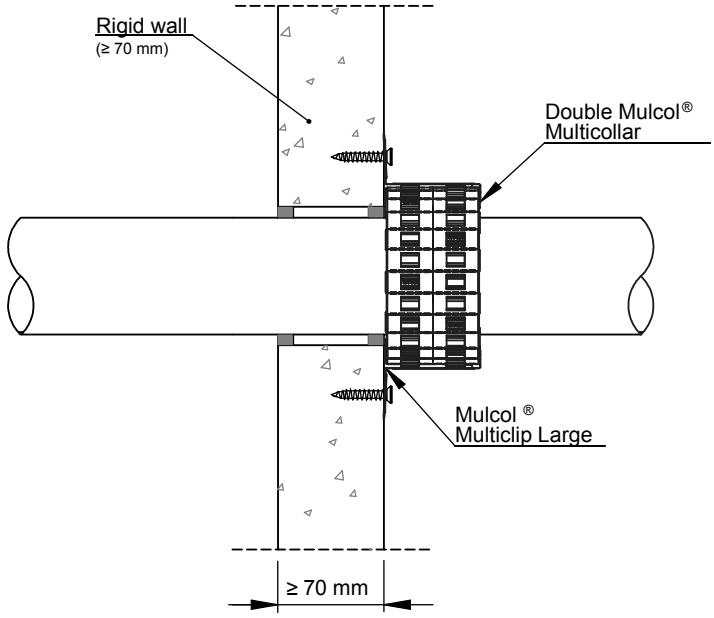


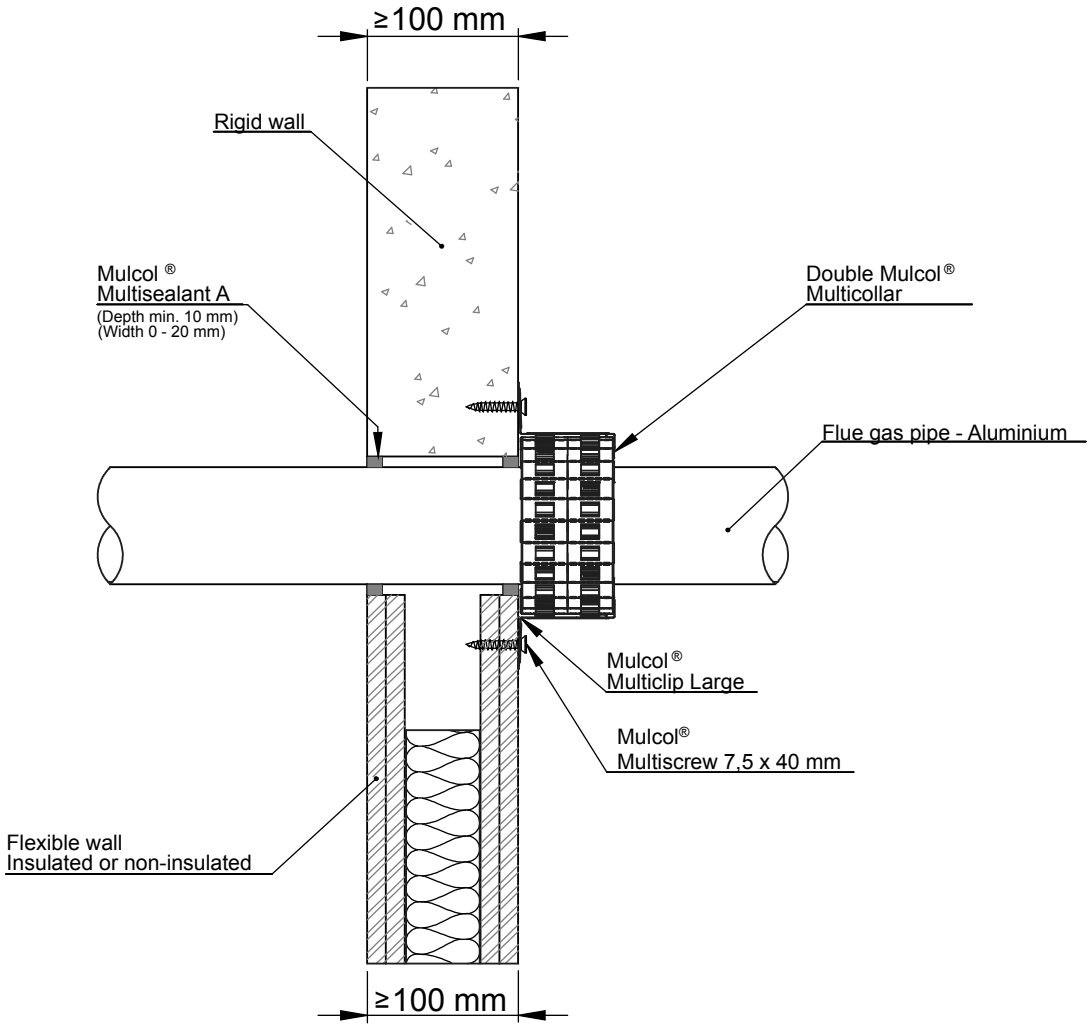
Front view



a - Annular space
(Maximum 5 mm between pipe and Mulcol ® Multicollar)
b - Mulcol® Multiclip
c - Mulcol ® Multiclip Large

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-RGA-21.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 25-4-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

The fire resistance applies for flue gas systems and may be supported by a fire rated or non fire rated support system. The (heating) boiler must be situated at the exposed face.

For this system, a fire resistance is valid in one direction (from the exposed face) to the following combinations of performance parameters and classes.

Fire resistance Two collars exposed face Flue gas system (aluminium)				
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Type of wall and thickness (mm)
Outer diameter	Wall thickness			
80	1.5	EI 15–U/C E 90–U/C	Aluminium	Rigid ≥ 70 mm / flexible ≥ 100 mm
130	1.5	E 90–U/C*		

5.7.2 Concentric steel

Flue gas pipes

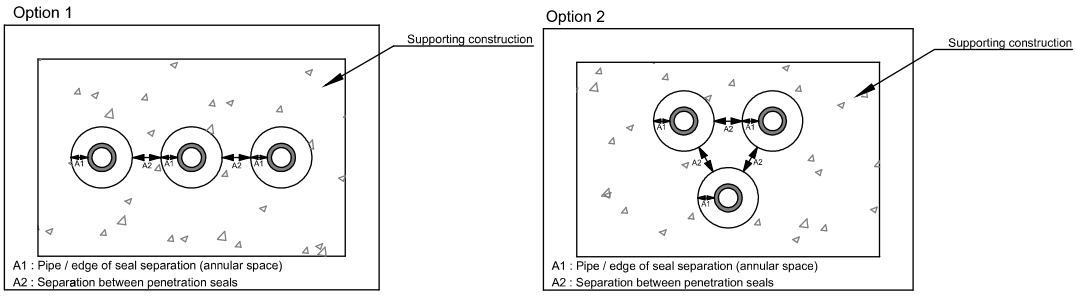
On the next page, drawing FW-RGAT-21.0.10 of the pipe penetration seal with a concentric steel flue gas pipe without insulation is given for the pipe fitted with two Mulcol® Multicollar Slim placed at the exposed face of the wall. In Table 5.47 the installation details regarding the field of application are given.

t5.47 Installation details

Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 81) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥ 10 mm	Outer diameter ≤ 200 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 81. The annular gap A_1 is also visible in this Figure.

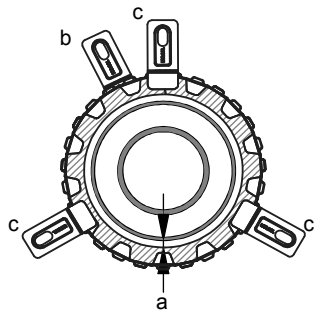
f81 Visualization single penetrations



The fire resistance applies for flue gas systems and may be supported by a fire rated or non fire rated support system. The (heating) boiler must be situated at the exposed face.

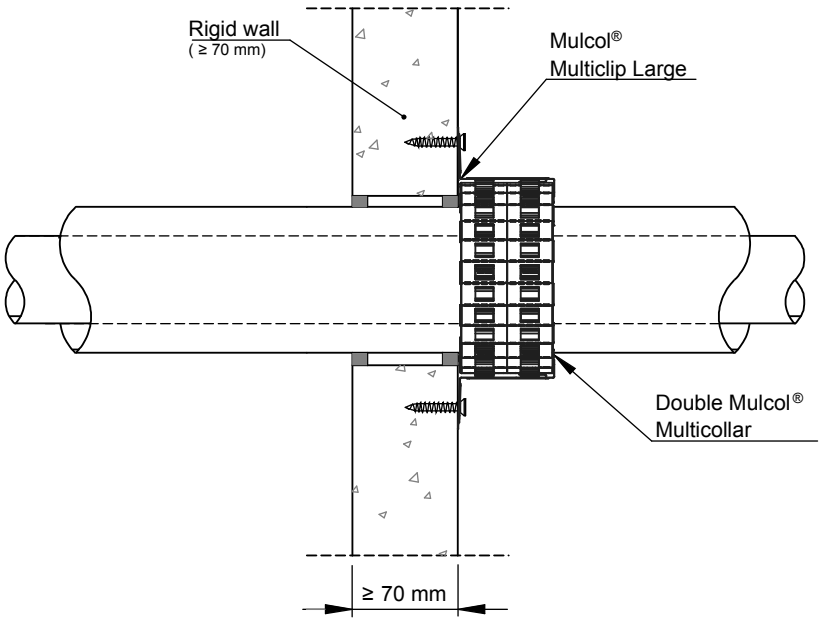
The fire resistance is for example valid for Burgerhout Twinsafe Push-Fit, Burgerhout M&G or equal.

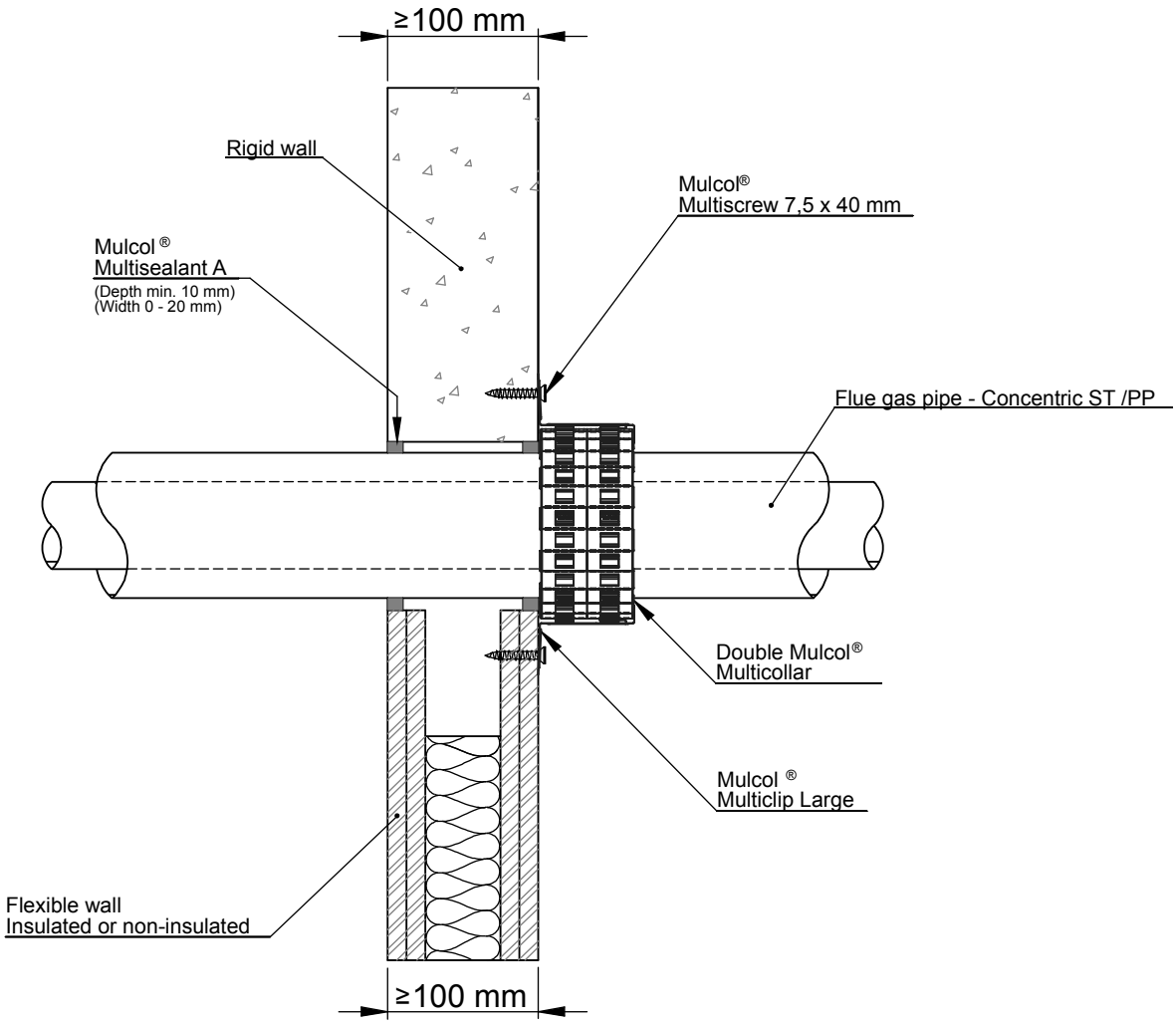
Front view



a - Annular space
(Maximum 5 mm between pipe and Mulcol ® Multicollar)
b - Mulcol® Multiclip
c - Mulcol ® Multiclip Large

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-RGAT-21.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 26-4-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance is valid in one direction (from the exposed face) to the following combinations of performance parameters and classes.

Fire resistance Two collars exposed face Flue gas system (concentric steel)				
Dimensions (mm)		Performance class with pipe end configuration	Pipe material	Type of wall and thickness (mm)
Diameter inner pipe (PP)	Diameter outer pipe (steel)			
60	100	E 90–U/C*	ST / PP	Rigid ≥ 70 mm / flexible ≥ 100 mm
80	125	E 90–U/C*		
100	150	E 90–U/C		
130	200	E 90–U/C*		

5.7.3 Plastic

Flue gas pipes

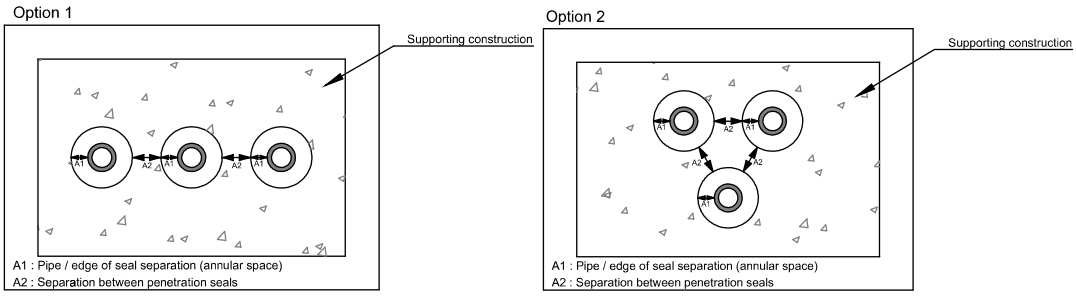
On the next page, drawing FW-RGA-11.0.10 of the pipe penetration seal with a plastic flue gas pipe without insulation is given for the pipe fitted with one or two Mulcol® Multicollars Slim placed at the exposed face of the wall. In Table 5.48 the installation details regarding the field of application are given.

t5.48 Installation details

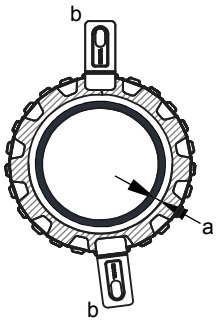
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 82) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 82. The annular gap A_1 is also visible in this Figure.

f82 Visualization single penetrations

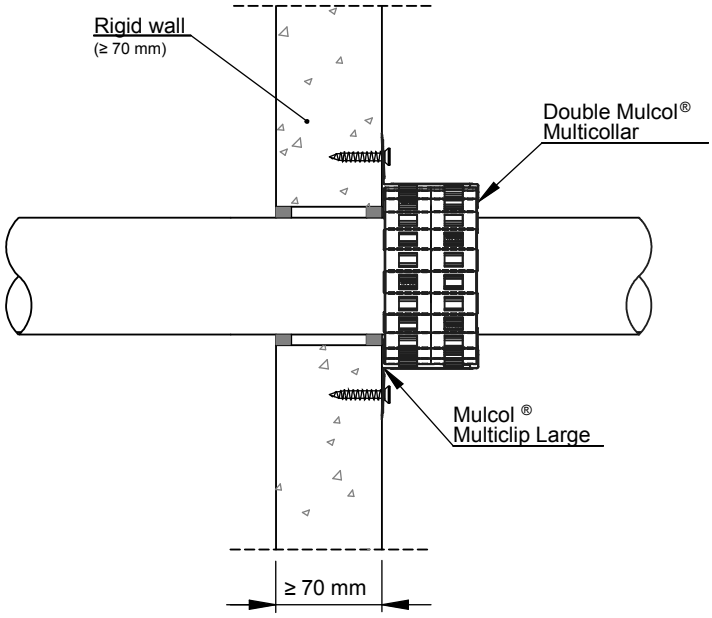


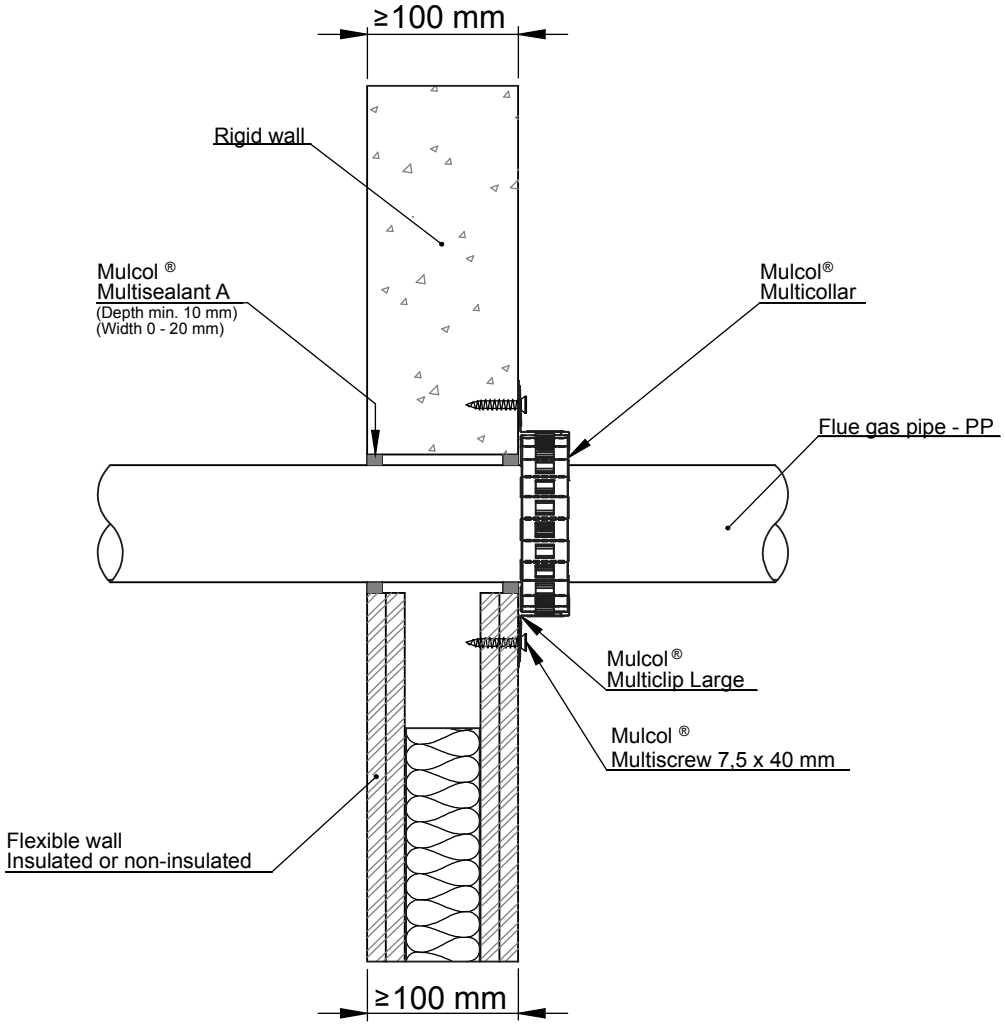
Front view



a - Annular space
(Maximum 5 mm between pipe and Mulcol ® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-RGA-11.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 25-4-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

The (heating) boiler must be situated at the exposed face.

For this system, the fire resistance is derived from PP pipes as stated in Paragraph 5.2.1 and is valid in one direction (from the exposed face) to the following combinations of performance parameters and classes.

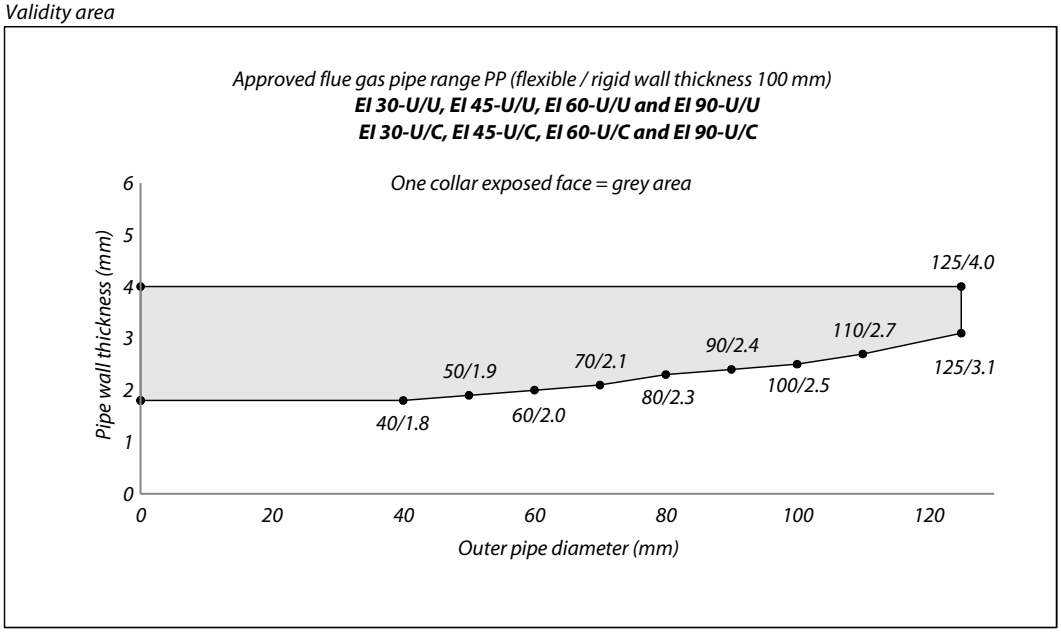
Fire resistance One collar exposed face Flue gas system (plastic)					
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material	Type of wall and thickness (mm)
Outer diameter	Wall thickness				
≤ 40	1.8 to 4.0	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C	PP	Flexible / rigid, ≥ 100
≤ 125	3.1 to 4.0	EI 90–U/U E 90–U/U	EI 90–U/C E 90–U/C	PP	

Fire resistance Two collars exposed face Flue gas system (plastic)					
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material	Type of wall and thickness (mm)
Outer diameter	Wall thickness				
≤ 40	1.8 to 4.0	EI 60–U/U* E 60–U/U*	EI 60–U/C* E 60–U/C*	PP	Rigid, ≥ 70
≤ 125	3.1 to 4.0	EI 60–U/U* E 60–U/U*	EI 60–U/C* E 60–U/C*	PP	

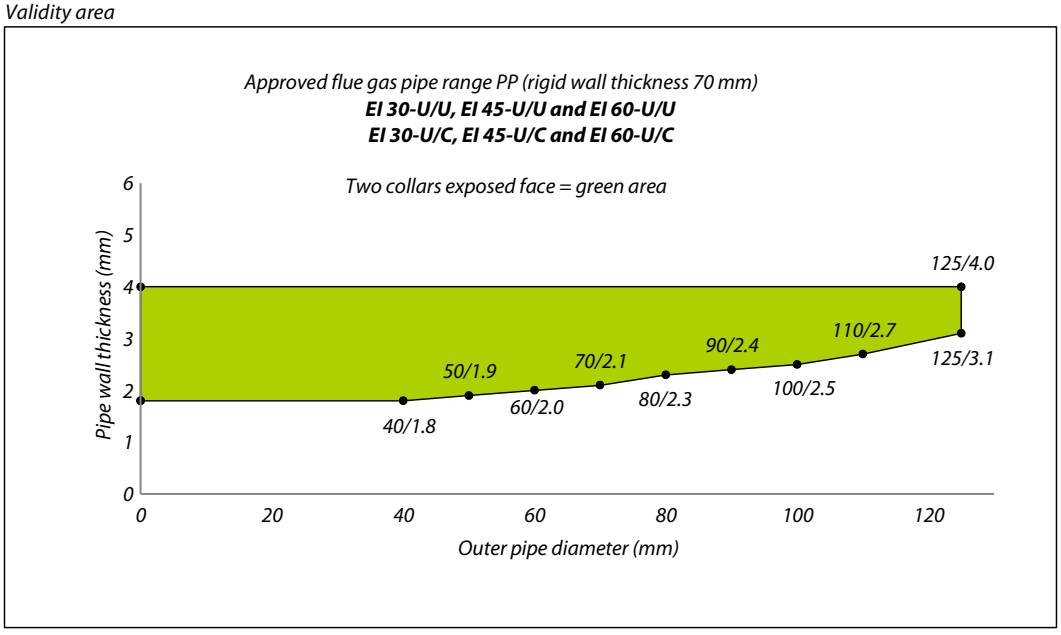
A visualization of the validity area for the fire resistance for EI 30, EI 45, EI 60 and EI 90 is given in the Figure hereafter.

The fire resistance is for example partly valid for Burgerhout Safe PP (wall thickness of 2.2 mm) or equal as long as the pipe dimensions meet the validity area.

f83 *Validity area*



f84 *Validity area*



5.7.4 Concentric plastic

Flue gas pipes

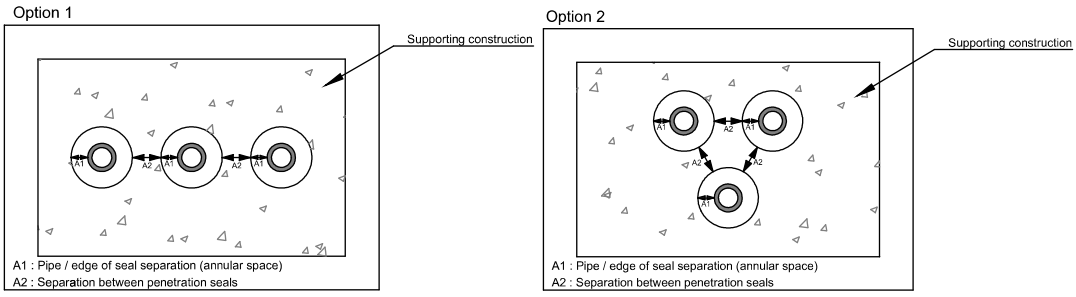
On the next page, drawing FW-RGAT_PP-11.0.10 of the pipe penetration seal with a concentric plastic flue gas pipe without insulation is given for the pipe fitted with one or two Mulcol® Multicollars Slim placed at the exposed face of the wall. In Table 5.49 the installation details regarding the field of application are given.

t5.49 Installation details

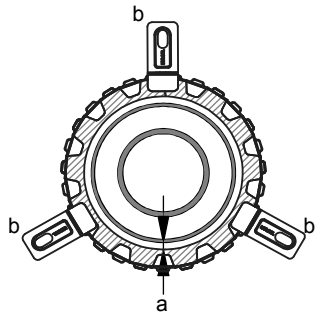
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 85) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)
≤ 450 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 85. The annular gap A_1 is also visible in this Figure.

f85 Visualization single penetrations

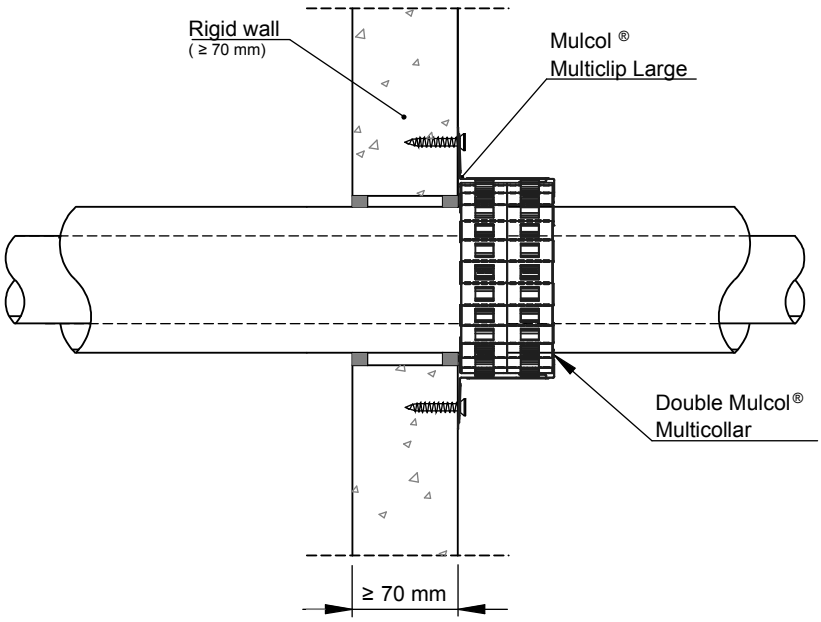


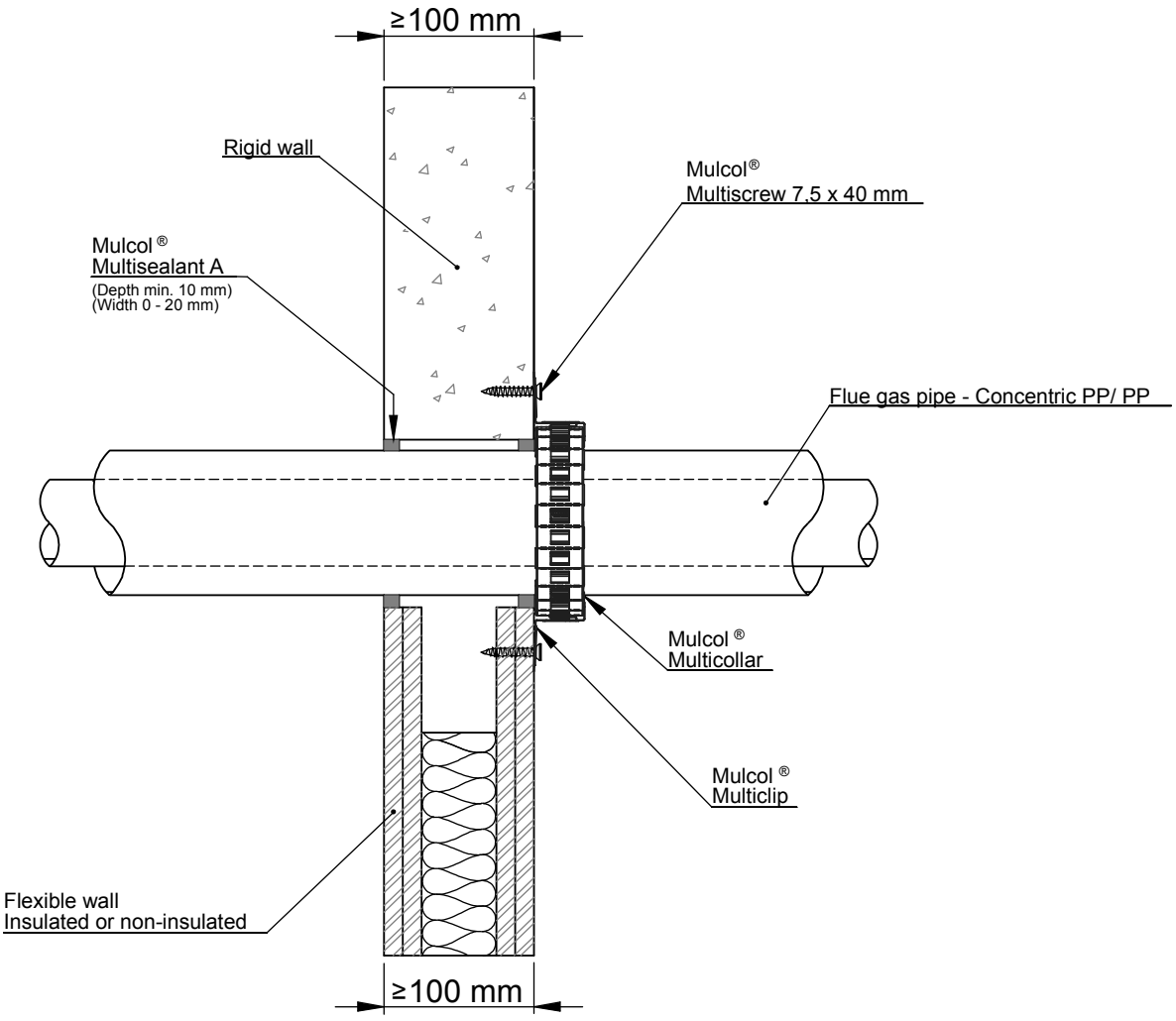
Front view



a - Annular space
(Maximum 5 mm between pipe and Mulcol ® Multicollar)
b - Mulcol® Multiclip

Side view





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-RGAT_PP-11.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 25-4-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

The (heating) boiler must be situated at the exposed face. The fire resistance is valid for concentric pipes with the inner and outer pipe made of plastic.

For this system, the fire resistance is derived from PP pipes as stated in Paragraph 5.2.1 and is valid in one direction (from the exposed face) to the following combinations of performance parameters and classes.

Fire resistance One collar exposed face Flue gas system (concentric plastic)					
Pipe dimensions outer pipe (mm)		Performance class with pipe end configuration		Pipe material	Type of wall and thickness (mm)
Diameter	Wall thickness				
≤ 40	1.8 to 4.0	EI 90–U/U* E 90–U/U*	EI 90–U/C* E 90–U/C*	PP / PP	Flexible / rigid, ≥ 100
≤ 125	3.1 to 4.0	EI 90–U/U* E 90–U/U*	EI 90–U/C* E 90–U/C*	PP / PP	

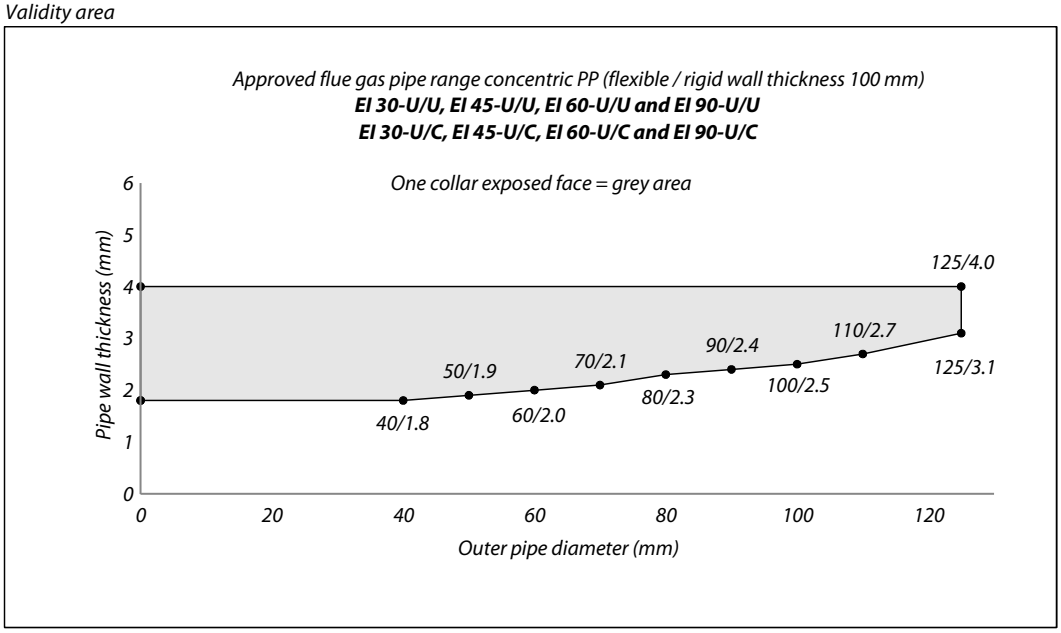
Fire resistance Two collars exposed face Flue gas system (concentric plastic)					
Pipe dimensions outer pipe (mm)		Performance class with pipe end configuration		Pipe material	Type of wall and thickness (mm)
Diameter	Wall thickness				
≤ 40	1.8 to 4.0	EI 60–U/U* E 60–U/U*	EI 60–U/C* E 60–U/C*	PP / PP	Rigid, ≥ 70
≤ 125	3.1 to 4.0	EI 60–U/U* E 60–U/U*	EI 60–U/C* E 60–U/C*	PP / PP	

The dimensions of the inner pipe made out of PP are not relevant for the given fire resistances in the Tables above (the fire resistances apply to any dimension of the inner pipe).

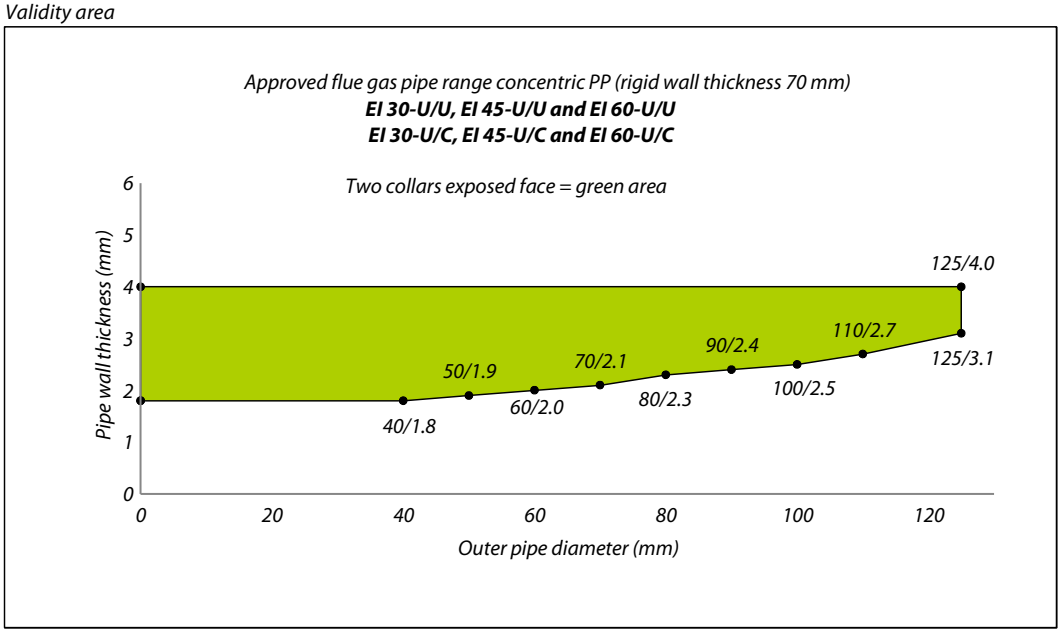
A visualization of the validity area for the fire resistance for EI 30, EI 45, EI 60 and EI 90 is given in the Figure hereafter.

The fire resistance is for example partly valid for an Ubbink Rolux 5H wall transfer (pipe wall thickness outer pipe 1.8 to 2.0 mm) or equal as long as the pipe dimensions meet the validity area.

f86 *Validity area*



f87 *Validity area*



5.8 Metal pipes

In this Chapter the expected fire resistance and field of application of metal pipes in several different applications is summarized.

5.8.1 With elastomeric thermal insulation (one collar each face, LS or CS)

Metal pipes

On the next page, drawing FW-ST-10.0.22 of the pipe penetration seals with metal pipes with elastomeric thermal insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.50 the installation details regarding the field of application are given.

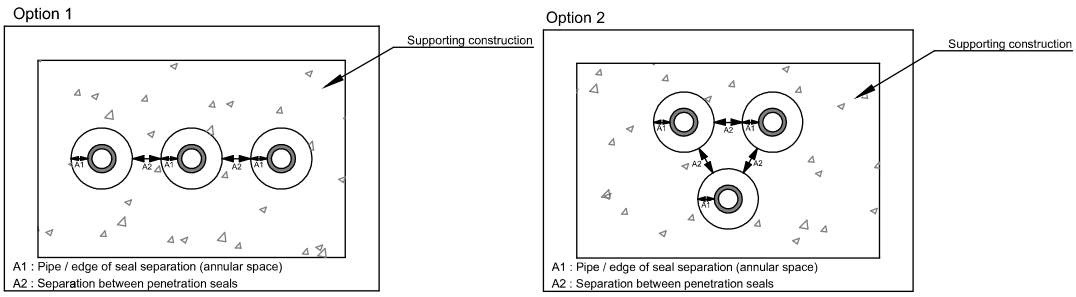
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be applied sustained through the aperture with a minimum distance of 500 mm on both sided from the point where the pipe emerges from the wall (LS in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CS).

t5.50 Installation details

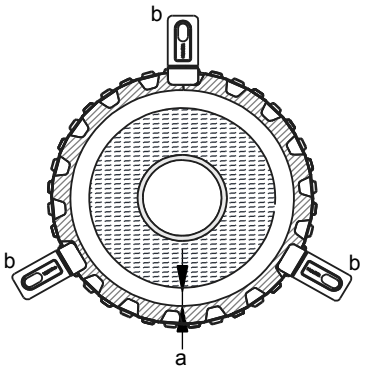
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 88) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 88. The annular gap A_1 is also visible in this Figure.

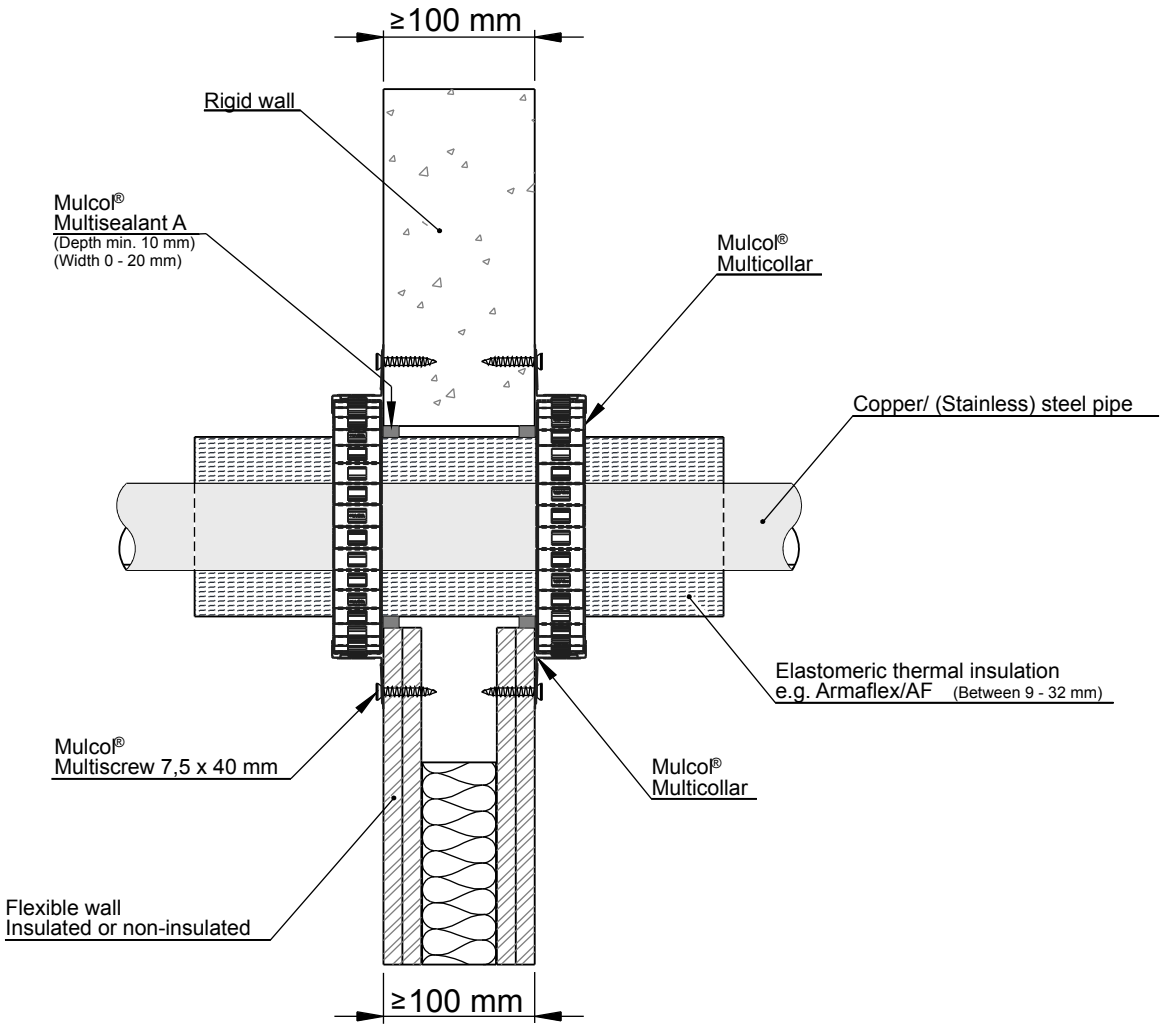
f88 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol®Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-ST-10.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 5-12-2016	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

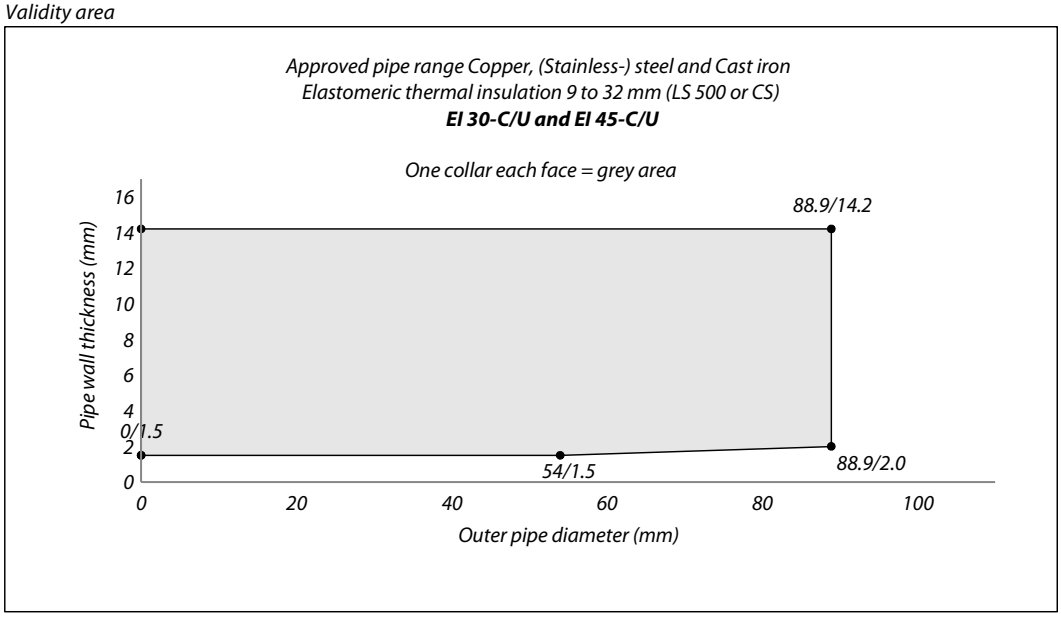
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 54	1.5 to 14.2	EI 60–C/U (LS 500 and CS) E 120–C/U (LS 500 and CS)	Copper / (Stainless-) steel / Cast iron	9 to 32	90
≤ 54	1.5 to 14.2	EI 90–C/U (LS 500 and CS) E 120–C/U (LS 500 and CS)		32	92 and 94
≤ 88.9	2.0 to 14.2	EI 45–C/U (LS 500 and CS) E 120–C/U (LS 500 and CS)		9 to 32	89
≤ 88.9	2.0 to 14.2	EI 60–C/U (CS)* E 120–C/U (CS)*		32	91 and 94
≤ 219.1	4.0 to 14.2	EI 60–C/U (LS 500 and CS) E 120–C/U (LS 500 and CS)	(Stainless-) steel / Cast iron	9* to 32	93
≤ 219.1	4.0 to 14.2	EI 90–C/U (CS)* E 120–C/U (CS)*		32	95

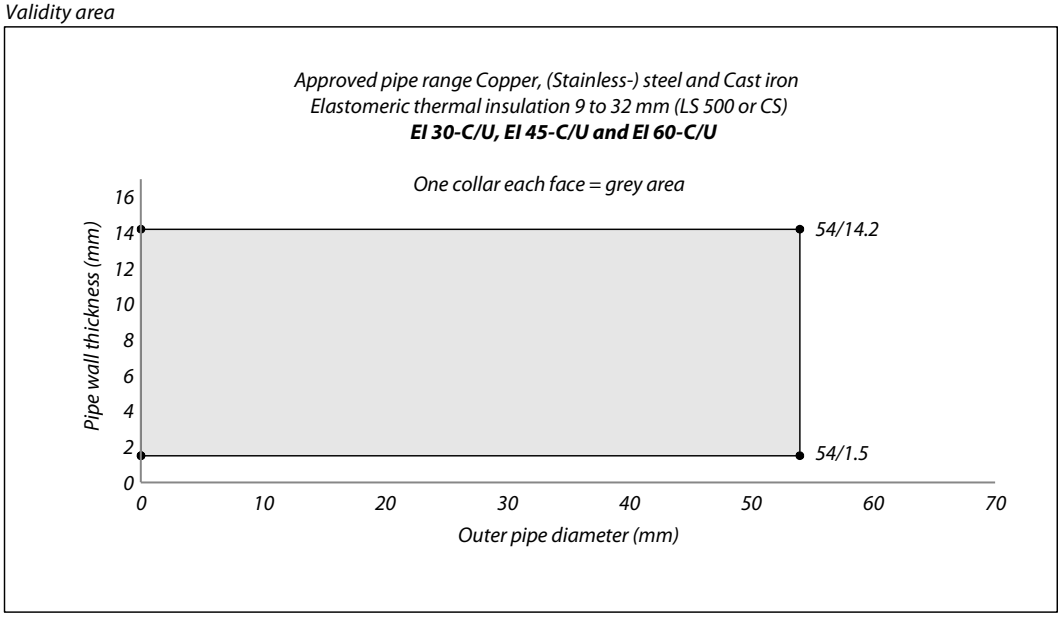
Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex and Armaflex XG;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

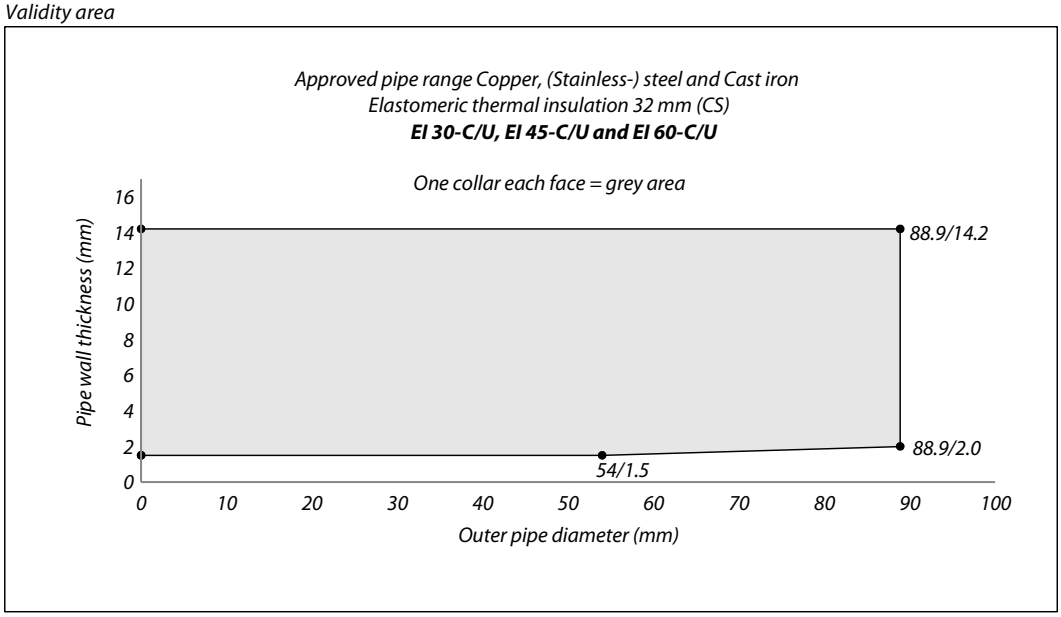
f89 Validity area



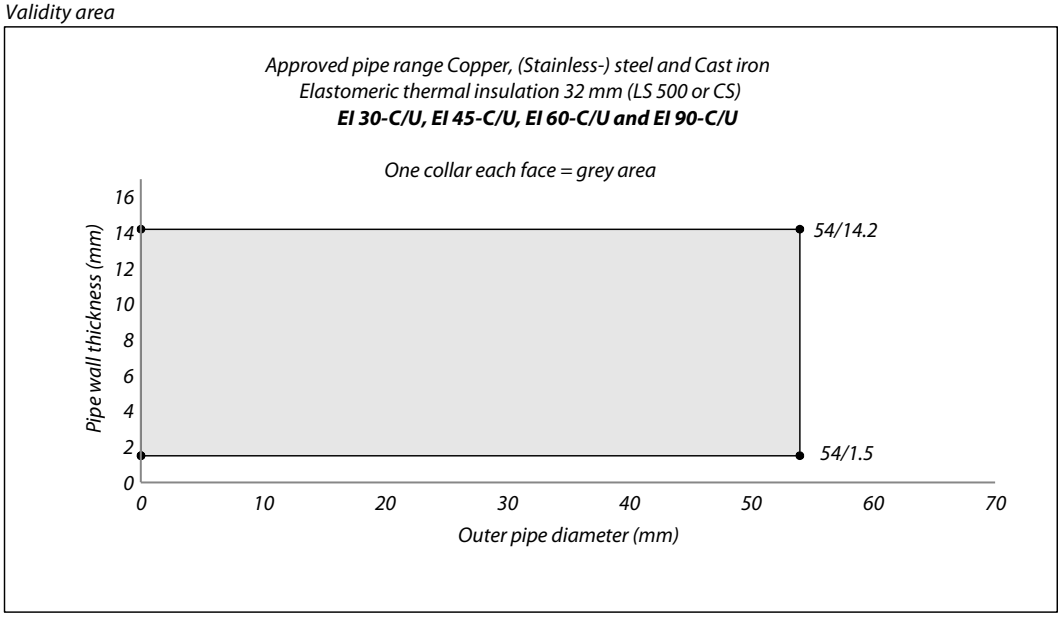
f90 Validity area



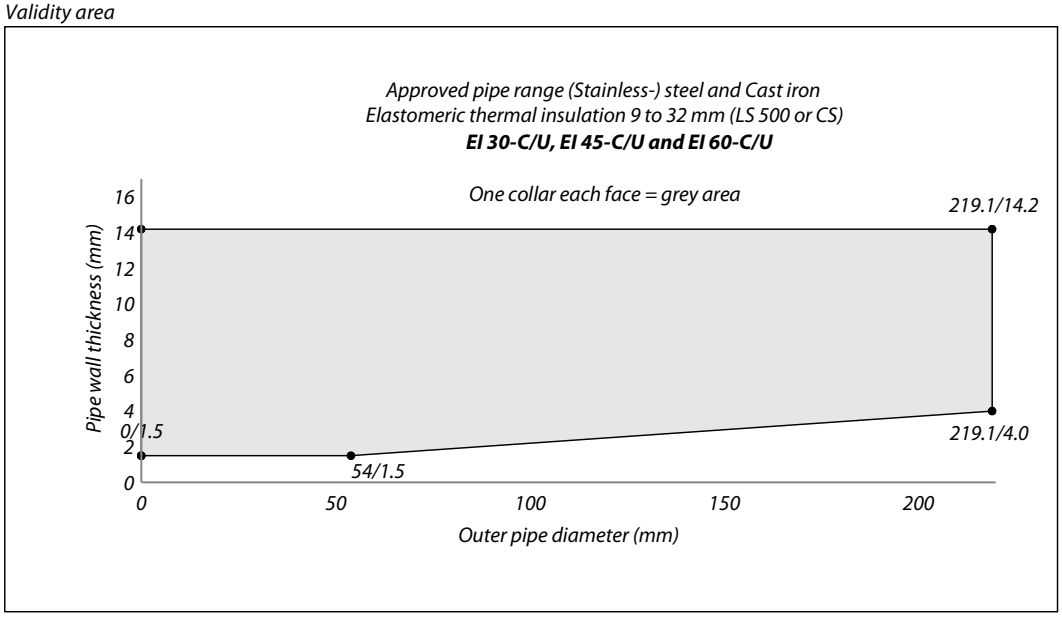
f91 *Validity area*



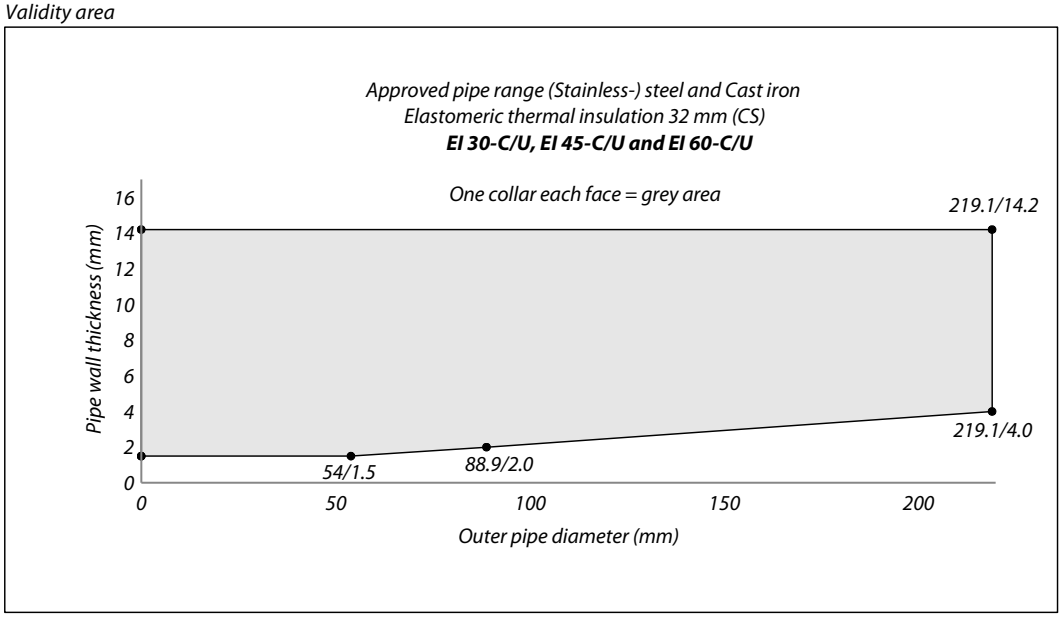
f92 *Validity area*



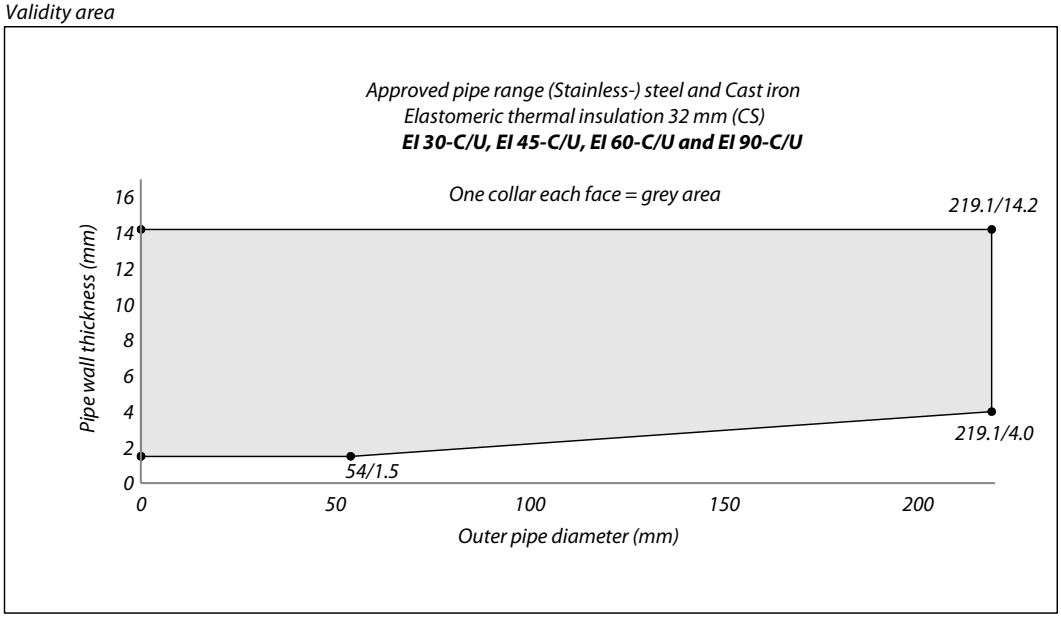
f93 Validity area



f94 Validity area



f95 *Validity area*



5.8.2 With elastomeric thermal insulation (one collar each face, CI)

Metal pipes

On the next page, drawing FW-ST-10.0.22 of the pipe penetration seals with metal pipes with elastomeric thermal insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.51 the installation details regarding the field of application are given.

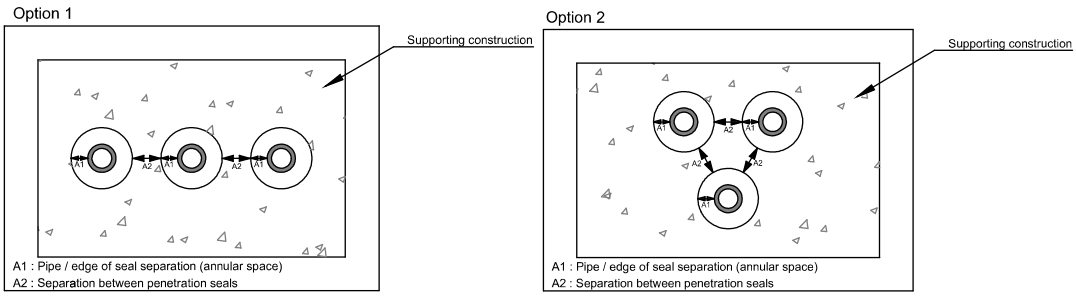
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3 or, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be interrupted at the seal. Furthermore is has to be applied continued at both sides of the seal (CI in accordance with Table 1 of EN 1366-3:2009).

t5.51 Installation details

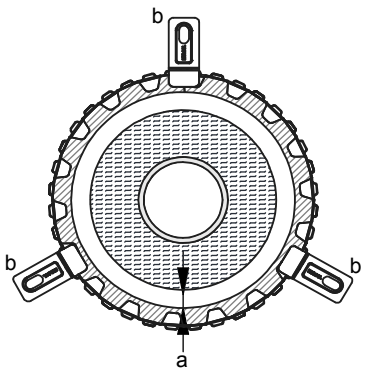
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 96) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 96. The annular gap A_1 is also visible in this Figure.

f96 Visualization single penetrations

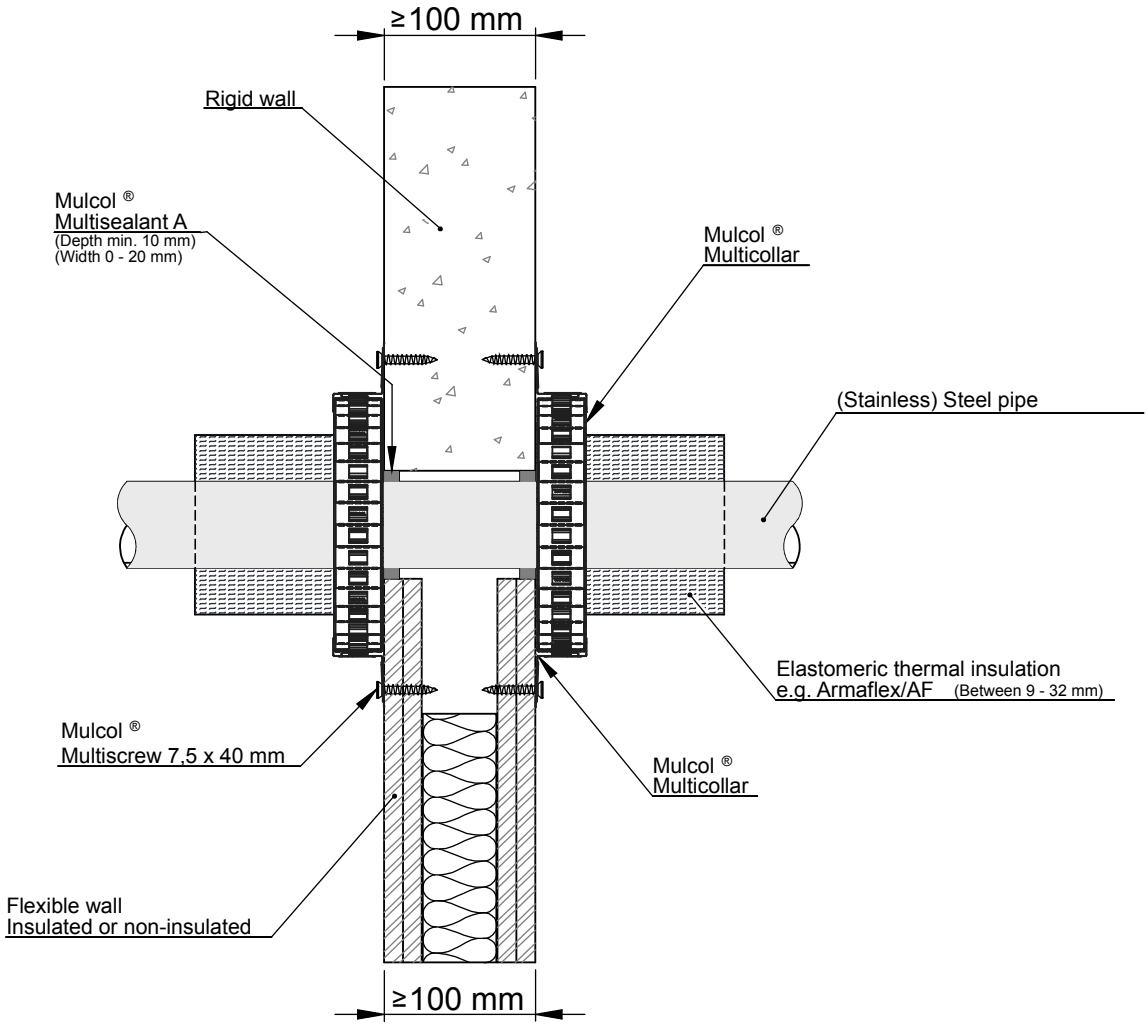


Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)

b - Mulcol ® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-ST-10.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 25-1-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

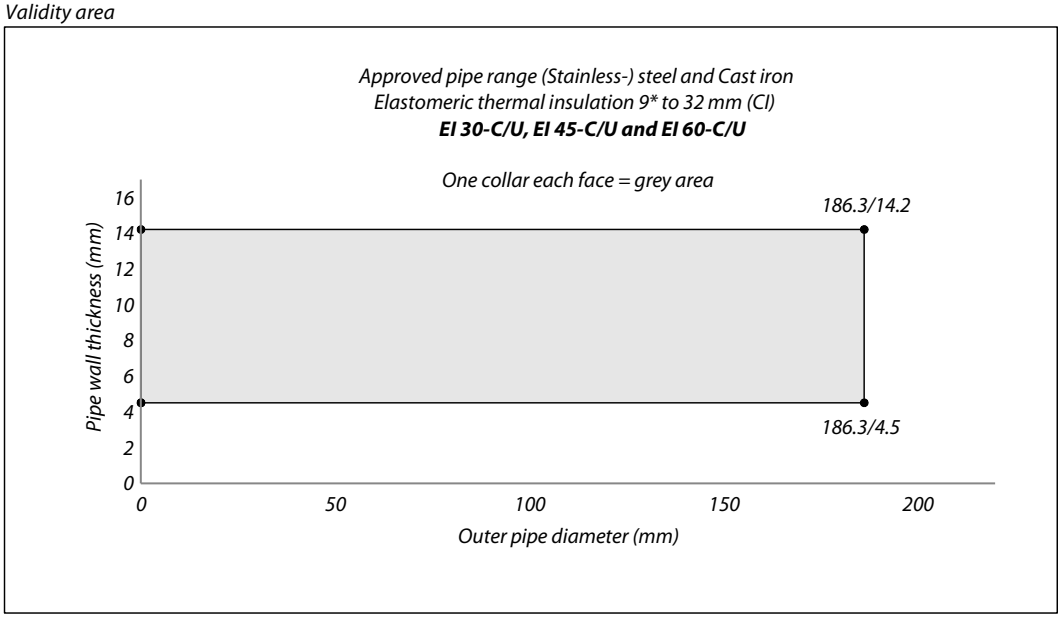
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 186.3	4.5 to 14.2	EI 60–C/U (CI)* E 120–C/U (CI)*	(Stainless-) steel / Cast iron	9* to 32	97
≤ 186.3	4.5 to 14.2	EI 120–C/U (CI) E 120–C/U (CI)		32	98

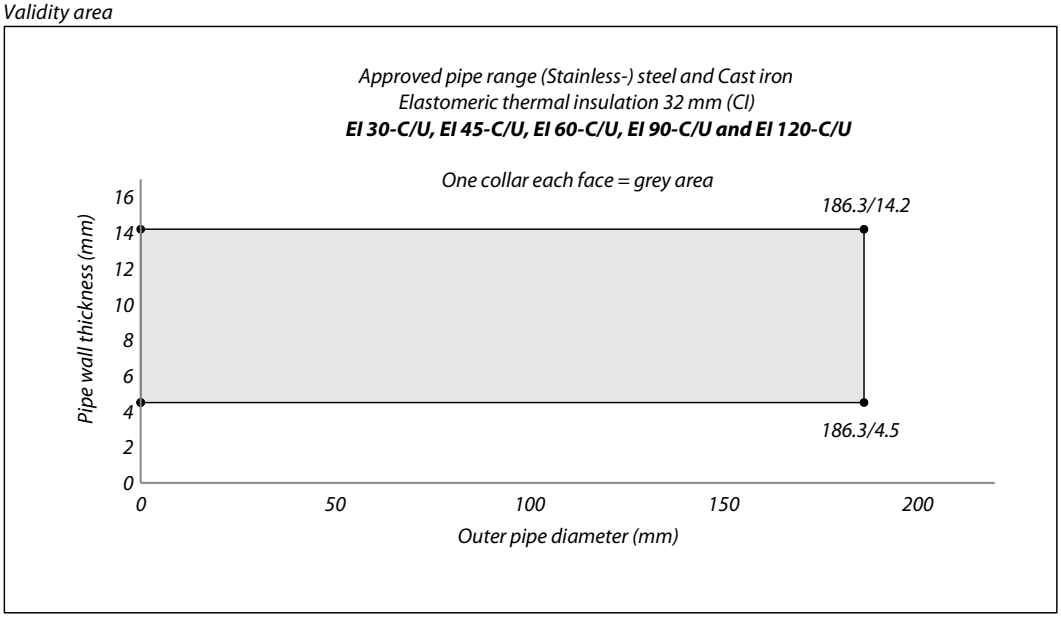
Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex and Armaflex XG;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

f97 Validity area



f98 *Validity area*



5.8.3 With elastomeric thermal insulation (two collars each face, CI)

Metal pipes

On the next page, drawing FW-ST-20.0.22 of the pipe penetration seals with metal pipes with elastomeric thermal insulation is given for the pipes fitted with two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.52 the installation details regarding the field of application are given.

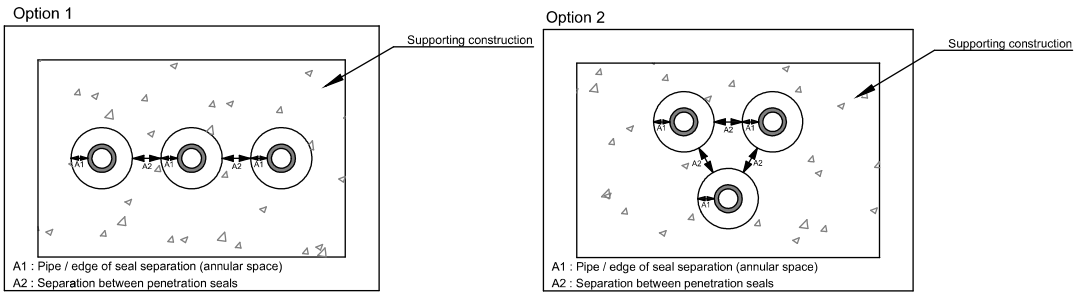
The fire resistance is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class B_L-s3, d0 or B-s3 or, d0 (or equal or better) in accordance with EN 13501-1. The insulation must be interrupted at the seal. Furthermore is has to be applied continued at both sides of the seal (CI in accordance with Table 1 of EN 1366-3:2009).

t5.52 Installation details

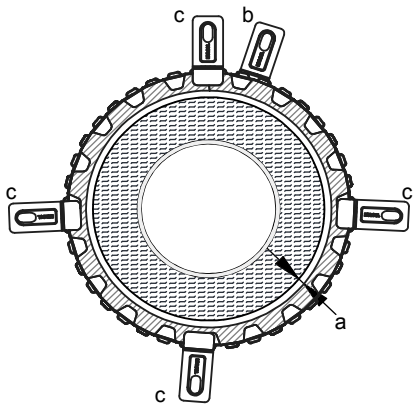
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 99) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 99. The annular gap A_1 is also visible in this Figure.

f99 Visualization single penetrations



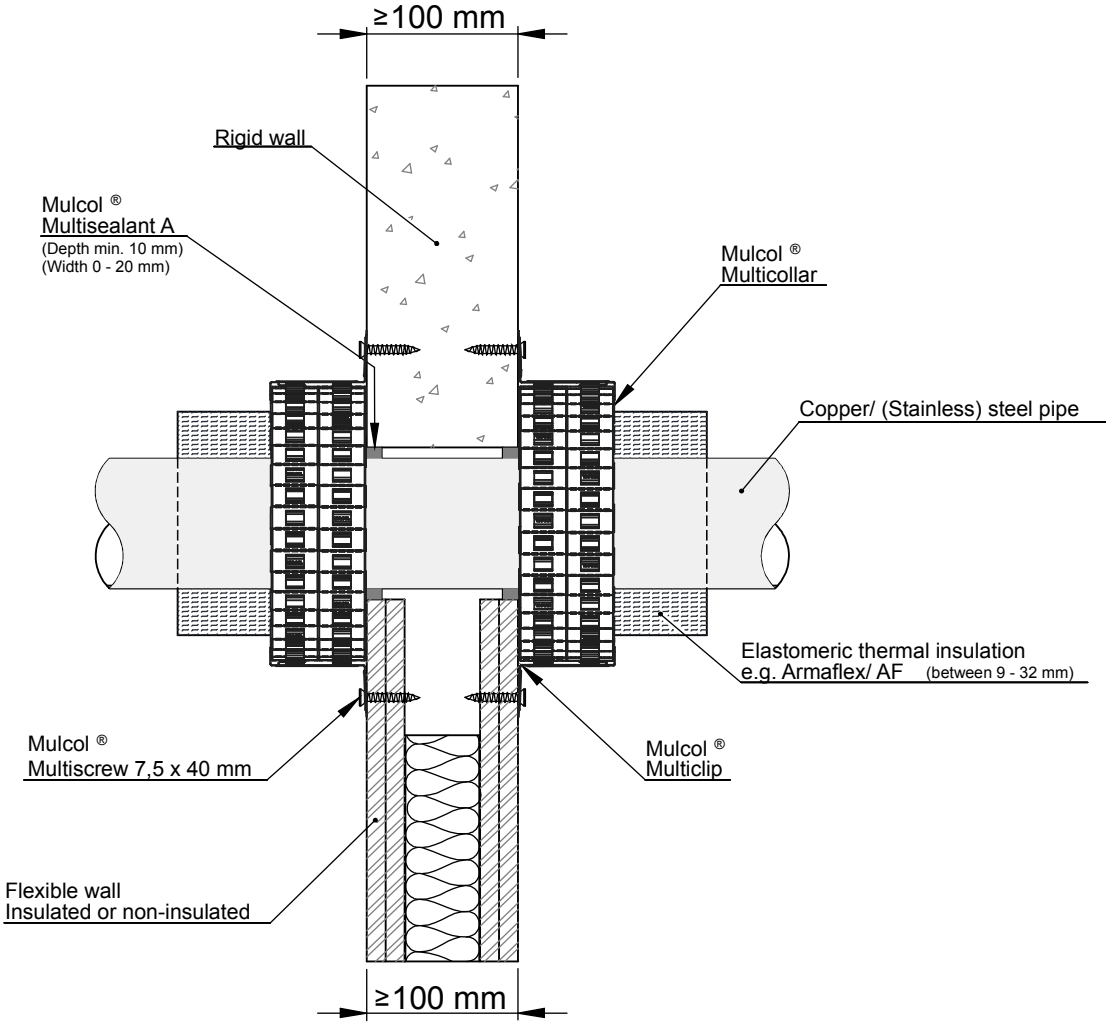
Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol ® Multicollar)

b - Mulcol ® Multiclip

c - Mulcol ® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-ST-20.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 25-1-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

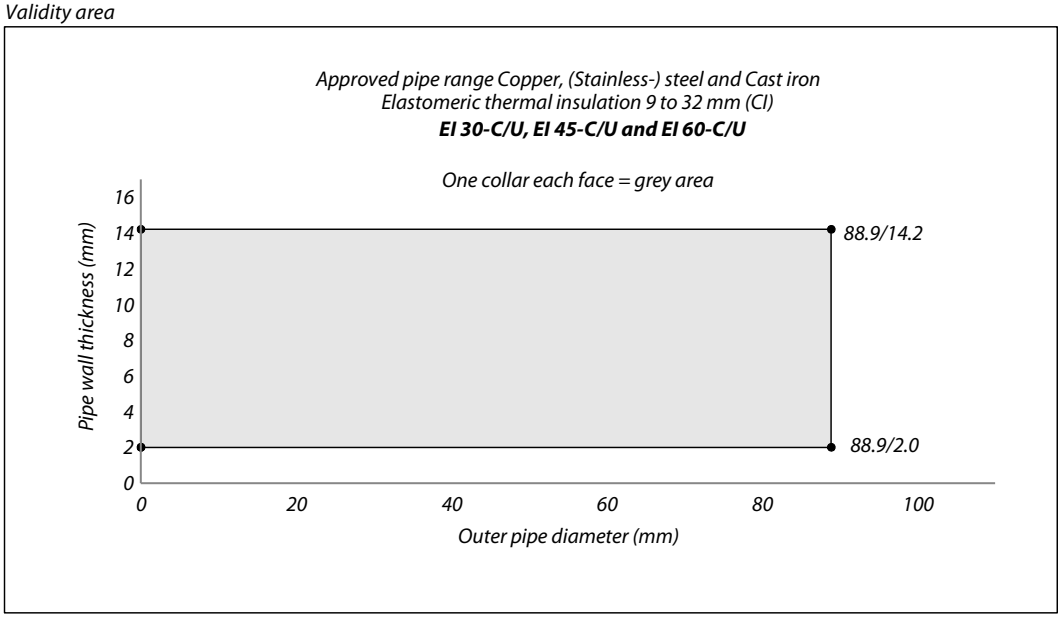
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 88.9	2.0 to 14.2	EI 60–C/U (CI) E 120–C/U (CI)	Copper / (Stainless-) steel / Cast iron	9 to 32	100
≤ 88.9	2.0 to 14.2	EI 120–C/U (CI) E 120–C/U (CI)		32	101

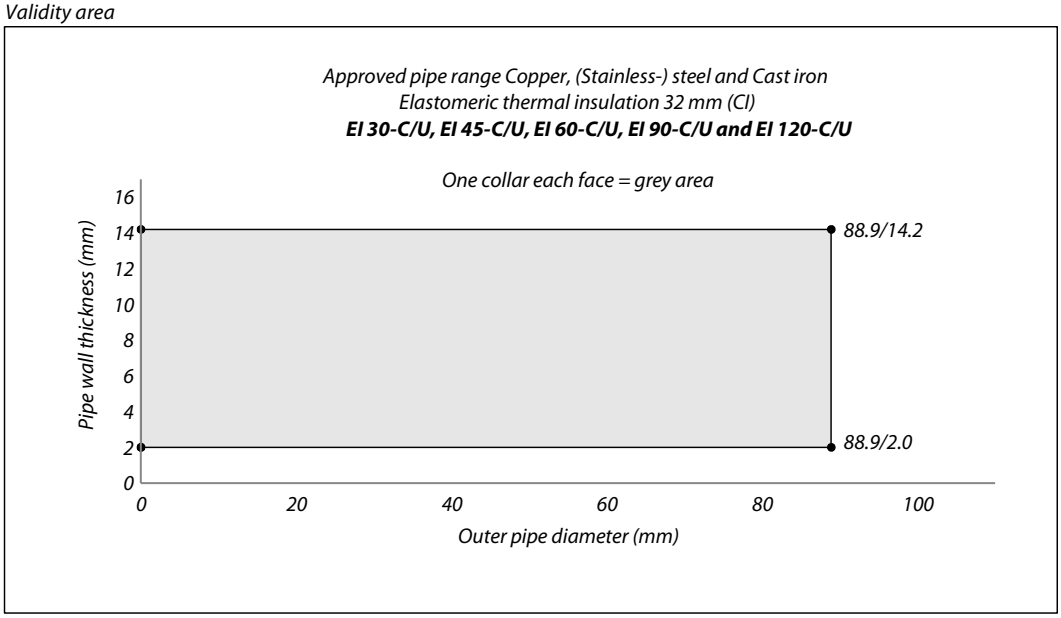
Based upon an assessment concerning different insulation materials it is expected that the fire resistances given above will also be met for penetration seals with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- AF/Armaflex and Armaflex XG;
- SH/Armaflex for outer pipe diameters up to Ø39 mm;
- Kaiflex ST and Kaiflex KKplus s2;
- K-Flex EC, K-Flex EC AD, K-Flex EC, K-Flex ST, K-Flex ST/SK, K-Flex ST Frigo, K-Flex SRC and K-Flex SRC Eco.

f100 Validity area



f101 Validity area



5.8.4 With PIR or PUR thermal insulation (one collar each face)

Metal pipes

On the next page, drawing FW-ST-10.0.25 of the pipe penetration seals with metal pipes with elastomeric thermal insulation is given for the pipes fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.53 the installation details regarding the field of application are given.

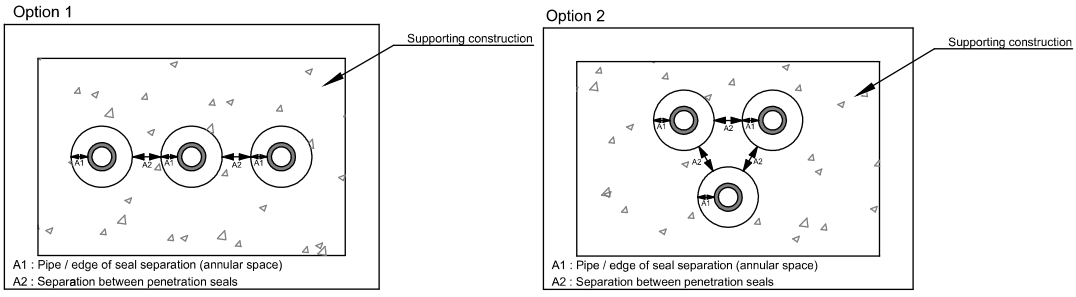
The fire resistance is valid for insulation Tarecpir B2 made out of polyisocyanurate foam with a reaction to fire class E in accordance with EN 13501-1 or Tarecpur (no reaction to fire class determined). Based upon assessment of the Tarecpur reaction to fire class E in accordance with EN 13501-1 is assigned to this material. The insulation must be applied sustained through the aperture with a minimum distance of 500 mm on both sided from the point where the pipe emerges from the wall (LS in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CS).

t5.53 Installation details

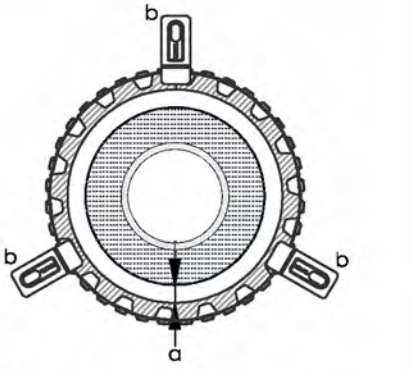
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 102) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 102. The annular gap A_1 is also visible in this Figure.

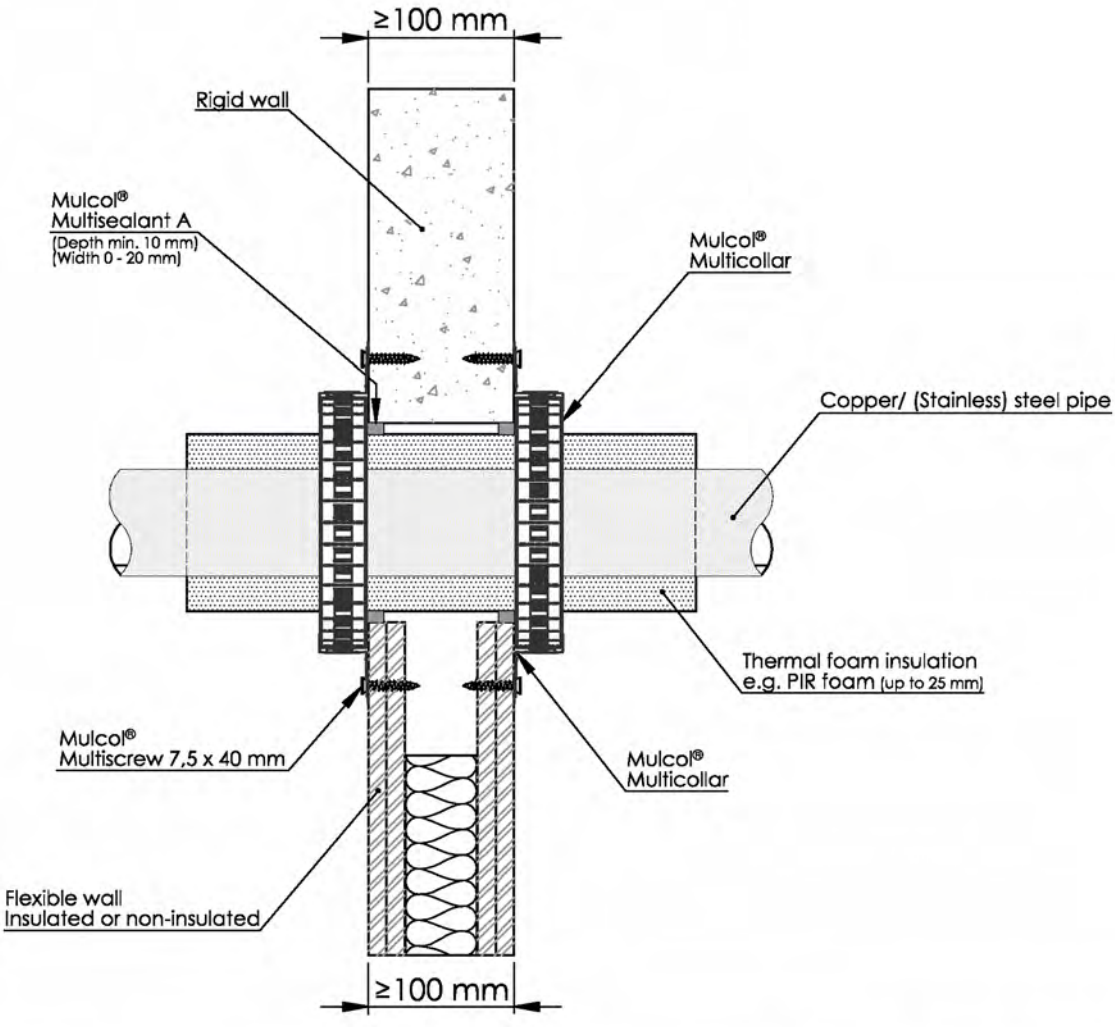
f102 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-ST-10.0.25
	Unit of measure : mm	Department : Research & Development	
	Date : 2-2-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

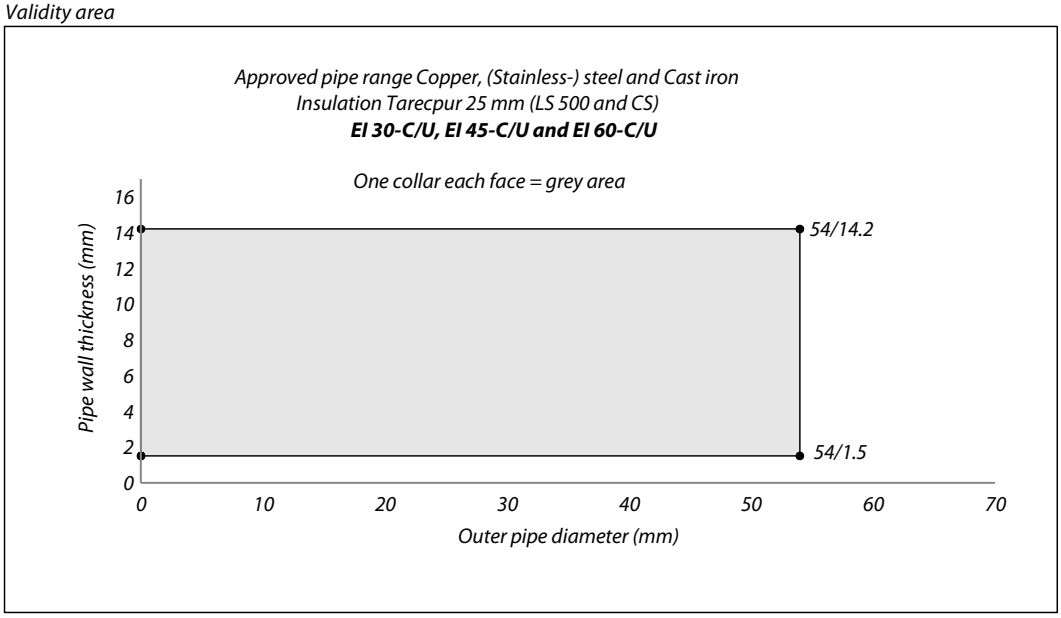
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance Insulation Tarecpur (or equal)					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 54	1.5 to 14.2	EI 60–C/U* (LS 500 or CS) E 120–C/U* (LS 500 or CS)	Copper / (Stainless-) steel /Cast iron	25	103

It is expected that the fire resistances given above will also be met for penetration seals fitted with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- Insul-Phen, Insul-Pirplus and Insul-Pir 33
- Kingspan Tarecpir M1, Kingspan Tarecpir CR, Kingspan Tarecpir B2, Kingspan Tarecpir HT, Kingspan Tarecpir HD and Kingspan Kooltherm FM.

f103 Validity area



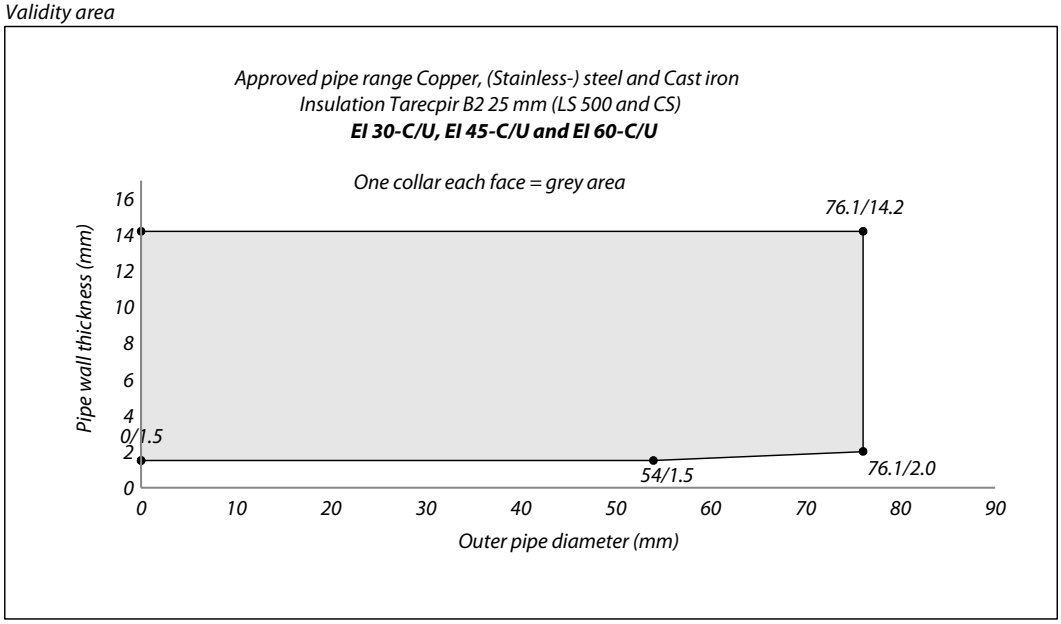
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance Insulation Tarecpir B2 (or equal)					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 54	1.5 to 14.2	EI 60–C/U* (LS 500 or CS) E 120–C/U* (LS 500 or CS)	Copper / (Stainless-) steel / Cast iron	25	104
≤ 76.1	2.0 to 14.2	EI 60–C/U (LS 500 or CS) E 120–C/U (LS 500 or CS)			

It is expected that the fire resistances given above will also be met for penetration seals fitted with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- Insul-Phen, Insul-Pirplus and Insul-Pir 33
- Kingspan Tarecpir M1, Kingspan Tarecpir CR, Kingspan Tarecpir HT, Kingspan Tarecpir HD and Kingspan Kooltherm FM.

f104 Validity area



5.8.5 With PIR thermal insulation (two collars each face)

Metal pipes

On the next page, drawing FW-ST-10.0.25 of the pipe penetration seals with metal pipes with elastomeric thermal insulation is given for the pipes fitted with two Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.54 the installation details regarding the field of application are given.

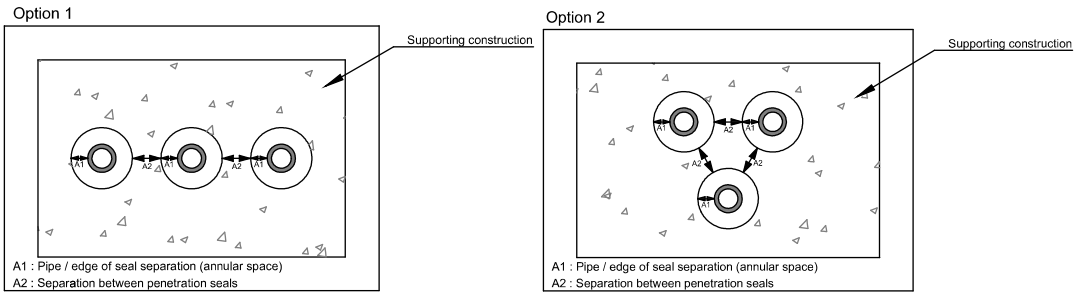
The classification is valid for insulation Tarecpir B2 made out of polyisocyanurate foam with a reaction to fire class E in accordance with EN 13501-1. The insulation must be applied sustained through the aperture with a minimum distance of 500 mm on both sided from the point where the pipe emerges from the wall (LS in accordance with Table 1 of EN 1366-3:2009). The insulation may also be applied continued (CS).

t5.54 Installation details

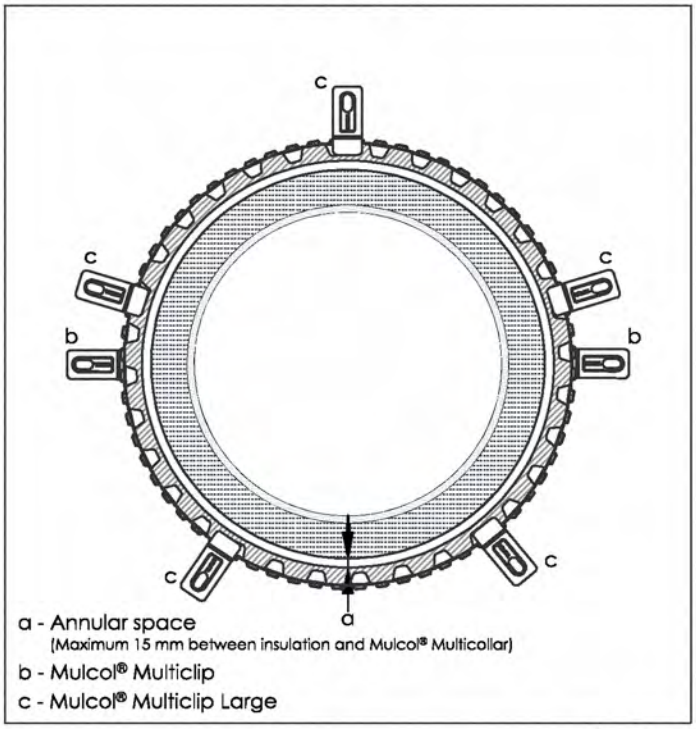
Distance to first pipe support (both faces)	Allowed filling of annular gap (distance A_1, see Figure 105) Mulcol® Multisealant A both faces	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm

If more single pipe penetrations are placed in the wall, the minimum distance between the aperture edges is 100 mm see distance A_2, see Figure 105. The annular gap A_1 is also visible in this Figure.

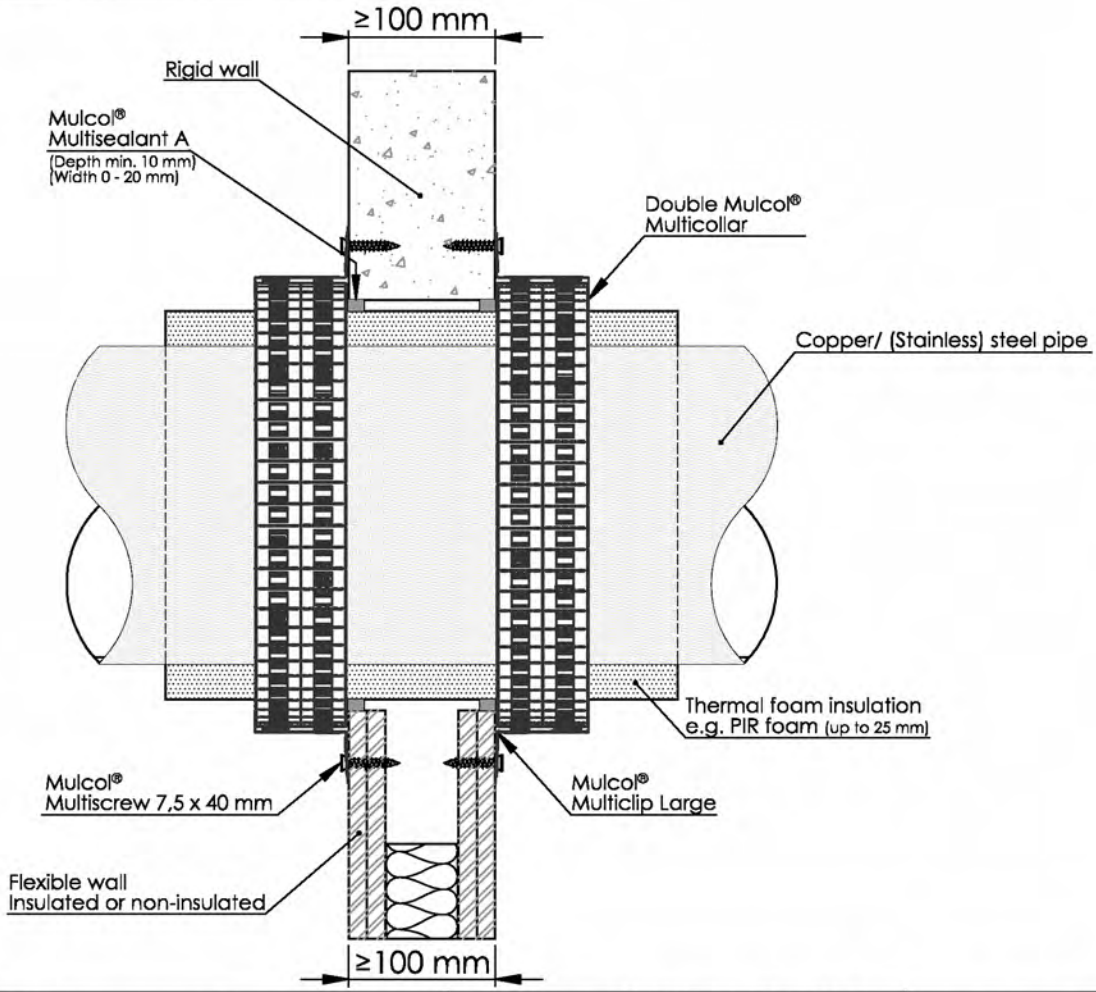
f105 Visualization single penetrations



Front view



a - Annular space
(Maximum 15 mm between insulation and Mulcol® Multicollar)
b - Mulcol® Multiclip
c - Mulcol® Multiclip Large



American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-ST-20.0.25
	Unit of measure : mm	Department : Research & Development	
	Date : 2-2-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

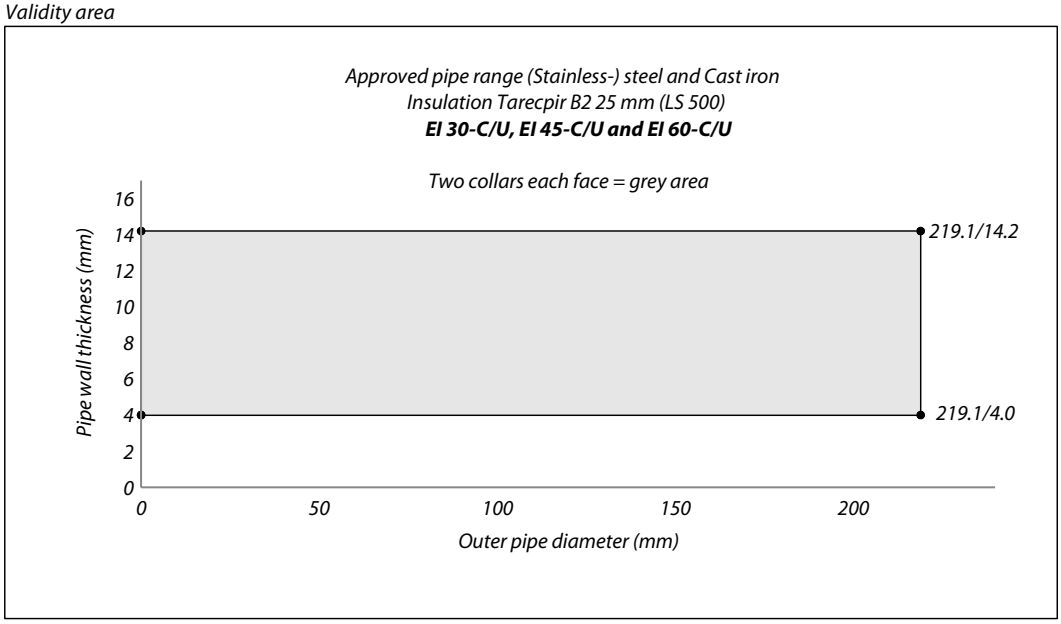
For this system, a fire resistance according to the following combinations of performance parameters and classes applies. A visualization of the validity area for the fire resistance for EI is given in the Figures as stated.

Fire resistance Insulation Tarecpir B2 (or equal)					
Pipe dimensions (mm)		Performance class with pipe end configuration	Pipe material	Insulation thickness (mm)	See Figure
Outer diameter	Wall thickness				
≤ 219.1	4.0 to 14.2	EI 60–C/U (LS 500) E 120–C/U (LS 500)	(Stainless-) steel / Cast iron	25	106
≤ 219.1	4.0 to 14.2	EI 90–C/U (CS)* E 120–C/U (CS)*			107

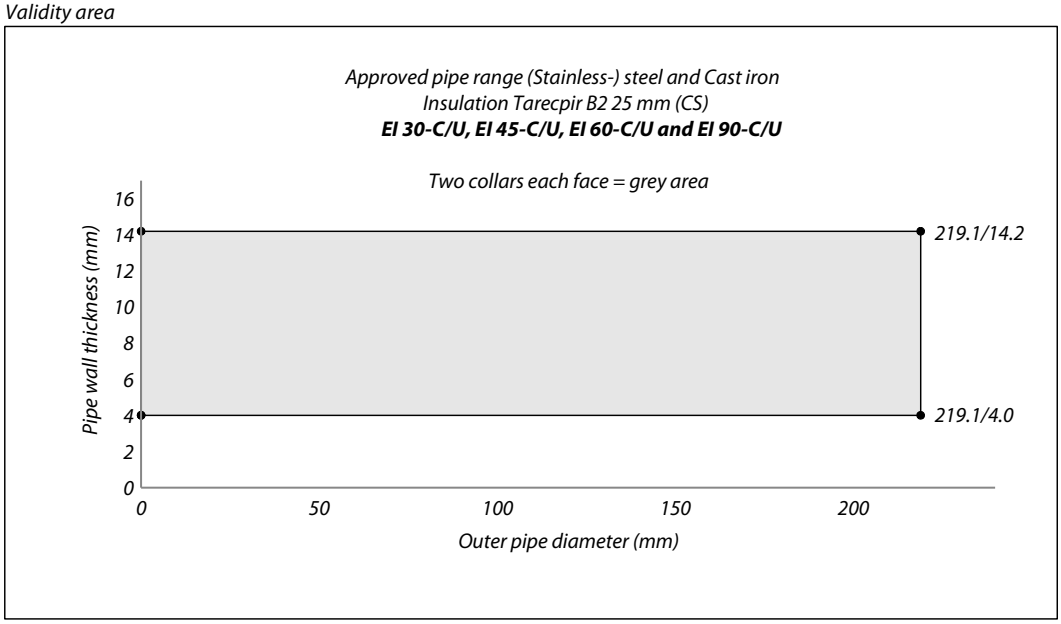
It is expected that the fire resistances given above will also be met for penetration seals fitted with insulation of the following types (the insulation dimensions shall correspond to the dimensions in the table):

- Insul-Phen, Insul-Pirplus and Insul-Pir 33
- Kingspan Tarecpir M1, Kingspan Tarecpir CR, Kingspan Tarecpir HT, Kingspan Tarecpir HD and Kingspan Kooltherm FM.

f106 Validity area



f107 Validity area



5.9 Penetration seals with cables

In this Chapter the expected fire resistance and field of application of cable penetration seals in several different applications is summarized.

5.9.1 PVC electrical pipes

Cables

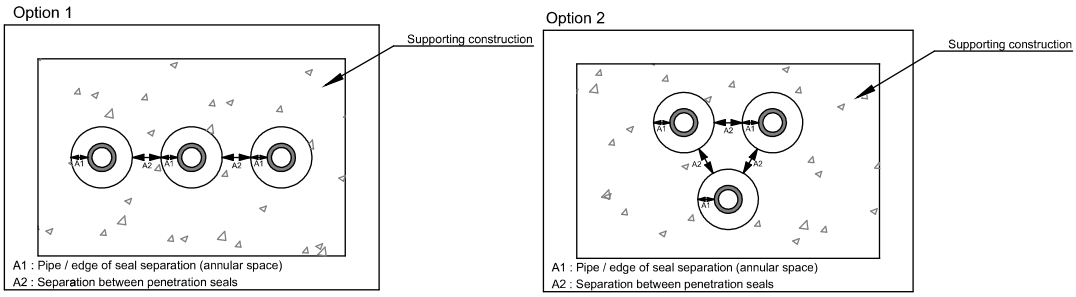
On the next page, drawing FW-EP-11.0.40 of the cable penetration seals with a bundle of PVC electrical pipes with cables is given fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.55 the installation details regarding the field of application are given.

t5.55 Installation details

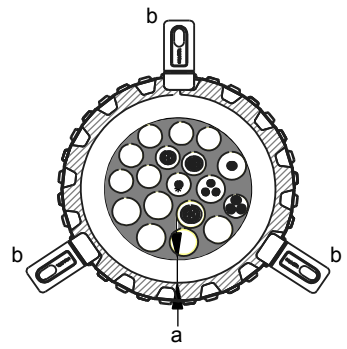
Distance to first pipe support (both faces)	Filling of annular gap (distance A_1, see Figure 108) Mulcol® Multisealant A both faces	Allowed bundle size	Allowed cables (in every possible number and combination)	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ Ø100 mm	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMVK 3 x 2.5 mm^2 Sheathed cable YMVK 5 x 1.5 mm^2 Sheathed cable YMVK 5 x 2.5 mm^2	Outer diameter ≤ 100 mm, 'a' ≤ 15 mm

If more single cable or pipe penetrations are placed in the floor, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 108. The annular gap A_1 is also visible in this Figure. Empty pipes are allowed.

f108 Visualization single penetrations



Front view

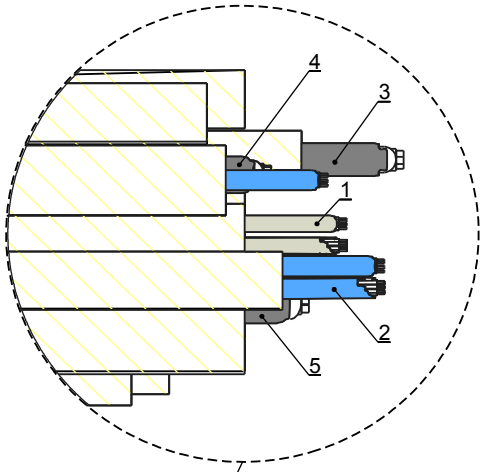


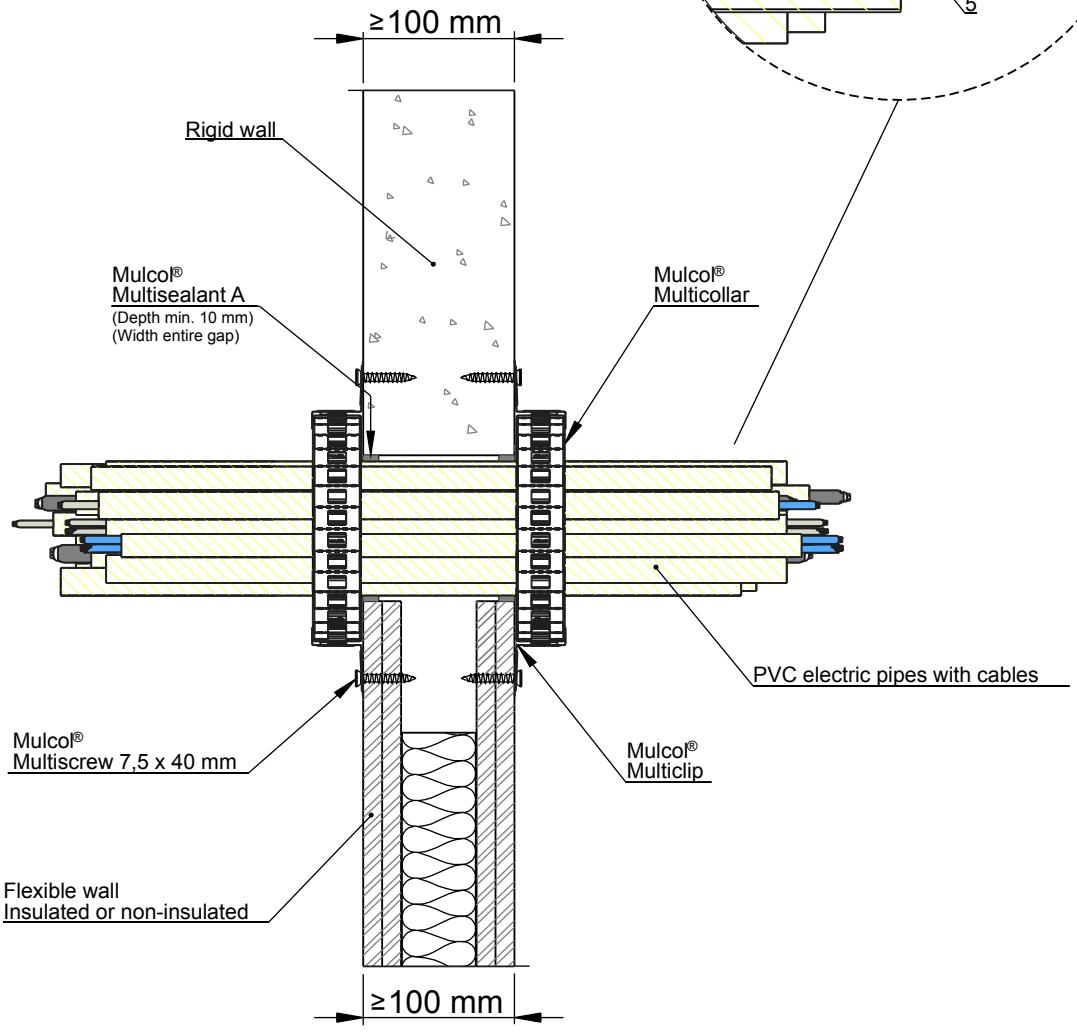
a - Annular space
(Maximum 15 mm between pipes and Mulcol®Multicollar)

b - Mulcol®Multiclip

PVC electric pipes
consisting of the following cables:

1 - e.g. UTP Cable Cat. 5
2 - e.g. UTP Cable Cat. 6
3 - e.g. YMVK Cable 3 x 2,5 mm
4 - e.g. YMVK Cable 5 x 1,5 mm
5 - e.g. YMVK Cable 5 x 2,5 mm





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-EP-10.0.40
	Unit of measure : mm	Department : Research & Development	
	Date : 2-2-2017	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance				
Aperture dimensions (mm)		Performance class with pipe end configuration		Number of pipes
Outer diameter	Pipes			
≤ 100	PVC pipes 5/8", 3/4" and Ø25 mm	EI 90–U/U* E 90–U/U*	EI 90–U/C* E 90–U/C*	≤ 18

5.9.2 Sheathed and telecommunication wires

Cables

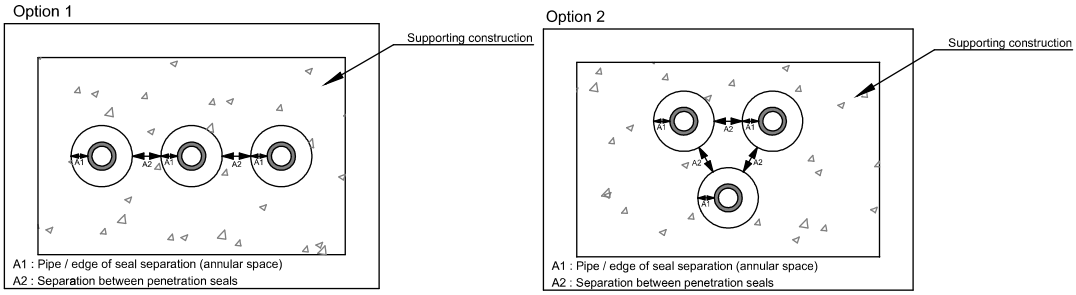
On the next page, drawing FW-EC-10.0.10 of the cable penetration seals with a bundle of sheathed and telecommunication cables is given fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.56 the installation details regarding the field of application are given.

t5.56 Installation details

Distance to first pipe support (both faces)	Filling of annular gap (distance A_1, see Figure 109) Mulcol® Multisealant A both faces	Allowed bundle size	Allowed cables (in every possible number and combination)	Allowed annular space (distance 'a' in drawing)
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ Ø100 mm	Telecommunication cables UTP Cat. 5	Outer diameter ≤ 100 mm, 'a' ≤ 15 mm
			Telecommunication cables UTP Cat. 5	
			Sheathed cable YMVK 3 x 2.5 mm^2	
			Sheathed cable YMVK 5 x 1.5 mm^2	
			Sheathed cable YMVK 5 x 2.5 mm^2	

If more single cable or pipe penetrations are placed in the floor, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 109. The annular gap A_1 is also visible in this Figure.

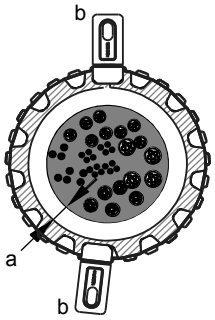
f109 Visualization single penetrations



For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance			
Aperture dimensions (mm)		Performance class with pipe end configuration	Number of cables
Outer diameter	Cables		
≤ 100	See Table 5.56	EI 120* E 120*	≤ 63

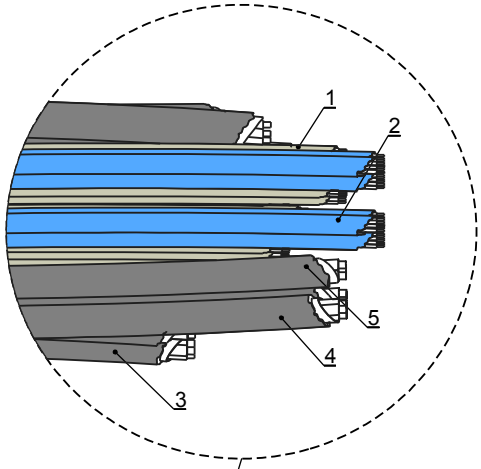
Front view

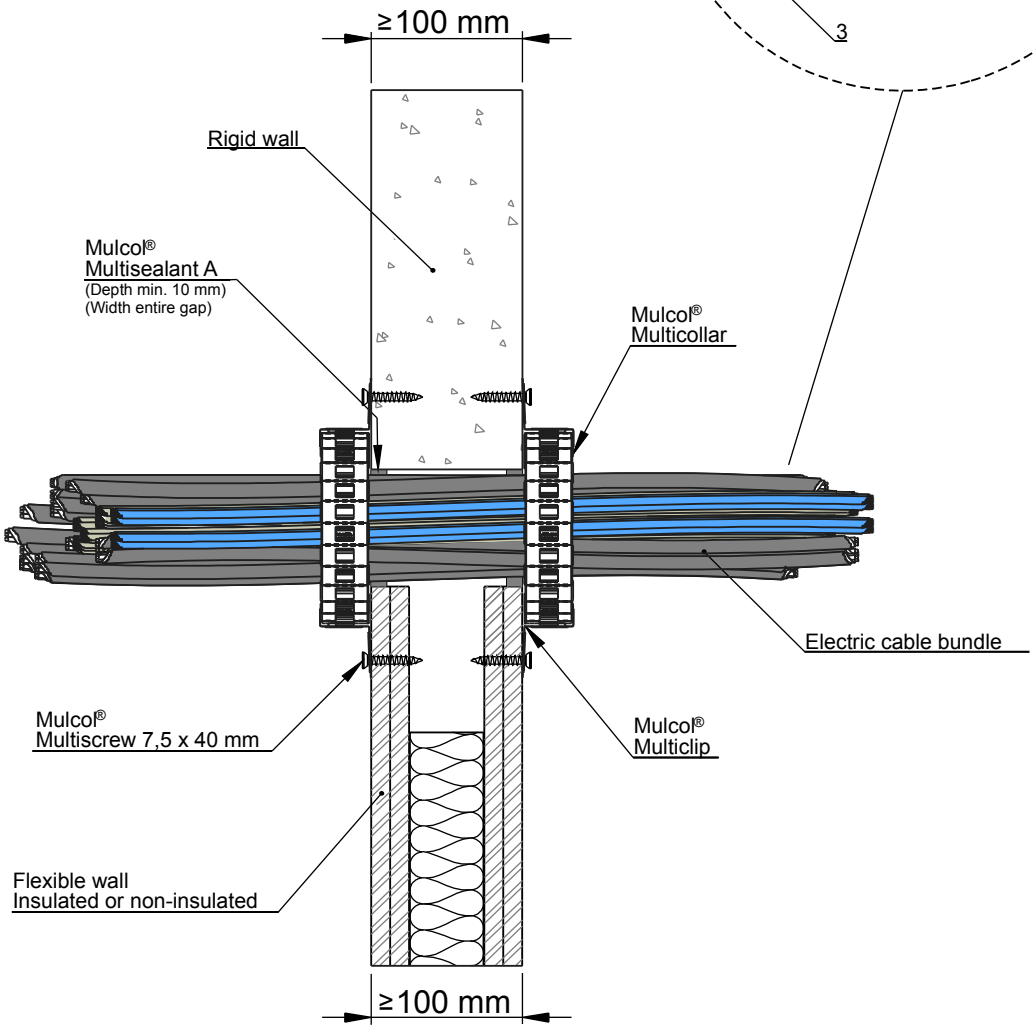


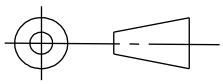
a - Annular space
(Maximum 15 mm between cable bundle and Mulcol®Multicollar)
b - Mulcol®Multiclip

Cable bundle
consisting of the following cables:

1 - e.g. UTP Cable Cat. 5
2 - e.g. UTP Cable Cat. 6
3 - e.g. YMVK Cable 3 x 2,5 mm
4 - e.g. YMVK Cable 5 x 1,5 mm
5 - e.g. YMVK Cable 5 x 2,5 mm





American projection 	Scale : 1:5	Company : Mulcol International B.V.	FW-EC-10.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 2-2-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

5.9.3 PE-conduit pipes

Cables

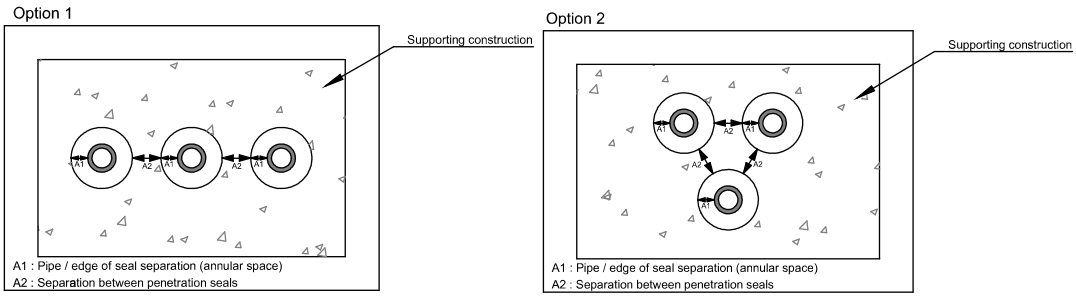
On the next page, drawing RF-EC-11.0.30 of the cable penetration seals made out of PE-conduits (outer diameter Ø50 mm) with bundles with sheathed and telecommunication cables is given for the system fitted with one Mulcol® Multicollar Slim placed at each face of the wall. In Table 5.57 the installation details regarding the field of application are given.

t5.57 Installation details

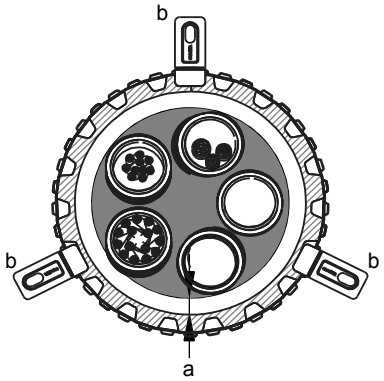
Distance to first pipe support (both faces)	Filling of annular gap (distance A_1, see Figure 110) Mulcol® Multisealant A both faces	Allowed bundle size	Allowed cables (in every possible number and combination)	Allowed annular space (distance 'a' in drawing)	
≤ 350 mm	Annular gap ≤ 20 mm / depth ≥10 mm	≤ Ø120 mm	Telecommunication cables UTP Cat. 5	Outer diameter ≤ 125 mm / 'a' ≤ 15 mm	Outer diameter > 125 mm / 'a' ≤ 5 mm
			Telecommunication cables UTP Cat. 5		
			Sheathed cable YMVK 3 x 2.5 mm²		
			Sheathed cable YMVK 5 x 1.5 mm²		
			Sheathed cable YMVK 5 x 2.5 mm²		

If more single cable or pipe penetrations are placed in the floor, the minimum distance between the aperture edges is 100 mm, distance A_2, see Figure 110. The annular gap A_1 is also visible in this Figure. Empty pipes are allowed.

f110 Visualization single penetrations



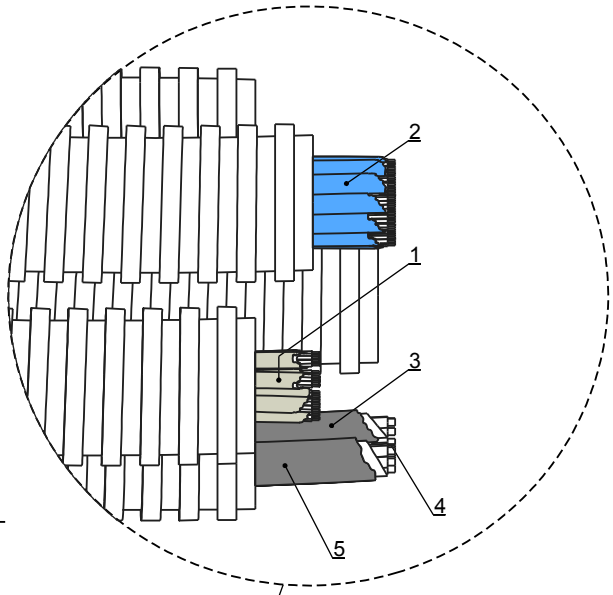
Front view

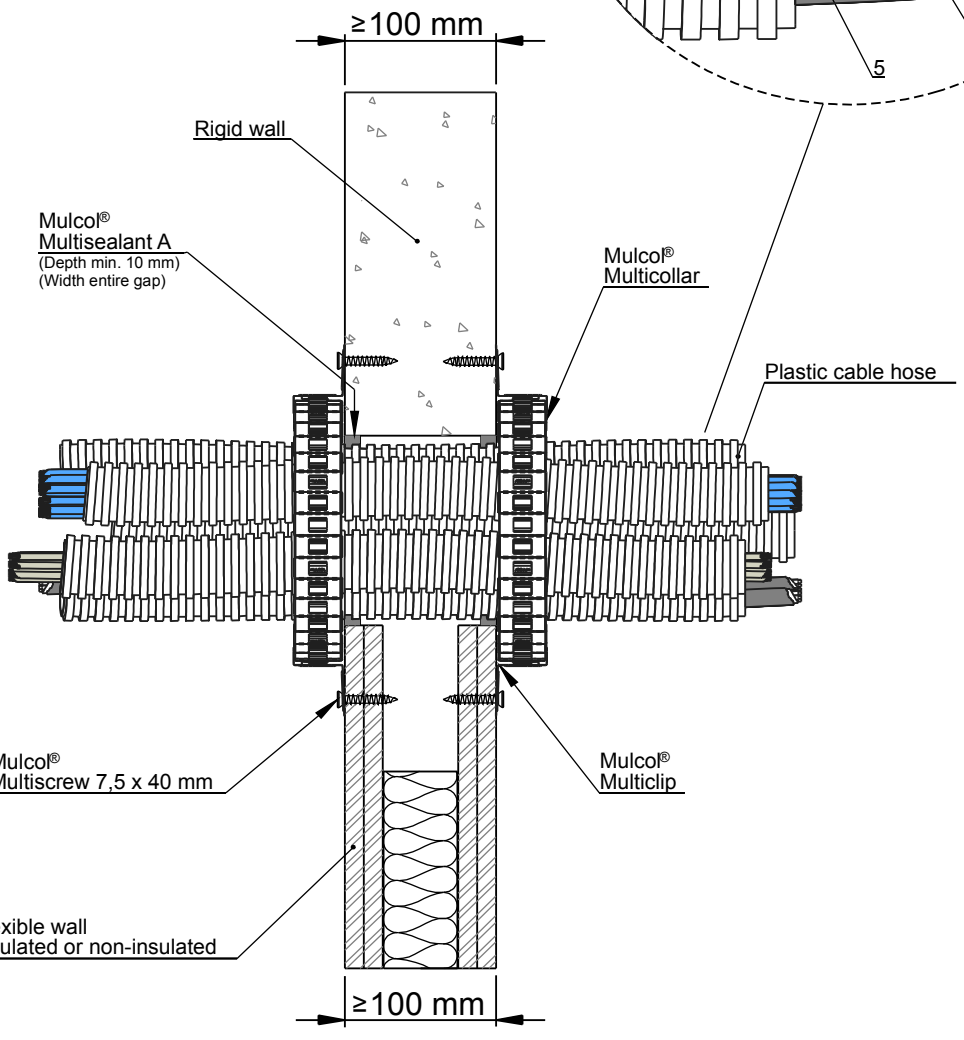


a - Annular space
(Maximum 15 mm between cable hose and Mulcol®Multicollar)
b - Mulcol®Multiclip

Cable hoses
consisting of the following cables:

1 - e.g. UTP Cable Cat. 5
2 - e.g. UTP Cable Cat. 6
3 - e.g. YMVK Cable 3 x 2,5 mm
4 - e.g. YMVK Cable 5 x 1,5 mm
5 - e.g. YMVK Cable 5 x 2,5 mm





American projection	Scale : 1:5	Company : Mulcol International B.V.	FW-EC-10.0.30
	Unit of measure : mm	Department : Research & Development	A4
	Date : 2-2-2017	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar
Installation in flexible wall and rigid wall

C 1744-1E-RA-010 210

For this system, a fire resistance according to the following combinations of performance parameters and classes applies.

Fire resistance Wavin flexible PE-conduit (or equal)				
Aperture dimensions (mm)		Performance class with pipe end configuration		Number of PE-conduits ≤ Ø50 mm
Outer diameter	Cables			
≤ 150	See Table 5.57	EI 120–U/U* E 120–U/U*	EI 120–U/C* E 120–U/C*	≤ 5

Based upon an assessment concerning different conduit materials is expected that the fire resistances given above will also be met for penetration seals with GEWA flexible HD-PE-conduits (the conduit dimensions shall correspond to the dimensions in the table).

6 Status of this document

This report provides a summary of the possible classifications in line with EN 13501-2:2016 and does not represent a type approval or certification of this product.

This report contains 212 pages

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