



Institut für Brandschutztechnik
und Sicherheitsforschung

CLASSIFICATION REPORT

in acc. with EN 13501-2:2016

Product name: “**FLAMRO products in CLT walls**“

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1. Introduction

This Classification Report defines the fire resistance class assigned to the installation situations of FLAMRO products in CLT in accordance with the procedure set out in EN 13501-2:2016.

2. Details of classified building components and products

2.1. Function type

The function of all FLAMRO construction products listed in this classification report is to resist fire in cross laminated timber (CLT) load-bearing structures in vertical orientation, according to the characteristic product behaviour, as specified in section 5 of EN 13502-2:2016.

2.1.1. BSB

The construction product BSB is defined as a fire protection brick and is used for sealing pipes and cables.

2.1.2. FLAMMOTECT-A

The construction product FLAMMOTECT-A is defined as a coating system used to coat or seal gaps in the soft penetration sealing system Flammotect.

Flammotect-A consists of the following components:

FLAMMOTECT-A Coating	→ for rock wool panels
FLAMMOTECT-A Solid emulsion	→ for coating of rock wool panels
FLAMMOTECT-A Filler	→ for sealing of joints and annular gaps
FLAMMOTECT-A Kitt	→ for sealing of joints and annular gaps
FLAMMOTECT	
Mineral fibre boards pre-coated	→ on one side, 50 mm thick

2.1.3. KSL double layer

The construction product KSL is defined as a coating system. It is used to coat or seal gaps in the soft penetration sealing system KSL.

KSL double layer consists of the following components:

BSL	Rockwool Hardrock 040 ($\rho \geq 150 \text{ kg/m}^3$, $\Theta \geq 1000^\circ\text{C}$, $t = 50 \text{ mm}$) pre-coated on one side with BML in a dry film thickness of $\sim 0.5 \text{ mm}$.
BML	Ablative fire protection coating, brushable
BMS	Ablative fire protection coating, spreadable with spatula
BMK	Ablative fire protection coating, cartridge

2.1.4. Cable tube

The CT cable tube building product is defined as a fire protection cable box. It is used to seal cables, conduits and climate-split cable combinations.

2.1.5. Variant N II A / AWM II

The Variant N II A building product is defined as a dimensional fire protection collar and is used to seal combustible pipes.

2.1.6. NBR-plus

The product NBR-plus is defined as a fire protection bandage. The NBR-plus building product is used to seal non-combustible pipes with combustible insulation, electrical installation conduits and clima-split bundles.

2.1.7. KSL-W

The construction product KSL-W is defined as a firestop wrap which is used to seal combustible pipes.

2.1.8. DG-SC

The construction product DG-SC is defined as an intumescent filler used to seal combustible pipes and annular gaps.

2.2. Descriptions

The installation situations of “FLAMRO products in CLT” are fully described in the test reports referred to in section 3 of this Classification Report.

2.2.1. Services

2.2.1.1. Non-regulated plastic pipes:

CONEL DRAIN REHAU Raupiano light	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
POLO-KAL XS / NG Poloplast	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
POLO-KAL 3S Poloplast	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
RAUPIANO PLUS REHAU	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
Geberit Silent dB20	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
Geberit Silent-Pro	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
Geberit Silent-PP	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
WAVIN SiTech+	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
WAVIN AS+	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative
HAKAN Silenta Premium	Application:	Building drainage
	Material:	Polyolefin
	Product standard:	informative



2.2.1.2. Multilayer composite pipes:

Viega Raxofix	Application:	Hot & cold water
	Material:	PE / aluminium / PE
	Product standard:	informative
REHAU Rautitan stabil	Application:	Hot & cold water
	Material:	PE / aluminium / PE
	Product standard:	informative
Geberit Mepla	Application:	Hot & cold water
	Material:	PE / aluminium / PE
	Product standard:	informative

2.2.2. Test specimen description

2.2.2.1. Table legend

Test report No. – Seal type – Test Specimen numbers current page																
Test specimen no.	No.	Material	Dimensions (mm) Cable load	Orientation	Pipe-end configura- tion	Insulation Acc. to EN 1366-3:2009; Table 1				Mixed penetration seal / Dimensions l x w x h [mm]	Pipe sealing system, as per EN 1366-3 3.12					
						Type	Case	Length [mm]	Insulation thickness [mm]		Type	Inside diame- ter [mm]	Active components			Installation
Plastic or metal type										Layers	Thick- ness [mm]	Length [mm]				
Manufacturer type designation																
Cable group acc. to EN 1366-3:2009 Table A.1/2																
Amount x outside diameter / wall thickness																
Cable designation acc. to EN 1366-3:2009 Table A.1/2																
Spec. designation of cables / coaxial cables or wave- guides deviating from EN 1366-3:2009 <u>Deviating cables /coaxial cables or waveguides</u>																
Angle between test specimen and supporting structure																
Pipe-end configuration acc. to EN 1366-3:2009 Table 2																
Manufacturer type designation																
Pipe insulation acc. to EN 1366-3:2009 Table 1																
Length of insulation on both sides of penetration seal																
Insulation thickness																
Type designation / dimensions																
Type designation of pipe sealing system																
Inside diameter of pipe sealing system																
Amount of active layers																
Total thickness of active layers																
Length of the active layers according to EN 1366- 3:2009 Illustration H.3																
E - fire Exposed side U - fire Unexposed side 2S - both sides CEN - Centred																
Type designation, filling depth																
Type designation and dimensions																



2.2.2.2. Test Report No. 322042005-1

Tested in:	CLT wall - Manufacturer: STORA ENSO - Type designation: CLT 100 C3S NVI WW C24 SAN - Thickness 100 mm - 3 layers: 30/40/30
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PB 322042005-1 - Empty penetration seals				
No.	Type	Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
Seal 1	KSL double layer	1000 x 600 x 100	2S-I	Flush with the respective outer wall sides
Seal 2	BSB	600 x 600 x 230	CEN	Support on both sides made of squared timber 45x50 mm (hwx)
Seal 3	FLAMMOTECT-A	1000 x 600 x 100	2S-I	Flush with the respective outer wall sides



TR 322042005-1 - pipe penetration seals																	
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12								
					Type	Case	Length ¹ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, Depth [mm]	Fastening	
											Layers	Thickness [mm]	Length [mm]				
AW-1	Geberit Silent dB 20	1x Ø63/3.2	90°	U/U	Flexen ²	LS		50	5	AWM II	73	-	12.8	25.4	2S-A	FLAMMOTECT-A ³ , 1	4 x timber screw 80x6
AW-2	Geberit Silent dB 20	1x Ø75/3.6	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-3	Geberit Silent dB 20	1x Ø110/6.0	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-4	Geberit Silent PP	1x Ø50/2.0	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-5	Geberit Silent PP	1x Ø75/2.6	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-6	Geberit Silent PP	1x Ø110/3.6	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-7	Geberit Silent Pro	1x Ø50/3.0	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-8	Geberit Silent Pro	1x Ø75/3.8	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-9	Geberit Silent Pro	1x Ø110/4.5	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-10	Raupiano Plus	1x Ø50/1.8	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-11	Raupiano Plus	1x Ø75/1.9	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-12	Raupiano Plus	1x Ø90/2.2	90°	U/U		LS		50	5	AWM II	100	-	19.2	25.4	2S-A		
AW-13	Raupiano Plus	1x Ø110/2.7	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-14	Conel Drain	1x Ø50/1.8	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-15	Conel Drain	1x Ø75/1.9	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-16	Conel Drain	1x Ø90/2.2	90°	U/U		LS		50	5	AWM II	100	-	19.2	25.4	2S-A		
AW-17	Conel Drain	1x Ø110/2.7	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		

1 Protruding out of seal on both sides

2 PEF insulation

3 Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



TR 322042005-1 - pipe penetration seals																	
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12								
					Type	Case	Length ¹ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, Depth [mm]	Fastening	
											Layers	Thickness [mm]	Length [mm]				
AW-18	Wavin SiTech+	1x Ø40/1.8	90°	U/U	Flexen ⁴	LS		50	5	AWM II	50	-	6.4	25.4	2S-A	FLAMMOTECT-A ⁵ , 1	4 x timber screw 80x6
AW-19	Wavin SiTech+	1x Ø50/1.8	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-20	Wavin SiTech+	1x Ø75/2.6	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-21	Wavin SiTech+	1x Ø110/3.4	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-22	POLO-KAL NG / XS	1x Ø40/1.8	90°	U/U		LS		50	5	AWM II	50	-	6.4	25.4	2S-A		
AW-23	POLO-KAL NG / XS	1x Ø50/2.0	90°	U/U		LS		50	5	AWM II	60	-	19.2	25.4	2S-A		
AW-24	POLO-KAL NG / XS	1x Ø75/2.6	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-25	POLO-KAL NG / XS	1x Ø110/3.4	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-26	POLO-KAL 3S	1x Ø75/3.8	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-27	POLO-KAL 3S	1x Ø110/4.8	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-28	Wavin AS+	1x Ø50/2.7	90°	U/U		LS		50	5	AWM II	60	-	6.4	25.4	2S-A		
AW-29	Wavin AS+	1x Ø75/3.2	90°	U/U		LS		50	5	AWM II	85	-	12.8	25.4	2S-A		
AW-30	Wavin AS+	1x Ø110/4.3	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		
AW-31	Hakan Silenta Premium	1x Ø58/4.1	90°	U/U		LS		50	5	AWM II	68	-	12.8	25.4	2S-A		
AW-32	Hakan Silenta Premium	1x Ø90/4.7	90°	U/U		LS		50	5	AWM II	100	-	19.2	25.4	2S-A		
AW-33	Hakan Silenta Premium	1x Ø110/5.3	90°	U/U		LS		50	5	AWM II	120	-	19.2	25.4	2S-A		

4 PEF insulation

5 Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



PB 322042005-1 - cable boxes																
No.	Material	Dimensions Ø / d [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, as per EN 1366-3 3.12							
					Type	Case	Length ⁶ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap sealing, Depth [mm]	Joint and gap sealing Cable box / occupation Type, depth [mm]
											Layers	Thickness [mm]	Length [mm]			
CT-1	Penetration	-	90°	-	-	-	-	-	Cable tube	107	1	1.5	150	CEN	FLAMMOTECT-A ⁷ , 1	BASOTECT-H plug sealed with FLAMMOTECT-A / 1
CT-3	Empty pipe	3x Ø32/WH4.0 empty	90°	U/U	-	-	-	-	Cable tube	107	1	1.5	150	CEN		
CT-4	Empty pipe	3x Ø32/WH4.0 occupied	90°	U/U	-	-	-	-	Cable tube	107	1	1.5	150	CEN		

6 Protruding out of seal on both sides

7 Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



2.2.2.3. Test Report No. 322042005-2

Tested in:	CLT wall - Manufacturer: STORA ENSO - Type designation: CLT 100C35S NVI WW C24 SAN - Thickness 100 mm - 3 layers: 30/40/30
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TR 321100703-2 - single seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12							
					Type	Case	Length ⁸ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
K-1	Copper	1x Ø60/0.6	90°	U/C	RS800	LS	450	20	-	-	-	-	-	-	FLAMMOTECT-A ⁹ , 1	-
K-2	Copper	1x Ø60/0.6	90°	U/C	RS800	LS	450	50	-	-	-	-	-	-		
K-3	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		
K-4	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	50	-	-	-	-	-	-		
K-5	Copper	1x Ø54/1.5	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		
K-6	Copper	1x Ø54/1.5	90°	U/C	Hvac	LS	450	50	-	-	-	-	-	-		
S-1	Steel	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		
S-2	Steel	1x Ø42/1.5	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		
S-3	Steel	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		
S-4	Steel	1x Ø42/1.5	90°	U/C	Hvac	LS	450	20	-	-	-	-	-	-		

⁸ Protruding out of seal on both sides

⁹ Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



TR 321100703-2 - single seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12							
					Type	Case	Length ⁸ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
E-1	Stainless steel	1x Ø110/1.0	90°	C/U	AF/Armaflex	LS	350	9.5	NBR-plus	129	1	1.5	2x62.5	2S-I	FLAMMOTECT-A ^{10, 1}	secured by wire
E-2	Stainless steel	1x Ø110/1.0	90°	C/U	AF/Armaflex	LS	350	23	NBR-plus	156	1	1.5	2x62.5	2S-I		
E-3	Stainless steel	1x Ø110/1.0	90°	C/U	RS800	LS	450	30	-	-	-	-	-	-		
E-4	Stainless steel	1x Ø110/1.0	90°	C/U	RS800	LS	450	100	-	-	-	-	-	-		
E-5	Stainless steel	1x Ø110/1.0	90°	C/U	Hvac	LS			-	-	-	-	-	-		
E-6	Stainless steel	1x Ø110/1.0	90°	C/U	Hvac	LS	450	2x30	-	-	-	-	-	-		
K-7	Copper	1x Ø60/0.6	90°	U/C	AF/Armaflex	LS	350	9	NBR-plus	78	1	1.5	2x62.5	2S-I	secured by wire	
K-8	Copper	1x Ø60/0.6	90°	U/C	AF/Armaflex	LS	350	21	NBR-plus	102	1	1.5	2x62.5	2S-I		
K-9	Copper	1x Ø28/1.0	90°	U/C	AF/Armaflex	LS	350	9	NBR-plus	46	1	1.5	2x62.5	2S-I		
K-10	Copper	1x Ø60/0.6	90°	U/C	AF/Armaflex	LS	350	9	NBR-plus	78	1	1.5	2x62.5	2S-I		
K-11	Copper	1x Ø28/1.0	90°	U/C	AF/Armaflex	LS	350	19	NBR-plus	56	1	1.5	2x62.5	2S-I		
K-12	Copper	1x Ø60/0.6	90°	U/C	AF/Armaflex	LS	350	21	NBR-plus	102	1	1.5	2x62.5	2S-I		
AW-34	Geberit Mepla	1x Ø16/2.25	90°	U/C	AF/Armaflex	LS	350	17	AWM II	50	-	6.4	25.4	2S-A	80x6	

¹⁰ Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



TR 321100703-2 - single seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12							
					Type	Case	Length ⁸ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
AW-35	Geberit Mepla	1x Ø20/2.5	90°	U/C	AF/Armaflex	LS	350	17.5	AWM II	55	-	6.4	25.4	2S-A	FLAMMOTECT-A ¹¹ , 1	Timber screw 80x6
AW-36	Geberit Mepla	1x Ø26/3.0	90°	U/C	AF/Armaflex	LS	350	18.5	AWM II	63	-	12.8	25.4	2S-A		
AW-37	Geberit Mepla	1x Ø32/3.0	90°	U/C	AF/Armaflex	LS	350	19	AWM II	70	-	12.8	25.4	2S-A		
AW-38	Geberit Mepla	1x Ø40/3.5	90°	U/C	AF/Armaflex	LS	350	20.5	AWM II	81	-	12.8	25.4	2S-A		
AW-39	Geberit Mepla	1x Ø50/4.0	90°	U/C	AF/Armaflex	LS	350	21	AWM II	92	-	19.2	25.4	2S-A		
AW-40	Viega Raxofix	1x Ø16/2.2	90°	U/C	AF/Armaflex	LS	350	17	AWM II	50	-	6.4	25.4	2S-A		
AW-41	Viega Raxofix	1x Ø20/2.8	90°	U/C	AF/Armaflex	LS	350	17.5	AWM II	55	-	6.4	25.4	2S-A		
AW-42	Viega Raxofix	1x Ø25/2.7	90°	U/C	AF/Armaflex	LS	350	18.5	AWM II	62	-	12.8	25.4	2S-A		
AW-43	Viega Raxofix	1x Ø32/3.2	90°	U/C	AF/Armaflex	LS	35	19	AWM II	70	-	12.8	25.4	2S-A		
AW-44	Viega Raxofix	1x Ø40/3.5	90°	U/C	AF/Armaflex	LS	350	20.5	AWM II	81	-	12.8	25.4	2S-A		
AW-45	Viega Raxofix	1x Ø50/4.0	90°	U/C	AF/Armaflex	LS	350	21	AWM II	92	-	19.2	25.4	2S-A		

11 Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



TR 321100703-2 - single seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, acc. to EN1366-3: 3.12							
					Type	Case	Length ⁸ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
AW-46	Rautitan stabil	1x Ø16/2.6	90°	U/C	AF/Armaflex	LS	350	17	AWM II	50	-	6.4	25.4	2S-A	FLAMMOTECT-A ^{12, 1}	Timber screw 80x6
AW-47	Rautitan stabil	1x Ø20/2.9	90°	U/C	AF/Armaflex	LS	350	17.5	AWM II	55	-	6.4	25.4	2S-A		
AW-48	Rautitan stabil	1x Ø25/3.7	90°	U/C	AF/Armaflex	LS	350	18.5	AWM II	62	-	12.8	25.4	2S-A		
AW-49	Rautitan stabil	1x Ø32/4.7	90°	U/C	AF/Armaflex	LS	350	19	AWM II	70	-	12.8	25.4	2S-A		
AW-50	Rautitan stabil	1x Ø40/6.0	90°	U/C	AF/Armaflex	LS	350	20.5	AWM II	81	-	12.8	25.4	2S-A		
AW-51	Rautitan stabil	1x Ø50/4.5	90°	U/C	AF/Armaflex	LS	350	21	AWM II	92	-	19.2	25.4	2S-A		

¹² Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



PB 322042005-2 - Mixed penetration seal				
No.	Type	Dimensions l x w x h [mm x mm x mm]	Installation	Remarks
Seal 1	FLAMMOTECT-A	600 x 600 x 100	2S-I	Flush with the respective outer wall sides
Seal 2	FLAMMOTECT-A	600 x 600 x 100	2S-I	Flush with the respective outer wall sides
Seal 3	BSB	600 x 600 x 230	CEN	Support on both sides made of squared timber 45x50 mm (hwx)

PB 322042005-2 - Mixed penetration seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, as per EN 1366-3 3.12							
					Type	Case	Length ¹³ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
Seal 1-1	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-	FLAMMOTECT-A ^{14, 1}	-
Seal 1-2	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-		-
Seal 1-3	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	AWM II	120	-	19.2	25.4	2S-A		threaded rod M6
Seal 1-4	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	AWM II	120	-	19.2	25.4	2S-A		threaded rod M6
Seal 1-6	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-		-
Seal 1-5	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-		-
Seal 1-11	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	AWM II	120	-	19.2	25.4	2S-A		threaded rod M6
Seal 1-7	Steel	1x Ø28/1.0	90°	C/U	AF/Ar- maflex	LS	350	19	NBR- plus	66	2	3	62.5	2S-I		secured by wire
Seal 1-8	Steel	1x Ø50/2.0	90°	C/U	AF/Ar- maflex	LS	350	19	NBR- plus	88	2	3	62.5	2S-I	secured by wire	

13 Protruding out of seal on both sides

14 Mineral wool filling as thick as penetration seal ($r \geq 40 \text{ kg/m}^3$, $Q \geq 1000^\circ\text{C}$).



PB 322042005-2 - Mixed penetration seal																
No.	Material	Dimensions Ø / t [mm]	Orientation	Pipe-end configuration	Insulation Acc. to EN 1366-3:2009; Table 1				Pipe sealing system, as per EN 1366-3 3.12							
					Type	Case	Length ¹³ [mm]	Insulation thickness [mm]	Type	Inside diameter [mm]	Active components			Installation	Joint and gap seal- ing, Depth [mm]	Fastening
											Layers	Thickness [mm]	Length [mm]			
Seal 1-9	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-	FLAMMO- TECT-A, 20	-
Seal 1-10	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-		-
Seal 3-1	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-	DG-SC, 20	-
Seal 3-2	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-		-
Seal 3-3	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	KSL-W	110	2	3	50	2S-I		secured by tape
Seal 3-4	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	KSL-W	110	2	3	50	2S-I		secured by tape
Seal 3-6	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-		-
Seal 3-5	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-		-
Seal 3-11	Geberit Silent dB20	1x Ø110/6.0	90°	U/U	flexen	LS	50	5	KSL-W	110	2	3	50	2S-I		secured by tape
Seal 3-7	Steel	1x Ø28/1.0	90°	C/U	AF/ Arma- flex	LS	350	19	-	66	-	-	-	-		-
Seal 3-8	Steel	1x Ø50/2.0	90°	C/U	AF/ Arma- flex	LS	350	19	-	92	-	-	-	-		-
Seal 3-9	Copper	1x Ø28/1.0	90°	U/C	Hvac	LS	450	20	-	68	-	-	-	-		-
Seal 3-10	Copper	1x Ø54/1.0	90°	U/C	Hvac	LS	450	20	-	94	-	-	-	-	-	



PB 322042005-2 - Penetration seals						
No.	Type	Amount	Material	Coating Case L x t [mm x mm]	Fastening or joint and sealing Type, depth [mm]	
Seal 2			FLAMMOTECT-A	FLAMMOTECT-A LS 200 x 1	FLAMMOTECT-A ¹⁵ , 20 Annular gap width 0 – 5 mm	
	T1 - Cable tray ¹⁶	F				Ø100
	L1 - Cable ladder ¹⁷					
		A1				3
A3		3				
	U	2				
L1 - Cable ladder ¹⁸						

15 Both-sided mineral wool filling as thick as penetration seal ($\rho \geq 40 \text{ kg/m}^3$, $\Theta \geq 1000^\circ\text{C}$).

16 Cable tray steel 500x60x1.5mm, unperforated

17 Cable ladder 300x60x1.5

18 Cable ladder 300x60x1.5

3. Test reports and results

3.1. Test reports

Name of testing laboratory	Customer	Test Report No.	Test method
IBS GmbH Petzoldstr. 45, A-4020 Linz	Flamro Brandschutzsysteme GmbH Glüsinger Str. 86 21217 Seevetal Germany	322042005-1 of 30.01.2023 (CLT 100mm)	EN 1363-1:1999 EN 1366-3:2009 prEN1366-3:2021
IBS GmbH Petzoldstr. 45, A-4020 Linz	Flamro Brandschutzsysteme GmbH Glüsinger Str. 86 21217 Seevetal Germany	322042005-2 of 30.01.2023 (CLT 100mm)	EN 1363-1:1999 EN 1366-3:2009 prEN1366-3:2021

3.2. Resistance to fire performance

Table 1: Terms of loading

Temperature-time curve:	Standard temperature-time curve (STTC) as specified in EN 1363-1. 1999.
Fire load:	Vertical penetration seal (wall)

Table 2: Test results

3.2.1. Test report 322042005-1

of 30.01.2023 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Fire integrity			I - Thermal insulation
		Time until cotton-wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until maximum temperature rise on the unexposed exceeds 180 K
[min]					
Seal 1	-	≥ 90	≥ 90	≥ 90	≥ 90
Seal 2	-	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3	-	≥ 90	≥ 90	≥ 90	≥ 90
AW-1	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-2	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-3	U/U	≥ 90	≥ 90	≥ 90	≥ 90



of 30.01.2023 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Fire integrity			I - Thermal insulation
		Time until cotton-wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until maximum temperature rise on the unexposed exceeds 180 K
		[min]			
AW-4	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-5	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-6	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-7	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-8	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-9	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-10	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-11	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-12	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-13	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-14	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-15	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-16	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-17	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-18	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-19	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-20	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-21	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-22	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-23	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-24	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-25	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-26	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-27	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-28	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-29	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-30	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-31	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-32	U/U	≥ 90	≥ 90	≥ 90	≥ 90
AW-33	U/U	≥ 90	≥ 90	≥ 90	≥ 90
CT-1	-	≥ 90	≥ 90	≥ 90	≥ 90
CT-3	-	≥ 90	≥ 90	≥ 90	≥ 90
CT-4	-	≥ 90	≥ 90	≥ 90	≥ 90

Specific supporting structure in accordance with EN 1366-3:2009, wall construction made of cross laminated timber with a total thickness of 100 mm



3.2.2. Test report 322042005-2

of 30.01.2022 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Fire integrity			I - Thermal insulation
		Time until cotton-wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until maximum temperature rise on the unexposed exceeds 180 K
		[min]			
K-2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
K-4	U/C	≥ 90	≥ 90	≥ 90	≥ 90
K-6	U/C	≥ 90	≥ 90	≥ 90	≥ 60
S-1	U/C	≥ 90	≥ 90	≥ 90	≥ 90
S-2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
S-3	U/C	≥ 90	≥ 90	≥ 90	≥ 90
S-4	U/C	≥ 90	≥ 90	≥ 90	≥ 90
K-7	U/C	≥ 90	≥ 90	≥ 90	≥ 60
K-9	U/C	≥ 90	≥ 90	≥ 90	≥ 90
K-10	U/C	≥ 90	≥ 90	≥ 90	≥ 60
K-11	U/C	≥ 90	≥ 90	≥ 90	≥ 90
K-12	U/C	≥ 90	≥ 90	≥ 90	≥ 60
AW-34	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-35	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-36	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-37	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-38	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-39	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-40	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-41	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-42	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-43	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-44	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-45	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-46	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-47	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-48	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-49	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-50	U/C	≥ 90	≥ 90	≥ 90	≥ 90
AW-51	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1	-	≥ 90	≥ 90	≥ 90	≥ 90
Seal 2	-	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3	-	≥ 90	≥ 90	≥ 90	≥ 90



of 30.01.2022 EN 1366-3: 2009 in connection with EN 1363-1: 1999					
No.	Pipe-end configuration	E - Fire integrity			I - Thermal insulation
		Time until cotton-wool pad ignition	Time until failure of gap gauge criteria	Time until occurrence of sustained flaming	Time until maximum temperature rise on the unexposed exceeds 180 K
		[min]			
Seal 1-2	U/C	≥ 90	≥ 90	≥ 90	≥ 60
Seal 1-3	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1-4	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1-6	U/C	≥ 90	≥ 90	≥ 90	≥ 60
Seal 1-5	U/C	≥ 90	≥ 90	≥ 90	≥ 60
Seal 1-11	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1-7	C/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1-8	C/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 1-10	U/C	≥ 90	≥ 90	≥ 90	≥ 60
Seal 3-1	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-2	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-3	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-4	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-6	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-5	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-11	U/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-7	C/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-8	C/U	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-9	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 3-10	U/C	≥ 90	≥ 90	≥ 90	≥ 90
Seal 2 - Trays and ladders	-	≥ 90	≥ 90	≥ 90	≥ 90
Seal 2 - Cable group 1	-	≥ 90	≥ 90	≥ 90	≥ 60
Seal 2 - Cable group 4	-	≥ 90	≥ 90	≥ 90	≥ 90

Specific supporting structure in accordance with EN 1366-3:2009, wall construction made of cross laminated timber with a total thickness of 100 mm



4. Classification and field of application

4.1. Reference for classification

This Classification is based on the normative reference EN 13501-2: 2016, section 7.

4.2. Reference for field of application

The field of direct application is based on the normative reference EN 1366-3:2022.

4.3. Definitions

4.3.1. Suspension

Pipes and cables must be supported on both sides of the wall construction. The maximum distance of the first suspension to the supporting structure is given in the respective sections.

4.3.2. Pipe-end configuration

4.3.2.1. Plastic pipes, composite pipes and metal pipes (Imp)

Tests performed with pipe-end configuration U/U cover the configurations C/U, U/C and C/C as well.

Tests performed with pipe-end configuration C/U also cover the configurations U/C and C/C.

Tests performed with pipe-end configuration U/C cover the configuration C/C as well.



4.3.2.2. Metal pipes (hmp)

Tests performed with pipe-end configuration U/C cover the configurations C/U and C/C as well.

Tests performed with pipe-end configuration C/U cover the configurations C/C as well.

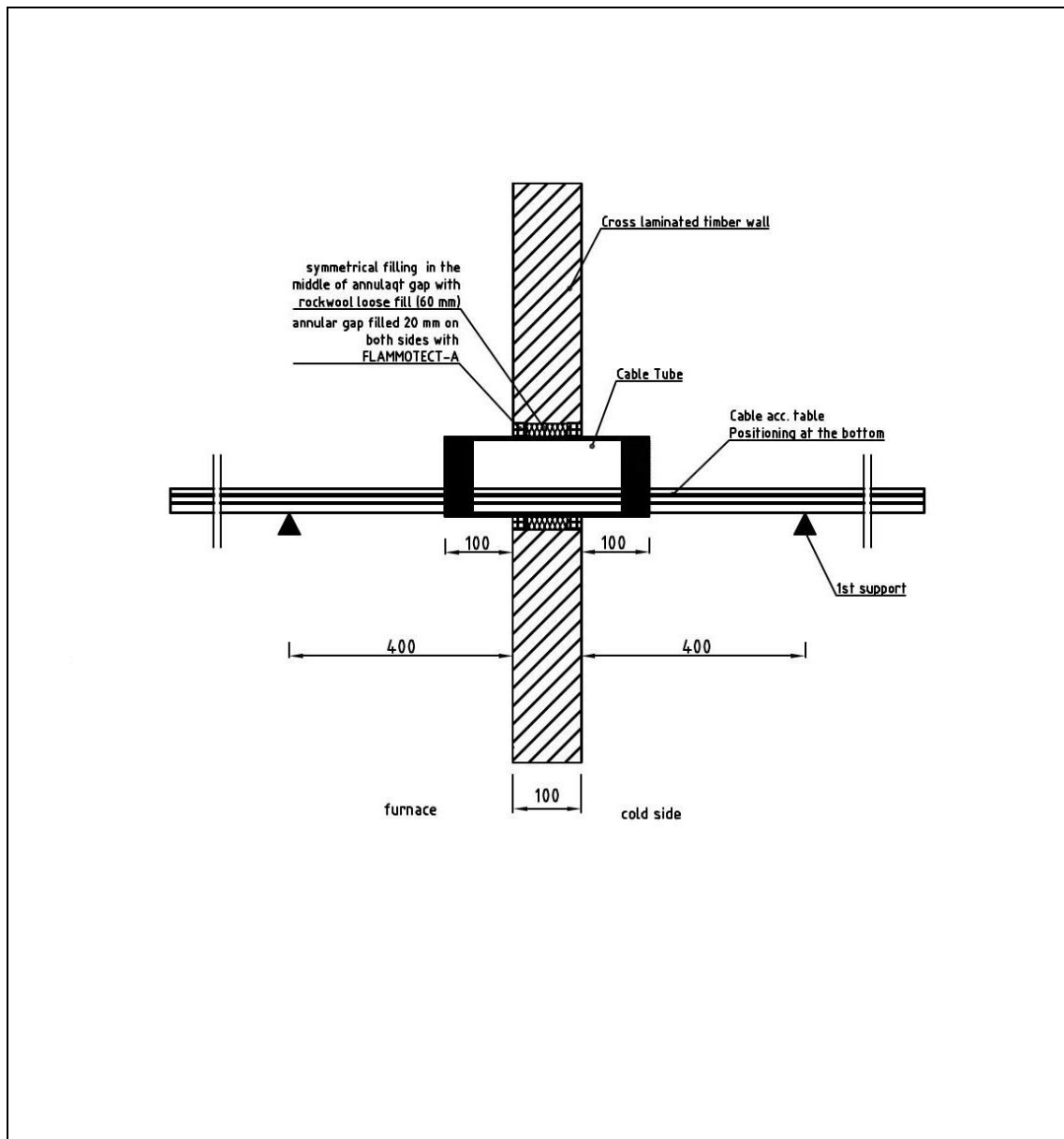
4.3.3. Supporting construction (WALL)

Test results that include a specific supporting structure apply to separating building components made of the same material and composition and of at least the same thickness and density as tested.

Building components (supporting structures) shall be classified in relation to their fire resistance in compliance with EN 13501-2.

4.4. CT 150 mm

4.4.1. Detail drawings



4.4.2. Suspension

The pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 400$ mm.

4.4.3. Annular gaps within CT

Annular gap width	0 – 5 mm
Filling	Basotect -H / 40 mm
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	1 mm

4.4.4. Annular gaps CT to supporting construction

Annular gap width	> 10 – 20 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT®-A Kitt
Filling depth on both sides	≥ 20 mm

4.4.5. Minimum distance (linear)

All distances	≥ 100 mm
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4.4.6. Classification and field of application

Conduits

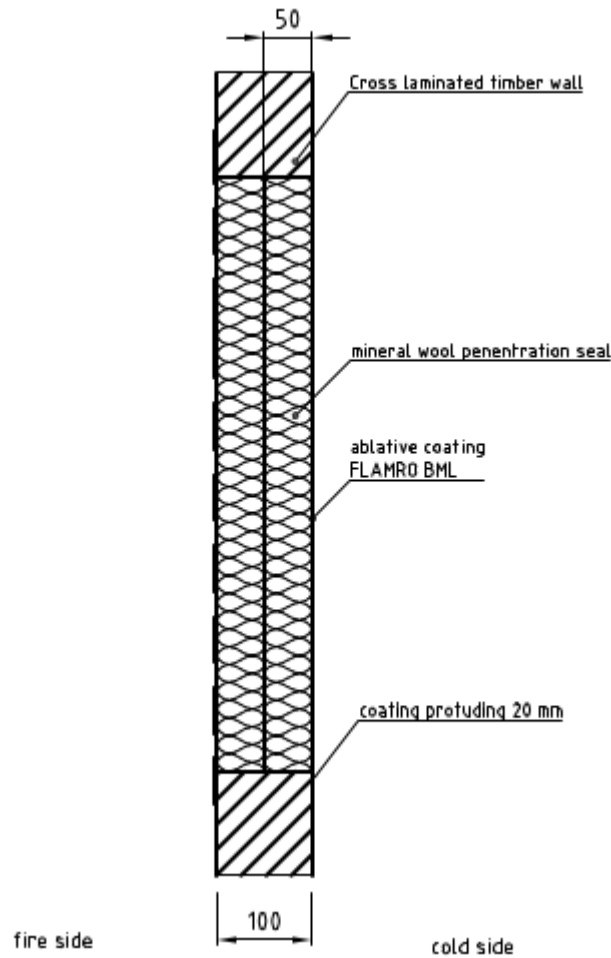
Electrical installation pipe ¹⁹ (ECP) occupied or unoccupied	$\varnothing \leq 32$ mm	EI 90 – U/U	322042005-1 CT-1, CT-3, CT-4,
ECP bundle ²⁰ occupied or unoccupied	$\varnothing \leq 3 \times 32$ mm		

¹⁹ EIR made of PE complying with DIN EN 61386-22 and VDE 0605-22

²⁰ Consisting of electrical installation conduits $2 \varnothing \leq 40$ mm

4.5. Panel seal KSL double layer

4.5.1. Detail drawings



4.5.2. Maximum penetration seal size and classification

Maximum penetration seal size	Classification
600 x 1000 x 100 (2x50mm) W x H x D	EI 90
	322042005-1 Seal 1

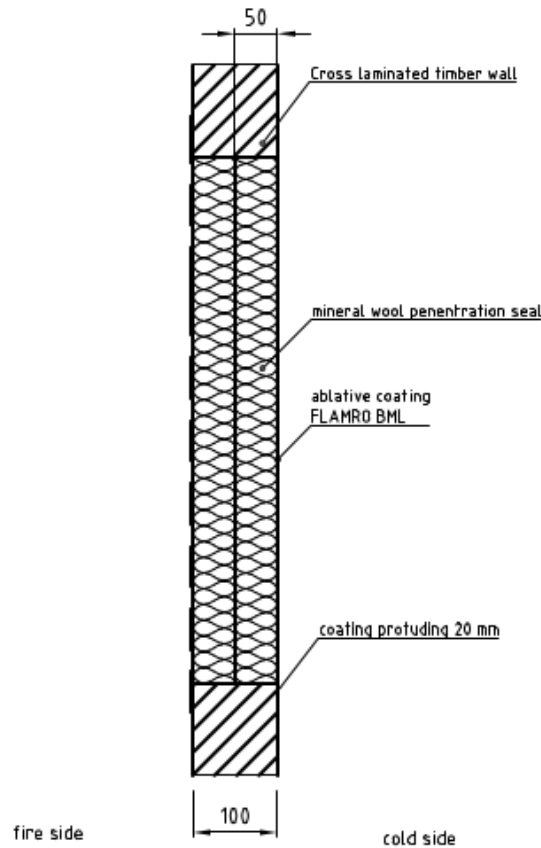
4.5.2.1. Note on the direct field of application

All penetrations in the KSL double layer panel seal classified \leq EI 90, EI 90 - U/C, EI 90 - C/U or EI 90 - U/U may be used.

The distance to the penetration reveal must be \geq 100 mm in these cases!

4.6. Panel seal FLAMMOTECT

4.6.1. Detail drawings



4.6.2. Maximum penetration seal size and classification

Maximum penetration seal size	Classification
600 x 1000 x 100 (2x50mm) W x H x D	EI 90
	322042005-1 Seal 3

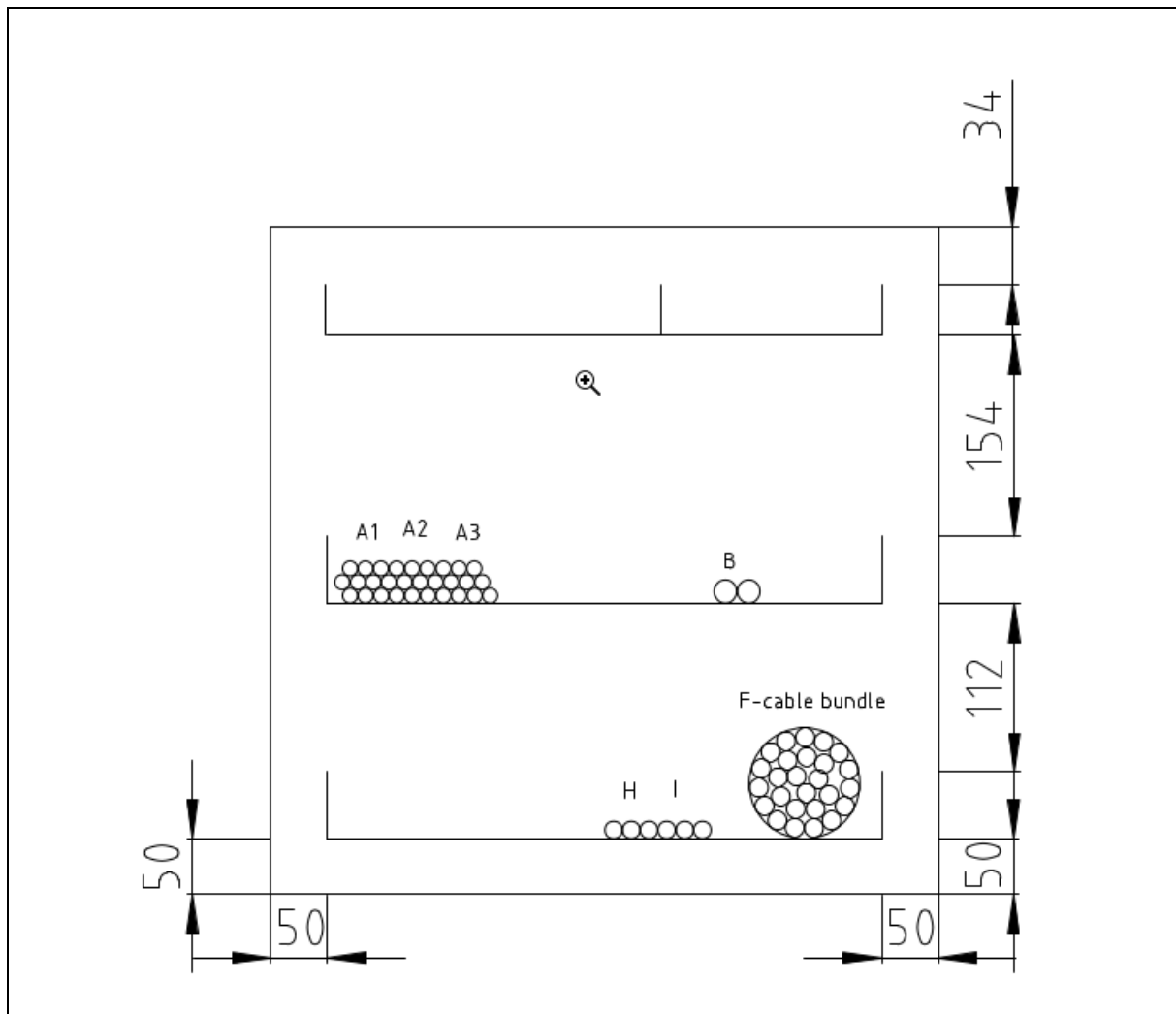
4.6.2.1. Note on the direct field of application

All penetration seals in the Flammotect panel seal classified \leq EI 90, EI 90 - U/C, EI 90 - C/U or EI 90 - U/U may be used.

The distance to the penetration reveal must be \geq 100 mm in these cases!

4.6.3. Cable (FLAMMOTECT-A)

4.6.3.1. Detail drawings



4.6.3.2. Suspension

Cables and their supporting structures (cable trays or ladders) must be supported at a distance of $d_1 \leq 400$ mm on both sides of the wall construction.

4.6.3.3. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	50 mm / panel thickness

Annular gap width	> 5 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	≥ 1 mm

4.6.3.4. Minimum distance (linear) – WALL

Reveal	≥ 34 mm
Cable trays / ladders facing each other (horizontal)	≥ 0 mm
Cable trays / ladders facing each other (vertically)	≥ 100 mm
All other distances	≥ 100 mm

4.6.3.5. Coating lengths

Cable types		Coating length on both sides Coating thickness [mm]	
Single cable ²¹ (Sheated cables)	$\varnothing \leq 21$ mm	$\geq 200, \geq 1$	
Cable bundle ²²	$\varnothing \leq 100$ mm	$\geq 200, \geq 1$	
Conduits / pipes	Steel	$\geq 200, \geq 1$	
	Plastic	$\geq 200, \geq 1$	

²¹ Single or multi-core services with individual cable core insulation and an additional protection of the core bundles. Optical fibre cables are covered.

²² Laced cable bundle consisting of single cables of $\varnothing \leq 21$ mm

4.6.3.6. Classification and field of application

Orientation		CLT WALL	Test report TS No.
Depth of building component		≥ 100 mm	
Single cable ²³ (Sheated cables)	∅ ≤ 21 mm	EI 60 E 90	322042005-2 Cable group 1
Cable bundle ²⁴	∅ ≤ 100 mm	EI 60 E 90	322042005-2 Cable group 4

Cable support system

The classified cables may be used on all cable ladders and trays with a melting point $\Theta \geq 1000^\circ\text{C}$, (FprEN1366-3;2021, A.4.4.1), e.g. stainless steel, galvanised steel of any width and steel thickness.

Retrofitting options

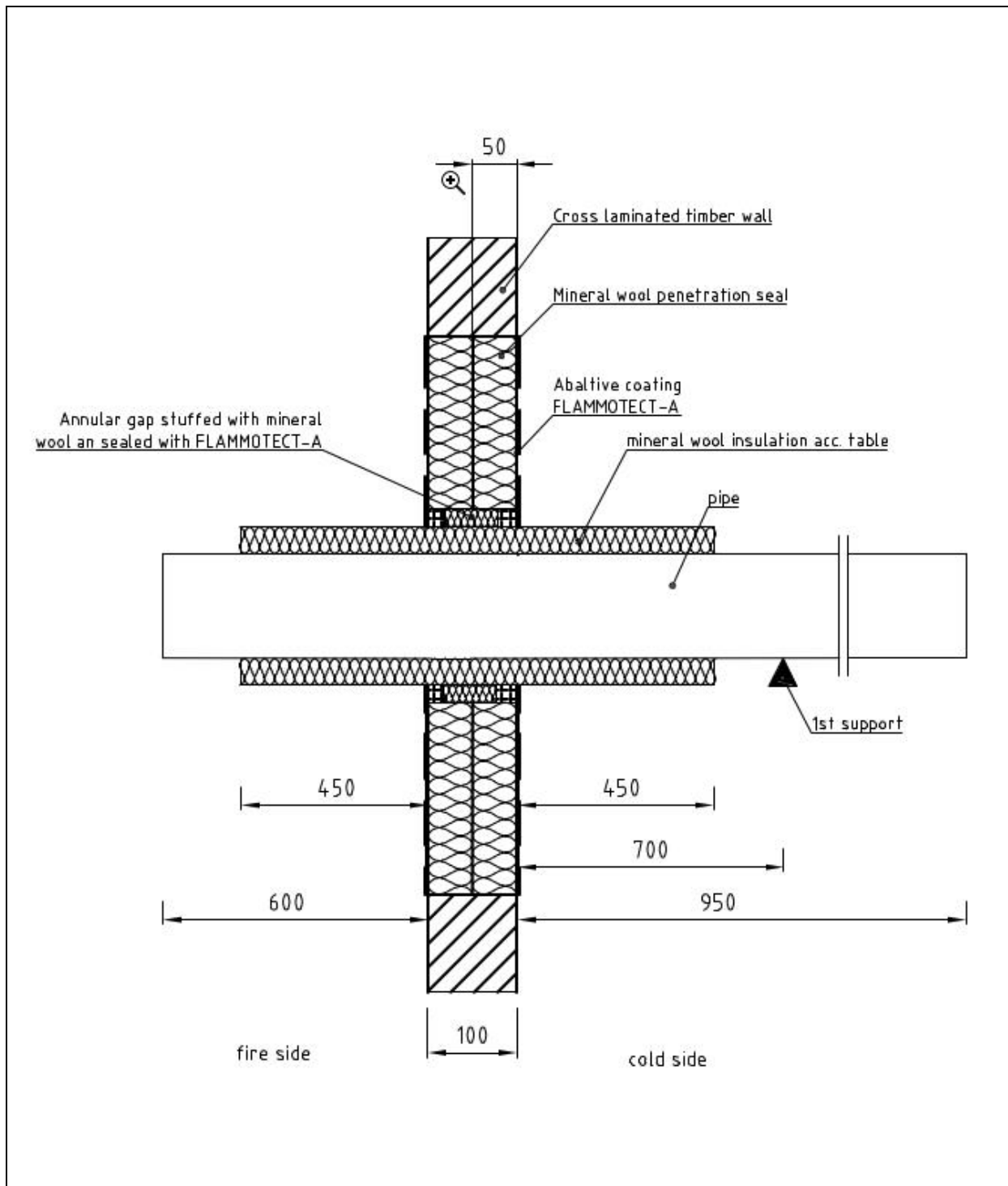
Retrofitting was verified.

²³ Single or multi-core services with individual cable core insulation and an additional protection of the core bundles. Optical fibre cables are covered.

²⁴ Laced cable bundle consisting of single cables of $\varnothing \leq 21$ mm

4.6.4. Single metal pipes with non-combustible sectional insulation

4.6.4.1. Detail drawings



4.6.4.2. Pipe orientation

All angles between 45° and 90° are approved.

4.6.4.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 700$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

4.6.4.4. Annular gaps

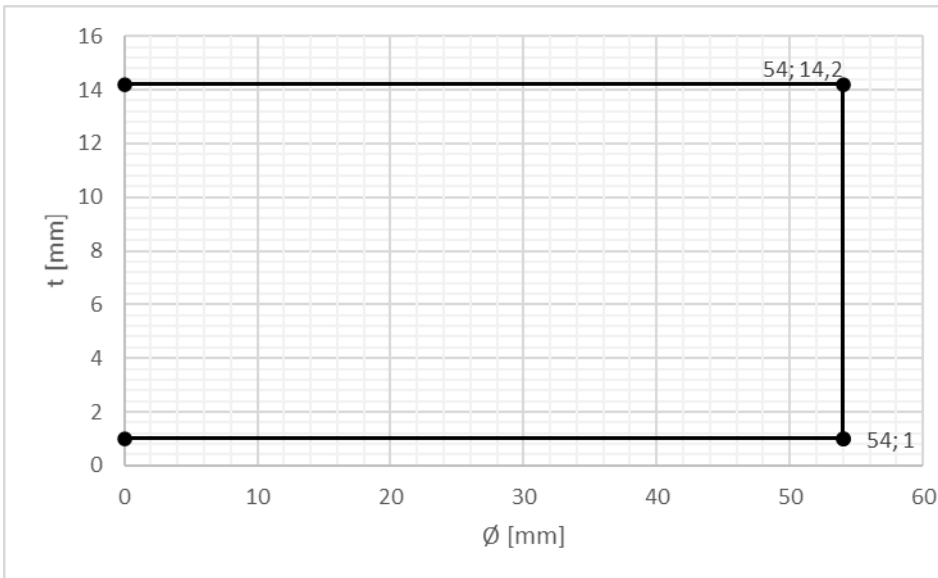
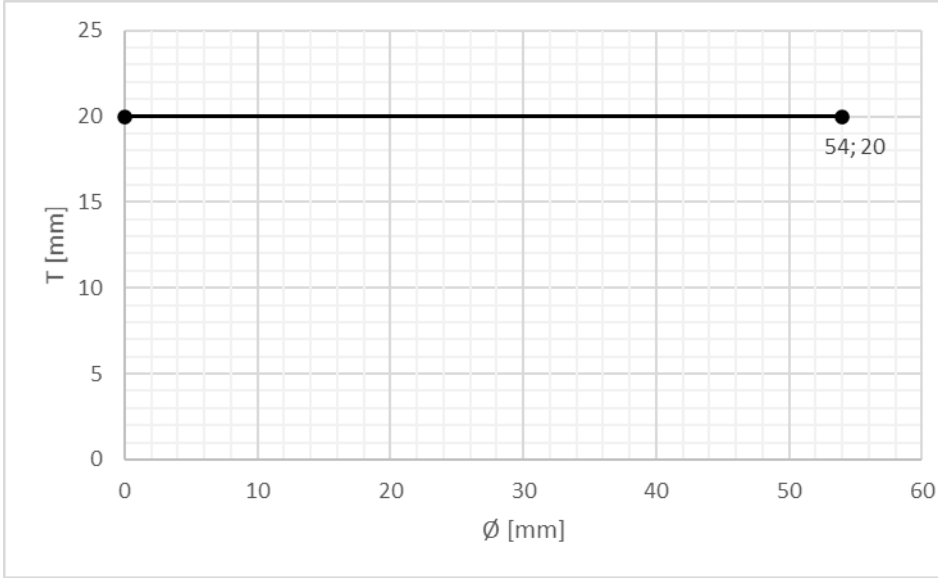
Annular gap width	0 – 5 mm
Filling	none
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	50 mm / panel thickness

Annular gap width	> 5 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	≥ 1 mm

4.6.4.5. Minimum distance (linear)

Reveal	≥ 20 mm
Metal pipes with non-combustible insulation	≥ 0 mm
Geberit Silent dB20 Ø110/ t6	≥ 25 mm
All other distances	≥ 100 mm

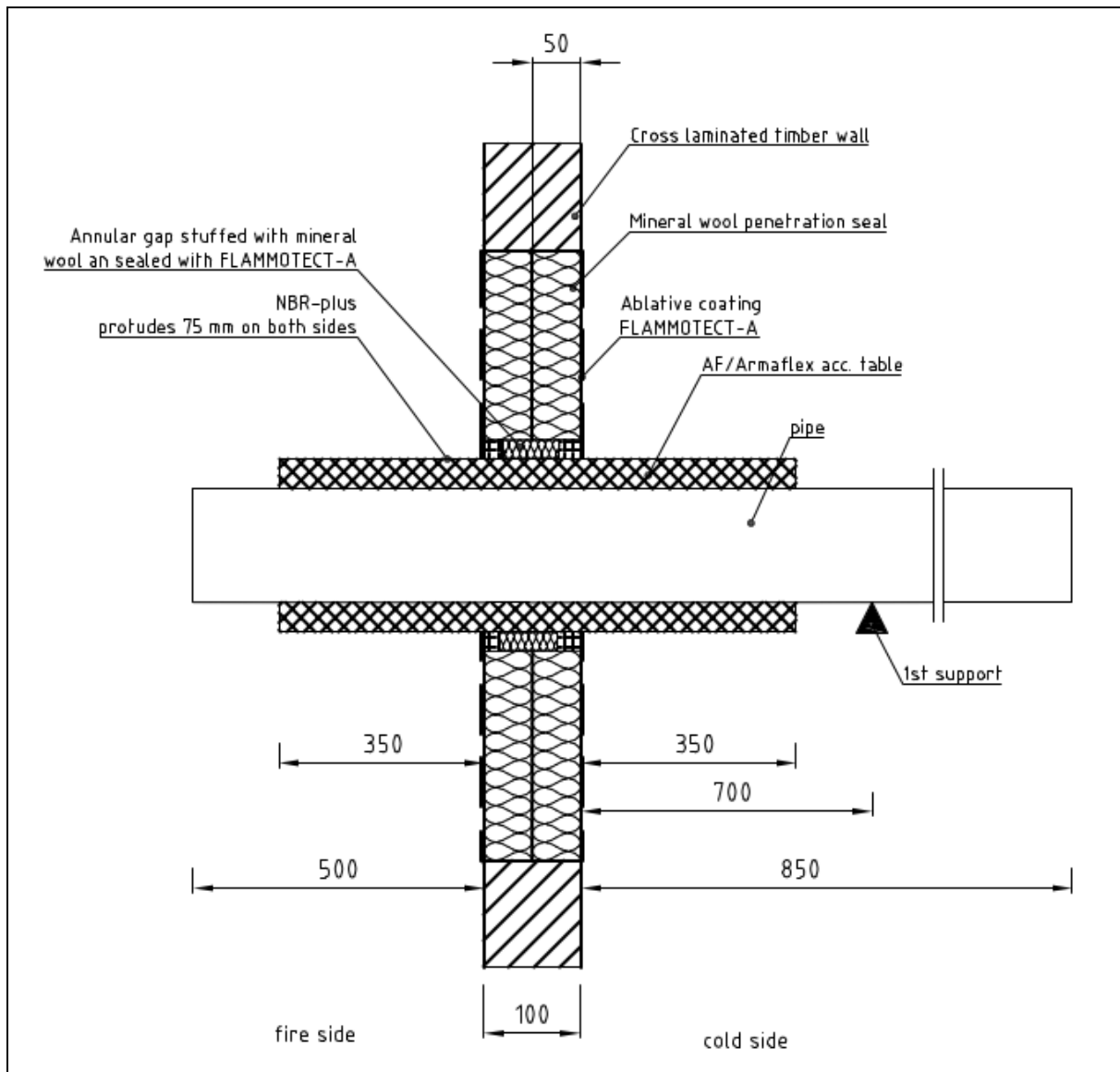
4.6.4.6. Classification and field of application

Copper pipe ²⁵ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 54$ mm	EI 60 – U/C E 90 – U/C
	t = 0.6 – 14.2 mm	
Insulation - LS/CS	Mineral wool ²⁶	
Protruding ≥ 430 mm out of the penetration seal (total length symmetrical ≥ 1000 mm)	$\varnothing = 0-54$ mm	T = 20 mm
		<p>322042005-2 seal 1-2, seal 1-5 Seal 1-6 Seal 1-10</p>
		

²⁵ Results on copper pipes also apply to cast iron, steel and stainless steel pipes
²⁶ Mineral wool of Euroclass A1 or A2 (density $\rho \geq 35$ kg/m³; melting point $\Theta \geq 1000$ °C)

4.6.5. Single metal pipes with combustible sectional insulation (FEF)

4.6.5.1. Detail drawings



4.6.5.2. Pipe orientation

Only pipes with an angle of 90° are permissible.

4.6.5.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 700$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

4.6.5.4. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	50 mm / panel thickness

Annular gap width	> 5 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	≥ 1 mm

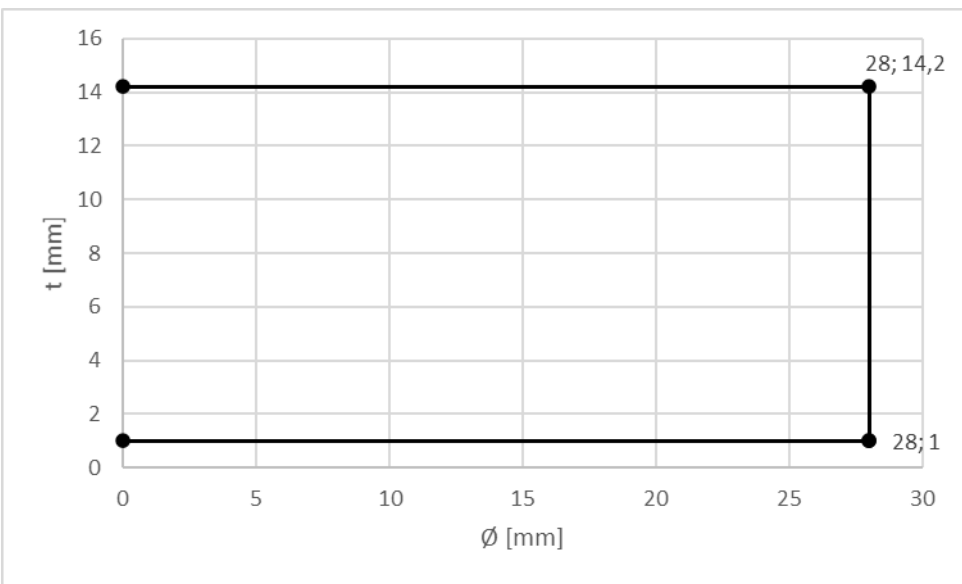
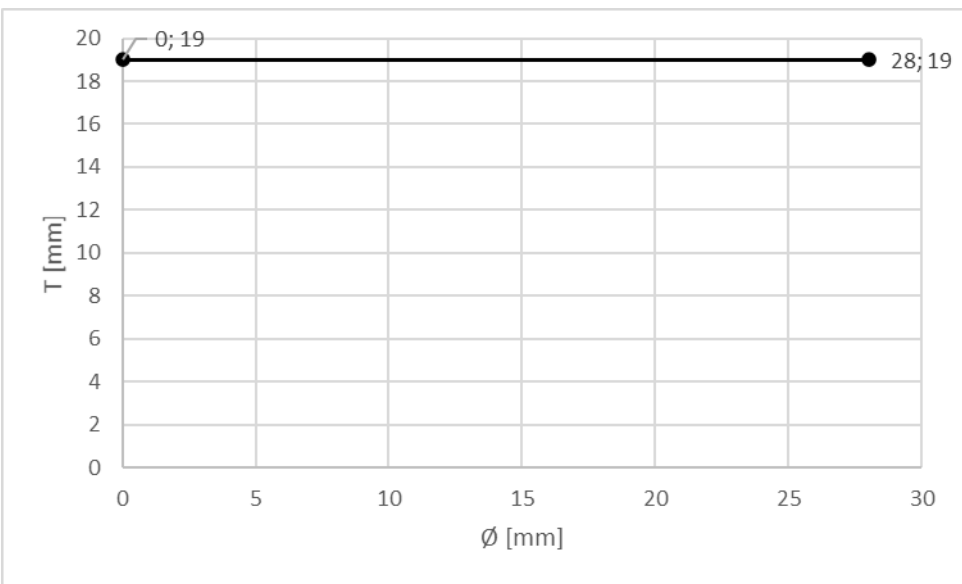
4.6.5.5. Minimum distance (linear)

Reveal	≥ 100 mm
All other distances	≥ 100 mm

4.6.5.6. Construction groups (NBR-plus)

$\varnothing_{\text{pipe}}$	$T_{\text{insulation}}$	Number of layers
0 - 54	19	2

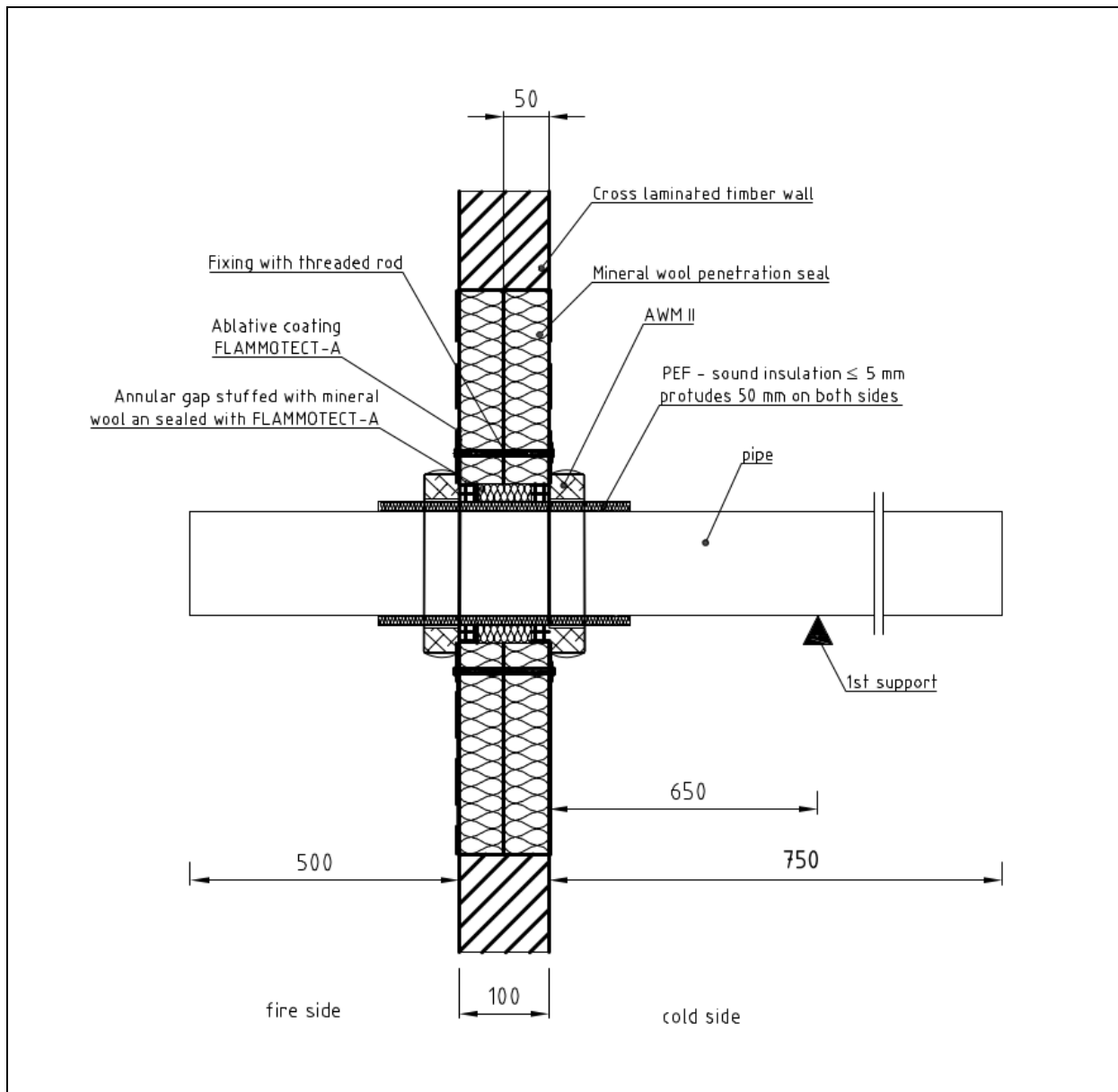
4.6.5.7. Classification and field of application

Steel pipe ²⁷ , $\lambda \leq 58 \text{ W/mK}$	$\varnothing = 0 - 28 \text{ mm}$	EI 90 – U/C	
Insulation - CS	$t = 1.0 - 14.2 \text{ mm}$		
Double layer NBR-plus	Butyl rubber ²⁸	$\varnothing = 0-54 \text{ mm}$	$T = 19 \text{ mm}$
		322042005-2 seal 1-7	
			

27 Results on steel pipes also apply to cast iron and stainless steel pipes
28 Butyl rubber of Euroclass B-s3, d0 (e.g. AF/Armaflex)

4.6.6. Non-regulated plastic pipes (Variant N II A)

4.6.6.1. Detail drawings



NOTE: Variant N II A is identical with AWM II.

4.6.6.2. Suspension

Plastic pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 650$ mm.

4.6.6.3. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	50 mm / panel thickness

Annular gap width	> 10 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT®-A
Filling depth on both sides	≥ 1 mm

4.6.6.4. Minimum distance (linear)

Reveal	≥ 20 mm
Geberit Silent dB20 Ø110/ t6	≥ 0 mm
Metal pipes with non-combustible insulation	≥ 0 mm
All other distances	≥ 100 mm

4.6.6.5. Insulation

Noise control strips made of PE soft foam are permissible up to a thickness of $T = 5$ mm.

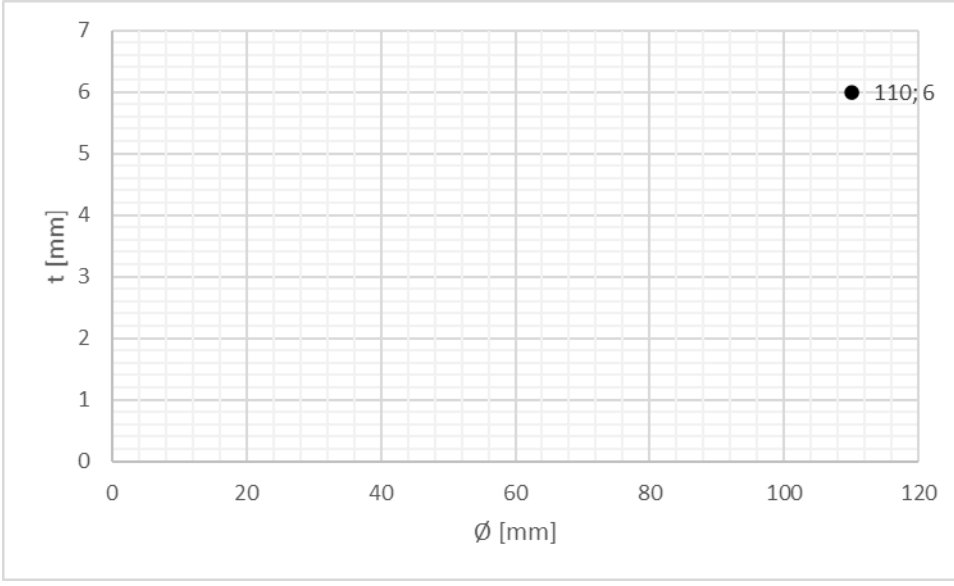
4.6.6.6. Construction groups

Pipe diameter [mm]	32 - 50	63 - 75	90	110
Total thickness of active inlay [mm]	6.4	12.8	17.1	19.2
Length of active inlay [mm]	25.4			

4.6.6.7. Fixing of variant N II A

The fire protection collar Variant N II A must be attached to the penetration sealing system FLAMMOTECT with threaded rods of \varnothing M6 – M8.

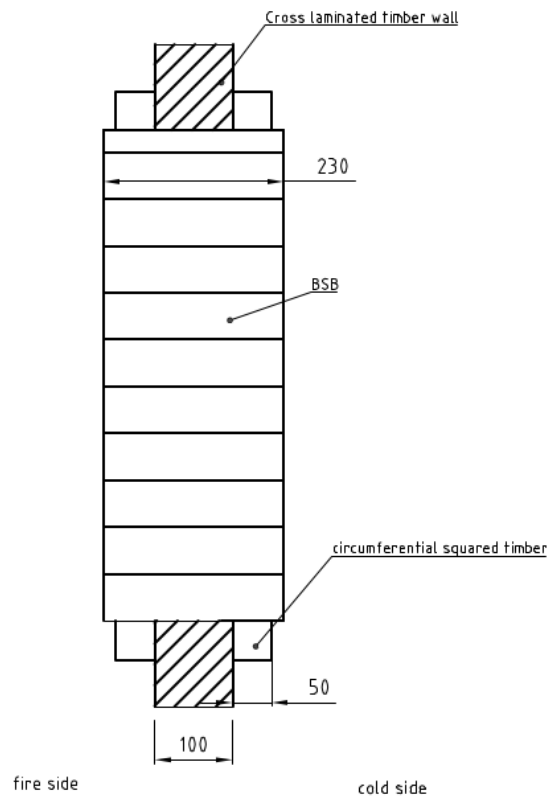
4.6.6.8. Classification and field of application

Geberit Silent dB20	$\varnothing = 110 \text{ mm}$ $t = 6.0 \text{ mm}$	EI 90-U/U
		<p>322042005-2 Seal 1-3 Seal 1-4 Seal 1-11</p>

4.7. Block bulkhead BSB

4.7.1. Maximum penetration seal size

4.7.1.1. Detail drawings



4.7.1.2. Classification and field of application

Maximum penetration seal size	Classification	Test report
600 x 600	EI 90	322042005-1 Seal 3

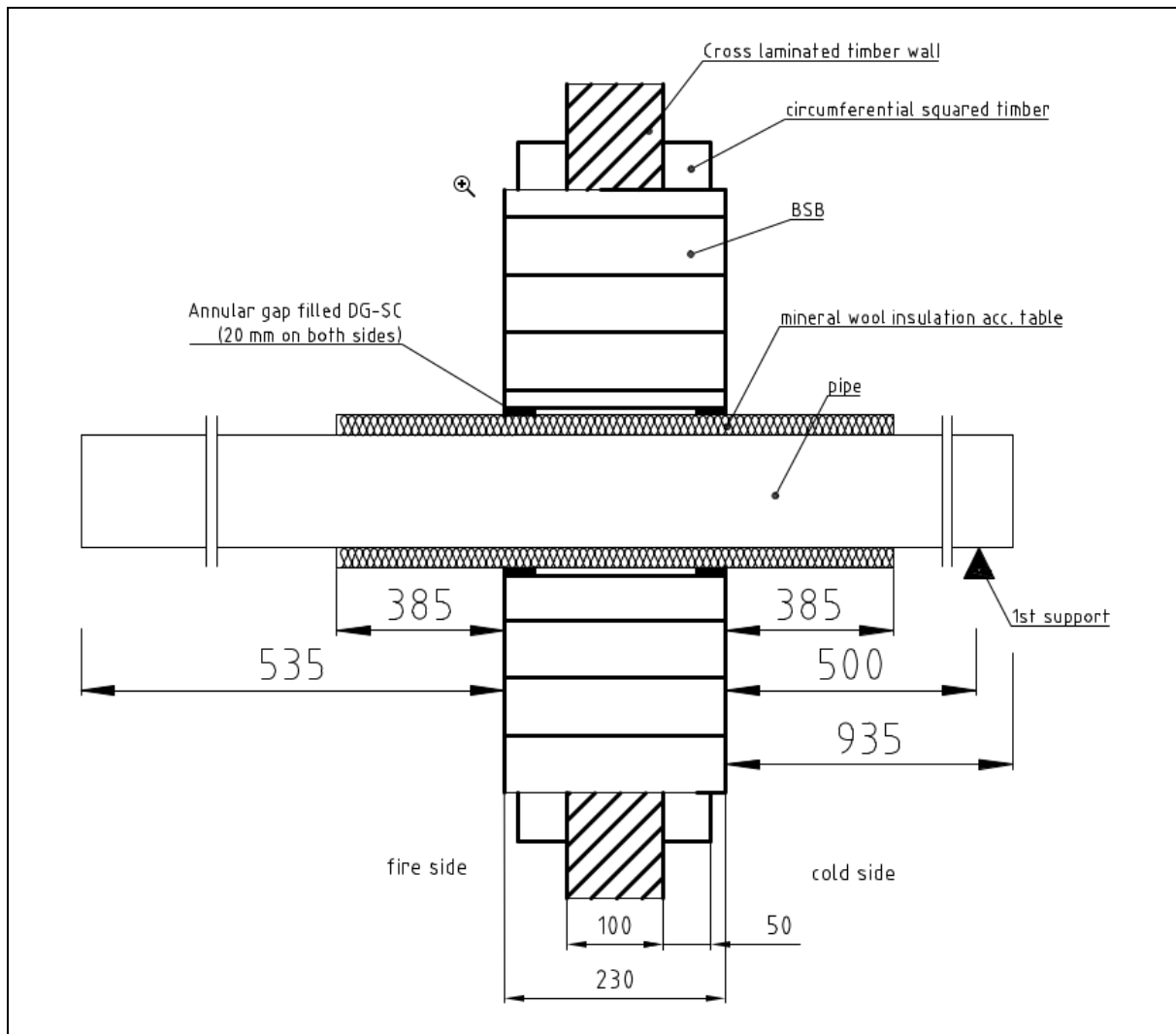
4.7.1.3. Note on the direct field of application

All penetration seals in block bulkhead BSB classified \leq EI 90, EI 90 - U/C, EI 90 - C/U or EI 90 - U/U may be used.

The distance to the penetration reveal must be \geq 100 mm in these cases!

4.7.2. Single metal pipes with non-combustible sectional insulation

4.7.2.1. Detail drawings



4.7.2.2. Pipe orientation

All angles between 45° and 90° are approved.

4.7.2.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 500$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

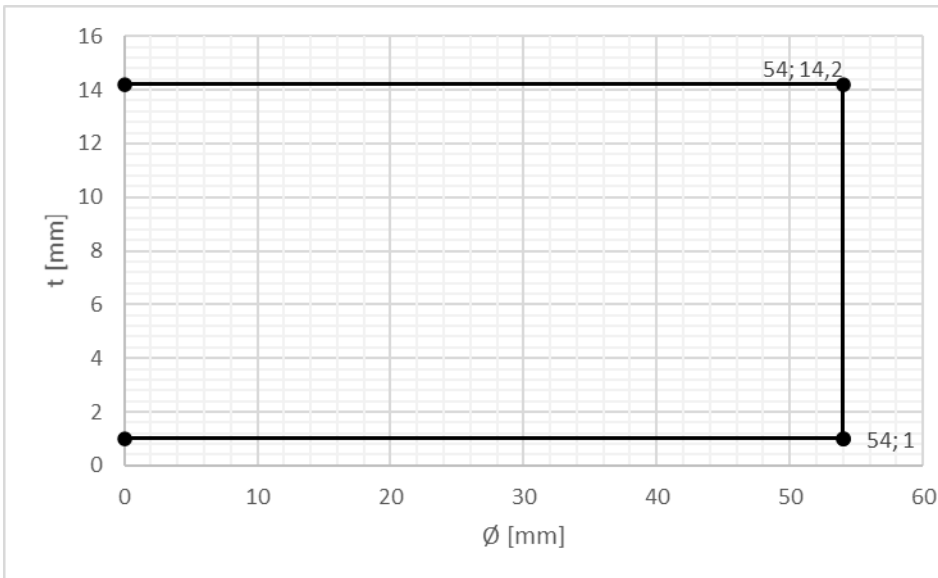
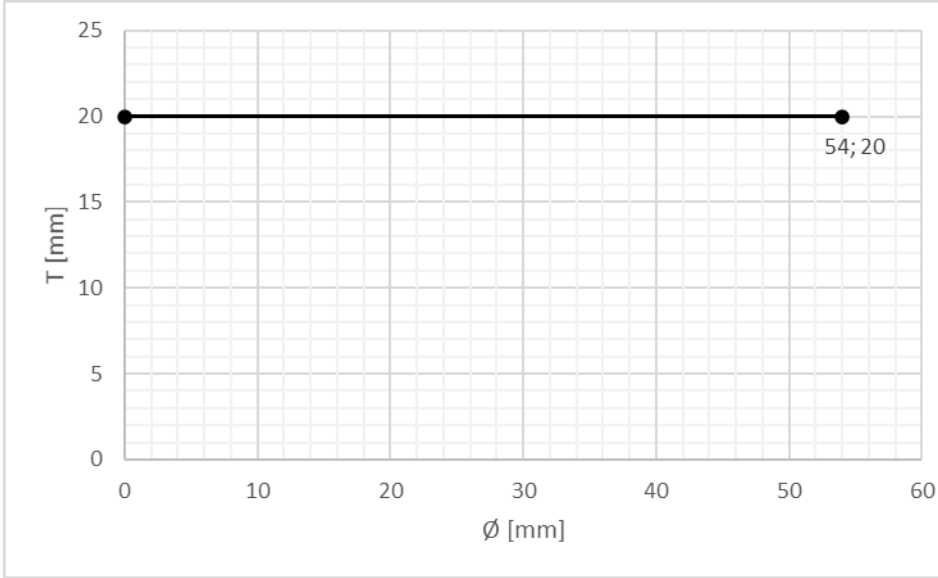
4.7.2.4. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	DG-SC
Filling depth on both sides	20 mm

4.7.2.5. Minimum distance (linear)

Reveal	≥ 25 mm
Metal pipes with non-combustible insulation	≥ 0 mm
Geberit Silent dB20 Ø110/ t6	≥ 0 mm
All other distances	≥ 100 mm

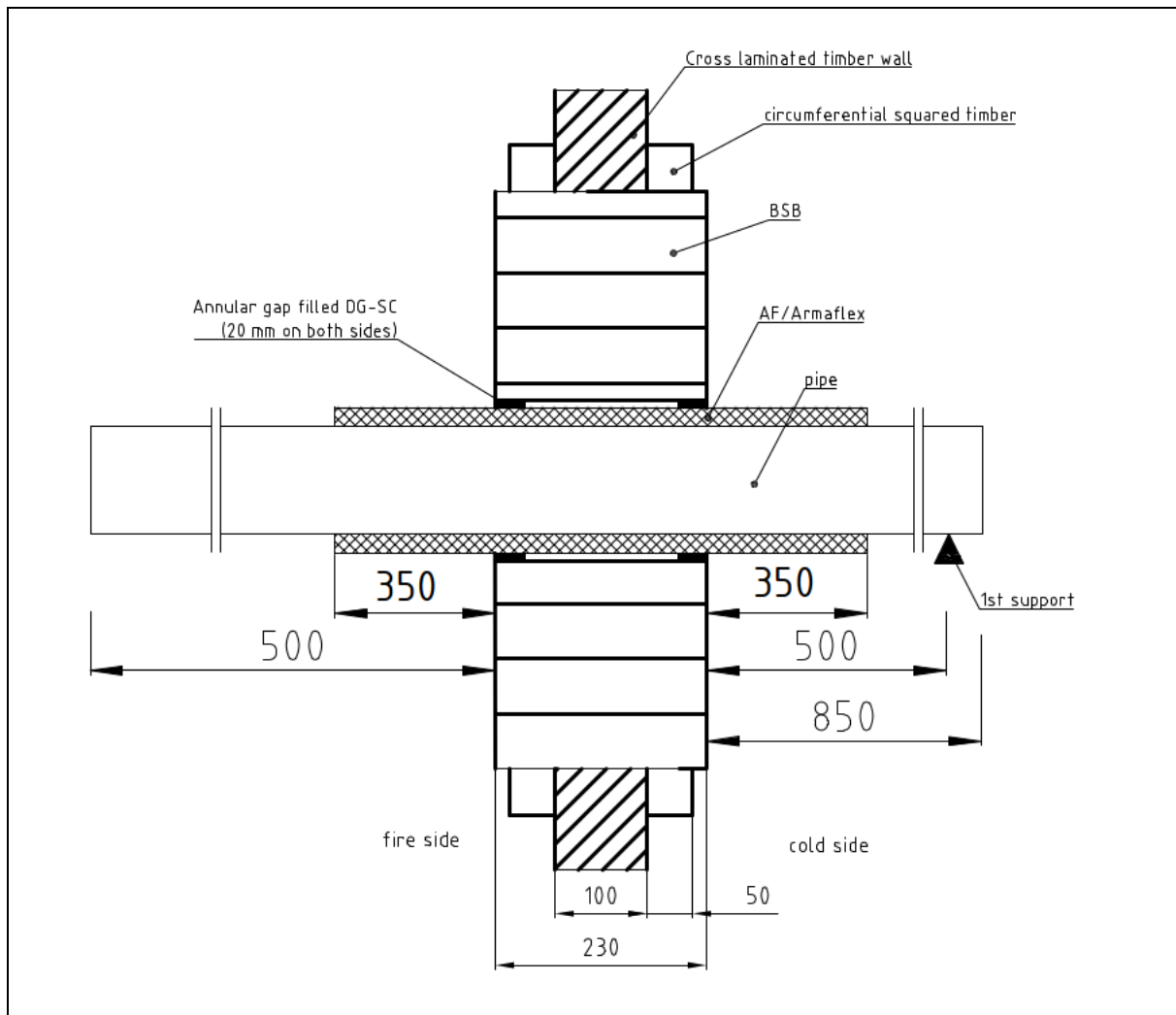
4.7.2.6. Classification and field of application

Copper pipe ²⁹ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 54$ mm	EI 90 – U/C	
Insulation - LS/CS	t = 0.6 – 14.2 mm		
	Mineral wool ³⁰		
Protruding ≥ 385 mm out of the penetration seal (total length symmetrical ≥ 1000 mm)		$\varnothing = 0-54$ mm	T = 20 mm
		<p>322042005-1 Seal 3-1, Seal 3-2, Seal 3-5, Seal 3-6, Seal 3-9, Seal 3-10</p>	
			

²⁹ Results on copper pipes also apply to cast iron, steel and stainless steel pipes
³⁰ Mineral wool of Euroclass A1 or A2 (density $\rho \geq 35$ kg/m³; melting point $\Theta \geq 1000$ °C)

4.7.3. Single metal pipes with combustible sectional insulation (FEF)

4.7.3.1. Detail drawings





4.7.3.2. Pipe orientation

Only pipes with an angle of 90° are permissible.

4.7.3.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 500$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

4.7.3.4. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	DG-SC
Filling depth on both sides	50 mm

4.7.3.5. Minimum distance (linear)

Reveal	≥ 100 mm
All other distances	≥ 100 mm

4.7.3.6. Classification and field of application

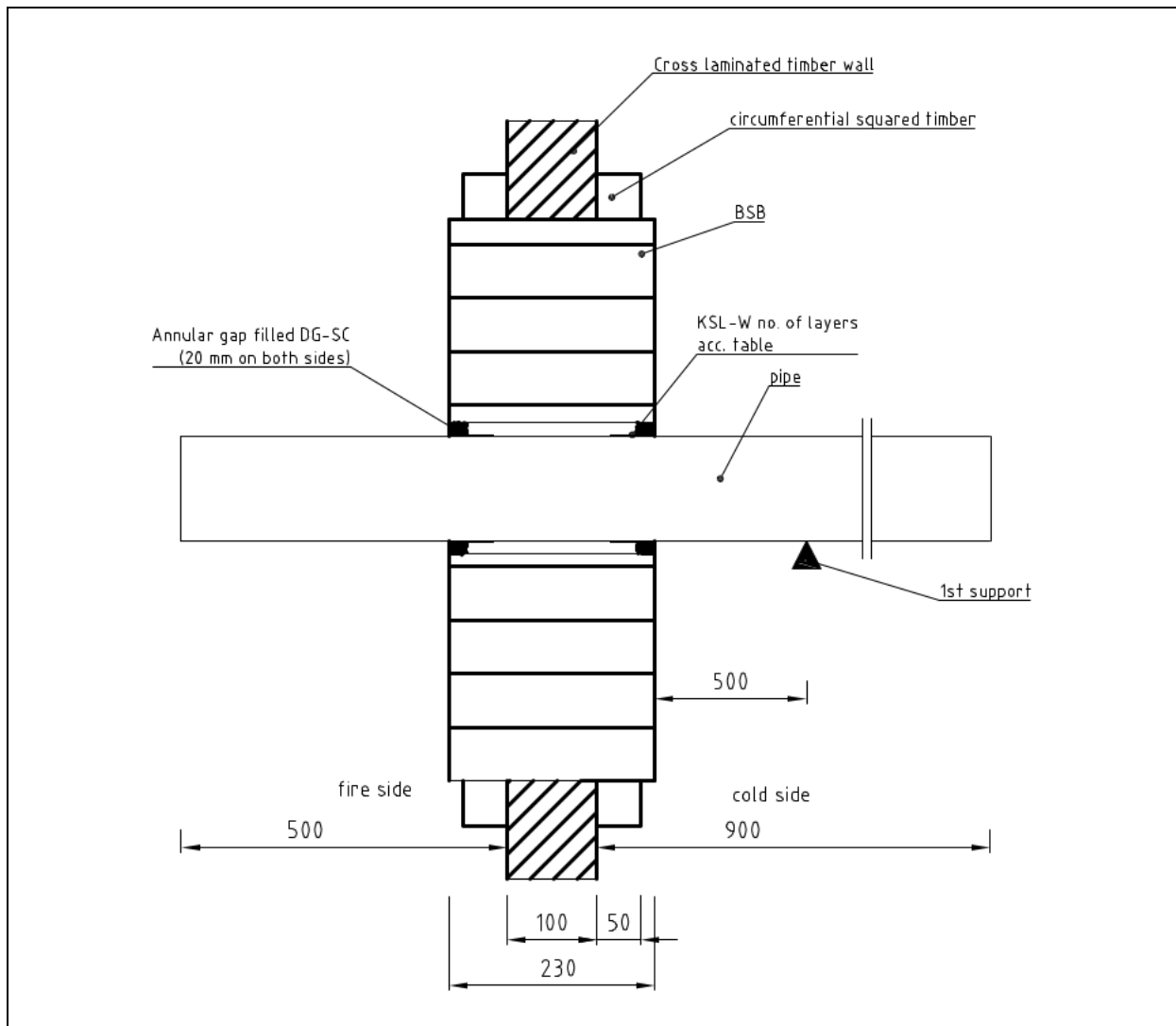
Steel pipe ³¹ , $\lambda \leq 58 \text{ W/mK}$	$\varnothing = 0 - 54 \text{ mm}$	EI 90 – U/C
Insulation - CS	t = 1.0 – 14.2 mm	
	Butyl rubber ³²	

322042005-2
seal 3-7
Seal 3-8

31 Results on steel pipes also apply to cast iron and stainless steel pipes
32 Butyl rubber of Euroclass B-s3, d0 (e.g. AF/Armaflex)

4.7.4. Non-regulated plastic pipes (KSL-W)

4.7.4.1. Detail drawings



4.7.4.2. Suspension

Plastic pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 500$ mm.

4.7.4.3. Annular gaps

Annular gap width	0 – 5 mm
Filling	none
Joint filler	DG-SC
Filling depth on both sides	50 mm / panel thickness

4.7.4.4. Minimum distance (linear)

Reveal	≥ 25 mm
Geberit Silent dB20 Ø110/ t6	≥ 6 mm
Metal pipes with non-combustible insulation	≥ 3 mm
All other distances	≥ 100 mm

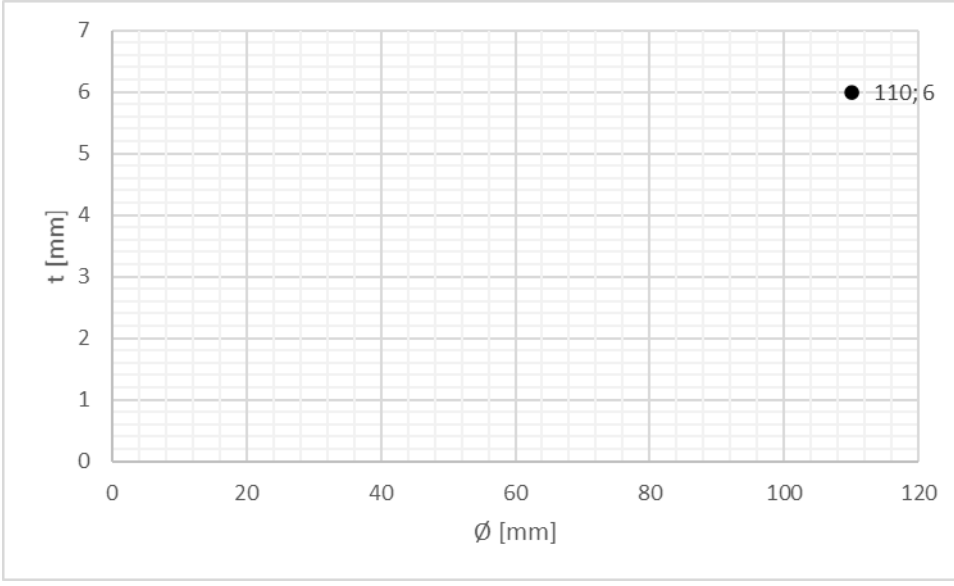
4.7.4.5. Construction groups

Pipe diameter [mm]	32 - 50	63 - 75	90 - 110
Total thickness of active inlay [mm]	0	1.5	3
Length of active inlay [mm]	50		

4.7.4.6. Installation KSL-W

The KSL-W fire protection wrap must be installed at least flush with the penetration seal surface and must not protrude more than 5 mm from the seal surface.

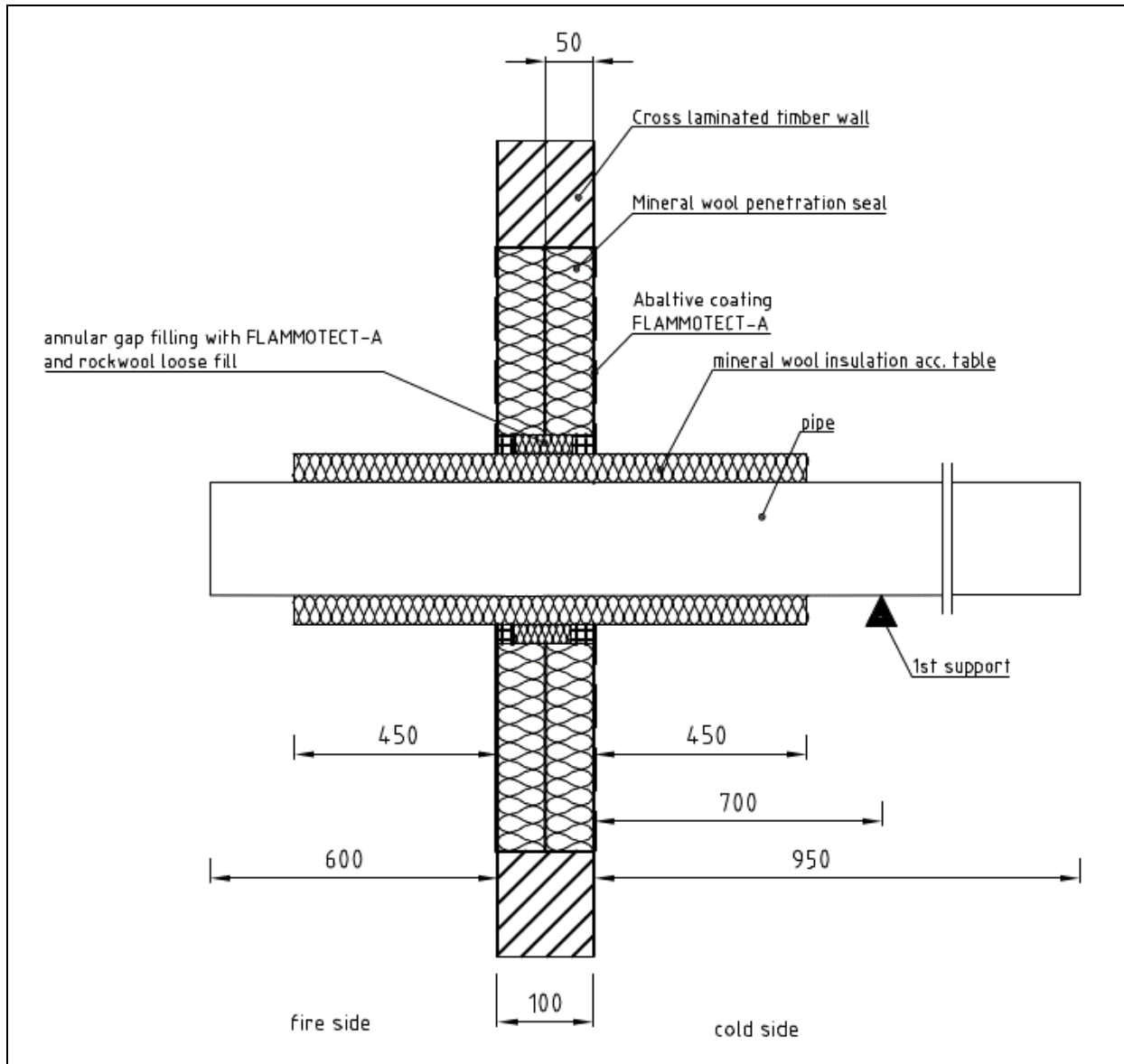
4.7.4.7. Classification and field of application

Geberit Silent dB20	$\varnothing = 110 \text{ mm}$ $t = 6.0 \text{ mm}$	EI 90-U/U
		<p>321100703-1 Seal 3-3 Seal 3-4</p>

4.8. Joint and gap sealing FLAMMOTECT-A

4.8.1. Single metal pipes with non-combustible sectional insulation

4.8.1.1. Detail drawings



4.8.1.2. Pipe orientation

All angles between 45° and 90° are approved.

4.8.1.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 700$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

4.8.1.4. Annular gaps

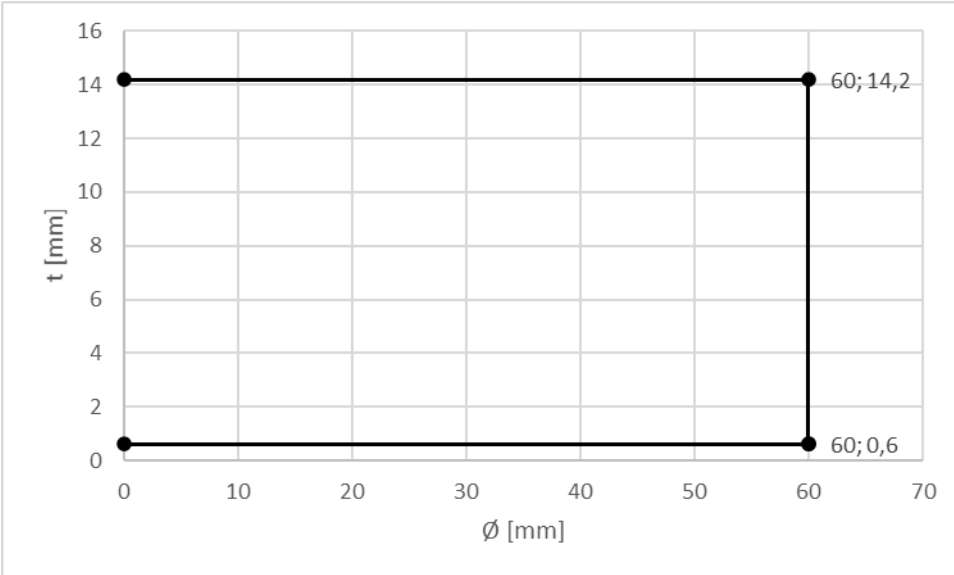
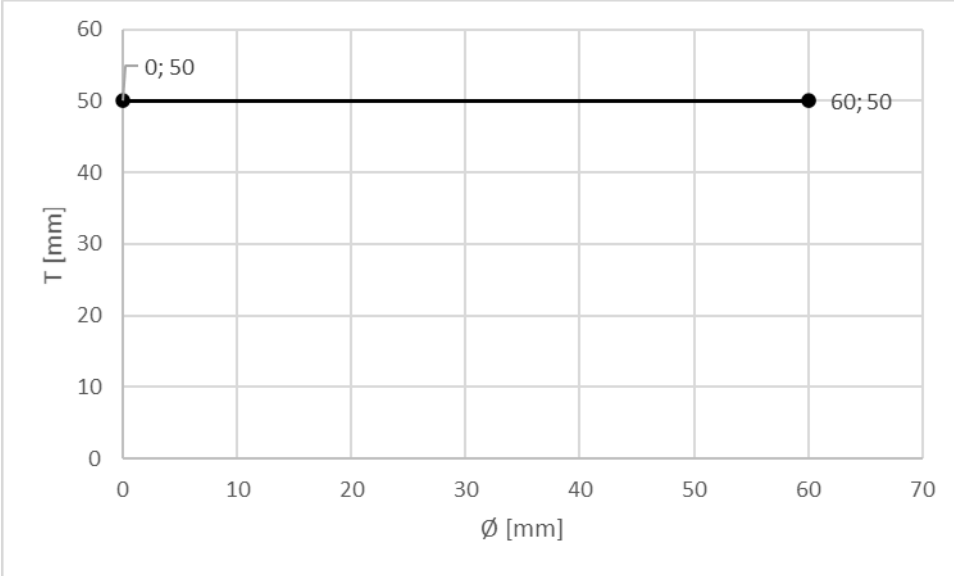
Annular gap width	> 10 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT-A
Filling depth on both sides	≥ 20 mm

4.8.1.5. Minimum distance (linear)

All other distances	≥ 100 mm
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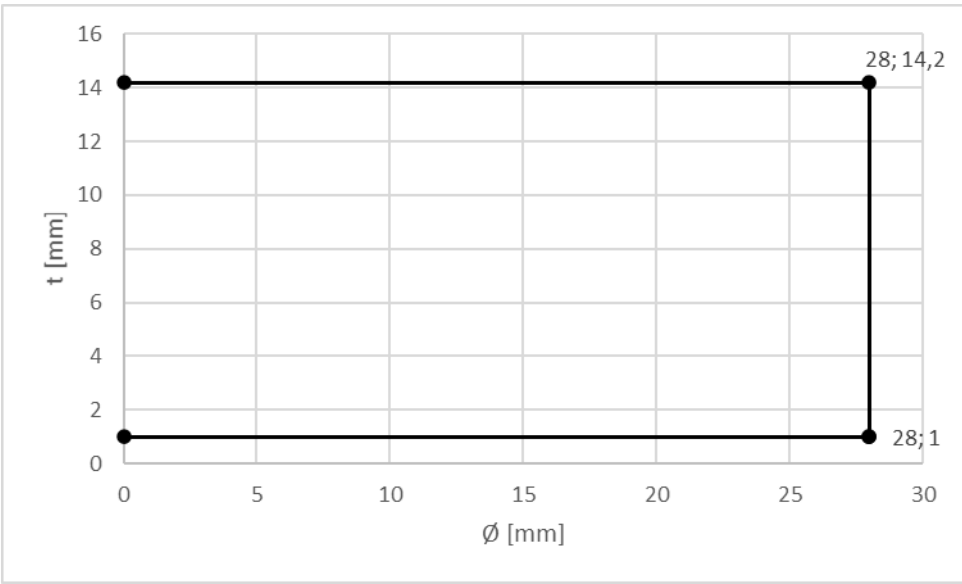
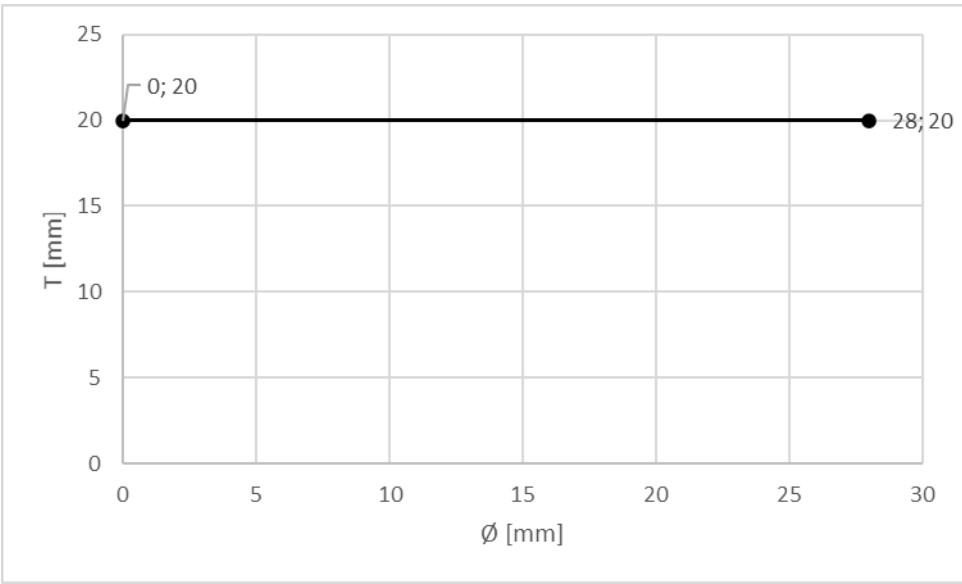
4.8.1.6. Classification and field of application

4.8.1.6.1. Copper

Copper pipe ³³ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 60$ mm	EI 90 – U/C	
	t = 0.6 – 14.2 mm		
Insulation - LS/CS – LI/CI	Pipe insulation shell ³⁴		
Projecting ≥ 450 mm from both sides of the wall (Total length symmetrical ≥ 1000 mm)		$\varnothing = 0-60$ mm	T = 50 mm
		322042005-2 K-2	
			

³³ Results on copper pipes also apply to cast iron, steel and stainless steel pipes

³⁴ Mineral wool of Euroclass A1 or A2 (density $\rho \geq 80$ kg/m³; melting point $\Theta \geq 1000$ °C)

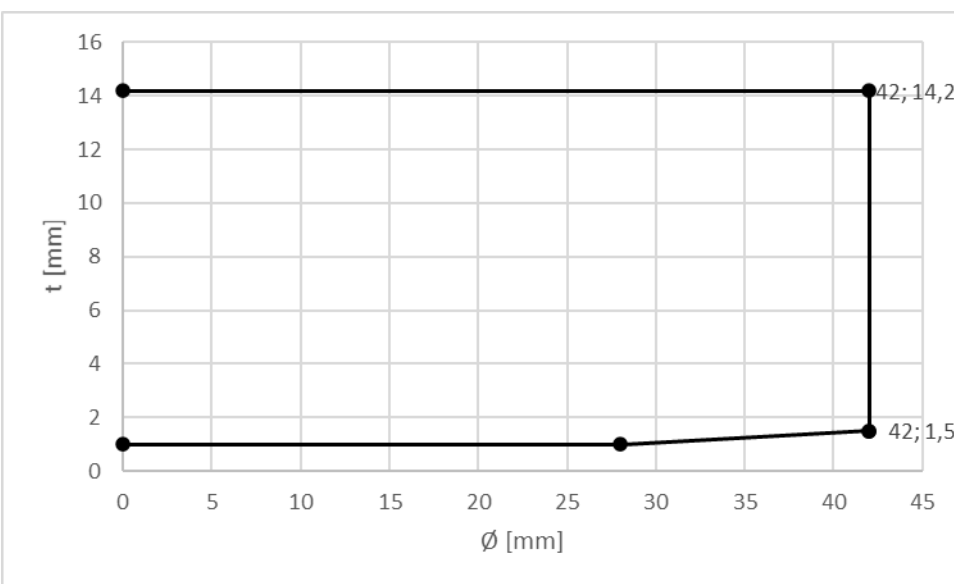
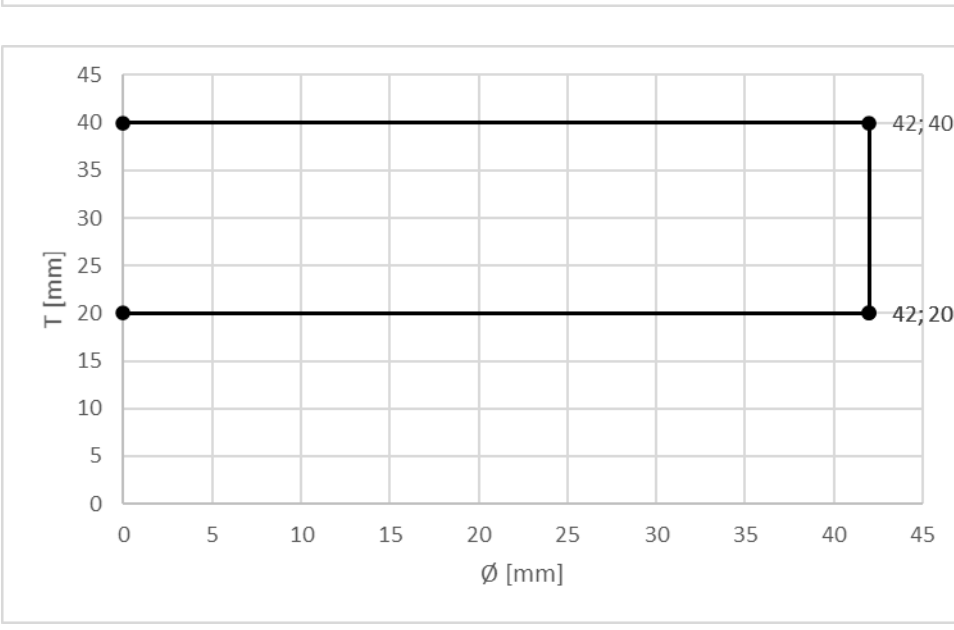
Copper pipe ³⁵ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 28$ mm $t = 1.0 - 14.2$ mm	EI 90 – U/C	
Insulation - LS/CS – LI/CI	Lamella mat ³⁶		
Projecting ≥ 450 mm from both sides of the wall (Total length symmetrical ≥ 1000 mm)		$\varnothing = 0-28$ mm	T = 20 mm
		322042005-2 K-4	
			

35 Results on copper pipes also apply to cast iron, steel and stainless steel pipes
36 Mineral wool of Euroclass A1 or A2 (density $\rho \geq 35$ kg/m³; melting point $\Theta \geq 1000$ °C)

Copper pipe ³⁷ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 54$ mm $t = 1.0 - 14.2$ mm	EI 60 – U/C E 90 – U/C	
Insulation - LS/CS – LI/CI	Lamella mat ³⁸		
Projecting ≥ 450 mm from both sides of the wall (Total length symmetrical ≥ 1000 mm)		$\varnothing = 0-54$ mm	T = 20 – 50 mm
		322042005-2 K-4, K-6	

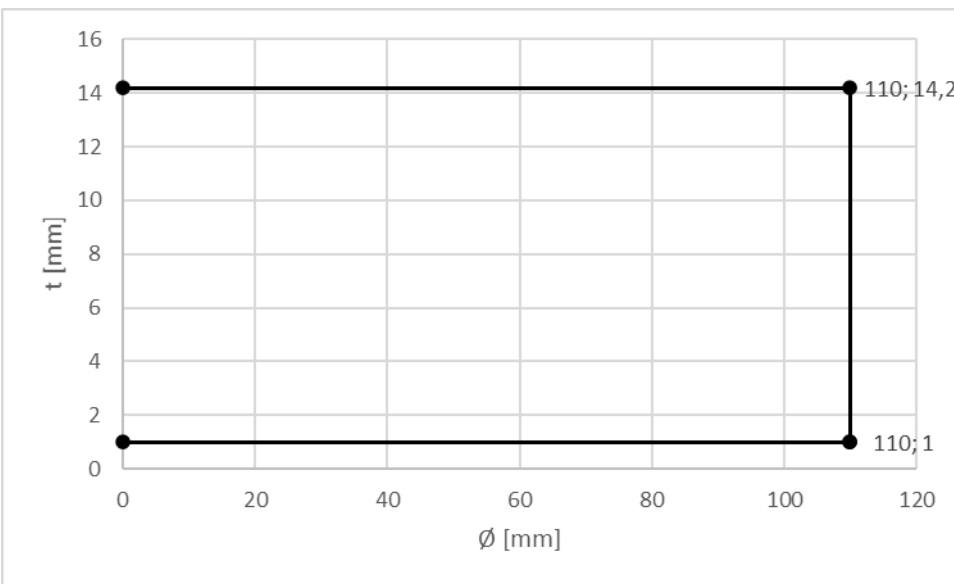
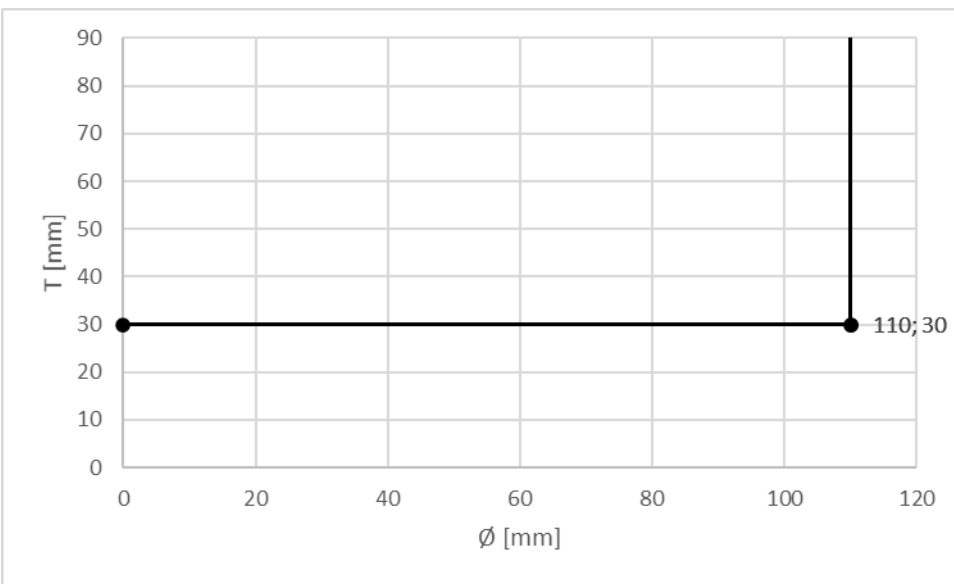
³⁷ Results on copper pipes also apply to cast iron, steel and stainless steel pipes
³⁸ Mineral wool of Euroclass A1 or A2 (density $\rho \geq 35$ kg/m³; melting point $\Theta \geq 1000$ °C)

4.8.1.6.2. Steel

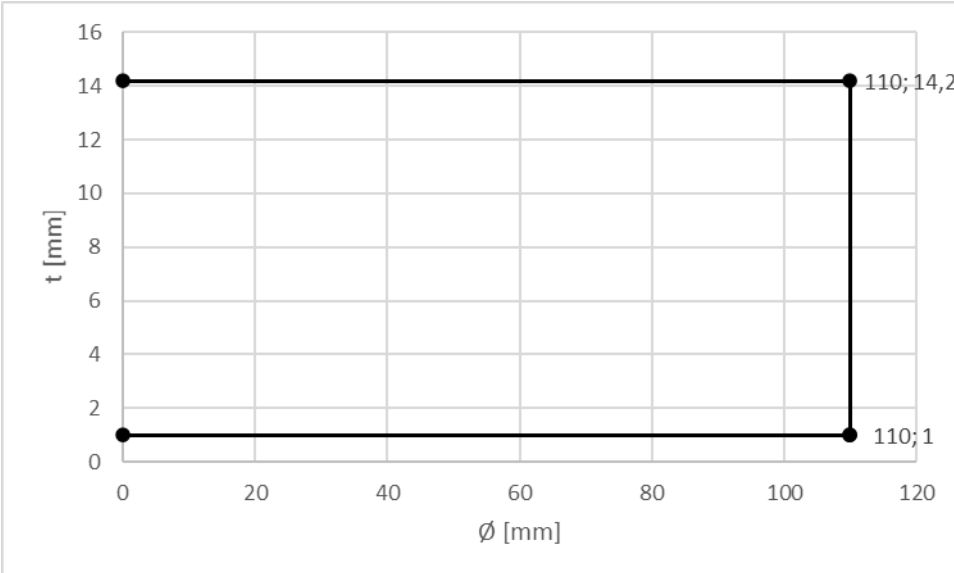
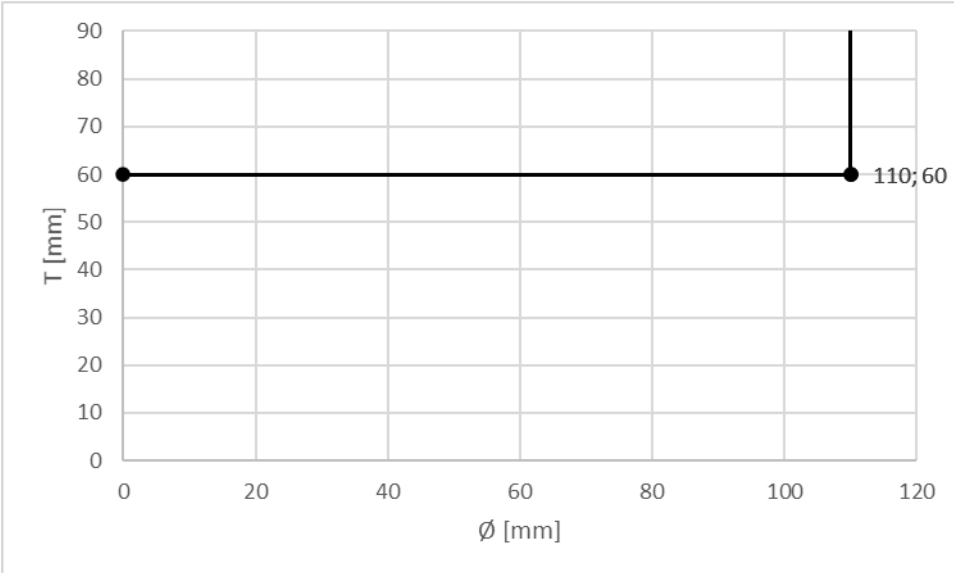
Steel pipe, $\lambda \leq 58 \text{ W/mK}$	$\varnothing = 0 - 42 \text{ mm}$ $t = 1.0 - 14.2 \text{ mm}$	EI 90 – U/C	
Insulation - LS/CS – LI/CI	Mineral wool ³⁹		
Projecting $\geq 200 \text{ mm}$ from both sides of the wall (Total length symmetrical $\geq 500 \text{ mm}$)		$\varnothing = 0-42 \text{ mm}$	$T = 20 - 40 \text{ mm}$
		<p>322042005-2 S-1, S-2, S-3, S-4</p>	
			

39 Mineral wool of Euroclass A1 or A2 (density $\rho \geq 80 \text{ kg/m}^3$; melting point $\Theta \geq 1000 \text{ °C}$)

4.8.1.6.3. Stainless steel

Stainless steel pipe, $\lambda \leq 18 \text{ W/mK}$	$\varnothing = 0 - 110 \text{ mm}$ $t = 1.0 - 14.2 \text{ mm}$	EI 90 – U/C	
Insulation – CS – CI	Pipe insulation shell ⁴⁰		
Case CS / CI: Cladding the entire pipe		$\varnothing = 0-110 \text{ mm}$	$T \geq 30 \text{ mm}$
		<p>322042005-2 E-3, E-4</p>	
			

40 Mineral wool of Euroclass A1 or A2 (density $\rho \geq 80 \text{ kg/m}^3$; melting point $\Theta \geq 1000 \text{ °C}$)

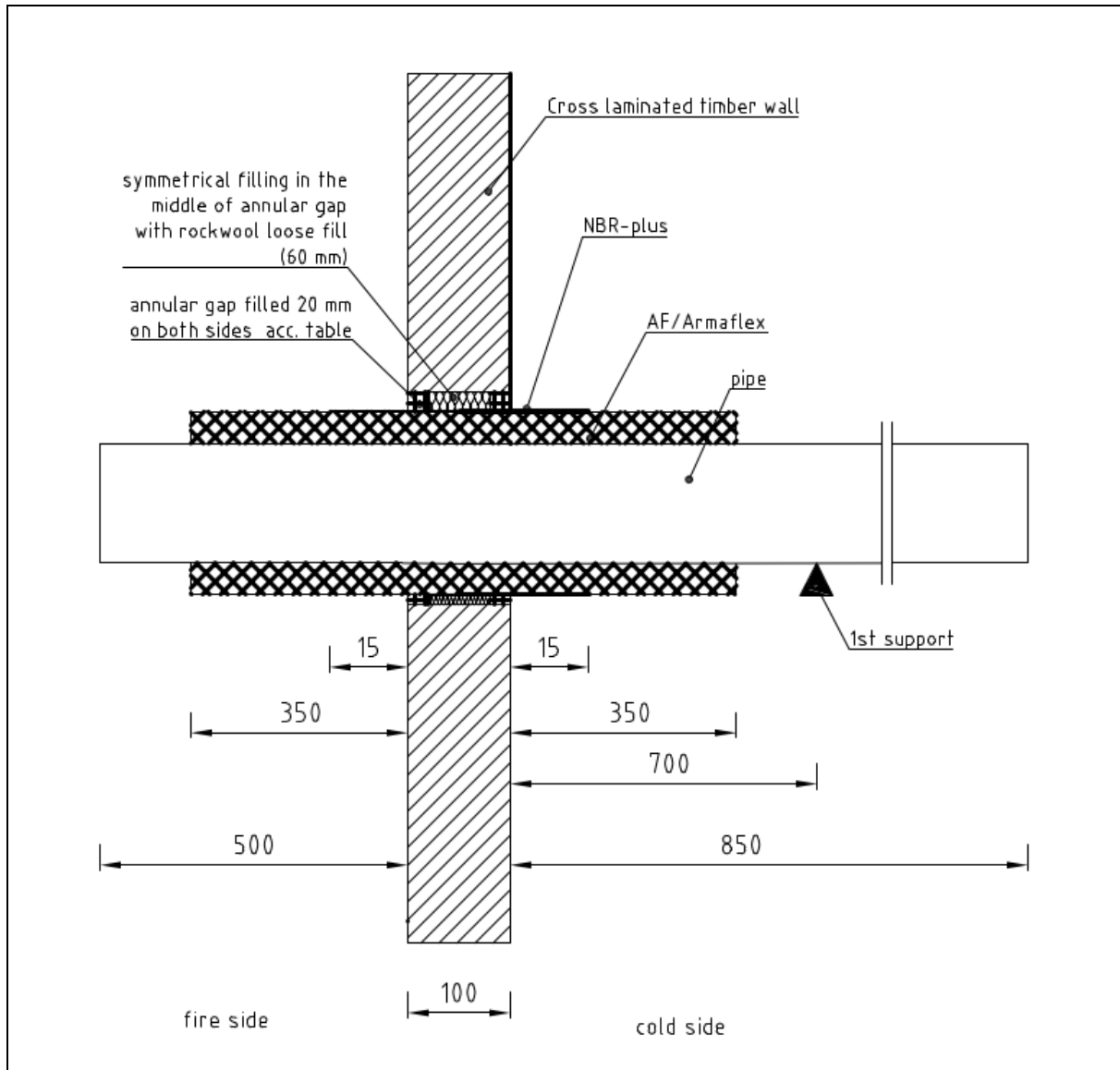
Stainless steel pipe, $\lambda \leq 18 \text{ W/mK}$	$\varnothing = 0 - 110 \text{ mm}$ $t = 1.0 - 14.2 \text{ mm}$	EI 90 – U/C	
Insulation – CS – CI	Lamella mat ⁴¹		
Case CS / CI: Cladding the entire pipe		$\varnothing = 0-110 \text{ mm}$	$T \geq 60 \text{ mm}$
		322042005-2 E-6	
			

41 Mineral wool of Euroclass A1 or A2 (density $\rho \geq 35 \text{ kg/m}^3$; melting point $\Theta \geq 1000 \text{ °C}$)

4.9. Pipe sealing system NBR-plus

4.9.1. Single metal pipes with combustible sectional insulation (FEF)

4.9.1.1. Detail drawings



4.9.1.2. Pipe orientation

Only pipes with an angle of 90° are permissible.

4.9.1.3. Suspension

Metal pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 700$ mm.

The suspension system may be designed without adhering to any fire protection requirements.

4.9.1.4. Annular gaps

Annular gap width	> 10 – 25 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT-A
Filling depth on both sides	≥ 20 mm

4.9.1.5. Minimum distance (linear)

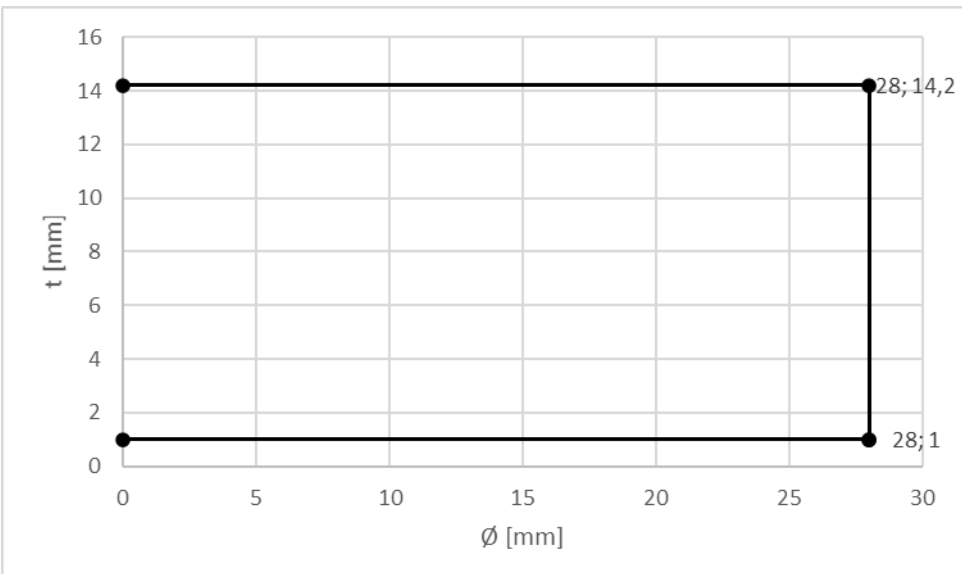
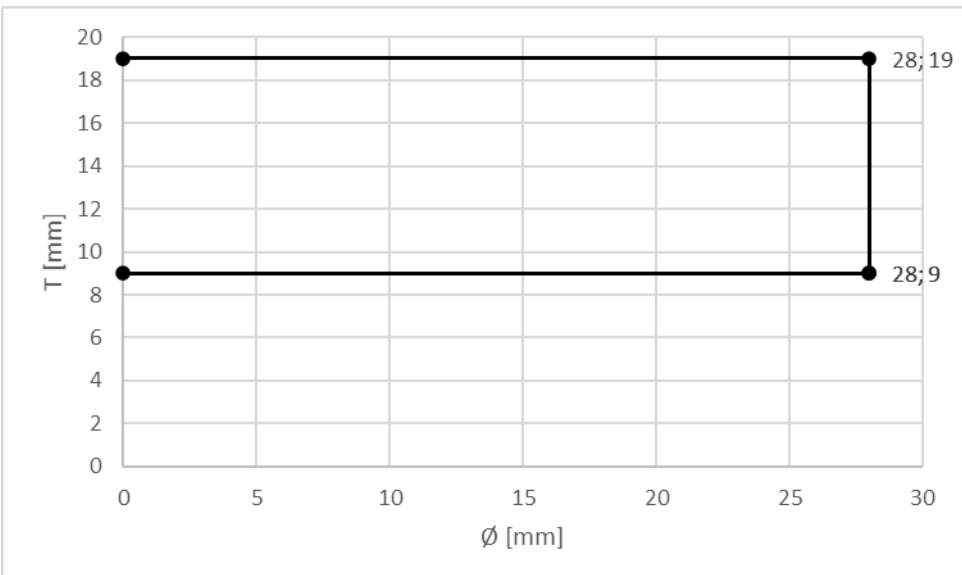
All other distances	≥ 100 mm
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4.9.1.6. Construction groups

Pipe diameter [mm]	0 - 110	0 - 110
Insulation thickness T [mm]	9	> 9 -21
Total thickness of active inlay [mm]	1.5	3
Length of active inlay [mm]	125	125

4.9.1.7. Classification and field of application

4.9.1.7.1. Copper

Copper pipe ⁴² , $\lambda \leq 380 \text{ W/mK}$	$\varnothing = 0 - 28 \text{ mm}$ $t = 1.0 - 14.2 \text{ mm}$	EI 90 – U/C	
Insulation - LS/CS – LI/CI	Butyl rubber ⁴³		
Projecting $\geq 350 \text{ mm}$ from both sides of the wall (Total length symmetrical $\geq 800 \text{ mm}$)		$\varnothing = 0-60 \text{ mm}$	$T = 9 - 19 \text{ mm}$
		<p>322042005-2 K-9, K-11</p>	
			

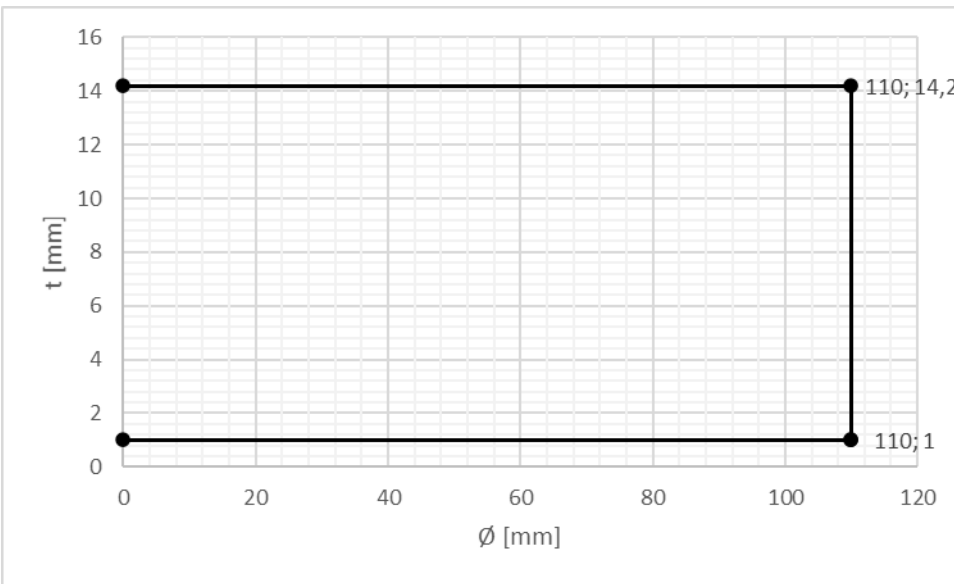
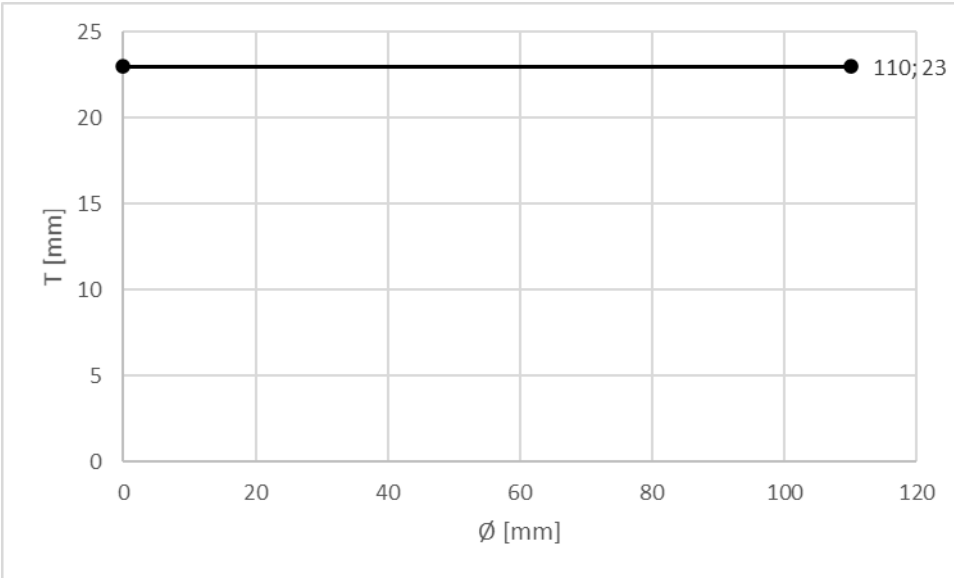
⁴² Results on copper pipes also apply to cast iron, steel and stainless steel pipes
⁴³ Butyl rubber of Euroclass B-s3,d0 (e.g. AF/Armaflex)



Copper pipe ⁴⁴ , $\lambda \leq 380$ W/mK	$\varnothing = 0 - 60$ mm $t = 0.6 - 14.2$ mm	EI 60 – U/C E 90 – U/C	
Insulation - LS/CS – LI/CI	Butyl rubber ⁴⁵		
Projecting ≥ 350 mm from both sides of the wall (Total length symmetrical ≥ 800 mm)		$\varnothing = 0-60$ mm	T = 9 - 21 mm
		<p>322042005-2 K-7, K-9, K-10, K-11, K-12</p>	

44 Results on copper pipes also apply to cast iron, steel and stainless steel pipes
45 Butyl rubber of Euroclass B-s3,d0 (e.g. AF/Armaflex)

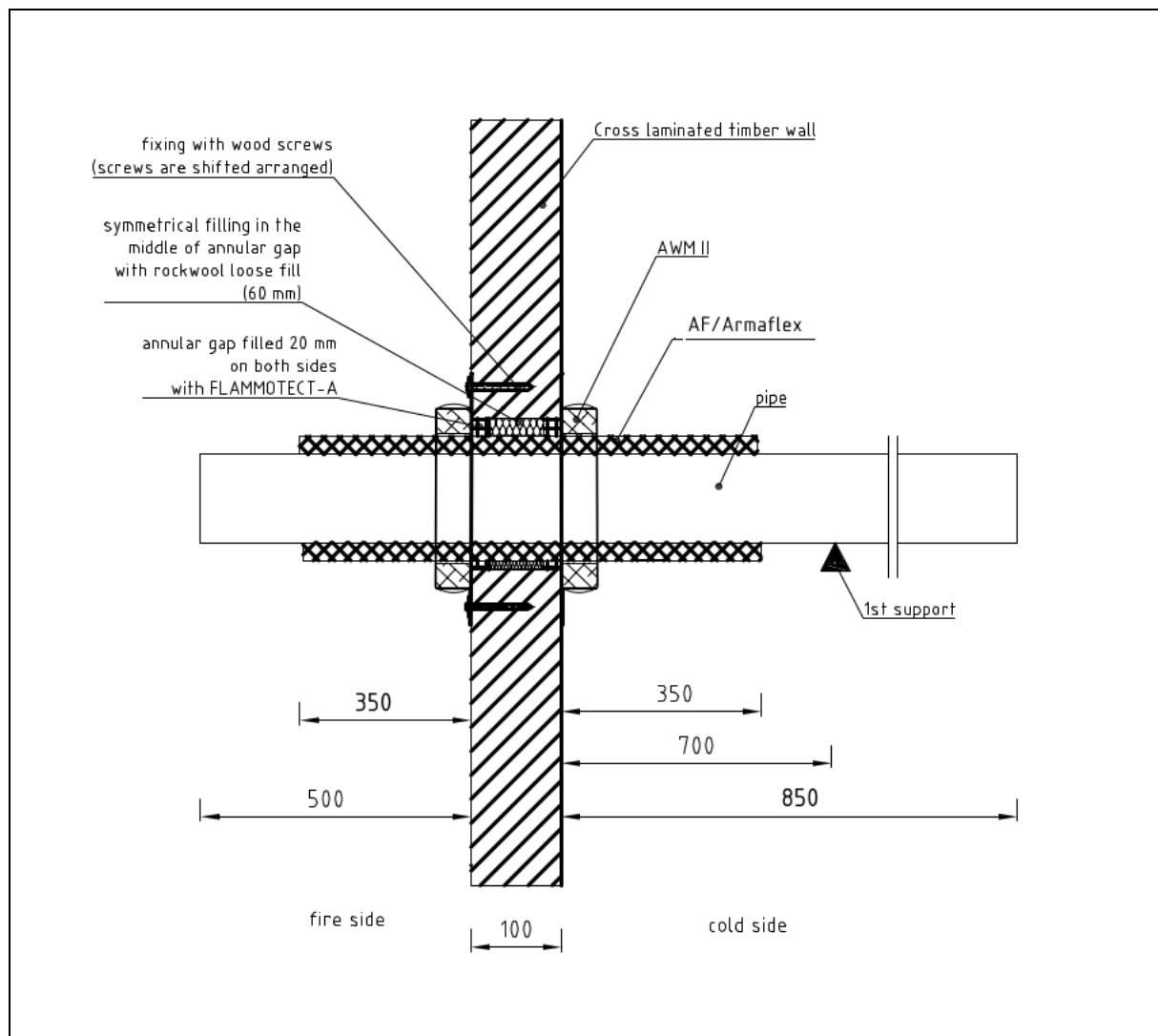
4.9.1.7.3. Stainless steel

Stainless steel pipe, $\lambda \leq 18 \text{ W/mK}$	$\varnothing = 0 - 110 \text{ mm}$ $t = 1.0 - 14.2 \text{ mm}$	EI 60 – U/C E 90 – U/C	
Insulation – CS – CI	Butyl rubber ⁴⁶		
Covering the entire pipe on both sides		$\varnothing = 0-110 \text{ mm}$	$T = 23 \text{ mm}$
		322042005-2 E-2	
			

46 Butyl rubber of Euroclass B-s3,d0 (e.g. AF/Armaflex)

4.10. Multilayer composite pipes with synthetic rubber insulation (Variant N II A)

4.10.1. Detail drawings



NOTE: Variant N II A is identical with AWM II.

4.10.2. Suspension

Multilayer composite pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 700$ mm.

4.10.3. Annular gaps

Annular gap width	> 10 – 25 mm
Filling	Mineral wool ($\rho \geq 40 \text{ kg/m}^3$)
Joint filler	FLAMMOTECT-A
Filling depth on both sides	$\geq 20 \text{ mm}$

4.10.4. Minimum distance (linear)

All other distances	$\geq 100 \text{ mm}$
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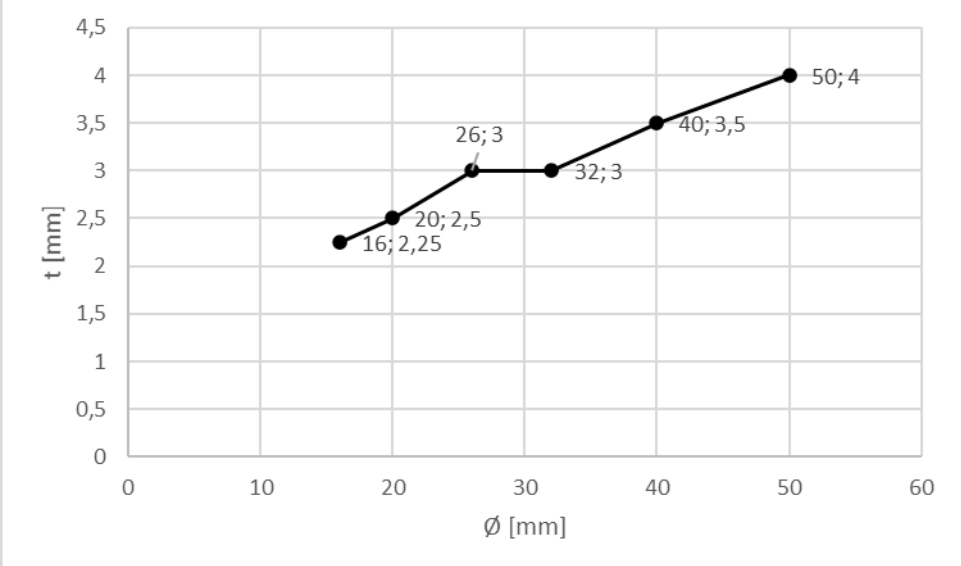
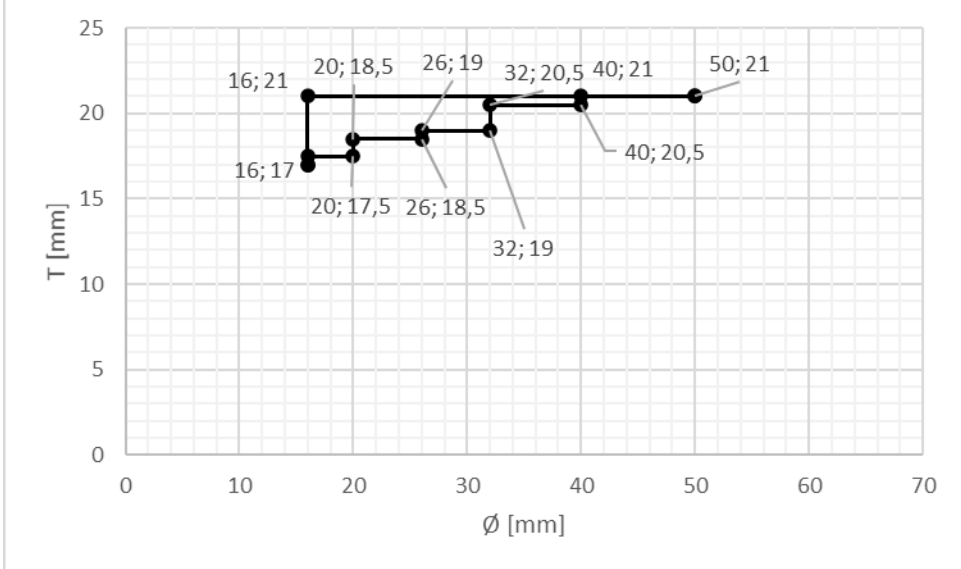
4.10.5. Construction groups

Pipe diameter [mm]	32 - 50	63 - 75	90	110	125	140 – 160
Total thickness of active inlay [mm]	6.4	12.8	17.1	19.2	19.2	25.6
Length of active insert [mm]	25.4			38.1		

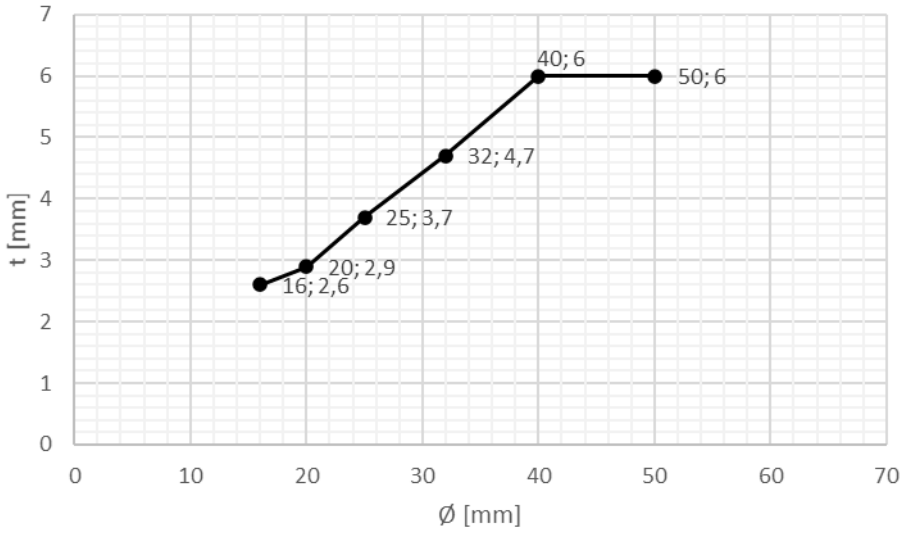
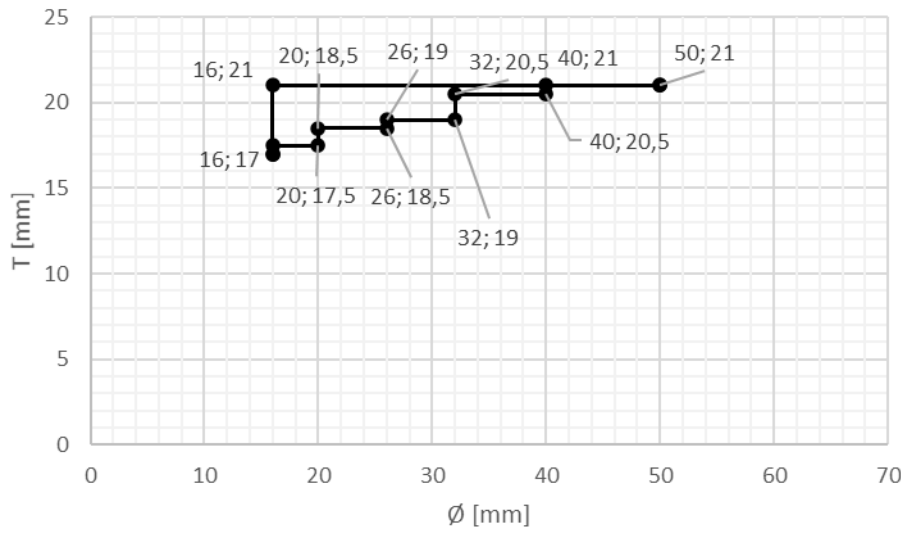
4.10.6. Fixing of variant N II A

The fire protection collar Variant N II A must be fixed to the supporting structure with timber construction screws of length $L = 80 \text{ mm}$.

4.10.7. Classification and field of application (WALL)

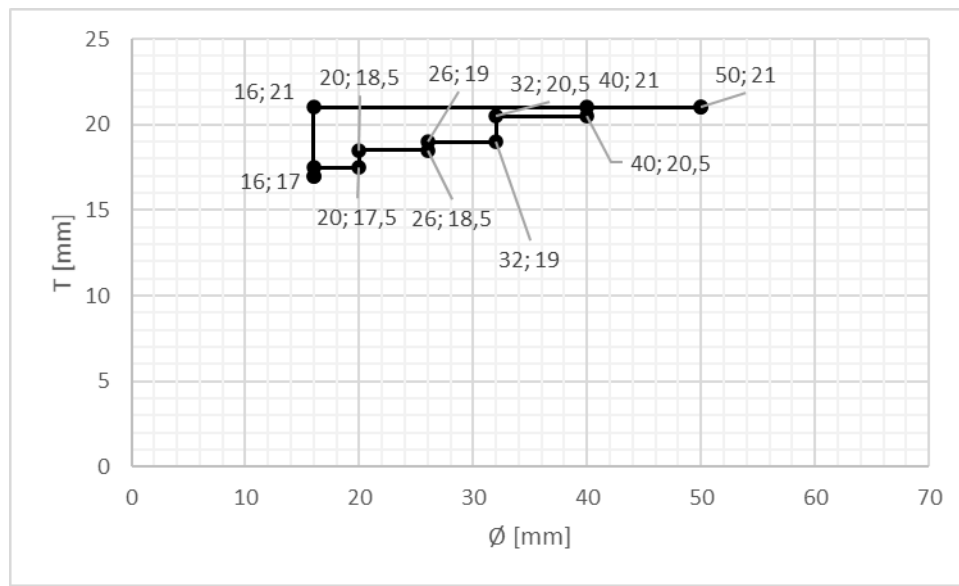
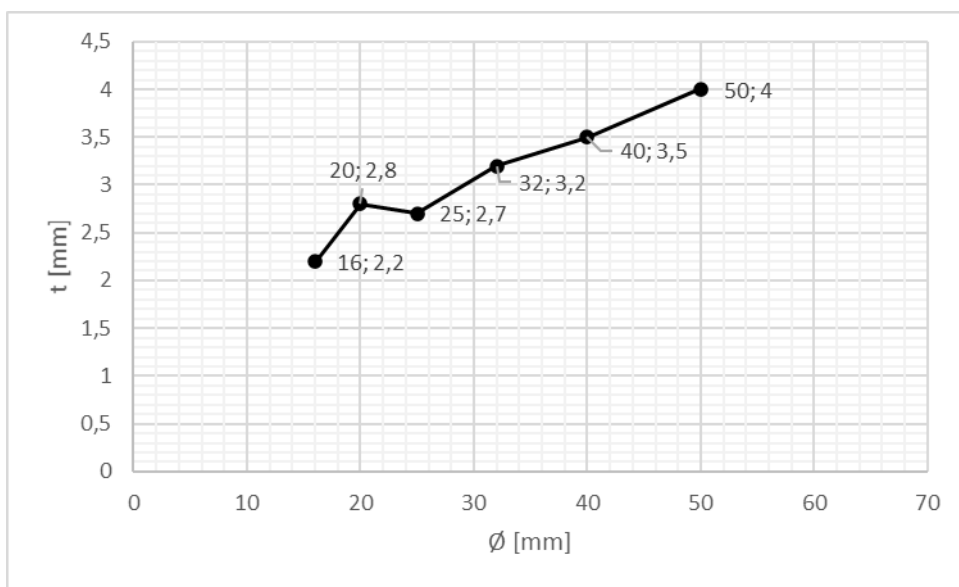
<p>Geberit Mepla</p> <p>Insulation - LS / CS Projecting ≥ 350 mm from both sides of the wall</p>	<p>$\varnothing = 16 - 50$ mm</p> <p>$t = 2.25 - 4.0$ mm</p> <p>Synthetic rubber⁴⁷</p> <p>$T = 17 - 21$ mm</p>	<p>EI 90 – U/C</p>																							
 <table border="1"> <caption>Data for Graph 1: t [mm] vs Ø [mm]</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr><td>16</td><td>2,25</td></tr> <tr><td>20</td><td>2,5</td></tr> <tr><td>26</td><td>3</td></tr> <tr><td>32</td><td>3</td></tr> <tr><td>40</td><td>3,5</td></tr> <tr><td>50</td><td>4</td></tr> </tbody> </table>		Ø [mm]	t [mm]	16	2,25	20	2,5	26	3	32	3	40	3,5	50	4	<p>322042005-2 AW-34, AW-35, AW-36, AW-37, AW-38, AW-39</p>									
Ø [mm]	t [mm]																								
16	2,25																								
20	2,5																								
26	3																								
32	3																								
40	3,5																								
50	4																								
 <table border="1"> <caption>Data for Graph 2: T [mm] vs Ø [mm]</caption> <thead> <tr> <th>Ø [mm]</th> <th>T [mm]</th> </tr> </thead> <tbody> <tr><td>16</td><td>17</td></tr> <tr><td>16</td><td>21</td></tr> <tr><td>20</td><td>17,5</td></tr> <tr><td>20</td><td>18,5</td></tr> <tr><td>26</td><td>18,5</td></tr> <tr><td>26</td><td>19</td></tr> <tr><td>32</td><td>19</td></tr> <tr><td>32</td><td>20,5</td></tr> <tr><td>40</td><td>20,5</td></tr> <tr><td>40</td><td>21</td></tr> <tr><td>50</td><td>21</td></tr> </tbody> </table>		Ø [mm]	T [mm]	16	17	16	21	20	17,5	20	18,5	26	18,5	26	19	32	19	32	20,5	40	20,5	40	21	50	21
Ø [mm]	T [mm]																								
16	17																								
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20	18,5																								
26	18,5																								
26	19																								
32	19																								
32	20,5																								
40	20,5																								
40	21																								
50	21																								

⁴⁷ Elastomeric foam based on synthetic rubber (FEF) according to EN 14304

<p>REHAU Rautitan stabil</p> <p>Insulation - LS / CS Projecting ≥ 350 mm from both sides of the wall</p>	<p>$\varnothing = 16 - 50$ mm</p> <p>$t = 2.6 - 6.0$ mm</p> <p>Synthetic rubber⁴⁸</p> <p>$T = 17 - 21$ mm</p>	<p>EI 90 – U/C</p>																							
 <table border="1"> <caption>Data for t [mm] vs Ø [mm]</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr><td>16</td><td>2,6</td></tr> <tr><td>20</td><td>2,9</td></tr> <tr><td>25</td><td>3,7</td></tr> <tr><td>32</td><td>4,7</td></tr> <tr><td>40</td><td>6</td></tr> <tr><td>50</td><td>6</td></tr> </tbody> </table>		Ø [mm]	t [mm]	16	2,6	20	2,9	25	3,7	32	4,7	40	6	50	6	<p>322042005-2 AW-46, AW-47, AW-48, AW-49, AW-50, AW-51</p>									
Ø [mm]	t [mm]																								
16	2,6																								
20	2,9																								
25	3,7																								
32	4,7																								
40	6																								
50	6																								
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Ø [mm]	T [mm]																								
16	17																								
16	21																								
20	17,5																								
20	18,5																								
26	18,5																								
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32	20,5																								
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40	21																								
50	21																								

⁴⁸ Elastomeric foam based on synthetic rubber (FEF) according to EN 14304

Viega RAXOFIX Insulation - LS / CS Projecting ≥ 350 mm from both sides of the wall	$\varnothing = 16 - 50$ mm	EI 90 – U/C
	$t = 2.2 - 4.0$ mm	
	Synthetic rubber ⁴⁹ $T = 17 - 21$ mm	

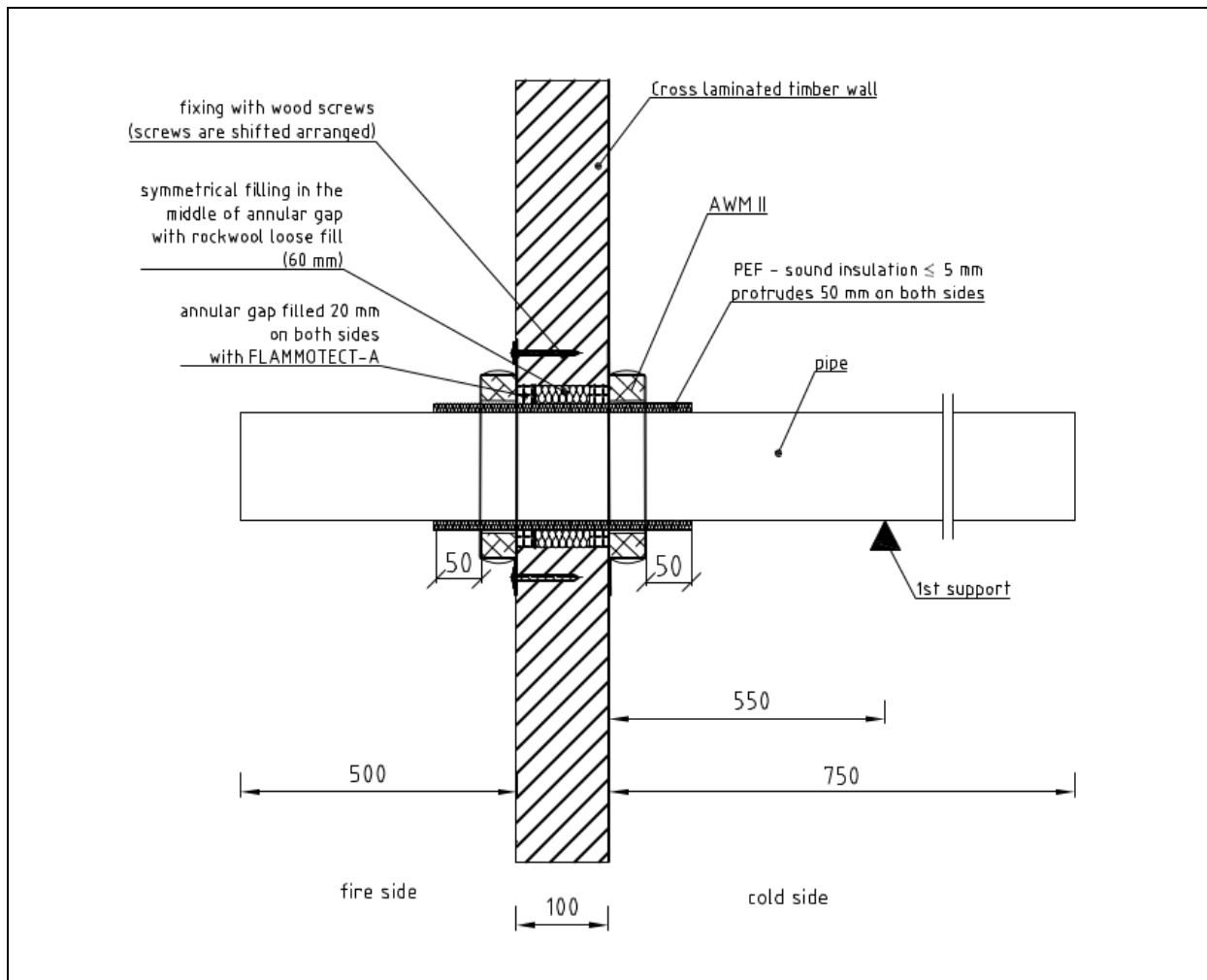


322042005-2
 AW-40, AW.41,
 AW-42, AW-43,
 AW-44, AW-45

⁴⁹ Elastomeric foam based on synthetic rubber (FEF) according to EN 14304

4.11. Non-regulated plastic pipes (Variant N II A)

4.11.1. Detail drawings



NOTE: Variant N II A is identical with AWM II.

4.11.2. Suspension

Plastic pipes must be supported on both sides of the wall construction at a distance of $d_1 \leq 550$ mm.

4.11.3. Annular gaps

Annular gap width	> 10 – 35 mm
Filling	Mineral wool ($\rho \geq 40$ kg/m ³)
Joint filler	FLAMMOTECT-A
Filling depth on both sides	≥ 20 mm

4.11.4. Minimum distance (linear)

Geberit Silent dB20 Ø110 /t6	≥ 50 mm
Metal pipe with non-combustible insulation, $\rho \geq 80$ kg/m ³	≥ 25 mm
All other distances	≥ 100 mm

4.11.5. Insulation

Noise control strips made of PE soft foam are permissible up to a thickness of $T = 5$ mm.

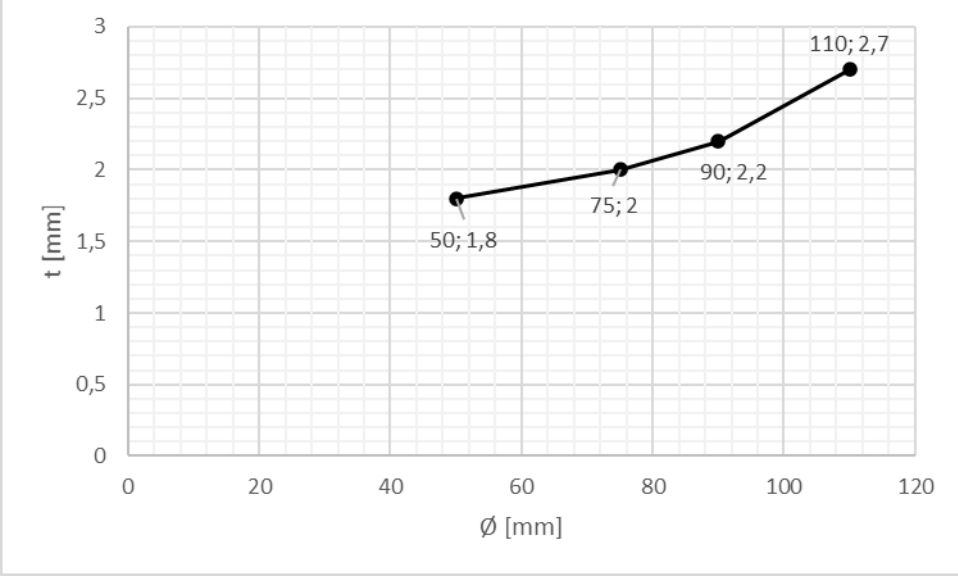
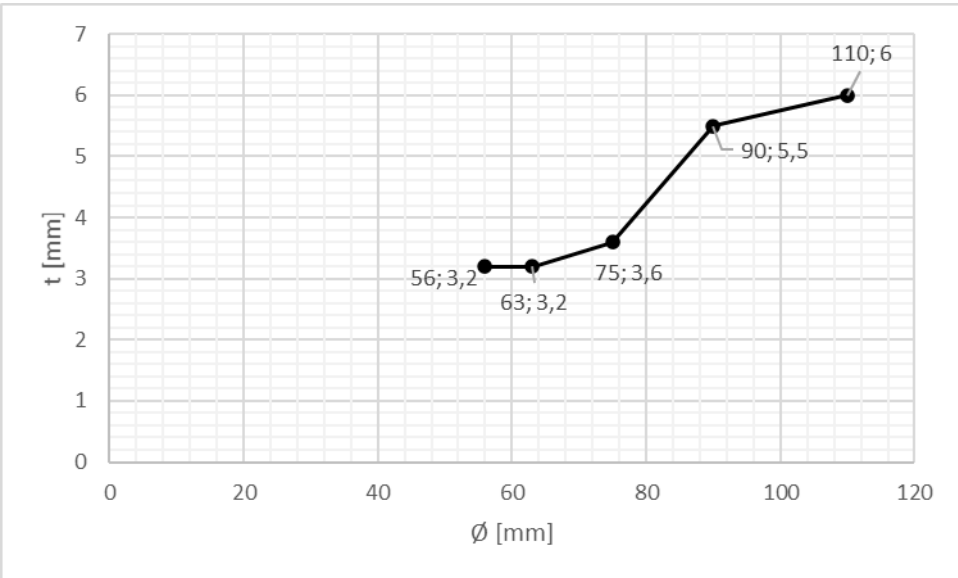
4.11.6. Construction groups

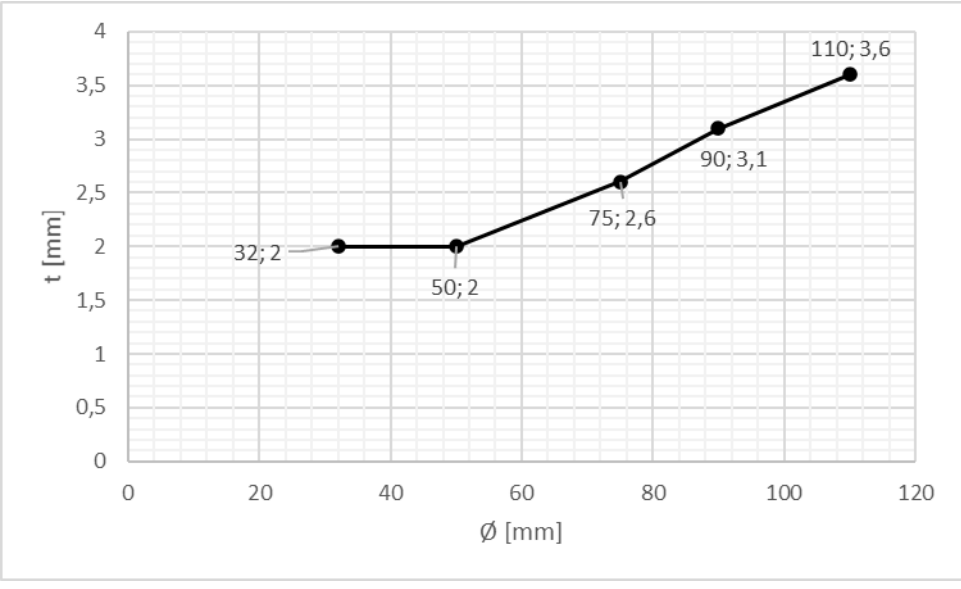
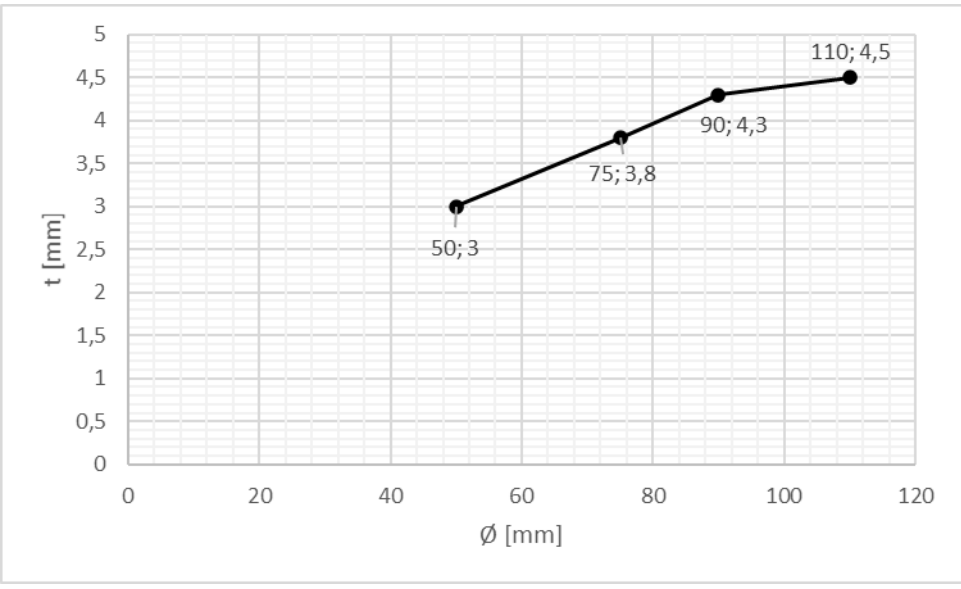
Pipe diameter [mm]	32 - 50	63 - 75	90	110	125	140 – 160
Total thickness of active insert [mm]	6.4	12.8	17.1	19.2	19.2	25.6
Length of active insert [mm]	25.4				38.1	

4.11.7. Fixing of variant N II A

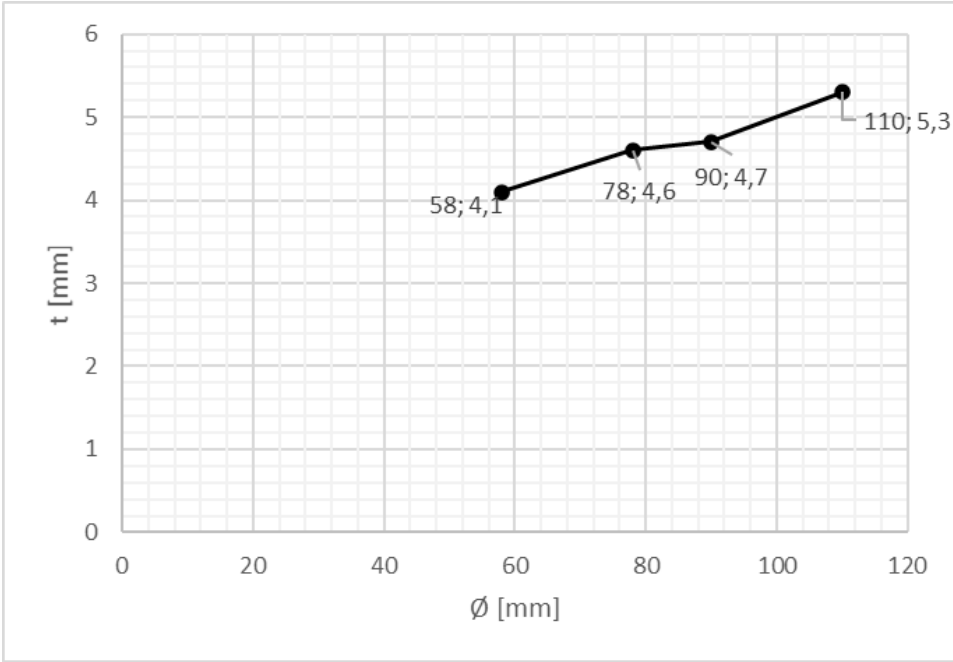
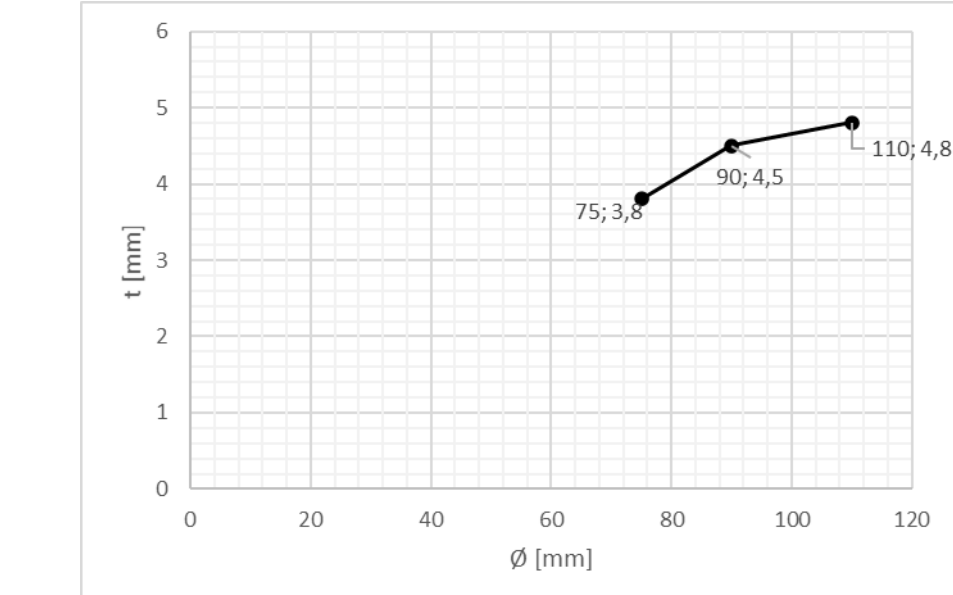
The fire protection collar Variant N II A must be fixed with timber construction screws of length $L = 80$ mm.

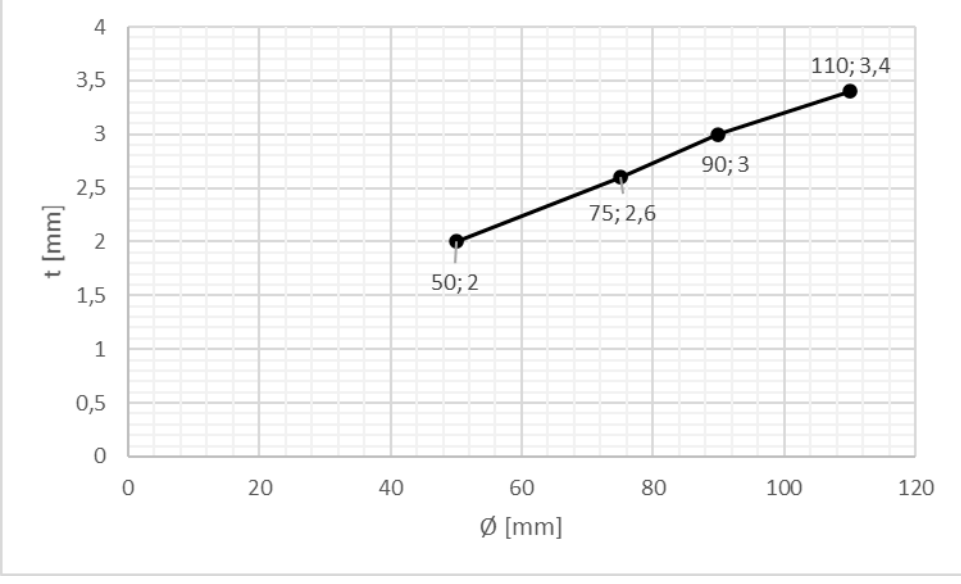
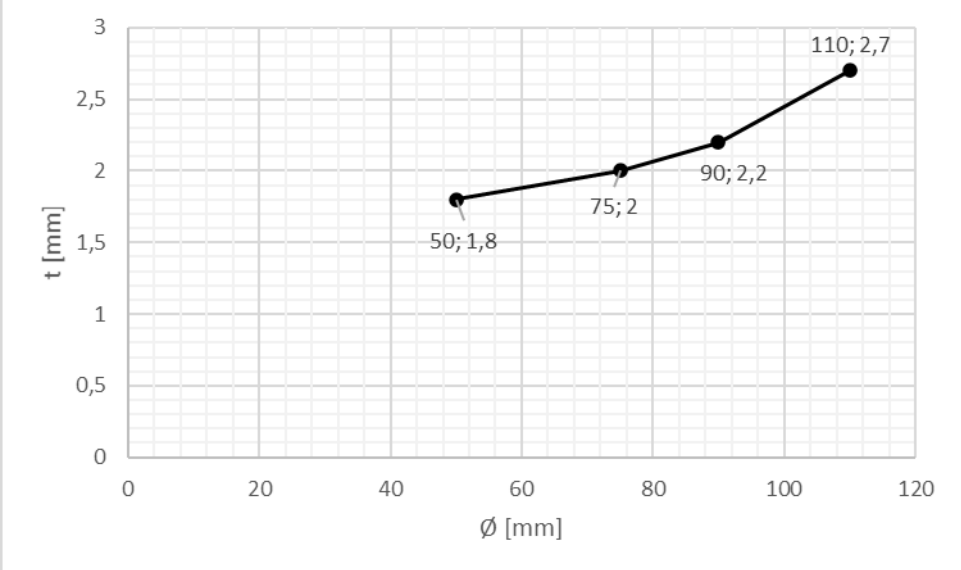
4.11.8. Classification and field of application

Rehau Raupiano light Conel DRAIN	$\varnothing = 40 - 110 \text{ mm}$ $t = 1.8 - 2.7 \text{ mm}$	EI 90-U/U												
 <table border="1"> <caption>Data for Rehau Raupiano light graph</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>1,8</td> </tr> <tr> <td>75</td> <td>2</td> </tr> <tr> <td>90</td> <td>2,2</td> </tr> <tr> <td>110</td> <td>2,7</td> </tr> </tbody> </table>		Ø [mm]	t [mm]	50	1,8	75	2	90	2,2	110	2,7	322042005-1 AW-14, AW-15, AW-16, AW-17		
Ø [mm]	t [mm]													
50	1,8													
75	2													
90	2,2													
110	2,7													
Geberit Silent dB20	$\varnothing = 56 - 110 \text{ mm}$ $t = 3.2 - 6.0 \text{ mm}$	EI 90-U/U												
 <table border="1"> <caption>Data for Geberit Silent dB20 graph</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>56</td> <td>3,2</td> </tr> <tr> <td>63</td> <td>3,2</td> </tr> <tr> <td>75</td> <td>3,6</td> </tr> <tr> <td>90</td> <td>5,5</td> </tr> <tr> <td>110</td> <td>6</td> </tr> </tbody> </table>		Ø [mm]	t [mm]	56	3,2	63	3,2	75	3,6	90	5,5	110	6	322042005-1 AW-1, AW-2, AW-3
Ø [mm]	t [mm]													
56	3,2													
63	3,2													
75	3,6													
90	5,5													
110	6													

<p>Geberit Silent PP</p>	<p>$\varnothing = 40 - 110 \text{ mm}$ $t = 1.8 - 2.7 \text{ mm}$</p>	<p>EI 90-U/U</p>												
 <table border="1"> <caption>Data for Geberit Silent PP</caption> <thead> <tr> <th>\varnothing [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>32</td> <td>2</td> </tr> <tr> <td>50</td> <td>2</td> </tr> <tr> <td>75</td> <td>2,6</td> </tr> <tr> <td>90</td> <td>3,1</td> </tr> <tr> <td>110</td> <td>3,6</td> </tr> </tbody> </table>		\varnothing [mm]	t [mm]	32	2	50	2	75	2,6	90	3,1	110	3,6	<p>322042005-1 AW-4, AW-5, AW-6</p>
\varnothing [mm]	t [mm]													
32	2													
50	2													
75	2,6													
90	3,1													
110	3,6													
<p>Geberit Silent Pro</p>	<p>$\varnothing = 50 - 110 \text{ mm}$ $t = 3.0 - 4.5 \text{ mm}$</p>	<p>EI 90-U/U</p>												
 <table border="1"> <caption>Data for Geberit Silent Pro</caption> <thead> <tr> <th>\varnothing [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>3</td> </tr> <tr> <td>75</td> <td>3,8</td> </tr> <tr> <td>90</td> <td>4,3</td> </tr> <tr> <td>110</td> <td>4,5</td> </tr> </tbody> </table>		\varnothing [mm]	t [mm]	50	3	75	3,8	90	4,3	110	4,5	<p>322042005-1 AW-7, AW-8, AW-9</p>		
\varnothing [mm]	t [mm]													
50	3													
75	3,8													
90	4,3													
110	4,5													



HAKAN Silenta Premium	$\varnothing = 58 - 110 \text{ mm}$ $t = 4.1 - 5.3 \text{ mm}$	EI 90-U/U										
 <table border="1"><thead><tr><th>\varnothing [mm]</th><th>t [mm]</th></tr></thead><tbody><tr><td>58</td><td>4,1</td></tr><tr><td>78</td><td>4,6</td></tr><tr><td>90</td><td>4,7</td></tr><tr><td>110</td><td>5,3</td></tr></tbody></table>		\varnothing [mm]	t [mm]	58	4,1	78	4,6	90	4,7	110	5,3	322042005-1 AW-31, AW-32, AW-33
\varnothing [mm]	t [mm]											
58	4,1											
78	4,6											
90	4,7											
110	5,3											
Poloplast POLO-KAL 3S	$\varnothing = 75 - 110 \text{ mm}$ $t = 3.8 - 4.8 \text{ mm}$	EI 90-U/U										
 <table border="1"><thead><tr><th>\varnothing [mm]</th><th>t [mm]</th></tr></thead><tbody><tr><td>75</td><td>3,8</td></tr><tr><td>90</td><td>4,5</td></tr><tr><td>110</td><td>4,8</td></tr></tbody></table>		\varnothing [mm]	t [mm]	75	3,8	90	4,5	110	4,8	322042005-1 AW-26, AW-27		
\varnothing [mm]	t [mm]											
75	3,8											
90	4,5											
110	4,8											

Poloplast POLO-KAL NG Poloplast POLO-KAL XS	$\varnothing = 40 - 110 \text{ mm}$ $t = 1.8 - 2.7 \text{ mm}$	EI 90-U/U										
 <table border="1"> <caption>Data for Poloplast POLO-KAL NG</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>2</td> </tr> <tr> <td>75</td> <td>2,6</td> </tr> <tr> <td>90</td> <td>3</td> </tr> <tr> <td>110</td> <td>3,4</td> </tr> </tbody> </table>		Ø [mm]	t [mm]	50	2	75	2,6	90	3	110	3,4	322042005-1 AW-22, AW-23, AW-24, AW-25
Ø [mm]	t [mm]											
50	2											
75	2,6											
90	3											
110	3,4											
Rehau Raupiano Plus	$\varnothing = 50 - 110 \text{ mm}$ $t = 1.8 - 2.7 \text{ mm}$	EI 90-U/U										
 <table border="1"> <caption>Data for Rehau Raupiano Plus</caption> <thead> <tr> <th>Ø [mm]</th> <th>t [mm]</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>1,8</td> </tr> <tr> <td>75</td> <td>2</td> </tr> <tr> <td>90</td> <td>2,2</td> </tr> <tr> <td>110</td> <td>2,7</td> </tr> </tbody> </table>		Ø [mm]	t [mm]	50	1,8	75	2	90	2,2	110	2,7	322042005-1 AW-10, AW-11, AW-12, AW-13
Ø [mm]	t [mm]											
50	1,8											
75	2											
90	2,2											
110	2,7											



WAVIN AS+	$\varnothing = 50 - 110 \text{ mm}$ $t = 2.7 - 4.3 \text{ mm}$	EI 90-U/U														
<table border="1"><thead><tr><th>\varnothing [mm]</th><th>t [mm]</th></tr></thead><tbody><tr><td>50</td><td>3</td></tr><tr><td>75</td><td>3,5</td></tr><tr><td>90</td><td>4,6</td></tr><tr><td>110</td><td>5,3</td></tr></tbody></table>		\varnothing [mm]	t [mm]	50	3	75	3,5	90	4,6	110	5,3	322042005-1 AW-28, AW-29, AW-30				
\varnothing [mm]	t [mm]															
50	3															
75	3,5															
90	4,6															
110	5,3															
WAVIN SiTEch+	$\varnothing = 32 - 110 \text{ mm}$ $t = 2.0 - 3.4 \text{ mm}$	EI 90-U/U														
<table border="1"><thead><tr><th>\varnothing [mm]</th><th>t [mm]</th></tr></thead><tbody><tr><td>32</td><td>2</td></tr><tr><td>40</td><td>2</td></tr><tr><td>50</td><td>2,1</td></tr><tr><td>75</td><td>2,6</td></tr><tr><td>90</td><td>3,1</td></tr><tr><td>110</td><td>3,6</td></tr></tbody></table>		\varnothing [mm]	t [mm]	32	2	40	2	50	2,1	75	2,6	90	3,1	110	3,6	322042005-1 AW-18, AW-19, AW-20, AW-21
\varnothing [mm]	t [mm]															
32	2															
40	2															
50	2,1															
75	2,6															
90	3,1															
110	3,6															



5. Limitations

The above classifications are valid for the FLAMRO products in CLT for the direct application according to EN 1366-3:2009-05 and following prEN 1366-3:2020.

5.1. Legal notice

This report does not constitute any type approval or certification of the tested product.

**IBS-INSTITUT FÜR BRANDSCHUTZTECHNIK UND
SICHERHEITSFORSCHUNG GESELLSCHAFT M.B.H.
Akkreditierte Prüf-, Inspektions- und Zertifizierungsstelle**

Mr Manfred EGLAUER
Engineer

Mr Ulrich STÖCKL
Monitoring