Laboratory for Fire Safety

Classification of fire resistance in accordance with EN13501-2:2016 of several penetration seals fitted with Mulcol® Multimastic C System and services directly through the floor

Classification report

Report incorporates:
Mulcol® Multimastic C System
Mulcol® Multicollar Slim
Mulcol® Multisealant GR
Mulcol® Multitherm Bandage
Mulcol® Multidisc

Report number YA 1979-3E-RA-002 dated 5 October 2020

Laboratory for Fire Safety

Classification of fire resistance in accordance with EN13501-2:2016 of several penetration seals fitted with Mulcol® Multimastic C System and services directly through the floor

Classification report

Client	Mulcol International Arnesteinweg 18 4338 PD Middelburg The Netherlands
Prepared by	Peutz bv Lindenlaan 41 6584 AC Molenhoek Postbus 66 6585 ZH Mook The Netherlands
Notified body	NB 2264
Product name	Penetration seals fitted with Mulcol® Multimastic C System and services directly through the floor
Report number	YA 1979-3E-RA-002
Date	5 October 2020
Reference	HL/RO//YA 1979-3E-RA-002
Representative	ing. H.H.A. Leenders
Author	ing. R.R.H. Okkersen 0031 85 8228618 r.okkersen@peutz.nl

This classification report, containing 89 pages, can only be used and reproduced as an entity.

Table of contents

1 Introduction

This classification report defines the fire resistance classifications assigned to several pipe and cable penetration seals fitted with Mulcol® products. The systems were tested in the Peutz Laboratory for Fire Safety in Mook in accordance with the standard heating curve and in accordance with the procedures given in EN 13501-2:2016, further referenced as EN 13501-2.

TESTEN
RvA L 505

For performing the testing and classification, the Laboratory for Fire Safety is recognized by the "Stichting Raad voor Accreditatie" (RvA).

The RvA is member of the EA MLA (**EA MLA**: **E**uropean **A**ccreditation Organisation **M**ulti**L**ateral **A**greement: http://www.european-accreditation.org).

EA: "Certificates and reports issued by bodies accredited by MLA and MRA members are considered to have the same degree of credibility, and are accepted in MLA and MRA countries."

2 Normative references and materials used

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

t2.1 Used publications

Reference	Summary of title
EN 13501-2:2016	Fire classification of construction products and building elements – classification using data from fire resistance tests
EN 1366-3:2009	Fire resistance tests for service installations – part 3: penetration seals
prEN1366-3:2020	Fire resistance tests for service installations – part 3: penetration seals
EN 1363-1:1999	Fire resistance tests – Part 1 General requirements
EN 10255	Non alloy steel tubes suitable for welding or threading - Technical delivery conditions
EN 12449	Copper and copper alloys - Seamless, round tubes for general purposes
EN 1451-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – polypropylene (PP) - part 1: Specifications for pipes, fittings and the system
DIN 8077	Polypropylene (PP) pipes – PP-H, PP-B, PP-R, PP-RCT – dimensions
DIN 8078	Polypropylene (PP) pipes – PP-H, PP-B, PP-R, PP-RCT – general quality requirements and testing
EN 15874	Plastic piping systems for hot and cold water installations – polypropylene (PP)
EN 15874-2	Plastic piping systems for hot and cold water installations – polypropylene (PP)
DIN 16962	Pipe joints and elements for polypropylene pressure pipelines (PP)
EN 1453-1	Plastic piping systems with structured-wall pipes inside buildings – unplasticized poly (vynil chloride) PVC-U
EN ISO 15493	Plastic piping systems for industrial applications - acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) - specifications for components and the system - metric series
EN ISO 15494	Plastic piping systems for industrial applications - polybutene (PB), polyethylene (PE), polyethylene of raised temperature resistance (PE-RT), crosslinked polyethylene (PE-X), polypropylene (PP) – metric series for specifications for components and the system
DIN 19535-10	High-density polyethylene (PE-HD) pipes and fittings for hot-water resistant waste and soil discharge systems (HT) inside buildings – part 10: Fire behaviour, quality control and installation recommendations

This classification report incorporates different Mulcol® Materials. For clearance, the materials used are listed in Table 2.2. When available, the existing European Technical Approval (ETA) and the reaction to fire classification according to EN 13501-1 are given.

t2.2 Used Mulcol® materials and available information

Commercial name	Type of material	Number and date European Technical Approval (ETA)	Reaction to fire classification (EN 13501-1)
Mulcol® Multimastic C System	Mineral wool board seal system	ETA-16/0985 dated April 17, 2019	A1
Mulcol® Multimastic C	Coating penetration seal system	ETA-16/0563 dated August 23, 2016	Not determined
Mulcol® Multimastic SP	Acrylic sealant penetration seal system	ETA-16/0565 dated April 17, 2019	D-s1, d1
Mulcol® Multisealant GR	Graphite sealant	ETA-16/0567 dated July 31, 2019	Not determined
Mulcol® Multicollar Slim	Pipe closure device	ETA-17/0836 dated April 30, 2018	E
Mulcol® Multitherm Bandage	Intumescent insulation material	ETA-17/0837 dated July 20, 2018	E
Mulcol® Multidisc	Intumescent insulation material	ETA-17/0838 dated August 21, 2018	E

3 Details of the classified system

3.1 General

The system, a horizontal floor with several penetration seals, is defined as a test specimen with fire resisting penetration sealing systems in accordance with Annex B.3 and Annex E of EN 1366-3:2009, further referenced as EN 1366-3.

The systems were tested in a floor which incorporated other elements. These other elements had no influence on the test results.

3.2 Product description

In this report, 4 systems are classified:

- system Mulcol® Multimastic FB1 with cavity 50 mm: this system is made out of two layers with a thickness each 50 mm (2 x 50 mm), with a cavity of 50 mm (total thickness seal 150 mm). The boards are treated with coating Mulcol® Multimastic C. The coating is applied on the outwards pointing faces of each panel (no coating between the boards). The system is centralised in the floor;
- system Mulcol® Multimastic FB1 without cavity: this system is made out of two layers with a thickness each 50 mm (total thickness of 100 mm, 2 x 50 mm). The boards are treated with coating Mulcol® Multimastic C. The coating is applied on the outwards pointing faces of each panel (no coating between the boards). The panels are placed in the top op the floor;
- system Mulcol® Multimastic FB2: this system is made out of one layer with a thickness of 60 mm (total thickness of 60 mm, 1 x 60 mm). The board is treated with coating Mulcol® Multimastic C on both faces. The panel is placed in the top op the floor;
- penetrations directly through the floor sealed with Mulcol® Multicollar Slim, Mulcol® Multisealant GR and coated Mulcol® Multisealant GR / Multimastic SP.

The Mulcol® Multimastic C system is used for sealing penetration seals. The basic material is Mulcol® Multimastic FB1 and FB2 mineral wool panel with a density of at least 150 kg/m^3.

It's allowed to seal the following elements with the Mulcol® Multimastic C system or directly through the floor:

- perforated cable trays, sheathed electrical cables and conduits;
- single PVC electrical pipes, bundle UTP Cat. 6 cables and YMVK 5 x 2.5 mm^2;
- aluminium composite pipes, plastic pipes, metal pipes, gas pipes and drinks combi pipe.

Details of the penetration seals tested are given in Chapter 4.

4 Test results in support of the classification

4.1 Used report

An overview of the test report used is given in Table 4.1.

t4.1 Used reports

Name of laboratory	Name of client	Report reference number and date	Used methods	Test number
Peutz bv	Mulcol International	Test report Y 1979-4E-RA-002 dated October 5, 2020	EN 1363-1:1999 EN 1366-3:2009	13

The client has stated that the provided report may be used for this classification report.

General Details of the penetration seals are given in Paragraph 4.2. For clarity, the numbering of the penetration seals is taken from the test reports mentioned in Table 4.1. The number before the dot represents the test number and the number behind the dot represents the penetration number (for example 13.2a means penetration 2a of test 13). A brief description of test results relevant for this classification report is given in Paragraph 4.2.1 to 4.2.5.

4.2 General details

The test was performed in accordance with the penetration seals as given in Annex B.3 and E of EN 1366-3. The floor complied to the standard supporting construction as described in EN 1366-3.

In the system Mulcol® Multimastic FB1 (2 x 50 mm, with cavity 50 mm and without cavity), the coating Mulcol® Multimastic C is applied with a thickness of 1.0 mm (wet film thickness, further referenced as WFT) on the outwards pointing faces of each panel (no coating between the boards). In the system Mulcol® Multimastic FB2 (1 x 60 mm), the coating Mulcol® Multimastic C is applied with a thickness of 1.0 mm (WFT) on both faces of the panel. The coating Mulcol® Multimastic C is also applied circumferential over the opening of the mineral wool with the adjacent construction with a thickness of 0.3 mm (WFT, overlap minimal 25 mm applied in one layer). The joints between the different board elements and the aperture edge is glued together with Mulcol® Multimastic SP. The openings between the seal and the cables, cable trays and cable ladders are closed of with Mulcol® Multimastic SP.

The standard service support construction complies with the standard EN 1366-3, Figures A.3A and A.3B.

In general the distance to the first support was:

- metal pipes 350 mm on top of the floor;
- aluminium composite pipes 450 mm on top of the floor;
- single PVC electrical pipes, bundle UTP Cat. 6 cables and YMVK 5 x 2.5 mm^2 450 mm on top of the floor;
- plastic pipes 450 mm on top of the floor.

4.2.1 Results Mulcol® Multimastic C Systems

The summary of the test results relevant for this classification are shown in Table 4.2.

t4.2 Relevant test results in minutes Mulcol® Multimastic C Systems

Test method	Parameter	Seal FB1 2 x 50 m, with cavity 50 mm (13.1 / maximum seal size)	Seal FB1 2x 50 mm without cavity (13.3 / maximum seal size)	Seal FB2 1 x 60 mm (13.5 / maximum seal size)
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[1]	120[1]	120[1]
	Insulation (I)	120[1]	120[1]	98

4.2.2 Results Mulcol® Multimastic FB1 (2 x 50 mm, cavity 50 mm)

The summary of the test results relevant for this classification are shown in Tables 4.3 and 4.4. For a full description of the test results see the reports summarized in Table 4.1.

t4.3 Relevant test results in minutes seal 13.2 (Mulcol® Multimastic FB1 - 2 x 50 mm, cavity 50 mm)

Test method	Parameter	Seal FB1	13.2a	13.2b	13.2c1	13.2c2	13.2c3	13.2c4
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[1]	108	117	120[1]	120[1]	120[1]	120[1]
	Insulation (I)	120[1]	86	108	120[1]	120[1]	120[1]	120[1]
Test method	**Parameter**	**13.2c5**	**13.2c6**	**13.2d2**	**13.2d3**	**13.2d4**	**13.2e1**	**13.2e2**
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[1]	120[1]	120[1]	120[1]	120[1]	120[1]	120[1]
	Insulation (I)	108	120[1]	106	120[1]	107	60	120[1]

t4.4 Relevant test results in minutes seal 13.4 (Mulcol® Multimastic FB1 - 2 x 50 mm, cavity 50 mm)

Test method	Parameter	Seal FB1	13.4a	13.4a1	13.4a2	13.4b1	13.4b2
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[1]	120[3]	120[3]	120[3]	120[3]	120[3]
	Insulation (I)	120[1]	120[1]	120[3]	120[3]	120[3]	120[3]
Test method	**Parameter**	**13.4b3**	**13.4c1**	**13.4c2**	**13.4c3**	**13.4c4**	
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[3]	120[3]	120[3]	120[3]	120[3]	
	Insulation (I)	120[3]	120[3]	120[3]	120[3]	120[3]	

1 Criterion passed at the end of the test

4.2.3 Results Mulcol® Multimastic FB1 (2 x 50 mm, no cavity)

The summary of the test results relevant for this classification are shown in Table 4.5. For a full description of the test results see the reports summarized in Table 4.1.

t4.5 Relevant test results in minutes seal 13.3 (Mulcol® Multimastic FB1 - 2 x 50 mm, no cavity)

Test method	Parameter	Seal FB1	13.3a	13.3a1	13.3a2	13.3a3	13.3a4
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[2]	110	110[3]	110[3]	110[3]	110[3]
	Insulation (I)	120[2]	109	110[4]	110[4]	110[4]	110[4]
Test method	**Parameter**	**13.3a5**	**13.3a6**	**13.3a7**	**13.3a8**	**13.3b**	
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	110[3]	109	110[3]	110[3]	60	
	Insulation (I)	62	108	79	65	60	

4.2.4 Results Mulcol® Multimastic FB2 (1 x 60 mm)

The summary of the test results relevant for this classification are shown in Table 4.6. For a full description of the test results see the reports summarized in Table 4.1.

t4.6 Relevant test results in minutes seal 13.6 (Mulcol® Multimastic FB2 - 1 x 60 mm)

Test method	Parameter	Seal FB2	13.6a	13.6b1	13.6b2	13.6b3
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	112	81	112	112[5]	80
	Insulation (I)	80	63	80[6]	80[6]	77
Test method	**Parameter**	**13.6b4**	**13.6c1**	**13.6c2**	**13.6d1**	**13.6d2**
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	112[5]	112[5]	112[5]	112[5]	112[5]
	Insulation (I)	80[6]	27	42	80[6]	80[6]

4.2.5 Penetrations directly directly through the floor

The summary of the test results relevant for this classification are shown in Table 4.7. For a full description of the test results see the reports summarized in Table 4.1.

t4.7 Relevant test results in minutes (penetration seals directly through the floor)

Test method	Parameter	13.7a1	13.7a2	13.8a2	13.8a2.1	13.9a	13.9b
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[2]	120[2]	120[2]	120[2]	120[2]	120[2]
	Insulation (I)	120[2]	120[2]	120[2]	118	120[2]	120[2]
Test method	**Parameter**	**13.9c**	**13,11**	**13.12a1**	**13.12a2**	**13.12b1**	**13.12b2**
EN 1363-1:1999 / EN 1366-3:2009	Integrity (E)	120[2]	103	120[2]	120[2]	120[2]	120[2]
	Insulation (I)	120[2]	102	120[2]	120[2]	120[2]	120[2]

2 Criterion passed at the end of the test
3 Attained by failure criterion integrity on total seal 13.3
4 Attained by failure criterion temperature on total seal 13.3
5 Attained by failure criterion integrity on total seal 13.6
6 Attained by failure criterion temperature on total seal 13.6

5 Classification and field of application for floor application

5.1 Reference of classification

This classification has been carried out in accordance with Chapter 7.5.8. of EN 13501-2 and is valid for the field of application as given in this classification document. The requested field of application is based on the direct field of application in accordance with EN 1366-3.

Note: As stated in the EN 1366-3, if several penetration seals are included in a single test construction, then the performance of each penetration seal shall be judged separately. Therefore the applicable classifications of the Mulcol® Multimastic C system are stated in different Chapters 5.3 to 5.6.

The classifications given in this Chapter also cover lower classification classes with the same combinations of criteria (for example EI 60 also cover EI 45 and lower). The classifications given in this Chapter with the criteria E and I (EI) also cover the same classification with only the criterion E (for example EI 60 also covers E 60).

5.2 General conditions

In this Chapter the general conditions are given of the classified systems of Chapters 5.3 to 5.6.

5.2.1 Orientation

The classification is valid for cables, cable carriers plastic pipes and metal pipes passing through perpendicular to a horizontal floor.

5.2.2 Rigid floor

The cable ans pipe penetrations may be applied in any type of floor of aerated concrete (class G4/600, density 600 ± 200 kg/m^3 or heavier), concrete or masonry with a minimum thickness of 150 mm.

When the floor is thicker than 150 mm, the system Mulcol® Multimastic FB1 (2 x 50 mm, cavity 50 mm) shall be located vertically centralized in the floor. The systems Mulcol® Multimastic FB1 (2 x 50 mm, no cavity) and Mulcol® Multimastic FB2 (1 x 60 mm) shall always be located flush with the top of the floor.

5.2.3 Distance to floor, corner or wall

A distance of at least 200 mm from the edge of the aperture of the penetration seal to a different floor, corner, wall or transfer to another type of floor (adjacent constructions) shall be taken into account.

5.2.4 Size Mulcol® Multimastic FB1 (2 x 50 mm, cavity 50 mm)

The maximum aperture size is 1200 x 600 mm or smaller, provided that the total cross section of the cables does not exceed 60 % of the penetration area.

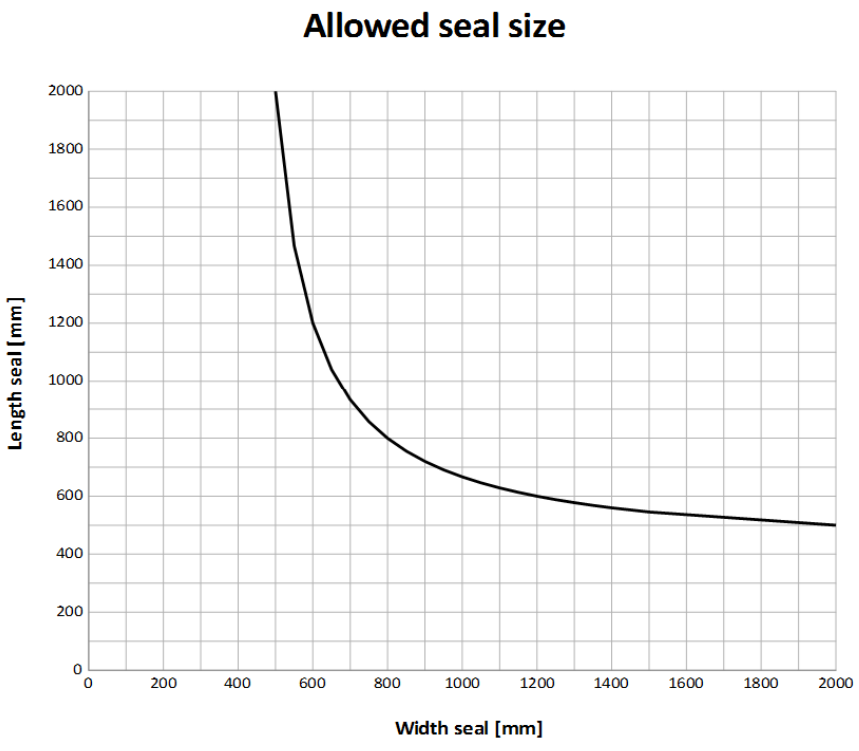
For the system Mulcol® Multimastic FB1 (2 x 50 mm, cavity 50 mm), a classification according to the following combinations of performance parameters and classes apply (placed centralized within the floor).

See Chapter 5.3 for details.

Fire resistance classification Mulcol® Multimastic C system (FB1 2 x 50 mm, cavity 50 mm)	
Seal size 1200 x 600 mm*	**EI 120**

* It is allowed make the aperture longer to any length provided that the circumferential length is less than relative to the area ratio is not less than 5.0 m^{-1}. In Figure 5.1 the maximum allowed seal size is shown up to an opening length of 2000 mm but it may be longer in practice. The aperture may also be circular up to a diameter of 600 mm.

f5.1 Maximum allowed seal size



5.2.5 Size Mulcol® Multimastic FB1 (2 x 50 mm, no cavity)

The maximum aperture size is 600 x 400 mm or smaller, provided that the total cross section of the cables does not exceed 60 % of the penetration area.

For the system Mulcol® Multimastic FB1 (2 x 50 mm, no cavity), a classification according to the following combinations of performance parameters and classes apply (placed flush with the top of the floor).

See Chapter 5.4 for details.

Fire resistance classification Mulcol® Multimastic C system (FB1 2 x 50 mm, no cavity)	
Seal size 600 x 400 mm	**EI 120**

The aperture may also be circular up to a diameter of 400 mm.

5.2.6 Size Mulcol® Multimastic FB2 (1 x 60 mm)

The maximum aperture size is 1200 x 600 mm or smaller, provided that the total cross section of the cables does not exceed 60 % of the penetration area.

For the system Mulcol® Multimastic FB2 (1 x 60 mm), a classification according to the following combinations of performance parameters and classes apply (placed flush with the top of the floor).

See Chapter 5.5 for details.

Fire resistance classification Mulcol® Multimastic C System (FB2 1 x 60 mm)	
Seal size 1200 x 600 mm*	**EI 90 / E 120**

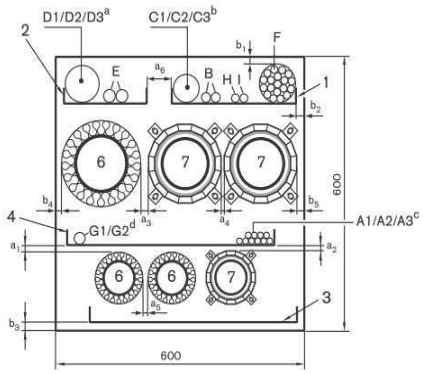
* It is allowed make the aperture longer to any length provided that the circumferential length is less than relative to the area ratio is not less than 5.0 m^{-1}. In Figure 5.1 the maximum allowed seal size is shown up to an opening length of 2000 mm but it may be longer in practice. The aperture may also be circular up to a diameter of 600 mm.

5.2.7 Mutual distances Mulcol® Multimastic C System (FB1 and FB2)

For the mutual distances a_1 to a_6 and b_1 to b_5 between the cables, cable carriers, and pipes see Table 5.1. For clearance the standard configuration for large cable penetration seals is used as a guideline. The configuration in practice may derive from this Figure as long as the mutual distances are applied.

t5.1 Distances cables, cable carriers and pipes Mulcol® Multimastic C System (2 x 50 mm and 1 x 60 mm)

Description	General distances (mm)			Figure F.1 of EN 1366-3
	FB 1 cavity 50 mm (2 x 50 mm)	FB 1 no cavity (2 x 50 mm)	FB 2 (1 x 60 mm)	
Distance metal pipe to cable / cable carrier / conduit – a_1	30	N.a.	30	
Distance plastic pipe to cable / cable carrier / conduit – a_2	30	30	30	
Distance metal pipe to plastic pipe – a_3	25	N.a.	25	
Mutual distance plastic pipes – a_4	30	N.a.	30	
Mutual distance metal pipes – a_5	0	N.a.	0	
Mutual distance cable carriers – a_6	0	N.a.	0	
Distance cable / cable carrier / conduit to top seal edge– b_1	0	20	0	
Distance cable / cable carrier / conduit to vertical seal edge – b_2	0	20	0	
Distance cable carrier to bottom seal edge – b_3	0	N.a.	0	
Distance metal pipe to seal edge – b_4	10	N.a.	10	
Distance plastic pipe to seal edge – b_5	15	15	15	



5.2.8 Thickness of the coating Mulcol® Multimastic C

The thickness of the coating Mulcol® Multimastic C is given as a wet film thickness, also referenced as WFT. The dry film thickness in practice can be slightly thinner after drying of the coating.

In the system Mulcol® Multimastic FB1 (2 x 50 mm, with or without cavity 50 mm), the coating Mulcol® Multimastic C is applied with a thickness of at least 1.0 mm (WFT) on the outwards pointing faces of each panel (no coating between the boards). In the system Mulcol® Multimastic FB2 (1 x 60 mm), the coating Mulcol® Multimastic C is applied with a thickness of at least 1.0 mm (WFT) on both faces of the panel. The coating Mulcol® Multimastic C is also applied circumferential over the opening of the mineral wool with the adjacent construction (overlap minimal 25 mm), with a thickness of 0.3 mm applied in one layer (WFT). The joints between the different board elements and the aperture edge shall be glued together with Mulcol® Multimastic SP.

Specific thickness (WFT) of the coating Mulcol® Multimastic C on the services is given in Chapters 5.3 to 5.5.

5.2.9 Cable carriers

The classifications are valid for cable penetrations seals in a horizontal floor and cable carriers passing through perpendicular to the floor. The classifications are valid for all metal cable carriers (trays and / or ladders) with a melting point higher than the furnace temperature at the classification time (for example stainless or galvanised steel). The cable carriers may be omitted. No lid on top of the cable carrier is allowed passing through the sealing system.

5.2.10 Distance to first support

The minimum distance to the first support shall be:

- cables and cable carriers 250 mm on top of the floor (see Chapter 5.4.1);
- metal pipes 350 mm on top of the floor (see Chapters 5.3.2 to 5.3.5, 5.5.2 to 5.5.4, 5.6.4 and 5.6.5);
- aluminium composite pipes 450 mm on top of the floor (see Chapters 5.3.1 and 5.5.1);
- single PVC electrical pipes, bundle UTP Cat. 6 cables and YMVK 5 x 2.5 mm^2 450 mm on top of the floor (see Chapters 5.3.1 and 5.5.1);
- gas pipes 350 mm on top of the floor (see Chapter 5.3.6, 5.3.7 and 5.6.3).
- plastic pipes and drinks combi pipe 450 mm on top of the floor (see Chapters 5.4.2, 5.6.1 and 5.6.2).

5.2.11 Pipe end configuration

The classification of plastic and aluminium composite pipes applies to a certain pipe end configuration. In Table 5.2, the configuration to be tested versus intended use is given.

t5.2 Pipe end configuration versus intended use

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

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

t5.3 *Pipe end configuration versus intended use*

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

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

5.2.12 Means of fixing Mulcol® Multicollar Slim

The Mulcol® Multicollar Slim shall be attached to the underside of the rock wool of the Mulcol® Multimastic C System using the Mulcol® Multiclip and Mulcol® Multiscrew FB40. In Table 5.4, the exact assembly instructions are given sorted by installation diameter of the collar (outer diameter of the pipe, cable or insulation).

It is also allowed to use rod and bolts M6.

t5.4 *Assembly instructions fixing*

Outer diameter pipe, cable or insulation (mm)	Single collar	Double collar		Allowed fastenings	
	Number of Mulcol® Multiclips	First collar (Mulcol® Multiclips)	Second collar (Mulcol® Multiclips Large)	Rigid floor	Rock wool board system
≤ 90	2	1*	2	Mulcol® Multiscrew FB40	Mulcol® Multiscrew FB 40 or threaded rod and bolts M6
> 90 and < 160	3	1*	3		
≥ 160 and ≤ 200	4	1*	4		
> 200 and ≤ 285	5	2	5		

*Mechanical fixation to the floor is not necessary

5.3 Mulcol® Multimastic FB1 (2 x 50 mm, with cavity)

For the system Mulcol® Multimastic FB1 (2 x 50 mm, with cavity 50 mm), a classification of pipes and cables according to the following combinations of performance parameters and classes apply.

The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic SP.

The system mus be placed vertically centralized within the floor.

5.3.1 Mulcol® Multidisc

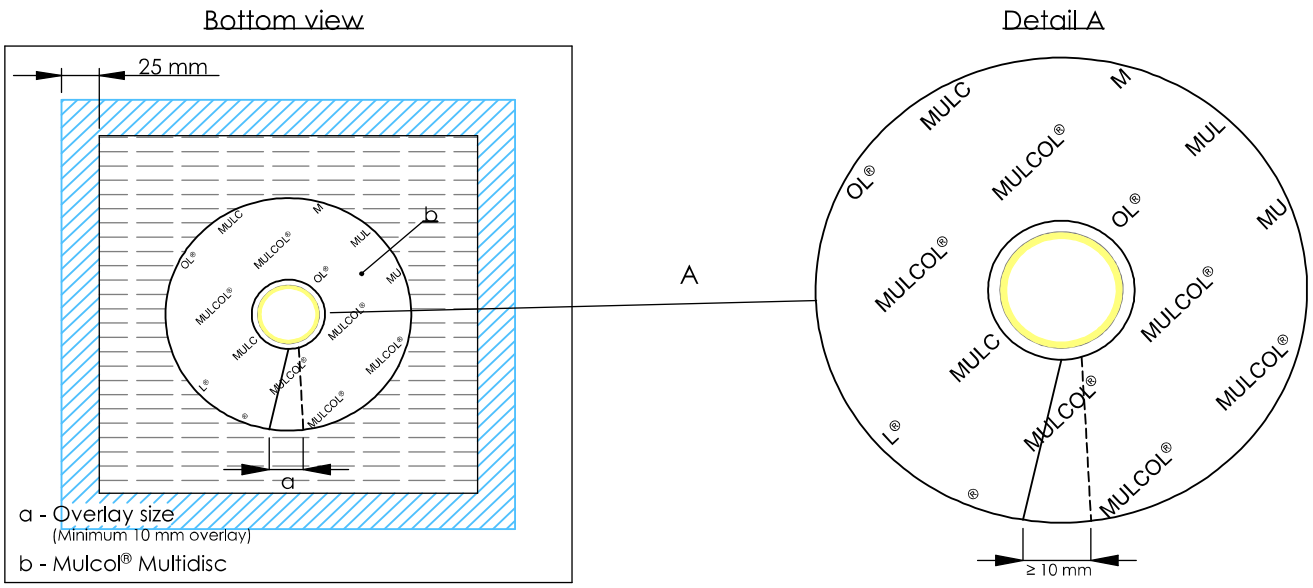
On the next pages, classifications, conditions and drawings of this system inside a seal are given.

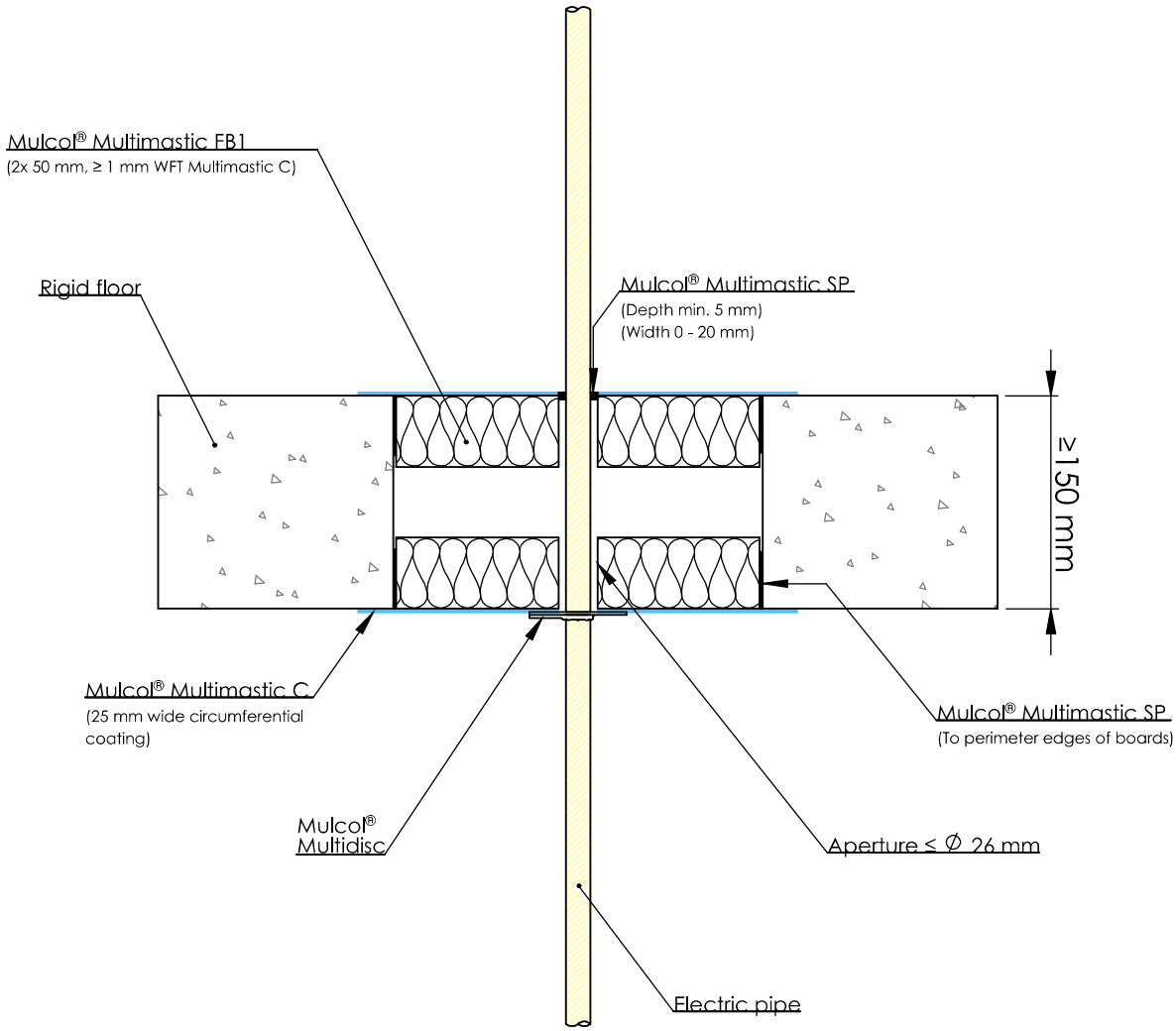
Fire resistance classification			
Outer diameter pipe / bundle (mm or inch)	**Performance class with pipe end configuration**	**Pipe / cable material**	**System**
Drawing PBrf-MFB1-EP19-M2.0.10			
≤ 3/4" **≤ 19 mm**	**EI 120–U/C**	**Electrical pipes PVC-U / PVC-C**	**Mulcol® Multidisc**
Drawing PBrf-MFB1-EC-M2.0.10			
Single electrical cable	**EI 90** **E 120**	**YMVK 5 x 2.5 mm²**	**Mulcol® Multidisc**
Drawing PBrf-MFB1-ECB-M2.0.10			
Bundle ≤ 25 mm	**EI 120**	**Bundle telecommunication cables UTP Cat. 6**	**Mulcol® Multidisc**
Drawing PBrf-MFB1-MLA-M2.0.10			
≤ 16 x 2.0 mm	**EI 120–U/C**	**Henco PE-Xc/AL/PE-Xc**	**Mulcol® Multidisc**

The holes for the penetrations seals fitted with the Mulcol® Multidisc shall be less than Ø26 mm. The Mulcol® Multidisc must be fitted below the floor.

The following minimum working distances for Mulcol® Multidisc apply within the penetration seal (see Table 5.1);

- a_3: ≥ 0 mm (distance Mulcol® Multidisc to Mulcol® Multitherm Bandage);
- a_4: ≥ 0 mm (mutual distance Mulcol® Multidisc);
- b_4: ≥ 10 mm (distance Mulcol® Multidisc to seal edge).

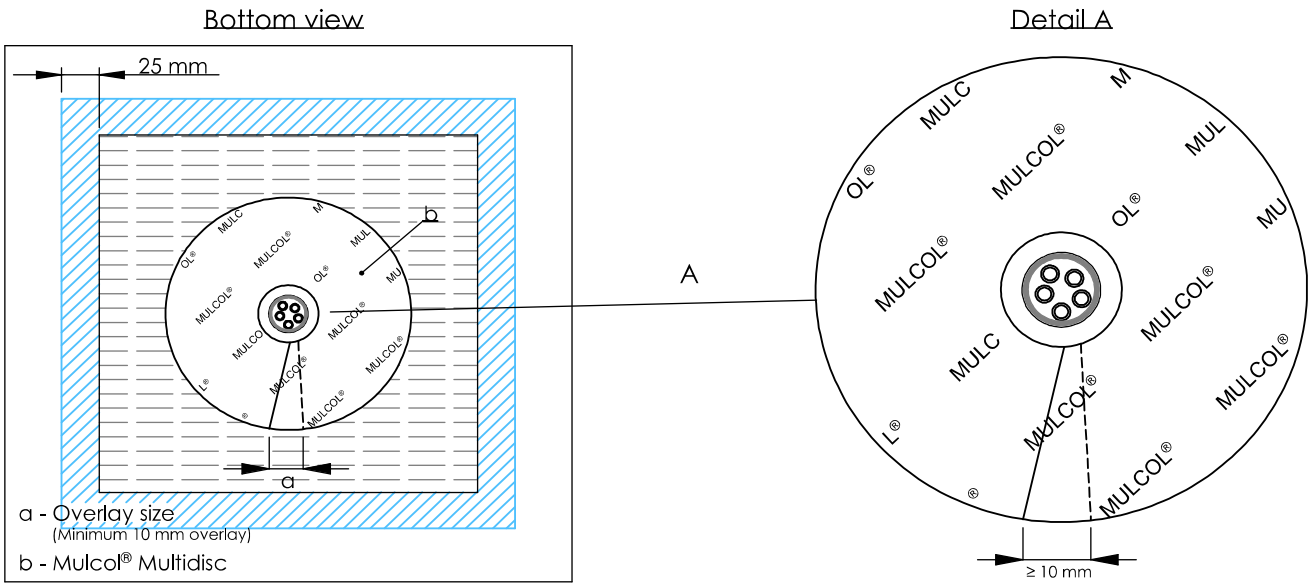


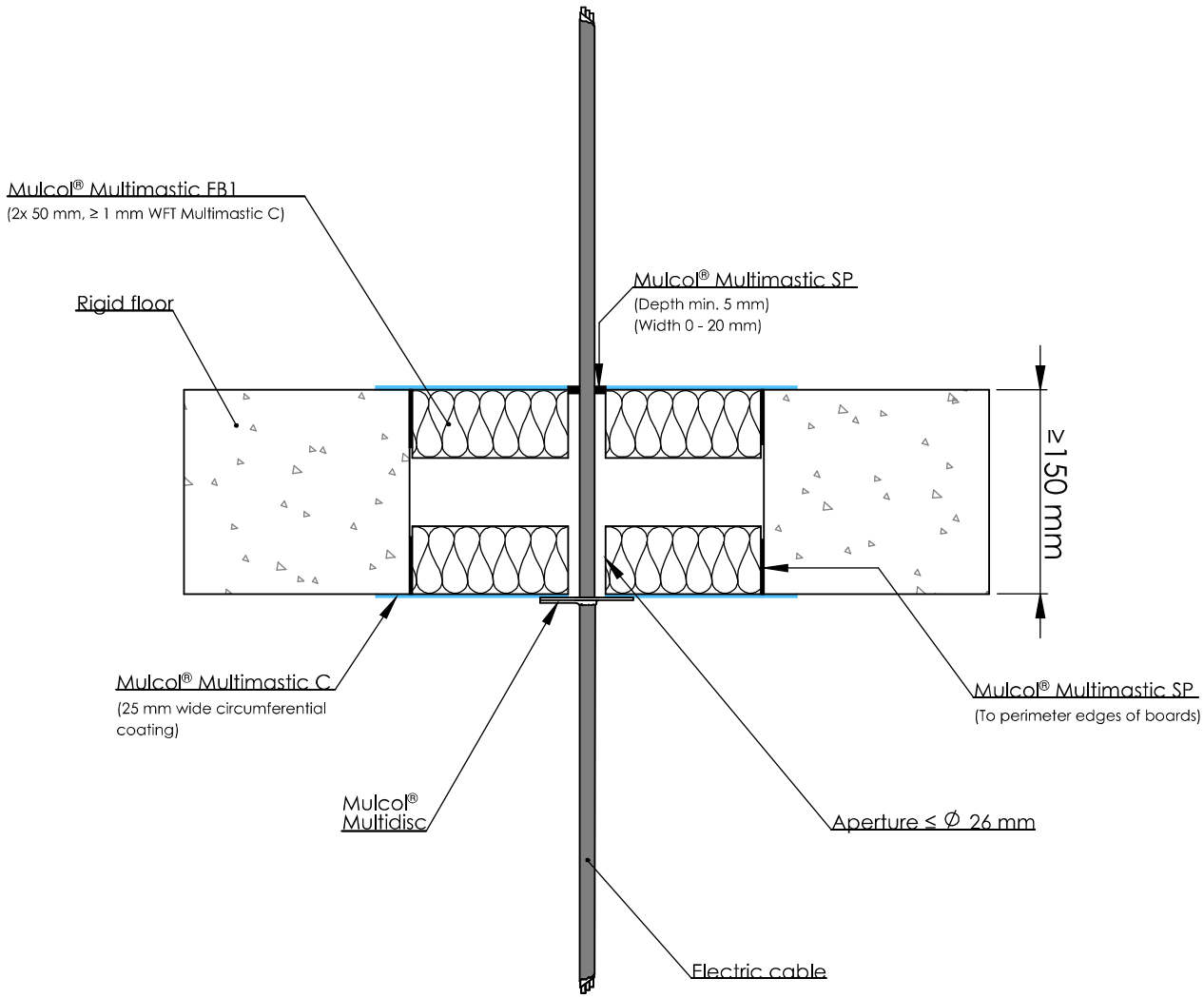


American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB1-EP19-M2.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multidisc Installation
in rigid floor

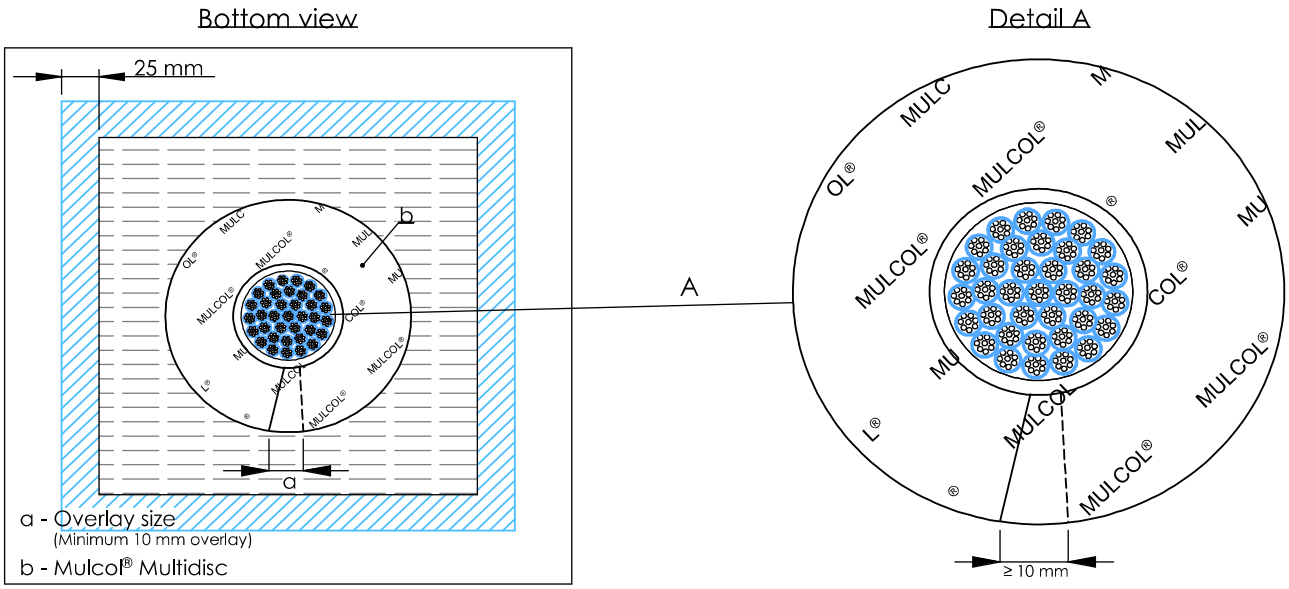


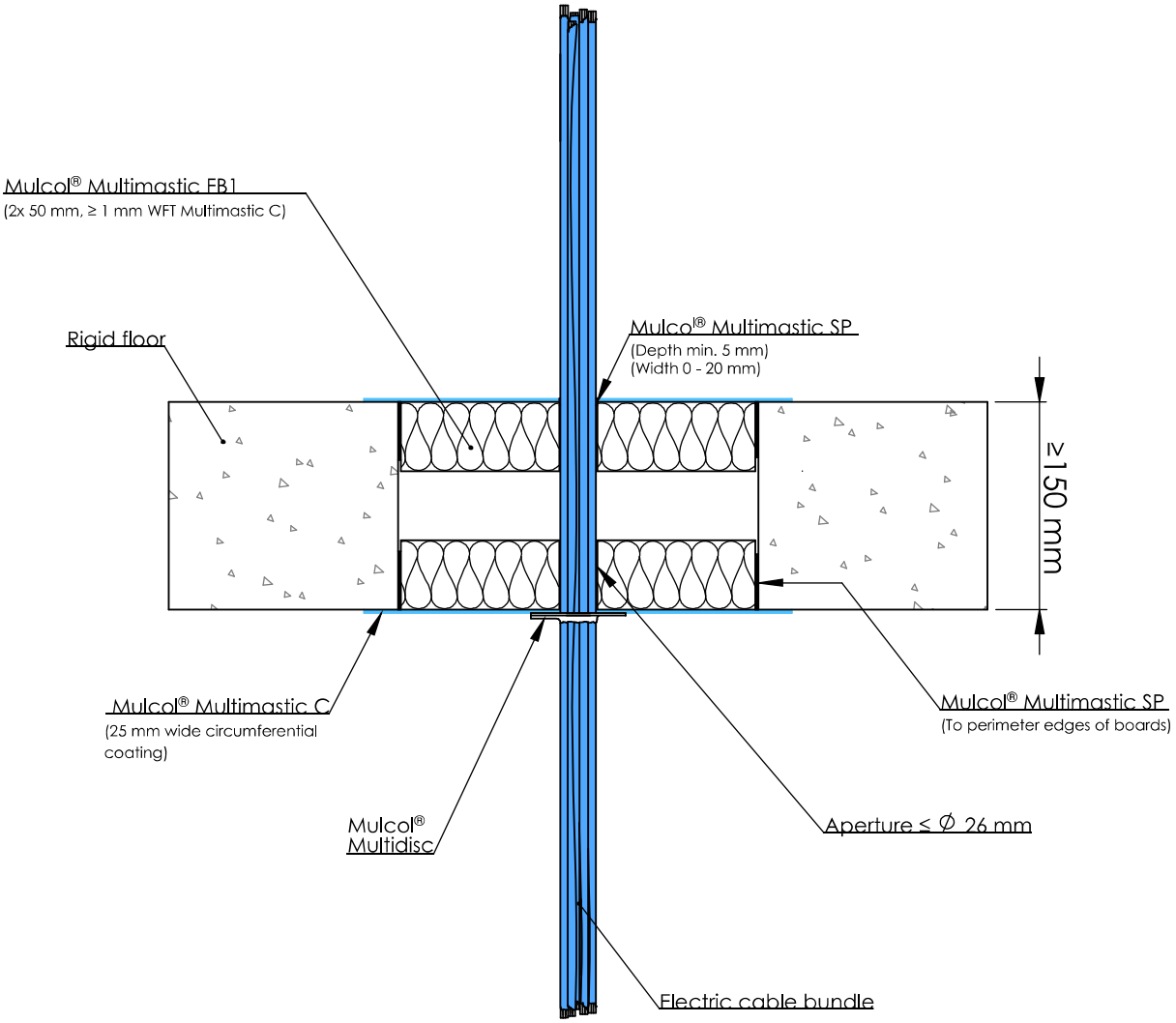


American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB1-EC-M2.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test cable penetration seal
Mulcol® Multidisc
Installation in rigid floor

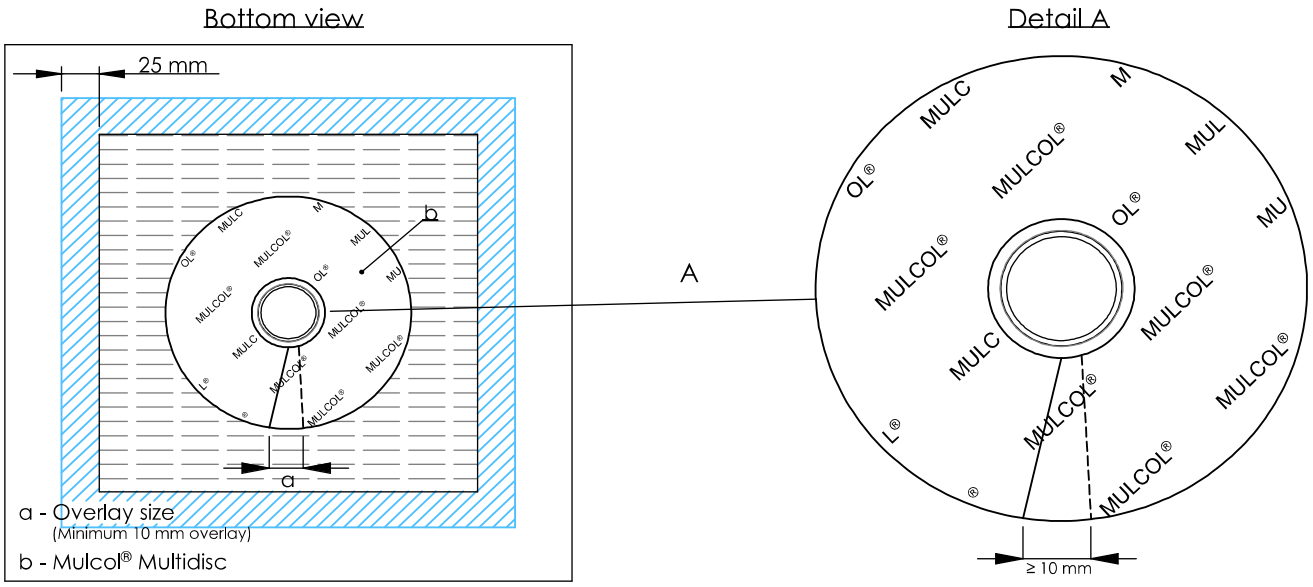


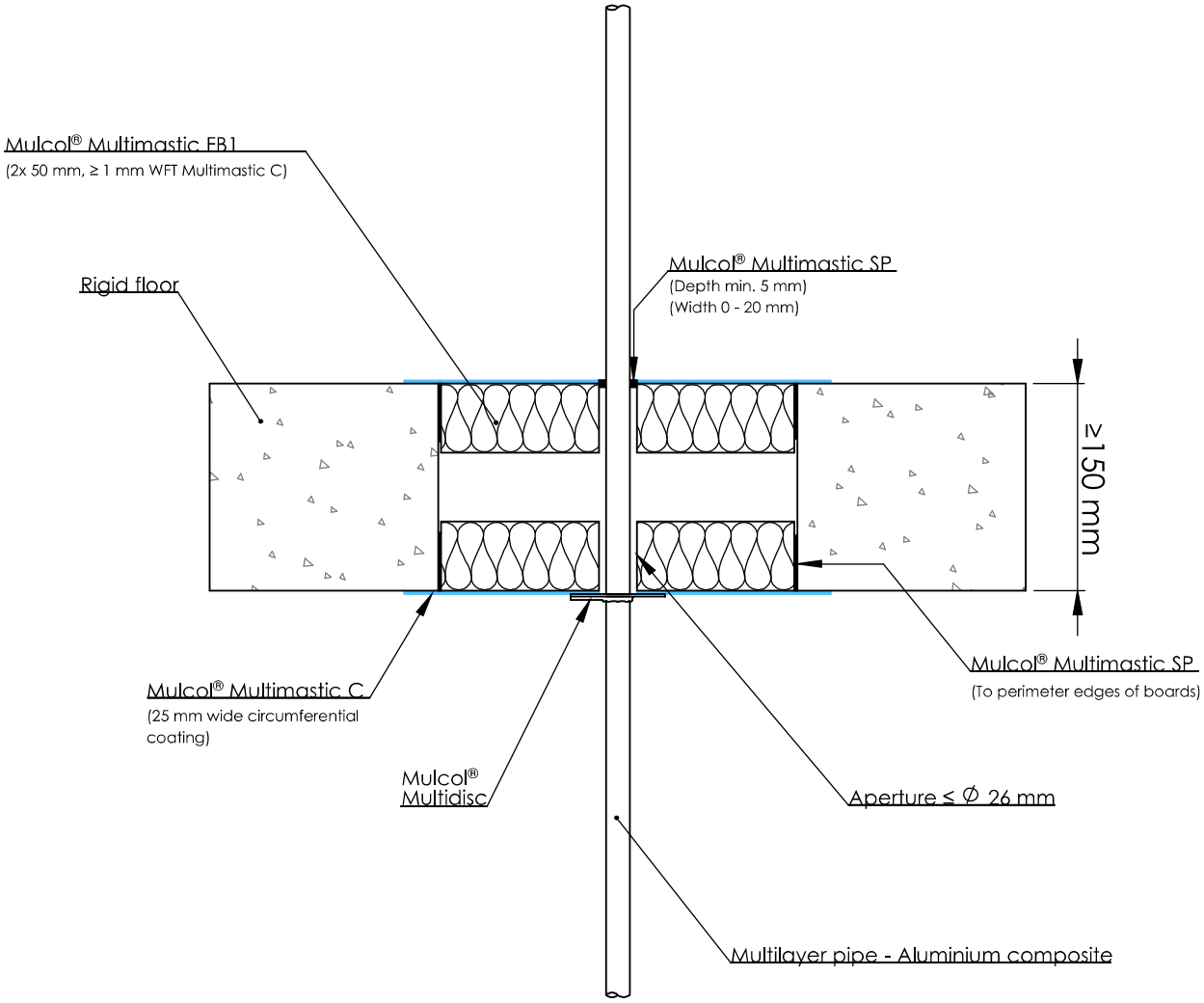


American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB1-ECB-M2.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable penetration seal
Mulcol® Multidisc
Installation in rigid floor





American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB1-MLA-M2.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multidisc Installation
in rigid floor

5.3.2 Mulcol® Multisealant GR

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

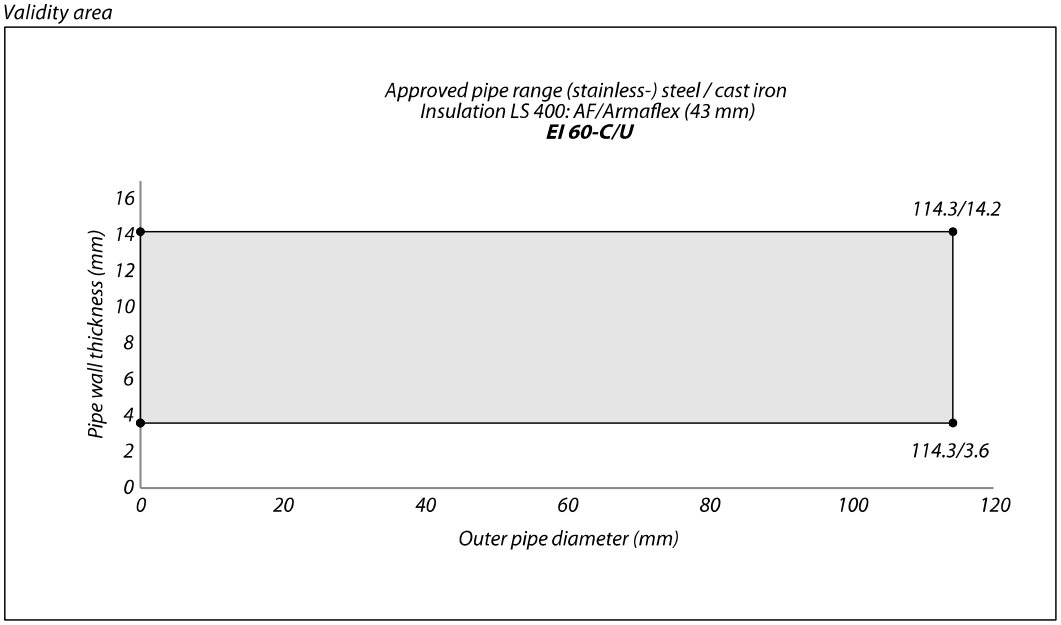
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-ST-MFB1-G2.2.22						
≤ 114.3	3.6 to 14.2	EI 60–C/U E 90–C/U	AF/Armaflex (43)	(Stainless-) steel / cast iron	Mulcol® Multisealant GR	5.2

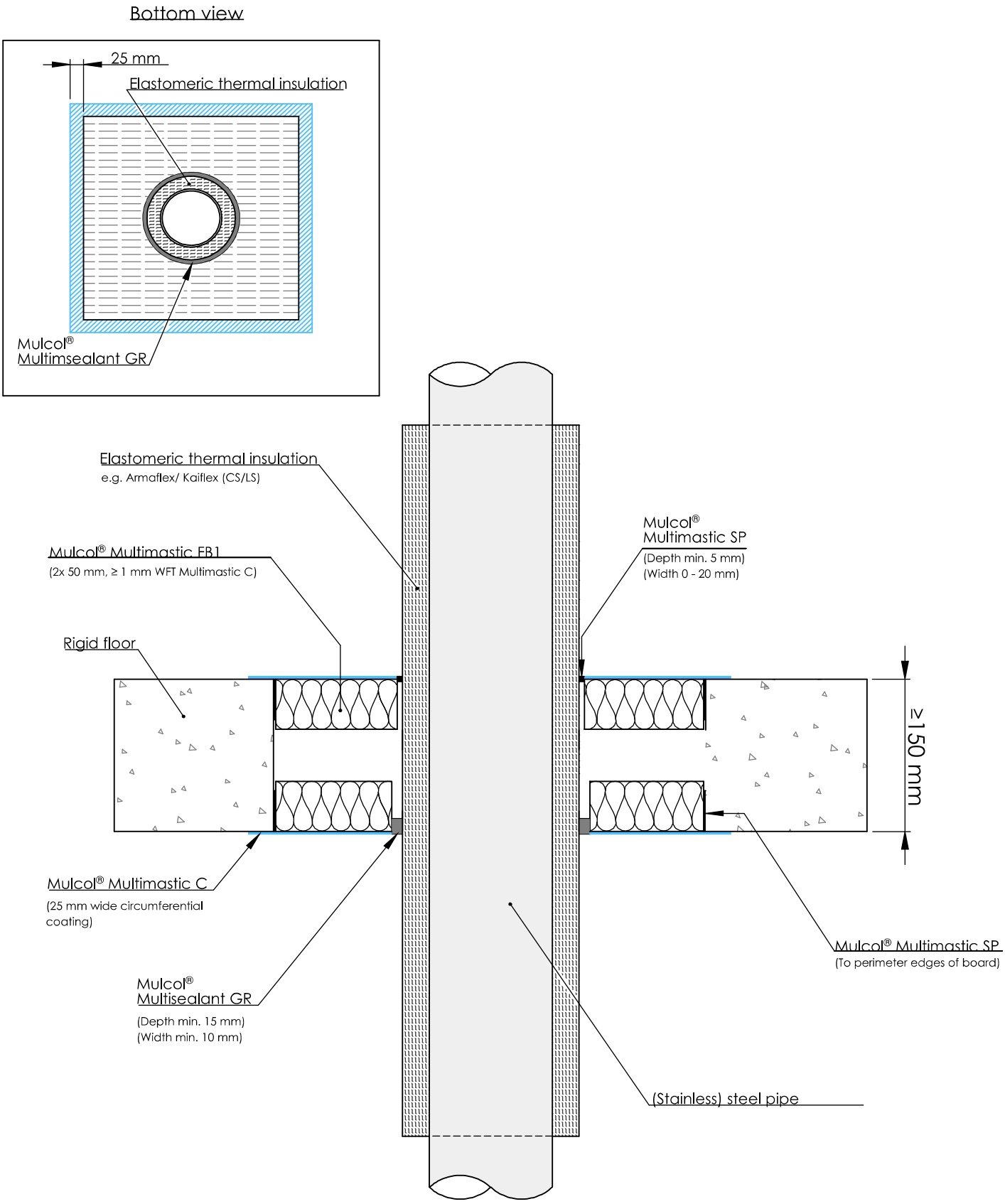
The fire resistance classification is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class BL-s3, d0 or B-s3, d0 in accordance with EN 13501-1. The insulation shall be applied sustained at the aperture with a minimum distance of 400 mm on both sides from the point where the pipe emerges out of the floor (allowed is LS and CS in accordance with Table 1 of EN 1366-3). When the insulation AF/Armaflex consists out of multiple parts or splices are present, the insulation is glued together with Armaflex 520.

The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- b_4: ≥ 10 mm (distance Mulcol® Multisealant GR to seal edge).

f5.2 Validity area





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB1-G2.2.22
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

5.3.3 Mulcol® Multisealant GR (coated on pipe)

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

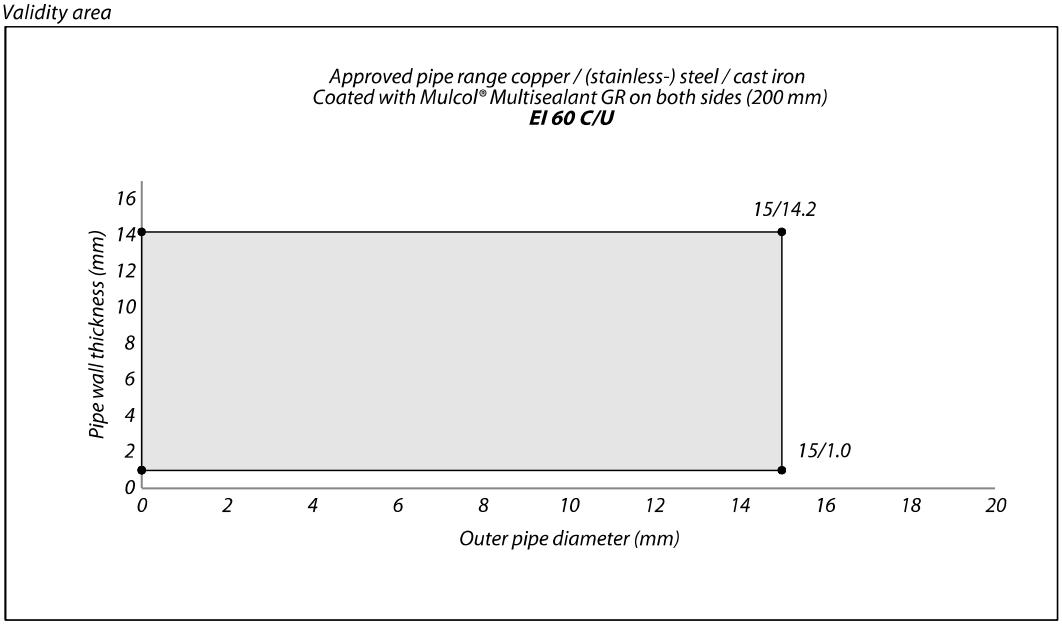
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-CU-MFB1-GRC.1.10						
≤ 15	1.0 to 14.2	EI 60–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.3
Drawing PBrf-ST-MFB1-GRC.1.10						
≤ 15	1.0 to 14.2	EI 60–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.4
≤ 42.4	3.2 to 14.2					
≤ 42.4	3.2 to 14.2	EI 120–C/U				5.5

For classification of the pipes coated with Mulcol® Multisealant GR, it shall be coated over a length of 200 mm on both sides with Mulcol® Multisealant GR, thickness 1.5 mm (WFT).

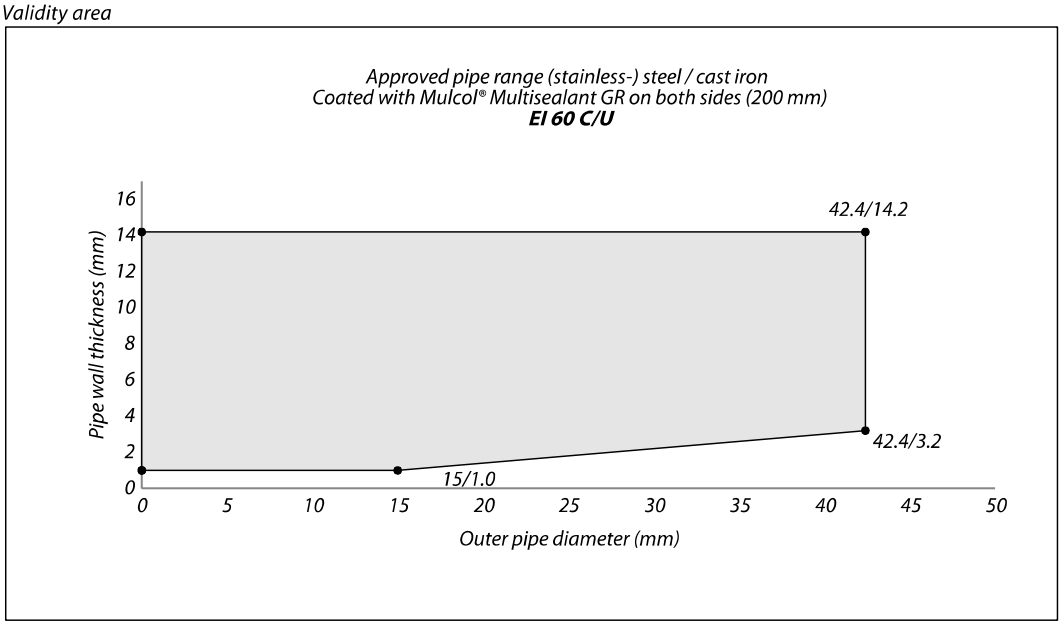
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- a_1: ≥ 30 mm (distance coated Mulcol® Multisealant GR to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance coated Mulcol® Multisealant GR to Mulcol® Multicollar Slim);
- a_5: ≥ 0 mm (mutual distance coated Mulcol® Multisealant GR seals);
- b_4: ≥ 10 mm (distance coated Mulcol® Multisealant GR to seal edge).

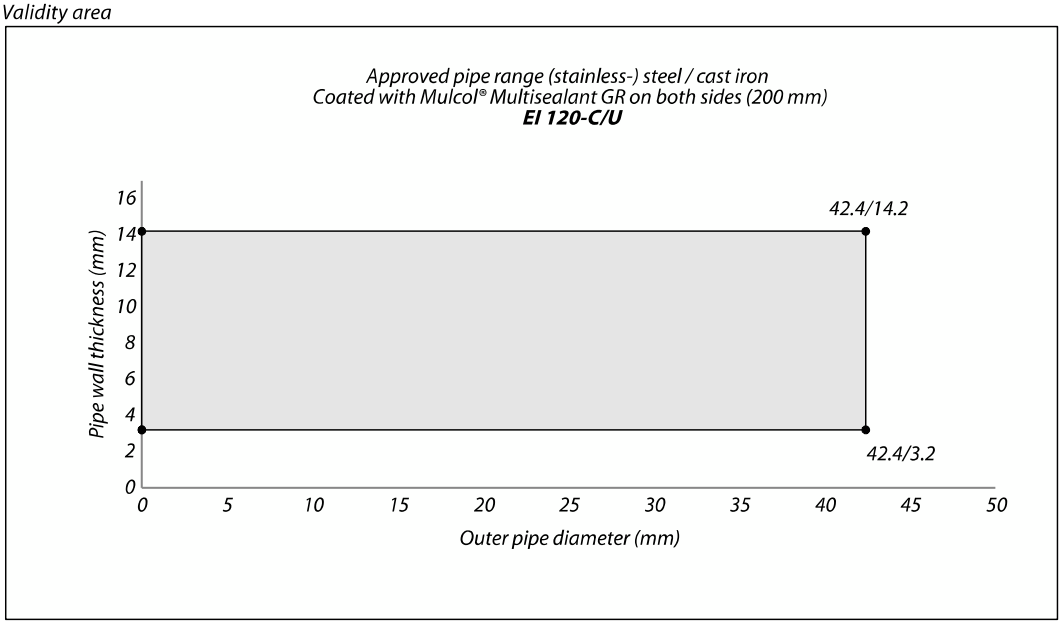
f5.3 *Validity area*

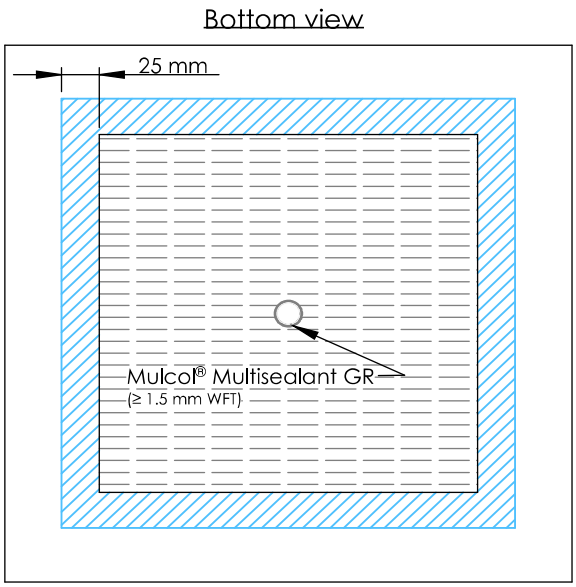


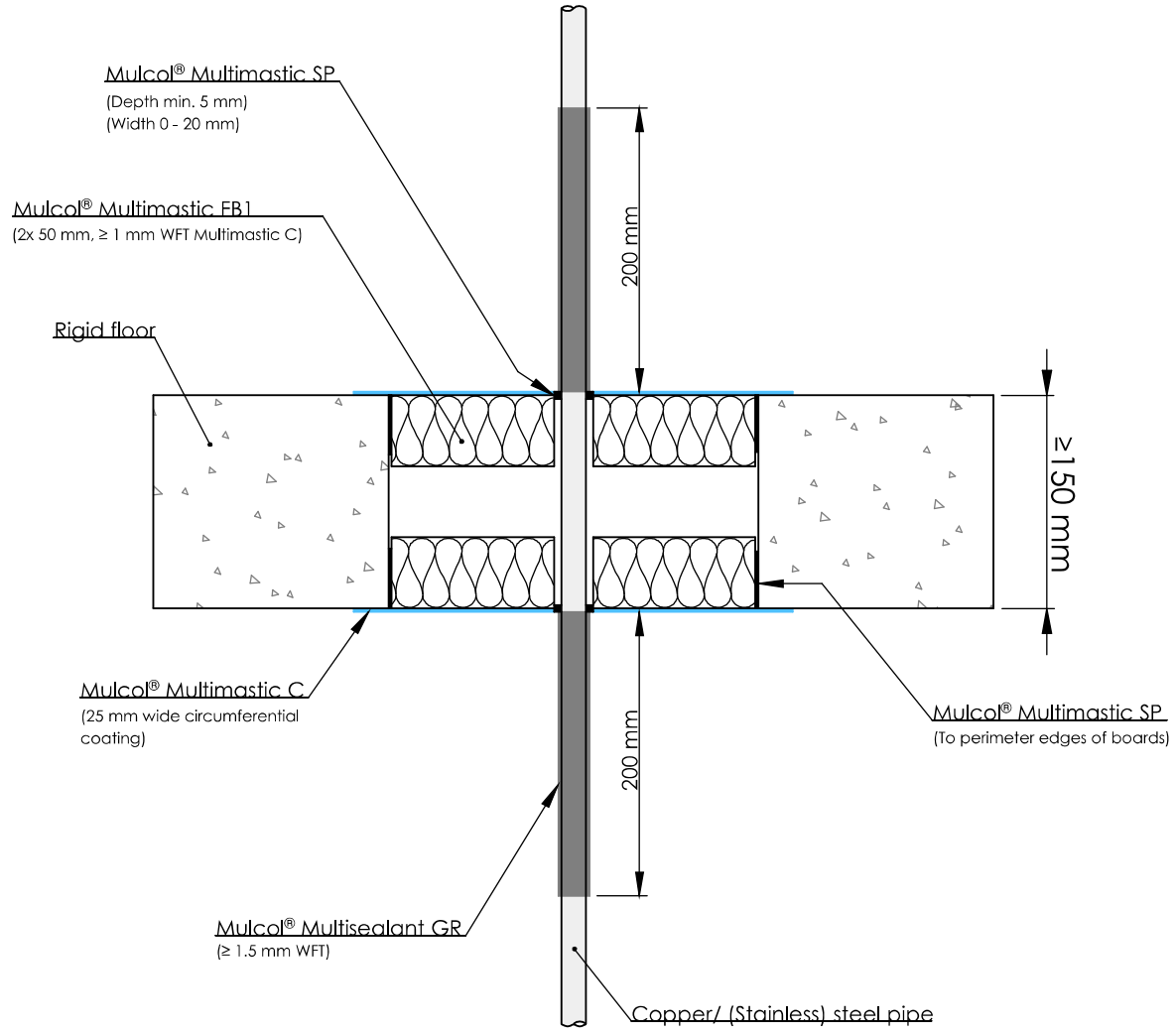
f5.4 *Validity area*



f5.5 *Validity area*



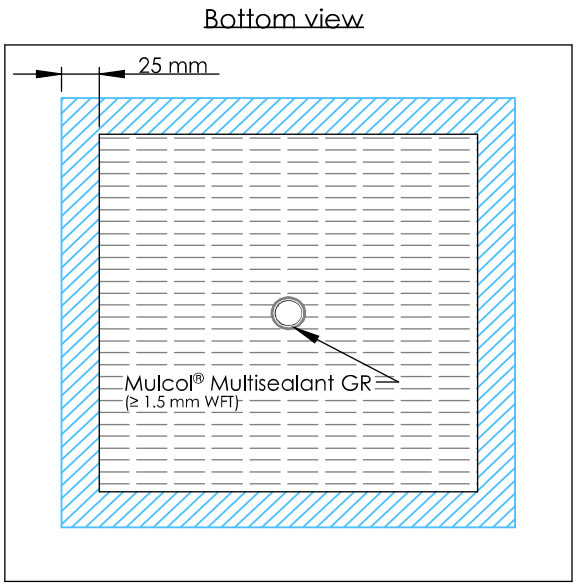


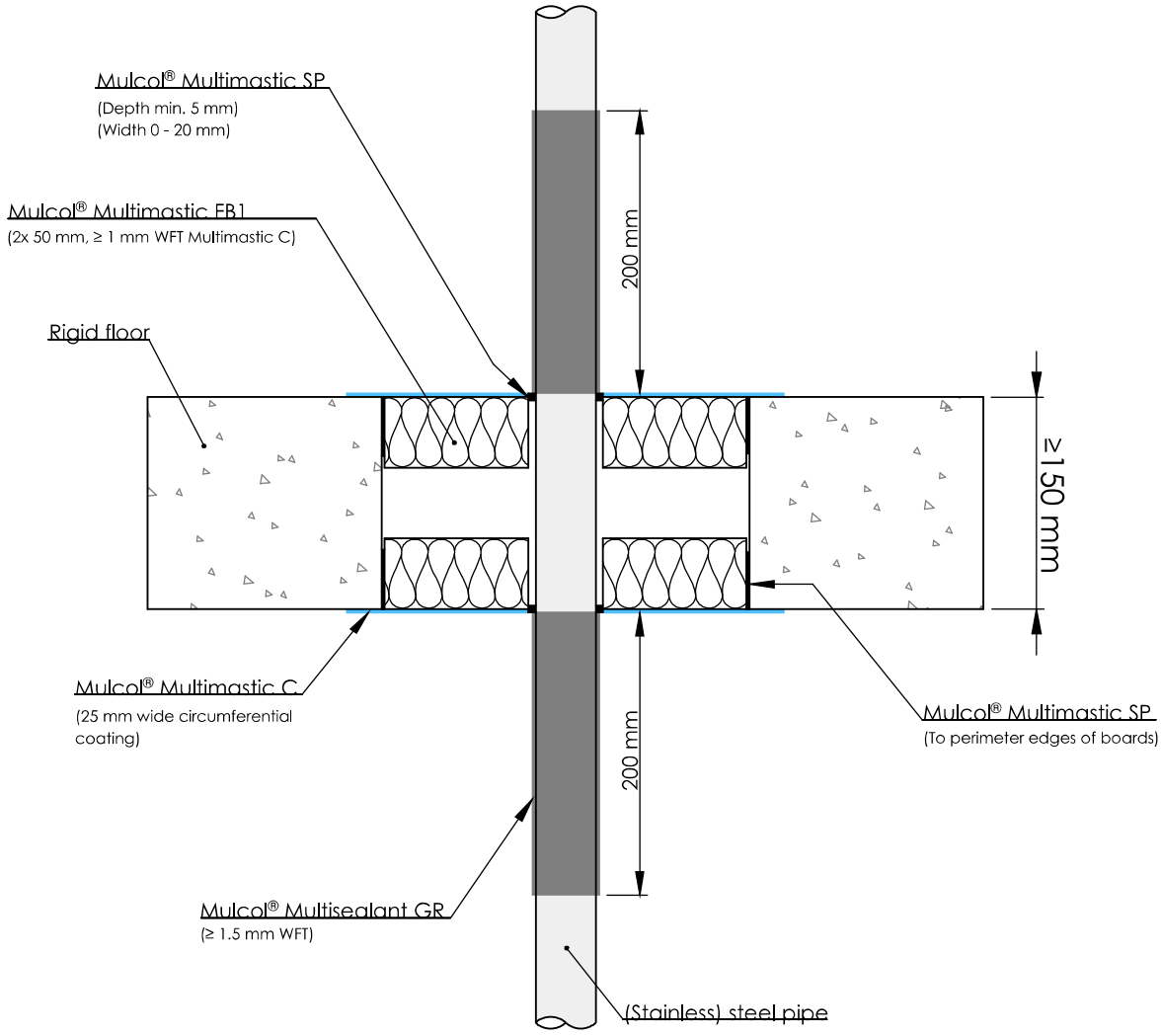


American projection	Scale :	Company : Mulcol International B.V.	PBrf-CU-MFB1-GRC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB1-GRC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.3.4 Mulcol® Multitherm Bandage

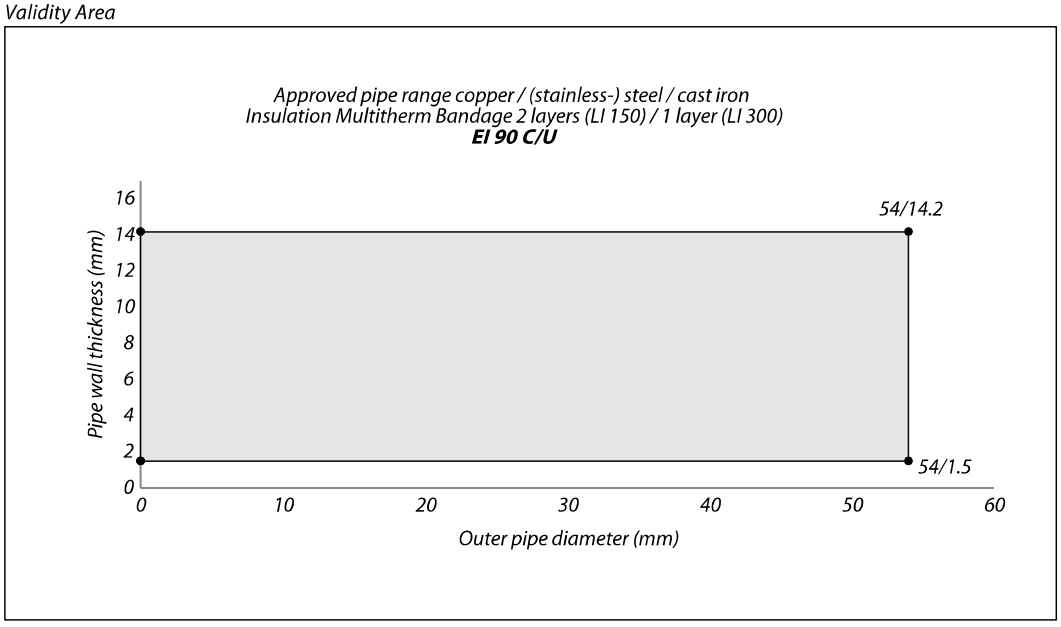
On the next pages, classifications, conditions and drawings of this system inside a mixed seal are given.

Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawings PBrf-CU-MFB1-B2.3.21						
≤ 54	1.5 to 14.2	EI 90–C/U	2 layers (LI 150) 1 layer (LI 300) (metal wire mandatory)	Copper / (stainless-) steel / cast iron	Mulcol® Multitherm Bandage	5.6

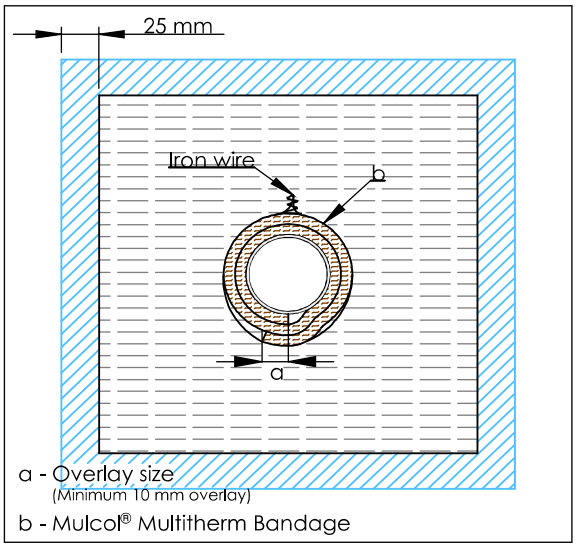
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- a_5: ≥ 0 mm (distance Mulcol® Mulcol® Multitherm Bandage to Multidisc);
- b_4: ≥ 10 mm (distance Mulcol® Multitherm Bandage to seal edge).

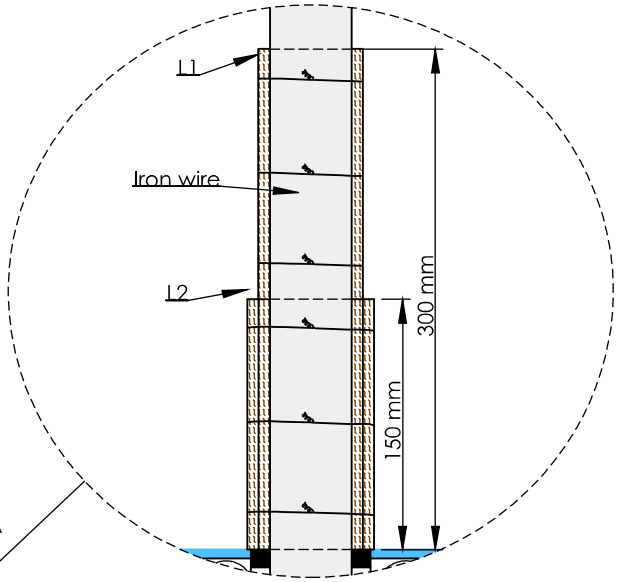
f5.6 Validity Area

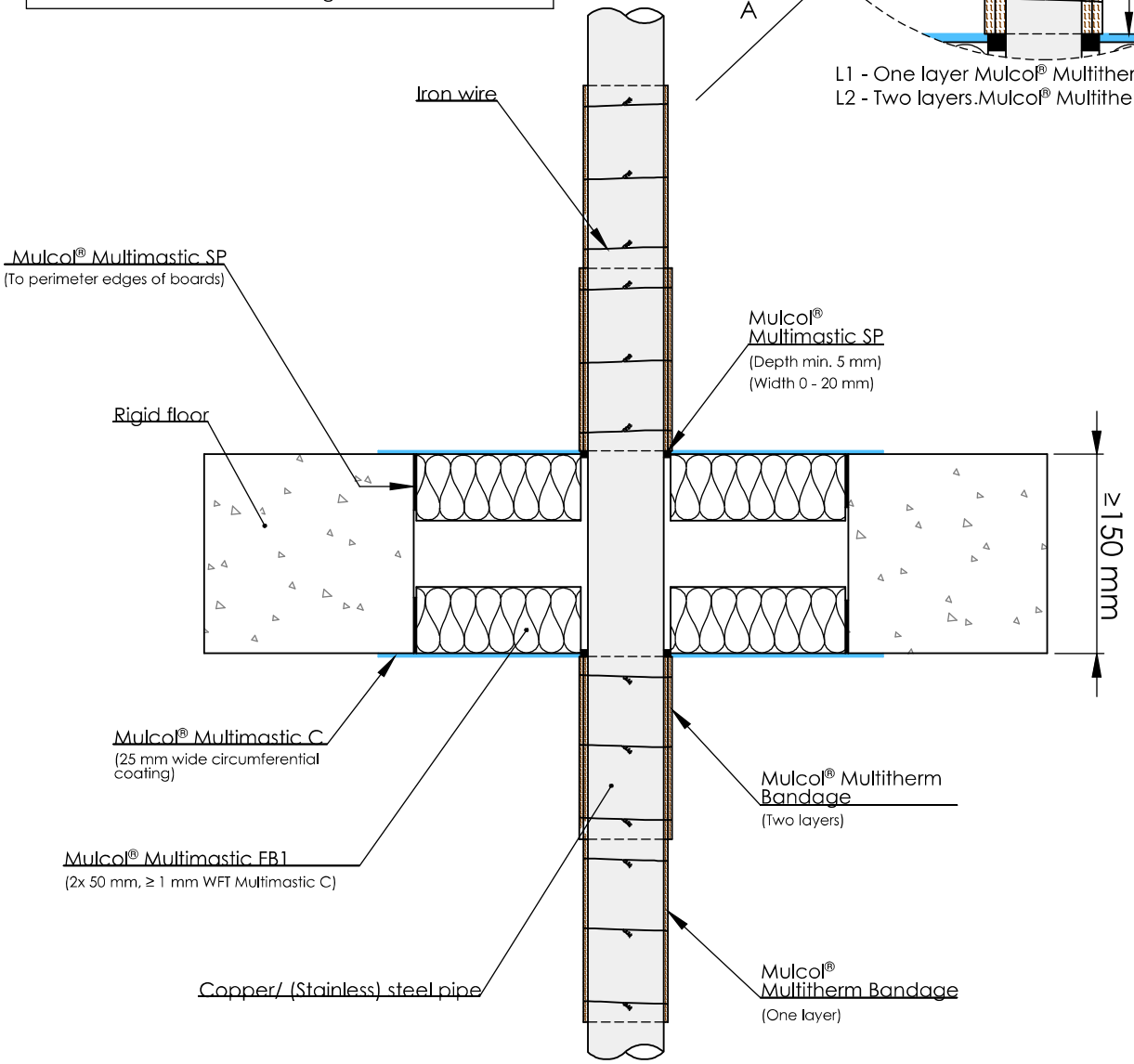


Top view



Detail A





American projection	Scale :	Company : Mulcol International B.V.	PBrf-CU-MFB1-B2.3.21
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.3.5 Mulcol® Multimastic SP (coated on pipe)

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

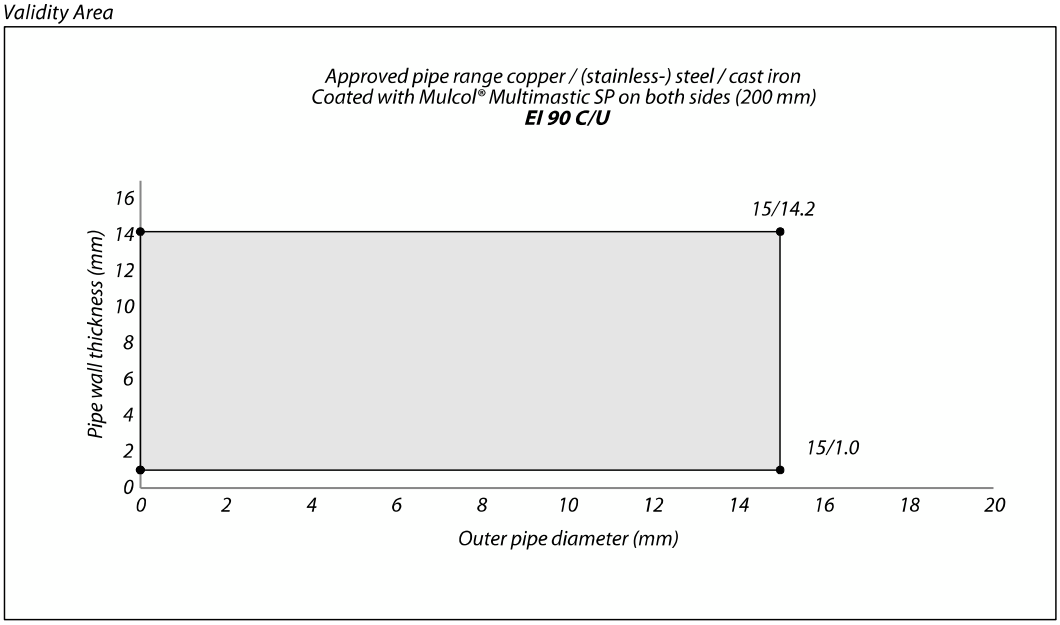
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-CU-MFB1-SPC.1.10 and						
≤ 22	1.0 to 14.2	EI 90–C/U E 120–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.7
Drawing PBrf-ST-MFB1-SPC.1.10						
≤ 26.9	2.3 to 14.2	EI 120–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.8
≤ 22	1.0 to 14.2	EI 90–C/U E 120–C/U				5.9
≤ 42.4	3.2 to 14.2					

The openings between the seal and the copper and steel pipes closed with Mulcol® Multimastic SP shall be coated over a length of 200 mm on both sides with Mulcol® Multimastic SP, thickness 1.5 mm (WFT).

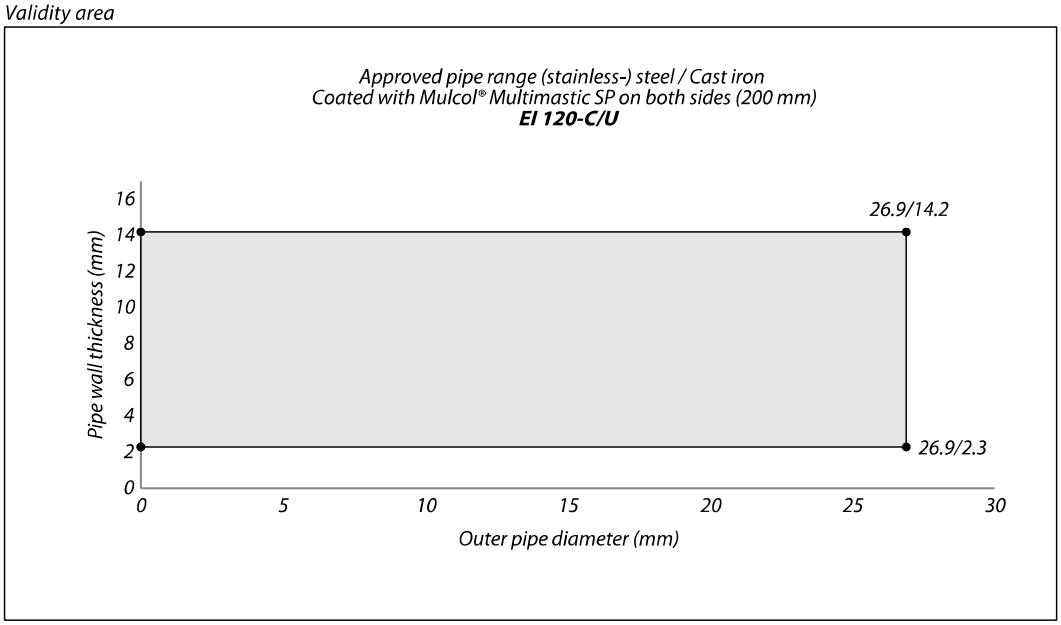
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- a_1: ≥ 30 mm (distance coated Mulcol® Multimastic SP to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance coated Mulcol® Multimastic SP to Mulcol® Multicollar Slim);
- a_5: ≥ 0 mm (mutual distance coated Mulcol® Multimastic SP seals);
- b_4: ≥ 10 mm (distance coated Mulcol® Multimastic SP to seal edge).

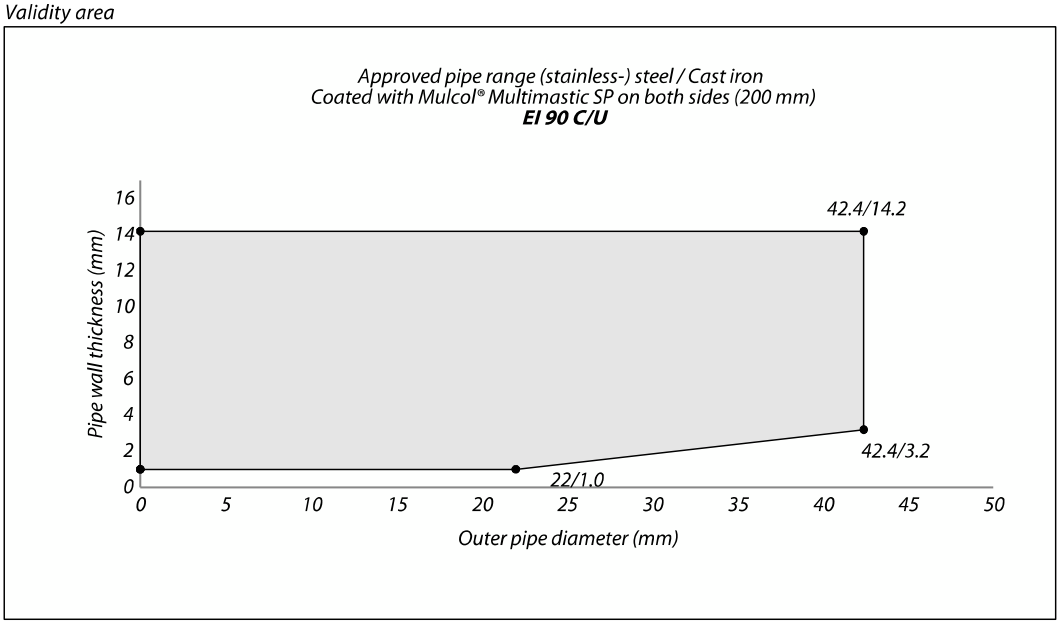
f5.7 *Validity Area*



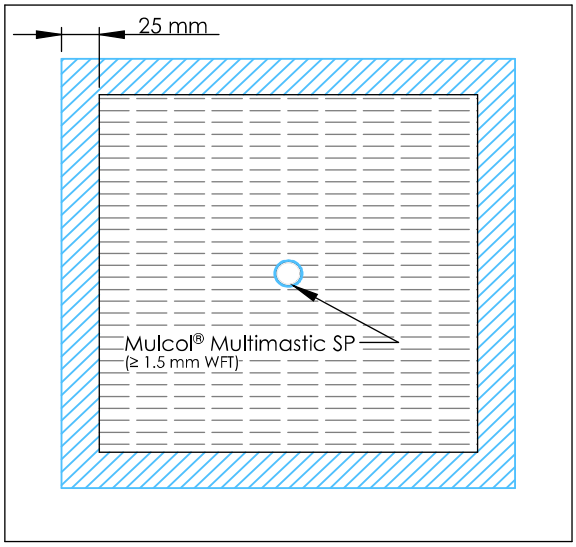
f5.8 *Validity area*

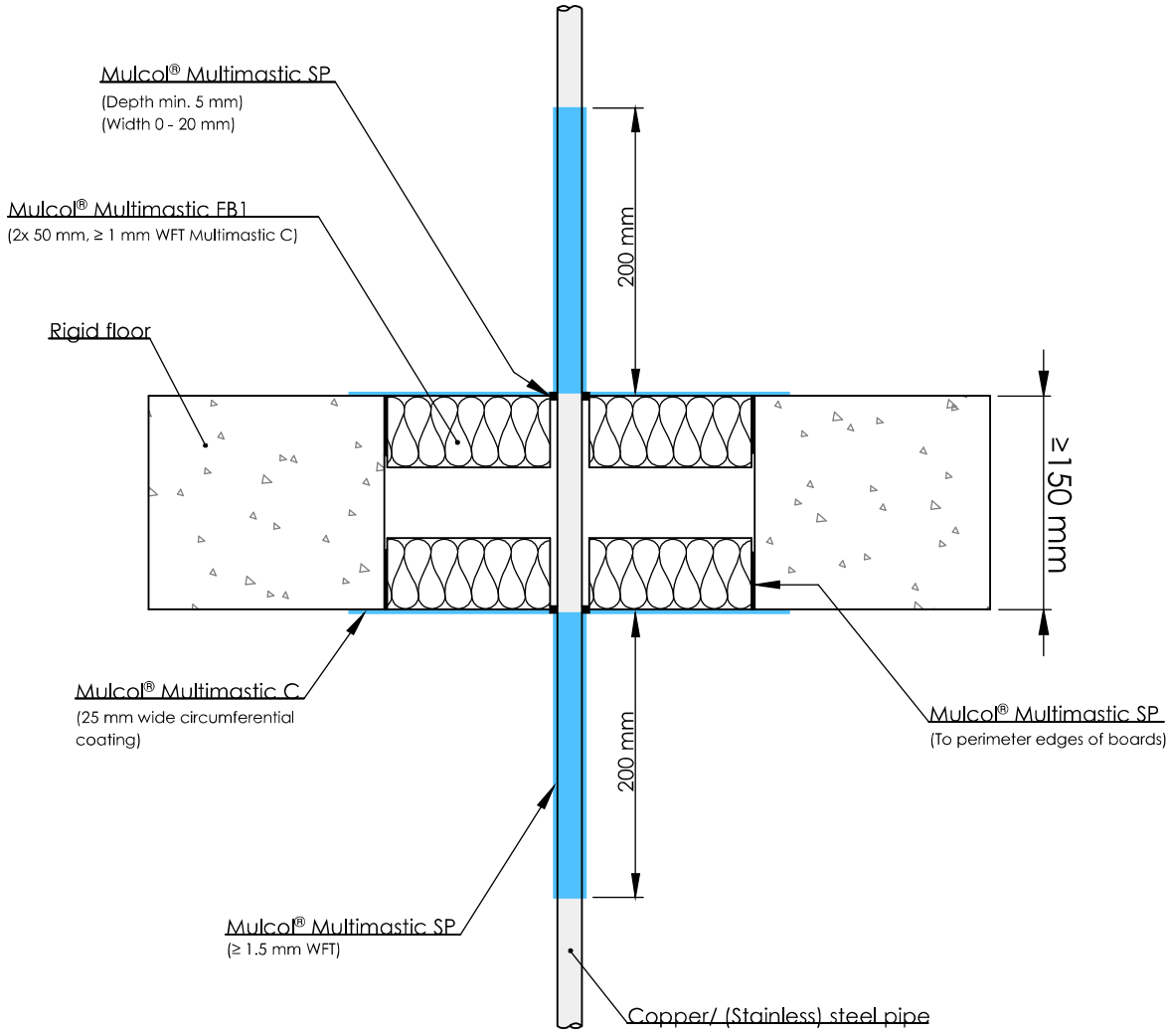


f5.9 *Validity area*



Bottom view



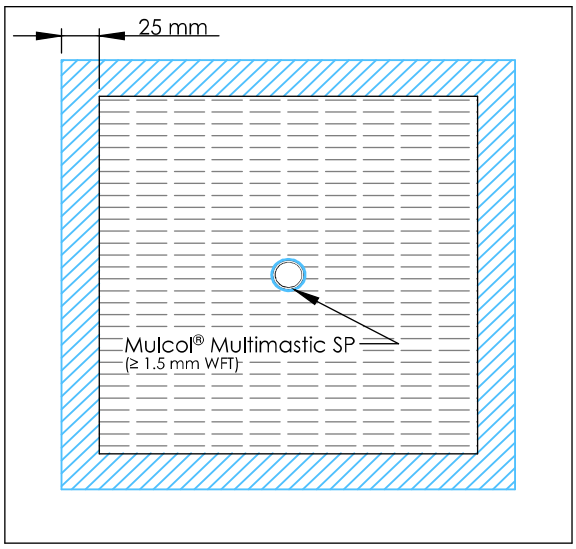


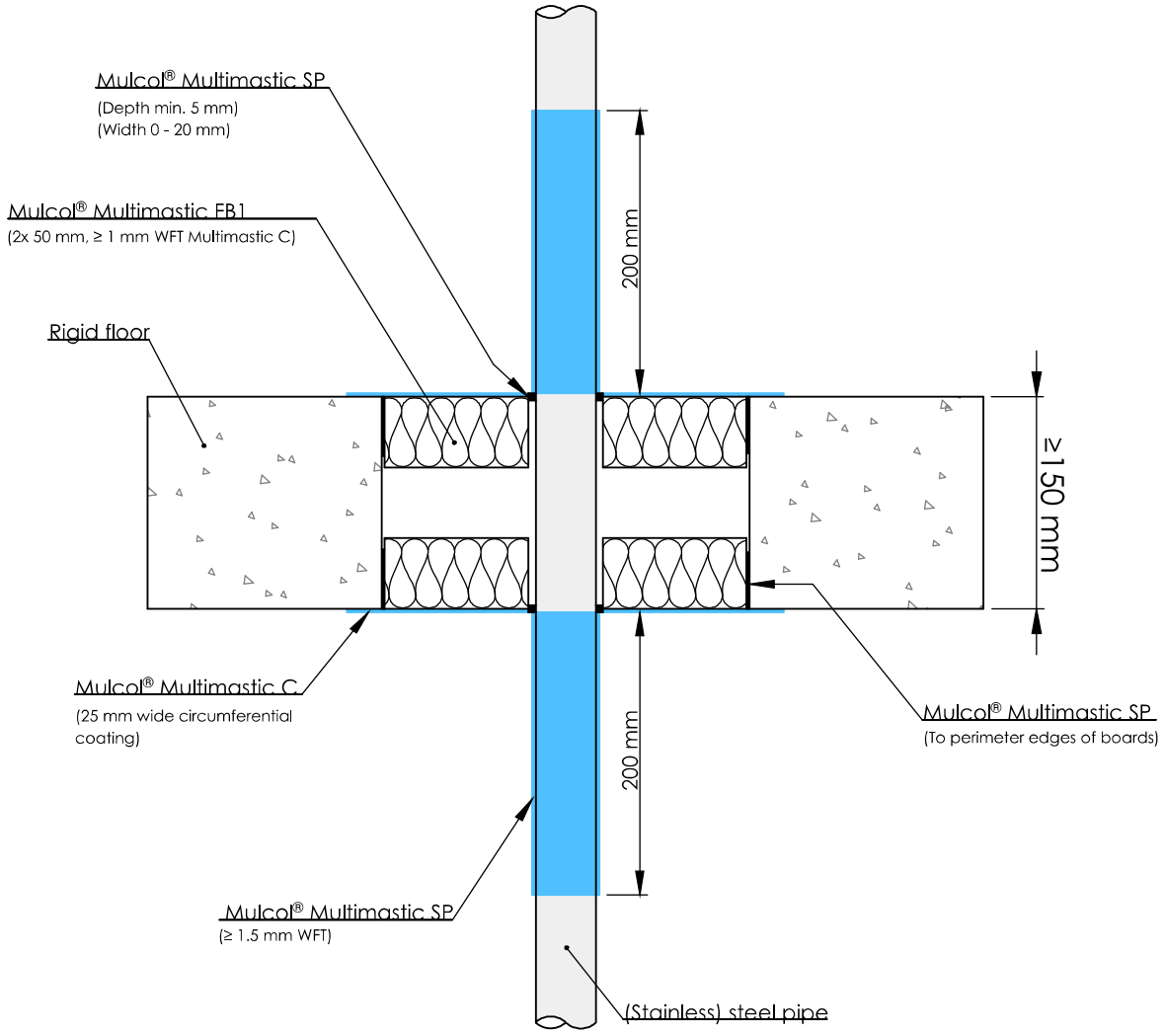
American projection	Scale :	Company : Mulcol International B.V.	PBrf-CU-MFB1-SPC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Bottom view





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB1-SPC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.3.6 Gas pipes with Mulcol® Multicollar Slim

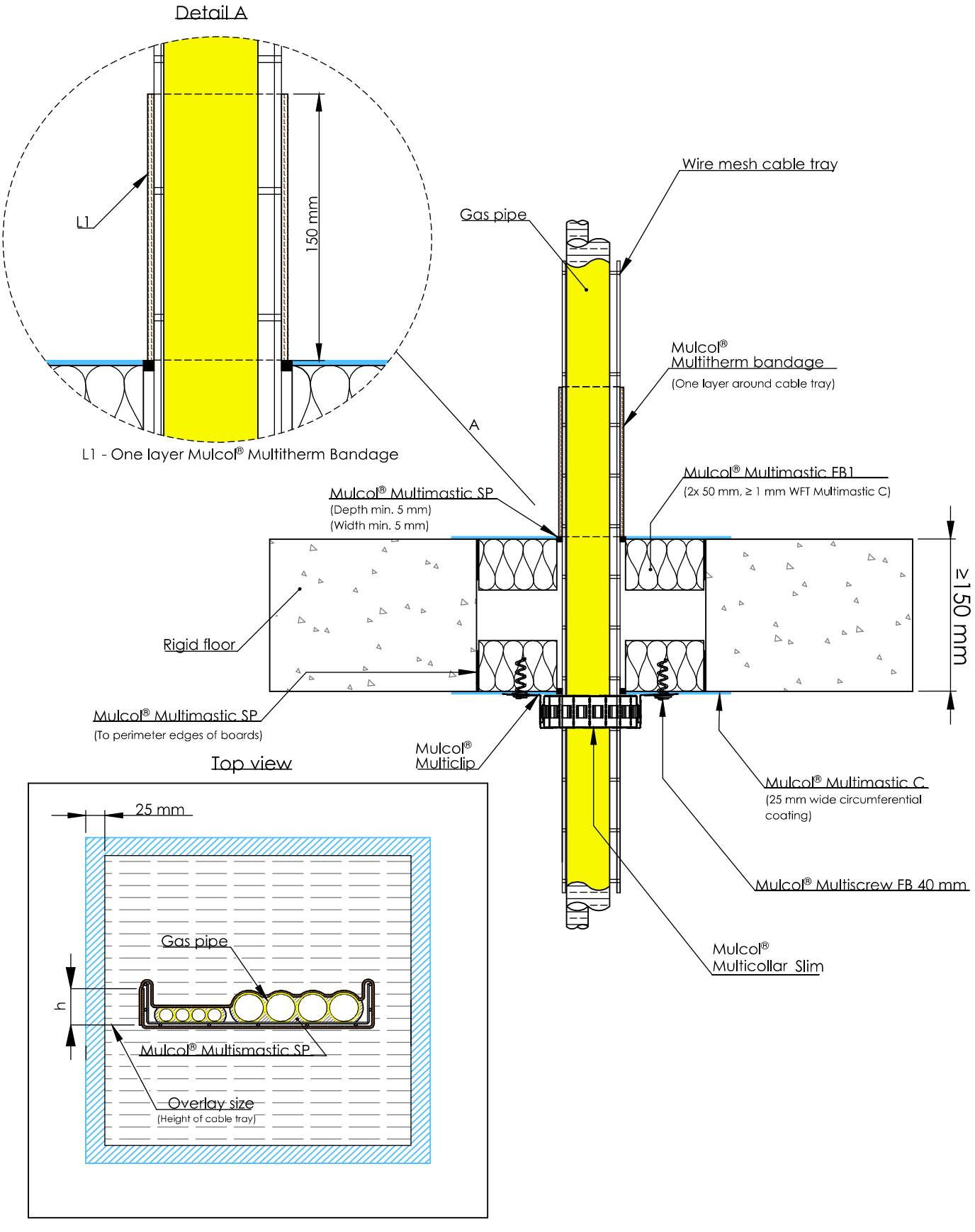
On the next pages, classifications, conditions and drawings of this system inside seal are given.

Fire resistance classification				
Configuration		Performance class with pipe end configuration	Pipe material	System
Size of pipe diameter (mm)	Number of pipes			
Drawing PBrf-CT-GFS-MFB1-B3.1.10				
≤ 19.9 x 0.2	≤ 4	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipes in wire mesh cable tray 300 x 45 mm	Mulcol® Multicollar Slim below and Mulcol® Multitherm Bandage on top (1 layer LI 150)
≤ 40.8 x 0.3	≤ 4			
Drawing PBrf-GFS2-MC30-B3.1.10				
≤ 40.8 x 0.3	≤ 2	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipes	Mulcol® Multicollar Slim below and Mulcol® Multitherm Bandage on top (1 layer LI 150)

The Mulcol® Multicollar Slim used for the multiple penetration PBrf-CT-GFS-MFB1-B3.1.10 must be fixed with four Mulcol® Multiscrews FB40.

The following minimum working distances apply within the penetration seal (see Table 5.1);

- a_2: ≥ 30 mm (distance Mulcol® Multicollar Slim to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance Mulcol® Multicollar Slim to Mulcol® Multimastic C seal);
- a_4: ≥ 30 mm (mutual distance Mulcol® Multicollar Slim);
- b_5: ≥ 15 mm (distance Mulcol® Multicollar Slim to seal edge).

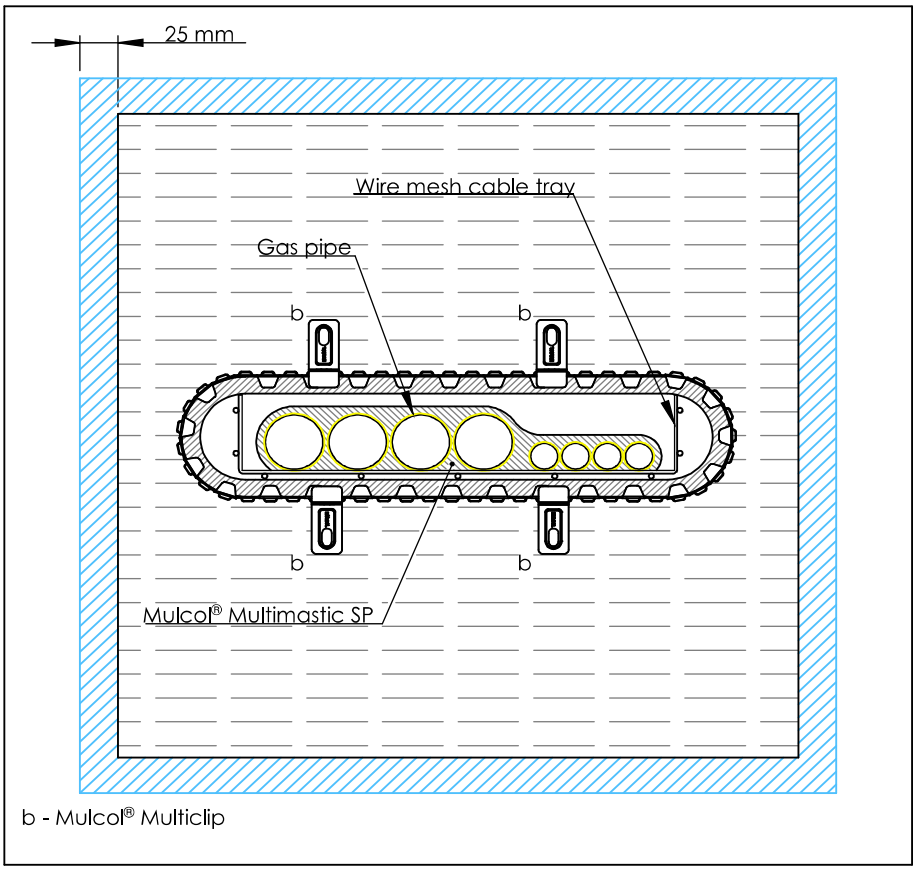


American projection	Scale :	Company : Mulcol International B.V.	PBrf-CT-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 1 of 2
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable tray penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

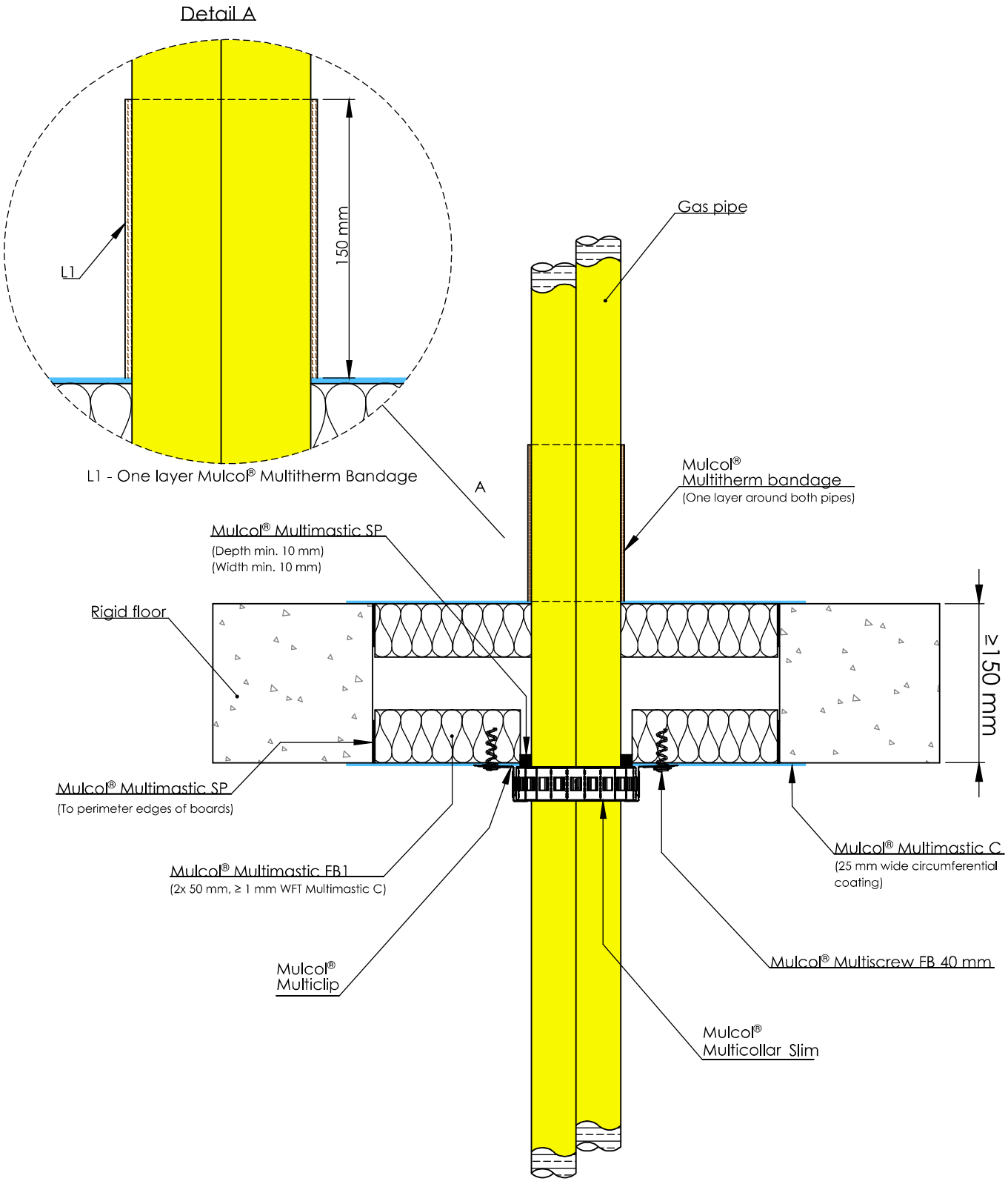
Bottom view



American projection	Scale :	Company : Mulcol International B.V.	PBrf-CT-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 2 of 2
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable tray penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

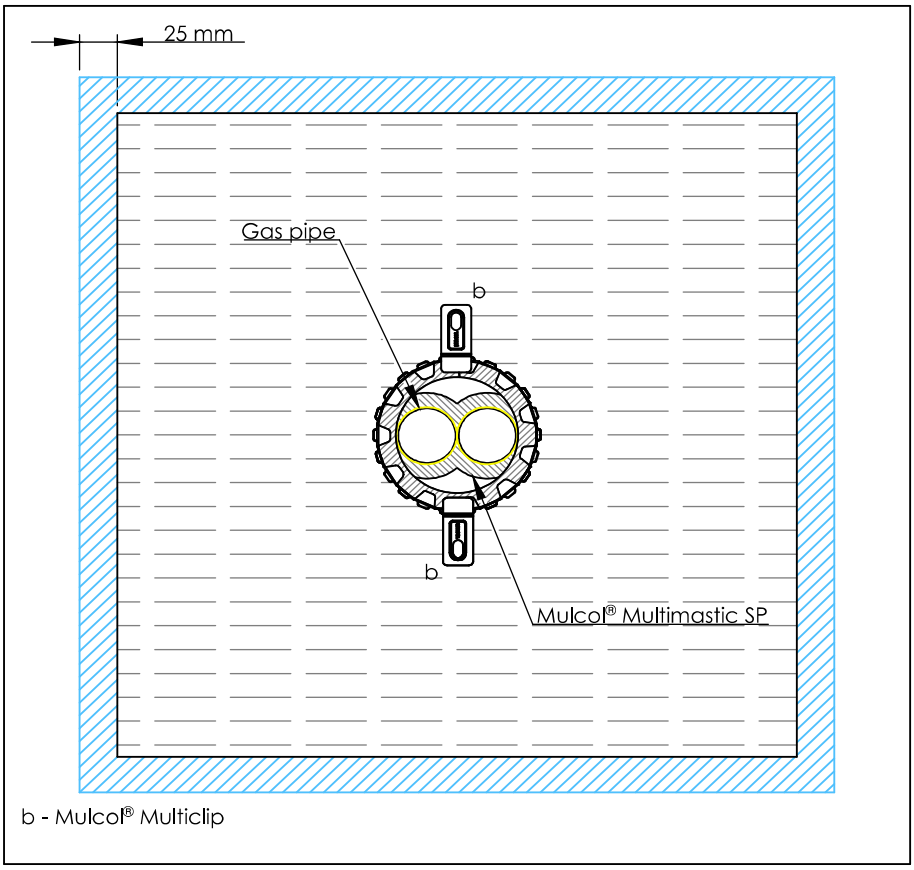


American projection	Scale :	Company : Mulcol International B.V.	PBrf-GFS2-MC30-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 1 of 2
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Bottom view



American projection	Scale :	Company : Mulcol International B.V.	PBrf-GFS2-MC30-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 2 of 2
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

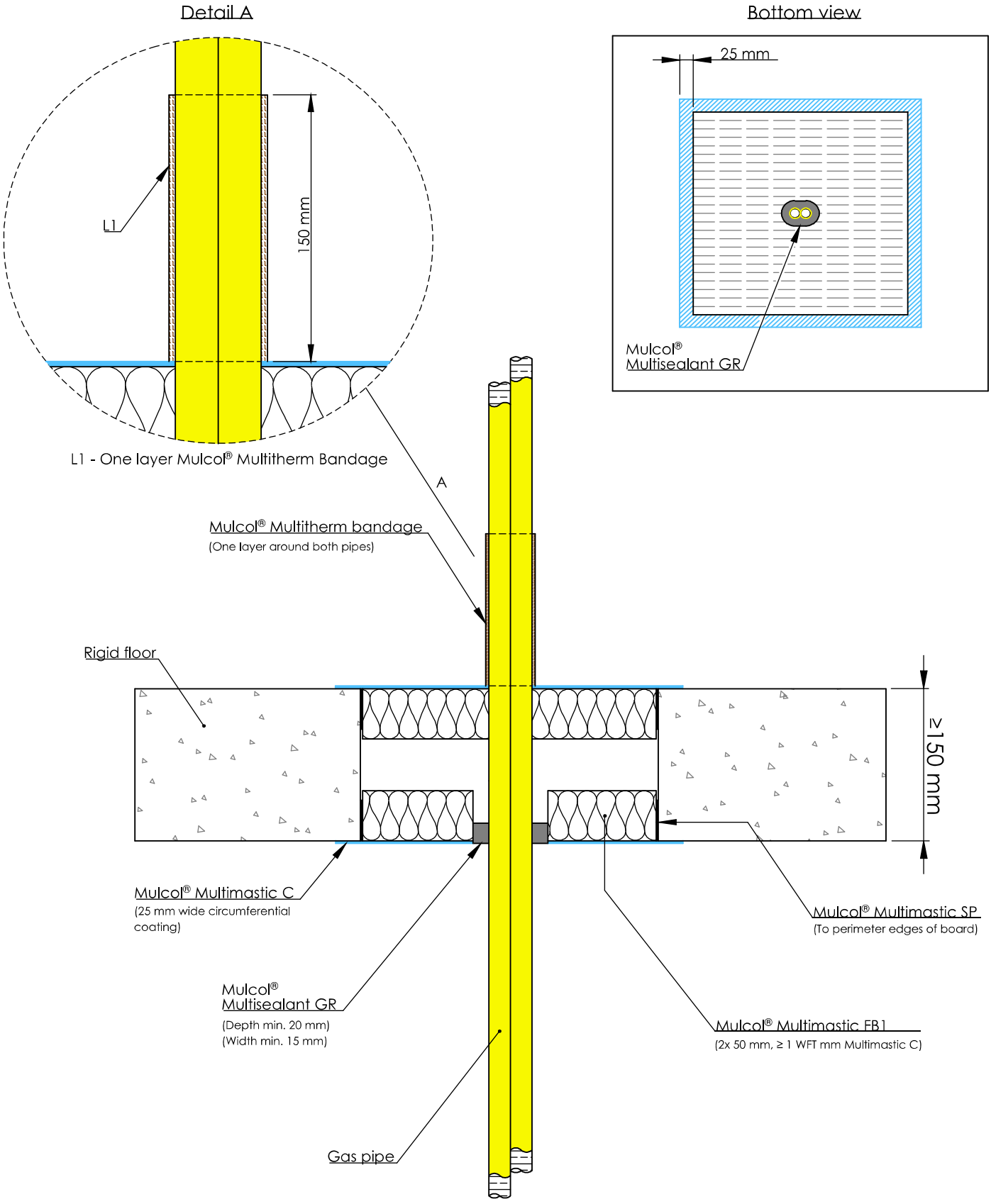
5.3.7 Gas pipes with Mulcol® Multisealant GR

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

Fire resistance classification				
Configuration		Performance class with pipe end configuration	Pipe material	System
Size of pipe diameter (mm)	Number of pipes			
Drawings PBrf-GFS2-MFB1-B3.1.10 and PBrf-GFS-MFB1-B3.1.10				
≤ 19.9 x 0.2	≤ 2	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipes	Mulcol® Multisealant GR and Mulcol® Multitherm Bandage on top (1 layer LI 150)
≤ 40.8 x 0.3	1			

The following minimum working distances apply within the penetration seal (see Table 5.1);

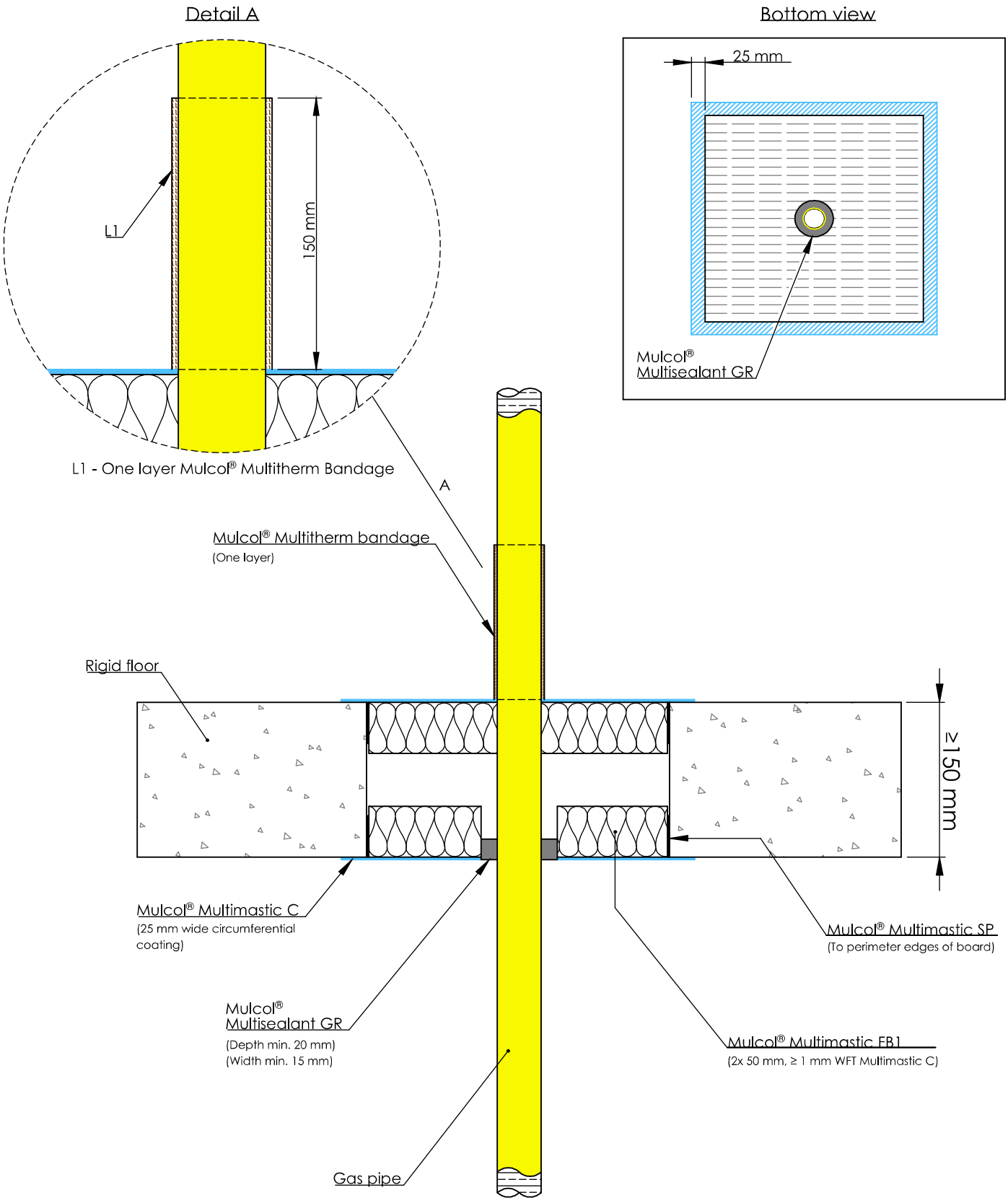
- b_4: ≥ 10 mm (distance Mulcol® Multisealant GR to seal edge).



American projection	Scale :	Company : Mulcol International B.V.	PBrf-GFS2-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor



American projection	Scale :	Company : Mulcol International B.V.	PBrf-GFS-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

5.3.8 Combi drinks pipe with Mulcol® Multicollar Slim

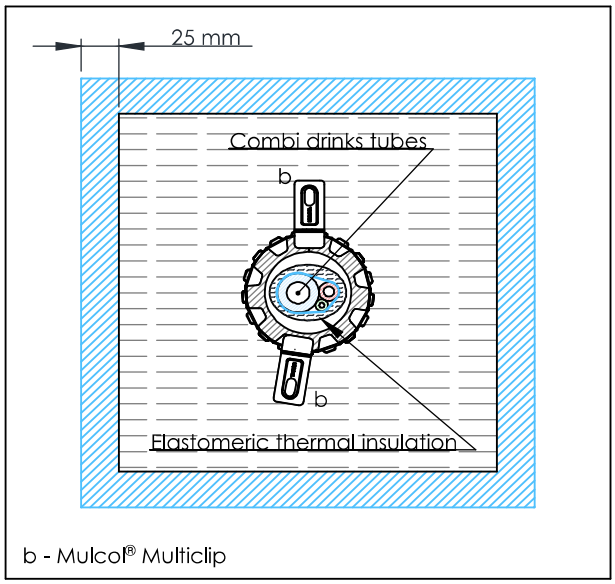
On the next pages, classifications, conditions and drawings of this system inside seal are given.

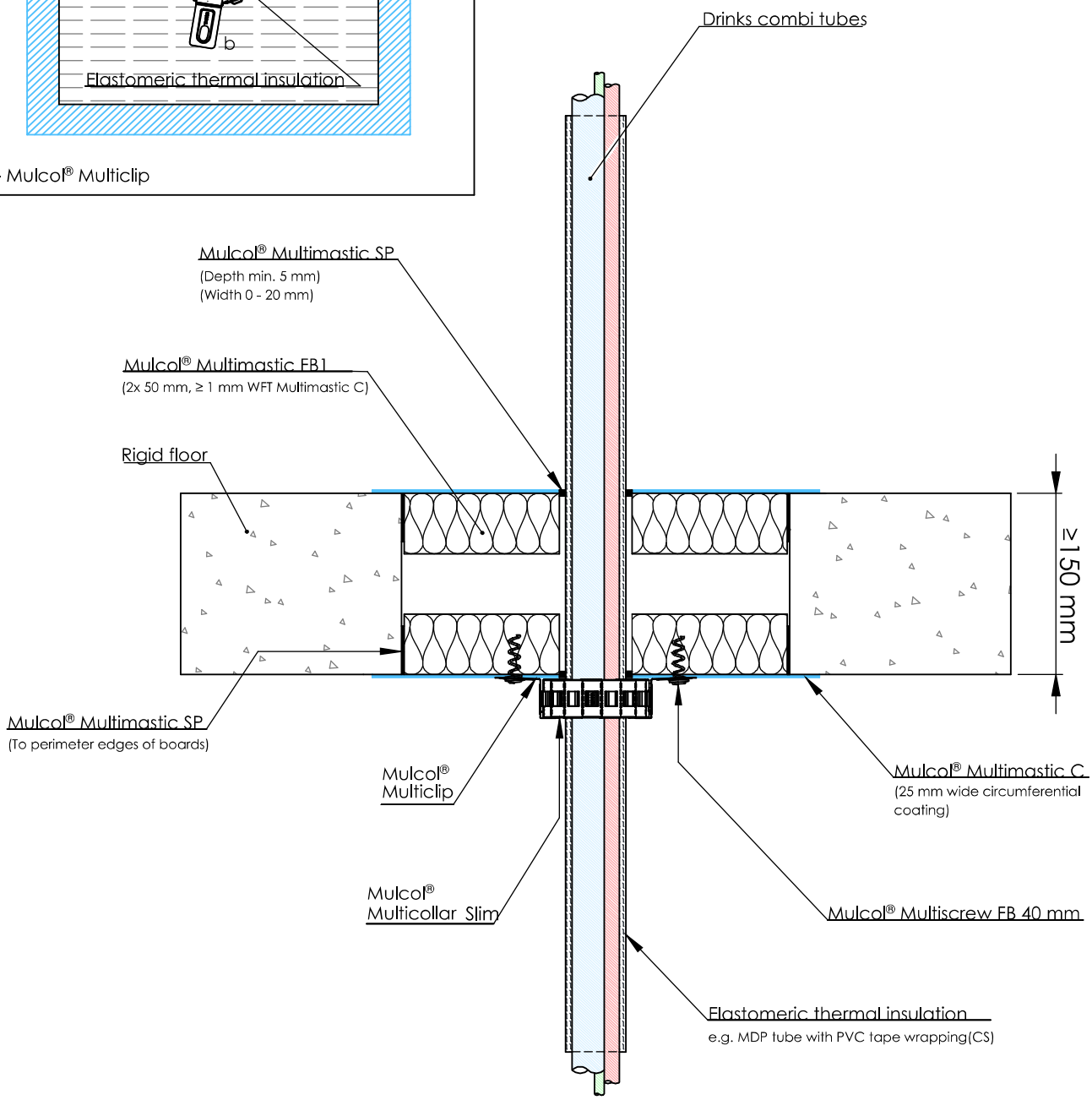
Fire resistance classification				
Pipe / bundle dimensions (mm)		Performance class with pipe end configuration	Pipe / cable material	System
Outer diameter	Wall thickness			
Drawings PBrf-MC30-DCT3-11.0.22, PBrf-MC30-DCT3-11.0.22, PBrf-MC30-DCT25-11.0.22 and PBrf-MC30-DCT52-11.0.22				
≤ 47	3 hoses	EI 120–U/C	Python Drinks Combi pipe with Armaflex insulation	Mulcol® Multicollar Slim
≤ 90	3 hoses			
≤ 100	25 hoses			
≤ 145	52 hoses			

The following minimum working distances for Mulcol® Multicollar Slim apply within the penetration seal (see Table 5.1);

- a_2: ≥ 30 mm (distance Mulcol® Multicollar Slim to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance Mulcol® Multicollar Slim to Mulcol® Multimastic C seal);
- a_4: ≥ 30 mm (mutual distance Mulcol® Multicollar Slim);
- b_5: ≥ 15 mm (distance Mulcol® Multicollar Slim to seal edge).

Bottom view

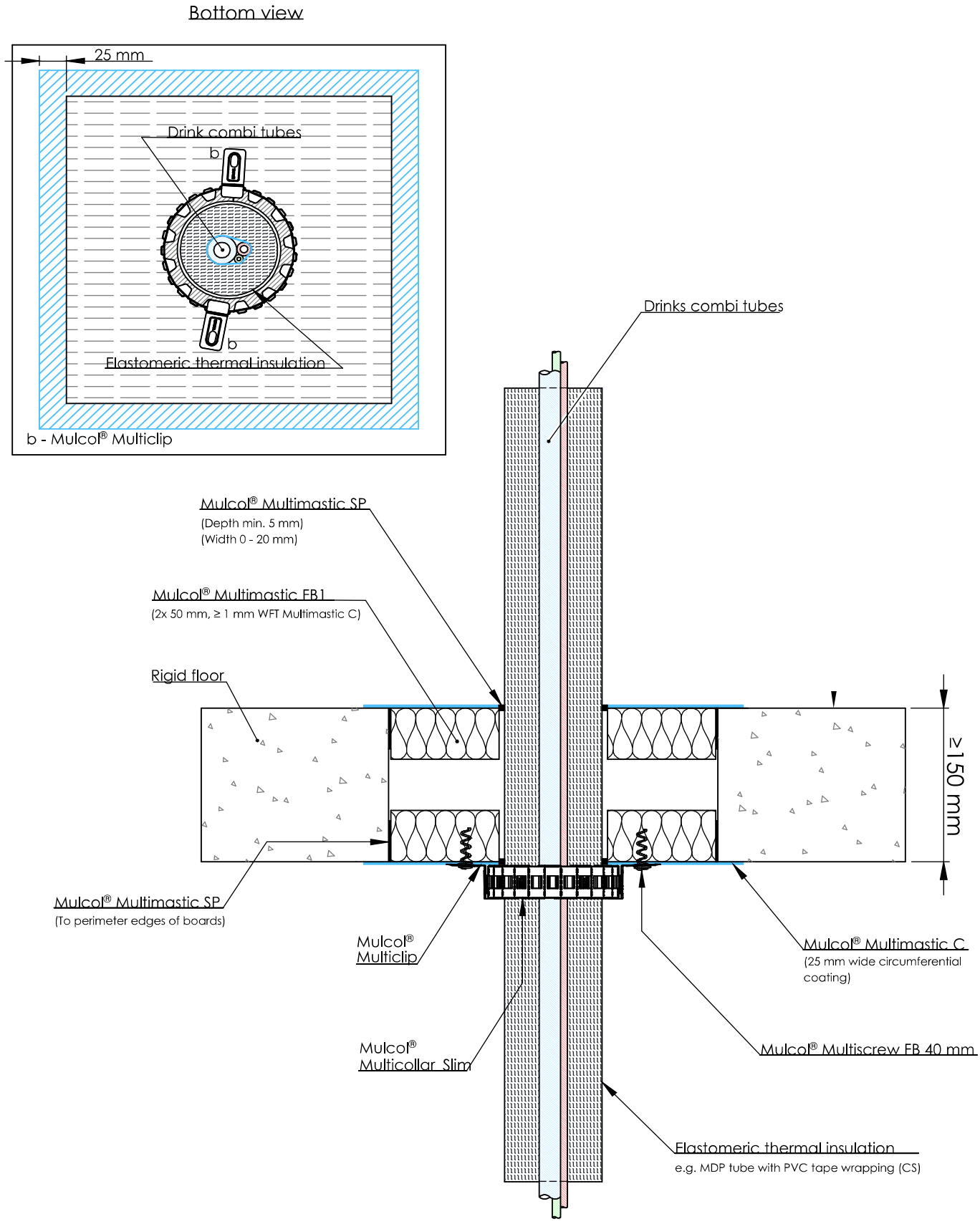




American projection	Scale :	Company : Mulcol International B.V.	PBrf-MC30-DCT3-11.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 16-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

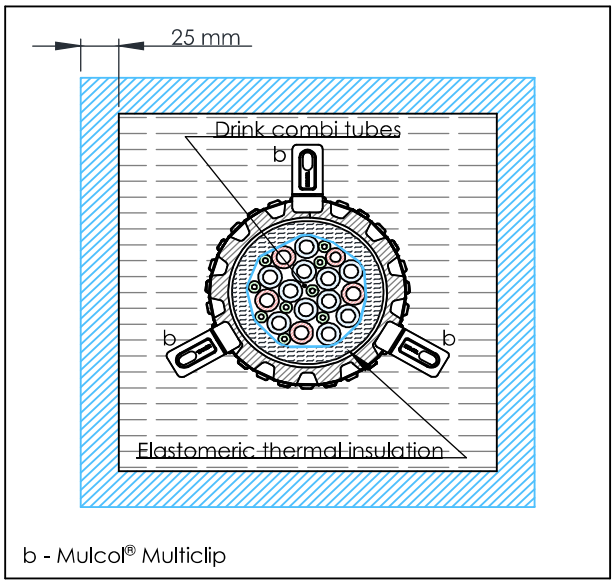


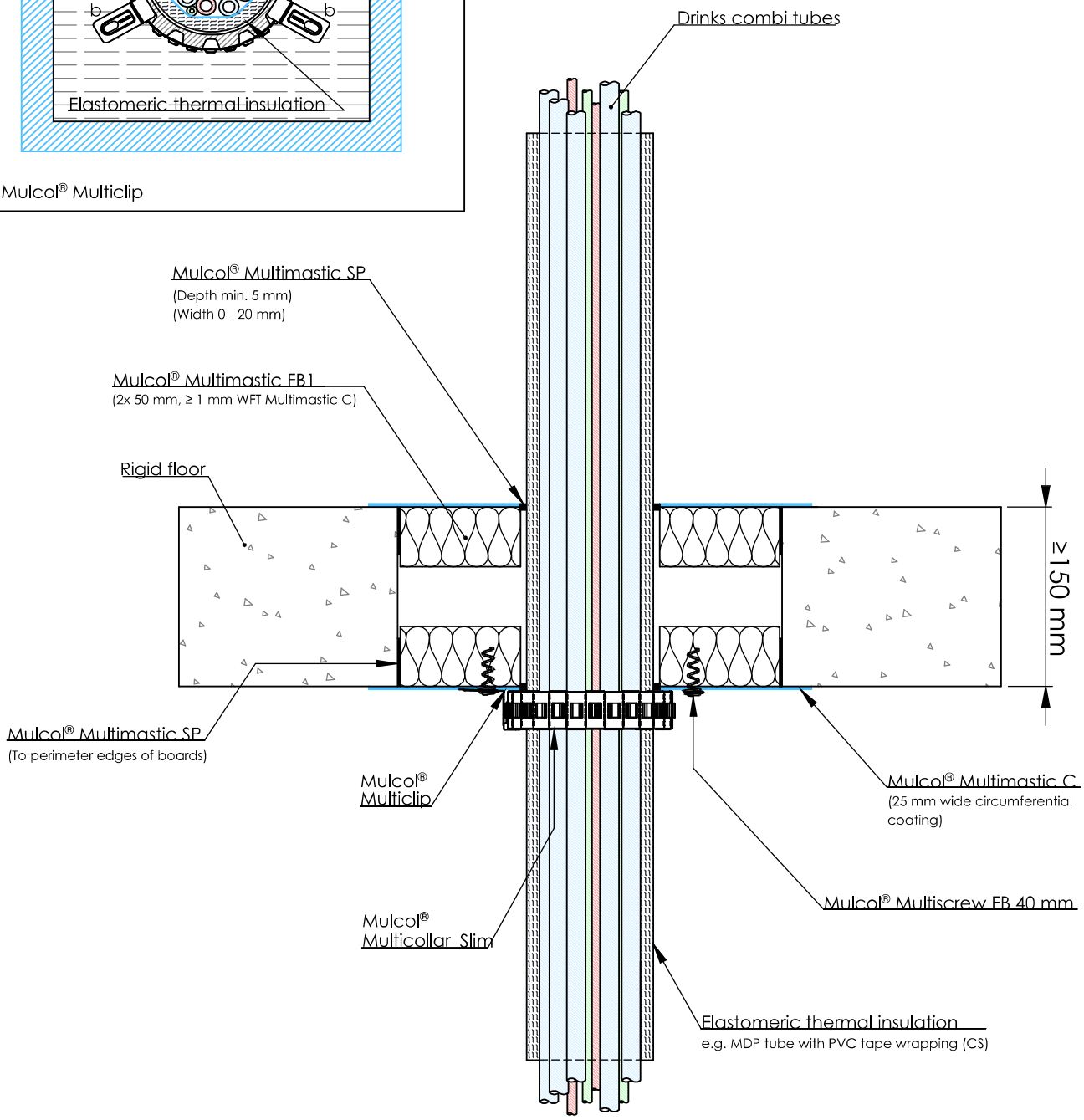
American projection	Scale :	Company : Mulcol International B.V.	PBrf-MC30-DCP3-11.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 16-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Bottom view

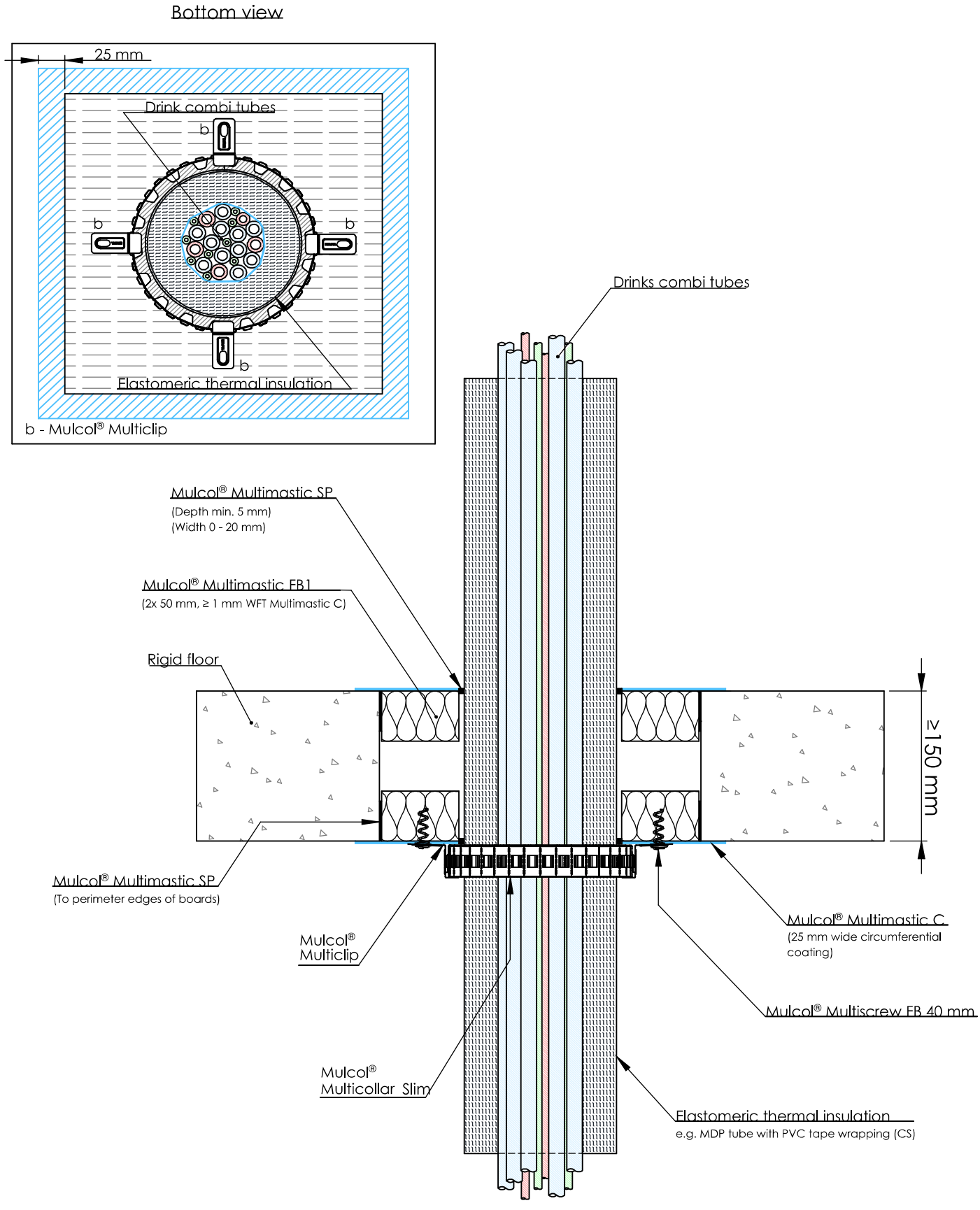




American projection	Scale :	Company : Mulcol International B.V.	PBrf-MC30-DCT25-11.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor



American projection	Scale :	Company : Mulcol International B.V.	PBrf-MC30-DCT52-11.0.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 16-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.4 Mulcol® Multimastic FB1 (2 x 50 mm, no cavity)

The Mulcol® Multimastic FB1 board system has a total thickness of 100 mm (2 x 50 mm, no cavity). For the system Mulcol® Multimastic FB1 (2 x 50 mm, no cavity), a classification of cables, conduits and pipes according to the following combinations of performance parameters and classes apply.

The system must be placed flush with the top of the floor.

5.4.1 Mulcol® Multimastic C

On the next pages, classifications, conditions and drawing PBrf-CT-MFB1.2.10 of this system in a mixed seal are given.

Fire resistance classification cable groups and conduits	
Sheeted cables up to Ø21 mm (including optical fibres)	EI 60 / E 90
Plastic conduits up to Ø16 mm	EI 90

Fire resistance classification cable trays and ladders	
Perforated cable trays	EI 90

Fire resistance classification single cables* (see details Figure 5.10)	
Sheathed cables A1	EI 90
Sheathed cables A2	EI 90
Sheathed cables A3	EI 90
Sheathed cables B	EI 60 / E 90
Sheathed cables C1	EI 90
Sheathed cables C2	EI 60 / E 90
Sheathed cables C3	EI 60 / E 90
Conduits I	EI 90

*The cables must apply exactly to the description and standards of Figure 5.10 (table EN 1366-3, Table A.1)

Multiple sheathed cables and conduits are allowed per cable carrier in any number or combination. The classifications are valid for cable carriers with a filling degree up to 100%. On the next pages drawings of cable penetrations in the seal are given. The actual type and number of cables inside the cable carrier may derive from this Figure.

The coating Mulcol® Multimastic C must be applied over a minimum distance of 50 mm with a minimal thickness of 1.0 mm (WFT) over the cables, conduits and cable carriers.

The following minimum working distances apply between the cables, cable carriers and conduits within the penetration seal (see Table 5.1);

- a_2: ≥ 30 mm (distance Mulcol® Multicollar Slim to cable, cable carrier or conduit);
- b_1: ≥ 20 mm (distance cable, cable carrier or conduit to top seal edge);
- b_2: ≥ 20 mm (distance cable, cable carrier or conduit to vertical seal edge).

f5.10 Cables for standard configuration (Table A.1 from EN 1366-3)

Table A.1 — Cables for the standard configuration

Cable	Cable type	Group	Number of cables	Dimensions	Designation	Standard	Insulation / sheath material	Diameter range (mm)	Nominal weight (kg/km) [a]
A1	small sheathed	1	10	5 mm × 1,5 mm²	see Table A.3	HD 603.3	PVC / PVC [b]	14 [a, c]	300 [c]
A2	small sheathed	1	10	5 mm × 1,5 mm²	H07RN-F 5G1,5	HD 22.4	EPR / PO [d]	11,2 – 14,4 [a, e]	186 [c]
A3	small sheathed	1	10	5 mm × 1,5 mm²	see Table A.3	HD 604.5	XLPE / EVA [f]	13 [a, g] (≤ 14,0 [h])	230 [c]
B	small sheathed	1	2	1 mm × 95 mm²	see Table A.3	HD 603.3	PVC / PVC [b]	18 – 21 [a, i]	1150 [c]
C1	medium sheathed	2	1	4 mm × 95 mm²	see Table A.3	HD 603.3	PVC / PVC [b]	40 – 47 [a, i]	5300 [c]
C2	medium sheathed	2	1	4 mm × 95 mm²	H07RN-F 4G95	HD 22.4	EPR / PO [d]	48,4 – 61 [a, e]	5830 [c]
C3	medium sheathed	2	1	4 mm × 95 mm²	see Table A.3	HD 604.5	XLPE / EVA [f]	42 [a, g] (≤ 45,5 [h])	4050 [c]
D1	large sheathed	3	1	4 mm × 185 mm²	see Table A.3	HD 603.3	PVC / PVC [b]	52 [a, i]	9900 [c]
D2	large sheathed	3	1	4 mm × 185 mm²	H07RN-F 4G185	HD 22.4	EPR / PO [d]	64 – 80 [a, e]	9700 [c]
D3	large sheathed	3	1	4 mm × 185 mm²	see Table A.3	HD 604.5	XLPE / EVA [f]	58 [a, g] (≤ 62,5 [h])	7750 [c]
E	medium sheathed	2	2	1 mm × 185 mm²	see Table A.3	HD 603.3	PVC / PVC [b]	23 – 27 [a, i]	2050 [c]
F	cable bundle (telecommunication cable)	4	1 tied bundle of 100 mm diameter [k]	20 mm × 2 mm × 0,6 mm screened [l]	see H.4.1.2 for examples	-	PE / PE [m]	15 to 17 [a, n, o]	275 to 320 [c, o]
G1	non-sheathed (wire)	5	1	1 mm × 95 mm²	H07V-R	HD 21.3	PVC / - [b]	14,1 – 17,1 [a, p]	980 [c]
G2	non-sheathed (wire)	5	1	1 mm × 185 mm²	H07V-R	HD 21.3	PVC / - [b]	19,3 – 23,3 [a, p]	1890 [c]

[a] For information only

[b] PVC = Polyvinyl chloride

[c] Average value from technical data sheets of manufacturers

[d] EPR = Ethylene-propylene rubber compound, PO = Polyolefin, synthetic rubber compound

[e] Values for minimum and maximum diameter from HD 22.4

[f] XLPE = Cross-linked Polyethylene, EVA = Ethylene-vinyl-acetate copolymer compound

[g] Nominal diameter from HD 604.5C

[h] Maximum diameter from HD 604.5C

[i] Values for minimum and maximum diameter from HD 603.3G

[j] Nominal diameter from HD 603.3L

[k] Depending on the actual diameter of the single cables 30 to 43 cables may be necessary to produce a tied bundle of 100 mm diameter

[l] Construction: solid bare copper conductors of 0,6 mm diameter, core insulation of polyethylene, cores stranded to quads and the quads stranded to bundles, one layer of plastic foil, static screen of plastic-laminated aluminium tape, polyethylene outer sheath.

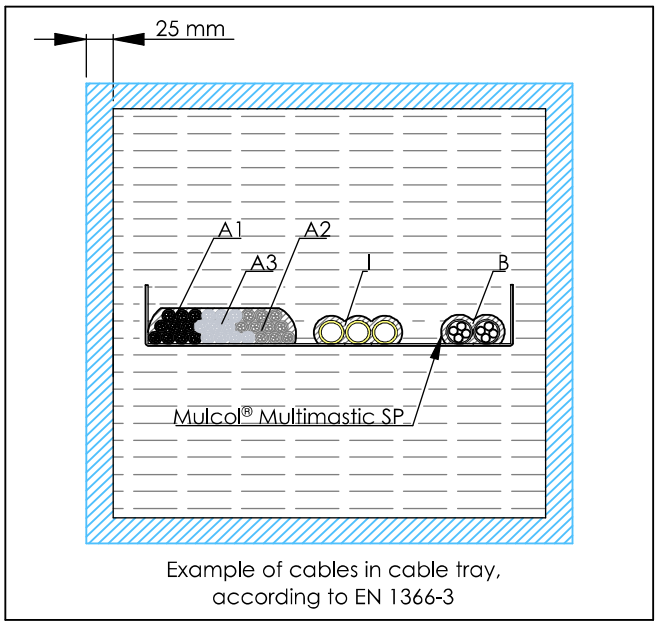
[m] PE = Polyethylene, solid or cellular

[n] Values from technical data sheets of manufacturers; actual values shall be used to calculate the number of cables necessary to form a tied bundle of 100 mm diameter

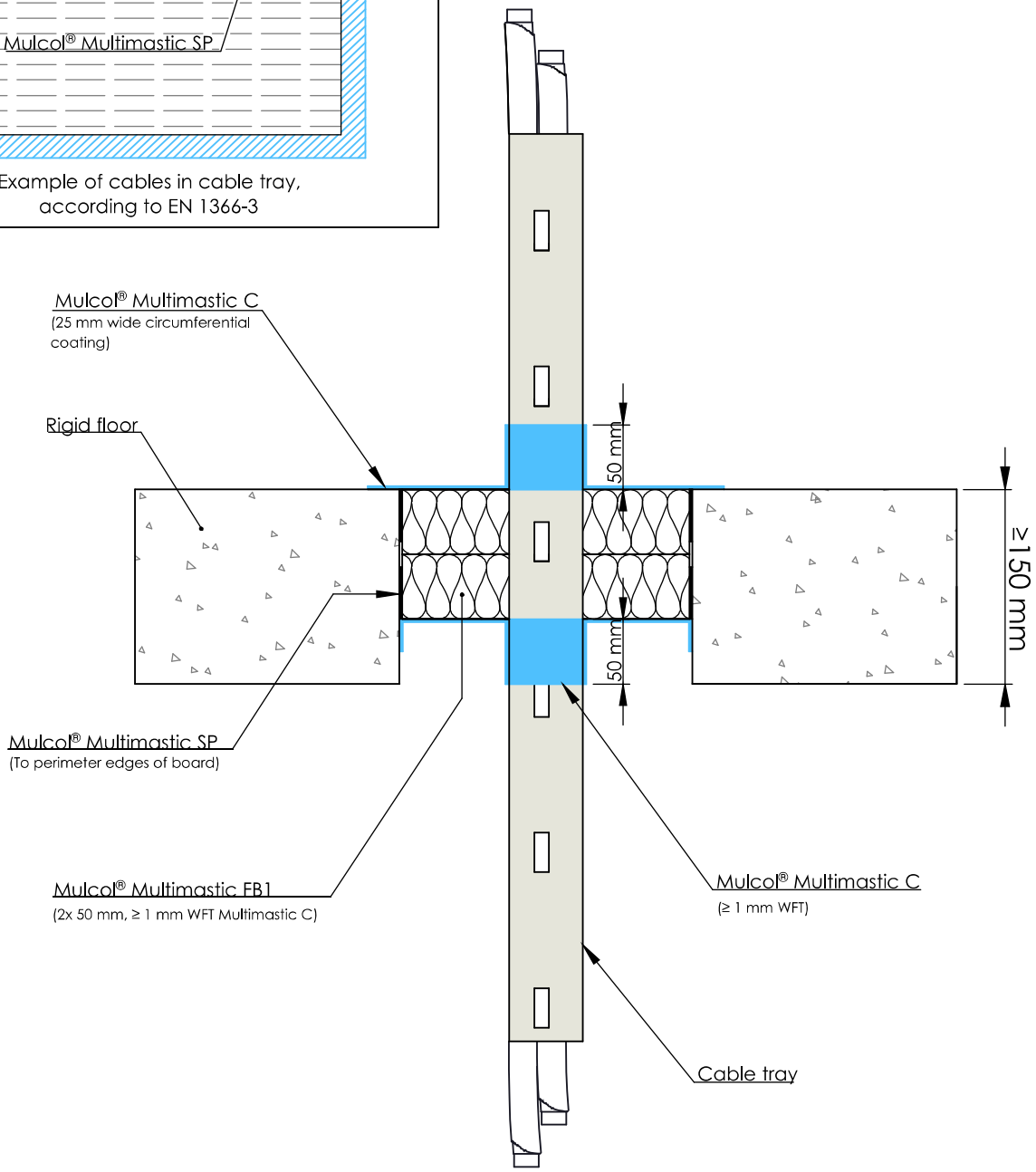
[o] The given value relates to the single cable, not the cable bundle, and depends on the construction details of the cable (solid-PE or cellular-PE)

[p] Values for minimum and maximum diameter from HD 21.3

Top view



Example of cables in cable tray, according to EN 1366-3

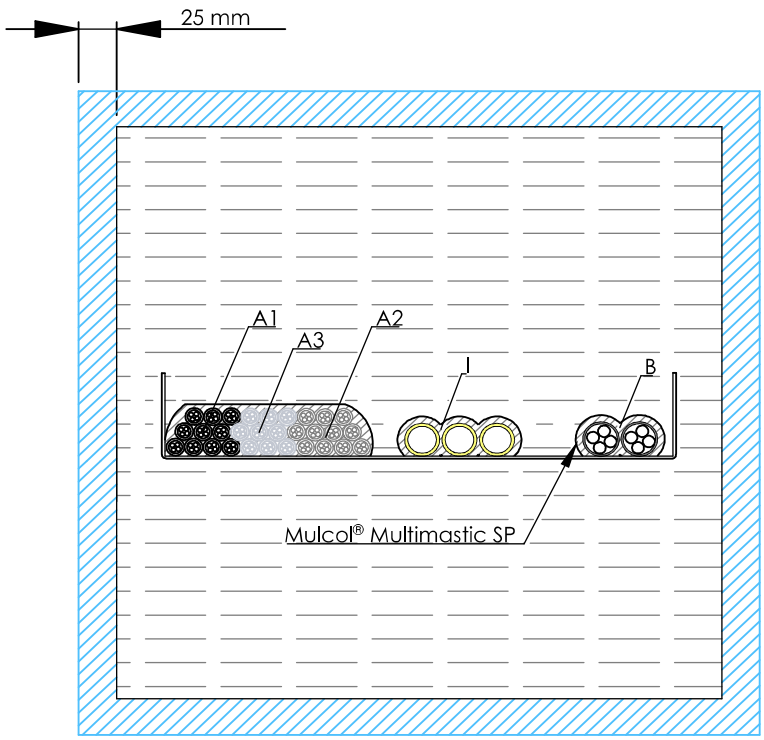


American projection	Scale :	Company : Mulcol International B.V.	PBrf-CT-MFB1.2.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 1 of 2
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable tray penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Top view



Example of cables in cable tray,
according to EN 1366-3

Cable tray can contain for example the following cables according to EN1366-3:

A1 - e.g. NYY-J Cable 5 x 1,5 mm²
A2 - e.g. H07RN-F 5G Cable 5 x 1,5 mm²
A3 - e.g. PVIK-LS-HF 5 x 1,5 mm²
B - e.g. EYY-J Cable 1 x 95 mm²
C1 - e.g. Plastic conduit Ø 16 mm
C2 - e.g. NYY-J Cable 5 x 1,5 mm²
C3 - e.g. H07RN-F 5G Cable 5 x 1,5 mm²

American projection	Scale :	Company : Mulcol International B.V.	PBrf-CT-MFB1.2.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 2 of 2
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable tray penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.4.2 Mulcol® Multicollar Slim

On the next pages, classifications, conditions and drawings of this system inside seal are given.

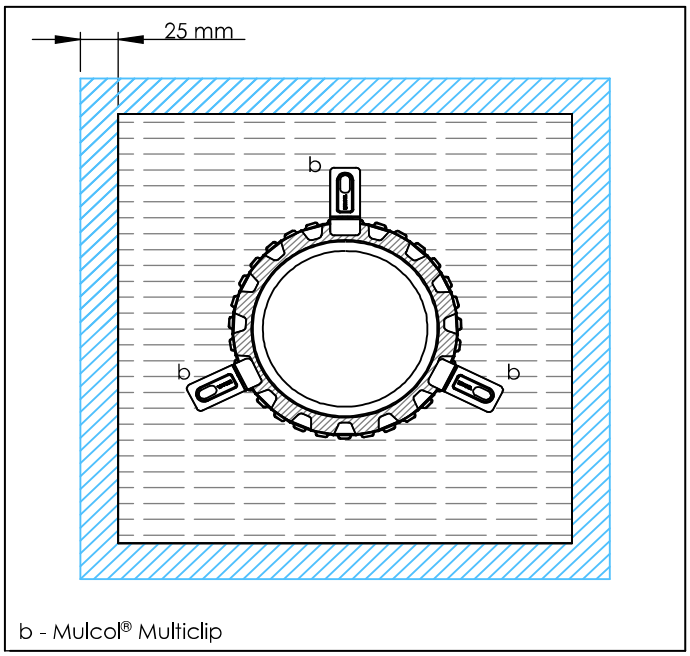
Fire resistance classification					
Pipe dimensions (mm)		Performance class with pipe end configuration		Pipe material	System
Outer diameter	Wall thickness				
Drawing PBrf-PP-MFB1.1.10					
≤ 110	6,6	EI 60–U/U	EI 60–U/C	PE-HD/ PE / ABS / SAN+PVC	Mulcol® Multicollar Slim

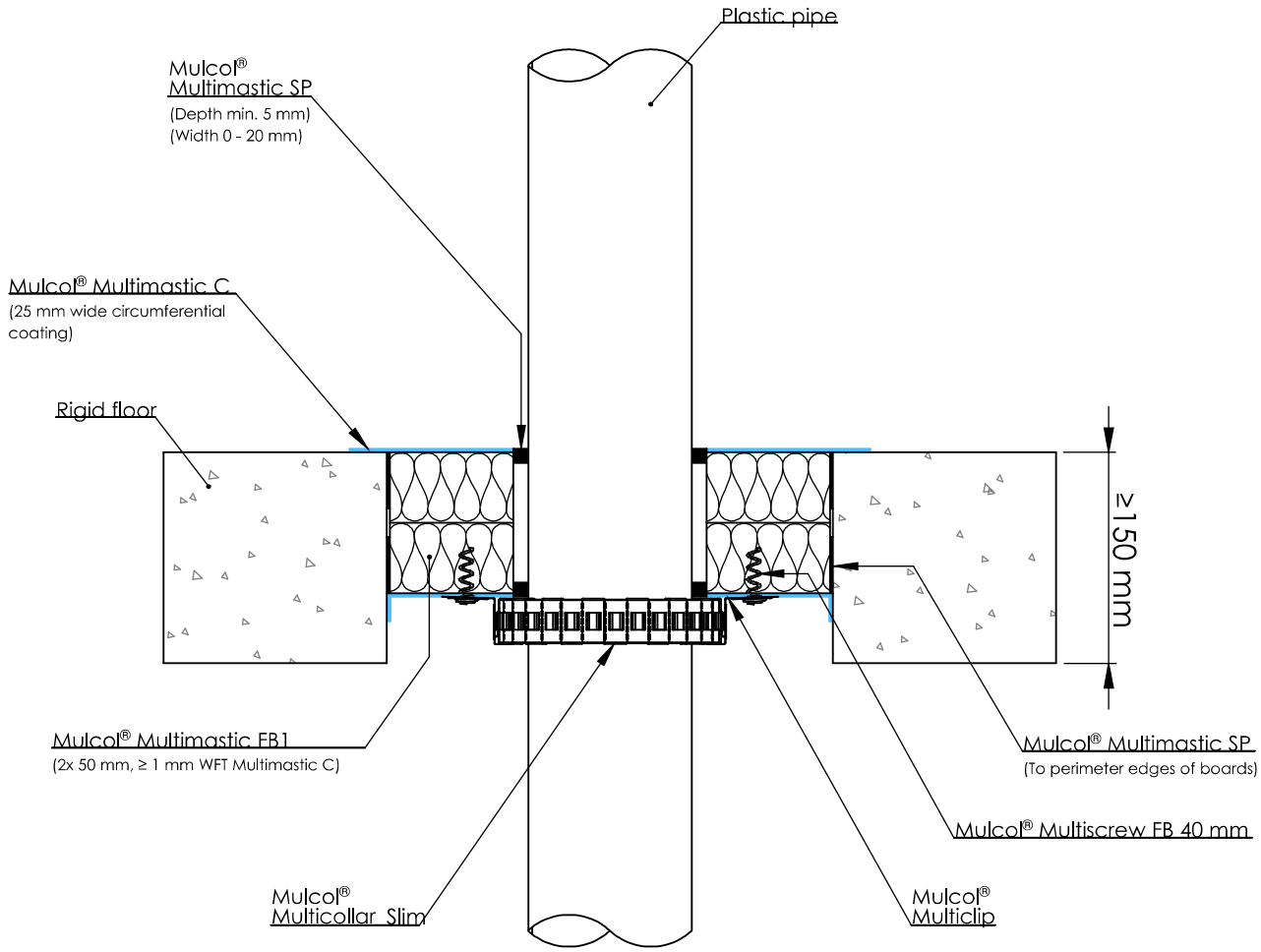
The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic SP.

The following minimum working distances apply between the cables, cable carriers and conduits within the penetration seal (see Table 5.1);

- a_2: ≥ 30 mm (distance Mulcol® Multicollar Slim to cable, cable carrier or conduit);
- b_5: ≥ 15 mm (distance Mulcol® Multicollar Slim to seal edge).

Bottom view





American projection	Scale :	Company : Mulcol International B.V.	PBrf-PP-MFB1.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 26-6-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar Slim
Installation in rigid floor

5.5 Mulcol® Multimastic FB2 (1 x 60 mm)

The Mulcol® Multimastic FB2 board system has a total thickness of 60 mm (1 x 60 mm). For the system Mulcol® Multimastic FB2 (1 x 60 mm), a classification of cables, conduits and pipes according to the following combinations of performance parameters and classes apply.

The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic SP.

The system must be placed flush with the top of the floor.

5.5.1 Mulcol® Multidisc

On the next pages, classifications, conditions and drawings of this system inside a mixed seal are given.

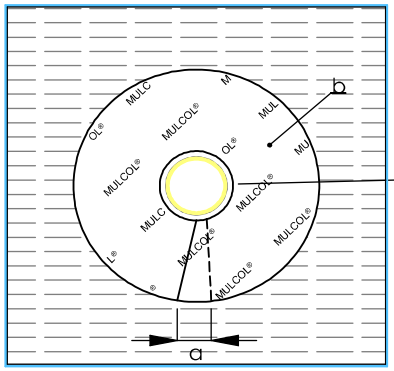
Fire resistance classification			
Outer diameter pipe / bundle (mm or inch)	**Performance class with pipe end configuration**	**Pipe / cable material**	**System**
Drawings PBrf-MFB2-EP19-M2.0.10			
≤ 3/4" **≤ 19 mm**	**EI 60–U/C** **E 90-U/C**	**Electrical pipes** **PVC-C / PVC-U**	**Mulcol®** **Multidisc**
Drawing PBrf-MFB2-EC-M2.0.10			
Single electrical cable	**EI 60** **E 90**	**YMVK 5 x 2.5 mm²**	**Mulcol®** **Multidisc**
Drawing PBrf-MFB2-MLA-M2.0.10			
≤ 19 x 2.0 mm	**EI 60–U/C**	**Henco** **PE-Xc/AL/PE-Xc**	**Mulcol®** **Multidisc**

The holes for the penetrations seals fitted with the Mulcol® Multidisc shall be less than Ø26 mm. The Mulcol® Multidisc must be fitted below the floor.

The following minimum working distances for Mulcol® Multidisc apply within the penetration seal (see Table 5.1);

- a_4: ≥ 0 mm (mutual distance Mulcol® Multidisc);
- b_4: ≥ 10 mm (distance Mulcol® Multidisc to seal edge).

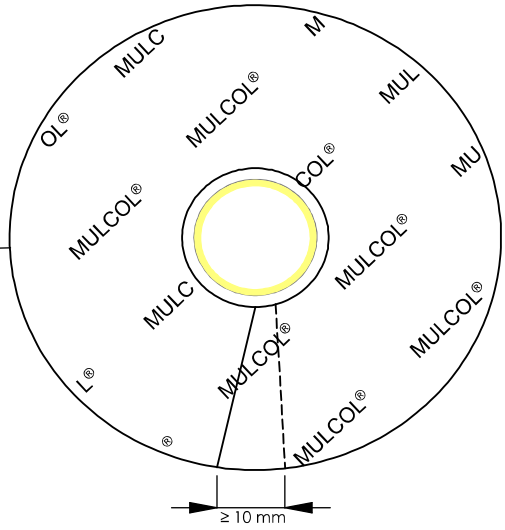
Bottom view

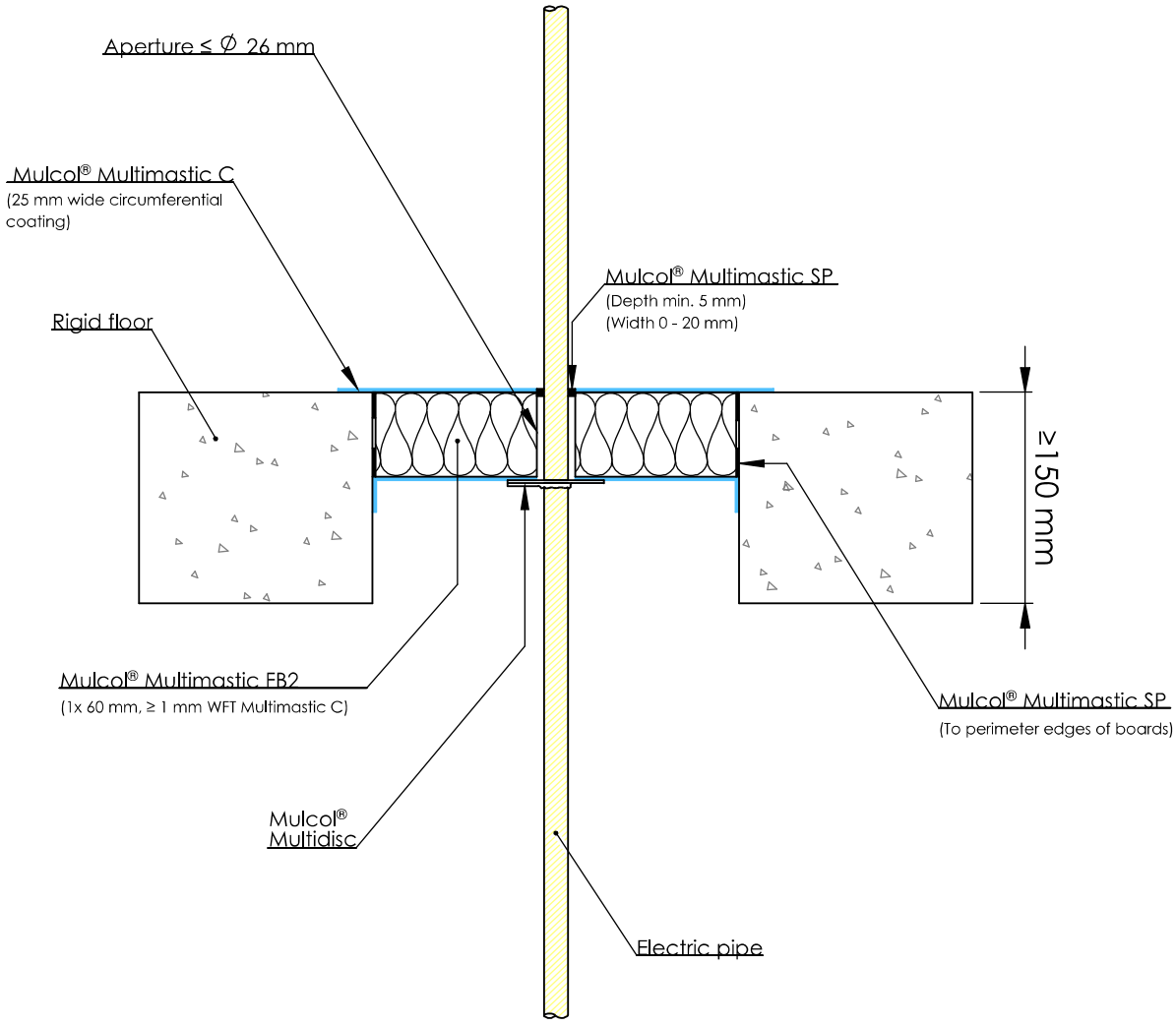


a - Overlay size
(Minimum 10 mm overlay)
b - Mulcol® Multidisc

A

Detail A

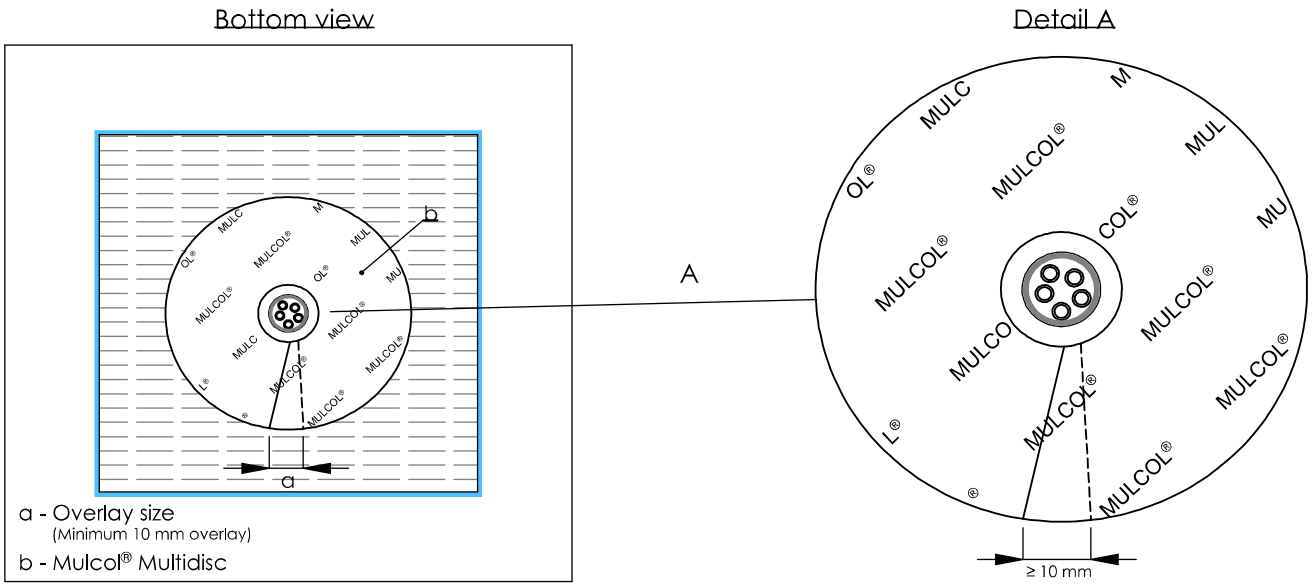


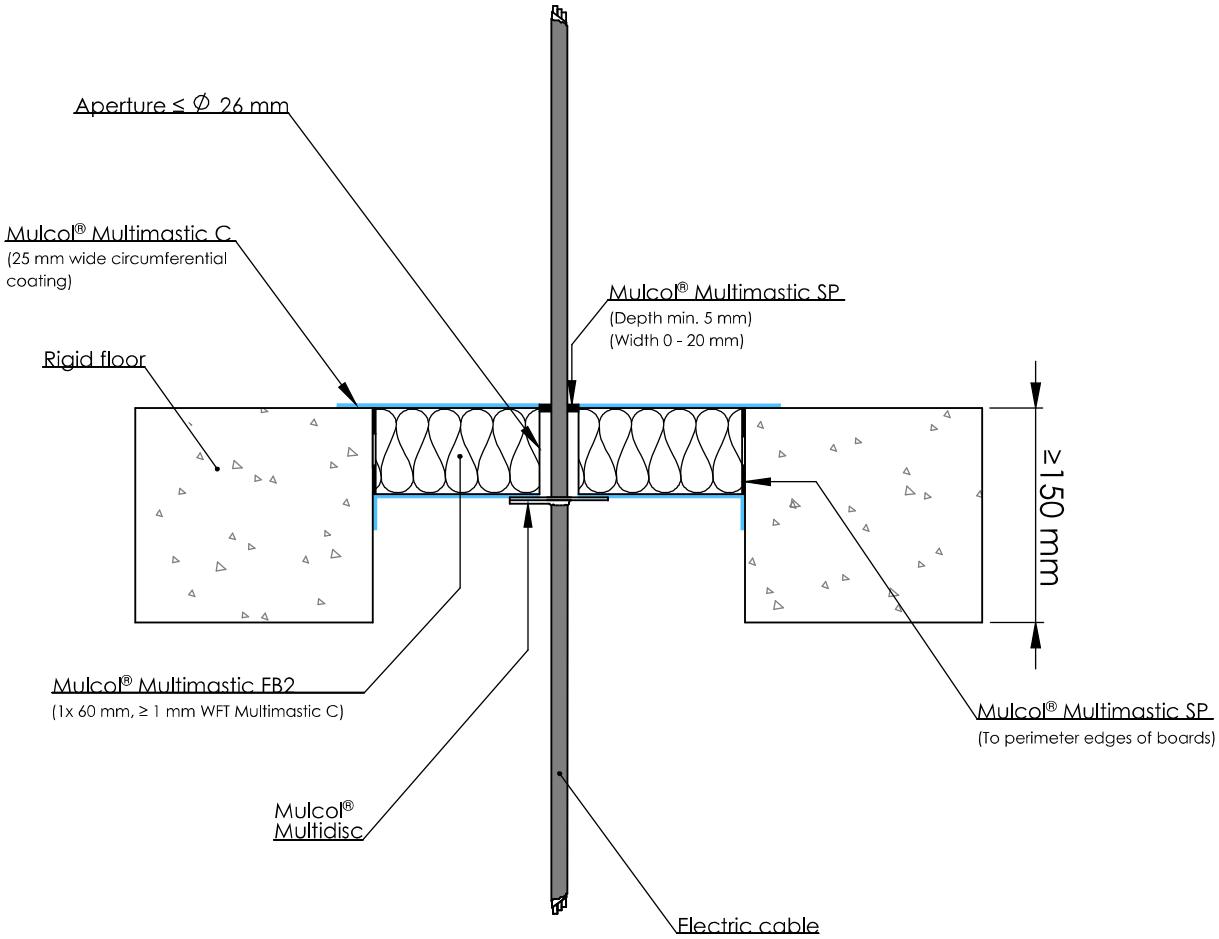


American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB2-EP19-M2.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multidisc
Installation in rigid floor



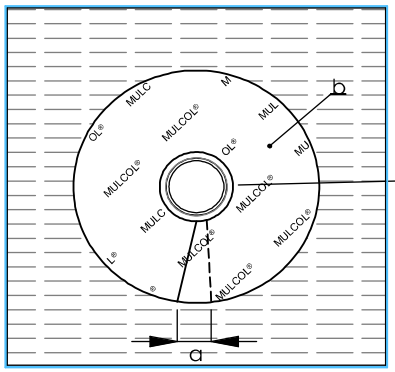


American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB2-EC-M2.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test cable penetration seal
Mulcol® Multidisc
Installation in rigid floor

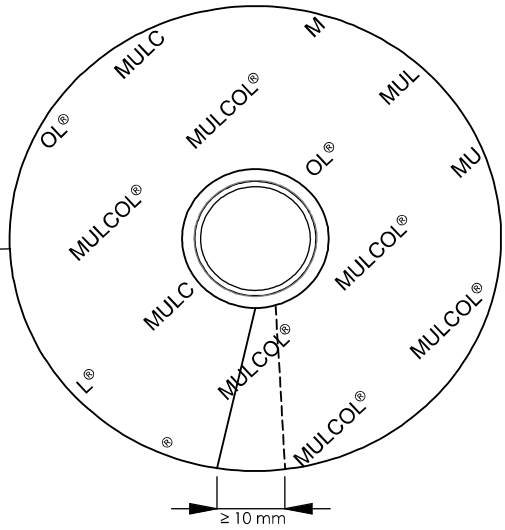
Bottom view

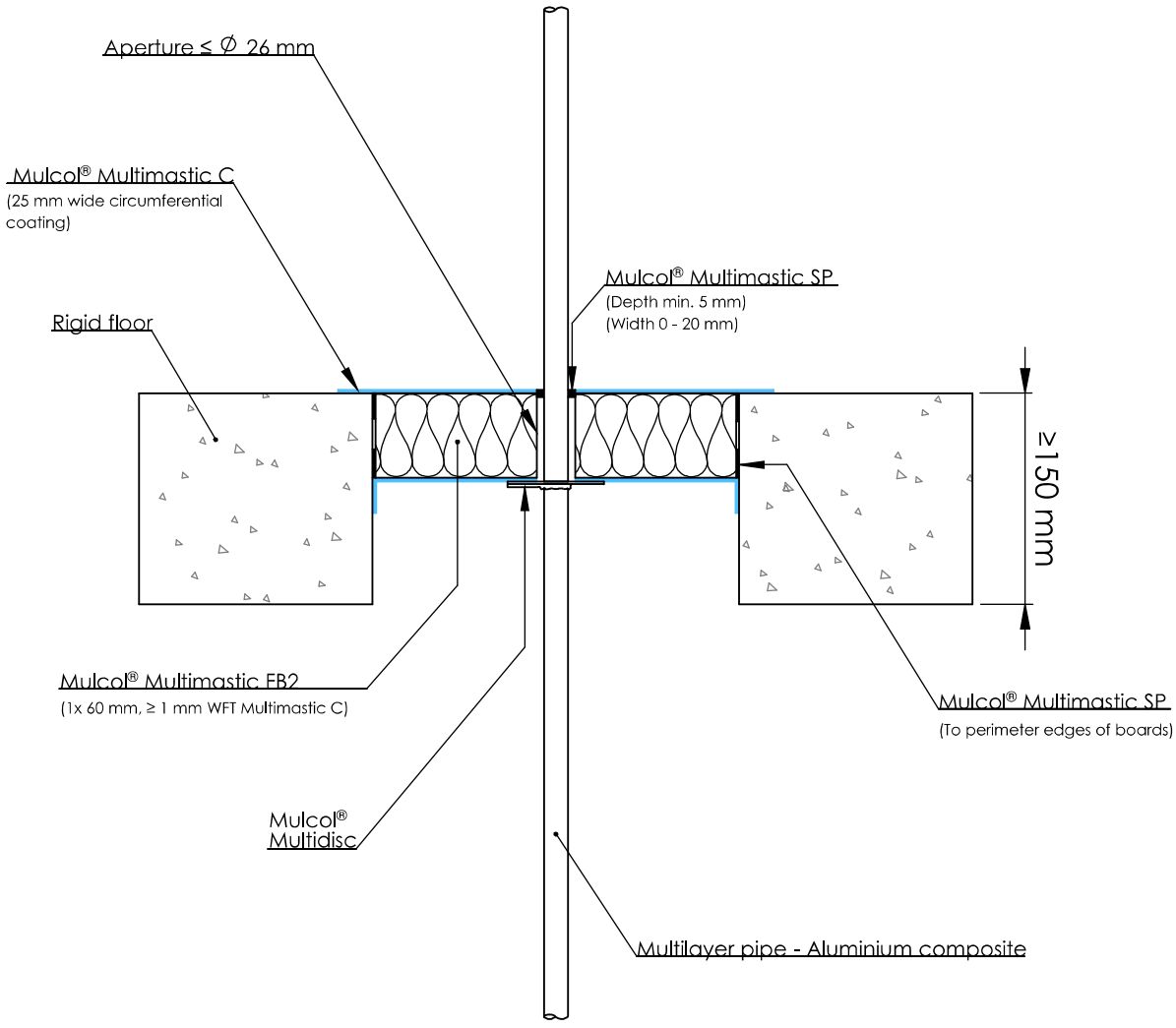


a - Overlay size
(Minimum 10 mm overlay)
b - Mulcol® Multidisc

A

Detail A





American projection	Scale :	Company : Mulcol International B.V.	PBrf-MFB2-MLA-M2.0.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multidisc
Installation in rigid floor

5.5.2 Mulcol® Multisealant GR

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

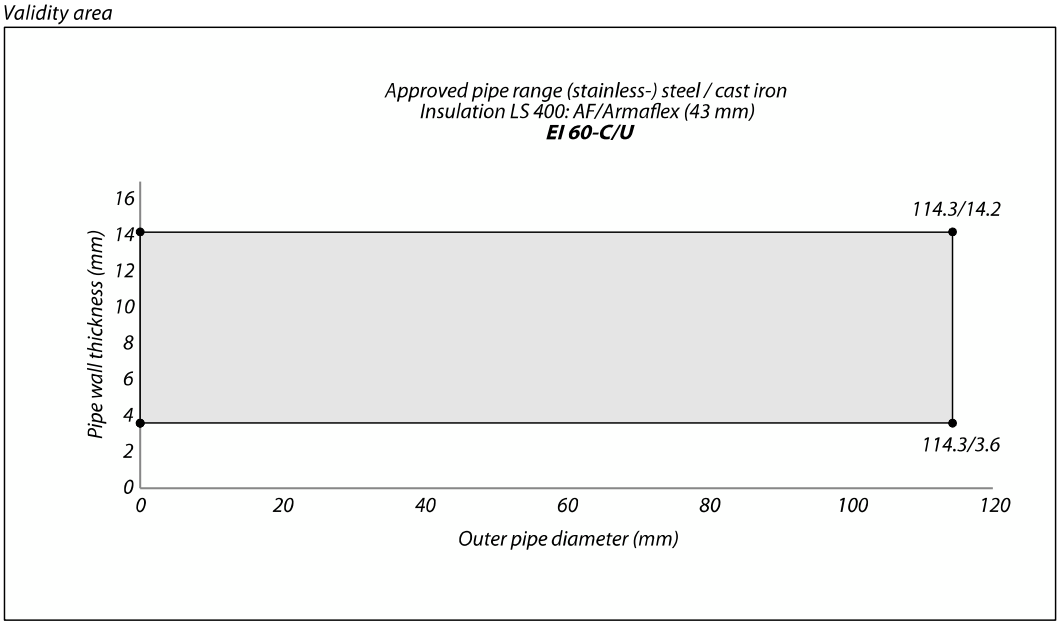
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-ST-MFB2-G2.2.22						
≤ 114.3	3.6 to 14.2	EI 60–C/U	AF/Armaflex (43)	(Stainless-) steel / cast iron	Mulcol® Multisealant GR	5.11

The fires resistance classification is valid for insulation AF/Armaflex made out of flexible elastomeric EPDM rubber foam with a reaction to fire class BL-s3, d0 or B-s3, d0 in accordance with EN 13501-1. The insulation shall be applied sustained at the aperture with a minimum distance of 400 mm on both sides from the point where the pipe emerges out of the floor (allowed is LS and CS in accordance with Table 1 of EN 1366-3). When the insulation AF/Armaflex consists out of multiple parts or splices are present, the insulation is glued together with Armaflex 520.

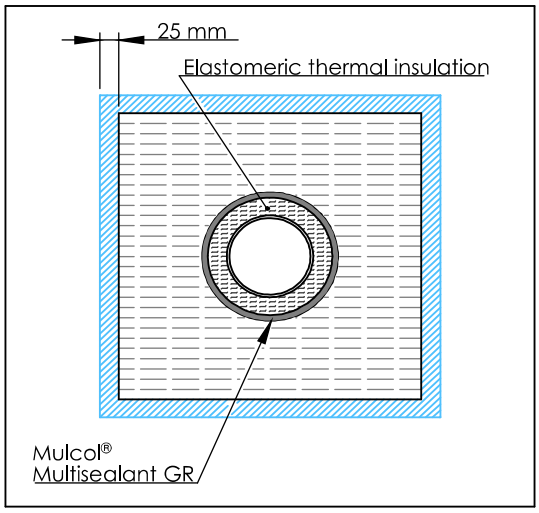
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

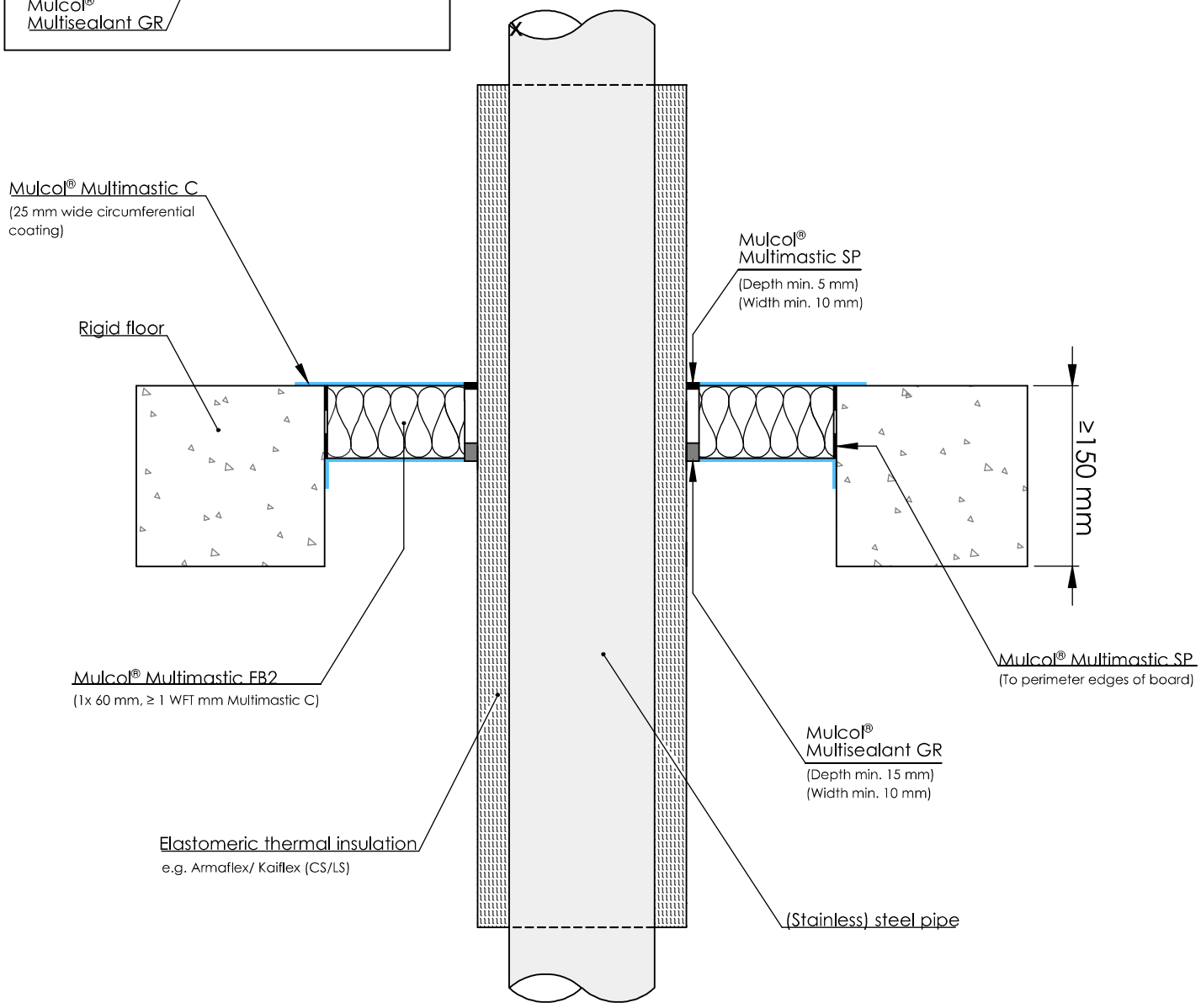
- b_4: ≥ 10 mm (distance Mulcol® Multisealant GR to seal edge).

f5.11 Validity area



Bottom view





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB2-G2.2.22
	Unit of measure : mm	Department : Research & Development	A4
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

5.5.3 Mulcol® Multisealant GR (coated on pipe)

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

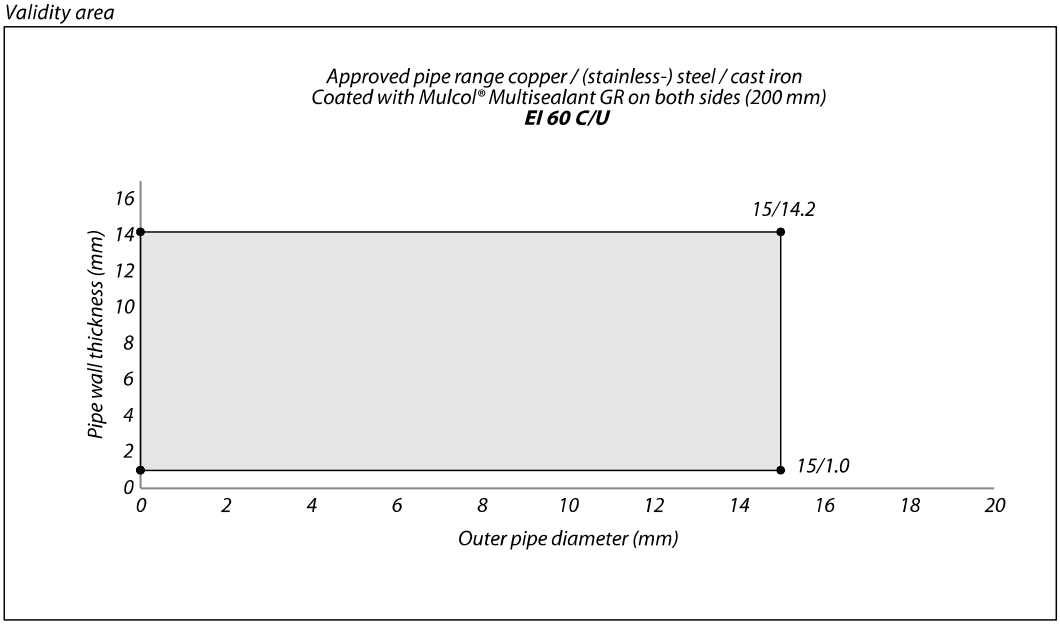
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-CU-MFB2-GRC.1.10						
≤ 15	1.0 to 14.2	EI 60–C/U E 90–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.12
Drawing PBrf-ST-MFB2-GRC.1.10						
≤ 15	1.0 to 14.2	EI 60–C/U E 90–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.13
≤ 42.4	3.2 to 14.2					

For classification of the pipes coated with Mulcol® Multisealant GR, it shall be coated over a length of 200 mm on both sides with Mulcol® Multisealant GR, thickness 1.5 mm (WFT).

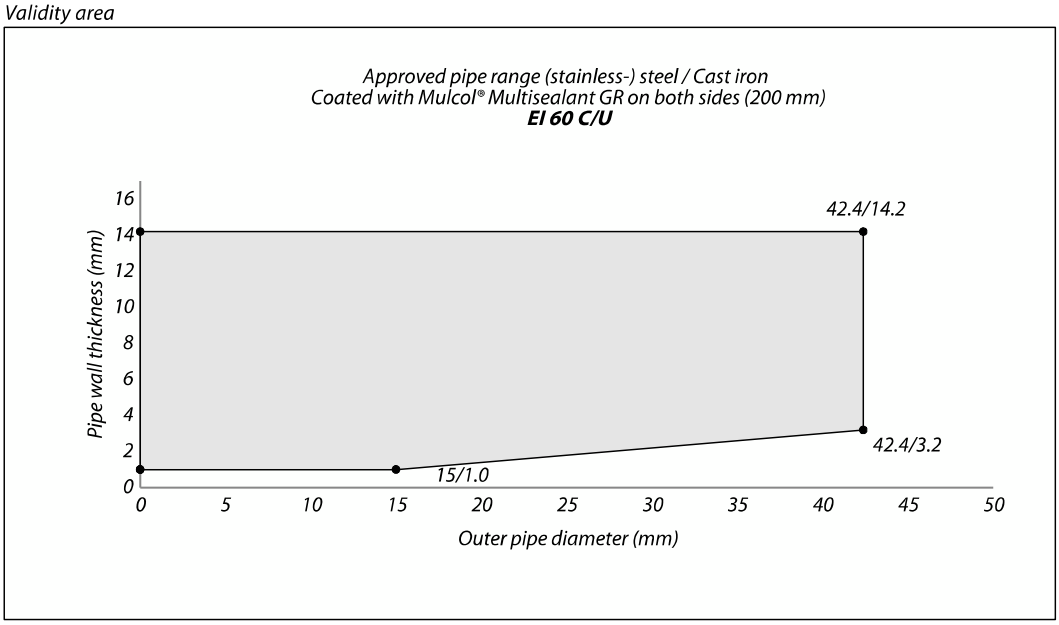
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- a_1: ≥ 30 mm (distance coated Mulcol® Multisealant GR to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance coated Mulcol® Multisealant GR to Mulcol® Multicollar Slim);
- a_5: ≥ 0 mm (mutual distance coated Mulcol® Multisealant GR seals);
- b_4: ≥ 10 mm (distance coated Mulcol® Multisealant GR to seal edge).

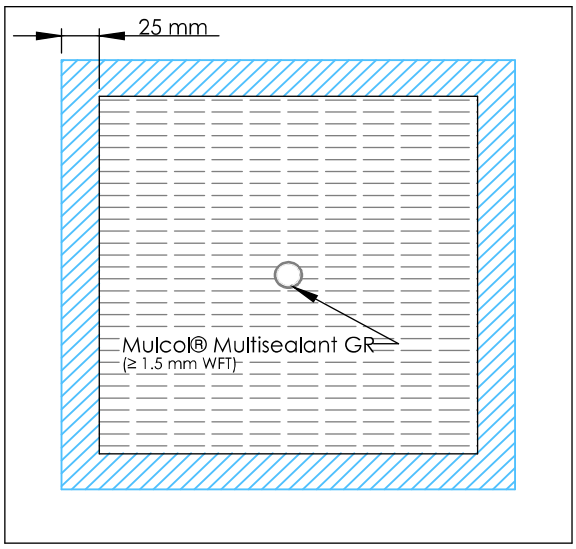
f5.12 Validity area

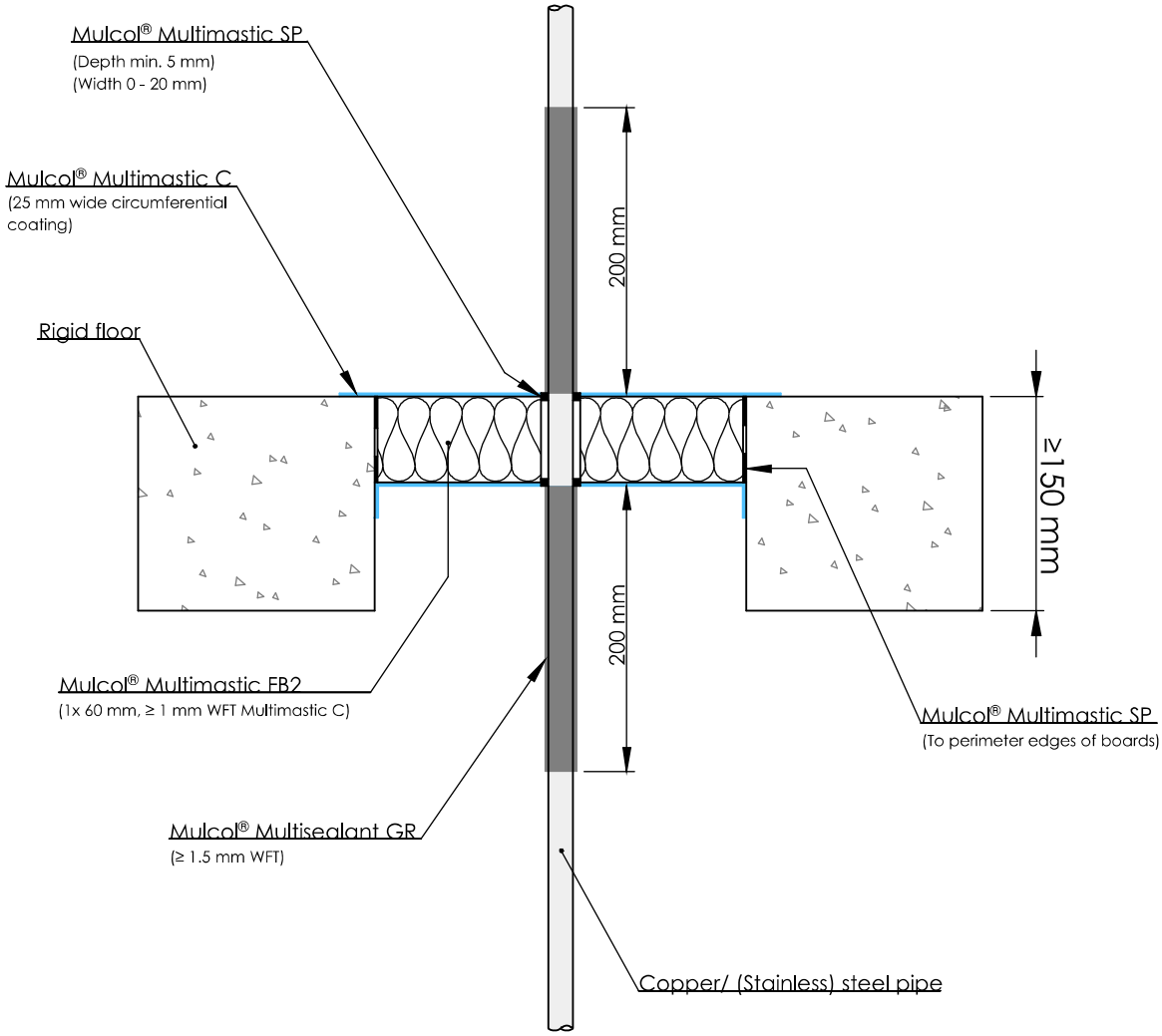


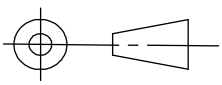
f5.13 Validity area



Top view



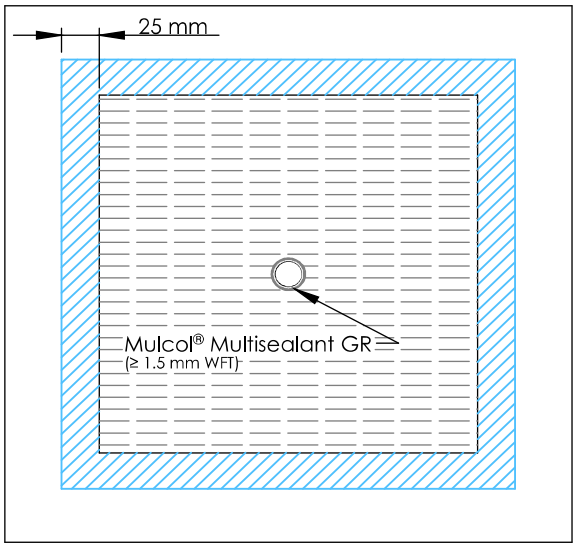


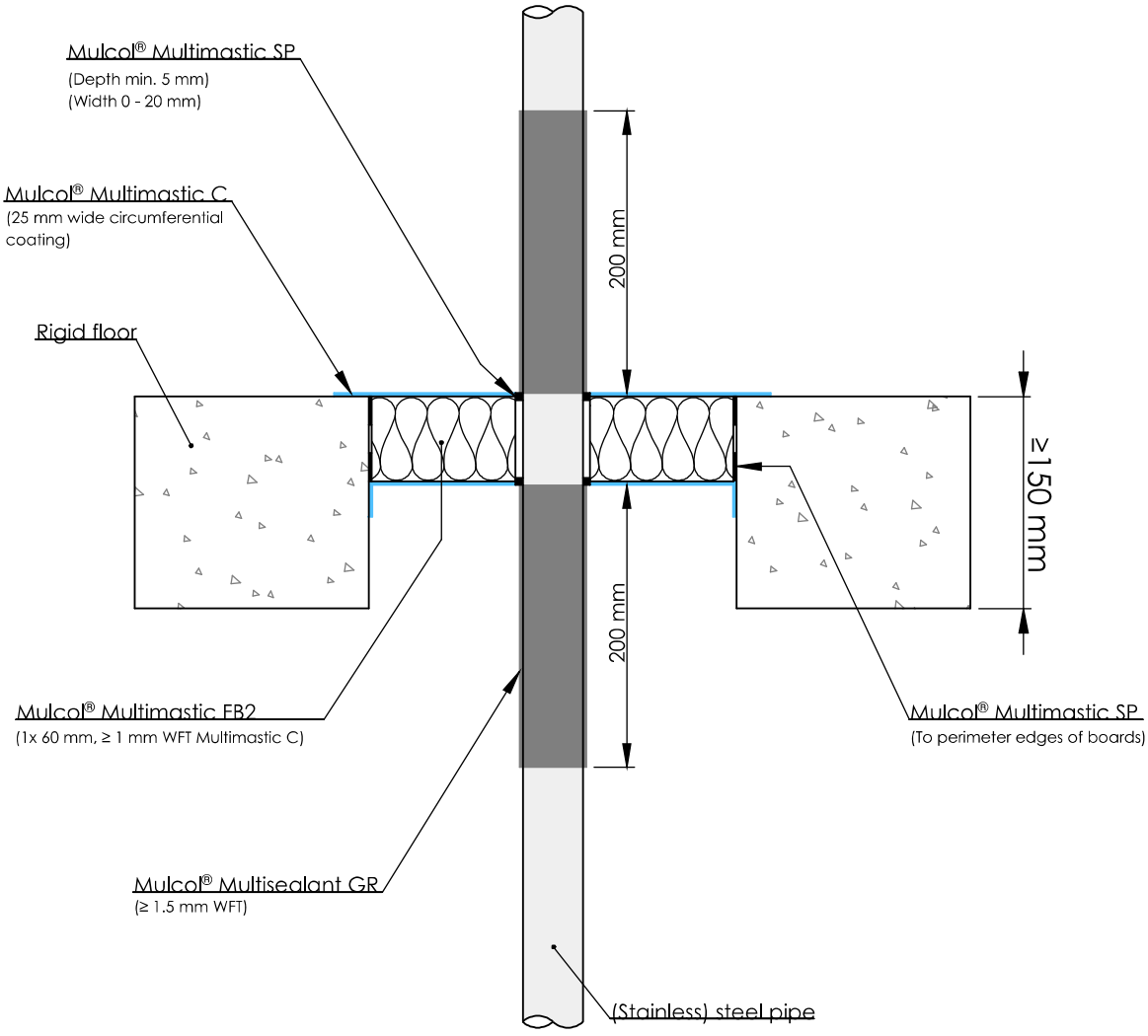
American projection 	Scale :	Company : Mulcol International B.V.	PBrf-CU-MFB2-GRC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Top view





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB2-GRC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.5.4 Mulcol® Multimastic SP (coated on pipe)

On the next pages, classifications, conditions and drawings of this system inside a seal are given.

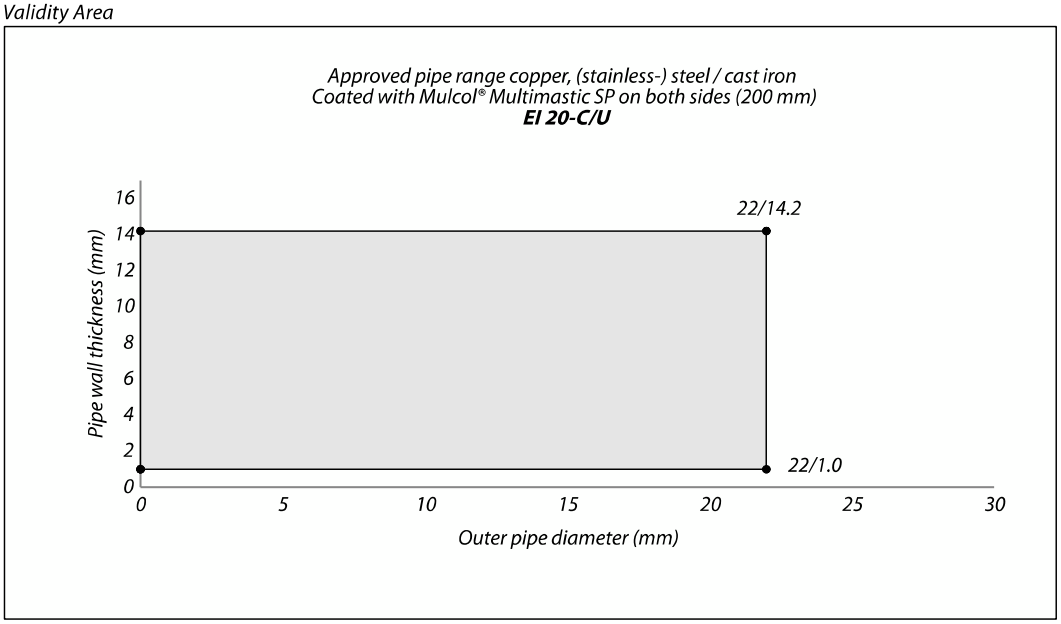
Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing PBrf-CU-MFB2-SPC.1.10						
≤ 22	1.0 to 14.2	EI 20–C/U E 90–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.14
Drawing PBrf-ST-MFB2-SPC.1.10						
≤ 22	1.0 to 14.2	EI 30–C/U E 90–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.15
≤ 42.4	3.2 to 14.2					
≤ 42.4	3.2 to 14.2	EI 30–C/U E 90–C/U				5.16

The openings between the seal and the copper and steel pipes closed with Mulcol® Multimastic SP shall be coated over a length of 200 mm on both sides with Mulcol® Multimastic SP, thickness 1.5 mm (WFT).

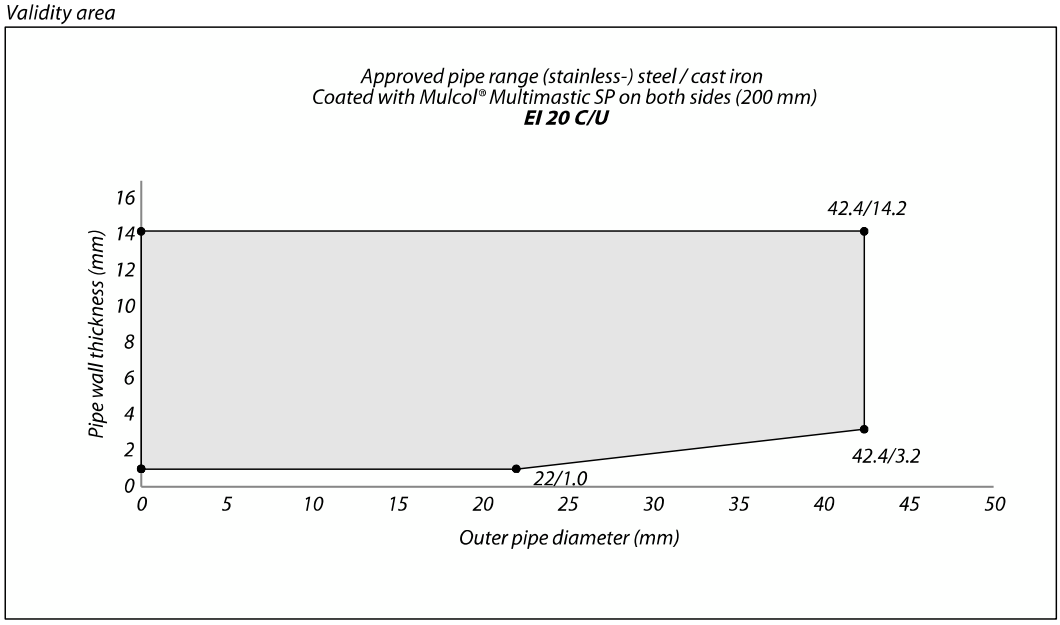
The following minimum working distances for Mulcol® Multimastic FB1 apply within the penetration seal (see Table 5.1);

- a_1: ≥ 30 mm (distance coated Mulcol® Multimastic SP to cable, cable carrier or conduit);
- a_3: ≥ 25 mm (distance coated Mulcol® Multimastic SP to Mulcol® Multicollar Slim);
- a_5: ≥ 0 mm (mutual distance coated Mulcol® Multimastic SP seals);
- b_4: ≥ 10 mm (distance coated Mulcol® Multimastic SP to seal edge).

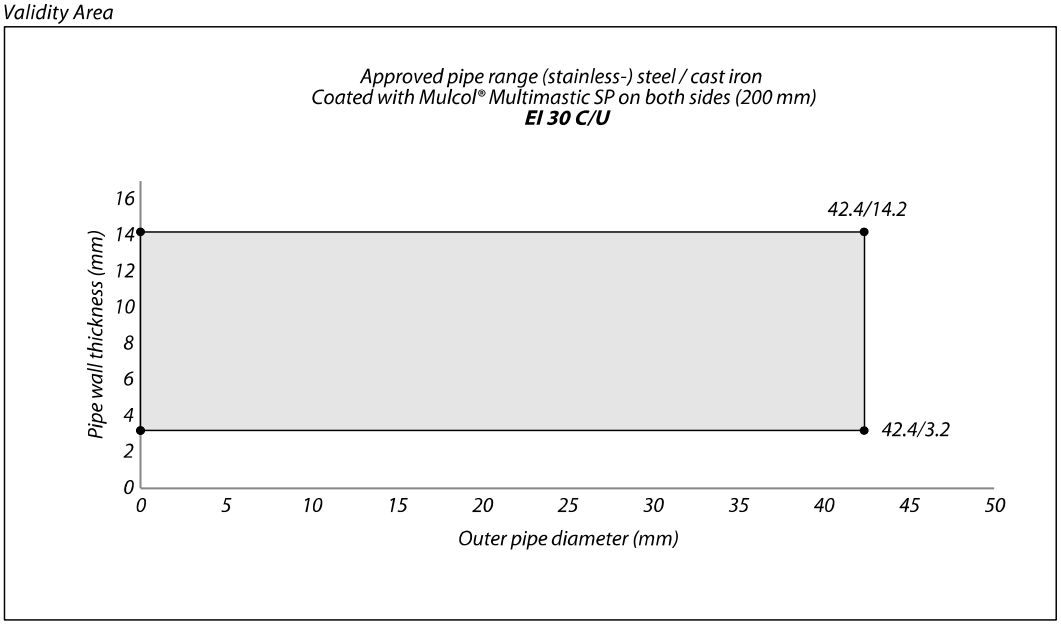
f5.14 Validity Area



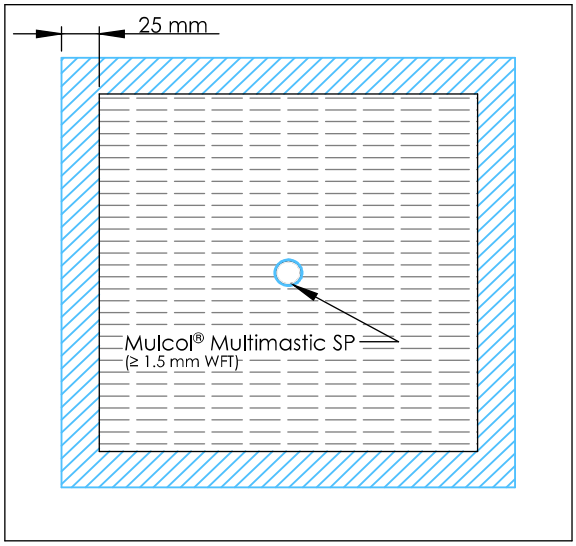
f5.15 Validity area

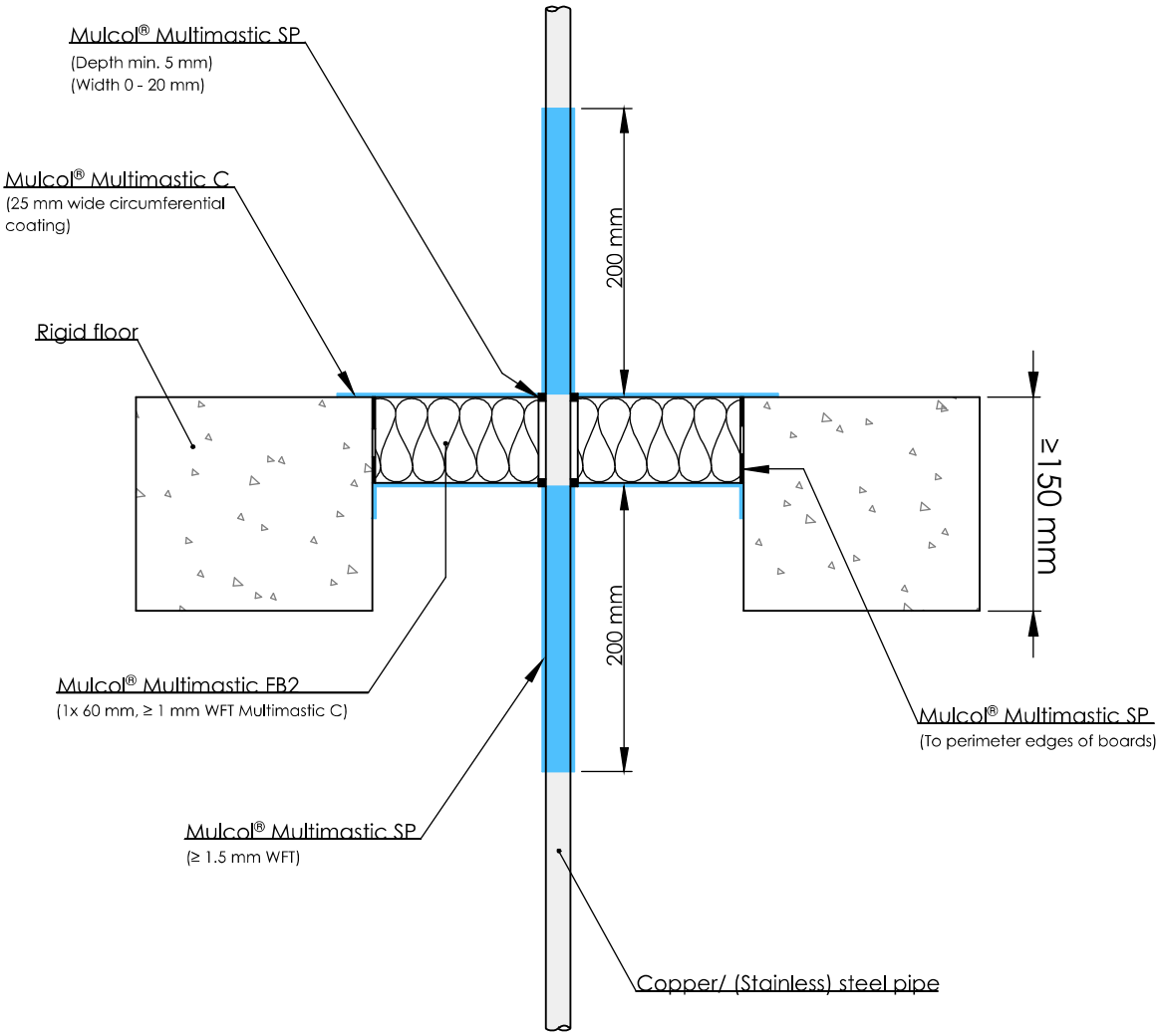


f5.16 Validity Area



Top view



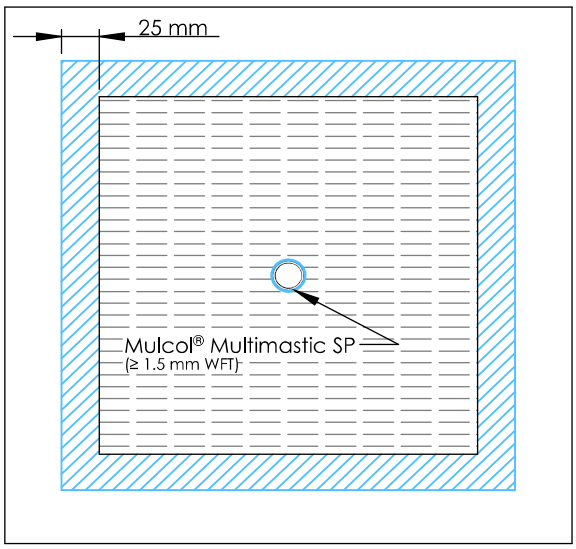


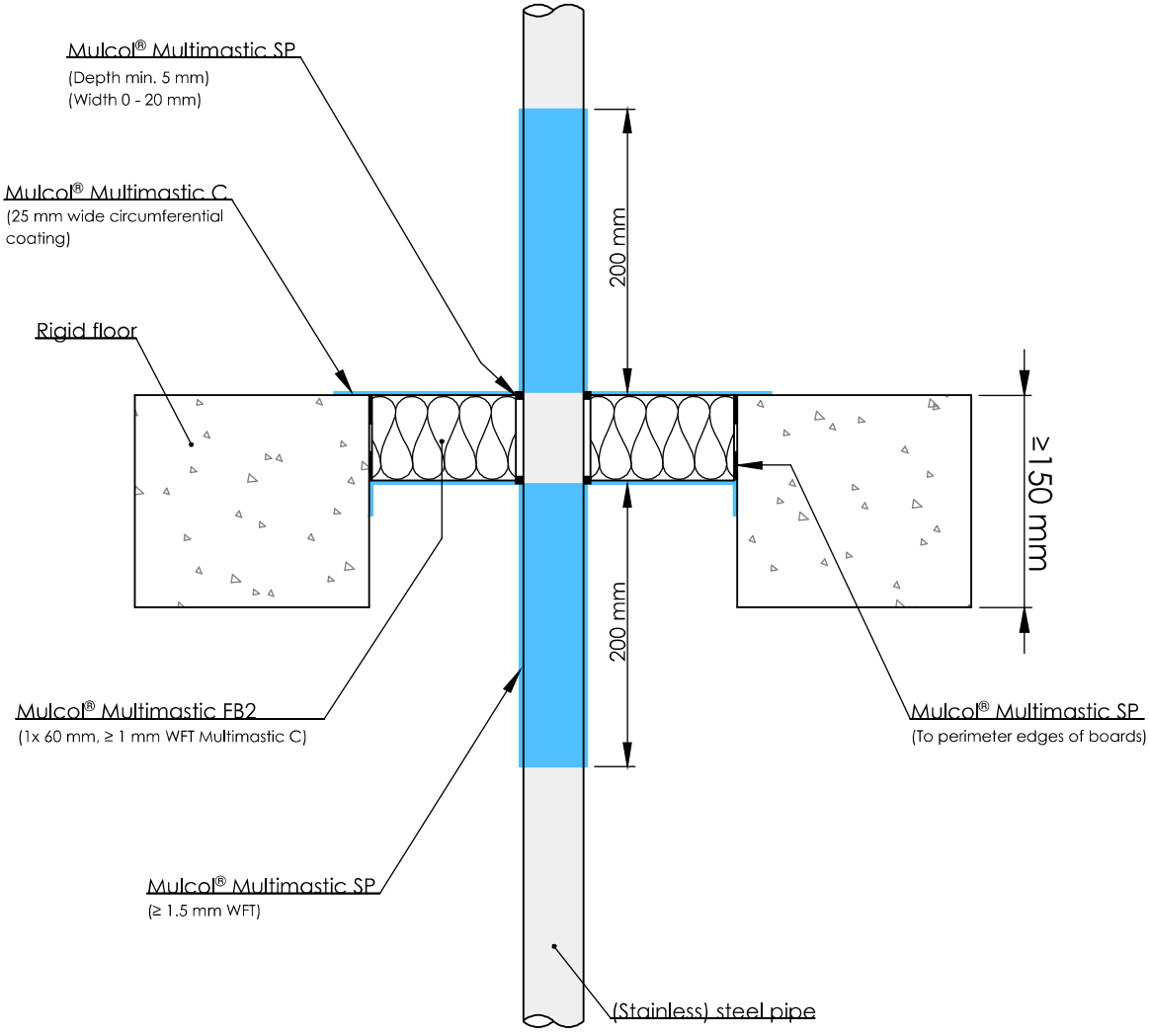
American projection	Scale :	Company : Mulcol International B.V.	PBrf-CU-MFB2-SPC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Top view





American projection	Scale :	Company : Mulcol International B.V.	PBrf-ST-MFB2-SPC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

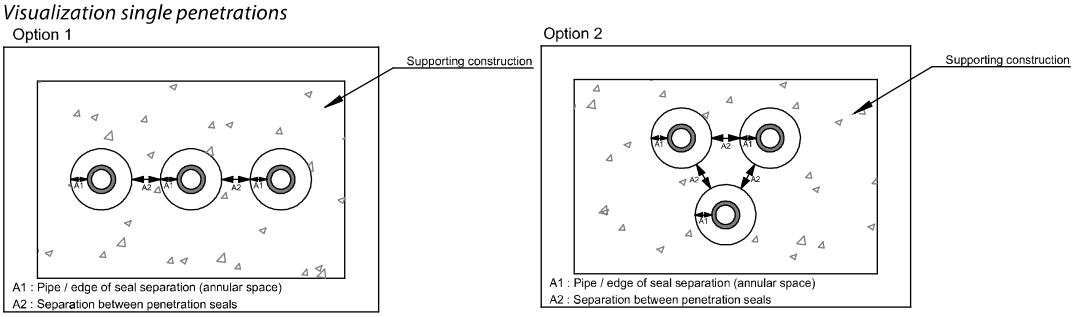
Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.6 Penetrations directly through the floor

A classification of pipes according to the following combinations of performance parameters and classes directly through the floor apply.

If more pipe penetrations are placed in the floor, the minimum distance between the aperture edges shall be 100 mm, distance a_2, see Figure 5.17.

f5.17 Visualization single penetrations



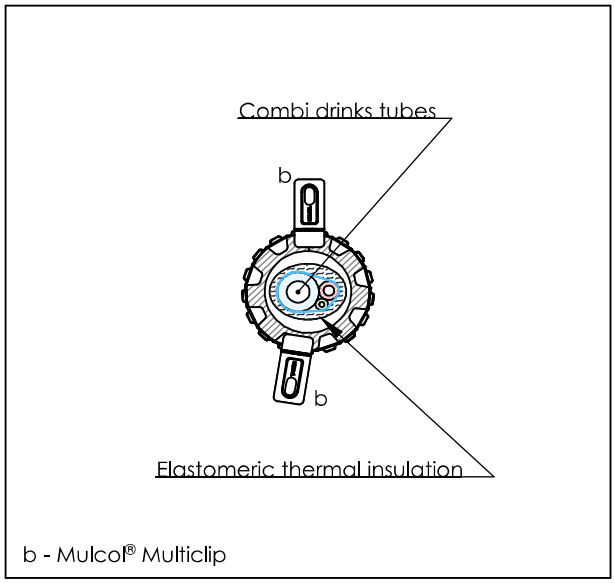
5.6.1 Combi drinks pipe with Mulcol® Multicollar Slim

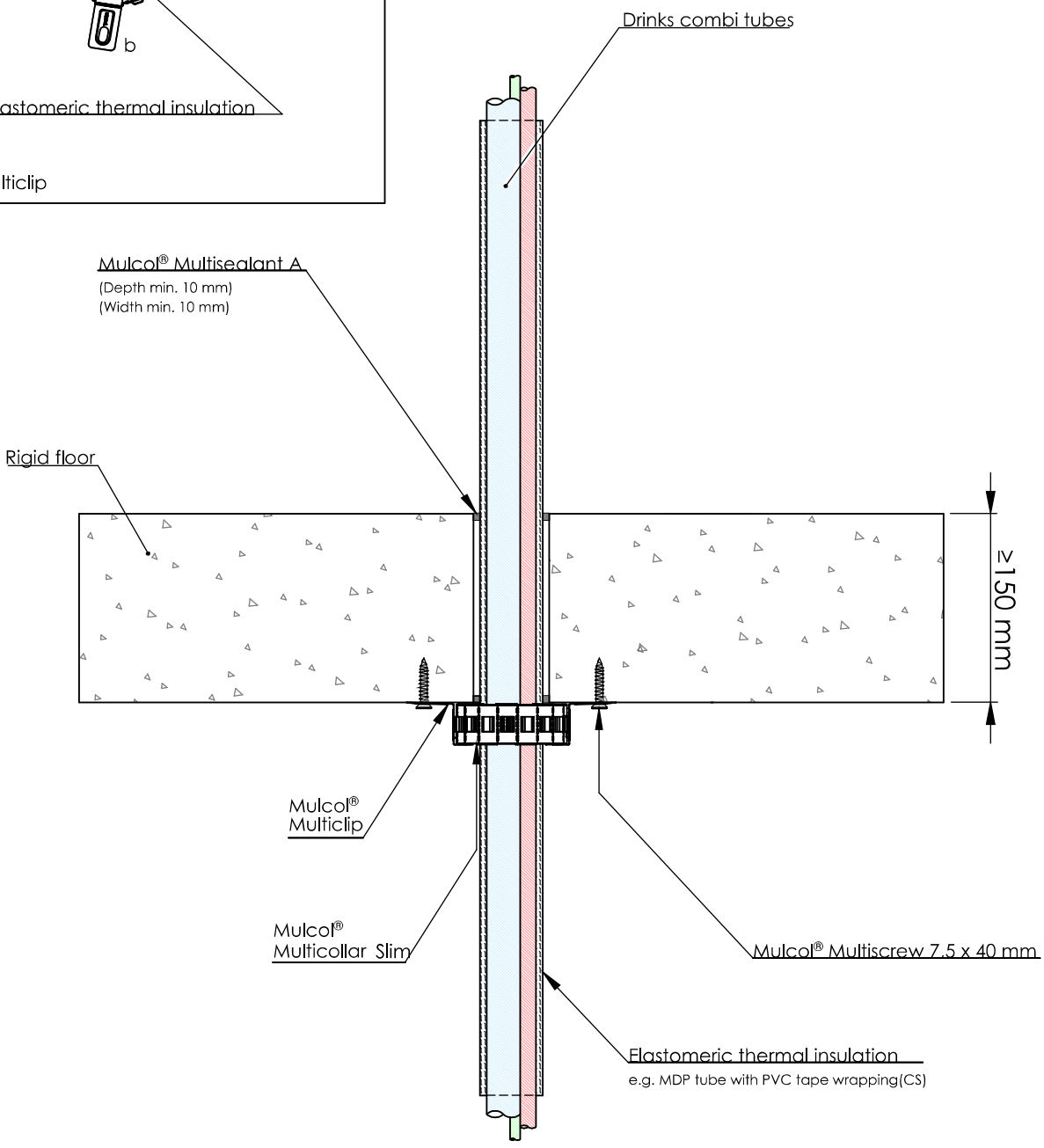
On the next pages, classifications, conditions and drawings of this system are given.

Fire resistance classification				
Pipe / bundle dimensions (mm)		Performance class with pipe end configuration	Pipe / insulation material	System
Outer diameter	Wall thickness			
Drawings RF-MC30-DCT3-11.0.22 and RF-MC30-DCT52-11.0.22				
≤ 47	3 hoses	EI 120–U/C	Python Drinks Combi pipe with Armaflex insulation	Mulcol® Multicollar Slim
≤ 145	52 hoses			

The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic A.

Bottom view



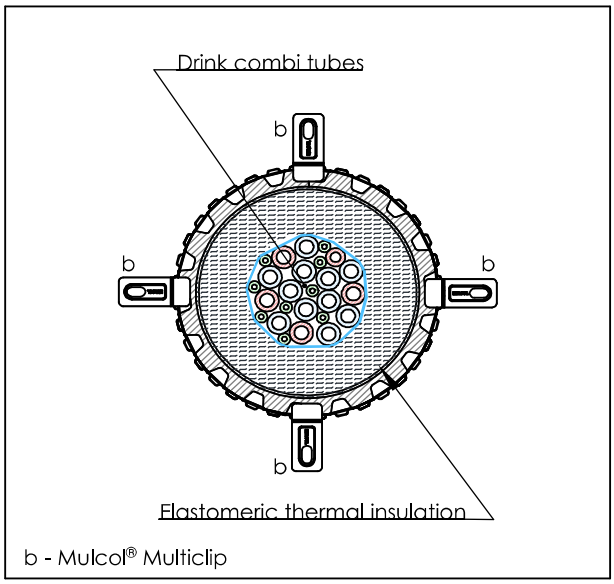


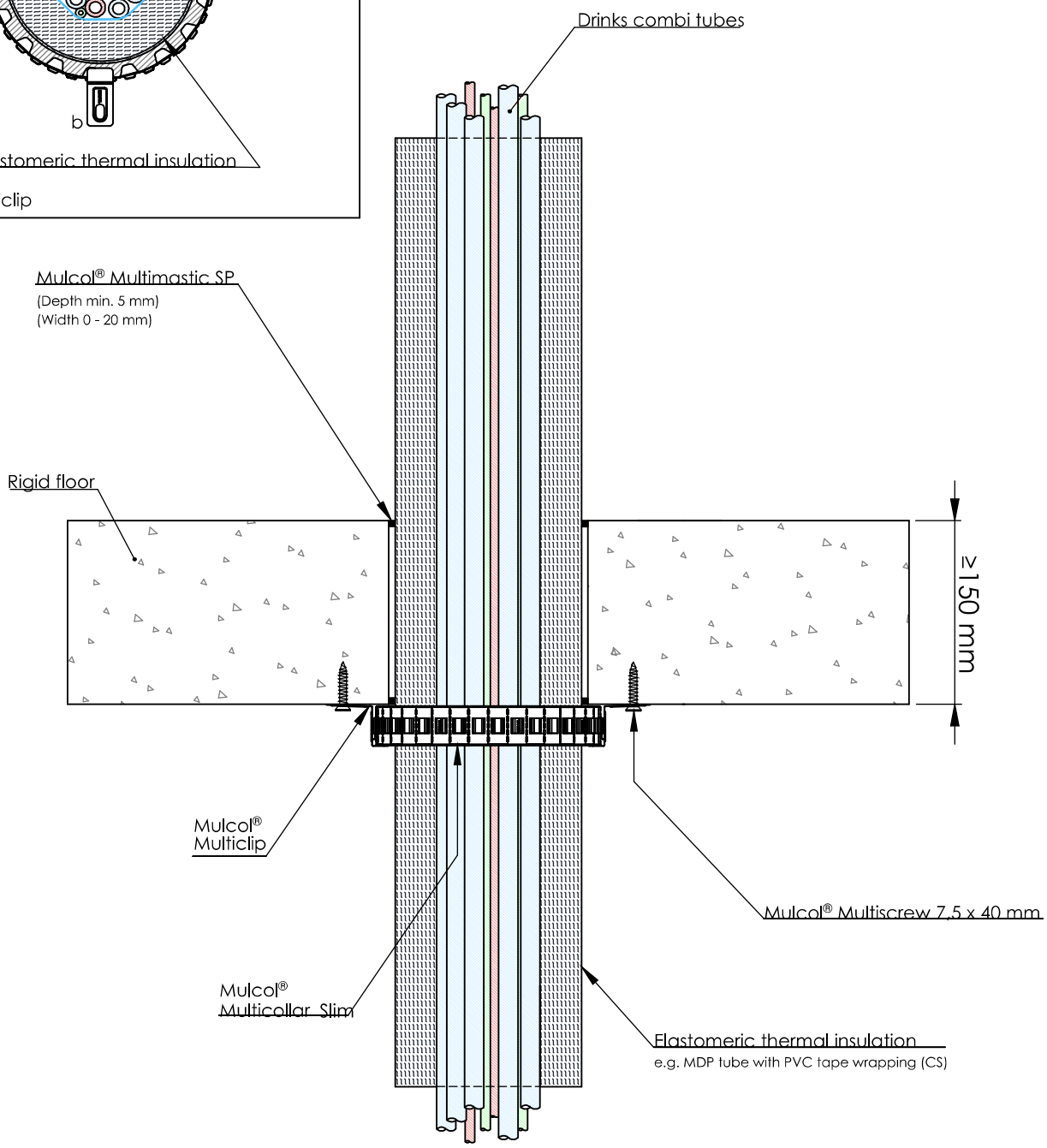
American projection	Scale :	Company : Mulcol International B.V.	RF-MC30-DCT3-11.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 16-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multicollar Slim
Installation in rigid floor

Bottom view





American projection	Scale :	Company : Mulcol International B.V.	RF-MC30-DCT52-11.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

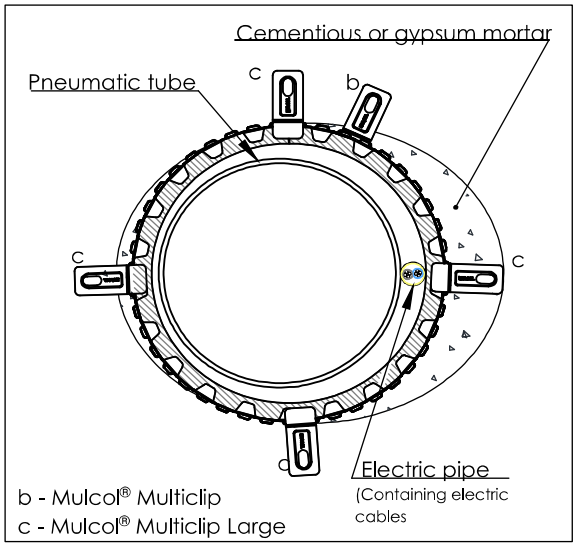
5.6.2 Mulcol® Multicollar Slim with Mulcol® Multimortar

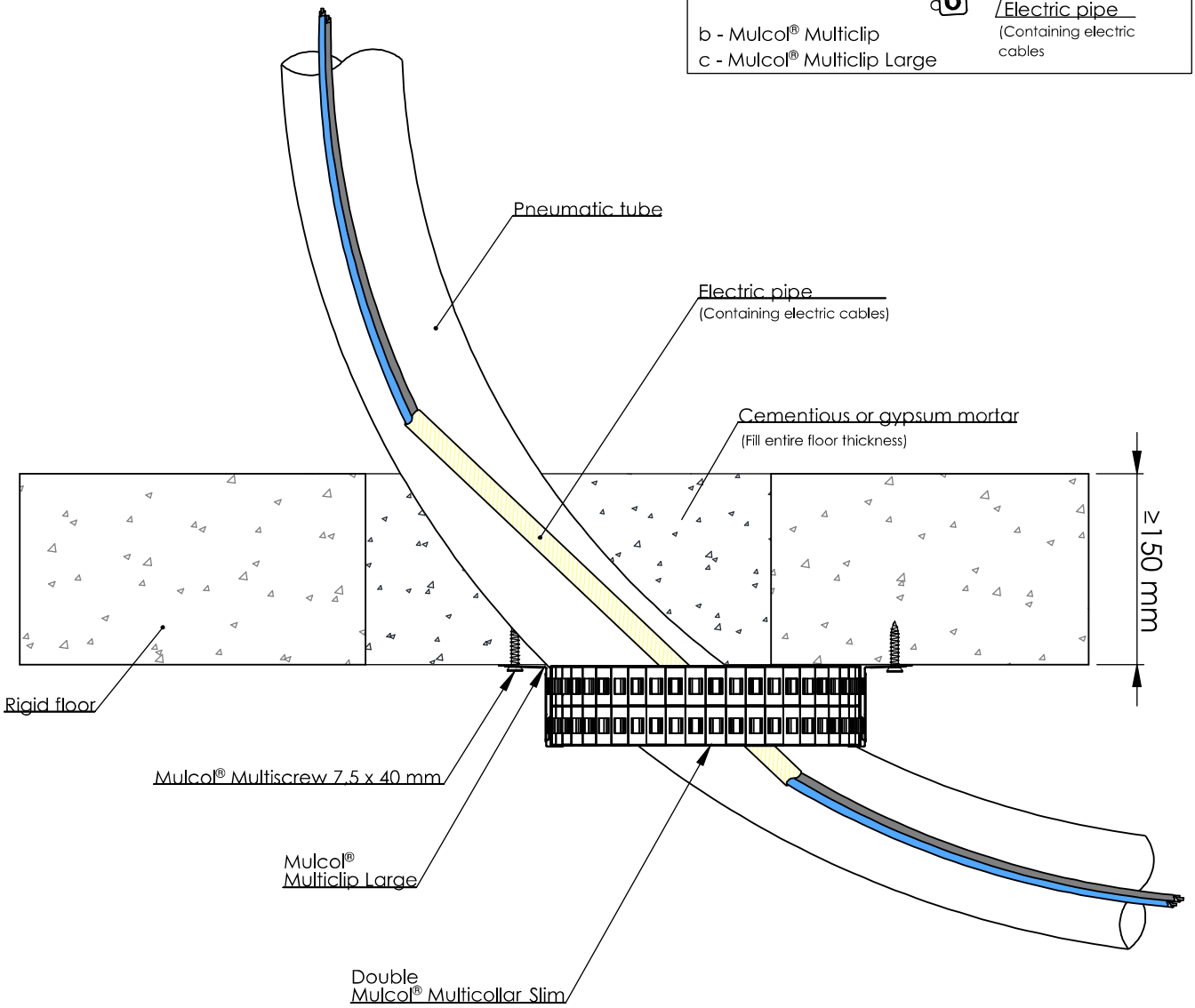
On the next pages, classifications, conditions and drawings of this system are given.

Fire resistance classification					
Pipe / bundle dimensions (mm)		Performance class with pipe end configuration		Pipe / cable material	System
Outer diameter	Wall thickness				
Drawing RF-PTS-MM-21.0.10					
≤ 160	3,2	EI 120–U/U	EI 120–U/C	PVC Aerocom "buispost" without electrical pipe Ø19 mm	Mulcol® Multicollar Slim and Mulcol® Multimortar
		EI 90–U/U E 120-U/U	EI 90–U/C E 120-U/C	PVC Aerocom "buispost" with electrical pipe P VC including data cables	
Drawing RF-PP-21.0.22					
≤ 250	7,7	EI 90–U/C		PE-HD/ PE / ABS / SAN+PVC	Mulcol® Multicollar Slim and Mulcol® Multimortar

The annular gap round the pipe must be fully sealed with Mulcol® Multimortar or cementious mortar (repair of the floor).

Bottom view



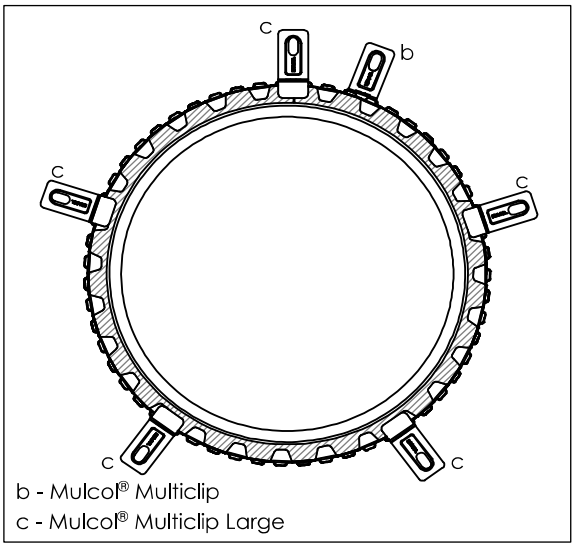


American projection	Scale :	Company : Mulcol International B.V.	RF-PTS-MM-21.0.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

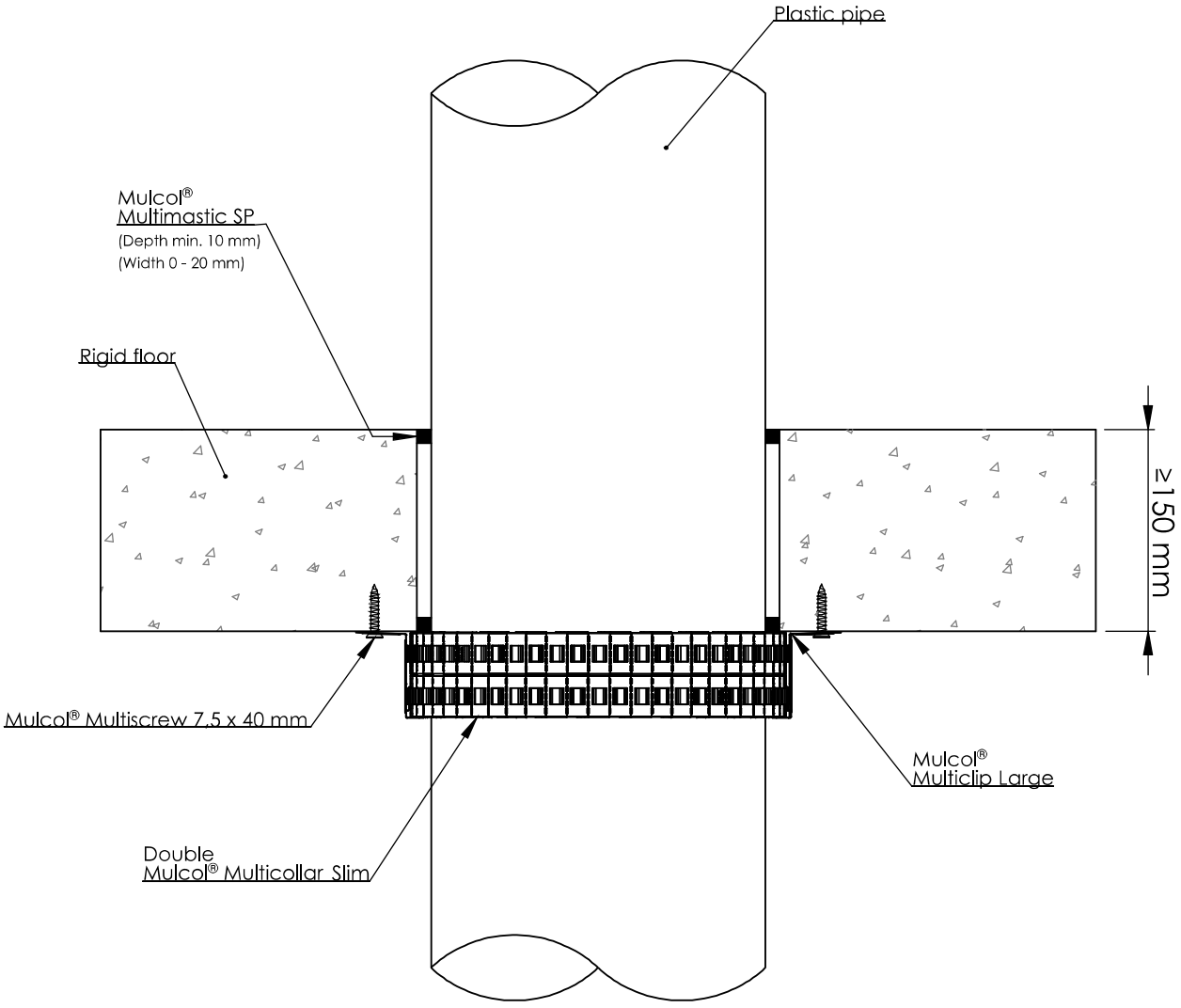
MULCOL FIRE PROTECTION

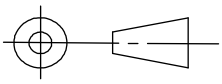
Fire test pipe penetration seal
Mulcol® Multicollar Slim
Installation in rigid floor

Bottom view



b - Mulcol® Multiclip
c - Mulcol® Multiclip Large



American projection 	Scale :	Company : Mulcol International B.V.	RF-PP-21.0.22
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

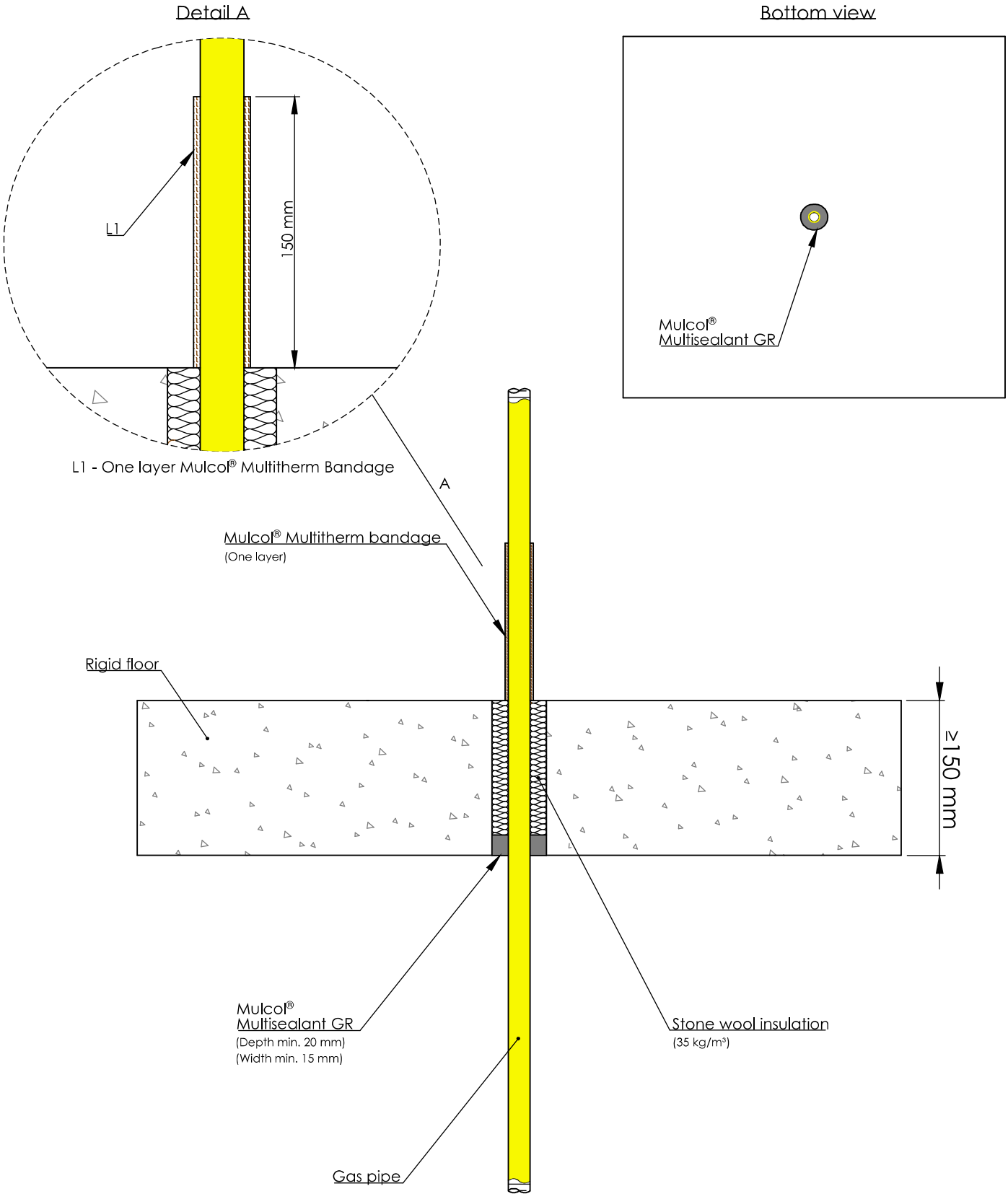
Fire test pipe penetration seal
Mulcol® Multicollar Slim
Installation in rigid floor

5.6.3 Gas pipers with Mulcol® Multicollar Slim and Multitherm Bandage

On the next pages, classifications, conditions and drawings of this system are given.

Fire resistance classification				
Pipe / bundle dimensions (mm)		Performance class with pipe end configuration	Pipe / cable material	System
Outer diameter	Wall thickness			
Drawing RF-GFS-MFB1-B3.1.10				
≤ 19.9	0,2	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipe	Mulcol® Multicollar Slim below and Mulcol® Multitherm Bandage on top (1 layer LI 150)
Drawing RF-GFS-MFB1-B3.1.10				
≤ 40.8	0,3	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipe	Mulcol® Multicollar Slim below and Mulcol® Multitherm Bandage on top (1 layer LI 150)
Drawing RF-GFS-MFB1-B3.1.10				
≤ 40.8 (two pipes)	0,3	EI 120–U/C	Stainless steel GFS EN 15226 PLT gas pipe	Mulcol® Multicollar Slim below and Mulcol® Multitherm Bandage on top (1 layer LI 150)

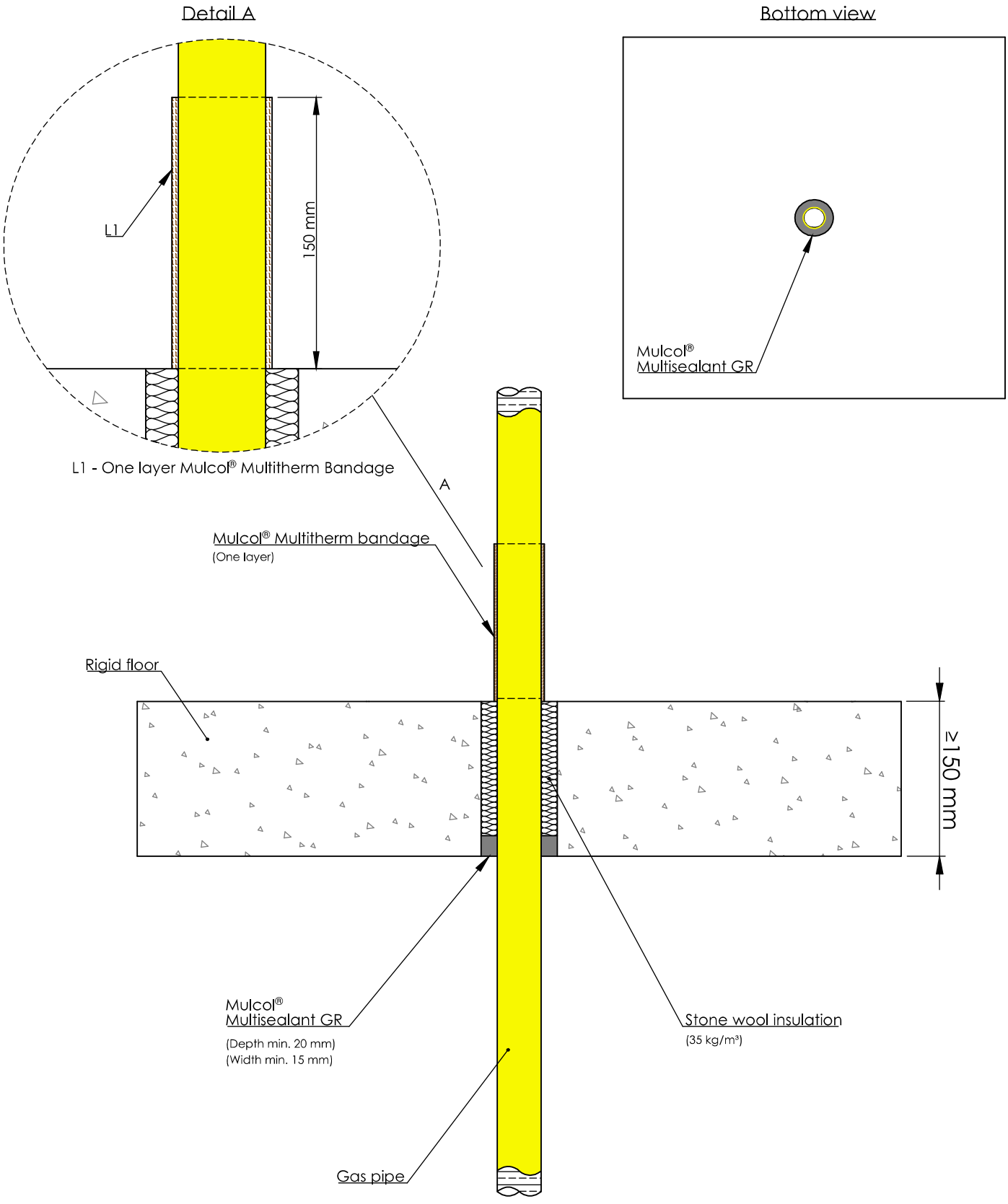
The opening between the seal and the penetrations shall be closed with rock wool insulation ≥ 35 kg/m^3.



American projection	Scale :	Company : Mulcol International B.V.	RF-GFS-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 18-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

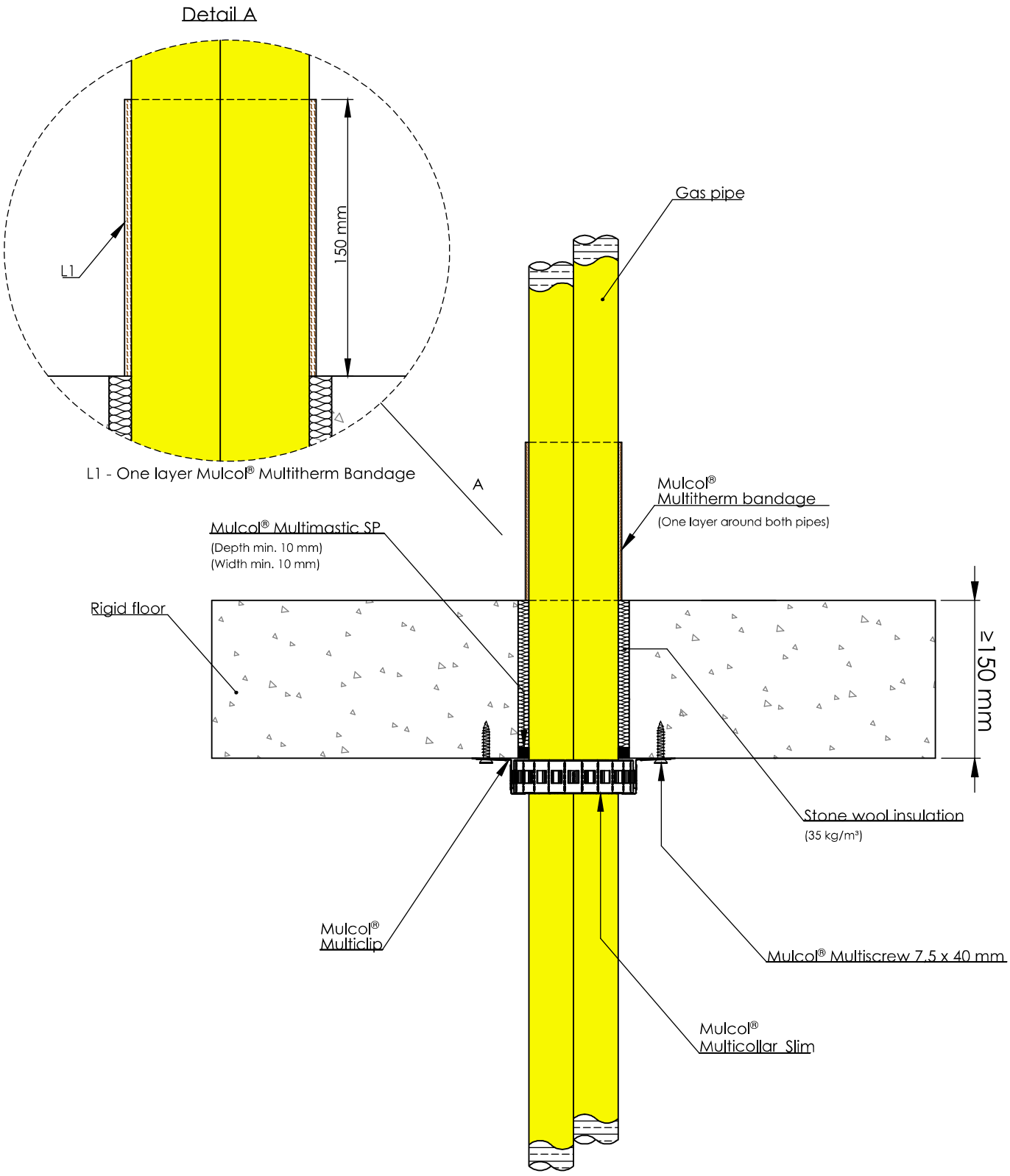
Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor



American projection	Scale :	Company : Mulcol International B.V.	RF-GFS-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

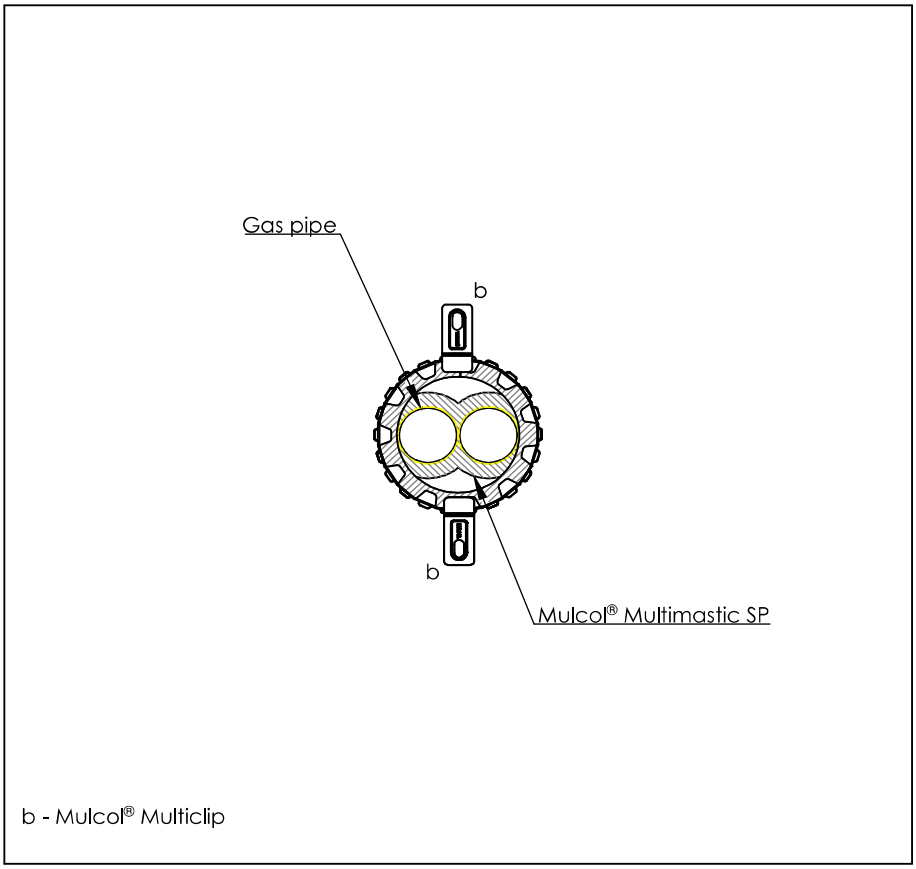


American projection	Scale :	Company : Mulcol International B.V.	RF-GFS2-MC30-MFB1-B3.1.10	
	Unit of measure : mm	Department : Research & Development	A4 - Page 1 of 2	
	Date : 18-9-2020	Draftsman : K.J.		

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

Bottom view



American projection	Scale :	Company : Mulcol International B.V.	RF-GFS2-MC30-MFB1-B3.1.10
	Unit of measure : mm	Department : Research & Development	A4 - Page 2 of 2
	Date : 18-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic C System
Installation in rigid floor

5.6.4 Mulcol® Multisealant GR (coated on pipe)

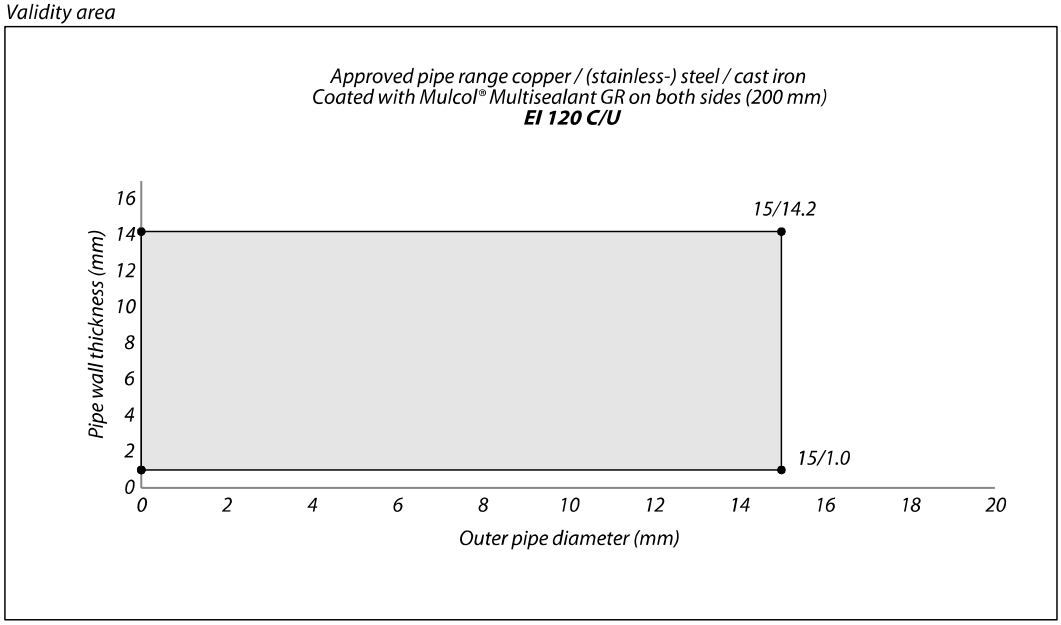
On the next pages, classifications, conditions and drawings of this system are given.

Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing RF-CU-GRC.1.10						
≤ 15	1.0 to 14.2	EI 120–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.18
Drawing RF-ST-GRC.1.10						
≤ 15	1.0 to 14.2	EI 120–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multisealant GR (coated)	5.19
≤ 60.3	3.6 to 14.2					

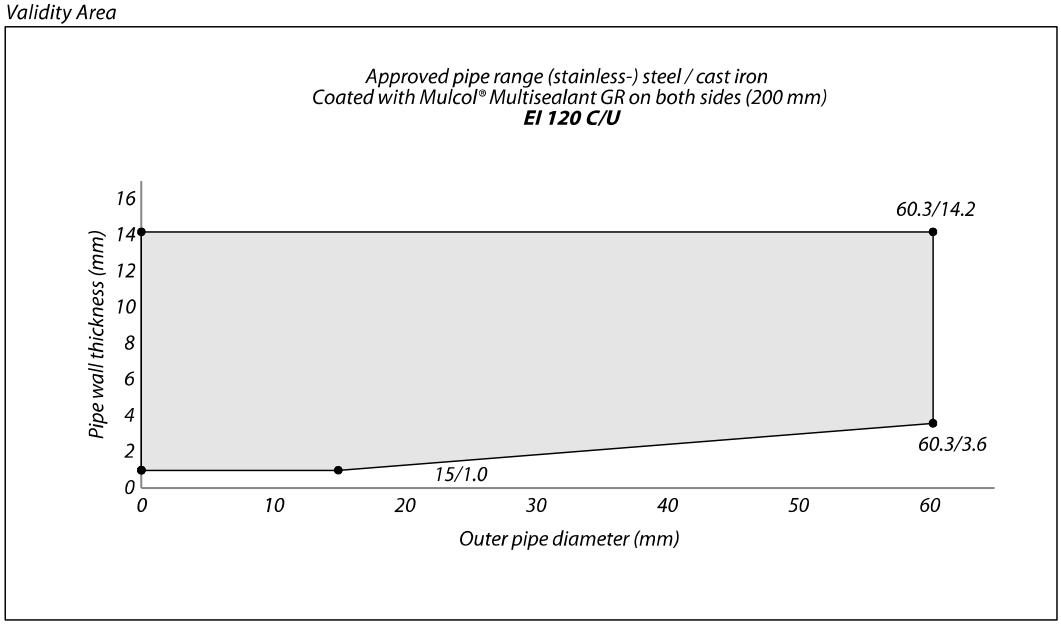
For classification of the pipes coated with Mulcol® Multisealant GR, it shall be coated over a length of 200 mm on both sides with Mulcol® Multisealant GR, thickness 2.0 mm (WFT).

The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic SP.

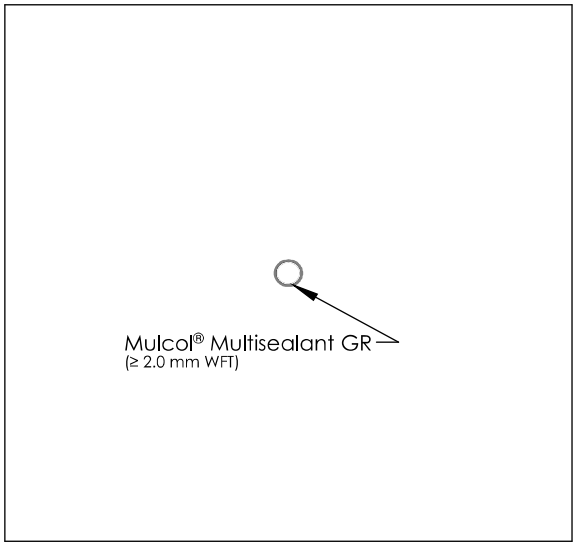
f5.18 Validity area

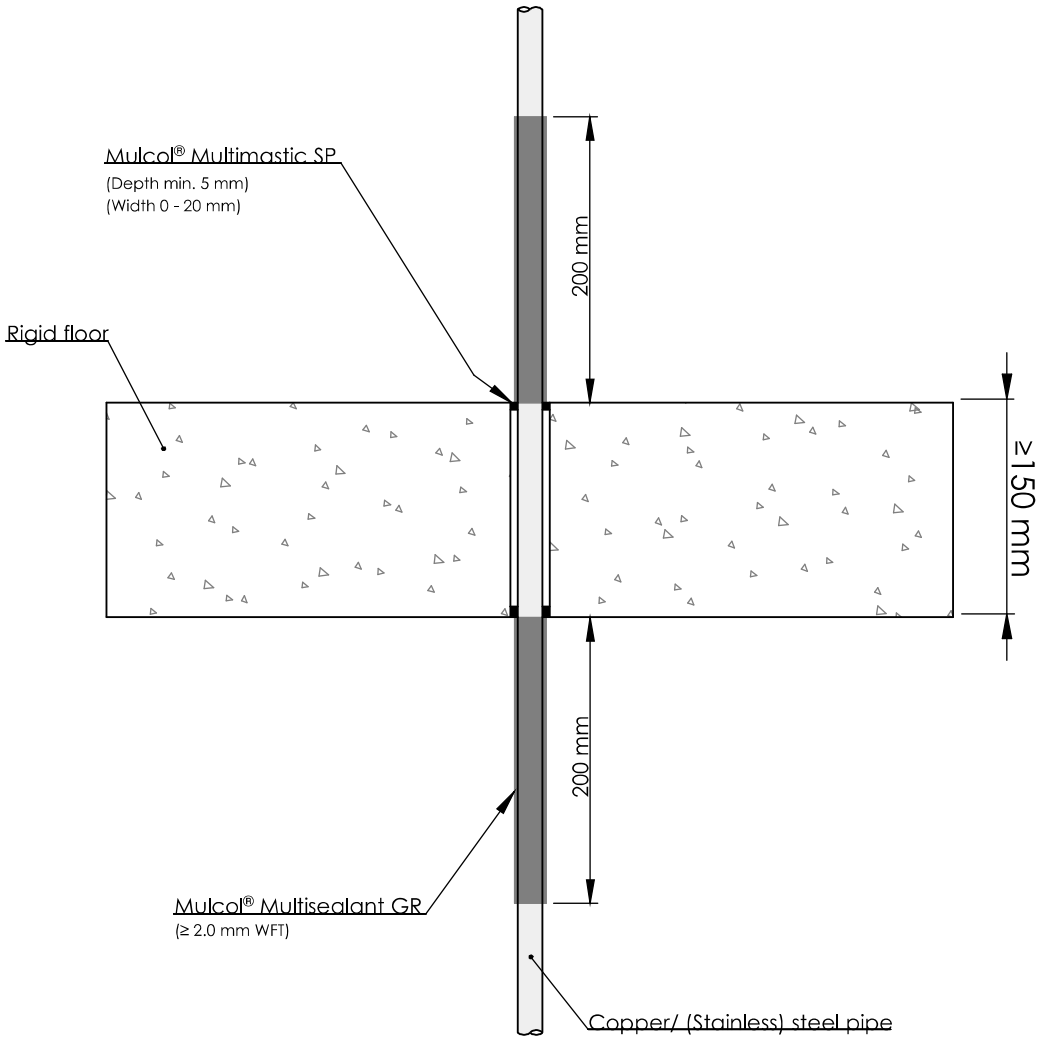


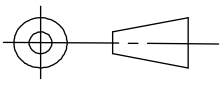
f5.19 Validity Area



Bottom view



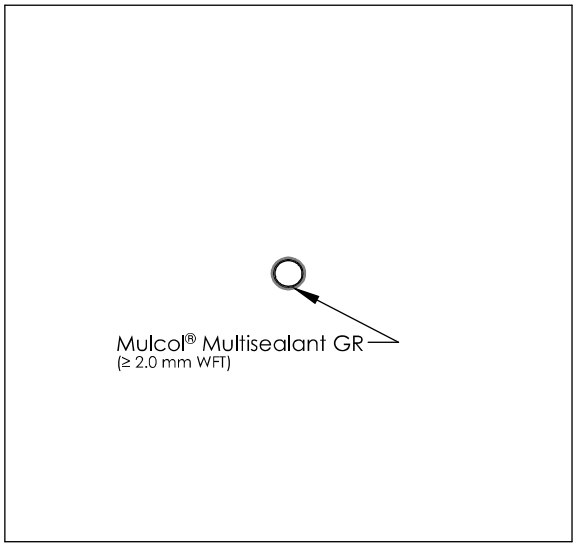


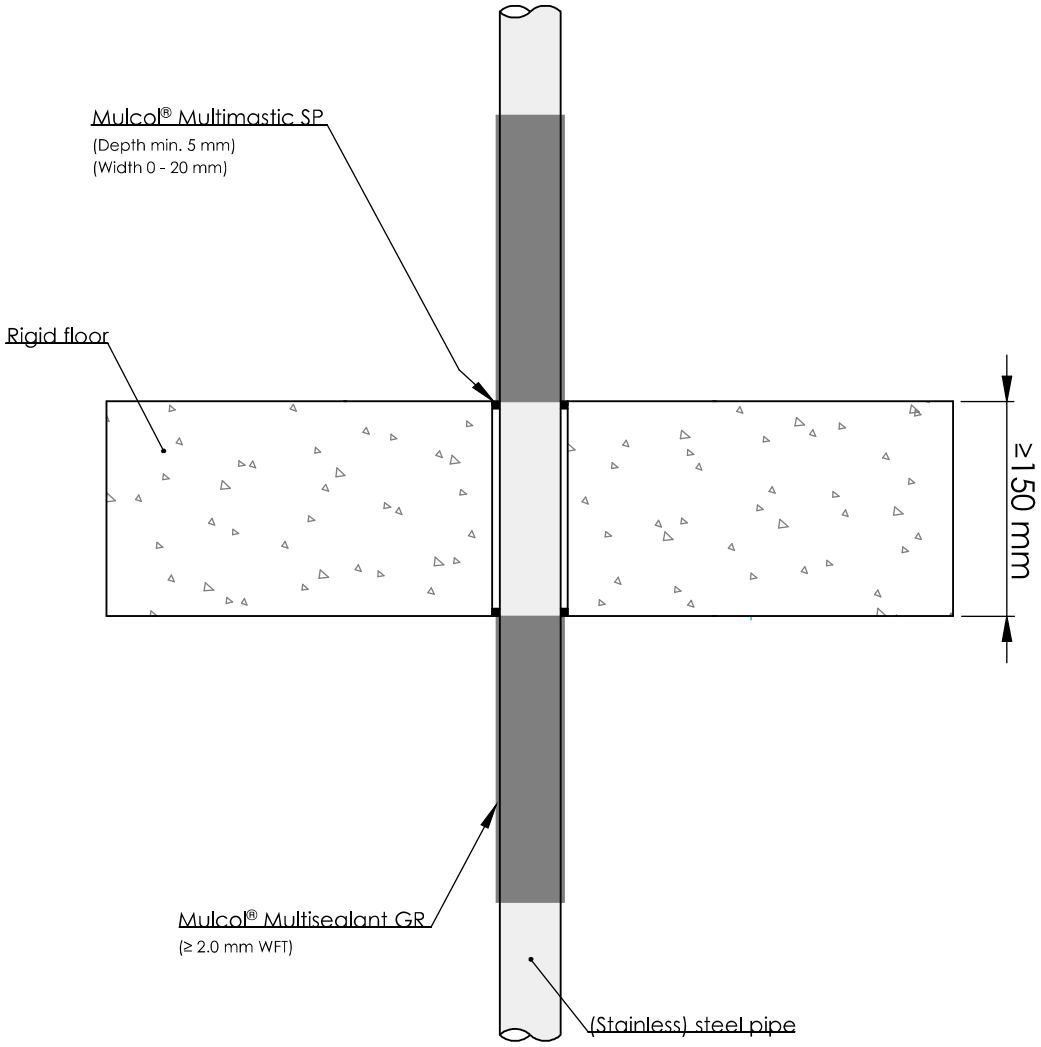
American projection 	Scale :	Company : Mulcol International B.V.	RF-CU-GRC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 17-9-2020	Draftsman : K.J.	

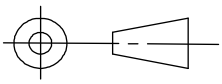
MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

Bottom view





American projection 	Scale :	Company : Mulcol International B.V.	RF-ST-GRC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multisealant GR
Installation in rigid floor

5.6.5 Mulcol® Multimastic SP (coated on pipe)

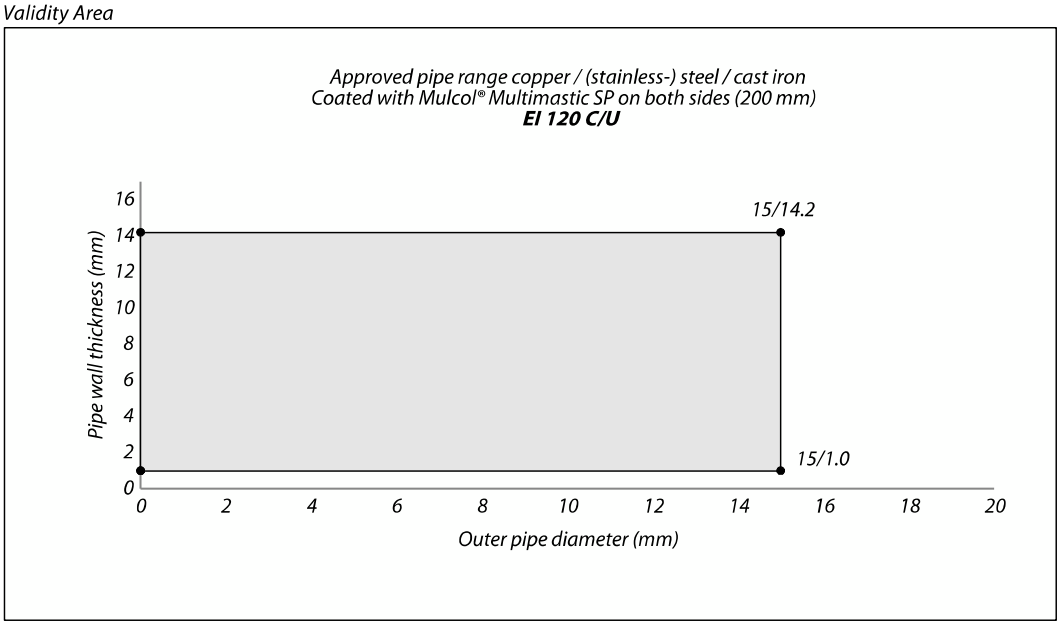
On the next pages, classifications, conditions and drawings of this are given.

Fire resistance classification						
Pipe dimensions (mm)		Performance class with pipe end configuration	Insulation type and thickness (mm)	Pipe material	System	See Figure
Outer diameter	Wall thickness					
Drawing RF-CU-SPC.1.10						
≤ 15	1.0 to 14.2	EI 120–C/U	None	Copper / (stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.20
Drawing RF-ST-SPC.1.10						
≤ 15	1.0 to 14.2	EI 120–C/U	None	(Stainless-) steel / cast iron	Mulcol® Multimastic SP (coated)	5.21
≤ 60.3	3.6 to 14.2					

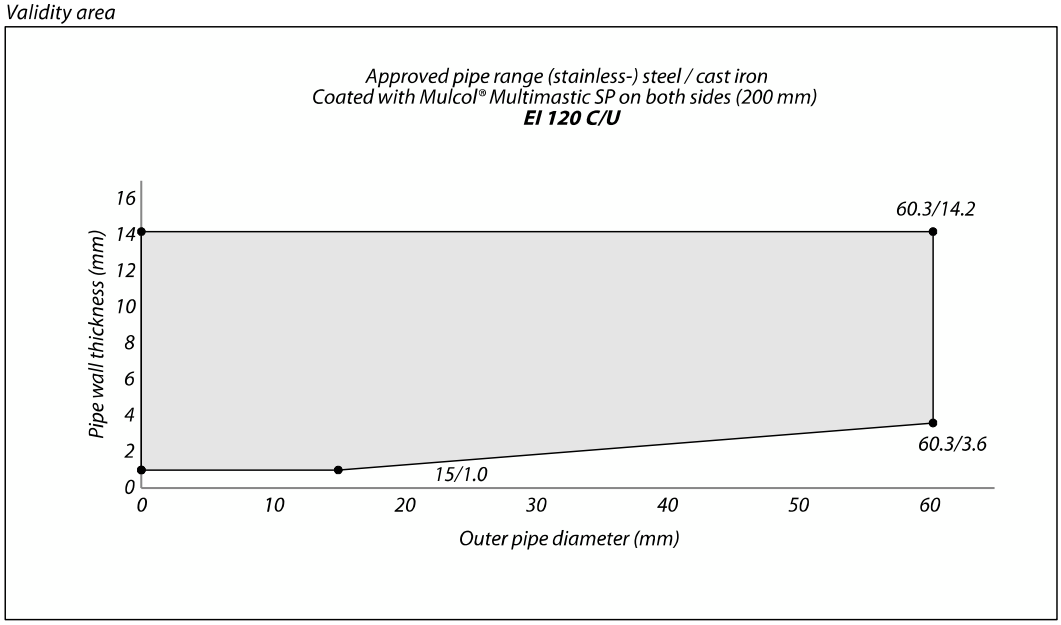
The openings between the floor and the copper and steel pipes closed with Mulcol® Multimastic SP shall be coated over a length of 200 mm on both sides with Mulcol® Multimastic SP, thickness 1.5 mm (WFT).

The opening between the seal and the penetrations shall be closed with Mulcol® Multimastic SP.

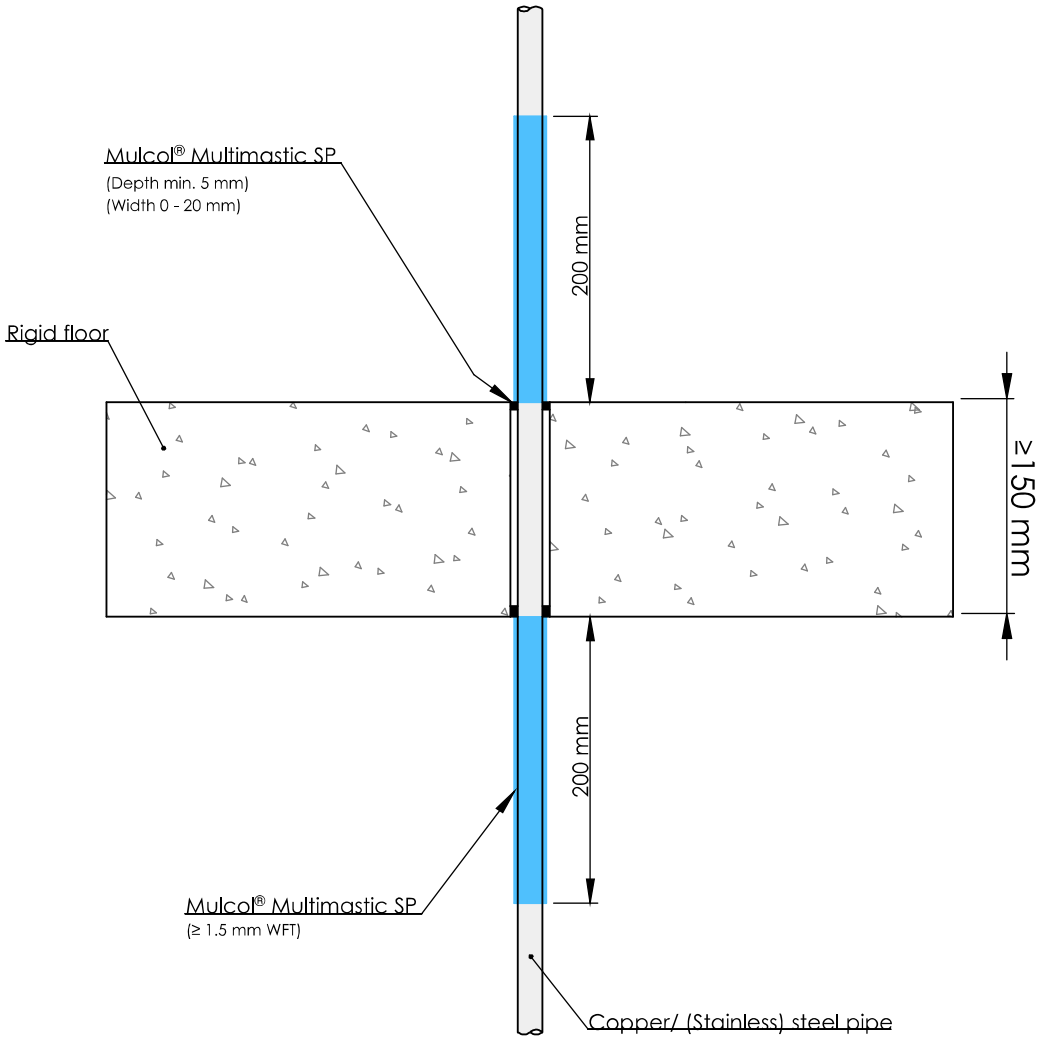
f5.20 Validity Area

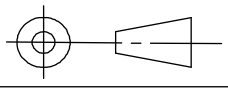


f5.21 *Validity area*



Bottom view

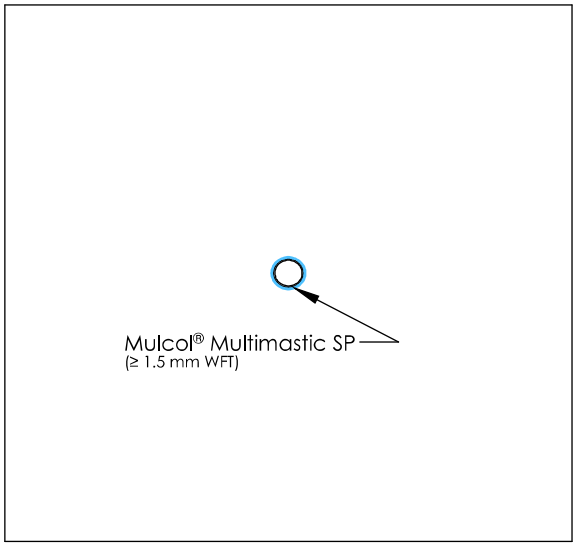


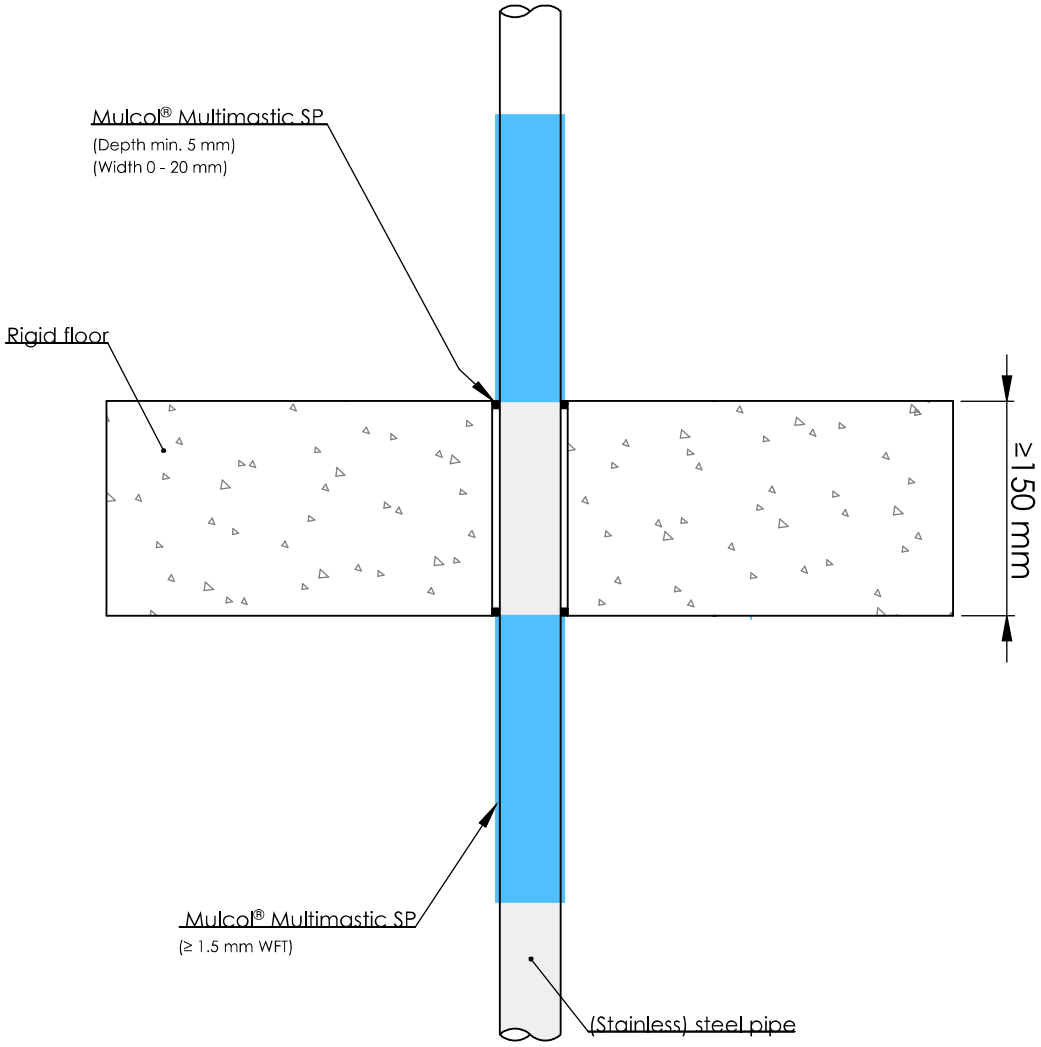
American projection 	Scale :	Company : Mulcol International B.V.	RF-CU-SPC.1.10
	Unit of measure : mm	Department : Research & Development	
	Date : 17-9-2020	Draftsman : K.J.	A4

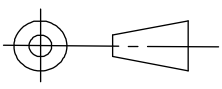
MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic SP
Installation in rigid floor

Bottom view





American projection 	Scale :	Company : Mulcol International B.V.	RF-ST-SPC.1.10
	Unit of measure : mm	Department : Research & Development	A4
	Date : 17-9-2020	Draftsman : K.J.	

MULCOL FIRE PROTECTION

Fire test pipe penetration seal
Mulcol® Multimastic SP
Installation in rigid floor

6 Limitations

This classification document does not represent type approval or certification of the product.

Mook,

H.H.A. Leenders, BSc.

Head of Laboratory for Fire Safety

D.J. den Boer, BSc.

Management

This report contains 89 pages.