



# Fire assessment report

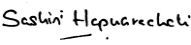


Mulcol® Multicollar Slim in  
accordance with AS 1530.4:2014

Sponsor: Mulcol International

Report number: FAS210306 Revision: R1.0

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## Quality management

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R1.0	Issue: 25 Nov 2022	Reason for issue	Initial issue		
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## Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of various penetrations – including plastic pipes, flue gas pipes, aluminium composite pipes, metal pipes with and without insulations, and cables – penetrating walls and floors protected by Mulcol® Multicollar Slim product in accordance with AS 1530.4:2014 and AS 4072.1:2005. Mulcol® Multicollar Slim is a pipe collar supplied with 30 × 12 mm intumescent liner complete within a stainless-steel shell to be closed around the services and fixed to the supporting element.

The analysis in sections 5 to 7 of this report found that the proposed systems, are expected to achieve FRLs as indicated in Table 1 in accordance with AS 1530.4:2014.

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 8 of this report. The results of this report are valid until 30 November 2027.

**Table 1 Assessment outcomes**

Item	Description	Outcome
1	Various penetration services penetrating a minimum 100 mm thick flexible/rigid walls, protected with one or two Mulcol® Multicollar Slim collars	As provided in section 6
2	Various penetration services penetrating a minimum 150 mm thick rigid floors, protected with one or two Mulcol® Multicollar Slim collars	As provided in section 7

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## 1. Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of various penetrations – including plastic pipes, flue gas pipes, aluminium composite pipes, metal pipes with and without insulations, and cables – penetrating walls and floors protected by Mulcol® Multicollar Slim product in accordance with AS 1530.4:2014<sup>1</sup> and AS 4072.1:2005<sup>2</sup>.

This assessment was carried out at the request of Mulcol International. The sponsor details are included in Table 2.

**Table 2 Sponsor details**

Sponsor	Address
Mulcol International	Arnesteinweg 18 Middelburg 4338PD The Netherlands

## 2. Framework for the assessment

### 2.1 Assessment approach

An assessment is an opinion about the expected performance of a component or element of structure subjected to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking these assessments. We have therefore followed the ‘Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence’ prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021<sup>3</sup>.

This guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- The interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments can vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

This assessment uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance of the elements in accordance with AS 1530.4:2014.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer’s stated design.

<sup>1</sup> Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.

<sup>2</sup> Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.

<sup>3</sup> Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

## 2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the NCC 2019, including amendments<sup>4</sup> under A5.2 (1) (d) and Schedule 5 (2). It also references test evidence for meeting a performance requirement or deemed to satisfy (DTS) provision of the NCC under A5.4 for fire resistance levels, that apply to the assessed systems.

This assessment report may also be used to demonstrate compliance with the requirements for evidence of suitability under NCC 2016, including amendments<sup>5</sup>.

This assessment has been written in accordance with the general principles outlined in EN 15725:2010<sup>6</sup> for extended application reports on the fire performance of construction products and building elements..

## 2.3 Declaration

The 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal on 22 October 2021, Mulcol International confirmed that:

- To their knowledge, the variations to the component or element of structure, which is the subject of this assessment, have not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.

## 3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results expected in accordance with AS 1530.4:2014 and AS 4072.1:2005.
- This assessment applies to floor systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014 where horizontal elements must be exposed to heat from the underside only. This assessment also applies to wall systems exposed to fire from each side (unless stated otherwise) in accordance with the requirements of AS 1530.4:2014 where vertical elements must be exposed to heat from the direction required to resist fire exposure.
- While it is recommended that for the elastomeric pipe insulation to be classified B-s3 as tested, the achieved results can be extended to cover an insulation material not deemed combustible as determined by AS 1530.1:1994 (R2016)<sup>7</sup>.
- Wall and floor elements are required to be tested or assessed by an Accredited Testing Laboratory (ATL) for the required fire resistance period. In cases where the FRL of the wall or floor is less than that of the penetration, the FRL will be derated accordingly.
- This report is only valid for the assessed systems and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end

<sup>4</sup> National Construction Code Volumes One and Two - Building Code of Australia 2019 including Amendments, Australian Building Codes Board, Australia

<sup>5</sup> National Construction Code Volumes One and Two - Building Code of Australia 2016 including Amendments, Australian Building Codes Board, Australia

<sup>6</sup> European Committee for Standardization, 2010, Extended application reports on the fire performance of construction products and building elements, EN 15725:2010, European Committee for Standardization, Brussels, Belgium.

<sup>7</sup> Standards Australia, 1994, Methods for fire tests on building materials, components and structures – Part 1: Combustibility test for materials, AS 1530.1:1994, Standards Australia, NSW.



conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an ATL that is accredited to the same nominated standards of this report.

- The documentation that forms the basis for this report is listed in Appendix A.
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

## 4. Description of the specimen and variations

### 4.1 Description of assessed systems

The proposed systems include various services penetrating flexible (steel/timber framed) / rigid walls with a minimum thickness of 100 mm and rigid floors of a minimum thickness of 150 mm protected by Mulcol® Multicollar Slim, tested in accordance with EN 1366-3:2009. It is proposed to assess the performance of the tested systems in accordance with AS 1530.4:2014. The services penetrating walls are protected with one or two collars on each side of the wall (unless specified otherwise), whereas services penetrating floors are protected with one or two collars on the exposed (bottom) side of the floor.

### 4.2 Referenced test data

The assessment of the variations to the tested systems and the determination of the expected fire performance is based on the results of the fire tests documented in the reports listed in Table 3.

**Table 3** Referenced test data

Report number	Test sponsor	Test date	Testing authority
YC 1518-1E-RA-001	Mulcol International	31 January 2017	Peutz
Y 1732-1E-RA-001		31 January 2017	Peutz
YB 1518-2E-RA-001		7 February 2017	Peutz
YB 1732-1E-RA		7 February 2017	Peutz
Y 1518-1E-RA-005		7 February 2017	Peutz
YA 1518-2E-RA-002		7 February 2017	Peutz
YA 1732-1E-RA		7 February 2017	Peutz
YC 1732-2E-RA-001		15 May 2017	Peutz
RFTR20006		7 April 2020	Efectis
RFTR20007		14 April 2020	Efectis
RFTR20008		15 May 2020	Efectis
Y 1979-4E-RA-002		5 October 2020	Peutz
2020-Efectis-R002525		17 November 2020	Efectis
2021-Efectis-R000223		13 January 2021	Efectis
Y 2434-1E-RA-001		5 November 2021	Peutz
Y 2453-1E-RA-001	5 November 2021	Peutz	

### 4.3 Variations to the tested systems

An identical system has not been subject to a standard fire test in accordance with AS 1530.4:2014. We have therefore reviewed the systems using baseline test information for similar systems. The variations to the tested systems – together with the referenced baseline standard fire tests – are described in Table 4.

**Table 4 Variations to tested systems**

Item	Reference test	Description	Variations
1.	Y 1518-1E-RA-005 YA 1518-2E-RA-002 YC 1518-1E-RA-001 YA 1732-1E-RA YC 1732-2E-RA-001 YB 1518-2E-RA-001 Y 1732-1E-RA-001 YB 1732-1E-RA RFTR20007 RFTR20006 RFTR20008 Y 1979-4E-RA-002 2020-Efectis-R002525 2021-Efectis-R000223 Y 2434-1E-RA-001 Y 2453-1E-RA-001	Various penetrations protected by Mulcol® Multicollar Slim were tested in accordance with EN 1366-3:2009 in the referenced test reports.	It is proposed to assess the tested systems in accordance with AS 1530.4:2014

### 4.4 Test and assessment standard

Section 10 of AS 1530.4:2014 sets out the procedure for determining the fire resistance of elements of construction penetrated by services.

AS 4072.1:2005 sets out the minimum requirements for the construction, installation and application of fire resistance tests to sealing systems.

### 4.5 Requirements for the assessed systems

- The services must directly penetrate the flexible/rigid separating element or penetrate through a seal system installed in the separating element. The specific elements of construction that the Mulcol® Multicollar Slim may be used to provide a penetration seal are as follows:
  - Flexible walls: The wall must have a minimum thickness of 100 mm and consist of steel or timber studs lined on both faces with minimum two layers of 13 mm thick fire rated plasterboards. No part of the penetration seal be closer than 100 mm to a stud. The cavity must be closed between the penetration seal and the stud, and minimum 100 mm of insulation confirmed to be deemed non-combustible in accordance with AS 1530.1:1994<sup>8</sup> must be provided within the cavity between the penetration seal and the stud.
  - Rigid walls: The wall must have a minimum thickness of 100 mm and constructed using concrete, aerated concrete or masonry, with a minimum density of 650 kg/m<sup>3</sup>.
  - Rigid floors: The floor must have a minimum thickness of 150 mm and constructed using aerated concrete or concrete with a minimum density of 600 kg/m<sup>3</sup>.
- The following products and fixings must be used in conjunction with Mulcol® Multicollar Slim to form the penetration seal:

<sup>8</sup> Standards Australia, 1994, Methods for fire tests on building materials, components and structures – Part 1: Combustibility test for materials, AS 1530.1:1994, Standards Australia, NSW.



- Mulcol® Multimortar (floor)
- Mulcol® Multisealant A (wall and floor)
- Mulcol® Multisealant A with backing rockwool  $\geq 35$  kg/m<sup>3</sup> (floor)
- Mulcol® Multisealant SP
- The annular gaps in services penetrating wall systems must be sealed with Mulcol® Multisealant A or Multimastic SP sealant on both faces with a depth of approximately 10 mm. The report sponsor has confirmed that both names refer to the same products, hence, can be used interchangeably.
- Table 5 presents the details of the annular gaps for the services assessed in this report.

**Table 5 Annular spaces for the services**

Separating element	Filling material	Annular space between pipe/insulation and collar		Minimum distance between aperture edges
Walls	Mulcol® Multisealant A or Multimastic SP sealant on both faces to a depth of $\geq 10$ mm	The annular space must be less than 10 mm if the outer diameter is less than 125 mm	The annular space must be less than 5 mm if the outer diameter is greater than 125 mm	100 mm
Floors	Mulcol® Multimortar with depth fully filled or Mulcol® Multisealant A or Multimastic SP sealant on both faces to a depth of $\geq 10$ mm as stated in Table 74 to Table 111.			

The requirements for fixings of the Mulcol® Multicollar Slim collar are shown in Table 6.

**Table 6 Fixings of the collar**

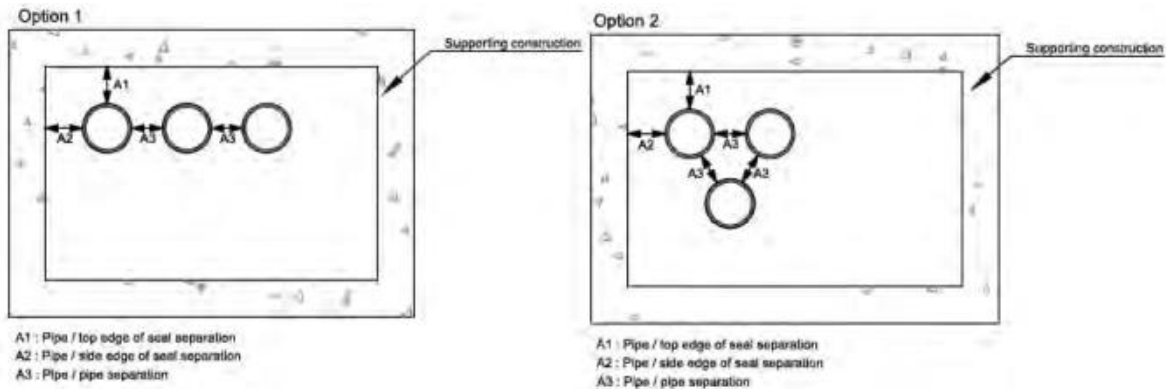
Outer diameter pipe, cable, or insulation (mm)	Single collar	Double collar		Allowed fixings		
	Number of Mulcol® Multiclips	First collar (Mulcol® Multiclips)	Second collar (Mulcol® Multiclips)	Rigid wall	Flexible wall	Coated firestop board system
$\leq 90$	2	1*	2	Mulcol® Multiscrew 7.5 x 40 mm	Mulcol® Multiscrew 7.5 x 40 mm or threaded rod and bolts M6	Mulcol® Multiscrew FB 40 or threaded rod and bolts M6
$> 90 < 160$	3	1*	3			
$\geq 160$ and $\geq 200$	4	1*	4			
$> 200 > 285$	5	2	5			
$> 285 > 315$	6	2	6			

Note : \* Mechanical fixation to the wall is not necessary

- The various penetration seal systems included in this assessment are as below:
  - Mulcol® Multimastic FB1 board system (2 x 50 mm) penetration seal system with Mulcol® Multimastic C coating (thickness 1 mm). The coating is also applied

circumferential over the opening of the rock wool with the adjacent construction (overlap minimal 10 mm). The joints between the different board elements and the aperture edge are glued together with Mulcol® Multimastic SP. The annular spaces/gaps of the pipe penetrations are also sealed with Mulcol® Multimastic SP.

- Mulcol® Multimastic FB2 (1 × 60 mm) penetration seal system with Mulcol® Multimastic C coating applied to a thickness of 1 mm on both faces of the panel. The Mulcol® Multimastic C coating is also applied circumferential over the opening of the mineral wool with the adjacent construction with a thickness of 0.3 mm. The joints between the different board elements and the aperture edge are glued together with Mulcol® Multimastic SP. The openings between the seal and the cables, cable trays and ladders are closed off with Mulcol® Multimastic SP.
- The following minimum distances between aperture edges and between the pipes must be maintained:  $A_1 = 50$  mm,  $A_2 = 50$  mm,  $A_3 = 100$  mm.



**Figure 1** minimum distances between apertures edges and between the pipes

Pipes must be supported at maximum 350 mm away from both faces of the wall constructions and from the upper face of floor constructions. Support of services in walls and floors must be maintained as per AS 1530.4:2014 and AS 4072.1:2005 requirements.

## 5. Assessment 1 – Applicability of test results in accordance with AS 1530.4:2014

### 5.1 Description of variation

This assessment report is prepared based on referenced tests provided in Appendix A describing fire resistance testing of fire seals and service penetration protection in various fire separating elements, tested in accordance with EN 1363-1:1999<sup>9</sup>, BS EN 1363-1:2012<sup>10</sup>, EN 1363-1:2020<sup>11</sup>, EN 1363-2:1999<sup>12</sup> and BS EN 1366-3:2009<sup>13</sup>. These standards differ from AS 1530.4:2014. The effect these differences have on the fire resistance performance of the test specimens if tested in accordance with AS 1530.4:2014 is discussed below.

### 5.2 Methodology

The method of assessment used is summarised in Table 7.

**Table 7 Method of assessment**

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Comparative

### 5.3 Assessment

#### 5.3.1 Specimen configuration

AS 1530.4:2014 specifies that the service(s) shall be installed so that it projects a minimum 500 mm on each side of the supporting construction, of which at least 200 mm shall extend beyond the extremities of the penetration sealing system. The penetration sealing system shall include any coating, wrapping or other protections to the services. The length of unprotected service on the unexposed face shall not be greater than 500 mm. For plastic pipes, the external projection away from the furnace shall be increased to a minimum of 2000 mm. The measurements shall not include any part of the plug or cap used to seal a pipe within the furnace.

EN 1366-3:2009 specifies that the service(s) shall be installed so that it projects a minimum of 500 mm on each side of the supporting construction, of which at least 150 mm shall extend beyond the extremities of the penetration seal. In the case of metallic services and metallic service supports that penetrate the seal the length of the unprotected part of the service/service support on the unexposed face shall not be greater than 500 mm.

With respect to the difference in the pipe projection from the wall system, it is considered that this difference will not likely introduce any detrimental effect to the wall system as the plastic pipe is expected to melt in the first few minutes in a test, and once the sealant is activated, this difference can be negligible. In case of a floor system, it is argued that having a 2000 mm projection out of the floor slab at the unexposed side may include a detrimental effect due to stack effect. However, it is argued that 500 mm projection as stipulated in the EN standard could be considered as the most onerous case due to the fact that more hot gases are expected to pass from the exposed to the unexposed side at a faster rate, hence increasing the temperature recorded by the TC placed on the service before the activation and closure of the fire rated sealant. In conclusion, considerable amount of research and test history has showed that the extension of the pipe from the unexposed side will not likely have an impact on the performance of the plastic pipes, hence it can be positively assessed.

<sup>9</sup> European Committee for Standardization, 1999, Fire resistance tests – General requirements, BS EN 1363-1:1999, European Committee for Standardization, Brussels, Belgium

<sup>10</sup> European Committee for Standardization, 2012, Fire resistance tests – General requirements, BS EN 1363-1:2012, European Committee for Standardization, Brussels, Belgium.

<sup>11</sup> European Committee for Standardization, 2020, Fire resistance tests – General requirements, BS EN 1363-1:2020, European Committee for Standardization, Brussels, Belgium

<sup>12</sup> European Committee for Standardization, 2012, Fire resistance tests – Part2:Alternative and additional procedures, BS EN 1363-1:2012, European Committee for Standardization, Brussels, Belgium

<sup>13</sup> European Committee for Standardization, 2009, Fire resistance tests for service installations. Penetration seals, BS EN 1366-3:2009, European Committee for Standardization, Brussels, Belgium.

The EN standard EN 1366-3:2021<sup>14</sup> stipulates the following field of application based on the tested pipe end configuration:

**Table 8 Field of application for pipe end configurations for single layer plastic pipes**

Tested					
		U/U	C/U	U/C	C/C
Covered	U/U	Y	N	N	N
	C/U	Y	Y	N	N
	U/C	Y	Y	Y	N
	C/C	Y	Y	Y	Y

Y=acceptable, N=not acceptable

**Table 9 Field of application for pipe end configurations for metal pipes**

Tested					
		U/U	C/U	U/C	C/C
Covered	U/U	Y	N	N	N
	C/U	Y	Y	Y	N
	U/C	Y	N	Y	N
	C/C	Y	Y	Y	Y

Y=acceptable, N=not acceptable

Based on the review of the test data and the above field of application, it is the opinion of this testing authority that services tested with an open/open end fire configuration are considered to be the worst-case scenario as the hot gases will have a clear path to the unexposed side. As a result, the thermocouple placed on the service will likely record the highest temperature when compared to the rest of the pipe end configurations. Therefore, FRL achieved in U/U configuration can be extended to services tested in any of the pipe end configurations.

With respect to the services tested in an open/closed configuration or closed/closed configuration, it is considered that both configurations are not in line with the general requirement of the AS 1530.4:2014. However, AS 1530.4:2014 stipulates that “service end conditions shall be representative of those intended to be used in practice”, therefore, it is reasonable to extend the FRL achieved in both configurations provided that they are representative of the system used in practice. Hence the open/closed configuration or closed/closed configurations for plastic and metal pipes are assessed according to Table 8 and Table 9, respectively.

### Furnace temperature regime

The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4:2014 follows the same trend as EN 1363-1.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and EN 1363-1 are not appreciably different.

### Furnace thermocouples

The furnace thermocouples specified in AS 1530.4:2014 are type K, mineral insulated metal sheathed (MIMS), with a stainless-steel sheath having a wire diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouple specified in EN 1363-1 is made from a folded steel plate that faces the furnace chamber. A thermocouple is fixed to the side of the plate facing the specimen, with the thermocouple hot junction protected by a pad of insulating material.

<sup>14</sup> European Committee for Standardization, 2021, Fire resistance tests for service installations. Penetration seals, BS EN 1366-3:2021, European Committee for Standardization, Brussels, Belgium.

The plate part is to be constructed from  $150 \pm 1$  mm long by  $100 \pm 1$  mm wide by  $0.7 \pm 0.1$  mm thick nickel alloy sheet strips.

The measuring junction is to consist of nickel chromium/nickel aluminium (Type K) wire as defined in IEC 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter of 1 mm, with the hot junctions electrically insulated from the sheath.

The thermocouple hot junction is to be fixed to the geometric centre of the plate by a small steel strip made from the same material as the plate. The steel strip can be welded to the plate – or may be screwed to it – to facilitate replacement of the thermocouple. The strip should be approximately 18 mm by 6 mm if it is spot-welded to the plate, and nominally 25 mm by 6 mm if it is to be screwed to the plate. The screw is to be 2 mm in diameter.

The assembly of plate and thermocouple should be fitted with a pad of inorganic insulation material  $97 \pm 1$  mm by  $97 \pm 1$  mm by  $10 \pm 1$  mm thick with a density of  $280 \pm 30$  kg/m<sup>3</sup>.

The relative locations of the furnace thermocouples for the exposed face of the specimen – for AS 1530.4:2014 and EN 1363-1 – are 100 mm + 10 mm and 100 mm + 50 mm, respectively.

The furnace control thermocouples required by EN 1363-1 are less responsive than those specified by AS 1530.4:2014. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN 1363-1, particularly when the furnace temperature is changing quickly in the early stages of the test.

### Furnace pressure

It is a requirement of AS 1530.4:2014 and EN 1363-1 that for vertical elements, a furnace gauge pressure of 0 Pa is established at a height of 500 mm above the notional floor level.

For wall penetrations, AS 1530.4:2014 requires that – if the separating element has a height greater than 1 m – it shall be tested with a pressure of  $20 \pm 3$  Pa at the top of the separating element and that the horizontal penetrating services shall be included in the zone where positive pressure exceeds 10 Pa.

EN 1366-3:2009 specifies that a minimum pressure of 20 Pa shall be maintained at the top of the uppermost penetration seal in a vertical supporting construction and that services shall only be included in the zone where the positive pressure exceeds 10 Pa.

Therefore, both standards require that a minimum pressure of 10 Pa be maintained at the lowest point of the lowest service.

It is a requirement of both AS 1530.4:2014 and EN 1363-1:2012 that for horizontal elements, a furnace gauge pressure of 20 Pa is established at a height of 100 mm below the floor soffit level.

The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and EN 1363-1:2012 are also not appreciably different.

### 5.3.2 Specimen thermocouples

The specimen thermocouple specification of service penetrations is generally the same for AS 1530.4:2014 and BS EN 1366-3:2009.

For the penetration construction considered, AS 1530.4:2014 specifies the following locations for thermocouples to be placed.

- At not less than two points approximately 25 mm from the edge of the hole made for the passage of the service (one in uppermost vertical plane).
- On the surface of the penetrating service, at least two thermocouples located approximately 25 mm from the plane of the general surface of the penetrated element (one in uppermost vertical plane).
- At least two positions 25 mm from the interface of the separating element and main penetration seal.

For penetration sealing systems, thermocouples are fixed in generally similar locations on the unexposed face in both EN 1363-1 and AS 1530.4:2014. These locations are on the supporting

construction, the sealing system, the penetrating service adjacent to the plane of penetration, and on the penetrating service some distance from the plane of penetration.

### 5.3.3 Performance criteria

The performance criteria discussed – as pertaining to the current assessment – are integrity and insulation.

#### Integrity

In accordance with AS 1530.4:2014, while a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion if it collapses or sustains flaming on the unexposed face, which can ignite a cotton pad when applied for up to 30 seconds.

A specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 when any of the following occurs:

- Sustained flaming for 10 seconds.
- A gap forms that allows the passage of hot gases to the unexposed face and ignites the cotton pad when applied for up to 30 seconds.
- A gap forms that allows the penetration of a 25 mm gap gauge anywhere on the specimen.
- A gap forms that allows a 6 mm × 150 mm gap gauge to penetrate the specimen anywhere on the specimen.

Except for minor variations, the integrity criteria in EN 1363-1 are generally applied in a comparable manner.

#### Insulation

The general insulation criteria of AS 1530.4:2014 and EN 1363-1 are not appreciably different.

## 5.4 Conclusion

The variations in furnace heating regimes, furnace thermocouples and the responses of the different thermocouple types to the furnace conditions are not expected to have a significant effect on the outcome of the referenced fire resistance test. Based on the above discussion, it is considered that the results relating to the integrity and insulation performance of the referenced tests can be used as a basis to assess the FRL of the specimens if tested in accordance with AS 1530.4:2014.



## 6. Assessment 2 - Mulcol® Multicollar Slim - Flexible or rigid wall constructions with wall thickness of minimum 100 mm

### 6.1 Description of variation

Various service penetrations including metal pipes, plastic pipes and cable configurations are protected with Mulcol® Multicollar Slim product. The services penetrating walls are protected with one or two collars on each side of the wall (unless specified otherwise). The annular gaps in services penetrating wall systems are sealed with Mulcol® Multisealant A or Multimastic SP sealant at both faces with a depth of approximately 10 mm. The report sponsor has confirmed that both names refer to the same products, hence, can be used interchangeably.

### 6.2 Methodology

The method of assessment used is summarised in Table 10.

**Table 10 Method of assessment**

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative

### 6.3 Assessment

#### 6.3.1 Plastic pipes

##### Plastic pipes fitted perpendicular to the wall

**Table 11 Plastic pipes fitted perpendicular to the wall**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL	
PE-HD, PE-X, ABS, SAN-PVC	Ø40	2.4	one	-/90/60 U/U	
	Ø50	3-4.6	one	-/120/120 U/U	
		2.7	one	-/60/60 U/U	
	Ø110	6.6	one	-/120/120U/U	
		Ø125	3.1	one	-/120/45 U/U
			4.9-7.4	one	-/120/90 U/U
	Ø160	7.4- 11.4	one	-/45/45 U/U	
		4	one	-/90/90 U/U	
		4-14.6	one	-/90/90 U/C	
		4-9.5	two	-/120/120 U/U	
		9.5-14.6	two	-/60/60 U/U	
Ø250	9.5-14.6	two	-/120/120 U/C		
	7.7	two	-/60/60 U/C		
PP	Ø40	1.8-5.5	one	-/120/120 U/U	
	Ø110	2.7-6.3	one	-/120/120 U/U	
	Ø125	3.1	one	-/120/120 U/U	

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
		3.1 - 7.3	one	-/120/90 U/U
		7.3 - 11.4	one	-/30/30 U/U
	Ø160	4	one	-/120/90 U/U
		4-6.2	one	-/60/45 U/U
		6.2-14.6	one	-/30/30 U/U
		9.1	one	-/120/90 U/C
		4	two	-/120/120 U/U
		9.1	two	-/90/90 U/U
		14.6	two	-/60/60 U/U
		14.6	two	-/120/120 U/C
PVC-U, PVC-C	Ø40	1.9-4.5	one	-/120/120 U/U
	Ø110	2.2	one	-/120/120 U/U
		12.3	one	-/120/90 U/U
	Ø125	2.5	one	-/120/120 U/U
		9.3	one	-/90/90 U/U
	Ø160	1.8	one	-/120/90 U/U
		11.8	one	-/120/90 U/U
		1.8-11.8	two	-/120/120 U/U
	Ø315	7.7	two	-/90/90 U/C

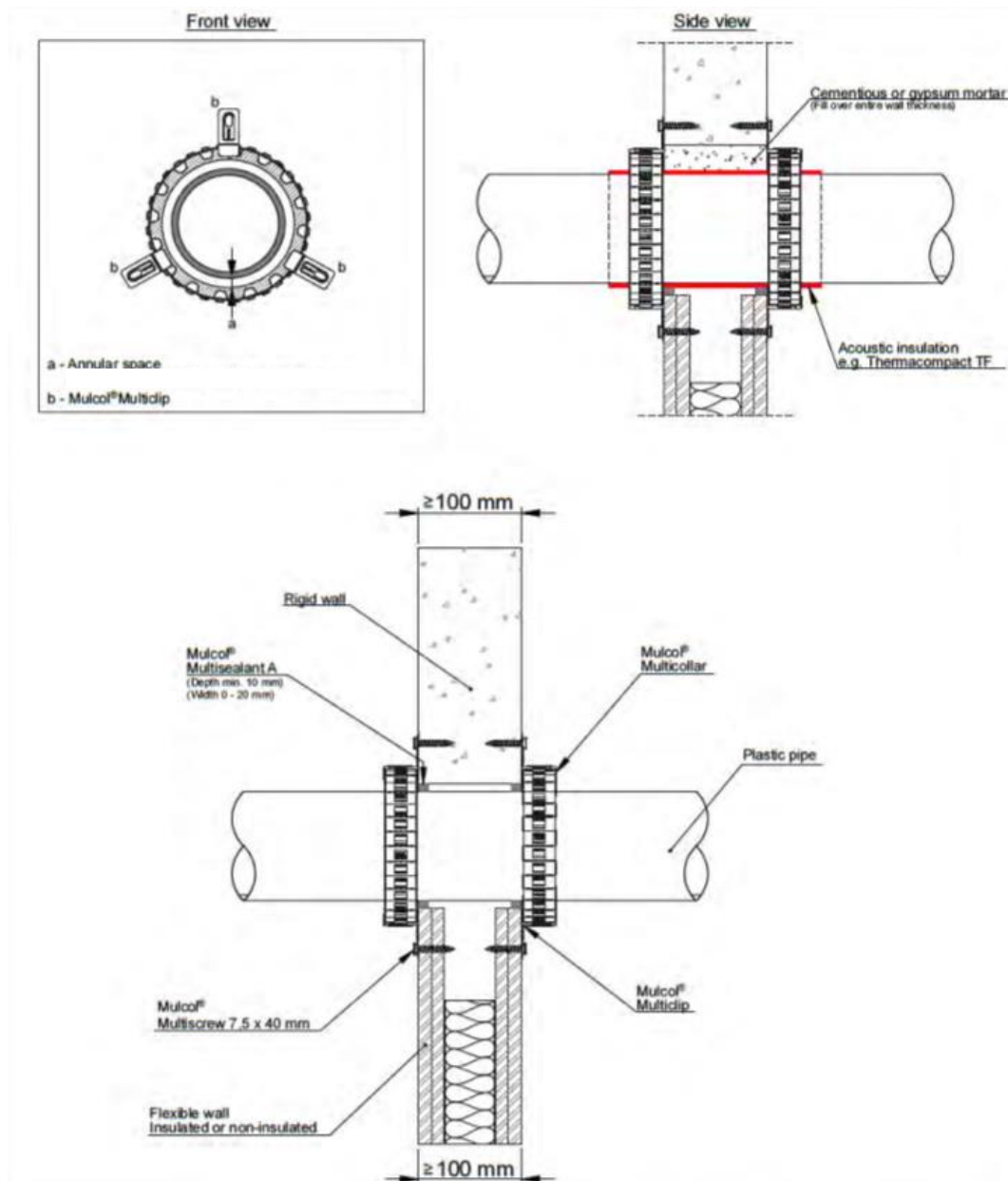


Figure 2 Plastic pipes fitted perpendicular to the wall protected with one collar

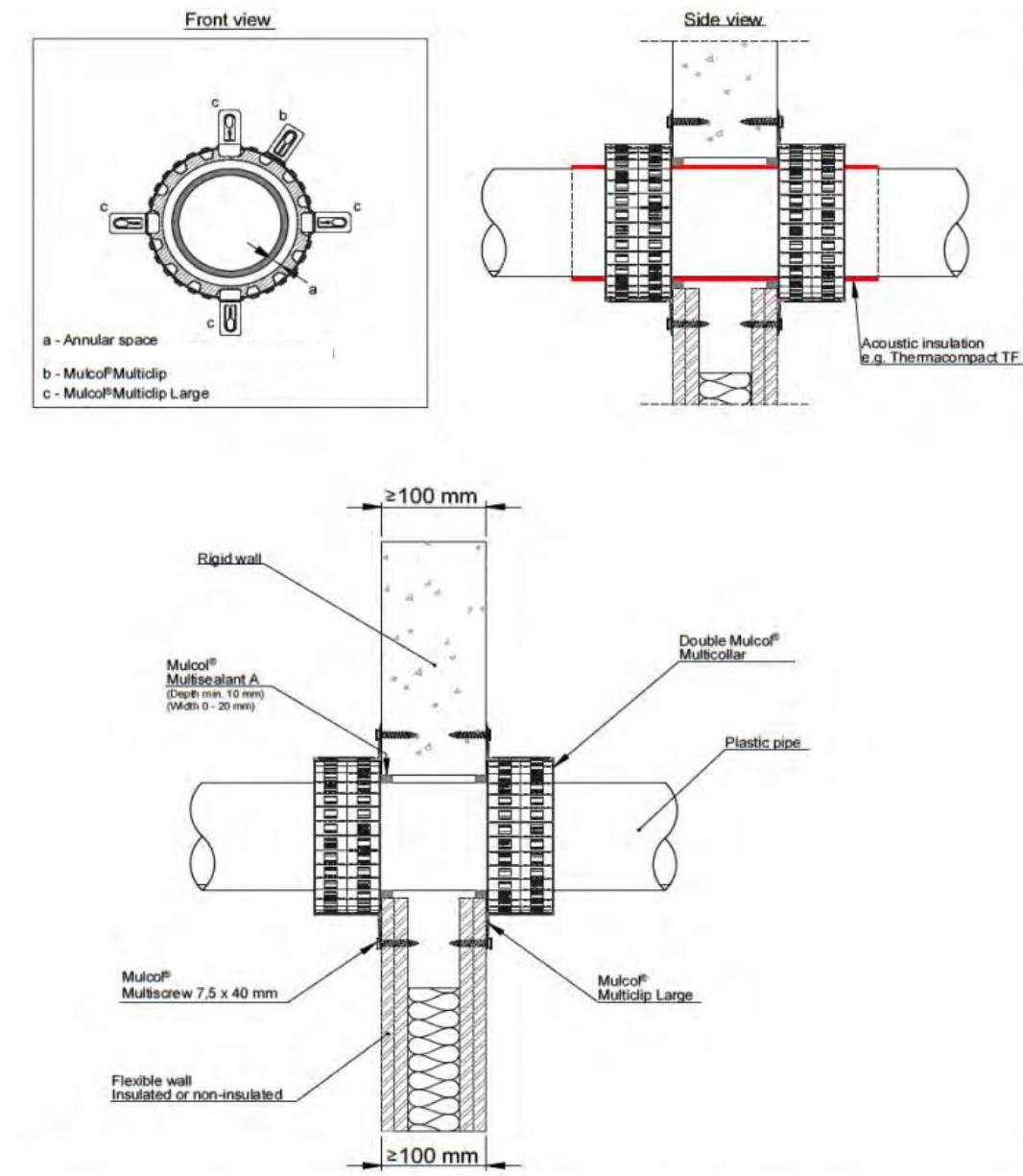


Figure 3 Plastic pipes fitted perpendicular to the wall protected with two collars

Plastic pipes fitted at angles 45°-90° to the wall

Table 12 Plastic pipes fitted at angles 45°-90° to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø110	2.7	one	-/60/45 U/C
		3.4-10	two	-/120/120 U/C
PP	Ø110	2.7	one	-/60/45 U/C
		3.4	two	-/120/120 U/C
		3.4-10	two	-/60/45 U/C
PVC-U, PVC-C	Ø125	2.5	one	-/45/30 U/U

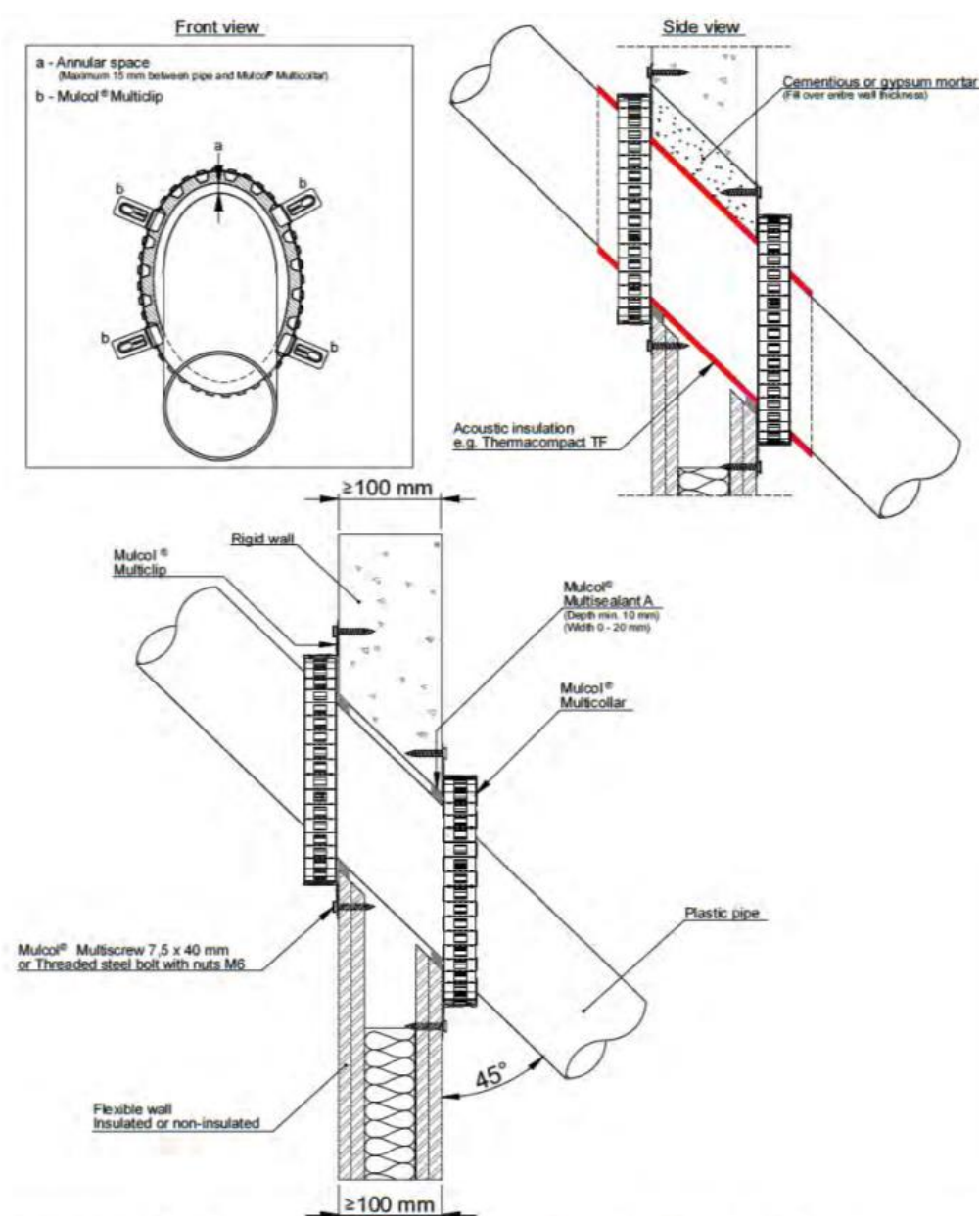


Figure 4 Plastic pipes fitted at angles 45° - 90° to the wall protected with

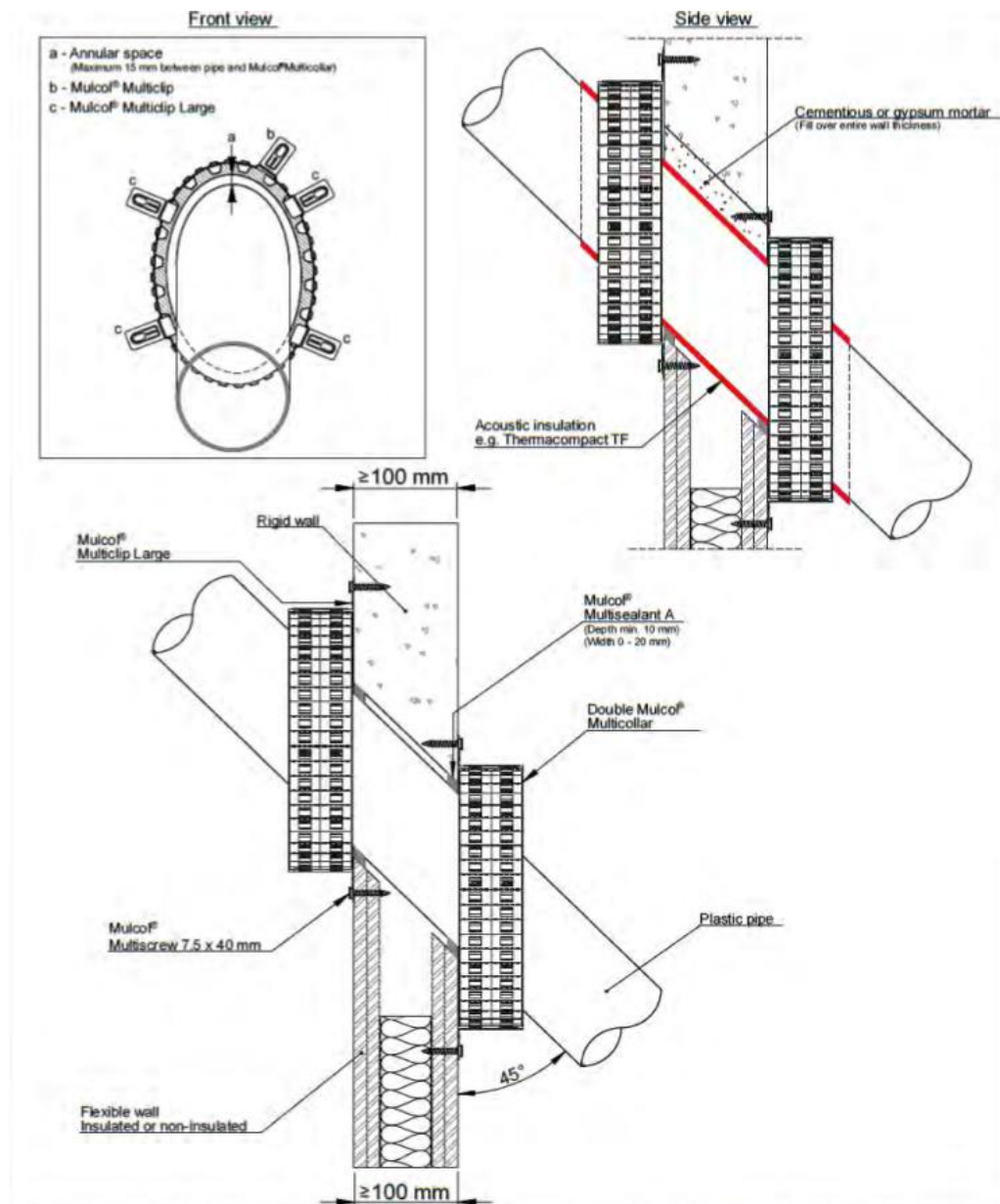


Figure 5 Plastic pipes fitted at angles 45° - 90° to the wall protected with two collars



Plastic pipes, perpendicular to the wall, in Mulcol® Multimastic FB1 coated board seals

Table 13 Plastic pipes, perpendicular to the wall, in Mulcol® Multimastic FB1 coated board seals

Pipe material	Seal penetration system	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Mulcol	Ø110	2.7	one	-/120/120 U/U
PP	Mulcol	Ø110	2.7	one	-/120/120 U/U

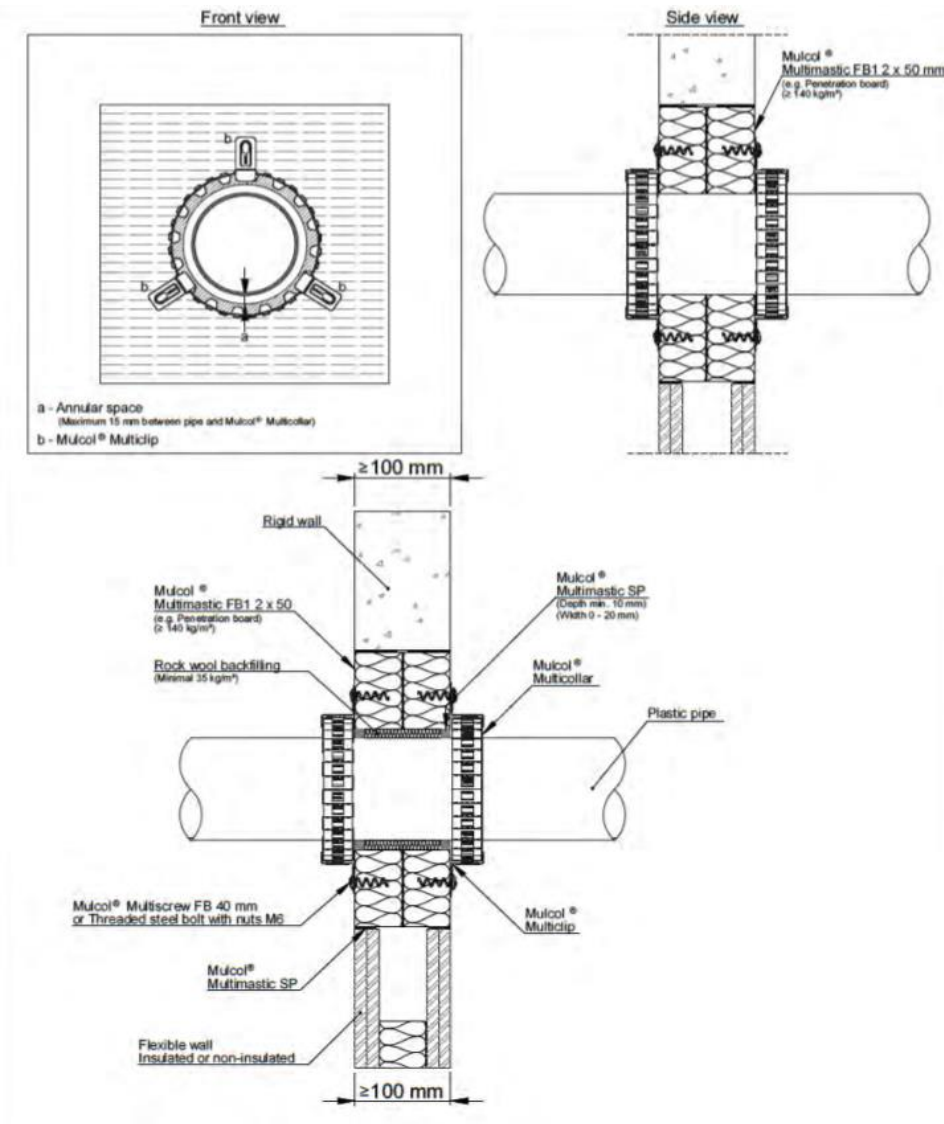


Figure 6 Plastic pipes, perpendicular to the wall, in Mulcol® Multimastic FB1 coated board seals protected

Plastic pipes insulated with AF/Armaflex (LI/CI) made out of flexible elastomeric EPDM rubber foam

Table 14 Plastic pipes insulated with AF/Armaflex (LI/CI) made out of flexible elastomeric EPDM rubber foam

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LI/CI thickness/length (mm)	Number of collars	FRL
PVC-U, PVC-C	Ø110	3.2	32 / 450 minimum	two	-/120/120 U/U

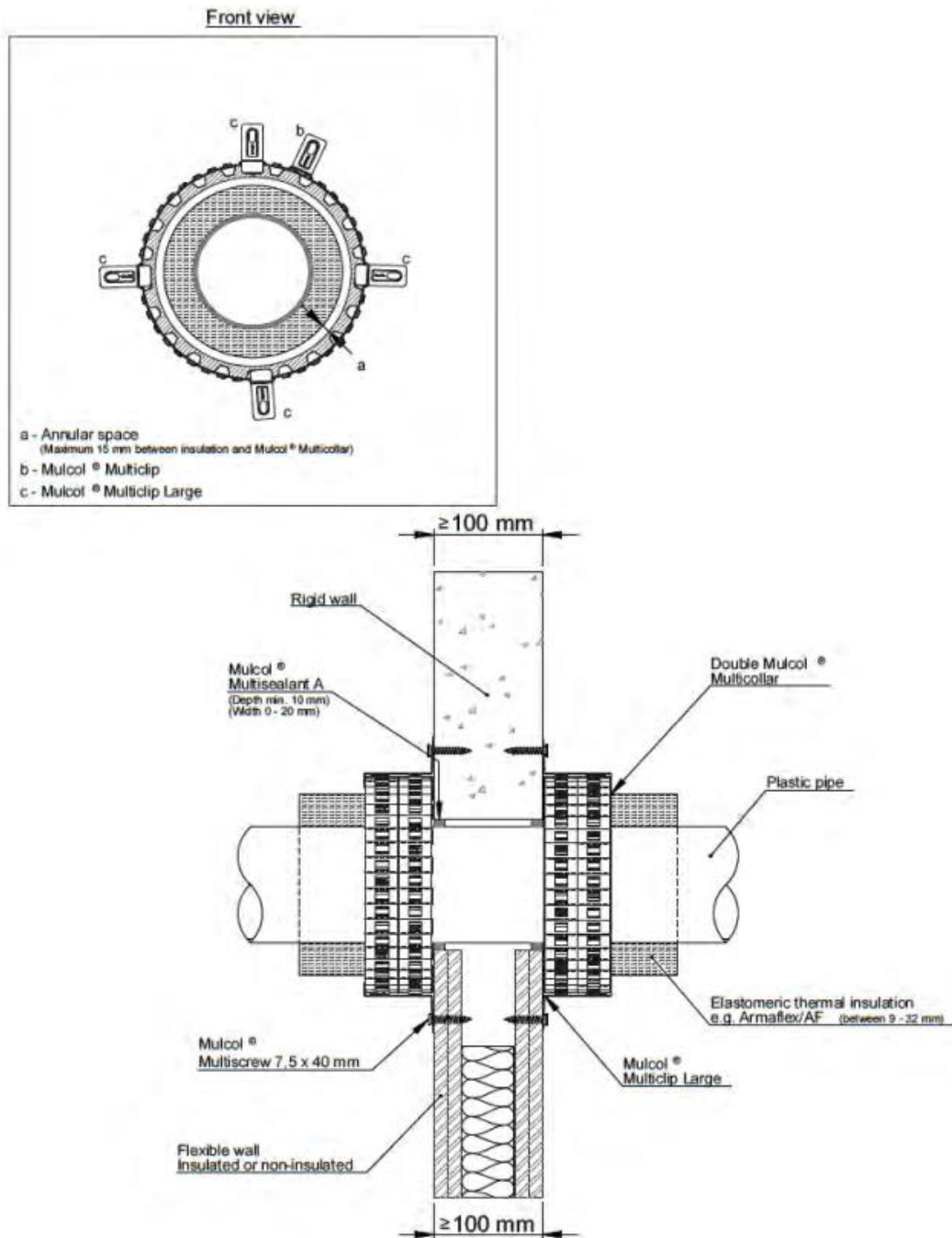
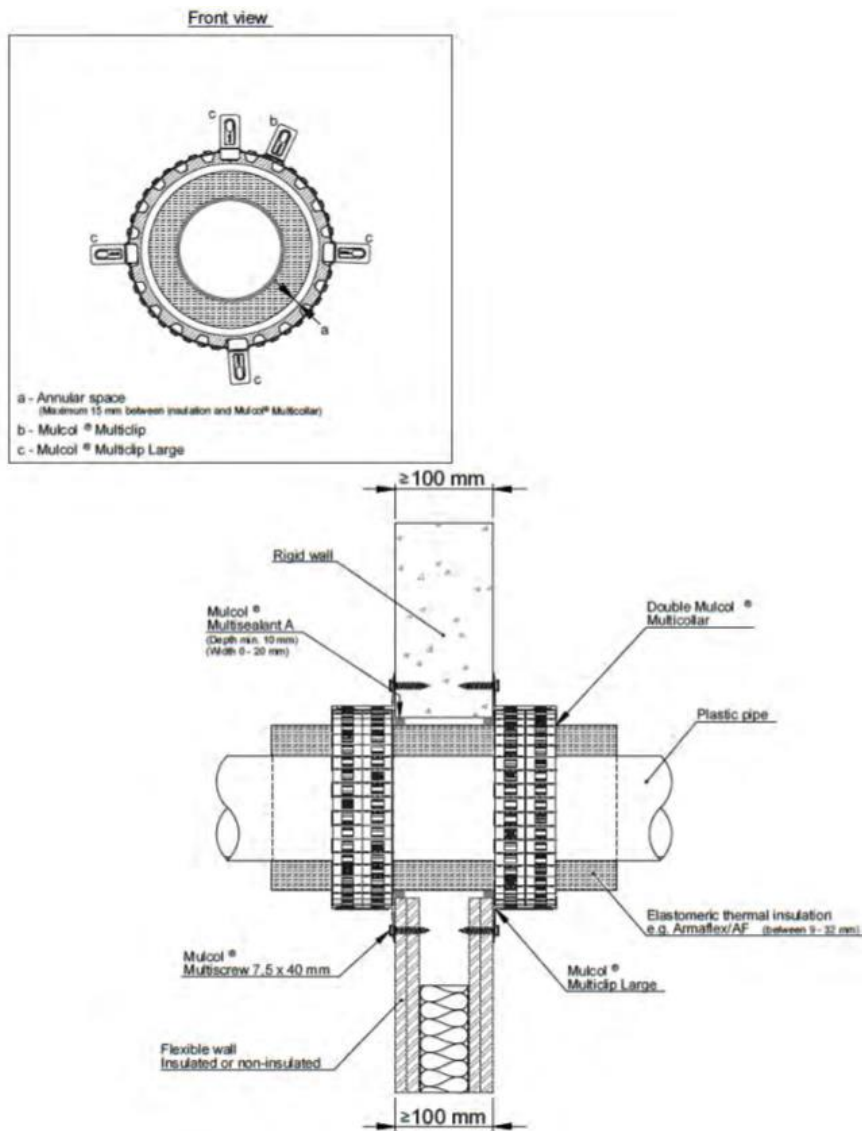


Figure 7 Plastic pipes insulated with AF/Armaflex (LI/CI) made out of flexible elastomeric EPDM rubber foam

**Plastic pipes insulated with AF/Armaflex (LS/CS) made out of flexible elastomeric EPDM rubber foam**

**Table 15 Plastic pipes insulated with AF/Armaflex (LS/CS) made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS thickness/length (mm)	Sealing system	Number of collars	FRL
PE, PE-X, ABS, SAN-PVC	Ø110	2.7	19/400 minimum	Mulcol multimastic SP	one	-/60/60 U/U
PP	Ø110	2.7	19/400 minimum	Mulcol multimastic SP	one	-/60/60 U/U
PVC	Ø110	2.7	19/400 minimum	Mulcol multimastic SP	one	-/60/60 U/U
PE-HD, PE-X, ABS, SAN-PVC	Ø110	3.2	32/450 minimum	Mulcol multimastic A	two	-/120/90 U/U



**Figure 8 Plastic pipes insulated with AF/Armaflex (LS/CS) made out of flexible elastomeric EPDM rubber foam**

Plastic pipes with (electrofusion) pipe coupling, perpendicular to the wall

Table 16 Plastic pipes with (electrofusion) pipe coupling, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø110	4.3-7.4	one	-/120/120 U/C
	Ø125	7.4	one	-/90/60 U/C

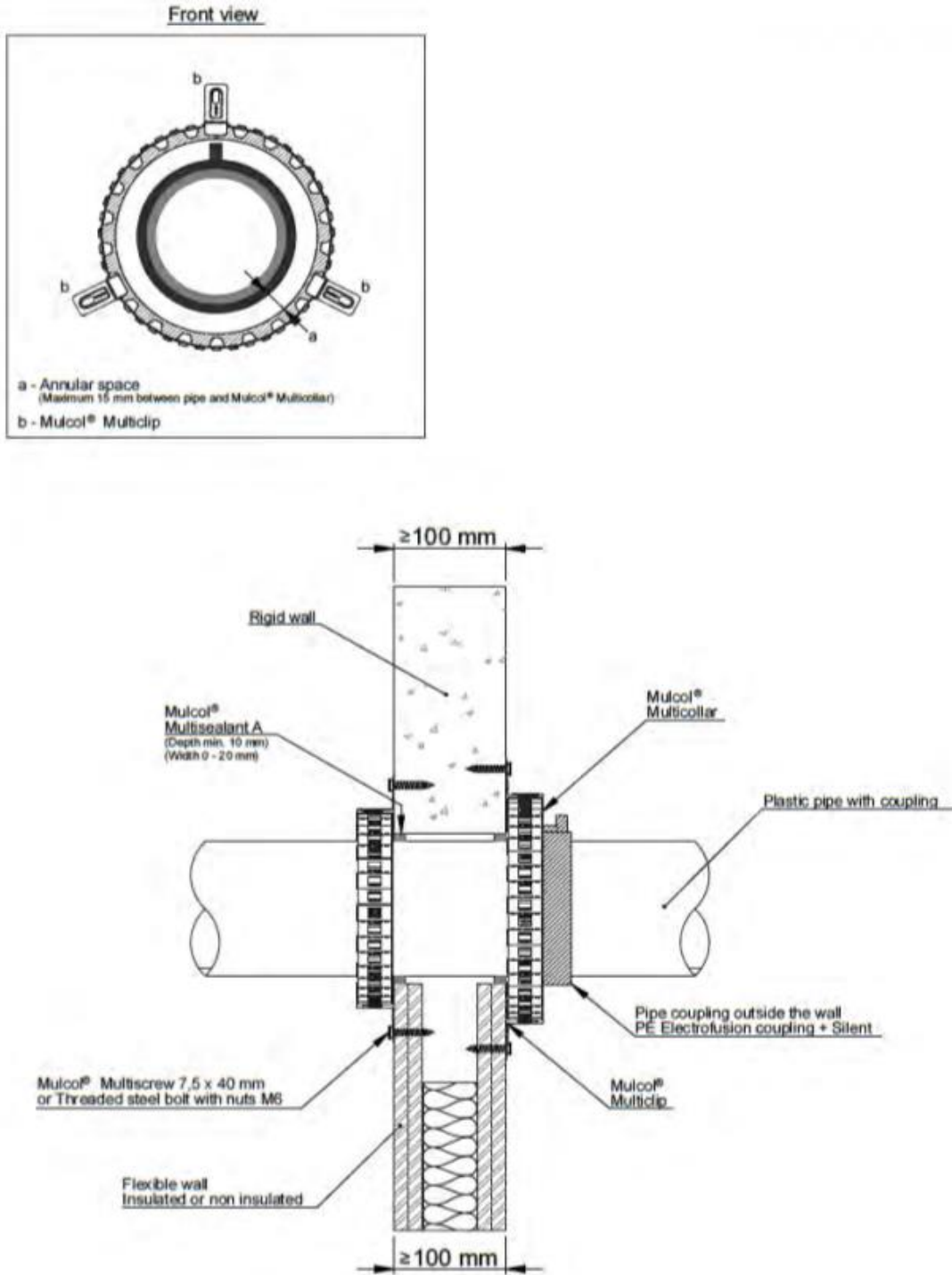


Figure 9 Plastic pipes with (electrofusion) pipe coupling, perpendicular to the wall

Plastic pipes with an elbow, perpendicular to the wall

Table 17 Plastic pipes with an elbow, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PP	Ø125	3.1	one	-/90/90 U/C
PVC-U, PVC-C	Ø125	2.5	one	-/90/90 U/U

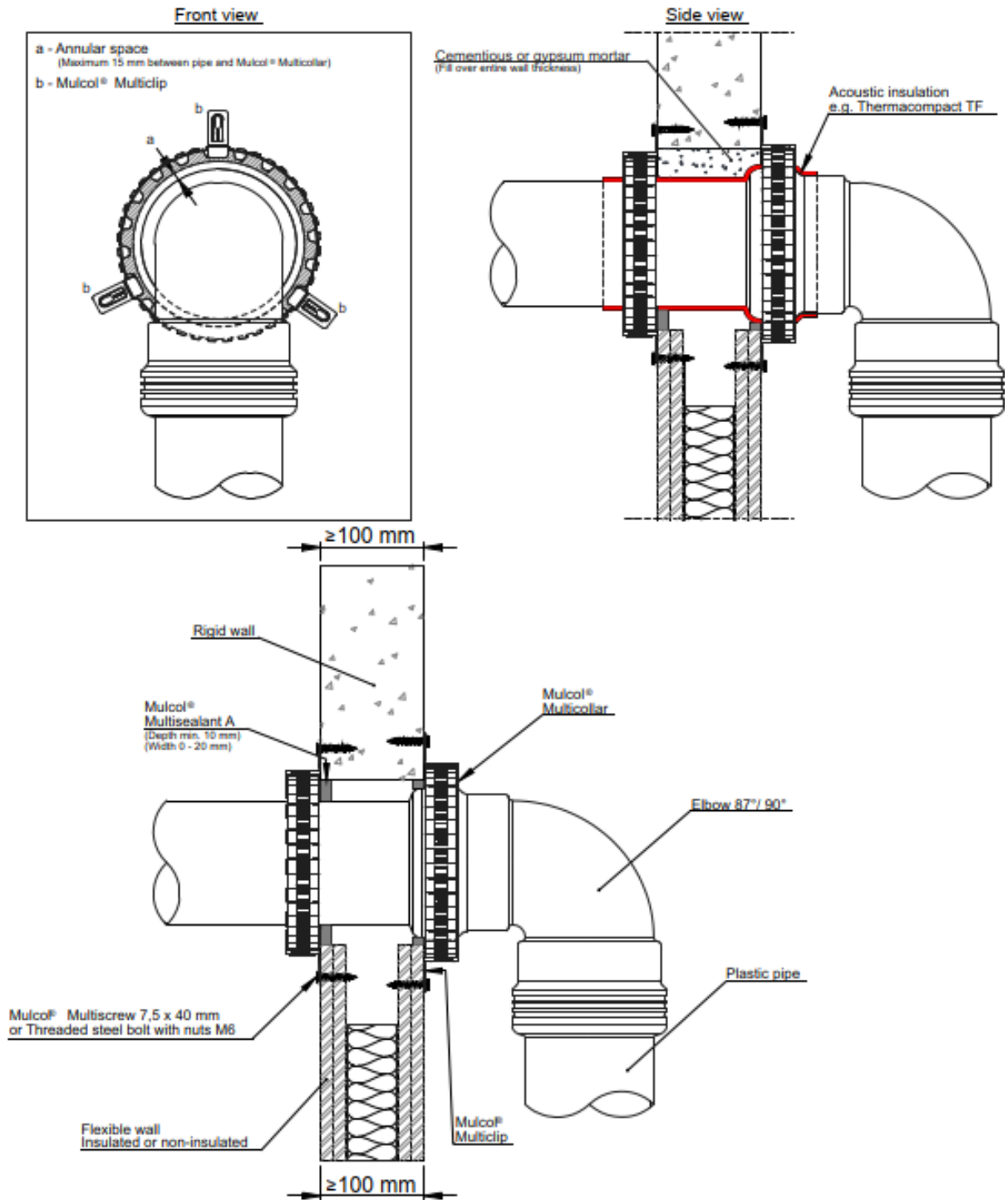


Figure 10 Plastic pipes with an elbow, perpendicular to the wall

Plastic pipes with an elbow in U shape, perpendicular to the wall

Table 18 Plastic pipes with an elbow in U shape, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE, PE-X, ABS, SAN-PVC	Ø110	3.4	one	-/120/120 U/C
PP	Ø110	3.4	one	-/120/120 U/C
PVC	Ø110	3.4	one	-/120/120 U/C

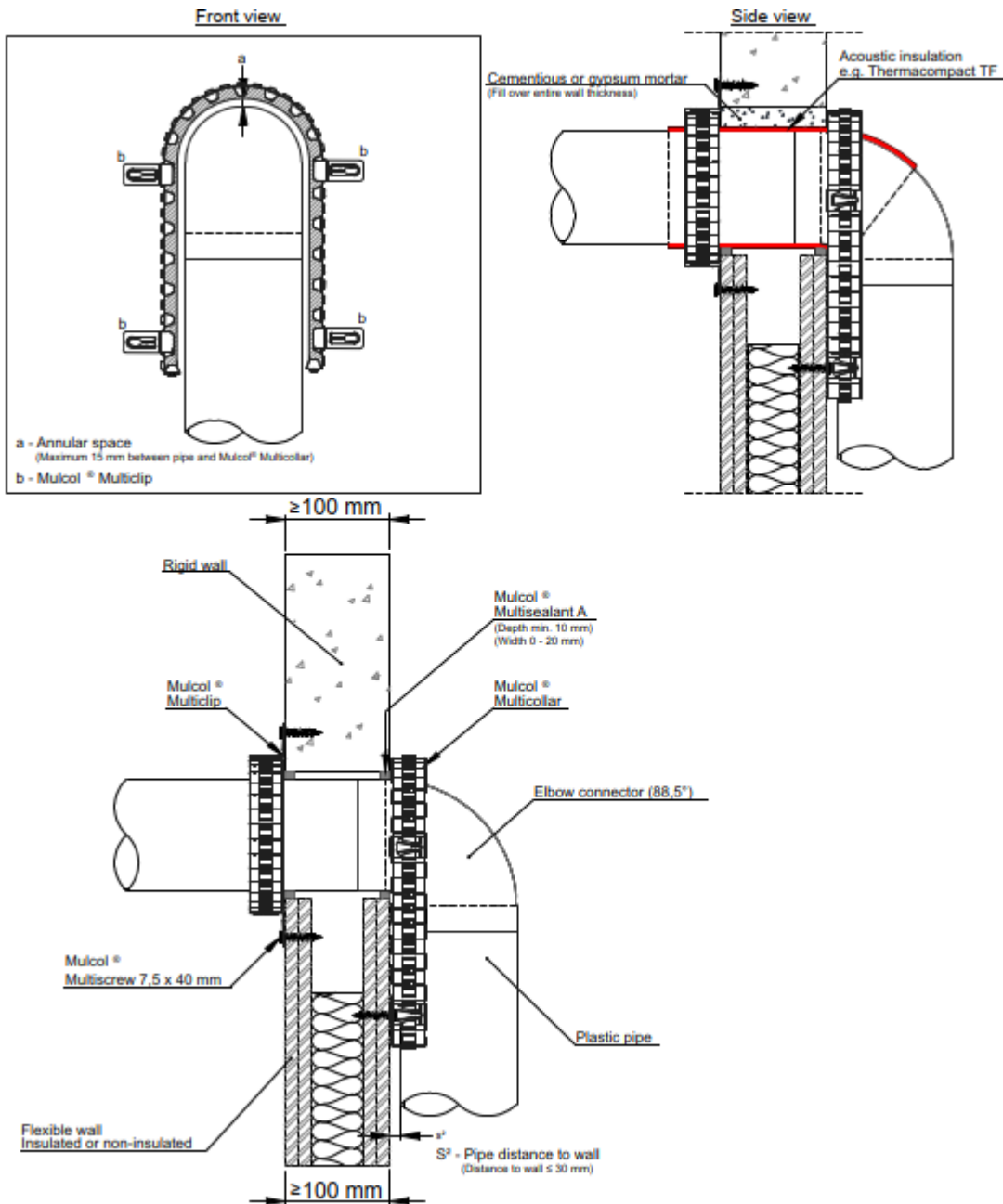


Figure 11 Plastic pipes with an elbow in U shape, perpendicular to the wall



Plastic pipes, perpendicular to the wall, in wall corner

Table 19 Plastic pipes, perpendicular to the wall, in wall corner

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Location	Number of collars	FRL
PVC-U, PVC-C	Ø110	2.2	Bottom corner	one	-/120/90 U/U
		3.2	Bottom corner	one	-/120/90 U/U

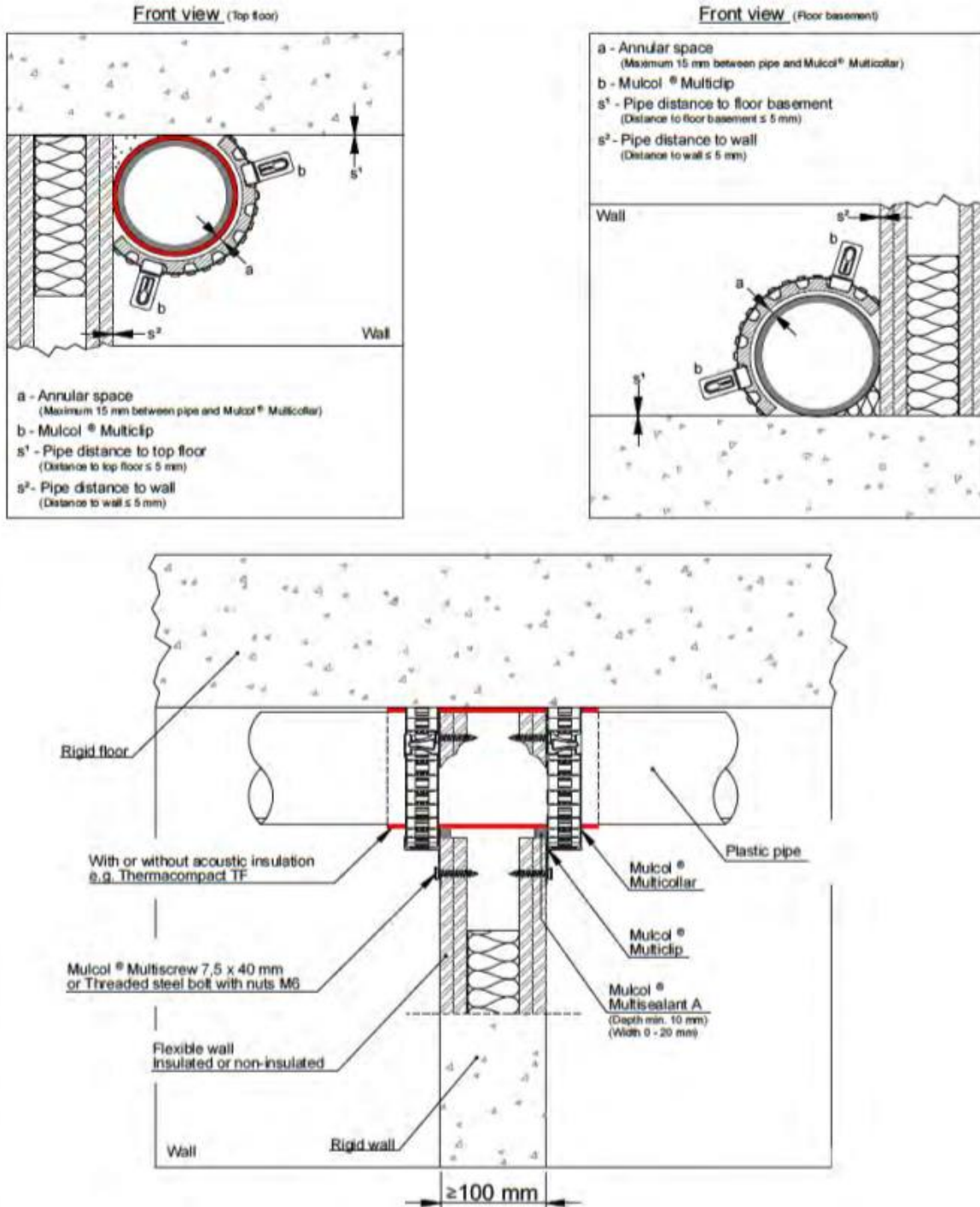


Figure 12 Plastic pipes, perpendicular to the wall, in wall corner

Plastic pipes, perpendicular to the wall, with zero distance to the floor

Table 20 Plastic pipes, perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE, PE-X, ABS, SAN-PVC	Ø90	2.8	one	-/90/90 U/U
PVC	Ø110	2.2	one	-/90/60 U/U

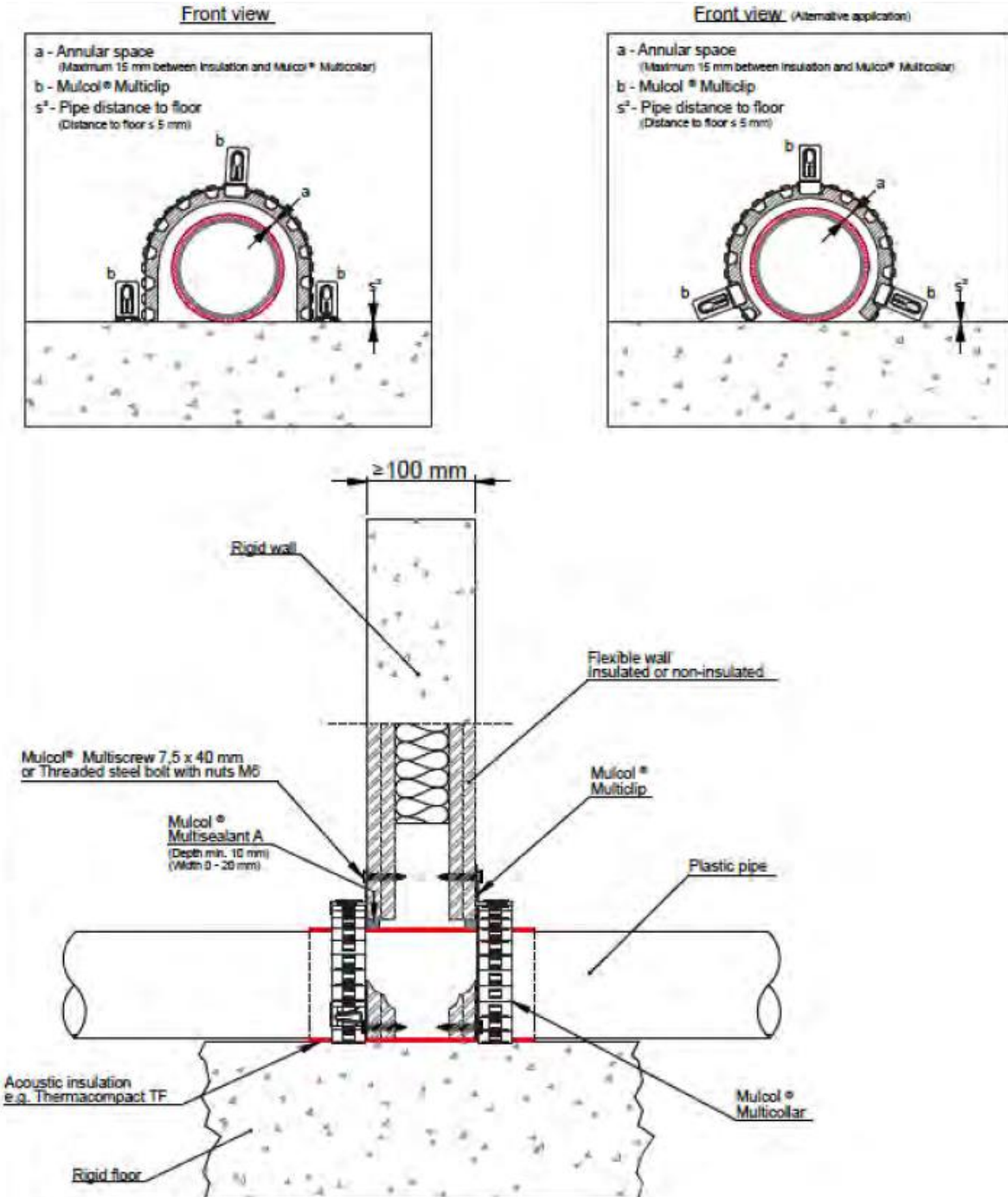


Figure 13 Plastic pipes, perpendicular to the wall, with zero distance to the floor

Plastic pipes supported by steel supporting half shell, perpendicular to the wall

Table 21 Plastic pipes supported by steel supporting half shell, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE, PE-X, ABS, SAN-PVC	Ø90	2.8	one	-/90/90 U/C

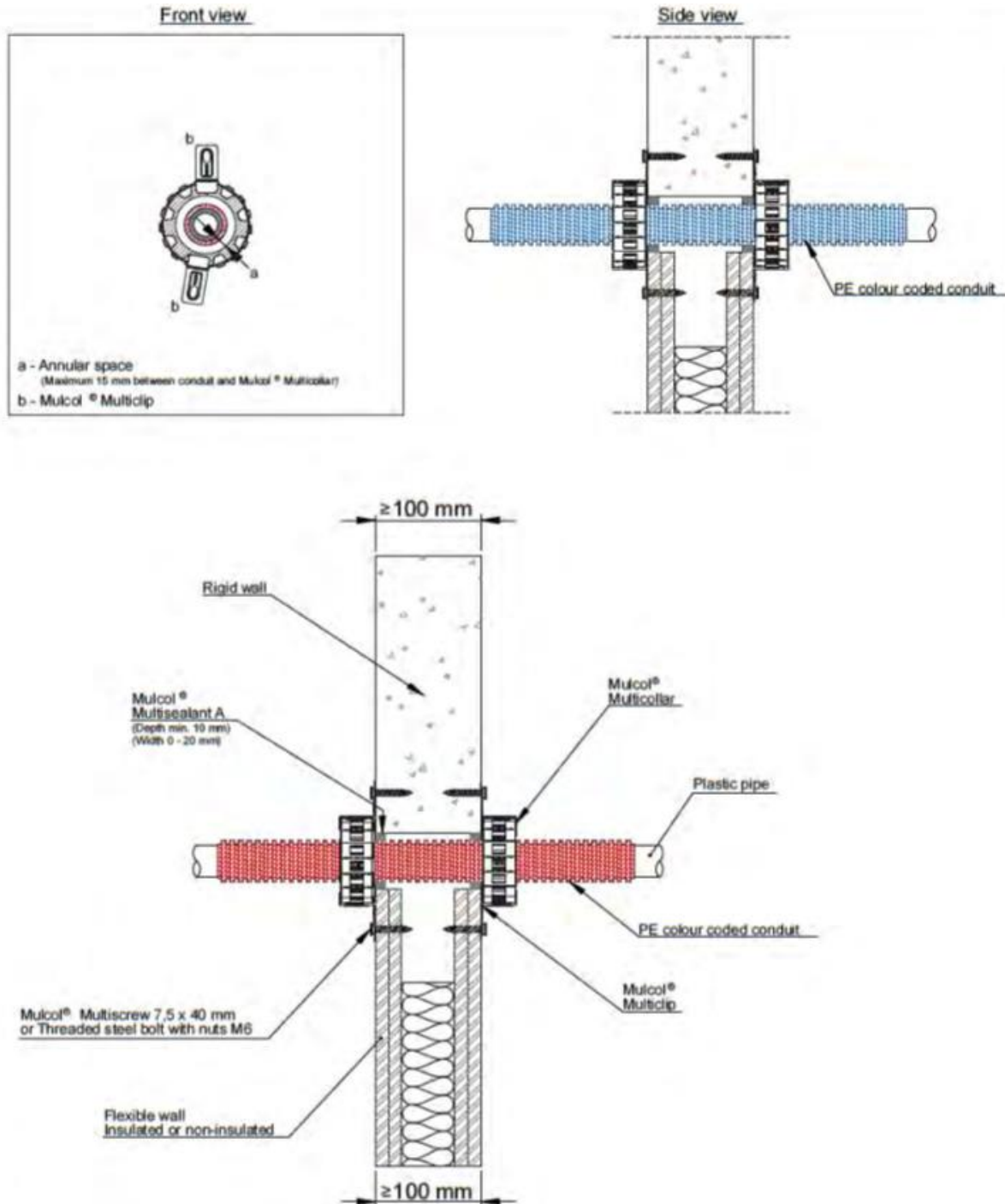


Figure 14 Plastic pipes supported by steel supporting half shell, perpendicular to the wall

### 6.3.2 Plastic pipes (silent)

Table 22 Plastic pipes (silent), perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Wavin SiTech+	Ø32	2	one	-/120/120 U/U
	Ø110	3.6	one	-/120/90 U/U
Geberit Silent dB 20	Ø110	6	one	-/120/120 U/U
Wavin Si Tech+	Ø160	5	two	-/120/90 U/U

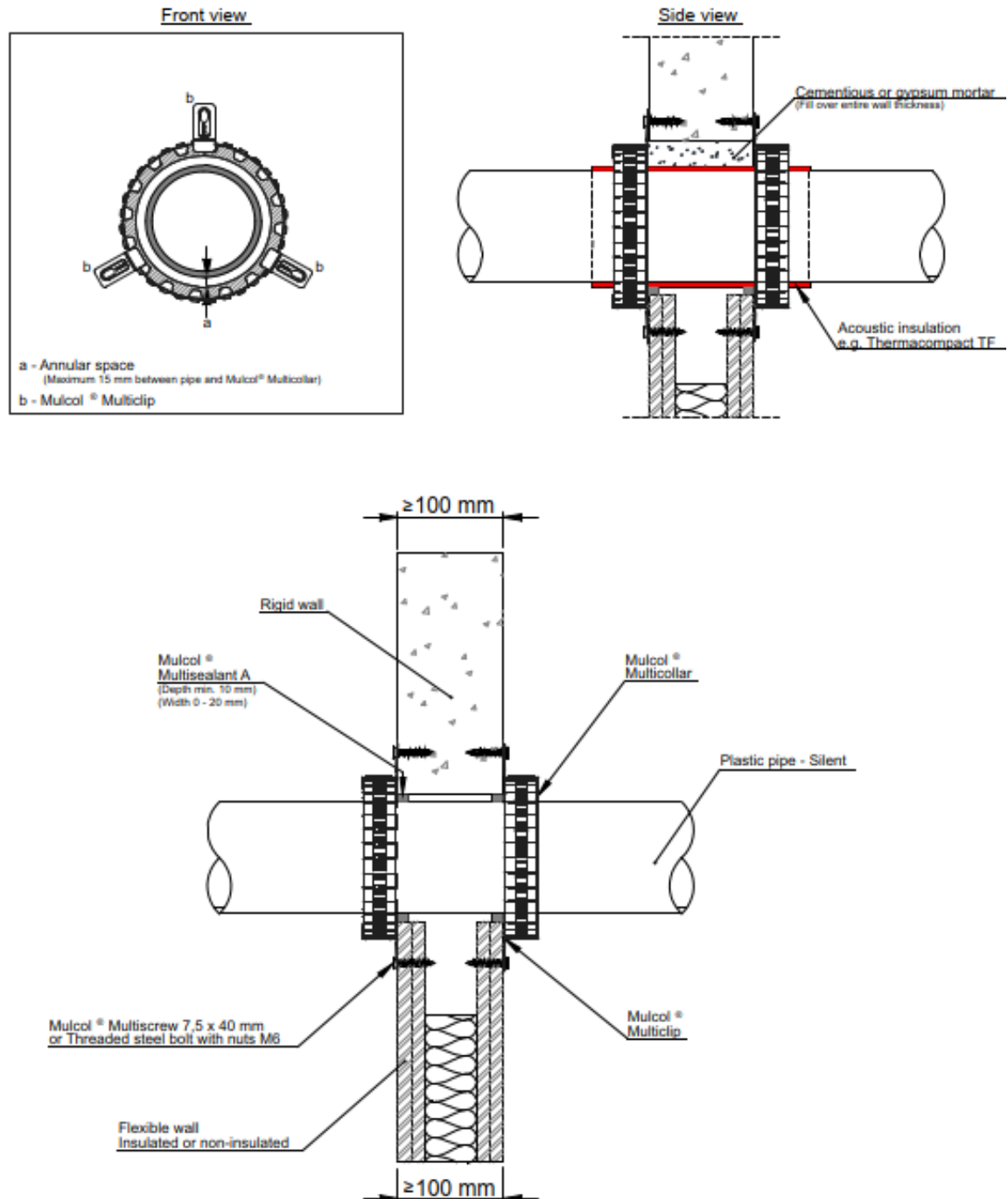


Figure 15 Plastic pipes (silent), perpendicular to the wall protected with one collar

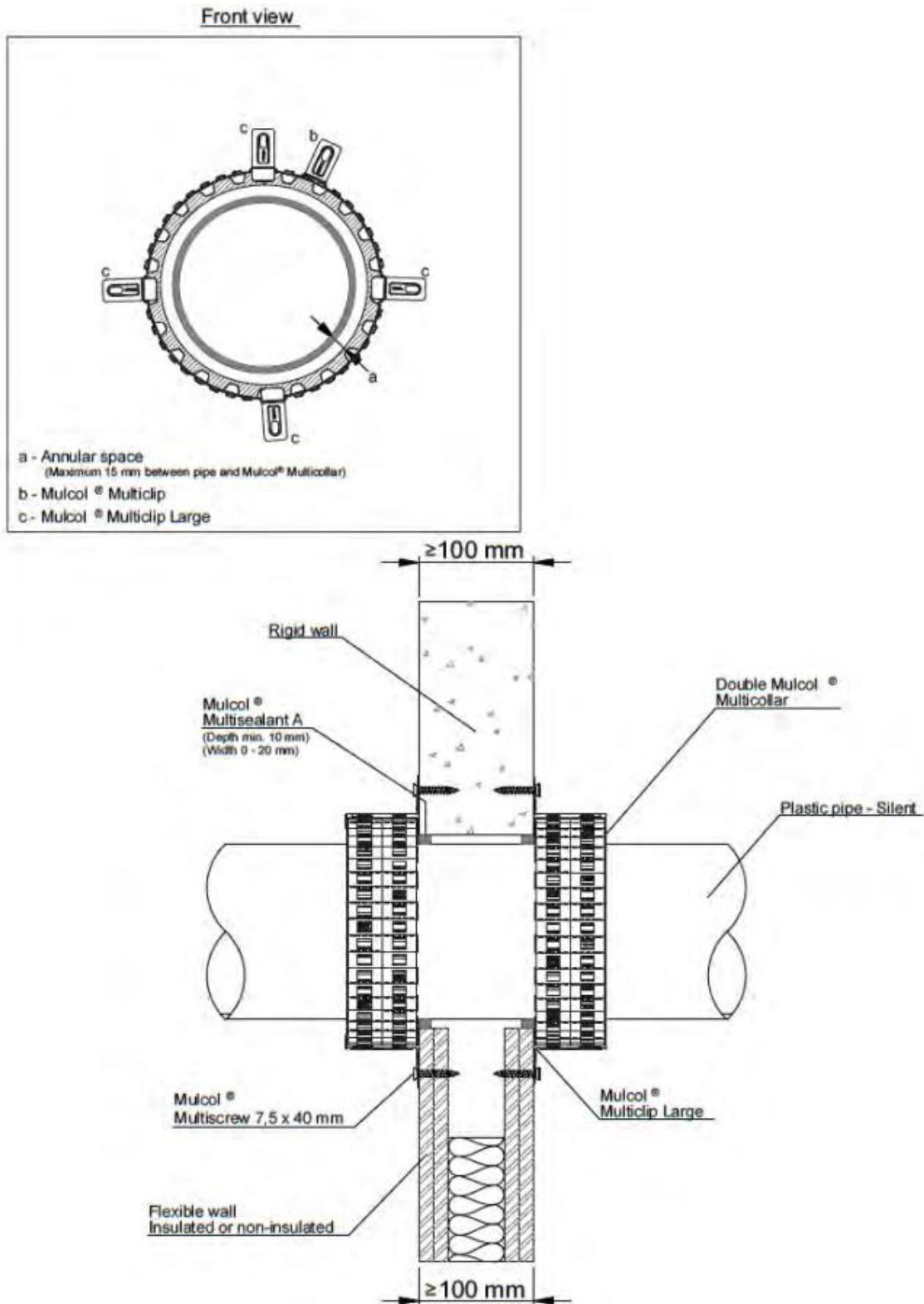


Figure 16 Plastic pipes (silent), perpendicular to the wall protected with two collars



Plastic pipes (silent) with moulded socket, perpendicular to the wall

Table 23 Plastic pipes (silent) with moulded socket, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Type of coupling	Number of collars	FRL
Raupiano Plus	Ø110	2.7	Raupiano Plus Ø110 mm Moulded socket	one	-/120/120 U/U

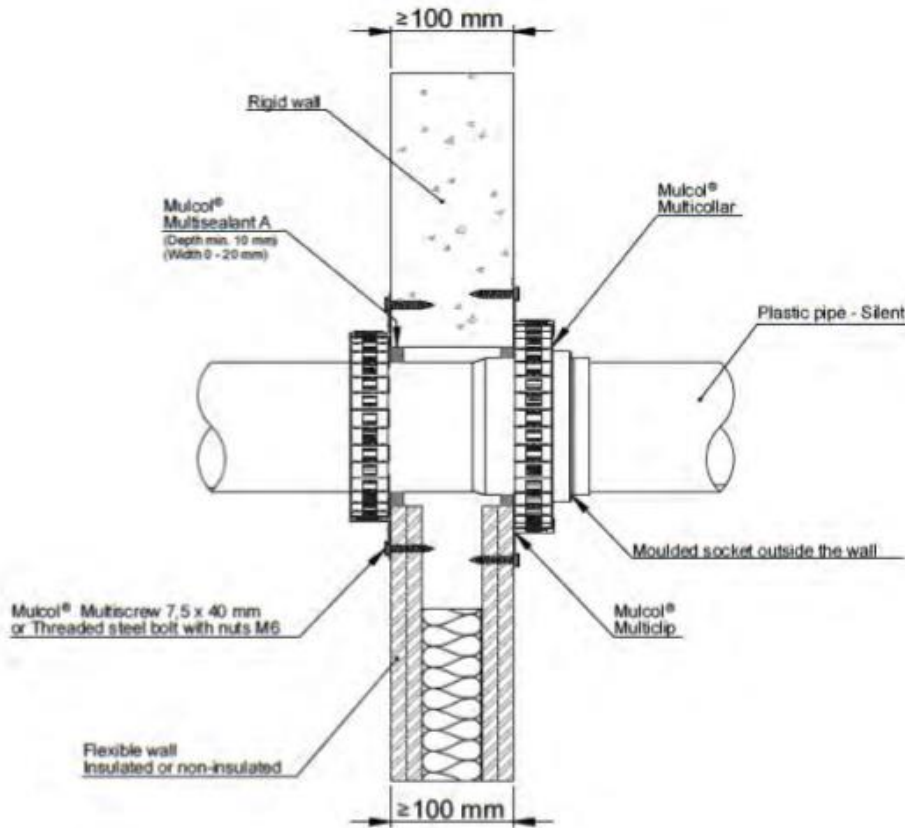
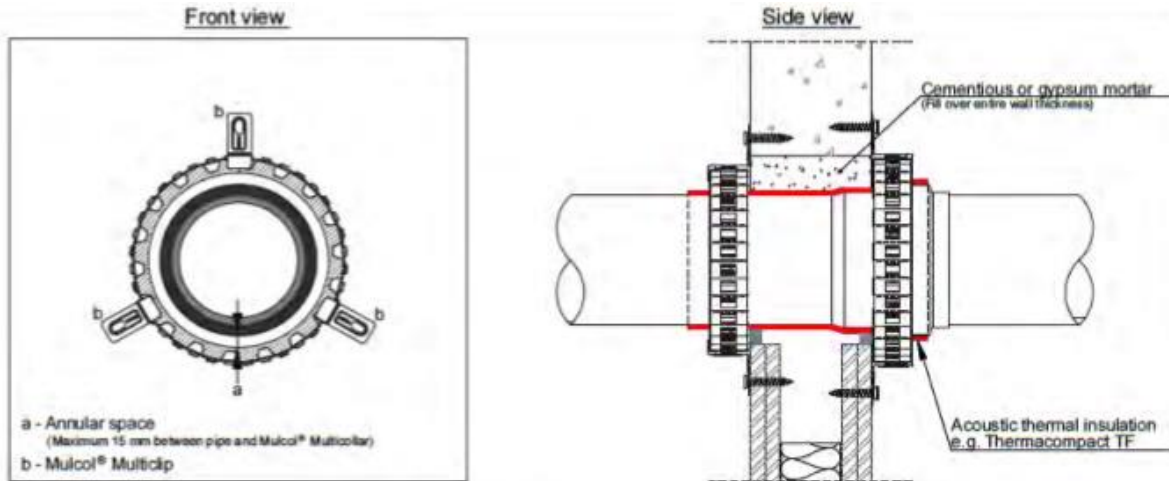


Figure 17 Plastic pipes (silent) with moulded socket, perpendicular to the wall

Table 24 Plastic pipes (silent) with an elbow, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Wavin SiTech+	Ø110	3.6	one	-/60/60 U/U
Geberit Silent dB 20	Ø110	6	one	-/120/90 U/U

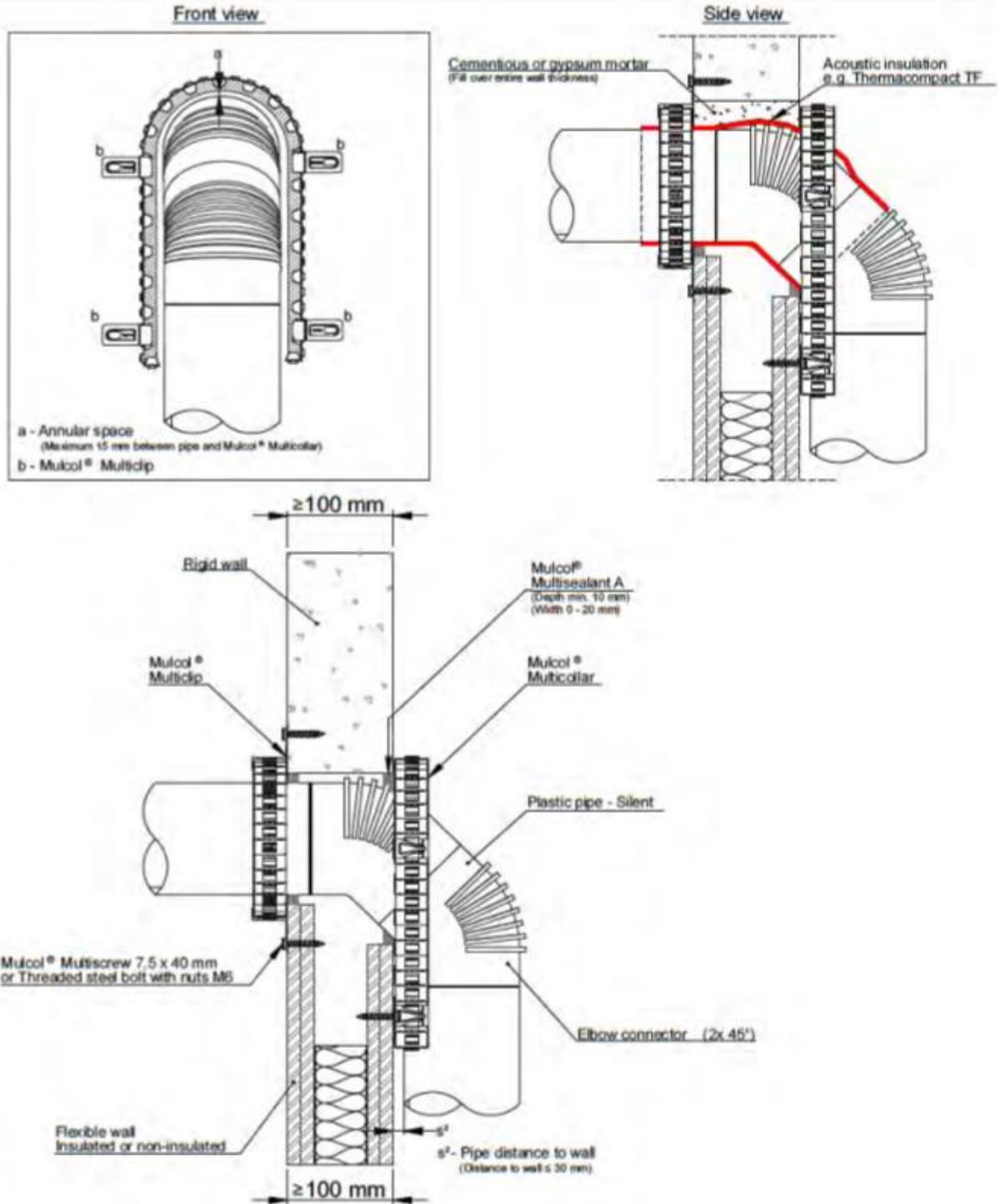


Figure 18 Plastic pipes (silent) with an elbow, perpendicular to the wall



Plastic pipes (silent), perpendicular to the wall, in wall corner

Table 25 Plastic pipes (silent), perpendicular to the wall, in wall corner

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Location	Number of collars	FRL
Geberlt Silent dB 20	Ø110	6	Top corner	one	-/60/60 U/U
Geberlt Silent dB 20	Ø110	6	Bottom corner	one	-/120/120 U/U

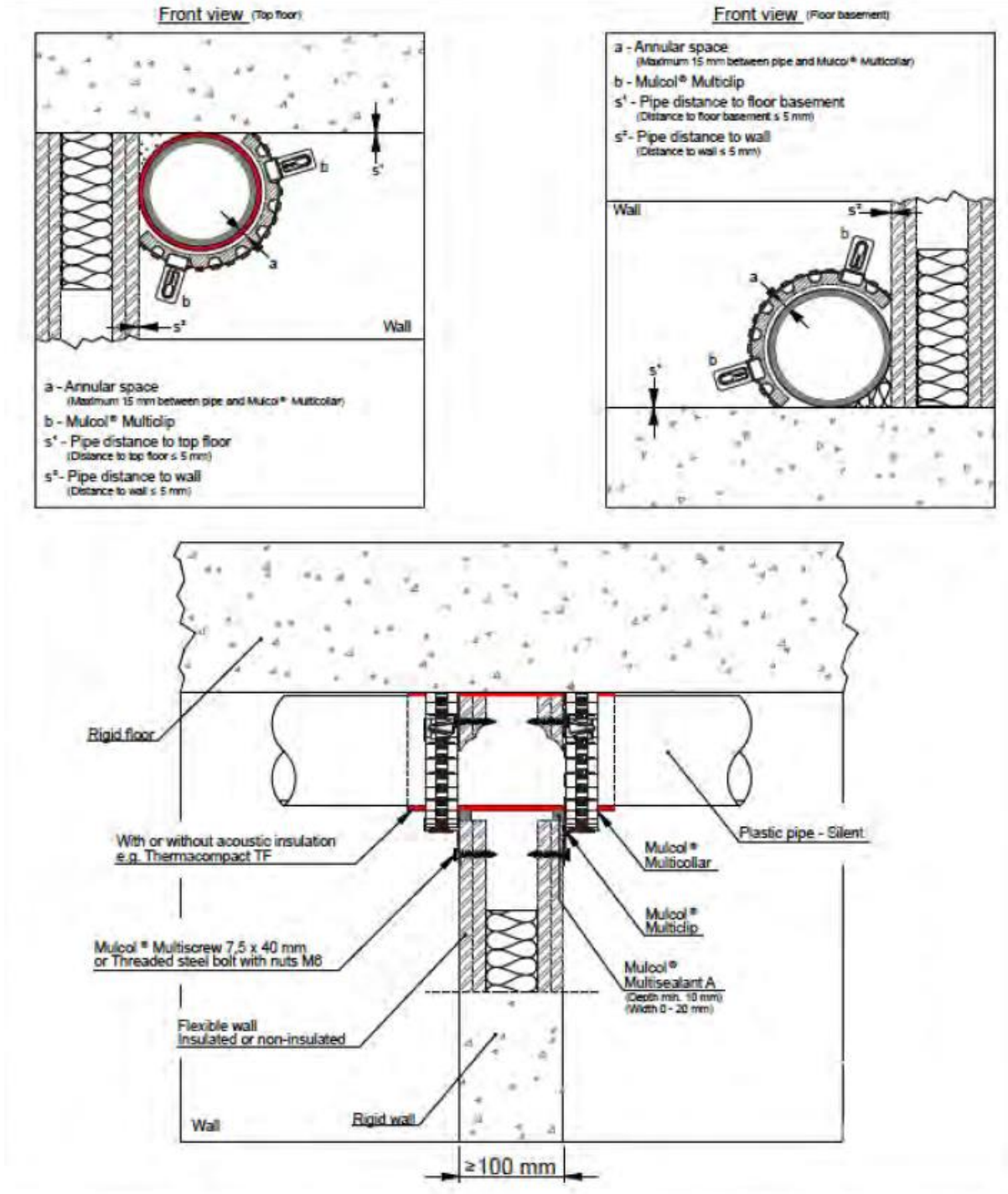


Figure 19 Plastic pipes (silent), perpendicular to the wall, in wall corner

### 6.3.3 PP-R multilayer pipes

Table 26 PP-R multilayer pipes, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Blue-MF	Ø20	2.8	one	-/90/60 U/C
	Ø110	10	one	-/60/60 U/C
	Ø160	14.6	one	-/90/60 U/C
Aquatherm Red-MF	Ø110	15.1	one	-/90/45 U/C

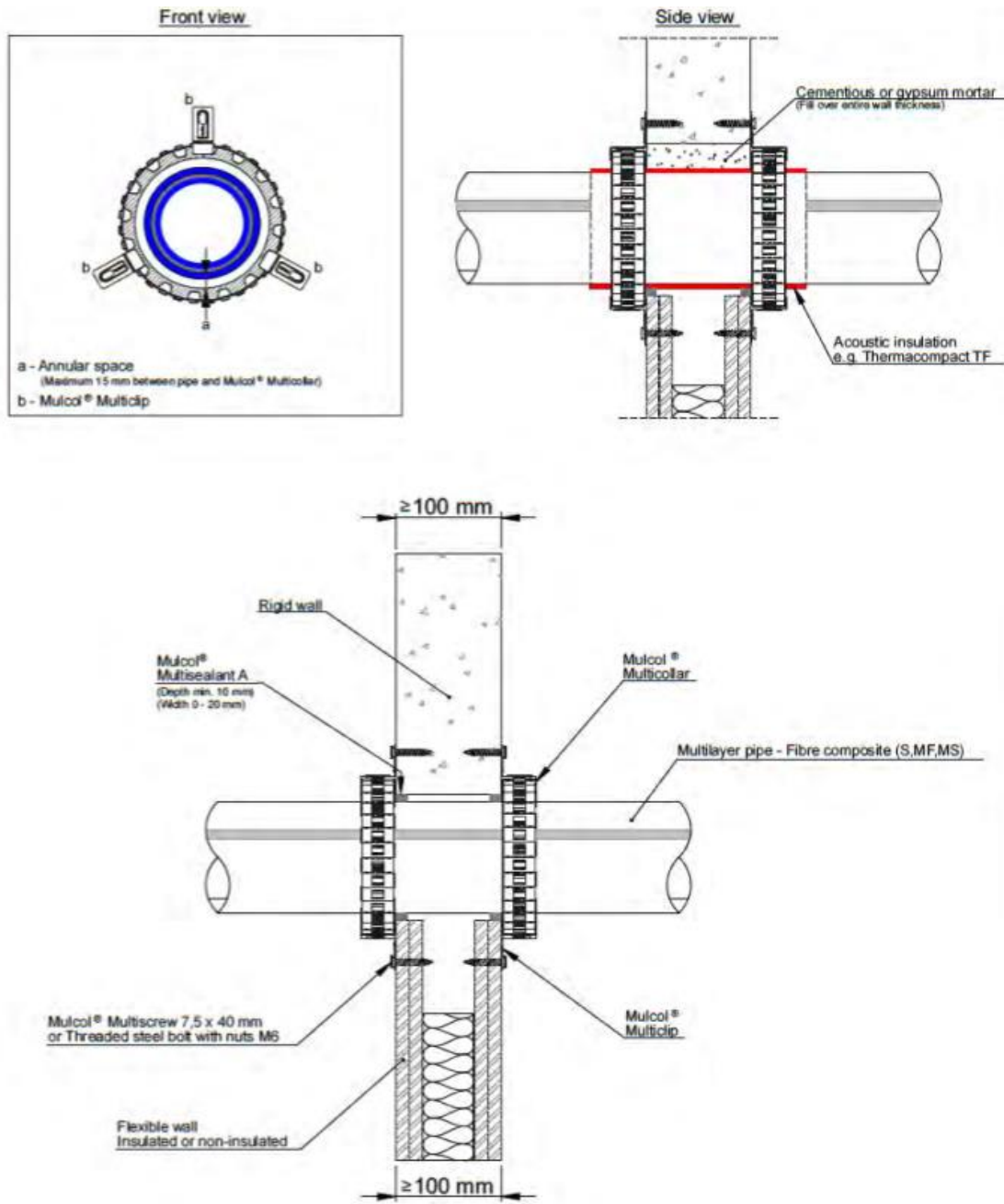


Figure 20 PP-R multilayer pipes, perpendicular to the wall

PP-R multilayer pipes, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals

Table 27 PP-R multilayer pipes, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals

Pipe material	Seal penetration system	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Green-MF	Mulcol	Ø50	6.9	one	-/120/120 U/C

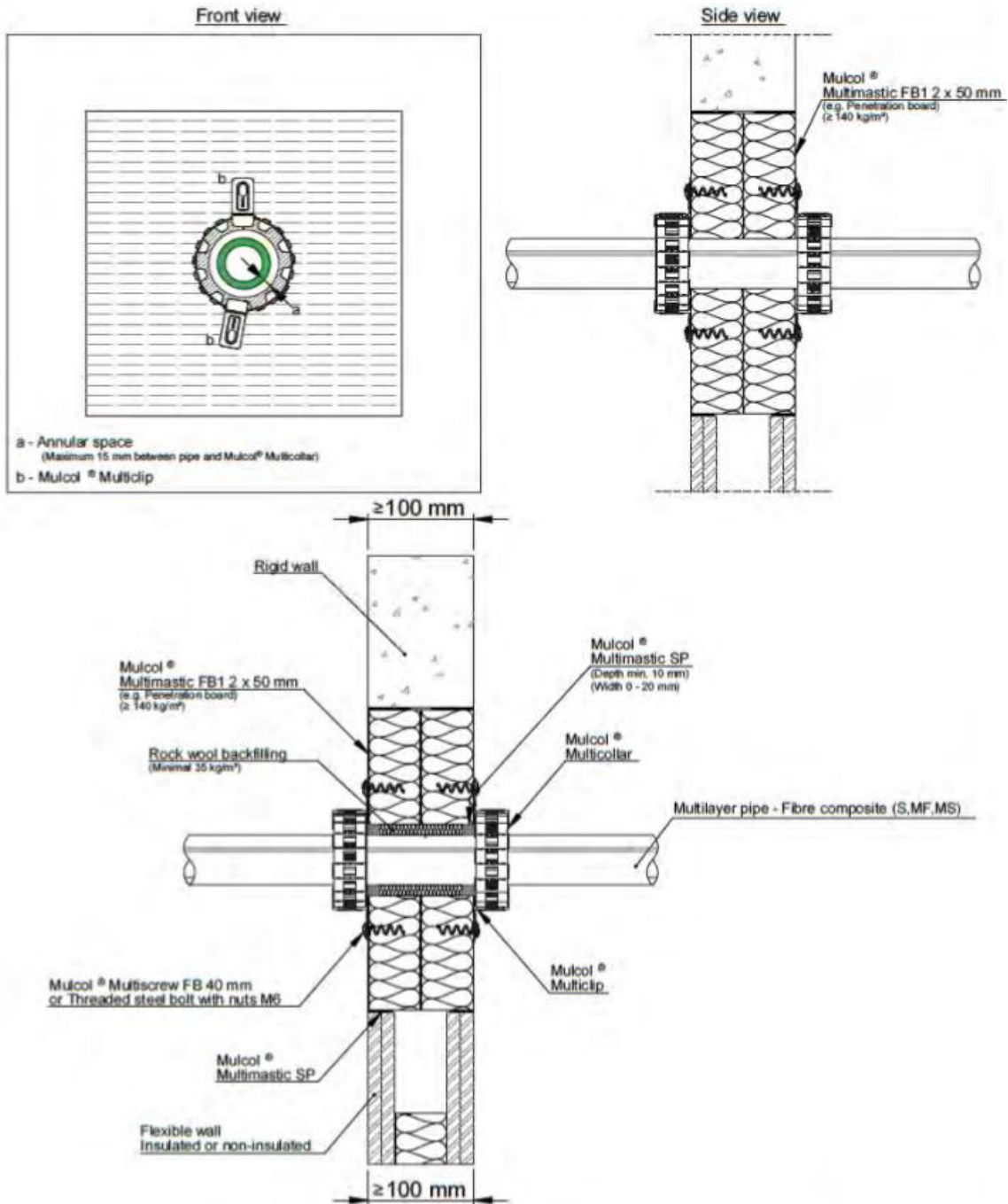
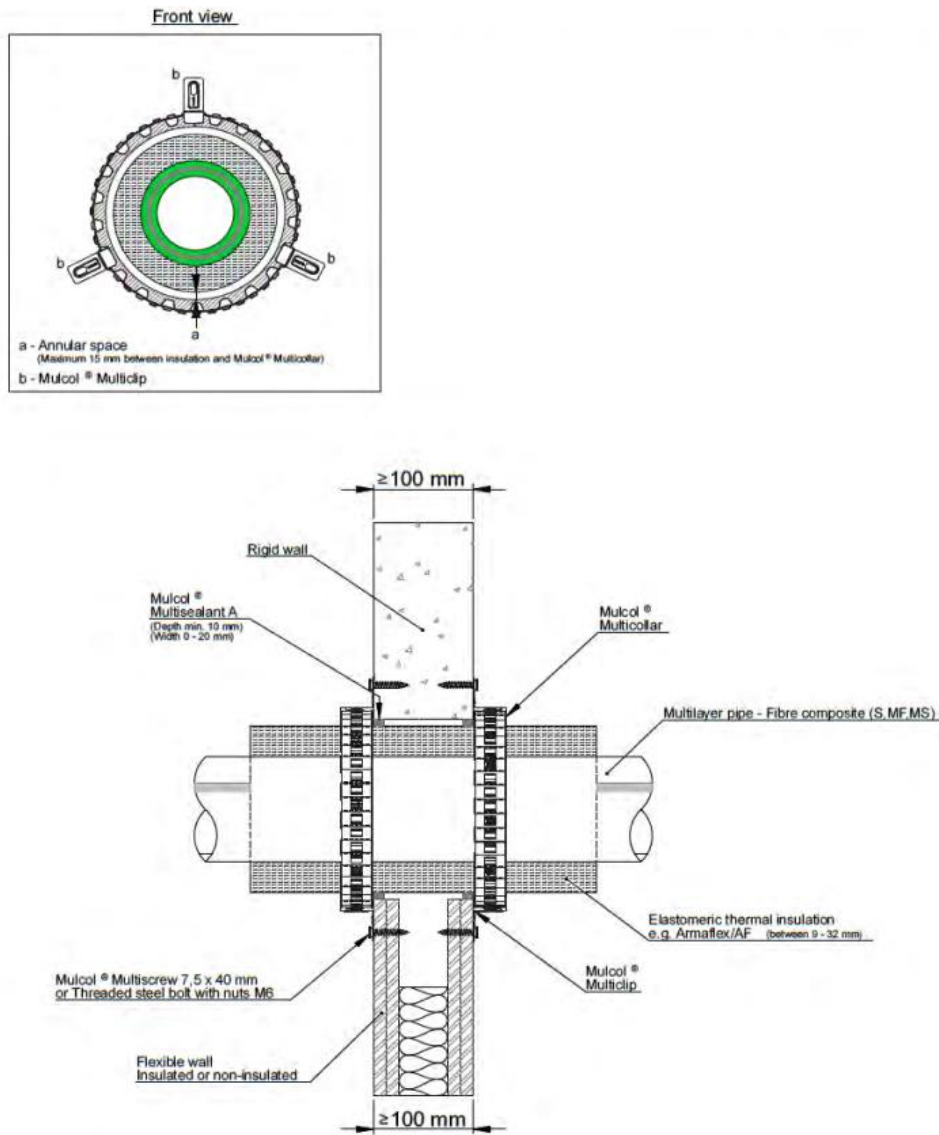


Figure 21 PP-R multilayer pipes, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals

**PP-R multilayer pipes insulated with AF/Armaflex (LS/CS/CI/LI) made out of flexible elastomeric EPDM rubber foam**

**Table 28 PP-R multilayer pipes insulated with AF/Armaflex (LS/CS/CI/LI) made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/length (mm)	Number of collars	FRL
Aquatherm Green-S	Ø110	18.3	32/300 minimum	one	-/60/60 U/C
Aquatherm Green-MS	Ø110	15.2	32/300 minimum	one	-/90/90 U/C
Aquatherm Green-MF	Ø110	15.1	32/300 minimum	one	-/90/90 U/C
Aquatherm Blue-MF	Ø20	2.8	32/300 minimum	one	-/120/120 U/C
	Ø110	10	9/300 minimum	one	-/90/60 U/C
	Ø110	10	9- 32/300 minimum	one	-/60/60 U/C

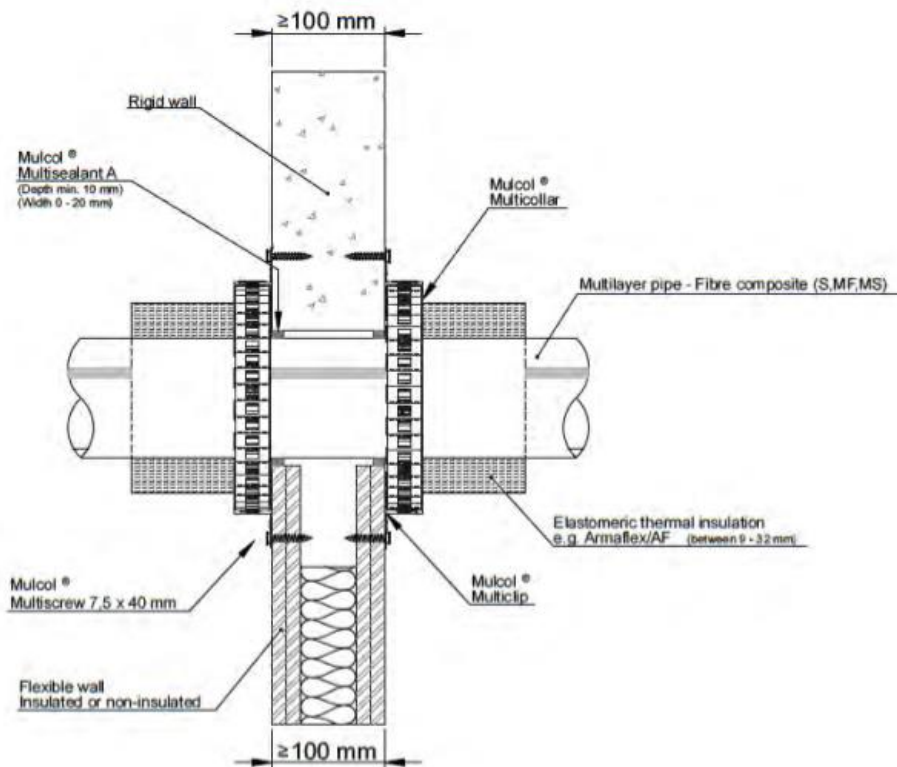
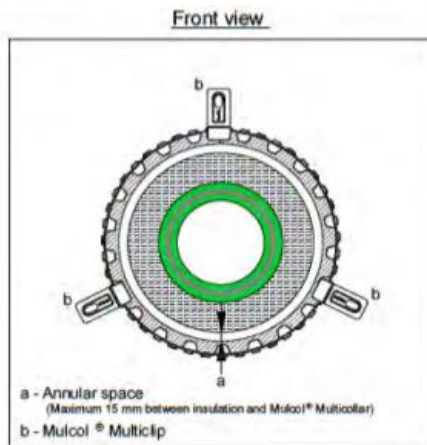


**Figure 22 PP-R multilayer pipes insulated with AF/Armaflex (LS/CS/CI/LI) made out of flexible elastomeric EPDM rubber foam**

**PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

**Table 29 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LI/CI thickness/ length (mm)	Number of collars	FRL
Aquatherm Blue-MF	Ø110	10	32/300 minimum	one	-/120/120 U/C
Aquatherm Blue-MF	Ø160	14.6	32/300 minimum	one	-/120/120 U/C



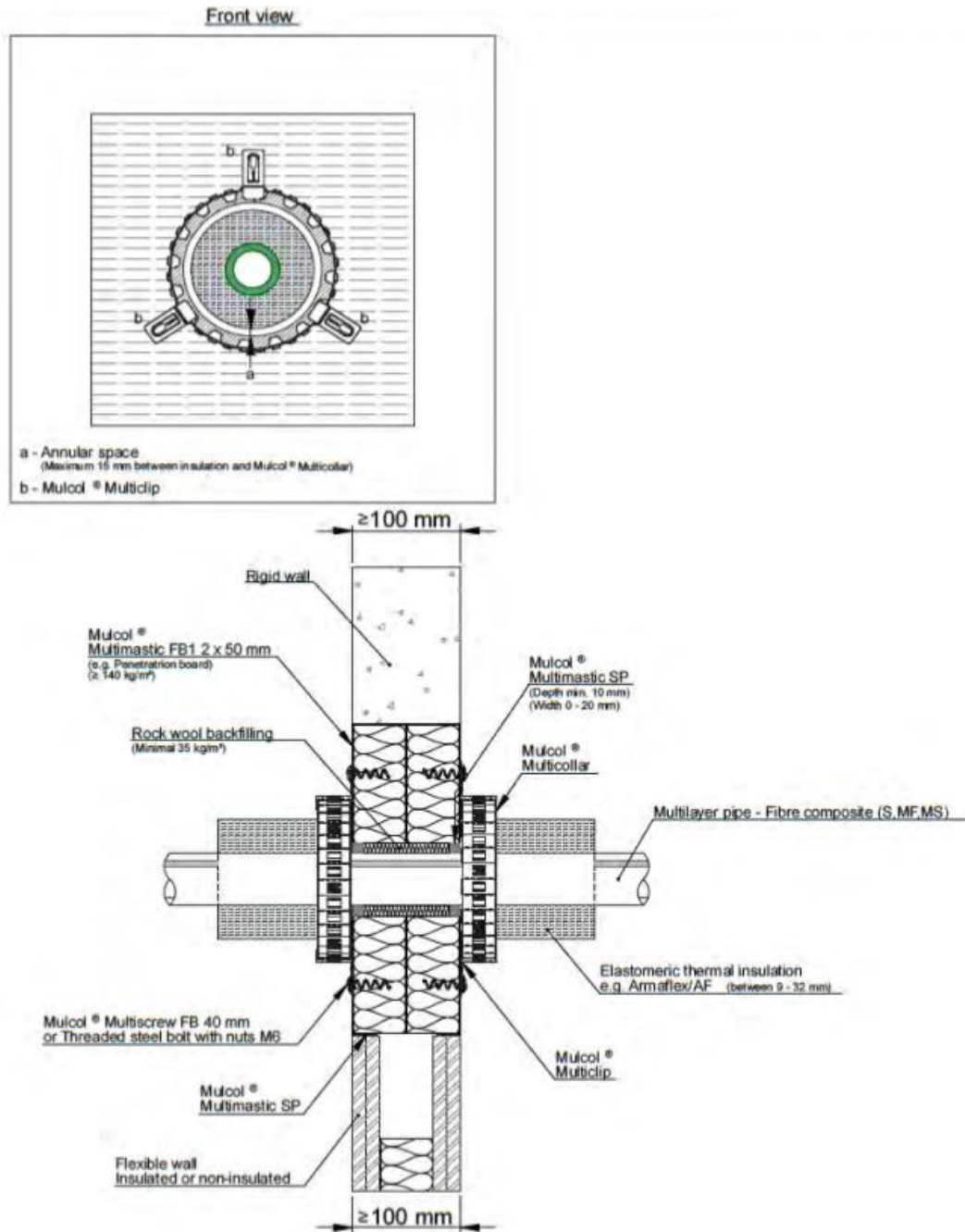
**Figure 23 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**



**PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in Mulcol Multimastic FB1 coated board seals**

**Table 30 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in Mulcol Multimastic FB1 coated board seals**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LI/CI thickness/length (mm)	Number of collars	FRL
Aquatherm Green-S	Ø50	6.9	32/300 minimum	one	-/120/120 U/C

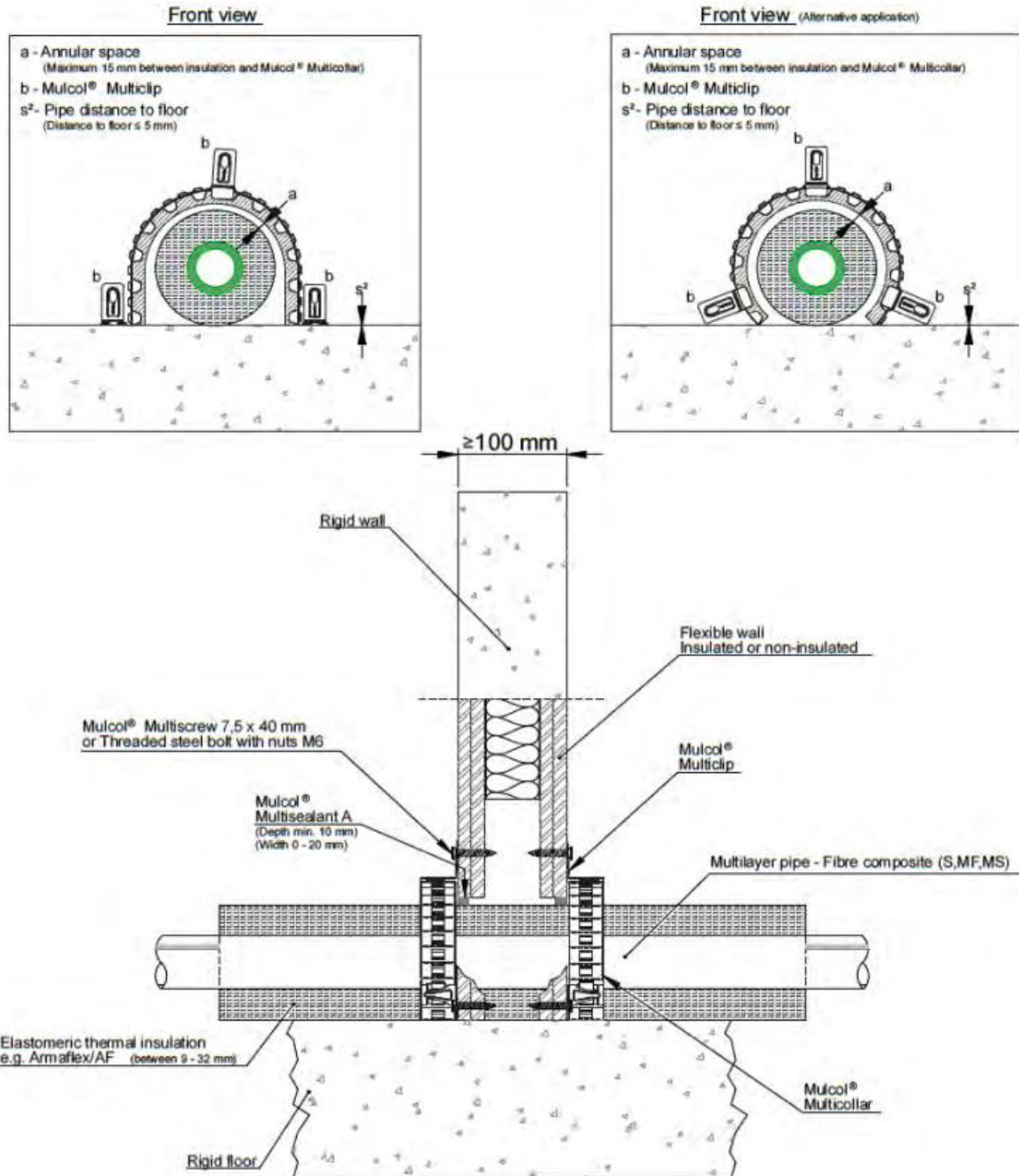


**Figure 24 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in Mulcol Multimastic FB1 coated board seals**

**PP-R multilayer pipes supported by steel supporting half shell, perpendicular to the wall**

**Table 31** PP-R multilayer pipes supported by steel supporting half shell, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Green-MS	Ø50	6.9	one	-/90/90 U/C



**Figure 25** PP-R multilayer pipes supported by steel supporting half shell, perpendicular to the wall



PP-R multilayer pipes with an elbow, perpendicular to the wall

Table 32 PP-R multilayer pipes with an elbow, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Blue-MF and elbow PP-R	Ø110	10	one	-/120/90 U/C

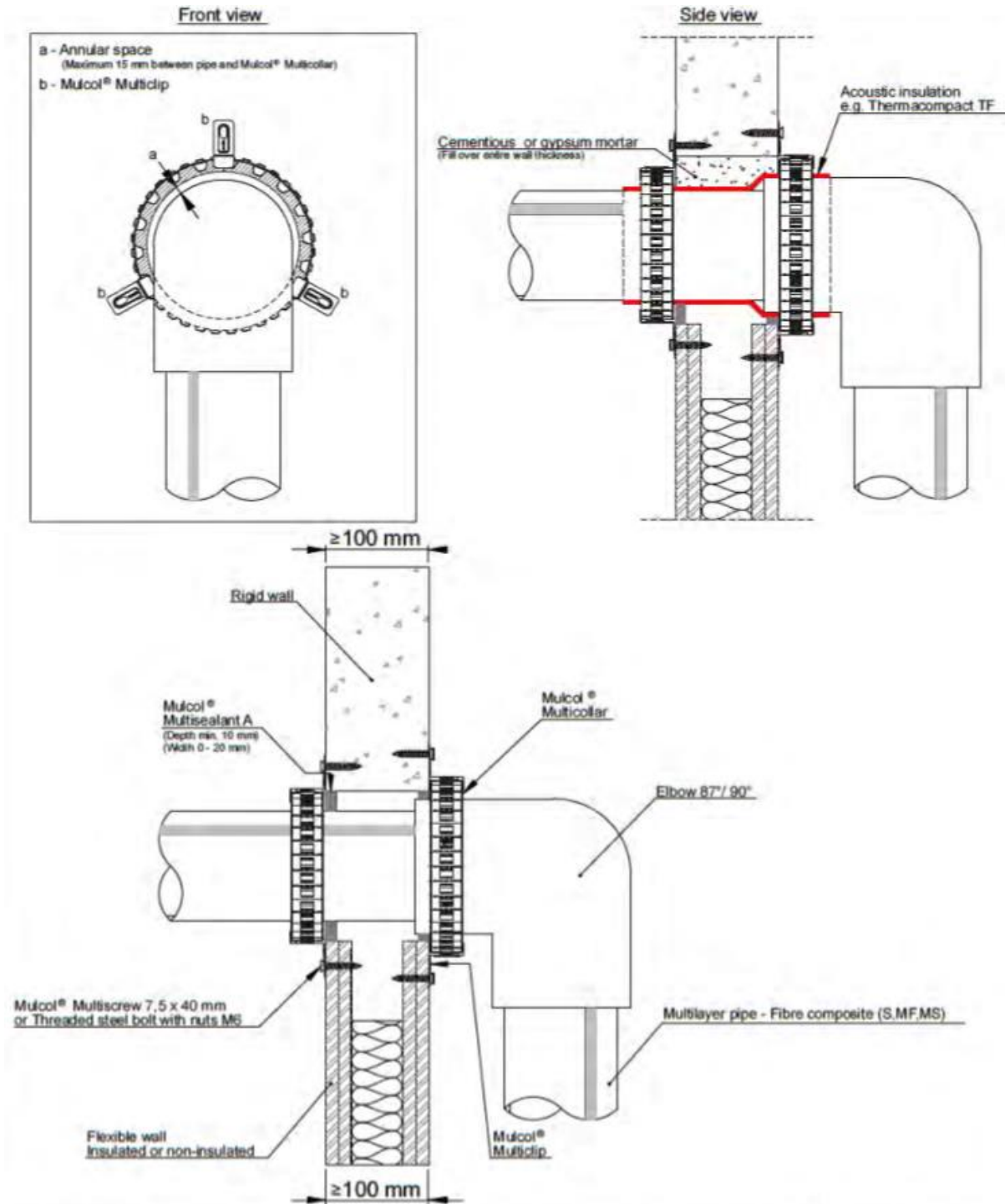
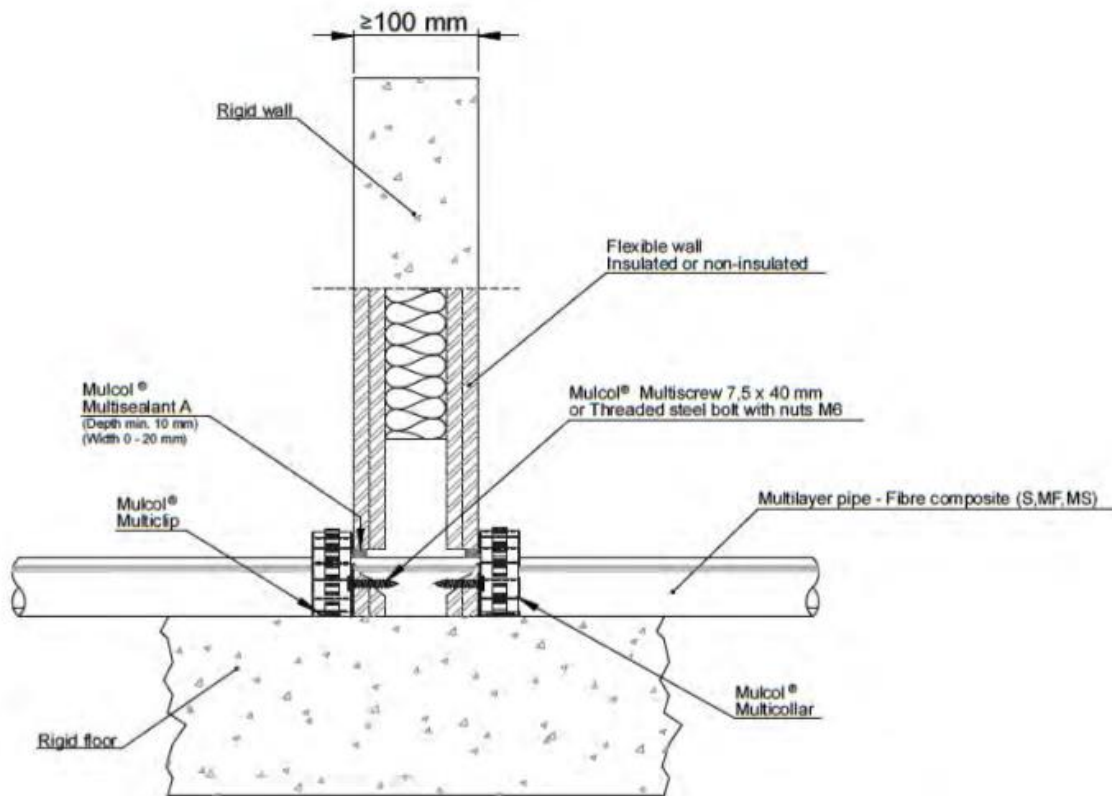
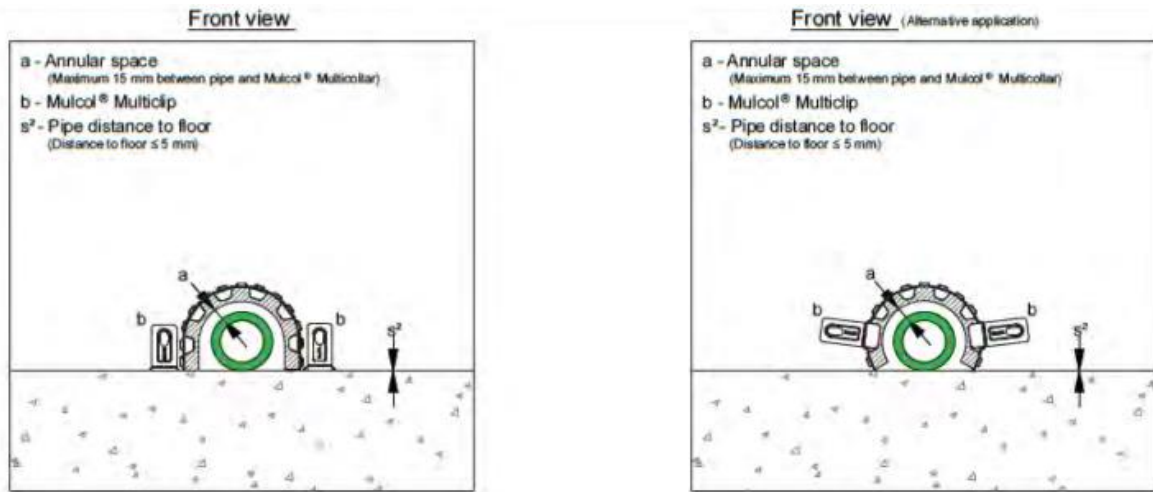


Figure 26 PP-R multilayer pipes with an elbow, perpendicular to the wall

**PP-R multilayer pipes, perpendicular to the wall, with zero distance to the floor**

**Table 33** PP-R multilayer pipes, perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Green-MF	Ø50	6.9	one	-/90/90 U/C

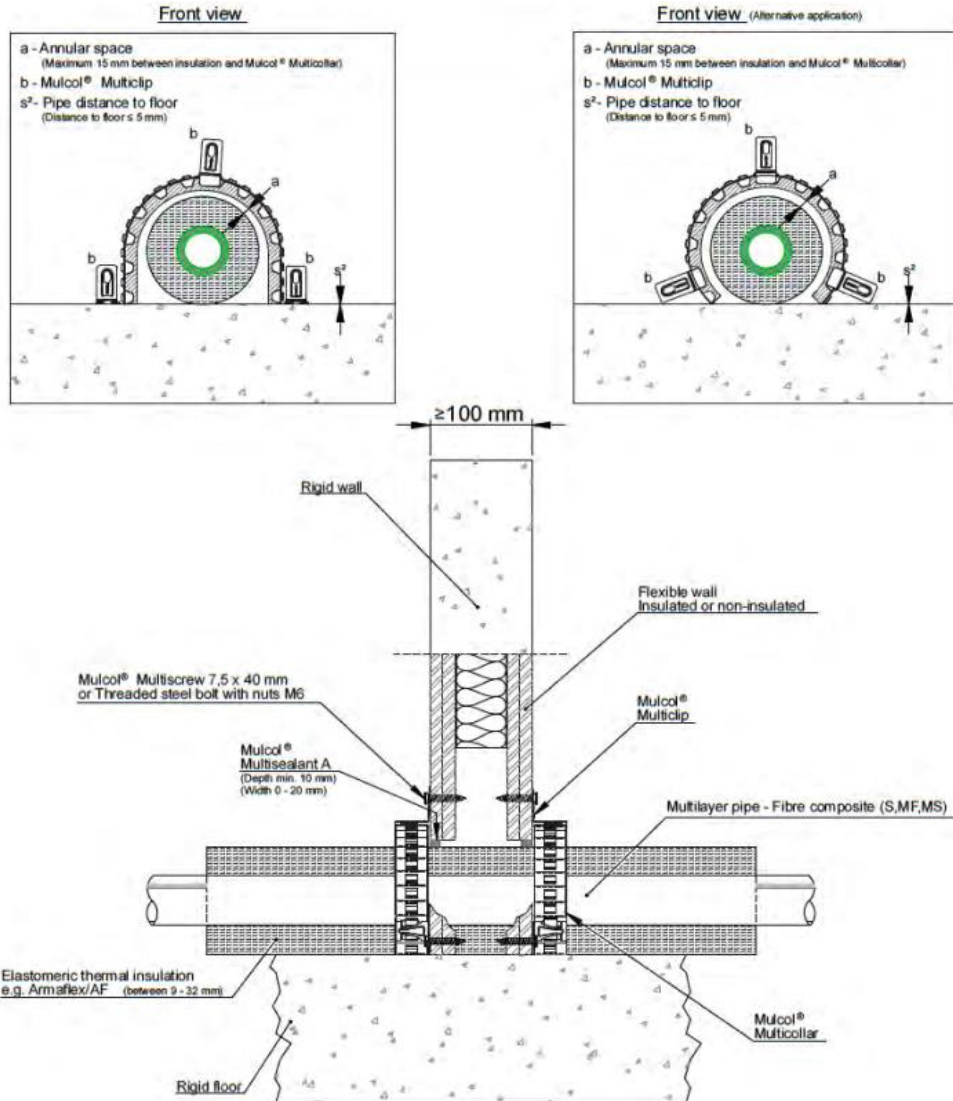


**Figure 27** PP-R multilayer pipes, perpendicular to the wall, with zero distance to the floor

**PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor**

**Table 34** PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/length (mm)	Number of collars	FRL
Aquatherm Green-MF	Ø50	6.9	9-32/300 minimum	one	-/90/90 U/C



**Figure 28** PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

### 6.3.4 Aluminium composite pipes

Table 35 Aluminium composite pipes fitted perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars on each side	FRL
PE-Xc/AL/PE-Xc	Ø16	2	one	-/120/120 U/C
PE-Xc/AL/PE-Xc	Ø32	3	one	-/120/120 U/C
PE-RT/AL/PE-RT	Ø40	4	one	-/120/120 U/C
PE-Xc/AL/PE-Xc	Ø50	4	one	-/120/90 U/C
Duo PE-Xb/AL/PE-Xb	Ø63	4.5	one	-/90/60 U/C
PE-Xc/AL/PE-Xc	Ø75	6	one	-/90/30 U/C
PE-Xc/AL/PE-Xc	Ø75	6	two	-/120/90 U/C

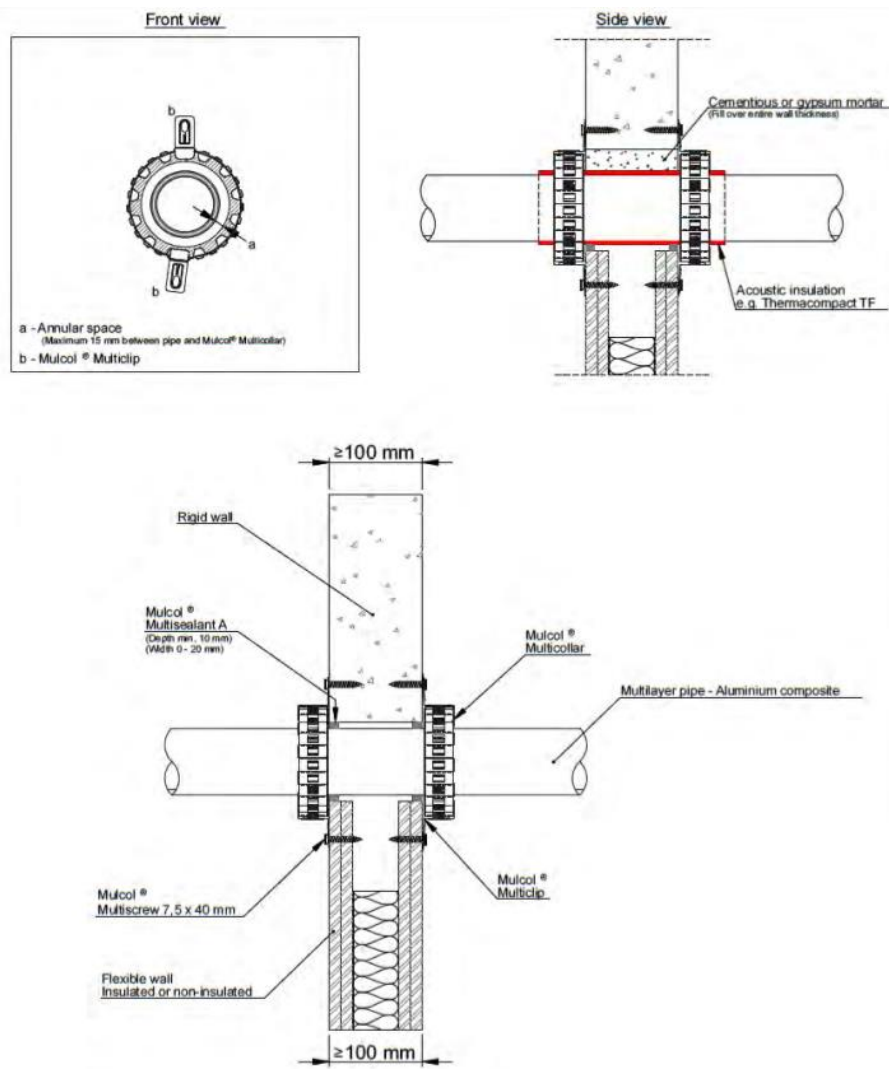


Figure 29 Aluminium composite pipes fitted perpendicular to the wall protected with one collar on both sides

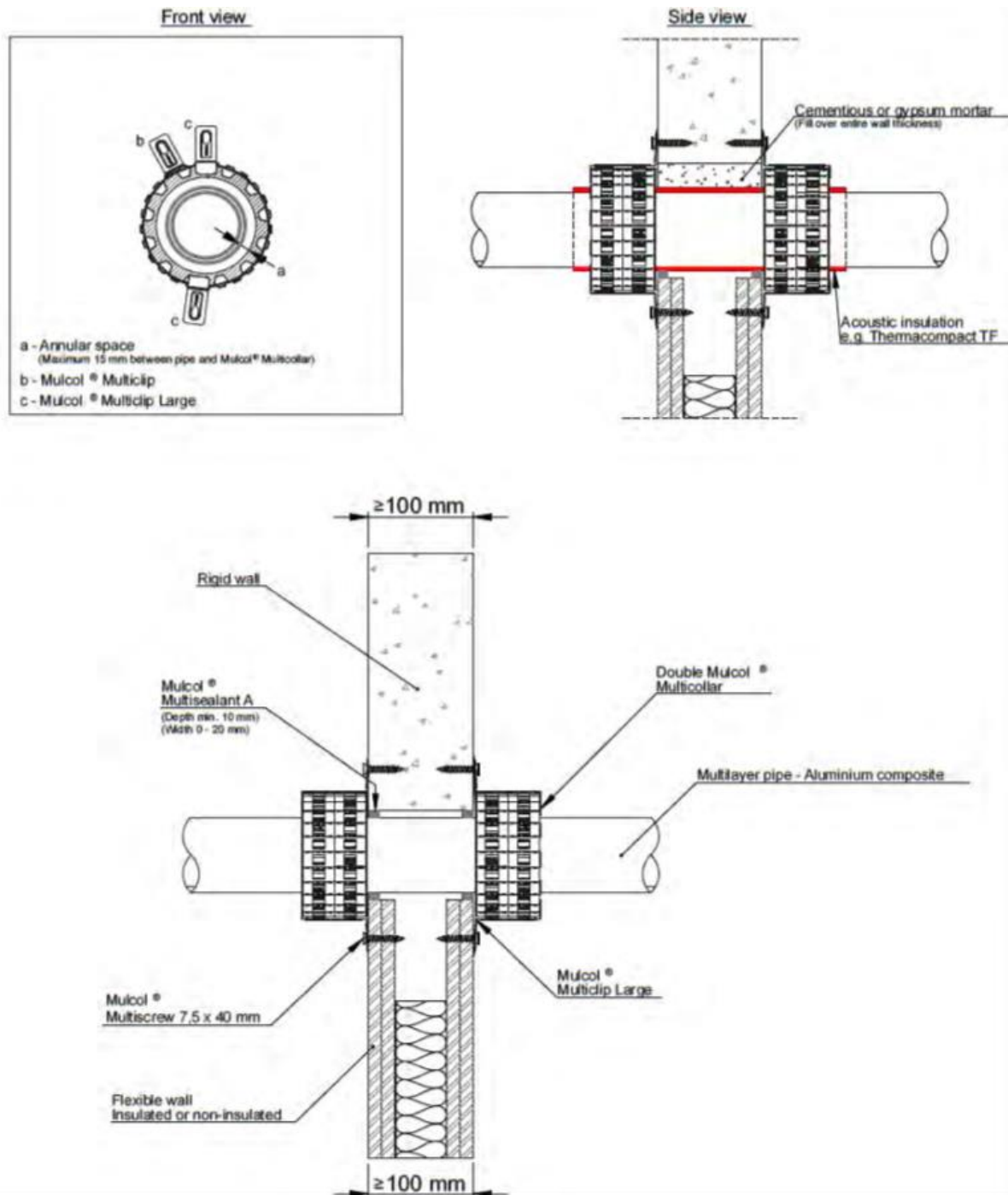


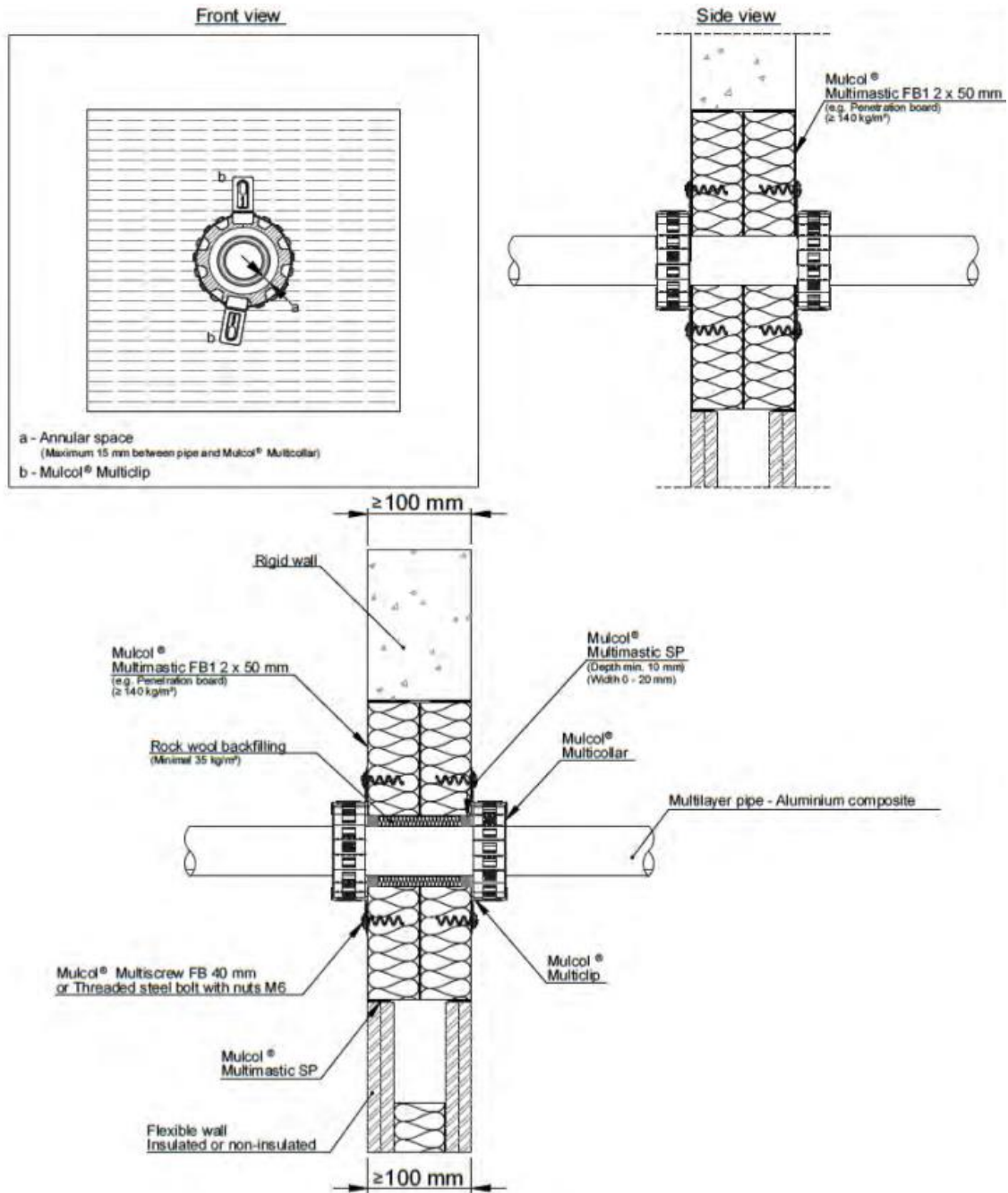
Figure 30 Aluminium composite pipes fitted perpendicular to the wall protected with two collars on both sides



**Aluminium composite pipes fitted, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals**

**Table 36 Aluminium composite pipes fitted, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø50	4	one	-/120/60 U/C
	Ø75	6	two	-/120/90 U/C



**Figure 31 Aluminium composite pipes fitted, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals protected with one collar on both sides**

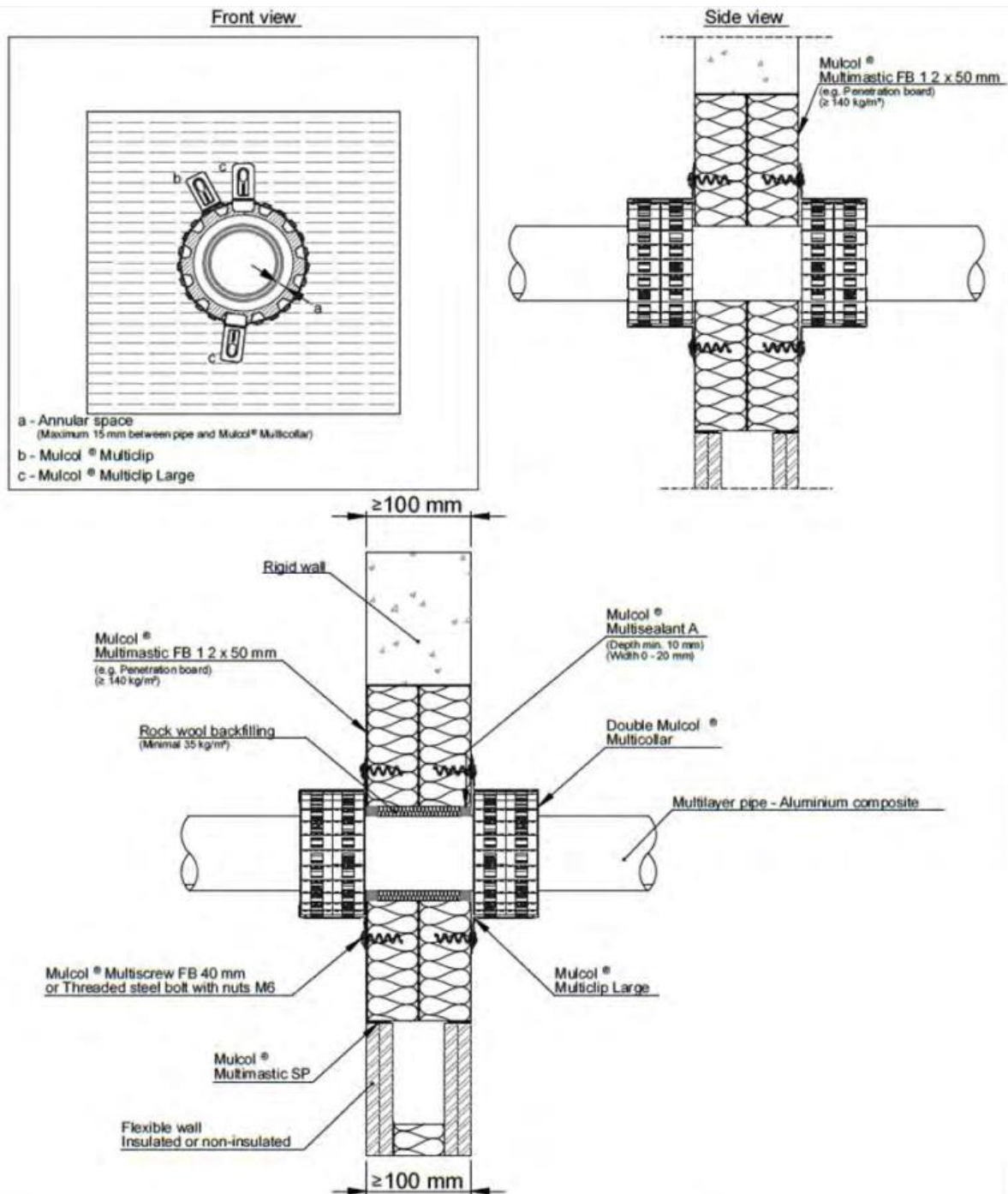


Figure 32 Aluminium composite pipes fitted, perpendicular to the wall, in Mulcol Multimastic FB1 coated board seals protected with two collars on both sides



Aluminium composite pipes with PE-conduit insulation, perpendicular to the wall

Table 37 Aluminium composite pipes with PE-conduit insulation, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Conduit diameter/length LS/CS/LI/CI (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	40/50 minimum	one	-/90/60U/C

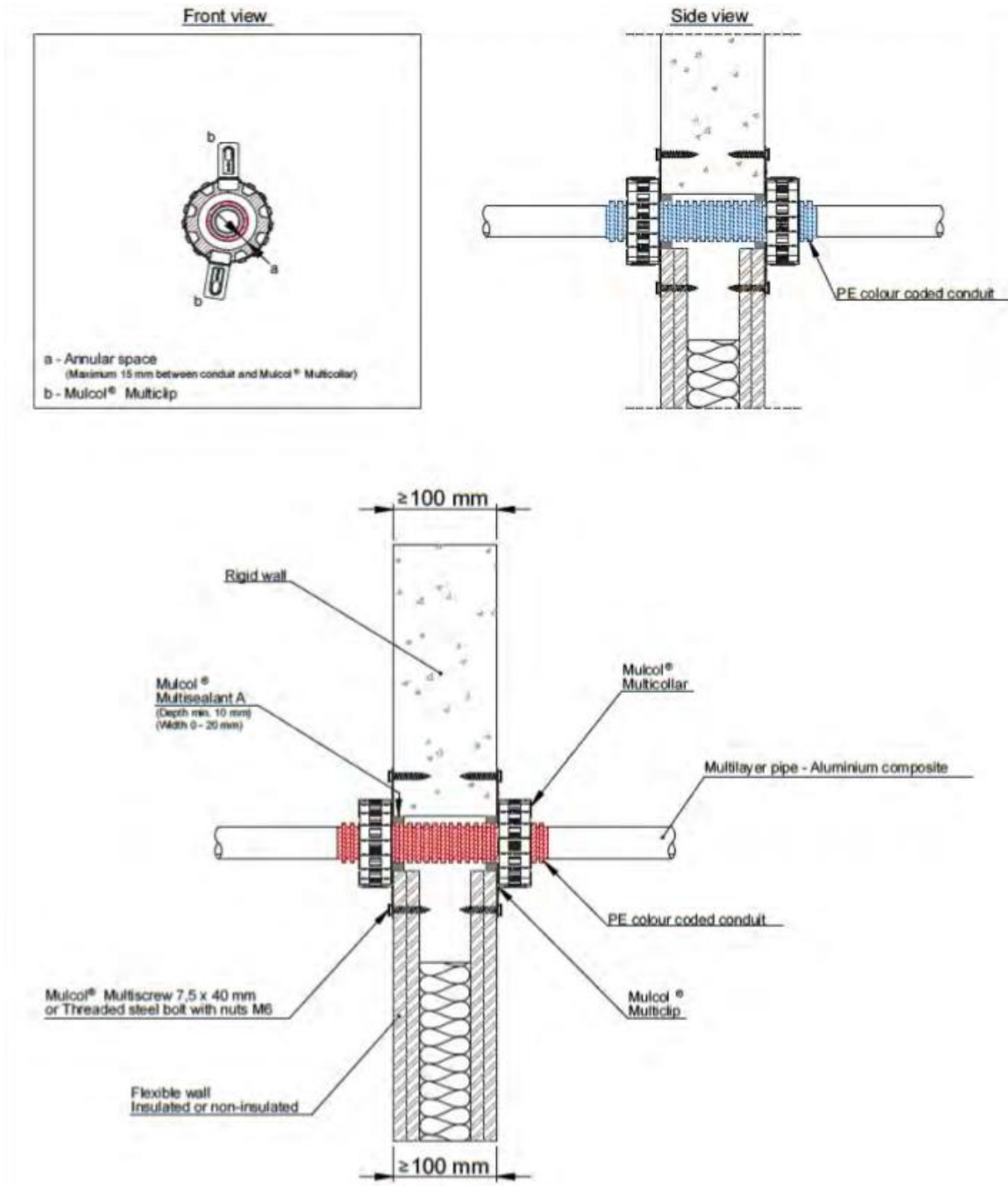


Figure 33 Aluminium composite pipes with PE-conduit insulation, perpendicular to the wall

Aluminium composite pipes insulated with PE-foam

Table 38 Aluminium composite pipes insulated with PE-foam

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness/length LS/CS/LI/CI (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø16	2	6/300 minimum	one	-/120/120 U/C
	Ø26	3	6/300 minimum	one	-/120/120 U/C
	Ø32	3	6/300 minimum	one	-/120/120 U/C

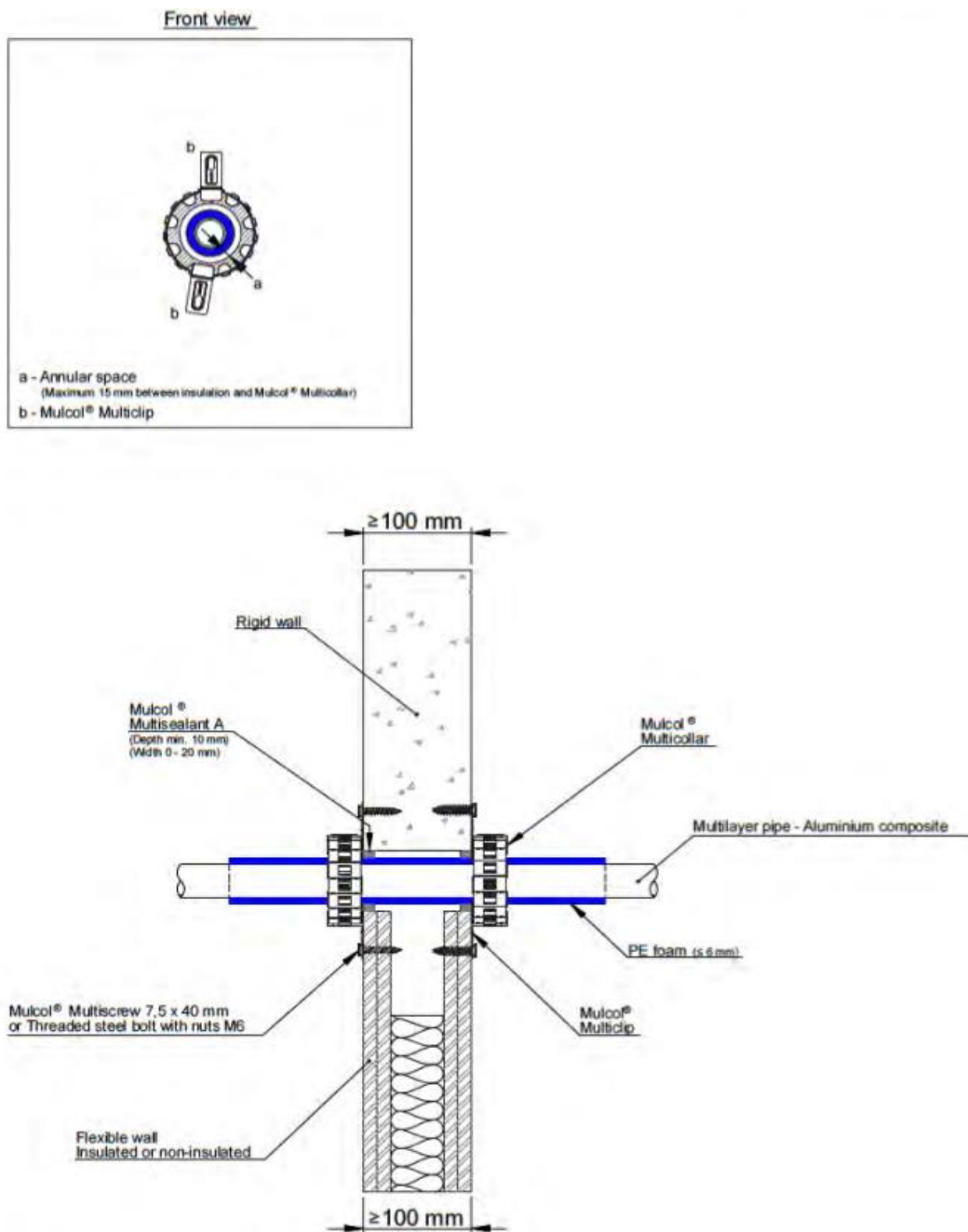


Figure 34 Aluminium composite pipes insulated with PE-foam

**Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric thermal insulation**

**Table 39 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric thermal insulation**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/length (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø16	2	9-32/ 300 minimum	one	-/120/120 U/C
	Ø26	3		one	-/120/120 U/C
	Ø32	3		one	-/120/120 U/C
	Ø50	4		one	-/120/120 U/C
	Ø75	6		one	-/120/120 U/C
	Ø90	7	9/300 minimum	one	-/120/120 U/C
	Ø90	7	9-32/ 300 minimum	one	-/90/90 U/C
PE-RT/AL/PE-RT	Ø75	4.7	9-32/ 300 minimum	one	-/90/90 U/C
	Ø75	4.7	9/300 minimum	one	-/120/90 U/C
PE-X/AL/PE	Ø75	7.5	9/300 minimum	one	-/120/90 U/C
PE-X/AL/PE	Ø75	7.5	32/300 minimum	one	-/90/90 U/C
PE-Xb/AL/PE-Xb	Ø32	4.5	32/300 minimum	one	-/90/90 U/C
	Ø63	4.5	9-32/ 300 minimum	one	-/120/60 U/C
	Ø63	4.5	32/ 300 minimum	one	-/120/90 U/C
PE-RT/AL/PE-RT	Ø40	4	32/300 minimum	one	-/120/120 U/C
	Ø110	10	9-32/ 500 minimum	one	-/90/90 U/C
	Ø110	10	32/500 minimum	one	-/120/120 U/C

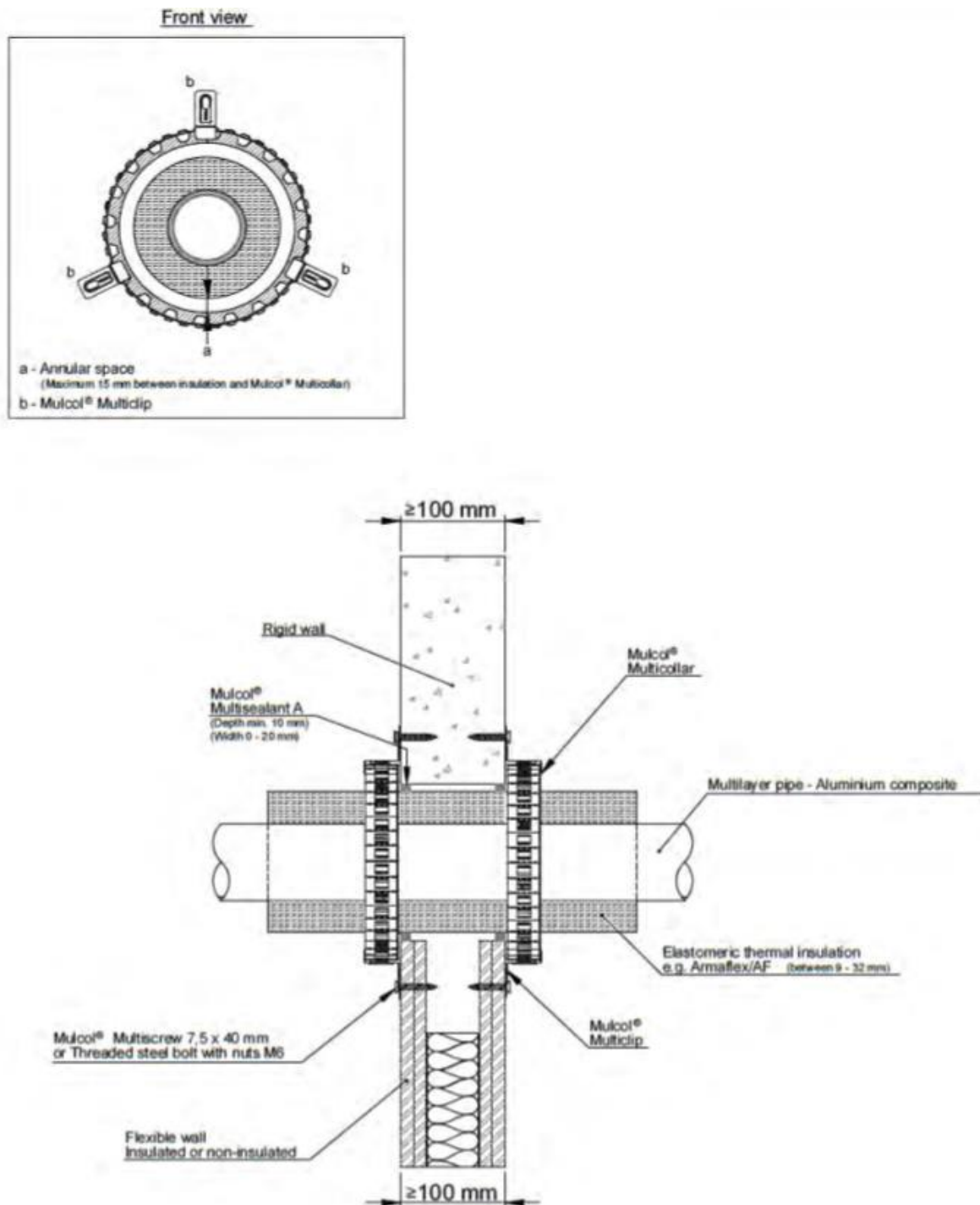
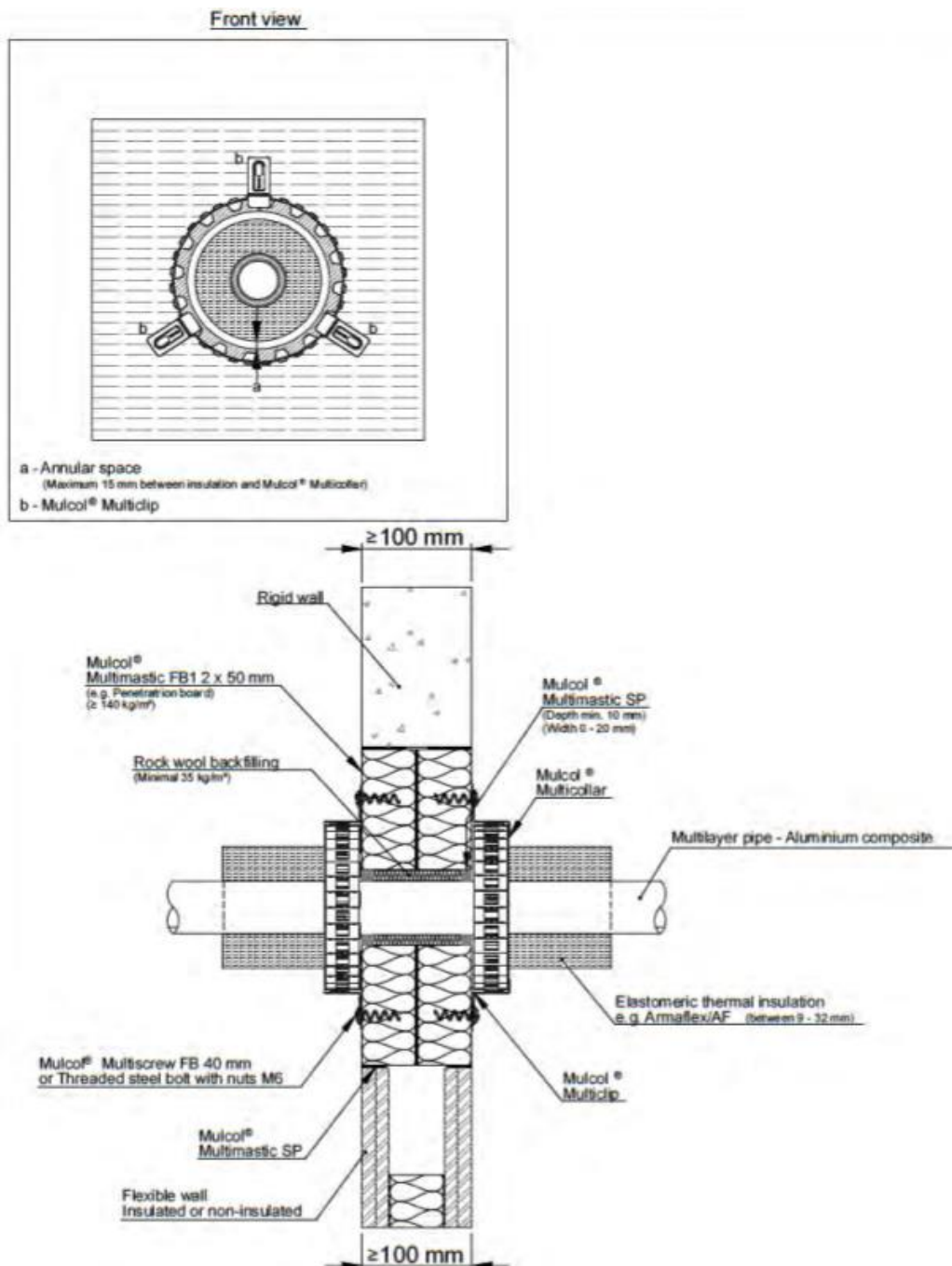


Figure 35 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric thermal insulation

**Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in in Mulcol Multimastic FB1 coated board seals**

**Table 40 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in in Mulcol Multimastic FB1 coated board seals**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LI/CI thickness/length (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø50	4	32/300 minimum	one	-/120/120 U/C

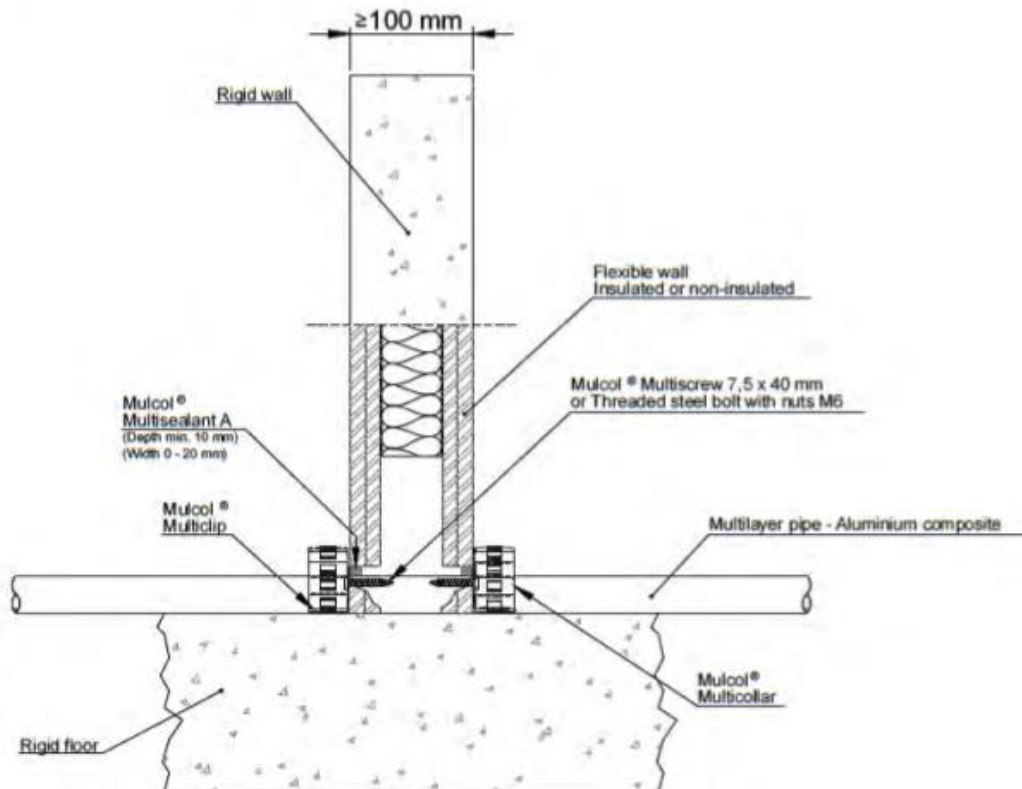
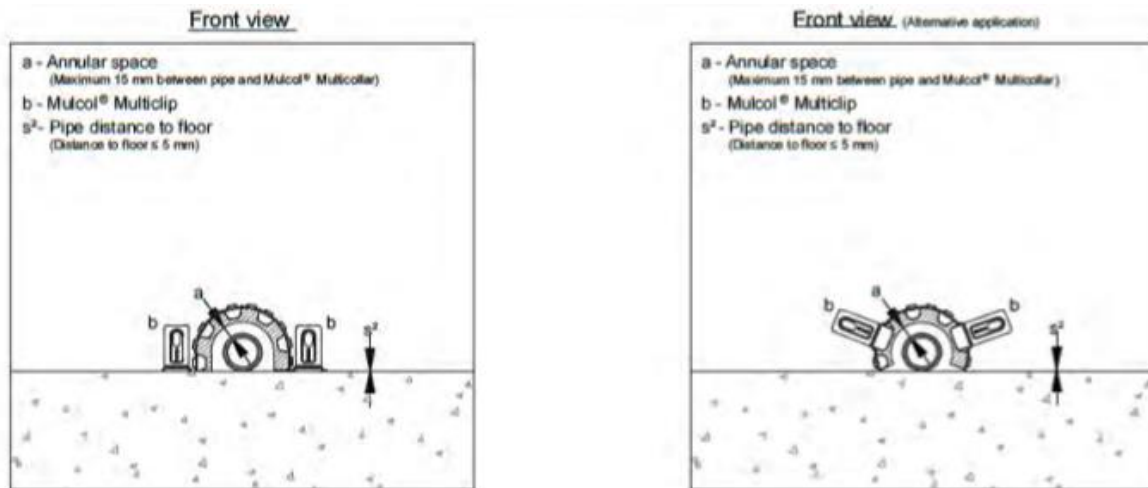


**Figure 36 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam in in Mulcol Multimastic FB1 coated board seals**

**Aluminium composite pipes, perpendicular to the wall, with zero distance to the floor**

**Table 41** Aluminium composite pipes, perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	one	-/90/30 U/C



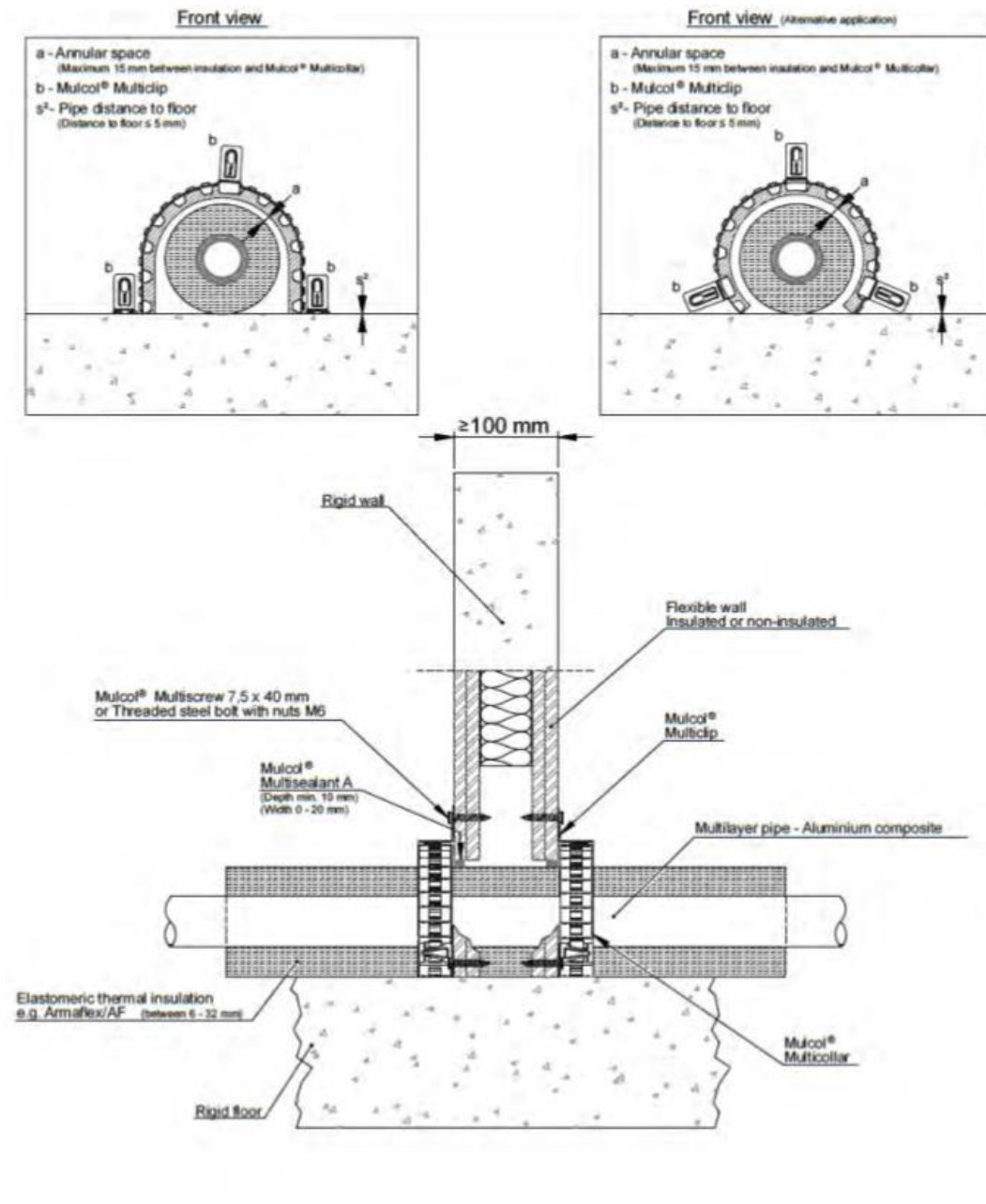
**Figure 37** Aluminium composite pipes, perpendicular to the wall, with zero distance to the floor



**Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor**

**Table 42** Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/length (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	9-32/300 minimum	one	-/90/90 U/C
	Ø50	4	32/300 minimum	one	-/90/90 U/C



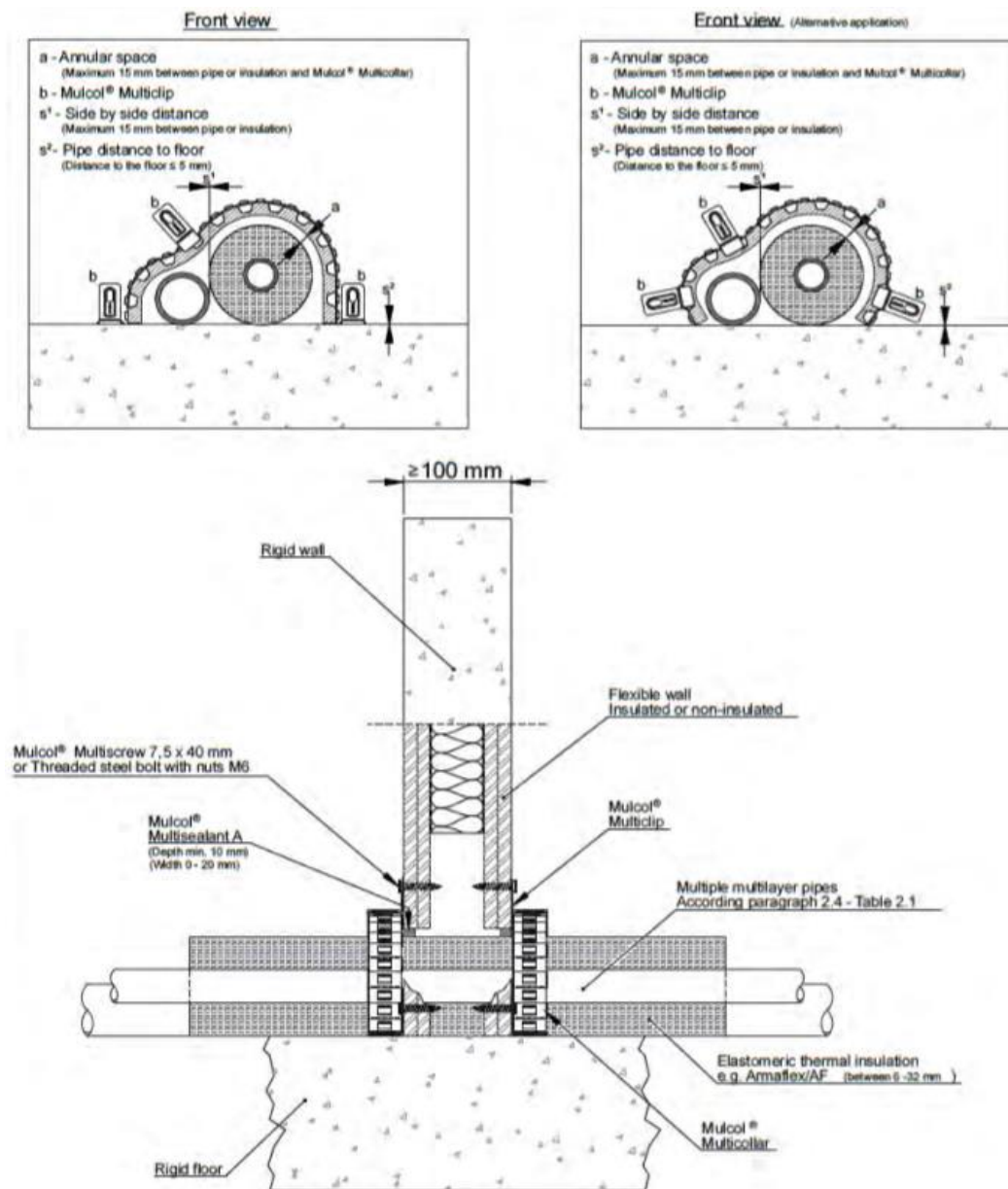
**Figure 38** Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor



**Multiple Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor**

**Table 43** Multiple Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/length (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	32/300 minimum	one	-/90/90 U/C
	Ø50	4	N/A	one	-/90/90 U/C



**Figure 39** Multiple Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

Aluminium composite pipes insulated with Kooltherm FM/PIR insulation

Table 44 Aluminium composite pipes insulated with Kooltherm FM/PIR insulation

Pipe material	Diameter (mm)	Wall thickness (mm)	Kooltherm FM/ PIR Insulation CS thickness/ length (mm)	Filling material	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø26	3	25/ 400 minimum	Mulcol Multisealant A on both sides to a minimum depth of 10 mm	one	-/120/120 U/C
	Ø32	3	47/ 400 minimum		one	-/120/120 U/C
	Ø50	6	40/ 400 minimum		one	-/120/90 U/C
	Ø50	6	60/ 400 minimum		two	-/120/120 U/C
	Ø90	6	60/ 400 minimum		two	-/120/90 U/C

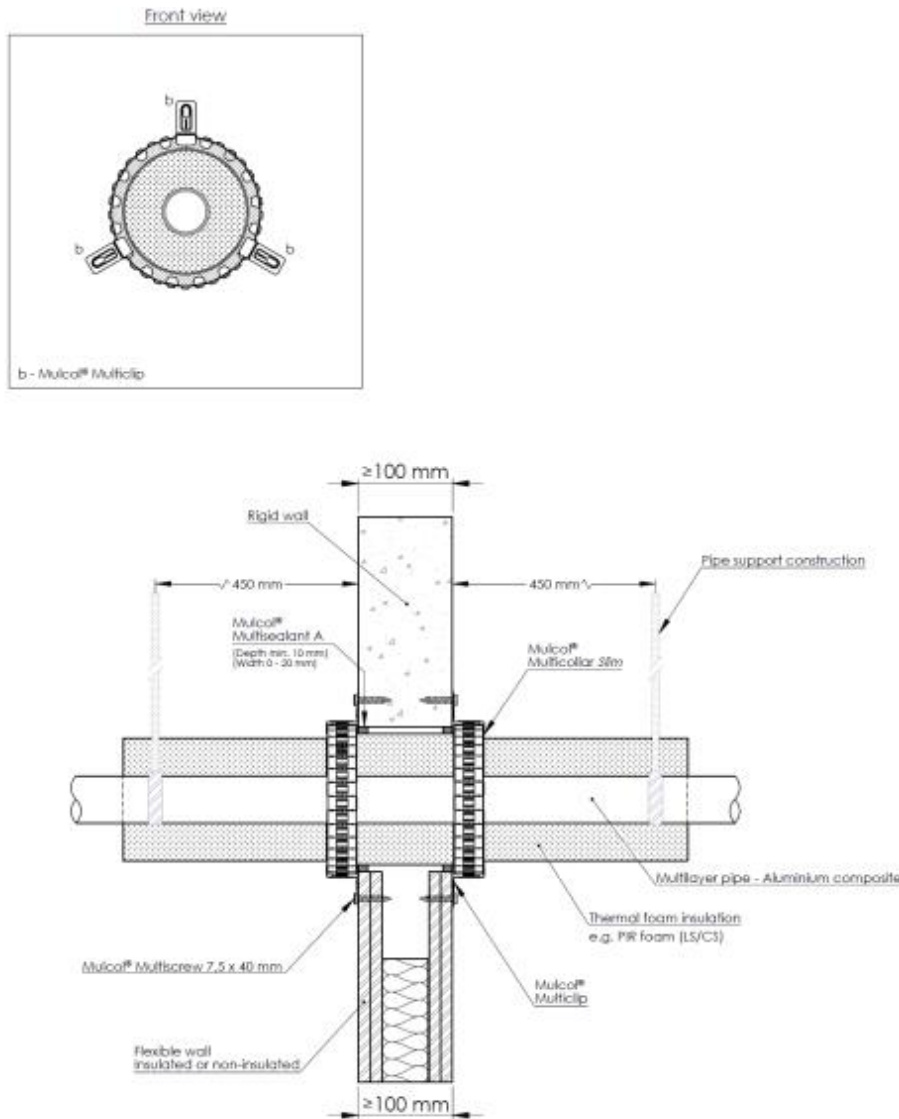


Figure 40 Aluminium composite pipes insulated with Kooltherm FM/PIR insulation

### 6.3.5 Multiple Penetrations

#### Up to 3 x mixed pipes and cables, perpendicular to the wall

Table 45 Up to 3 x mixed pipes and cables, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø90	2.8	one	-/120/90 U/U
PE-Xc/AL/PE-Xc	Ø50	4		-/120/90 U/C
Aquatherm Green-MF	Ø50	6.9		-/120/60 U/C
Telecom UTP Cat. 5 or Cat. 6	1 no.	N/A		-/120/90
Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> , YMVK 5 x 1.5 mm <sup>2</sup> or YMVK 5 x 2.5 mm <sup>2</sup>	1 no.	N/A		

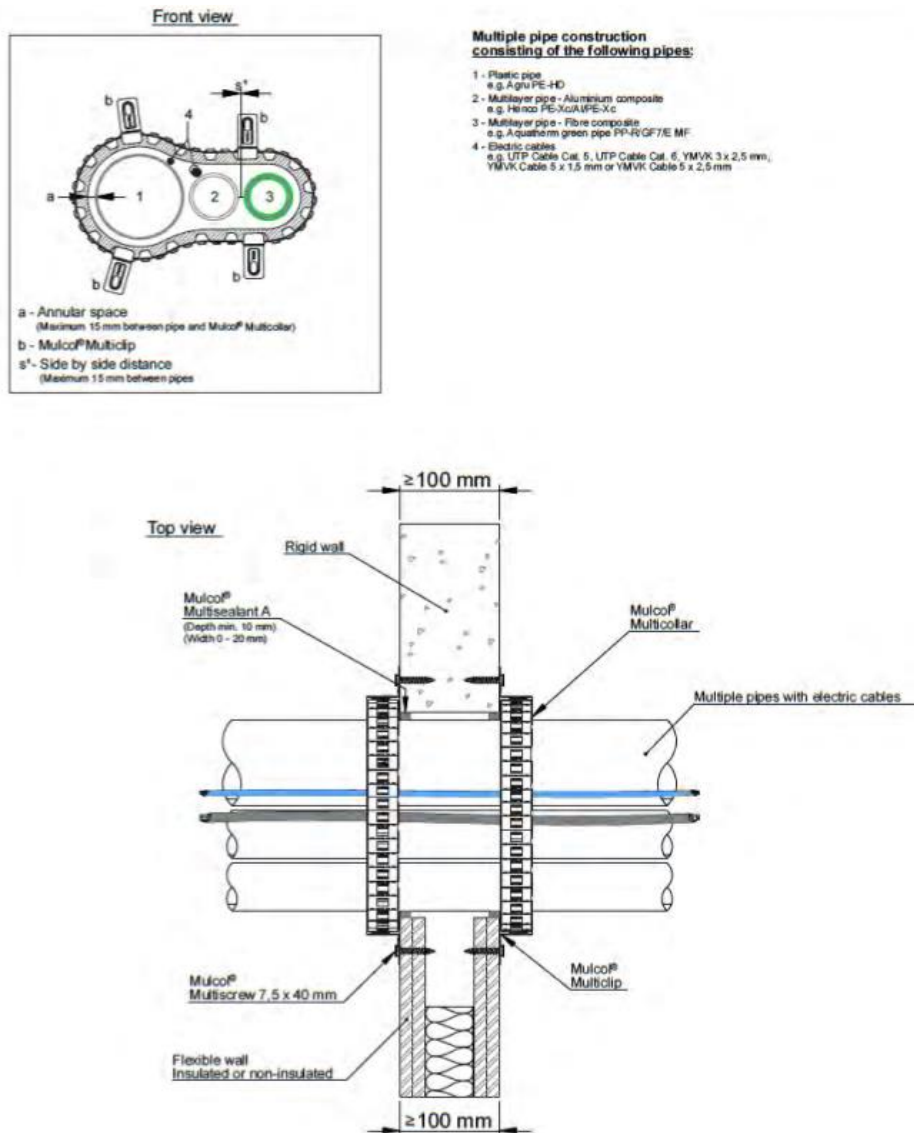


Figure 41 Up to 3 x mixed pipes and cables, perpendicular to the wall

Up to 3 x mixed pipes and cables, perpendicular to the wall with AF/Armaflex insulation

Table 46 Up to 3 x mixed pipes and cables, perpendicular to the wall with AF/Armaflex insulation

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS thickness/length (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø90	2.8	4/50	one	-/60/60 U/C
PE-Xc/AL/PE-Xc	Ø50	4	32/300		-/60/60 U/C
Aquatherm Green-MF	Ø50	6.9	32/300		-/60/60 U/C
Telecom UTP Cat. 5 or Cat. 6	1 no.	N/A	N/A		-/60/60
Sheathed cable YMKV 3 x 2.5 mm <sup>2</sup> , YMKV 5 x 1.5 mm <sup>2</sup> or YMKV 5 x 2.5 mm <sup>2</sup>	1 no.	N/A			

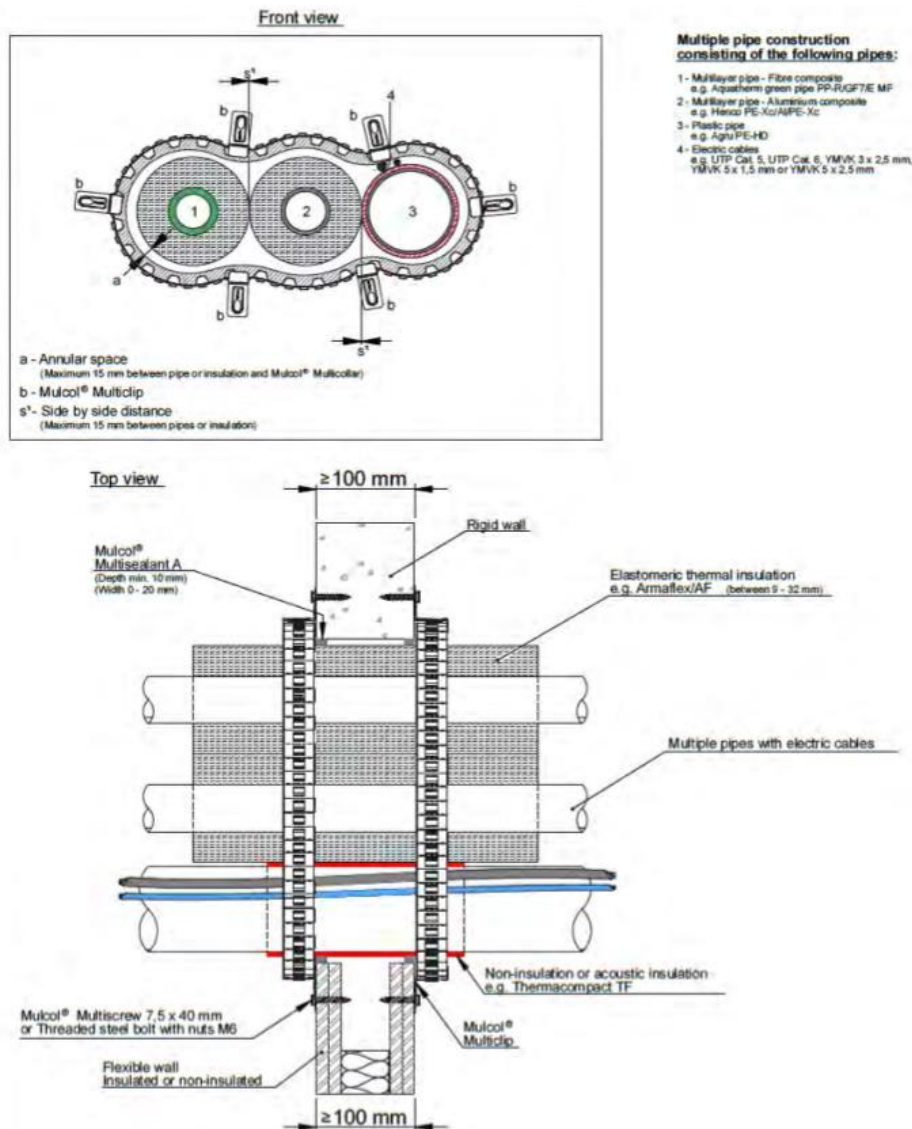


Figure 42 Up to 3 x mixed pipes and cables, perpendicular to the wall with AF/Armaflex insulation

**Up to 3 x mixed pipes and cables, with insulation of PE foam perpendicular to the wall**

**Table 47 Up to 3 x mixed pipes and cables, with insulation of PE foam perpendicular to the wall**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation diameter/ length LS/CS/LI/CI (mm)	Filling material	Number of collars	FRL
Copper with insulation Wicu Flex PE-foam (6 mm thick 300 mm long)	Ø15	1.5	6/300 minimum	Multisealant A at the exposed and unexposed face and rockwool for the rest of the gap	one	-/120/60 C/U
PVC-U, PVC-C	Ø32	3	None			-/120/120 U/U
Telecom UTP CAT 5 or CAT 6	1 no	N/A				-/120/120
Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> , YMVK 5 x 1.5 mm <sup>2</sup> or YMVK 5 x 2.5 mm <sup>2</sup>	1 no	N/A				
Note: A maximum of 2 copper pipes can be used in the combination.						

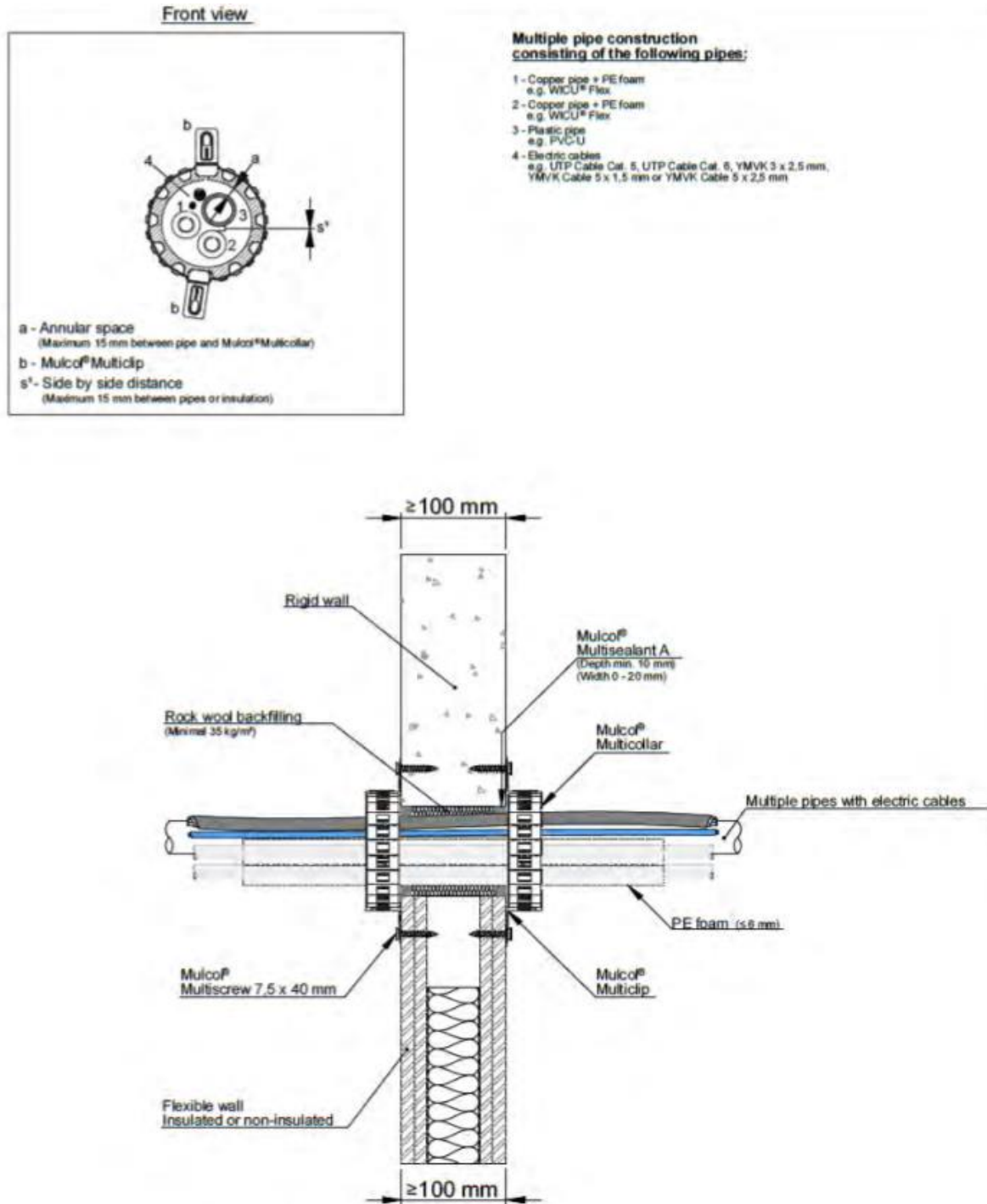


Figure 43 Up to 3 x mixed pipes and cables, with insulation of PE foam perpendicular to the wall



Up to 3 x plastic pipes, perpendicular to the wall

Table 48 Up to 3 x plastic pipes, perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PVC-U / PVC-C	Ø75	3	one	-/120/90 U/C

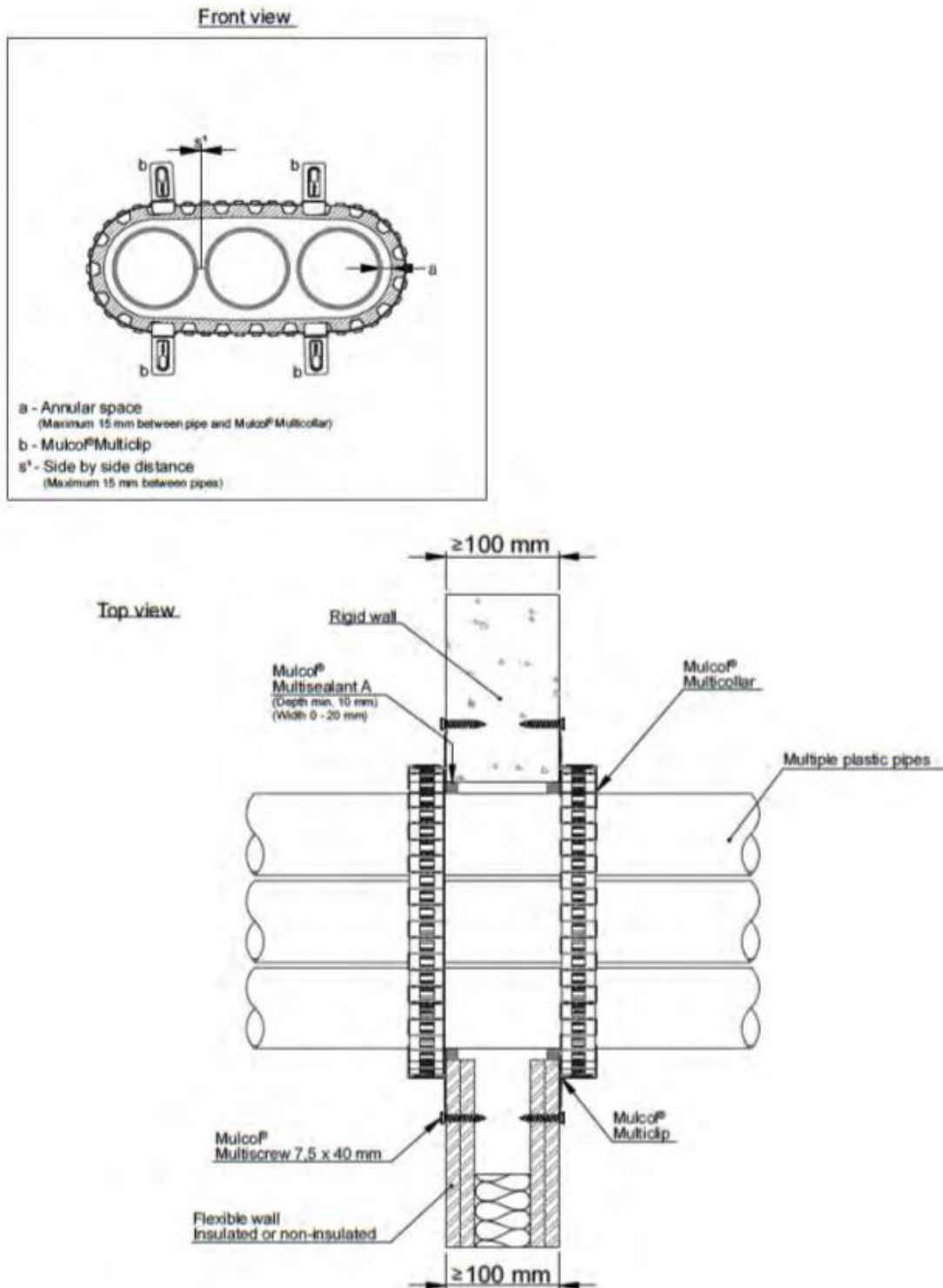


Figure 44 Up to 3 x plastic pipes, perpendicular to the wall

Up to 4 x Aluminium composite pipes, with insulation of PE foam perpendicular to the wall

Table 49 Up to 4 x Aluminium composite pipes, with insulation of PE foam perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI Thickness / Length (mm)	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø26	3	PE foam 6/300 minimum	one	-/120/120 U/C
	Ø26				
	Ø32		None		
	Ø32				

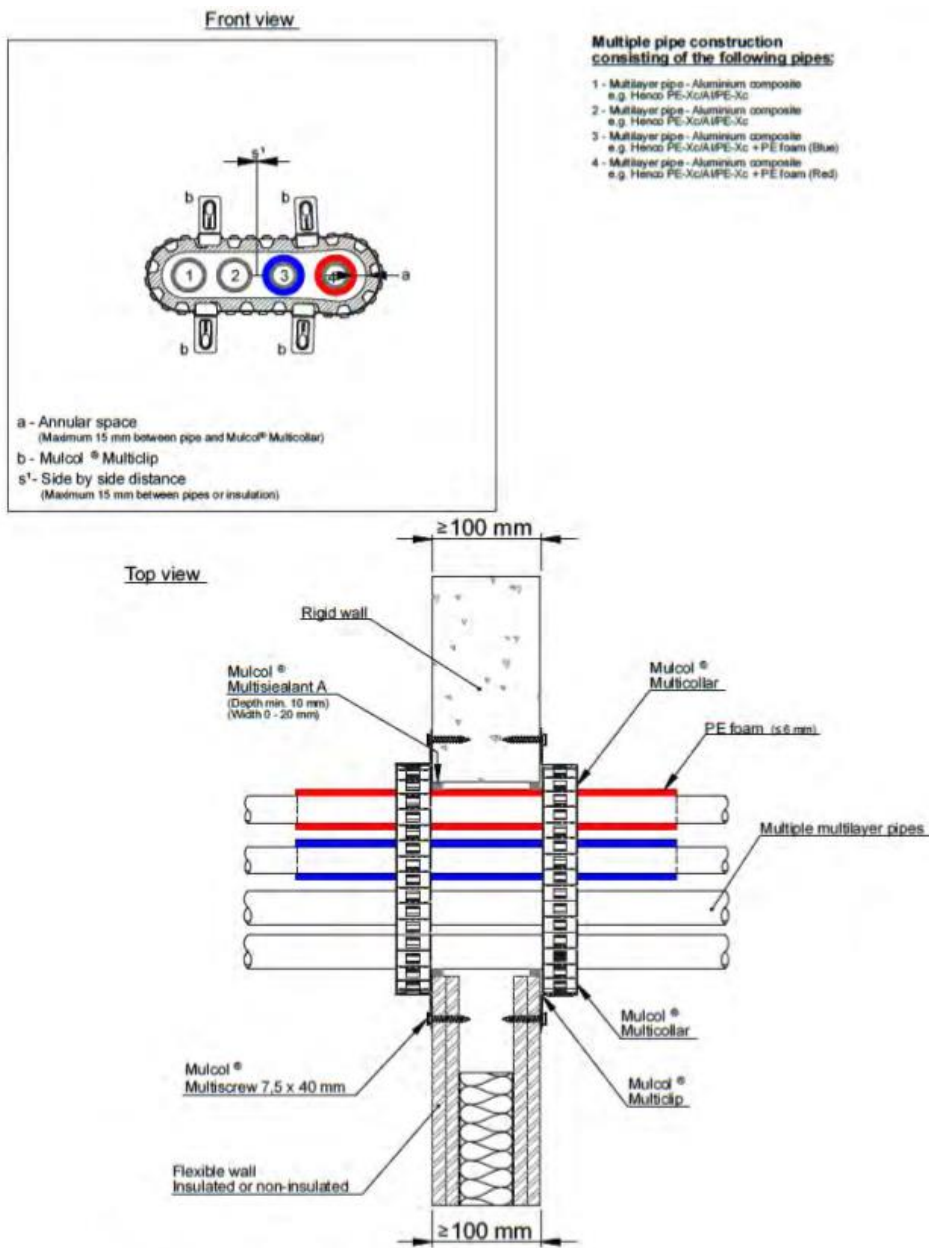


Figure 45 Up to 4 x Aluminium composite pipes, with insulation of PE foam perpendicular to the wall

Up to 2 x Aluminium composite pipes with PE-foam insulation, perpendicular to the wall in Mulcol Multimastic FB1 coated board seals

Table 50 Up to 2 x Aluminium composite pipes with PE-foam insulation, perpendicular to the wall in Mulcol Multimastic FB1 coated board seals

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø32	3	one	-/120/120 U/C

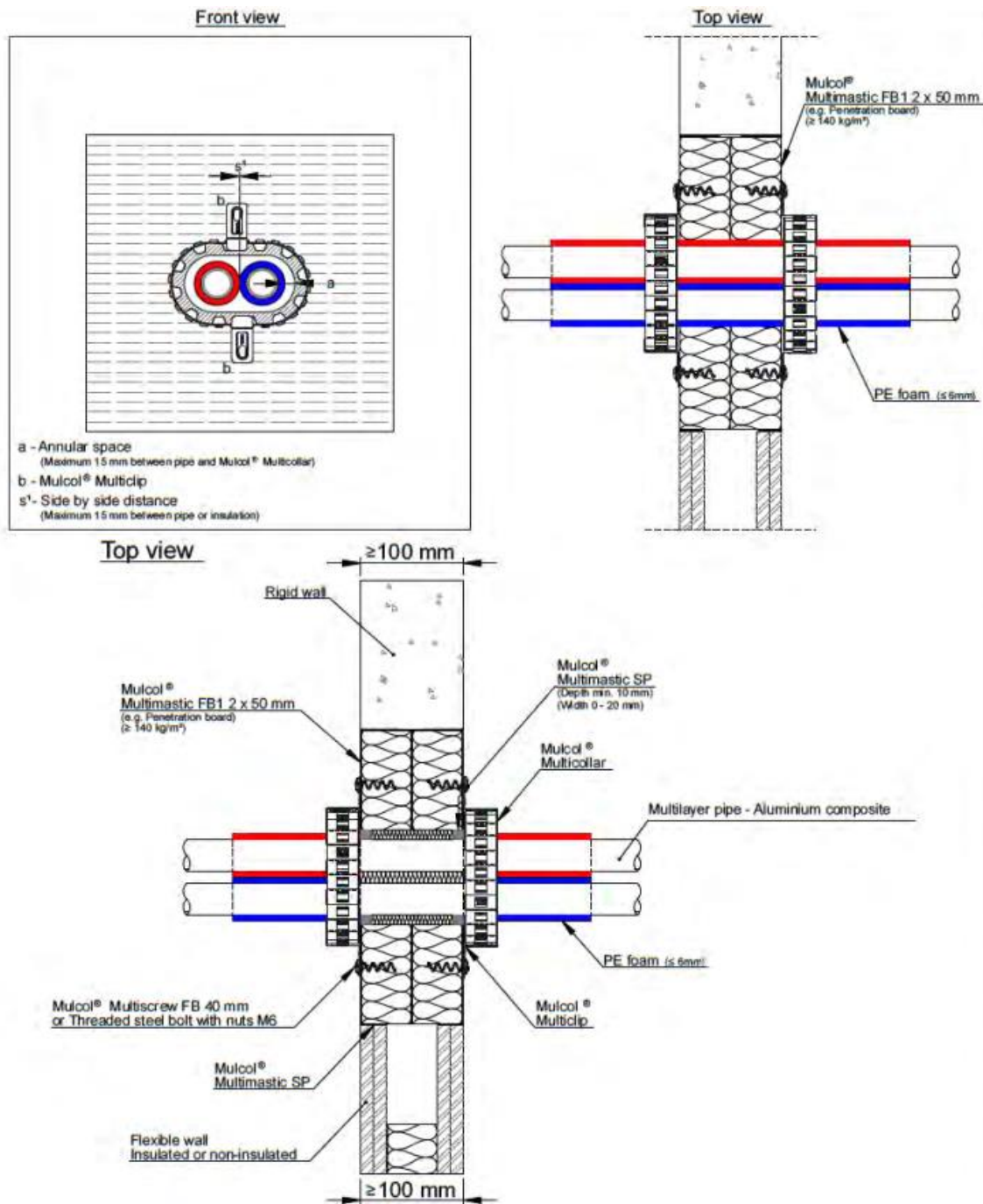
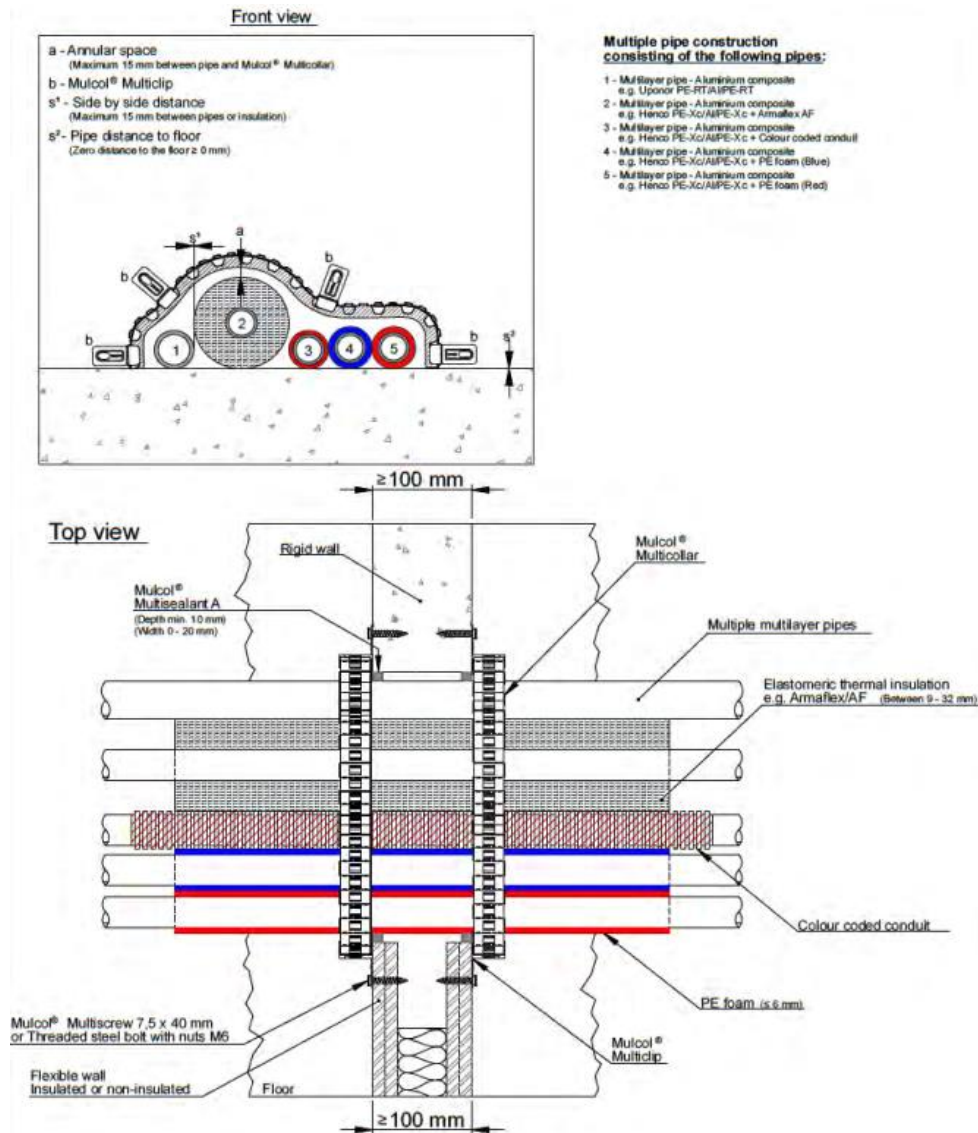


Figure 46 Up to 2 x Aluminium composite pipes with PE-foam insulation, perpendicular to the wall in Mulcol Multimastic FB1 coated board seals

**5 x Aluminium composite pipes insulated with PE foam or AF/Armaflex made out of flexible elastomeric EPDM rubber foam or PE conduit, zero distance to floor**

**Table 51** 5 x Aluminium composite pipes insulated with PE foam or AF/Armaflex made out of flexible elastomeric EPDM rubber foam or PE conduit, zero distance to floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI Thickness /length (mm)	Number of collars	FRL
PE-RT/AL/PE-RT	Ø40	4	None	one	-/120/120 U/C
PE-Xc/AL/PE-Xc	Ø32	3	AF/Armaflex 32/300 minimum		
	Ø32	3	PE conduit Ø54x6 / 300 minimum		
	Ø32	3	PE-foam 6/300 minimum		
	Ø32	3			

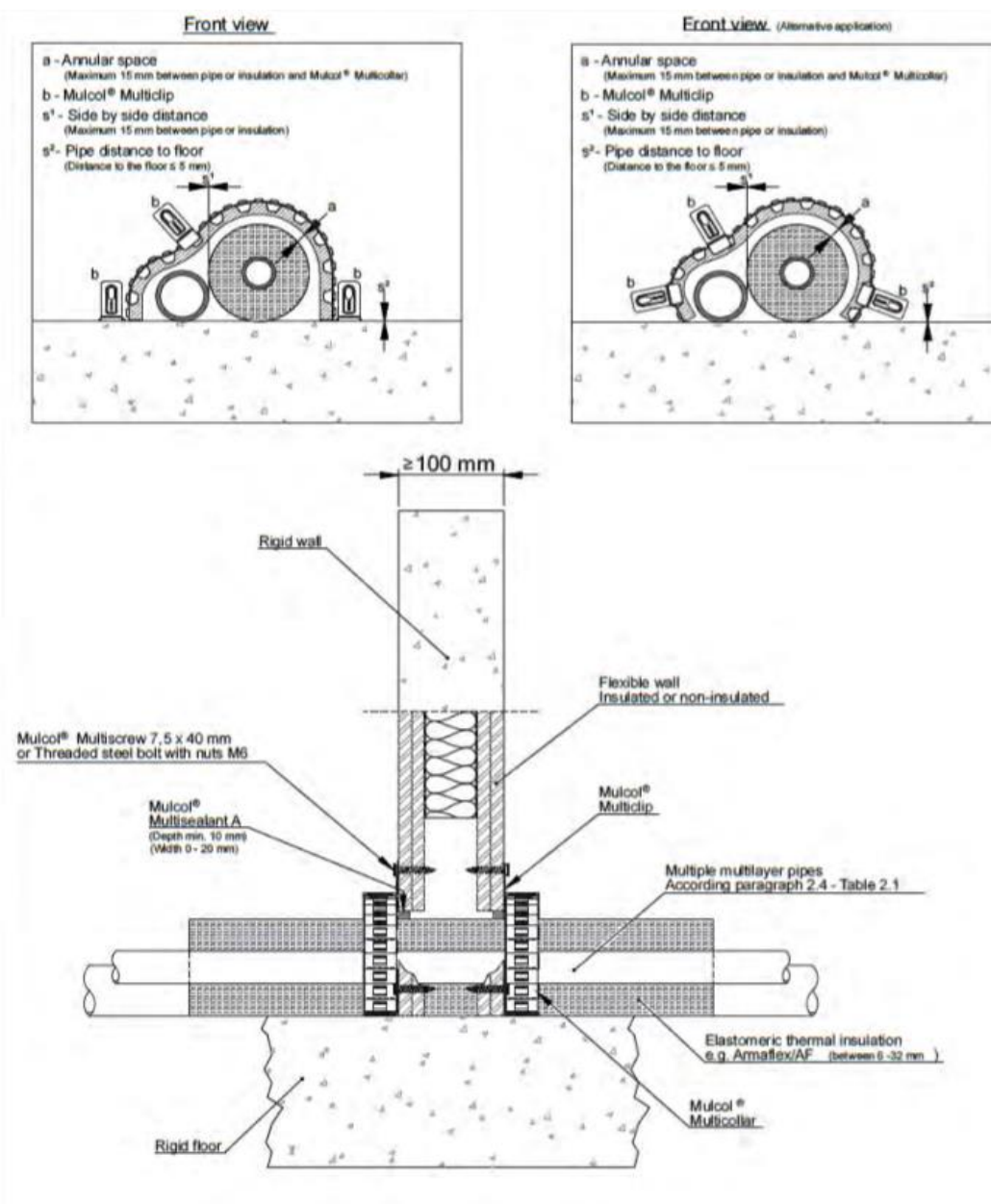


**Figure 47** 5 x Aluminium composite pipes insulated with PE foam or AF/Armaflex made out of flexible elastomeric EPDM rubber foam or PE conduit, zero distance to floor

**Multiple aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor**

**Table 52** Multiple aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI Thickness /length (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	32/300 minimum	one	-/90/90 U/C
	Ø50	4	None		-/90/90 U/C



**Figure 48** Multiple aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam perpendicular to the wall, with zero distance to the floor



### Multiple aluminium composite pipes

Table 53 Multiple aluminium composite pipes

Pipe material	Number of pipes	Pipe diameter (mm)	Pipe wall thickness (mm)	Sealing system	Number of collars	FRL
PE-Xc/AL/PE-Xc	7	Ø26	3	Mulcol Multimastic SP	one	-/60/60 U/C

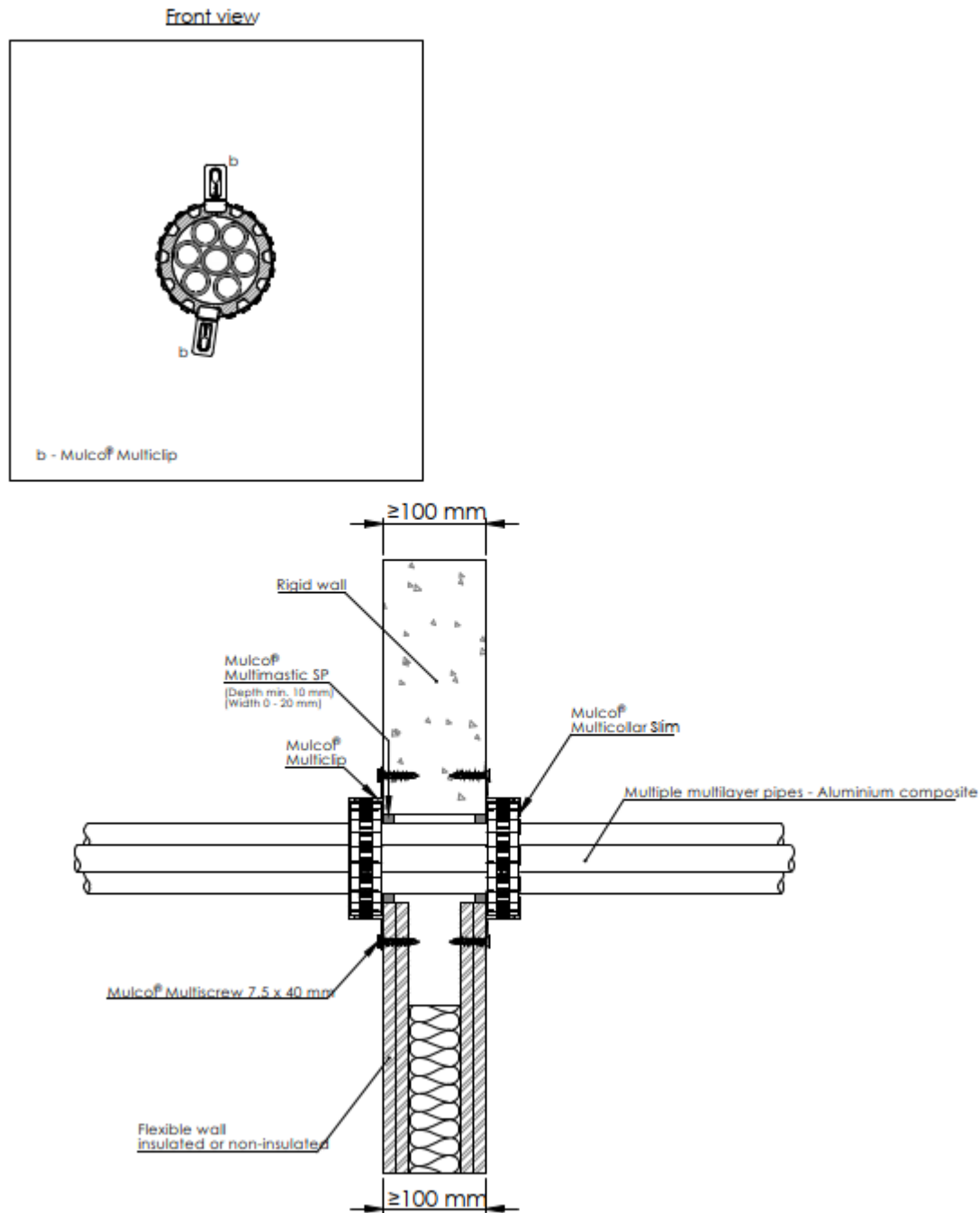


Figure 49 Multiple aluminium composite pipes



Multiple set of copper air-conditioning pipes

Table 54 Multiple set of copper air-conditioning pipes

Service	Number of services	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation material/ thickness	Filling material	Number of collars	FRL
Copper air conditioning pipes with YMKV 3 x 1.5 mm <sup>2</sup> sheathed cable	6	15	1.5	Wicu Flex PE-foam/ 6 mm CS	Mulcol Multisealant SP	one	-/90/60 U/C

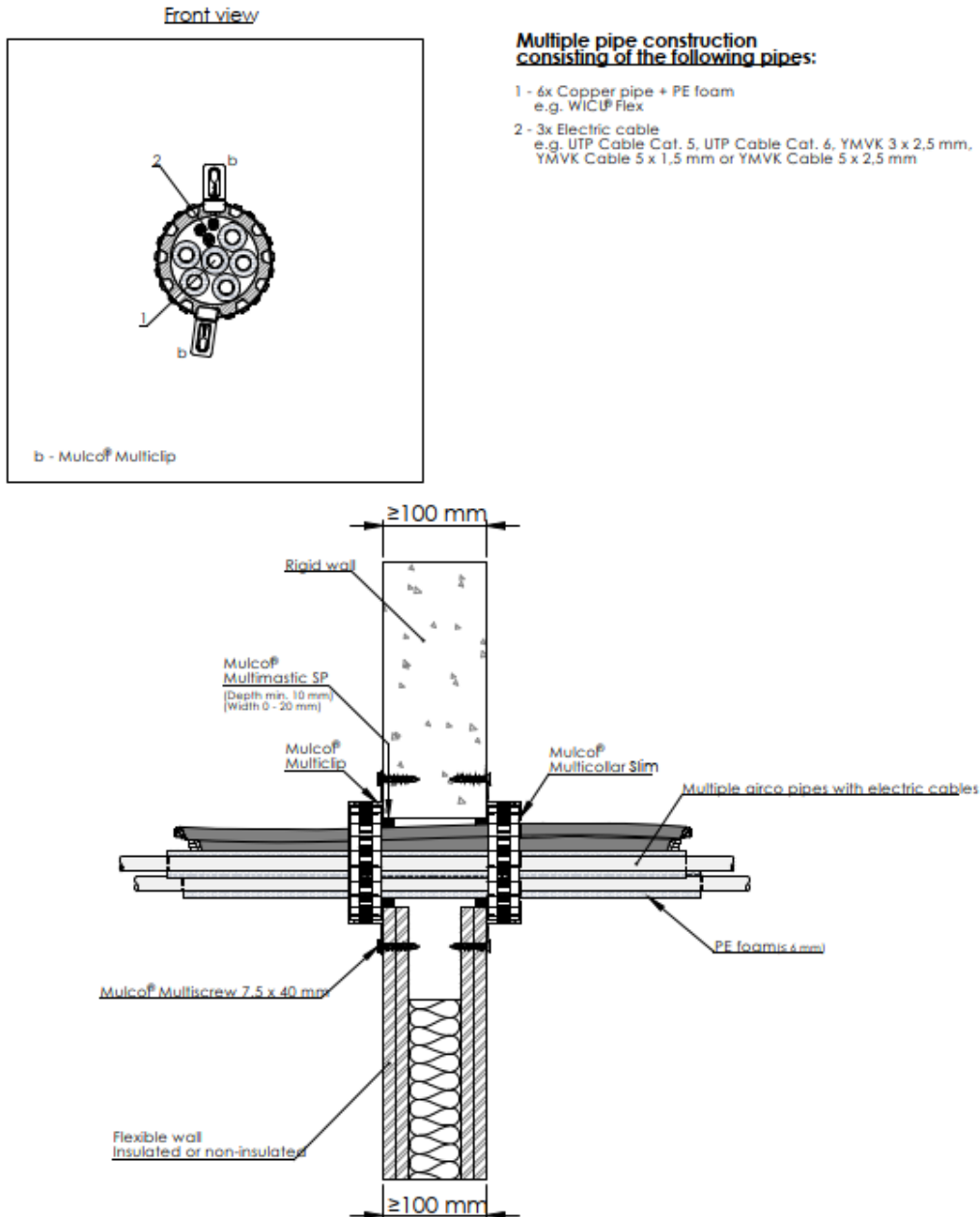


Figure 50 Multiple set of copper air-conditioning pipes

### 6.3.6 Flue gas pipes

#### Aluminium flue gas pipes

Table 55 Aluminium flue gas pipes fitted perpendicular to the wall, with two Mulcol® Multicollar Slim pipe collars to the exposed (fire risk) side of the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aluminium	Ø80	1.5	two	-/90/- U/C

Note: This application must only be used where the risk of fire in the building can be established as being from one side of the wall only.

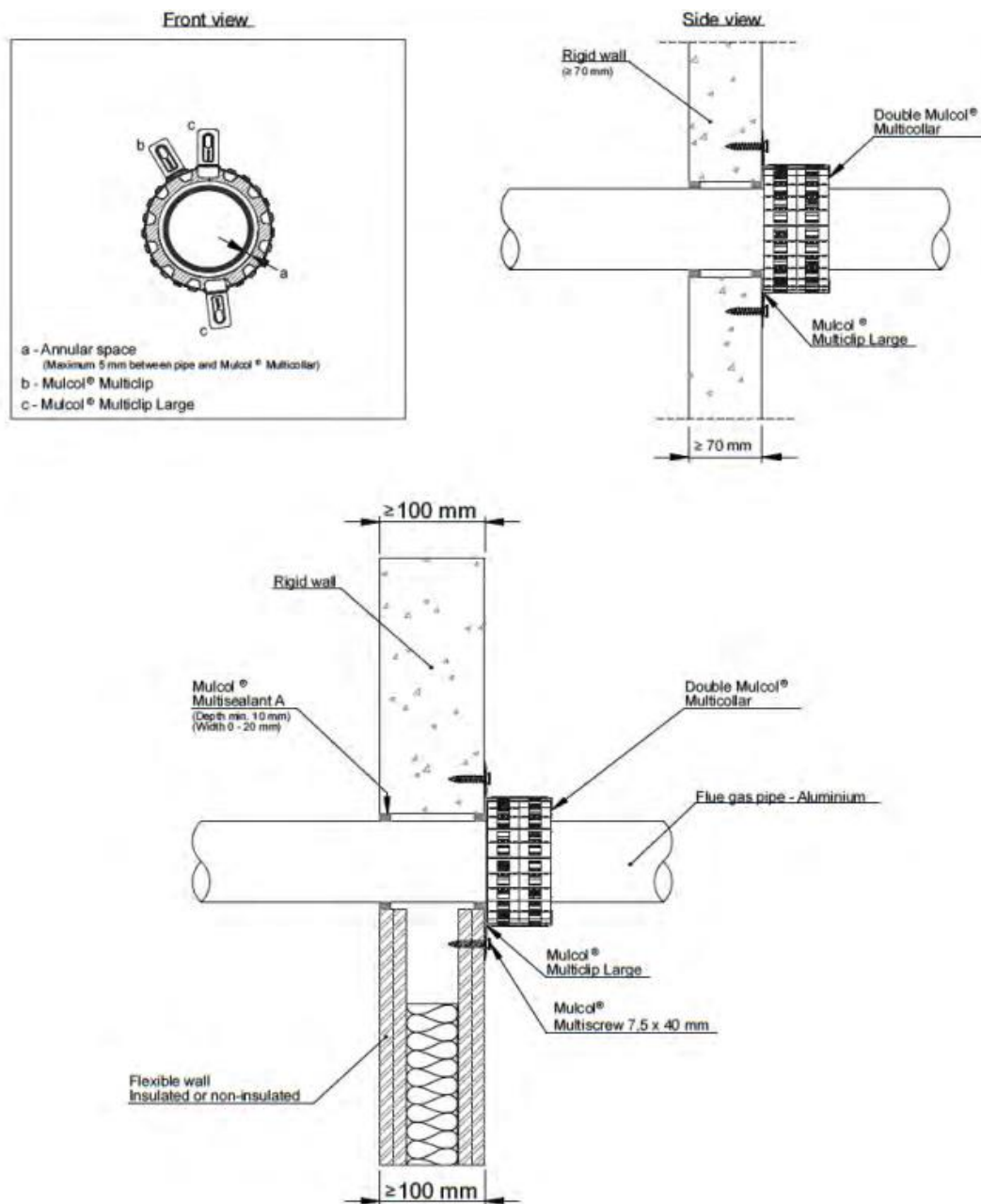


Figure 51 Aluminium flue gas pipes fitted perpendicular to the wall, with two Mulcol® Multicollar Slim pipe collars to the exposed (fire risk) side of the wall

Concentric steel flue gas pipes

Table 56 Concentric steel flue gas pipes fitted perpendicular to the wall, with two Mulcol® Multicollar Slim pipe collars to the exposed (fire risk) side of the wall

Pipe material	Outer steel diameter (mm)	Inner PP pipe diameter (mm)	Number of collars	FRL
Steel flue gas System concentric	Ø150	Ø100	two	-/90/- U/C

Note: This application must only be used where the risk of fire in the building can be established as being from one side of the wall only.

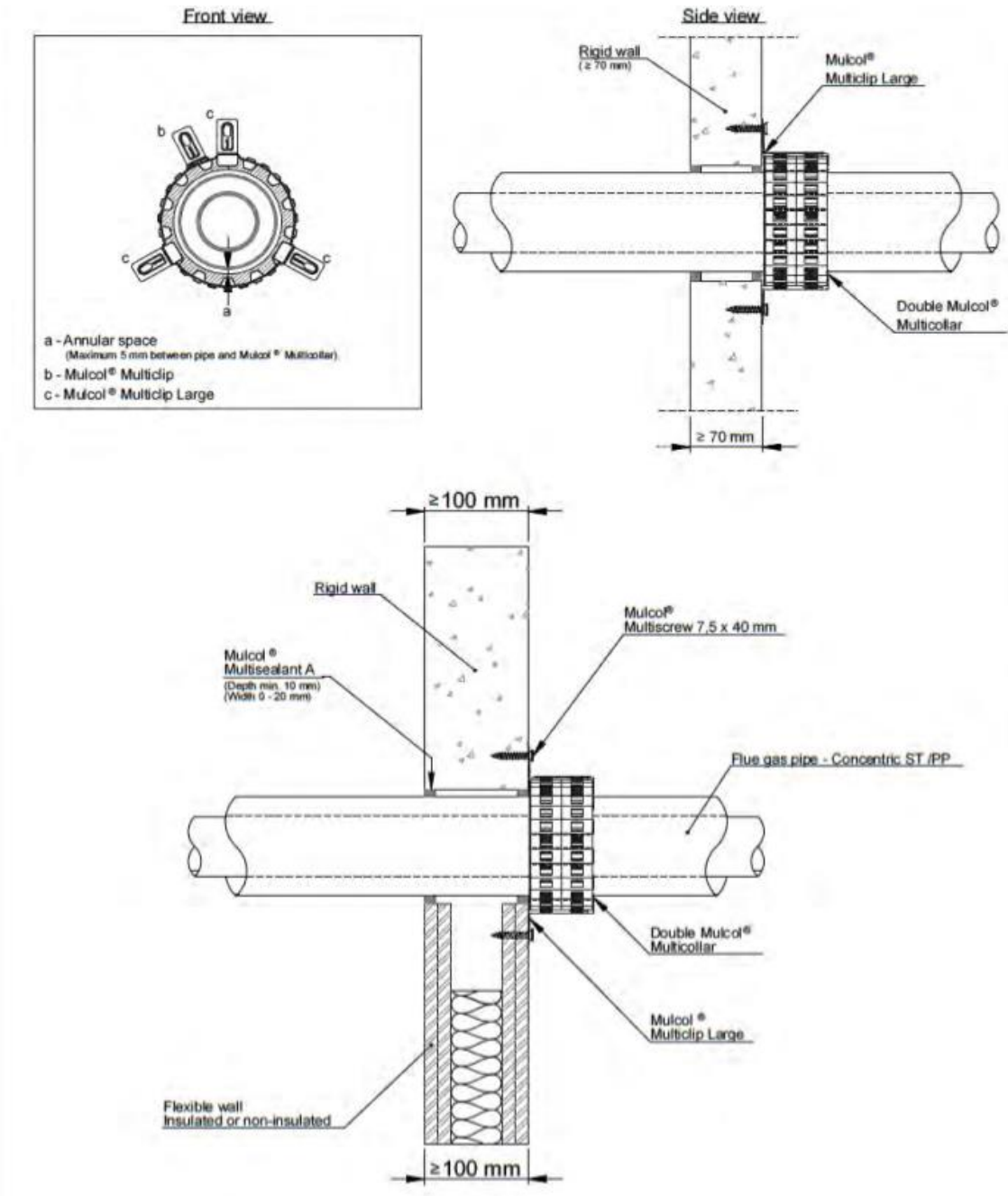


Figure 52 Concentric steel flue gas pipes fitted perpendicular to the wall, with two Mulcol® Multicollar Slim pipe collars to the exposed (fire risk) side of the wall

### 6.3.7 Electrical cables

#### PVC pipes containing electrical cables, fitted perpendicular to the wall

Table 57 PVC pipes containing electrical cables, fitted perpendicular to the wall

Pipe material/ maximum number	Maximum pipe diameter	Maximum aperture diameter (mm)	Permitted cables (empty to full)	Number of collars per face	FRL
PVC / 18	Ø25	Ø100	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMKV 3 x 2.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 1.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 2.5 mm <sup>2</sup>	one	-/120/90 U/U

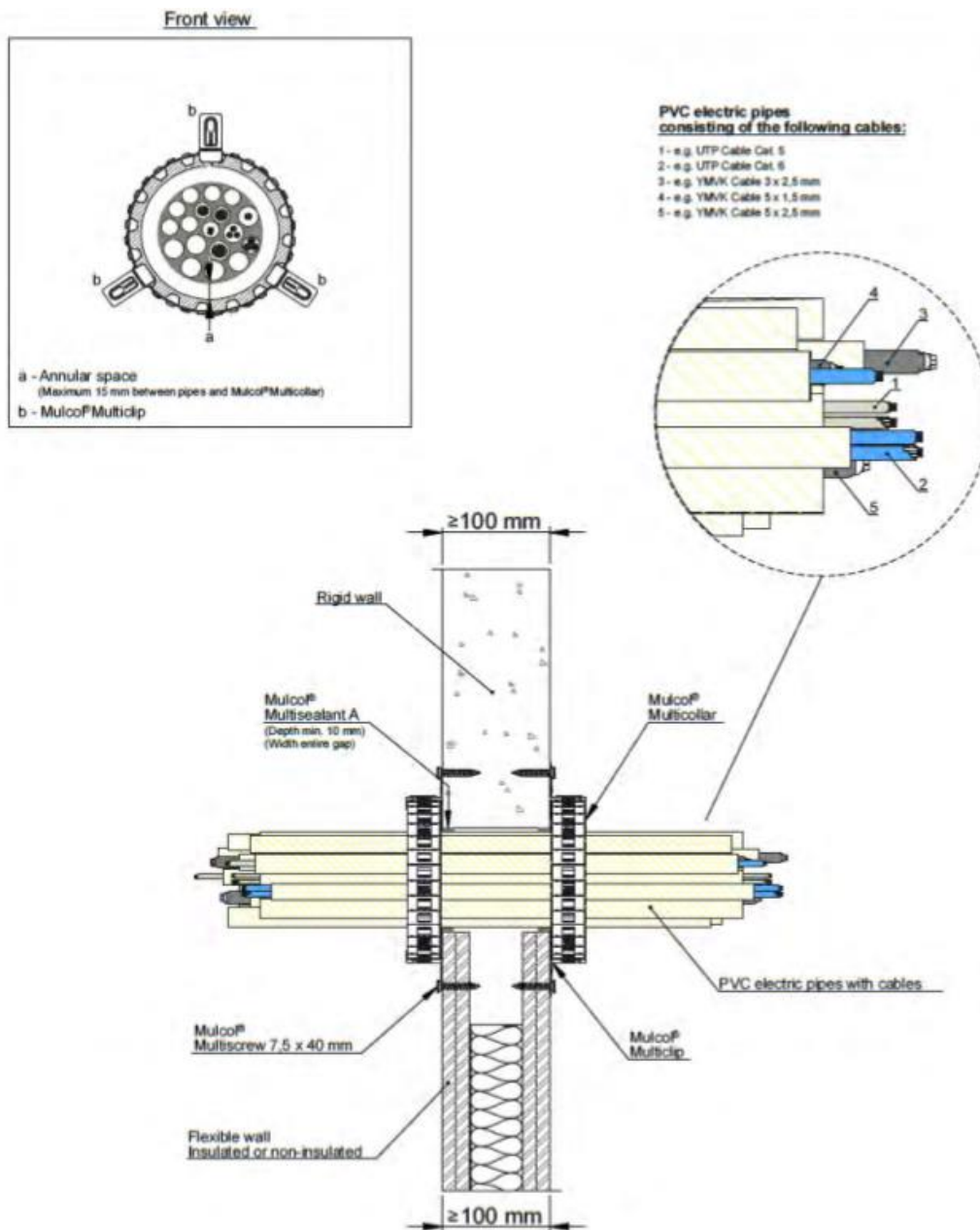


Figure 53 PVC pipes containing electrical cables, fitted perpendicular to the wall

Electrical cables, fitted perpendicular to the wall

Table 58 Electrical cables, fitted perpendicular to the wall

Maximum number	Maximum aperture diameter (mm)	Permitted cables (empty to full)	Number of collars per face	FRL
63	Ø100	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 1.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 2.5 mm <sup>2</sup>	one	-/120/120

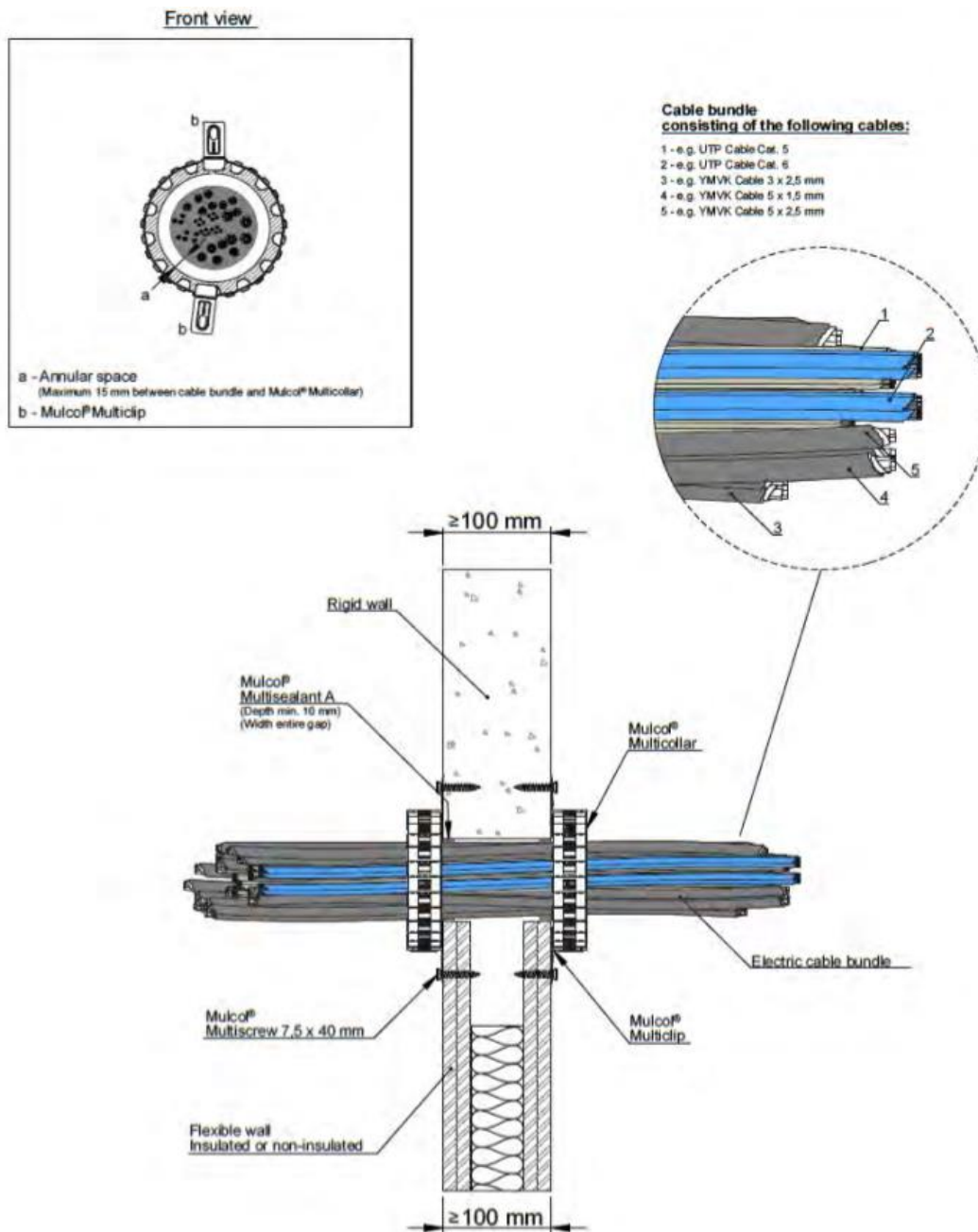
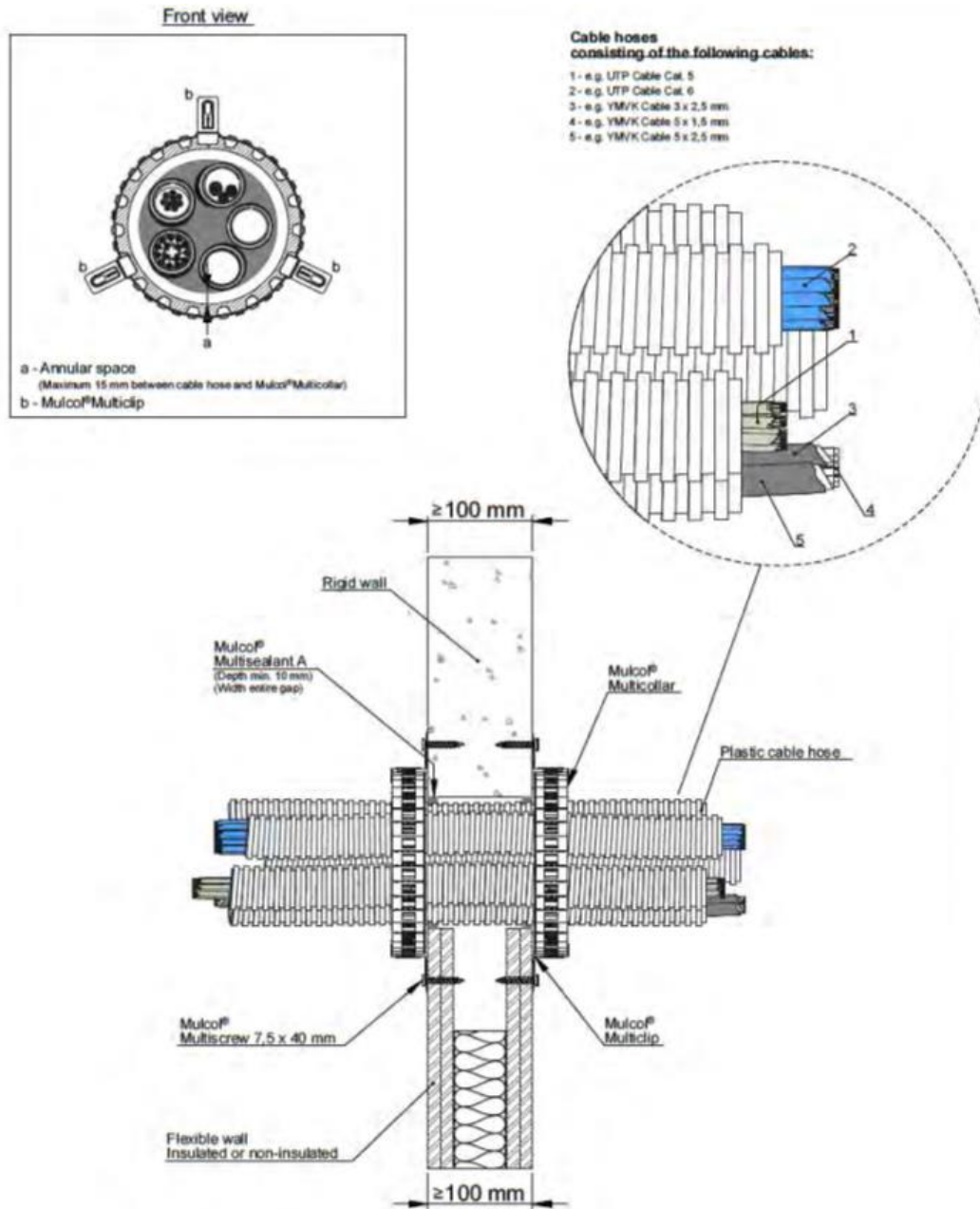


Figure 54 Electrical cables, fitted perpendicular to the wall

**PE conduits containing electrical cables, fitted perpendicular to the wall**

**Table 59 PE conduits containing electrical cables, fitted perpendicular to the wall**

Pipe material/ maximum number	Maximum pipe diameter	Maximum aperture diameter (mm)	Permitted cables (empty to full)	Number of collars per face	FRL
PE/5	Ø50	Ø150	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMKV 3 x 2.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 1.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 2.5 mm <sup>2</sup>	one	-/120/120 U/U



**Figure 55 PE conduits containing electrical cables, fitted perpendicular to the wall**



### 6.3.8 Metal pipes

#### Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (LS/CS)

Table 60 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (LS/CS) fitted perpendicular to the wall

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS thickness/length (mm)	Number of collars	FRL
Copper/ Steel/Iron/ Stainless steel	Ø54	1.5-14.2	9-32/300	one	-/120/30 C/U
	Ø54	1.5-14.2	32/300	one	-/120/90 C/U
	Ø88.9	2-14.2	9-32/500	one	-/120/45 C/U
	Ø88.9	2-14.2	9-32/ continuous CS	one	-/120/60 C/U
Stainless steel /Iron/ Steel	Ø219.1	4-14.2	9-32/500	one	-/120/60 C/U
	Ø219.1	4-14.2	9-32/ continuous	one	-/120/90 C/U

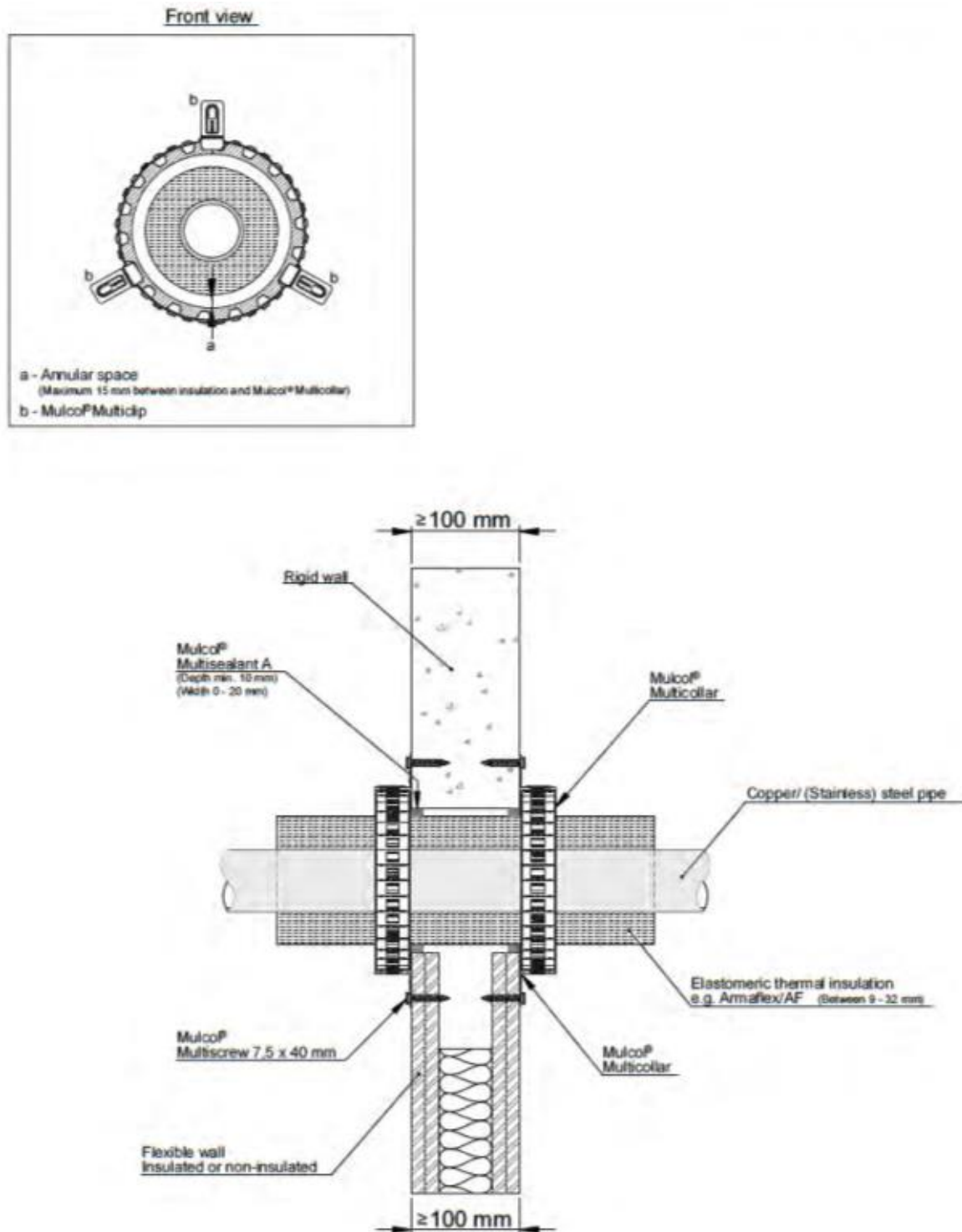
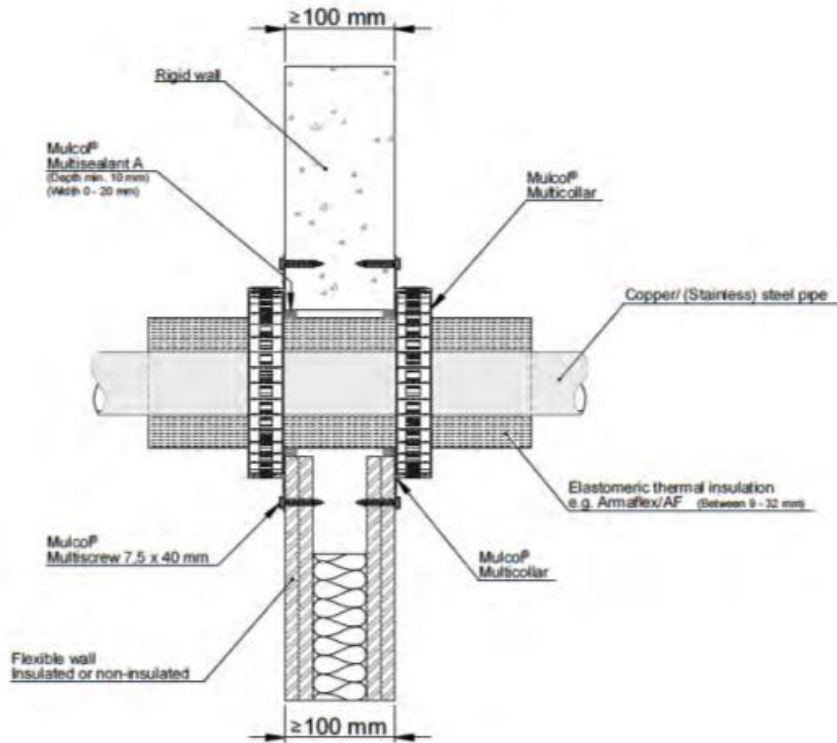
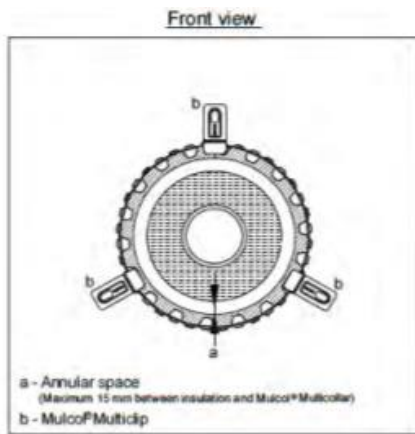


Figure 56 Metal pipes insulated with AF/Armafex made out of flexible elastomeric EPDM rubber foam

**Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

**Table 61 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (CI) fitted perpendicular to the wall**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation CI thickness/length (mm)	Number of collars	FRL
Steel/Iron/ Stainless steel	Ø168.3	4.5-14.2	32	one	-/120/120 C/U
Copper/Steel/Iron/Stainless steel	Ø88.9	2-14.2	9-32	two	-/120/90 C/U
	Ø88.9	2-14.2	32	two	-/120/120 C/U

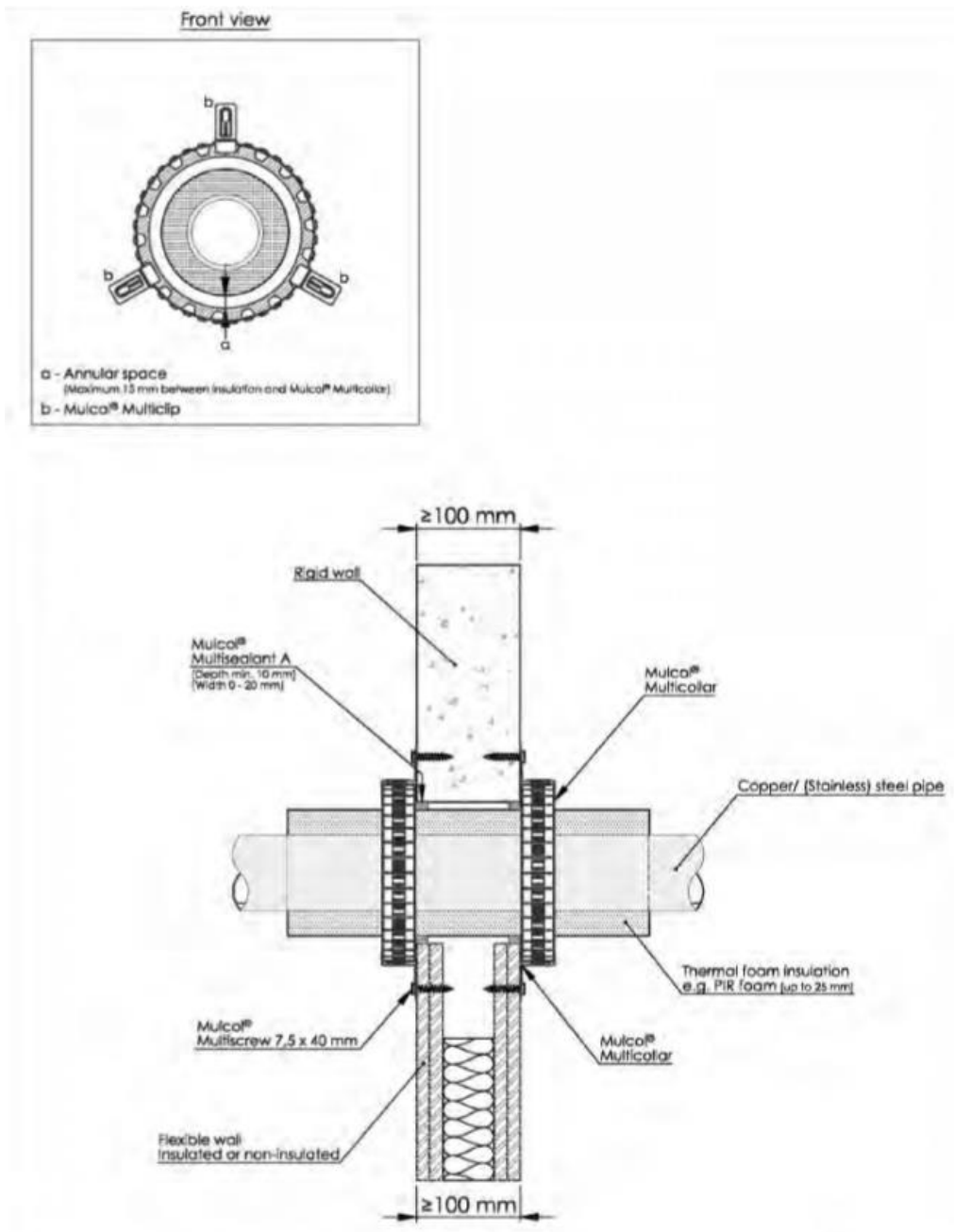


**Figure 57 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (CI)**

**Metal pipes insulated with PIR or PUR foam**

**Table 62 Metal pipes insulated with PIR or PUR foam fitted perpendicular to the wall**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS thickness/ length (mm)	Number of collars	FRL
Copper/Steel/Iron/Stainless steel	Ø76.1	2-14.2	Tarecpir B2 25/500 minimum	one	-/120/60 C/U
Stainless steel /Iron/ Steel	Ø219.1	4-14.2	Tarecpir B2 25/500 minimum (LS)	two	-/120/60 C/U
Stainless steel /Iron/ Steel	Ø219.1	4-14.2	Tarecpir B2 25/CS	two	-/120/90 C/U



**Figure 58 Metal pipes insulated with PIR or PUR foam protected with one collar**

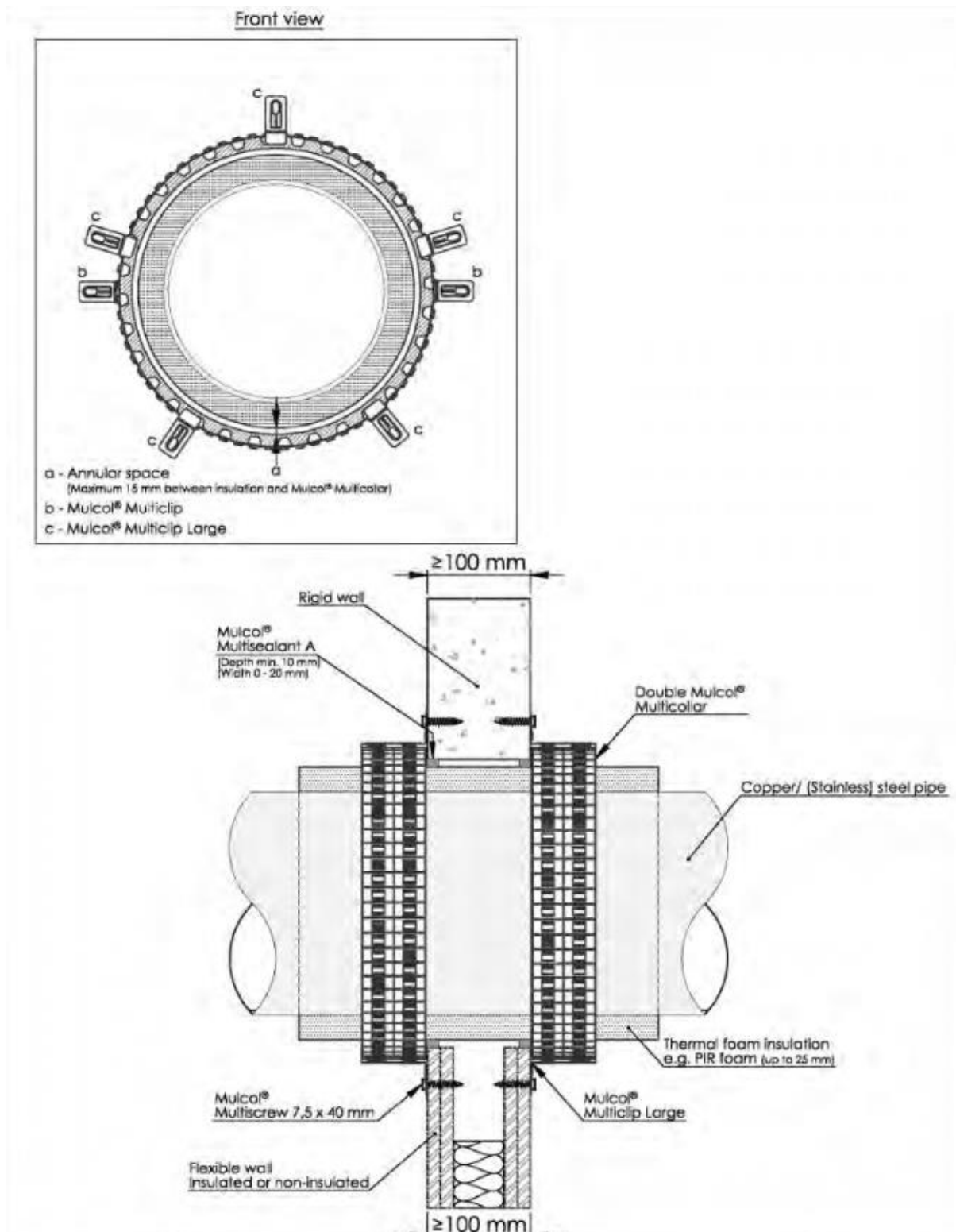


Figure 59 Metal pipes insulated with PIR or PUR foam protected with two collars

### 6.3.9 Services through Mulcol Multimastic systems

**Table 63 Plastic pipes – Mulcol Multimastic FB1 (2 × 50 mm)**

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Green MF	500 × 500	Ø50	6.9	one	-/120/120 U/C
PE-HD, PE-X, ABS, SAN-PVC	500 × 500	Ø110	2.7	one	-/120/120 U/U
PP	500 × 500	Ø110	2.7	one	-/120/120 U/U
PVC-U/PVC-C	500 × 500	Ø110	2.7	one	-/120/120 U/U
PE-HD, PE-X, ABS, SAN-PVC perpendicular to 45°	450 × 400	Ø110	2.7	one	-/90/90 U/U
PP perpendicular to 45°	450 × 400	Ø110	2.7	one	-/90/90 U/U
PE-HD, PE-X, ABS, SAN-PVC perpendicular to 45°	450 × 400	Ø110	2.7	two	-/90/90 U/U
PP perpendicular to 45°	450 × 400	Ø110	2.7	two	-/30/30 U/U
<p>Note: The annular gap between the pipe and the collar must be sealed with Multimastic SP on both sides to a depth of at least 10 mm.</p>					



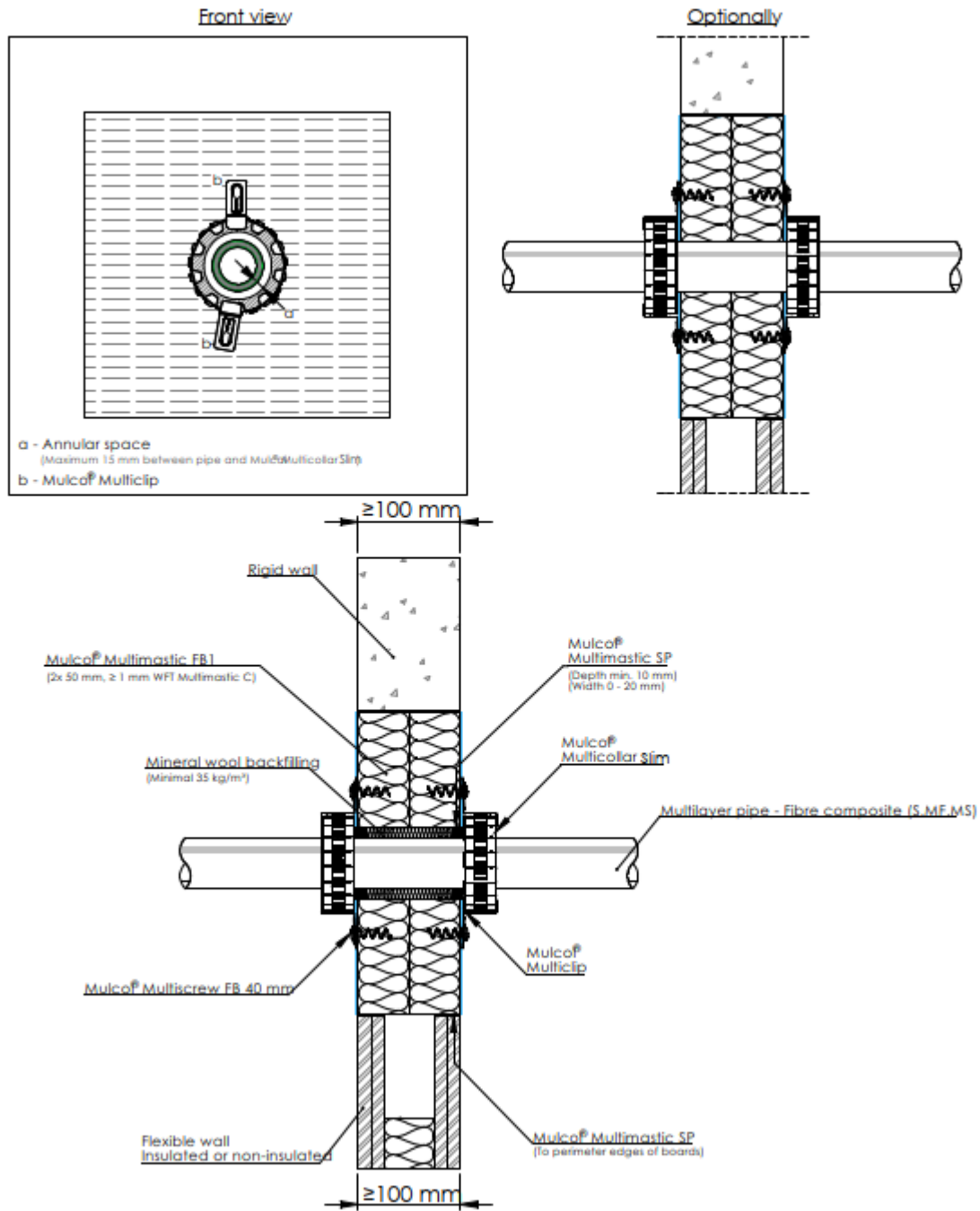


Figure 60 Pipes perpendicular to the wall through Mulcol Multimastic FB1

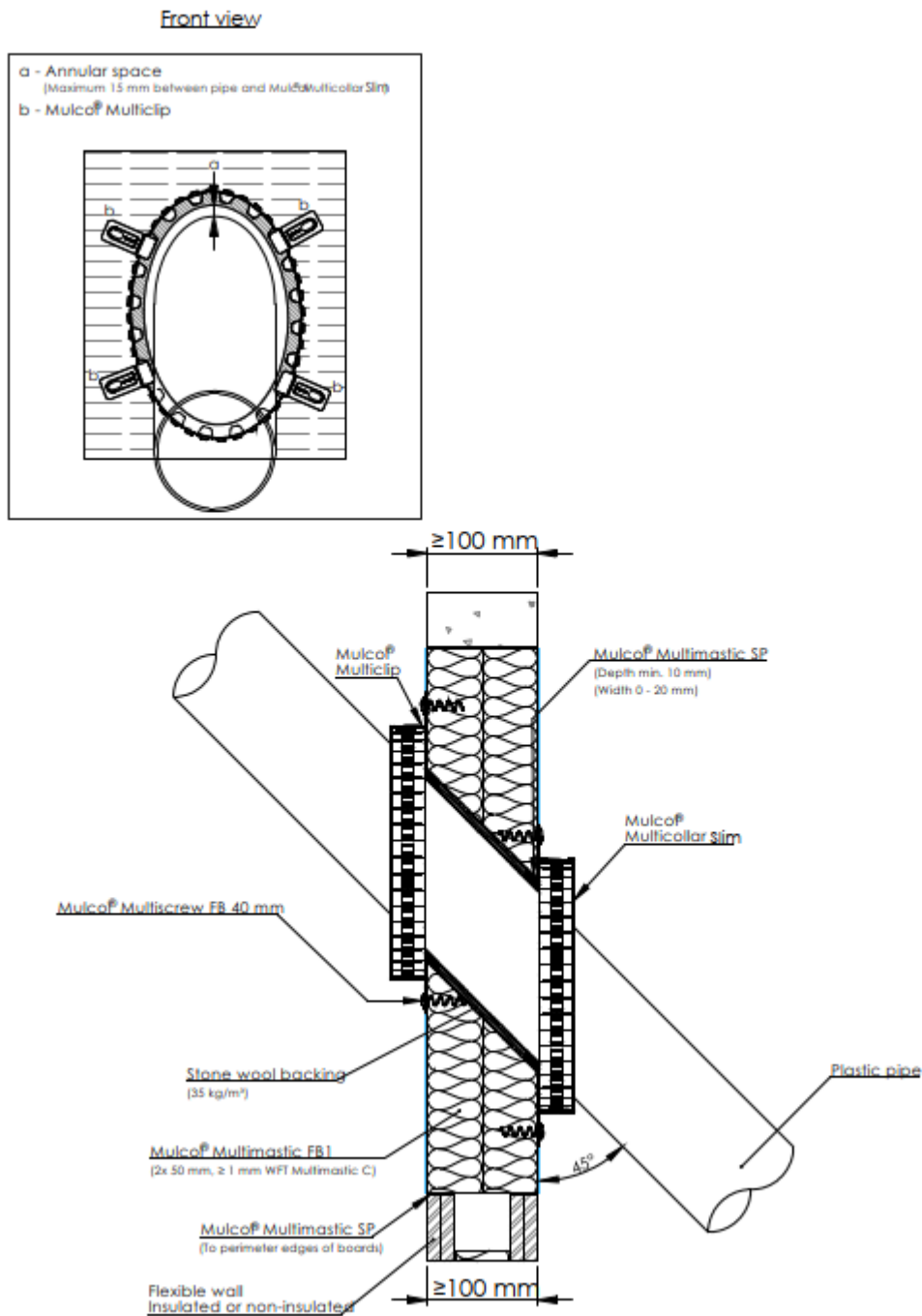


Figure 61 Pipes at 0-45° angle to the wall through Mulcol Multimastic FB1 protected with one collar

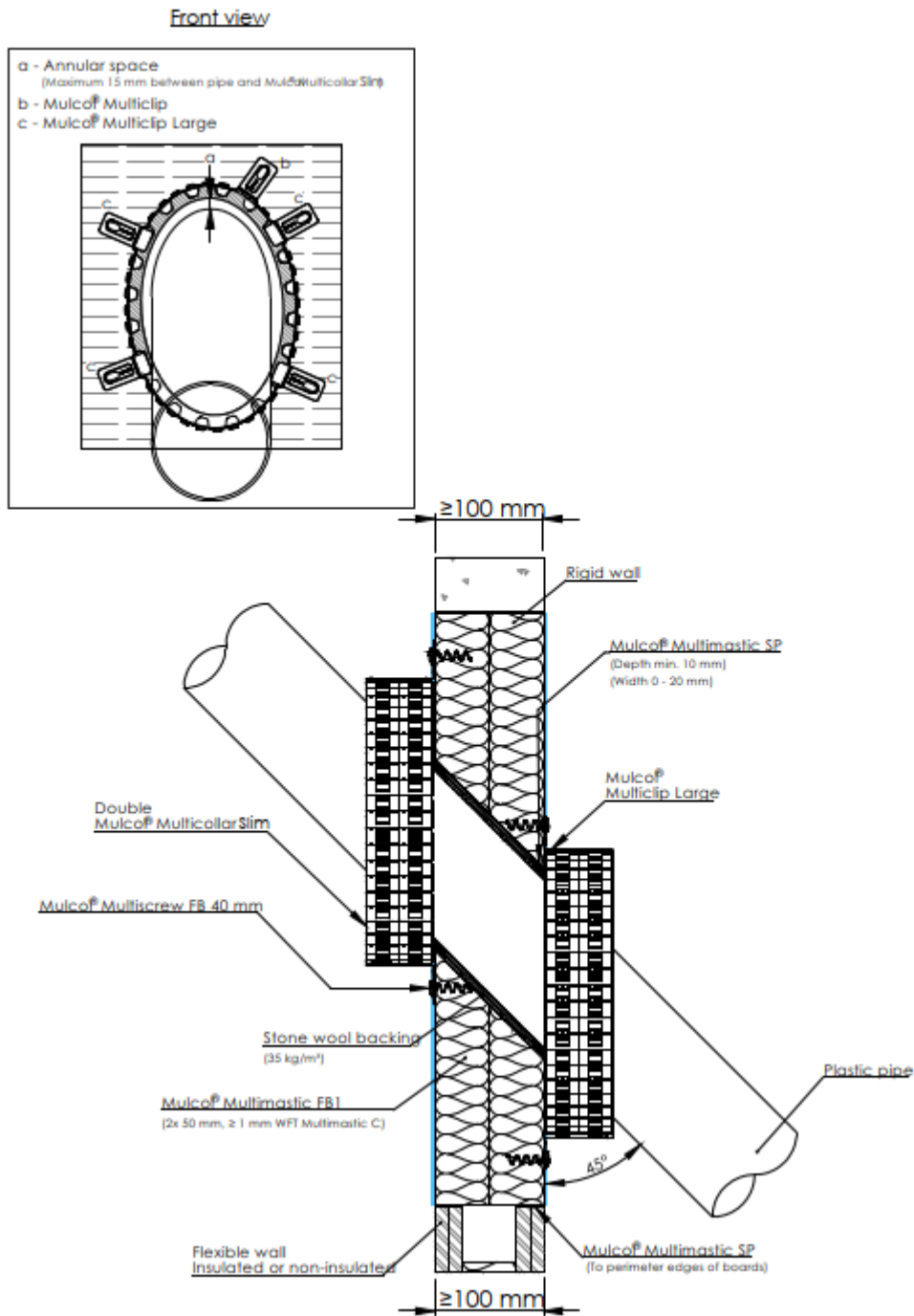


Figure 62 Pipes at 0-45° angle to the wall through Mulcol Multimastic FB1 protected with two collars

Table 64 Plastic pipes – Mulcol Multimastic FB2 (1 × 60 mm)

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Sealant	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	210 × 210	Ø110	2.7	Multimastic SP 10 × 20 on both sides	one	-/120/120 U/U

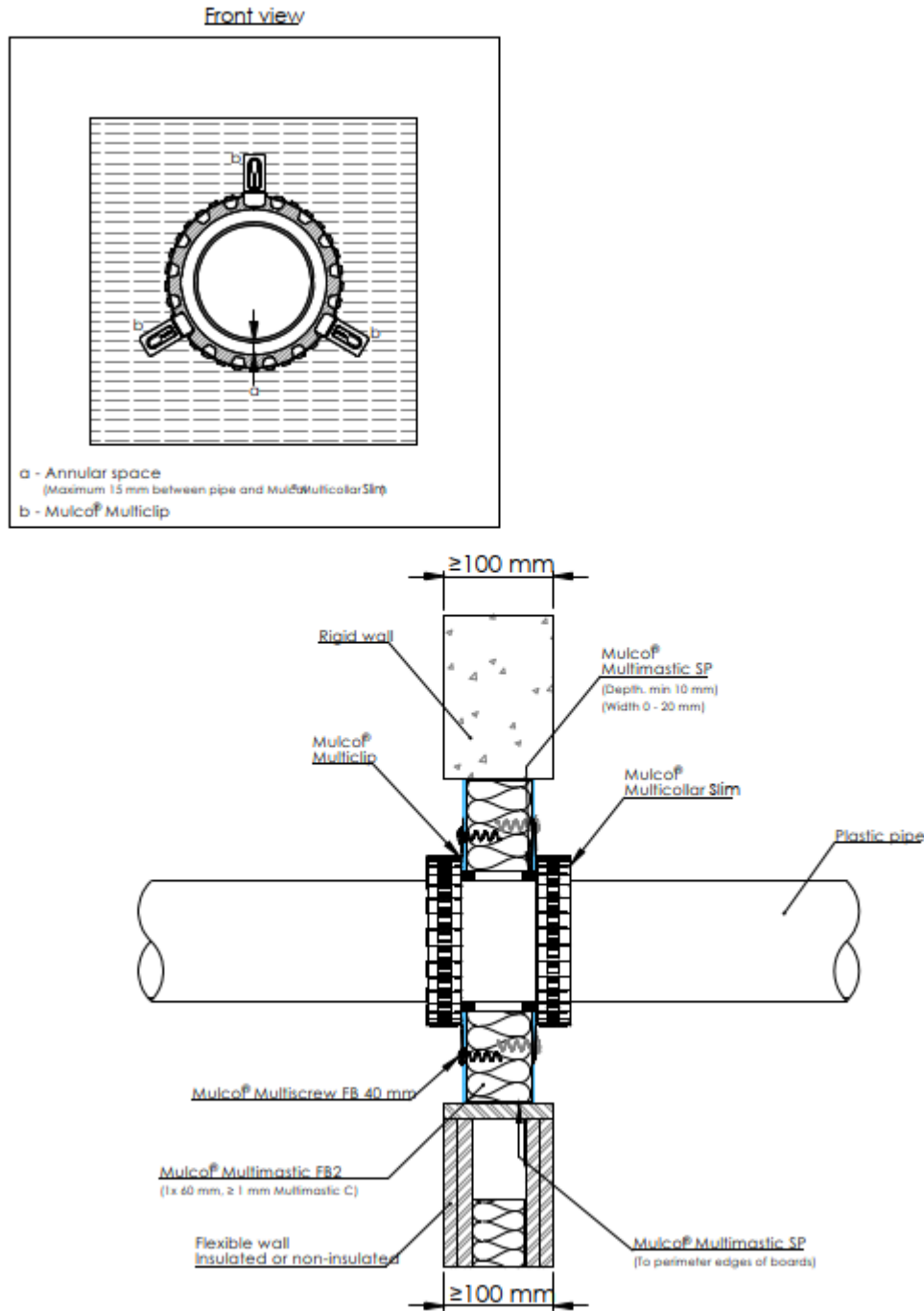


Figure 63 Plastic pipes – Mulcol Multimastic FB2 (1 × 60 mm)

Table 65 Plastic Aluminium composite pipes – Mulcol Multimastic FB1 (2 × 50 mm)

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-Xc/AL/PE-Xc	500 × 500	Ø50	4	one	-/120/60 U/C
	500 × 500	Ø75	6	two	-/90/60 U/C

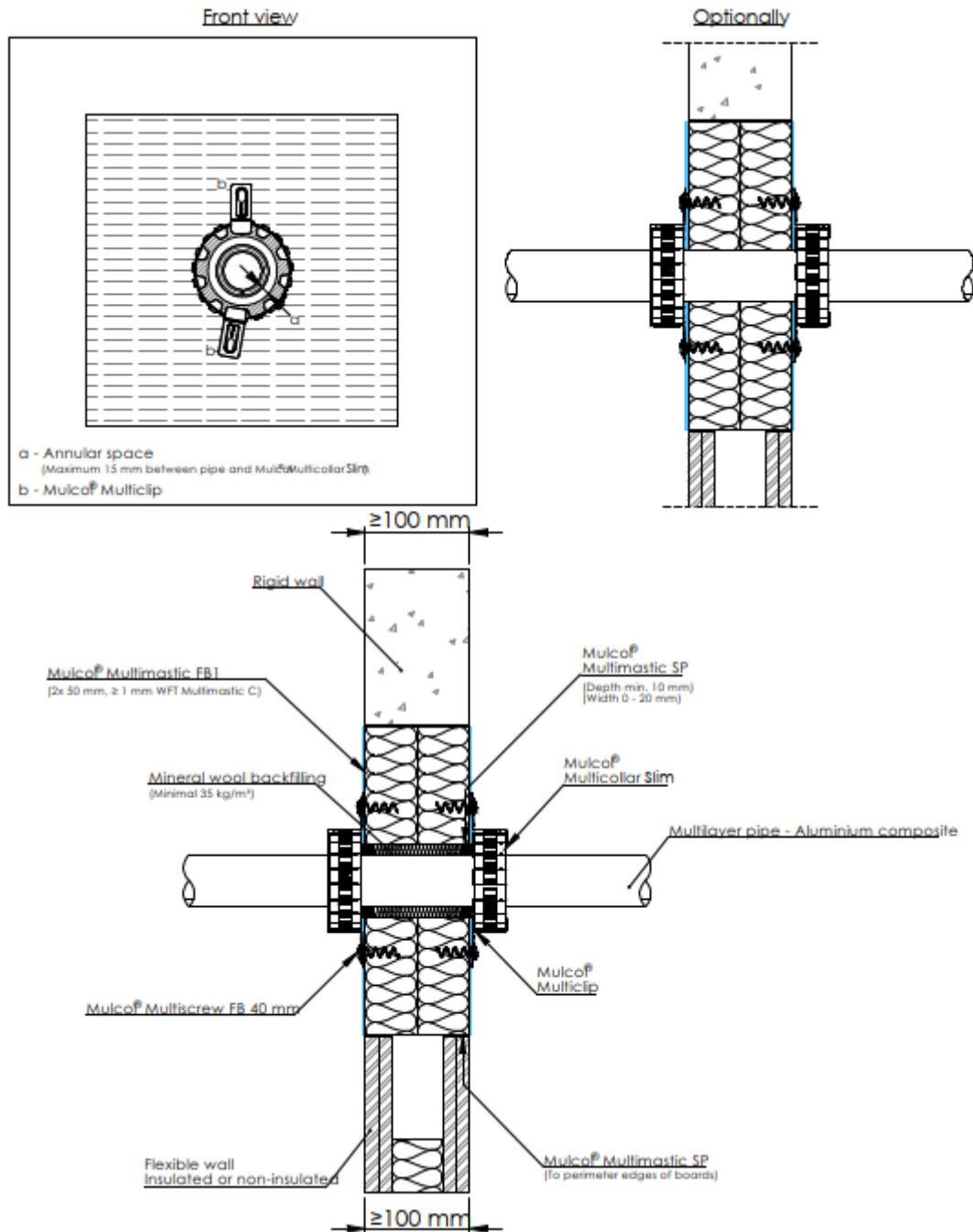


Figure 64 Plastic Aluminium composite pipes – Mulcol Multimastic FB1

**Table 66 Multiple penetrations - Mulcol Multimastic FB1 (2 × 50 mm)**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Aperture size	Insulation diameter/length each face LS/CS/LI/CI (mm)	Filling material	Number of collars	Configuration	FRL
Copper	Ø15	1.5	280 × 600	Wicu-Flex PE foam 6/400 minimum	Mulcol Multisealant A at both faces	one	C/U	-/120/90
Copper	Ø15	1.5						
PVC-U, PVC-C	Ø40	3		None			U/U	
Telecom UTP Cat. 5 or Cat. 6	1 no	N/A					N/A	
Sheathed cable YMKV 3 x 2.5 mm <sup>2</sup> , YMKV 5 x 1.5 mm <sup>2</sup> or YMKV 5 x 2.5 mm <sup>2</sup>	1 no	N/A					N/A	



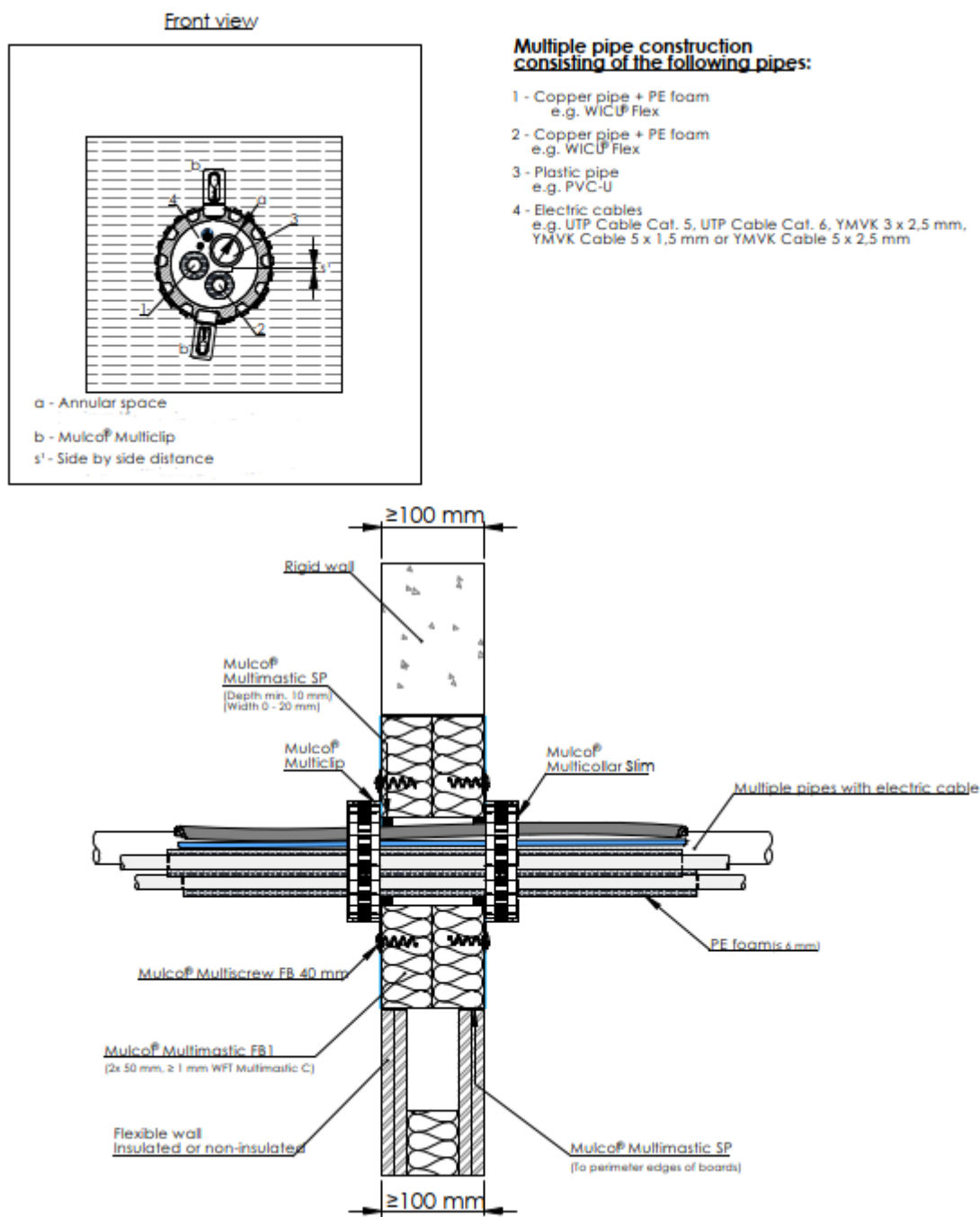
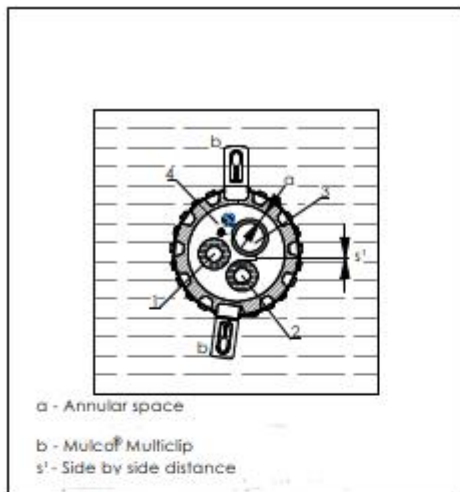


Figure 65 Multiple penetrations - Mulcol Multimastic FB1 (2 × 50 mm)

**Table 67 Multiple penetrations - Mulcol Multimastic FB2 (1 × 60 mm)**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Aperture size	Insulation diameter/length each face LS/CS/LI/CI (mm)	Filling material	Number of collars	Configuration	FRL
Copper	Ø15	1.5	280 × 600	PE foam 6/400 minimum	Mulcol Multisealant A at both faces	one	C/U	-/120/60
Copper	Ø15	1.5					C/U	
PVC-U/PVC-C	Ø40	3		None			U/U	
Telecom UTP Cat. 5 or Cat. 6	1 no	N/A					N/A	
Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> , YMVK 5 x 1.5 mm <sup>2</sup> or YMVK 5 x 2.5 mm <sup>2</sup>	1 no	N/A					N/A	

Front view



**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, YMKV 3 x 2,5 mm,  
YMKV Cable 5 x 1,5 mm or YMKV Cable 5 x 2,5 mm

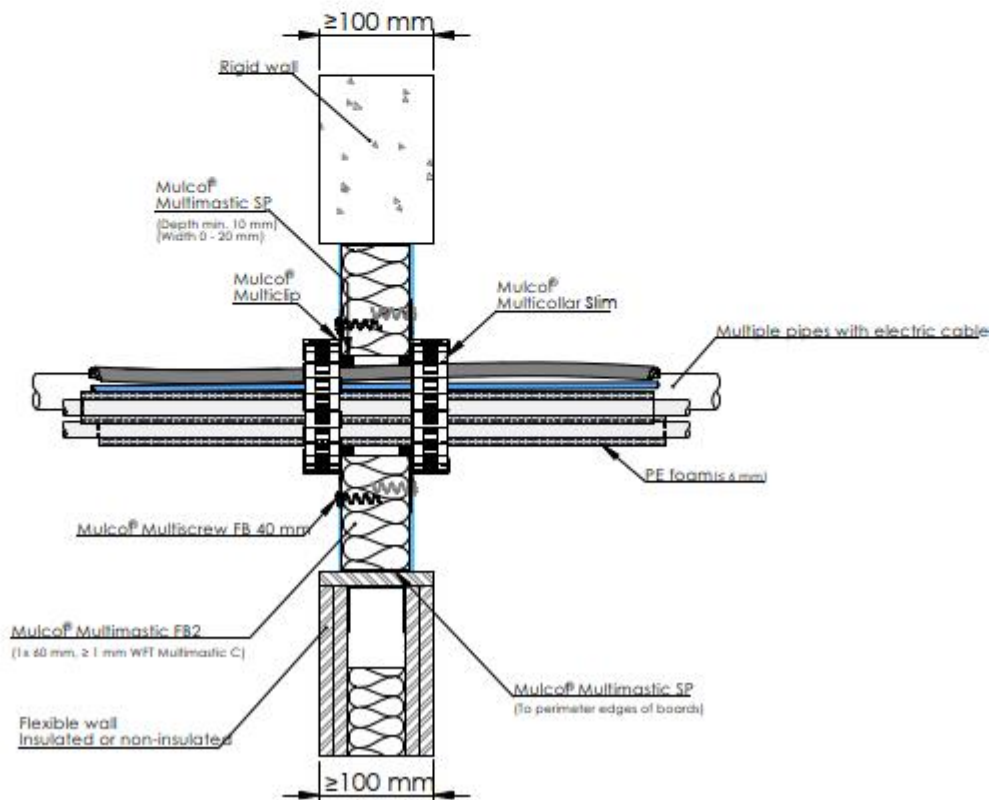


Figure 66 Multiple penetrations - Mulcol Multimastic FB2 (1 × 60 mm)

Table 68 Python drink combi pipes - Mulcol Multimastic FB1 (2 × 50 mm)

Pipe material	Pipe diameter (mm)	Maximum annular space	Insulation material	Filling material	Number of collars	FRL
Python Drinks 3 hoses	47	10	AF/Armaflex CS	Mulcol Multimastic SP to the depth of 5 mm	one	-/60/60 U/C
Python Drinks 52 hoses	145	10	AF/Armaflex CS	Mulcol Multimastic SP to the depth of 5 mm	one	-/60/60 U/C

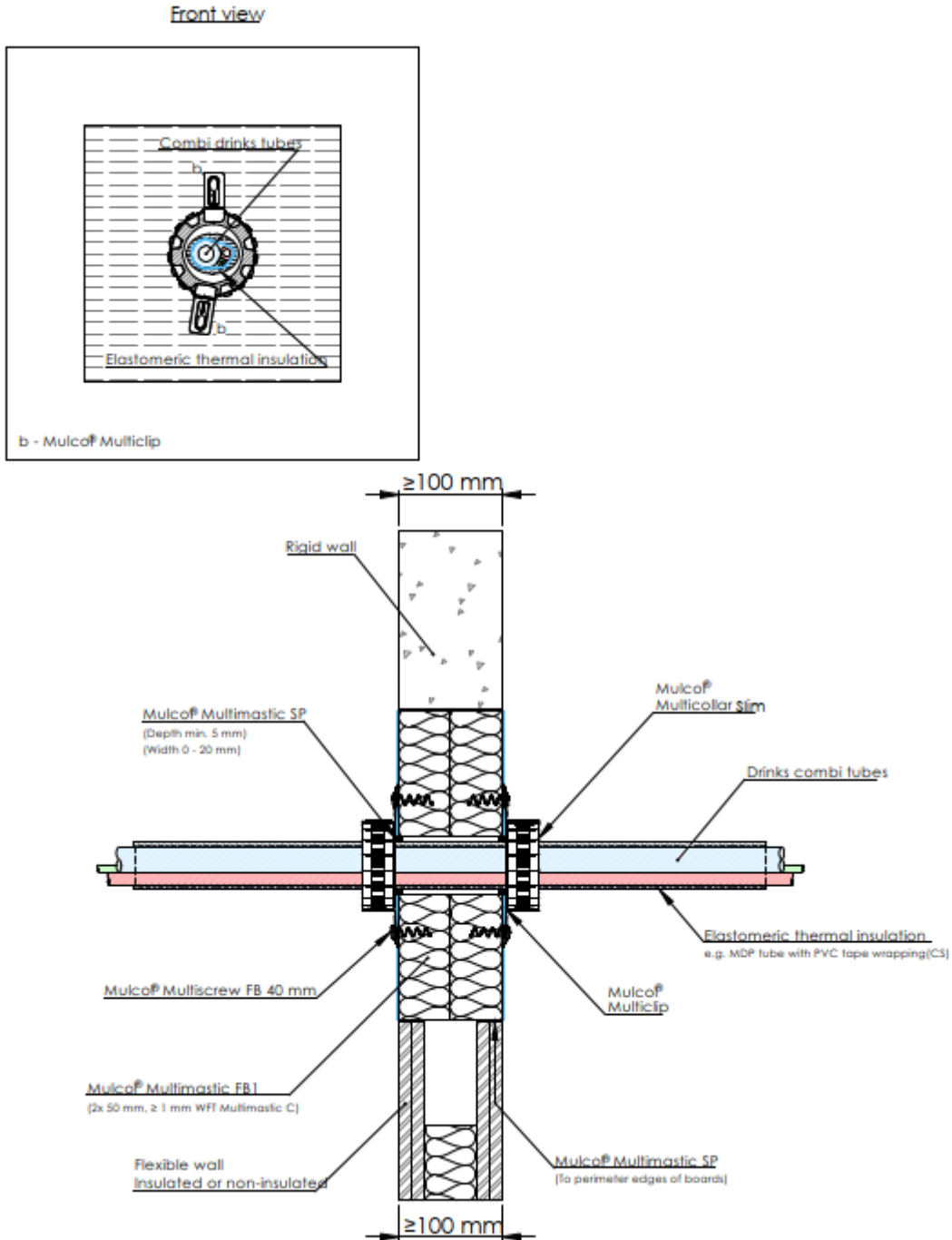
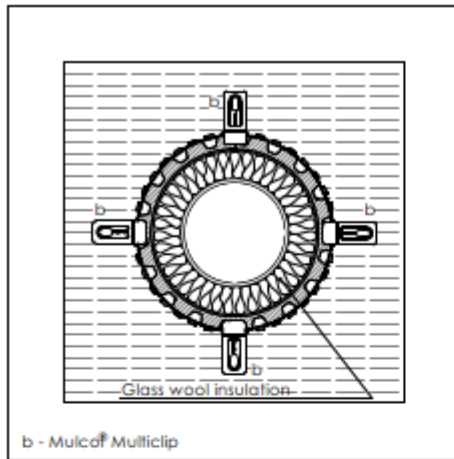


Figure 67 Python drink combi pipes - Mulcol Multimastic FB1 (2 × 50 mm)

Table 69 Steel pipe - Mulcol Multimastic FB1(2 × 50 mm)

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness/length each face	Filling material	Number of collars	Configuration	FRL
Steel	Ø76.2	3.3	IS Climcover Lamella 30 mm/400 LS	Mulcol Multimastic SP at both faces 10 × 10 mm (w × h)	one	C/U	-/120/90

Front view



b - Mulco<sup>®</sup> Multiclip

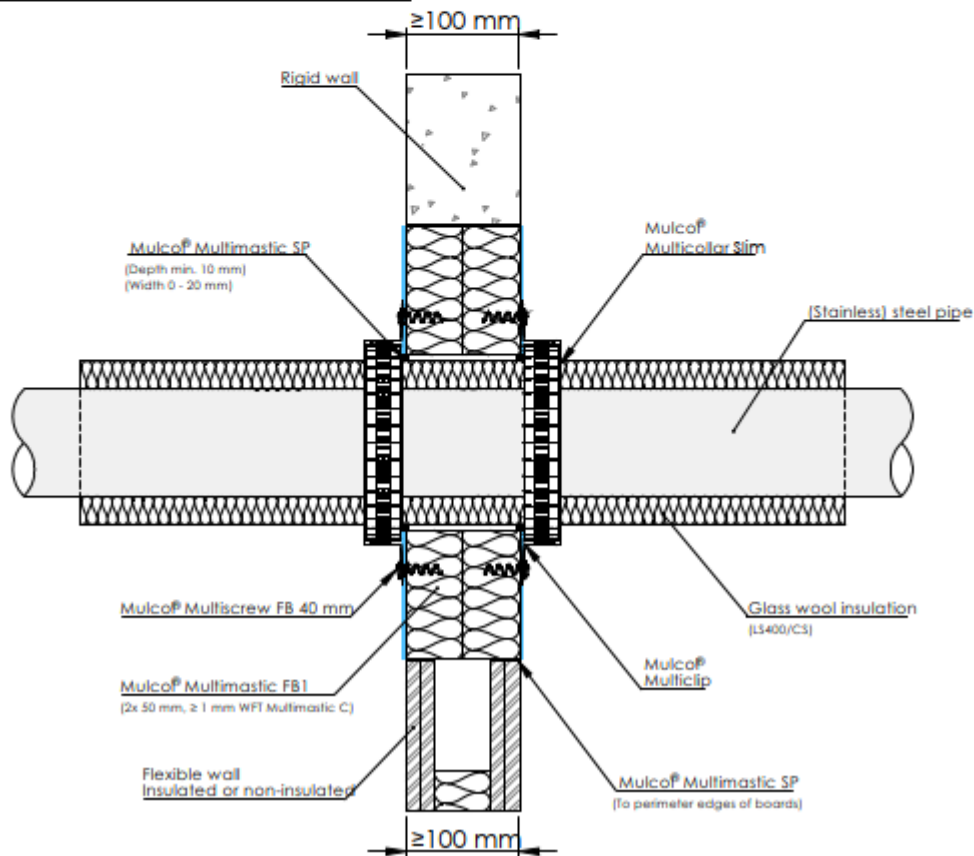


Figure 68 Steel pipe - Mulcol Multimastic FB1(2 × 50 mm)

### 6.3.10 Rubber coolwater hose

Table 70 Rubber coolwater hose

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
Rubber coolwater hose Adonis WP/BP	Ø75	6	Mulcol Multisealant SP	one	-/60/60 U/C

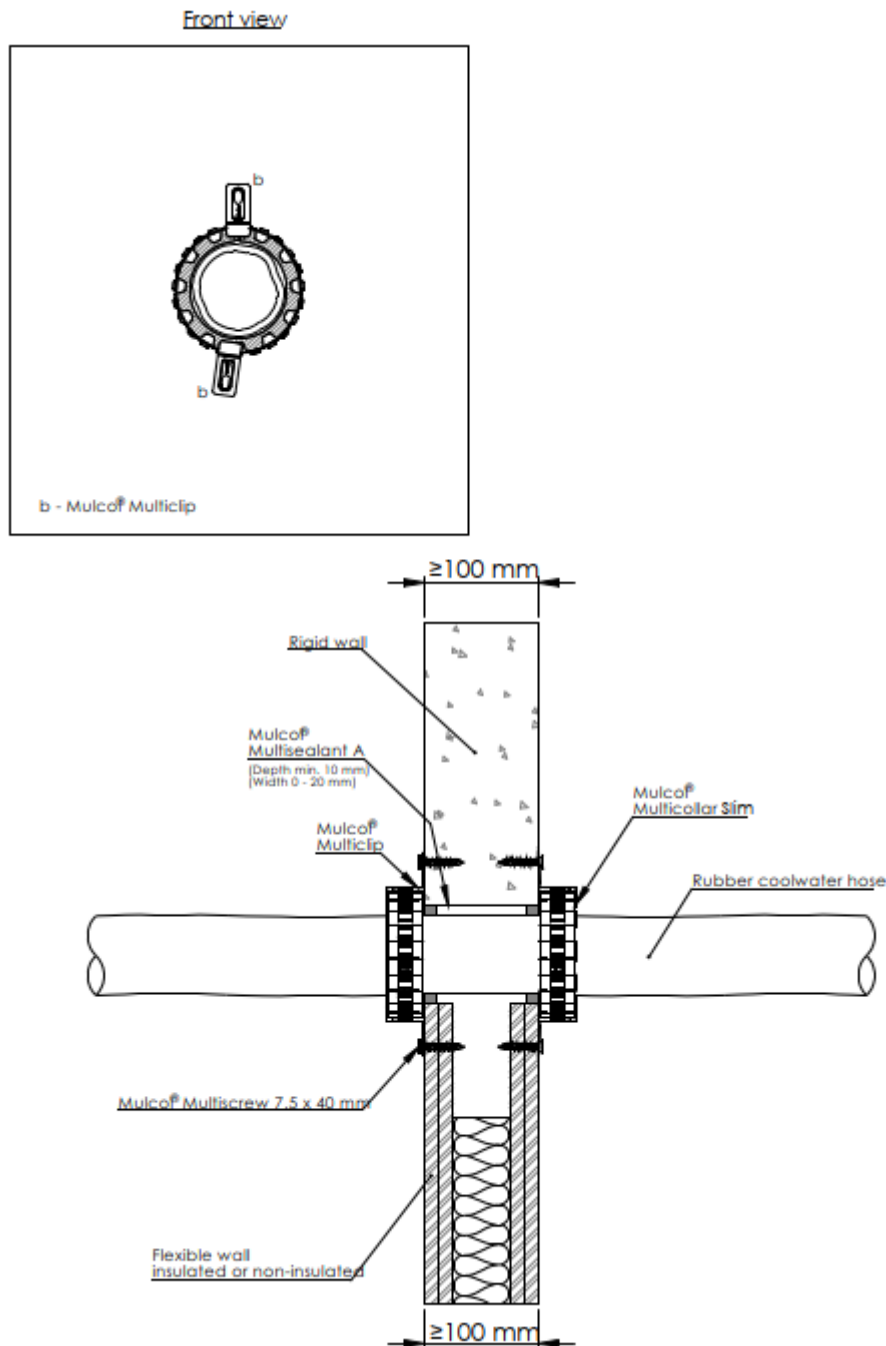


Figure 69 Rubber coolwater hose



### 6.3.11 Python drink combi pipes

Table 71 Python drink combi pipes

Pipe material	Pipe diameter (mm)	Insulation material	Filling material	Number of collars	FRL
Python Drinks 3 hoses	47	AF/Armaflex CS	Mulcol Multimastic SP to the depth of 5 mm	one	-/90/90 U/C
Python Drinks 52 hoses	145	AF/Armaflex CS	Mulcol Multimastic SP to the depth of 5 mm	one	-/60/60 U/C

Front view

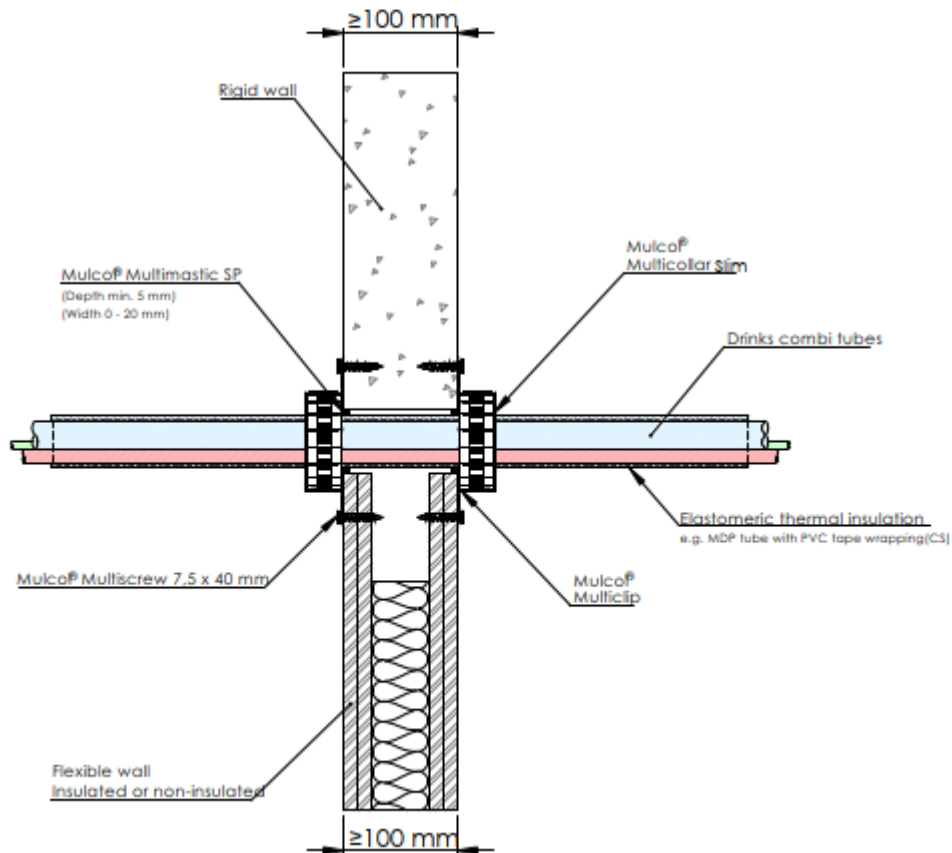
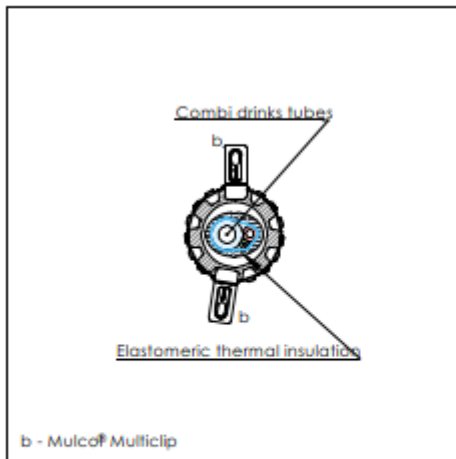


Figure 70 Python drink combi pipes

### 6.3.12 Rectangular ducts

Table 72 Rectangular ducts

Duct material	Dimensions (mm)	Wall thickness (mm)	Filling material	Number of collars	FRL
PVC -U/PVC-C	220 (width) × 90 (height)	2.0	Mulcol Multimastic SP to the depth of 5 mm	one	-/120/120 U/C

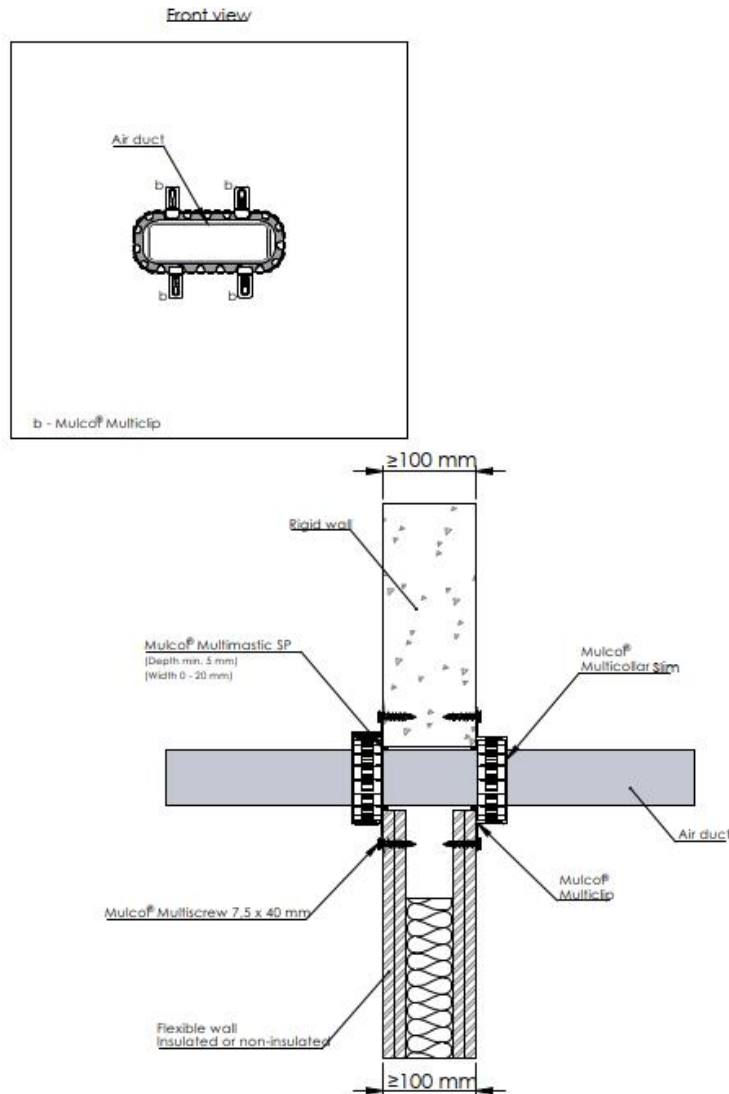


Figure 71 Rectangular ducts

## 6.4 Conclusion

It is concluded that the services protected using Mulcol® Multicollar Slim products are likely to achieve the FRLs as outlined in section 6.3 when installed in flexible/rigid wall systems in accordance with AS 1530.4:2014 and AS 4072.1:2005.

## 7. Assessment 3 - Mulcol® Multicollar Slim - Rigid floor constructions with floor thickness of minimum 150 mm

### 7.1 Description of variation

Various service penetrations including metal pipes, plastic pipes and cable configurations are protected with Mulcol® Multicollar Slim product. The services penetrating floors are protected with one or two collars from the bottom side of the floor (fire-exposed). The annular gaps in services penetrating wall systems are sealed with Mulcol® Multisealant A or Multimastic SP sealant at both faces with a depth of approximately 10 mm. The report sponsor has confirmed that both names refer to the same products, hence, can be used interchangeably.

### 7.2 Methodology

The method of assessment used is summarised in Table 7.

**Table 73 Method of assessment**

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative

### 7.3 Assessment

#### 7.3.1 Plastic pipes

##### Plastic pipes without insulation

**Table 74 Plastic pipes without insulation**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø40	2.4 -3.7	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø110	2.7-6.6	Mortar at the unexposed side and Mulcol Multisealant A at the exposed face	one	-/90/60 U/U
	Ø110	6.6	Mortar	one	-/120/120 U/U
	Ø125	4.9	Rock wool at the unexposed side and Mulcol Multisealant A at the exposed face	one	-/90/60 U/U
	Ø160	4	Mulcol Multisealant A at both faces	one	-/60/60 U/U
	Ø160	14.6	Mortar	one	-/120/120 U/C
	Ø160	4	Mortar	two	-/90/90 U/C
	Ø160	14.6	Mortar	two	-/90/90 U/C
	Ø250	7.7	Mortar	one	-/90/90 U/C
PP	Ø40	1.8-5.5	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø110	2.7-6.3	Mortar the unexposed side and Mulcol Multisealant A at the exposed face	one	-/90/90 U/U

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
	Ø125	3.1	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/90/90 U/U
	Ø125	4.8	Mulcol Multimortar	one	-/60/60 U/U
	Ø160	4	Mulcol Multisealant A at both faces	one	-/90/90 U/U
	Ø160	4-14.6	Mortar	one	-/90/90 U/C
	Ø160	14.6	Mortar	one	-/120/120 U/C
	Ø160	4	Mortar	two	-/90/90 U/U
	Ø160	14.6	Mortar	two	-/90/90 U/C
PVC-U, PVC-C	Ø40	1.9-4.5	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø110	2.2-8.2	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/U
	Ø110	8.2-12.3	Mulcol Multimortar"	one	-/90/90 U/U
	Ø125	2.5	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/60/60 U/U
	Ø160	1.8	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/30/30 U/U
	Ø160	4-11.6	Mortar Walraven Pacifyre FPM at the unexposed side and Multicol Multisealant A at the exposed face	one	-/60/60 U/U
	Ø160	4-14.6	Mortar Walraven Pacifyre FPM at the unexposed side and Multicol Multisealant A at the exposed face	one	-/60/60 U/C
	Ø160	14.6	Mortar Pacifyer	one	-/120/120 U/C
	Ø160	3.2-11.8	Mortar Walraven Pacifyre FPM at the unexposed side and Multicol Multisealant A at the exposed face	two	-/90/90 U/U
	Ø315	7.7	Mortar Walraven Pacifyre FPM	two	-/120/120 U/C

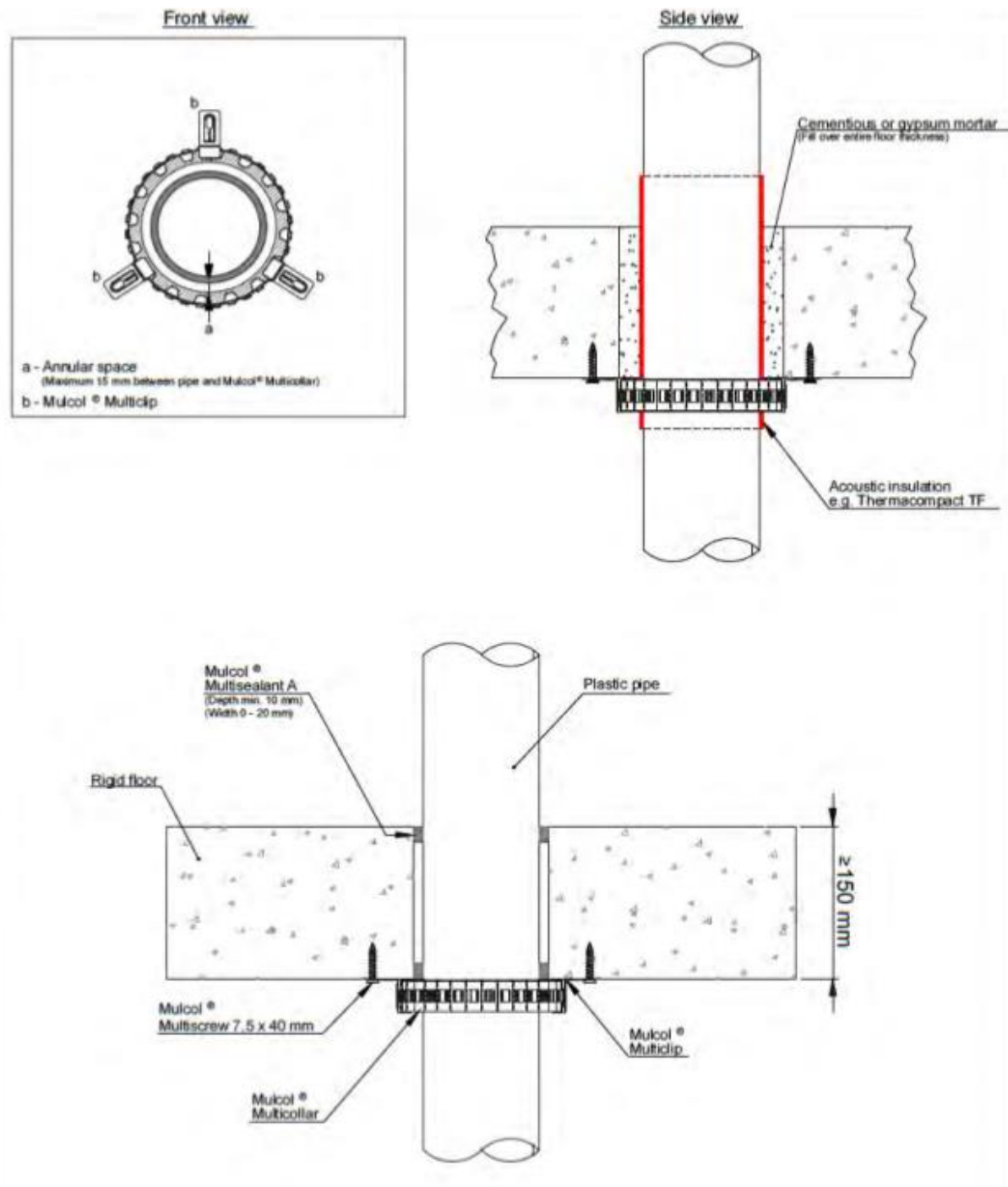


Figure 72 Plastic pipes without insulation protected with one collar



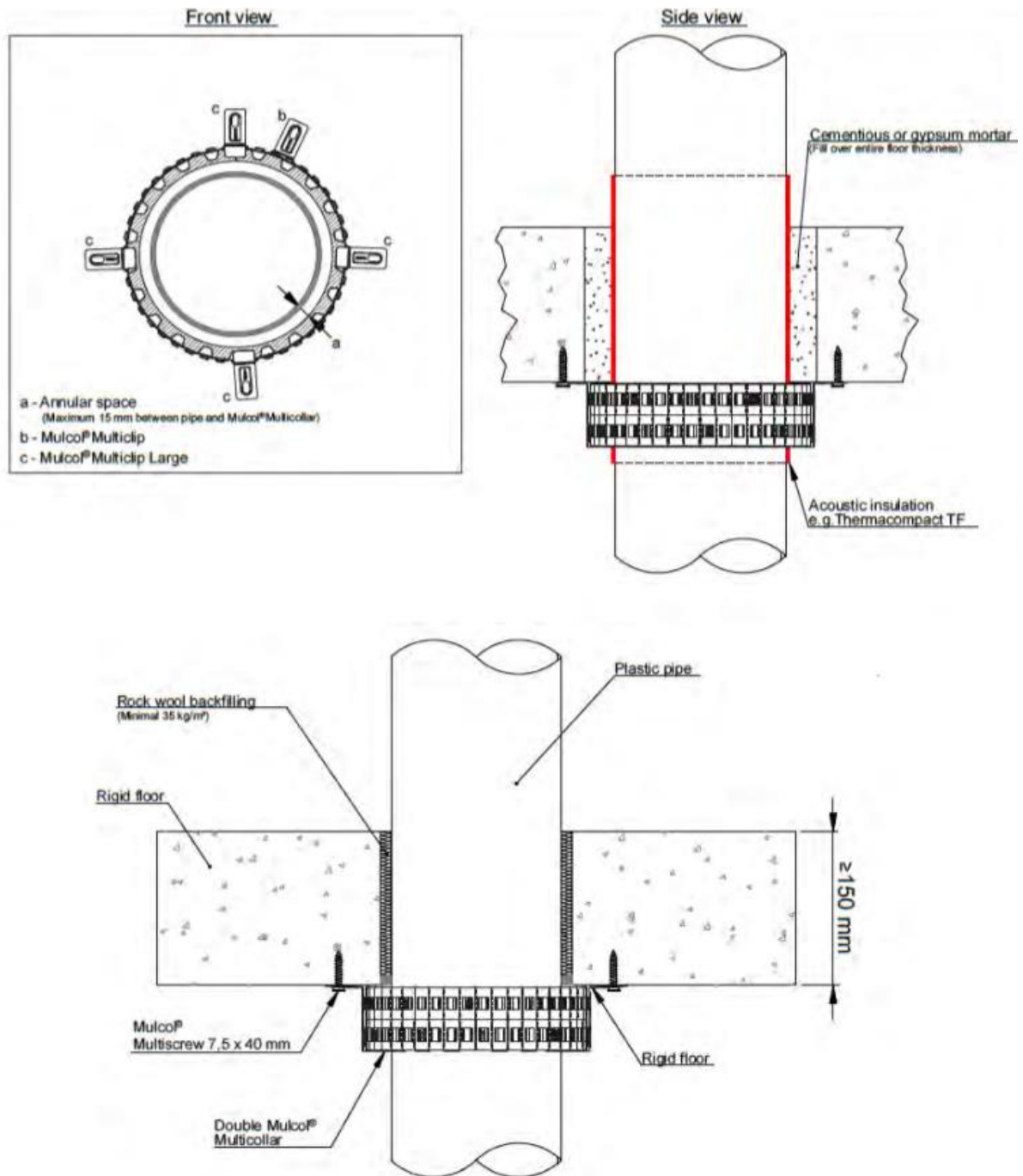


Figure 73 Plastic pipes without insulation protected with two collars

Plastic pipes fitted at angles 45°- 90° to the floor

Table 75 Plastic pipes fitted at angles 45°- 90° to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation	Filling material	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø110	3.4	Thermacompact TF (4)/ 50 mm minimum (LS)	Mortar	two	-/60/60 U/U
		10	N/A	Mortar	two	-/90/90 U/U
PP	Ø110	3.4	Thermacompact TF (4)/ 50 mm minimum (LS)	Mortar	two	-/120/120 U/U
		10	N/A	Mortar	two	-/90/90 U/U
PVC-U/PVC-C	Ø110	3.4	Thermacompact TF (4)/ 50 mm minimum (LS)	Mortar	two	-/60/60 U/U
		10	N/A	Mortar	two	-/90/90 U/U

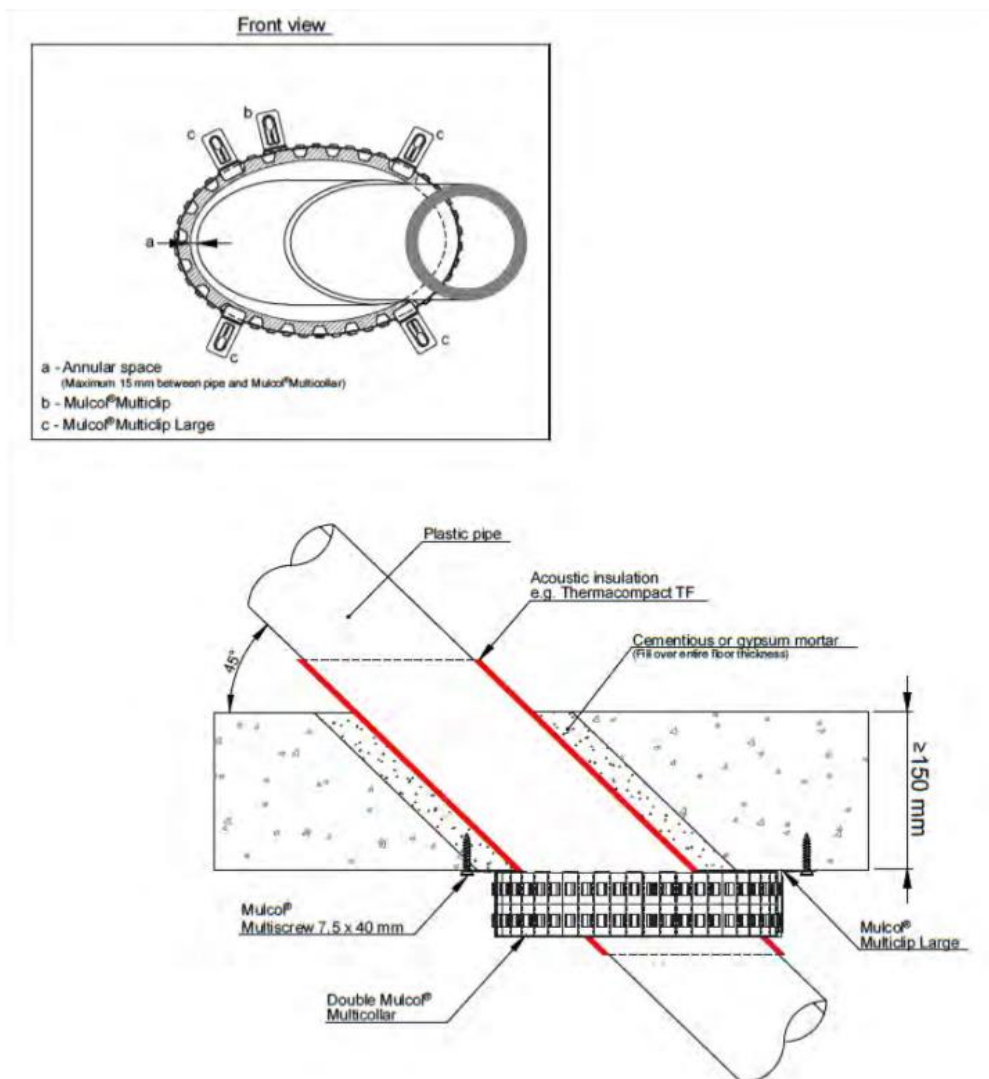


Figure 74 Plastic pipes fitted at angles 45°- 90° to the floor protected with two collars

Plastic pipes, perpendicular to the floor, in a seal penetration system

Table 76 Plastic pipes, perpendicular to the floor, in a seal penetration system

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PP	Ø110	2.7	one	-/90/90 U/U
		2.7-6.3	one	-/60/60 U/U
PE-HD, PE-X, ABS, SAN-PVC	Ø110	2.7	one	-/90/45 U/U
		2.7-6.6	one	-/60/45 U/U
PVC	Ø110	2.7	one	-/90/45 U/U
		2.7-6.3	one	-/60/45 U/U

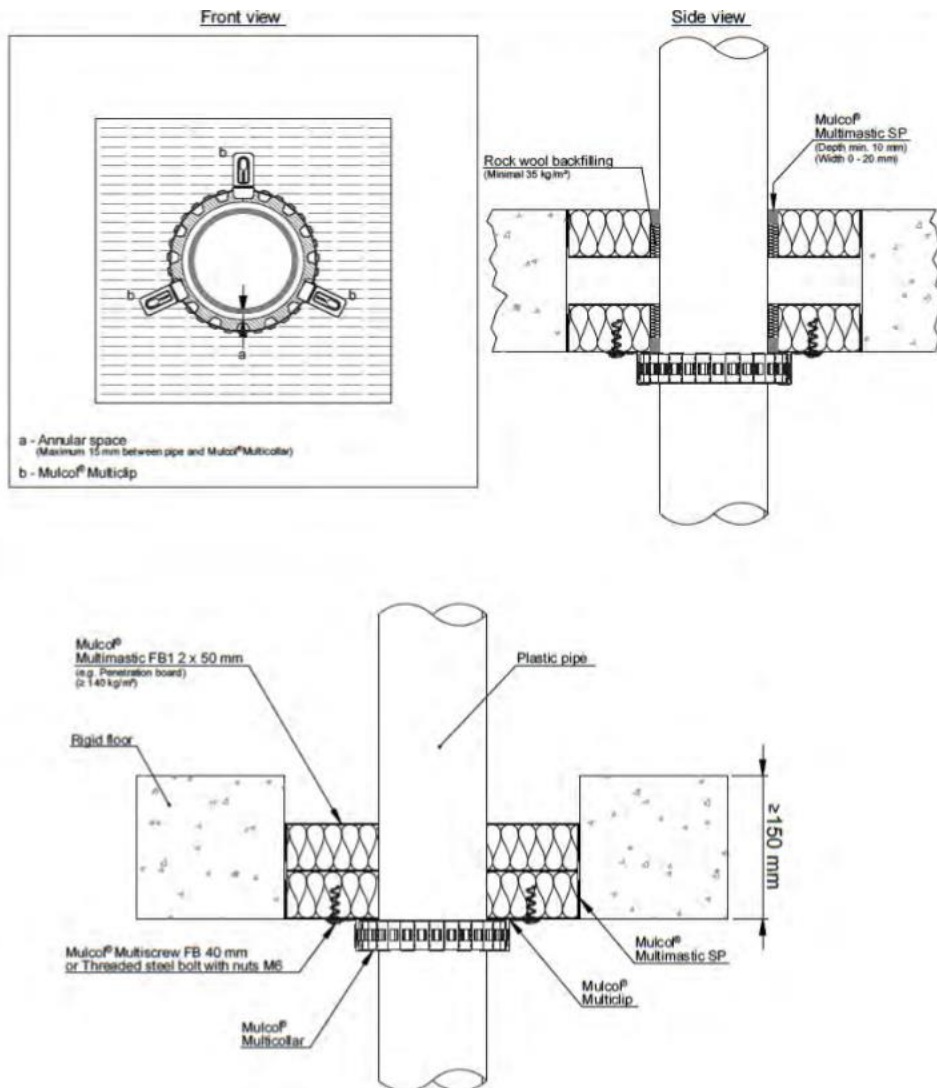


Figure 75 Plastic pipes, perpendicular to the floor, in a seal penetration system

Plastic pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam

Table 77 Plastic pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness/ length	Filling material	Number of collars	FRL
PVC-U, PVC-C	Ø110	3.2	9-32 mm/ 450 LS	Mulcol Multisealant A at both faces.	two	-/120/120 U/U

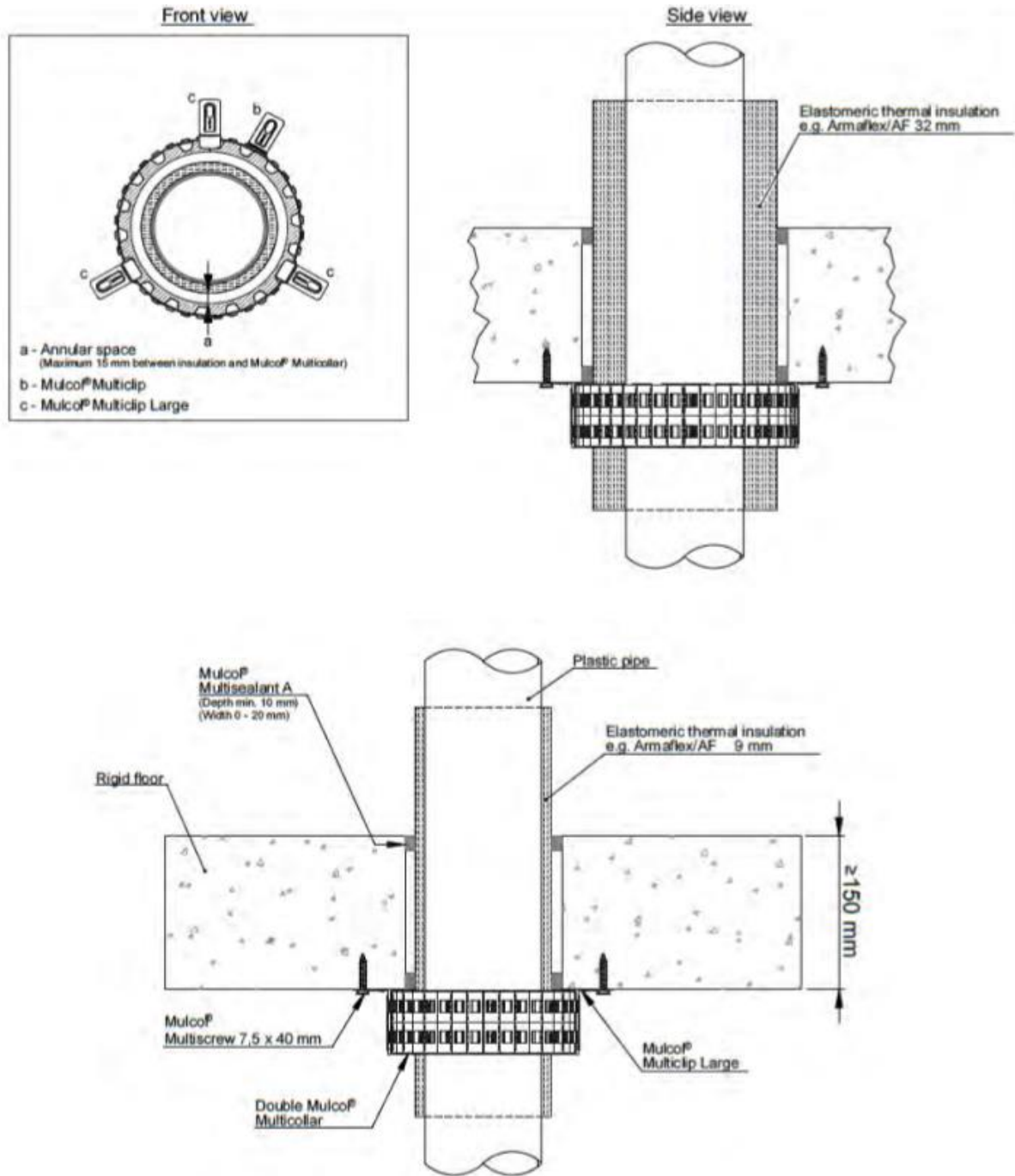


Figure 76 Plastic pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam

Plastic pipes with pipe collar cast into the soffit

Table 78 Plastic pipes with pipe collar cast into the soffit

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
PP	Ø110	5.3	Mortar	one	-/30/15 U/U

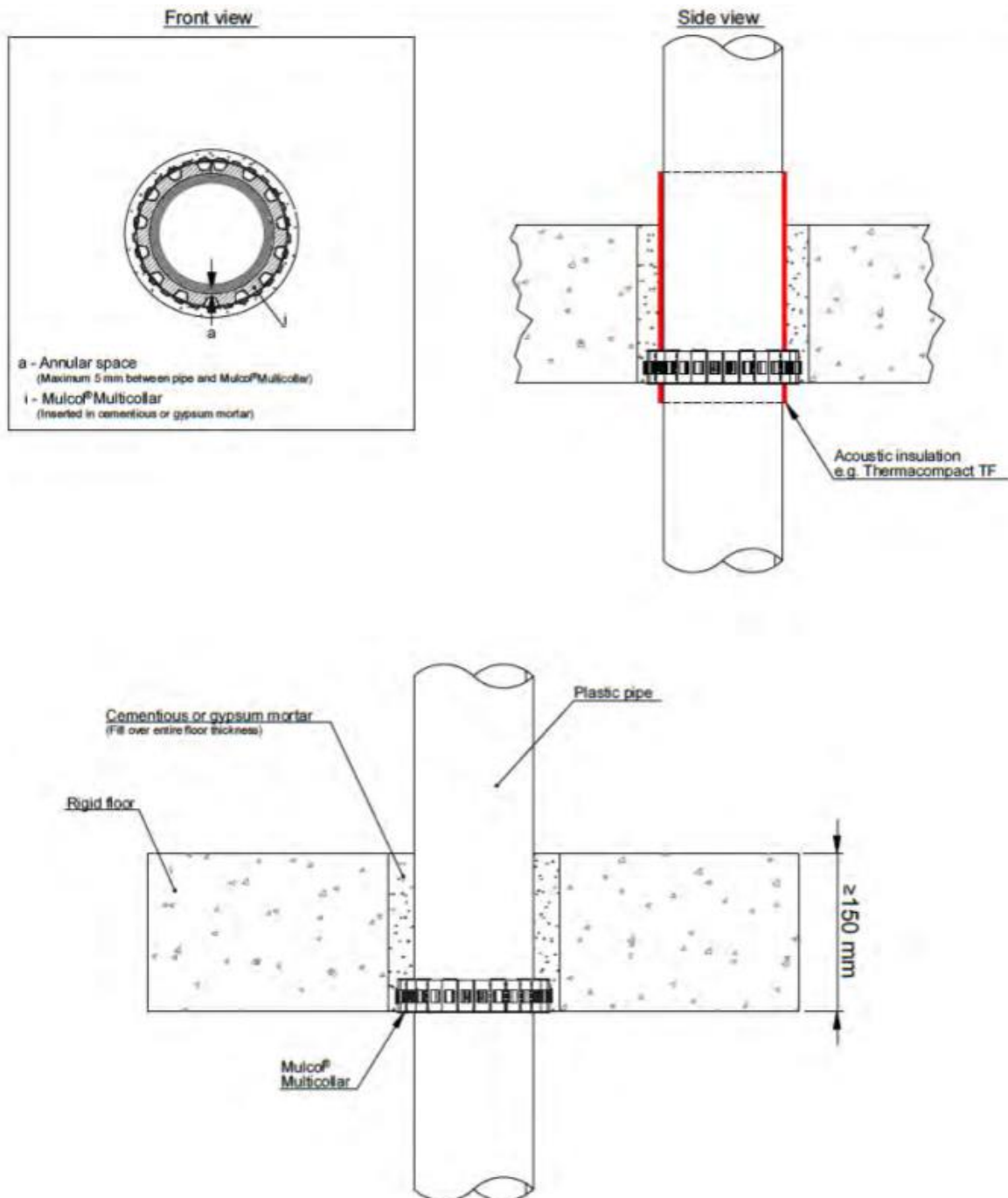


Figure 77 Plastic pipes with pipe collar cast into the soffit

Plastic pipes with an (electrofusion) pipe coupling

Table 79 Plastic pipes with an (electrofusion) pipe coupling

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø110	4.3	Mortar	one	-/90/90 U/C
	Ø125	7.4	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/60/60 U/C

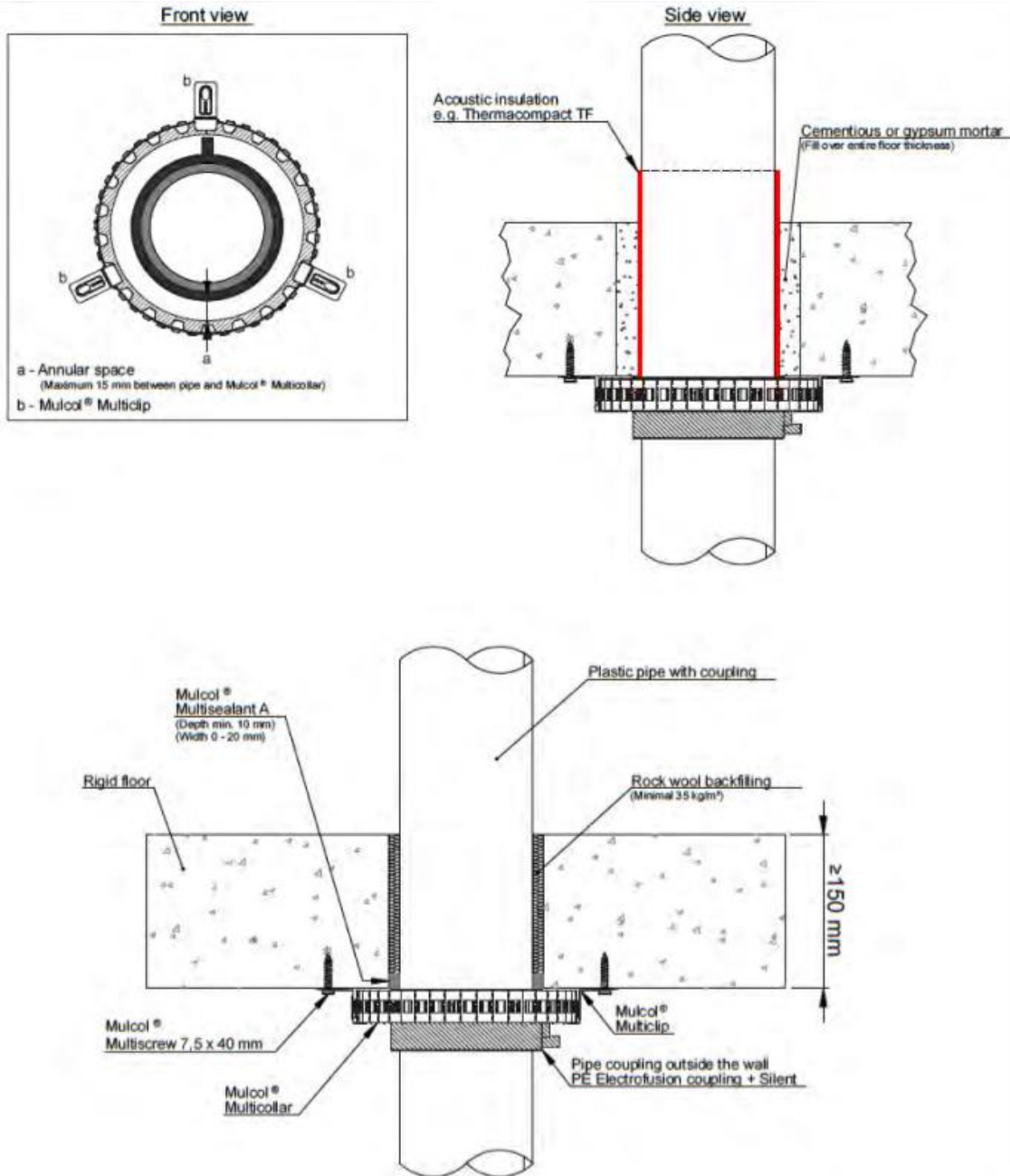


Figure 78 Plastic pipes with an (electrofusion) pipe coupling



Plastic pipes with elbows

Table 80 Plastic pipes with elbows

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Elbow type	Filling material	Number of collars	FRL
PVC-U, PVC-C	Ø50	3	PVC-U / PVC-C Ø50 mm 2x 45°	Mortar	one	-/90/90 U/U
	Ø110	3.2	PVC-U / PVC-C Ø110 mm 2x 45°	Mortar	one	-/60/45U /U

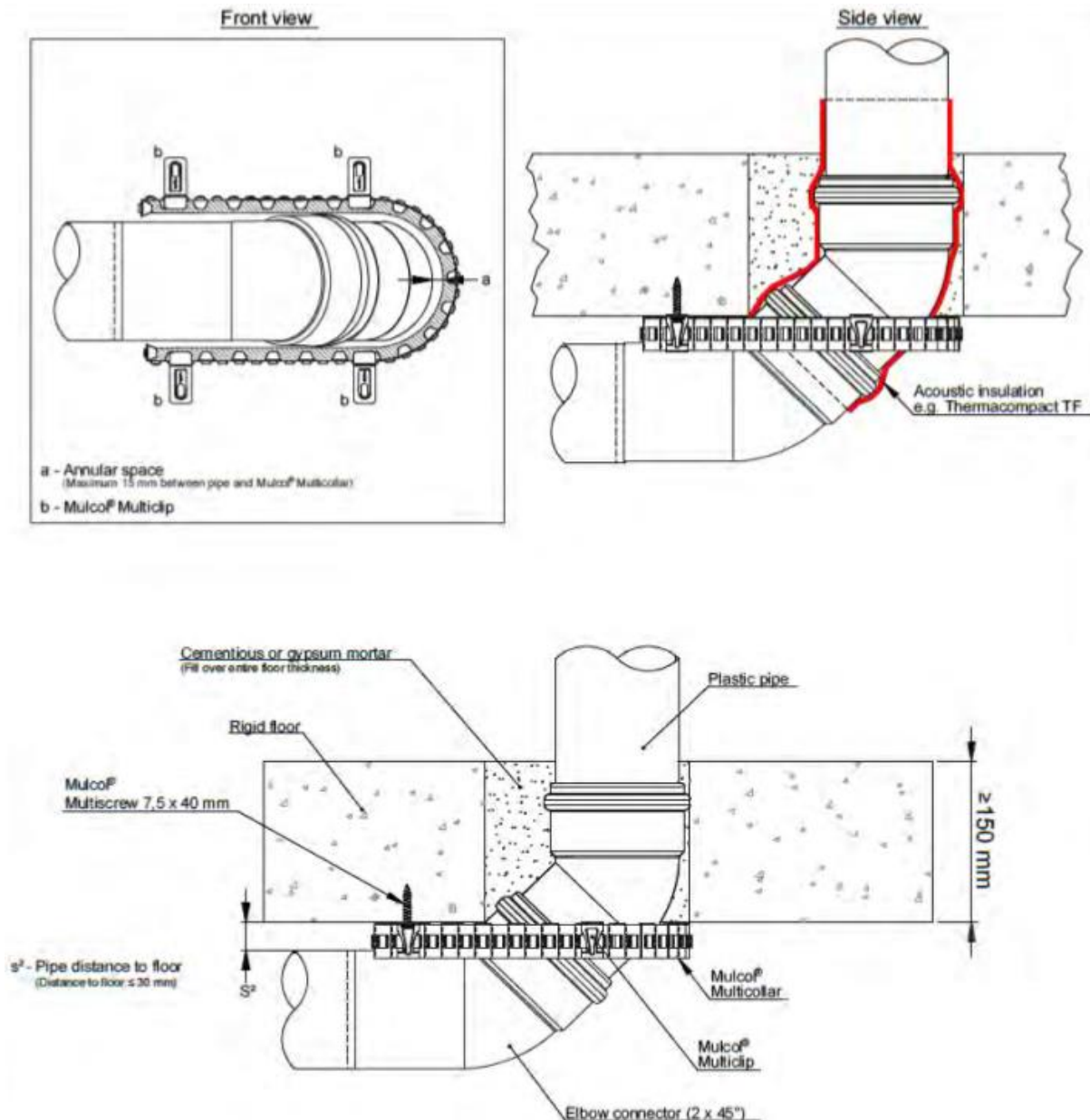


Figure 79 Plastic pipes with elbows

Plastic pipes in floor corner

Table 81 Plastic pipes in floor corner

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation	Filling material	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø110	6.6	N/A	Mulcol Multimortar	one	-/120/120 U/U
PP	Ø110	6.3	Thermacompact TF (4)/ 50 (LS)	Mortar	one	-/90/60 U/U

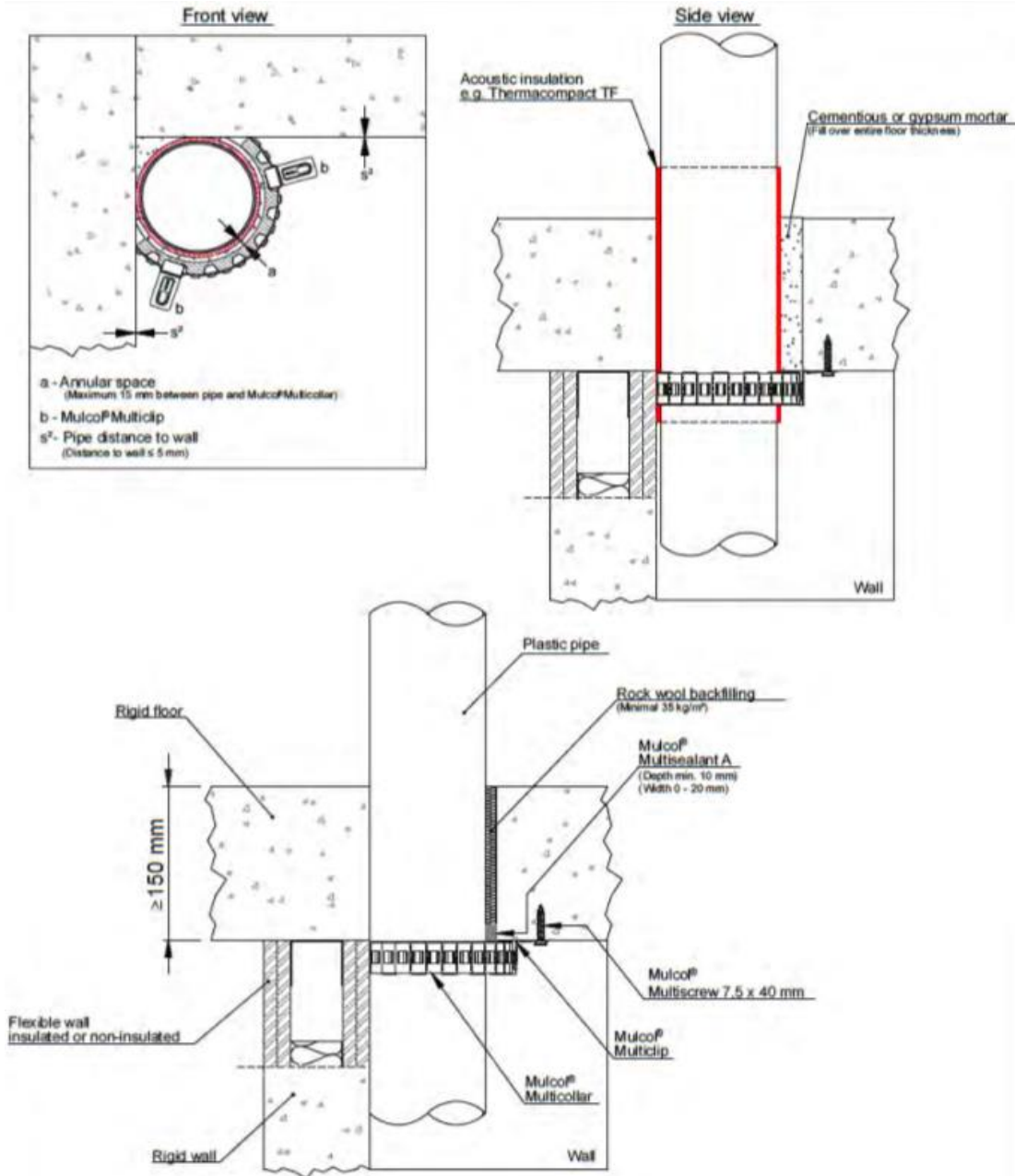


Figure 80 Plastic pipes in floor corner

### 7.3.2 Plastic pipes (Silent)

#### Plastic pipes (silent) perpendicular to floor

Table 82 Plastic pipes (silent) perpendicular to floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness/ length (mm)	Filling material	Number of collars	FRL
Raupiano Plus	Ø50	1.8-4	N/A	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø110	2.7-4	Thermacomp act TF (4)/ 50 LS	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø160	4	N/A	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/U
Geberlt Silent dB20	Ø56	3.2-7	N/A	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/U
	Ø110	6-7	Thermacomp act TF (4)/ 50 LS	Mulcol Multisealant A at both faces	one	-/120/120 U/U
	Ø160	7	N/A	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/U
Wavin SiTech+	Ø110	3.6	N/A	Mortar	one	-/120/120 U/U
	Ø160	5	N/A	Mortar	two	-/120/120 U/C

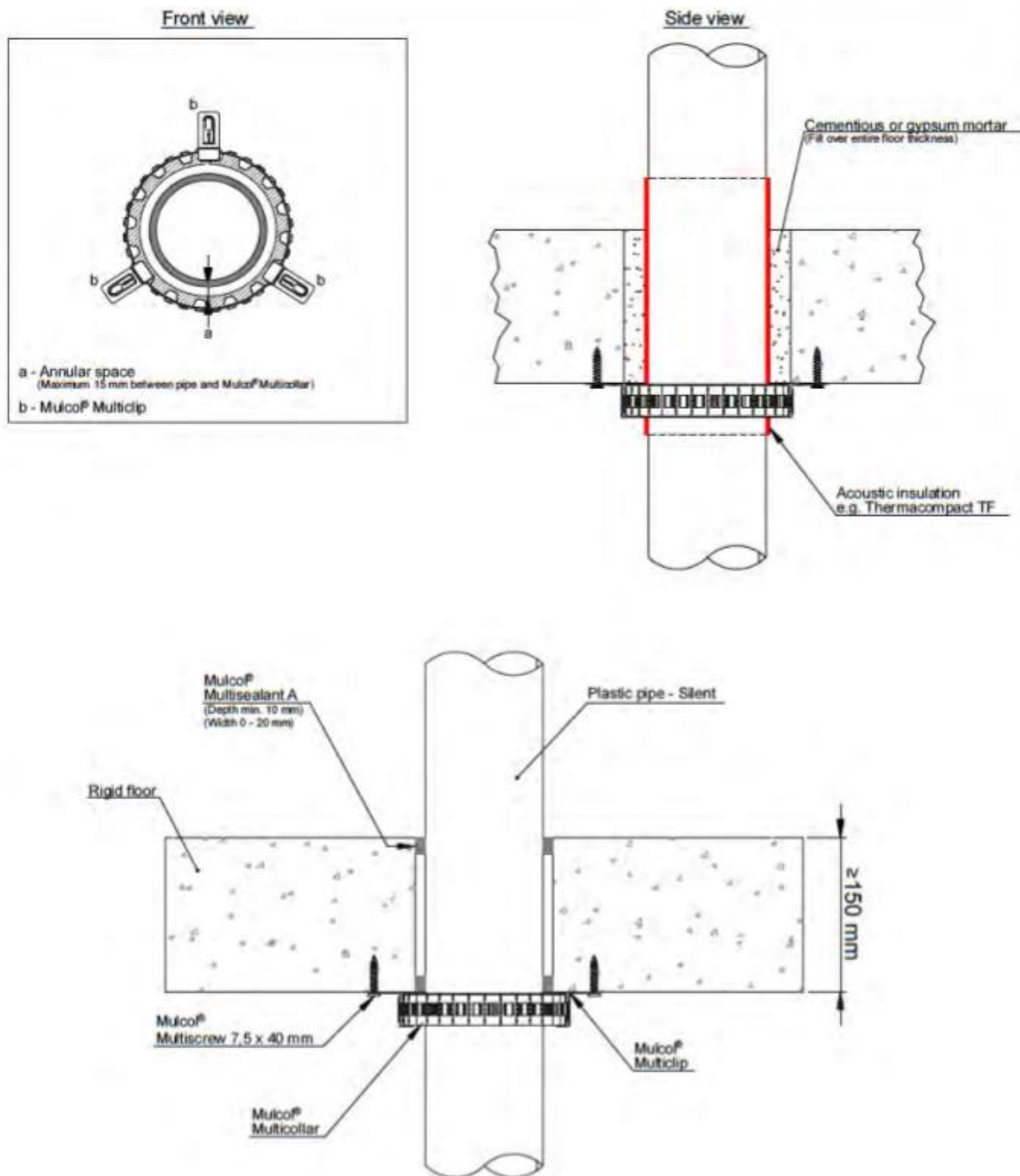


Figure 81 Plastic pipes (silent) perpendicular to floor

Plastic pipes (silent) fitted at angles 45°-90° to the floor

Table 83 Plastic pipes (silent) fitted at angles 45°-90° to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness/length (mm)	Filling material	Number of collars	FRL
Geberit Silent dB20	Ø110	6	Thermacompact TF (4)/ 50 LS	Mortar	two	-/120/90 U/U

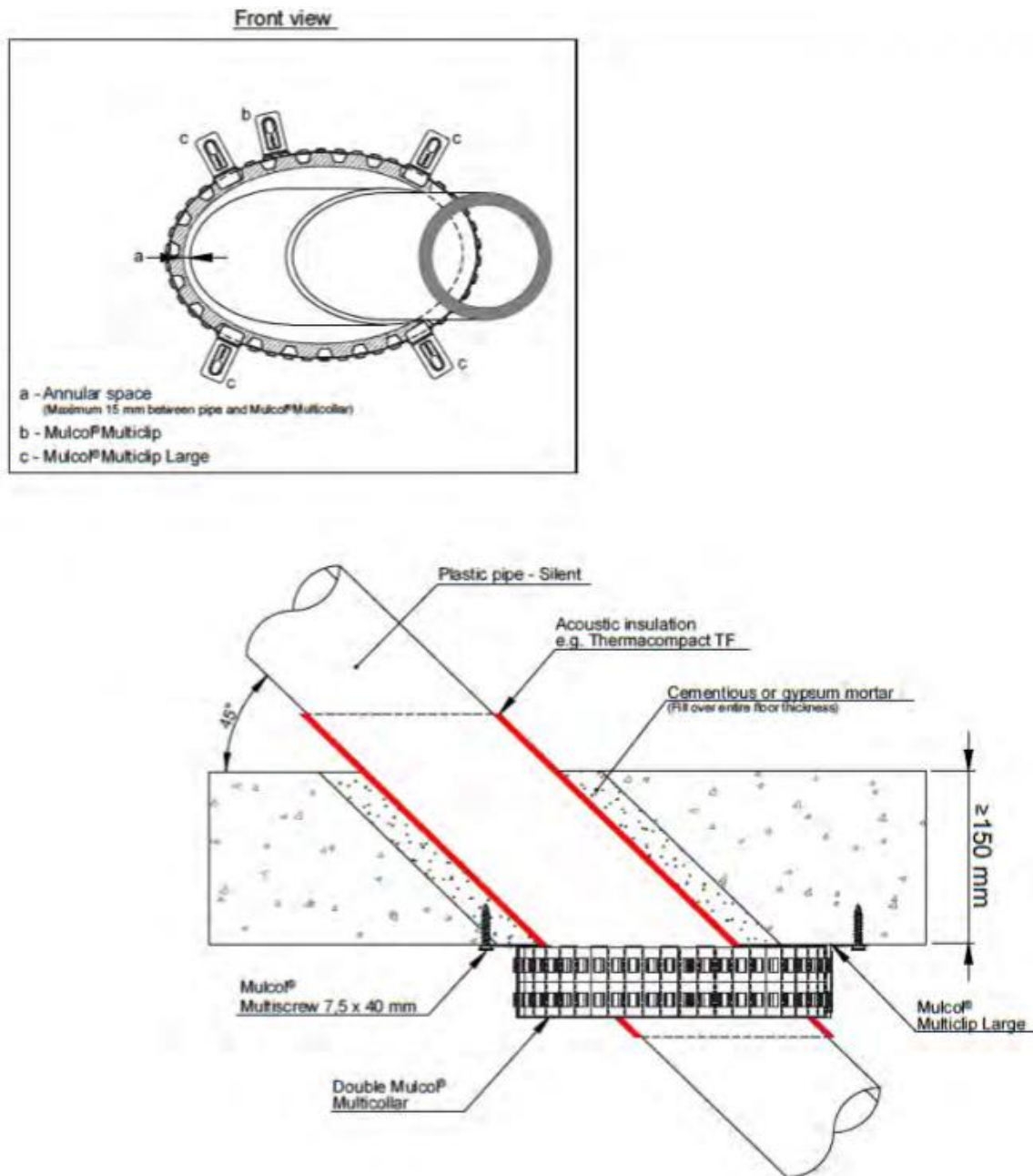
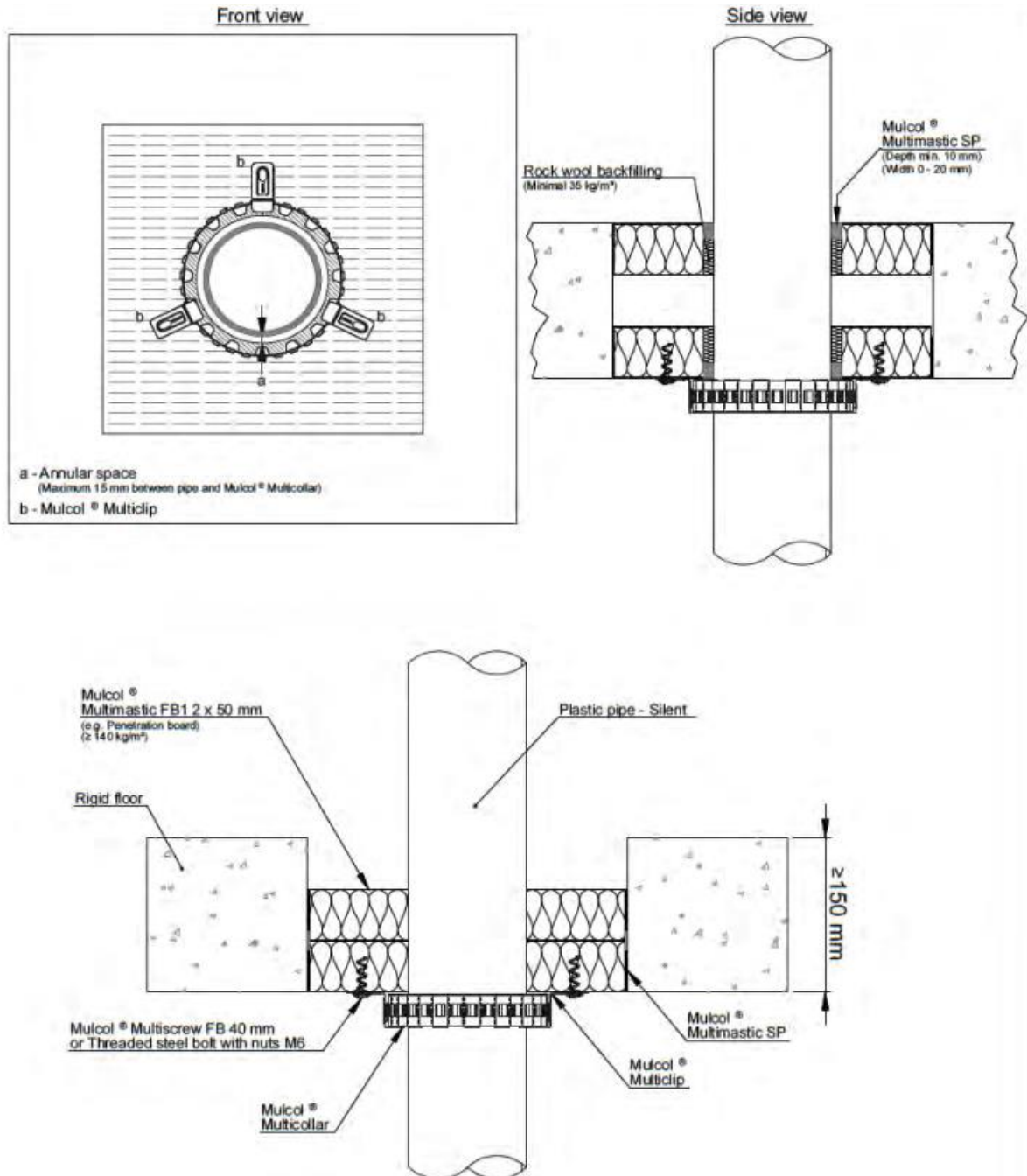


Figure 82 Plastic pipes (silent) fitted at angles 45°-90° to the floor

**Plastic pipes (silent), perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals**

**Table 84 Plastic pipes (silent), perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Geberit Silent dB20	Ø110	6	one	-/90/90 U/U



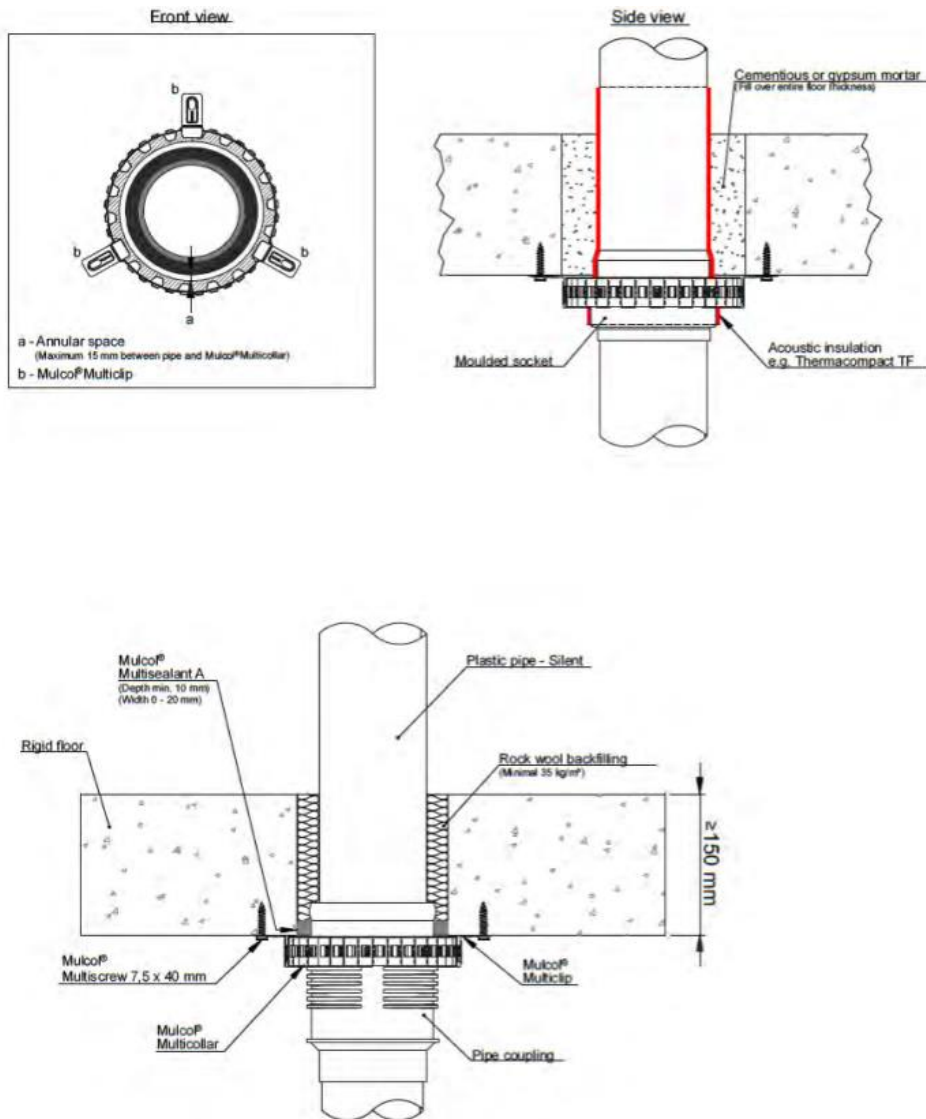
**Figure 83 Plastic pipes (silent), perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals**



**Plastic pipes (Silent) with moulded socket or expansion pipe coupling**

**Table 85 Plastic pipes (Silent) with moulded socket or expansion pipe coupling**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Type of coupling	Filling material	Number of collars	FRL
Geberlt Silent dB20	Ø110	6	Geberlt Silent dB20 Ø110 mm expansion coupling	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/U
Raupiano Plus	Ø110	2.7	Raupiano Plus Ø110 mm moulded socket	Mortar at the unexposed side and Multicol Multisealant A at the exposed face	one	-/120/120 U/C
Wavin SiTech+	Ø110	3.6	Wavin SiTech+ Ø110 mm socket	Mortar at the unexposed side and Multicol Multisealant A at the exposed face	one	-/90/30 U/U

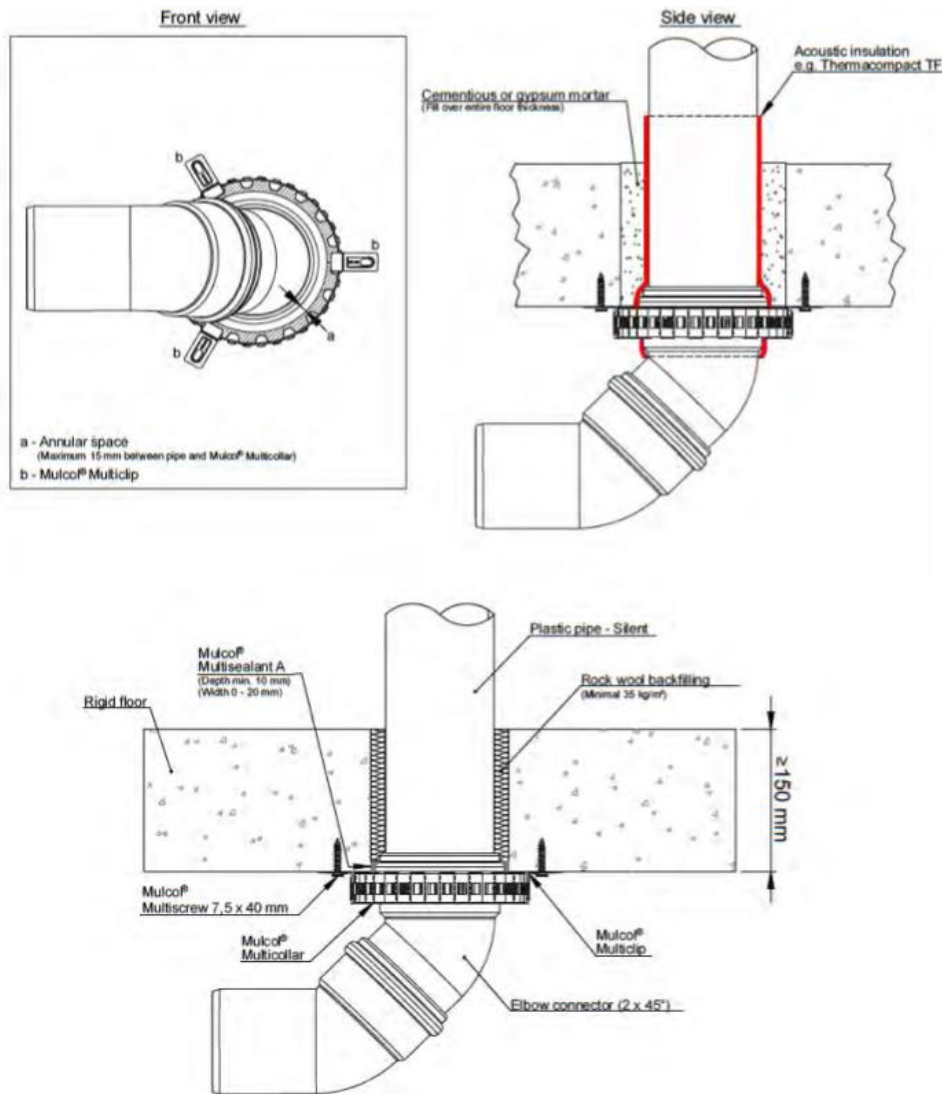


**Figure 84 Plastic pipes (Silent) with moulded socket or expansion pipe coupling**

**Plastic pipes (silent) with an elbow circular collar, perpendicular to the floor**

**Table 86 Plastic pipes (silent) with an elbow circular collar, perpendicular to the floor**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation on thickness/length (mm)	Type of elbow	Filling material	Number of collars	FRL
Wavin AS (PP)	Ø110	5.3	N/A	Wavin AS PP 110mm 2x 45°	Mortar at unexposed side and Mulcol Multisealant A at exposed face	one	-/120/120 U/U
Geberit Silent dB20	Ø110	6	Therma compact TF (4) 50 LS	Geberit Silent dB 20 110mm 2x 45°	Mortar	one	-/90/90 U/U



**Figure 85 Plastic pipes (silent) with an elbow circular collar, perpendicular to the floor**

Plastic pipes (silent) with an elbow in U shape, perpendicular to the floor

Table 87 Plastic pipes (silent) with an elbow in U shape, perpendicular to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness / length (mm)	Type of elbow	Filling material	Number of collars	FRL
Geberit Silent dB20	Ø110	6	Thermaco mpack TF (4) / 50 LS	Geberit Silent dB 20 Ø110 mm 2x 45°	Mortar	one	-/90/90 U/U

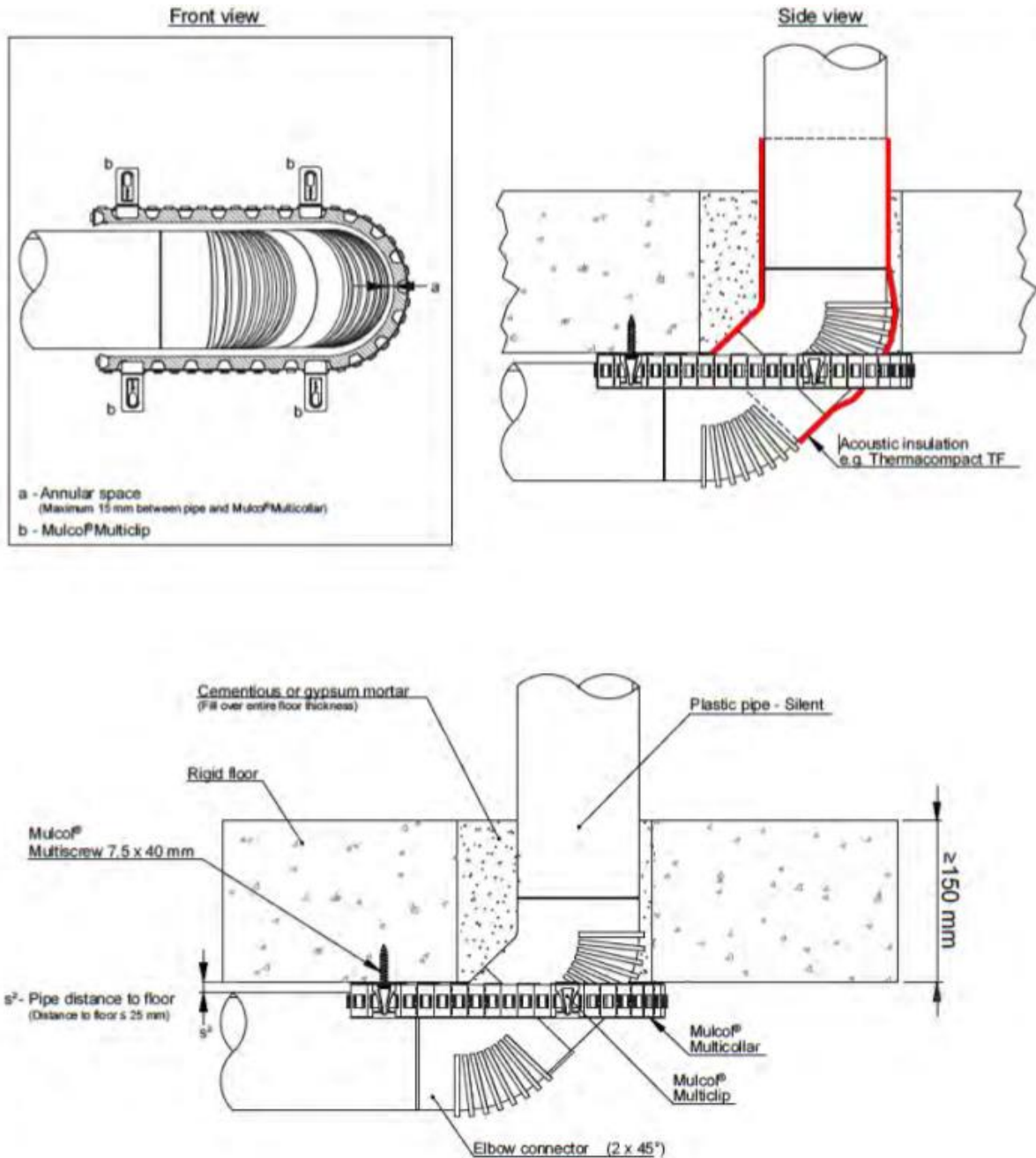
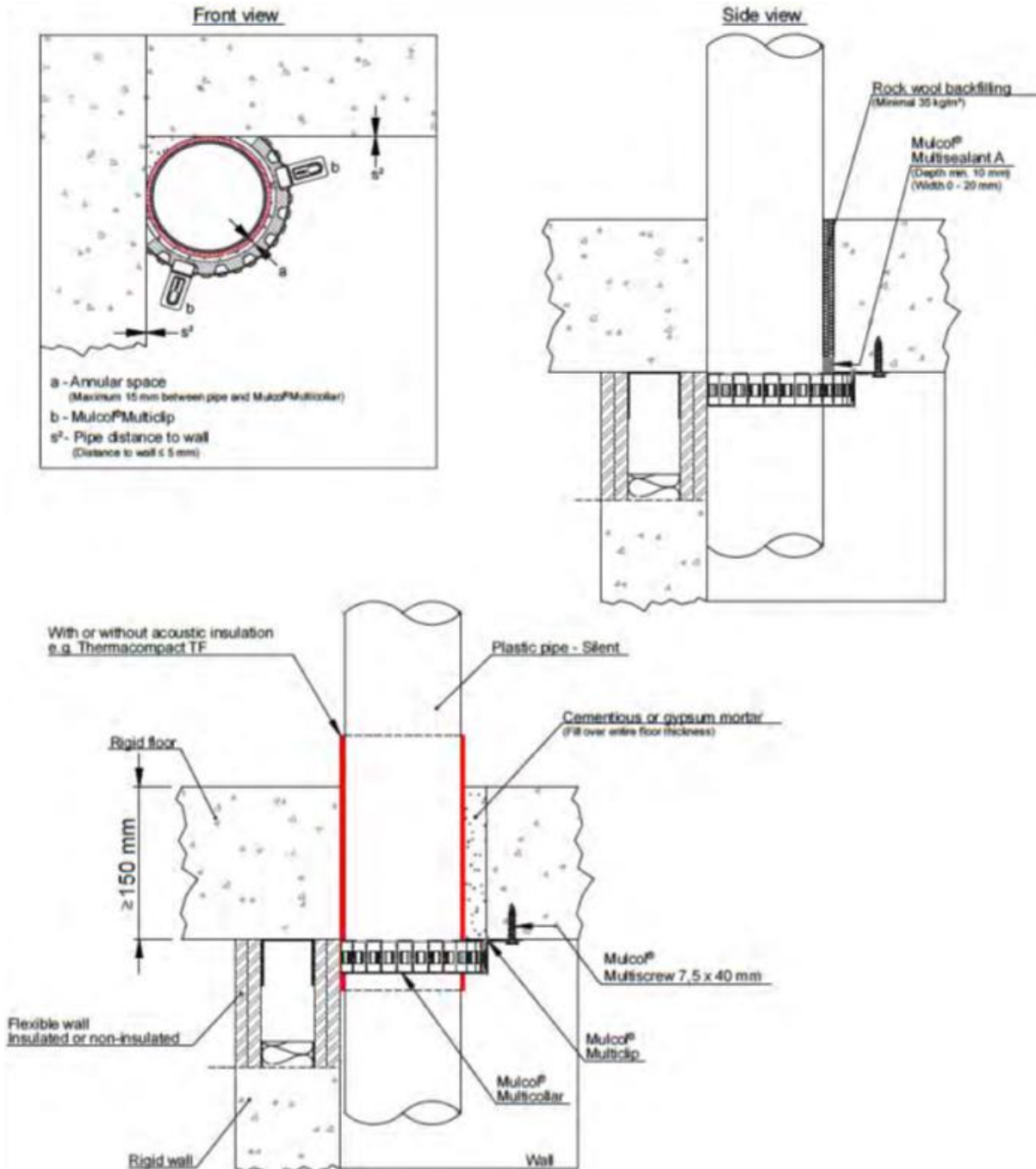


Figure 86 Plastic pipes (silent) with an elbow in U shape, perpendicular to the floor

Plastic pipes (silent), perpendicular to the floor, in floor corner

Table 88 Plastic pipes (silent), perpendicular to the floor, in floor corner

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness/ length (mm)	Filling material	Number of collars	FRL
Geberit Silent dB20	Ø110	6	Thermacompact TF (4)/ 50 LS	Mortar	one	-/120/120 U/U



### 7.3.3 PP-R multilayer pipes

#### PP-R multilayer pipes, perpendicular to the floor

Table 89 PP-R multilayer pipes, perpendicular to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
Aquatherm Blue-MF	Ø20	2.8	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø110	10-14.6	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø160	14.6	Rock wool at the unexposed side and Multicol Multisealant A at the exposed face	one	-/90/90 U/C
Aquatherm Red-MF	Ø110	15.1	Mulcol Multisealant A at both faces	one	-/120/120 U/C
Aquatherm Blue-MF	Ø250	22.7	Mortar	two	-/120/120 U/C

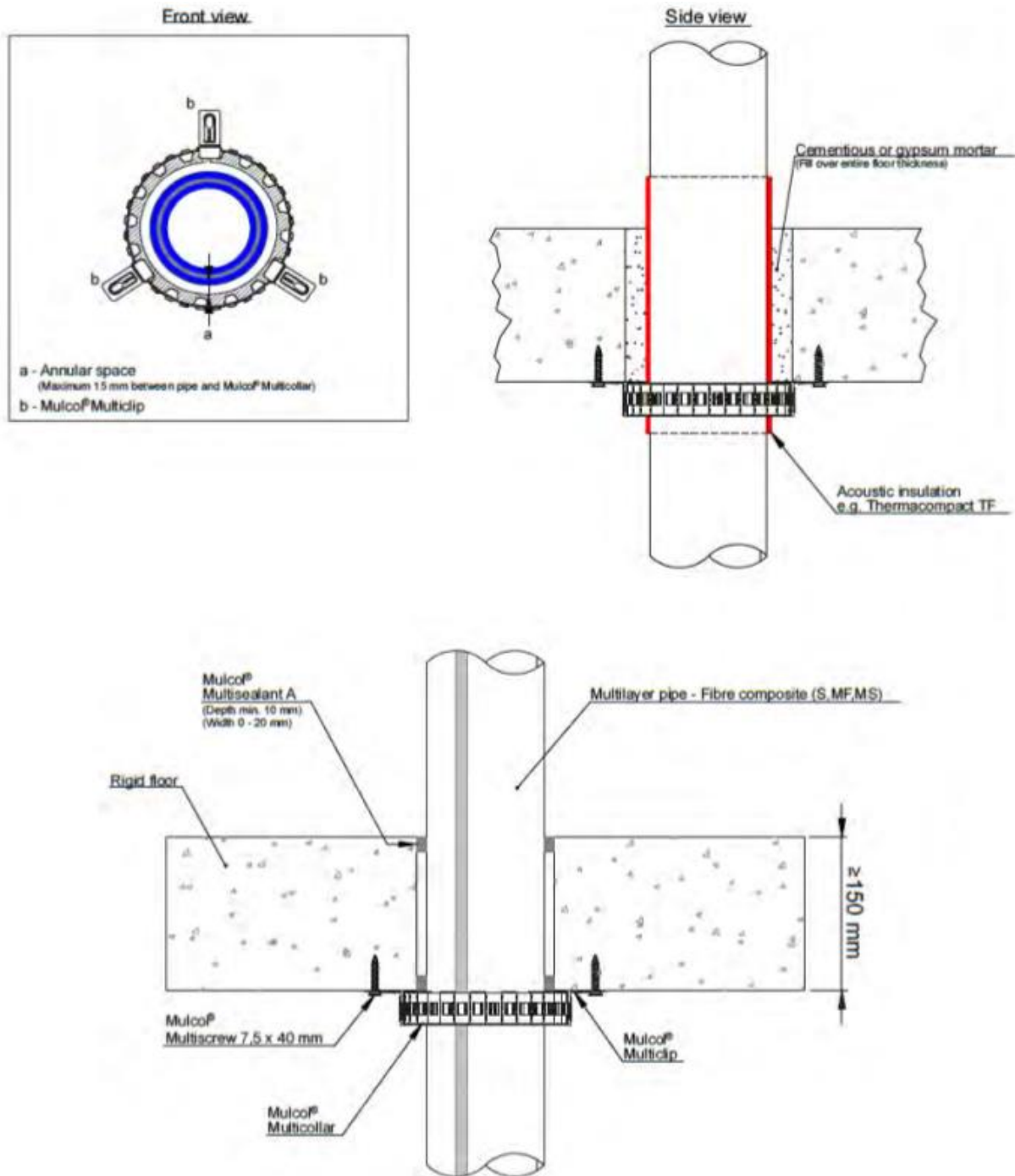


Figure 88 PP-R multilayer pipes, perpendicular to the floor protected with one collar



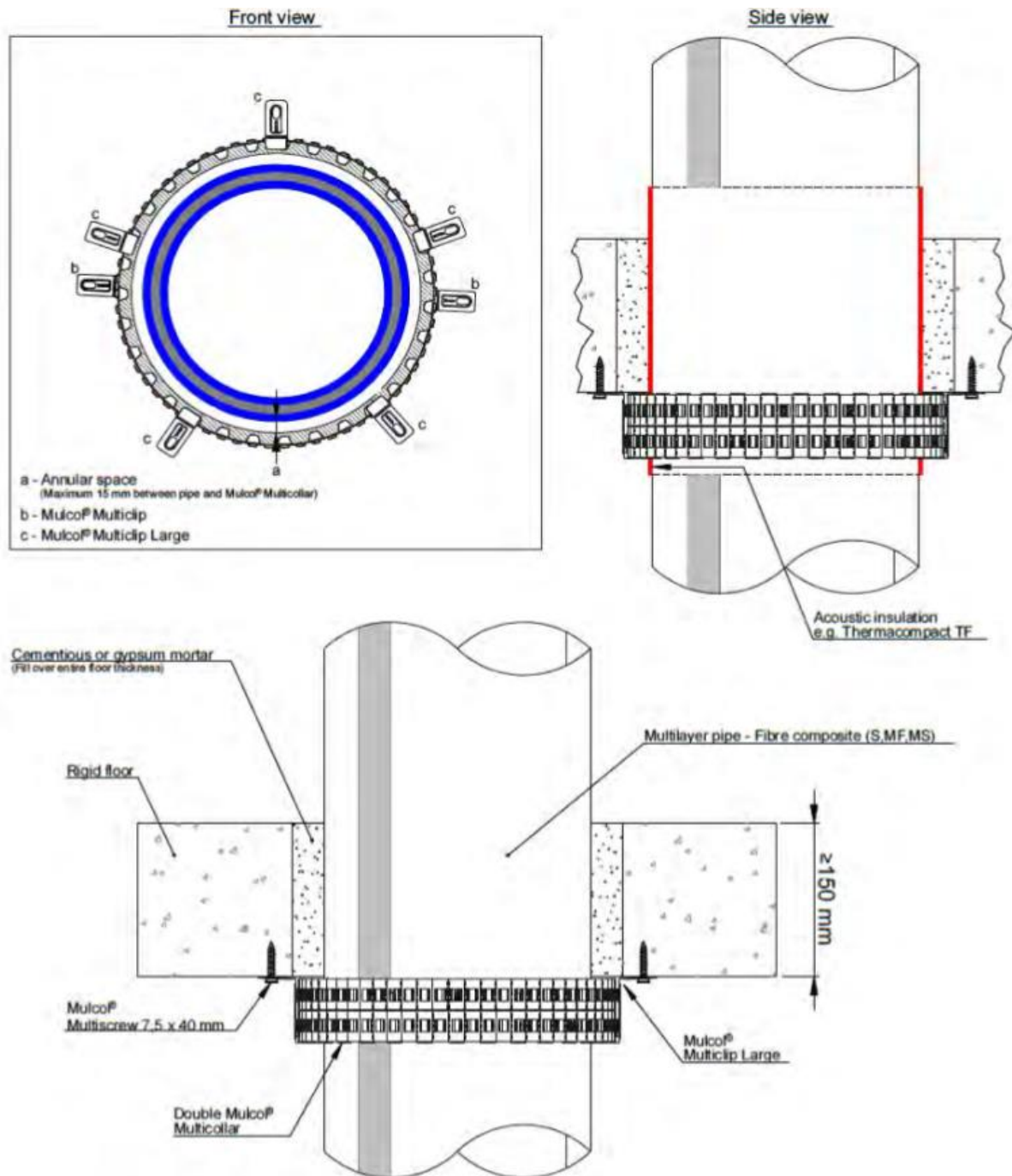
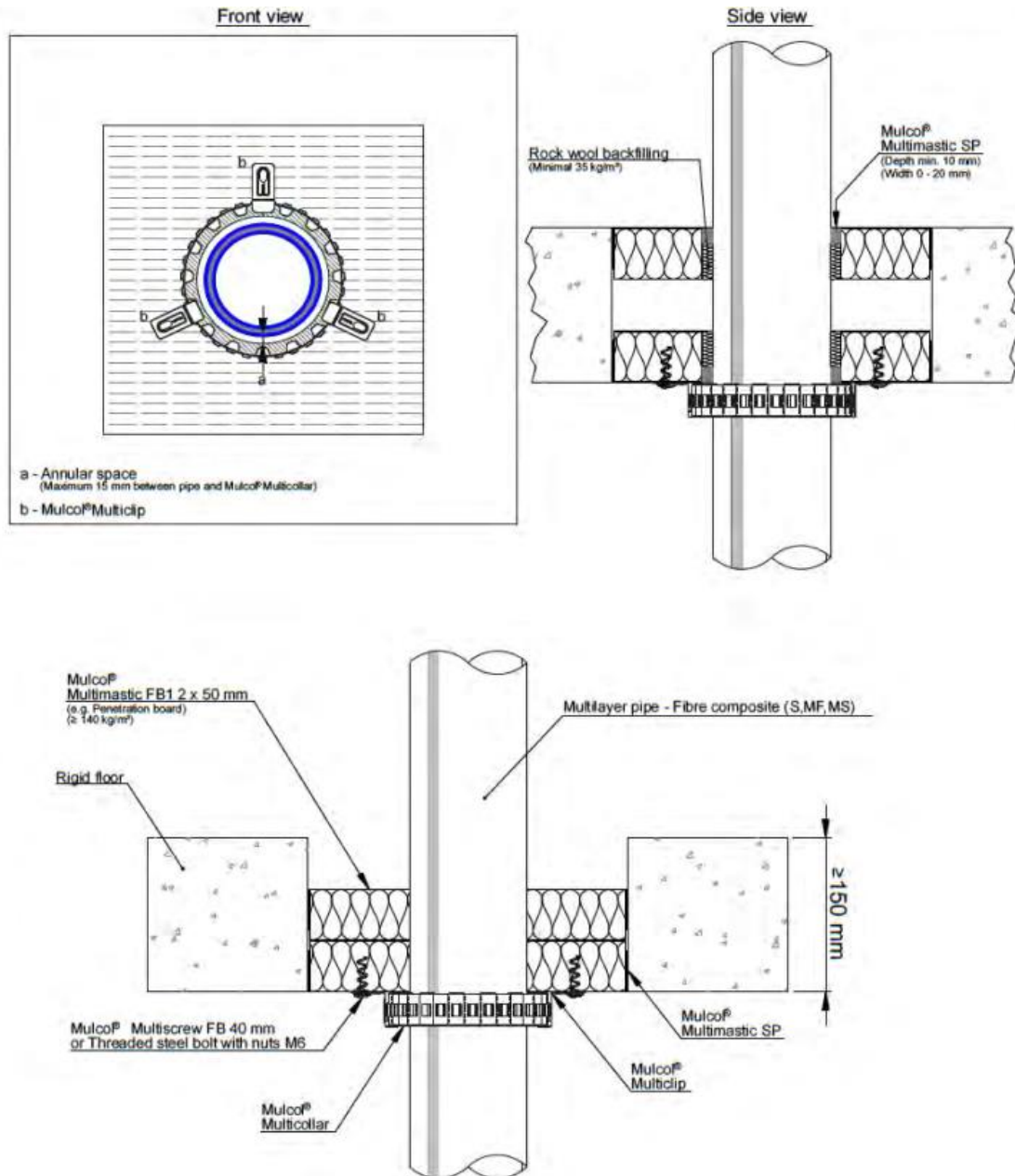


Figure 89 PP-R multilayer pipes, perpendicular to the floor protected with two collars

**PP-R multilayer pipes, perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals**

**Table 90** PP-R multilayer pipes, perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
Aquatherm Green-MF	Ø50	6.9	one	-/90/90 U/C
Aquatherm Blue-MF	Ø110	10	one	-/120/120 U/C



**Figure 90** PP-R multilayer pipes, perpendicular to the floor, in Mulcol Multimastic FB1 coated board seals

**PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

**Table 91 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness /length	Filling material	Number of collars	FRL
Aquatherm Green-S	Ø110	18.3	AF Armaflex 9-32 mm / 300 minimum	Mulcol Multisealant A at both faces	one	-/120/120 U/C
Aquatherm Green-MS	Ø110	15.2		Mulcol Multisealant A at both faces	one	-/120/120 U/C
Aquatherm Green-MF	Ø110	15.1		Mulcol Multisealant A at both faces	one	-/120/120 U/C
Aquatherm Blue-MF	Ø20	2.8		Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø110	10		Mulcol Multisealant A at both faces/ Mortar	one	-/120/120 U/C

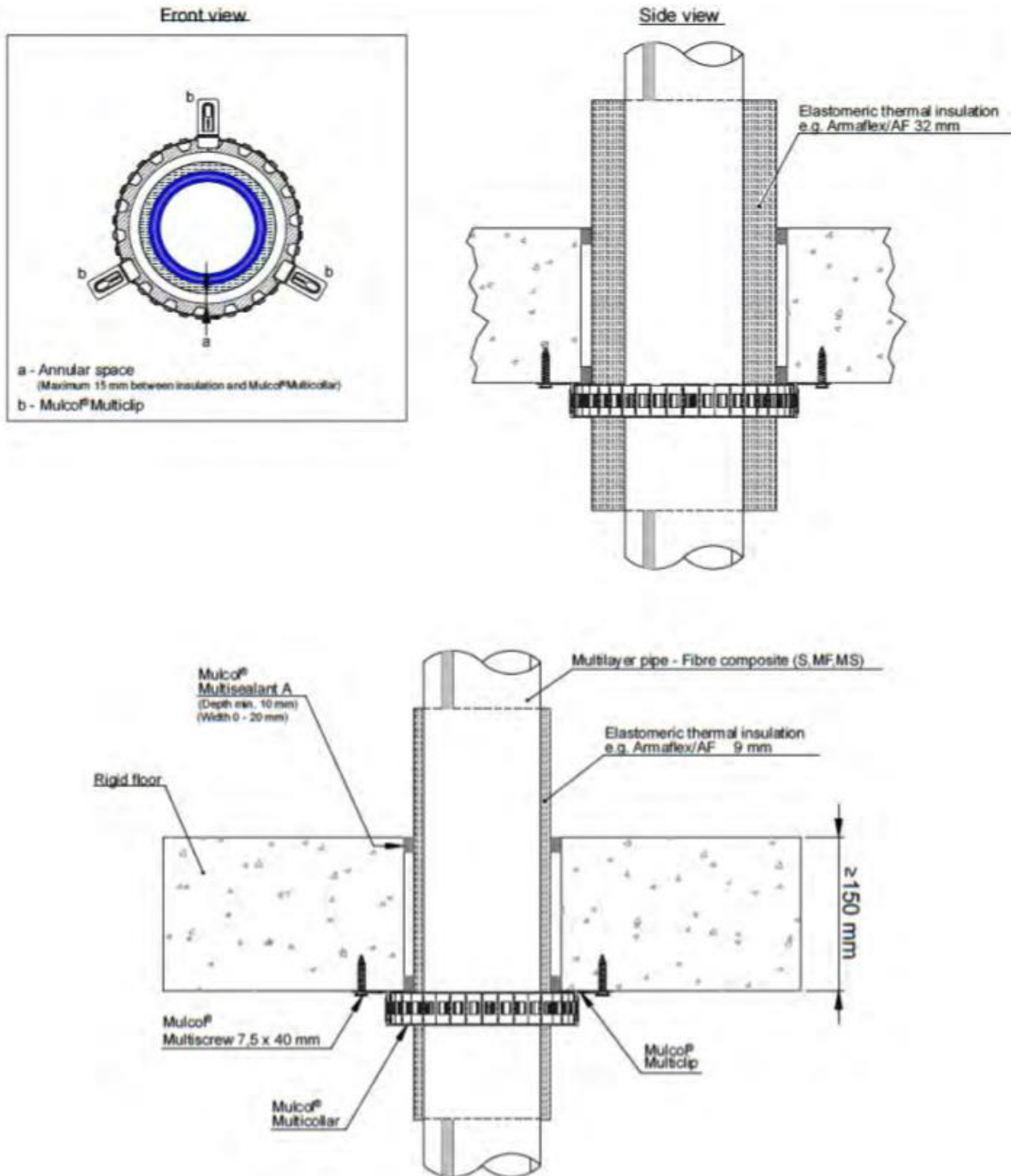


Figure 91 PP-R multilayer pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam

Table 92 PP-R multilayer pipes, perpendicular to the floor, in corner of floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation thickness /length	Filling material	Number of collars	FRL
Aquatherm Blue-MF	Ø110	10	Thermacompact TF (4)/50 (LS)	Mortar	one	-/90/90 U/C

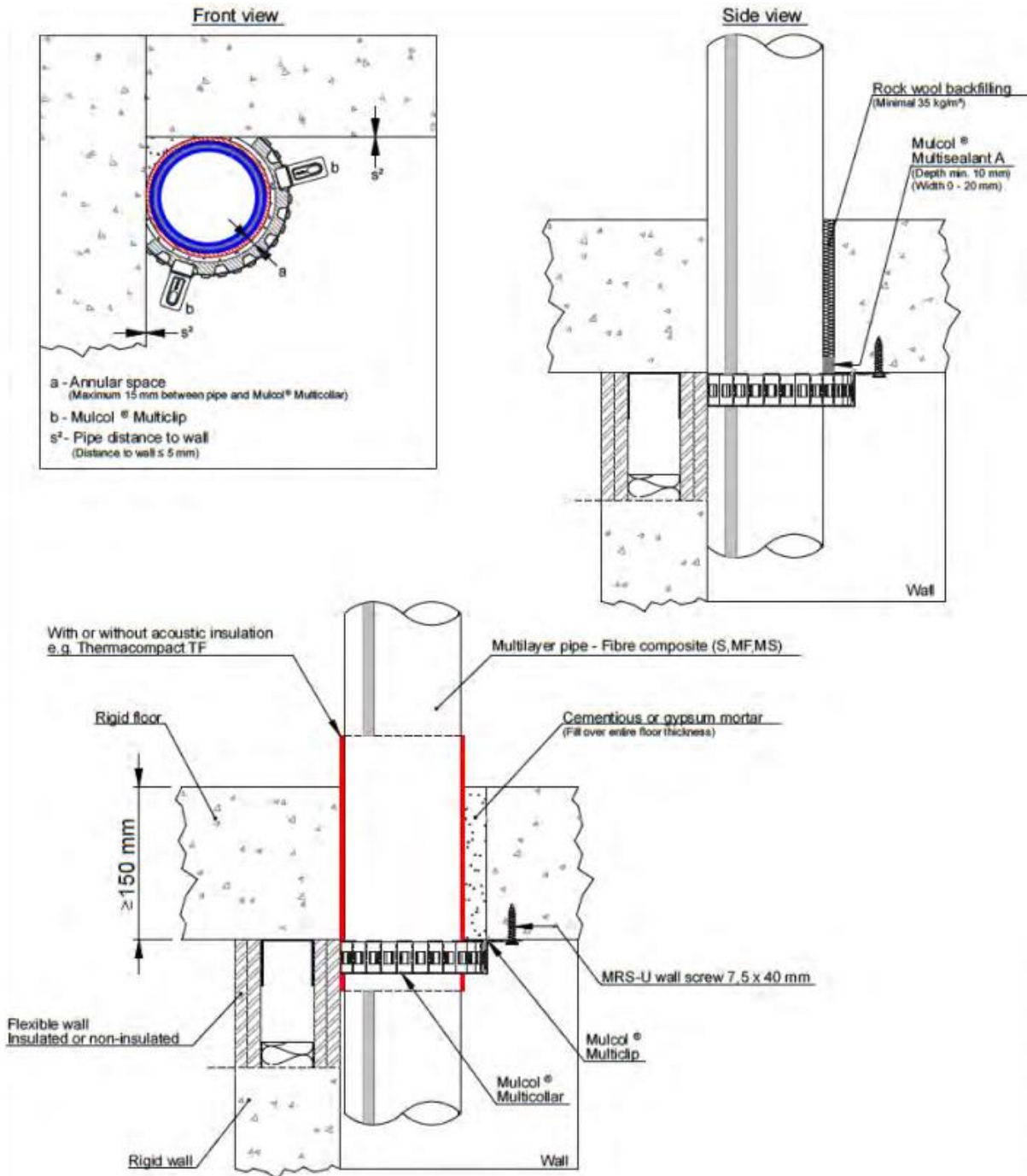


Figure 92 PP-R multilayer pipes, perpendicular to the floor, in corner of floor

### 7.3.4 Aluminium composite pipes

**Table 93 Aluminium composite pipes fitted perpendicular to the floor**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø16 -20	2	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø32	3	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø40	4	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø50	4	Mulcol Multisealant A at both faces	one	-/120/120 U/C
	Ø63	4.5	Mulcol Multisealant A at both faces	one	-/120/60 U/C
	Ø75	6	Rock wool at the unexposed face and Mulcol Multisealant A at exposed face	one	-/120/60 U/C
	Ø63	4.5	Mortar	two	-/90/90 U/C
	Ø75	6	Mortar	two	-/90/90 U/C



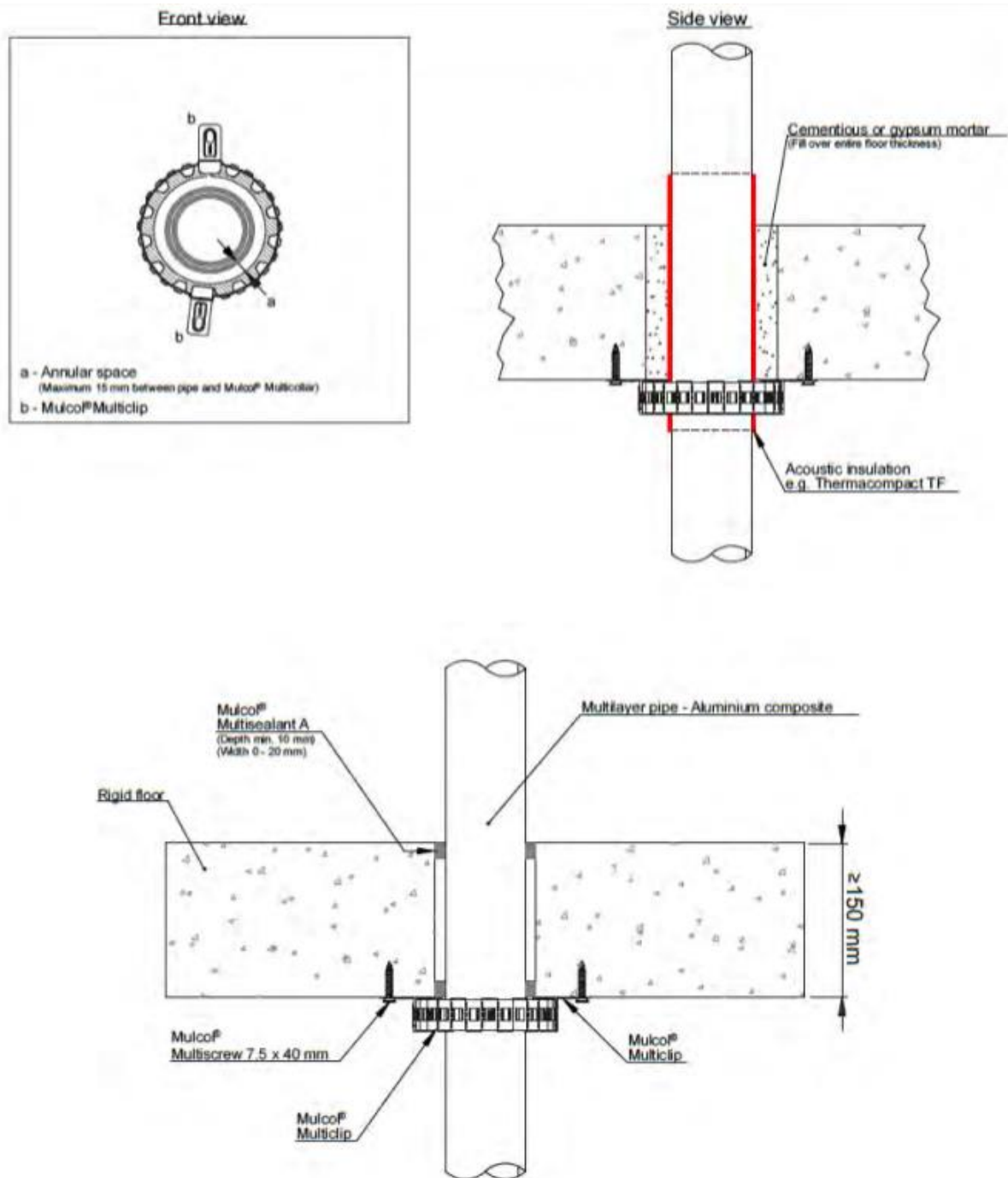


Figure 93 Aluminium composite pipes fitted perpendicular to the floor protected with one collar

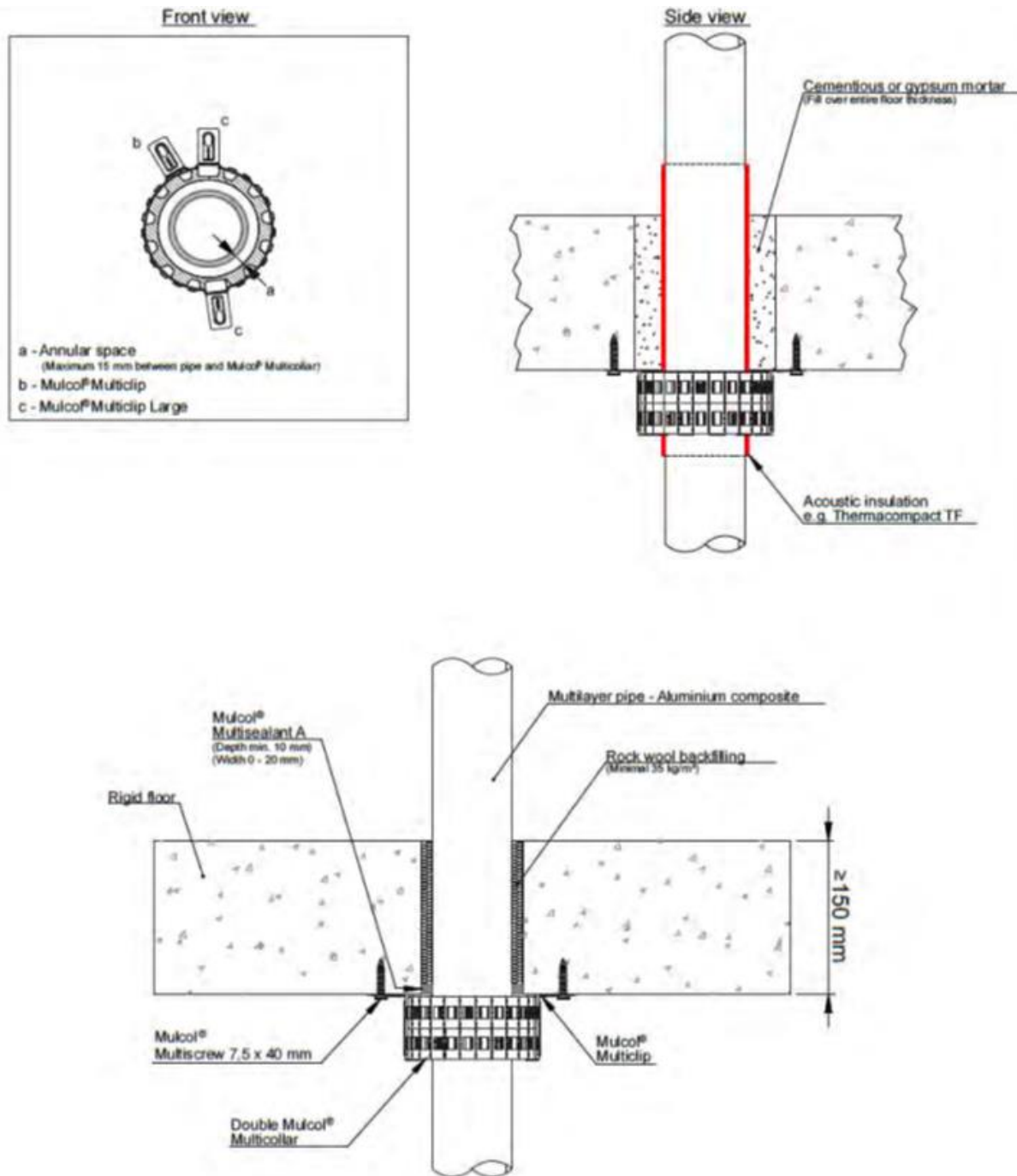


Figure 94 Aluminium composite pipes fitted perpendicular to the floor protected with two collars

Aluminium composite pipes insulated with PE-foam

Table 94 Aluminium composite pipes insulated with PE-foam

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness /length	Filling material	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø32	3	PE-foam (6)/300 minimum	Mulcof Multisealant A at both faces	one	-/120/120 U/C

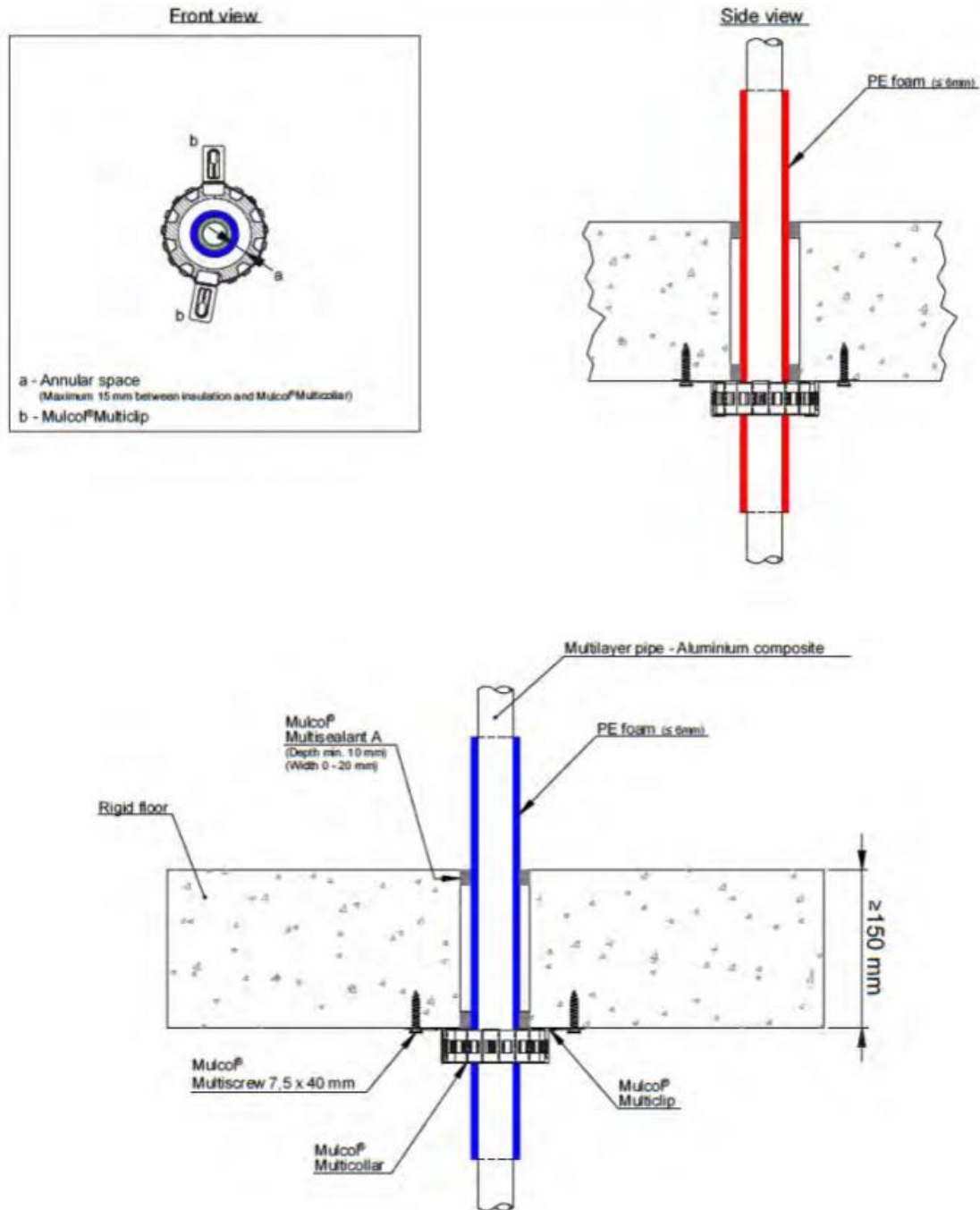


Figure 95 Aluminium composite pipes insulated with PE-foam

**Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

**Table 95 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation LS/CS/LI/CI thickness /length	Filling material	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø20	2	9-32 mm /500 mm minimum	Rock wool at the unexposed face and Mulcol Multisealant A at exposed face	one	-/120/120 U/C
PE-Xa Aqua Pipe	Ø25	3.5		Rock wool at the unexposed face and Mulcol Multisealant A at exposed face	one	-/120/120 U/C
PE-Xc/Al/PE-Xc	Ø32	3		Rock wool at the unexposed face and Mulcol Multisealant A at exposed face	one	-/120/120 U/C
PE-Xc/Al/PE-Xc	Ø40	3.5		Mulcol Multisealant A at both faces	one	-/120/120 U/C
PE-Xa Aqua Pipe	Ø40	4		Mulcol Multisealant A at both faces	one	-/120/120 U/C
PE-Xc/Al/PE-Xc	Ø50	4		Mulcol Multisealant A at both faces	one	-/120/120 U/C
PE-Xc/Al/PE-Xc	Ø75	6		Mulcol Multisealant A at both faces	one	-/120/120 U/C
PE-Xc/Al/PE-Xc	Ø90	7		Mulcol Multisealant A at both faces	one	-/120/90 U/C
PE-Xc/Al/PE-Xc	Ø90	7	32 mm /500 mm minimum	Mulcol Multisealant A at both faces	one	-/120/120 U/C
PE-Xa Aqua Pipe	Ø110	10	9-32 mm /500 mm minimum	Rock wool at the unexposed face and Mulcol Multisealant A at exposed face	one	-/90/90 U/C

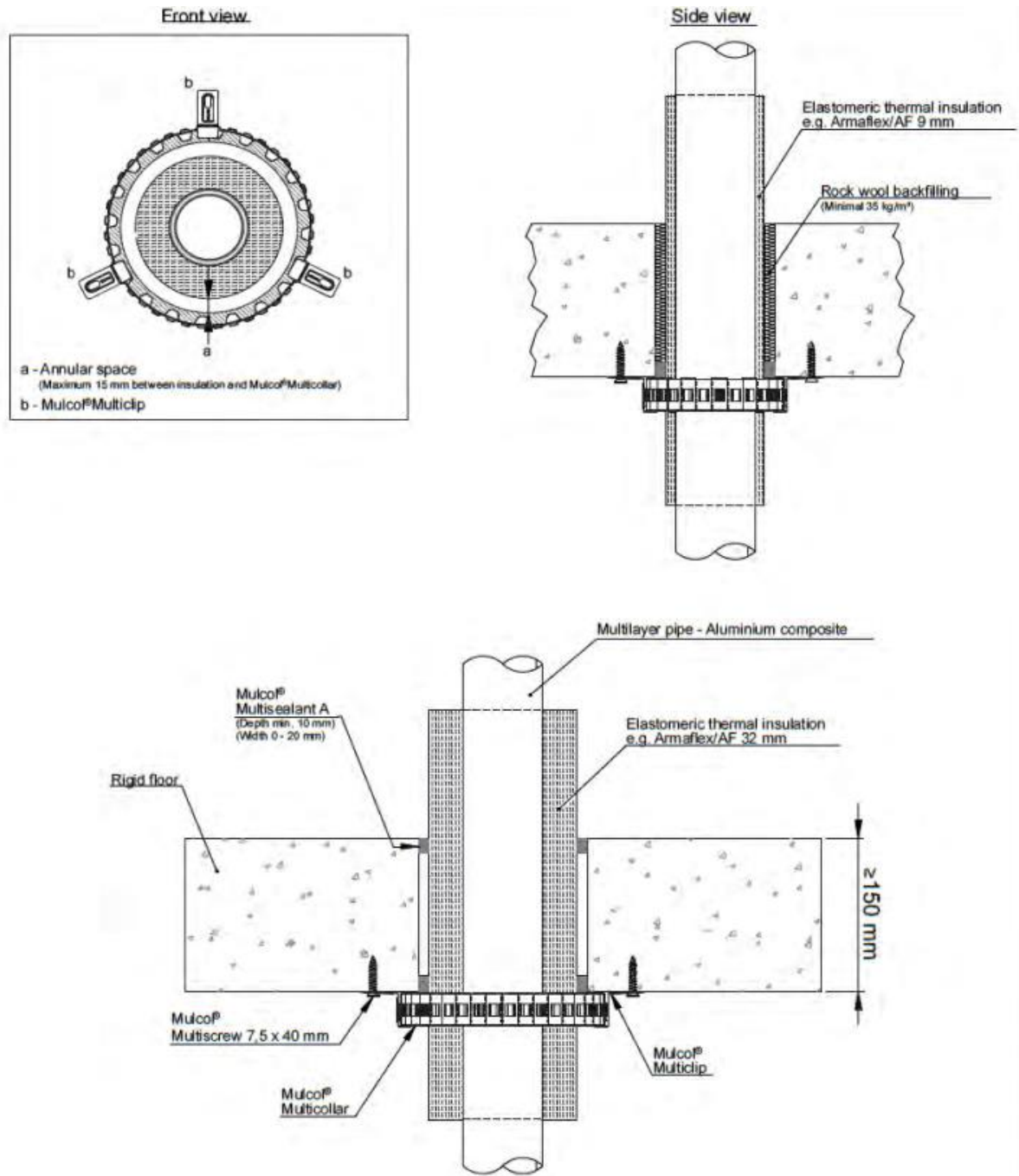


Figure 96 Aluminium composite pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam

Aluminium composite pipes in PE conduit

Table 96 Aluminium composite pipes in PE conduit, perpendicular to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Conduit diameter/length LS/CS (mm)	Filling material	Number of collars	FRL
PE-Xc/Al/PE-Xc	Ø32	3	40/50 minimum	Mortar	one	-/120/120 U/C

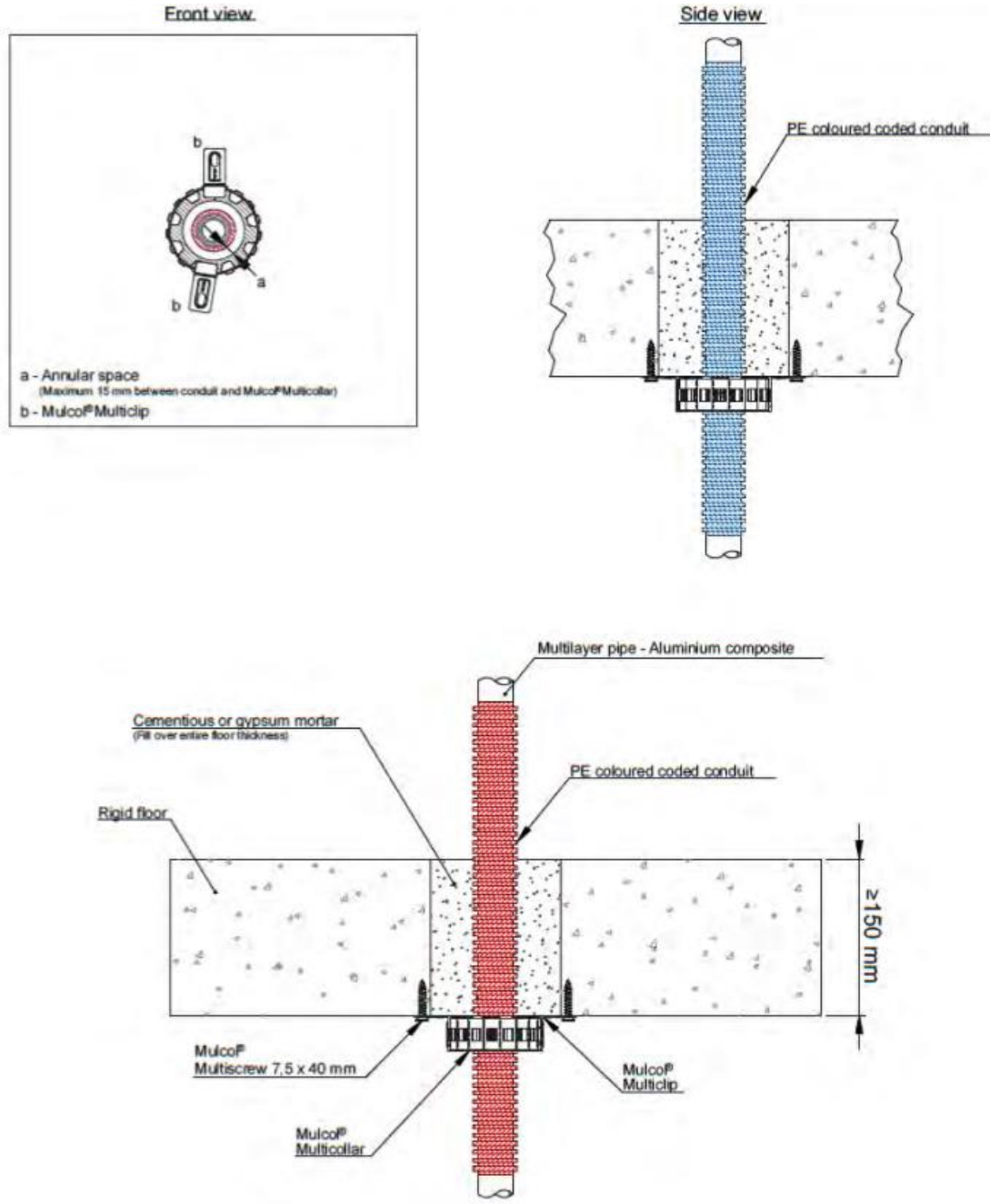


Figure 97 Aluminium composite pipes in PE conduit, perpendicular to the floor



**Aluminium composite pipes insulated with Kooltherm FM/PIR insulation**

**Table 97 Aluminium composite pipes insulated with Kooltherm FM/PIR insulation**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Kooltherm FM/ PIR Insulation thickness/length (mm)	Filling material – Mulcol Multisealant A	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø26	3	25/ LS 400 minimum or CS	At the underside to a minimum depth of 10 mm	one	-/90/45 U/C
	Ø32	3	47/ LS 400 minimum or CS		one	-/120/120 U/C
	Ø50	6	40/ LS 400 minimum or CS	At the underside to the full depth	one	-/90/60 U/C
	Ø50	6	60/ LS 400 minimum or CS	At the underside to a minimum depth of 10 mm	two	-/60/30 U/C
	Ø90	6	60/ LS 400 minimum or CS		two	-/120/90 U/C

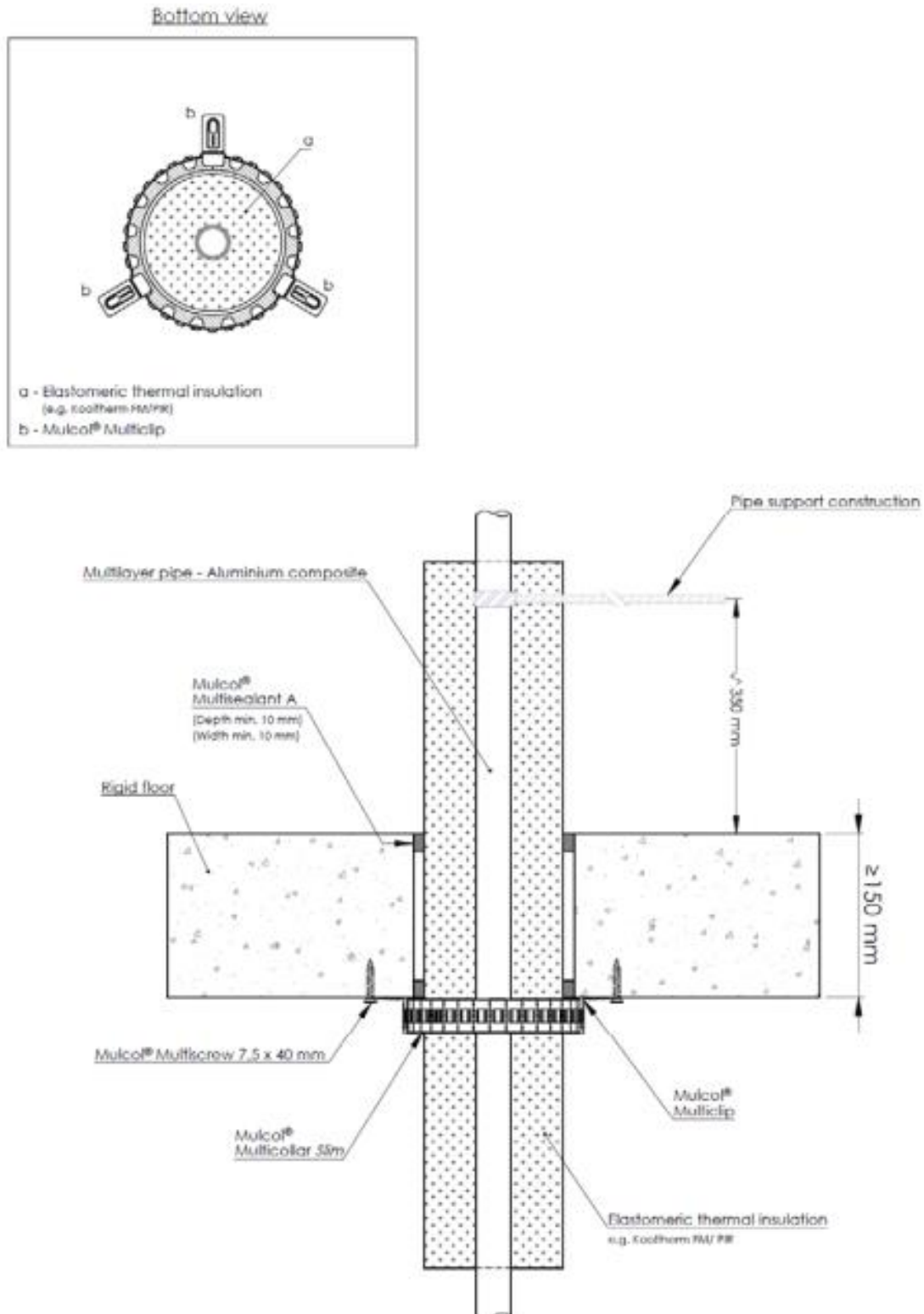


Figure 98 Aluminium composite pipes insulated with Kooltherm FM/PIR insulation

### 7.3.5 Multiple services

**Table 98 Up to 3 x mixed pipes and cables, perpendicular to the floor**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Filling material	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	Ø90	2.8	Mulcol Multisealant A at both faces.	two	-/120/120 U/U
PE-Xc/AL/PE-Xc	Ø50	4			-/120/120 U/C
Aquatherm Green-MF	Ø50	6.9			-/120/120 U/C
Telecom UTP Cat. 5 or Cat. 6	1 no.	N/A			-/120/120
Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> , YMVK 5 x 1.5 mm <sup>2</sup> or YMVK 5 x 2.5 mm <sup>2</sup>	1 no.	N/A			

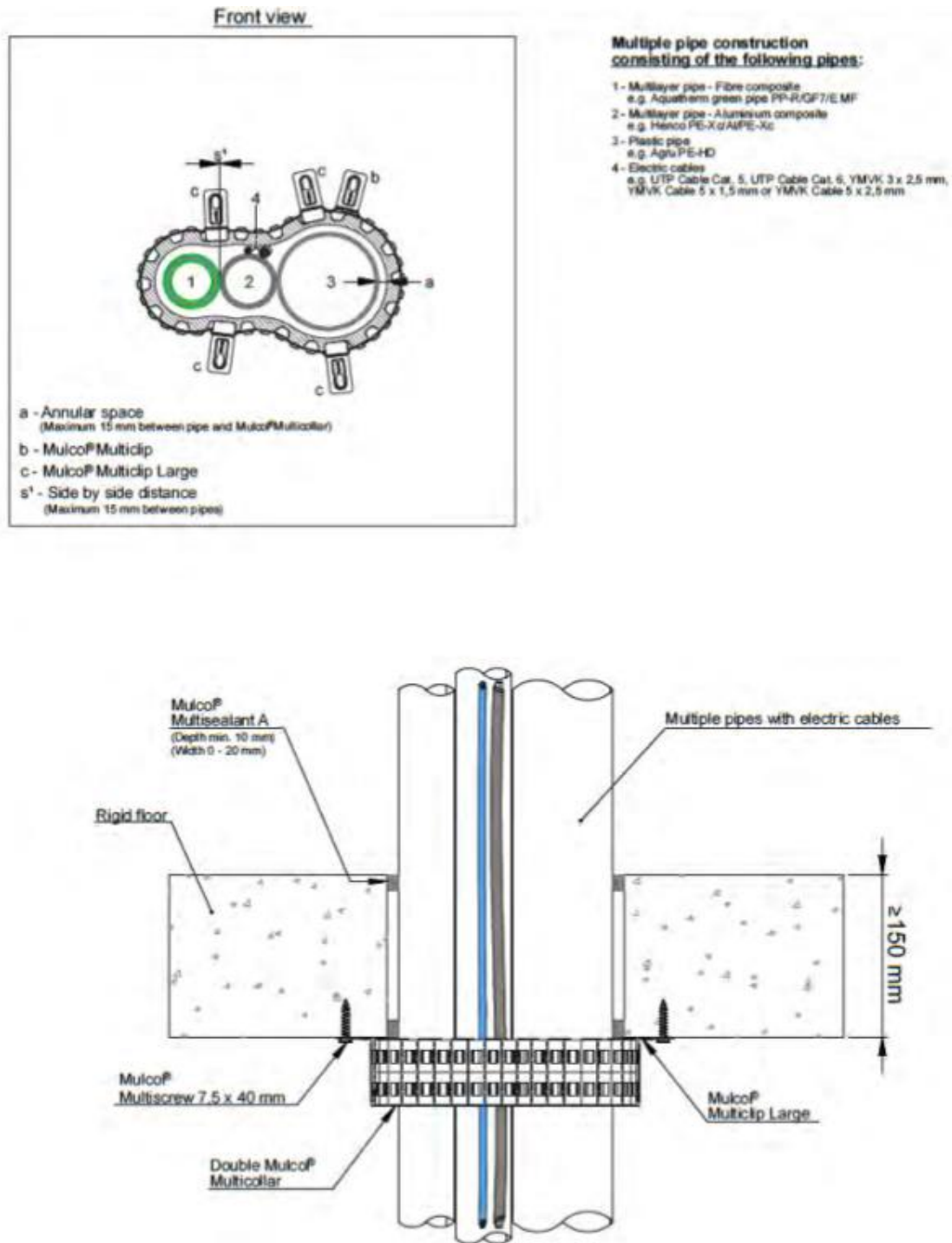


Figure 99 Up to 3 x mixed pipes and cables, perpendicular to the floor

**Table 99 Up to 3 x mixed pipes and cables, insulated with PE-foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation diameter/ length LS/CS/LI/CI (mm)	Filling material	Number of collars	FRL
Copper	Ø15	1	6/300 minimum	Mulcol Multisealant A at the exposed face and rockwool for the rest of the gap	two	-/120/120 C/U
PVC-U, PVC-C	Ø32	3	None			-/120/120 U/U
Telecom UTP Cat. 5 or Cat. 6	1 no	N/A				-/120/120
Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> , YMVK 5 x 1.5 mm <sup>2</sup> or YMVK 5 x 2.5 mm <sup>2</sup>	1 no	N/A				
Note: A maximum of 2 copper pipes can be used in the combination.						

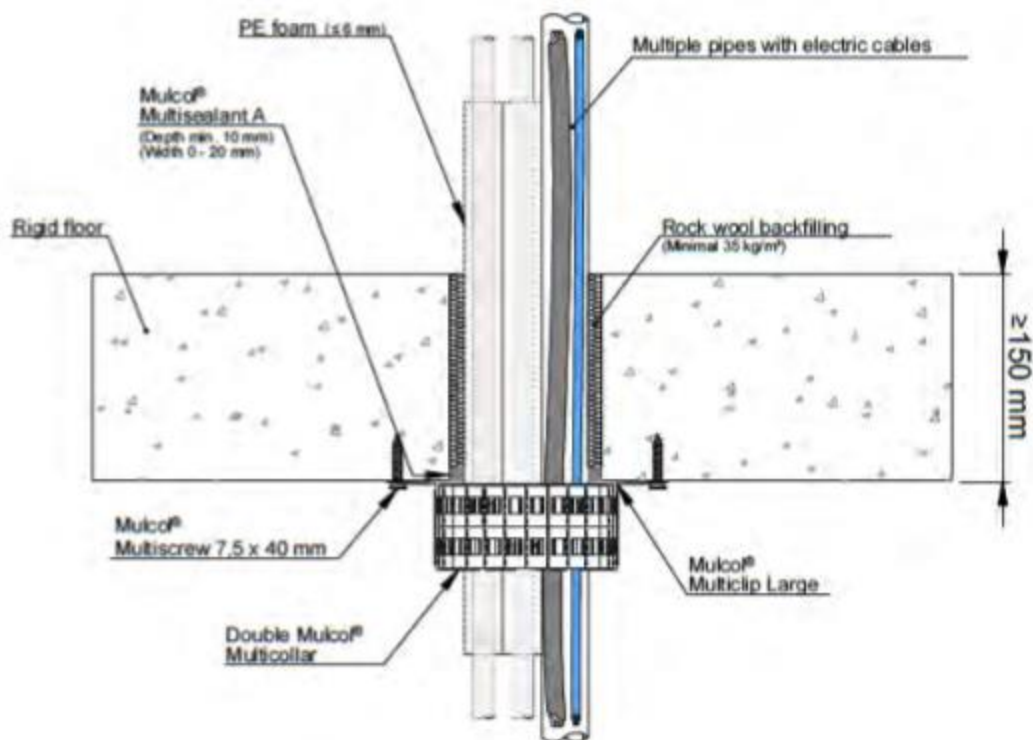
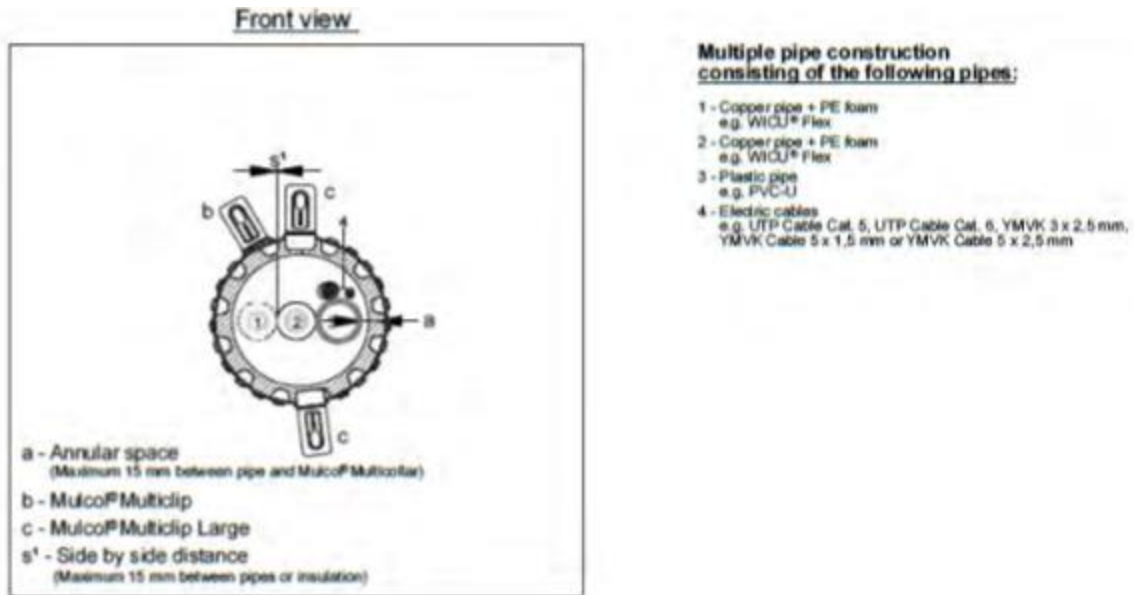


Figure 100 Up to 3 x mixed pipes and cables, insulated with PE-foam



Table 100 Up to 4 x Aluminium composite pipes insulated with PE-foam

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation diameter/length LS/CS/LI/CI (mm)	Filling material	Number of collars	FRL
PE-Xc/AL/PE-Xc	Ø32	3	PE foam (6)/300	Multisealant A at the exposed face and rockwool for the rest of the gap	two	-/120/120 U/C
	Ø50	4				-/120/90 U/C
	Ø26	3	6/300 minimum			-/120/120 U/C
	Ø32	3				-/120/120 U/C

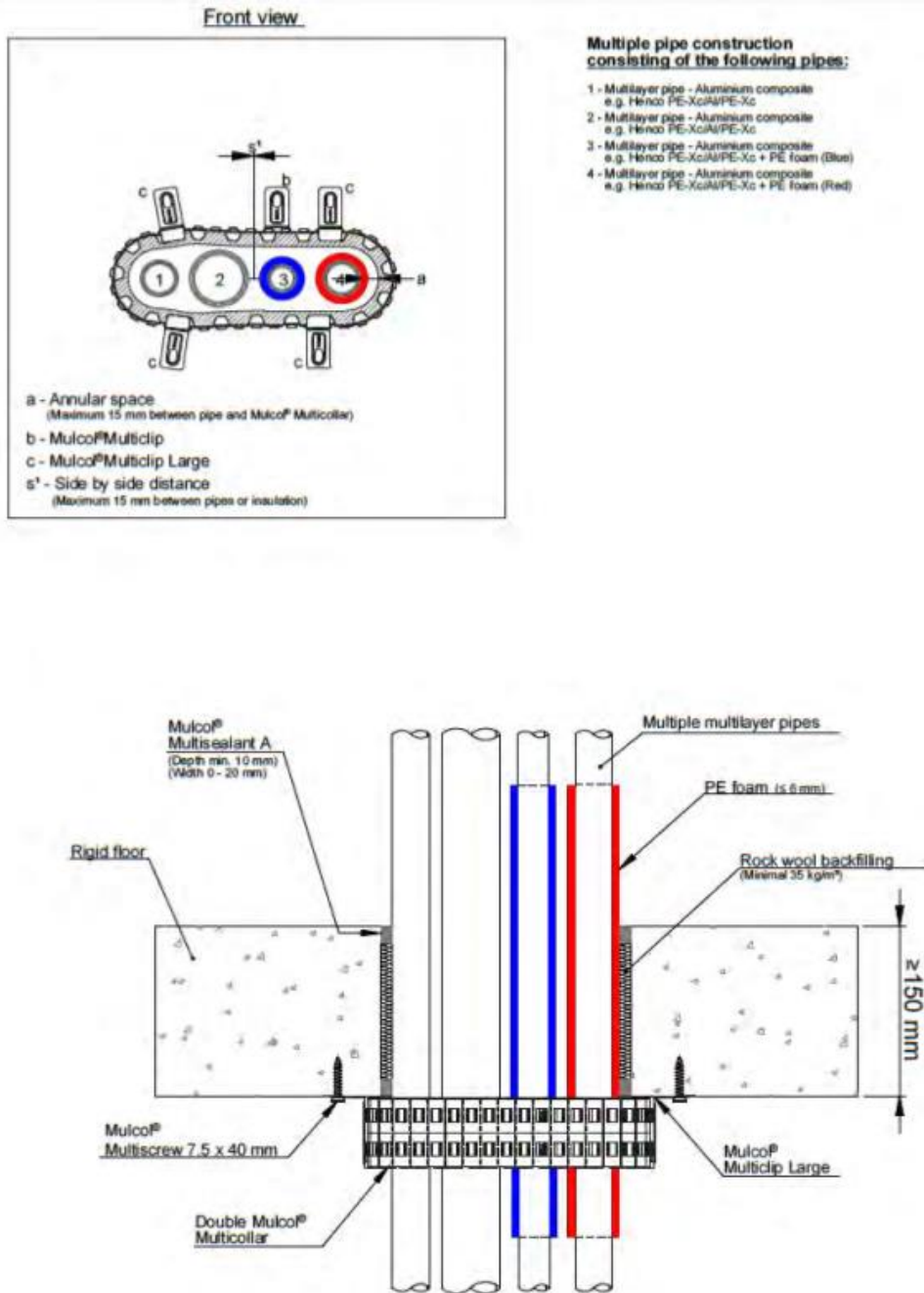


Figure 101 Up to 4 x Aluminium composite pipes insulated with PE-foam

### 7.3.6 Electrical cables

Table 101 Electrical cables, fitted perpendicular to the floor

Maximum number	Maximum aperture diameter (mm)	Permitted cables (empty to fulfill)	Number of collars per face	FRL
42	Ø80	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMKV 3 x 2.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 1.5 mm <sup>2</sup> Sheathed cable YMKV 5 x 2.5 mm <sup>2</sup>	one	-/120/120

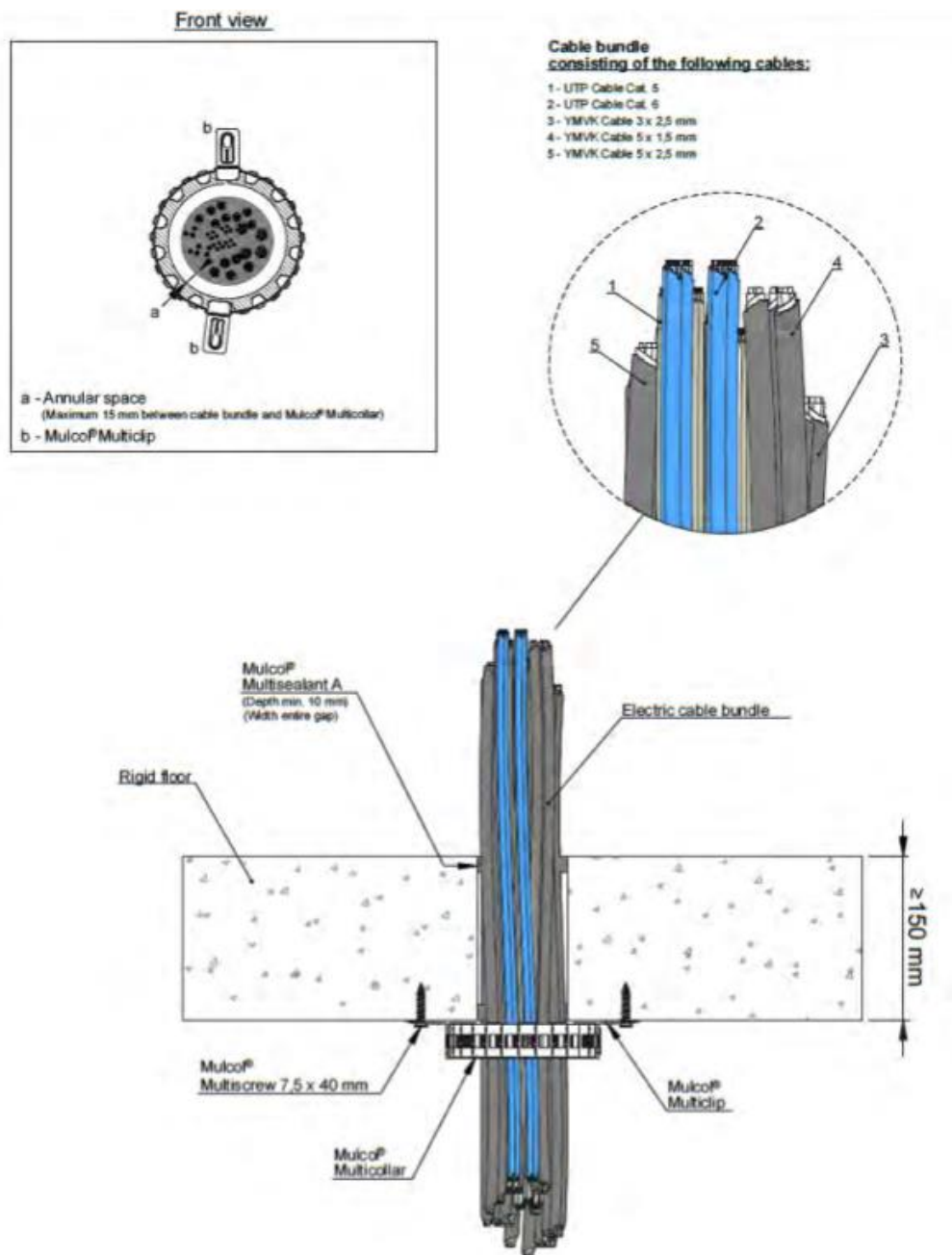


Figure 102 Electrical cables, fitted perpendicular to the floor

Table 102 PE conduits containing electrical cables, fitted perpendicular to the floor

Pipe material/ maximum number	Maximum pipe diameter	Maximum aperture diameter (mm)	Permitted cables (empty to fulfill)	Number of collars per face	FRL
PE/5	Ø50	Ø130	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 1.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 2.5 mm <sup>2</sup>	one (below the floor)	-/60/60 U/U

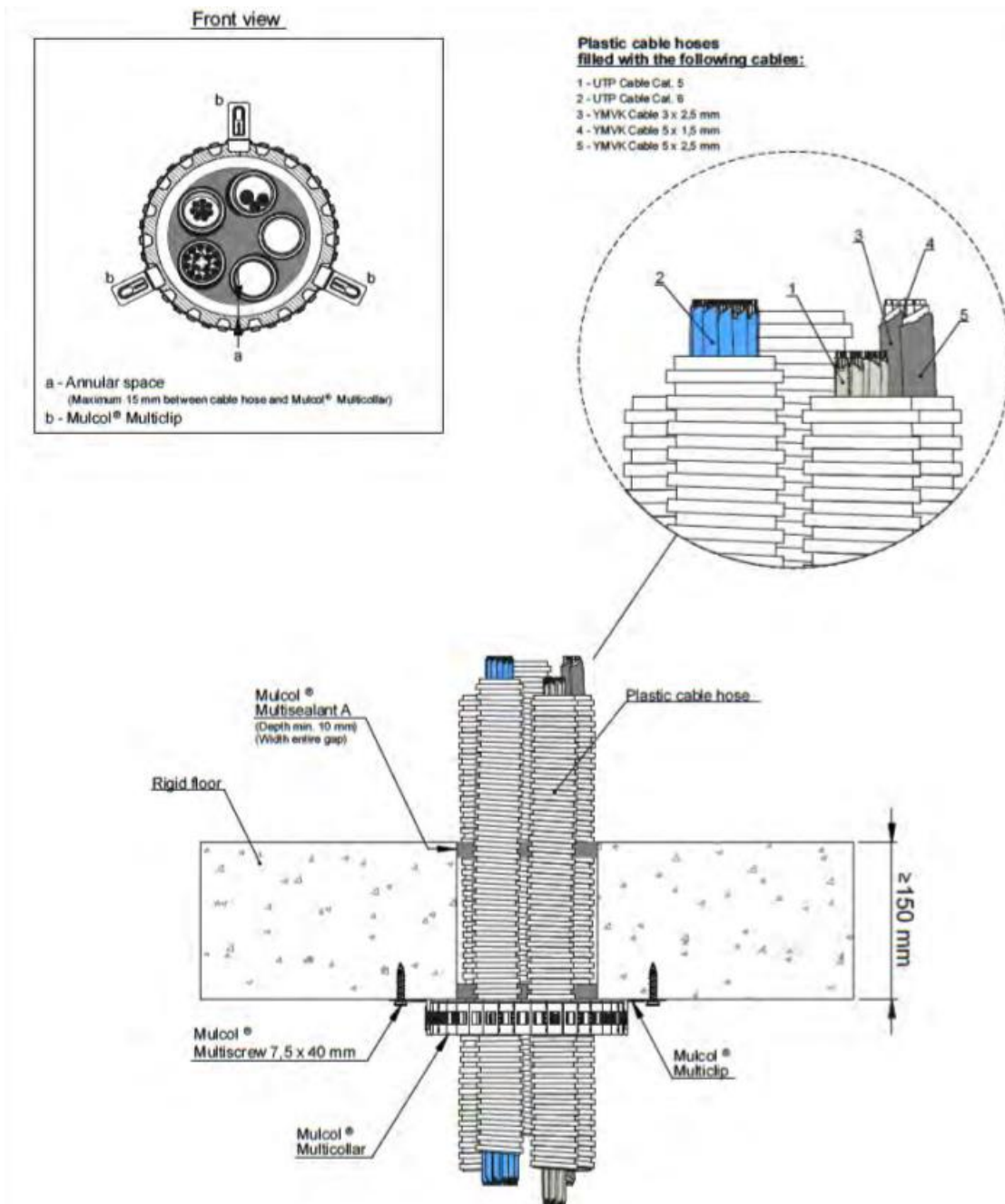


Figure 103 PE conduits containing electrical cables, fitted perpendicular to the floor

Table 103 PVC pipes containing electrical cables, fitted perpendicular to the floor

Pipe material/ maximum number	Maximum pipe diameter	Maximum aperture diameter (mm)	Permitted cables (empty to fulfill)	Number of collars per face	FRL
PVC / 18	Ø25	Ø100	Telecommunication cables UTP Cat. 5 Telecommunication cables UTP Cat. 6 Sheathed cable YMVK 3 x 2.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 1.5 mm <sup>2</sup> Sheathed cable YMVK 5 x 2.5 mm <sup>2</sup>	One (below the floor)	-/120/120 U/U

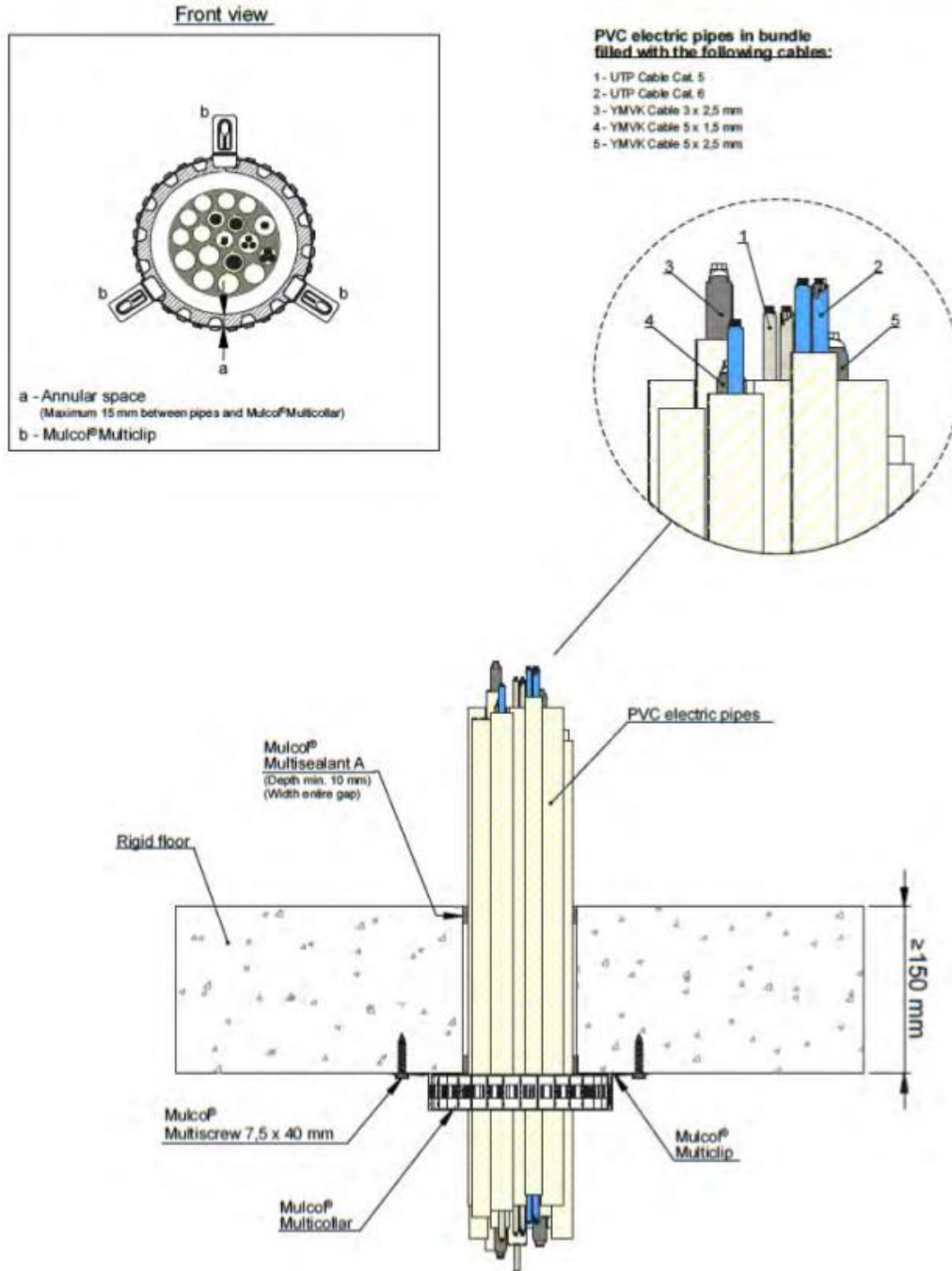


Figure 104 PVC pipes containing electrical cables, fitted perpendicular to the floor

### 7.3.7 Metal pipes

#### Metal pipes fitted perpendicular to the floor

Table 104 Metal pipes fitted perpendicular to the floor

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation	Filling material	Number of collars	FRL
Copper / Steel /Iron/ Stainless steel	Ø35	1.5-14.2	N/A	Rock wool at the unexposed side and Mulco Multisealant A at exposed side	one	-/120/15 C/U

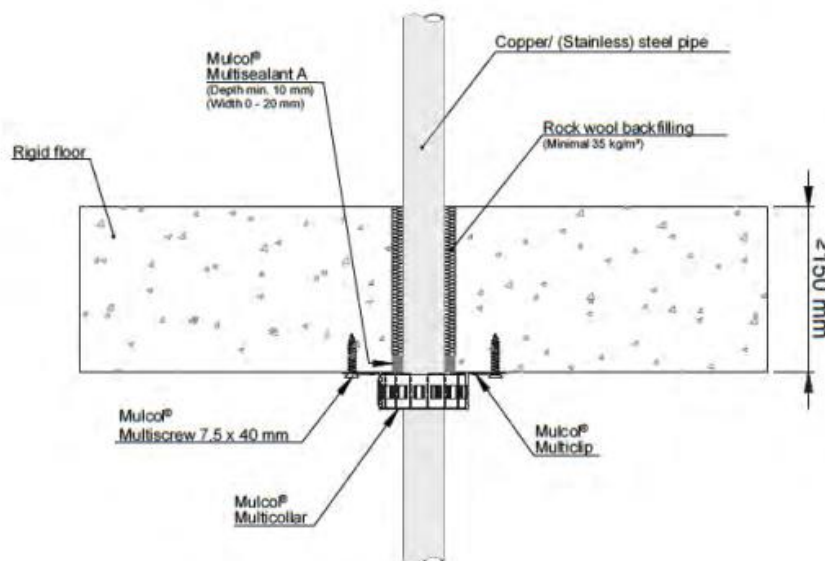
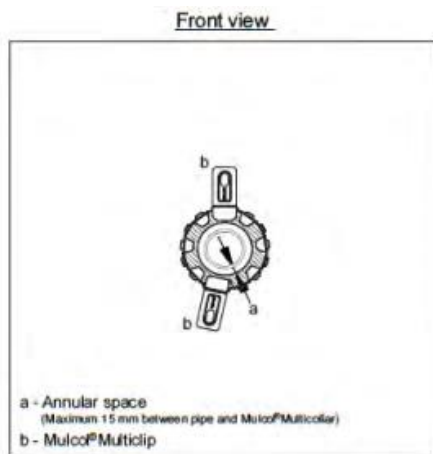


Figure 105 Metal pipes fitted perpendicular to the floor

**Table 105 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam**

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation diameter/ length LS/CS (mm)	Filling material	Number of collars	FRL
Steel /Iron/ Stainless steel	Ø114.3	3.6-14.2	32 mm /500 (LI/CI)	Mulcol Multisealant A at both faces	one	-/90/90 C/U
	Ø168.3	4.5-14.2				-/90/60 C/U
Copper / Steel /Iron/ Stainless steel	Ø88.9	2-14.2	32 mm /450 (LS/CS)	Mulcol Multisealant A at both faces	one	-/90/45 C/U
Steel /Iron/ Stainless steel	Ø114.3	3.6-14.2	6-32 mm /450 (LS/CS)	Mulcol Multisealant A at both faces	one	-/90/60 C/U
	Ø168.3	4.5-14.2	32 mm /450 (LS/CS)	Mortar	one	-/60/60 C/U



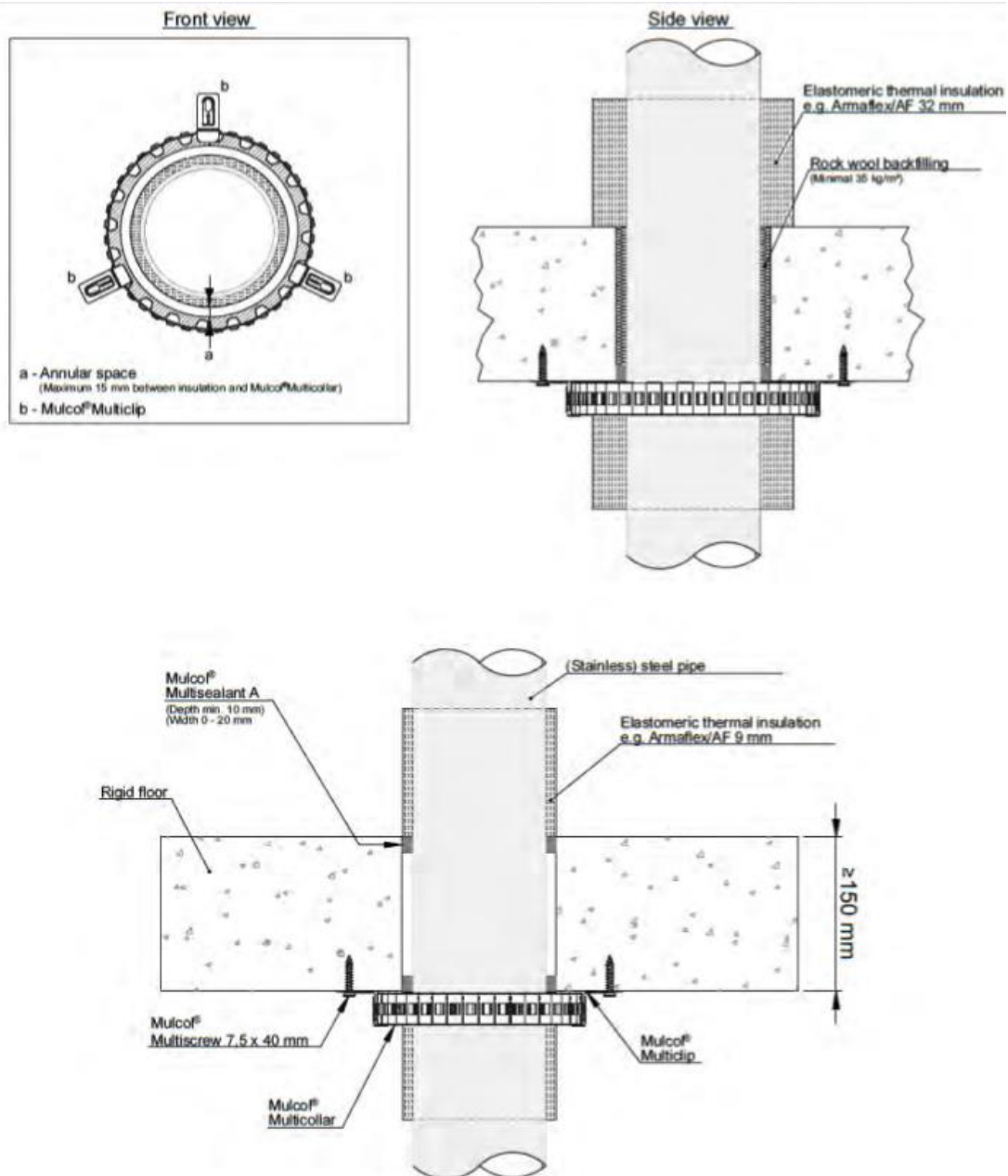


Figure 106 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (L/CI)



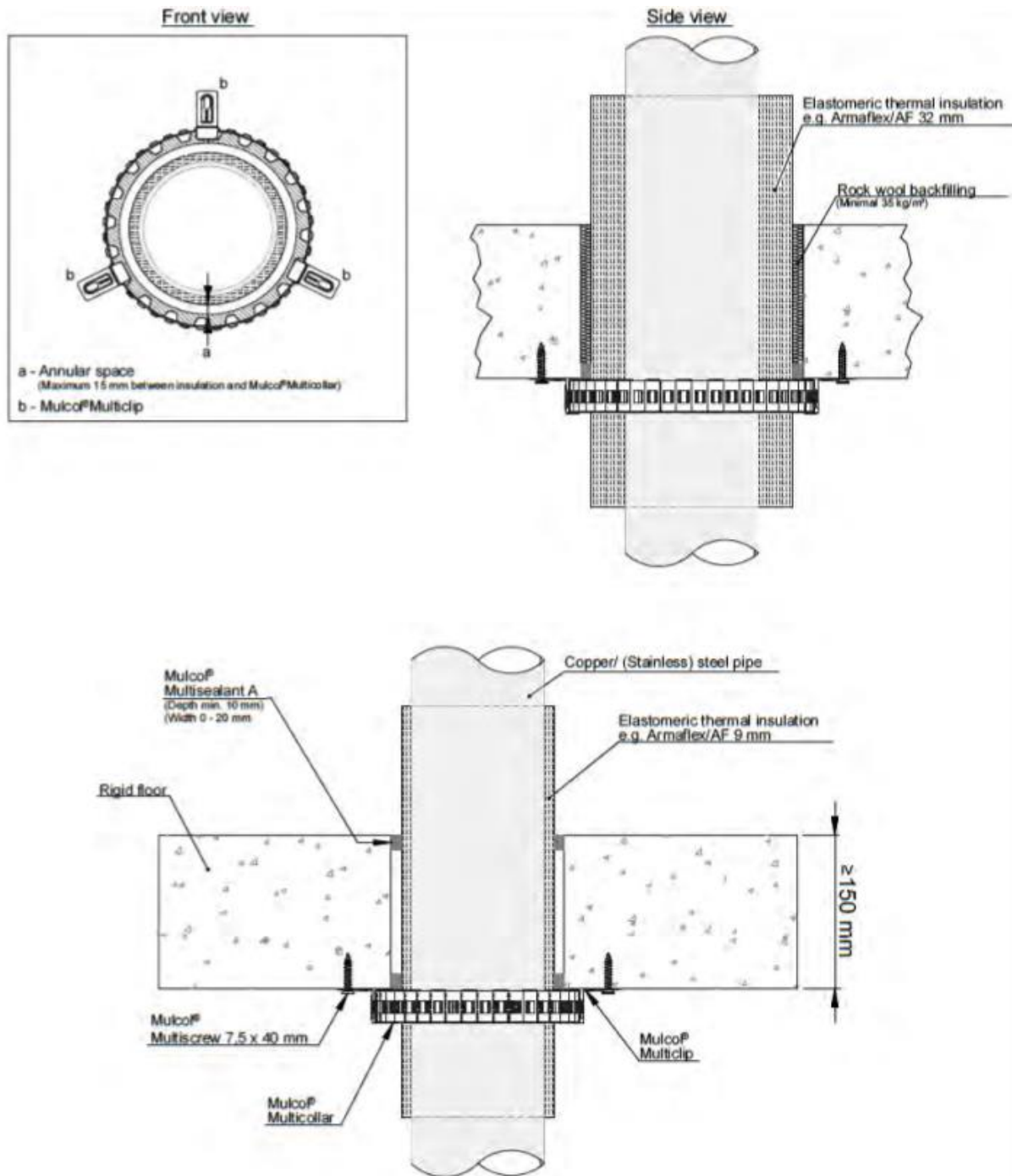


Figure 107 Metal pipes insulated with AF/Armaflex made out of flexible elastomeric EPDM rubber foam (LS/CS)

Table 106 Metal pipes, perpendicular to the floor, in a seal penetration system

Pipe material	Pipe diameter (mm)	Pipe wall thickness (mm)	Insulation diameter/ length (mm)	Filling material	Number of collars	FRL
Steel /Iron/Stainless steel	Ø114.3	3.6-14.2	AF/Armaflex 32 mm /300 minimum	Mulcol Multisealant A at both faces	one	-/90/90 C/U

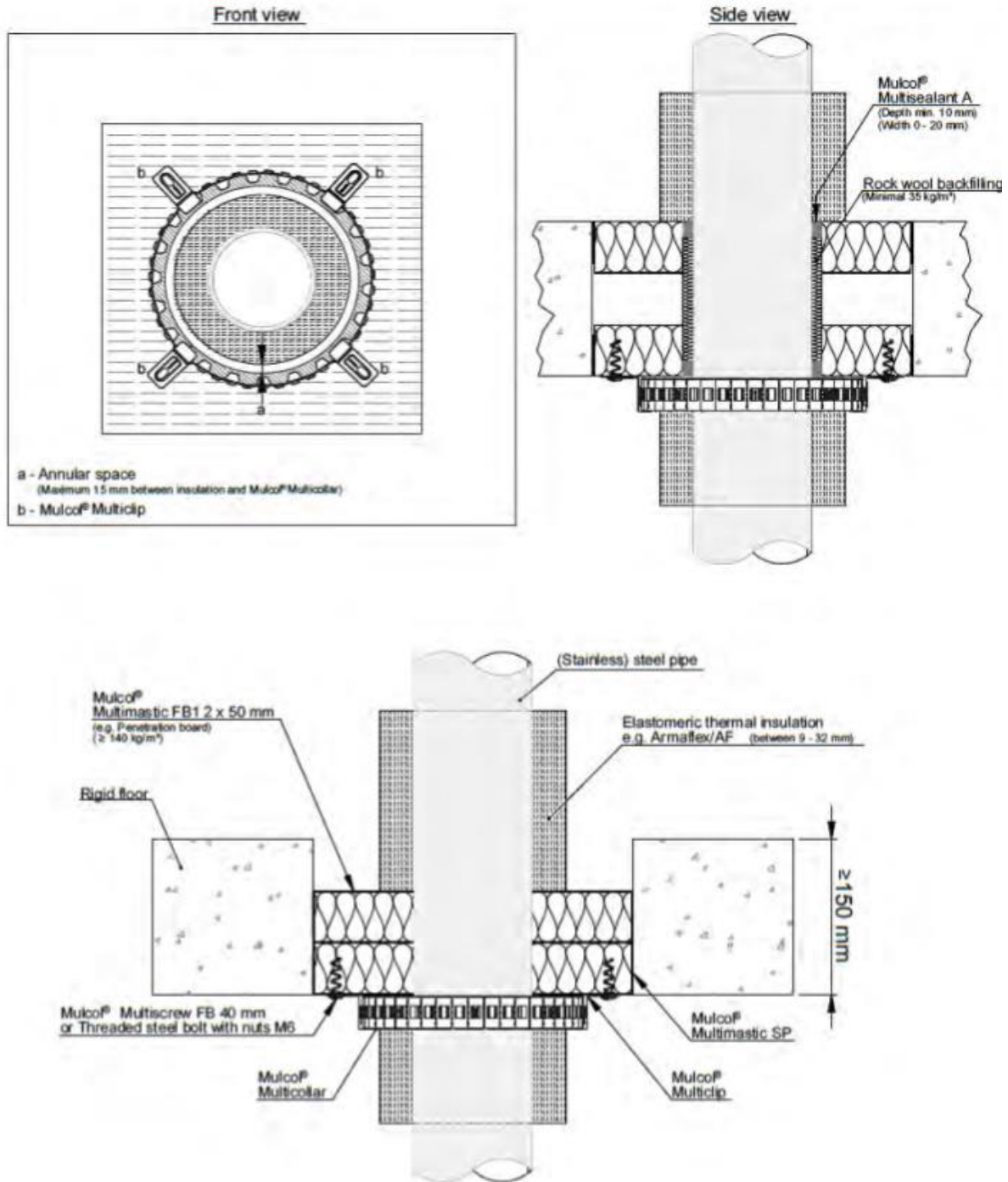


Figure 108 Metal pipes, perpendicular to the floor, in a seal penetration system

### 7.3.8 Python drinks combi pipes

Table 107 Python drinks combi pipes

Pipe material	Pipe diameter (mm)	Amount	Insulation	Number of collars	FRL
Python drinks combi pipe	Ø47	1	Armaflex	one	-/120/120 U/C
	Ø145	1	Armaflex	one	-/120/120 U/C

Bottom view

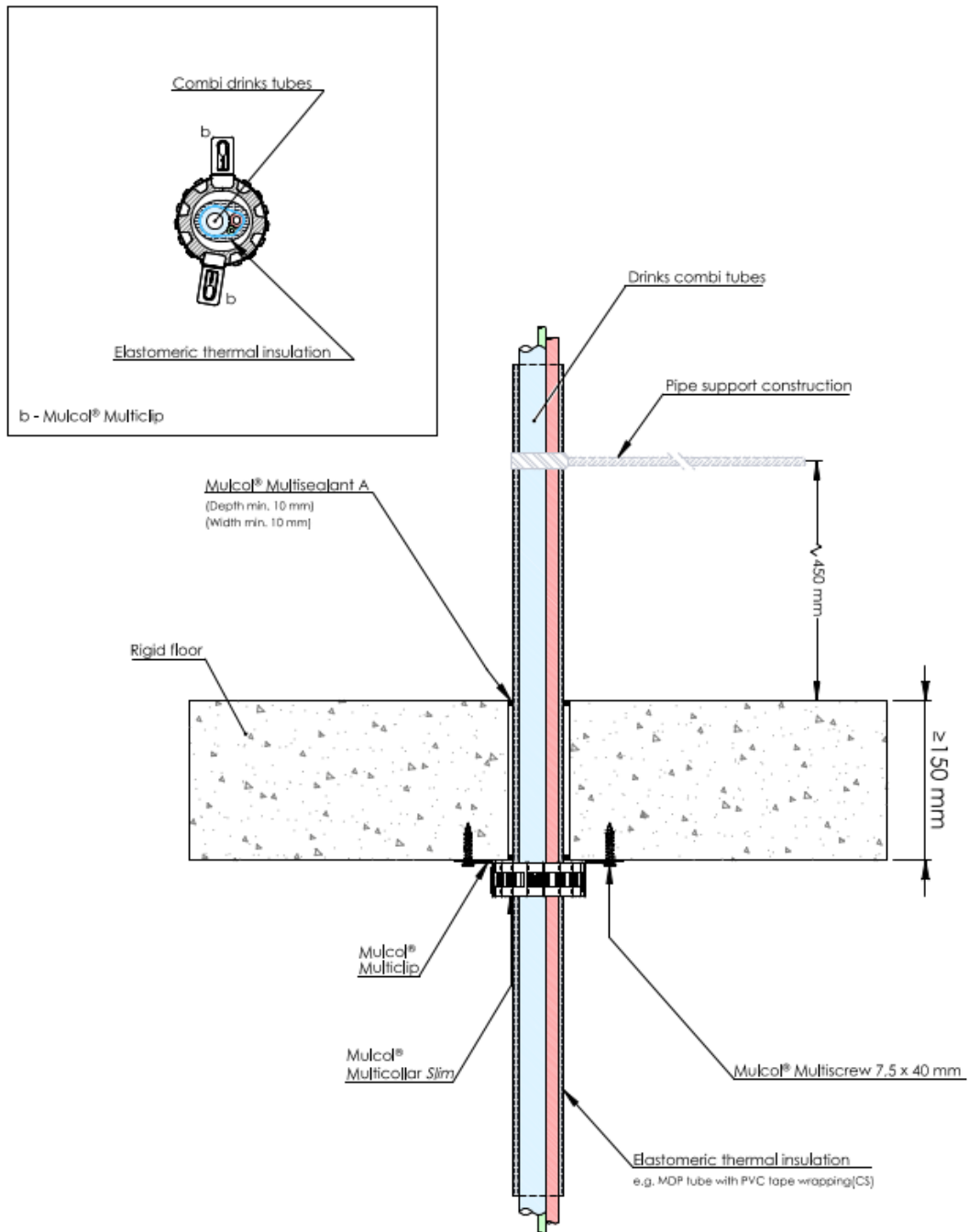


Figure 109 47 mm diameter Python drinks combi pipes

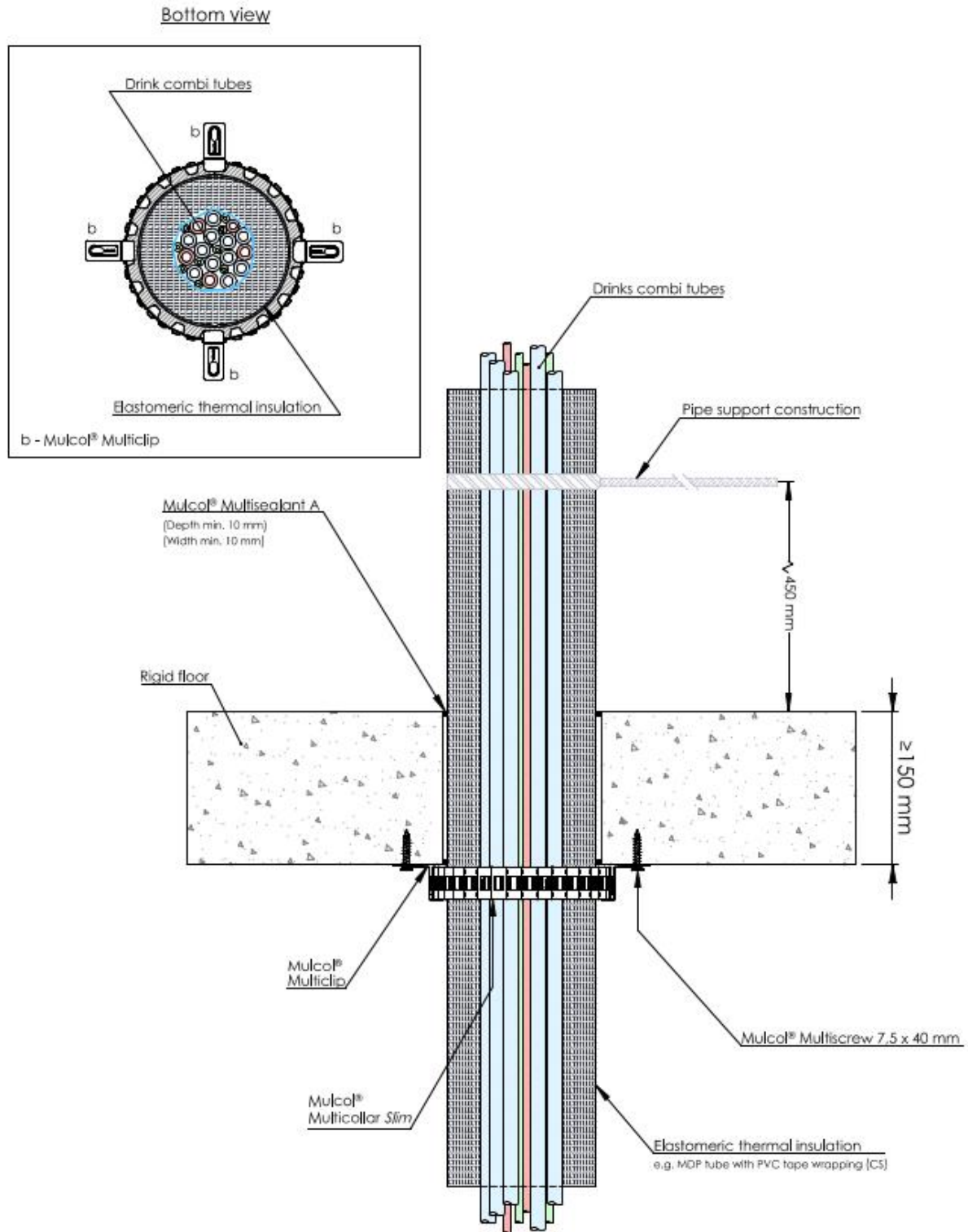


Figure 110 145 mm diameter Python drinks combi pipes

### 7.3.9 Services through Mulcol Multimastic systems

Table 108 Plastic pipes - Mulcol Multimastic FB2 (1 × 60 mm)

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Sealant	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	210 × 210	Ø110	2.7	Mulcol Multisealant A underside	one	-/120/120 U/U

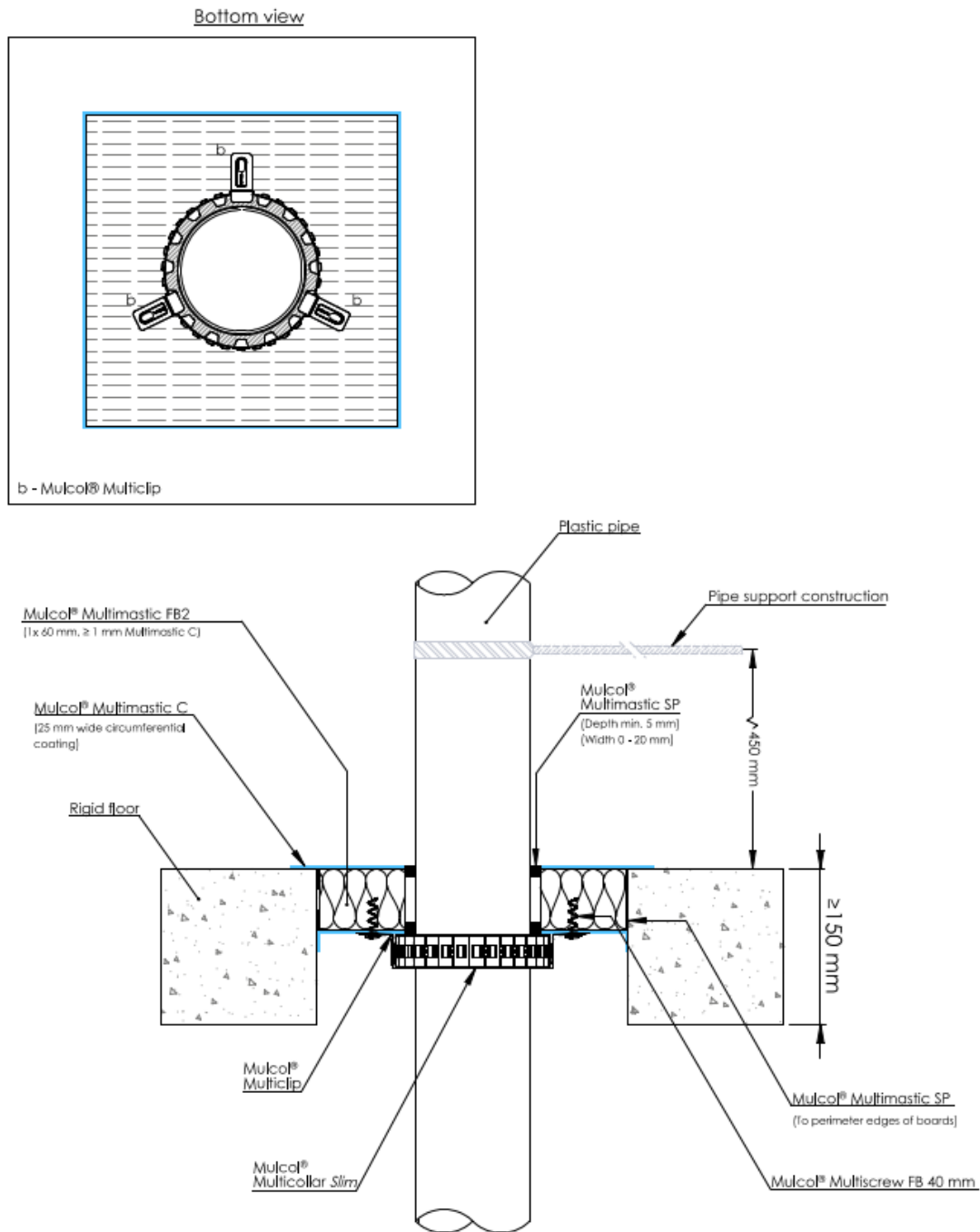
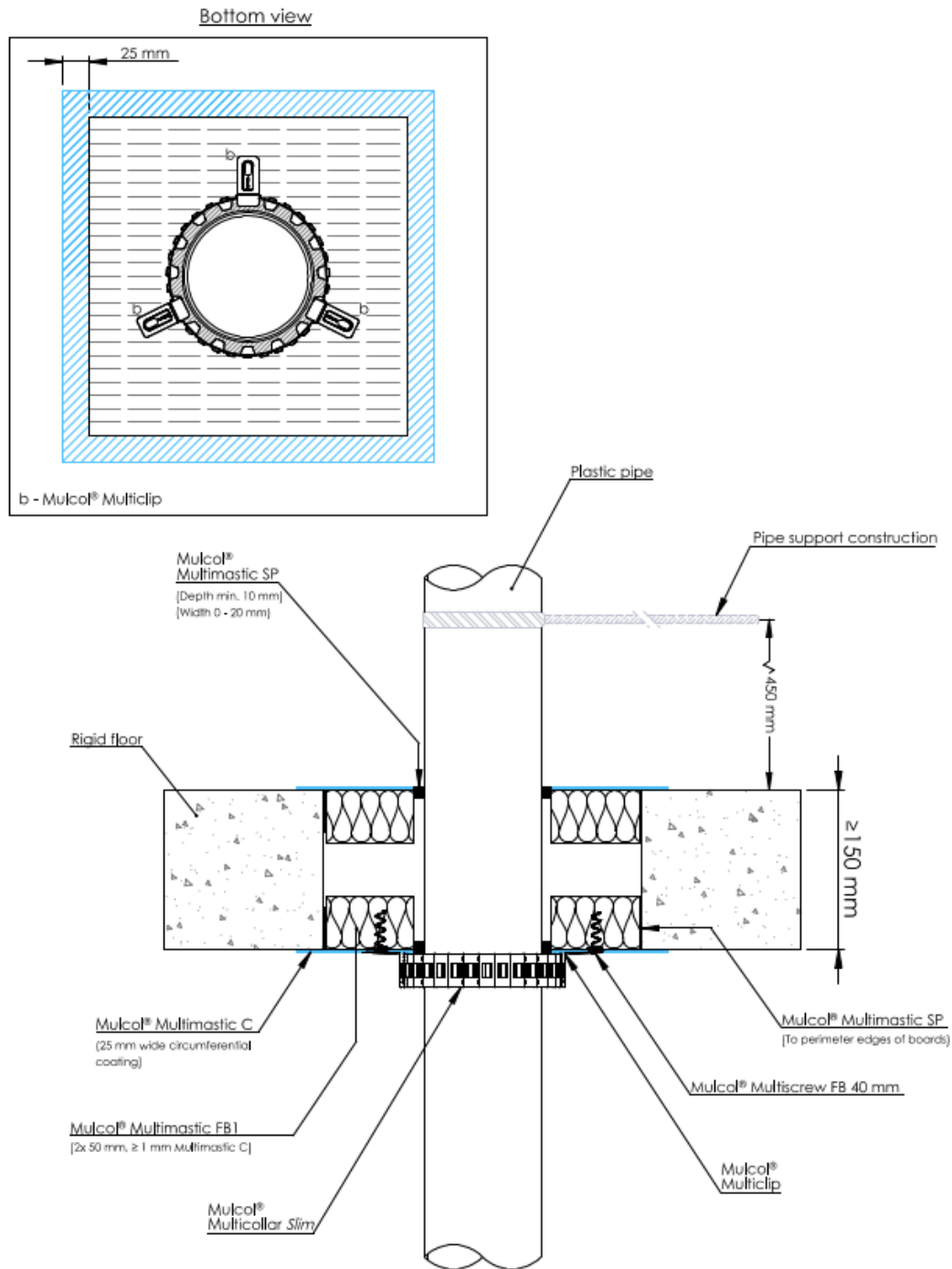


Figure 111 Plastic pipes - Mulcol Multimastic FB2 (1 × 60 mm)

**Table 109 Plastic pipes - Mulcol Multimastic FB1 (2 × 50 mm) with 50 mm cavity**

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	1200 × 600	Ø110	2.7	one	-/120/120 U/C

Note: The openings between the seal and the pipes must be closed off with Mulcol Multimastic SP.



**Figure 112 Plastic pipes - Mulcol Multimastic FB1 (2 × 50 mm) with 50 mm cavity**



Table 110 Plastic pipes - Mulcol Multimastic FB1 (2 × 50 mm) with no cavity

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Number of collars	FRL
PE-HD, PE-X, ABS, SAN-PVC	600 × 400	Ø110	6.6	one	-/60/60 U/U

Note: The openings between the seal and the pipes must be closed off with Mulcol Multimastic SP.

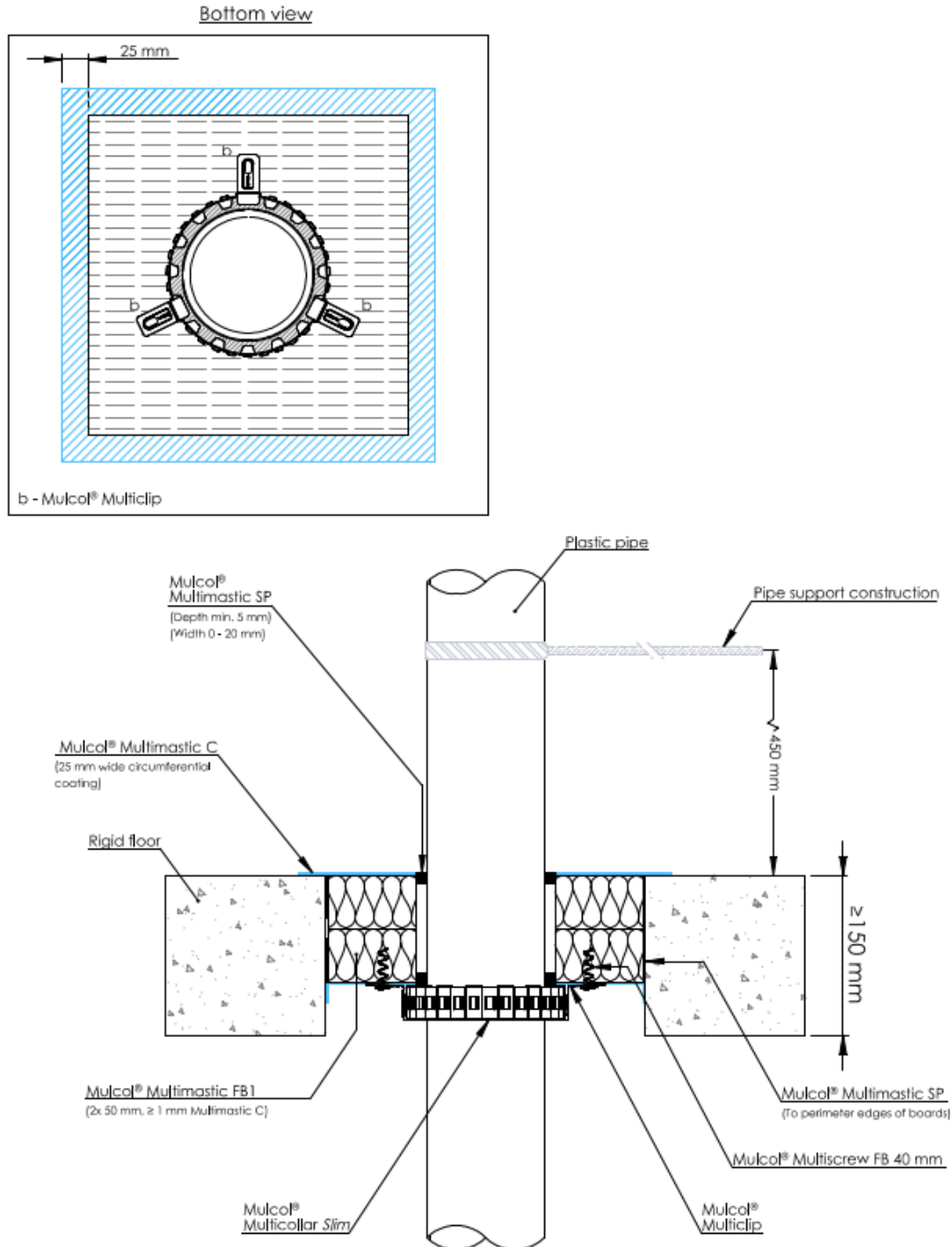


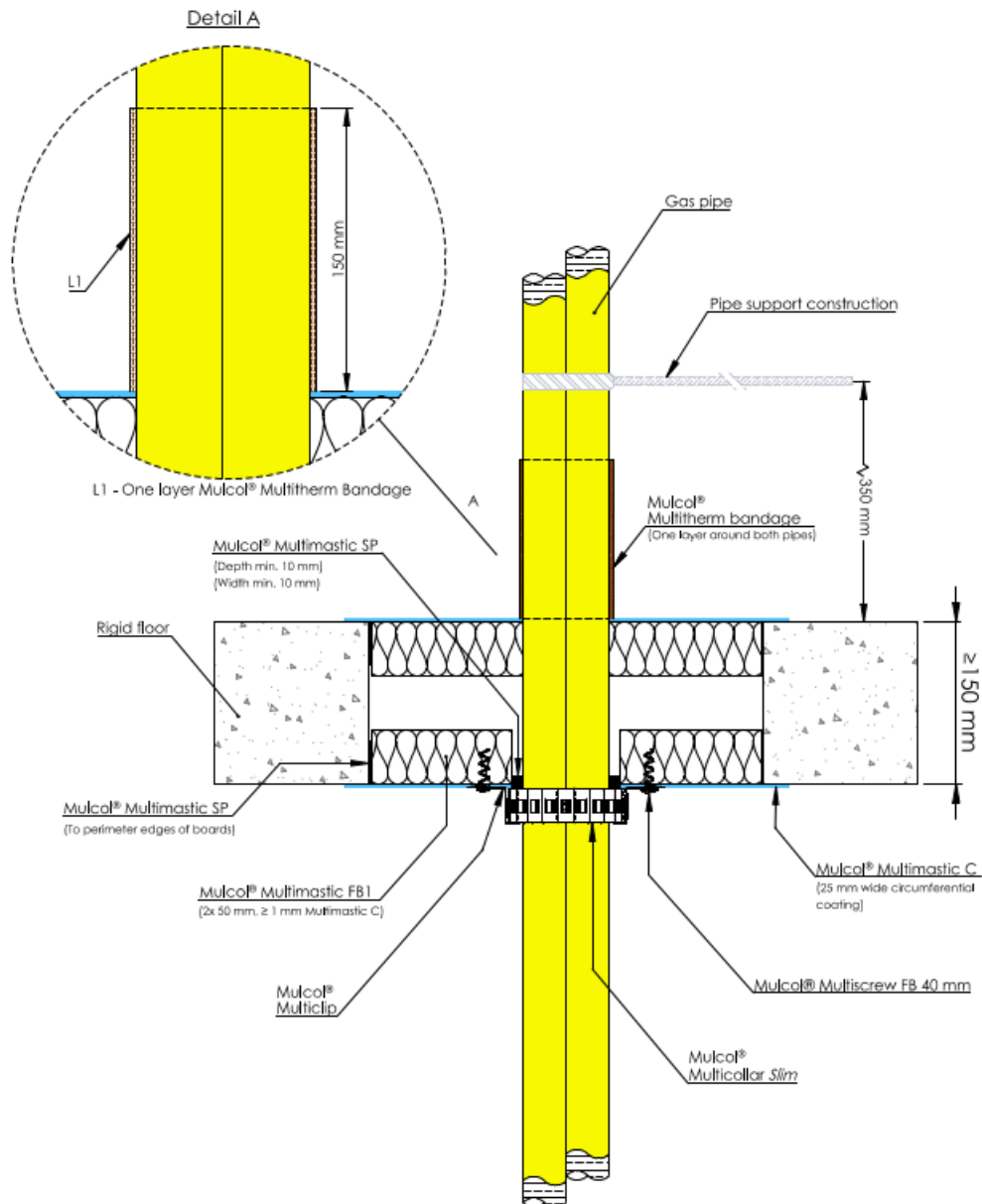
Figure 113 Plastic pipes - Mulcol Multimastic FB1 (2 × 50 mm) with no cavity

**Table 111 Gas pipes - Mulcol Multimastic FB1 (2 × 50 mm) with 50 mm cavity**

Pipe material	Aperture size	Outer diameter (mm)	Pipe wall thickness (mm)	Number of pipes	Number of collars	FRL
Stainless steel gas pipes in wire mesh cable tray 300 × 45 mm	600 × 400	Ø19.9	0.2	4	one	-/120/120 U/C
		Ø40.8	0.3	4	one	-/120/120 U/C
Stainless steel gas pipes		Ø40.8	0.3	2	one	-/120/120 U/C

Notes.

1. Mulcol Multitherm bandage is installed on top of the service.
2. The openings between the seal and the pipes must be closed off with Mulcol Multimastic SP.

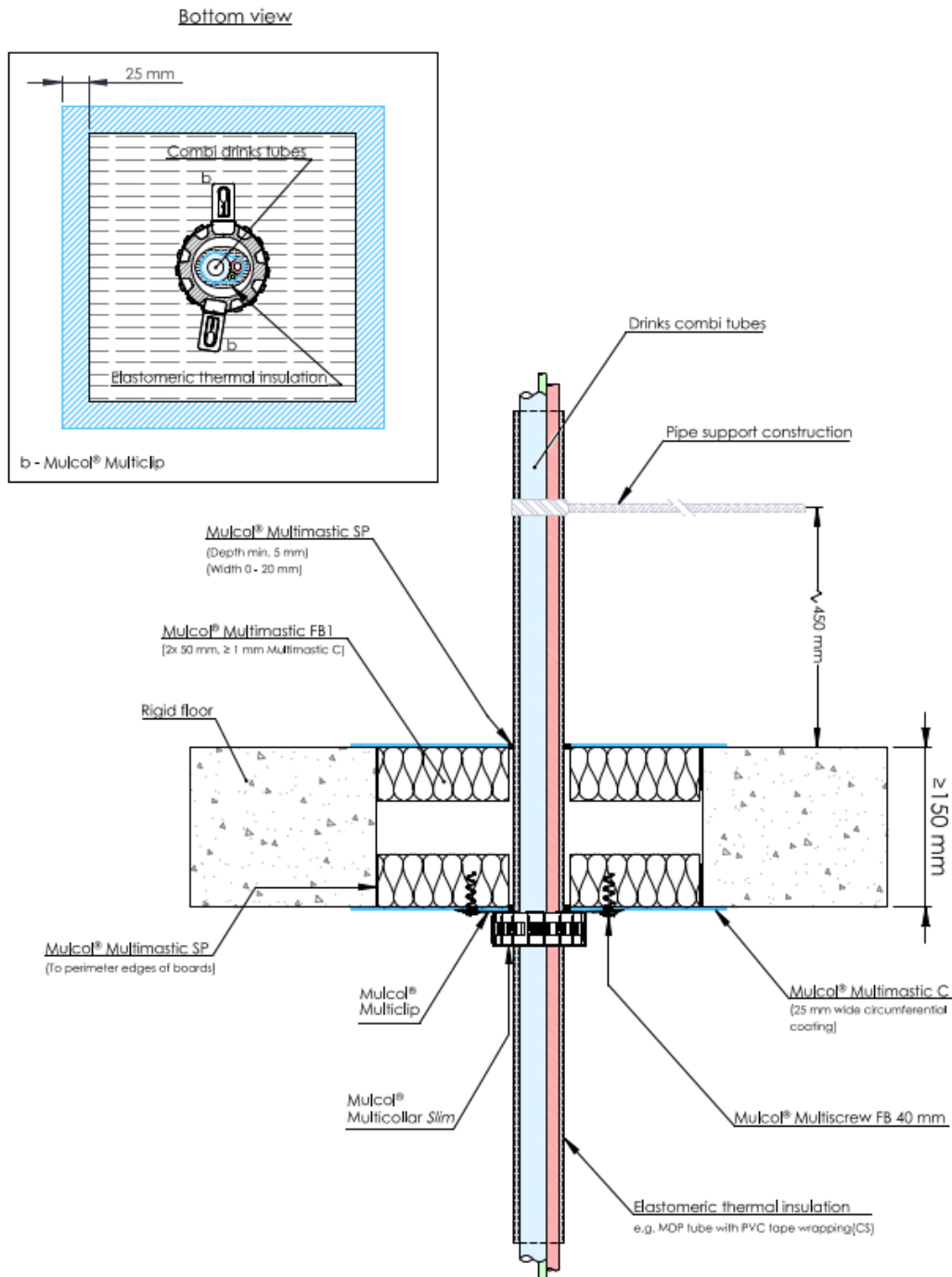


**Figure 114 Gas pipes - Mulcol Multimastic FB1 (2 × 50 mm) with 50 mm cavity**

**Table 112 Combi drinks pipes - Mulcol Multimastic FB1 (2 × 50 mm) with 50 mm cavity**

Pipe material	Aperture size	Outer diameter (mm)	Amount	Number of collars	FRL
Python drinks combi pipes with Armaflex insulation	600 × 400	Ø 47	3 hoses	one	-/120/120 U/C
		Ø 90	3 hoses	one	-/120/120 U/C
		Ø 100	25 hoses	one	-/120/120 U/C
		Ø 145	52 hoses	one	-/120/120 U/C

Note: The openings between the seal and the pipes must be closed off with Mulcol Multimastic SP.



**Figure 115 Python drinks combi pipes**

## 7.4 Conclusion

It is concluded that the services protected using Mulcol® Multicollar Slim products are likely to achieve the FRLs, as outlined in section 7.3 when installed in rigid floor systems in accordance with AS 1530.4:2014 and AS 4072.1:2005.

## 8. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire resistance, but it should be recognised that a single test method will not provide a full assessment of fire resistance under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on test data, information and experience available at the time of preparation. If contradictory evidence becomes available to the assessing authority, the assessment will be unconditionally withdrawn and the report sponsor will be notified in writing. Similarly, the assessment should be re-evaluated, if the assessed construction is subsequently tested since actual test data is deemed to take precedence.

The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance of the proposed systems expected to be demonstrated on a test in accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to Mulcol International for their own specific purposes. This report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code. Building certifiers and other third parties must determine the suitability of the systems described in this report for a specific installation.

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