

A large, stylized arrow graphic pointing to the right, composed of a light gray arrow shape with a red arrowhead, located in the bottom left corner of the page.


Solutions catalog
FIRE PROTECTION OF CIVIL
ENGINEERING STRUCTURES

over **30 000** m² of production space
located on **16** ha of plots housing **7** production facilities



over **750** people working
for the Mercor Group

Stable
technological advancement
automation, software
and production management
intelligent solutions

A light gray map of Asia and Oceania with red outlines, serving as a background for the text.

4 **product divisions:**

- » gravitational smoke exhaust
- » fire ventilation
- » building structure protections
- » fire partitions provided by DFM Doors company

10 subsidiaries
supplying over **50** markets
worldwide

production supported by IT systems

i.e. ERP Vault and trademark Shop Floor Software



➤ MERCOR GROUP

30 YEARS OF RELIABLE SOLUTIONS IN DESIGNING PASSIVE FIRE PROTECTION

We are one of the largest entities in Poland, operating in the passive fire protection system industry. We are part of an international capital group – one of the industry's European leaders. Our comprehensive offer includes: smoke ventilation systems, heat dissipation and roof illuminators, fire ventilation systems and fire protection devices for civil engineering structures. Our customers are also offered comprehensive aftersales service.

We have been providing safety for more than 30 years. The company's portfolio consists of hundreds of projects completed both in Poland and abroad. We combine our expertise with innovation, creating new solutions to meet the challenges of the modern construction industry.

We are a publicly traded company. Since July 2007, "MERCOR" S.A. shares are listed on the Warsaw Stock Exchange.

Providing comprehensive services, we cooperate closely with building designers and contractors. We offer support in selecting and designing fire protection systems, manufacture components for these systems, ship them to the construction site and erect or install them on-site. We also provide comprehensive aftersales service to guarantee long-term functioning of our systems.

Most of the items we offer are manufactured upon individual orders of the customer who may specify the required product parameters, while maintaining safety standards and adhering to legal requirements.

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PRODUCTS

Calcium silicate (CaSil)
board systems



mcr Silboard

European Technical Assessment ETA 19/0736
Certificate of constancy of performance 1396-CPR-0188
European Technical Assessment ETA-18/0546
Certificate of constancy of performance 1488-CPR-0698/W
Declaration of performance DOP/HZ/01/2018
National Technical Assessment ITB-KOT.0561
National Certificate of constancy of performance 020-UWB-2738/W
National declaration of performance KDWU/HZ/01/2019
National Technical Assessment ITB-KOT.0560
National Certificate of constancy of performance 020-UWB-2713/W
National declaration of performance KDWU/HZ/01/2018

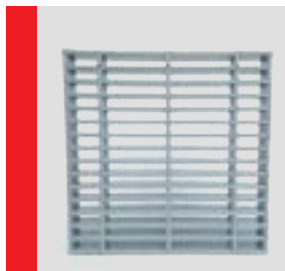
Magnesium (MGO)
board systems



mcr Tecbor

European Technical Assessment ETA 18/1017
Certificate of constancy of performance 1220-CPR-1912
Declaration of performance TCRS-TB-03

Intumescent fire grilles



Tecsel

CIDEMCO-TECNALIA report no. 23548

Intumescent fire grilles



mcr SilGrill

Building Research Institute assessment report no. 01031/21/Z00NP

Fireproof adhesive



mcr Sil-MK

European Technical Assessment ETA-18/0546
Certificate of constancy of performance 1488-CPR-0698/W
European Technical Assessment ETA 19/0736
Certificate of constancy of performance 1396-CPR-0188
Declaration of performance DOP/HZ/01/2018
National Technical Assessment ITB-KOT.0560
National Technical Assessment ITB-KOT.0561

Intumescent gasket



mcr Sil-MU

European Technical Assessment ETA 19/0736
Certificate of constancy of performance 1396-CPR-0188
Declaration of performance DOP/HZ/2018
National Technical Assessment ITB-KOT.0561
National Certificate of constancy of performance 020-UWB-2738/W
National declaration of performance KDWU/HZ/01/2019

Spray-on flame retardant system

mcr Tecwool F



European Technical Assessment ITeC ETA 11/0185
Certificate of constancy of performance 1220-CPR-1110
Declaration of performance TCRS-TW-01
National Technical Assessment ITB-KOT-2021/1800
National Certificate of constancy of performance 020-UWB-2468/W
National declaration of performance KDWU/HZ/03/2017

Spray-on flame retardant system

mcr Isoverm 825
mcr Tecwool 825



National Technical Assessment ITB-KOT-2021/1717
National Certificate of Constancy of Performance 020/UWB/2861/W
National declaration of performance KDWU/HZ/01/2021

Flame retardant
intumescent collar

mcr PS



European Technical Assessment ETA-17/0676
Certificate of constancy of performance 1488-CPR-0624/W
Declaration of performance DoP 84033

Intumescent fire wrap

mcr PS-25



European Technical Assessment ETA-17/0676
Certificate of constancy of performance 1488-CPR-0624/W
Declaration of performance DoP 84101

Intumescent fire laminate

mcr Dunastrip



European Technical Assessment ETA 21/0566
Certificate of constancy of performance 1220-CPR-2126
Declaration of performance 84106

Elastic fire rated
intumescent paint

mcr Polylack Elastic



European Technical Assessment ETA-18/0170
Certificate of constancy of performance 1488-CPR-0679/W
European Technical Assessment ETA-18/0169
Certificate of constancy of performance 1488-CPR-0701/W
European Technical Assessment ETA 19/0321
Certificate of constancy of performance 1396-CPR-0160
Declaration of performance DoP 81500

FIRE PROTECTION OF STEEL STRUCTURES

Sealant



mcr Tecbor Joint Paste

European Technical Assessment ETA 18/1017
Certificate of constancy of performance 1220-CPR-1912

Adhesive



mcr Tecsel Adhesive

European Technical Assessment ETA 18/1017
Certificate of constancy of performance 1220-CPR-1912

Intumescent fire paint



mcr Polylack F

European Technical Assessment ETA-18/0171
Certificate of constancy of performance 1488-CPR-0680/W
Declaration of performance DoP 81282
European Technical Assessment ETA 17/1040
Certificate of constancy of performance 1396-CPR-0158

Intumescent fire paste



mcr Polylack K

European Technical Assessment ETA-18/0171
Certificate of constancy of performance 1488-CPR-0680/W
European Technical Assessment ETA 17/1040
Certificate of constancy of performance 1396-CPR-0158
Declaration of performance DoP 81303

Fireproof intumescent paste
with graphite



mcr Polylack KG

European Technical Assessment ETA-18/0171
Certificate of constancy of performance 1488-CPR-0680/W
European Technical Assessment ETA 17/1040
Certificate of constancy of performance 1396-CPR-0158
Fire resistance rating up to EI 120
Declaration of performance DoP 81340

Firestop
sealing tape



mcr Dunaseal

European Technical Assessment ETA-18/0475
Certificate of constancy of performance 1488-CPR-0678/W
Declaration of performance DoP 81400

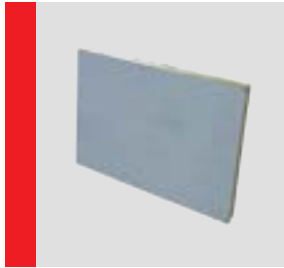
Intumescent fire bandage



mcr PS Bandage

European Technical Assessment ETA-18/0171
Certificate of constancy of performance 1488-CPR-0680/W
European Technical Assessment ETA 17/1040
Certificate of constancy of performance 1396-CPR-0158
European Technical Assessment ETA 19/0321
Certificate of constancy of performance 1396-CPR-0160
Declaration of performance DoP 84151

Mineral wool board covered with intumescent paint



mcr Dunaboard

European Technical Assessment ETA-18/0171
Certificate of constancy of performance 1488-CPR-0680/W
European Technical Assessment ETA-17/1040
Certificate of constancy of performance 1396-CPR-0158
Declaration of performance DOP 81070

Water-based intumescent paint system for flame retardant treatments



mcr Polylack W

European Technical Assessment ETA-15/0801
Certificate of constancy of performance 1301-CPR-1145
Declaration of performance DoP 81230

Solvent-based intumescent paint system for flame retardant treatments



mcr Polylack A

European Technical Assessment ETA-17/0735
Certificate of constancy of performance 1301-CPR-1376
Declaration of performance DoP 81250

Solvent-based intumescent paint system



**mcr Polylack Wood
Transparent**

National Technical Assessment NME-28231187 001
Certificate of constancy of performance MC69254704 0001
Declaration of performance 81270

Water-based intumescent paint system




**mcr Polylack Wood
Bianco Aqua**

National Technical Assessment NME-28231187 001
Certificate of constancy of performance MC69254704 0001
Declaration of performance 81260



STEEL STRUCTURES



➤ The key principle the company follows is the endeavor to meet the needs of the constantly changing and competitive market. By providing solutions that do not boil down to mere development and marketing of fire protection materials, we contribute to increasing safety and preventing both personal and property damage. We support our customers in optimizing passive fire protection solutions, including structure protection.

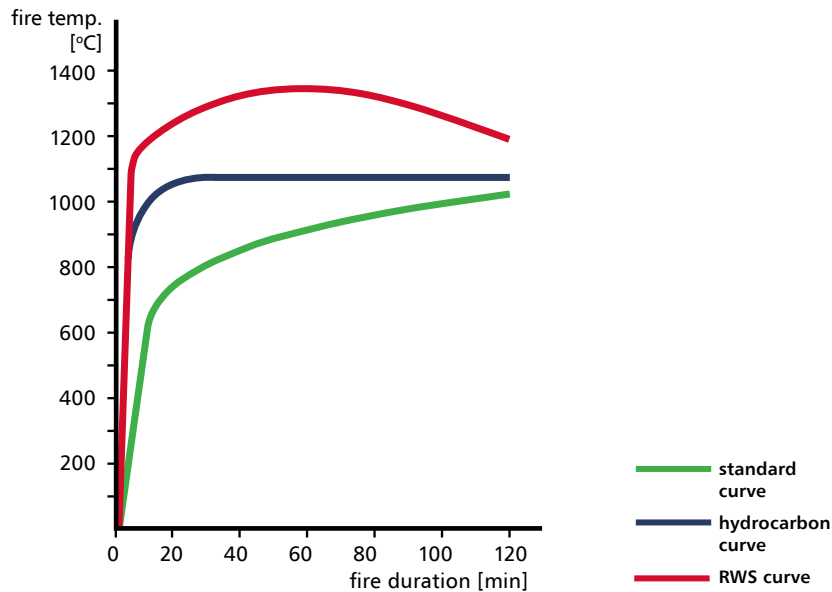
Mercor experts have developed protective system solutions that comply with construction law and standard requirements. By offering comprehensive support, we guarantee safety meeting the expectations of today's market.

All products in our offer have been tested by independent laboratories and hold specialized approval documents. The range of structure protection solutions includes:

- » plate systems
- » spray-on systems
- » service penetration systems
- » intumescent coating systems
- » spray-on acoustic coatings

1.1 | Curves presenting fire resistance ratings of construction elements

The assumption of the appropriate fire pattern for a fire protection system when testing fire resistance ratings of elements creates the possibility to assess the behavior of materials under actual fire conditions.



The **standard (cellulose) curve** is defined (as per EN 1363-1) in order to present the combustion of cellulose materials (paper, wood, etc.).

The **hydrocarbon curve** is defined (as per EN 1363-2) in order to present a very high intensity fire. They usually occur at chemical or petrochemical plants and oil platforms. A characteristic feature of this type of fire is the rapid temperature increase and quick spreading of the fire.

Rijkswaterstaat tunnel curve (RWS Netherlands) is defined to present the course of a fire in a tunnel. It reaches the highest fire temperature among all the model curves.

1.1.2 | Flame retardant treatments for steel columns and beams

The fire safety of facilities with a steel structural system depends on the preventive measures, as well as on active and passive fire protection measures. Active protection (monitoring and alarm devices, as well as extinguishing systems) and passive protection (appropriate structural solutions) are aimed to reduce the thermal impact during a fire and/or limit its range.

Steel structures are characterized by a poor fire endurance R. At the design stage, in order to mitigate the risk, appropriate fire protection measures must be used, ensuring proper facility resistance under fire conditions.

„MERCOR“ S.A. offers solutions allowing steel structures to achieve fire resistance ratings of R15–R360, both under standard fire and hydrocarbon fire conditions.

1.1.3 | Calculating the section factor for steel sections

Flame retardant treatments applied onto structures form a barrier that results in slower heating of the element, whereby it can maintain its load-bearing features for a longer time under fire conditions. The minimum flame retardant material thickness is chosen based on the type of fire, the structure's fire resistance rating and the critical temperature. Moreover, it depends on the element's section factor (exposure under fire conditions).

As a rule of thumb, massive sections have a low section factor compared to thin-walled sections with the same circumference, whose section factor is high. During a fire, thin-walled sections reach the critical temperature of about 500°C faster, therefore they require thicker cladding than massive sections.

1.1.4 | Section factor of contour-protected sections

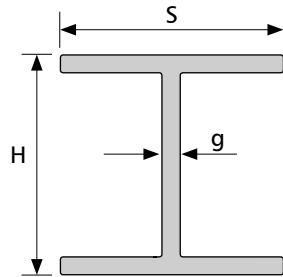
The section factor for sections calculated for the protection using the contour method concerns proofing with intumescent paint and flame retardant sprays.

The section factor U/A is determined as the relationship between the heated section circumference and its cross-section area U/A (m^{-1}):

U – heated circumference [m]

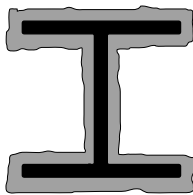
A – cross-section area [m^2]

$$\frac{U}{A} = \frac{\text{heated circumference}}{\text{sectional area}} \left[\frac{m}{m^2} = m^{-1} \right]$$

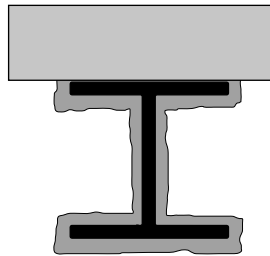


H – total section height [m]
 S – section foot width [m]
 g – section web thickness [m]

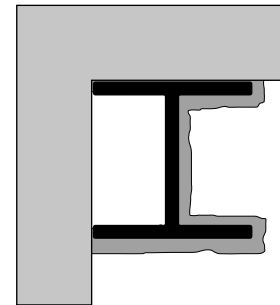
Sample formulas for calculating the length of the heated circumference U for an I-section section for various insulation versions:



Section insulation from four sides:
 $U = 2H + 4S - 2g$ [m]



Section insulation from three sides:
 $U = 2H + 3S - 2g$ [m]



Section insulation from two sides:
 $U = H + 2S - 2g$ [m]

1.1.5 | Section factor of sections with boxed protection

The section factor for the sections calculated for boxed protection concerns proofing with fireproof boards.

The section factor U/A is determined as the relationship between the heated section circumference and its cross-section area U/A (m^{-1}):

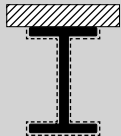
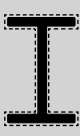
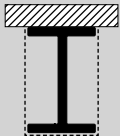

U – heated circumference [m]

A – cross-section area [m^2]

1.1.6 | Section factor for open sections

							section factor U/A for protective systems			
							contour		boxed	
							3-sided	4-sided	3-sided	4-sided
symbol	section dimensions		thickness		weight [kg/m]	sectional area [cm ²]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
	height H [mm]	width S [mm]	web g [mm]	flange G [mm]						
I 80	80	42	3,9	5,9	5,94	7,57	347	402	267	323
I 100	100	50	4,5	6,8	8,34	10,6	302	350	236	284
I 120	120	58	5,1	7,7	11,1	14,2	269	310	210	251
I 140	140	66	5,7	8,6	14,3	18,2	240	276	191	227
I 160	160	74	6,3	9,5	17,9	22,8	219	251	173	206
I 180	180	82	6,9	10,4	21,9	27,9	200	230	159	188
I 200	200	90	7,5	11,3	26,2	33,4	186	213	147	174
I 220	220	98	8,1	12,2	31,1	39,5	172	197	137	162
I 240	240	106	8,7	13,1	36,2	46,1	161	184	128	151
I 260	260	113	9,4	14,1	41,9	53,3	149	170	119	140
I 300	300	125	10,8	16,2	54,2	69	132	150	106	124
I 340	340	137	12,2	18,3	68,0	86,7	117	133	95	111
I 360	360	143	13,0	19,5	76,1	97	110	125	89	104
I 400	400	155	14,4	21,6	92,4	118	100	113	81	95
I 450	450	170	16,2	24,3	115	147	90	101	73	85
I 500	500	185	18,0	27,0	141	179	81	92	67	77
I 550	550	200	19,0	30,0	166	212	76	85	62	71
I 600	600	215	21,6	32,4	199	254	68	76	56	65

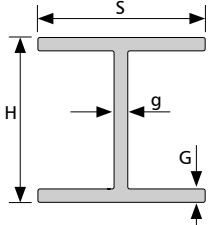
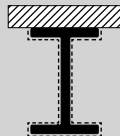

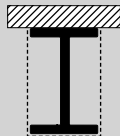
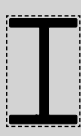
1.1.7 | Section factor for IPE open sections

							section factor U/A for protective systems			
							contour		boxed	
							3-sided	4-sided	3-sided	4-sided
										
symbol	section dimensions		thickness		weight [kg/m]	sectional area [cm ²]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
	height H [mm]	width S [mm]	web g [mm]	flange G [mm]						
IPE 80	80	46	3,8	5,2	6,0	7,64	370	430	270	330
IPE 100	100	55	4,1	5,7	8,1	10,3	335	389	248	301
IPE 120	120	64	4,4	6,3	10,4	13,2	312	360	231	279
IPE 140	140	73	4,7	6,9	12,9	16,4	292	336	216	260
IPE 160	160	82	5,0	7,4	15,8	20,1	270	310	200	241
IPE 180	180	91	5,3	8,0	18,8	23,9	254	293	189	227
IPE 200	200	100	5,6	8,5	22,4	28,5	235	270	176	211
IPE 220	220	110	5,9	9,2	26,2	33,4	221	254	165	198
IPE 240	240	120	6,2	9,8	30,7	39,1	206	236	154	185
IPE 270	270	135	6,6	10,2	36,1	45,9	198	227	148	177
IPE 300	300	150	7,1	10,7	42,2	53,8	188	216	140	168
IPE 330	330	160	7,5	11,5	49,1	62,6	175	201	131	157
IPE 360	360	170	8,0	12,7	57,1	72,7	163	187	123	146
IPE 400	400	180	8,6	13,5	66,3	84,5	153	174	116	138
IPE 450	450	190	9,4	14,6	77,6	98,8	144	163	111	130
IPE 500	500	200	10,2	16,0	90,7	116	134	151	104	121
IPE 550	550	210	11,1	17,2	106	134	125	141	98	114
IPE 600	600	220	12,0	19,0	122	156	116	130	92	106

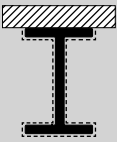

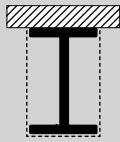

1.1.8 | Section factor for HEA open sections

							section factor U/A for protective systems			
							contour		boxed	
							3-sided	4-sided	3-sided	4-sided
							[m ⁻¹]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
symbol	section dimensions		thickness		weight [kg/m]	sectional area [cm ²]				
	height H [mm]	width S [mm]	web g [mm]	flange G [mm]						
HEA 100	96	100	5,0	8,0	16,7	21,2	218	265	138	185
HEA 120	114	120	5,0	8,0	19,9	25,3	221	268	138	185
HEA 140	133	140	5,5	8,5	24,7	31,4	209	253	130	174
HEA 160	152	160	6,0	9,0	30,4	38,8	193	234	120	161
HEA 180	171	180	6,0	9,5	35,5	45,3	186	226	116	155
HEA 200	190	200	6,5	10,0	42,3	53,8	175	212	108	145
HEA 220	210	220	7,0	11,0	50,5	64,3	162	196	100	134
HEA 240	230	240	7,5	12,0	60,3	76,8	148	179	92	123
HEA 260	250	260	7,5	12,5	68,2	86,8	141	171	88	118
HEA 280	270	280	8,0	13,0	76,4	97,3	136	165	85	114
HEA 300	290	300	8,5	14,0	88,3	113	126	153	78	105
HEA 320	310	300	9,0	15,5	97,6	124	118	142	75	99
HEA 340	330	300	9,5	16,5	105	133	113	135	73	95
HEA 360	350	300	10,0	17,5	112	143	107	128	70	91
HEA 400	390	300	11,0	19,0	125	159	102	121	68	87
HEA 450	440	300	11,5	21,0	140	178	97	113	67	84
HEA 500	490	300	12,0	23,0	155	198	92	107	65	80
HEA 550	540	300	12,5	24,0	166	212	91	105	66	80
HEA 600	590	300	13,0	25,0	178	226	89	103	66	79
HEA 650	640	300	13,5	26,0	190	242	88	100	66	78
HEA 700	690	300	14,5	27,0	204	260	85	97	65	77
HEA 800	790	300	15,0	28,0	224	286	84	95	66	77
HEA 900	890	300	16,0	30,0	252	321	81	91	65	75
HEA 1000	990	300	16,5	31,0	272	347	81	90	66	75

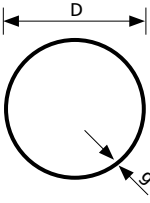
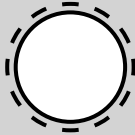
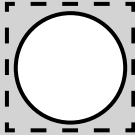
1.1.9| Section factor for HEB open sections

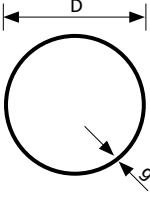
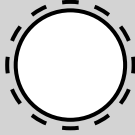
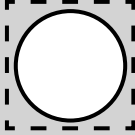
							section factor U/A for protective systems			
							contour		boxed	
							3-sided	4-sided	3-sided	4-sided
										
symbol	section dimensions		thickness		weight [kg/m]	sectional area [cm ²]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
	height H [mm]	width S [mm]	web g [mm]	flange G [mm]						
HEB 100	100	100	6,0	10,0	20,4	26	180	219	116	154
HEB 120	120	120	6,5	11,0	26,7	34	167	202	106	142
HEB 140	140	140	7,0	12,0	33,7	43	155	188	98	131
HEB 160	160	160	8,0	13,0	42,6	54,3	140	170	89	118
HEB 180	180	180	8,5	14,0	51,2	65,3	132	160	83	111
HEB 200	200	200	9,0	15,0	61,3	78,1	122	148	77	103
HEB 220	220	220	9,5	16,0	71,5	91	116	140	73	97
HEB 240	240	240	10,0	17,0	83,2	106	108	131	68	91
HEB 260	260	260	10,0	17,5	93,0	118	106	128	67	89
HEB 280	280	280	10,5	18,0	103	131	103	124	65	86
HEB 300	300	300	11,0	19,0	117	149	96	117	61	81
HEB 320	320	300	11,5	20,5	127	161	92	110	59	78
HEB 340	340	300	12,0	21,5	134	171	89	106	58	75
HEB 360	360	300	12,5	22,5	142	181	86	103	57	73
HEB 400	400	300	13,5	24,0	155	198	83	98	56	71
HEB 450	450	300	14,0	26,0	171	218	80	94	56	69
HEB 500	500	300	14,5	28,0	187	239	77	89	55	67
HEB 550	550	300	15,0	29,0	199	254	76	88	56	67
HEB 600	600	300	15,5	30,0	212	270	75	86	56	67
HEB 650	650	300	16,0	31,0	225	286	75	85	56	67
HEB 700	700	300	17,0	32,0	241	306	73	83	56	66
HEB 800	800	300	17,5	33,0	262	334	73	82	57	66
HEB 900	900	300	18,5	35,0	291	371	71	79	57	65
HEB 1000	1000	300	10,0	36,0	314	400	71	78	58	65

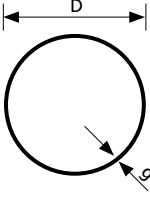
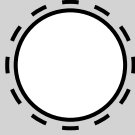
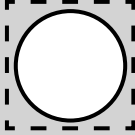
1.1.10 | Section factor for HEM open sections

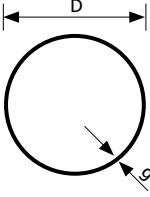
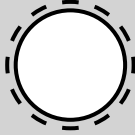
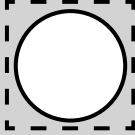
							section factor U/A for protective systems			
							contour		boxed	
							3-sided	4-sided	3-sided	4-sided
										
symbol	section dimensions		thickness		weight [kg/m]	sectional area [cm ²]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
	height H [mm]	width S [mm]	web g [mm]	flange G [mm]						
HEM 100	120	106	12,0	20,0	41,8	53,2	97	117	66	85
HEM 120	140	126	12,5	21,0	52,1	66,4	93	112	62	81
HEM 140	160	146	13,0	22,0	63,2	80,6	89	107	58	76
HEM 160	180	166	14,0	23,0	76,2	97,1	83	100	55	72
HEM 180	200	186	14,5	24,0	88,9	113	80	97	52	69
HEM 200	220	206	15,0	25,0	103	131	76	92	50	66
HEM 220	240	226	15,5	26,0	117	149	74	89	48	63
HEM 240	270	248	18,0	32,0	157	200	61	73	40	52
HEM 260	290	268	18,0	32,5	172	220	60	72	39	51
HEM 280	310	288	18,5	33,0	189	240	59	71	38	50
HEM 300	340	310	21,0	39,0	238	303	51	61	33	43
HEM 320	359	309	21,0	40,0	245	312	51	60	33	43
HEM 340	377	309	21,0	40,0	248	316	51	61	34	44
HEM 360	395	308	21,0	40,0	250	319	51	61	35	45
HEM 400	432	307	21,0	40,0	256	326	52	62	36	46
HEM 450	478	307	21,0	40,0	263	335	54	63	38	47
HEM 500	524	306	21,0	40,0	270	344	55	64	40	49
HEM 550	572	306	21,0	40,0	278	354	56	65	41	50
HEM 600	620	305	21,0	40,0	285	364	57	66	43	51
HEM 650	668	305	21,0	40,0	293	374	58	67	44	53
HEM 700	716	304	21,0	40,0	301	383	59	67	46	54
HEM 800	814	303	21,0	40,0	317	404	61	69	48	56
HEM 900	910	302	21,0	40,0	333	424	62	70	51	58
HEM 1000	1008	302	21,0	40,0	349	444	64	71	53	60

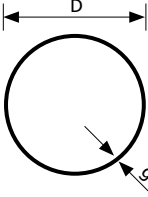
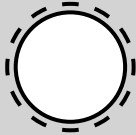
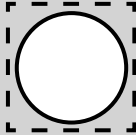
1.1.11 | Circular hollow sections, as per PN-EN 10210-2:2007 and PN-EN 10219-2:2007

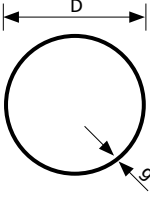
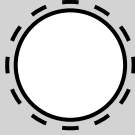
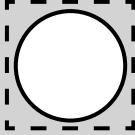
				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
21,3	2,0	0,95	1,21	554	705
	2,3	1,08	1,37	489	622
	2,5	1,16	1,48	453	576
	2,6	1,20	1,53	438	557
	3,0	1,35	1,72	390	496
	3,2	1,43	1,82	368	469
26,9	2,0	1,23	1,56	542	690
	2,3	1,40	1,78	475	605
	2,5	1,50	1,92	441	561
	2,6	1,56	1,98	427	544
	3,0	1,77	2,25	376	479
	3,2	1,87	2,38	356	453
33,7	2,0	1,56	1,99	533	678
	2,5	1,92	2,45	433	551
	2,6	1,99	2,54	417	531
	3,0	2,27	2,89	367	467
	3,2	2,41	3,07	345	440
	4,0	2,93	3,73	284	362
42,4	2,0	1,99	2,54	525	668
	2,5	2,46	3,13	426	542
	2,6	2,55	3,25	410	522
	3,0	2,91	3,71	360	458
	3,2	3,09	3,94	339	431
	4,0	3,79	4,83	276	352
48,3	2,0	2,28	2,91	522	664
	2,5	2,82	3,60	422	537
	2,6	2,93	3,73	407	518
	3,0	3,35	4,27	356	453
	3,2	3,56	4,53	335	427
	4,0	4,37	5,57	273	347
60,3	5,0	5,34	6,80	224	285
	2,0	2,88	3,66	518	660
	2,5	3,56	4,54	418	532
	2,6	3,70	4,71	403	513

				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
	3,0	4,24	5,40	351	447
	3,2	4,51	5,74	331	421
	4,0	5,55	7,07	268	342
	5,0	6,82	8,69	218	278
76,1	2,0	3,65	4,66	514	654
	2,5	4,54	5,78	414	527
	2,6	4,71	6,00	399	508
	3,0	5,41	6,89	347	442
	3,2	5,75	7,33	327	416
	4,0	7,11	9,06	264	336
	5,0	8,77	11,2	214	272
	6,0	10,4	13,2	182	231
88,9	2,0	4,29	5,46	512	652
	2,5	5,33	6,79	412	524
	3,0	6,36	8,10	345	440
	3,2	6,76	8,62	324	413
	4,0	8,38	10,7	262	333
	5,0	10,3	13,2	212	270
	6,0	12,3	15,6	180	228
	6,3	12,8	16,3	172	219
101,6	2,0	4,91	6,26	510	650
	2,5	6,11	7,78	411	523
	3,0	7,29	9,29	344	438
	3,2	7,77	9,89	323	411
	4,0	9,63	12,3	260	331
	5,0	11,9	15,2	210	268
	6,0	14,1	18,0	178	226
	6,3	14,8	18,9	169	216
	8,0	18,5	23,5	136	173
	10,0	22,6	28,8	111	142
114,3	2,5	6,89	8,8	409	520
	3,0	8,23	10,5	342	436
	3,2	8,77	11,2	321	409
	4,0	10,9	13,9	259	329

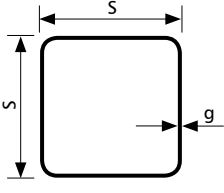
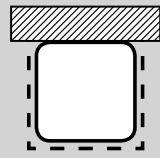
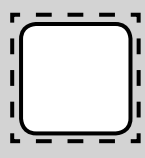
				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
	5,0	13,5	17,2	209	266
	6,0	16,0	20,4	177	225
	6,3	16,8	21,4	168	214
	8,0	21,0	26,7	135	172
	10,0	25,7	32,8	110	140
139,7	3,0	10,1	12,9	341	434
	4,0	13,4	17,1	257	327
	5,0	16,6	21,2	208	264
	6,0	19,8	25,2	175	222
	6,3	20,7	26,4	167	212
	8,0	26,0	33,1	133	169
	10,0	32,0	40,7	108	138
	12,0	37,8	48,1	92	117
	12,5	39,2	50,0	88	112
168,3	3,0	12,2	15,6	339	432
	4,0	16,2	20,6	257	327
	4,5	18,2	23,2	228	291
	5,0	20,1	25,7	206	262
	6,0	24,0	30,6	173	220
	6,3	25,2	32,1	165	210
	8,0	31,6	40,3	132	168
	10,0	39,0	49,7	107	136
	12,0	46,3	58,9	90	115
	12,5	48,0	61,2	87	110
177,8	5,0	21,3	27,1	207	263
	6,0	25,4	32,4	173	220
	6,3	26,6	33,9	165	210
	8,0	33,5	42,7	131	167
	10,0	41,4	52,7	106	135
	12,0	49,1	62,5	90	114
	12,5	51,0	64,9	87	110
193,7	5,0	23,3	29,6	206	262
	6,0	27,8	35,4	172	219
	6,3	29,1	37,1	165	209

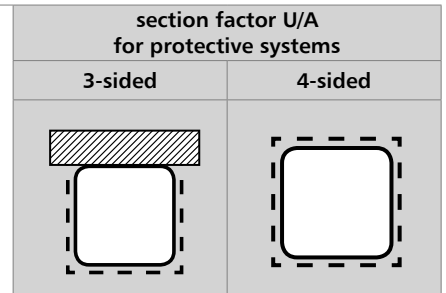
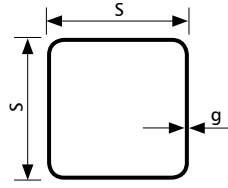
				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
	8,0	36,6	46,7	131	166
	10,0	45,3	57,7	106	135
	11,0	49,6	63,1	97	123
	12,5	55,9	71,2	86	109
	16,0	70,1	89,3	69	87
219,1	5,0	26,4	33,6	205	261
	6,0	31,5	40,2	172	219
	6,3	33,1	42,1	164	209
	8,0	41,6	53,1	130	166
	10,0	51,6	65,7	105	134
	12,0	61,3	78,1	89	113
	12,5	63,7	81,1	85	109
	16,0	80,1	102	68	86
	20,0	98,2	125	56	71
244,5	5,0	29,5	37,6	205	261
	6,0	35,3	45,0	171	218
	6,3	37,0	47,1	164	208
	8,0	46,7	59,4	130	165
	10,0	57,8	73,7	104	133
	12,0	68,8	87,7	88	112
	12,5	71,5	91,1	85	108
	16,0	90,2	115	67	86
	20,0	111	141	55	70
	25,0	135	172	45	57
273,0	5,0	33,0	42,1	204	260
	6,0	39,5	50,3	171	218
	6,3	41,4	52,8	163	207
	8,0	52,3	66,6	129	164
	10,0	64,9	82,6	104	133
	12,0	77,2	98,4	88	111
	12,5	80,3	102	85	108
	16,0	101	129	67	85
	20,0	125	159	54	69
	25,0	153	195	44	56

				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
323,9	5,0	39,3	50,1	204	259
	6,0	47,0	59,9	170	217
	6,3	49,3	62,9	162	206
	8,0	62,3	79,4	129	164
	10,0	77,4	98,6	104	132
	12,0	92,3	118	87	110
	12,5	96,0	122	84	107
	16,0	121	155	66	84
	20,0	150	191	54	68
	25,0	184	235	44	56
	355,6	6,0	51,7	65,9	170
6,3		54,3	69,1	162	206
8,0		68,6	87,4	128	163
10,0		85,2	109	103	131
12,0		102	130	86	110
12,5		106	135	83	106
16,0		134	171	66	84
20,0		166	211	53	68
25,0		204	260	43	55
406,4		6,0	59,2	75,5	170
	6,3	62,2	79,2	162	206
	8,0	78,6	100	128	163
	10,0	97,8	125	103	131
	12,0	117	149	86	110
	12,5	121	155	83	105
	16,0	154	196	66	83
	20,0	191	243	53	67
	25,0	235	300	43	55
	30,0	278	355	36	46
457,0	40,0	361	460	28	36
	6,0	66,7	85,0	169	216
	6,3	70,0	89,2	161	205
	8,0	88,6	113	128	162
	10,0	110	140	103	131

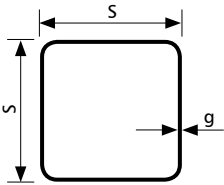
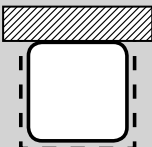
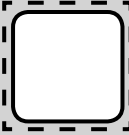
				section factor U/A for protective systems	
				contour	boxed
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
	12,0	132	168	86	109
	12,5	137	175	83	105
	16,0	174	222	65	83
	20,0	216	275	53	67
	25,0	266	339	43	54
	30,0	316	402	36	46
	40,0	411	524	28	35
508,0	6,0	74,3	94,6	169	215
	6,3	77,9	99,3	161	205
	8,0	98,6	126	127	162
	10,0	123	156	103	131
	12,0	147	187	86	109
	12,5	153	195	82	105
	16,0	194	247	65	83
	20,0	241	307	52	67
	25,0	298	379	43	54
	30,0	354	451	36	46
	40,0	462	588	28	35
	50,0	565	719	23	29

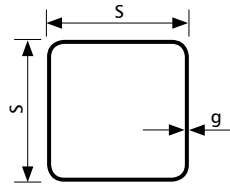
1.1.12 | Rectangular hollow sections, as per PN-EN 10210-2:2007 and PN-EN 10219-2:2007


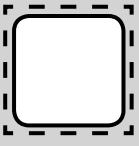
				section factor U/A for protective systems	
				3-sided	4-sided
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
40 x 40	2,5	2,89	3,68	327	435
	3,0	3,41	4,34	277	369
	4,0	4,39	5,59	215	287
50 x 50	5,0	5,28	6,73	179	238
	2,5	3,68	4,68	321	428
	3,0	4,35	5,54	271	362
	4,0	5,64	7,19	209	279
60 x 60	5,0	6,85	8,73	172	230
	6,0	7,99	10,2	148	197
	6,3	8,31	10,6	142	189
	2,5	4,46	5,68	317	423
	3,0	5,29	6,74	268	357
	4,0	6,9	8,79	205	274
70 x 70	5,0	8,42	10,7	169	225
	6,0	9,87	12,6	143	191
	6,3	10,3	13,1	138	184
	8,0	12,5	16,0	113	150
	3,0	6,24	7,94	265	353
	4,0	8,15	10,4	202	270
80 x 80	5,0	9,99	12,7	166	221
	6,0	11,8	15,0	140	187
	6,3	12,3	15,6	135	180
	8,0	15,0	19,2	110	146
	3,0	7,18	9,14	263	351
	4,0	9,41	12,0	200	267
90 x 90	5,0	11,6	14,7	164	218
	6,0	13,6	17,4	138	184
	6,3	14,2	18,1	133	177
	8,0	17,5	22,4	108	143
	4,0	10,7	13,6	199	265
	5,0	13,1	16,7	162	216
	6,0	15,5	19,8	137	182
	6,3	16,2	20,7	131	174
	8,0	20,1	25,6	106	141



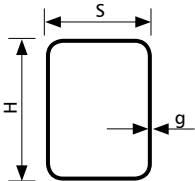
external diameter	wall thickness	weight	sectional area	section factor U/A for protective systems	
				3-sided	4-sided
D [mm]	g [mm]	[kg/m]	[cm ²]	[m ⁻¹]	[m ⁻¹]
100 x 100	4,0	11,9	15,2	198	264
	5,0	14,7	18,7	161	214
	6,0	17,4	22,2	136	181
	6,3	18,2	23,2	130	173
	8,0	22,6	28,8	105	139
120 x 120	10,0	27,0	34,9	86	115
	5,0	17,8	22,7	159	212
	6,0	21,2	27,0	134	178
	6,3	22,2	28,2	128	171
	8,0	27,6	35,2	103	137
140 x 140	10,0	33,7	42,9	84	112
	12,0	39,5	50,3	72	96
	12,5	40,9	52,1	70	93
	5,0	21,0	26,7	158	210
	6,0	24,9	31,8	133	177
150 x 150	6,3	26,1	33,3	127	169
	8,0	32,6	41,6	101	135
	10,0	40,0	50,9	83	111
	12,0	47,0	59,9	71	94
	12,5	48,7	62,1	68	91
160 x 160	5,0	22,6	28,7	157	210
	6,0	26,8	34,2	132	176
	6,3	28,1	35,8	126	168
	8,0	35,1	44,8	101	134
	10,0	43,1	54,9	82	110
150 x 150	12,0	50,8	64,7	70	93
	12,5	52,7	67,1	68	90
	16,0	65,2	83,0	55	73
	5,0	24,1	30,7	157	209
	6,0	28,7	36,6	132	175
160 x 160	6,3	30,1	38,3	126	168
	8,0	37,6	48,0	100	134
	10,0	46,3	58,9	82	109
	12,0	54,6	69,5	70	93

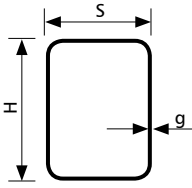
				section factor U/A for protective systems	
				3-sided	4-sided
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
180 x 180	12,5	56,6	72,1	67	89
	16,0	70,2	89,4	54	72
	5,0	27,3	34,7	156	208
	6,0	32,5	41,4	131	174
	6,3	34,0	43,3	125	167
	8,0	42,7	54,4	100	133
	10,0	52,5	66,9	81	108
	12,0	62,1	79,1	69	92
200 x 200	12,5	64,4	82,1	66	88
	16,0	80,2	102,2	53	71
	5,0	30,4	38,7	156	207
	6,0	36,2	46,2	130	174
	6,3	38,0	48,4	124	166
	8,0	47,7	60,8	99	132
	10,0	58,8	74,9	81	107
	12,0	69,6	88,7	68	91
220 x 220	12,5	72,3	92,1	66	87
	16,0	90,3	115	53	70
	6,0	40,0	51,0	130	173
	6,3	41,9	53,4	124	165
	8,0	52,7	67,2	99	131
	10,0	65,1	82,9	80	107
	12,0	77,2	98,3	68	90
	12,5	80,1	102	65	87
250 x 250	16,0	100	128	52	69
	6,0	45,7	58,2	129	172
	6,3	47,9	61,0	123	164
	8,0	60,3	76,8	98	131
	10,0	74,5	94,9	80	106
	12,0	88,5	113	67	89
	12,5	91,9	117	65	86
	16,0	115	147	52	69
260 x 260	6,0	47,6	60,6	129	172
	6,3	49,9	63,5	123	164

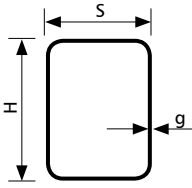


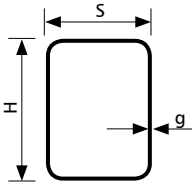
				section factor U/A for protective systems	
				3-sided	4-sided
					
external diameter	wall thickness	weight	sectional area	[m ⁻¹]	[m ⁻¹]
D [mm]	g [mm]	[kg/m]	[cm ²]		
	8,0	62,8	80,0	98	130
	10,0	77,7	98,9	79	106
	12,0	92,2	117	67	89
	12,5	95,8	122	64	86
	16,0	120	153	51	68
300 x 300	6,0	55,1	70,2	129	171
	6,3	57,8	73,6	123	164
	8,0	72,8	92,8	97	130
	10,0	90,	115	79	105
	12,0	107	137	66	88
	12,5	112	142	64	85
	16,0	141	179	51	68
350 x 350	8,0	85,4	109	97	129
	10,0	106	135	78	104
	12,0	126	161	66	87
	12,5	131	167	63	84
	16,0	166	211	50	67
400 x 400	10,0	122	155	78	104
	12,0	145	185	65	87
	12,5	151	192	63	84
	16,0	191	243	50	66
	20,0	235	300	40	54

1.1.13| Box hollow sections, as per PN-EN 10210-2:2007 and PN-EN 10219-2:2007

				section factor U/A for protective systems		
				3-sided	3-sided	4-sided
				[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
external diameter	wall thickness	weight	sectional area			
D [mm]	g [mm]	[kg/m]	[cm ²]			
50 x 25	2,5	3,43	2,69	292	365	438
	3	4,04	3,17	248	310	372
50 x 30	2,5	3,68	2,89	299	354	435
	3,0	4,34	3,41	254	300	369
	4,0	5,59	4,39	197	233	287
	5,0	6,73	5,28	164	194	238
60 x 40	2,5	4,68	3,68	300	342	428
	3,0	5,54	4,35	253	289	362
	4,0	7,19	5,64	195	223	279
	5,0	8,73	6,85	161	184	230
	6,0	10,2	7,99	138	157	197
	6,3	10,6	8,31	133	151	189
80 x 40	3,0	6,74	5,29	238	297	357
	4,0	8,79	6,90	183	228	274
	5,0	10,7	8,42	150	187	225
	6,0	12,6	9,87	127	159	191
	6,3	13,1	10,3	123	153	184
	8,0	16,0	12,5	100	125	150
90 x 50	3,0	7,94	6,24	240	290	353
	4,0	10,4	8,15	183	222	270
	5,0	12,7	9,99	150	182	221
	6,0	15,0	11,8	127	154	187
	6,3	15,6	12,3	122	148	180
	8,0	19,2	15,0	99	120	146
100 x 50	3,0	8,54	6,71	235	293	352
	4,0	11,2	8,78	179	224	268
	5,0	13,7	10,8	146	183	219
	6,0	16,2	12,7	124	155	186
	6,3	16,9	13,3	119	148	178
	8,0	20,8	16,3	97	121	145
100 x 60	3,0	9,14	7,18	241	285	351
	4,0	12,0	9,41	184	217	267
	5,0	14,7	11,6	150	177	218
	6,0	17,4	13,6	127	150	184

				section factor U/A for protective systems		
				3-sided	3-sided	4-sided
				[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
external diameter	wall thickness	weight	sectional area			
D [mm]	g [mm]	[kg/m]	[cm ²]			
120 x 60	6,3	18,1	14,2	122	144	177
	8,0	22,4	17,5	99	117	143
	4,0	13,6	10,7	177	221	265
	5,0	16,7	13,1	144	180	216
	6,0	19,8	15,5	122	152	182
	6,3	20,7	16,2	116	145	174
120 x 80	8,0	25,6	20,1	94	118	141
	10,0	30,9	24,3	78	98	117
	4,0	15,2	11,9	185	211	264
	5,0	18,7	14,7	150	172	214
	6,0	22,2	17,4	127	145	181
	6,3	23,2	18,2	121	138	173
140 x 80	8,0	28,8	22,6	98	112	139
	10,0	34,9	27,4	81	92	115
	4,0	16,8	13,2	179	215	262
	5,0	20,7	16,3	145	174	213
	6,0	24,6	19,3	122	147	179
	6,3	25,7	20,2	117	141	172
150 x 100	8,0	32,0	25,1	94	113	138
	10,0	38,9	30,6	78	93	114
	4,0	19,2	15,1	183	209	261
	5,0	23,7	18,6	148	169	211
	6,0	28,2	22,1	125	142	178
	6,3	29,5	23,1	119	136	170
160 x 80	8,0	36,8	28,9	96	109	136
	10,0	44,9	35,3	78	90	112
	4,0	18,4	14,4	174	218	261
	5,0	22,7	17,8	141	177	212
	6,0	27,0	21,2	119	149	178
	6,3	28,2	22,2	114	142	171
	8,0	35,2	27,6	91	114	137
	10,0	42,9	33,7	75	94	112

				section factor U/A for protective systems		
				3-sided	3-sided	4-sided
				[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
external diameter	wall thickness	weight	sectional area			
D [mm]	g [mm]	[kg/m]	[cm ²]			
180 x 100	12,0	50,3	39,5	64	80	96
	12,5	52,1	40,9	62	77	93
	4,0	21,6	16,9	176	213	260
	5,0	26,7	21,0	143	173	210
	6,0	31,8	24,9	120	145	177
	6,3	33,3	26,1	115	139	169
	8,0	41,6	32,6	92	111	135
	10,0	50,9	40,0	75	91	111
	12,0	59,9	47,0	64	77	94
	12,5	62,1	48,7	62	75	91
200 x 100	4,0	23,2	18,2	173	216	259
	5,0	28,7	22,6	140	175	210
	6,0	34,2	26,8	117	147	176
	6,3	35,8	28,1	112	140	168
	8,0	44,8	35,1	90	112	134
	10,0	54,9	43,1	73	92	110
	12,0	64,7	50,8	62	78	93
	12,5	67,1	52,7	60	75	90
	16,0	83,0	65,2	49	61	73
	6,0	36,6	28,7	121	143	175
200 x 120	6,3	38,3	30,1	115	136	168
	8,0	48,0	37,6	92	109	134
	8,0	48,0	37,6	92	109	109
	10,0	58,9	46,3	75	89	93
	12,0	69,5	54,6	64	75	89
	12,5	72,1	56,6	62	73	84
	6,0	46,2	36,2	120	141	174
	6,3	48,4	38,0	114	135	166
	8,0	60,8	47,7	91	107	132
	10,0	74,9	58,8	74	87	107
250 x 150	12,0	88,7	69,6	63	74	91
	12,5	92,1	72,3	60	71	87
	16,0	115	90,3	48	57	70
	6,0	51,0	40,0	122	138	173
	6,3	53,4	41,9	117	132	165

				section factor U/A for protective systems		
				3-sided	3-sided	4-sided
				[m ⁻¹]	[m ⁻¹]	[m ⁻¹]
external diameter	wall thickness	weight	sectional area			
D [mm]	g [mm]	[kg/m]	[cm ²]			
	8,0	67,2	52,7	93	105	131
	10,0	82,9	65,1	75	85	107
	12,0	98,3	77,2	64	72	90
	12,5	102	80,1	61	69	87
	16,0	128	100	49	55	69
300 x 200	6,0	58,2	45,7	121	138	172
	6,3	61,0	47,9	115	132	164
	8,0	76,8	60,3	92	105	131
	10,0	94,9	74,5	74	85	106
	12,0	113	88,5	62	71	89
	12,5	117	91,9	60	69	86
	16,0	147	115	48	55	69
350 x 250	6,0	70,2	55,1	107	129	157
	6,3	73,6	57,8	102	123	150
	8,0	92,8	72,8	81	97	119
	10,0	115	90,2	66	79	96
	12,0	137	107	55	66	81
	12,5	142	112	53	64	78
	16,0	179	141	42	51	62
400 x 200	8,0	92,8	72,8	87	108	130
	10,0	115	90,2	70	87	105
	12,0	137	107	59	73	88
	12,5	142	112	57	71	85
	16,0	179	141	45	56	68
450 x 250	8,0	109	85,4	88	106	129
	10,0	135	106	71	86	104
	12,0	161	126	60	72	87
	12,5	167	131	57	69	84
	16,0	211	166	46	55	67
500 x 300	10,0	155	122	71	84	104
	12,0	185	145	60	71	87
	12,5	192	151	58	68	84
	16,0	243	191	46	54	66
	20,0	300	235	37	44	54





**SPRAY-ON FLAME
RETARDANT SYSTEMS**

➤ **mcr Tecwool F**
-SPRAY-ON FLAME RETARDANT SYSTEM

The mcr Tecwool F spray-on system is designed for fire protection of steel structural components, reinforced concrete elements, as well as reinforced concrete ceilings on trapezoidal sheet and indoor beam-hollow ceilings. The mcr Tecwool F system also offers a very high acoustic absorption coefficient which makes it particularly suitable as an acoustic coating (sound absorbing).

➤ **mcr Isoverm 825 / mcr Tecwool 825**
-SPRAY-ON FLAME RETARDANT SYSTEM

The mcr Isoverm 825 spray-on system is designed for providing flame retardant treatment of steel structural components both inside and outside of civil structures, including those exposed to thermal impact of hydrocarbon fires.



Technical parameters

» mortar physical and mechanical properties

dry mcr Tecwool F mix	
external appearance	grey dry mix, without clumping or contamination
cured mcr Tecwool F mortar	
bulk density of dry material	351 +/-10% kg/m ³
linear shrinkage	≤ 0,07 %
steel surface adhesiveness	≥ 0,002 MPa or render rupture
concrete surface adhesiveness	≥ 0,002 MPa or render rupture
reaction to fire class	A1

Constant quality control during the manufacturing process of the mcr Tecwool F mix guarantees proper physical and mechanical features are maintained to ensure flame retardant properties.

» R30-R240

- » European Technical Assessment ETA 11/0185
- » Certificate of constancy of performance 1220-CPR-110
- » Declaration of performance TCRS-TW-01

Application

The mcr Tecwool F is designed to provide flame retardant treatment for open and box section steel structural components, reinforced concrete elements, reinforced concrete ceilings and reinforced concrete ceilings on trapezoidal sheets, as well as beam-hollow ceilings with bearers made of reinforced concrete, prestensioned prestressed concrete or steel beams filled with ceramic, concrete or light concrete hollow or full bricks.

mcr Tecwool F belongs to a group of so-called light flame retardant spray-ons, i.e. with a low density of the sprayable mass. It is designed for general purpose onshore civil structures, where an increased fire resistance rating is required for structural components due to their exposure to standard fires.

With mcr Tecwool F, steel structural components with a section factor $U/A = 495 \text{ m}^{-1}$ gain a fire resistance rating between R30 and R240.

Besides outstanding flame retardant features, mcr Tecwool F also offers good thermal performance – its thermal conduction coefficient λ is 0.061 W/mK.

Due to its very good sound absorption parameters, mcr Tecwool F may also be used as acoustic/sound isolation inside rooms, where reverberation time needs to be corrected, e.g. in conference and lecture rooms or in concert halls.

The system should not be used for protecting structural components not covered against the direct impact of weather conditions (rain, snow).

System features

- » high durability
- » quick and simple application
- » flame retardant insulation weight neglectable
- » biologically neutral, non-toxic, environment friendly
- » resistant to cracking, dust, rotting or fungi
- » airtight – ensures perfect coverage
- » high thermal performance
- » very good acoustic properties (sound absorption)
- » no corrosive action on unprotected steel surface
- » traditional light grey external texture
- » paintable with finishing paints
- » heavy metal free

Fire resistance rating

The system's fire resistance is provided by the appropriate selection of the sprayable mass thickness, depending on the section factor $U/A [\text{m}^{-1}]$ of the proofed steel section.



1.2.1 | Open sections

» Fire resistance – **30 minutes**

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	10	10	10	10	10	10	10	10	10
70	10	10	10	10	10	10	10	10	10
80	10	10	10	10	10	10	10	10	10
90	10	10	10	10	10	10	10	10	10
100	10	10	10	10	10	10	10	10	10
110	11	10	10	10	10	10	10	10	10
120	12	10	10	10	10	10	10	10	10
130	12	10	10	10	10	10	10	10	10
140	13	11	10	10	10	10	10	10	10
150	13	11	10	10	10	10	10	10	10
160	14	12	10	10	10	10	10	10	10
170	14	12	10	10	10	10	10	10	10
180	14	12	11	10	10	10	10	10	10
190	15	13	11	10	10	10	10	10	10
200	15	13	11	10	10	10	10	10	10
210	15	13	12	10	10	10	10	10	10
220	15	13	12	10	10	10	10	10	10
230	15	14	12	11	10	10	10	10	10
240	16	14	12	11	10	10	10	10	10
250	16	14	12	11	10	10	10	10	10
260	16	14	13	11	10	10	10	10	10
270	16	14	13	11	10	10	10	10	10
280	16	14	13	12	10	10	10	10	10
290	16	15	13	12	10	10	10	10	10
300	16	15	13	12	11	10	10	10	10
310	16	15	13	12	11	10	10	10	10
320	16	15	13	12	11	10	10	10	10
330	17	15	14	12	11	10	10	10	10
340	17	15	14	12	11	10	10	10	10
350	17	15	14	12	11	10	10	10	10
360	17	15	14	12	11	10	10	10	10
370	17	15	14	13	11	10	10	10	10
380	17	15	14	13	11	10	10	10	10
390	17	15	14	13	12	10	10	10	10
400	17	16	14	13	12	11	10	10	10
410	17	16	14	13	12	11	10	10	10
420	17	16	14	13	12	11	10	10	10
430	17	16	14	13	12	11	10	10	10
440	17	16	14	13	12	11	10	10	10
495	18	16	15	13	12	11	10	10	10



» Fire resistance – 45 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	11	10	10	10	10	10	10	10	10
70	12	10	10	10	10	10	10	10	10
80	13	11	10	10	10	10	10	10	10
90	14	12	10	10	10	10	10	10	10
100	15	13	11	10	10	10	10	10	10
110	16	14	12	10	10	10	10	10	10
120	17	14	12	11	10	10	10	10	10
130	17	15	13	11	10	10	10	10	10
140	18	16	14	12	10	10	10	10	10
150	18	16	14	12	11	10	10	10	10
160	19	16	15	13	11	10	10	10	10
170	19	17	15	13	12	10	10	10	10
180	19	17	15	14	12	11	10	10	10
190	20	17	16	14	12	11	10	10	10
200	20	18	16	14	13	11	10	10	10
210	20	18	16	15	13	12	10	10	10
220	20	18	16	15	13	12	11	10	10
230	20	18	17	15	14	12	11	10	10
240	21	19	17	15	14	12	11	10	10
250	21	19	17	15	14	13	11	10	10
260	21	19	17	16	14	13	12	10	10
270	21	19	17	16	14	13	12	11	10
280	21	19	18	16	15	13	12	11	10
290	21	19	18	16	15	13	12	11	10
300	21	20	18	16	15	14	12	11	10
310	22	20	18	16	15	14	12	11	10
320	22	20	18	17	15	14	13	11	10
330	22	20	18	17	15	14	13	12	11
340	22	20	18	17	15	14	13	12	11
350	22	20	18	17	15	14	13	12	11
360	22	20	18	17	16	14	13	12	11
370	22	20	19	17	16	14	13	12	11
380	22	20	19	17	16	15	13	12	11
390	22	20	19	17	16	15	13	12	11
400	22	20	19	17	16	15	14	12	11
410	22	20	19	17	16	15	14	13	11
420	22	21	19	17	16	15	14	13	12
430	22	21	19	18	16	15	14	13	12
440	22	21	19	18	16	15	14	13	12
495	23	21	19	18	17	15	14	13	12



» Fire resistance – 60 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	16	13	10	10	10	10	10	10	10
70	16	13	11	10	10	10	10	10	10
80	18	15	12	10	10	10	10	10	10
90	19	16	14	12	10	10	10	10	10
100	20	17	15	13	11	10	10	10	10
110	21	18	16	14	12	10	10	10	10
120	22	19	17	15	13	11	10	10	10
130	22	20	17	15	13	12	10	10	10
140	23	20	18	16	14	13	11	10	10
150	23	21	18	16	15	13	12	10	10
160	24	21	19	17	15	14	12	11	10
170	24	22	19	17	16	14	13	11	10
180	24	22	20	18	16	15	13	12	11
190	25	22	20	18	16	15	13	12	11
200	25	23	20	19	17	15	14	13	11
210	25	23	21	19	17	16	14	13	12
220	25	23	21	19	17	16	14	13	12
230	26	23	21	19	18	16	15	13	12
240	26	23	21	20	18	16	15	14	13
250	26	24	22	20	18	17	15	14	13
260	26	24	22	20	18	17	15	14	13
270	26	24	22	20	19	17	16	14	13
280	26	24	22	20	19	17	16	15	13
290	26	24	22	21	19	17	16	15	14
300	27	24	22	21	19	18	16	15	14
310	27	25	23	21	19	18	16	15	14
320	27	25	23	21	19	18	17	15	14
330	27	25	23	21	20	18	17	15	14
340	27	25	23	21	20	18	17	16	14
350	27	25	23	21	20	18	17	16	15
360	27	25	23	21	20	18	17	16	15
370	27	25	23	22	20	19	17	16	15
380	27	25	23	22	20	19	17	16	15
390	27	25	23	22	20	19	17	16	15
400	27	25	24	22	20	19	18	16	15
410	27	25	24	22	20	19	18	16	15
420	27	25	24	22	20	19	18	17	15
430	27	26	24	22	21	19	18	17	15
440	28	26	24	22	21	19	18	17	16
495	28	26	24	23	21	20	18	17	16



» Fire resistance – 90 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	25	21	18	15	13	11	10	10	10
70	26	22	19	16	13	11	10	10	10
80	28	24	21	18	15	13	12	10	10
90	29	25	22	19	17	15	13	11	10
100	30	26	23	21	18	16	14	13	11
110	31	27	24	22	19	17	15	14	12
120	32	28	25	23	20	18	16	15	13
130	32	29	26	23	21	19	17	16	14
140	33	30	27	24	22	20	18	16	15
150	33	30	27	25	23	21	19	17	16
160	34	31	28	25	23	21	19	18	16
170	34	31	28	26	24	22	20	18	17
180	34	31	29	26	24	22	20	19	17
190	35	32	29	27	25	23	21	19	18
200	35	32	29	27	25	23	21	20	18
210	35	32	30	27	25	23	22	20	19
220	35	33	30	28	26	24	22	20	19
230	36	33	30	28	26	24	22	21	19
240	36	33	31	28	26	24	23	21	20
250	36	33	31	29	27	25	23	21	20
260	36	33	31	29	27	25	23	22	20
270	36	34	31	29	27	25	23	22	20
280	36	34	31	29	27	25	24	22	21
290	37	34	32	29	27	26	24	22	21
300	37	34	32	30	28	26	24	23	21
310	37	34	32	30	28	26	24	23	21
320	37	34	32	30	28	26	24	23	21
330	37	34	32	30	28	26	25	23	22
340	37	35	32	30	28	26	25	23	22
350	37	35	32	30	28	27	25	23	22
360	37	35	33	30	29	27	25	24	22
370	37	35	33	31	29	27	25	24	22
380	37	35	33	31	29	27	25	24	22
390	37	35	33	31	29	27	26	24	23
400	38	35	33	31	29	27	26	24	23
410	38	35	33	31	29	27	26	24	23
420	38	35	33	31	29	27	26	24	23
430	38	35	33	31	29	28	26	24	23
440	38	35	33	31	29	28	26	25	23
495	38	36	34	32	30	28	27	25	24



» Fire resistance – 120 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	35	30	26	22	19	17	15	13	11
70	36	31	27	23	20	18	16	14	12
80	38	33	29	25	22	20	18	16	14
90	39	34	30	27	24	22	19	17	16
100	40	36	32	28	26	23	21	19	17
110	41	37	33	30	27	24	22	20	18
120	42	37	34	31	28	25	23	21	19
130	42	38	35	32	29	26	24	22	20
140	43	39	35	32	30	27	25	23	21
150	43	40	36	33	30	28	26	24	22
160	44	40	37	34	31	29	27	25	23
170	44	41	37	34	32	29	27	25	23
180	45	41	38	35	32	30	28	26	24
190	45	41	38	35	33	30	28	26	25
200	45	42	39	36	33	31	29	27	25
210	45	42	39	36	34	31	29	27	25
220	46	42	39	36	34	32	30	28	26
230	46	42	39	37	34	32	30	28	26
240	46	43	40	37	35	32	30	28	27
250	46	43	40	37	35	33	31	29	27
260	46	43	40	38	35	33	31	29	27
270	47	43	40	38	35	33	31	29	28
280	47	44	41	38	36	33	31	30	28
290	47	44	41	38	36	34	32	30	28
300	47	44	41	38	36	34	32	30	28
310	47	44	41	39	36	34	32	30	29
320	47	44	41	39	36	34	32	31	29
330	47	44	41	39	37	35	33	31	29
340	47	44	42	39	37	35	33	31	29
350	47	44	42	39	37	35	33	31	29
360	48	45	42	39	37	35	33	31	30
370	48	45	42	40	37	35	33	31	30
380	48	45	42	40	37	35	33	32	30
390	48	45	42	40	38	35	34	32	30
400	48	45	42	40	38	36	34	32	30
410	48	45	42	40	38	36	34	32	30
420	48	45	43	40	38	36	34	32	31
430	48	45	43	40	38	36	34	32	31
440	48	45	43	40	38	36	34	32	31
495	48	46	43	41	39	37	35	33	31

» Fire resistance – 180 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	54	47	41	37	33	29	26	24	21
70	55	48	42	38	34	30	27	24	22
80	57	50	45	40	36	33	30	27	25
90	59	52	47	42	38	35	32	29	27
100	60	54	48	44	40	37	34	31	29
110	61	55	50	46	42	38	35	33	30
120	62	56	51	47	43	40	37	34	32
130	62	57	52	48	44	41	38	35	33
140	63	58	53	49	45	42	39	36	34
150	63	58	54	50	46	43	40	37	35
160	64	59	54	51	47	44	41	38	36
170	64	59	55	51	48	45	42	39	37
180	65	60	56	52	48	45	42	40	37
190	65	60	56	52	49	46	43	40	38
200	65	61	57	53	49	46	44	41	39
210	66	61	57	53	50	47	44	42	39
220	66	61	57	54	50	47	45	42	40
230	66	62	58	54	51	48	45	43	40
240	66	62	58	55	51	48	46	43	41
250	67	62	58	55	52	49	46	44	41
260	67	62	59	55	52	49	46	44	42
270	67	63	59	55	52	49	47	44	42
280	67	63	59	56	53	50	47	45	42
290	67	63	59	56	53	50	47	45	43
300	67	63	60	56	53	50	48	45	43
310	67	63	60	56	53	51	48	46	43
320	68	64	60	57	54	51	48	46	44
330	68	64	60	57	54	51	48	46	44
340	68	64	60	57	54	51	49	46	44
350	68	64	60	57	54	51	49	47	44
360	68	64	61	57	54	52	49	47	45
370	68	64	61	58	55	52	49	47	45
380	68	64	61	58	55	52	49	47	45
390	68	64	61	58	55	52	50	47	45
400	68	65	61	58	55	52	50	47	45
410	68	65	61	58	55	53	50	48	45
420	68	65	61	58	55	53	50	48	46
430	68	65	61	58	55	53	50	48	46
440	69	65	62	58	56	53	50	48	46
495	69	65	62	59	56	54	51	49	47



» Fire resistance – 240 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	–	65	57	51	46	41	38	34	31
70	–	66	58	52	47	43	39	35	32
80	–	68	61	55	50	46	42	38	35
90	–	–	63	58	53	48	44	41	38
100	–	–	65	60	55	50	47	43	40
110	–	–	67	61	57	52	49	45	42
120	–	–	68	63	58	54	50	47	44
130	–	–	–	64	60	55	52	48	45
140	–	–	–	65	61	57	53	50	47
150	–	–	–	66	62	58	54	51	48
160	–	–	–	67	63	59	55	52	49
170	–	–	–	68	64	60	56	53	50
180	–	–	–	69	64	61	57	54	51
190	–	–	–	–	65	61	58	55	52
200	–	–	–	–	66	62	59	55	52
210	–	–	–	–	66	63	59	56	53
220	–	–	–	–	67	63	60	57	54
230	–	–	–	–	67	64	60	57	54
240	–	–	–	–	68	64	61	58	55
250	–	–	–	–	68	65	61	58	55
260	–	–	–	–	69	65	62	59	56
270	–	–	–	–	69	66	62	59	56
280	–	–	–	–	–	66	63	60	57
290	–	–	–	–	–	66	63	60	57
300	–	–	–	–	–	67	63	60	58
310	–	–	–	–	–	67	64	61	58
320	–	–	–	–	–	67	64	61	58
330	–	–	–	–	–	68	64	61	59
340	–	–	–	–	–	68	65	62	59
350	–	–	–	–	–	68	65	62	59
360	–	–	–	–	–	68	65	62	59
370	–	–	–	–	–	68	65	62	60
380	–	–	–	–	–	69	66	63	60
390	–	–	–	–	–	69	66	63	60
400	–	–	–	–	–	69	66	63	60
410	–	–	–	–	–	69	66	63	61
420	–	–	–	–	–	–	66	63	61
430	–	–	–	–	–	–	67	64	61
440	–	–	–	–	–	–	67	64	61
495	–	–	–	–	–	–	68	65	62

1.2.2 | Box sections

» Fire resistance – **30 minutes**

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	10	10	10	10	10	10	10	10	10
70	10	10	10	10	10	10	10	10	10
80	10	10	10	10	10	10	10	10	10
90	10	10	10	10	10	10	10	10	10
100	11	10	10	10	10	10	10	10	10
110	12	11	11	11	11	11	11	11	11
120	13	11	11	11	11	11	11	11	11
130	14	12	11	11	11	11	11	11	11
140	15	12	11	11	11	11	11	11	11
150	15	13	11	11	11	11	11	11	11
160	16	14	12	11	11	11	11	11	11
170	16	14	12	11	11	11	11	11	11
180	17	15	13	11	11	11	11	11	11
190	17	15	13	11	11	11	11	11	11
200	18	16	14	12	11	11	11	11	11
210	18	16	14	12	11	11	11	11	11
220	19	16	14	13	12	12	12	12	12
230	19	17	15	13	12	12	12	12	12
240	19	17	15	13	12	12	12	12	12
250	20	17	16	14	12	12	12	12	12
260	20	18	16	14	12	12	12	12	12
270	20	18	16	14	13	12	12	12	12
280	20	18	16	14	13	12	12	12	12
290	20	18	16	15	13	12	12	12	12
300	20	18	16	15	13	12	12	12	12
310	20	18	17	15	13	12	12	12	12
320	21	19	17	15	14	12	12	12	12
330	21	19	17	15	14	12	12	12	12
340	21	19	17	15	14	12	12	12	12
350	21	19	17	15	14	13	12	12	12
360	21	19	17	16	14	13	12	12	12
370	21	19	17	16	14	13	12	12	12
380	21	19	17	16	14	13	12	12	12
390	21	19	18	16	14	13	12	12	12
400	21	19	18	16	15	13	12	12	12
410	21	19	18	16	15	13	12	12	12
420	21	20	18	16	15	13	12	12	12
430	22	20	18	16	15	13	12	12	12
440	22	20	18	16	15	14	12	12	12
495	22	20	18	17	15	14	13	12	12



» Fire resistance – 45 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	12	10	10	10	10	10	10	10	10
70	12	10	10	10	10	10	10	10	10
80	14	11	10	10	10	10	10	10	10
90	16	13	11	10	10	10	10	10	10
100	17	14	12	10	10	10	10	10	10
110	18	15	13	11	11	11	11	11	11
120	19	16	14	12	11	11	11	11	11
130	20	17	15	13	11	11	11	11	11
140	20	18	15	13	12	11	11	11	11
150	21	18	16	14	12	11	11	11	11
160	22	19	17	15	13	11	11	11	11
170	22	20	17	15	14	12	11	11	11
180	23	20	18	16	14	13	11	11	11
190	23	21	19	17	15	13	12	11	11
200	24	21	19	17	15	14	12	11	11
210	24	22	20	18	16	14	13	11	11
220	25	22	20	18	16	15	13	12	12
230	25	23	20	18	17	15	13	12	12
240	26	23	21	19	17	15	14	12	12
250	26	24	21	19	17	16	14	13	12
260	26	24	22	20	18	16	15	13	12
270	26	24	22	20	18	16	15	13	12
280	26	24	22	20	18	17	15	14	12
290	27	24	22	20	18	17	15	14	12
300	27	24	22	20	19	17	15	14	13
310	27	25	22	21	19	17	16	14	13
320	27	25	23	21	19	17	16	14	13
330	27	25	23	21	19	17	16	15	13
340	27	25	23	21	19	18	16	15	13
350	27	25	23	21	19	18	16	15	14
360	27	25	23	21	19	18	16	15	14
370	27	25	23	21	20	18	17	15	14
380	28	25	23	21	20	18	17	15	14
390	28	25	23	22	20	18	17	15	14
400	28	26	24	22	20	18	17	16	14
410	28	26	24	22	20	18	17	16	14
420	28	26	24	22	20	19	17	16	14
430	28	26	24	22	20	19	17	16	15
440	28	26	24	22	20	19	17	16	15
495	28	26	24	22	21	19	18	16	15

» Fire resistance – 60 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	17	13	11	10	10	10	10	10	10
70	18	14	11	10	10	10	10	10	10
80	19	16	13	11	10	10	10	10	10
90	21	18	15	13	11	10	10	10	10
100	22	19	16	14	12	10	10	10	10
110	23	20	18	15	13	11	11	11	11
120	24	21	19	16	14	12	11	11	11
130	25	22	20	17	15	13	12	11	11
140	26	23	20	18	16	14	13	11	11
150	27	24	21	19	17	15	13	12	11
160	28	25	22	20	18	16	14	13	11
170	28	25	23	20	18	16	15	13	12
180	29	26	23	21	19	17	15	14	12
190	29	26	24	22	20	18	16	14	13
200	30	27	25	22	20	18	17	15	14
210	30	28	25	23	21	19	17	16	14
220	31	28	26	23	21	19	18	16	15
230	31	29	26	24	22	20	18	17	15
240	32	29	27	24	22	20	19	17	16
250	32	30	27	25	23	21	19	17	16
260	33	30	27	25	23	21	19	18	16
270	33	30	28	25	23	21	20	18	17
280	33	30	28	25	23	22	20	18	17
290	33	30	28	26	24	22	20	19	17
300	33	30	28	26	24	22	20	19	17
310	33	31	28	26	24	22	21	19	17
320	33	31	28	26	24	22	21	19	18
330	33	31	29	26	24	23	21	19	18
340	34	31	29	27	25	23	21	19	18
350	34	31	29	27	25	23	21	20	18
360	34	31	29	27	25	23	21	20	18
370	34	31	29	27	25	23	22	20	19
380	34	31	29	27	25	23	22	20	19
390	34	32	29	27	25	23	22	20	19
400	34	32	29	27	25	24	22	20	19
410	34	32	30	27	26	24	22	21	19
420	34	32	30	28	26	24	22	21	19
430	34	32	30	28	26	24	22	21	19
440	34	32	30	28	26	24	22	21	19
495	35	32	30	28	26	25	23	21	20



» Fire resistance – 90 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	27	23	19	16	14	11	10	10	10
70	28	24	20	17	14	12	10	10	10
80	30	26	22	19	17	14	12	11	10
90	32	28	24	21	18	16	14	12	11
100	33	29	26	23	20	18	16	14	12
110	34	30	27	24	21	19	17	15	14
120	36	32	28	25	23	20	18	17	15
130	37	33	29	26	24	22	20	18	16
140	38	34	30	28	25	23	21	19	17
150	38	35	31	29	26	24	22	20	18
160	39	36	32	29	27	25	22	21	19
170	40	36	33	30	28	25	23	21	20
180	41	37	34	31	29	26	24	22	20
190	41	38	35	32	29	27	25	23	21
200	42	39	35	33	30	28	26	24	22
210	43	39	36	33	31	28	26	24	22
220	43	40	37	34	31	29	27	25	23
230	44	40	37	35	32	30	27	26	24
240	44	41	38	35	33	30	28	26	24
250	45	42	39	36	33	31	29	27	25
260	45	42	39	36	33	31	29	27	25
270	45	42	39	36	34	31	29	27	26
280	46	42	39	37	34	32	30	28	26
290	46	42	39	37	34	32	30	28	26
300	46	43	40	37	35	32	30	28	26
310	46	43	40	37	35	32	30	28	27
320	46	43	40	37	35	33	31	29	27
330	46	43	40	38	35	33	31	29	27
340	46	43	40	38	35	33	31	29	27
350	46	43	41	38	35	33	31	29	27
360	47	43	41	38	36	33	31	29	28
370	47	44	41	38	36	34	32	30	28
380	47	44	41	38	36	34	32	30	28
390	47	44	41	38	36	34	32	30	28
400	47	44	41	39	36	34	32	30	28
410	47	44	41	39	36	34	32	30	29
420	47	44	41	39	36	34	32	30	29
430	47	44	41	39	37	34	32	31	29
440	47	44	42	39	37	35	33	31	29
495	48	45	42	40	37	35	33	31	30

» Fire resistance – 120 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	37	32	27	24	21	18	16	14	12
70	38	33	28	25	22	19	17	15	13
80	41	35	31	27	24	21	19	17	15
90	42	37	33	29	26	23	21	19	17
100	44	39	35	31	28	25	23	21	19
110	45	41	36	33	30	27	25	22	20
120	47	42	38	34	31	28	26	24	22
130	48	43	39	36	33	30	27	25	23
140	49	44	40	37	34	31	29	26	24
150	50	45	42	38	35	32	30	27	25
160	51	46	43	39	36	33	31	29	26
170	52	47	44	40	37	34	32	29	27
180	53	48	44	41	38	35	33	30	28
190	53	49	45	42	39	36	34	31	29
200	54	50	46	43	40	37	34	32	30
210	55	51	47	44	41	38	35	33	31
220	56	52	48	44	41	39	36	34	32
230	56	52	49	45	42	39	37	35	32
240	57	53	49	46	43	40	38	35	33
250	58	54	50	47	44	41	38	36	34
260	58	54	50	47	44	41	39	36	34
270	58	54	51	47	44	42	39	37	35
280	58	54	51	48	45	42	39	37	35
290	58	55	51	48	45	42	40	37	35
300	59	55	51	48	45	42	40	38	35
310	59	55	51	48	45	43	40	38	36
320	59	55	52	49	46	43	40	38	36
330	59	55	52	49	46	43	41	38	36
340	59	55	52	49	46	43	41	39	37
350	59	56	52	49	46	44	41	39	37
360	59	56	52	49	46	44	41	39	37
370	59	56	53	49	47	44	42	39	37
380	60	56	53	50	47	44	42	40	37
390	60	56	53	50	47	44	42	40	38
400	60	56	53	50	47	45	42	40	38
410	60	56	53	50	47	45	42	40	38
420	60	56	53	50	47	45	42	40	38
430	60	56	53	50	48	45	43	40	38
440	60	57	53	50	48	45	43	41	38
495	60	57	54	51	48	46	43	41	39



» Fire resistance – 180 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	58	50	44	39	35	31	28	25	23
70	59	52	45	40	36	32	29	26	24
80	62	54	48	43	39	35	32	29	27
90	64	57	51	46	42	38	35	32	29
100	66	59	53	48	44	40	37	34	32
110	67	61	55	51	46	43	39	36	34
120	69	63	57	52	48	44	41	38	35
130	–	64	59	54	50	46	43	40	37
140	–	66	60	56	52	48	45	41	39
150	–	67	62	57	53	49	46	43	40
160	–	68	63	59	54	51	47	44	42
170	–	–	64	60	56	52	49	46	43
180	–	–	66	61	57	53	50	47	44
190	–	–	67	62	58	55	51	48	45
200	–	–	68	63	59	56	52	49	46
210	–	–	69	65	60	57	53	50	48
220	–	–	–	66	62	58	55	51	49
230	–	–	–	67	63	59	56	52	50
240	–	–	–	68	64	60	57	53	51
250	–	–	–	69	65	61	58	54	52
260	–	–	–	69	65	61	58	55	52
270	–	–	–	69	65	62	58	55	52
280	–	–	–	–	66	62	59	56	53
290	–	–	–	–	66	63	59	58	53
300	–	–	–	–	66	63	60	57	54
310	–	–	–	–	67	63	60	57	54
320	–	–	–	–	67	63	60	57	54
330	–	–	–	–	67	64	61	58	55
340	–	–	–	–	68	64	61	58	55
350	–	–	–	–	68	64	61	58	55
360	–	–	–	–	68	65	61	58	56
370	–	–	–	–	68	65	62	59	56
380	–	–	–	–	68	65	62	59	56
390	–	–	–	–	69	65	62	59	56
400	–	–	–	–	69	65	62	59	57
410	–	–	–	–	69	66	63	60	57
420	–	–	–	–	69	66	63	60	57
430	–	–	–	–	69	66	63	60	57
440	–	–	–	–	69	66	63	60	57
495	–	–	–	–	–	67	64	61	58

» Fire resistance – 240 minutes

section factor U/A [m ⁻¹]	Minimum thickness [mm] of mcr Tecwool F at the design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
67	–	69	61	54	49	44	40	36	33
70	–	–	62	56	50	46	41	38	35
80	–	–	66	60	54	49	45	42	38
90	–	–	69	63	57	53	48	45	41
100	–	–	–	66	60	56	51	48	44
110	–	–	–	68	63	58	54	50	47
120	–	–	–	–	65	60	56	53	49
130	–	–	–	–	67	63	58	55	51
140	–	–	–	–	69	65	60	57	53
150	–	–	–	–	–	67	62	59	55
160	–	–	–	–	–	68	64	60	57
170	–	–	–	–	–	–	66	62	58
180	–	–	–	–	–	–	67	64	60
190	–	–	–	–	–	–	69	65	62
200	–	–	–	–	–	–	–	66	63
210	–	–	–	–	–	–	–	68	64
220	–	–	–	–	–	–	–	69	66
230	–	–	–	–	–	–	–	–	67
240	–	–	–	–	–	–	–	–	68
250	–	–	–	–	–	–	–	–	69
260	–	–	–	–	–	–	–	–	–
270	–	–	–	–	–	–	–	–	–
280	–	–	–	–	–	–	–	–	–
290	–	–	–	–	–	–	–	–	–
300	–	–	–	–	–	–	–	–	–
310	–	–	–	–	–	–	–	–	–
320	–	–	–	–	–	–	–	–	–
330	–	–	–	–	–	–	–	–	–
340	–	–	–	–	–	–	–	–	–
350	–	–	–	–	–	–	–	–	–
360	–	–	–	–	–	–	–	–	–
370	–	–	–	–	–	–	–	–	–
380	–	–	–	–	–	–	–	–	–
390	–	–	–	–	–	–	–	–	–
400	–	–	–	–	–	–	–	–	–
410	–	–	–	–	–	–	–	–	–
420	–	–	–	–	–	–	–	–	–
430	–	–	–	–	–	–	–	–	–
440	–	–	–	–	–	–	–	–	–
495	–	–	–	–	–	–	–	–	–

1.2.3 | mcr Tecwool F flame retardant mass spraying method

The mcr Tecwool F mortar is delivered to the construction site in powdered form, in 25 kg bags. The proofing is performed with specialized spray-on machines. The dry mass is poured into the machine's tank and transported under pressure through hoses to a special spray-on nozzle, where it is mixed with water. Water is provided to the nozzle with an independent hose.

- » Before applying the mcr Tecwool F mass, the elements to be protected must be cleaned from dirt, oil, grease, peeling paint and rust – anything that may reduce adhesion.
- » The application surface must be compatible with or chemically resistant to the sprayed material components (high pH).
- » For best adhesion, apply the mortar directly after dampening the proofed element with water.
- » Apply in layers no thicker than 25 mm each, until the required target total thickness is reached. Spray the proofed surface at a straight angle, maintaining a distance between the nozzle and the surface of approximately 500–600 mm.
- » After applying the final flame retardant layer thickness, dampen with water to increase its hardness.
- » After spraying, the proofed sections and surfaces retain their natural shapes, while gaining the characteristic grey texture.
- » Perform all the works at ambient temperatures of no less than +3°C and no more than +40°C, at relative air humidity not exceeding 85%.

1.2.4 | mcr Tecwool 825/ mcr Isoverm 825



- » R15-R360
- » Conformity certificate ITB-1918/W
- » National declaration of performance KDWU/HZ/01/2017
- » Technical approval ITB AT-15-8196/2016

Application

The mcr Isoverm 825 product range is designed for flame retardant treatments of open sections, as well as round and rectangular box sections of steel structural components.

Flame retardant insulation with the mcr Isoverm 825 system, where steel elements are proofed with anti-corrosive paint or zinc coating, may be used in X category environments as per ETAG 018-3, i.e. both in indoor and outdoor conditions.

Optimum density of the sprayable mass ensures that mcr Isoverm 825 is perfect for industry applications in specialized facilities, such as: power plants, refineries, chemical plants, drilling platforms, etc. – wherever there is a threat of hydrocarbon fires, as well as for general construction applications against standard fires for structures exposed to weather conditions.

For general purpose construction facilities at risk of standard fires, we recommend using the mcr Tecwool F light spray-on system. With mcr Isoverm 825, steel structural components with a section factor $U/A = 453 \text{ m}^{-1}$ gain fire a resistance rating between R15 and R360.

The mcr Isoverm 825 product set contains:

- » mcr Tecwool 825 mortar for the basic layer of flame retardant insulation, steel mesh with hexagonal or squared openings (optional),
- » steel pins with clamping caps for mesh fixing (optional).
- » If the protected structure is directly exposed to weather conditions, it is possible to use an additional protective layer of finishing paints.

System features

- » high durability
- » quick application
- » flame retardant insulation weight neglectable in static calculations
- » biologically neutral, non-toxic
- » resistant to cracking, rotting and fungi
- » no corrosive action on a steel surface
- » traditional light grey external texture
- » box protection possible

Fire resistance rating

Fire resistance is provided by choosing the adequate sprayable mass thickness depending on: section factor, required fire resistance rating and critical temperature of steel.

Technical parameters

- » physical and mechanical properties of mcr Tecwool 825 mortar as a part of the mcr Isoverm 825 system

dry mix	
external appearance	light grey dry mix, without clumping or contamination
bulk density	$385 \pm 10\% \text{ kg/m}^3$
fresh mortar	
external appearance	uniform grey mass with beige intrusions, without clumping or contamination
fresh mortar	
bulk density of dry material	$402 \pm 10\% \text{ kg/m}^3$
bending strength	$\geq 1,0 \text{ MPa}$
compressive strength	$\geq 1,5 \text{ MPa}$
adhesive capacity to steel surface, protected with anti-corrosive two-component epoxy paint	$\geq 0,1 \text{ MPa}$ or render rupture
adhesive capacity to steel surface, protected with anti-corrosive polyurethane paint	$\geq 0,1 \text{ MPa}$ or render rupture
adhesive capacity to galvanized steel surface	$\geq 0,1 \text{ MPa}$ or render rupture
linear shrinkage	0,03 %

Constant quality control during the manufacturing process of the mcr Tecwool 825 mix guarantees proper physical and mechanical features are maintained to ensure flame retardant properties.

1.2.5 | Open sections

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 15 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
90	15	15	15	15	15	15	15	15	15
100	16	15	15	15	15	15	15	15	15
110	17	15	15	15	15	15	15	15	15
120	17	16	15	15	15	15	15	15	15
130	18	16	15	15	15	15	15	15	15
140	18	17	15	15	15	15	15	15	15
150	18	17	16	15	15	15	15	15	15
160	18	17	16	15	15	15	15	15	15
170	19	18	17	16	15	15	15	15	15
180	19	18	17	16	15	15	15	15	15
190	19	18	17	16	15	15	15	15	15
200	19	18	17	16	15	15	15	15	15
210	19	18	17	17	16	15	15	15	15
220	20	19	18	17	16	15	15	15	15
230	20	19	18	17	16	15	15	15	15
240	20	19	18	17	16	16	15	15	15
250	20	19	18	17	16	16	15	15	15
260	20	19	18	17	17	16	15	15	15
270	20	19	18	17	17	16	15	15	15
280	20	19	18	18	17	16	15	15	15
290	20	19	18	18	17	16	16	15	15
300	20	19	19	18	17	16	16	15	15
310	20	19	19	18	17	16	16	15	15
320	20	20	19	18	17	17	16	15	15
330	20	20	19	18	17	17	16	15	15
340	20	20	19	18	17	17	16	16	15
350	21	20	19	18	18	17	16	16	15
360	21	20	19	18	18	17	16	16	15
370	21	20	19	18	18	17	16	16	15
380	21	20	19	18	18	17	17	16	15
390	21	20	19	18	18	17	17	16	15
400	21	20	19	19	18	17	17	16	16
410	21	20	19	19	18	17	17	16	16
420	21	20	19	19	18	17	17	16	16
430	21	20	19	19	18	17	17	16	16
440	21	20	19	19	18	17	17	16	16
430	21	20	19	19	18	17	17	16	16
440	21	20	19	19	18	17	17	16	16
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 30 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	16	15	15	15	15	15	15	15	15
70	16	15	15	15	15	15	15	15	15
80	17	16	15	15	15	15	15	15	15
90	18	17	15	15	15	15	15	15	15
100	19	17	16	15	15	15	15	15	15
110	20	18	17	15	15	15	15	15	15
120	20	19	17	16	15	15	15	15	15
130	20	19	18	16	15	15	15	15	15
140	21	19	18	17	16	15	15	15	15
150	21	20	19	17	16	15	15	15	15
160	21	20	19	18	17	16	15	15	15
170	22	20	19	18	17	16	15	15	15
180	22	21	19	18	17	17	16	15	15
190	22	21	20	19	18	17	16	15	15
200	22	21	20	19	18	17	16	15	15
210	22	21	20	19	18	17	17	16	15
220	22	21	20	19	18	18	17	16	15
230	22	21	20	19	19	18	17	16	16
240	23	22	21	20	19	18	17	16	16
250	23	22	21	20	19	18	17	17	16
260	23	22	21	20	19	18	18	17	16
270	23	22	21	20	19	18	18	17	16
280	23	22	21	20	19	19	18	17	16
290	23	22	21	20	19	19	18	17	17
300	23	22	21	20	20	19	18	17	17
310	23	22	21	20	20	19	18	18	17
320	23	22	21	21	20	19	18	18	17
330	23	22	21	21	20	19	18	18	17
340	23	22	22	21	20	19	19	18	17
350	23	22	22	21	20	19	19	18	17
360	23	23	22	21	20	19	19	18	17
370	23	23	22	21	20	20	19	18	18
380	23	23	22	21	20	20	19	18	18
390	24	23	22	21	20	20	19	18	18
400	24	23	22	21	20	20	19	18	18
410	24	23	22	21	20	20	19	19	18
420	24	23	22	21	21	20	19	19	18
430	24	23	22	21	21	20	19	19	18
440	24	23	22	21	21	20	19	19	18
430	24	23	22	21	21	20	19	19	18
440	24	23	22	21	21	20	19	19	18
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 45 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	19	17	15	15	15	15	15	15	15
70	19	17	15	15	15	15	15	15	15
80	20	18	16	15	15	15	15	15	15
90	21	19	18	16	15	15	15	15	15
100	22	20	18	17	16	15	15	15	15
110	23	21	19	18	17	15	15	15	15
120	23	21	20	18	17	16	15	15	15
130	23	22	20	19	18	17	16	15	15
140	24	22	21	19	18	17	16	15	15
150	24	23	21	20	19	18	17	16	15
160	24	23	21	20	19	18	17	16	15
170	24	23	22	21	20	19	18	17	16
180	25	23	22	21	20	19	18	17	16
190	25	24	22	21	20	19	18	17	17
200	25	24	23	21	20	19	19	18	17
210	25	24	23	22	21	20	19	18	17
220	25	24	23	22	21	20	19	18	18
230	25	24	23	22	21	20	19	19	18
240	25	24	23	22	21	20	20	19	18
250	26	24	23	22	21	21	20	19	18
260	26	24	23	22	22	21	20	19	18
270	26	25	24	23	22	21	20	19	19
280	26	25	24	23	22	21	20	19	19
290	26	25	24	23	22	21	20	20	19
300	26	25	24	23	22	21	20	20	19
310	26	25	24	23	22	21	21	20	19
320	26	25	24	23	22	21	21	20	19
330	26	25	24	23	22	22	21	20	19
340	26	25	24	23	22	22	21	20	20
350	26	25	24	23	23	22	21	20	20
360	26	25	24	23	23	22	21	20	20
370	26	25	24	24	23	22	21	21	20
380	26	25	24	24	23	22	21	21	20
390	26	25	25	24	23	22	21	21	20
400	26	25	25	24	23	22	21	21	20
410	26	25	25	24	23	22	22	21	20
420	26	26	25	24	23	22	22	21	20
430	26	26	25	24	23	22	22	21	20
440	26	26	25	24	23	22	22	21	20
430	26	26	25	24	23	23	22	21	21
440	27	26	25	24	23	23	22	21	21
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 60 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	22	19	17	15	15	15	15	15	15
70	22	20	18	16	15	15	15	15	15
80	23	21	19	17	16	15	15	15	15
90	24	22	20	19	17	16	15	15	15
100	25	23	21	19	18	17	16	15	15
110	26	24	22	20	19	18	16	15	15
120	26	24	22	21	20	18	17	16	15
130	26	25	23	22	20	19	18	17	16
140	27	25	23	22	21	20	18	17	17
150	27	25	24	22	21	20	19	18	17
160	27	26	24	23	22	21	19	18	18
170	27	26	24	23	22	21	20	19	18
180	28	26	25	23	22	21	20	19	18
190	28	26	25	24	23	22	21	20	19
200	28	26	25	24	23	22	21	20	19
210	28	27	25	24	23	22	21	20	19
220	28	27	26	24	23	22	21	21	20
230	28	27	26	25	24	23	22	21	20
240	28	27	26	25	24	23	22	21	20
250	28	27	26	25	24	23	22	21	20
260	28	27	26	25	24	23	22	21	21
270	29	27	26	25	24	23	22	22	21
280	29	27	26	25	24	23	23	22	21
290	29	28	26	25	24	24	23	22	21
300	29	28	27	26	25	24	23	22	21
310	29	28	27	26	25	24	23	22	21
320	29	28	27	26	25	24	23	22	22
330	29	28	27	26	25	24	23	22	22
340	29	28	27	26	25	24	23	23	22
350	29	28	27	26	25	24	23	23	22
360	29	28	27	26	25	24	24	23	22
370	29	28	27	26	25	24	24	23	22
380	29	28	27	26	25	25	24	23	22
390	29	28	27	26	25	25	24	23	22
400	29	28	27	26	25	25	24	23	22
410	29	28	27	26	26	25	24	23	23
420	29	28	27	26	26	25	24	23	23
430	29	28	27	27	26	25	24	23	23
440	29	28	27	27	26	25	24	23	23
430	29	28	27	27	26	25	24	24	23
440	29	28	27	27	26	25	24	24	23
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 90 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	28	25	22	20	18	17	15	15	15
70	29	25	23	21	19	17	16	15	15
80	30	27	24	22	20	19	17	16	15
90	30	28	25	23	22	20	19	17	16
100	31	28	26	24	23	21	20	19	17
110	31	29	27	25	24	22	21	20	18
120	32	30	28	26	24	23	22	20	19
130	32	30	28	27	25	24	22	21	20
140	32	30	29	27	26	24	23	22	21
150	33	31	29	28	26	25	24	22	21
160	33	31	29	28	26	25	24	23	22
170	33	31	30	28	27	26	24	23	22
180	33	32	30	29	27	26	25	24	23
190	33	32	30	29	28	26	25	24	23
200	34	32	30	29	28	27	26	24	23
210	34	32	31	29	28	27	26	25	24
220	34	32	31	30	28	27	26	25	24
230	34	32	31	30	29	27	26	25	24
240	34	33	31	30	29	28	27	26	25
250	34	33	31	30	29	28	27	26	25
260	34	33	31	30	29	28	27	26	25
270	34	33	32	30	29	28	27	26	25
280	34	33	32	30	29	28	27	26	25
290	34	33	32	31	30	28	27	27	26
300	34	33	32	31	30	29	28	27	26
310	34	33	32	31	30	29	28	27	26
320	34	33	32	31	30	29	28	27	26
330	35	33	32	31	30	29	28	27	26
340	35	33	32	31	30	29	28	27	26
350	35	33	32	31	30	29	28	27	27
360	35	33	32	31	30	29	28	27	27
370	35	34	32	31	30	29	28	28	27
380	35	34	32	31	30	29	29	28	27
390	35	34	33	31	30	30	29	28	27
400	35	34	33	32	31	30	29	28	27
410	35	34	33	32	31	30	29	28	27
420	35	34	33	32	31	30	29	28	27
430	35	34	33	32	31	30	29	28	27
440	35	34	33	32	31	30	29	28	27
430	35	34	33	32	31	30	29	28	28
440	35	34	33	32	31	30	29	28	28
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 120 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	34	31	28	25	23	21	19	18	16
70	35	31	28	26	23	21	20	18	17
80	36	32	30	27	25	23	21	20	19
90	36	33	31	28	26	24	23	21	20
100	37	34	32	29	27	26	24	23	21
110	37	35	32	30	28	27	25	24	22
120	38	35	33	31	29	27	26	25	23
130	38	36	34	32	30	28	27	25	24
140	38	36	34	32	30	29	27	26	25
150	38	36	34	33	31	29	28	27	25
160	39	37	35	33	31	30	29	27	26
170	39	37	35	33	32	30	29	28	27
180	39	37	35	34	32	31	29	28	27
190	39	37	36	34	32	31	30	29	27
200	39	37	36	34	33	31	30	29	28
210	39	38	36	34	33	32	30	29	28
220	39	38	36	35	33	32	31	30	28
230	40	38	36	35	33	32	31	30	29
240	40	38	36	35	34	32	31	30	29
250	40	38	37	35	34	33	31	30	29
260	40	38	37	35	34	33	32	31	30
270	40	38	37	36	34	33	32	31	30
280	40	38	37	36	34	33	32	31	30
290	40	38	37	36	35	33	32	31	30
300	40	39	37	36	35	33	32	31	30
310	40	39	37	36	35	34	33	32	31
320	40	39	37	36	35	34	33	32	31
330	40	39	37	36	35	34	33	32	31
340	40	39	38	36	35	34	33	32	31
350	40	39	38	36	35	34	33	32	31
360	40	39	38	36	35	34	33	32	31
370	40	39	38	37	35	34	33	32	31
380	40	39	38	37	35	34	33	32	31
390	40	39	38	37	36	34	33	33	32
400	40	39	38	37	36	35	34	33	32
410	40	39	38	37	36	35	34	33	32
420	40	39	38	37	36	35	34	33	32
430	40	39	38	37	36	35	34	33	32
440	40	39	38	37	36	35	34	33	32
430	41	39	38	37	36	35	34	33	32
440	41	39	38	37	36	35	34	33	32
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 180 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	47	42	38	35	32	29	27	25	23
70	47	42	39	35	32	30	28	26	24
80	48	44	40	37	34	32	30	28	26
90	48	44	41	38	36	33	31	29	28
100	49	45	42	39	37	35	33	31	29
110	49	46	43	40	38	36	34	32	30
120	49	46	44	41	39	37	35	33	31
130	50	47	44	42	39	37	36	34	32
140	50	47	45	42	40	38	36	35	33
150	50	47	45	43	41	39	37	35	34
160	50	48	45	43	41	39	38	36	34
170	50	48	46	44	42	40	38	37	35
180	51	48	46	44	42	40	39	37	36
190	51	48	46	44	42	41	39	37	36
200	51	48	46	44	43	41	39	38	37
210	51	49	47	45	43	41	40	38	37
220	51	49	47	45	43	42	40	39	37
230	51	49	47	45	43	42	40	39	38
240	51	49	47	45	44	42	41	39	38
250	51	49	47	46	44	42	41	40	38
260	51	49	47	46	44	43	41	40	38
270	51	49	48	46	44	43	41	40	39
280	51	49	48	46	44	43	42	40	39
290	51	49	48	46	45	43	42	40	39
300	51	50	48	46	45	43	42	41	39
310	51	50	48	46	45	43	42	41	40
320	51	50	48	46	45	44	42	41	40
330	51	50	48	47	45	44	42	41	40
340	51	50	48	47	45	44	43	41	40
350	51	50	48	47	45	44	43	41	40
360	52	50	48	47	45	44	43	42	40
370	52	50	48	47	46	44	43	42	41
380	52	50	48	47	46	44	43	42	41
390	52	50	48	47	46	44	43	42	41
400	52	50	49	47	46	44	43	42	41
410	52	50	49	47	46	45	43	42	41
420	52	50	49	47	46	45	43	42	41
430	52	50	49	47	46	45	44	42	41
440	52	50	49	47	46	45	44	42	41
430	52	50	49	47	46	45	44	43	41
440	52	50	49	47	46	45	44	43	42
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 240 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	59	53	48	44	41	38	35	32	30
70	59	54	49	45	41	38	36	33	31
80	60	55	50	47	43	40	38	35	33
90	60	56	52	48	45	42	40	37	35
100	61	56	53	49	46	44	41	39	37
110	61	57	53	50	47	45	42	40	38
120	61	57	54	51	48	46	43	41	39
130	61	58	55	52	49	47	44	42	40
140	62	58	55	52	50	47	45	43	41
150	62	58	56	53	50	48	46	44	42
160	62	59	56	53	51	49	47	45	43
170	62	59	56	54	51	49	47	45	44
180	62	59	56	54	52	50	48	46	44
190	62	59	57	54	52	50	48	46	45
200	62	59	57	55	53	51	49	47	45
210	62	60	57	55	53	51	49	47	46
220	62	60	57	55	53	51	49	48	46
230	62	60	58	55	53	51	50	48	46
240	62	60	58	56	54	52	50	48	47
250	62	60	58	56	54	52	50	49	47
260	62	60	58	56	54	52	51	49	47
270	63	60	58	56	54	52	51	49	48
280	63	60	58	56	54	53	51	49	48
290	63	60	58	56	55	53	51	50	48
300	63	60	58	57	55	53	51	50	48
310	63	61	59	57	55	53	52	50	49
320	63	61	59	57	55	53	52	50	49
330	63	61	59	57	55	54	52	51	49
340	63	61	59	57	55	54	52	51	49
350	63	61	59	57	55	54	52	51	49
360	63	61	59	57	56	54	52	51	50
370	63	61	59	57	56	54	53	51	50
380	63	61	59	57	56	54	53	51	50
390	63	61	59	57	56	54	53	51	50
400	63	61	59	58	56	54	53	52	50
410	63	61	59	58	56	54	53	52	50
420	63	61	59	58	56	55	53	52	50
430	63	61	59	58	56	55	53	52	51
440	63	61	59	58	56	55	53	52	51
430	63	61	59	58	56	55	53	52	51
440	63	61	59	58	56	55	53	52	51
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 360 minutes – open sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	-	-	-	64	59	54	51	47	44
70	-	-	-	64	59	55	51	48	45
80	-	-	-	-	62	58	54	51	48
90	-	-	-	-	64	60	56	53	50
100	-	-	-	-	64,9	61	58	55	52
110	-	-	-	-	-	63	60	57	54
120	-	-	-	-	-	64	61	58	56
130	-	-	-	-	-	64,9	62	59	57
140	-	-	-	-	-	-	63	60	58
150	-	-	-	-	-	-	64	61	59
160	-	-	-	-	-	-	64,9	62	60
170	-	-	-	-	-	-	-	63	61
180	-	-	-	-	-	-	-	64	61
190	-	-	-	-	-	-	-	64	62
200	-	-	-	-	-	-	-	64,9	63
210	-	-	-	-	-	-	-	64,9	63
220	-	-	-	-	-	-	-	-	64
230	-	-	-	-	-	-	-	-	64
240	-	-	-	-	-	-	-	-	64,9
250	-	-	-	-	-	-	-	-	64,9
260	-	-	-	-	-	-	-	-	64,9
>260	-	-	-	-	-	-	-	-	-

1.2.6 | Box sections

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 15 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
90	17	15	15	15	15	15	15	15	15
100	18	16	15	15	15	15	15	15	15
110	18	17	15	15	15	15	15	15	15
120	19	18	16	15	15	15	15	15	15
130	20	18	17	16	15	15	15	15	15
140	20	19	18	16	15	15	15	15	15
150	21	19	18	17	16	15	15	15	15
160	21	20	19	18	17	16	15	15	15
170	22	20	19	18	17	16	15	15	15
180	22	21	20	19	18	17	16	15	15
190	23	21	20	19	18	17	16	15	15
200	23	22	21	19	18	18	17	16	15
210	23	22	21	20	19	18	17	16	15
220	24	22	21	20	19	18	17	17	16
230	24	23	22	21	20	19	18	17	16
240	24	23	22	21	20	19	18	17	17
250	25	23	22	21	20	19	19	18	17
260	25	24	23	22	21	20	19	18	17
270	25	24	23	22	21	20	19	18	17
280	25	24	23	22	21	20	19	18	18
290	25	24	23	22	21	20	19	19	18
300	25	24	23	22	21	20	20	19	18
310	25	24	23	22	21	20	20	19	18
320	25	24	23	22	21	21	20	19	18
330	25	24	23	22	22	21	20	19	18
340	25	24	23	23	22	21	20	19	19
350	26	25	24	23	22	21	20	19	19
360	26	25	24	23	22	21	20	20	19
370	26	25	24	23	22	21	20	20	19
380	26	25	24	23	22	21	21	20	19
390	26	25	24	23	22	21	21	20	19
400	26	25	24	23	22	21	21	20	19
410	26	25	24	23	22	22	21	20	19
420	26	25	24	23	22	22	21	20	19
430	26	25	24	23	22	22	21	20	20
440	26	25	24	23	23	22	21	20	20
430	26	25	24	23	23	22	21	20	20
440	26	25	24	23	23	22	21	20	20
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 30 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	17	15	15	15	15	15	15	15	15
70	17	15	15	15	15	15	15	15	15
80	19	17	15	15	15	15	15	15	15
90	20	18	16	15	15	15	15	15	15
100	21	19	17	16	15	15	15	15	15
110	22	20	18	17	16	15	15	15	15
120	22	21	19	18	17	15	15	15	15
130	23	21	20	19	17	16	15	15	15
140	24	22	21	19	18	17	16	15	15
150	24	23	21	20	19	18	17	16	15
160	25	23	22	21	19	18	17	16	15
170	25	24	22	21	20	19	18	17	16
180	26	24	23	22	20	19	18	17	17
190	26	25	23	22	21	20	19	18	17
200	26	25	24	23	21	20	19	18	18
210	27	25	24	23	22	21	20	19	18
220	27	26	25	23	22	21	20	19	19
230	28	26	25	24	23	22	21	20	19
240	28	27	25	24	23	22	21	20	19
250	28	27	26	25	24	23	22	21	20
260	28	27	26	25	24	23	22	21	20
270	28	27	26	25	24	23	22	21	20
280	29	27	26	25	24	23	22	21	20
290	29	27	26	25	24	23	22	21	21
300	29	28	26	25	24	23	23	22	21
310	29	28	27	25	24	24	23	22	21
320	29	28	27	26	25	24	23	22	21
330	29	28	27	26	25	24	23	22	21
340	29	28	27	26	25	24	23	22	21
350	29	28	27	26	25	24	23	22	22
360	29	28	27	26	25	24	23	22	22
370	29	28	27	26	25	24	23	23	22
380	29	28	27	26	25	24	24	23	22
390	29	28	27	26	25	24	24	23	22
400	29	28	27	26	25	25	24	23	22
410	29	28	27	26	25	25	24	23	22
420	29	28	27	26	26	25	24	23	22
430	29	28	27	26	26	25	24	23	22
440	29	28	27	27	26	25	24	23	23
430	29	28	28	27	26	25	24	23	23
440	30	29	28	27	26	25	24	23	23
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 45 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	20	18	16	15	15	15	15	15	15
70	21	18	16	15	15	15	15	15	15
80	22	20	18	16	15	15	15	15	15
90	23	21	19	17	16	15	15	15	15
100	24	22	20	19	17	16	15	15	15
110	25	23	21	20	18	17	16	15	15
120	26	24	22	21	19	18	17	16	15
130	26	25	23	21	20	19	18	17	16
140	27	25	24	22	21	20	18	17	16
150	28	26	24	23	22	20	19	18	17
160	28	26	25	23	22	21	20	19	18
170	29	27	25	24	23	22	21	19	19
180	29	27	26	25	23	22	21	20	19
190	29	28	26	25	24	23	22	21	20
200	30	28	27	26	24	23	22	21	20
210	30	29	27	26	25	24	23	22	21
220	31	29	28	27	25	24	23	22	21
230	31	30	28	27	26	25	24	23	22
240	31	30	29	27	26	25	24	23	22
250	32	30	29	28	27	26	25	24	23
260	32	30	29	28	27	26	25	24	23
270	32	31	29	28	27	26	25	24	23
280	32	31	29	28	27	26	25	24	23
290	32	31	30	28	27	26	25	24	23
300	32	31	30	29	27	26	25	25	24
310	32	31	30	29	28	27	26	25	24
320	32	31	30	29	28	27	26	25	24
330	32	31	30	29	28	27	26	25	24
340	33	31	30	29	28	27	26	25	24
350	33	31	30	29	28	27	26	25	24
360	33	31	30	29	28	27	26	25	25
370	33	31	30	29	28	27	26	26	25
380	33	32	30	29	28	27	27	26	25
390	33	32	31	29	28	28	27	26	25
400	33	32	31	30	29	28	27	26	25
410	33	32	31	30	29	28	27	26	25
420	33	32	31	30	29	28	27	26	25
430	33	32	31	30	29	28	27	26	25
440	33	32	31	30	29	28	27	26	25
430	33	32	31	30	29	28	27	26	26
440	33	32	31	30	29	28	27	26	26
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 60 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	23	21	18	16	15	15	15	15	15
70	24	21	19	17	15	15	15	15	15
80	25	23	21	19	17	16	15	15	15
90	26	24	22	20	19	17	16	15	15
100	27	25	23	21	20	18	17	16	15
110	28	26	24	22	21	19	18	17	16
120	29	27	25	23	22	21	19	18	17
130	30	28	26	24	23	21	20	19	18
140	30	28	27	25	24	22	21	20	19
150	31	29	27	26	24	23	22	21	20
160	31	30	28	26	25	24	22	21	20
170	32	30	29	27	26	24	23	22	21
180	32	31	29	28	26	25	24	23	22
190	33	31	30	28	27	26	24	23	22
200	33	32	30	29	27	26	25	24	23
210	34	32	31	29	28	27	25	24	23
220	34	33	31	30	28	27	26	25	24
230	35	33	31	30	29	28	27	25	24
240	35	33	32	31	29	28	27	26	25
250	35	34	32	31	30	29	27	26	25
260	35	34	33	31	30	29	28	27	26
270	36	34	33	31	30	29	28	27	26
280	36	34	33	32	30	29	28	27	26
290	36	34	33	32	30	29	28	27	26
300	36	34	33	32	31	30	28	27	27
310	36	34	33	32	31	30	29	28	27
320	36	35	33	32	31	30	29	28	27
330	36	35	33	32	31	30	29	28	27
340	36	35	33	32	31	30	29	28	27
350	36	35	34	32	31	30	29	28	27
360	36	35	34	32	31	30	29	28	27
370	36	35	34	33	31	30	29	28	28
380	36	35	34	33	32	31	30	29	28
390	36	35	34	33	32	31	30	29	28
400	36	35	34	33	32	31	30	29	28
410	36	35	34	33	32	31	30	29	28
420	36	35	34	33	32	31	30	29	28
430	36	35	34	33	32	31	30	29	28
440	36	35	34	33	32	31	30	29	28
430	37	35	34	33	32	31	30	29	28
440	37	35	34	33	32	31	30	29	28
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 90 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	30	27	24	22	19	18	16	15	15
70	30	27	24	22	20	18	17	15	15
80	32	29	26	24	22	20	19	17	16
90	33	30	28	26	24	22	20	19	18
100	34	31	29	27	25	23	22	20	19
110	35	32	30	28	26	25	23	22	20
120	36	33	31	29	27	26	24	23	22
130	36	34	32	30	28	27	25	24	23
140	37	35	33	31	29	28	26	25	24
150	38	35	33	32	30	28	27	26	24
160	38	36	34	32	31	29	28	26	25
170	39	37	35	33	31	30	28	27	26
180	39	37	35	34	32	31	29	28	27
190	40	38	36	34	33	31	30	29	27
200	40	38	36	35	33	32	31	29	28
210	41	39	37	35	34	32	31	30	29
220	41	39	38	36	34	33	32	30	29
230	42	40	38	36	35	34	32	31	30
240	42	40	39	37	35	34	33	32	30
250	42	41	39	37	36	35	33	32	31
260	43	41	39	38	36	35	34	32	31
270	43	41	39	38	36	35	34	33	31
280	43	41	39	38	37	35	34	33	32
290	43	41	40	38	37	35	34	33	32
300	43	41	40	38	37	36	34	33	32
310	43	41	40	38	37	36	35	33	32
320	43	41	40	39	37	36	35	34	33
330	43	41	40	39	37	36	35	34	33
340	43	42	40	39	37	36	35	34	33
350	43	42	40	39	38	36	35	34	33
360	43	42	40	39	38	36	35	34	33
370	43	42	40	39	38	37	35	34	33
380	43	42	40	39	38	37	36	35	33
390	43	42	41	39	38	37	36	35	34
400	43	42	41	39	38	37	36	35	34
410	43	42	41	39	38	37	36	35	34
420	43	42	41	39	38	37	36	35	34
430	43	42	41	40	38	37	36	35	34
440	43	42	41	40	38	37	36	35	34
430	44	42	41	40	38	37	36	35	34
440	44	42	41	40	38	37	36	35	34
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 120 minutes– box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	37	33	29	27	24	22	20	19	17
70	37	33	30	27	25	23	21	19	18
80	38	35	32	29	27	25	23	21	20
90	40	36	33	31	29	27	25	23	22
100	41	37	35	32	30	28	26	25	23
110	41	38	36	34	31	30	28	26	25
120	42	39	37	35	33	31	29	27	26
130	43	40	38	36	34	32	30	29	27
140	44	41	39	37	35	33	31	30	28
150	44	42	39	37	35	34	32	31	29
160	45	42	40	38	36	35	33	32	30
170	45	43	41	39	37	35	34	32	31
180	46	44	42	40	38	36	35	33	32
190	46	44	42	40	39	37	35	34	33
200	47	45	43	41	39	38	36	35	33
210	48	45	43	42	40	38	37	35	34
220	48	46	44	42	40	39	37	36	35
230	49	46	45	43	41	40	38	37	35
240	49	47	45	43	42	40	39	37	36
250	50	48	46	44	42	41	39	38	37
260	50	48	46	44	42	41	39	38	37
270	50	48	46	44	43	41	40	38	37
280	50	48	46	44	43	41	40	39	37
290	50	48	46	45	43	42	40	39	38
300	50	48	46	45	43	42	40	39	38
310	50	48	46	45	43	42	41	39	38
320	50	48	47	45	43	42	41	39	38
330	50	48	47	45	44	42	41	40	38
340	50	48	47	45	44	42	41	40	39
350	50	48	47	45	44	43	41	40	39
360	50	49	47	45	44	43	41	40	39
370	50	49	47	46	44	43	41	40	39
380	50	49	47	46	44	43	42	40	39
390	50	49	47	46	44	43	42	41	39
400	50	49	47	46	44	43	42	41	40
410	50	49	47	46	45	43	42	41	40
420	50	49	47	46	45	43	42	41	40
430	50	49	47	46	45	43	42	41	40
440	50	49	47	46	45	43	42	41	40
430	51	49	48	46	45	44	42	41	40
440	51	49	48	46	45	44	42	41	40
> 453	–	–	–	–	–	–	–	–	–

» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 180 minutes – box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	50	45	41	37	34	31	29	27	25
70	50	45	41	38	35	32	29	27	25
80	52	47	43	40	37	34	32	30	28
90	53	48	45	42	39	36	34	32	30
100	54	50	46	43	40	38	36	34	32
110	54	51	48	45	42	40	37	35	34
120	55	52	49	46	43	41	39	37	35
130	56	53	50	47	45	42	40	38	36
140	57	54	51	48	46	43	41	39	38
150	58	54	52	49	47	44	42	41	39
160	58	55	52	50	48	45	44	42	40
170	59	56	53	51	49	46	44	43	41
180	60	57	54	52	49	47	45	44	42
190	60	57	55	52	50	48	46	45	43
200	61	58	56	53	51	49	47	45	44
210	61	59	56	54	52	50	48	46	45
220	62	59	57	55	53	51	49	47	45
230	63	60	58	55	53	51	50	48	46
240	63	61	58	56	54	52	50	49	47
250	64	61	59	57	55	53	51	49	48
260	64	61	59	57	55	53	51	50	48
270	64	61	59	57	55	53	52	50	48
280	64	62	59	57	55	54	52	50	49
290	64	62	60	57	56	54	52	50	49
300	64	62	60	58	56	54	52	51	49
310	64	62	60	58	56	54	52	51	49
320	64	62	60	58	56	54	53	51	50
330	64	62	60	58	56	55	53	51	50
340	64	62	60	58	56	55	53	52	50
350	64	62	60	58	57	55	53	52	50
360	64	62	60	58	57	55	53	52	50
370	64	62	60	59	57	55	54	52	51
380	64	62	60	59	57	55	54	52	51
390	64	62	60	59	57	55	54	52	51
400	64	62	61	59	57	55	54	52	51
410	64	62	61	59	57	56	54	53	51
420	64	63	61	59	57	56	54	53	51
430	64	63	61	59	57	56	54	53	51
440	64,9	63	61	59	57	56	54	53	52
430	64,9	63	61	59	58	56	55	53	52
440	64,9	63	61	59	58	56	55	53	52
> 453	–	–	–	–	–	–	–	–	–



» Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 240 minutes – box sections.

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	63	57	52	47	43	40	37	35	32
70	63	57	52	48	44	41	38	35	33
80	64,9	59	54	50	47	44	41	38	36
90	–	61	56	52	49	46	43	41	38
100	–	62	58	54	51	48	45	43	40
110	–	63	59	56	52	50	47	45	42
120	–	64	60	57	54	51	49	46	44
130	–	64,9	62	58	55	53	50	48	46
140	–	–	63	60	57	54	52	49	47
150	–	–	64	61	58	55	53	51	48
160	–	–	64,9	62	59	56	54	52	50
170	–	–	–	63	60	57	55	53	51
180	–	–	–	64	61	59	56	54	52
190	–	–	–	64,9	62	60	57	55	53
200	–	–	–	–	63	61	58	56	54
210	–	–	–	–	64	61	59	57	55
220	–	–	–	–	64,9	62	60	58	56
230	–	–	–	–	–	63	61	59	57
240	–	–	–	–	–	64	62	60	58
250	–	–	–	–	–	64,9	63	61	59
260	–	–	–	–	–	64,9	63	61	59
270	–	–	–	–	–	–	63	61	60
280	–	–	–	–	–	–	64	62	60
290	–	–	–	–	–	–	64	62	60
300	–	–	–	–	–	–	64	62	60
310	–	–	–	–	–	–	64	63	61
320	–	–	–	–	–	–	64,9	63	61
330	–	–	–	–	–	–	64,9	63	61
340	–	–	–	–	–	–	64,9	63	61
350	–	–	–	–	–	–	64,9	63	62
360	–	–	–	–	–	–	–	64	62
370	–	–	–	–	–	–	–	64	62
380	–	–	–	–	–	–	–	64	62
390	–	–	–	–	–	–	–	64	62
400	–	–	–	–	–	–	–	64	63
410	–	–	–	–	–	–	–	64	63
420	–	–	–	–	–	–	–	64,9	63
430	–	–	–	–	–	–	–	64,9	63
440	–	–	–	–	–	–	–	64,9	63
430	–	–	–	–	–	–	–	64,9	63
440	–	–	–	–	–	–	–	64,9	63
> 453	–	–	–	–	–	–	–	–	–

» **Minimum thicknesses of mcr Tecwool 825 in mcr Isoverm 825 system protection for hydrogen fire conditions over 360 minutes – box sections.**

section factor U/A [m ⁻¹]	minimum protection thickness after mortar curing [mm] at the steel design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 68	-	-	-	-	63	58	54	50	47
70	-	-	-	-	63	59	55	51	48
80	-	-	-	-	-	62	58	55	52
90	-	-	-	-	-	64,9	61	58	55
100	-	-	-	-	-	-	64	61	58
110	-	-	-	-	-	-	-	63	60
120	-	-	-	-	-	-	-	64,9	62
130	-	-	-	-	-	-	-	-	64
> 130	-	-	-	-	-	-	-	-	-

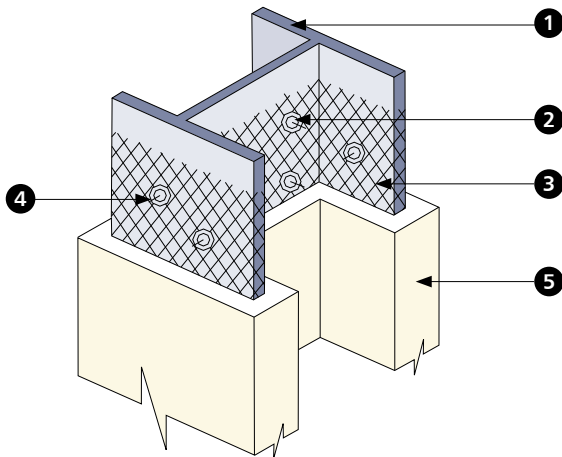
2.3.4 | Flame retardant treatment technology

The proofing is performed with specialized spray-on machines. The dry mix is poured into the machine's tank and transported under pressure through hoses to a spray-on nozzle where it is mixed with water. Water is provided to the nozzle with an independent hose. Before applying the mcr Tecwool 825 mortar, the elements to be protected must be cleaned from dirt, oil, grease, peeling paint and rust – all soiling that may reduce adhesion. The application surface must be compatible with or chemically resistant to the sprayed material components.

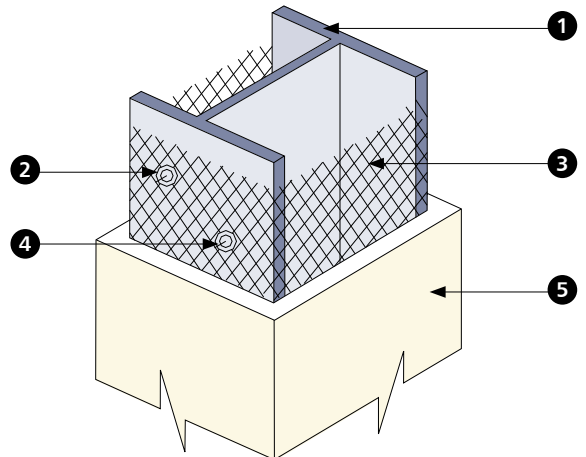
The mcr Isoverm 825 system may be used both with and without steel mesh reinforcement. Where mesh reinforcement is used, prepare the surface subject to flame retardant treatments with lathing using steel pins..

Steel column proofing with reinforcement mesh. The pin location is only indicative.

» fixing the mesh along the section shape



» fixing the mesh as a box



- 1. steel element
- 2. clamping caps
- 3. steel mesh
- 4. steel pins
- 5. mcr Tecwool 825

» **Fixing steel pins**

Fix steel pins so that the mesh is evenly stretched over the surface of the elements. Choose the appropriate pin length so that once the mesh is fixed, the pins do not extend above the surface of the insulation under any circumstances. Fix the pins using steel surface spot welding, spaced at no more than 500 mm. Upon fixing, restore the anti-corrosion coating at each welding spot to prevent rusting. In special cases, pins may be used.

» **Lathing fixing**

Stretch the mesh evenly over each element, carefully following their shapes. In the case of sections with a cross section height of 290 mm or more, the mesh may be fixed along the external section border (creating a so-called box).

The mesh is stretched over previously fixed pins, making sure it adheres well to the element's surface and does not extend for more than 1/3 – 1/2 of the final insulation thickness. Be sure not to overstretch the mesh, causing deformation of the mesh aperture.

- » For best adhesion, apply the mcr Tecwool 825 mortar directly after dampening the proofed element with water.
- » Apply the mortar in layers, until the required target total thickness is reached. Spray the proofed surface at a straight angle, maintaining a distance between the nozzle and the surface of approximately 500–800 mm.
- » After applying the final flame retardant thickness, dampen with water to increase its hardness.
- » Upon application of fire resistant insulation, the proofed sections and surfaces retain their natural shapes. The protection surface gains the characteristic grey texture.
- » Perform all the works at ambient temperatures of no less than +3°C and no more than +40°C, at relative air humidity not exceeding 85%.
- » Upon curing and hardening, the mcr Tecwool 825 mortar creates a flame retardant insulation that may be covered with a protective coating of finishing paints. The purpose of such a coating is to additionally protect the flame retardant treatment against the destructive impact of weather conditions (precipitation, low temperatures, temperature spikes) and aggressive environment, etc.

Consult any specific selection of coatings with „MERCOR“ S.A.'s technical department.



**FIRE-PROOF BOARDS
AND BOARD SYSTEMS**



mcr Silboard

- CALCIUM SILICATE (CaSi) BOARD SYSTEMS

Calcium silicate boards are designed for: building self-supporting ventilation and smoke extract ducts with an EIS120 rating; building cable ducts ensuring continuous electrical power or signal delivery over 30, 60, 90 and 120 minutes; providing flame retardant treatments for reinforced concrete structures reinforced with carbon fiber tapes and mats up to 120 minutes, depending on the critical temperature of the adhesive; providing fire protection for steel structures with an R15–R180 rated single-layer system and dual-layer system with a R15–R360 rating; building non-bearing class EI 120 and EI fire dividing walls.

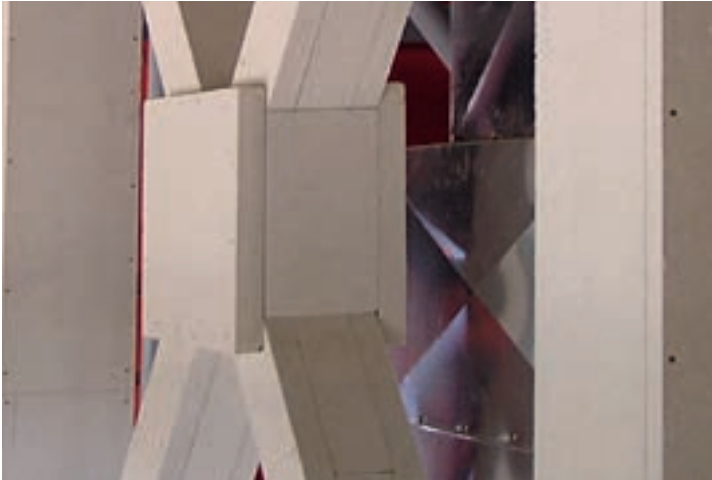


mcr Tecbor

- MAGNESIUM (MGO) BOARD SYSTEMS

mcr Tecbor boards are a modern construction material for flame retardant cladding of construction elements and building standalone elements with the declared fire resistance rating.

1.3 | **mcr Silboard**



- » R15–R180 – single-layer system
- » R15–R360 – double-layer system
- » European Technical Assessment ETA-18/0546
- » Certificate of constancy of performance 1488-CPR-0698/W
- » Declaration of performance DOP/HZ/01/2018

Application

mcr Silboard – a flame retardant calcium silicate board, non-combustible, with a wide range of application in general and industrial construction. Designed for self-supporting firestop general ventilation ducts (comfort ventilation) and multi-zone smoke extract ducts, cable ducts, installation ducts, non-bearing walls (shafts), protecting steel structures and reinforced concrete structural components reinforced with carbon fiber tapes and mats.

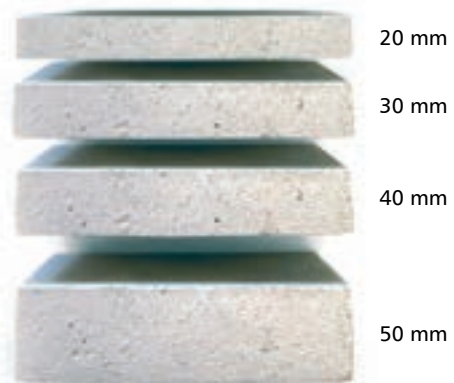
Board features

- » high mechanical strength
- » easy processing; quick, easy and clean installation
- » smooth and clean flame retardant insulation surface
- » no need to insulate steel hanger supporting ventilation and smoke extract ducts, as well as cable ducts
- » non-toxic and free from substances harmful to health
- » total biological corrosion resistance (fungi, bacteria)
- » environmental category Y – indoor applications and partial exposure to weather conditions as per ETAG 018-4

Technical parameters

» Board physical and chemical properties

available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
external appearance	white/cream color, trowelled superficial layers smooth sanding on one side
density	550 kg/m ³ ± 15%
compressive strength	≥ 1,0 MPa
perpendicular tensile strength	≥ 0,10 MPa
parallel tensile strength	≥ 0,40 MPa
dimension stability	the boards are dimensionally stable
compressive strength	≥ 1,0 MPa
perpendicular tensile strength	≥ 0,10 MPa
use category	Y

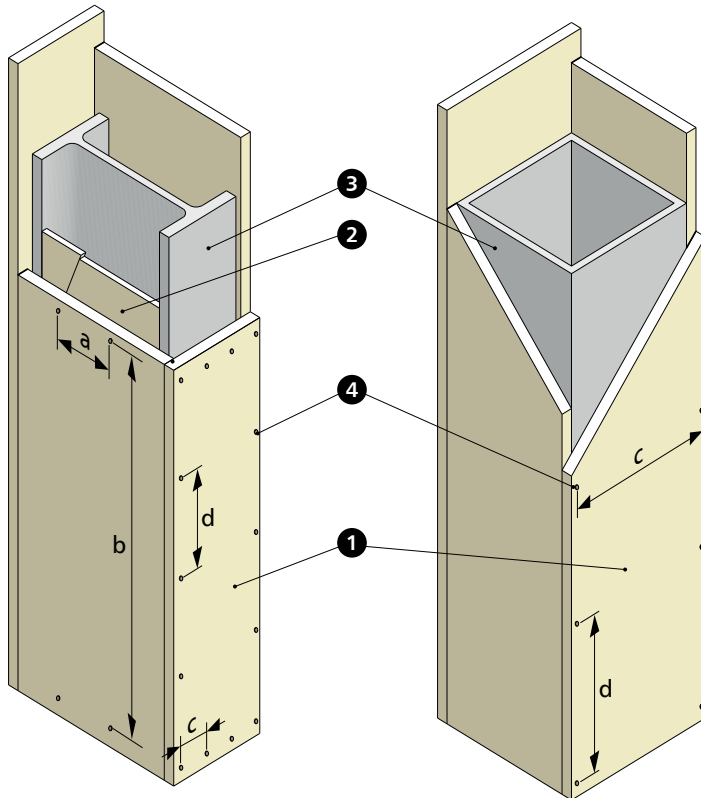


Fire resistance rating

The thickness of a flame retardant cladding for steel elements results from the required fire resistance rating, assumed critical temperature and the section factor U/A.

1.3.1 | Installation

1.3.2 | Single-layer mcr Silboard system – installation details



$a \leq 150 \text{ mm}$
 $b = \text{spacer distance}$
 $c \leq 150 \text{ mm}$
 $d \leq 200 \text{ mm}$

1. mcr Silboard boards with a thickness of 20, 30, 40 and 50 mm
2. two-part mcr Silboard board spacer with a thickness of 20 mm and width of at least 150 mm; spaced at $\leq 1250 \text{ mm}$
3. steel element
4. steel screws and steel staples as per the tables below

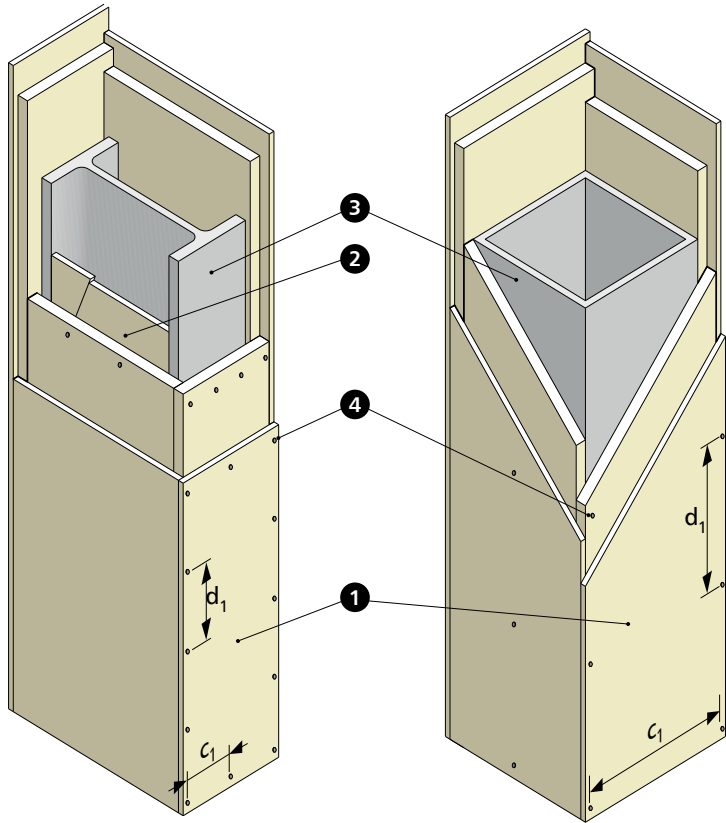
» steel screws used in the mcr Silboard system

mcr Silboard board thickness [mm]	steel screws minimum dimensions, diameter × length [mm]	
	corner joints	joints with spacers
20	3,5 x 40	3,0 x 35
30	4,0 x 60	3,5 x 40
40	4,0 x 70	3,5 x 50
50	5,0 x 90	4,0 x 60

» mcr Silboard board fixing system using steel staples

board size [mm]	staple dimensions (minimum) [mm]			
	perpendicular joints "corner"	connections "parallel" with a 20 mm board	connections "parallel" with a 30 mm board	connections "parallel" with a 40 mm board
20	50/10,5/1,45	35/10,5/1,45	45/10,5/1,45	-
30	50/10,5/1,45	45/10,5/1,45	50/10,5/1,45	55/11,3/1,84
40	80/11,3/1,84	55/11,3/1,84	65/11,3/1,84	65/11,3/1,84
50	80/11,3/1,84	65/11,3/1,84	-	-

1.3.3 | Dual-layer mcr Silboard system – installation details



1. mcr Silboard boards with a thickness according to the table below
2. two-part mcr Silboard spacer with a thickness of 20 mm and a width of at least 150 mm; spaced at ≤ 1250 mm
3. steel element
4. steel screws and steel staples as per the tables below

The installation of the first layer of mcr Silboard boards onto steel elements is shown in section 1.3.2.

$c_1 \leq 200$ mm

$d_1 \leq 200$ mm - to one row of fasteners (steel screws)

$d_1 \leq 425$ mm - to two rows of fasteners (steel screws)

The board joints in subsequent layers should be offset by at least 400 mm.

» board thickness in the two-layer mcr Silboard system

protection thickness [mm]	mcr Silboard board thickness [mm]	
	internal layer	external layer
40	20	20
50	30	20
60	30	30
70	40	30
80	40	40

» steel screws used in the mcr Silboard system

mcr Silboard board thickness [mm]	steel screws minimum dimensions, diameter × length [mm]			
	corner joints	connections with spacers	joints with 30 mm thick boards	joints with 40 mm thick boards
20	3,5 x 40	3,0 x 35	3,5 x 40	-
30	4,0 x 60	3,5 x 40	3,5 x 50	3,5 x 50
40	4,0 x 70	3,5 x 50	3,5 x 50	4,0 x 60
50	5,0 x 90	4,0 x 60	5,0 x 90	4,0 x 60

1.3.4 | Installation

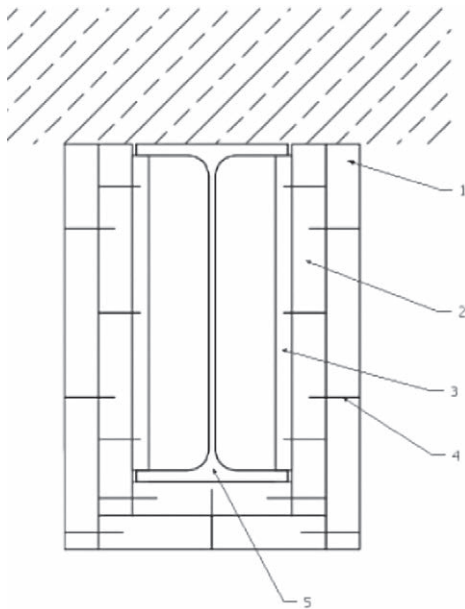
» mcr Silboard board fixing system using steel staples.

board size [mm]	staple dimensions (minimum) [mm]			
	perpendicular joints "corner"	connections "parallel" with a 20 mm board	connections "parallel" with a 30 mm board	connections "parallel" with a 40 mm board
20	50/10,5/1,45	35/10,5/1,45	45/10,5/1,45	-
30	50/10,5/1,45	45/10,5/1,45	50/10,5/1,45	55/11,3/1,84
40	80/11,3/1,84	55/11,3/1,84	65/11,3/1,84	65/11,3/1,84
50	80/11,3/1,84	65/11,3/1,84	-	-

1.3.5 | Installation examples

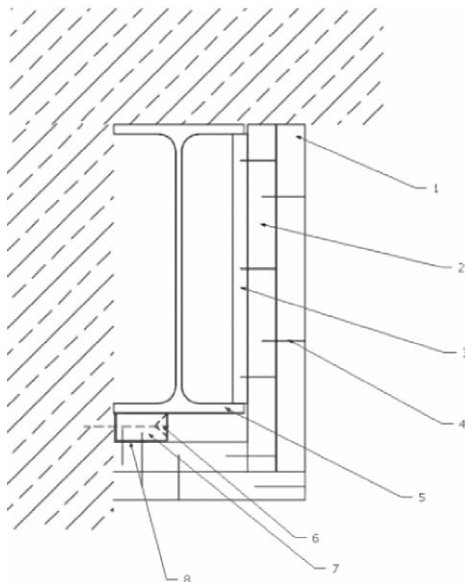
Structure protection options with a two-sided and three-sided system based on the assessment report no. FIRES-JR-097-21-NURE21

» **Three-sided protection**



1. Second protection layer
2. First protection layer or single protection layer
3. mcr Silboard board spacer with a thickness of 20 mm and a width of at least 150 mm; spaced at ≤ 1250 mm
4. Steel screws or staples
5. Protected steel element

» **Two-sided protection**



1. Second protection layer.
2. First protection layer or single protection layer.
3. Two-part mcr Silboard board spacer with a thickness of 20 mm and a width of at least 150 mm; spaced at ≤ 1250 mm
4. Steel screws or staples
5. Protected steel element
6. Wood screw ($\varnothing 8 \times 1000$) mm spaced at 300 mm.
7. Stripe of mcr Silboard boards with a thickness of 40 mm
8. Angle section, at least L 40 x 40 x 3 mm

» Single-layer flame retardant treatment for the mcr Silboard system

For steel beams and columns with open and box, rectangular and round cross-sections, as well as hot-rolled and prefabricated stop sections, i.e. plate girders with a constant cross-section with solid walls and continuous welds.

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm]					
	R15	R30	R60	R90	R120	R180
≤ 55	20	20	20	20	21	34
60	20	20	20	20	23	36
70	20	20	20	20	27	41
80	20	20	20	22	30	45
90	20	20	20	24	33	49
100	20	20	20	26	35	–
110	20	20	20	28	37	–
120	20	20	21	30	39	–
130	20	20	22	32	41	–
140	20	20	23	33	43	–
150	20	20	24	34	45	–
160	20	20	25	35	46	–
170	20	20	26	37	48	–
180	20	20	26	38	49	–
190	20	20	27	39	50	–
200	20	20	28	40	–	–
210	20	20	29	40	–	–
220	20	20	29	41	–	–
230	20	20	30	42	–	–
240	20	20	30	43	–	–
250	20	20	31	43	–	–
260	20	20	31	44	–	–
270	20	20	32	44	–	–
280	20	20	32	45	–	–
290	20	20	33	46	–	–
300	20	20	33	46	–	–
310	20	20	33	47	–	–
320	20	20	34	47	–	–
321	20	20	34	47	–	–
> 321	–	–	–	–	–	–

» mcr Silboard double-layer flame retardant treatment system

For steel beams and columns with open and box, rectangular and round cross-sections, as well as hot-rolled and prefabricated stop sections, i.e. plate girders with a constant cross-section with solid walls and continuous welds.

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm]							
	R15	R30	R60	R90	R120	R180	R240	R360
≤ 55	40	40	40	40	40	40	40	70
60	40	40	40	40	40	40	44	75
70	40	40	40	40	40	40	50	–
80	40	40	40	40	40	40	55	–
90	40	40	40	40	40	43	59	–
100	40	40	40	40	40	46	63	–
110	40	40	40	40	40	49	65	–
120	40	40	40	40	40	51	68	–
130	40	40	40	40	40	53	70	–
140	40	40	40	40	40	55	72	–
150	40	40	40	40	40	56	73	–
160	40	40	40	40	40	57	74	–
170	40	40	40	40	41	58	76	–
180	40	40	40	40	42	59	77	–
190	40	40	40	40	43	60	78	–
200	40	40	40	40	44	61	79	–
210	40	40	40	40	44	62	79	–
220	40	40	40	40	45	63	80	–
230	40	40	40	40	46	63	–	–
240	40	40	40	40	46	64	–	–
250	40	40	40	40	47	64	–	–
260	40	40	40	40	47	65	–	–
270	40	40	40	40	48	65	–	–
280	40	40	40	40	48	66	–	–
290	40	40	40	40	48	66	–	–
300	40	40	40	40	49	67	–	–
310	40	40	40	40	49	67	–	–
320	40	40	40	40	49	67	–	–
327	40	40	40	41	50	68	–	–
> 327	–	–	–	–	–	–	–	–

The minimum fire protection insulation thicknesses provided in the tables, required for protecting the appropriate steel structural element under cellulose fire conditions, were determined assuming the critical temperature of steel to be 450°C. Should the design engineer determine a different critical temperature, the minimum flame retardant insulation thicknesses made of mcr Silboard needs to be verified in the European Technical Assessment.

1.3.6 | mcr Silboard single-layer flame retardant treatment system

» Fire resistive rating **R15**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
130	20	20	20	20	20	20	20	20	20
140	20	20	20	20	20	20	20	20	20
150	20	20	20	20	20	20	20	20	20
160	20	20	20	20	20	20	20	20	20
170	20	20	20	20	20	20	20	20	20
180	20	20	20	20	20	20	20	20	20
190	20	20	20	20	20	20	20	20	20
200	20	20	20	20	20	20	20	20	20
210	20	20	20	20	20	20	20	20	20
220	20	20	20	20	20	20	20	20	20
230	20	20	20	20	20	20	20	20	20
240	20	20	20	20	20	20	20	20	20
250	20	20	20	20	20	20	20	20	20
260	20	20	20	20	20	20	20	20	20
270	20	20	20	20	20	20	20	20	20
280	20	20	20	20	20	20	20	20	20
290	20	20	20	20	20	20	20	20	20
300	20	20	20	20	20	20	20	20	20
310	20	20	20	20	20	20	20	20	20
320	20	20	20	20	20	20	20	20	20
321	20	20	20	20	20	20	20	20	20
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R20**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
130	20	20	20	20	20	20	20	20	20
140	20	20	20	20	20	20	20	20	20
150	20	20	20	20	20	20	20	20	20
160	20	20	20	20	20	20	20	20	20
170	20	20	20	20	20	20	20	20	20
180	20	20	20	20	20	20	20	20	20
190	20	20	20	20	20	20	20	20	20
200	20	20	20	20	20	20	20	20	20
210	20	20	20	20	20	20	20	20	20
220	20	20	20	20	20	20	20	20	20
230	20	20	20	20	20	20	20	20	20
240	20	20	20	20	20	20	20	20	20
250	20	20	20	20	20	20	20	20	20
260	20	20	20	20	20	20	20	20	20
270	20	20	20	20	20	20	20	20	20
280	20	20	20	20	20	20	20	20	20
290	20	20	20	20	20	20	20	20	20
300	20	20	20	20	20	20	20	20	20
310	20	20	20	20	20	20	20	20	20
320	20	20	20	20	20	20	20	20	20
321	20	20	20	20	20	20	20	20	20
> 321	–	–	–	–	–	–	–	–	–

» Fire resistive rating R30

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
130	20	20	20	20	20	20	20	20	20
140	20	20	20	20	20	20	20	20	20
150	20	20	20	20	20	20	20	20	20
160	20	20	20	20	20	20	20	20	20
170	20	20	20	20	20	20	20	20	20
180	20	20	20	20	20	20	20	20	20
190	20	20	20	20	20	20	20	20	20
200	20	20	20	20	20	20	20	20	20
210	21	20	20	20	20	20	20	20	20
220	21	20	20	20	20	20	20	20	20
230	22	20	20	20	20	20	20	20	20
240	22	20	20	20	20	20	20	20	20
250	23	20	20	20	20	20	20	20	20
260	23	21	20	20	20	20	20	20	20
270	23	21	20	20	20	20	20	20	20
280	23	21	20	20	20	20	20	20	20
290	24	22	20	20	20	20	20	20	20
300	24	22	20	20	20	20	20	20	20
310	24	22	20	20	20	20	20	20	20
320	25	22	20	20	20	20	20	20	20
321	25	22	20	20	20	20	20	20	20
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R45**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
90	20	20	20	20	20	20	20	20	20
100	20	20	20	20	20	20	20	20	20
110	20	20	20	20	20	20	20	20	20
120	20	20	20	20	20	20	20	20	20
130	21	20	20	20	20	20	20	20	20
140	22	20	20	20	20	20	20	20	20
150	23	21	20	20	20	20	20	20	20
160	24	22	20	20	20	20	20	20	20
170	25	22	20	20	20	20	20	20	20
180	26	23	21	20	20	20	20	20	20
190	26	24	22	20	20	20	20	20	20
200	27	24	22	20	20	20	20	20	20
210	27	25	23	21	20	20	20	20	20
220	28	25	23	21	20	20	20	20	20
230	28	26	24	22	20	20	20	20	20
240	29	26	24	22	20	20	20	20	20
250	29	27	25	23	21	20	20	20	20
260	30	27	25	23	21	20	20	20	20
270	30	28	25	23	21	20	20	20	20
280	31	28	26	24	22	20	20	20	20
290	31	28	26	24	22	20	20	20	20
300	31	29	26	24	22	21	20	20	20
310	32	29	27	25	23	21	20	20	20
320	32	29	27	25	23	21	20	20	20
321	32	29	27	25	23	21	20	20	20
> 321	-	-	-	-	-	-	-	-	-

» Fire resistive rating R60

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	20	20	20	20	20	20	20	20	20
70	20	20	20	20	20	20	20	20	20
80	20	20	20	20	20	20	20	20	20
90	21	20	20	20	20	20	20	20	20
100	23	20	20	20	20	20	20	20	20
110	24	22	20	20	20	20	20	20	20
120	26	23	21	20	20	20	20	20	20
130	27	24	22	20	20	20	20	20	20
140	28	25	23	21	20	20	20	20	20
150	29	26	24	22	20	20	20	20	20
160	30	27	25	23	21	20	20	20	20
170	31	28	26	23	21	20	20	20	20
180	32	29	26	24	22	20	20	20	20
190	33	30	27	25	23	21	20	20	20
200	33	30	28	26	24	22	20	20	20
210	34	31	29	26	24	22	21	20	20
220	35	32	29	27	25	23	21	20	20
230	35	32	30	27	25	23	22	20	20
240	36	33	30	28	26	24	22	20	20
250	36	33	31	29	26	24	23	21	20
260	37	34	31	29	27	25	23	21	20
270	37	34	32	29	27	25	23	22	20
280	38	35	32	30	28	26	24	22	21
290	38	35	33	30	28	26	24	23	21
300	38	36	33	31	29	27	25	23	21
310	39	36	33	31	29	27	25	23	22
320	39	36	34	31	29	27	25	24	22
321	39	36	34	31	29	27	25	24	22
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R90**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	20	20	20	20	20	20	20	20	20
60	22	20	20	20	20	20	20	20	20
70	25	22	20	20	20	20	20	20	20
80	28	25	22	20	20	20	20	20	20
90	31	27	24	22	20	20	20	20	20
100	33	29	26	24	22	20	20	20	20
110	35	31	28	26	23	22	20	20	20
120	37	33	30	27	25	23	21	20	20
130	38	35	32	29	26	24	22	21	20
140	40	36	33	30	28	26	24	22	20
150	41	37	34	31	29	27	25	23	21
160	42	39	35	33	30	28	26	24	22
170	43	40	37	34	31	29	27	25	23
180	44	41	38	35	32	30	28	26	24
190	45	42	39	36	33	31	29	27	25
200	46	43	40	37	34	32	30	28	26
210	47	44	40	37	35	32	30	28	26
220	48	44	41	38	36	33	31	29	27
230	49	45	42	39	36	34	32	30	28
240	49	46	43	40	37	35	32	30	29
250	50	46	43	40	38	35	33	31	29
260	50	47	44	41	38	36	34	32	30
270	–	48	44	42	39	37	34	32	30
280	–	48	45	42	40	37	35	33	31
290	–	49	46	43	40	38	35	33	31
300	–	49	46	43	41	38	36	34	32
310	–	50	47	44	41	39	36	34	32
320	–	50	47	44	42	39	37	35	33
321	–	50	47	44	42	39	37	35	33
> 321	–	–	–	–	–	–	–	–	–

» Fire resistive rating R120

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	28	24	21	20	20	20	20	20	20
60	30	26	23	21	20	20	20	20	20
70	34	30	27	24	22	20	20	20	20
80	37	33	30	27	25	22	21	20	20
90	40	36	33	30	27	25	23	21	20
100	43	39	35	32	29	27	25	23	21
110	45	41	37	34	31	29	27	25	23
120	47	43	39	36	33	31	29	27	25
130	49	45	41	38	35	33	30	28	26
140	–	47	43	40	37	34	32	30	28
150	–	48	45	41	38	36	33	31	29
160	–	50	46	43	40	37	34	32	30
170	–	–	48	44	41	38	36	33	31
180	–	–	49	45	42	39	37	35	32
190	–	–	50	47	43	41	38	36	34
200	–	–	–	48	45	42	39	37	35
210	–	–	–	49	46	43	40	38	35
220	–	–	–	50	47	44	41	39	36
230	–	–	–	50	47	45	42	40	37
240	–	–	–	–	48	45	43	40	38
250	–	–	–	–	49	46	44	41	39
260	–	–	–	–	50	47	44	42	40
270	–	–	–	–	–	48	45	43	40
280	–	–	–	–	–	48	46	43	41
290	–	–	–	–	–	49	46	44	42
300	–	–	–	–	–	50	47	45	42
310	–	–	–	–	–	50	48	45	43
320	–	–	–	–	–	–	48	46	43
321	–	–	–	–	–	–	48	46	44
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R180**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤55	42	38	34	30	27	25	23	21	20
60	45	40	36	33	30	27	25	23	21
70	–	45	41	37	34	31	29	27	25
80	–	50	45	41	38	35	32	30	28
90	–	–	49	45	41	38	35	33	31
100	–	–	–	48	44	41	38	36	33
110	–	–	–	–	47	44	41	38	36
120	–	–	–	–	50	46	43	41	38
130	–	–	–	–	–	49	46	43	40
140	–	–	–	–	–	–	48	45	42
150	–	–	–	–	–	–	50	47	44
160	–	–	–	–	–	–	–	49	46
170	–	–	–	–	–	–	–	50	48
180	–	–	–	–	–	–	–	–	49
>180	–	–	–	–	–	–	–	–	–

1.3.7 | mcr Silboard double-layer flame retardant treatment system

» Fire resistive rating **R15**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	40	40	40	40	40	40	40	40	40
190	40	40	40	40	40	40	40	40	40
200	40	40	40	40	40	40	40	40	40
210	40	40	40	40	40	40	40	40	40
220	40	40	40	40	40	40	40	40	40
230	40	40	40	40	40	40	40	40	40
240	40	40	40	40	40	40	40	40	40
250	40	40	40	40	40	40	40	40	40
260	40	40	40	40	40	40	40	40	40
270	40	40	40	40	40	40	40	40	40
280	40	40	40	40	40	40	40	40	40
290	40	40	40	40	40	40	40	40	40
300	40	40	40	40	40	40	40	40	40
310	40	40	40	40	40	40	40	40	40
320	40	40	40	40	40	40	40	40	40
321	40	40	40	40	40	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R20**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	40	40	40	40	40	40	40	40	40
190	40	40	40	40	40	40	40	40	40
200	40	40	40	40	40	40	40	40	40
210	40	40	40	40	40	40	40	40	40
220	40	40	40	40	40	40	40	40	40
230	40	40	40	40	40	40	40	40	40
240	40	40	40	40	40	40	40	40	40
250	40	40	40	40	40	40	40	40	40
260	40	40	40	40	40	40	40	40	40
270	40	40	40	40	40	40	40	40	40
280	40	40	40	40	40	40	40	40	40
290	40	40	40	40	40	40	40	40	40
300	40	40	40	40	40	40	40	40	40
310	40	40	40	40	40	40	40	40	40
320	40	40	40	40	40	40	40	40	40
321	40	40	40	40	40	40	40	40	40
> 321	-	-	-	-	-	-	-	-	-

» Fire resistive rating R30

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	40	40	40	40	40	40	40	40	40
190	40	40	40	40	40	40	40	40	40
200	40	40	40	40	40	40	40	40	40
210	40	40	40	40	40	40	40	40	40
220	40	40	40	40	40	40	40	40	40
230	40	40	40	40	40	40	40	40	40
240	40	40	40	40	40	40	40	40	40
250	40	40	40	40	40	40	40	40	40
260	40	40	40	40	40	40	40	40	40
270	40	40	40	40	40	40	40	40	40
280	40	40	40	40	40	40	40	40	40
290	40	40	40	40	40	40	40	40	40
300	40	40	40	40	40	40	40	40	40
310	40	40	40	40	40	40	40	40	40
320	40	40	40	40	40	40	40	40	40
321	40	40	40	40	40	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R45**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	40	40	40	40	40	40	40	40	40
190	40	40	40	40	40	40	40	40	40
200	40	40	40	40	40	40	40	40	40
210	40	40	40	40	40	40	40	40	40
220	40	40	40	40	40	40	40	40	40
230	40	40	40	40	40	40	40	40	40
240	40	40	40	40	40	40	40	40	40
250	40	40	40	40	40	40	40	40	40
260	40	40	40	40	40	40	40	40	40
270	40	40	40	40	40	40	40	40	40
280	40	40	40	40	40	40	40	40	40
290	40	40	40	40	40	40	40	40	40
300	40	40	40	40	40	40	40	40	40
310	40	40	40	40	40	40	40	40	40
320	40	40	40	40	40	40	40	40	40
321	40	40	40	40	40	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–

» Fire resistive rating R60

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	40	40	40	40	40	40	40	40	40
190	40	40	40	40	40	40	40	40	40
200	40	40	40	40	40	40	40	40	40
210	40	40	40	40	40	40	40	40	40
220	40	40	40	40	40	40	40	40	40
230	40	40	40	40	40	40	40	40	40
240	40	40	40	40	40	40	40	40	40
250	40	40	40	40	40	40	40	40	40
260	40	40	40	40	40	40	40	40	40
270	40	40	40	40	40	40	40	40	40
280	40	40	40	40	40	40	40	40	40
290	40	40	40	40	40	40	40	40	40
300	40	40	40	40	40	40	40	40	40
310	40	40	40	40	40	40	40	40	40
320	40	40	40	40	40	40	40	40	40
321	40	40	40	40	40	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R90**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	40	40	40	40	40	40	40	40	40
120	40	40	40	40	40	40	40	40	40
130	40	40	40	40	40	40	40	40	40
140	40	40	40	40	40	40	40	40	40
150	40	40	40	40	40	40	40	40	40
160	40	40	40	40	40	40	40	40	40
170	40	40	40	40	40	40	40	40	40
180	41	40	40	40	40	40	40	40	40
190	41	40	40	40	40	40	40	40	40
200	42	40	40	40	40	40	40	40	40
210	43	40	40	40	40	40	40	40	40
220	43	40	40	40	40	40	40	40	40
230	44	40	40	40	40	40	40	40	40
240	44	41	40	40	40	40	40	40	40
250	44	41	40	40	40	40	40	40	40
260	45	41	40	40	40	40	40	40	40
270	45	42	40	40	40	40	40	40	40
280	45	42	40	40	40	40	40	40	40
290	46	43	40	40	40	40	40	40	40
300	46	43	40	40	40	40	40	40	40
310	46	43	40	40	40	40	40	40	40
320	47	43	40	40	40	40	40	40	40
321	47	44	41	40	40	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–

» Fire resistive rating R120

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	40	40	40	40	40	40	40	40	40
70	40	40	40	40	40	40	40	40	40
80	40	40	40	40	40	40	40	40	40
90	40	40	40	40	40	40	40	40	40
100	40	40	40	40	40	40	40	40	40
110	41	40	40	40	40	40	40	40	40
120	43	40	40	40	40	40	40	40	40
130	44	40	40	40	40	40	40	40	40
140	45	41	40	40	40	40	40	40	40
150	47	43	40	40	40	40	40	40	40
160	48	44	40	40	40	40	40	40	40
170	48	45	41	40	40	40	40	40	40
180	49	46	42	40	40	40	40	40	40
190	50	46	43	40	40	40	40	40	40
200	51	47	44	40	40	40	40	40	40
210	51	48	44	41	40	40	40	40	40
220	52	48	45	42	40	40	40	40	40
230	52	49	46	42	40	40	40	40	40
240	53	50	46	43	40	40	40	40	40
250	53	50	47	43	40	40	40	40	40
260	54	50	47	44	41	40	40	40	40
270	54	51	48	44	41	40	40	40	40
280	55	51	48	45	42	40	40	40	40
290	55	52	48	45	42	40	40	40	40
300	55	52	49	46	42	40	40	40	40
310	55	52	49	46	43	40	40	40	40
320	56	53	49	46	43	40	40	40	40
321	56	53	50	46	43	40	40	40	40
> 321	–	–	–	–	–	–	–	–	–



» Fire resistive rating **R180**

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	40	40	40	40	40	40	40	40	40
60	41	40	40	40	40	40	40	40	40
70	45	40	40	40	40	40	40	40	40
80	49	44	40	40	40	40	40	40	40
90	52	48	43	40	40	40	40	40	40
100	55	51	46	42	40	40	40	40	40
110	57	53	49	44	40	40	40	40	40
120	59	55	51	47	43	40	40	40	40
130	61	57	53	49	45	41	40	40	40
140	62	58	55	51	47	43	40	40	40
150	64	60	56	52	48	44	40	40	40
160	65	61	57	54	50	46	42	40	40
170	66	62	58	55	51	47	44	40	40
180	67	63	59	56	52	49	45	41	40
190	68	64	60	57	53	50	46	43	40
200	68	65	61	58	54	51	47	44	40
210	69	65	62	58	55	52	48	45	41
220	70	66	63	59	56	52	49	46	42
230	70	67	63	60	56	53	50	46	43
240	71	67	64	60	57	54	50	47	44
250	71	68	64	61	58	54	51	48	45
260	72	68	65	62	58	55	52	48	45
270	72	69	65	62	59	55	52	49	46
280	73	69	66	62	59	56	53	50	47
290	73	70	66	63	60	56	53	50	47
300	73	70	67	63	60	57	54	51	48
310	74	70	67	64	60	57	54	51	48
320	74	71	67	64	61	58	55	51	48
321	74	71	68	64	61	58	55	52	49
> 321	-	-	-	-	-	-	-	-	-

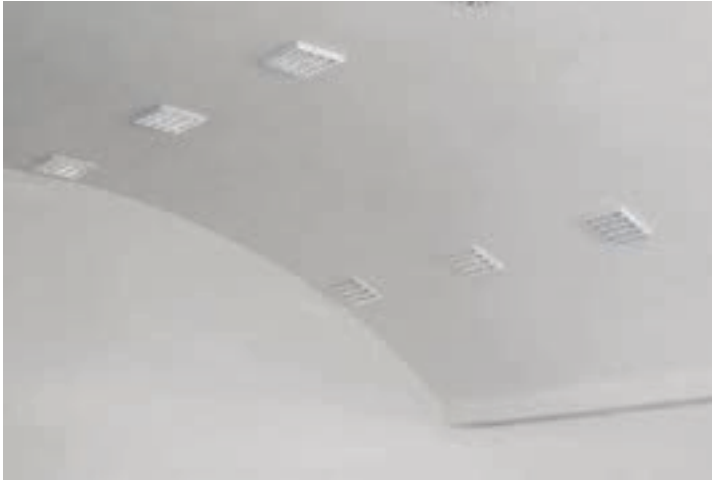
» Fire resistive rating R240

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤ 55	52	46	40	40	40	40	40	40	40
60	55	50	44	40	40	40	40	40	40
70	60	55	50	45	40	40	40	40	40
80	64	60	55	51	45	40	40	40	40
90	68	64	59	55	50	45	40	40	40
100	71	67	63	58	54	49	45	40	40
110	73	69	65	61	57	53	48	44	40
120	75	72	68	64	60	56	51	47	42
130	77	74	70	66	62	58	54	50	45
140	79	75	72	68	64	60	56	52	48
150	80	77	73	69	66	62	58	54	50
160	–	78	74	71	67	63	60	56	52
170	–	79	76	72	68	65	61	57	54
180	–	80	77	73	70	66	62	59	55
190	–	–	78	74	71	67	63	60	56
200	–	–	79	75	72	68	64	61	57
210	–	–	79	76	72	69	65	62	58
220	–	–	80	77	73	70	66	63	59
230	–	–	–	77	74	70	67	64	60
240	–	–	–	78	75	71	68	64	61
250	–	–	–	79	75	72	68	65	62
260	–	–	–	79	76	72	69	66	62
270	–	–	–	80	76	73	70	66	63
280	–	–	–	80	77	73	70	67	64
290	–	–	–	80	77	74	70	67	64
300	–	–	–	–	78	74	71	68	65
310	–	–	–	–	78	75	71	68	65
320	–	–	–	–	78	75	72	69	65
321	–	–	–	–	79	75	72	69	66
> 321	–	–	–	–	–	–	–	–	–

» Fire resistive rating R360

section factor U/A [m ⁻¹]	minimum thickness of mcr Silboard flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
≤55	79	75	70	65	60	54	47	40	40
60	–	79	75	70	65	59	53	46	40
70	–	–	–	77	73	68	63	57	51
80	–	–	–	–	79	75	70	65	60
90	–	–	–	–	–	80	76	71	66
100	–	–	–	–	–	–	80	76	71
110	–	–	–	–	–	–	–	79	75
120	–	–	–	–	–	–	–	–	78
>120	–	–	–	–	–	–	–	–	–

1.3.8 | mcr Tecbor



- » R15–R240 – multi-layer system
- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03

Application

mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction. It is designed for protecting cladding for steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, building masonry walls, building suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

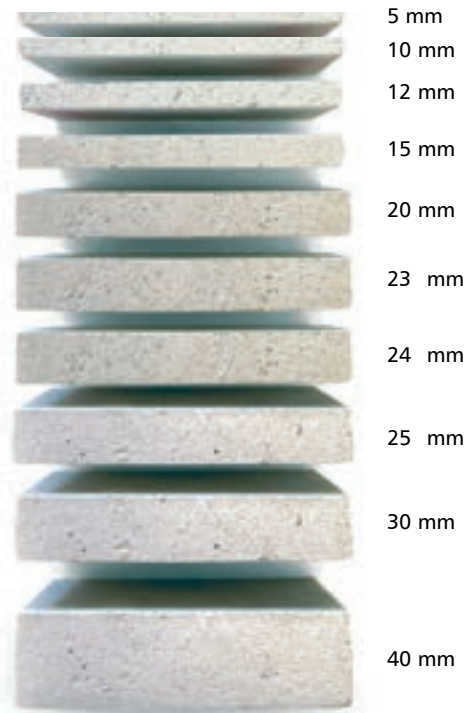
Board features

- » high fire resistance rating, non-combustible
- » good thermal performance
- » quick and easy to install
- » mechanical strength
- » free from harmful substances, no health hazard
- » resistant to fungi, insects and rodents

Technical parameters

» Board physical and chemical properties

available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
external appearance	smooth surface in a light color
density	900 kg/m ³ ± 10%
compressive strength	9,61 MPa
perpendicular tensile strength	1,47 MPa
elastic modulus	475 MPa
bending strength	4,74 MPa
dimension stability	≤ 0,25%
heat conductivity	0,31 W/(m•K)
reaction to fire class	A1
use category	Z2

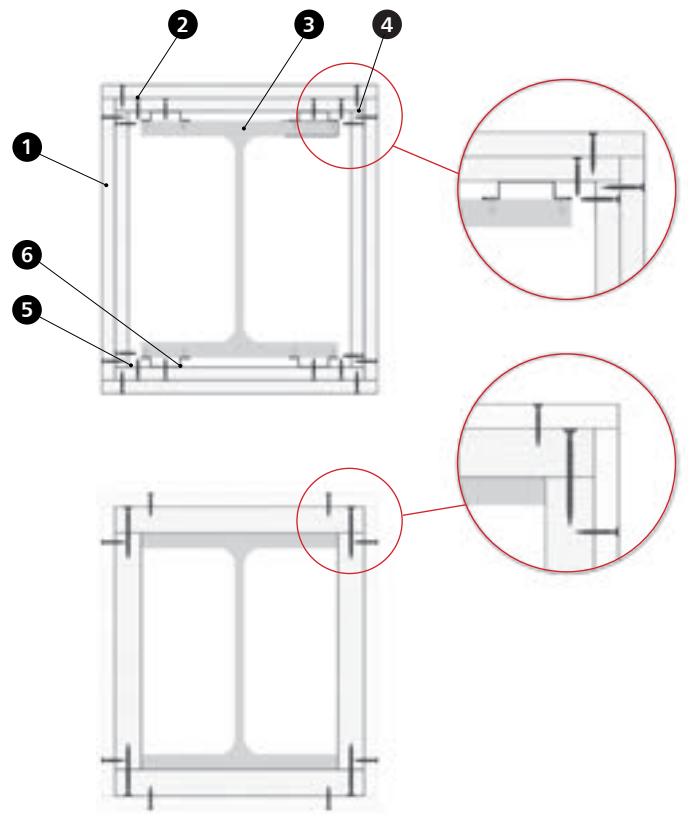
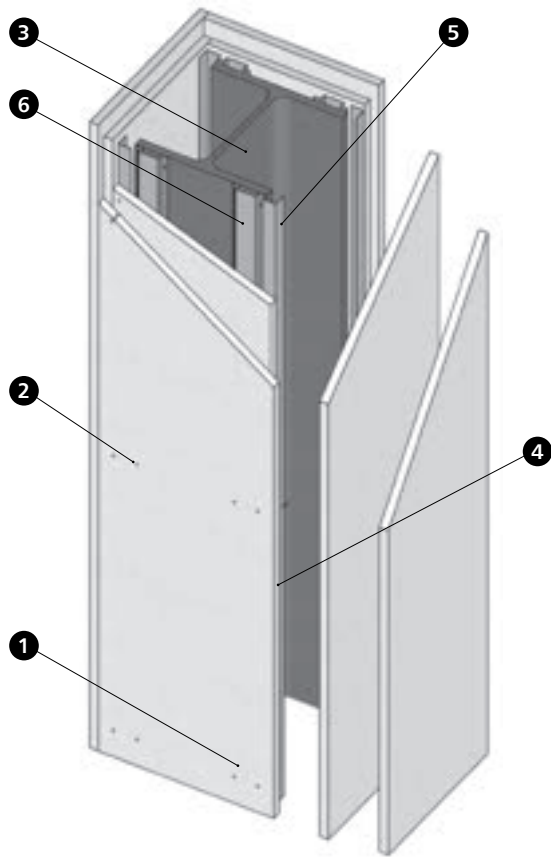


Fire resistance rating

The thickness of a flame retardant cladding for steel elements results from the required fire resistance rating, assumed critical temperature and the section factor U/A.

1.3.9 | Installation

1.3.9.1 | Columns



- 1. mcr Tecbor board
- 2. self-drilling screw (dimensions as per the table below)
- 3. steel element

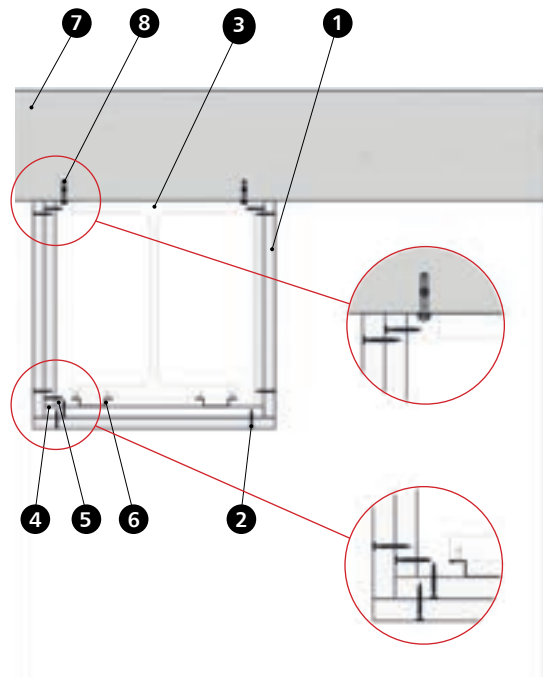
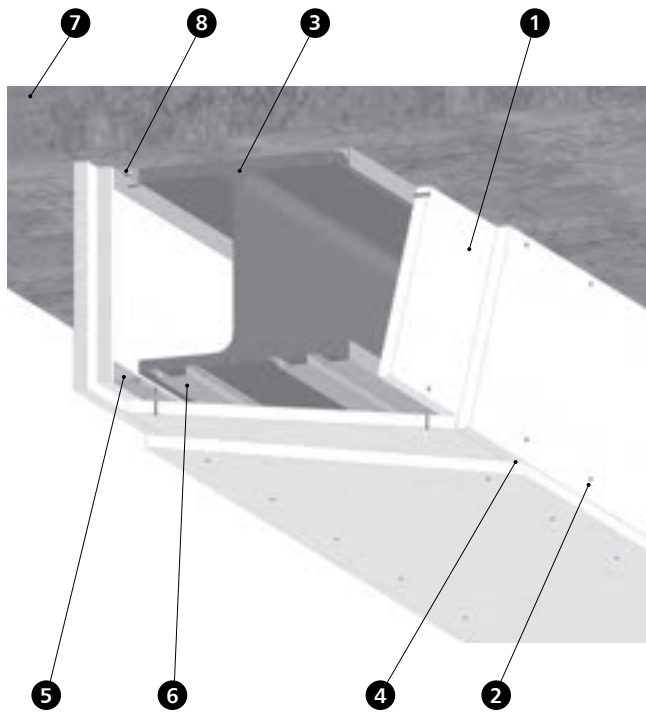
- 4. mcr Tecbor Joint Paste adhesive
- 5. angled section
- 6. Omega profile

» multi-layer flame retardant systems.

overall board thickness	mcr Tecbor layers thickness*	inner layer screws	intermediate layer screws	outer layer screws
[mm]	[mm]	[mm]	[mm]	[mm]
10	5 + 5	Ø 3,5 x 25	-	Ø 3,5 x 25
15	10 + 5	Ø 3,5 x 25	-	Ø 3,5 x 25
20	10 + 10	Ø 3,5 x 25	-	Ø 3,5 x 25
25	15 + 10	Ø 3,5 x 25	-	Ø 3,5 x 35
30	15 + 15	Ø 3,5 x 25	-	Ø 3,5 x 45
30	20 + 10	Ø 3,5 x 35	-	Ø 3,5 x 45
30	10 + 10 + 10	Ø 3,5 x 25	Ø 3,5 x 35	Ø 3,5 x 45
35	20 + 15	Ø 3,5 x 35	-	Ø 3,5 x 45
35	15 + 10 + 10	Ø 3,5 x 25	Ø 3,5 x 35	Ø 3,5 x 45
40	20 + 20	Ø 3,5 x 35	-	Ø 3,5 x 55
40	20 + 10 + 10	Ø 3,5 x 35	Ø 3,5 x 45	Ø 3,5 x 55
40	30 + 10	Ø 3,5 x 45	-	Ø 3,5 x 55
45	30 + 15	Ø 3,5 x 45	-	Ø 3,5 x 55
45	15 + 15 + 15	Ø 3,5 x 25	Ø 3,5 x 45	Ø 3,5 x 55
50	30 + 20	Ø 3,5 x 45	-	Ø 4,2 x 70
50	20 + 20 + 10	Ø 3,5 x 35	Ø 3,5 x 55	Ø 4,2 x 70
50	20 + 15 + 15	Ø 3,5 x 35	Ø 3,5 x 45	Ø 4,2 x 70
55	20 + 20 + 15	Ø 3,5 x 35	Ø 3,5 x 55	Ø 4,2 x 70
60	30 + 30	Ø 3,5 x 45	-	Ø 4,2 x 70
60	30 + 15 + 15	Ø 3,5 x 45	Ø 3,5 x 55	Ø 4,2 x 70

* board thickness values are shown in the following order: internal layer + intermediate layer (if present) + external

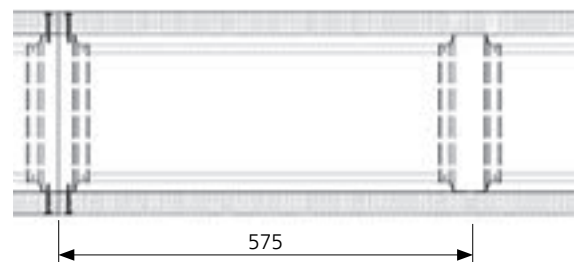
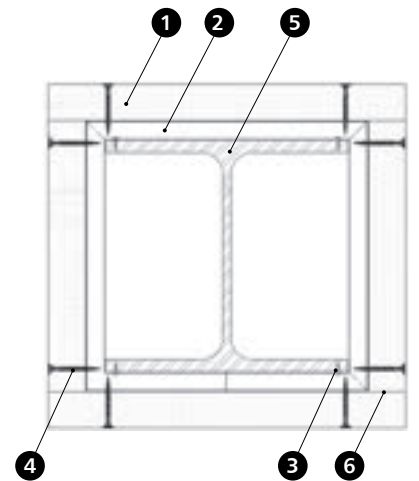
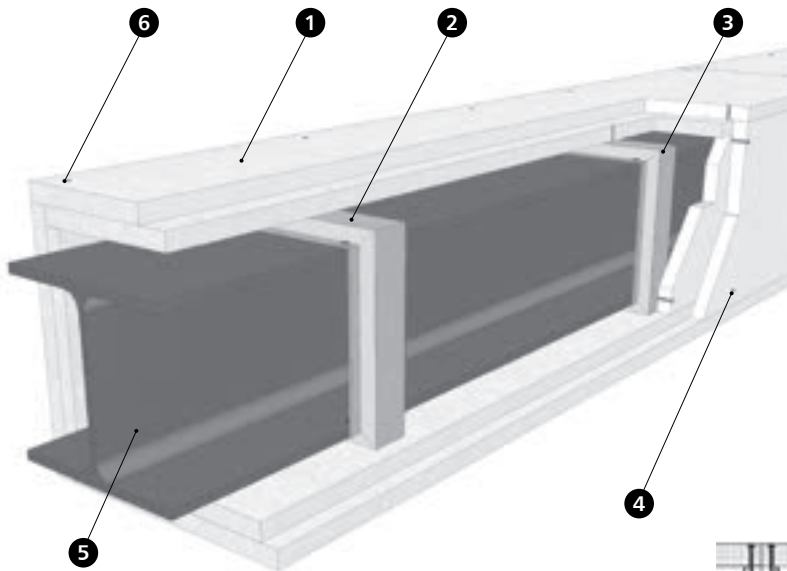
1.3.92 | Beams



- 1. mcr Tecbor board
- 2. self-drilling screw (dimensions as per the table)
- 3. steel element
- 4. mcr Tecbor Joint Paste adhesive

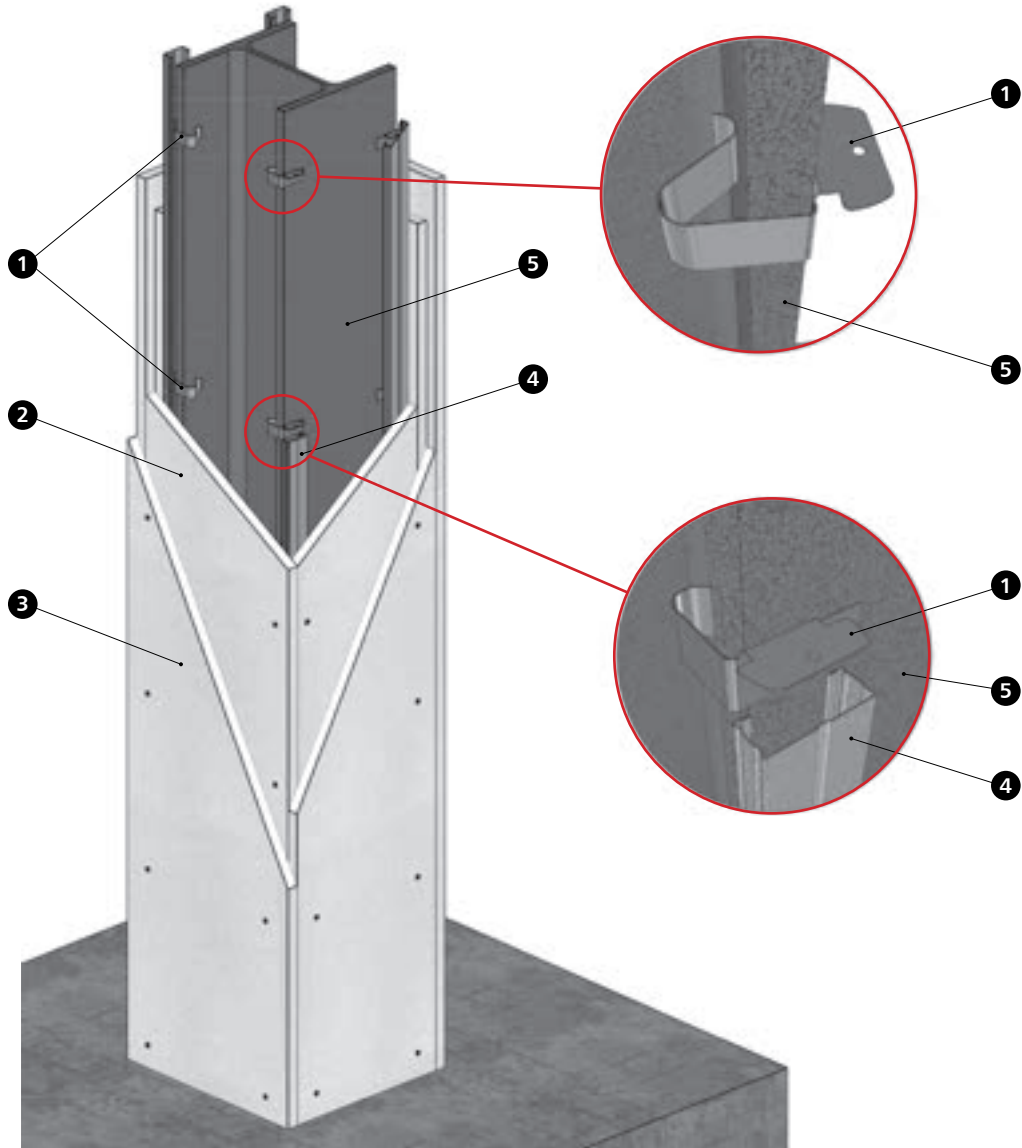
- 5. angled section
- 6. Omega profile
- 7. floor slab
- 8. steel anchor

1.3.93 | Annular system



- 1. mcr Tecbor board
- 2. Omega profile
- 3. X-dnl nail or similar

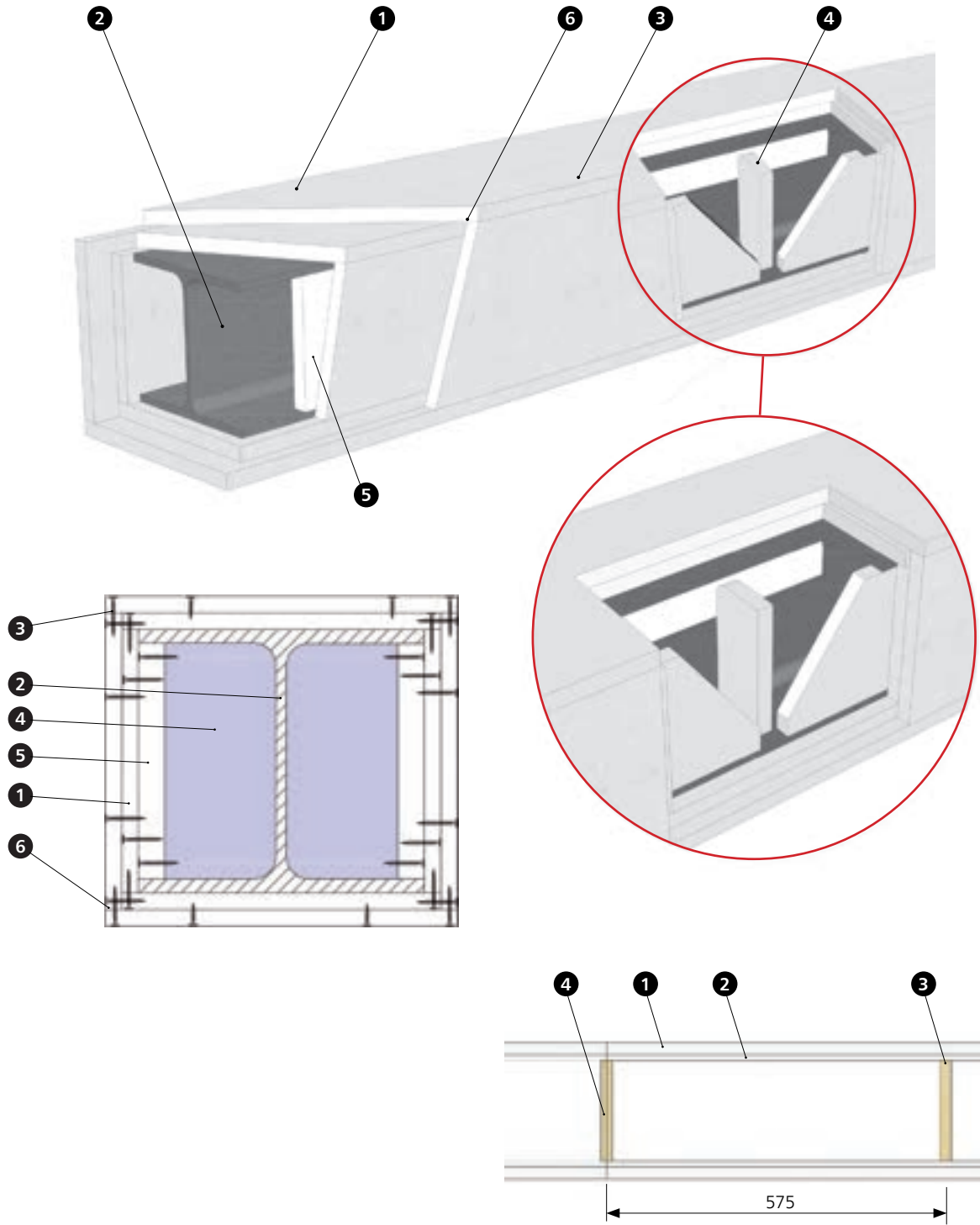
- 4. self-drilling screw (dimensions as per the table)
- 5. steel element
- 6. mcr Tecbor Joint Paste adhesive



- 1. Tecbor clip
- 2. mcr Tecbor board
- 3. self-drilling screw (dimensions as per the table)

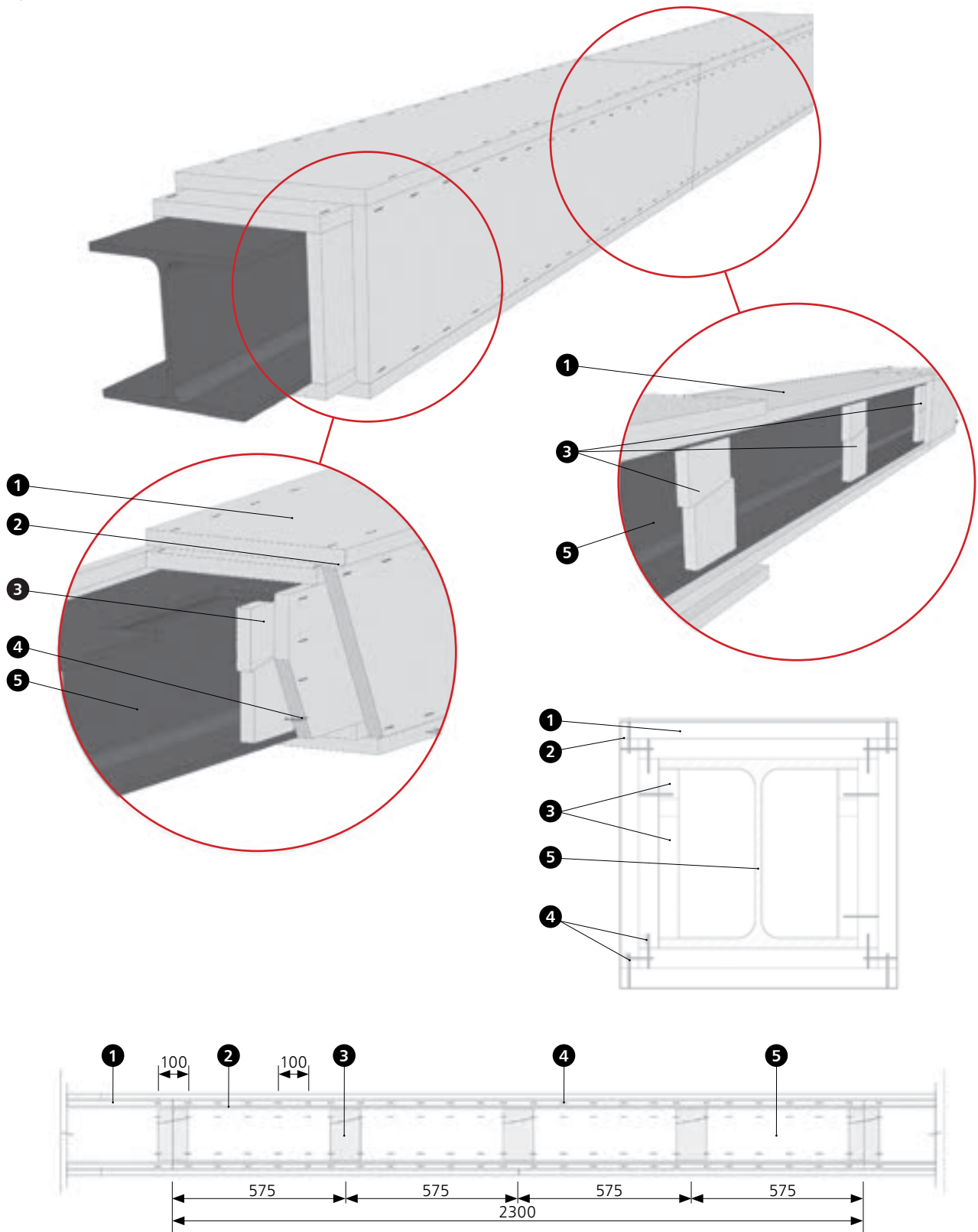
- 4. TC section
- 5. steel element

13.95 | Board fixing system



- 1. mcr Tecbor board
- 2. steel element
- 3. self-drilling screw (dimensions as per the table)

- 4. mcr Tecbor board spacer
- 5. mcr Tecbor board
- 6. mcr Tecbor Joint Paste adhesive



1. mcr Tecbor board
2. mcr Tecbor Joint Paste adhesive

3. mcr Tecbor 20 mm spacer
4. self-drilling screw (dimensions as per the table)
5. steel element

13.10 | Fire resistance properties of steel sections
13.11 | mcr Tecbor multi-layer flame retardant treatment system

 » Fire resistive rating **R15**

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
70	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
80	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
90	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
100	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
110	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
120	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
130	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
140	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
150	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
160	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
170	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
180	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
190	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
200	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
210	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
220	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
230	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
240	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
250	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
260	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
270	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
280	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
290	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
300	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
310	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
320	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
330	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
340	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
350	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
360	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
370	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
373	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5

» Fire resistive rating R30

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
70	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
80	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
90	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
100	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
110	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
120	9,8	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
130	10,2	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
140	10,4	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
150	10,7	9,8	9,5	9,5	9,5	9,5	9,5	9,5	9,5
160	10,9	10,0	9,5	9,5	9,5	9,5	9,5	9,5	9,5
170	11,1	10,3	9,6	9,5	9,5	9,5	9,5	9,5	9,5
180	11,3	10,5	9,8	9,5	9,5	9,5	9,5	9,5	9,5
190	11,5	10,6	10,0	9,5	9,5	9,5	9,5	9,5	9,5
200	11,6	10,8	10,1	9,6	9,5	9,5	9,5	9,5	9,5
210	11,8	11,0	10,3	9,8	9,5	9,5	9,5	9,5	9,5
220	11,9	11,1	10,5	9,9	9,5	9,5	9,5	9,5	9,5
230	12,0	11,2	10,6	10,1	9,6	9,5	9,5	9,5	9,5
240	12,1	11,3	10,7	10,2	9,8	9,5	9,5	9,5	9,5
250	12,2	11,5	10,8	10,3	9,9	9,5	9,5	9,5	9,5
260	12,3	11,6	11,0	10,4	10,0	9,7	9,5	9,5	9,5
270	12,4	11,6	11,1	10,6	10,1	9,8	9,5	9,5	9,5
280	12,4	11,7	11,1	10,7	10,2	9,9	9,6	9,5	9,5
290	12,5	11,8	11,2	10,7	10,3	10,0	9,7	9,5	9,5
300	12,6	11,9	11,3	10,8	10,4	10,1	9,8	9,5	9,5
310	12,7	12,0	11,4	10,9	10,5	10,2	9,9	9,6	9,5
320	12,7	12,0	11,5	11,0	10,6	10,3	10,0	9,7	9,5
330	12,8	12,1	11,5	11,1	10,7	10,3	10,0	9,8	9,5
340	12,8	12,2	11,6	11,1	10,7	10,4	10,1	9,9	9,6
350	12,9	12,2	11,7	11,2	10,8	10,5	10,2	9,9	9,7
360	12,9	12,3	11,7	11,3	10,9	10,5	10,3	10,0	9,8
370	13,0	12,3	11,8	11,3	10,9	10,6	10,3	10,1	9,9
373	13,0	12,3	11,8	11,3	11,0	10,6	10,3	10,1	9,9

» Fire resistive rating R45

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
70	11,1	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
80	12,0	10,4	9,5	9,5	9,5	9,5	9,5	9,5	9,5
90	12,7	11,2	9,9	9,5	9,5	9,5	9,5	9,5	9,5
100	13,3	11,8	10,6	9,5	9,5	9,5	9,5	9,5	9,5
110	13,8	12,4	11,2	10,1	9,5	9,5	9,5	9,5	9,5
120	14,3	12,8	11,7	10,7	9,8	9,5	9,5	9,5	9,5
130	14,6	13,2	12,1	11,1	10,3	9,6	9,5	9,5	9,5
140	15,0	13,6	12,5	11,5	10,7	10,0	9,5	9,5	9,5
150	15,3	13,9	12,8	11,9	11,1	10,4	9,8	9,5	9,5
160	15,5	14,2	13,1	12,2	11,4	10,7	10,1	9,6	9,5
170	15,7	14,4	13,4	12,5	11,7	11,0	10,5	9,9	9,5
180	15,9	14,7	13,6	12,7	11,9	11,3	10,7	10,2	9,8
190	16,1	14,9	13,8	12,9	12,2	11,5	11,0	10,5	10,1
200	16,3	15,0	14,0	13,1	12,4	11,8	11,2	10,7	10,3
210	16,4	15,2	14,2	13,3	12,6	12,0	11,4	10,9	10,5
220	16,6	15,4	14,3	13,5	12,8	12,1	11,6	11,1	10,7
230	16,7	15,5	14,5	13,6	12,9	12,3	11,8	11,3	10,9
240	16,8	15,6	14,6	13,8	13,1	12,5	11,9	11,5	11,1
250	16,9	15,7	14,8	13,9	13,2	12,6	12,1	11,6	11,2
260	17,0	15,9	14,9	14,0	13,3	12,7	12,2	11,8	11,4
270	17,1	16,0	15,0	14,2	13,5	12,9	12,3	11,9	11,5
280	17,2	16,0	15,1	14,3	13,6	13,0	12,5	12,0	11,6
290	17,3	16,1	15,2	14,4	13,7	13,1	12,6	12,1	11,7
300	17,4	16,2	15,3	14,5	13,8	13,2	12,7	12,2	11,8
310	17,5	16,3	15,3	14,5	13,9	13,3	12,8	12,3	11,9
320	17,5	16,4	15,4	14,6	14,0	13,4	12,9	12,4	12,0
330	17,6	16,4	15,5	14,7	14,0	13,5	13,0	12,5	12,1
340	17,7	16,5	15,6	14,8	14,1	13,5	13,0	12,6	12,2
350	17,7	16,6	15,6	14,8	14,2	13,6	13,1	12,7	12,3
360	17,8	16,6	15,7	14,9	14,2	13,7	13,2	12,8	12,4
370	17,8	16,7	15,8	15,0	14,3	13,7	13,3	12,8	12,4
373	17,8	16,7	15,8	15,0	14,3	13,8	13,3	12,8	12,5

» Fire resistive rating **R60**

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	10,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5	9,5
70	15,2	13,1	11,4	9,9	9,5	9,5	9,5	9,5	9,5
80	16,2	14,2	12,5	11,1	9,8	9,5	9,5	9,5	9,5
90	17,0	15,0	13,4	12,0	10,8	9,8	9,5	9,5	9,5
100	17,7	15,8	14,2	12,8	11,7	10,7	9,8	9,5	9,5
110	18,2	16,4	14,8	13,5	12,4	11,4	10,5	9,8	9,5
120	18,7	16,9	15,3	14,0	12,9	12,0	11,2	10,4	9,8
130	19,1	17,3	15,8	14,5	13,5	12,5	11,7	11,0	10,4
140	19,5	17,7	16,2	15,0	13,9	13,0	12,2	11,5	10,8
150	19,8	18,0	16,6	15,3	14,3	13,4	12,6	11,9	11,3
160	20,1	18,3	16,9	15,7	14,6	13,7	12,9	12,3	11,7
170	20,4	18,6	17,2	16,0	14,9	14,0	13,3	12,6	12,0
180	20,6	18,8	17,4	16,2	15,2	14,3	13,6	12,9	12,3
190	20,8	19,1	17,6	16,5	15,4	14,6	13,8	13,2	12,6
200	21,0	19,3	17,9	16,7	15,7	14,8	14,1	13,4	12,8
210	21,1	19,4	18,0	16,9	15,9	15,0	14,3	13,6	13,0
220	21,3	19,6	18,2	17,1	16,1	15,2	14,5	13,8	13,2
230	21,4	19,8	18,4	17,2	16,2	15,4	14,6	14,0	13,4
240	21,6	19,9	18,5	17,4	16,4	15,5	14,8	14,2	13,6
250	21,7	20,0	18,7	17,5	16,5	15,7	15,0	14,3	13,8
260	21,8	20,1	18,8	17,6	16,7	15,8	15,1	14,5	13,9
270	21,9	20,3	18,9	17,8	16,8	16,0	15,2	14,6	14,1
280	22,0	20,4	19,0	17,9	16,9	16,1	15,4	14,7	14,2
290	22,1	20,5	19,1	18,0	17,0	16,2	15,5	14,9	14,3
300	22,2	20,6	19,2	18,1	17,1	16,3	15,6	15,0	14,4
310	22,3	20,6	19,3	18,2	17,2	16,4	15,7	15,1	14,5
320	22,3	20,7	19,4	18,3	17,3	16,5	15,8	15,2	14,6
330	22,4	20,8	19,5	18,3	17,4	16,6	15,9	15,3	14,7
340	22,5	20,9	19,5	18,4	17,5	16,7	16,0	15,3	14,8
350	22,5	20,9	19,6	18,5	17,6	16,7	16,0	15,4	14,9
360	22,6	21,0	19,7	18,6	17,6	16,8	16,1	15,5	15,0
370	22,7	21,1	19,7	18,6	17,7	16,9	16,2	15,6	15,0
373	22,7	21,1	19,8	18,6	17,7	16,9	16,2	15,6	15,1

» Fire resistive rating R90

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	17,7	14,6	12,0	9,8	9,5	9,5	9,5	9,5	9,5
70	23,4	20,5	18,2	16,2	14,5	13,0	11,7	10,5	9,5
80	24,6	21,8	19,5	17,5	15,8	14,4	13,1	12,0	11,0
90	25,6	22,8	20,5	18,6	16,9	15,5	14,2	13,1	12,2
100	26,4	23,6	21,4	19,5	17,8	16,4	15,2	14,1	13,1
110	27,0	24,3	22,1	20,2	18,6	17,2	16,0	14,9	14,0
120	27,6	24,9	22,7	20,8	19,2	17,8	16,6	15,6	14,7
130	28,1	25,4	23,2	21,4	19,8	18,4	17,2	16,2	15,2
140	28,6	25,9	23,7	21,8	20,3	18,9	17,7	16,7	15,8
150	28,9	26,3	24,1	22,3	20,7	19,3	18,2	17,1	16,2
160	29,3	26,6	24,5	22,6	21,1	19,7	18,6	17,5	16,6
170	29,6	26,9	24,8	23,0	21,4	20,1	18,9	17,9	17,0
180	29,9	27,2	25,1	23,3	21,7	20,4	19,2	18,2	17,3
190	30,1	27,5	25,3	23,5	22,0	20,7	19,5	18,5	17,6
200	30,3	27,7	25,6	23,8	22,2	20,9	19,8	18,7	17,9
210	30,5	27,9	25,8	24,0	22,4	21,1	20,0	19,0	18,1
220	30,7	28,1	26,0	24,2	22,7	21,3	20,2	19,2	18,3
230	30,9	28,3	26,2	24,4	22,8	21,5	20,4	19,4	18,5
240	31,0	28,5	26,3	24,5	23,0	21,7	20,6	19,6	18,7
250	31,2	28,6	26,5	24,7	23,2	21,9	20,7	19,7	18,9
260	31,3	28,7	26,6	24,8	23,3	22,0	20,9	19,9	19,0
270	31,5	28,9	26,7	25,0	23,5	22,2	21,0	20,0	19,2
280	31,6	29,0	26,9	25,1	23,6	22,3	21,2	20,2	19,3
290	31,7	29,1	27,0	25,2	23,7	22,4	21,3	20,3	19,4
300	31,8	29,2	27,1	25,3	23,8	22,5	21,4	20,4	19,6
310	31,9	29,3	27,2	25,4	23,9	22,6	21,5	20,5	19,7
320	32,0	29,4	27,3	25,5	24,0	22,7	21,6	20,6	19,8
330	32,1	29,5	27,4	25,6	24,1	22,8	21,7	20,7	19,9
340	32,1	29,6	27,5	25,7	24,2	22,9	21,8	20,8	20,0
350	32,2	29,7	27,5	25,8	24,3	23,0	21,9	20,9	20,1
360	32,3	29,7	27,6	25,9	24,4	23,1	22,0	21,0	20,1
370	32,4	29,8	27,7	25,9	24,4	23,2	22,1	21,1	20,2
373	32,4	29,8	27,7	26,0	24,5	23,2	22,1	21,1	20,2

» Fire resistive rating R120

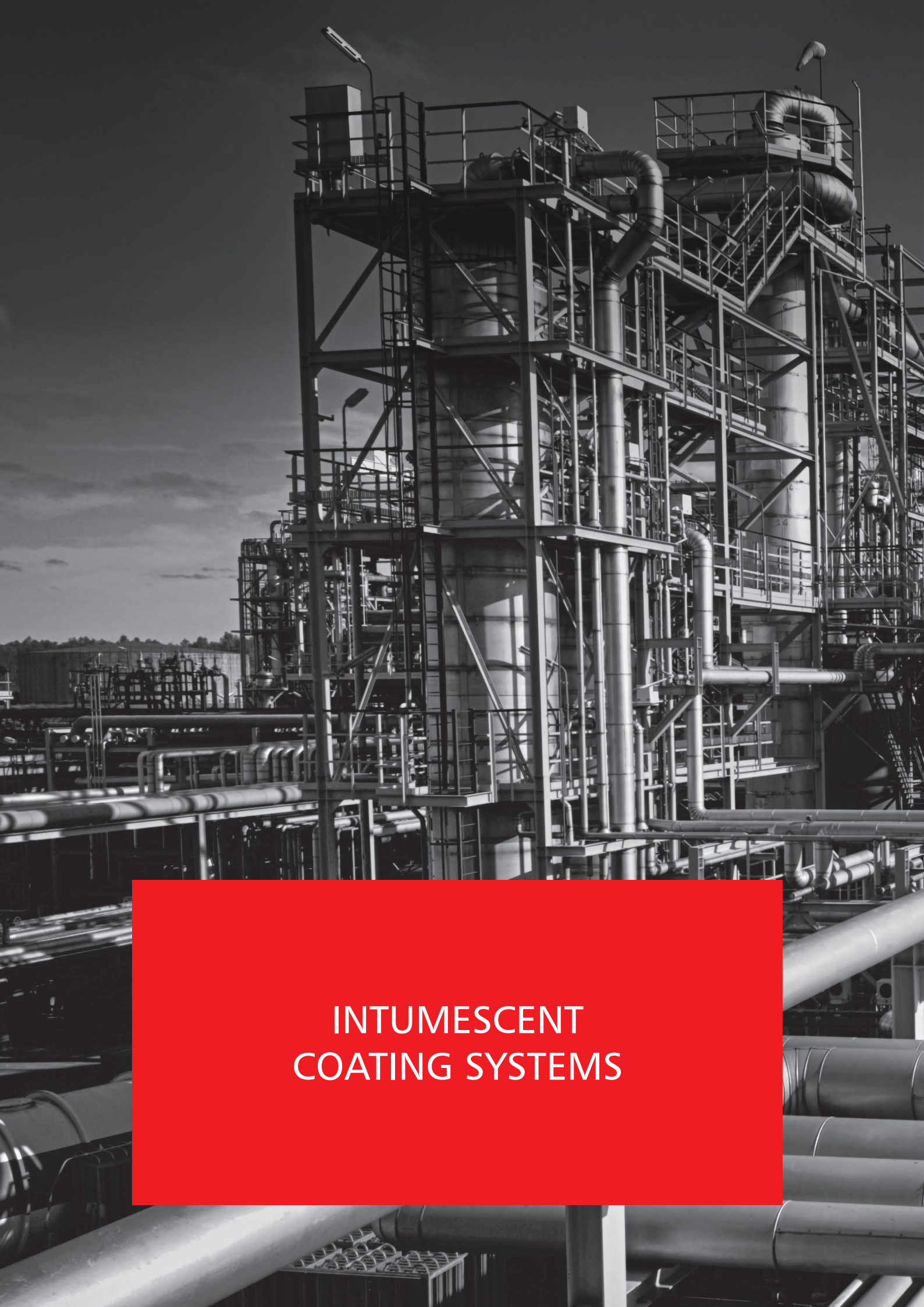
section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	24,9	21,2	18,1	15,4	13,1	11,1	9,5	9,5	9,5
70	31,6	28,0	25,0	22,5	20,3	18,4	16,8	15,3	14,0
80	33,0	29,4	26,4	23,9	21,8	19,9	18,3	16,9	15,6
90	34,1	30,5	27,6	25,1	23,0	21,1	19,5	18,1	16,9
100	35,0	31,5	28,6	26,1	24,0	22,1	20,6	19,1	17,9
110	35,8	32,3	29,4	26,9	24,8	23,0	21,4	20,0	18,8
120	36,5	33,0	30,1	27,6	25,5	23,7	22,1	20,7	19,5
130	37,1	33,6	30,7	28,2	26,1	24,3	22,7	21,4	20,1
140	37,6	34,1	31,2	28,7	26,6	24,8	23,3	21,9	20,7
150	38,1	34,5	31,6	29,2	27,1	25,3	23,8	22,4	21,2
160	38,5	34,9	32,0	29,6	27,5	25,7	24,2	22,8	21,6
170	38,8	35,3	32,4	30,0	27,9	26,1	24,5	23,2	22,0
180	39,1	35,6	32,7	30,3	28,2	26,4	24,9	23,5	22,3
190	39,4	35,9	33,0	30,6	28,5	26,7	25,2	23,8	22,6
200	39,7	36,2	33,3	30,8	28,8	27,0	25,5	24,1	22,9
210	39,9	36,4	33,5	31,1	29,0	27,2	25,7	24,4	23,2
220	40,1	36,6	33,7	31,3	29,2	27,5	25,9	24,6	23,4
230	40,3	36,8	33,9	31,5	29,5	27,7	26,1	24,8	23,6
240	40,5	37,0	34,1	31,7	29,6	27,9	26,3	25,0	23,8
250	40,7	37,2	34,3	31,9	29,8	28,0	26,5	25,2	24,0
260	40,9	37,3	34,4	32,0	30,0	28,2	26,7	25,3	24,1
270	41,0	37,5	34,6	32,2	30,1	28,4	26,8	25,5	24,3
280	41,1	37,6	34,7	32,3	30,3	28,5	27,0	25,6	24,4
290	41,3	37,8	34,9	32,4	30,4	28,6	27,1	25,8	24,6
300	41,4	37,9	35,0	32,6	30,5	28,8	27,2	25,9	24,7
310	41,5	38,0	35,1	32,7	30,6	28,9	27,3	26,0	24,8
320	41,6	38,1	35,2	32,8	30,7	29,0	27,5	26,1	24,9
330	41,7	38,2	35,3	32,9	30,8	29,1	27,6	26,2	25,0
340	41,8	38,3	35,4	33,0	30,9	29,2	27,7	26,3	25,1
350	41,9	38,4	35,5	33,1	31,0	29,3	27,7	26,4	25,2
360	42,0	38,5	35,6	33,2	31,1	29,4	27,8	26,5	25,3
370	42,1	38,5	35,7	33,2	31,2	29,4	27,9	26,6	25,4
373	42,1	38,6	35,7	33,3	31,2	29,5	27,9	26,6	25,4

» Fire resistive rating R180

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	39,3	34,4	30,2	26,7	23,6	20,9	18,5	16,4	14,6
70	47,9	42,9	38,6	35,1	32,0	29,3	27,0	25,0	23,1
80	49,7	44,6	40,4	36,8	33,7	31,1	28,7	26,7	24,9
90	51,2	46,1	41,8	38,2	35,1	32,5	30,1	28,1	26,3
100	52,4	47,2	43,0	39,4	36,3	33,6	31,3	29,2	27,4
110	53,4	48,2	43,9	40,3	37,2	34,6	32,3	30,2	28,4
120	54,3	49,1	44,8	41,2	38,1	35,4	33,1	31,0	29,2
130	55,1	49,8	45,5	41,9	38,8	36,1	33,8	31,7	29,9
140	55,7	50,5	46,1	42,5	39,4	36,7	34,4	32,3	30,5
150	56,3	51,0	46,7	43,0	39,9	37,3	34,9	32,9	31,1
160	56,8	51,5	47,2	43,5	40,4	37,7	35,4	33,4	31,5
170	57,3	52,0	47,6	44,0	40,8	38,2	35,8	33,8	32,0
180	57,7	52,4	48,0	44,3	41,2	38,5	36,2	34,2	32,3
190	58,0	52,7	48,4	44,7	41,6	38,9	36,5	34,5	32,7
200	58,4	53,1	48,7	45,0	41,9	39,2	36,9	34,8	33,0
210	58,7	53,4	49,0	45,3	42,2	39,5	37,1	35,1	33,3
220	59,0	53,6	49,2	45,6	42,4	39,7	37,4	35,3	33,5
230	59,2	53,9	49,5	45,8	42,7	40,0	37,6	35,6	33,8
240	59,5	54,1	49,7	46,0	42,9	40,2	37,9	35,8	34,0
250	59,7	54,3	49,9	46,2	43,1	40,4	38,1	36,0	34,2
260	59,9	54,5	50,1	46,4	43,3	40,6	38,2	36,2	34,4
270	60,1	54,7	50,3	46,6	43,5	40,8	38,4	36,4	34,5
280	60,3	54,9	50,5	46,8	43,6	40,9	38,6	36,5	34,7
290	60,4	55,0	50,6	46,9	43,8	41,1	38,7	36,7	34,8
300	60,6	55,2	50,8	47,1	43,9	41,2	38,9	36,8	35,0
310	60,7	55,3	50,9	47,2	44,1	41,3	39,0	36,9	35,1
320	60,9	55,5	51,0	47,3	44,2	41,5	39,1	37,1	35,2
330	61,0	55,6	51,2	47,4	44,3	41,6	39,2	37,2	35,4
340	61,1	55,7	51,3	47,6	44,4	41,7	39,4	37,3	35,5
350	61,2	55,8	51,4	47,7	44,5	41,8	39,5	37,4	35,6
360	61,3	55,9	51,5	47,8	44,6	41,9	39,6	37,5	35,7
370	61,4	56,0	51,6	47,9	44,7	42,0	39,6	37,6	35,8
373	61,5	56,1	51,6	47,9	44,7	42,0	39,7	37,6	35,8

» Fire resistive rating R240

section factor U/A [m ⁻¹]	minimum thickness of mcr Tecbor flame retardant treatment system [mm] at design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
41	53,8	47,6	42,4	37,9	34,1	30,7	27,8	25,2	22,8
70	-	57,7	52,3	47,6	43,7	40,2	37,2	34,6	32,2
80	-	59,8	54,3	49,7	45,7	42,2	39,2	36,5	34,1
90	-	61,6	56,0	51,3	47,3	43,8	40,7	38,1	35,7
100	-	63,0	57,4	52,6	48,6	45,1	42,0	39,3	37,0
110	-	-	58,5	53,8	49,7	46,2	43,1	40,4	38,0
120	-	-	59,5	54,7	50,6	47,1	44,0	41,3	38,9
130	-	-	60,4	55,5	51,4	47,9	44,8	42,1	39,7
140	-	-	61,1	56,3	52,1	48,6	45,5	42,8	40,4
150	-	-	61,7	56,9	52,8	49,2	46,1	43,4	41,0
160	-	-	62,3	57,5	53,3	49,7	46,6	43,9	41,5
170	-	-	62,8	58,0	53,8	50,2	47,1	44,4	41,9
180	-	-	-	58,4	54,2	50,6	47,5	44,8	42,4
190	-	-	-	58,8	54,6	51,0	47,9	45,2	42,7
200	-	-	-	59,2	55,0	51,4	48,3	45,5	43,1
210	-	-	-	59,5	55,3	51,7	48,6	45,8	43,4
220	-	-	-	59,8	55,6	52,0	48,9	46,1	43,7
230	-	-	-	60,1	55,9	52,3	49,1	46,4	43,9
240	-	-	-	60,3	56,1	52,5	49,4	46,6	44,2
250	-	-	-	60,6	56,4	52,7	49,6	46,8	44,4
260	-	-	-	60,8	56,6	53,0	49,8	47,0	44,6
270	-	-	-	61,0	56,8	53,2	50,0	47,2	44,8
280	-	-	-	61,2	57,0	53,3	50,2	47,4	45,0
290	-	-	-	61,4	57,1	53,5	50,3	47,6	45,1
300	-	-	-	61,6	57,3	53,7	50,5	47,7	45,3
310	-	-	-	61,7	57,5	53,8	50,7	47,9	45,4
320	-	-	-	61,9	57,6	54,0	50,8	48,0	45,6
330	-	-	-	62,0	57,7	54,1	50,9	48,1	45,7
340	-	-	-	62,1	57,9	54,2	51,0	48,3	45,8
350	-	-	-	62,3	58,0	54,3	51,2	48,4	45,9
360	-	-	-	62,4	58,1	54,5	51,3	48,5	46,0
370	-	-	-	62,5	58,2	54,6	51,4	48,6	46,1
373	-	-	-	62,5	58,3	54,6	51,4	48,6	46,2



INTUMESCENT
COATING SYSTEMS



mcr Polylack W, mcr Polylack A - INTUMESCENT PAINT SYSTEM FOR FLAME RETARDANT TREATMENTS

The mcr Polylack W water-based intumescent paint system and mcr Polylack A solvent-based intumescent paint system are designed for flame retardant treatments of steel structures in the construction industry. They can be used both indoors and outdoors with partial exposure, in particular where high fire protection esthetics is required.

Fire resistance is provided by choosing the adequate protection thickness depending on: section factor U/A, required fire resistance rating, critical temperature of steel.

1.4 | mcr Polylack W



- » **R15-R60**
- » European Technical Assessment ETA-15/0801
- » Certificate of constancy of performance 1301-CPR-1145
- » Declaration of performance 81230

Application

The **mcr Polylack W** water-based intumescent paint system is designed for flame retardant treatments of steel structures in the construction industry. It may be used both indoors and outdoors with partial exposure, in particular where high fire protection esthetics is required. Open and box section steel elements protected with mcr Polylack W intumescent paint were rated as per the EN 13501-2:2007+A1:2009 standard and received fire resistance ratings from R15 to R60.

The mcr Polylack W paint may be used for protecting the following steel structural components:

- » open sections – columns and beams
 - fire resistance rating R15–R60
 - protection thickness from 0.230 to 1.397 mm
 - section factor U/A up to 440 m⁻¹
 - critical temperatures within the range of 350°C and 700°C
- » circular and rectangular box sections – columns
 - fire resistance rating R15–R45
 - protection thickness from 0.262 to 1.391 mm
 - section factor U/A up to 467 m⁻¹
 - critical temperatures within the range of 350°C and 750°C
- » rectangular box sections – beams
 - fire resistance rating R15–R120
 - protection thickness from 0.250 to 3.469 mm
 - section factor U/A up to 400 m⁻¹
 - critical temperatures within the range of 350°C and 700°C

Flame retardant treatment technology

Flame retardant insulation consists in applying the mcr Polylack coating system on each element of the structure.

The works mentioned above do not change the shape of proofed sections.

Before applying the mcr Polylack W fire-retardant paints, the elements to be protected should be thoroughly cleaned from dirt, oil, grease, peeling paint and rust.

Subsequently applied system layers:

- » epoxy or alkyd undercoat layer – primer
 - coating thickness depends on the corrosiveness category of the environment
- » basic intumescent layer
 - during fire, when exposed to flame and radiated heat, this layer creates a coating of insulating foam which protects the structure against high temperature, providing the required fire resistance rating
 - thickness of the coating applied depends on the section factor U/A, required fire resistance rating and critical temperature of steel
- » finishing epoxy layer
 - it protects the intumescent layer against humidity, mechanical damage and soiling, also providing a decorative finish
 - coating thickness depends on the corrosiveness category of the environment

mcr Polylack W paints may be applied with a roller, brush (300–500 μm of wet paint per layer) or with a spray-on machine (800–1000 μm of wet paint per layer; hydrodynamic spraying – 0.43–0.53 mm nozzles are recommended).

mcr Polylack W can be applied undiluted or diluted after thorough mixing. Recommended thinner: water (max. 3% of volume). The coating drying time depends on the temperature, ventilation, air exchange and the dryness of the previously applied layer.

Technical parameters

- » density: 1.34 ± 0.06 g/cm³
- » intumescent paint color: white
- » solid particle content: 70 ± 2 m/m %
- » theoretical consumption: 1.95 kg/m²/1 mm of dry layer

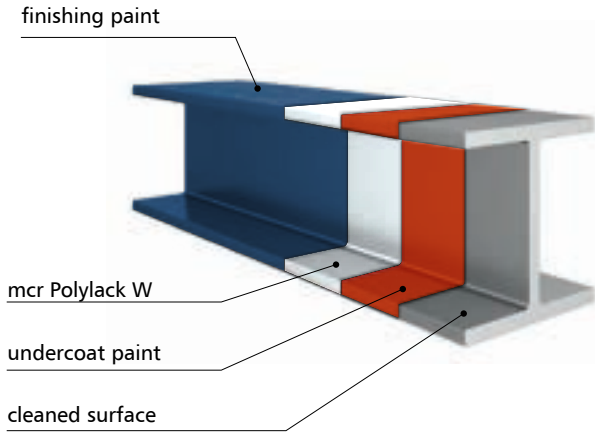
Paint features

- » high aesthetics
- » high durability
- » quick and simple application
- » resistant to cracking, abrasion, dust
- » environmentally friendly, non-toxic
- » protection of elements previously coated with other epoxy undercoats possible without the need to remove them
- » RAL color selection possible

Fire resistance rating

The system's fire resistance rating is provided by choosing adequate protection thickness depending on:

- » section factor U/A of the protected element,
- » required fire resistance rating,
- » critical temperature of steel.



Surface coating may be applied after 24 hours.

Application conditions

The temperature of the proofed surface should be between 5 and 40°C with a relative humidity of 70%; temperature must always exceed the dew point temperature by no less than 3°C.

Application not recommended at ambient temperatures below 5°C.

1.4.1 | Fire resistance rating

1.4.2 | Open sections

» Fire resistive rating **R15 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
70	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
80	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
90	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
100	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
110	0,226	0,230	0,230	0,230	0,230	0,230	0,230	0,230
120	0,251	0,230	0,230	0,230	0,230	0,230	0,230	0,230
130	0,275	0,230	0,230	0,230	0,230	0,230	0,230	0,230
140	0,299	0,230	0,230	0,230	0,230	0,230	0,230	0,230
150	0,321	0,230	0,230	0,230	0,230	0,230	0,230	0,230
160	0,343	0,230	0,230	0,230	0,230	0,230	0,230	0,230
170	0,365	0,230	0,230	0,230	0,230	0,230	0,230	0,230
180	0,385	0,230	0,230	0,230	0,230	0,230	0,230	0,230
190	0,405	0,230	0,230	0,230	0,230	0,230	0,230	0,230
200	0,425	0,230	0,230	0,230	0,230	0,230	0,230	0,230
210	0,444	0,230	0,230	0,230	0,230	0,230	0,230	0,230
220	0,462	0,230	0,230	0,230	0,230	0,230	0,230	0,230
230	0,480	0,230	0,230	0,230	0,230	0,230	0,230	0,230
240	0,497	0,230	0,230	0,230	0,230	0,230	0,230	0,230
250	0,514	0,230	0,230	0,230	0,230	0,230	0,230	0,230
260	0,530	0,230	0,230	0,230	0,230	0,230	0,230	0,230
270	0,546	0,230	0,230	0,230	0,230	0,230	0,230	0,230
280	0,561	0,230	0,230	0,230	0,230	0,230	0,230	0,230
290	0,576	0,237	0,230	0,230	0,230	0,230	0,230	0,230
300	0,591	0,245	0,230	0,230	0,230	0,230	0,230	0,230
310	0,605	0,253	0,230	0,230	0,230	0,230	0,230	0,230
320	0,619	0,261	0,230	0,230	0,230	0,230	0,230	0,230
330	0,632	0,268	0,230	0,230	0,230	0,230	0,230	0,230
340	0,646	0,276	0,230	0,230	0,230	0,230	0,230	0,230
350	0,658	0,283	0,230	0,230	0,230	0,230	0,230	0,230
360	0,671	0,290	0,230	0,230	0,230	0,230	0,230	0,230
365	0,677	0,294	0,230	0,230	0,230	0,230	0,230	0,230

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	0,392	0,260	0,230	0,230	0,230	0,230	0,230	0,230
70	0,467	0,315	0,230	0,230	0,230	0,230	0,230	0,230
80	0,539	0,368	0,253	0,230	0,230	0,230	0,230	0,230
90	0,608	0,420	0,292	0,230	0,230	0,230	0,230	0,230
100	0,675	0,471	0,331	0,230	0,230	0,230	0,230	0,230
110	0,739	0,520	0,369	0,230	0,230	0,230	0,230	0,230
120	0,802	0,569	0,406	0,230	0,230	0,230	0,230	0,230
130	0,862	0,616	0,443	0,230	0,230	0,230	0,230	0,230
140	0,920	0,661	0,479	0,252	0,230	0,230	0,230	0,230
150	0,976	0,706	0,515	0,274	0,230	0,230	0,230	0,230
160	1,031	0,750	0,550	0,296	0,230	0,230	0,230	0,230
170	1,083	0,793	0,585	0,317	0,230	0,230	0,230	0,230
180	1,134	0,834	0,618	0,339	0,230	0,230	0,230	0,230
190	1,184	0,875	0,652	0,360	0,230	0,230	0,230	0,230
200	1,232	0,915	0,685	0,380	0,230	0,230	0,230	0,230
210	1,278	0,954	0,717	0,401	0,230	0,230	0,230	0,230
220	1,323	0,992	0,749	0,422	0,230	0,230	0,230	0,230
230	1,367	1,029	0,780	0,442	0,230	0,230	0,230	0,230
240	-	1,065	0,811	0,462	0,235	0,230	0,230	0,230
250	-	1,101	0,841	0,482	0,247	0,230	0,230	0,230
260	-	1,136	0,871	0,502	0,259	0,230	0,230	0,230
270	-	1,170	0,901	0,521	0,271	0,230	0,230	0,230
280	-	1,203	0,930	0,541	0,283	0,230	0,230	0,230
290	-	1,236	0,959	0,560	0,295	0,230	0,230	0,230
300	-	1,268	0,987	0,579	0,307	0,230	0,230	0,230
310	-	1,299	1,015	0,598	0,319	0,230	0,230	0,230
320	-	1,330	1,042	0,617	0,331	0,230	0,230	0,230
330	-	1,360	1,069	0,635	0,343	0,230	0,230	0,230
340	-	1,389	1,096	0,654	0,354	0,230	0,230	0,230
350	-	-	1,122	0,672	0,366	0,230	0,230	0,230
360	-	-	1,148	0,690	0,378	0,230	0,230	0,230
365	-	-	1,161	0,699	0,384	0,230	0,230	0,230



» Fire resistive rating **R45 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	0,700	0,531	0,425	0,293	0,230	0,230	0,230	0,230
70	0,819	0,627	0,505	0,352	0,270	0,230	0,230	0,230
80	0,933	0,720	0,584	0,411	0,318	0,230	0,230	0,230
90	1,044	0,811	0,661	0,470	0,365	0,243	0,230	0,230
100	1,151	0,900	0,738	0,527	0,412	0,277	0,230	0,230
110	1,253	0,986	0,812	0,584	0,459	0,311	0,230	0,230
120	1,353	1,070	0,886	0,641	0,506	0,346	0,230	0,230
130	-	1,152	0,959	0,697	0,553	0,380	0,230	0,230
140	-	1,232	1,030	0,753	0,600	0,414	0,249	0,230
150	-	1,310	1,100	0,808	0,647	0,449	0,272	0,230
160	-	1,387	1,169	0,863	0,693	0,484	0,295	0,230
170	-	-	1,237	0,917	0,739	0,518	0,318	0,230
180	-	-	1,304	0,970	0,786	0,553	0,341	0,230
190	-	-	1,369	1,024	0,832	0,588	0,365	0,230
200	-	-	-	1,076	0,878	0,623	0,389	0,230
210	-	-	-	1,128	0,924	0,658	0,413	0,230
220	-	-	-	1,180	0,969	0,694	0,437	0,230
230	-	-	-	1,231	1,015	0,729	0,462	0,230
240	-	-	-	1,282	1,060	0,765	0,486	0,230
250	-	-	-	1,332	1,106	0,800	0,511	0,230
260	-	-	-	1,382	1,151	0,836	0,536	0,230
270	-	-	-	-	1,196	0,872	0,562	0,230
280	-	-	-	-	1,241	0,908	0,587	0,230
290	-	-	-	-	1,286	0,944	0,613	0,230
300	-	-	-	-	1,331	0,980	0,639	0,230
310	-	-	-	-	1,375	1,017	0,665	0,230
320	-	-	-	-	-	1,053	0,692	0,230
330	-	-	-	-	-	1,090	0,719	0,230
340	-	-	-	-	-	1,127	0,746	0,230
350	-	-	-	-	-	1,163	0,773	0,230
360	-	-	-	-	-	1,200	0,801	0,230
365	-	-	-	-	-	1,219	0,815	0,235

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	1,007	0,802	0,677	0,516	0,434	0,337	0,255	0,230
70	1,170	0,939	0,797	0,611	0,517	0,404	0,308	0,230
80	1,328	1,072	0,915	0,705	0,599	0,471	0,361	0,230
90	-	1,202	1,030	0,799	0,681	0,538	0,414	0,261
100	-	1,328	1,144	0,892	0,763	0,605	0,468	0,297
110	-	-	1,256	0,983	0,845	0,672	0,522	0,334
120	-	-	1,366	1,074	0,926	0,740	0,577	0,371
130	-	-	-	1,164	1,007	0,808	0,632	0,409
140	-	-	-	1,254	1,088	0,876	0,687	0,447
150	-	-	-	1,342	1,169	0,944	0,744	0,485
160	-	-	-	-	1,249	1,012	0,800	0,525
170	-	-	-	-	1,330	1,081	0,857	0,564
180	-	-	-	-	-	1,150	0,915	0,605
190	-	-	-	-	-	1,219	0,973	0,646
200	-	-	-	-	-	1,289	1,032	0,687
210	-	-	-	-	-	1,358	1,091	0,729
220	-	-	-	-	-	-	1,151	0,772
230	-	-	-	-	-	-	1,211	0,815
240	-	-	-	-	-	-	1,272	0,859
250	-	-	-	-	-	-	1,333	0,904
260	-	-	-	-	-	-	1,395	0,949
270	-	-	-	-	-	-	-	0,995
280	-	-	-	-	-	-	-	1,042
290	-	-	-	-	-	-	-	1,089
300	-	-	-	-	-	-	-	1,137
310	-	-	-	-	-	-	-	1,186
320	-	-	-	-	-	-	-	1,235
330	-	-	-	-	-	-	-	1,286
340	-	-	-	-	-	-	-	1,337
350	-	-	-	-	-	-	-	1,389
360	-	-	1,148	0,690	0,378	0,230	0,230	0,230
365	-	-	1,161	0,699	0,384	0,230	0,230	0,230



» Fire resistive rating **R15 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
110	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
120	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
130	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
140	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
150	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
160	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
170	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
180	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
190	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
200	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
210	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
220	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
230	0,252	0,250	0,250	0,250	0,250	0,250	0,250	0,250
240	0,274	0,250	0,250	0,250	0,250	0,250	0,250	0,250
250	0,297	0,250	0,250	0,250	0,250	0,250	0,250	0,250
260	0,319	0,250	0,250	0,250	0,250	0,250	0,250	0,250
270	0,341	0,250	0,250	0,250	0,250	0,250	0,250	0,250
280	0,364	0,250	0,250	0,250	0,250	0,250	0,250	0,250
290	0,387	0,250	0,250	0,250	0,250	0,250	0,250	0,250
300	0,409	0,250	0,250	0,250	0,250	0,250	0,250	0,250
310	0,432	0,250	0,250	0,250	0,250	0,250	0,250	0,250
320	0,455	0,250	0,250	0,250	0,250	0,250	0,250	0,250
330	0,478	0,250	0,250	0,250	0,250	0,250	0,250	0,250
340	0,502	0,250	0,250	0,250	0,250	0,250	0,250	0,250
350	0,525	0,250	0,250	0,250	0,250	0,250	0,250	0,250
360	0,549	0,250	0,250	0,250	0,250	0,250	0,250	0,250
370	0,572	0,250	0,250	0,250	0,250	0,250	0,250	0,250
380	0,596	0,256	0,250	0,250	0,250	0,250	0,250	0,250
390	0,620	0,275	0,250	0,250	0,250	0,250	0,250	0,250
400	0,644	0,293	0,250	0,250	0,250	0,250	0,250	0,250
410	0,668	0,312	0,250	0,250	0,250	0,250	0,250	0,250
420	0,692	0,332	0,250	0,250	0,250	0,250	0,250	0,250
430	0,717	0,352	0,250	0,250	0,250	0,250	0,250	0,250
440	0,741	0,372	0,250	0,250	0,250	0,250	0,250	0,250

» Fire resistive rating R30 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
110	0,477	0,267	0,250	0,250	0,250	0,250	0,250	0,250
120	0,543	0,319	0,250	0,250	0,250	0,250	0,250	0,250
130	0,609	0,372	0,250	0,250	0,250	0,250	0,250	0,250
140	0,675	0,426	0,250	0,250	0,250	0,250	0,250	0,250
150	0,742	0,481	0,252	0,250	0,250	0,250	0,250	0,250
160	0,809	0,537	0,294	0,250	0,250	0,250	0,250	0,250
170	0,877	0,593	0,337	0,250	0,250	0,250	0,250	0,250
180	0,945	0,650	0,382	0,250	0,250	0,250	0,250	0,250
190	1,013	0,708	0,427	0,250	0,250	0,250	0,250	0,250
200	1,082	0,767	0,473	0,276	0,250	0,250	0,250	0,250
210	1,150	0,827	0,521	0,314	0,250	0,250	0,250	0,250
220	1,220	0,888	0,569	0,353	0,250	0,250	0,250	0,250
230	1,289	0,949	0,619	0,394	0,264	0,250	0,250	0,250
240	1,359	1,012	0,669	0,435	0,300	0,250	0,250	0,250
250	-	1,076	0,721	0,478	0,338	0,250	0,250	0,250
260	-	1,140	0,775	0,523	0,377	0,250	0,250	0,250
270	-	1,206	0,829	0,568	0,418	0,250	0,250	0,250
280	-	1,273	0,885	0,616	0,460	0,250	0,250	0,250
290	-	1,340	0,943	0,664	0,504	0,273	0,250	0,250
300	-	-	1,001	0,715	0,550	0,309	0,250	0,250
310	-	-	1,062	0,767	0,597	0,346	0,250	0,250
320	-	-	1,124	0,821	0,647	0,385	0,250	0,250
330	-	-	1,187	0,877	0,699	0,425	0,250	0,250
340	-	-	1,253	0,935	0,753	0,468	0,250	0,250
350	-	-	1,320	0,995	0,809	0,513	0,250	0,250
360	-	-	1,389	1,057	0,868	0,561	0,277	0,250
370	-	-	-	1,121	0,930	0,611	0,314	0,250
380	-	-	-	1,189	0,995	0,664	0,353	0,250
390	-	-	-	1,258	1,063	0,720	0,395	0,250
400	-	-	-	1,331	1,135	0,780	0,441	0,250
410	-	-	-	-	1,210	0,843	0,489	0,250
420	-	-	-	-	1,289	0,911	0,541	0,250
430	-	-	-	-	1,373	0,983	0,597	0,250
440	-	-	-	-	-	1,060	0,658	0,250



» Fire resistive rating **R45 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
110	0,958	0,676	0,436	0,282	0,250	0,250	0,250	0,250
120	1,069	0,769	0,510	0,344	0,251	0,250	0,250	0,250
130	1,181	0,863	0,586	0,408	0,308	0,250	0,250	0,250
140	1,293	0,959	0,664	0,473	0,367	0,250	0,250	0,250
150	-	1,056	0,743	0,540	0,428	0,283	0,250	0,250
160	-	1,154	0,824	0,609	0,490	0,335	0,250	0,250
170	-	1,254	0,906	0,680	0,555	0,389	0,250	0,250
180	-	1,355	0,991	0,752	0,621	0,445	0,297	0,250
190	-	-	1,077	0,827	0,690	0,503	0,346	0,250
200	-	-	1,165	0,904	0,761	0,564	0,397	0,254
210	-	-	1,255	0,983	0,834	0,627	0,450	0,299
220	-	-	1,348	1,065	0,911	0,692	0,505	0,345
230	-	-	-	1,149	0,989	0,760	0,563	0,393
240	-	-	-	1,235	1,071	0,830	0,623	0,444
250	-	-	-	1,324	1,156	0,904	0,686	0,497
260	-	-	-	-	1,243	0,981	0,752	0,553
270	-	-	-	-	1,335	1,061	0,821	0,612
280	-	-	-	-	-	1,144	0,894	0,674
290	-	-	-	-	-	1,232	0,970	0,739
300	-	-	-	-	-	1,323	1,050	0,808
310	-	-	-	-	-	-	1,134	0,881
320	-	-	-	-	-	-	1,223	0,958
330	-	-	-	-	-	-	1,317	1,041
340	-	-	-	-	-	-	-	1,128
350	-	-	-	-	-	-	-	1,221
360	-	-	-	-	-	-	-	1,321

» Fire resistive rating R60 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
110	-	1,086	0,781	0,588	0,482	0,348	0,250	0,250
120	-	1,219	0,891	0,682	0,568	0,422	0,301	0,250
130	-	1,354	1,003	0,779	0,657	0,498	0,367	0,257
140	-	-	1,117	0,878	0,748	0,577	0,435	0,316
150	-	-	1,234	0,979	0,842	0,659	0,506	0,377
160	-	-	1,353	1,084	0,939	0,743	0,579	0,441
170	-	-	-	1,191	1,039	0,830	0,655	0,507
180	-	-	-	1,302	1,143	0,921	0,734	0,576
190	-	-	-	-	1,249	1,015	0,817	0,649
200	-	-	-	-	1,360	1,113	0,903	0,724
210	-	-	-	-	-	1,214	0,992	0,803
220	-	-	-	-	-	1,319	1,085	0,885
230	-	-	-	-	-	-	1,183	0,971
240	-	-	-	-	-	-	1,284	1,062
250	-	-	-	-	-	-	1,391	1,156
260	-	-	-	-	-	-	-	1,256
270	-	-	-	-	-	-	-	1,361



1.4.3 | Circular box sections

» Fire resistive rating **R15 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack W flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
76	0,612	0,434	0,262	0,262	0,262	0,262	0,262	0,262	0,262
80	0,612	0,434	0,262	0,262	0,262	0,262	0,262	0,262	0,262
85	0,612	0,434	0,272	0,262	0,262	0,262	0,262	0,262	0,262
90	0,659	0,473	0,306	0,262	0,262	0,262	0,262	0,262	0,262
95	0,707	0,513	0,340	0,262	0,262	0,262	0,262	0,262	0,262
100	0,750	0,552	0,374	0,262	0,262	0,262	0,262	0,262	0,262
105	0,773	0,591	0,408	0,262	0,262	0,262	0,262	0,262	0,262
110	0,795	0,630	0,443	0,262	0,262	0,262	0,262	0,262	0,262
115	0,818	0,670	0,477	0,287	0,262	0,262	0,262	0,262	0,262
120	0,841	0,709	0,511	0,317	0,262	0,262	0,262	0,262	0,262
125	0,863	0,748	0,545	0,347	0,262	0,262	0,262	0,262	0,262
130	0,886	0,769	0,579	0,377	0,262	0,262	0,262	0,262	0,262
135	0,908	0,791	0,613	0,407	0,262	0,262	0,262	0,262	0,262
140	0,931	0,813	0,647	0,436	0,262	0,262	0,262	0,262	0,262
145	0,954	0,835	0,681	0,466	0,262	0,262	0,262	0,262	0,262
150	0,976	0,858	0,715	0,496	0,262	0,262	0,262	0,262	0,262
155	0,999	0,880	0,748	0,526	0,271	0,262	0,262	0,262	0,262
160	1,022	0,902	0,769	0,556	0,300	0,262	0,262	0,262	0,262
165	1,044	0,924	0,790	0,586	0,329	0,262	0,262	0,262	0,262
170	1,067	0,946	0,811	0,616	0,358	0,262	0,262	0,262	0,262
175	1,090	0,968	0,832	0,645	0,387	0,262	0,262	0,262	0,262
180	1,112	0,990	0,853	0,675	0,416	0,270	0,262	0,262	0,262
185	1,135	1,012	0,874	0,705	0,445	0,296	0,262	0,262	0,262
190	1,157	1,034	0,895	0,735	0,474	0,321	0,262	0,262	0,262
195	1,180	1,056	0,916	0,758	0,503	0,346	0,262	0,262	0,262
200	1,203	1,078	0,936	0,778	0,532	0,372	0,262	0,262	0,262
205	1,225	1,100	0,957	0,797	0,561	0,397	0,262	0,262	0,262
210	1,248	1,122	0,978	0,817	0,590	0,422	0,262	0,262	0,262
215	1,271	1,144	0,999	0,836	0,619	0,448	0,262	0,262	0,262
220	1,293	1,167	1,020	0,856	0,648	0,473	0,262	0,262	0,262
225	1,316	1,189	1,041	0,875	0,678	0,498	0,262	0,262	0,262
230	1,339	1,211	1,062	0,895	0,707	0,524	0,262	0,262	0,262
235	1,361	1,233	1,083	0,914	0,736	0,549	0,262	0,262	0,262
240	1,384	1,255	1,104	0,934	0,758	0,574	0,282	0,262	0,262

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	-	1,277	1,125	0,953	0,776	0,600	0,304	0,262	0,262
250	-	1,299	1,146	0,973	0,795	0,625	0,326	0,262	0,262
255	-	1,321	1,167	0,992	0,813	0,650	0,347	0,262	0,262
260	-	1,343	1,188	1,011	0,832	0,676	0,369	0,262	0,262
265	-	1,365	1,209	1,031	0,850	0,701	0,390	0,262	0,262
270	-	1,387	1,230	1,050	0,869	0,726	0,412	0,262	0,262
275	-	-	1,251	1,070	0,887	0,750	0,434	0,262	0,262
280	-	-	1,271	1,089	0,906	0,769	0,455	0,262	0,262
285	-	-	1,292	1,109	0,924	0,789	0,477	0,262	0,262
290	-	-	1,313	1,128	0,943	0,808	0,498	0,262	0,262
295	-	-	1,334	1,148	0,961	0,827	0,520	0,262	0,262
300	-	-	1,355	1,167	0,980	0,846	0,542	0,262	0,262
305	-	-	1,376	1,187	0,998	0,865	0,563	0,262	0,262
310	-	-	-	1,206	1,017	0,884	0,585	0,262	0,262
315	-	-	-	1,226	1,035	0,904	0,607	0,262	0,262
320	-	-	-	1,245	1,054	0,923	0,628	0,262	0,262
325	-	-	-	1,265	1,072	0,942	0,650	0,262	0,262
330	-	-	-	1,284	1,090	0,961	0,671	0,275	0,262
335	-	-	-	1,304	1,109	0,980	0,693	0,289	0,262
340	-	-	-	1,323	1,127	1,000	0,715	0,303	0,262
345	-	-	-	1,343	1,146	1,019	0,736	0,317	0,262
350	-	-	-	1,362	1,164	1,038	0,757	0,331	0,262
360	-	-	-	-	1,201	1,076	0,799	0,359	0,262
370	-	-	-	-	1,238	1,115	0,840	0,387	0,262
380	-	-	-	-	1,275	1,153	0,881	0,415	0,262
390	-	-	-	-	1,312	1,191	0,923	0,443	0,262
400	-	-	-	-	1,349	1,230	0,964	0,471	0,262
410	-	-	-	-	1,386	1,268	1,005	0,499	0,262
420	-	-	-	-	-	1,306	1,047	0,527	0,262
430	-	-	-	-	-	1,345	1,088	0,555	0,262
440	-	-	-	-	-	1,383	1,129	0,583	0,262
450	-	-	-	-	-	-	1,171	0,611	0,262
460	-	-	-	-	-	-	1,212	0,639	0,262
467	-	-	-	-	-	-	1,241	0,659	0,262



» Fire resistive rating **R30 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack W flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
76	-	-	-	0,740	0,560	0,487	0,328	0,262	0,262
80	-	-	-	0,740	0,560	0,487	0,328	0,262	0,262
85	-	-	-	0,740	0,560	0,487	0,328	0,262	0,262
90	-	-	-	0,775	0,615	0,539	0,377	0,262	0,262
95	-	-	-	0,807	0,670	0,591	0,425	0,262	0,262
100	-	-	-	0,839	0,725	0,643	0,474	0,276	0,262
105	-	-	-	0,870	0,765	0,696	0,523	0,320	0,262
110	-	-	-	0,902	0,794	0,747	0,572	0,363	0,262
115	-	-	-	0,934	0,824	0,778	0,620	0,406	0,262
120	-	-	-	0,966	0,854	0,809	0,669	0,449	0,262
125	-	-	-	0,998	0,884	0,840	0,718	0,493	0,262
130	-	-	-	1,030	0,913	0,871	0,759	0,536	0,262
135	-	-	-	1,062	0,943	0,901	0,789	0,579	0,289
140	-	-	-	1,094	0,973	0,932	0,819	0,622	0,323
145	-	-	-	1,126	1,002	0,963	0,849	0,665	0,357
150	-	-	-	1,158	1,032	0,994	0,880	0,709	0,391
155	-	-	-	1,190	1,062	1,025	0,910	0,750	0,425
160	-	-	-	1,222	1,092	1,056	0,940	0,780	0,459
165	-	-	-	1,254	1,121	1,087	0,970	0,809	0,493
170	-	-	-	1,286	1,151	1,118	1,001	0,839	0,527
175	-	-	-	1,318	1,181	1,149	1,031	0,869	0,561
180	-	-	-	1,350	1,210	1,179	1,061	0,899	0,596
185	-	-	-	1,382	1,240	1,210	1,091	0,928	0,630
190	-	-	-	-	1,270	1,241	1,122	0,958	0,664
195	-	-	-	-	1,300	1,272	1,152	0,988	0,698
200	-	-	-	-	1,329	1,303	1,182	1,018	0,732
205	-	-	-	-	1,359	1,334	1,212	1,047	0,766
210	-	-	-	-	1,389	1,365	1,243	1,077	0,801
215	-	-	-	-	-	-	1,273	1,107	0,836
220	-	-	-	-	-	-	1,303	1,136	0,870
225	-	-	-	-	-	-	1,333	1,166	0,905
230	-	-	-	-	-	-	1,364	1,196	0,940
235	-	-	-	-	-	-	-	1,226	0,975
240	-	-	-	-	-	-	-	1,255	1,009
245	-	-	-	-	-	-	-	1,285	1,044
250	-	-	-	-	-	-	-	1,315	1,079
255	-	-	-	-	-	-	-	1,345	1,113
260	-	-	-	-	-	-	-	1,374	1,148
265	-	-	-	-	-	-	-	-	1,183
270	-	-	-	-	-	-	-	-	1,217
275	-	-	-	-	-	-	-	-	1,252
280	-	-	-	-	-	-	-	-	1,287
285	-	-	-	-	-	-	-	-	1,321
290	-	-	-	-	-	-	-	-	1,356
295	-	-	-	-	-	-	-	-	1,391
300	-	-	-	-	-	-	-	-	-

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
76	-	-	-	-	-	-	-	0,654	0,389
80	-	-	-	-	-	-	-	0,654	0,389
85	-	-	-	-	-	-	-	0,654	0,389
90	-	-	-	-	-	-	-	0,727	0,454
95	-	-	-	-	-	-	-	0,778	0,519
100	-	-	-	-	-	-	-	0,821	0,583
105	-	-	-	-	-	-	-	0,864	0,648
110	-	-	-	-	-	-	-	0,906	0,713
115	-	-	-	-	-	-	-	0,949	0,766
120	-	-	-	-	-	-	-	0,992	0,806
125	-	-	-	-	-	-	-	1,035	0,846
130	-	-	-	-	-	-	-	1,078	0,886
135	-	-	-	-	-	-	-	1,121	0,927
140	-	-	-	-	-	-	-	1,164	0,967
145	-	-	-	-	-	-	-	1,207	1,007
150	-	-	-	-	-	-	-	1,249	1,047
155	-	-	-	-	-	-	-	1,292	1,088
160	-	-	-	-	-	-	-	1,335	1,128
165	-	-	-	-	-	-	-	1,378	1,168
170	-	-	-	-	-	-	-	-	1,209
175	-	-	-	-	-	-	-	-	1,249
180	-	-	-	-	-	-	-	-	1,289
185	-	-	-	-	-	-	-	-	1,329
190	-	-	-	-	-	-	-	-	1,370
195	-	-	-	-	-	-	-	-	-



1.4.4 | Profile zamknięte prostokątne

» Fire resistive rating **R15 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
70	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
80	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
90	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
100	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
110	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
120	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
130	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
140	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
150	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
160	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
170	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
180	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
190	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
200	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
210	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
220	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
230	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
240	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
250	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
260	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
270	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
280	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
290	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
300	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
310	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
320	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
330	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
340	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
350	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
360	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
370	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
380	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
390	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
400	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250

» Fire resistive rating R30 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	0,539	0,295	0,250	0,250	0,250	0,250	0,250	0,250
70	0,608	0,338	0,250	0,250	0,250	0,250	0,250	0,250
80	0,680	0,381	0,250	0,250	0,250	0,250	0,250	0,250
90	0,752	0,426	0,250	0,250	0,250	0,250	0,250	0,250
100	0,826	0,472	0,250	0,250	0,250	0,250	0,250	0,250
110	0,901	0,519	0,250	0,250	0,250	0,250	0,250	0,250
120	0,978	0,568	0,250	0,250	0,250	0,250	0,250	0,250
130	1,057	0,617	0,258	0,250	0,250	0,250	0,250	0,250
140	1,137	0,668	0,282	0,250	0,250	0,250	0,250	0,250
150	1,219	0,721	0,308	0,250	0,250	0,250	0,250	0,250
160	1,302	0,774	0,335	0,250	0,250	0,250	0,250	0,250
170	1,388	0,830	0,362	0,250	0,250	0,250	0,250	0,250
180	1,475	0,887	0,390	0,250	0,250	0,250	0,250	0,250
190	1,564	0,945	0,420	0,250	0,250	0,250	0,250	0,250
200	1,654	1,006	0,450	0,250	0,250	0,250	0,250	0,250
210	1,747	1,068	0,482	0,250	0,250	0,250	0,250	0,250
220	1,842	1,132	0,515	0,250	0,250	0,250	0,250	0,250
230	1,939	1,198	0,549	0,250	0,250	0,250	0,250	0,250
240	2,039	1,266	0,584	0,250	0,250	0,250	0,250	0,250
250	2,140	1,336	0,621	0,250	0,250	0,250	0,250	0,250
260	2,244	1,408	0,659	0,250	0,250	0,250	0,250	0,250
270	2,351	1,483	0,699	0,250	0,250	0,250	0,250	0,250
280	2,460	1,560	0,740	0,250	0,250	0,250	0,250	0,250
290	2,571	1,640	0,783	0,250	0,250	0,250	0,250	0,250
300	2,686	1,723	0,828	0,250	0,250	0,250	0,250	0,250
310	2,803	1,809	0,876	0,250	0,250	0,250	0,250	0,250
320	2,923	1,898	0,925	0,250	0,250	0,250	0,250	0,250
330	3,046	1,989	0,976	0,250	0,250	0,250	0,250	0,250
340	3,173	2,085	1,031	0,250	0,250	0,250	0,250	0,250
350	3,302	2,184	1,087	0,250	0,250	0,250	0,250	0,250
360	3,436	2,286	1,147	0,250	0,250	0,250	0,250	0,250
370	-	2,393	1,210	0,250	0,250	0,250	0,250	0,250
380	-	2,504	1,276	0,250	0,250	0,250	0,250	0,250
390	-	2,620	1,345	0,250	0,250	0,250	0,250	0,250
400	-	2,740	1,419	0,250	0,250	0,250	0,250	0,250



» Fire resistive rating **R45 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	1,023	0,722	0,485	0,293	0,250	0,250	0,250	0,250
70	1,178	0,842	0,575	0,359	0,250	0,250	0,250	0,250
80	1,337	0,964	0,668	0,426	0,250	0,250	0,250	0,250
90	1,499	1,090	0,763	0,496	0,273	0,250	0,250	0,250
100	1,664	1,220	0,862	0,568	0,322	0,250	0,250	0,250
110	1,833	1,352	0,963	0,642	0,373	0,250	0,250	0,250
120	2,005	1,488	1,068	0,720	0,426	0,250	0,250	0,250
130	2,180	1,628	1,176	0,800	0,482	0,250	0,250	0,250
140	2,359	1,771	1,288	0,883	0,539	0,250	0,250	0,250
150	2,541	1,919	1,403	0,969	0,599	0,280	0,250	0,250
160	2,728	2,070	1,522	1,059	0,662	0,317	0,250	0,250
170	2,918	2,226	1,645	1,152	0,727	0,357	0,250	0,250
180	3,113	2,386	1,773	1,248	0,795	0,399	0,250	0,250
190	3,311	2,551	1,905	1,349	0,866	0,442	0,250	0,250
200	-	2,721	2,042	1,454	0,941	0,488	0,250	0,250
210	-	2,895	2,183	1,563	1,019	0,536	0,250	0,250
220	-	3,075	2,330	1,677	1,100	0,587	0,250	0,250
230	-	3,261	2,483	1,797	1,186	0,641	0,250	0,250
240	-	3,453	2,642	1,921	1,277	0,697	0,250	0,250
250	-	-	2,806	2,051	1,372	0,757	0,250	0,250
260	-	-	2,978	2,188	1,472	0,821	0,250	0,250
270	-	-	3,156	2,331	1,578	0,888	0,254	0,250
280	-	-	3,342	2,482	1,690	0,960	0,285	0,250
290	-	-	-	2,640	1,809	1,037	0,318	0,250
300	-	-	-	2,806	1,934	1,119	0,353	0,250
310	-	-	-	2,981	2,068	1,206	0,391	0,250
320	-	-	-	3,166	2,210	1,300	0,433	0,250
330	-	-	-	3,362	2,362	1,401	0,478	0,250
340	-	-	-	-	2,524	1,511	0,526	0,250
350	-	-	-	-	2,698	1,629	0,580	0,250
360	-	-	-	-	2,885	1,757	0,638	0,250
370	-	-	-	-	3,086	1,897	0,703	0,250
380	-	-	-	-	3,303	2,050	0,774	0,250
390	-	-	-	-	-	2,218	0,854	0,250
400	-	-	-	-	-	2,403	0,944	0,250

» Fire resistive rating R60 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	1,507	1,148	0,866	0,638	0,450	0,292	0,250	0,250
70	1,748	1,345	1,026	0,767	0,553	0,373	0,250	0,250
80	1,995	1,547	1,191	0,901	0,660	0,457	0,283	0,250
90	2,246	1,755	1,361	1,039	0,771	0,544	0,349	0,250
100	2,503	1,967	1,536	1,182	0,886	0,635	0,419	0,250
110	2,764	2,185	1,717	1,330	1,005	0,729	0,491	0,284
120	3,031	2,409	1,903	1,483	1,130	0,828	0,567	0,339
130	3,303	2,638	2,095	1,642	1,259	0,930	0,646	0,397
140	-	2,874	2,293	1,806	1,393	1,038	0,729	0,458
150	-	3,117	2,498	1,977	1,533	1,150	0,815	0,521
160	-	3,366	2,710	2,155	1,679	1,267	0,907	0,589
170	-	-	2,929	2,339	1,831	1,390	1,002	0,659
180	-	-	3,155	2,531	1,991	1,519	1,103	0,734
190	-	-	3,390	2,730	2,157	1,654	1,209	0,813
200	-	-	-	2,938	2,331	1,796	1,321	0,896
210	-	-	-	3,155	2,513	1,945	1,439	0,985
220	-	-	-	3,381	2,705	2,103	1,564	1,079
230	-	-	-	-	2,906	2,269	1,697	1,179
240	-	-	-	-	3,117	2,445	1,837	1,285
250	-	-	-	-	3,339	2,631	1,987	1,399
260	-	-	-	-	-	2,828	2,146	1,521
270	-	-	-	-	-	3,037	2,316	1,651
280	-	-	-	-	-	3,260	2,498	1,792
290	-	-	-	-	-	-	2,694	1,944
300	-	-	-	-	-	-	2,904	2,108
310	-	-	-	-	-	-	3,130	2,286
320	-	-	-	-	-	-	3,375	2,480
330	-	-	-	-	-	-	-	2,693
340	-	-	-	-	-	-	-	2,926
350	-	-	-	-	-	-	-	3,183
360	-	-	-	-	-	-	-	3,469



» Fire resistive rating **R90 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	2,474	2,002	1,629	1,328	1,079	0,871	0,693	0,540
70	2,889	2,353	1,929	1,585	1,300	1,061	0,856	0,680
80	3,311	2,713	2,238	1,851	1,530	1,258	1,026	0,826
90	-	3,083	2,557	2,126	1,767	1,464	1,203	0,978
100	-	3,462	2,885	2,410	2,014	1,677	1,388	1,137
110	-	-	3,223	2,705	2,270	1,900	1,581	1,303
120	-	-	-	3,010	2,536	2,132	1,782	1,477
130	-	-	-	3,326	2,813	2,374	1,993	1,659
140	-	-	-	-	3,101	2,626	2,213	1,851
150	-	-	-	-	3,401	2,890	2,444	2,052
160	-	-	-	-	-	3,166	2,687	2,264
170	-	-	-	-	-	3,456	2,942	2,487
180	-	-	-	-	-	-	3,210	2,723
190	-	-	-	-	-	-	-	2,971
200	-	-	-	-	-	-	-	3,235

» Fire resistive rating **R120 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack W flame retardant treatment system [mm] at design temperature							
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
60	3,442	2,855	2,392	2,017	1,708	1,449	1,229	1,039
70	-	3,361	2,832	2,403	2,048	1,749	1,494	1,274
80	-	-	3,285	2,801	2,399	2,060	1,770	1,519
90	-	-	-	3,213	2,763	2,383	2,057	1,775
100	-	-	-	-	3,142	2,720	2,357	2,042
110	-	-	-	-	-	3,070	2,670	2,322
120	-	-	-	-	-	3,436	2,997	2,615
130	-	-	-	-	-	-	3,340	2,922
140	-	-	-	-	-	-	-	3,244

1.4.5 | mcr Polylack A



Technical parameters

- » density: $1.36 \pm 0.06 \text{ g/cm}^3$
- » intumescent paint color: white
- » solid particle content: $76 \pm 2 \text{ m/m} \%$
- » theoretical consumption: $1.8 \text{ kg/m}^2/1 \text{ mm}$ of dry layer

» R15-R90

- » European Technical Assessment ETA-17/0735
- » Certificate of constancy of performance 1301-CPR-1376
- » Declaration of performance (DoP) 81250

Application

The mcr Polylack A intumescent thinner fire paint system is designed for flame retardant treatments of steel structures in the construction industry. It may be used both indoors and outdoors with partial exposure, in particular where high fire protection esthetics is required.

Open and box section steel elements protected with mcr Polylack W intumescent paint were rated as per the EN13501-2:2016 standard and received fire resistance ratings from R15 to R90.

The mcr Polylack A paint may be used for protecting the following steel structural components:

- » open sections – columns and beams
 - fire resistance rating R15–R90
 - protection thickness from 0.236 to 1.883 mm
 - section factor U/A up to 388 m^{-1}
 - critical temperatures within the range of 350°C and 750°C
- » circular and rectangular box sections – columns
 - fire resistance rating R15–R60
 - protection thickness from 0.410 to 2.525 mm
 - section factor U/A up to 468 m^{-1}
 - critical temperatures within the range of 350°C and 750°C
- » rectangular box sections – beams
 - fire resistance rating R15–R60
 - protection thickness from 0.377 to 2.511 mm
 - section factor U/A up to 345 m^{-1}
 - critical temperatures within the range of 350°C and 750°C

Paint features

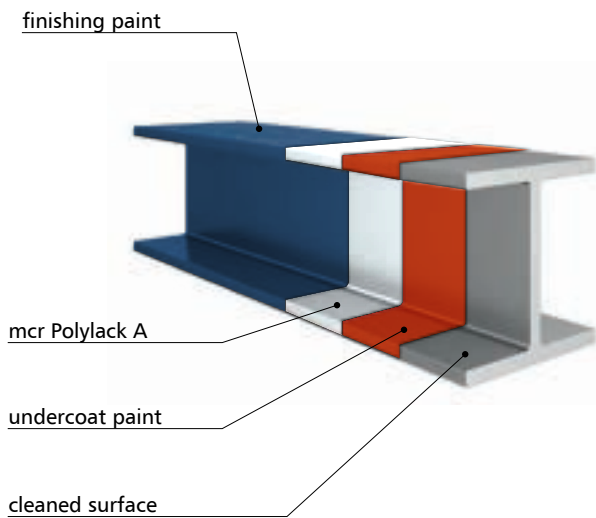
- » high aesthetics
- » high durability
- » quick and simple application
- » resistant to cracking, abrasion, dust
- » protection of elements previously coated with other epoxy undercoats possible without the need to remove them

Fire resistance rating

The system's fire resistance rating is provided by choosing adequate protection thickness depending on:

- » section factor U/A of the protected element,
- » required fire resistance rating,
- » critical temperature of steel.

mcr Polylack A | Intumescent thinner fire paint system



Surface coating may be applied after 24 hours.

Application conditions

The temperature of the proofed surface should be between 5°C and 40°C with a relative humidity of 70%; temperature must always exceed the dew point temperature by no less than 3°C.

Application not recommended at ambient temperatures below 5°C.

Flame retardant treatment technology

Flame retardant insulation consists in applying the mcr Polylack A coating system on each element of the structure. The works do not change the shape of proofed sections.

Before applying the mcr Polylack A fire-retardant paints, the elements to be protected should be thoroughly cleaned from dirt, oil, grease, peeling paint and rust.

Subsequently applied system layers:

- » epoxy or alkyd undercoat layer – primer
 - coating thickness depends on the corrosiveness category of the environment
- » basic intumescent layer
 - during fire, when exposed to flame and radiated heat, this layer creates a coating of insulating foam which protects the structure against high temperature, providing the required fire resistance rating
 - thickness of the coating applied depends on the section factor U/A, required fire resistance rating and critical temperature of steel
- » finishing epoxy layer
 - it protects the intumescent layer against humidity, mechanical damage and soiling, also providing a decorative finish
 - coating thickness depends on the corrosiveness category of the environment

mcr Polylack A paints may be applied with a roller, brush (300–500 μm of wet paint per layer) or with a spray-on machine (800–1000 μm of wet paint per layer; hydrodynamic spraying – 0.48–0.63 mm nozzles are recommended).

mcr Polylack A can be applied undiluted or diluted after thorough mixing. Thinner amount: up to 5% of volume.

The coating drying time depends on the temperature, ventilation, air exchange and the dryness of the previously applied layer.

1.4.6 | Fire resistance rating

1.4.7 | Open sections

Tables concerning column protection refer both to columns and beams with four-sided protection, whereas tables concerning beam protection refer to beams with three-sided protection.

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
58	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
60	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
65	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
70	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
75	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
80	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
85	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
90	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
95	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
100	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
105	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
110	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
115	0,241	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
120	0,258	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
125	0,276	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
130	0,293	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
135	0,311	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
140	0,329	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
145	0,346	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
150	0,364	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
155	0,381	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
160	0,399	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
165	0,417	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
170	0,434	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
175	0,452	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
180	0,469	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
185	0,487	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
190	0,505	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
195	0,522	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
200	0,540	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
205	0,558	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
210	0,575	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
215	0,593	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
220	0,610	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
225	0,628	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
230	0,646	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
235	0,663	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
240	0,681	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
245	0,698	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
250	0,716	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
255	0,734	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
260	0,751	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
265	0,769	0,236	0,236	0,236	0,236	0,236	0,236	0,236	0,236
270	0,787	0,244	0,236	0,236	0,236	0,236	0,236	0,236	0,236
275	0,804	0,252	0,236	0,236	0,236	0,236	0,236	0,236	0,236
280	0,822	0,261	0,236	0,236	0,236	0,236	0,236	0,236	0,236
285	0,839	0,269	0,236	0,236	0,236	0,236	0,236	0,236	0,236
290	0,857	0,277	0,236	0,236	0,236	0,236	0,236	0,236	0,236
295	0,875	0,285	0,236	0,236	0,236	0,236	0,236	0,236	0,236
300	0,892	0,294	0,236	0,236	0,236	0,236	0,236	0,236	0,236
305	0,910	0,302	0,236	0,236	0,236	0,236	0,236	0,236	0,236
310	0,927	0,310	0,236	0,236	0,236	0,236	0,236	0,236	0,236
315	0,945	0,318	0,236	0,236	0,236	0,236	0,236	0,236	0,236
320	0,963	0,326	0,236	0,236	0,236	0,236	0,236	0,236	0,236
325	0,980	0,335	0,236	0,236	0,236	0,236	0,236	0,236	0,236
330	0,998	0,343	0,236	0,236	0,236	0,236	0,236	0,236	0,236
335	1,016	0,351	0,236	0,236	0,236	0,236	0,236	0,236	0,236
340	1,033	0,359	0,236	0,236	0,236	0,236	0,236	0,236	0,236
345	1,051	0,368	0,242	0,236	0,236	0,236	0,236	0,236	0,236
350	1,068	0,376	0,249	0,236	0,236	0,236	0,236	0,236	0,236
355	1,086	0,384	0,256	0,236	0,236	0,236	0,236	0,236	0,236
360	1,104	0,392	0,262	0,236	0,236	0,236	0,236	0,236	0,236
365	1,121	0,401	0,269	0,236	0,236	0,236	0,236	0,236	0,236
370	1,139	0,409	0,276	0,236	0,236	0,236	0,236	0,236	0,236
375	1,156	0,417	0,282	0,236	0,236	0,236	0,236	0,236	0,236
380	1,174	0,425	0,289	0,236	0,236	0,236	0,236	0,236	0,236
385	1,196	0,434	0,296	0,236	0,236	0,236	0,236	0,236	0,236
388	1,211	0,439	0,300	0,236	0,236	0,236	0,236	0,236	0,236

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
58	0,714	0,403	0,236	0,236	0,236	0,236	0,236	0,236	0,236
60	0,714	0,403	0,236	0,236	0,236	0,236	0,236	0,236	0,236
65	0,717	0,404	0,236	0,236	0,236	0,236	0,236	0,236	0,236
70	0,792	0,435	0,261	0,236	0,236	0,236	0,236	0,236	0,236
75	0,866	0,465	0,276	0,236	0,236	0,236	0,236	0,236	0,236
80	0,941	0,495	0,291	0,237	0,236	0,236	0,236	0,236	0,236
85	1,016	0,525	0,306	0,245	0,236	0,236	0,236	0,236	0,236
90	1,090	0,556	0,321	0,253	0,236	0,236	0,236	0,236	0,236
95	1,165	0,586	0,336	0,260	0,236	0,236	0,236	0,236	0,236
100	1,210	0,616	0,351	0,268	0,236	0,236	0,236	0,236	0,236
105	1,244	0,646	0,366	0,276	0,236	0,236	0,236	0,236	0,236
110	1,279	0,677	0,382	0,284	0,236	0,236	0,236	0,236	0,236
115	1,313	0,710	0,397	0,291	0,245	0,236	0,236	0,236	0,236
120	1,348	0,754	0,412	0,299	0,252	0,236	0,236	0,236	0,236
125	1,382	0,798	0,427	0,307	0,259	0,236	0,236	0,236	0,236
130	1,417	0,841	0,442	0,314	0,266	0,236	0,236	0,236	0,236
135	1,451	0,885	0,457	0,322	0,273	0,236	0,236	0,236	0,236
140	1,486	0,929	0,472	0,330	0,280	0,236	0,236	0,236	0,236
145	1,521	0,972	0,488	0,338	0,287	0,236	0,236	0,236	0,236
150	1,555	1,016	0,503	0,345	0,294	0,236	0,236	0,236	0,236
155	1,590	1,059	0,518	0,353	0,301	0,236	0,236	0,236	0,236
160	1,624	1,103	0,533	0,361	0,308	0,236	0,236	0,236	0,236
165	1,659	1,147	0,548	0,368	0,315	0,237	0,236	0,236	0,236
170	1,693	1,186	0,563	0,376	0,321	0,244	0,236	0,236	0,236
175	1,728	1,205	0,578	0,384	0,328	0,250	0,236	0,236	0,236
180	1,763	1,223	0,594	0,391	0,335	0,257	0,236	0,236	0,236
185	1,797	1,242	0,609	0,399	0,342	0,263	0,236	0,236	0,236
190	1,832	1,260	0,624	0,407	0,349	0,270	0,236	0,236	0,236
195	1,866	1,279	0,639	0,415	0,356	0,276	0,236	0,236	0,236
200	-	1,297	0,654	0,422	0,363	0,283	0,236	0,236	0,236
205	-	1,316	0,669	0,430	0,370	0,289	0,236	0,236	0,236
210	-	1,334	0,684	0,438	0,377	0,296	0,236	0,236	0,236
215	-	1,353	0,700	0,445	0,384	0,302	0,236	0,236	0,236
220	-	1,371	0,737	0,453	0,391	0,309	0,236	0,236	0,236

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
225	-	1,390	0,774	0,461	0,398	0,315	0,236	0,236	0,236
230	-	1,408	0,812	0,469	0,405	0,322	0,236	0,236	0,236
235	-	1,427	0,849	0,476	0,412	0,329	0,236	0,236	0,236
240	-	1,445	0,887	0,484	0,419	0,335	0,236	0,236	0,236
245	-	1,464	0,925	0,492	0,426	0,342	0,236	0,236	0,236
250	-	1,482	0,962	0,499	0,433	0,348	0,236	0,236	0,236
255	-	1,500	1,000	0,507	0,440	0,355	0,236	0,236	0,236
260	-	1,519	1,037	0,515	0,447	0,361	0,236	0,236	0,236
265	-	1,537	1,075	0,523	0,454	0,368	0,236	0,236	0,236
270	-	1,556	1,112	0,530	0,461	0,374	0,236	0,236	0,236
275	-	1,574	1,150	0,538	0,468	0,381	0,236	0,236	0,236
280	-	1,593	1,186	0,546	0,475	0,387	0,236	0,236	0,236
285	-	1,611	1,210	0,553	0,482	0,394	0,236	0,236	0,236
290	-	1,630	1,233	0,561	0,489	0,400	0,236	0,236	0,236
295	-	1,648	1,257	0,569	0,496	0,407	0,236	0,236	0,236
300	-	1,667	1,280	0,577	0,503	0,413	0,242	0,236	0,236
305	-	1,685	1,304	0,584	0,510	0,420	0,250	0,236	0,236
310	-	1,704	1,328	0,592	0,517	0,426	0,258	0,236	0,236
315	-	1,722	1,351	0,600	0,524	0,433	0,265	0,236	0,236
320	-	1,741	1,375	0,607	0,531	0,439	0,273	0,236	0,236
325	-	1,759	1,399	0,615	0,538	0,446	0,281	0,236	0,236
330	-	1,777	1,422	0,623	0,545	0,452	0,289	0,236	0,236
335	-	1,796	1,446	0,631	0,552	0,459	0,297	0,236	0,236
340	-	1,814	1,470	0,638	0,559	0,465	0,305	0,236	0,236
345	-	1,833	1,493	0,646	0,566	0,472	0,312	0,236	0,236
350	-	1,851	1,517	0,654	0,573	0,478	0,320	0,236	0,236
355	-	1,870	1,541	0,661	0,580	0,485	0,328	0,236	0,236
360	-	-	1,564	0,669	0,587	0,491	0,336	0,236	0,236
365	-	-	1,588	0,677	0,594	0,498	0,344	0,236	0,236
370	-	-	1,612	0,684	0,601	0,504	0,354	0,236	0,236
375	-	-	1,635	0,692	0,608	0,511	0,359	0,236	0,236
380	-	-	1,659	0,700	0,615	0,517	0,367	0,236	0,236
385	-	-	1,683	0,880	0,622	0,524	0,375	0,236	0,236
388	-	-	1,697	0,985	0,626	0,528	0,380	0,236	0,236

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
58	-	0,925	0,658	0,485	0,364	0,236	0,236	0,236	0,236
60	-	0,925	0,658	0,485	0,364	0,236	0,236	0,236	0,236
65	-	0,928	0,661	0,486	0,365	0,250	0,236	0,236	0,236
70	-	1,007	0,718	0,519	0,388	0,264	0,236	0,236	0,236
75	-	1,085	0,772	0,552	0,411	0,278	0,236	0,236	0,236
80	-	1,163	0,825	0,585	0,434	0,293	0,243	0,236	0,236
85	-	1,209	0,879	0,618	0,458	0,307	0,252	0,236	0,236
90	-	1,245	0,932	0,651	0,481	0,321	0,260	0,236	0,236
95	-	1,280	0,986	0,684	0,504	0,336	0,269	0,236	0,236
100	-	1,315	1,039	0,721	0,527	0,350	0,278	0,236	0,236
105	-	1,350	1,093	0,762	0,550	0,364	0,287	0,236	0,236
110	-	1,386	1,146	0,803	0,573	0,379	0,296	0,236	0,236
115	-	1,421	1,192	0,844	0,596	0,393	0,305	0,243	0,236
120	-	1,456	1,219	0,885	0,619	0,407	0,313	0,250	0,236
125	-	1,492	1,247	0,927	0,642	0,422	0,322	0,258	0,236
130	-	1,527	1,274	0,968	0,665	0,436	0,331	0,265	0,236
135	-	1,562	1,302	1,009	0,688	0,450	0,340	0,273	0,236
140	-	1,597	1,329	1,050	0,714	0,465	0,349	0,280	0,236
145	-	1,633	1,356	1,091	0,744	0,479	0,357	0,288	0,236
150	-	1,668	1,384	1,132	0,774	0,493	0,366	0,295	0,236
155	-	1,703	1,411	1,173	0,803	0,508	0,375	0,303	0,236
160	-	1,738	1,439	1,201	0,833	0,522	0,384	0,310	0,236
165	-	1,774	1,466	1,225	0,863	0,536	0,393	0,317	0,236
170	-	1,809	1,494	1,249	0,893	0,551	0,401	0,325	0,236
175	-	1,844	1,521	1,272	0,922	0,565	0,410	0,332	0,236
180	-	1,879	1,548	1,296	0,952	0,579	0,419	0,340	0,236
185	-	-	1,576	1,320	0,982	0,594	0,428	0,347	0,236
190	-	-	1,603	1,343	1,011	0,608	0,437	0,355	0,236
195	-	-	1,631	1,367	1,041	0,622	0,445	0,362	0,236
200	-	-	1,658	1,391	1,071	0,637	0,454	0,370	0,236
205	-	-	1,686	1,415	1,101	0,651	0,463	0,377	0,236
210	-	-	1,713	1,438	1,130	0,665	0,472	0,385	0,236
215	-	-	1,740	1,462	1,160	0,680	0,481	0,392	0,236
220	-	-	1,768	1,486	1,188	0,694	0,489	0,400	0,236

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
225	-	-	1,795	1,509	1,212	0,712	0,498	0,407	0,236
230	-	-	1,823	1,533	1,236	0,733	0,507	0,414	0,236
235	-	-	1,850	1,557	1,260	0,754	0,516	0,422	0,236
240	-	-	1,878	1,581	1,284	0,774	0,525	0,429	0,236
245	-	-	-	1,604	1,307	0,795	0,534	0,437	0,236
250	-	-	-	1,628	1,331	0,816	0,542	0,444	0,236
255	-	-	-	1,652	1,355	0,837	0,551	0,452	0,236
260	-	-	-	1,675	1,379	0,857	0,560	0,459	0,236
265	-	-	-	1,699	1,403	0,878	0,569	0,467	0,236
270	-	-	-	1,723	1,426	0,899	0,578	0,474	0,236
275	-	-	-	1,747	1,450	0,919	0,586	0,482	0,236
280	-	-	-	1,770	1,474	0,940	0,595	0,489	0,236
285	-	-	-	1,794	1,498	0,961	0,604	0,496	0,236
290	-	-	-	1,818	1,522	0,982	0,613	0,504	0,242
295	-	-	-	1,841	1,545	1,002	0,622	0,511	0,253
300	-	-	-	1,865	1,569	1,023	0,630	0,519	0,263
305	-	-	-	-	1,593	1,044	0,639	0,526	0,273
310	-	-	-	-	1,617	1,065	0,648	0,534	0,283
315	-	-	-	-	1,641	1,085	0,657	0,541	0,294
320	-	-	-	-	1,664	1,106	0,666	0,549	0,304
325	-	-	-	-	1,688	1,127	0,674	0,556	0,314
330	-	-	-	-	1,712	1,147	0,683	0,564	0,324
335	-	-	-	-	1,736	1,168	0,692	0,571	0,335
340	-	-	-	-	1,759	1,197	0,704	0,578	0,345
345	-	-	-	-	1,783	1,248	0,738	0,586	0,355
350	-	-	-	-	1,807	1,299	0,772	0,593	0,365
355	-	-	-	-	1,831	1,350	0,806	0,601	0,376
360	-	-	-	-	1,855	1,401	0,840	0,608	0,386
365	-	-	-	-	-	1,452	0,874	0,616	0,396
370	-	-	-	-	-	1,503	0,908	0,623	0,407
375	-	-	-	-	-	1,554	0,942	0,631	0,417
380	-	-	-	-	-	1,605	0,976	0,638	0,427
385	-	-	-	-	-	1,656	1,010	0,646	0,437
388	-	-	-	-	-	1,687	1,030	0,650	0,443

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
58	-	-	-	0,836	0,676	0,531	0,422	0,289	0,236
60	-	-	-	0,836	0,676	0,531	0,422	0,289	0,236
65	-	-	-	0,839	0,679	0,532	0,423	0,289	0,236
70	-	-	-	0,903	0,733	0,570	0,458	0,311	0,236
75	-	-	-	0,968	0,783	0,608	0,492	0,333	0,236
80	-	-	-	1,032	0,833	0,645	0,527	0,355	0,236
85	-	-	-	1,097	0,884	0,683	0,561	0,377	0,244
90	-	-	-	1,161	0,934	0,722	0,596	0,400	0,256
95	-	-	-	1,204	0,984	0,762	0,630	0,422	0,267
100	-	-	-	1,236	1,034	0,801	0,665	0,444	0,279
105	-	-	-	1,268	1,084	0,841	0,699	0,466	0,290
110	-	-	-	1,301	1,134	0,881	0,725	0,488	0,302
115	-	-	-	1,333	1,184	0,920	0,751	0,510	0,314
120	-	-	-	1,365	1,211	0,960	0,777	0,532	0,325
125	-	-	-	1,397	1,238	1,000	0,803	0,554	0,337
130	-	-	-	1,429	1,265	1,039	0,828	0,576	0,348
135	-	-	-	1,461	1,292	1,079	0,854	0,598	0,360
140	-	-	-	1,493	1,319	1,119	0,880	0,620	0,372
145	-	-	-	1,525	1,346	1,158	0,906	0,642	0,383
150	-	-	-	1,557	1,373	1,193	0,932	0,664	0,395
155	-	-	-	1,589	1,400	1,217	0,958	0,686	0,406
160	-	-	-	1,621	1,427	1,242	0,983	0,706	0,418
165	-	-	-	1,653	1,455	1,267	1,009	0,725	0,430
170	-	-	-	1,685	1,482	1,292	1,035	0,743	0,441
175	-	-	-	1,717	1,509	1,316	1,061	0,761	0,453
180	-	-	-	1,749	1,536	1,341	1,087	0,779	0,464
185	-	-	-	1,781	1,563	1,366	1,112	0,797	0,476
190	-	-	-	1,813	1,590	1,391	1,138	0,815	0,488
195	-	-	-	1,845	1,617	1,415	1,164	0,833	0,499
200	-	-	-	1,877	1,644	1,440	1,190	0,852	0,511
205	-	-	-	-	1,671	1,465	1,216	0,870	0,522
210	-	-	-	-	1,698	1,490	1,242	0,888	0,534
215	-	-	-	-	1,725	1,514	1,267	0,906	0,546
220	-	-	-	-	1,752	1,539	1,293	0,924	0,557

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
225	-	-	-	-	1,779	1,564	1,319	0,942	0,569
230	-	-	-	-	1,806	1,589	1,345	0,960	0,580
235	-	-	-	-	1,833	1,613	1,371	0,978	0,592
240	-	-	-	-	1,860	1,638	1,397	0,997	0,604
245	-	-	-	-	-	1,663	1,422	1,015	0,615
250	-	-	-	-	-	1,688	1,448	1,033	0,627
255	-	-	-	-	-	1,712	1,474	1,051	0,638
260	-	-	-	-	-	1,737	1,500	1,069	0,650
265	-	-	-	-	-	1,762	1,526	1,087	0,662
270	-	-	-	-	-	1,787	1,552	1,105	0,673
275	-	-	-	-	-	1,811	1,577	1,124	0,685
280	-	-	-	-	-	1,836	1,603	1,142	0,696
285	-	-	-	-	-	1,861	1,629	1,160	0,730
290	-	-	-	-	-	-	1,655	1,178	0,772
295	-	-	-	-	-	-	1,681	1,216	0,813
300	-	-	-	-	-	-	1,707	1,262	0,855
305	-	-	-	-	-	-	1,732	1,309	0,897
310	-	-	-	-	-	-	1,758	1,355	0,939
315	-	-	-	-	-	-	1,784	1,402	0,980
320	-	-	-	-	-	-	1,810	1,448	1,022
325	-	-	-	-	-	-	1,836	1,495	1,064
330	-	-	-	-	-	-	1,862	1,542	1,106
335	-	-	-	-	-	-	-	1,588	1,148
340	-	-	-	-	-	-	-	1,635	1,189
345	-	-	-	-	-	-	-	1,681	1,231
350	-	-	-	-	-	-	-	1,728	1,273
355	-	-	-	-	-	-	-	1,774	1,315
360	-	-	-	-	-	-	-	1,821	1,356
365	-	-	-	-	-	-	-	-	1,398
370	-	-	-	-	-	-	-	-	1,440
375	-	-	-	-	-	-	-	-	1,482
380	-	-	-	-	-	-	-	-	1,524
385	-	-	-	-	-	-	-	-	1,565
388	-	-	-	-	-	-	-	-	1,590

» Fire resistive rating R90 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
58	-	-	-	-	-	-	0,968	0,832	0,653
60	-	-	-	-	-	-	0,968	0,832	0,653
65	-	-	-	-	-	-	0,970	0,834	0,656
70	-	-	-	-	-	-	1,037	0,894	0,713
75	-	-	-	-	-	-	1,104	0,954	0,759
80	-	-	-	-	-	-	1,171	1,014	0,804
85	-	-	-	-	-	-	1,208	1,074	0,850
90	-	-	-	-	-	-	1,239	1,134	0,895
95	-	-	-	-	-	-	1,270	1,189	0,941
100	-	-	-	-	-	-	1,300	1,218	0,986
105	-	-	-	-	-	-	1,331	1,248	1,032
110	-	-	-	-	-	-	1,362	1,277	1,078
115	-	-	-	-	-	-	1,392	1,307	1,123
120	-	-	-	-	-	-	1,423	1,336	1,169
125	-	-	-	-	-	-	1,454	1,366	1,203
130	-	-	-	-	-	-	1,484	1,395	1,232
135	-	-	-	-	-	-	1,515	1,425	1,261
140	-	-	-	-	-	-	1,546	1,454	1,290
145	-	-	-	-	-	-	1,576	1,484	1,319
150	-	-	-	-	-	-	1,607	1,513	1,348
155	-	-	-	-	-	-	1,638	1,543	1,377
160	-	-	-	-	-	-	1,668	1,572	1,406
165	-	-	-	-	-	-	1,699	1,602	1,435
170	-	-	-	-	-	-	1,730	1,631	1,463
175	-	-	-	-	-	-	1,760	1,661	1,492
180	-	-	-	-	-	-	1,791	1,690	1,521
185	-	-	-	-	-	-	1,822	1,720	1,550
190	-	-	-	-	-	-	1,852	1,749	1,579
195	-	-	-	-	-	-	1,883	1,779	1,608
200	-	-	-	-	-	-	-	1,808	1,637
205	-	-	-	-	-	-	-	1,838	1,666
210	-	-	-	-	-	-	-	1,867	1,695
215	-	-	-	-	-	-	-	-	1,724
220	-	-	-	-	-	-	-	-	1,753
225	-	-	-	-	-	-	-	-	1,782
230	-	-	-	-	-	-	-	-	1,811
235	-	-	-	-	-	-	-	-	1,840
240	-	-	-	-	-	-	-	-	1,869
245	-	-	-	-	-	-	-	-	-

» Fire resistive rating R15 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
64	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
70	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
75	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
80	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
85	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
90	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
95	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
100	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
105	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
110	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
115	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
120	0,258	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
125	0,275	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
130	0,292	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
135	0,309	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
140	0,326	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
145	0,343	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
150	0,360	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
155	0,377	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
160	0,394	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
165	0,411	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
170	0,428	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
175	0,446	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
180	0,463	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
185	0,480	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
190	0,497	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
195	0,514	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
200	0,531	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
205	0,548	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
210	0,565	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
215	0,582	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
220	0,599	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
225	0,616	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226

» Fire resistive rating R15 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
230	0,633	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
235	0,650	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
240	0,667	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
245	0,684	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
250	0,701	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
255	0,718	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
260	0,735	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
265	0,752	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
270	0,769	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
275	0,786	0,226	0,226	0,226	0,226	0,226	0,226	0,226	0,226
280	0,803	0,261	0,226	0,226	0,226	0,226	0,226	0,226	0,226
285	0,820	0,269	0,226	0,226	0,226	0,226	0,226	0,226	0,226
290	0,837	0,277	0,226	0,226	0,226	0,226	0,226	0,226	0,226
295	0,854	0,285	0,226	0,226	0,226	0,226	0,226	0,226	0,226
300	0,872	0,293	0,226	0,226	0,226	0,226	0,226	0,226	0,226
305	0,889	0,301	0,226	0,226	0,226	0,226	0,226	0,226	0,226
310	0,906	0,309	0,226	0,226	0,226	0,226	0,226	0,226	0,226
315	0,923	0,317	0,226	0,226	0,226	0,226	0,226	0,226	0,226
320	0,940	0,325	0,226	0,226	0,226	0,226	0,226	0,226	0,226
325	0,957	0,333	0,226	0,226	0,226	0,226	0,226	0,226	0,226
330	0,974	0,341	0,226	0,226	0,226	0,226	0,226	0,226	0,226
335	0,991	0,349	0,226	0,226	0,226	0,226	0,226	0,226	0,226
340	1,008	0,358	0,226	0,226	0,226	0,226	0,226	0,226	0,226
345	1,025	0,366	0,226	0,226	0,226	0,226	0,226	0,226	0,226
350	1,042	0,374	0,226	0,226	0,226	0,226	0,226	0,226	0,226
355	1,059	0,382	0,226	0,226	0,226	0,226	0,226	0,226	0,226
360	1,076	0,390	0,262	0,226	0,226	0,226	0,226	0,226	0,226
365	1,093	0,398	0,269	0,226	0,226	0,226	0,226	0,226	0,226
370	1,110	0,406	0,275	0,226	0,226	0,226	0,226	0,226	0,226
375	1,127	0,414	0,282	0,226	0,226	0,226	0,226	0,226	0,226
380	1,144	0,422	0,288	0,226	0,226	0,226	0,226	0,226	0,226
385	1,161	0,430	0,295	0,226	0,226	0,226	0,226	0,226	0,226
388	1,171	0,435	0,298	0,226	0,226	0,226	0,226	0,226	0,226

» Fire resistive rating R30 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
64	0,682	0,395	0,226	0,226	0,226	0,226	0,226	0,226	0,226
70	0,761	0,430	0,260	0,226	0,226	0,226	0,226	0,226	0,226
75	0,833	0,458	0,274	0,226	0,226	0,226	0,226	0,226	0,226
80	0,904	0,487	0,288	0,226	0,226	0,226	0,226	0,226	0,226
85	0,976	0,515	0,302	0,226	0,226	0,226	0,226	0,226	0,226
90	1,047	0,544	0,316	0,226	0,226	0,226	0,226	0,226	0,226
95	1,119	0,572	0,330	0,260	0,226	0,226	0,226	0,226	0,226
100	1,186	0,601	0,344	0,268	0,226	0,226	0,226	0,226	0,226
105	1,218	0,629	0,358	0,275	0,226	0,226	0,226	0,226	0,226
110	1,250	0,658	0,372	0,283	0,226	0,226	0,226	0,226	0,226
115	1,282	0,686	0,386	0,290	0,226	0,226	0,226	0,226	0,226
120	1,314	0,721	0,400	0,298	0,226	0,226	0,226	0,226	0,226
125	1,346	0,761	0,414	0,306	0,258	0,226	0,226	0,226	0,226
130	1,378	0,802	0,428	0,313	0,265	0,226	0,226	0,226	0,226
135	1,409	0,842	0,442	0,321	0,272	0,226	0,226	0,226	0,226
140	1,441	0,882	0,456	0,328	0,279	0,226	0,226	0,226	0,226
145	1,473	0,923	0,470	0,336	0,285	0,226	0,226	0,226	0,226
150	1,505	0,963	0,483	0,343	0,292	0,226	0,226	0,226	0,226
155	1,537	1,003	0,497	0,351	0,299	0,226	0,226	0,226	0,226
160	1,569	1,044	0,511	0,359	0,306	0,226	0,226	0,226	0,226
165	1,601	1,084	0,525	0,366	0,313	0,226	0,226	0,226	0,226
170	1,632	1,125	0,539	0,374	0,320	0,226	0,226	0,226	0,226
175	1,664	1,165	0,553	0,381	0,327	0,226	0,226	0,226	0,226
180	1,696	1,193	0,567	0,389	0,334	0,226	0,226	0,226	0,226
185	1,728	1,210	0,581	0,397	0,340	0,262	0,226	0,226	0,226
190	1,760	1,226	0,595	0,404	0,347	0,268	0,226	0,226	0,226
195	1,792	1,243	0,609	0,412	0,354	0,275	0,226	0,226	0,226
200	1,824	1,260	0,623	0,419	0,361	0,281	0,226	0,226	0,226
205	1,856	1,277	0,637	0,427	0,368	0,288	0,226	0,226	0,226
210	-	1,294	0,651	0,435	0,375	0,294	0,226	0,226	0,226
215	-	1,311	0,665	0,442	0,382	0,300	0,226	0,226	0,226
220	-	1,328	0,679	0,450	0,389	0,307	0,226	0,226	0,226
225	-	1,345	0,693	0,457	0,395	0,313	0,226	0,226	0,226

» Fire resistive rating R30 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
230	-	1,362	0,707	0,465	0,402	0,319	0,226	0,226	0,226
235	-	1,379	0,721	0,472	0,409	0,326	0,226	0,226	0,226
240	-	1,395	0,735	0,480	0,416	0,332	0,226	0,226	0,226
245	-	1,412	0,749	0,488	0,423	0,339	0,226	0,226	0,226
250	-	1,429	0,763	0,495	0,430	0,345	0,226	0,226	0,226
255	-	1,446	0,776	0,503	0,437	0,351	0,226	0,226	0,226
260	-	1,463	0,790	0,510	0,444	0,358	0,226	0,226	0,226
265	-	1,480	0,804	0,518	0,450	0,364	0,226	0,226	0,226
270	-	1,497	0,818	0,526	0,457	0,371	0,226	0,226	0,226
275	-	1,514	0,832	0,533	0,464	0,377	0,226	0,226	0,226
280	-	1,531	0,846	0,541	0,471	0,383	0,226	0,226	0,226
285	-	1,548	0,860	0,548	0,478	0,390	0,226	0,226	0,226
290	-	1,564	0,874	0,556	0,485	0,396	0,226	0,226	0,226
295	-	1,581	0,888	0,563	0,492	0,402	0,226	0,226	0,226
300	-	1,598	0,902	0,571	0,499	0,409	0,226	0,226	0,226
305	-	1,615	0,916	0,579	0,505	0,415	0,226	0,226	0,226
310	-	1,632	1,214	0,586	0,512	0,422	0,256	0,226	0,226
315	-	1,649	1,239	0,594	0,519	0,428	0,264	0,226	0,226
320	-	1,666	1,264	0,601	0,526	0,434	0,271	0,226	0,226
325	-	1,683	1,289	0,609	0,533	0,441	0,279	0,226	0,226
330	-	1,700	1,313	0,617	0,540	0,447	0,286	0,226	0,226
335	-	1,717	1,338	0,624	0,547	0,454	0,294	0,226	0,226
340	-	1,733	1,363	0,632	0,554	0,460	0,301	0,226	0,226
345	-	1,750	1,388	0,639	0,561	0,466	0,309	0,226	0,226
350	-	1,767	1,413	0,647	0,567	0,473	0,316	0,226	0,226
355	-	1,784	1,438	0,655	0,574	0,479	0,324	0,226	0,226
360	-	1,801	1,462	0,662	0,581	0,485	0,331	0,226	0,226
365	-	1,818	1,487	0,670	0,588	0,492	0,339	0,226	0,226
370	-	1,835	1,512	0,677	0,595	0,498	0,347	0,226	0,226
375	-	1,852	1,537	0,685	0,602	0,505	0,354	0,226	0,226
380	-	-	1,562	0,692	0,609	0,511	0,362	0,226	0,226
385	-	-	1,586	0,706	0,616	0,517	0,369	0,226	0,226
388	-	-	1,601	0,775	0,620	0,521	0,374	0,226	0,226



» Fire resistive rating **R45 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
64	-	0,887	0,639	0,469	0,355	0,226	0,226	0,226	0,226
70	-	0,976	0,694	0,506	0,381	0,263	0,226	0,226	0,226
75	-	1,050	0,743	0,537	0,403	0,276	0,226	0,226	0,226
80	-	1,124	0,793	0,568	0,424	0,289	0,226	0,226	0,226
85	-	1,190	0,843	0,599	0,446	0,302	0,226	0,226	0,226
90	-	1,223	0,892	0,630	0,467	0,315	0,260	0,226	0,226
95	-	1,256	0,942	0,661	0,489	0,328	0,268	0,226	0,226
100	-	1,288	0,992	0,692	0,510	0,341	0,276	0,226	0,226
105	-	1,321	1,042	0,728	0,532	0,354	0,284	0,226	0,226
110	-	1,354	1,092	0,766	0,553	0,367	0,293	0,226	0,226
115	-	1,387	1,142	0,803	0,575	0,381	0,301	0,226	0,226
120	-	1,420	1,188	0,841	0,597	0,394	0,309	0,226	0,226
125	-	1,453	1,213	0,878	0,618	0,407	0,317	0,226	0,226
130	-	1,486	1,238	0,916	0,640	0,420	0,326	0,264	0,226
135	-	1,519	1,263	0,954	0,661	0,433	0,334	0,271	0,226
140	-	1,552	1,288	0,991	0,683	0,446	0,342	0,278	0,226
145	-	1,584	1,313	1,029	0,705	0,459	0,350	0,285	0,226
150	-	1,617	1,339	1,066	0,731	0,472	0,358	0,292	0,226
155	-	1,650	1,364	1,104	0,758	0,485	0,367	0,299	0,226
160	-	1,683	1,389	1,142	0,784	0,498	0,375	0,306	0,226
165	-	1,716	1,414	1,179	0,810	0,511	0,383	0,314	0,226
170	-	1,749	1,439	1,203	0,836	0,524	0,391	0,321	0,226
175	-	1,782	1,464	1,225	0,863	0,537	0,400	0,328	0,226
180	-	1,815	1,490	1,247	0,889	0,550	0,408	0,335	0,226
185	-	1,847	1,515	1,269	0,915	0,563	0,416	0,342	0,226
190	-	-	1,540	1,291	0,941	0,576	0,424	0,349	0,226
195	-	-	1,565	1,312	0,967	0,589	0,432	0,357	0,226
200	-	-	1,590	1,334	0,994	0,603	0,441	0,364	0,226
205	-	-	1,616	1,356	1,020	0,616	0,449	0,371	0,226
210	-	-	1,641	1,378	1,046	0,629	0,457	0,378	0,226
215	-	-	1,666	1,400	1,072	0,642	0,465	0,385	0,226
220	-	-	1,691	1,422	1,098	0,655	0,474	0,392	0,226
225	-	-	1,716	1,444	1,125	0,668	0,482	0,399	0,226

» Fire resistive rating R45 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
230	-	-	1,741	1,466	1,151	0,681	0,490	0,407	0,226
235	-	-	1,767	1,488	1,177	0,694	0,498	0,414	0,226
240	-	-	1,792	1,510	1,201	0,711	0,506	0,421	0,226
245	-	-	1,817	1,532	1,224	0,730	0,515	0,428	0,226
250	-	-	1,842	1,554	1,248	0,750	0,523	0,435	0,226
255	-	-	-	1,576	1,271	0,769	0,531	0,442	0,226
260	-	-	-	1,597	1,294	0,789	0,539	0,450	0,226
265	-	-	-	1,619	1,318	0,808	0,548	0,457	0,226
270	-	-	-	1,641	1,341	0,828	0,556	0,464	0,226
275	-	-	-	1,663	1,364	0,847	0,564	0,471	0,226
280	-	-	-	1,685	1,388	0,867	0,572	0,478	0,226
285	-	-	-	1,707	1,411	0,886	0,580	0,485	0,226
290	-	-	-	1,729	1,434	0,906	0,589	0,493	0,226
295	-	-	-	1,751	1,458	0,925	0,597	0,500	0,226
300	-	-	-	1,773	1,481	0,945	0,605	0,507	0,259
305	-	-	-	1,795	1,504	0,964	0,613	0,514	0,268
310	-	-	-	1,817	1,528	0,984	0,622	0,521	0,278
315	-	-	-	1,839	1,551	1,003	0,630	0,528	0,287
320	-	-	-	1,860	1,574	1,023	0,638	0,535	0,297
325	-	-	-	-	1,597	1,042	0,646	0,543	0,306
330	-	-	-	-	1,621	1,062	0,654	0,550	0,316
335	-	-	-	-	1,644	1,082	0,663	0,557	0,325
340	-	-	-	-	1,667	1,101	0,671	0,564	0,335
345	-	-	-	-	1,691	1,121	0,679	0,571	0,344
350	-	-	-	-	1,714	1,140	0,687	0,578	0,353
355	-	-	-	-	1,737	1,160	0,695	0,586	0,363
360	-	-	-	-	1,761	1,179	0,716	0,593	0,372
365	-	-	-	-	1,784	1,224	0,750	0,600	0,382
370	-	-	-	-	1,807	1,276	0,783	0,607	0,391
375	-	-	-	-	1,831	1,329	0,817	0,614	0,401
380	-	-	-	-	1,854	1,381	0,850	0,621	0,410
385	-	-	-	-	-	1,433	0,884	0,628	0,420
388	-	-	-	-	-	1,465	0,904	0,633	0,425

» Fire resistive rating R60 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
64	-	-	1,184	0,802	0,647	0,506	0,404	0,277	0,226
70	-	-	1,184	0,874	0,709	0,549	0,442	0,299	0,226
75	-	-	1,190	0,934	0,755	0,585	0,473	0,318	0,226
80	-	-	1,227	0,993	0,802	0,621	0,504	0,337	0,226
85	-	-	1,263	1,053	0,848	0,657	0,535	0,356	0,226
90	-	-	1,300	1,113	0,895	0,693	0,566	0,374	0,226
95	-	-	1,337	1,173	0,942	0,729	0,597	0,393	0,264
100	-	-	1,374	1,208	0,988	0,764	0,628	0,412	0,272
105	-	-	1,411	1,238	1,035	0,800	0,659	0,430	0,281
110	-	-	1,447	1,267	1,081	0,836	0,691	0,449	0,290
115	-	-	1,484	1,297	1,128	0,871	0,715	0,468	0,299
120	-	-	1,521	1,327	1,174	0,907	0,737	0,486	0,308
125	-	-	1,558	1,357	1,204	0,943	0,758	0,505	0,317
130	-	-	1,594	1,386	1,229	0,979	0,780	0,524	0,326
135	-	-	1,631	1,416	1,254	1,014	0,802	0,542	0,334
140	-	-	1,668	1,446	1,280	1,050	0,823	0,561	0,343
145	-	-	1,705	1,476	1,305	1,086	0,845	0,580	0,352
150	-	-	1,742	1,505	1,330	1,121	0,867	0,598	0,361
155	-	-	1,778	1,535	1,356	1,157	0,888	0,617	0,370
160	-	-	1,815	1,565	1,381	1,190	0,910	0,636	0,379
165	-	-	1,852	1,595	1,406	1,213	0,932	0,655	0,388
170	-	-	-	1,624	1,432	1,236	0,953	0,673	0,397
175	-	-	-	1,654	1,457	1,259	0,975	0,692	0,405
180	-	-	-	1,684	1,482	1,282	0,997	0,707	0,414
185	-	-	-	1,714	1,508	1,305	1,018	0,721	0,423
190	-	-	-	1,744	1,533	1,329	1,040	0,734	0,432
195	-	-	-	1,773	1,558	1,352	1,062	0,747	0,441
200	-	-	-	1,803	1,584	1,375	1,083	0,761	0,450
205	-	-	-	1,833	1,609	1,398	1,105	0,774	0,459
210	-	-	-	-	1,634	1,421	1,127	0,787	0,468
215	-	-	-	-	1,660	1,444	1,148	0,800	0,476
220	-	-	-	-	1,685	1,468	1,170	0,814	0,485
225	-	-	-	-	1,710	1,491	1,192	0,827	0,494

» Fire resistive rating R60 - BEAMS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
230	-	-	-	-	1,736	1,514	1,214	0,840	0,503
235	-	-	-	-	1,761	1,537	1,235	0,854	0,512
240	-	-	-	-	1,786	1,560	1,257	0,867	0,521
245	-	-	-	-	1,812	1,583	1,279	0,880	0,530
250	-	-	-	-	1,837	1,607	1,300	0,894	0,539
255	-	-	-	-	-	1,630	1,322	0,907	0,547
260	-	-	-	-	-	1,653	1,364	0,920	0,556
265	-	-	-	-	-	1,676	1,388	0,933	0,565
270	-	-	-	-	-	1,699	1,412	0,947	0,574
275	-	-	-	-	-	1,722	1,437	0,960	0,583
280	-	-	-	-	-	1,746	1,461	0,973	0,592
285	-	-	-	-	-	1,769	1,486	0,987	0,601
290	-	-	-	-	-	1,792	1,510	1,000	0,609
295	-	-	-	-	-	1,815	1,534	1,013	0,618
300	-	-	-	-	-	1,838	1,559	1,026	0,627
305	-	-	-	-	-	1,861	1,583	1,040	0,636
310	-	-	-	-	-	-	1,608	1,053	0,645
315	-	-	-	-	-	-	1,632	1,066	0,654
320	-	-	-	-	-	-	1,656	1,080	0,663
325	-	-	-	-	-	-	1,681	1,093	0,672
330	-	-	-	-	-	-	1,705	1,106	0,680
335	-	-	-	-	-	-	1,730	1,119	0,689
340	-	-	-	-	-	-	1,754	1,133	0,698
345	-	-	-	-	-	-	1,778	1,146	0,718
350	-	-	-	-	-	-	1,803	1,159	0,739
355	-	-	-	-	-	-	1,827	1,173	0,760
360	-	-	-	-	-	-	1,852	1,199	0,782
365	-	-	-	-	-	-	-	1,283	0,803
370	-	-	-	-	-	-	-	1,367	0,825
375	-	-	-	-	-	-	-	1,451	0,846
380	-	-	-	-	-	-	-	1,536	0,867
385	-	-	-	-	-	-	-	1,620	0,889
388	-	-	-	-	-	-	-	1,670	0,902



» Fire resistive rating **R90 - BEAMS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
64	-	-	-	-	-	1,184	0,906	0,755	0,584
70	-	-	-	-	-	1,184	0,980	0,816	0,646
75	-	-	-	-	-	1,196	1,041	0,868	0,697
80	-	-	-	-	-	1,228	1,102	0,919	0,732
85	-	-	-	-	-	1,261	1,163	0,971	0,765
90	-	-	-	-	-	1,293	1,202	1,022	0,799
95	-	-	-	-	-	1,325	1,230	1,073	0,833
100	-	-	-	-	-	1,358	1,258	1,125	0,866
105	-	-	-	-	-	1,390	1,286	1,176	0,900
110	-	-	-	-	-	1,422	1,314	1,206	0,934
115	-	-	-	-	-	1,454	1,342	1,232	0,967
120	-	-	-	-	-	1,487	1,370	1,257	1,001
125	-	-	-	-	-	1,519	1,398	1,283	1,035
130	-	-	-	-	-	1,551	1,426	1,309	1,068
135	-	-	-	-	-	1,584	1,454	1,335	1,102
140	-	-	-	-	-	1,616	1,482	1,361	1,136
145	-	-	-	-	-	1,648	1,510	1,387	1,169
150	-	-	-	-	-	1,681	1,538	1,413	1,198
155	-	-	-	-	-	1,713	1,566	1,439	1,224
160	-	-	-	-	-	1,745	1,594	1,464	1,250
165	-	-	-	-	-	1,778	1,622	1,490	1,275
170	-	-	-	-	-	1,810	1,650	1,516	1,301
175	-	-	-	-	-	1,842	1,678	1,542	1,326
180	-	-	-	-	-	-	1,706	1,568	1,352
185	-	-	-	-	-	-	1,734	1,594	1,377
190	-	-	-	-	-	-	1,762	1,620	1,403
195	-	-	-	-	-	-	1,790	1,645	1,428
200	-	-	-	-	-	-	1,817	1,671	1,454
205	-	-	-	-	-	-	1,845	1,697	1,479
210	-	-	-	-	-	-	-	1,723	1,505
215	-	-	-	-	-	-	-	1,749	1,531
220	-	-	-	-	-	-	-	1,775	1,556
225	-	-	-	-	-	-	-	1,801	1,582
230	-	-	-	-	-	-	-	1,827	1,607
235	-	-	-	-	-	-	-	1,852	1,633
240	-	-	-	-	-	-	-	-	1,658
245	-	-	-	-	-	-	-	-	1,684
250	-	-	-	-	-	-	-	-	1,709
255	-	-	-	-	-	-	-	-	1,735
260	-	-	-	-	-	-	-	-	1,761
265	-	-	-	-	-	-	-	-	1,786
270	-	-	-	-	-	-	-	-	1,812
275	-	-	-	-	-	-	-	-	1,837
280	-	-	-	-	-	-	-	-	-

1.4.8 | Circular box sections

» Fire resistive rating **R15 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
80	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
85	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
90	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
95	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
100	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
105	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
110	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
115	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
120	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
125	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
130	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
135	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
140	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
145	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
150	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
155	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
160	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
165	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
170	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
175	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
180	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
185	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
190	0,465	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
195	0,545	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
200	0,626	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
205	0,706	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
210	0,786	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
215	0,866	0,470	0,410	0,410	0,410	0,410	0,410	0,410	0,410
220	0,947	0,608	0,410	0,410	0,410	0,410	0,410	0,410	0,410
225	1,027	0,745	0,410	0,410	0,410	0,410	0,410	0,410	0,410
230	1,107	0,882	0,410	0,410	0,410	0,410	0,410	0,410	0,410
235	1,163	1,020	0,410	0,410	0,410	0,410	0,410	0,410	0,410
240	1,184	1,155	0,476	0,410	0,410	0,410	0,410	0,410	0,410

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	1,205	1,177	0,618	0,410	0,410	0,410	0,410	0,410	0,410
250	1,226	1,199	0,760	0,410	0,410	0,410	0,410	0,410	0,410
255	1,248	1,221	0,902	0,410	0,410	0,410	0,410	0,410	0,410
260	1,269	1,243	1,044	0,410	0,410	0,410	0,410	0,410	0,410
265	1,290	1,265	1,160	0,410	0,410	0,410	0,410	0,410	0,410
270	1,311	1,287	1,183	0,410	0,410	0,410	0,410	0,410	0,410
275	1,332	1,309	1,206	0,410	0,410	0,410	0,410	0,410	0,410
280	1,353	1,331	1,230	0,426	0,410	0,410	0,410	0,410	0,410
285	1,374	1,353	1,253	0,544	0,410	0,410	0,410	0,410	0,410
290	1,396	1,375	1,277	0,661	0,410	0,410	0,410	0,410	0,410
295	1,417	1,397	1,300	0,779	0,410	0,410	0,410	0,410	0,410
300	1,438	1,419	1,323	0,896	0,410	0,410	0,410	0,410	0,410
305	1,459	1,441	1,347	1,013	0,410	0,410	0,410	0,410	0,410
310	1,480	1,463	1,370	1,131	0,410	0,410	0,410	0,410	0,410
315	1,501	1,485	1,393	1,174	0,410	0,410	0,410	0,410	0,410
320	1,522	1,507	1,417	1,198	0,410	0,410	0,410	0,410	0,410
325	1,543	1,529	1,440	1,223	0,439	0,410	0,410	0,410	0,410
330	1,565	1,551	1,463	1,247	0,536	0,410	0,410	0,410	0,410
335	1,586	1,573	1,487	1,271	0,633	0,410	0,410	0,410	0,410
340	1,607	1,595	1,510	1,296	0,730	0,410	0,410	0,410	0,410
345	1,628	1,617	1,533	1,320	0,828	0,410	0,410	0,410	0,410
350	1,649	1,639	1,557	1,344	0,925	0,410	0,410	0,410	0,410
360	1,691	1,683	1,604	1,393	1,119	0,410	0,410	0,410	0,410
370	1,734	1,727	1,650	1,442	1,195	0,410	0,410	0,410	0,410
380	1,776	1,771	1,697	1,491	1,245	0,410	0,410	0,410	0,410
390	1,818	1,815	1,744	1,539	1,295	0,410	0,410	0,410	0,410
400	1,860	1,859	1,790	1,588	1,345	0,528	0,410	0,410	0,410
410	1,903	1,903	1,837	1,637	1,395	0,650	0,410	0,410	0,410
420	1,947	1,947	1,884	1,685	1,445	0,772	0,410	0,410	0,410
430	1,991	1,991	1,931	1,734	1,495	0,895	0,410	0,410	0,410
440	2,035	2,035	1,977	1,783	1,546	1,017	0,410	0,410	0,410
450	2,080	2,080	2,024	1,832	1,596	1,139	0,410	0,410	0,410
460	2,124	2,124	2,071	1,880	1,646	1,202	0,410	0,410	0,410
468	2,159	2,159	2,108	1,919	1,681	1,241	0,410	0,410	0,410

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	1,266	1,115	1,155	1,155	1,155	1,155	1,155	1,155	0,410
80	1,266	1,115	1,155	1,155	1,155	1,155	1,155	1,155	0,410
85	1,266	1,115	1,155	1,155	1,155	1,155	1,155	1,155	0,410
90	1,312	1,167	1,155	1,155	1,155	1,155	1,155	1,155	0,410
95	1,358	1,220	1,179	1,155	1,155	1,155	1,155	1,155	0,410
100	1,403	1,272	1,229	1,155	1,155	1,155	1,155	1,155	0,410
105	1,449	1,324	1,280	1,176	1,155	1,155	1,155	1,155	0,410
110	1,495	1,377	1,330	1,226	1,155	1,155	1,155	1,155	0,410
115	1,541	1,429	1,381	1,276	1,188	1,155	1,155	1,155	0,410
120	1,587	1,481	1,432	1,325	1,235	1,155	1,155	1,155	0,410
125	1,633	1,534	1,482	1,375	1,283	1,172	1,155	1,155	0,410
130	1,679	1,586	1,533	1,424	1,330	1,218	1,155	1,155	0,410
135	1,724	1,638	1,583	1,474	1,377	1,265	1,155	1,155	0,410
140	1,770	1,690	1,634	1,523	1,425	1,312	1,155	1,155	0,410
145	1,816	1,743	1,685	1,573	1,472	1,358	1,185	1,155	0,410
150	1,862	1,795	1,735	1,623	1,520	1,405	1,231	1,155	0,410
155	1,908	1,847	1,786	1,672	1,567	1,452	1,278	1,155	0,410
160	1,954	1,900	1,836	1,722	1,614	1,498	1,325	1,155	0,410
165	2,000	1,952	1,887	1,771	1,662	1,545	1,371	1,155	0,410
170	2,046	2,004	1,937	1,821	1,709	1,592	1,418	1,155	0,410
175	2,091	2,057	1,988	1,870	1,757	1,638	1,465	1,155	0,410
180	2,137	2,109	2,039	1,920	1,804	1,685	1,511	1,155	0,410
185	2,183	2,161	2,089	1,970	1,852	1,732	1,558	1,155	0,410
190	2,229	2,213	2,140	2,019	1,899	1,778	1,605	1,177	0,410
195	2,275	2,266	2,190	2,069	1,946	1,825	1,651	1,224	0,410
200	2,321	2,318	2,241	2,118	1,994	1,872	1,698	1,270	0,410
205	2,370	2,370	2,291	2,168	2,041	1,918	1,744	1,316	0,410
210	2,423	2,423	2,342	2,217	2,089	1,965	1,791	1,362	0,410
215	2,475	2,475	2,393	2,267	2,136	2,012	1,838	1,408	0,410
220	-	-	2,443	2,316	2,183	2,058	1,884	1,454	0,410
225	-	-	2,494	2,366	2,231	2,105	1,931	1,501	0,410
230	-	-	-	2,416	2,278	2,152	1,978	1,547	0,410
235	-	-	-	2,465	2,326	2,198	2,024	1,593	0,410
240	-	-	-	2,515	2,373	2,245	2,071	1,639	0,410

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	-	-	-	-	2,420	2,292	2,118	1,685	0,410
250	-	-	-	-	2,468	2,338	2,164	1,731	0,410
255	-	-	-	-	2,515	2,385	2,211	1,778	0,410
260	-	-	-	-	-	2,432	2,258	1,824	0,410
265	-	-	-	-	-	2,478	2,304	1,870	0,410
270	-	-	-	-	-	2,525	2,351	1,916	0,410
275	-	-	-	-	-	-	2,397	1,962	0,410
280	-	-	-	-	-	-	2,444	2,008	0,410
285	-	-	-	-	-	-	2,491	2,054	0,410
290	-	-	-	-	-	-	-	2,101	0,410
295	-	-	-	-	-	-	-	2,147	0,410
300	-	-	-	-	-	-	-	2,193	0,410
305	-	-	-	-	-	-	-	2,239	0,410
310	-	-	-	-	-	-	-	2,285	0,410
315	-	-	-	-	-	-	-	2,331	0,439
320	-	-	-	-	-	-	-	2,378	0,482
325	-	-	-	-	-	-	-	2,424	0,525
330	-	-	-	-	-	-	-	2,470	0,568
335	-	-	-	-	-	-	-	2,516	0,611
340	-	-	-	-	-	-	-	-	0,654
345	-	-	-	-	-	-	-	-	0,697
350	-	-	-	-	-	-	-	-	0,740
360	-	-	-	-	-	-	-	-	0,826
370	-	-	-	-	-	-	-	-	0,912
380	-	-	-	-	-	-	-	-	0,999
390	-	-	-	-	-	-	-	-	1,085
400	-	-	-	-	-	-	-	-	1,199
410	-	-	-	-	-	-	-	-	1,434
420	-	-	-	-	-	-	-	-	1,670
430	-	-	-	-	-	-	-	-	1,905
440	-	-	-	-	-	-	-	-	2,140
450	-	-	-	-	-	-	-	-	2,376
460	-	-	-	-	-	-	-	-	-

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	-	-	-	-	-	-	-	1,155	0,410
80	-	-	-	-	-	-	-	1,155	0,410
85	-	-	-	-	-	-	-	1,155	0,410
90	-	-	-	-	-	-	-	1,155	0,410
95	-	-	-	-	-	-	-	1,155	0,410
100	-	-	-	-	-	-	-	1,214	0,410
105	-	-	-	-	-	-	-	1,285	0,410
110	-	-	-	-	-	-	-	1,355	0,410
115	-	-	-	-	-	-	-	1,426	0,410
120	-	-	-	-	-	-	-	1,496	0,410
125	-	-	-	-	-	-	-	1,567	0,410
130	-	-	-	-	-	-	-	1,638	0,410
135	-	-	-	-	-	-	-	1,708	0,410
140	-	-	-	-	-	-	-	1,779	0,410
145	-	-	-	-	-	-	-	1,849	0,613
150	-	-	-	-	-	-	-	1,920	1,188
155	-	-	-	-	-	-	-	1,990	1,270
160	-	-	-	-	-	-	-	2,061	1,352
165	-	-	-	-	-	-	-	2,131	1,434
170	-	-	-	-	-	-	-	2,202	1,516
175	-	-	-	-	-	-	-	2,272	1,598
180	-	-	-	-	-	-	-	2,343	1,680
185	-	-	-	-	-	-	-	2,413	1,762
190	-	-	-	-	-	-	-	2,484	1,844
195	-	-	-	-	-	-	-	-	1,926
200	-	-	-	-	-	-	-	-	2,009
205	-	-	-	-	-	-	-	-	2,091
210	-	-	-	-	-	-	-	-	2,173
215	-	-	-	-	-	-	-	-	2,255
220	-	-	-	-	-	-	-	-	2,337
225	-	-	-	-	-	-	-	-	2,419
230	-	-	-	-	-	-	-	-	2,501
235	-	-	-	-	-	-	-	-	-

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	-	-	-	-	-	-	-	-	0,410
80	-	-	-	-	-	-	-	-	0,410
85	-	-	-	-	-	-	-	-	0,410
90	-	-	-	-	-	-	-	-	1,011
95	-	-	-	-	-	-	-	-	1,269
100	-	-	-	-	-	-	-	-	1,407
105	-	-	-	-	-	-	-	-	1,545
110	-	-	-	-	-	-	-	-	1,683
115	-	-	-	-	-	-	-	-	1,821
120	-	-	-	-	-	-	-	-	1,959
125	-	-	-	-	-	-	-	-	2,097
130	-	-	-	-	-	-	-	-	2,235
135	-	-	-	-	-	-	-	-	2,374
140	-	-	-	-	-	-	-	-	2,512
145	-	-	-	-	-	-	-	-	-

1.4.9 | Circular box sections

» Fire resistive rating **R15 - COLUMNS**

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
80	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
85	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
90	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
95	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
100	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
105	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
110	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
115	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
120	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
125	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
130	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
135	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
140	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
145	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
150	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
155	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
160	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
165	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
170	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
175	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
180	0,458	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
185	0,560	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
190	0,662	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
195	0,764	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
200	0,866	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
205	0,968	0,410	0,410	0,410	0,410	0,410	0,410	0,410	0,410
210	1,069	0,420	0,410	0,410	0,410	0,410	0,410	0,410	0,410
215	1,158	0,572	0,410	0,410	0,410	0,410	0,410	0,410	0,410
220	1,180	0,725	0,410	0,410	0,410	0,410	0,410	0,410	0,410
225	1,201	0,877	0,410	0,410	0,410	0,410	0,410	0,410	0,410
230	1,223	1,030	0,410	0,410	0,410	0,410	0,410	0,410	0,410
235	1,244	1,159	0,410	0,410	0,410	0,410	0,410	0,410	0,410
240	1,266	1,181	0,410	0,410	0,410	0,410	0,410	0,410	0,410

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	1,287	1,203	0,419	0,410	0,410	0,410	0,410	0,410	0,410
250	1,309	1,225	0,534	0,410	0,410	0,410	0,410	0,410	0,410
255	1,330	1,247	0,649	0,410	0,410	0,410	0,410	0,410	0,410
260	1,352	1,269	0,763	0,410	0,410	0,410	0,410	0,410	0,410
265	1,373	1,291	0,878	0,410	0,410	0,410	0,410	0,410	0,410
270	1,395	1,314	0,993	0,410	0,410	0,410	0,410	0,410	0,410
275	1,416	1,336	1,108	0,410	0,410	0,410	0,410	0,410	0,410
280	1,438	1,358	1,168	0,410	0,410	0,410	0,410	0,410	0,410
285	1,459	1,380	1,191	0,410	0,410	0,410	0,410	0,410	0,410
290	1,481	1,402	1,215	0,410	0,410	0,410	0,410	0,410	0,410
295	1,502	1,424	1,238	0,410	0,410	0,410	0,410	0,410	0,410
300	1,524	1,446	1,261	0,410	0,410	0,410	0,410	0,410	0,410
305	1,545	1,469	1,284	0,471	0,410	0,410	0,410	0,410	0,410
310	1,567	1,491	1,307	0,538	0,410	0,410	0,410	0,410	0,410
315	1,588	1,513	1,331	0,605	0,410	0,410	0,410	0,410	0,410
320	1,610	1,535	1,354	0,671	0,410	0,410	0,410	0,410	0,410
325	1,631	1,557	1,377	0,738	0,410	0,410	0,410	0,410	0,410
330	1,653	1,579	1,400	0,805	0,410	0,410	0,410	0,410	0,410
335	1,674	1,601	1,423	0,872	0,410	0,410	0,410	0,410	0,410
340	1,696	1,623	1,446	0,938	0,410	0,410	0,410	0,410	0,410
345	1,717	1,646	1,470	1,005	0,410	0,410	0,410	0,410	0,410
350	1,739	1,668	1,493	1,072	0,410	0,410	0,410	0,410	0,410
360	1,782	1,712	1,539	1,173	0,410	0,410	0,410	0,410	0,410
370	1,825	1,756	1,586	1,223	0,508	0,410	0,410	0,410	0,410
380	1,868	1,801	1,632	1,272	0,603	0,410	0,410	0,410	0,410
390	1,911	1,845	1,678	1,322	0,698	0,410	0,410	0,410	0,410
400	1,954	1,889	1,725	1,371	0,794	0,410	0,410	0,410	0,410
410	1,997	1,933	1,771	1,421	0,889	0,410	0,410	0,410	0,410
420	2,040	1,978	1,818	1,470	0,985	0,410	0,410	0,410	0,410
430	2,083	2,022	1,864	1,520	1,080	0,410	0,410	0,410	0,410
440	2,126	2,066	1,910	1,569	1,166	0,410	0,410	0,410	0,410
450	2,169	2,111	1,957	1,619	1,218	0,410	0,410	0,410	0,410
460	2,212	2,155	2,003	1,668	1,269	0,410	0,410	0,410	0,410
468	2,247	2,190	2,040	1,708	1,305	0,430	0,410	0,410	0,410



mcr Polyack A | Intumescent thinner fire paint system

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polyack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	-	-	1,155	1,155	1,155	1,155	1,155	0,410	0,410
80	-	-	1,155	1,155	1,155	1,155	1,155	0,410	0,410
85	-	-	1,155	1,155	1,155	1,155	1,155	0,410	0,410
90	-	-	1,155	1,155	1,155	1,155	1,155	0,410	0,410
95	-	-	1,155	1,155	1,155	1,155	1,155	0,410	0,410
100	-	-	1,196	1,155	1,155	1,155	1,155	0,410	0,410
105	-	-	1,245	1,155	1,155	1,155	1,155	0,410	0,410
110	-	-	1,294	1,155	1,155	1,155	1,155	0,410	0,410
115	-	-	1,343	1,180	1,155	1,155	1,155	0,410	0,410
120	-	-	1,392	1,226	1,155	1,155	1,155	0,410	0,410
125	-	-	1,441	1,272	1,155	1,155	1,155	0,410	0,410
130	-	-	1,490	1,318	1,184	1,155	1,155	0,410	0,410
135	-	-	1,539	1,364	1,227	1,155	1,155	0,410	0,410
140	-	-	1,588	1,410	1,269	1,155	1,155	0,410	0,410
145	-	-	1,637	1,456	1,312	1,155	1,155	0,410	0,410
150	-	-	1,686	1,502	1,355	1,155	1,155	0,410	0,410
155	-	-	1,735	1,548	1,397	1,180	1,155	0,410	0,410
160	-	-	1,784	1,594	1,440	1,220	1,155	0,410	0,410
165	-	-	1,833	1,640	1,483	1,260	1,155	0,410	0,410
170	-	-	1,882	1,686	1,525	1,300	1,155	0,410	0,410
175	-	-	1,931	1,732	1,568	1,340	1,155	0,410	0,410
180	-	-	1,980	1,777	1,611	1,380	1,155	0,410	0,410
185	-	-	2,029	1,823	1,653	1,420	1,155	0,410	0,410
190	-	-	2,078	1,869	1,696	1,460	1,155	0,410	0,410
195	-	-	2,127	1,915	1,739	1,500	1,155	0,410	0,410
200	-	-	2,176	1,961	1,782	1,540	1,155	0,410	0,410
205	-	-	2,225	2,007	1,824	1,579	1,173	0,410	0,410
210	-	-	2,274	2,053	1,867	1,619	1,211	0,410	0,410
215	-	-	2,323	2,099	1,910	1,659	1,248	0,410	0,410
220	-	-	2,372	2,145	1,952	1,699	1,286	0,410	0,410
225	-	-	2,421	2,191	1,995	1,739	1,323	0,410	0,410
230	-	-	2,470	2,237	2,038	1,779	1,360	0,410	0,410
235	-	-	-	2,283	2,080	1,819	1,398	0,410	0,410
240	-	-	-	2,329	2,123	1,859	1,435	0,410	0,410

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	-	-	-	2,375	2,166	1,899	1,473	0,410	0,410
250	-	-	-	2,420	2,208	1,939	1,510	0,410	0,410
255	-	-	-	2,466	2,251	1,979	1,548	0,410	0,410
260	-	-	-	-	2,294	2,019	1,585	0,410	0,410
265	-	-	-	-	2,337	2,059	1,623	0,410	0,410
270	-	-	-	-	2,379	2,099	1,660	0,410	0,410
275	-	-	-	-	2,422	2,139	1,698	0,410	0,410
280	-	-	-	-	2,465	2,179	1,735	0,410	0,410
285	-	-	-	-	-	2,219	1,772	0,410	0,410
290	-	-	-	-	-	2,259	1,810	0,410	0,410
295	-	-	-	-	-	2,298	1,847	0,410	0,410
300	-	-	-	-	-	2,338	1,885	0,545	0,410
305	-	-	-	-	-	2,378	1,922	0,746	0,410
310	-	-	-	-	-	2,418	1,960	0,947	0,410
315	-	-	-	-	-	2,458	1,997	1,148	0,410
320	-	-	-	-	-	-	2,035	1,194	0,410
325	-	-	-	-	-	-	2,072	1,234	0,410
330	-	-	-	-	-	-	2,109	1,275	0,410
335	-	-	-	-	-	-	2,147	1,316	0,410
340	-	-	-	-	-	-	2,184	1,356	0,410
345	-	-	-	-	-	-	2,222	1,397	0,410
350	-	-	-	-	-	-	2,259	1,437	0,410
360	-	-	-	-	-	-	2,334	1,519	0,410
370	-	-	-	-	-	-	2,409	1,600	0,410
380	-	-	-	-	-	-	2,484	1,681	0,410
390	-	-	-	-	-	-	-	1,762	0,410
400	-	-	-	-	-	-	-	1,843	0,410
410	-	-	-	-	-	-	-	1,925	0,410
420	-	-	-	-	-	-	-	2,006	0,410
430	-	-	-	-	-	-	-	2,087	0,437
440	-	-	-	-	-	-	-	2,168	0,477
450	-	-	-	-	-	-	-	2,249	0,518
460	-	-	-	-	-	-	-	2,330	0,558
468	-	-	-	-	-	-	-	2,387	0,587

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	-	-	-	-	-	-	1,155	1,155	0,410
80	-	-	-	-	-	-	1,155	1,155	0,410
85	-	-	-	-	-	-	1,155	1,155	0,410
90	-	-	-	-	-	-	1,155	1,155	0,410
95	-	-	-	-	-	-	1,155	1,155	0,410
100	-	-	-	-	-	-	1,155	1,155	0,410
105	-	-	-	-	-	-	1,155	1,155	0,410
110	-	-	-	-	-	-	1,211	1,155	0,410
115	-	-	-	-	-	-	1,269	1,155	0,410
120	-	-	-	-	-	-	1,327	1,155	0,410
125	-	-	-	-	-	-	1,385	1,155	0,410
130	-	-	-	-	-	-	1,443	1,155	0,410
135	-	-	-	-	-	-	1,501	1,155	0,410
140	-	-	-	-	-	-	1,559	1,167	0,410
145	-	-	-	-	-	-	1,617	1,222	0,410
150	-	-	-	-	-	-	1,675	1,277	0,410
155	-	-	-	-	-	-	1,733	1,331	0,410
160	-	-	-	-	-	-	1,791	1,386	0,410
165	-	-	-	-	-	-	1,850	1,440	0,410
170	-	-	-	-	-	-	1,908	1,495	0,410
175	-	-	-	-	-	-	1,966	1,550	0,410
180	-	-	-	-	-	-	2,024	1,604	0,410
185	-	-	-	-	-	-	2,082	1,659	0,410
190	-	-	-	-	-	-	2,140	1,713	0,410
195	-	-	-	-	-	-	2,198	1,768	0,410
200	-	-	-	-	-	-	2,256	1,823	0,410
205	-	-	-	-	-	-	2,314	1,877	0,458
210	-	-	-	-	-	-	2,372	1,932	0,640
215	-	-	-	-	-	-	2,430	1,986	0,823
220	-	-	-	-	-	-	2,488	2,041	1,006
225	-	-	-	-	-	-	-	2,096	1,168
230	-	-	-	-	-	-	-	2,150	1,242
235	-	-	-	-	-	-	-	2,205	1,316
240	-	-	-	-	-	-	-	2,259	1,389

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
245	-	-	-	-	-	-	-	2,314	1,463
250	-	-	-	-	-	-	-	2,423	1,610
255	-	-	-	-	-	-	-	2,478	1,684
260	-	-	-	-	-	-	-	-	1,758
265	-	-	-	-	-	-	-	-	1,831
270	-	-	-	-	-	-	-	-	1,905
275	-	-	-	-	-	-	-	-	1,979
280	-	-	-	-	-	-	-	-	2,052
285	-	-	-	-	-	-	-	-	2,126
290	-	-	-	-	-	-	-	-	2,200
295	-	-	-	-	-	-	-	-	2,273
300	-	-	-	-	-	-	-	-	2,347
305	-	-	-	-	-	-	-	-	2,421
310	-	-	-	-	-	-	-	-	-

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
77	-	-	-	-	-	-	-	-	0,410
80	-	-	-	-	-	-	-	-	0,410
85	-	-	-	-	-	-	-	-	0,410
90	-	-	-	-	-	-	-	-	0,410
95	-	-	-	-	-	-	-	-	0,410
100	-	-	-	-	-	-	-	-	0,410
105	-	-	-	-	-	-	-	-	0,410
110	-	-	-	-	-	-	-	-	0,410
115	-	-	-	-	-	-	-	-	0,410
120	-	-	-	-	-	-	-	-	0,410
125	-	-	-	-	-	-	-	-	1,010
130	-	-	-	-	-	-	-	-	1,228
135	-	-	-	-	-	-	-	-	1,316
140	-	-	-	-	-	-	-	-	1,405
145	-	-	-	-	-	-	-	-	1,494
150	-	-	-	-	-	-	-	-	1,582
155	-	-	-	-	-	-	-	-	1,671
160	-	-	-	-	-	-	-	-	1,760
165	-	-	-	-	-	-	-	-	1,848
170	-	-	-	-	-	-	-	-	1,937
175	-	-	-	-	-	-	-	-	2,026
180	-	-	-	-	-	-	-	-	2,114
185	-	-	-	-	-	-	-	-	2,203
190	-	-	-	-	-	-	-	-	2,292
195	-	-	-	-	-	-	-	-	2,380
200	-	-	-	-	-	-	-	-	2,469
205	-	-	-	-	-	-	-	-	-

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
46	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
50	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
55	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
60	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
65	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
70	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
75	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
80	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
85	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
90	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
95	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
100	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
105	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
110	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
115	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
120	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
125	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
130	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
135	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
140	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
145	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
150	0,408	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
155	0,452	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
160	0,495	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
165	0,539	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
170	0,582	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
175	0,626	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
180	0,669	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
185	0,713	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
190	0,756	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
195	0,800	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377

» Fire resistive rating R15 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
200	0,843	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
205	0,887	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
210	0,931	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
215	0,974	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
220	1,018	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
225	1,061	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
230	1,105	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
235	1,148	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
240	1,192	0,398	0,377	0,377	0,377	0,377	0,377	0,377	0,377
245	1,235	0,460	0,377	0,377	0,377	0,377	0,377	0,377	0,377
250	1,279	0,521	0,377	0,377	0,377	0,377	0,377	0,377	0,377
255	1,323	0,583	0,377	0,377	0,377	0,377	0,377	0,377	0,377
260	1,366	0,644	0,377	0,377	0,377	0,377	0,377	0,377	0,377
265	1,410	0,706	0,377	0,377	0,377	0,377	0,377	0,377	0,377
270	1,453	0,767	0,377	0,377	0,377	0,377	0,377	0,377	0,377
275	1,497	0,829	0,377	0,377	0,377	0,377	0,377	0,377	0,377
280	1,540	0,890	0,377	0,377	0,377	0,377	0,377	0,377	0,377
285	1,584	0,952	0,377	0,377	0,377	0,377	0,377	0,377	0,377
290	1,627	1,013	0,377	0,377	0,377	0,377	0,377	0,377	0,377
295	1,671	1,075	0,404	0,377	0,377	0,377	0,377	0,377	0,377
300	1,715	1,136	0,477	0,377	0,377	0,377	0,377	0,377	0,377
305	1,758	1,197	0,551	0,377	0,377	0,377	0,377	0,377	0,377
310	1,802	1,259	0,624	0,377	0,377	0,377	0,377	0,377	0,377
315	1,845	1,320	0,697	0,377	0,377	0,377	0,377	0,377	0,377
320	1,889	1,382	0,771	0,377	0,377	0,377	0,377	0,377	0,377
325	1,932	1,443	0,844	0,377	0,377	0,377	0,377	0,377	0,377
330	1,976	1,505	0,918	0,377	0,377	0,377	0,377	0,377	0,377
335	2,019	1,566	0,991	0,377	0,377	0,377	0,377	0,377	0,377
340	2,063	1,628	1,064	0,377	0,377	0,377	0,377	0,377	0,377
345	2,107	1,689	1,138	0,377	0,377	0,377	0,377	0,377	0,377

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
46	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
50	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
55	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
60	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
65	0,483	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
70	0,614	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
75	0,746	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
80	0,878	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
85	1,010	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
90	1,142	0,462	0,377	0,377	0,377	0,377	0,377	0,377	0,377
95	1,235	0,558	0,377	0,377	0,377	0,377	0,377	0,377	0,377
100	1,291	0,655	0,377	0,377	0,377	0,377	0,377	0,377	0,377
105	1,346	0,752	0,377	0,377	0,377	0,377	0,377	0,377	0,377
110	1,402	0,848	0,399	0,377	0,377	0,377	0,377	0,377	0,377
115	1,458	0,945	0,474	0,377	0,377	0,377	0,377	0,377	0,377
120	1,513	1,041	0,549	0,377	0,377	0,377	0,377	0,377	0,377
125	1,569	1,138	0,624	0,377	0,377	0,377	0,377	0,377	0,377
130	1,624	1,224	0,698	0,377	0,377	0,377	0,377	0,377	0,377
135	1,680	1,281	0,773	0,397	0,377	0,377	0,377	0,377	0,377
140	1,736	1,338	0,848	0,474	0,377	0,377	0,377	0,377	0,377
145	1,791	1,396	0,923	0,551	0,377	0,377	0,377	0,377	0,377
150	1,847	1,453	0,998	0,627	0,377	0,377	0,377	0,377	0,377
155	1,902	1,510	1,073	0,704	0,377	0,377	0,377	0,377	0,377
160	1,958	1,568	1,147	0,781	0,377	0,377	0,377	0,377	0,377
165	2,013	1,625	1,221	0,857	0,389	0,377	0,377	0,377	0,377
170	2,069	1,682	1,290	0,934	0,477	0,377	0,377	0,377	0,377
175	2,125	1,740	1,359	1,011	0,565	0,377	0,377	0,377	0,377
180	2,180	1,797	1,428	1,087	0,654	0,377	0,377	0,377	0,377
185	2,236	1,854	1,497	1,164	0,742	0,377	0,377	0,377	0,377
190	2,291	1,912	1,566	1,241	0,831	0,377	0,377	0,377	0,377
195	2,347	1,969	1,635	1,317	0,919	0,377	0,377	0,377	0,377

» Fire resistive rating R30 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
200	2,403	2,027	1,704	1,394	1,007	0,377	0,377	0,377	0,377
205	2,458	2,084	1,772	1,471	1,096	0,377	0,377	0,377	0,377
210	-	2,141	1,841	1,547	1,184	0,377	0,377	0,377	0,377
215	-	2,199	1,910	1,624	1,273	0,467	0,377	0,377	0,377
220	-	2,256	1,979	1,701	1,361	0,598	0,377	0,377	0,377
225	-	2,313	2,048	1,777	1,449	0,730	0,377	0,377	0,377
230	-	2,371	2,117	1,854	1,538	0,861	0,377	0,377	0,377
235	-	2,428	2,186	1,930	1,626	0,993	0,377	0,377	0,377
240	-	2,485	2,255	2,007	1,715	1,124	0,377	0,377	0,377
245	-	-	2,324	2,084	1,803	1,256	0,377	0,377	0,377
250	-	-	2,393	2,160	1,891	1,387	0,377	0,377	0,377
255	-	-	2,462	2,237	1,980	1,518	0,562	0,377	0,377
260	-	-	-	2,314	2,068	1,650	0,771	0,377	0,377
265	-	-	-	2,390	2,156	1,781	0,979	0,377	0,377
270	-	-	-	2,467	2,245	1,913	1,187	0,377	0,377
275	-	-	-	-	2,333	2,044	1,395	0,377	0,377
280	-	-	-	-	2,422	2,176	1,604	0,377	0,377
285	-	-	-	-	2,510	2,307	1,812	0,377	0,377
290	-	-	-	-	-	2,438	2,020	0,377	0,377
295	-	-	-	-	-	-	2,228	0,377	0,377
300	-	-	-	-	-	-	2,436	0,377	0,377
305	-	-	-	-	-	-	-	1,271	0,377
310	-	-	-	-	-	-	-	2,363	0,377
315	-	-	-	-	-	-	-	-	0,377
320	-	-	-	-	-	-	-	-	0,377
325	-	-	-	-	-	-	-	-	0,377
330	-	-	-	-	-	-	-	-	0,377
335	-	-	-	-	-	-	-	-	0,377
340	-	-	-	-	-	-	-	-	0,377
345	-	-	-	-	-	-	-	-	0,377

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
46	-	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
50	-	0,377	0,377	0,377	0,377	0,377	0,377	0,377	0,377
55	-	0,530	0,377	0,377	0,377	0,377	0,377	0,377	0,377
60	-	0,761	0,377	0,377	0,377	0,377	0,377	0,377	0,377
65	-	0,991	0,426	0,377	0,377	0,377	0,377	0,377	0,377
70	-	1,213	0,604	0,377	0,377	0,377	0,377	0,377	0,377
75	-	1,306	0,781	0,382	0,377	0,377	0,377	0,377	0,377
80	-	1,398	0,959	0,520	0,377	0,377	0,377	0,377	0,377
85	-	1,490	1,136	0,659	0,377	0,377	0,377	0,377	0,377
90	-	1,583	1,256	0,797	0,448	0,377	0,377	0,377	0,377
95	-	1,675	1,337	0,936	0,560	0,377	0,377	0,377	0,377
100	-	1,767	1,418	1,074	0,672	0,377	0,377	0,377	0,377
105	-	1,860	1,499	1,210	0,784	0,437	0,377	0,377	0,377
110	-	1,952	1,579	1,280	0,896	0,531	0,377	0,377	0,377
115	-	2,044	1,660	1,350	1,008	0,625	0,377	0,377	0,377
120	-	2,137	1,741	1,420	1,120	0,719	0,379	0,377	0,377
125	-	2,229	1,822	1,490	1,221	0,813	0,452	0,377	0,377
130	-	2,321	1,903	1,560	1,280	0,907	0,525	0,377	0,377
135	-	2,414	1,984	1,630	1,340	1,001	0,598	0,377	0,377
140	-	2,506	2,065	1,700	1,400	1,095	0,671	0,377	0,377
145	-	-	2,145	1,770	1,459	1,189	0,743	0,393	0,377
150	-	-	2,226	1,840	1,519	1,261	0,816	0,450	0,377
155	-	-	2,307	1,910	1,578	1,328	0,889	0,506	0,377
160	-	-	2,388	1,980	1,638	1,394	0,962	0,563	0,377
165	-	-	2,469	2,050	1,697	1,461	1,035	0,619	0,377
170	-	-	-	2,120	1,757	1,527	1,108	0,676	0,377
175	-	-	-	2,190	1,817	1,594	1,181	0,732	0,377
180	-	-	-	2,260	1,876	1,660	1,261	0,789	0,377
185	-	-	-	2,330	1,936	1,727	1,346	0,846	0,377
190	-	-	-	2,400	1,995	1,793	1,431	0,902	0,377
195	-	-	-	2,470	2,055	1,859	1,516	0,959	0,377

» Fire resistive rating R45 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
200	-	-	-	-	2,115	1,926	1,601	1,015	0,402
205	-	-	-	-	2,174	1,992	1,686	1,072	0,547
210	-	-	-	-	2,234	2,059	1,770	1,128	0,691
215	-	-	-	-	2,293	2,125	1,855	1,185	0,836
220	-	-	-	-	2,353	2,192	1,940	1,296	0,981
225	-	-	-	-	2,412	2,258	2,025	1,442	1,125
230	-	-	-	-	2,472	2,325	2,110	1,589	1,270
235	-	-	-	-	-	2,391	2,195	1,736	1,414
240	-	-	-	-	-	2,458	2,280	1,883	1,559
245	-	-	-	-	-	-	2,365	2,029	1,703
250	-	-	-	-	-	-	2,450	2,176	1,848
255	-	-	-	-	-	-	-	2,323	1,993
260	-	-	-	-	-	-	-	2,469	2,137
265	-	-	-	-	-	-	-	-	2,282
270	-	-	-	-	-	-	-	-	2,426
275	-	-	-	-	-	-	-	-	-

» Fire resistive rating R60 - COLUMNS

section factor U/A [m ⁻¹]	minimum thickness of mcr Polylack A flame retardant treatment system [mm] at design temperature								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
46	-	-	-	0,377	0,377	0,377	0,377	0,377	0,377
50	-	-	-	0,377	0,377	0,377	0,377	0,377	0,377
55	-	-	-	0,513	0,377	0,377	0,377	0,377	0,377
60	-	-	-	0,742	0,408	0,377	0,377	0,377	0,377
65	-	-	-	0,971	0,595	0,377	0,377	0,377	0,377
70	-	-	-	1,200	0,782	0,463	0,377	0,377	0,377
75	-	-	-	1,311	0,969	0,618	0,377	0,377	0,377
80	-	-	-	1,418	1,156	0,773	0,466	0,377	0,377
85	-	-	-	1,525	1,274	0,928	0,591	0,377	0,377
90	-	-	-	1,632	1,366	1,083	0,716	0,410	0,377
95	-	-	-	1,739	1,458	1,224	0,840	0,510	0,377
100	-	-	-	1,846	1,550	1,307	0,965	0,611	0,377
105	-	-	-	1,953	1,642	1,389	1,089	0,711	0,377
110	-	-	-	2,061	1,734	1,472	1,211	0,811	0,377
115	-	-	-	2,168	1,826	1,555	1,284	0,911	0,445
120	-	-	-	2,275	1,918	1,637	1,356	1,011	0,518
125	-	-	-	2,382	2,009	1,720	1,429	1,111	0,591
130	-	-	-	2,489	2,101	1,802	1,502	1,210	0,664
135	-	-	-	-	2,193	1,885	1,574	1,275	0,736
140	-	-	-	-	2,285	1,968	1,647	1,340	0,809
145	-	-	-	-	2,377	2,050	1,719	1,405	0,882
150	-	-	-	-	2,469	2,133	1,792	1,470	0,955
155	-	-	-	-	-	2,215	1,865	1,535	1,028
160	-	-	-	-	-	2,298	1,937	1,600	1,101
165	-	-	-	-	-	2,381	2,010	1,665	1,174
170	-	-	-	-	-	2,463	2,082	1,730	1,259
175	-	-	-	-	-	-	2,155	1,795	1,355
180	-	-	-	-	-	-	2,228	1,861	1,452
185	-	-	-	-	-	-	2,300	1,926	1,548
190	-	-	-	-	-	-	2,373	1,991	1,644
195	-	-	-	-	-	-	2,445	2,056	1,740
200	-	-	-	-	-	-	-	2,121	1,837
205	-	-	-	-	-	-	-	2,186	1,933
210	-	-	-	-	-	-	-	2,251	2,029
215	-	-	-	-	-	-	-	2,316	2,126
220	-	-	-	-	-	-	-	2,381	2,222
225	-	-	-	-	-	-	-	2,446	2,318
230	-	-	-	-	-	-	-	2,511	2,414
235	-	-	-	-	-	-	-	-	2,511
240	-	-	-	-	-	-	-	-	-



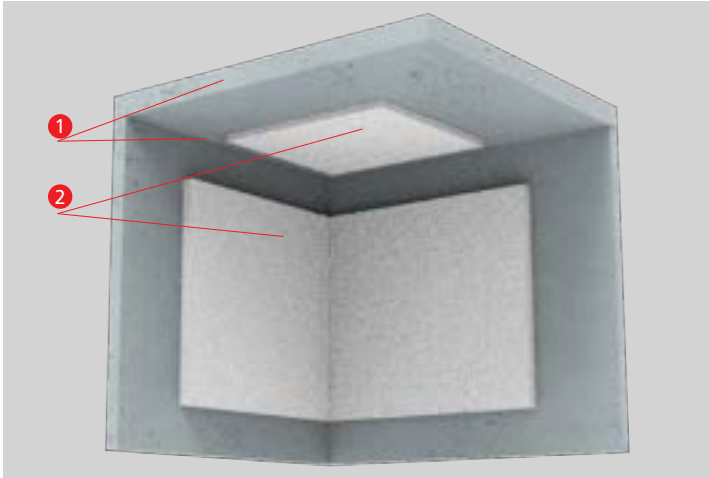
**REINFORCED
CONCRETE STRUCTURES**

➤ Requirements for building elements, and therefore for materials they are made with, depend on the specific thermal effects these elements will be exposed to during fire and what function should they perform. Expansion of metals due to high temperatures during fire significantly impacts the behavior of the building's structure. Under high temperatures, excessive deformations and tensions occur, which in consequence lead to damaging the elements or the entire structure. Therefore particular attention should be paid to protecting the load-bearing reinforced concrete structure, in order to prevent construction disasters caused by thermal actions during fire.

Reinforced concrete structures are usually fire resistant by nature and only an increase in their fire resistance rating is required, e.g. from R60 to R120 (REI60 to REI120), whereby there is a differentiation between ceilings or walls and beams or columns. Thus, the analysis should include the type of element, its external dimensions (wall thickness, ceiling thickness), as well as the material thickness around the reinforcement, measured from the face of the element to bar edge. Application of flame retardant insulation will slow down the process of heating the reinforcement, as a consequence extending the time for which the element retains its assumed load-bearing "R", tightness "E" and insulating capacity "I" (REI).

„MERCOR" S.A. offers solutions allowing to achieve fire resistance ratings for reinforced concrete structures up to R30-R240 under standard fire conditions.

2.1 | mcr Tecwool F



Solution

1. Concrete
2. mcr Tecwool F (thickness depending on the concrete thickness and the required fire resistance time)

Technical parameters

» physical and mechanical properties

dry mcr Tecwool F mix	
external appearance	grey dry mix, without clumping or contamination
cured mcr Tecwool F mortar	
bulk density of dry material	351 +/- 10% kg/m ³
linear shrinkage	≤ 0,07 ‰
steel surface adhesiveness	≥ 0,002 MPa or render rupture
concrete surface adhesiveness	≥ 0,002 MPa or render rupture
reaction to fire class	A1

Constant quality control during the manufacturing process of the mcr Tecwool F mix guarantees proper physical and mechanical features are maintained to ensure flame retardant properties.

- » European Technical Assessment ETA 11/0185
- » Certificate of constancy of performance 1220-CPR-1110
- » Declaration of performance TCRS-TW-01

Application

mcr Tecwool F is applied with a pneumatic machine according to the following instructions:

The proofed surface does not require a base coating (primer), mesh or any other support to ensure mortar adhesion. The proofed surface should be free from dust, oil, waste, loose particles, paint residues, etc.

Before mortar application, it is recommended to slightly dampen the surface with water from mortar applicator hose in order to remove contamination from the surface. Such spraying will allow to achieve thermal balance between the mortar and the proofed surface.

Several finish options are available: rough, painted, etc. according to individual esthetic requirements. It is possible to paint the mortar with flexible acrylic coatings. Before painting, the mortar should be completely dry (28 days). Upon application, spray the mortar again with water, to ensure proper curing of the cement.

System features

- » high durability
- » tightness – ensures perfect coverage
- » high thermal performance
- » quick and simple application
- » traditional light grey external texture
- » painting with finishing paints possible
- » flame retardant insulation weight neglectable in static calculations
- » biologically neutral, non-toxic, environment friendly
- » resistant to cracking and rotting
- » very good acoustic properties (sound absorption)
- » no corrosive action on unprotected steel surface

Fire resistance rating

The system's fire resistance rating is provided by choosing the adequate thickness of the sprayable mass, depending on the thickness of concrete around the reinforcement and the critical temperature of reinforcement steel.

2.1.1 | Fire resistance rating
» reinforced concrete walls and ceilings

Concrete thickness equivalent ϵ for mcr Tecwool F system insulation with a thickness of $g = 12.1$ mm (walls and ceilings)

Time [min]	ϵ [mm]
30	40
60	50
90	53
120	52
180	42
240	27

Concrete thickness equivalent ϵ for mcr Tecwool F system insulation with a thickness of $g = 35.2$ mm (walls and ceilings)

Time [min]	ϵ [mm]
30	85
60	100
90	114
120	121
180	126
240	132

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R30** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R30 fire resistance rating for the θ_{crit} design temperaturej								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	0	0	0	0	0
15-19	11,5	11,5	11,5	0	0	0	0	0	0
20-22	11,5	0	0	0	0	0	0	0	0
≥ 23	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R60** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R60 fire resistance rating for the θ_{crit} design temperaturej								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0
15-19	11,5	11,5	11,5	11,5	11,5	11,5	0	0	0
20-24	11,5	11,5	11,5	11,5	11,5	0	0	0	0
25-29	11,5	11,5	11,5	0	0	0	0	0	0
30-34	11,5	11,5	0	0	0	0	0	0	0
35-38	11,5	0	0	0	0	0	0	0	0
≥ 39	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R90** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R90 fire resistance rating for the θ_{crit} design temperaturej								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
15-19	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0
20-24	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0	0
25-29	11,5	11,5	11,5	11,5	11,5	0	0	0	0
30-34	11,5	11,5	11,5	11,5	0	0	0	0	0
35-39	11,5	11,5	11,5	0	0	0	0	0	0
40-44	11,5	11,5	0	0	0	0	0	0	0
45-49	11,5	0	0	0	0	0	0	0	0
50-51	11,5	0	0	0	0	0	0	0	0
≥ 52	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R120** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R120 fire resistance rating for the θ_{crit} design temperaturej								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
15-19	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
20-24	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0
25-29	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0	0
30-34	11,5	11,5	11,5	11,5	11,5	11,5	0	0	0
35-39	11,5	11,5	11,5	11,5	11,5	0	0	0	0
40-44	11,5	11,5	11,5	11,5	0	0	0	0	0
45-49	11,5	11,5	11,5	0	0	0	0	0	0
50-54	11,5	11,5	0	0	0	0	0	0	0
55-59	11,5	0	0	0	0	0	0	0	0
60-61	11,5	0	0	0	0	0	0	0	0
≥62	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R180** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R180 fire resistance rating for the θ_{crit} design temperaturej								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
15-19	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
20-24	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
25-29	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
30-34	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0
35-39	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0	0
40-44	11,5	11,5	11,5	11,5	11,5	11,5	0	0	0
45-49	11,5	11,5	11,5	11,5	11,5	0	0	0	0
50-54	11,5	11,5	11,5	11,5	0	0	0	0	0
55-59	11,5	11,5	11,5	0	0	0	0	0	0
60-64	11,5	11,5	11,5	0	0	0	0	0	0
65-69	11,5	11,5	0	0	0	0	0	0	0
70-74	11,5	0	0	0	0	0	0	0	0
75-79	11,5	0	0	0	0	0	0	0	0
≥80	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for **R240** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete walls and ceilings for R240 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
15-19	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
20-24	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
25-29	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
30-34	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5
35-39	11,5	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0
40-44	11,5	11,5	11,5	11,5	11,5	11,5	11,5	0	0
45-49	11,5	11,5	11,5	11,5	11,5	11,5	0	0	0
50-54	11,5	11,5	11,5	11,5	11,5	11,5	0	0	0
55-59	11,5	11,5	11,5	11,5	11,5	0	0	0	0
60-64	11,5	11,5	11,5	11,5	0	0	0	0	0
65-69	11,5	11,5	11,5	11,5	0	0	0	0	0
70-74	11,5	11,5	11,5	0	0	0	0	0	0
75-79	11,5	11,5	0	0	0	0	0	0	0
80-84	11,5	11,5	0	0	0	0	0	0	0
85-89	11,5	0	0	0	0	0	0	0	0
90-94	11,5	0	0	0	0	0	0	0	0
≥ 95	0	0	0	0	0	0	0	0	0

» **reinforced concrete beams and columns**

Concrete thickness equivalent ε for mcr Tecwool F system insulation with a thickness of $g = 12.2$ mm (beams and columns)

Time [min]	ε [mm]
30	56
60	70
90	75
120	72
180	65
240	62

Concrete thickness equivalent ε for mcr Tecwool F system insulation with a thickness of $g = 38.0$ mm (beams and columns)

Time [min]	ε [mm]
30	96
60	100
90	114
120	117
180	123
240	116

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for **R30** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R30 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
15-19	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
20-24	12,2	12,2	12,2	12,2	12,2	0	0	0	0
25-29	12,2	12,2	12,2	12,2	0	0	0	0	0
30-34	12,2	12,2	12,2	0	0	0	0	0	0
35-38	12,2	0	0	0	0	0	0	0	0
≥ 39	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for **R60** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R60 fire resistance rating for the θ _{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
15-19	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
20-24	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
25-29	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0
30-34	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
35-39	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
40-44	12,2	12,2	12,2	12,2	12,2	0	0	0	0
45-49	12,2	12,2	12,2	0	0	0	0	0	0
50-54	12,2	12,2	0	0	0	0	0	0	0
55-59	12,2	12,2	0	0	0	0	0	0	0
60-61	12,2	0	0	0	0	0	0	0	0
≥62	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for **R90** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R90 fire resistance rating for the θ _{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
15-19	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
20-24	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
25-29	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
30-34	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
35-39	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0
40-44	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
45-49	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
50-54	12,2	12,2	12,2	12,2	12,2	0	0	0	0
55-59	12,2	12,2	12,2	12,2	0	0	0	0	0
60-64	12,2	12,2	12,2	0	0	0	0	0	0
65-69	12,2	12,2	0	0	0	0	0	0	0
70-74	12,2	12,2	0	0	0	0	0	0	0
75-79	12,2	0	0	0	0	0	0	0	0
≥80	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for **R120** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R120 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
15-19	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
20-24	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
25-29	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
30-34	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
35-39	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
40-44	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
45-49	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0
50-54	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
55-59	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
60-64	12,2	12,2	12,2	12,2	12,2	0	0	0	0
65-69	12,2	12,2	12,2	12,2	0	0	0	0	0
70-74	12,2	12,2	12,2	12,2	0	0	0	0	0
75-79	12,2	12,2	12,2	0	0	0	0	0	0
80-84	12,2	12,2	0	0	0	0	0	0	0
85-89	12,2	12,2	0	0	0	0	0	0	0
90-94	12,2	0	0	0	0	0	0	0	0
95	12,2	0	0	0	0	0	0	0	0
≥96	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for **R180** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R180 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
15-19	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
20-24	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
25-29	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
30-34	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
35-39	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
40-44	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
45-49	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
50-54	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
55-59	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
60-64	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
65-69	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0
70-74	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
75-79	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
80-84	12,2	12,2	12,2	12,2	12,2	0	0	0	0
85-89	12,2	12,2	12,2	12,2	12,2	0	0	0	0
90-94	12,2	12,2	12,2	12,2	0	0	0	0	0
95-99	12,2	12,2	12,2	0	0	0	0	0	0
100-104	12,2	12,2	12,2	0	0	0	0	0	0
105-109	12,2	12,2	0	0	0	0	0	0	0
110-114	12,2	12,2	0	0	0	0	0	0	0
115-119	12,2	0	0	0	0	0	0	0	0
120-121	12,2	0	0	0	0	0	0	0	0
≥122	0	0	0	0	0	0	0	0	0

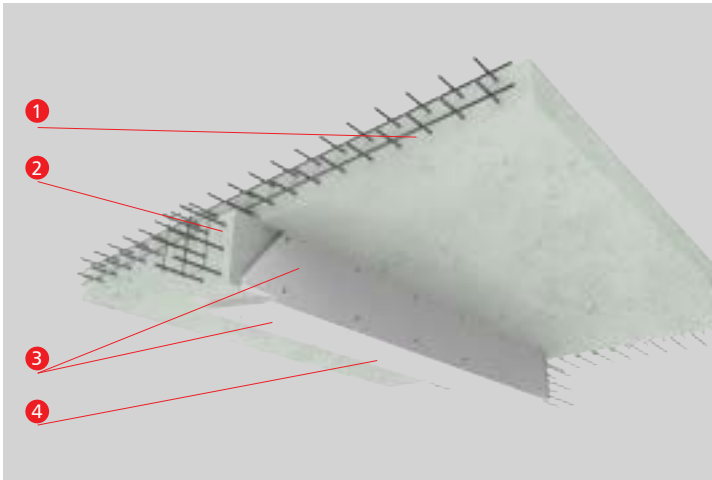
Insulation thickness in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R240 fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecwool F system required for protecting reinforced concrete beams and columns for R240 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	-	-	36,1	31,8	27,5	23,7	20,4	17,0	14,2
15-19	-	-	33,7	29,4	25,1	21,3	18,0	14,6	12,2
20-24	-	36,6	31,4	27,1	22,8	18,9	15,6	12,2	12,2
25-29	-	34,2	29,0	24,7	20,4	16,5	13,2	12,2	12,2
30-34	37,6	31,8	26,6	22,3	18,0	14,2	12,2	12,2	12,2
35-39	35,2	29,4	24,2	19,9	15,6	12,2	12,2	12,2	12,2
40-44	32,8	27,1	21,8	17,5	13,2	12,2	12,2	12,2	12,2
45-49	30,4	24,7	19,4	15,1	12,2	12,2	12,2	12,2	12,2
50-54	28,0	22,3	17,0	12,7	12,2	12,2	12,2	12,2	12,2
55-59	25,6	19,9	14,6	12,2	12,2	12,2	12,2	12,2	12,2
60-64	23,2	17,5	12,2	12,2	12,2	12,2	12,2	12,2	12,2
65-69	20,8	15,1	12,2	12,2	12,2	12,2	12,2	12,2	12,2
70-74	18,5	12,7	12,2	12,2	12,2	12,2	12,2	12,2	12,2
75-79	16,1	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
80-84	13,7	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0
85-89	12,2	12,2	12,2	12,2	12,2	12,2	12,2	0	0
90-94	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
95-99	12,2	12,2	12,2	12,2	12,2	12,2	0	0	0
100-104	12,2	12,2	12,2	12,2	12,2	0	0	0	0
105-109	12,2	12,2	12,2	12,2	0	0	0	0	0
110-114	12,2	12,2	12,2	12,2	0	0	0	0	0
115-119	12,2	12,2	12,2	0	0	0	0	0	0
120-124	12,2	12,2	12,2	0	0	0	0	0	0
125-129	12,2	12,2	0	0	0	0	0	0	0
130-134	12,2	12,2	0	0	0	0	0	0	0
135-139	12,2	0	0	0	0	0	0	0	0
140-144	12,2	0	0	0	0	0	0	0	0
≥145	0	0	0	0	0	0	0	0	0

2.1.2 | mcr Tecwool flame retardant mass spraying method

- » Before applying the mcr Tecwool F mass, the elements to be protected must be cleaned from dirt, oil, grease, peeling paint and rust – anything that may reduce adhesion.
- » For best adhesion, apply the mortar directly after damping the proofed element with water.
- » Apply in layers no thicker than 25 mm each, until the required target total thickness is reached. Spray the proofed surface at a straight angle, maintaining a distance between the nozzle and the surface of approximately 500–600 mm.
- » After applying the final flame retardant layer thickness, dampen with water to increase its hardness.
- » After spraying, the proofed sections and surfaces retain their natural shapes, while gaining the characteristic grey texture. For decorative purposes, the protected elements may additionally be painted with finishing paints.
- » The mcr Tecwool F mortar is delivered to the construction site in powdered form, in 25 kg bags.
- » The proofing is performed with specialized spray-on machines. The dry mass is poured into the machine's tank and transported under pressure through hoses to a special spray-on nozzle, where it is mixed with water. Water is provided to the nozzle with an independent hose.

2.2 | **mcr Tecbor**



Solution

1. Floor slab
2. Reinforced concrete beam
3. mcr Tecbor board
4. Steel anchor DBZ 6/35

Technical parameters

» physical and mechanical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	Smooth surface in a light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03
- » ITB expert assessment on the fire protection performance no. 0099/19/R252NZZP

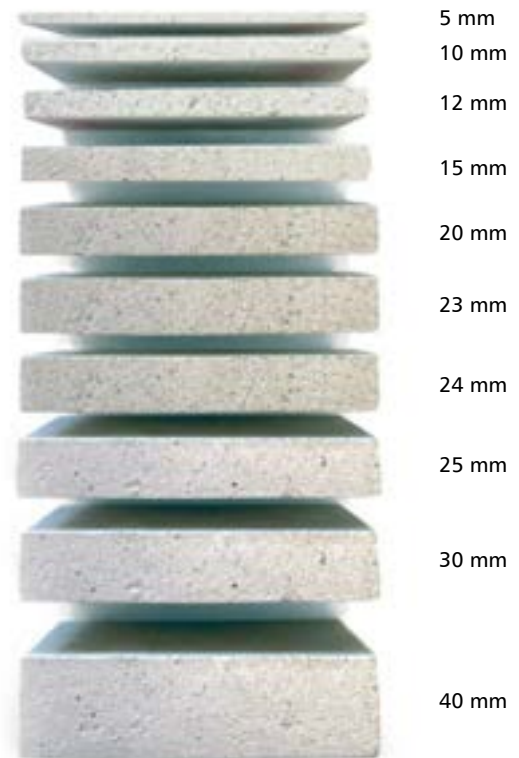
Installation description

As the minimum and maximum board thickness have been tested depending on the REI required, we will need a specific number of layers to be installed. The boards will be fixed to the concrete directly with metal nail plugs.

The boards are butt-aligned and no gluing is needed. If the distance between the joints exceeds 3 mm, a sealant should be used.

System features

- » high durability
- » tightness – ensures perfect coverage
- » high thermal performance
- » quick and simple application
- » painting with finishing paints possible
- » biologically neutral, non-toxic, environment friendly
- » resistant to cracking, dust, rotting or fungi
- » very good acoustic properties (sound absorption)
- » no corrosive action on an unprotected steel surface



Fire resistance rating

The system's fire resistance rating is provided by choosing the adequate thickness of the sprayable mass, depending on the thickness of concrete around the reinforcement and the critical temperature of reinforcement steel.

2.2.1 | Fire resistance rating

» reinforced concrete walls and ceilings

Concrete thickness equivalent for mcr Tecbor system insulation with a thickness of $g = 10$ mm (walls and ceilings)

Time [min]	ϵ [mm]
30	43
60	54
90	26

“0” in the tables means there is no need to use flame retardant treatments for the ceiling or wall fire endurance criterion, whereas “-” means it is not possible to apply flame retardant treatments using mcr Tecbor system according to the set criteria.

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for **R30** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for R30 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	10	10	10	10	0	0	0	0	0
15-19	10	10	10	0	0	0	0	0	0
20-22	10	0	0	0	0	0	0	0	0
≥ 23	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for **R60** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for R60 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	10	10	10	10	10	10	10	10	0
15-19	10	10	10	10	10	10	0	0	0
20-24	10	10	10	10	10	0	0	0	0
25-29	10	10	10	0	0	0	0	0	0
30-34	10	10	0	0	0	0	0	0	0
35-38	10	0	0	0	0	0	0	0	0
≥ 39	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for **R90** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for R90 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	20	15	12	10	10	10	10	10	10
15-19	15	12	10	10	10	10	10	10	0
20-24	15	10	10	10	10	10	10	0	0
25-29	12	10	10	10	10	0	0	0	0
30-34	10	10	10	10	0	0	0	0	0
35-39	10	10	10	0	0	0	0	0	0
40-44	10	10	0	0	0	0	0	0	0
45-49	10	0	0	0	0	0	0	0	0
50-51	10	0	0	0	0	0	0	0	0
≥52	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for **R120** fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete walls and ceilings for R120 fire resistance rating for the θ_{crit} design temperature					
	450°C	500°C	550°C	600°C	650°C	700°C
10-14	20	20	20	15	15	15
15-19	20	20	15	15	15	12
20-24	20	15	15	12	12	0
25-29	15	15	12	12	0	0
30-34	15	12	12	0	0	0
35-39	12	12	0	0	0	0
40-44	12	0	0	0	0	0
≥45	0	0	0	0	0	0

» reinforced concrete beams and columns

Concrete thickness equivalent for mcr Tecbor system insulation with a thickness of $g = 10 \text{ mm}$ (beams and columns)

Time [min]	ϵ [mm]
30	50
60	62
90	62
120	56

“0” in the tables means there is no need to use flame retardant treatments for the ceiling or wall fire endurance criterion, whereas “-” means it is not possible to apply flame retardant treatments using mcr Tecbor system according to the set criteria.

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete beams and columns for **R30** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete beams and columns for R30 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	10	10	10	10	10	10	10	10	10
15-19	10	10	10	10	10	10	10	0	0
20-24	10	10	10	10	10	0	0	0	0
25-29	10	10	10	10	0	0	0	0	0
30-34	10	10	10	0	0	0	0	0	0
35-38	10	0	0	0	0	0	0	0	0
≥ 39	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete beams and columns for **R60** fire resistance rating

a_0 [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete beams and columns for R60 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	10	10	10	10	10	10	10	10	10
15-19	10	10	10	10	10	10	10	10	10
20-24	10	10	10	10	10	10	10	10	10
25-29	10	10	10	10	10	10	10	10	0
30-34	10	10	10	10	10	10	10	0	0
35-39	10	10	10	10	10	10	0	0	0
40-44	10	10	10	10	10	0	0	0	0
45-49	10	10	10	0	0	0	0	0	0
50-54	10	10	0	0	0	0	0	0	0
55-59	10	10	0	0	0	0	0	0	0
60-61	10	0	0	0	0	0	0	0	0
≥ 62	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete beams and columns for R90 fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete beams and columns for R90 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	-	-	10	10	10	10	10	10	10
15-19	-	10	10	10	10	10	10	10	10
20-24	10	10	10	10	10	10	10	10	10
25-29	10	10	10	10	10	10	10	10	10
30-34	10	10	10	10	10	10	10	10	10
35-39	10	10	10	10	10	10	10	10	0
40-44	10	10	10	10	10	10	10	0	0
45-49	10	10	10	10	10	10	0	0	0
50-54	10	10	10	10	10	0	0	0	0
55-59	10	10	10	10	0	0	0	0	0
60-64	10	10	10	0	0	0	0	0	0
65-69	10	10	0	0	0	0	0	0	0
70-74	10	10	0	0	0	0	0	0	0
75-79	10	0	0	0	0	0	0	0	0
≥80	0	0	0	0	0	0	0	0	0

Insulation thickness in mcr Tecbor system required for protecting reinforced concrete beams and columns for R120 fire resistance rating

a ₀ [mm]	Insulation thickness [mm] in mcr Tecbor system required for protecting reinforced concrete beams and columns for R120 fire resistance rating for the θ_{crit} design temperature								
	300°C	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C
10-14	-	-	-	-	10	10	10	10	10
15-19	-	-	-	-	10	10	10	10	10
20-24	-	-	-	10	10	10	10	10	10
25-29	-	-	10	10	10	10	10	10	10
30-34	-	10	10	10	10	10	10	10	10
35-39	-	10	10	10	10	10	10	10	10
40-44	10	10	10	10	10	10	10	10	10
45-49	10	10	10	10	10	10	10	10	0
50-54	10	10	10	10	10	10	10	0	0
55-59	10	10	10	10	10	10	0	0	0
60-64	10	10	10	10	10	0	0	0	0
65-69	10	10	10	10	0	0	0	0	0
70-74	10	10	10	10	0	0	0	0	0
75-79	10	10	10	0	0	0	0	0	0
80-84	10	10	0	0	0	0	0	0	0
85-89	10	10	0	0	0	0	0	0	0
90-94	10	0	0	0	0	0	0	0	0
95	10	0	0	0	0	0	0	0	0
≥96	0	0	0	0	0	0	0	0	0



OTHER STRUCTURES



Many facilities, especially industrial and engineering ones, require unconventional solutions.

“MERCOR” S. A. offers a range of modern materials and products to meet the needs for non-standard fire protection solutions.



Approving documents

- » National Technical Assessment ITB-KOT-2021/1800 edition 1
- » National Certificate of constancy of performance 020-UWB-2468/W
- » National declaration of performance KDWU/HZ/03/2017

Hollow beam ceilings should meet the following requirements

- » the load-bearing elements should be reinforced concrete or prestressed concrete beams designed in accordance with EN 1992-1-1 or steel beams designed in accordance with EN 1992-1-1:2008,
- » the distance between the beam axes should not exceed 150 cm,
- » the ceiling should be filled with ceramic, concrete or light concrete hollow or full bricks with a wall thickness of at least 10 mm,
- » hollow bricks should be joined with cementitious or concrete screed or concrete with a thickness of at least 40 mm,
- » the floor slab height without the screed and topping slab should be at least 100 mm,
- » bottom ceiling surface:
 - is unplastered and primed with Mapei Malech to create an adhesion layer or with another product indicated by the manufacturer,
 - is plastered and free from loose elements, reinforced with 25 × 25 mm galvanized wire mesh with a wire diameter $\varnothing 0.80$ mm or another indicated by the manufacturer, fixed using mechanical connectors appropriate for the existing substrate.
- » maximum admissible utilization of ceiling structural components (beams and ceiling slab) under normal design conditions is 100% (designed load to calculated carrying capacity of the element).

Hollow beam ceilings meeting the above requirements and EN 15037-1:2011 standard were rated as per EN 13501-2+A1:2010, depending on the flame retardant treatment thickness, with the following ratings:

- REI60 fire resistance rating with an mcr Tecwool F mortar thickness of 15 mm,
- REI120 fire resistance rating with an mcr Tecwool F mortar thickness of 25 mm,

with maximum admissible utilization of ceiling structural components (beams and ceiling slab) under normal design conditions is 100%, defined as the ratio of the designed load to the calculated carrying capacity of the element.

3.2 | Spandrels

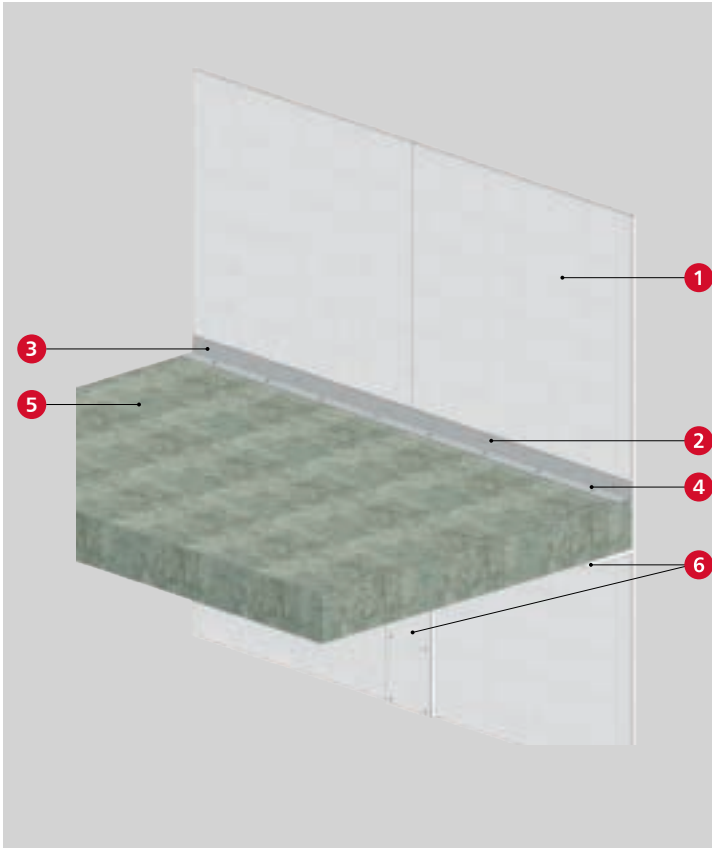
Without appropriate flame retardant treatment, the openings between the façade wall and the light façade may act like a chimney, allowing flame and smoke to spread to upper stories of the building, hindering successful evacuation. For this reason, spandrels are used, whose essential role – in the case of a fire – is to stop the fire from spreading to adjacent stories of the building.

Pursuant to the Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions for buildings and their location: § 223.

1. Spandrel walls of at least 0.8 m height should be provided in the exterior walls of multi-story buildings, with reservation of § 224.
2. Horizontal divisions in a form of canopies, cornices and balconies of at least 0.5 m outreach, or other horizontal and vertical divisions in which the sum of the outreach and the vertical dimension amounts to at least 0.8 m are considered as equivalent solutions.
3. Horizontal elements specified in item 2 should be characterized by fire resistive rating as required for the exterior building walls and should be made of non-flammable materials.
4. The requirements specified in items 1 and 2 are not applicable to hall walls and to general circulation routes.

mcr Tecbor boards of different thicknesses and sizes, appropriately selected for the buildings fire resistance rating, may be used for spandrels.

3.3.1 | mcr Tecbor board 20 mm – EI60 free standing façade wall



Approving documents

- » Standard: EN 1364-4
- » Laboratory: CIDEMCO
- » Report no. 22100-1/-2-a-M1

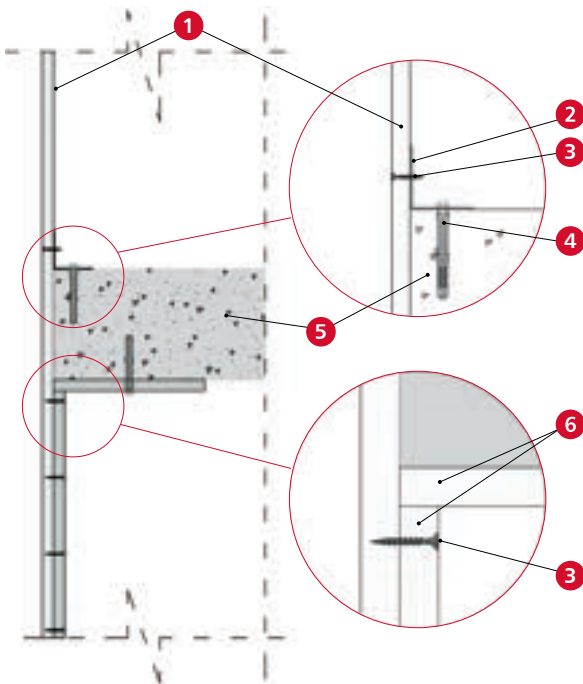
Solution

1. mcr Tecbor board 20 mm
2. 70 × 70 × 1 mm steel angle section
3. 3.5 × 45 mm galvanized self-drilling screw
4. steel plug 10x100 mm
5. floor slab
6. mcr Tecbor 20 mm board for covering joints.

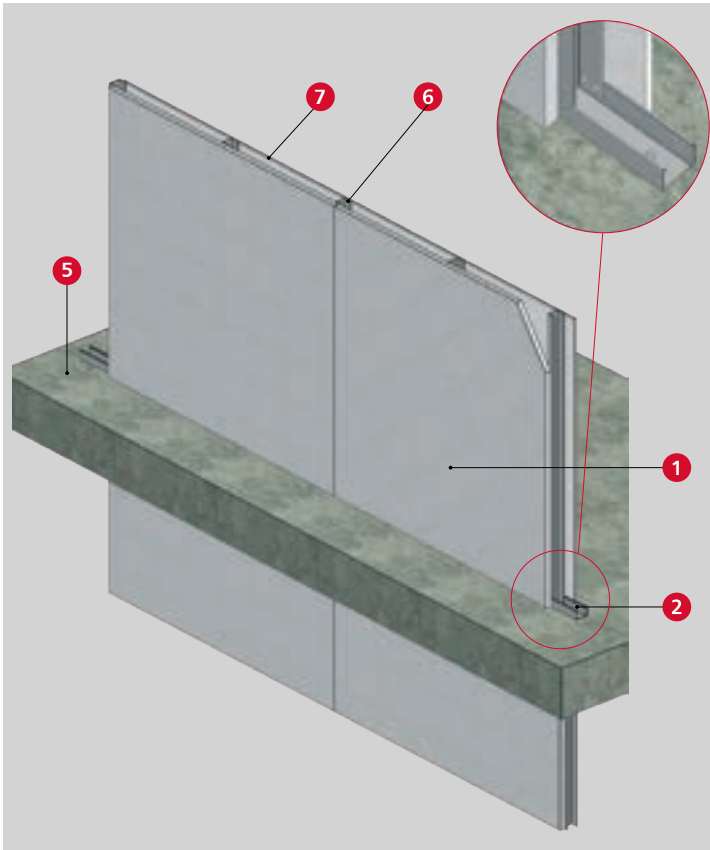
Installation description

Fix the 70 × 70 × 1 mm supporting angle section along the mcr Tecbor 20 mm board using 3.5 × 45 mm galvanized self-drilling screws spaced at 250–300 mm. Place the angle section right at the edge of the ceiling slab, fixing it with 10 × 100 mm plugs spaced at 250–300 mm. Then, place the mcr Tecbor 20 mm plates with a width of 200–250 mm at the lower edge of the ceiling slab using 10 × 100 mm plugs.

Fix the mcr Tecbor 20 mm boards with the width of 200–250 mm at the top of the lower end of the façade wall with 3.5 × 45 mm galvanized self-drilling screws. Finally, protect screw heads and joints between the boards with mcr Tecbor Joint Paste.



3.3.2 | mcr Tecbor board 20 mm – EI90 façade wall



Approving documents

- » Standard: EN 1364-1
- » Laboratory: CIDEMCO
- » Report no. 18598-1/-2 M1

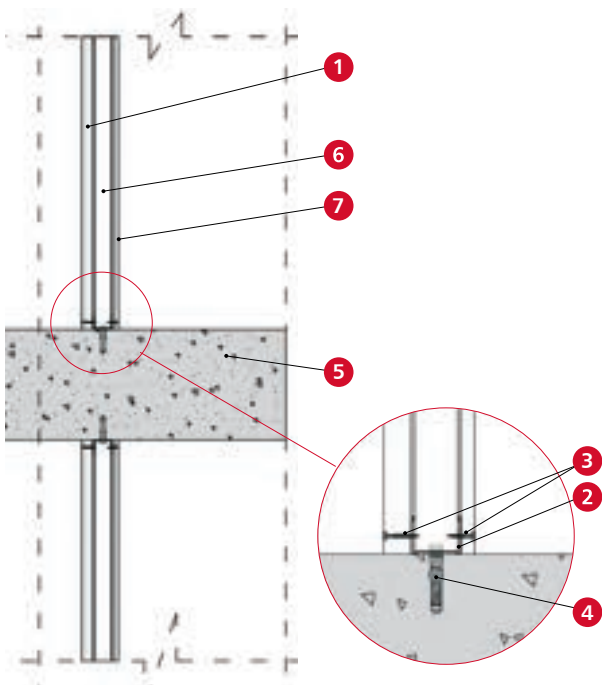
Solution

1. mcr Tecbor board 20 mm
2. steel joint section $48 \times 30 \times 0.5$ mm
3. galvanized self-drilling screw 3.5×35 mm
4. steel plug 10×60 mm
5. floor slab
6. steel stud $46 \times 36 \times 0.6$ mm
7. plasterboard with a thickness of at least 12.5 mm

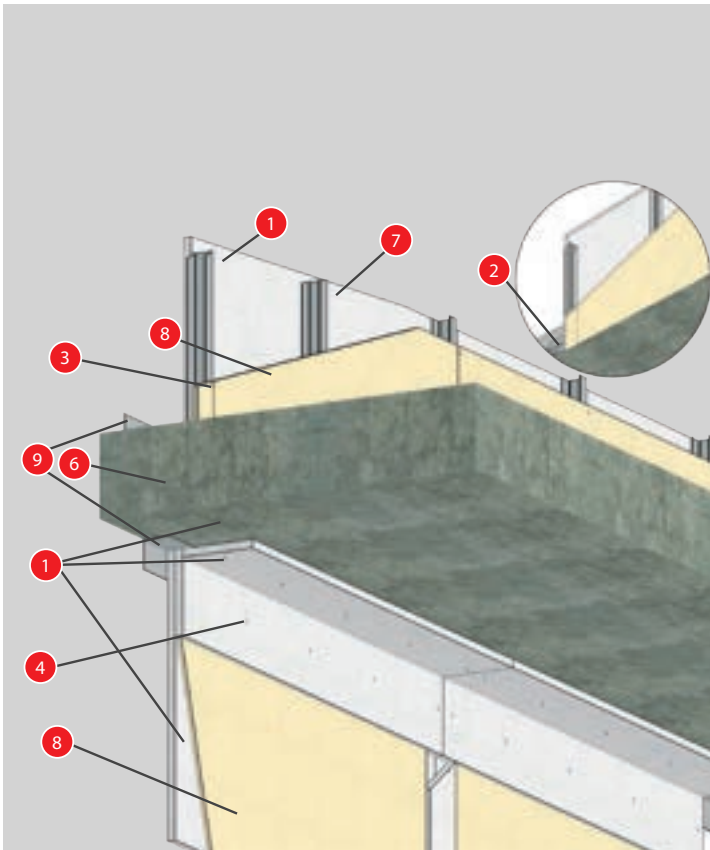
Installation description

Fix the steel $48 \times 30 \times 0.5$ mm joint section to the ceiling slab using a 10×60 mm metal plug. Then place $46 \times 36 \times 0.6$ mm pole sections at a distance of 610 mm between their axes. Fix mcr Tecbor 20 mm boards to the structure with 3.5×35 mm galvanized self-drilling screws. Apply mcr Tecbor Joint Paste on screw heads and spaces between the boards. Finally fix plasterboard inside using 3.5×35 mm galvanized self-drilling screws.

This solution was tested in two set-ups: for upper façade wall and lower façade wall.



3.3.3 | mcr Tecbor board 20 mm – EI120 façade wall



Approving documents

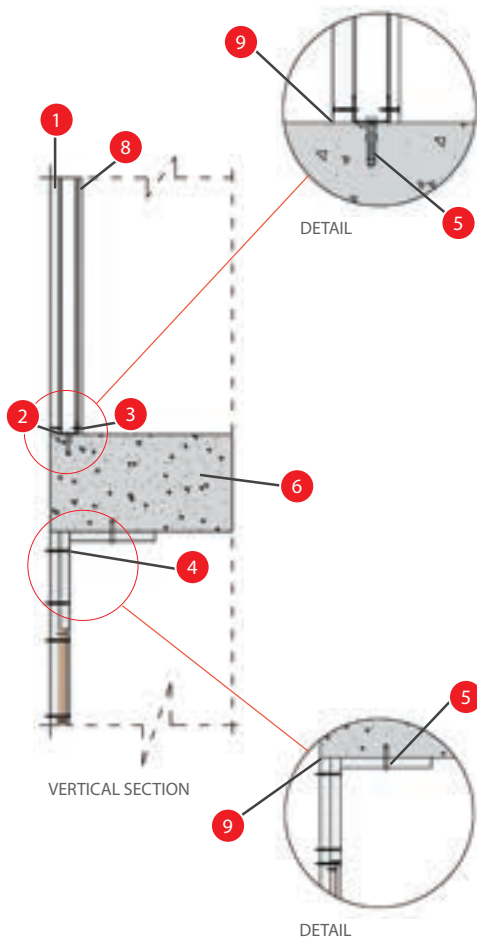
- » Standard: EN 1364-1
- » Laboratory: CIDEMCO
- » Report no. 12_02712

Solution

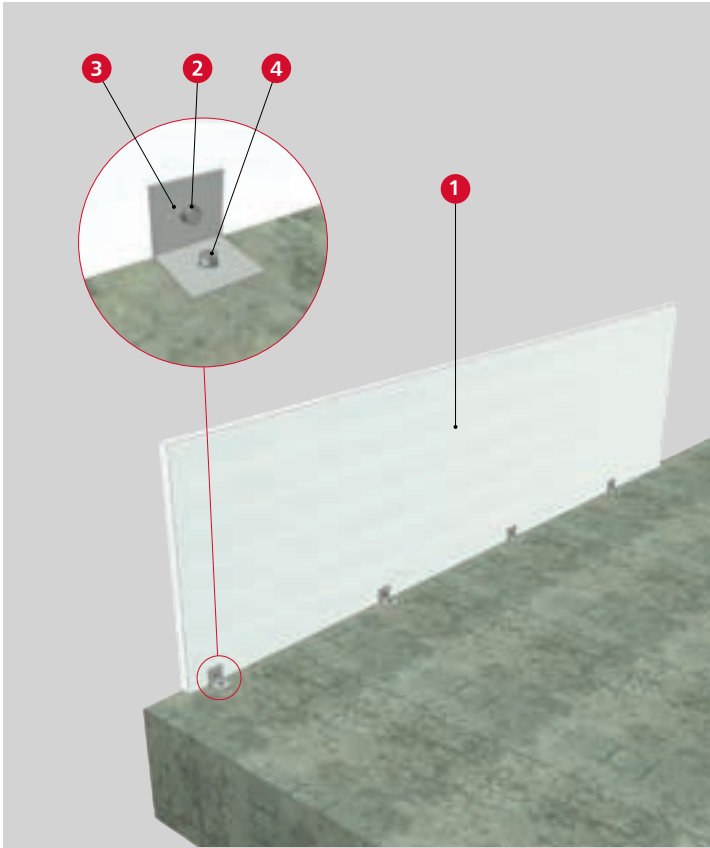
1. mcr Tecbor board 20 mm
2. steel joint section 48 × 30 × 0.5 mm
3. galvanized self-drilling screw 3.5 × 5 mm
4. 3.5 × 45 mm galvanized self-drilling screw
5. steel plug 10x60 mm
6. floor slab
7. steel stud 46 × 36 × 0.6 mm
8. plasterboard with a thickness of at least 12.5 mm
9. 70 × 70 × 1 mm steel angle section

Installation description

The upper part consists of a partition without wool, made of non-combustible plasterboard with a thickness of min. 12.5 mm, fixed on the inside to a 46 × 36 × 0.6 mm steel pole section with 3.5 × 35 mm galvanized self-drilling screws. On the opposite side, mcr Tecbor 20 mm board is fixed to a 46 × 36 × 0.6 mm steel pole section with 3.5 × 35 mm self-drilling screws. Underneath the ceiling slab, mcr Tecbor boards were installed using 70 × 70 × 1 mm section and 3.5 × 45 mm galvanized screws.



3.3.4 | mcr Tecbor board 30 mm – EI60 façade wall



Approving documents

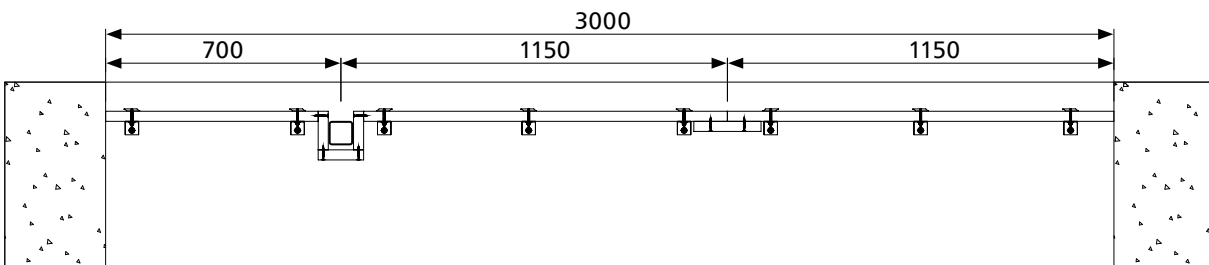
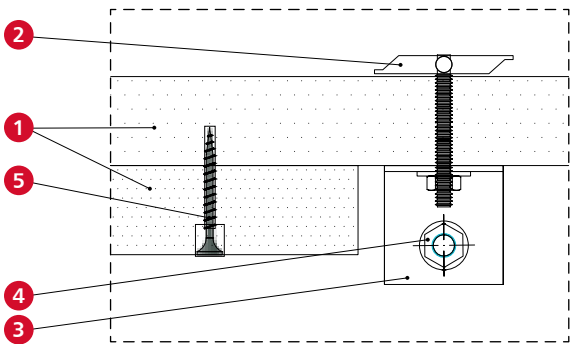
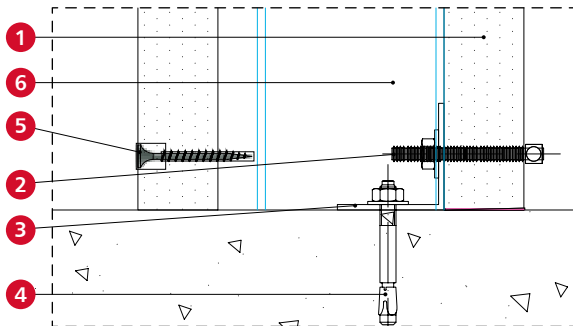
- » Standard: EN 1364-4
- » Laboratory: TECNALIA
- » Report no.: 074490-001-1/2

Solution

1. mcr Tecbor board 30 mm
2. fixing angle section
3. 40 x 40 x 2 mm steel angle section
4. M6 steel anchor
5. 3.5 x 45 mm galvanized self-drilling screw
6. steel plug 70x70 mm

Installation description

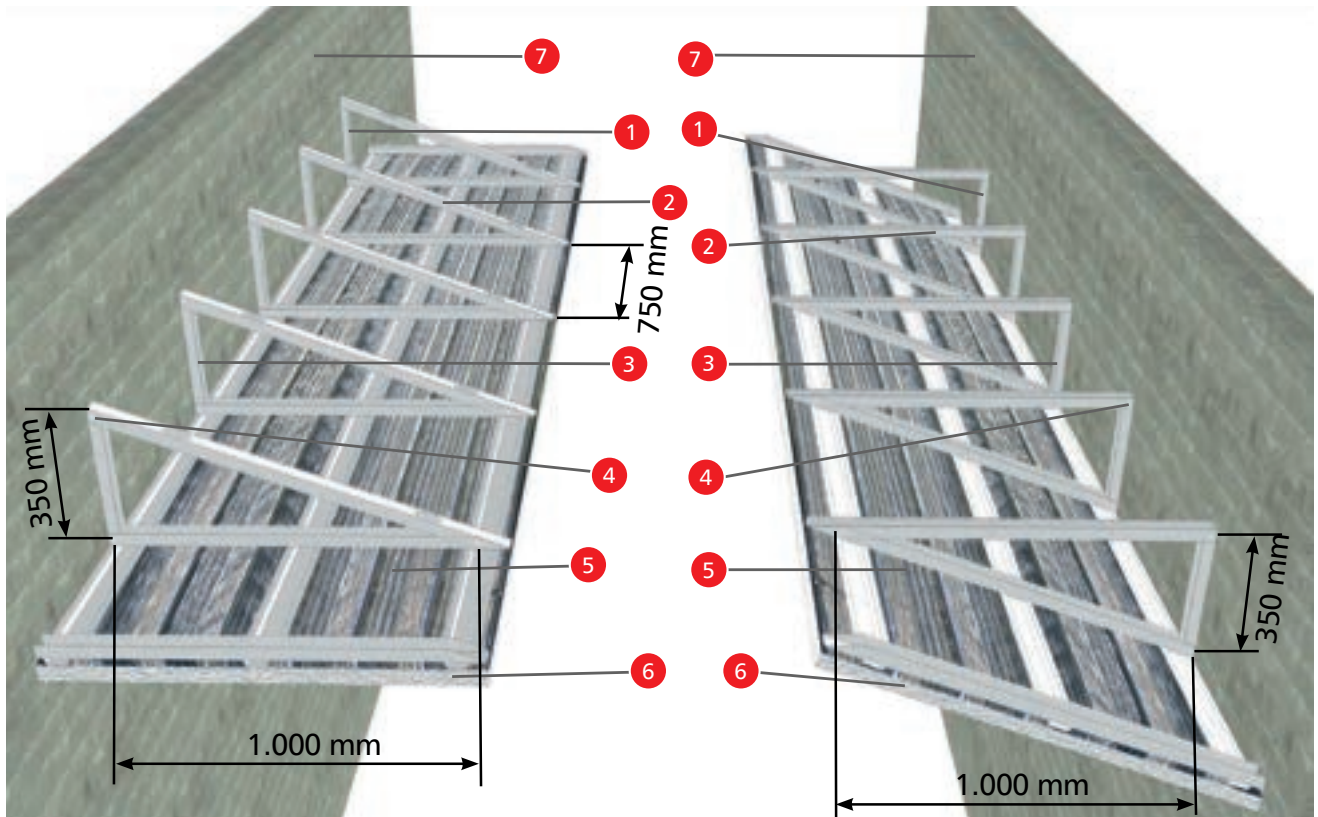
Fix the 40 x 40 x 2 mm steel angle section to the mcr Tecbor 30 mm board using fixing anchors spaced at 500 mm. Once the angle section is fixed to the boards, fix it to the ceiling slab using M6 steel anchors. Then place 30 mm mcr Tecbor boards with a width of 250 mm using 3.5 x 45 mm galvanized self-drilling screws. Apply mcr Tecbor Joint Paste on screw heads and spaces between the boards.



3.3.5 | Firebreak system / roof barrier EI 60/ EI 90

Horizontal barrier: EI 60 - EI 90

Slanted barrier: EI 60 - EI 90



Approving documents

- » Fire resistance rating test report for a firebreak / roof barrier system.
- » Laboratory: TECNALIA
- » Test N°: 060930-001-1 horizontal. 060930-001-2 slanted

Solution

1. Metal anchor 10 × 100 mm
2. Pole section 46 × 36 × 0.6 mm
3. Wall support 48 × 36 × 0.5 mm
4. Metal bolt 4.2 × 27 mm
5. Metal ribbed mesh
6. mcr Tecwool F (thickness 37 mm).
7. Partition wall

Installation description

Build a square frame using 48 × 36 × 0.6 mm sections, maintaining all dimensions specified for horizontal details and slanted setups.

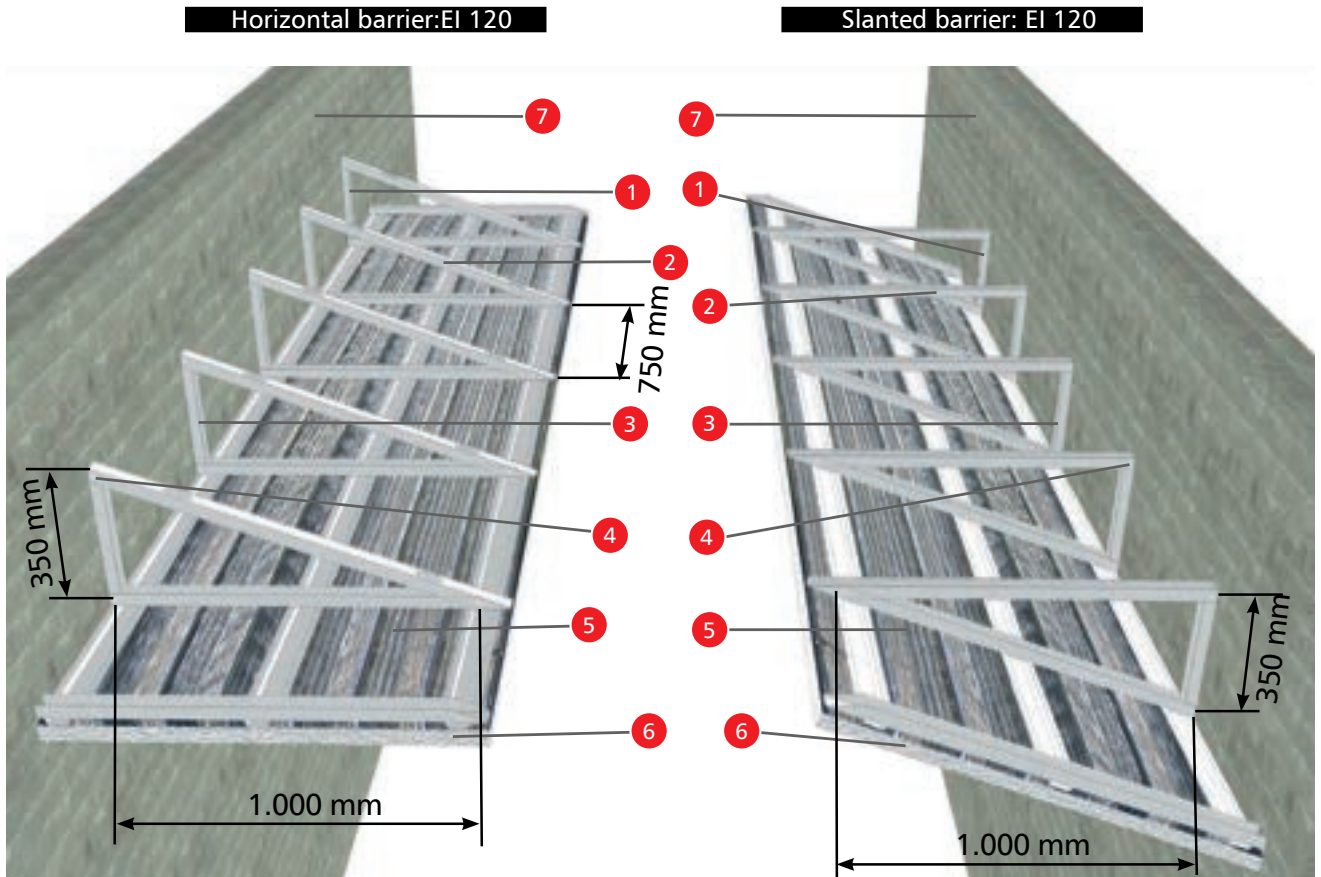
The section joints are made using 4.2 × 27 mm metal-metal screws. Framing squares are located at 750 mm and fixed to the support using a plug and a 10 × 100 mm bolt, at least 2 fastenings per support.

The three main 45 × 15 × 0.6 omega type sections, spaced at 500 mm, are fixed with 4.2 × 27 mm steel screws.

The mesh is fixed to the assembled steel sections structure using self-drilling screws and appropriate washer. The mesh is then sprayed upon with 37 mm of mcr Tecwool F mortar.

This solution has been tested as horizontal and slanted (at an angle of 30 degrees to the horizontal). Such setups enable installation in works with setups between 0° and 50° to the horizontal, provided that the installation system and maximum distances previously indicated and illustrated in various details of structural installation are met.

3.3.6 | Firebreak system / roof barrier EI120



Approving documents

- » Fire resistance rating test report for a firebreak / roof barrier system.
- » Laboratory: TECNALIA
- » Report no.: 060930-001-1 horizontal. 060930-001-2 slanted

Solution

1. Metal anchor 10 × 100 mm
2. Pole section 46 × 36 × 0.6 mm
3. Wall support 48 × 36 × 0.5 mm
4. Metal bolt 4.2 × 27 mm
5. Metal ribbed mesh
6. mcr Tecwool F (thickness 50 mm).
7. Partition wall

Installation description

Build a square frame using 48 × 36 × 0.6 mm sections, maintaining all dimensions specified for horizontal details and slanted setups.

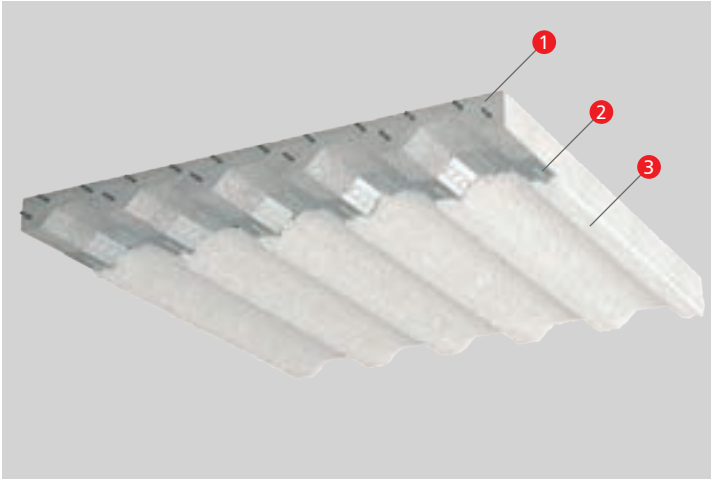
The section joints are made using 4.2 × 27 mm metal-metal screws. Framing squares are located at 750 mm and fixed to the support using a plug and a 10 × 100 mm bolt, at least 2 fastenings per support.

The three main 45 × 15 × 0.6 omega type sections, spaced at 500 mm, are fixed with 4.2 × 27 mm steel screws.

The ribbed mesh is fixed to the supporting structure on its omega sections using self-drilling screws and appropriate washer. The mesh is then sprayed upon with 50 mm of mcr Tecwool F mortar.

This solution has been tested as horizontal and slanted, creating an angle of 30° degrees to the horizontal. Such setups enable installation in works with setups between 0° and 50° to the horizontal, provided that the installation system and maximum distances previously indicated and illustrated in various details of structural installation are met.

3.3.7 | Mixed elements of sectiond REI120 steel sheets



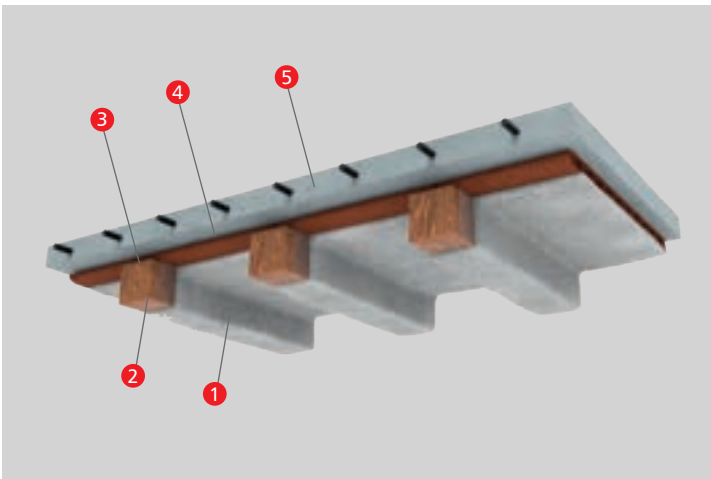
Approving documents

- » Standard: UNE ENV 13381-5
- » Laboratory: APPLUS
- » Report no.: 10/100324-148

Solution

1. Concrete / reinforced concrete element.
2. Trapezoidal sheet
3. **mcr Tecwool F** (required thickness depending on concrete thickness and the required fire resistance time)

3.3.8 | REI180 ceramic ceiling and wooden beam structure



Approving documents

- » Standard: UNE EN 1365-2
- » Laboratory: TECNALIA
- » Report no.: 77579

Solution

1. **mcr Tecwool F** with a thickness of 24 mm
2. Reinforcing mesh
3. Wooden beams
4. Ceiling formwork
5. Concrete layer (or topping slab, if it is a screed on the ceiling slab)

Installation description

Due to the specific properties of wood, application of mcr Tecwool F in this solution differs from other analyzed surfaces. Hygroscopic properties of wood cause it to absorb and release water from the environment.

To avoid adherence issues due to wood shrinking, its surface is covered with a wire mesh fixed with clamps or similar fasteners before the mcr Tecwool F mortar is applied.

The mesh acts as a reinforcement between the product and the face, providing additional flexibility and adherence to the supporting structure regardless of its expansion.

Application on ceramic bricks is similar to application on concrete slabs and walls. It is important to check the slab structure for any cavities, to avoid material waste and ensure uniform and homogeneous finish of application.

3.3.9 | EI120–EI180 partition wall / large format cladding



Approving documents

- » Standard: UNE EN 1364-1
- » Laboratory: CIDEMCO
- » Report no.: 27916

Solution

1. Corrugated metal sheet with a thickness of 0.6 mm
2. 3.5 × 25 mm self-drilling screw
3. Plug 46 × 36 × 0.6 mm
4. 60 x 60 x 1.5 mm steel section
5. **mcr Tecwool F** with a thickness of 49 mm
6. Steel rectangular section 48 × 30 × 0.5 mm

Installation description

Fix a 60 × 60 × 1.5 mm section.

Fix a 48 × 30 × 0.5 mm metal guide rail above the metal structure module and, above it, 46 × 36 × 0.6 mm metal guide rails spaced at 600 mm, using 3.5 × 25 mm self-drilling screws.

Then, place the 0.6 mm corrugated metal sheet and fix it using 3.5 × 25 mm self-drilling screws. Finally, apply mcr Tecwool F mortar on the corrugated sheet.

Due to the properties of wood, mcr Tecwool F application requires the structure to be covered with mesh and one of the spray-on mass features is its ability not to trap humidity in the wood, allowing it to evaporate freely.



REINFORCED CONCRETE
STRUCTURE ELEMENTS
REINFORCED WITH CARBON
FIBER TAPES AND MATS

- Carbon tapes (CFRP) are becoming a more and more common material for additionally reinforcing structural components made of reinforced concrete, such as ceilings, walls, beams and columns. Tapes are often used when the occupancy type of the building changes, but also to overcome design or execution errors. Their key advantage is their low weight and thickness – they do not increase the dimensions of reinforced elements significantly.

The most common tape installation method is to join them with the reinforced element using an adhesive. This is a very convenient method under construction site conditions and is also beneficial for the static performance of reinforced concrete structures. However, it also has some limitations, primarily related to the low critical temperature of the adhesive (50–100°C) and the resulting high exposure to temperatures in case of a fire. In such a case, failure to apply flame retardant treatments leads to a rapid tape adhesion loss and decrease in the load-bearing capacity of the reinforced concrete elements.

7.1 | mcr Silboard



Approving documents

- » National Technical Assessment ITB-KOT-2018/0560 edition 1
- » National Certificate of constancy of performance 020-UWB-2713/W
- » National declaration of performance KDWU/HZ/01/2018

Application

mcr Silboard – a flame retardant calcium silicate board, non-combustible, with a wide range of application in general and industrial construction. Designed for self-supporting firestop general ventilation ducts (comfort ventilation) and multi-zone smoke extract ducts, cable ducts, installation ducts, non-bearing walls (shafts), protecting steel structures and reinforced concrete structural components reinforced with carbon fiber tapes and mats.

A set for applying flame retardant treatments onto reinforced concrete structural components reinforced with carbon fiber tapes and mats consists of:

- » mcr Silboard boards with a thickness of 40 mm and/or 20 mm,
- » mcr Sil-MK adhesive,
- » mcr Polylock K firestop sealing compound,
- » steel dowels and concrete screws,
- » steel screws.

Technical parameters

» Board physical and chemical properties

Available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
External appearance	white/cream color
Density	550 ± 15% kg/m ³
Compressive strength	≥ 1,0 MPa
Perpendicular tensile strength	≥ 0,10 MPa
Parallel tensile strength	≥ 0,40 MPa
Dimension stability	the boards are dimensionally stable
Heat conductivity	0,095 W/(m·K)
Reaction to fire class	A1
Use category	Y

Board features

- » high mechanical strength
- » easy processing; quick, easy and clean installation
- » smooth and clean flame retardant insulation surface
- » non-toxic and free from substances harmful to health
- » total biological corrosion resistance (fungi, bacteria)
- » environmental category Y – indoor applications and partial exposure to weather conditions as per ETAG 018-4

Concrete elements with flame retardant treatments, reinforced with carbon fiber tapes and mats, should be:

- » at least 150 mm thick – for walls,
- » at least 150 mm thick – for ceilings reinforced and protected from underneath,
- » at least 200 mm thick – for ceilings reinforced and protected from above, with fire exposure up to 120 minutes,
- » width of at least 150 mm and height of at least 250 mm – for beams,
- » cross-section of at least 150 × 150 mm – for columns.

7.2 | Installation

7.2.1 | Reinforced concrete ceilings and walls – flame retardant treatments execution conditions

Apply the first layer of the flame retardant treatment onto reinforced concrete structural components reinforced with carbon fiber tapes and mats as baseplates from mcr Silboard with a thickness of 20 mm and width of at least 100 mm (base plate projection dimensions should be identical with the proper flame retardant treatment or larger), fixed to the substrate with the mcr Sil-MK adhesive. When the adhesive cures, the proper retardant layer is made of mcr Silboard boards fixed to the reinforced concrete ceiling or wall through the 20 mm mcr Silboard baseplates using steel dowels or 8 × 90 mm concrete screws spaced at no more than 400 × 400 mm.

For flame retardant treatment consisting of many mcr Silboard layers, subsequent layers are fixed to the previous ones using steel screws:

- » 5 × 70 mm for mcr Silboard boards with a thickness of 40 mm
 - » 5 × 50 mm for mcr Silboard boards with a thickness of 20 mm
- with a transversal spacing of no more than 300 mm and longitudinal spacing of no more than 400 mm.

The baseplate and the proper plate layer sides of the protection are closed with mcr Silboard with a thickness of 40 mm, fixed perpendicularly using steel screws and mcr Polylack K. Protect board joints and screw or dowel sites with mcr Sil-MK adhesive.

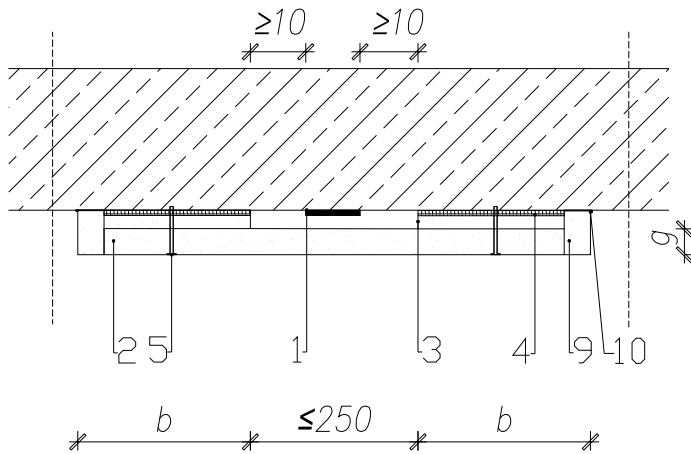
When performing flame retardant treatments, take into consideration the side overlap width (b) as per the tables below.

» Minimum thickness (g) and side overlap width (b) of the mcr Silboard flame retardant insulation on ceilings and walls for the assumed critical temperature of the adhesive

Time [min.]	minimum thickness (g) and side overlap width (b) of the mcr Silboard flame retardant insulation on ceilings and walls (g/b) [mm] for the assumed critical temperature of the adhesive				
	50°C - 59°C	60°C - 69°C	70°C - 79°C	80°C - 89°C	≥ 90°C
30	60 / 200	60 / 200	40 / 100	40 / 100	40 / 100
60	80 / 250	80 / 250	80 / 250	80 / 250	80 / 150
90	120 / 300	120 / 250	120 / 250	120 / 250	120 / 150
120	120 / 400	120 / 350	120 / 300	120 / 250	120 / 250

Time [min.]	minimum fixing distance of the mcr Silboard flame retardant treatment from the ceiling and wall opening edges [mm] with a firestop insulation thickness (g) / side overlap width (b)								
	40 / 100	60 / 200	80 / 150	80 / 250	120 / 150	120 / 250	120 / 300	120 / 350	120 / 140
30	100	100	125	0	100	0	0	0	0
60	-	-	200	100	200	100	50	0	0
90	-	-	-	-	250	150	100	50	0
120	-	-	-	-	-	200	150	100	50

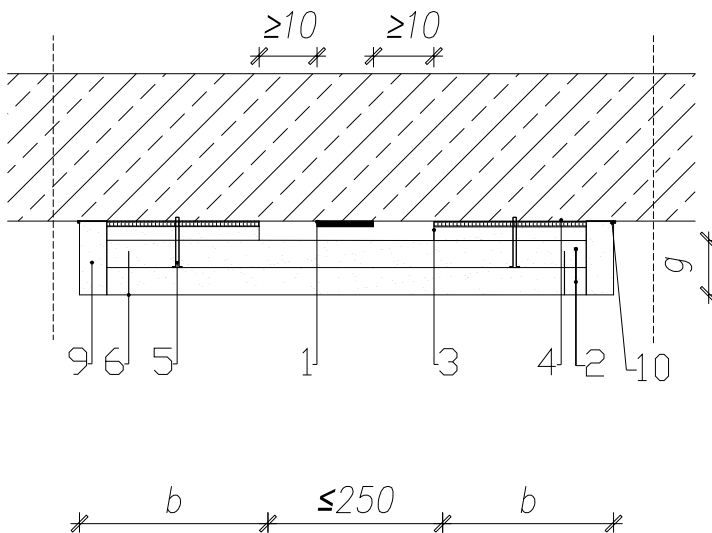
721.1 | Reinforced concrete ceilings and walls – single-layer protection



g – overall board cladding thickness
 b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylock K mass

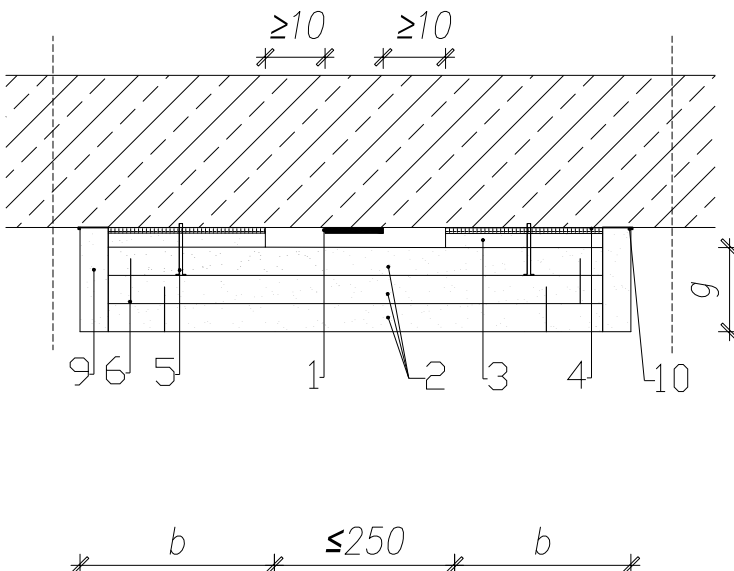
721.2 | Reinforced concrete ceilings and walls – double-layer protection



g – overall board cladding thickness
 b – overlap width

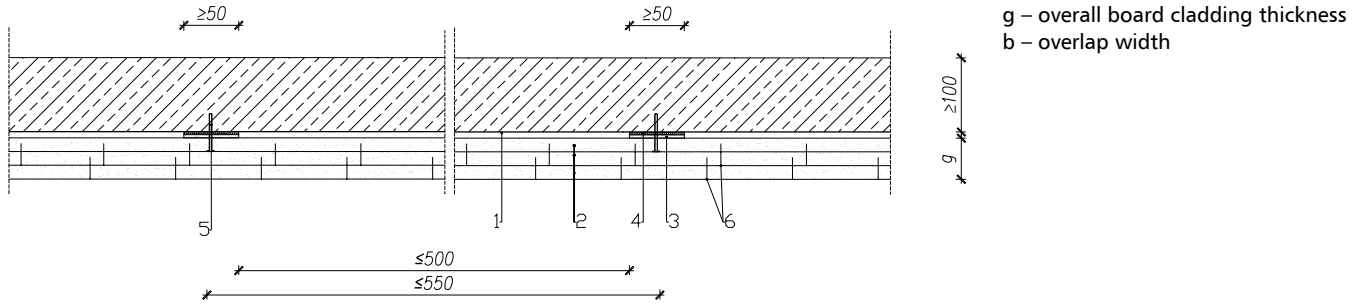
1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5 x 50 mm or 3.5 x 70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylock K mass

721.3 | Reinforced concrete ceilings and walls – triple-layer protection

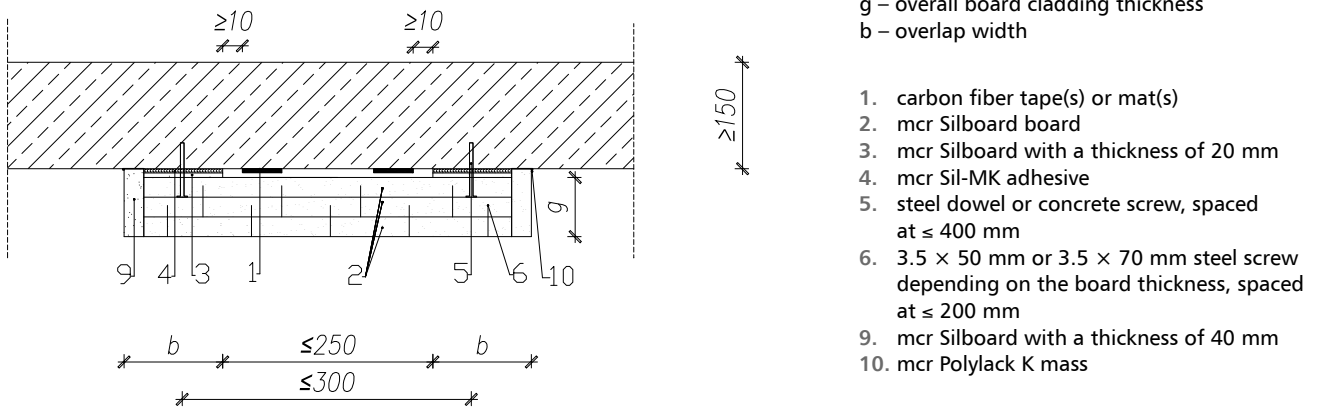


g – overall board cladding thickness
 b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5 x 50 mm or 3.5 x 70 mm steel screw, depending on the board thickness, spaced at ≤ 200 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylock K mass

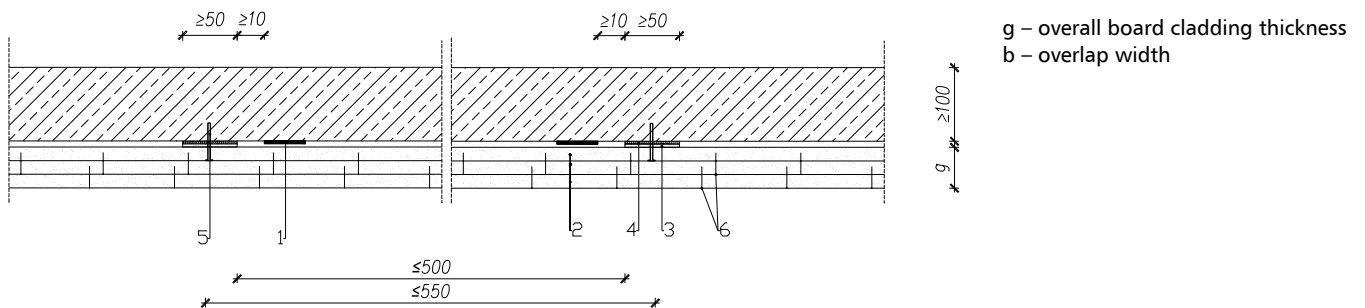


1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw, depending on the board thickness, spaced at ≤ 200 mm



g – overall board cladding thickness
 b – overlap width

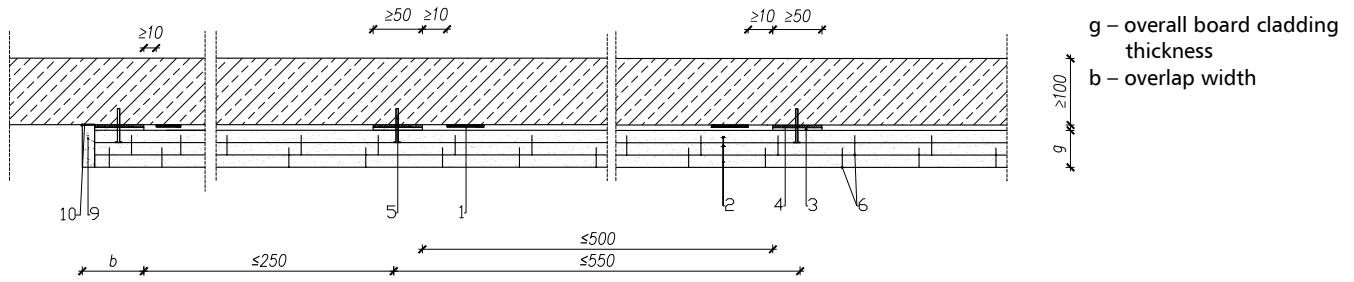
1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylack K mass



g – overall board cladding thickness
 b – overlap width

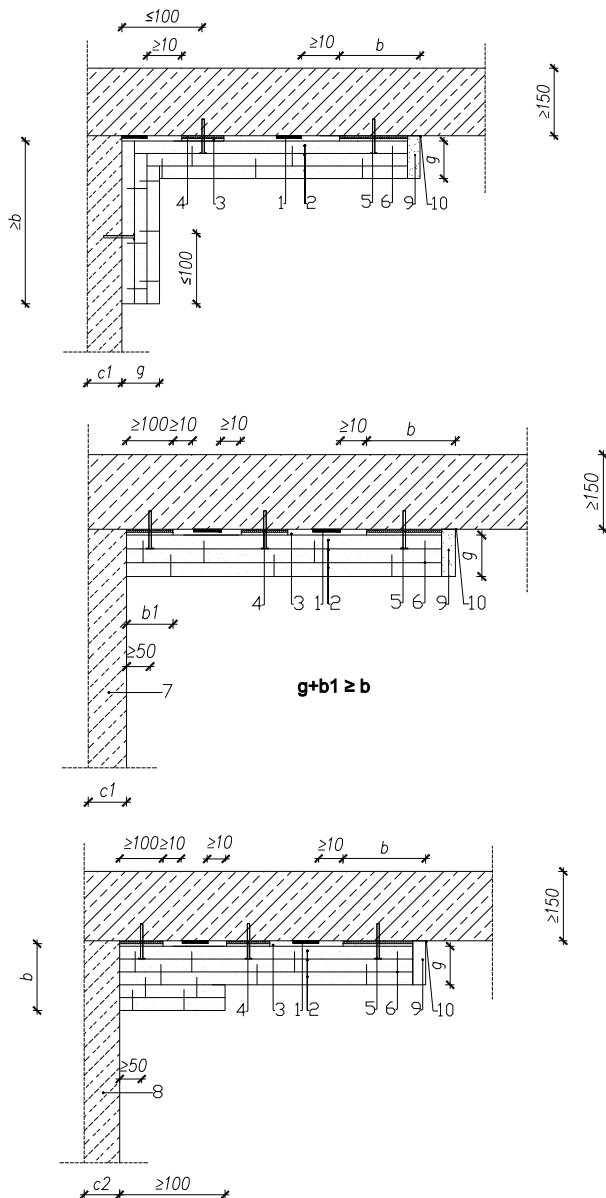
1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw, depending on the board thickness, spaced at ≤ 200 mm

7.214| Reinforced concrete ceilings and walls – multi-layer protection



1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw, depending on the board thickness, spaced at ≤ 200 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylack K mass

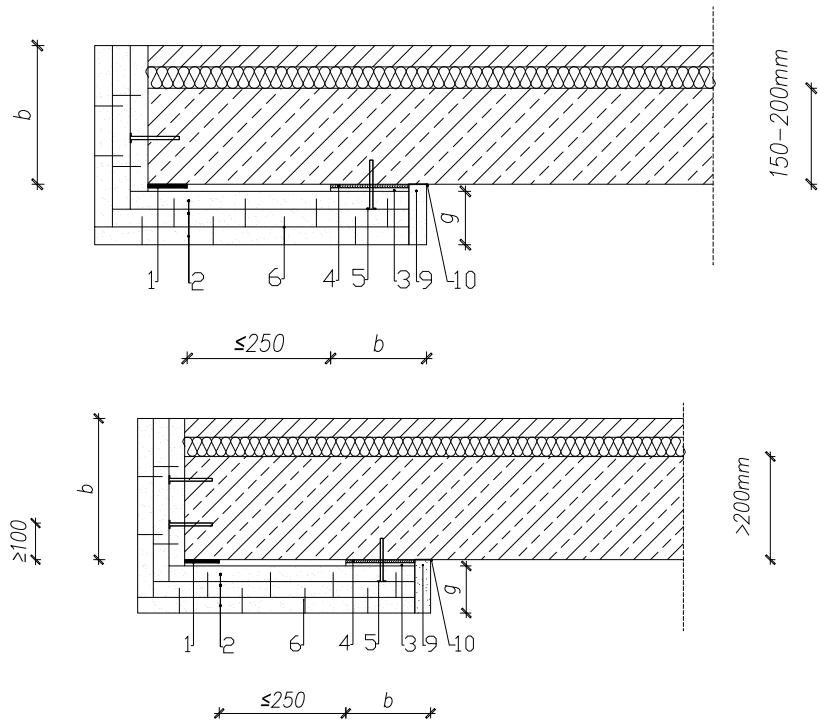
7.215| Reinforced concrete ceilings and walls – protection at the joint with the vertical partition



g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm
7. vertical reinforced concrete partition with $c1$ thickness and $\geq b + 100$ mm length
8. vertical reinforced concrete partition wall with $c2$ thickness and EI rating not lower than required for the protected element
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylack K mass

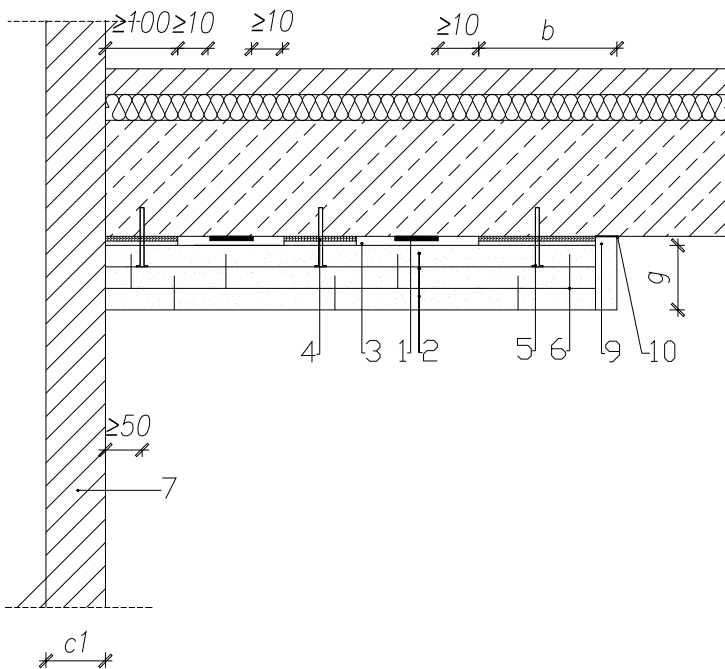
72.16 Reinforced concrete ceilings and walls – opening edge protection



g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylack K mass

72.17 Reinforced concrete ceilings and walls – protection at the edge adjacent to the vertical element with an EI fire resistance rating



g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm
7. vertical reinforced concrete partition with c1 thickness and $\geq b + 100$ mm length
9. mcr Silboard with a thickness of 40 mm
10. mcr Polylack K mass

7.2.2 | Reinforced concrete beams and column – conditions for performing flame retardant treatments

The first layer of the flame retardant treatment for reinforced concrete structural components reinforced with carbon fiber tapes and mats should be fixed to the substrate (beam and column sides) with steel dowels or 8 × 90 mm concrete screws in transversal spacing of no more than 200 mm and longitudinal spacing of no more than 400 mm. mcr Silboard boards are fixed from below to the beam on top of the previously fixed side boards using 5 × 70 mm steel screws in longitudinal spacing of no more than 200 mm and to the substrate using steel dowels or 8 × 90 mm concrete screws in transversal spacing of no more than 200 mm and longitudinal spacing of no more than 400 mm.

For flame retardant treatment consisting of many mcr Silboard layers, subsequent layers are fixed to the previous ones using steel screws:

- » 5 × 70 mm for mcr Silboard boards with a thickness of 40 mm
- » 5 × 50 mm for mcr Silboard boards with a thickness of 20 mm in transversal spacing of no more than 300 mm and longitudinal spacing of no more than 400 mm, whereby the layer protecting the bottom of the beam is fixed to the boards protecting the beam sides with screws:
- » 5 × 70 mm for mcr Silboard boards with a thickness of 40 mm
- » 5 × 50 mm for mcr Silboard boards with a thickness of 20 mm spacing of no more than 200 mm.

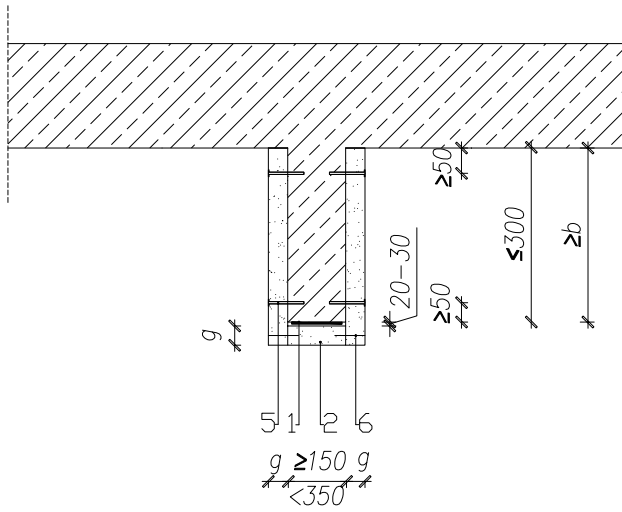
Protect board joints and screw or dowel sites with mcr Sil-MK adhesive.

» Minimum thickness (g) and side overlap width (b) of the mcr Silboard flame retardant insulation on beams for the assumed critical temperature of the adhesive

Time [min.]	Minimum thickness (g) and side overlap width (b) of the flame retardant insulation on ceilings and walls for the assumed critical temperature of the adhesive, g / b, mm				
	50°C ÷ 59°C	60°C ÷ 69°C	70°C ÷ 79°C	80°C ÷ 89°C	≥ 90°C
30	60 / 150	60 / 150	40 / 100	40 / 100	40 / 100
60	80 / 300	80 / 300	60 / 200	60 / 200	60 / 200
90	80 / 300	80 / 300	80 / 300	80 / 300	60 / 200
120	100 / 300	100 / 300	80 / 300	80 / 300	80 / 300

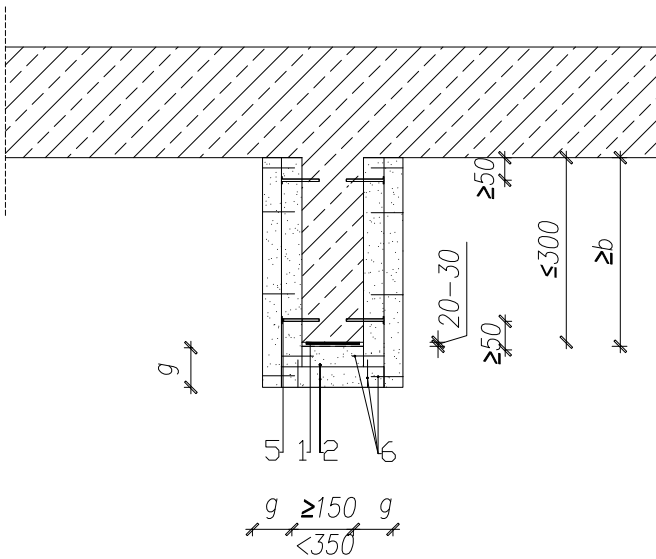
Time [min.]	Minimum thickness (g) and side overlap width (b) of the flame retardant insulation on ceilings and walls for the assumed critical temperature of the adhesive, g / b, mm				
	50°C ÷ 59°C	60°C ÷ 69°C	70°C ÷ 79°C	80°C ÷ 89°C	≥ 90°C
30	60	60	40	40	40
60	80	80	60	60	60
90	80	80	80	80	60
120	100	100	80	80	80

7.22.1 | Single-, double- and three-layer protection

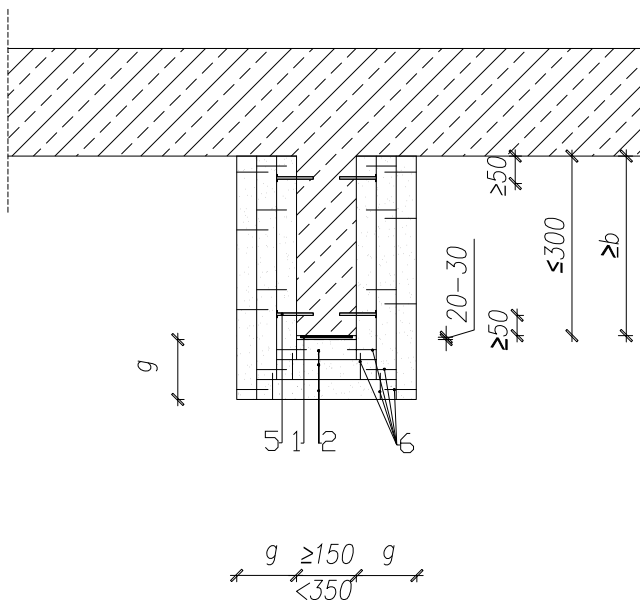


g – overall board cladding thickness
b – overlap width

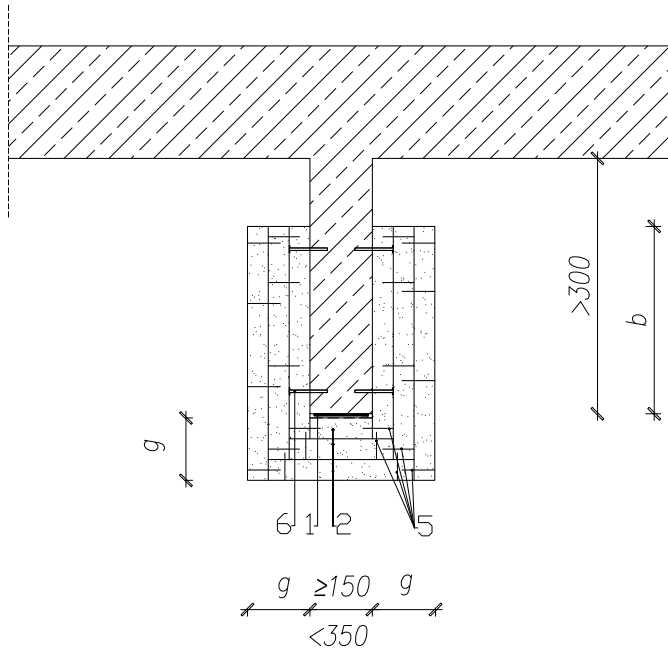
1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw, depending on the board thickness, spaced at ≤ 200 mm



» Protection of a beam with a height over 300 mm

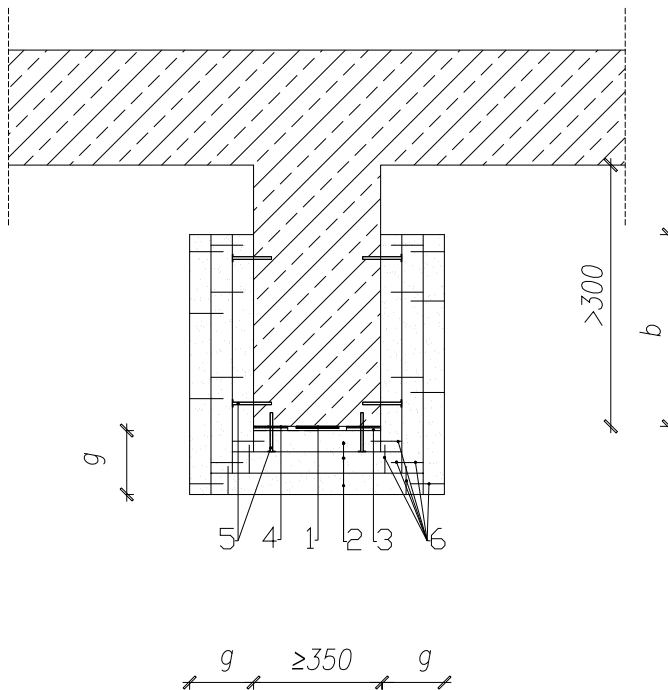


» Protection of a beam with a height over 300 mm

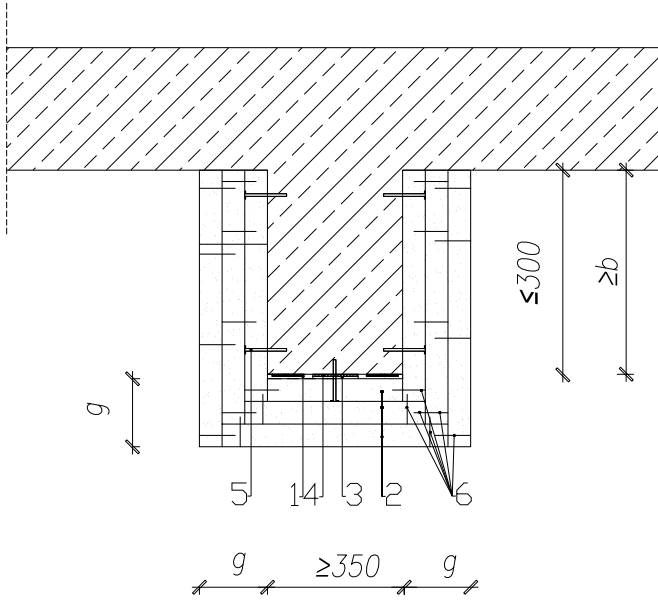


g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm

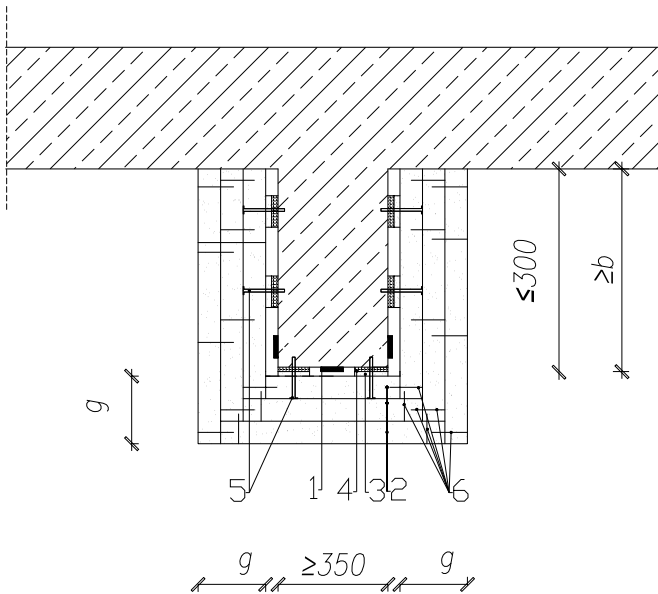


» Protection of a beam with a height over 300 mm and width of no more than 350 mm

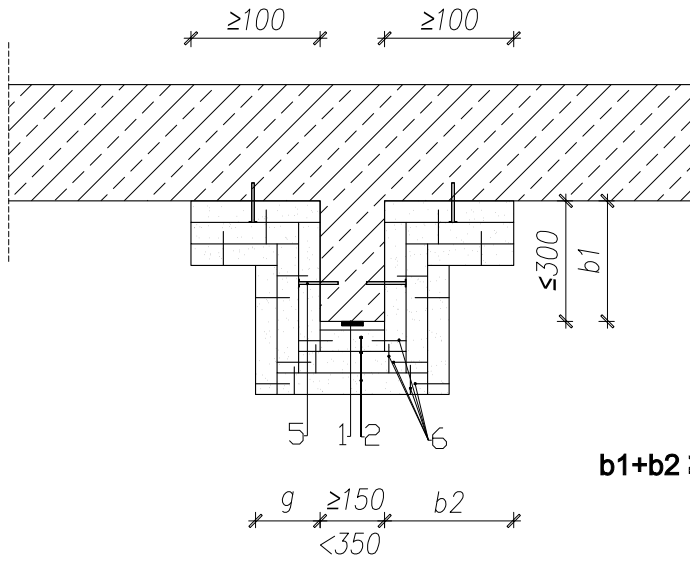


g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 or 3.5×70 mm steel screw mm depending on the board thickness, spaced at ≤ 200 mm

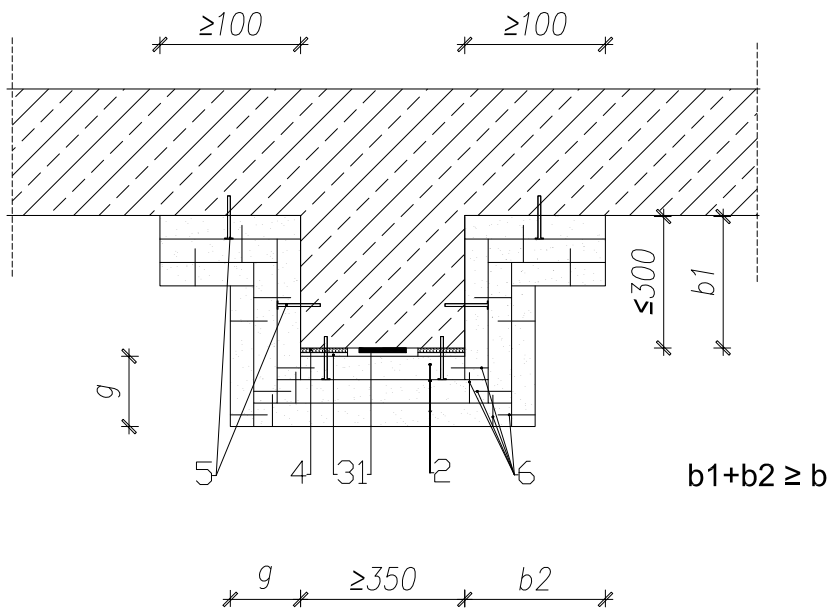


» Protection of a beam with a height not exceeding 300 mm

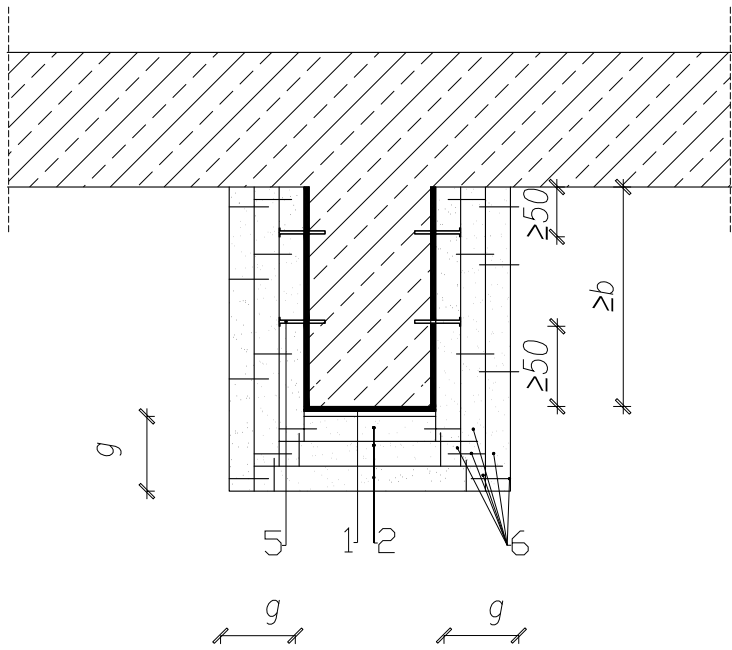


g – overall board cladding thickness
b – overlap width

1. carbon fiber tape(s) or mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm

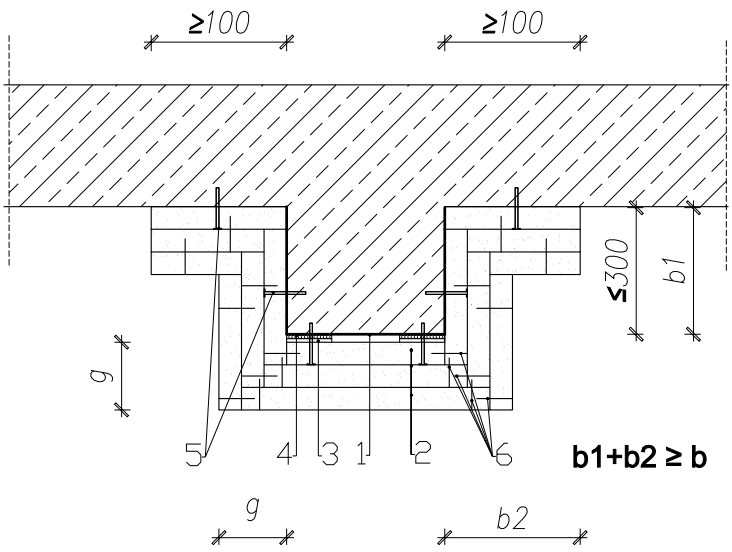


» Protection of a beam reinforced with carbon fiber mats



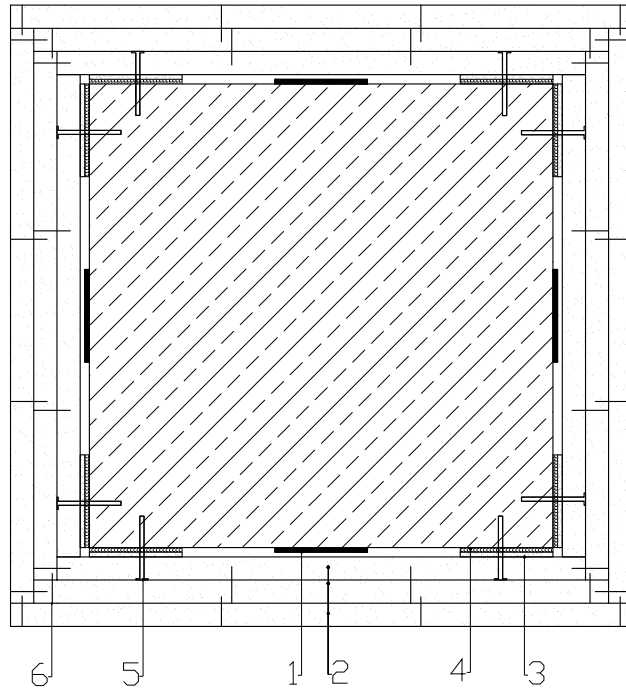
g – overall board cladding thickness
b – overlap width

1. carbon fiber mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. 3.5×50 mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm



$b_1 + b_2 \geq b$

» Protection of a column reinforced with carbon fiber mats

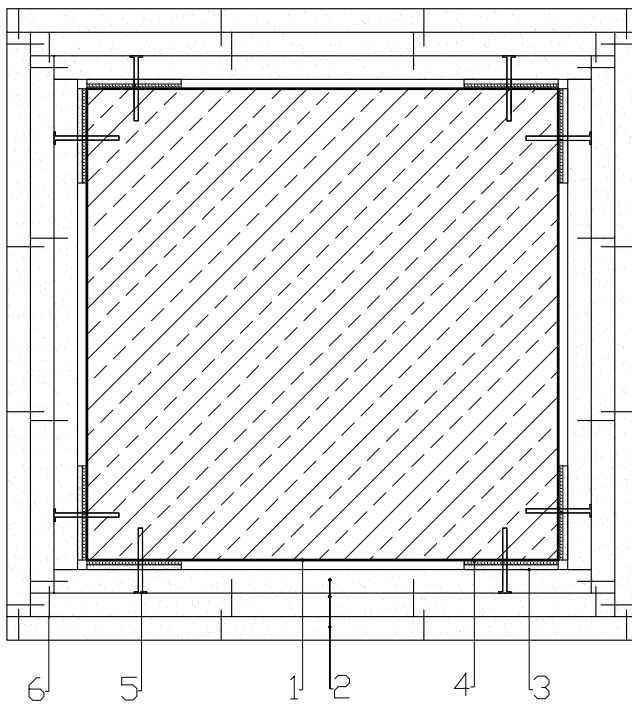


g – overall board cladding thickness
b – overlap width

1. carbon fiber mat(s)
2. mcr Silboard board
3. mcr Silboard with a thickness of 20 mm
4. mcr Sil-MK adhesive
5. steel dowel or concrete screw, spaced at ≤ 400 mm
6. $6.3.5 \times 50$ mm or 3.5×70 mm steel screw depending on the board thickness, spaced at ≤ 200 mm

g

g



g

g

NOTE

For flame retardant treatment consisting of many mcr Silboard layers, thicker boards are fixed closer to the surface of the protected element.

7.3 | mcr Tecbor



Technical parameters

» Board physical and chemical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	smooth on one side, light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤ 0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

Approving documents

- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03
- » ITB flame retardance evaluation no. 00990.2/16/R200NZP

Application

mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction. It is designed for protecting cladding for steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, building masonry walls, building suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

The mcr Tecbor system is designed, among others, for protecting carbon fiber tapes and mats constituting an external, glued-on reinforcement of concrete elements (beams, columns) under standard fire conditions.

The system is designed for indoor applications on reinforced concrete elements of at least C 20/25 concrete with the dimensions:

- » column cross-section of at least 200 × 200 mm,
- » beam width of at least 150 mm and height of at least 250 mm.

Board features

- » high fire resistance rating, non-combustible
- » good thermal performance
- » quick and easy to install
- » mechanical strength
- » free from substances harmful to health
- » resistant to fungi, insects and rodents

4.3.1 | Installation

The protection is installed on beams and columns in the following order:

1. mcr Tecbor board stripes are fixed to the beam sides using 8 × 90 mm concrete nails in transversal spacing of 200 mm and longitudinal spacing ≤ of 400 mm,
2. mcr Tecbor board stripes are fixed from underneath to the previously fixed boards using 5 × 70 mm screws in transversal spacing of 200 mm,
3. Any subsequent fire protection layers are fixed to the previously fixed layer using 5 × 70 mm screws in transversal spacing ≤ of 300 mm and longitudinal spacing ≤ of 400 mm for boards with a thickness of 40 mm or with 5 × 50 mm screws in transversal spacing ≤ of 300 mm and longitudinal spacing ≤ of 400 mm for boards with a thickness of 20 mm, whereby the layer protecting the bottom of the beam is fixed to the boards protecting the beam sides with 5 × 70 mm screws spaced at ≤ 200 mm for boards with a thickness of 40 mm and 5 × 50 mm screws spaced at ≤ 200 mm for boards with a thickness of 20 mm.

Board joints and screw or dowel sites are sealed with mcr Tecbor Joint Paste.

» **Required thickness [mm] and side overlap width [mm] of the insulation made using mcr Tecbor boards on beams for the set critical temperature of the adhesive**

Time [min.]	Required thickness "g" [mm] / side overlap width "b" [mm] of the insulation made using mcr Tecbor boards on beams for the set critical temperature of the adhesive				
	50°C to 59°C	60°C to 69°C	70°C to 79°C	80°C to 89°C	90°C and more
30	80/200	80/200	60/200	40/150	40/150
60	100/300	80/200	80/200	60/200	60/200
90	100/300	100/300	100/300	100/300	100/300
120	–	–	–	–	–

» **Required thickness [mm] and side overlap width [mm] of the insulation made using mcr Tecbor boards on columns for the set critical temperature of the adhesive**

Time [min.]	Required thickness [mm] of the insulation made using mcr Tecbor boards on columns for the set critical temperature of the adhesive				
	50°C to 59°C	60°C to 69°C	70°C to 79°C	80°C to 89°C	90°C and more
30	80	80	60	40	40
60	100	80	80	60	60
90	100	100	100	100	100
120	–	–	–	–	–

4.4 | mcr Isoverm 825



Technical parameters

» Physical and mechanical properties of mcr Tecwool 825 mortar as a part of the mcr Isoverm 825 system

Bulk density of the cured mortar, kg/m ³	402 ± 10%
Mortar bending strength, MPa	≥ 1,0
Wytrzymałość zaprawy na ściskanie, MPa	≥ 1,5
Concrete surface mortar adhesiveness, MPa	≥ 0,1 or render rupture
Durability, described as change in insulation performance, adhesion and appearance	resistant to X environment conditions

Constant quality control during the manufacturing process of the mcr Tecwool 825 mix guarantees proper physical and mechanical features are maintained to ensure flame retardant properties.

Approving documents

- » National Technical Assessment ITB-KOT-2021/1717 edition 1
- » National Certificate of constancy of performance 020-UWB-2861/W
- » National declaration of performance KDWU/HZ/01/2021
- » ITB flame retardance evaluation no. 00990.3/16/R200NZP

Application

mcr Isoverm 825 – a set of products for performing flame retardant treatments of steel structural components, as well as for applying flame retardant treatments onto reinforced concrete structural components reinforced with carbon fiber tapes and mats.

The mcr Isoverm 825 product set includes:

- » mcr Tecwool 825 mortar for the basic layer of flame retardant insulation,
- » steel mesh with rectangular openings,
- » steel pins with clamping caps for mesh fixing (optional).

If the protected structure is directly exposed to weather conditions, it is possible to use an additional protective layer of finishing paints.

The **mcr Isoverm 825** system is designed, among others, for protecting carbon fiber tapes and mats constituting an external, glued-on reinforcement of concrete elements (beams, columns) under standard fire conditions.

The system is designed for indoor applications on reinforced concrete elements of at least C 20/25 concrete with the dimensions:

- » column cross-section of at least 200 × 200 mm,
- » beam width of at least 150 mm and height of at least 250 mm.

4.4.1 | Installation

The protection is installed on beams and columns in the following order:

1. Fix steel pins to galvanized perforated plates with a diameter of 1.5 mm and maximum length of 80 mm to the sides of the beam to be protected, with transversal spacing of maximum 300 mm and longitudinal spacing of maximum 300 mm.
2. Spray the first layer of mcr Tecwool 825 mortar, max. 35 mm, on the sides and the bottom of the protected beam following the method described in mcr Isoverm 825 system Technical Information.
3. Fix an Izola type min. 0.6 mm galvanized wire concealed mesh with openings of maximum 50 × 50 mm on the pins using galvanized clamping caps.
4. 12 hours after spraying the first layer is finished, spray the second layer of mcr Tecwool 825 mortar, max. 35 mm, on the protected element, following the method described in mcr Isoverm 825 system Technical Information.
5. Fix the second layer of the concealed mesh in the same manner the first layer was fixed.
6. Spray the third layer of mcr Tecwool 825 mortar with a thickness of 100 mm, following the method described in mcr Isoverm 825 system Technical Information.

» **Required thickness [mm] and side overlap width [mm] of the insulation in mcr Isoverm 825 system on beams for the set critical temperature of the adhesive**

Time [min.]	Required thickness "g" [mm] / side overlap width "b" [mm] of the insulation in mcr Isoverm 825 system on beams for the set critical temperature of the adhesive				
	50°C to 59°C	60°C to 69°C	70°C to 79°C	80°C to 89°C	90°C and more
60	100/300	100/300	100/300	100/300	100/300

» **Required thickness [mm] and side overlap width [mm] of the insulation in mcr Isoverm 825 system on columns for the set critical temperature of the adhesive**

Time [min.]	Required thickness "g" [mm] / side overlap width "b" [mm] of the insulation in mcr Isoverm 825 system on beams for the set critical temperature of the adhesive				
	50°C to 59°C	60°C to 69°C	70°C to 79°C	80°C to 89°C	90°C and more
60	100	100	100	100	100

4.5 | mcr Tecwool F



Technical parameters

» **Physical and mechanical properties**

dry mcr Tecwool F mix	
external appearance	grey dry mix, without clumping or contamination
cured mcr Tecwool F mortar	
bulk density of dry material	351 +/- 10% kg/m ³
linear shrinkage	≤ 0,07 %
steel surface adhesiveness	≥ 0,002 MPa or render rupture
concrete surface adhesiveness	≥ 0,002 MPa or render rupture
reaction to fire class	A1

As per the UNE-EN 1361-1 standard, proofing of carbon fiber tapes and mats with mcr Tecwool F mortar with a thickness of 50 mm provides a fire resistance of EI120.

Approving documents

- » European Technical Assessment ETA 11/0185
- » Certificate of constancy of performance 1220-CPR-110
- » Declaration of performance TCRS-TW-01
- » TECNALIA test report no. 27796-1

Application

mcr Tecwool F – spray-on flame retardant system for steel and reinforced concrete construction structures, spray-on acoustic coating, flame retardant treatment for reinforced concrete structural components reinforced with carbon fiber tapes and mats.

The mcr Tecwool F is designed to provide flame retardant treatment for open and box section steel structural components, reinforced concrete elements, reinforced concrete ceilings and reinforced concrete ceilings on trapezoidal sheets, as well as beam-hollow ceilings with bearers made of reinforced concrete, pretensioned prestressed concrete or steel beams filled with ceramic, concrete or light concrete hollow or full bricks.

System features

- » high durability
- » quick and simple application
- » flame retardant insulation weight neglectable in static calculations
- » biologically neutral, non-toxic, environment friendly
- » resistant to cracking, dust, rotting or fungi
- » airtight – ensures perfect coverage
- » high thermal performance
- » very good acoustic properties (sound absorption)
- » no corrosive action on an unprotected steel surface
- » traditional light grey external texture
- » paintable with finishing paints
- » heavy metal free

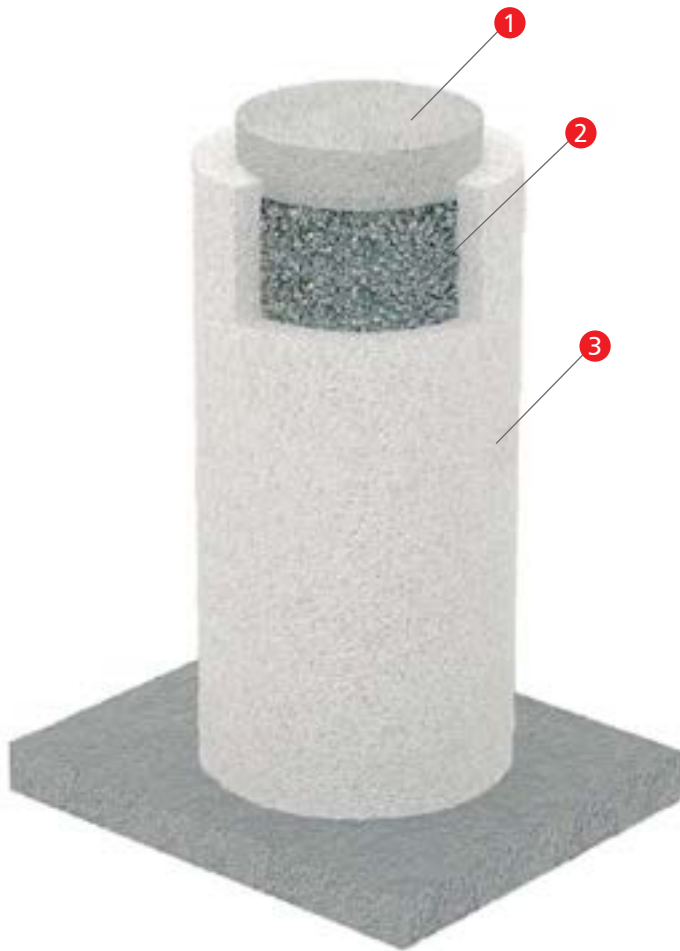
4.5.1 | Installation

The carbon fiber surface must be rough, which may be achieved by sprinkling the still sticky external resin layer with silica sand. This prevents bonding issues between the mortar and the resin. The protected surface must be completely free from dust, oil and/or grease, loose particles, paint marks, etc.

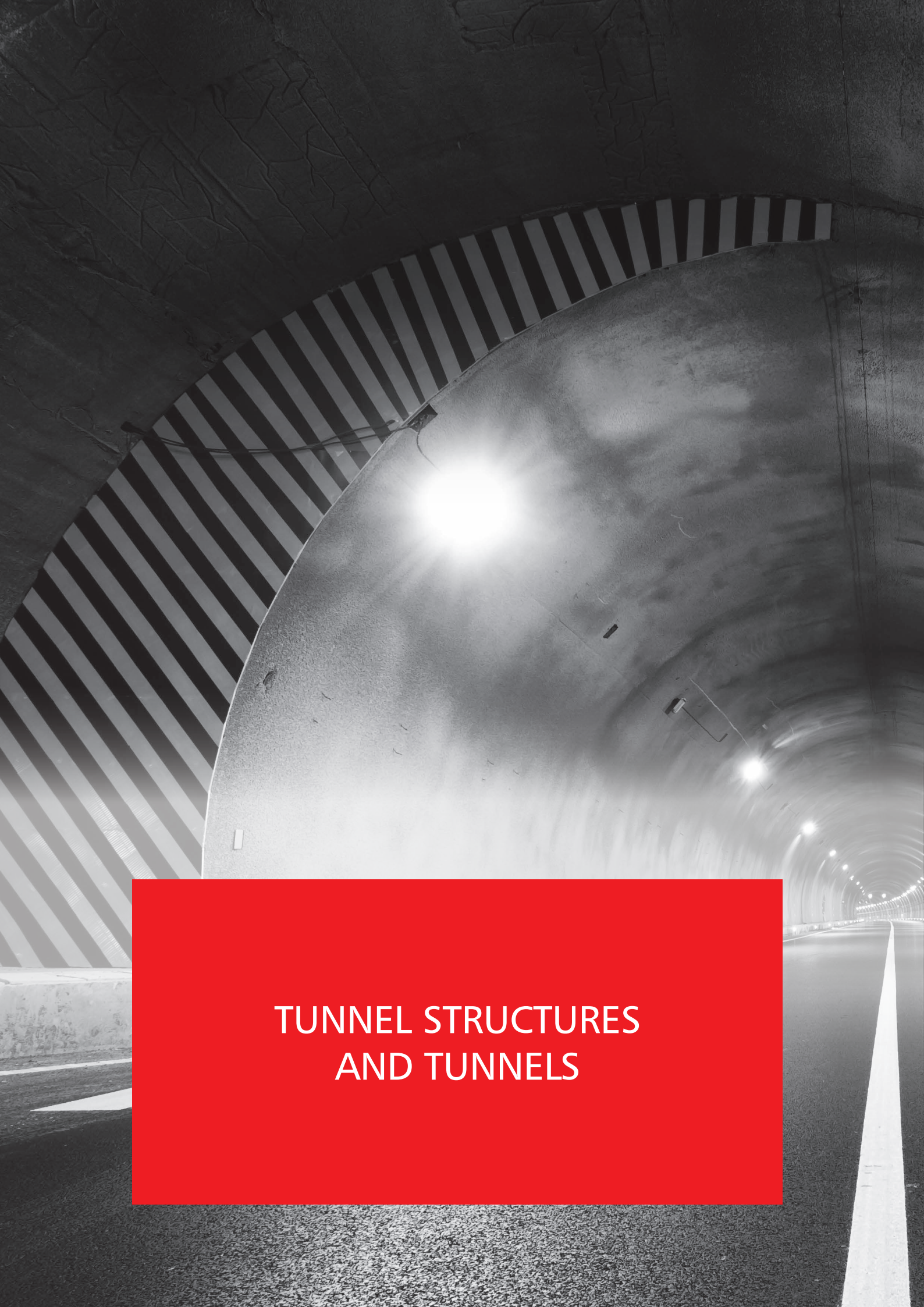
It is recommended to gently flush the structure surface with water from the application hose in order to remove any remaining contamination. This also ensures a thermal equilibrium between the mortar and the protected surface.

mcr Tecwool F may provide several finish options: rough, smooth, painted, etc. Application of flexible acrylic coating on mortar is possible to prevent water vapor from penetrating the structure. Before application of the coating, the mortar must be completely dry (28 days).

After finishing work, gently sprinkle the mortar with water in the appropriate order to ensure appropriate conditions for cement curing.



- 1. reinforced concrete column
- 2. carbon fiber tape/mat
- 3. mcr Tecwool F with a thickness of 50 mm



**TUNNEL STRUCTURES
AND TUNNELS**

➤ In recent years, due to fire incidents in tunnels, effective solutions have been sought to protect their structural integrity.

„MERCOR“ S.A.’s mission is to guarantee safety of individuals and property by ensuring stability and integrity of tunnels to ultimately increase the time for evacuation.

The company offers tunnel protection solutions based on RWS, RABT-ZT 170, RWS/HCM, ISO 834 heating curves. As a result, the solutions we offer can withstand even the most adverse fire conditions.

Moreover, tests in a real tunnel were conducted, applying a fire power (combustible diesel fuel) with an approximate output power of 15 MW.

8.1 | mcr Tecbor



Approving documents

- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03

Application

mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction, for erecting steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, masonry walls, suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

Technical parameters

» Physical and mechanical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	smooth surface in a light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤ 0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

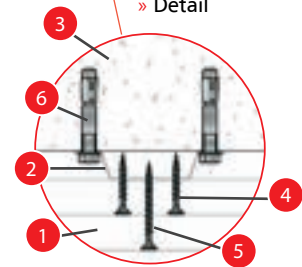
5.1.1 | 20 mm+20 mm mcr Tecbor board
– REI 60 protection of concrete structure inside a tunnel



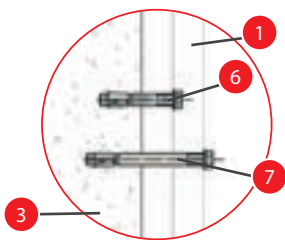
» Horizontal view of the ceiling



» Detail



» Wall detail



Approving documents

- » Laboratory: Tunnel Safety Testing S.A. (TST)
[tunnel safety testing]
- » » Report no.: Real Test1

Solution

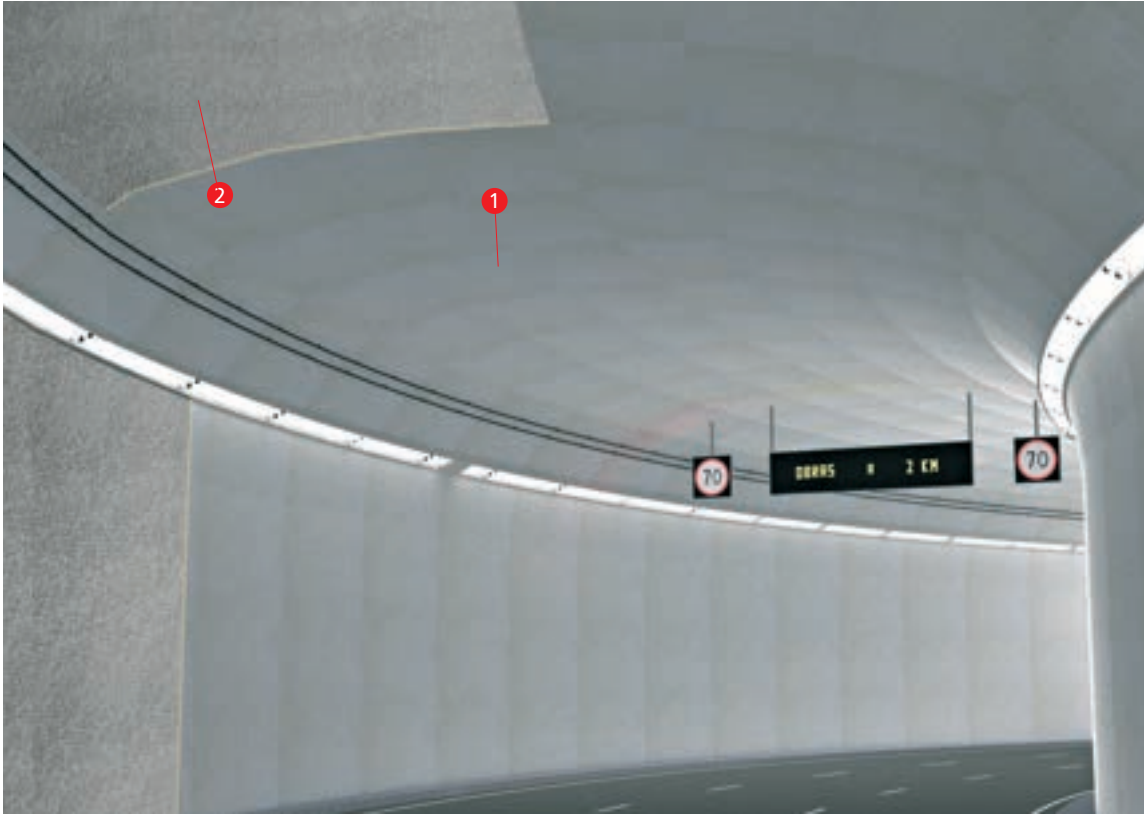
1. mcr Tecbor board 20 mm.
2. Omega section 15 × 45 × 0.5 mm.
3. Floor slab.
4. 3.5 × 45 mm self-drilling screw.
5. 4.2 × 55 mm self-drilling screw.
6. 8 × 46 mm steel toggle bolt.
7. 8 × 76 mm steel toggle bolt.
8. mcr Tecbor Joint Paste adhesive.

Installation description

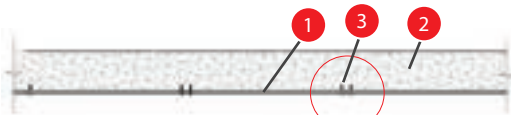
The ceiling is proofed with two 20 mm mcr Tecbor boards. First, attach metal 15 × 45 × 0.5 mm omega sections at every 610 mm, directly to the concrete ceiling slab, with 8 × 46 mm metal anchor. Then attach the first 20 mm mcr Tecbor board with 3.5 × 45 mm self-drilling screws. Attach the second 20 mm mcr Tecbor board with 4.2 × 55 mm self-drilling screws.

The walls are proofed with 20 mm mcr Tecbor boards, anchored directly to the concrete. Use 8 × 46 mm metal anchors to attach the first board. Use 8 × 76 mm metal anchors to attach the second board. Apply the mcr Tecbor Joint Paste on the joints between the boards, both on the ceiling and on the walls.

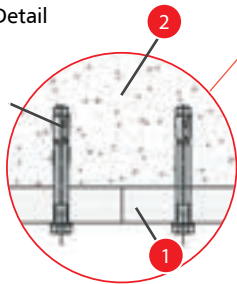
5.1.2 | 20 mm mcr Tecbor board – EI 120 suspended ceiling in a tunnel



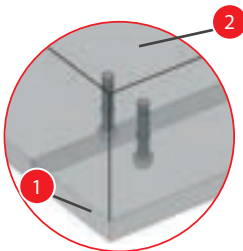
» Horizontal view of the ceiling



» Detail



» Perspective



Approving documents

- » Standard: EN 1364-2. Hydrocarbon fire heating curve.
- » Laboratory: CIDEMCO
- » Report no.: 17566-1/-2-a-M1

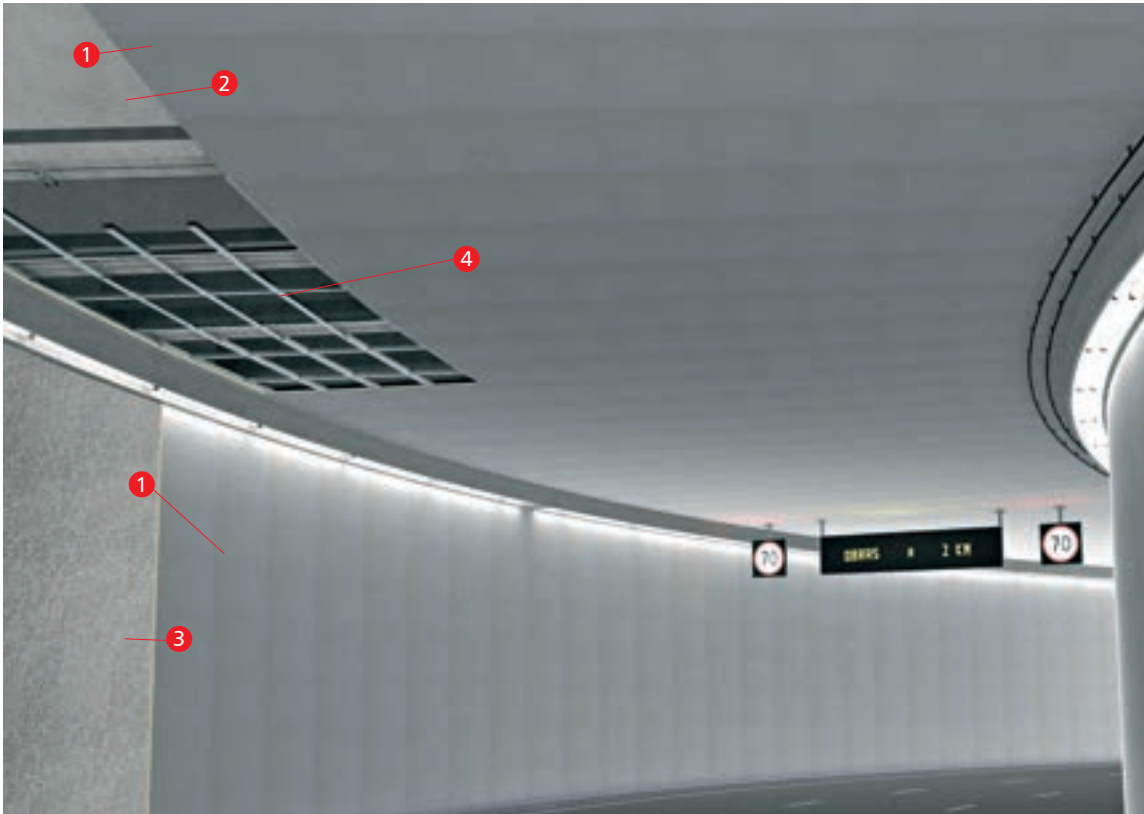
Solution

1. mcr Tecbor board 20 mm.
2. Ceiling slab with a thickness of 120 mm.
3. Steel plug 10 × 60 mm.
4. mcr Tecbor Joint Paste adhesive.

Installation description

Attach the 20 mm mcr Tecbor board directly to the concrete ceiling slab with a 10 × 60 mm metal plug. Apply the mcr Tecbor Joint Paste on the joints between the boards, both on the ceiling and on the walls.

5.1.3 | 20 mm+20 mm mcr Tecbor board
– REI 60 protection of concrete structure inside a tunnel



» EI 120

Approving documents

- » RWS fire curve
- » Laboratory: EFECTIS
- » Report no.: 2009-Efectis-R0998

Solution

1. mcr Tecbor board 40 mm.
2. Floor slab
3. Concrete wall
4. Steel section

» EI 180

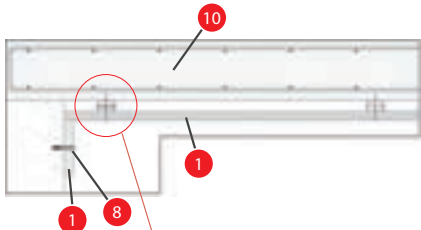
Approving documents

- » RWS fire curve
- » Laboratory: EFECTIS
- » Report no.: 2009-Efectis-R0999

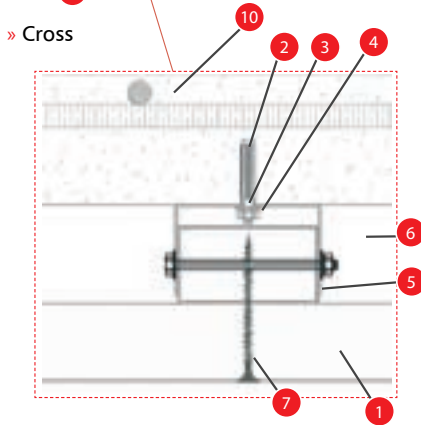
Solution

1. mcr Tecbor board 40 mm.
2. Floor slab.
3. Concrete wall.
4. Steel section.

» Part



» Cross



» **Solution 1:**

- » mcr Tecbor board 40 mm.
- » Steel expansion anchor with internal thread.
- » Steel threaded rod \varnothing 12 mm.
- » Zinc coated nut \varnothing 12 mm.
- » Steel section 75 × 46 × 1.2 mm.
- » Steel section 75 × 40 × 1.2 mm.
- » Screw 5.5 × 73 mm.
- » Plug anchoring + screw 10 × 100 mm.
- » Tecsel intumescent sealing compound for construction joints.
- » Reinforced concrete ceiling slab.

Installation description

Install the steel structure supporting the suspended ceiling and forming a grate (discuss dimensions with the technical department) with primary and secondary sections with the dimensions 75 × 46 × 1.2 mm and 75 × 40 × 1.2 mm, respectively.

Following installation of the steel structure, attach a 40 mm mcr Tecbor board with 5.5 × 73 mm self-drilling screws.

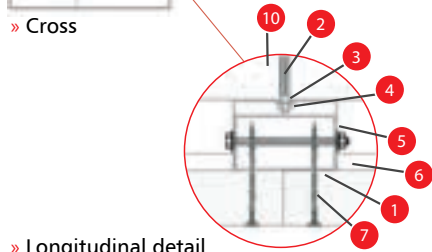
Apply the Tecsel intumescent sealing compound on the joints.

In case of other installation, please contact the technical department.

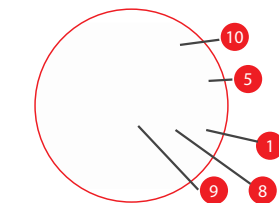
» Part



» Cross



» Longitudinal detail



» **Solution 2:**

- » mcr Tecbor board 40 mm for tunnels.
- » Steel expansion anchor with internal thread.
- » Steel threaded rod \varnothing 12 mm.
- » Zinc coated nut \varnothing 12 mm.
- » Steel section 75 × 46 × 1.2 mm.
- » mcr Tecbor board 12 mm.
- » Screw 6.3 × 65 mm.
- » Double-sided studbolt 4.5 × 50 mm.
- » Tecsel intumescent sealing compound for construction joints.
- » Reinforced concrete ceiling slab.

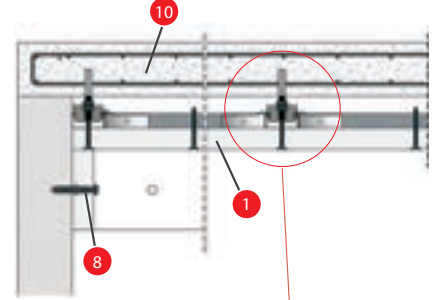
Installation description

Install the steel structure supporting the suspended ceiling and forming a grate (discuss dimensions with the technical department) with primary sections with the dimensions 75 × 46 × 1.2 mm.

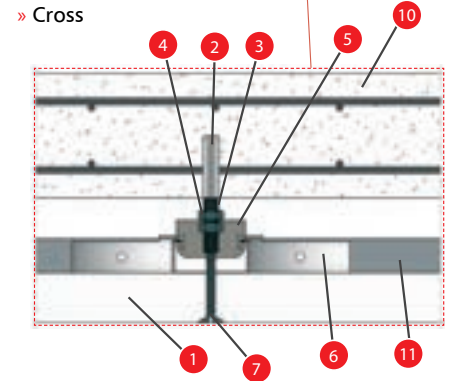
The secondary section has been replaced with a strip of 12 mm mcr Tecbor board with a width of 150 mm. Following installation of the steel structure, attach a 40 mm mcr Tecbor board with 6.3 × 65 mm self-drilling screws.

In case of other installation, please contact the technical department.

» Part



» Cross



» **Solution 3:**

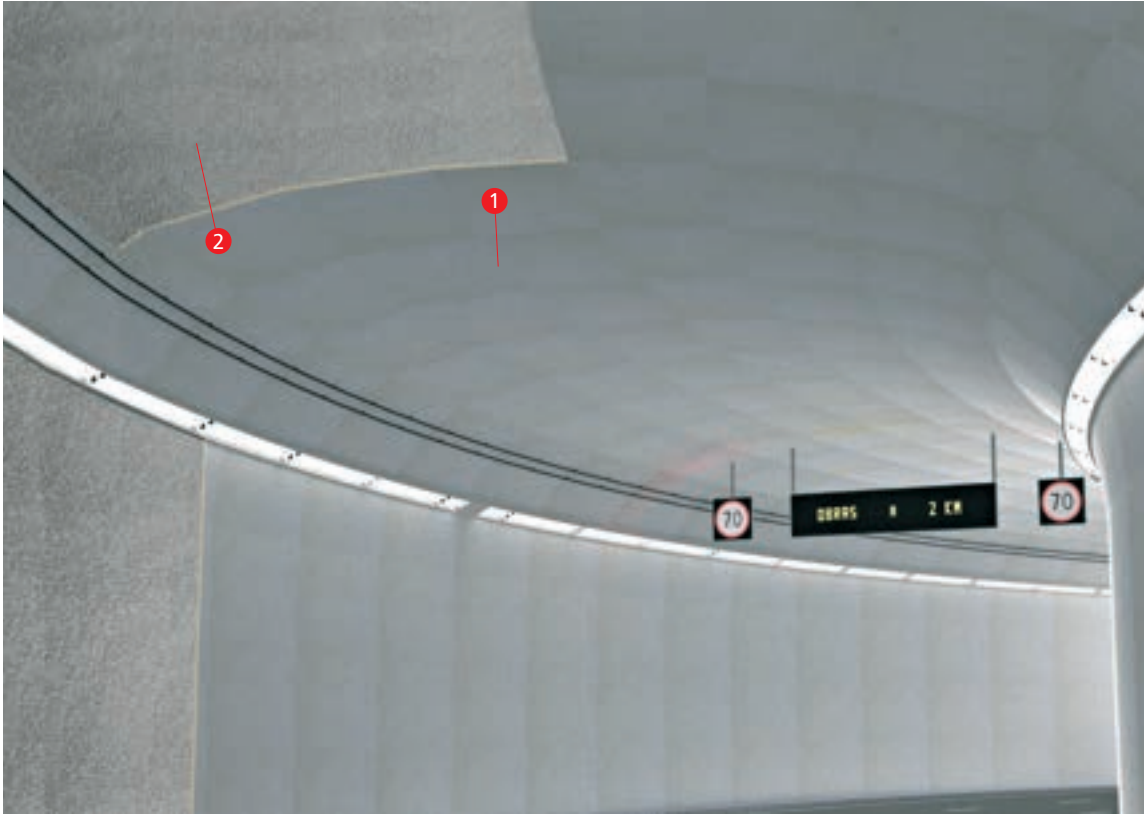
- » mcr Tecbor board 40 mm.
- » Metal connecting for anchoring.
- » Steel threaded rod \varnothing 12 mm.
- » Zinc coated nut \varnothing 12 mm.
- » Primary section 80 × 40 × 1.5 mm.
- » Secondary section 80 × 40 × 1.5 mm.
- » Screw 6.3 × 65 mm.
- » Clamp support.
- » Tecsel intumescent sealing compound for construction joints.
- » Concrete ceiling slab.

Installation description

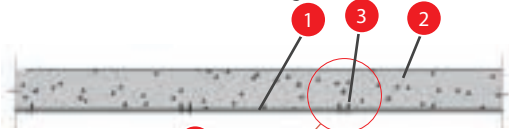
Install the metal structure supporting the suspended ceiling and forming a grate (discuss dimensions with the technical department) with primary and secondary sections with the dimensions 75 × 46 × 1.2 mm and 75 × 40 × 1.2 mm, respectively. The secondary sections should be supported by the primary ones without fixing. It is a versatile solution, as the secondary section mobility allows for correcting any faults of the construction joints. Following installation of the metal structure, attach a 40 mm mcr Tecbor board with 6.3 × 65 mm self-drilling screws.

In case of other installation, please contact the technical department.

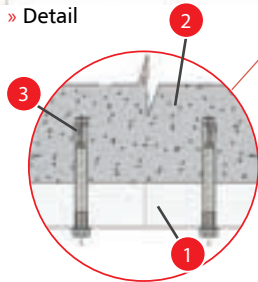
5.1.4 | TECBOR board 23 mm – suspended ceiling in RWS 120 tunnels



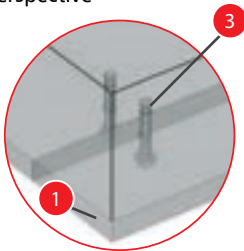
» Horizontal view of the ceiling



» Detail



» Perspective



Approving documents

- » RWS fire curve.
- » Laboratory: EFECTIS
- » Report no.: 2011-Efectis-R0280

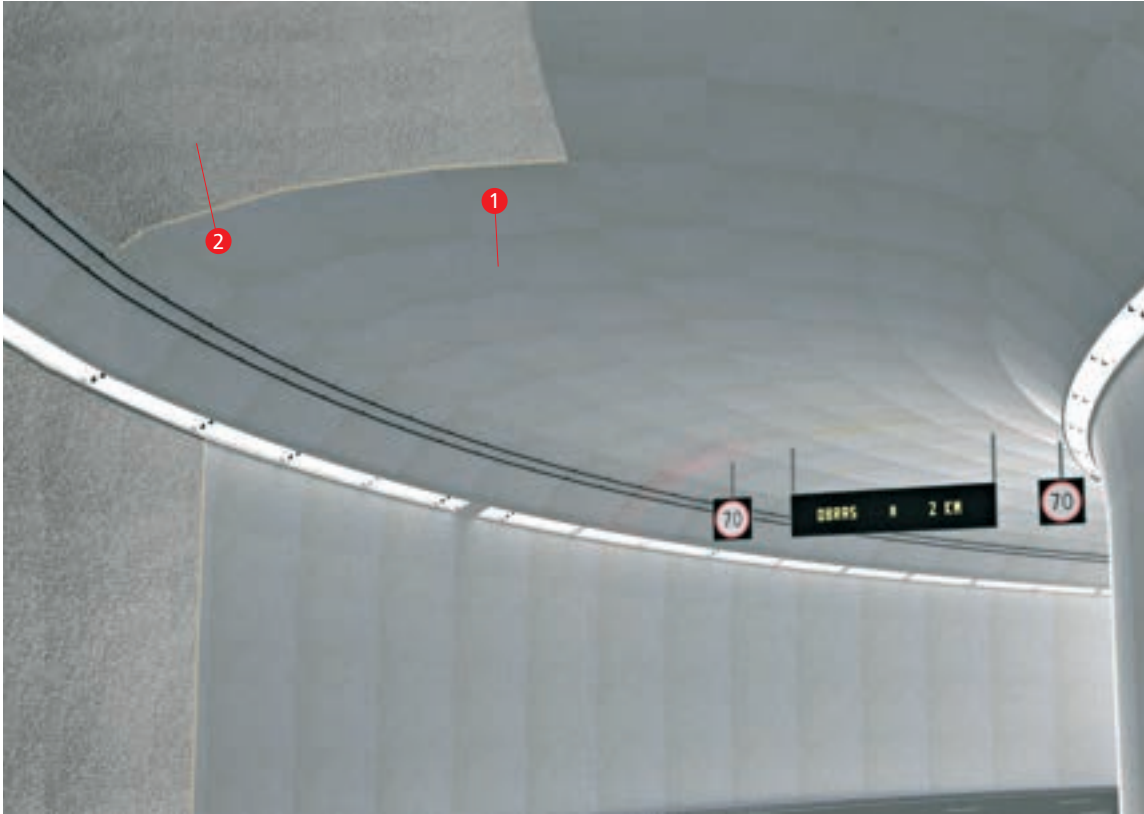
Solution

1. mcr Tecbor board 23 mm.
2. Ceiling slab 120 mm
3. Steel anchor HLC-H 8 × 70 mm

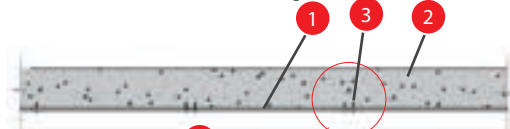
Installation description

Attach the 23 mm mcr Tecbor board directly to the concrete ceiling slab with a 10 × 60 mm HLC-H 8 × 70 mm metal anchor. This system does not require any joint paste, although sealing with Tecsel sealing compound is recommended for holes larger than 3 mm.

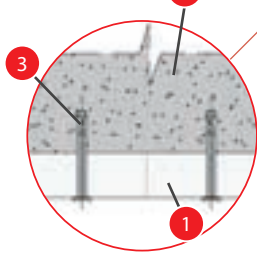
5.1.5 | TECBOR board 25 mm – suspended ceiling in RABT-ZTV-170 tunnels



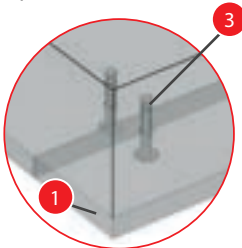
» Horizontal view of the ceiling



» Detail



» Perspective



Approving documents

- » RABT-ZTV fire curve
- » Laboratory: EFECTIS
- » Report no.: R-000909

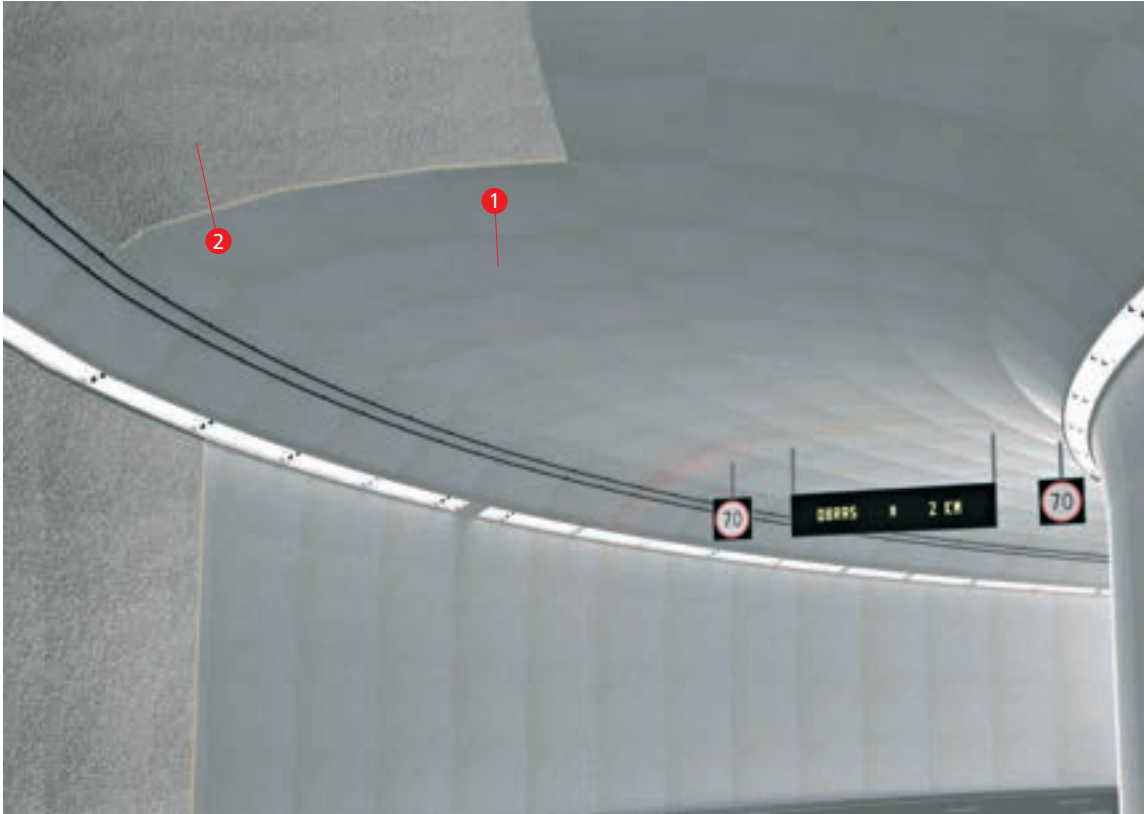
Solution

1. mMcrc Tecbor board 25 mm
2. Ceiling slab 120 mm
3. FNA II 6×30 mm steel anchor

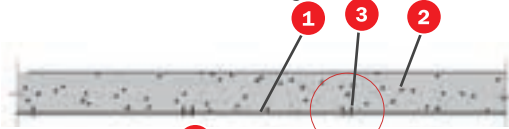
Installation description

Attach the 25 mm mcr Tecbor board directly to the concrete ceiling slab with a 10 × 60 mm FNA II 6 × 30 mm metal anchor. This system does not require any joint paste, although sealing with Tecsel sealing compound is recommended for holes larger than 3 mm.

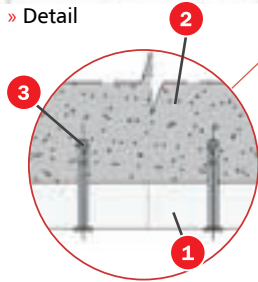
5.1.6 | TECBOR board 24 mm – suspended ceiling in RWS/HCM 120 tunnels



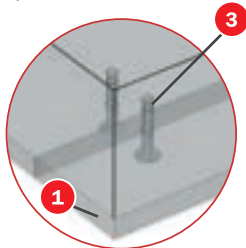
» Horizontal view of the ceiling



» Detail



» Perspective



Approving documents

- » RWS/HCM fire curve
- » Laboratory: EFACTIS
- » Report no.: R-000911

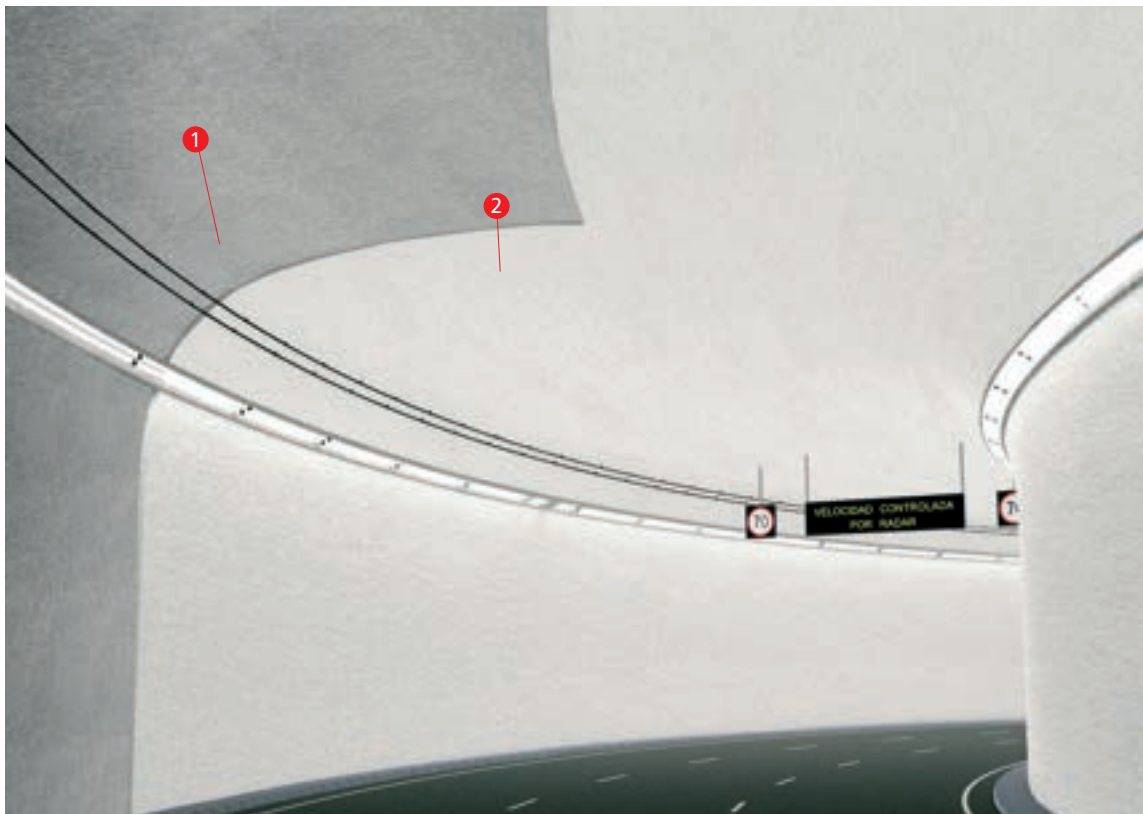
Solution

1. mcr Tecbor board 25 mm
2. Ceiling slab 120 mm
3. FNA II 6×30/30 A4 steel anchor

Installation description

Attach the 24 mm mcr Tecbor board directly to the concrete ceiling slab with a 10 × 60 mm FNA II 6 × 30/30 A4 metal anchor. This system does not require any joint paste, although sealing with Tecsel sealing compound is recommended for holes larger than 3 mm.

8.2 | mcr Tecwool 825 – mcr Isoverm 825 system component



» Minimal thickness of flame retardant treatment with mcr Tecwool 825 mortar depending on fire resistance rating – tunnel fire (RWS) and hydrocarbon fire exposure time according to the hydrocarbon modified curve (HCM)

RWS tunnel fire / hydrocarbon fire exposure time according to the hydrocarbon modified curve (HCM) [min.]	Minimalna grubość zabezpieczenia ogniochronnego z zaprawy [mm]
60	23,8
90	23,8
120	27,6
180	35,2

Tabela 1

Approving documents

- » National Technical Assessment ITB-KOT-2021/1717 edition 1
- » National Certificate of constancy of performance 020-UWB-2861/W
- » National declaration of performance KDWU/ HZ/01/2021

Application

The mcr Isoverm 825 product set contains:

- » mcr Tecwool 825 mortar for the basic layer of flame retardant insulation,
- » steel mesh with hexagonal openings,
- » fasteners (nails) shot into concrete or anchors hammered into concrete for attaching mesh.


If the protected structure is directly exposed to weather conditions, it is possible to use an additional protective layer of finishing paints.

Solution

1. Ceiling slab or wall
2. mcr Tecwool 825 with a thickness according to Table 1



WOODEN STRUCTURES

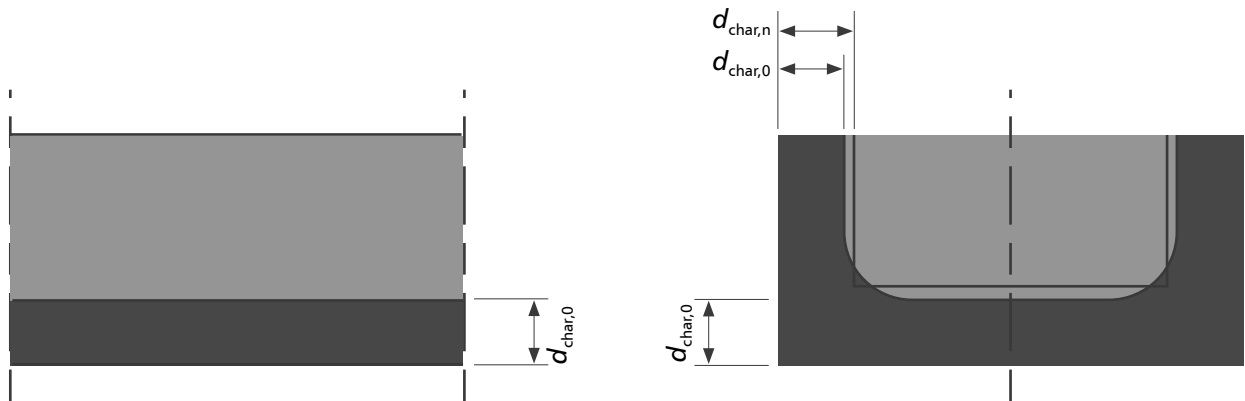


> In accordance with the publication of the Polish Institute of Construction Technology entitled “Designing Wooden Structures with Consideration for Fire Conditions According to the Eurocode 5”, wood behavior during fire is significantly different from the behavior of other construction materials. Unlike steel, reinforced concrete and masonry elements, wood is a combustible material. Due to pyrolysis and consequent combustion, a charred layer is formed and the remaining cross-section core, decreasing with fire duration, serves structural functions until load bearing-capacity is exhausted. Although durability properties of wood, similar to other structural materials, also decrease at high temperature, the basic cause of the load-bearing capacity loss of wooden structural components is the change of cross-section geometric dimensions of elements in the fire.

6.1 | Protecting wooden structures

Carbonation onset temperature is 250°C–300°C. It is recommended to use the 300°C isotherm for determining the carbonation line front. Temperature distribution below the carbonation line front is parabolic and the temperature increase effect is recorded at a depth of 35 mm – 40 mm inside the uncharred material. In the increased temperature zone, an area is highlighted where wood pyrolysis occurred (between carbonation front and isotherm 200°C), as well an area where water evaporation occurred (between the 100°C and 200°C isotherms). Carbonation occurs differently in flat elements and rod elements with small cross-section dimensions. The following carbonation cases illustrated in the Fig. below should be differentiated:

- » unidirectional carbonation in flat elements or elements with large cross-section dimensions, characterized by carbonation speed β_0 and unidirectional carbonation depth $d_{char,0}$ and
- » carbonation in the vicinity of angles of such elements as poles and beams, characterized by carbonation speed β_n and carbonation depth in the vicinity of angles $d_{char,n}$.



Rys. 6 Unidirectional carbonation depth and carbonation with angles effect.

» Carbonation speeds β_0 and β_n for uninsulated wooden elements according to PN-EN 1995-1-2 are provided in the table below:

Type	Element name	Carbonation speed [mm/min]	
		β_0	β_n
Coniferous and beech wood $\rho \geq 290 \text{ kg/m}^3$	solid	0,65	0,80
	glued-laminated timber	0,65	0,70
Hardwood $\rho \geq 290 \text{ kg/m}^3$	solid	0,65	0,70
	glued-laminated timber	0,65	0,65
Hardwood $\rho \geq 450 \text{ kg/m}^3$	solid	0,50	0,50
	glued-laminated timber	0,50	0,50
LVL $\rho \geq 480 \text{ kg/m}^3$	forniry glued-laminated timber	0,65	0,65
Panels $\rho \geq 450 \text{ kg/m}^3$	plywood	0,9	-
	wooden panels	1,0	-
	wood-based panels	0,9	-

β_0 values provided below apply to elements with a thickness of no less than $h_p=20$ mm. In case of thickness below than 20 mm or densities other than $\rho_k=450 \text{ kg/m}^3$, carbonation speeds should be corrected according to the formula:

$$\beta_{0,p,t} = \beta_0 \sqrt{\frac{450}{\rho_k}} \sqrt{\frac{20}{h_p}} \quad \begin{array}{l} \rho - \text{wooden element density} \\ h_p - \text{wooden element thickness} \end{array}$$

It is assumed that the carbonation speed of wood that has not undergone flame retardant treatment is constant and carbonation depth is calculated as:

- » $d_{char,0} = \beta_{0t}$ – for unidirectional carbonation,
- » $d_{char,n} = \beta_{nt}$ – for carbonation with angles effect.

Carbonation speeds provided in the table above have been determined for a standard fire. In reality, they depend on fire exposure characteristic for various fire types. The studies conducted at the ITB Fire Research Department allowed to experimentally determine the following carbonation speeds β_0 of glued-laminated timber from class C 27 spruce sawn timber:

- » hydrocarbon fire (H) $\beta_0 = 0,75 \text{ mm/min}$,
- » standard fire (N) $\beta_0 = 0,51 \text{ mm/min}$,
- » external fire (E) $\beta_0 = 0,38 \text{ mm/min}$.

In order to obtain class B, s2, d0, it is recommended to fireproof wooden elements by using the appropriate flame retardant product.

6.2 | Explanation of fire resistance ratings according to Eurocode 5

» Markings explanation:

Terms regarding combustibility used in the regulation		Reaction to fire class as per PN-EN 13501-1:2008
Non-combustible		A1; A2-s1,d0; A2-s2,d0; A2-s3,d0;
Combustible	incombustible	A2-s1,d1; A2-s2,d1; A2-s3,d1; A2-s1,d2; A2-s2,d2; A2-s3,d2; B-s1,d0; B-s2,d0; B-s3,d0; B-s1,d1; B-s2,d1; B-s3,d1; B-s1,d2; B-s2,d2; B-s3,d2
	hardly combustible	C-s1,d0; C-s2,d0; C-s3,d0; C-s1,d1; C-s2,d1; C-s3,d1; C-s1,d2; C-s2,d2; C-s3,d2; D-s1,d0; D-s1,d1; D-s1,d2;
	heavily combustible	D-s2,d0; D-s3,d0; D-s2,d1; D-s3,d1; D-s2,d2; D-s3,d2; E-d2; E; F
Non-dripping		A1; A2-s1,d0; A2-s2,d0; A2-s3,d0; B-s1,d0; B-s2,d0; B-s3,d0; C-s1,d0; C-s2,d0; C-s3,d0; D-s1,d0; D-s2,d0; D-s3,d0;
Self-extinguishing		at least E
Intensively smoke-emitting		A2-s3,d0; A2-s3,d1; A2-s3,d2; B-s3,d0; B-s3,d1; B-s3,d2; C-s3,d0; C-s3,d1; C-s3,d2; D-s3,d0; D-s3,d1; D-s3,d2; E-d2; E; F

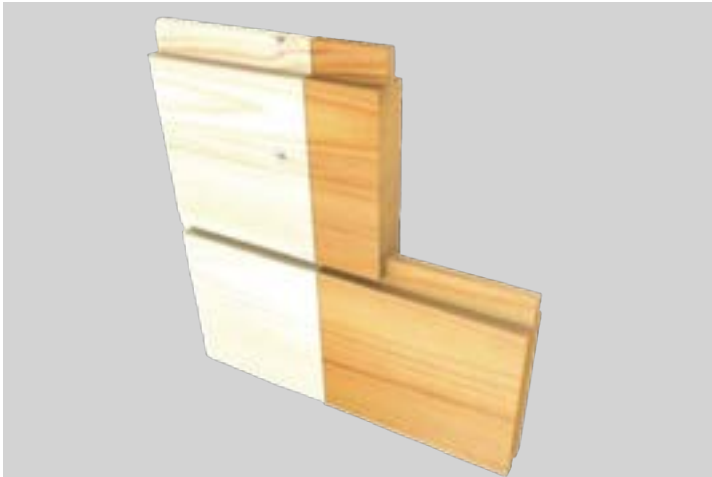
Euroclass	Properties	Flashover during the RCT (Room Corner Test) reference test	Exemplary products
A1	non-combustible	no flashover, min. heat of combustion value	concrete, steel, rock wool, glass wool
A2	non-combustible	no flashover, low heat of combustion value	gypsum board, mineral wool with a high density and high binder content
B	small flame ignitability for 60 s $F_s < 150$ mm, limited contribution to fire	no flashover	hard PVC, proofed wood
C	small flame ignitability f or 60 s $F_s < 150$ mm, limited but noticeable contribution to fire	flashover no sooner than after 10 minutes at heat flux 300 kW	selected PU (PIR) foams, gypsum board with wallpaper/td>
D	small flame ignitability for 60 s $F_s < 150$ mm, significant contribution to fire	flashover no sooner than after 2 minutes at heat flux 100 kW	most PU (PIR) foams, non-proofed wood
E	small flame ignitability for 20 s $F_s < 150$ mm, very high contribution to fire	flashover in less than 2 minutes with a heat flux of 100 kW	expanded plastic with decreased combustibility, polystyrene, PU (PIR) with added retardants
F	very high contribution to fire or no requirements	untested or does not meet any criteria	expanded plastic

F_s – vertical flame propagation

WOODEN STRUCTURES

Euroclass	Properties	Exemplary products
s1	almost no smoke	gypsum boards
s2	moderate smoke emission	fireproofed wood
s3	extensive smoke emission	rubber, expanded polyurethane materials
d0	no burning droplets	mineral wool, steel, concrete
d1	few burning droplets/particles (similar to sparks of burning wood)	plywood
d2	many burning droplets/particles that may cause skin burns or spread fire	expanded polystyrene

6.3 | **mcr Polylack Wood BIANCO AQUA**



Approving documents

- » National Technical Assessment ÜV nr NMÉ-282 31187 001
- » Certificate of constancy of performance TÜV nr MC 69254704 0001
- » Declaration of performance no. 81260

Application

mcr Polylack Wood Bianco Aqua is a water-based intumescent paint for flame retardant treatments of wooden structural components, such as rafters, poles, girts and interior decoration elements: wall panels made of solid wood, plywood and wood-based materials (including OSB), for indoor use.

It allows to include readily combustible wood to be included in the category of hardly combustible materials with increased resistance to fire. Recommended mostly for surfaces free of moisture and mechanical stresses. Creates a white coat.

In outdoor locations exposed to weather conditions, the surface coated with **mcr Polylack Wood Bianco Aqua** should be protected with an enamel that is recommended for outdoor use.

Reaction to fire class

B-s2, d0 fire resistant parameters according to PN-EN 13501-1+A1:2010 in accordance with the classification report no. 2887.1/15/Z00NP issued by the Polish Institute of Construction Technology.

Advantages

- » High aesthetics
- » High durability
- » Quick and simple application
- » Resistant to cracking, dust
- » Environmentally friendly, non-toxic

Technical data

Density	1,25 ± 0,06 g/cm ³
Color	white
Solid particle content	67 ± 2 m/m %
Theoretical consumption	0,3 kg/m ²
Average drying time at 20°C	dust dry – 1 hour, fully dry – 24 hours

6.3.1 | Flame retardant treatment technology

» **Surface preparation**

The proofed surface must be free of dust or other contaminations. The product may be applied on surfaces coated with stain or a thin layer of enamel. Using the fire-retardant paint **mcr Polylack Wood Bianco Aqua** on processed, varnished or previously painted surfaces requires the opinion of the manufacturer.

» **Performing flame retardant insulation**

After mixing, apply the paint at temperatures between +5°C and +40°C with a brush or a roller in two layers, with at least 2-hour drying time between layers. In case of spray application, apply the required amount of paint in a single layer. Application at temperatures below +5°C is not recommended. The paint is ready to use. Where necessary, it may be diluted with 1–3% water (e.g. in case of spray-painting or with paint from a previously opened container).

» **Storage**

In the original factory packaging for 1 year from the date of purchase. Storage temperature from +5°C to +35°C.

6.4 | mcr Polylack Wood Transparent



Technical data

Density	1,14 ± 0,06 g/cm ³
Color	pale yellowish, opalescent
Solid particle content	64 ± 2 m/m %
Theoretical consumption	0,3 kg/m ²
Average drying time at 20°C	dust dry – 1 hour, fully dry – 24 hours

Approving documents

- » National Technical Assessment TÜV nr NME-282 31187 001
- » Certificate of constancy of performance TÜV nr MC 69254704 0001
- » Declaration of performance no. 81270

Application

mcr Polylack Wood Transparent a solvent-based paint for flame retardant treatments of wooden structural components, such as rafters, poles, girts and interior decoration elements: wall panels made of solid wood, plywood and wood-based materials (including OSB), for indoor use.

It allows to include readily combustible wood to be included in the category of hardly combustible materials with increased resistance to fire. Recommended mostly for surfaces free of moisture and mechanical stresses. Creates a transparent coating, similar to enamel.

Outdoors, where exposed to weather conditions, the surface coated with **mcr Polylack Wood Transparent** coating should be protected with enamel recommended for outdoor use.

Reaction to fire class

B-s2, d0 fire resistant parameters according to PN-EN 13501-1+A1:2010 in accordance with the classification report no. 1933/15/Z00NP issued by the Polish Institute of Construction Technology.

Advantages

- » High aesthetics
- » High durability
- » Quick and simple application
- » Resistant to cracking, dust
- » Environmentally friendly, non-toxic

6.4.1 | Flame retardant treatment technology

» Surface preparation

The proofed surface must be free of dust or other contaminations. The product may be applied on surfaces coated with stain or a thin layer of enamel. Using the fire-retardant paint **mcr Polylack Wood Transparent** on processed, varnished or previously painted surfaces requires the opinion of the manufacturer.

» Performing flame retardant insulation

After mixing, apply the paint at temperatures between +5°C and +40°C with a brush or a roller in two layers, with at least 2-hour drying time between layers. In case of spray application, apply the required amount of paint in a single layer. The paint is ready to use. Where necessary, it may be diluted with 1–3% aromatic solvent (e.g. in case of spray-on painting or with paint from a previously opened container).



**SEALING LINEAR JOINTS
AND EXPANSION GAPS**

➤ Expansion gaps and linear joints occur in the vast majority of civil structures. This type of joints is used in walls, ceilings and also between walls and ceilings. In some cases this type of solution is used at more unusual sites, e.g. between a balcony slab and a ceiling slab. A linear joint is an empty space, a gap or a discontinuity within one structural element, between two structural components put together or a larger number of elements put together.

These are performed for several reasons:

- » using dimensional tolerances between at least two building elements,
- » absorbing displacements (assumed at the design stage) caused by temperature differences, seismicity and displacements caused by wind loading,
- » incorrect designs, installation inaccuracies, renovations or damage to the building.

Linear joint filling is performed to ensure the continuity of the particular structural element and fire resistance rating.

7.1 | mcr Polylack Elastic



Technical data

- » Joint nominal width: 10 ÷ 100 mm.
- » Joint displacement capacity ±36%.
- » Environmental category – type Z1

color	white
density	1,25 ± 10% g/cm ³
complete drying	24 h / 1 mm
temperature resistance*	-40°C to 80°C
dry coating thickness	min. 1 mm
storage temperature	5°C to 25°C
storage time	12 months from the production date

* refers to the applied paint when completely bound and dried

Approving documents

- » European Technical Assessment ETA-18/0170
- » Certificate of constancy of performance 1488-CPR-0679/W
- » Declaration of performance 81500

Application

mcr Polylack Elastic is an ablative acrylic mass, used to perform thin coatings to seal linear joints or gaps in walls and ceilings. It can be applied with spray or brush onto mineral wool with a density of at least 50 kg/m³, used as gap filling material.

The following partitions are structural components allowing for sealing linear joints or gaps with mcr Polylack Elastic:

» Rigid walls:

walls at least 120 mm thick, made of concrete, reinforced concrete, aerated concrete, brick or blocks, with a density of at least 600 kg/m³.

» Rigid walls reaching the ceiling:

walls at least 150 mm thick, made of aerated concrete or reinforced concrete with a density of at least 600 kg/m³ or structural components made of metal with a melting temperature above 1000°C, creating the front joint surface.

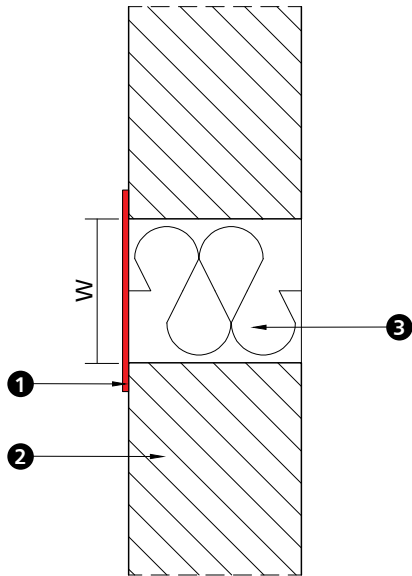
» Rigid ceilings:

ceilings at least 150 mm thick, consisting of structural components made of aerated concrete or reinforced concrete with a density of at least 600 kg/m³ and structural components made of metal with a melting temperature above 1000°C.

Fire resistance rating up to EI120

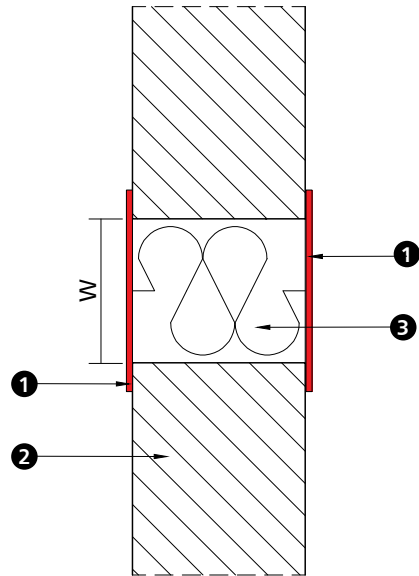
7.1.1 | Selected examples of protection installation

7.1.2 | Linear joint in a rigid wall



1. mcr Polylack Elastic coating (on one side of a linear joint) with a thickness of ≥ 1 mm
2. rigid wall with a thickness of ≥ 120 mm and a density of ≥ 600 kg/m³ made of concrete, aerated concrete, bricks or blocks
3. mineral wool with a density of ≥ 50 m³

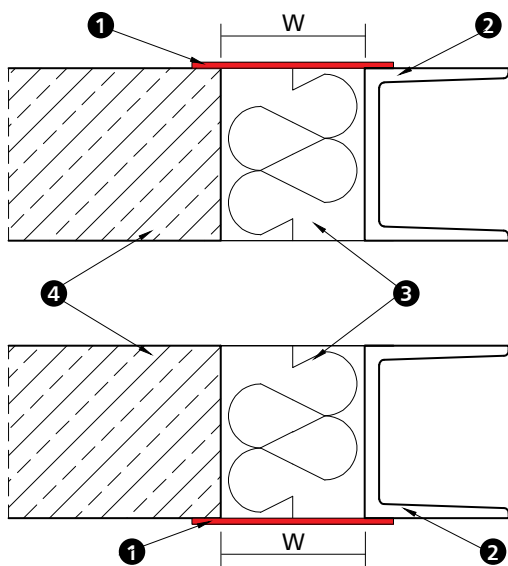
W - linear joint width



1. mcr Polylack Elastic coating (on both sides of a linear joint) with a thickness of ≥ 1 mm
2. rigid wall with a thickness of ≥ 120 mm and a density of ≥ 600 kg/m³ made of concrete, aerated concrete, bricks or blocks
3. mineral wool with a density of ≥ 50 m³

W - linear joint width

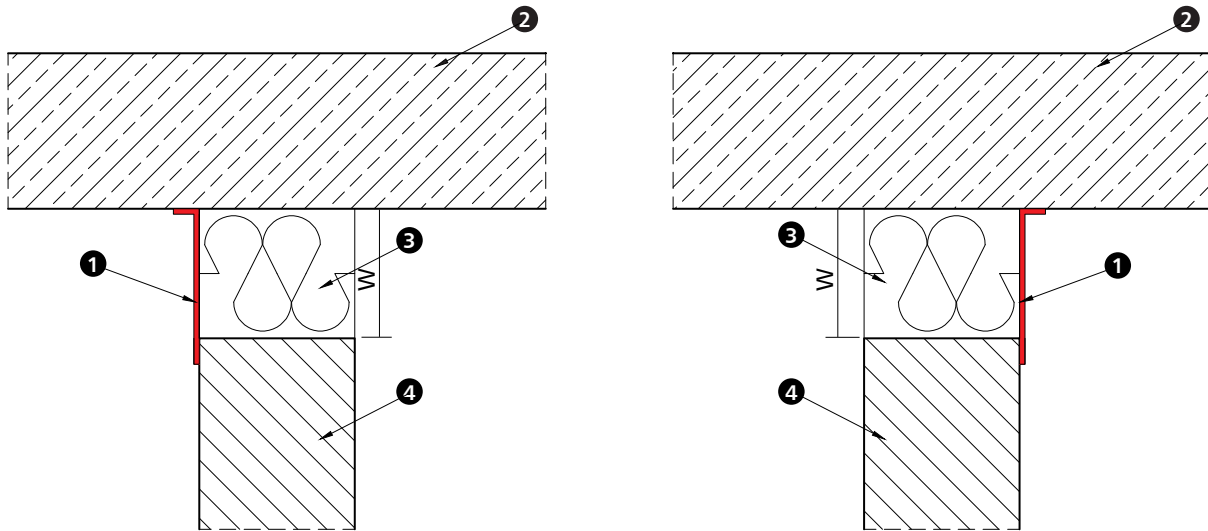
7.1.3 | Linear joint in a rigid ceiling



1. mcr Polylack Elastic coating (on one side of a linear joint) with a thickness of ≥ 1 mm
2. rigid ceiling with a thickness of ≥ 150 mm; front joint surface made of metal with a melting temperature $>1000^{\circ}\text{C}$
3. mineral wool with a density of ≥ 50 kg/m³
4. rigid ceiling, ≥ 150 mm thick and with density ≥ 600 kg/m³ made of cellular concrete or reinforced concrete

W - linear joint width

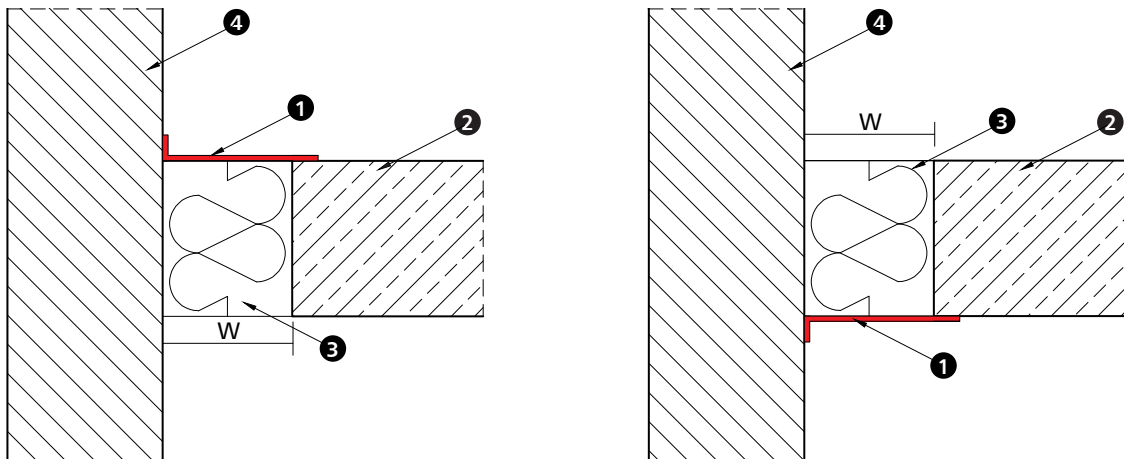
7.14| Linear joint in a rigid wall reaching a rigid ceiling



1. mcr Polylack Elastic coating (on one side of a linear joint) with a thickness of ≥ 1 mm
2. rigid ceiling with a thickness of ≥ 150 mm; front joint surface made of metal with a melting temperature $>1000^{\circ}\text{C}$
3. mineral wool with a density of ≥ 50 kg/m³
4. rigid wall reaching a rigid ceiling, made of aerated concrete or reinforced concrete; with a thickness of ≥ 150 mm and a density of ≥ 600 kg/m³

W - linear joint width

7.15| Linear joint in a rigid ceiling reaching a rigid wall



1. mcr Polylack Elastic coating (on one side of a linear joint) with a thickness of ≥ 1 mm
2. rigid ceiling reaching a rigid wall; with a thickness of ≥ 150 mm; front joint surface made of metal with a melting temperature $>1000^{\circ}\text{C}$
3. mineral wool with a density of ≥ 50 kg/m³
4. rigid wall made of aerated concrete or reinforced concrete; with a thickness of ≥ 150 mm and a density of ≥ 600 kg/m³

W - linear joint width



Technical data

- » Joint nominal width: 10 ÷ 100 mm.
- » Joint displacement capacity ±50%.
- » Environmental category – type Z2.

Approving documents

- » European Technical Assessment ETA-18/0475
- » Certificate of constancy of performance 1488-CPR-0678/W
- » Declaration of performance 81400

Application

mcr Dunaseal is a compressible tape, press-fitted, consisting of layers of expanded polyurethane, coated with intumescent material with a thickness of 2.5 mm.

Available in the following versions:

- » **mcr Dunaseal Single**, 30 × 35 × 1000 mm, consisting of one layer of expanded polyurethane and two layers of intumescent material.
- » **mcr Dunaseal Double**, 30 × 67.5 × 1000 mm, consisting of two layers of expanded polyurethane and three layers of intumescent material separating it.
- » **mcr Dunaseal Multilayer (3)**, 60 × 100 × 1000 mm, consisting of three layers of expanded polyurethane and four layers of intumescent material separating it.
- » **mcr Dunaseal Multilayer (4)**, 60 × 132.5 × 1000 mm, consisting of four layers of expanded polyurethane and five layers of intumescent material separating it.
- » **mcr Dunaseal Multilayer (5)**, 60 × 165 × 1000 mm, consisting of five layers of expanded polyurethane and six layers of intumescent material separating it.

The mcr Dunaseal tape is provided in any amount in sections of 1 lin. m.

Before inserting it into a gap, the tape must be compressed and placed manually in a linear joint or a gap, using mineral wool with a density of at least 50 kg/m³, used as a gap filling material.

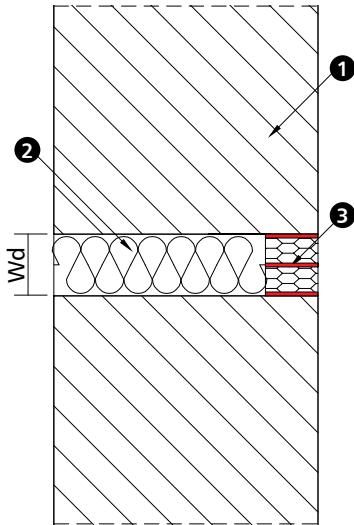
Linear joints or gaps may be sealed with mcr Dunaseal in the following construction partitions:

- » Rigid walls:
walls at least 150 mm thick, made of concrete, aerated concrete, brick or blocks, with a density of at least 600 kg/m³.
- » Rigid ceilings:
ceilings at least 150 mm thick, made of aerated concrete or reinforced concrete, with a density of no less than 600 kg/m³.

Fire resistance rating up to EI120.

7.2.1 | Selected examples of protection installation

7.2.2 | Vertical linear joint in a rigid wall



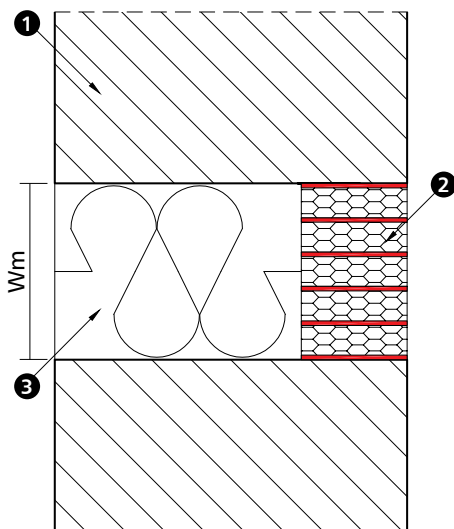
1. rigid wall ≥ 150 mm thick and with density ≥ 600 kg/m³
2. mineral wool with a density of ≥ 50 kg/m³ ; compressed widthwise by 50% before installation in a joint
3. mcr Dunaseal double

Wd - width of a linear joint sealed
with mcr Dunaseal double: 35 mm

» Selecting mcr Dunaseal depending on gap width and displacement capacity

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	n.d.	n.d.	n.d.	EI 120
10	0 - 18	19 - 48	n.d.	n.d.	n.d.	EI 120
20	0 - 17	18 - 44	n.d.	n.d.	n.d.	EI 120
30	0 - 15	16 - 40	n.d.	n.d.	n.d.	EI 120
40	0 - 14	15 - 38	n.d.	n.d.	n.d.	EI 120
50	0 - 13	14 - 35	n.d.	n.d.	n.d.	EI 120

7.2.3 | Vertical linear joint in a rigid wall



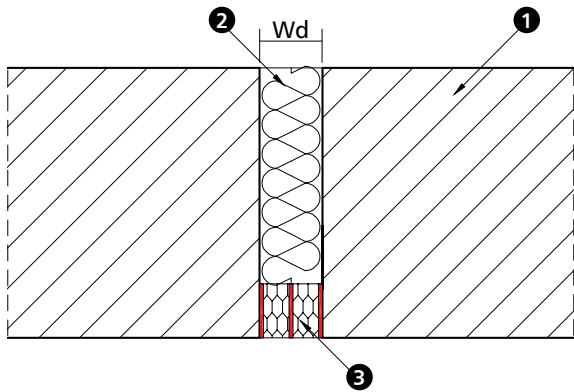
1. rigid wall with a thickness of ≥ 200 mm and a density of ≥ 600 kg/m³
2. mcr Dunaseal multilayer
3. mineral wool with a density of ≥ 50 kg/m³ ; compressed widthwise by 50% before installation in a joint Wm. width of a linear joint sealed with mcr Dunaseal multilayer: 36 do 100 mm

Wm - width of a linear joint sealed
with mcr Dunaseal multilayer: 36 to 100 mm

» Selecting mcr Dunaseal depending on gap width and displacement capacity

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	54 - 85	86 - 118	119 - 150	EI 120
10	0 - 18	19 - 48	49 - 77	78 - 107	108 - 136	EI 120
20	0 - 17	18 - 44	45 - 71	72 - 98	99 - 125	EI 120
30	0 - 15	16 - 40	41 - 65	66 - 90	91 - 115	EI 120
40	0 - 14	15 - 38	39 - 61	62 - 84	85 - 107	EI 120
50	0 - 13	14 - 35	36 - 57	58 - 78	79 - 100	EI 120

7.2.4 | Horizontal linear joint in a rigid ceiling, rigid ceiling reaching a rigid wall or a rigid wall reaching a rigid ceiling



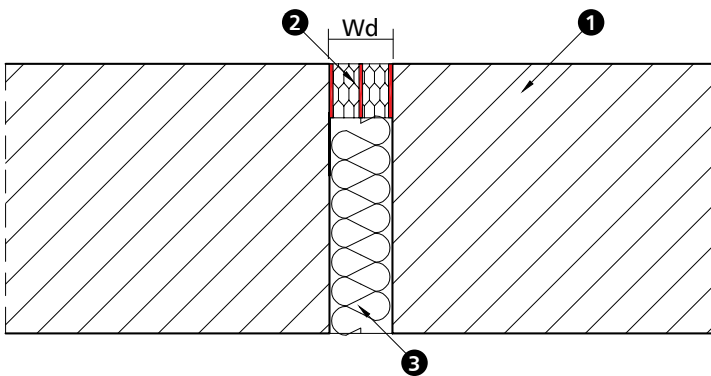
- 1. rigid ceiling or rigid wall with a thickness of ≥ 150 mm and a density of ≥ 600 kg/m³
- 2. mineral wool with a density of ≥ 50 kg/m³; compressed widthwise by 50% before installation in a joint
- 3. mcr Dunaseal double

Wd - width of a linear joint sealed with mcr Dunaseal double: 35 mm

» Dobór mcr Dunaseal w zależności od szerokości i zdolności przemieszczenia szczeliny

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	n.d.	n.d.	n.d.	EI 120
10	0 - 18	19 - 48	n.d.	n.d.	n.d.	EI 120
20	0 - 17	18 - 44	n.d.	n.d.	n.d.	EI 120
30	0 - 15	16 - 40	n.d.	n.d.	n.d.	EI 120
40	0 - 14	15 - 38	n.d.	n.d.	n.d.	EI 120
50	0 - 13	14 - 35	n.d.	n.d.	n.d.	EI 120

7.2.5 | Horizontal linear joint in a rigid ceiling or a rigid wall reaching a rigid ceiling



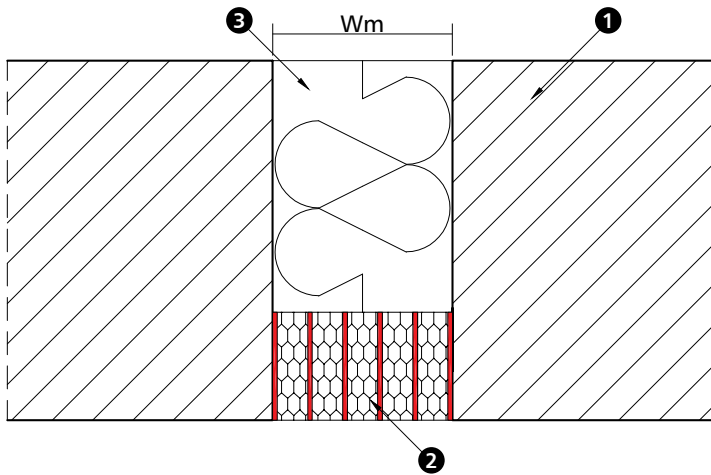
- 1. rigid ceiling or rigid wall with a thickness of ≥ 50 mm and a density of ≥ 600 kg/m³
- 2. mcr Dunaseal double
- 3. mineral wool with a density of ≥ 50 kg/m³; compressed widthwise by 50% before installation in a joint

Wd - width of a linear joint sealed with mcr Dunaseal double: 35 mm

» Selecting mcr Dunaseal depending on gap width and displacement capacity

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	n.d.	n.d.	n.d.	EI 120
10	0 - 18	19 - 48	n.d.	n.d.	n.d.	EI 120
20	0 - 17	18 - 44	n.d.	n.d.	n.d.	EI 120
30	0 - 15	16 - 40	n.d.	n.d.	n.d.	EI 120
40	0 - 14	15 - 38	n.d.	n.d.	n.d.	EI 120
50	0 - 13	14 - 35	n.d.	n.d.	n.d.	EI 120

7.2.7 | Horizontal linear joint in a rigid ceiling or a rigid wall reaching a rigid ceiling



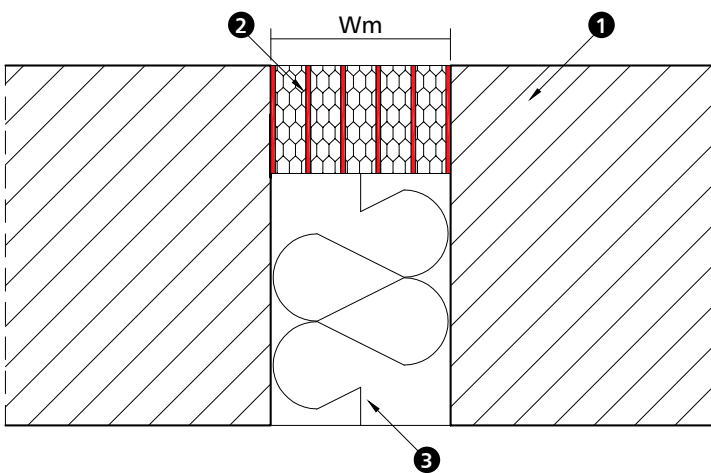
- 1. rigid ceiling or rigid wall with a thickness of ≥ 200 mm and a density of ≥ 600 kg/m³
- 2. mcr Dunaseal multilayer
- 3. mineral wool with a density of ≥ 50 kg/m³; compressed widthwise by 50% before installation in a joint

Wm - width of a linear joint sealed with mcr Dunaseal multilayer: 36 to 100 mm

» Selecting mcr Dunaseal depending on gap width and displacement capacity

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	54 - 85	86 - 118	119 - 150	EI 120
10	0 - 18	19 - 48	49 - 77	78 - 107	108 - 136	EI 120
20	0 - 17	18 - 44	45 - 71	72 - 98	99 - 125	EI 120
30	0 - 15	16 - 40	41 - 65	66 - 90	91 - 115	EI 120
40	0 - 14	15 - 38	39 - 61	62 - 84	85 - 107	EI 120
50	0 - 13	14 - 35	36 - 57	58 - 78	79 - 100	EI 120

7.2.8 | Horizontal linear joint in a rigid ceiling or a rigid wall reaching a rigid ceiling



- 1. rigid ceiling or rigid wall with a thickness of ≥ 200 mm and a density of ≥ 600 kg/m³
- 2. mcr Dunaseal multilayer
- 3. mineral wool with a density of ≥ 50 kg/m³; compressed widthwise by 50% before installation in a joint

Wm - width of a linear joint sealed with mcr Dunaseal multilayer: 36 to 100 mm

» Selecting mcr Dunaseal depending on gap width and displacement capacity

joint displacement capacity (%)	gap width (mm)					Fire resistive rating
	Dunaseal single	Dunaseal double	Dunaseal multilayer 3	Dunaseal multilayer 4	Dunaseal multilayer 5	
0	0 - 20	21 - 53	54 - 85	86 - 118	119 - 150	EI 120
10	0 - 18	19 - 48	49 - 77	78 - 107	108 - 136	EI 120
20	0 - 17	18 - 44	45 - 71	72 - 98	99 - 125	EI 120
30	0 - 15	16 - 40	41 - 65	66 - 90	91 - 115	EI 120
40	0 - 14	15 - 38	39 - 61	62 - 84	85 - 107	EI 120
50	0 - 13	14 - 35	36 - 57	58 - 78	79 - 100	EI 120



ACOUSTICS



The mcr Tecwool F spray-on system is designed for flame retardant treatment of structural components in onshore civil structures. It belongs to a group of so-called light flame retardant spray-ons, i.e. with a low density of the sprayable mass.

The mcr Tecwool F mortar applied on the structure is flame retardant and sound-absorbing – it can be successfully used as an acoustic coating, able to dissipate sound and limit sound energy rebounds from the surface of proofed partitions.

The use of mcr Tecwool F mortar indoors allows for soundwave absorption, reverberation reduction and significant improvement of acoustic comfort.

8.1 | mcr Tecwool F –spray-on acoustic coating



Technical parameters

» Physical and mechanical properties

mcr Tecwool F is fully non-combustible, has the highest reaction to fire rating A1 according to EN 13501-1 and simultaneously increases fire resistance of proofed construction elements.

dry mcr Tecwool F mix	
external appearance	grey dry mix, without clumping or contamination
cured mcr Tecwool F mortar	
bulk density of dry material	351+/-10% kg/m ³
linear shrinkage	≤ 0,07 %
steel surface adhesiveness	≥ 0,002 MPa or render rupture
concrete surface adhesiveness	≥ 0,002 MPa or render rupture
reaction to fire class	A1

The mcr Tecwool F system acoustic absorptivity has been tested in accordance with PN-EN ISO 354:2005.

The coating thickness directly impacts sound absorption. The thicker it is, the higher the acoustical absorption coefficient.

Acoustic absorption coefficient determines the material sound absorption level. For example, 0.9 means that 90% of the acoustic wave energy is absorbed by the particular material.

» Acoustic absorption coefficients depending on soundwave frequency and mcr Tecwool F sound-absorbing mortar thickness

frequency f [Hz]	mortar thickness [mm]						a _w	absorption class
	125	250	500	1000	2000	4000		
16	0,10	0,25	0,45	0,65	0,75	0,80	0,50	D
26	0,15	0,45	0,80	0,95	0,85	0,80	0,75	C
33	0,20	0,55	0,90	0,95	0,85	0,80	0,85	B
50	0,30	0,65	0,90	0,95	0,85	0,80	0,90	A
55	0,30	0,85	1,00	1,00	0,85	0,85	0,95	A

a_w - acoustical absorption coefficient, a single number value, determined based on the characteristic of practical acoustical absorption coefficient (according to PN-EN ISO 11654:1999)

Approving documents

- » European Technical Assessment ETA 11/0185
- » Certificate of constancy of performance 1220-CPR-1110
- » Declaration of performance TCRS-TW-01
- » ITB acoustic testing reports: LZFO2-00990/15/R179NZF and LZFO0-01434/19/Z00NZF.

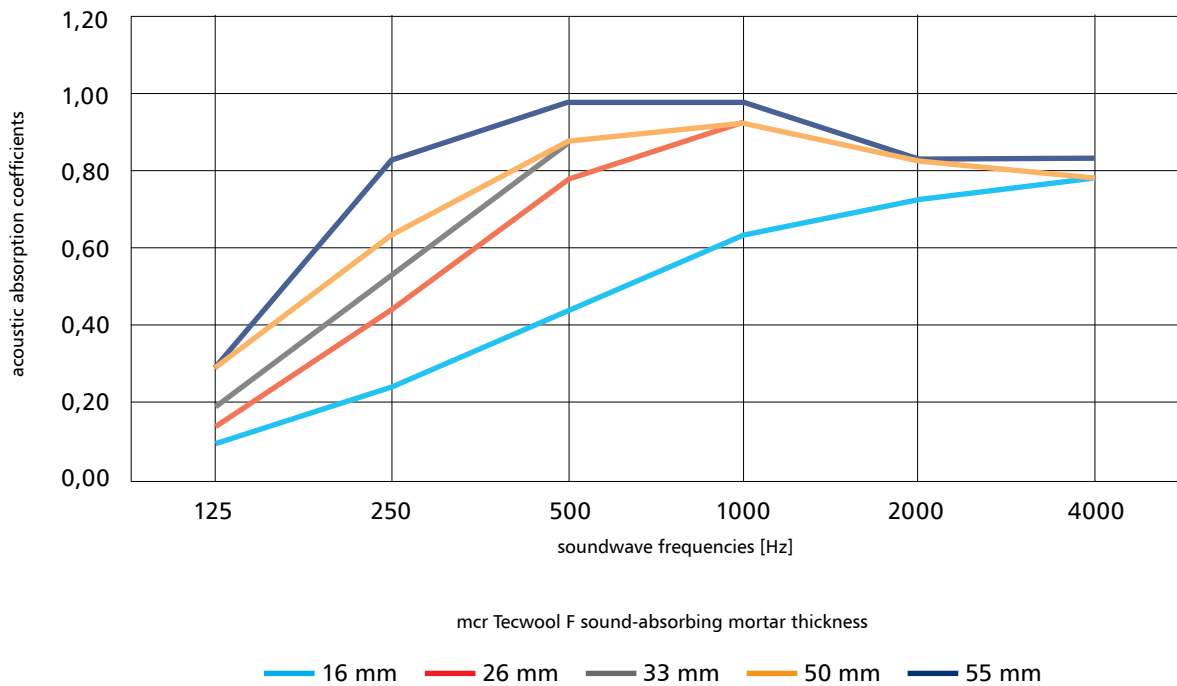
Application

Maximum reverberation time values for various types of rooms have been determined in detail in the Regulation of the Minister of Infrastructure on technical conditions for buildings and their location (section IX invoking the Polish Standard PN-B-02151-4:2015-06 Construction acoustics. Protection against noise in buildings. Part 4: "Requirements concerning reverberation conditions and speech intelligibility in rooms and guidelines for conducting studies"). The Regulation also contains requirements regarding minimal acoustic absorption. The Polish Standard PN-B-02151-4:2015-06 does not apply to interiors with qualified acoustics, which require individual calculations (e.g. concert or theater halls) but regular rooms in public buildings and multi-apartment residential buildings, where good acoustics determines the comfort of their use. In most cases the purpose of meeting the standard requirements is to improve the functioning of voice alarm systems (VAS) and/or sound systems wherever required.

Acoustic insulations are designed and used in, for example:

- » educational facilities (corridors, staircases, reading rooms, libraries),
- » sports facilities (gym halls, sports halls, pools, water parks, underground garages),
- » office facilities (conference rooms, office rooms or other rooms with similar purpose, underground garages),
- » healthcare facilities (waiting rooms, corridors, offices, staircases),
- » other public buildings (atria, halls, terminals, exhibition galleries, multi-storey, underground garages).

» Acoustic absorption coefficients depending on soundwave frequency and mcr Tecwool F sound-absorbing mortar thickness



8.2 | Acoustic insulation performance technology

- » Before applying the mcr Tecwool F mass, the elements to be acoustically isolated must be cleaned from dirt, oil, grease, peeling paint and rust – anything that may reduce adhesion.
- » For best adhesion, apply the mortar directly after damping the acoustically insulated element.
- » Apply the mass in layers, until the required target total thickness is reached. Spray the acoustically insulated surface at a straight angle, maintaining a distance between the nozzle and the surface of approximately 500–600 mm.
- » After applying the final thickness of the acoustic insulation, dampen with water to increase its hardness. Additional interference in the applied insulation in the form of rolling or dyeing may have a negative impact on acoustic parameters.
- » The final texture shape may be achieved as a fine or coarse version.
- » Insulation may be applied as a continuous spray on the entire insulated surface or on selected areas.




The mcr Tecwool F mortar is provided in powdered form, in 25 kg bags.

The acoustic insulation is performed with specialized spray-on machines. The dry mass is poured into the machine's tank and transported under pressure through hoses to a special spray-on nozzle, where it is mixed with water. Water is provided to the nozzle with an independent hose.

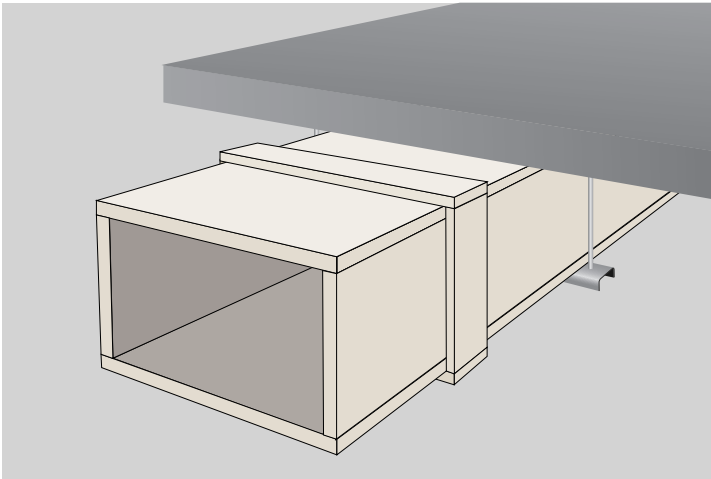


VENTILATION
AND SMOKE EXTRACT DUCTS,
METAL SHEET DUCT CASING



> Fire protection requirements on ventilation and smoke extract ducts concern fire rating of the construction materials used and fire resistance rating of these ducts as construction elements. Using materials with the appropriate properties will reduce the risk of fire spreading to other levels, fire compartments and evacuation routes.

„MERCOR“ S.A. offers solutions allowing to achieve fire resistance ratings up to EIS 120.



Technical parameters

» physical and mechanical properties

Available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
External appearance	white/cream color, smooth sanding on one side
Density	550 ± 15% kg/m ³
Compressive strength	≥1,0 MPa
Perpendicular tensile strength	≥0,10 MPa
Parallel tensile strength	≥0,40 MPa
Dimension stability	the boards are dimensionally stable
Heat conductivity	0,095 W/(m·K)
Reaction to fire class	A1
Use category	Y
Use category	Z

Approving documents

- » European Technical Assessment ETA 19/0736
- » Certificate of constancy of performance 1396-CPR-0188
- » Declaration of performance DOP/HZ/01/2018

Application

Self-supporting ventilation and smoke exhaust ducts made of **mcr Silboard** boards with a thickness of 40 mm may be used at a penetration through the following construction partitions:

- » concrete ceilings with a thickness of no less than 150 mm,
- » concrete walls with a thickness of no less than 110 mm,
- » masonry walls made of full ceramic bricks or aerated concrete blocks with a thickness of no less than 110 mm,
- » masonry walls made of full silicate bricks with a thickness of no less than 110 mm and a fire resistance rating of no less than EI 120,
- » light walls made of gypsum boards on a steel framework, with a total thickness of no less than 125 mm and a fire resistance rating of no less than EI 120.

entilation ducts made of mcr Silboard boards have been rated as **EI120(ve ho i↔o)S**. These are intended to be used in air supply/exhaust systems with a working pressure between -500 Pa and +500 Pa. Multi-compartment smoke extract ducts made of mcr Silboard boards have been rated as **EI120(ve-ho)S1500multi**. These are intended to be used in fire ventilation systems with a working pressure between -1500 Pa and +500 Pa.

Przewody wentylacyjne z płyt mcr Silboard zostały sklasyfikowane w klasie **EI120(ve ho i↔o)S** odporności ogniowej. Są przeznaczone do stosowania w instalacjach nawiewnych/wywiewnych o ciśnieniu roboczym od -500 Pa do +500 Pa. Wielostrefowe przewody oddymiające z płyt mcr Silboard zostały sklasyfikowane w klasie **EI120(ve-ho)S1500multi** odporności ogniowej. Są przeznaczone do zastosowania w instalacjach wentylacji pożarowej o ciśnieniu roboczym od -1500 Pa do +500 Pa.

Self-supporting ventilation and smoke extract ducts made of mcr Silboard boards have been rated as non-fire spreading.

The set for erecting self-supporting ventilation and smoke extract ducts consists of:

- » mcr Silboard boards with a thickness of 40 mm and 20 mm,
- » mcr Sil-MK adhesive for sealing board and board strip joints,
- » mcr Sil-MU intumescent gaskets with a 30 × 2 mm cross-section or mcr Dunastrip with a 20 × 2 mm cross-section for sealing inspection covers
- » firestop sealing compounds mcr Polylock K or mcr Polylock KG or mcr Polylock Elastic for sealing duct partition penetrations,
- » non-combustible mineral wool with a density of at least 50 kg/m³,
- » steel (stop) sections and steel threaded rods with nuts and washers for duct suspension,
- » steel anchors / dowels for installing suspensions and strips protecting duct penetrations through walls and ceilings.

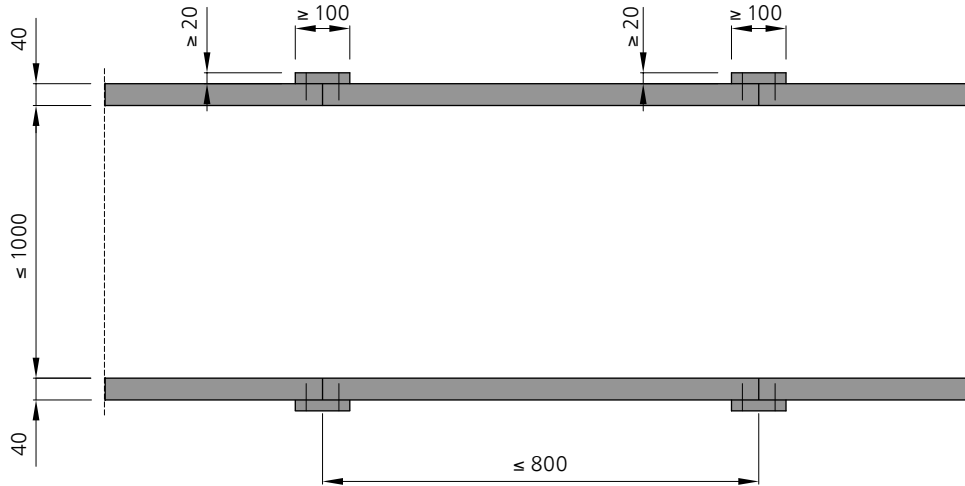
9.1.1 | Design

Vertical and horizontal ventilation and smoke extract ducts are made in a **four-wall layout** with a cross-section:

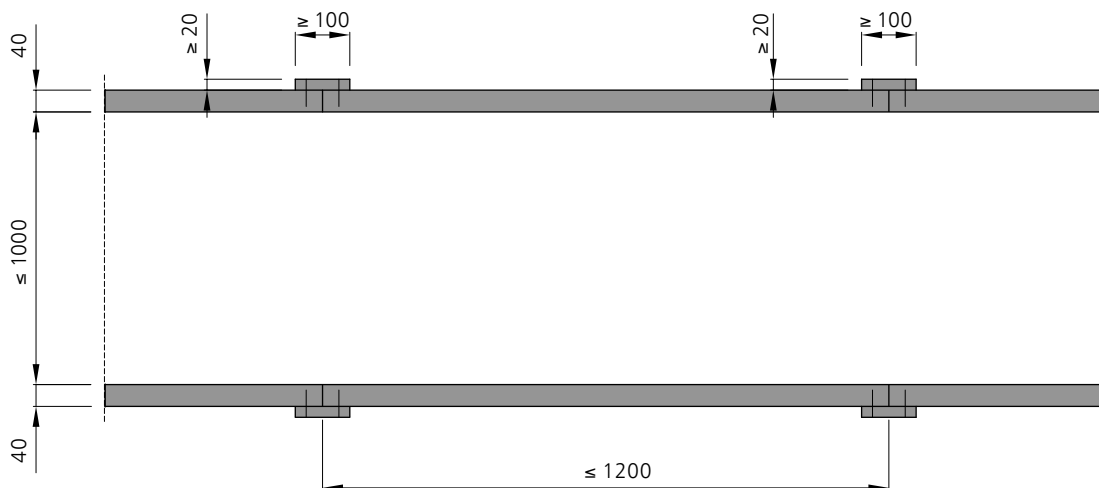
- » vertical and horizontal ventilation and smoke extract ducts in a four-wall layout with a cross-section no larger than 1250 × 1000 mm (1.25 m²)
- » vertical and horizontal ventilation and smoke extract ducts in a four-wall layout, with a width between 1251 mm and 2000 mm, height no greater than 1000 mm and a cross-section no larger 1.955 m².

They can be used in an environment corresponding to category Y according to EAD 250142-00-1106 (ETAG 018-4), which means the possibility of partial board exposure to weather conditions.

- » Longitudinal cross-section of ducts with a cross-section no larger than 1,250 × 1,000 mm (1.25 m²):



- » Longitudinal cross-section with a cross-section no larger than 1.955 m²:



9.1.2 | Installation of ventilation and smoke extract ducts

Self-supporting ventilation and smoke extract ducts made of mcr Silboard boards have a boxed structure. Duct walls are made of mcr Silboard boards with a thickness of 40 mm. Trims should be used at every 800 mm of the duct. The boards are connected at the corners with steel screws or nails.

» Dimensions of fasteners – connecting the boards at the corners

thickness of connected boards	staple spacing = 150 mm
20 mm + 20 mm	80/11,3/1,84 mm
30 mm + 30 mm	80/11,3/1,84 mm
40 mm + 40 mm	90/11,3/1,84 mm

screw spacing ≤ 200 mm	staple spacing ≤ 150 mm
5,0 x 70 mm	70 mm

Transversal connections are covered on the external side with mcr Silboard strips (connecting trims) with a thickness of 20 mm and width of no less than 100 mm.

» Dimensions of fasteners – transversal board connection

thickness of connected boards	staple spacing = 150 mm
20 mm + 20 mm	50/10,5/1,45 mm
30 mm + 30 mm	50/10,5/1,45 mm
40 mm + 40 mm	70/11,3/1,84 mm

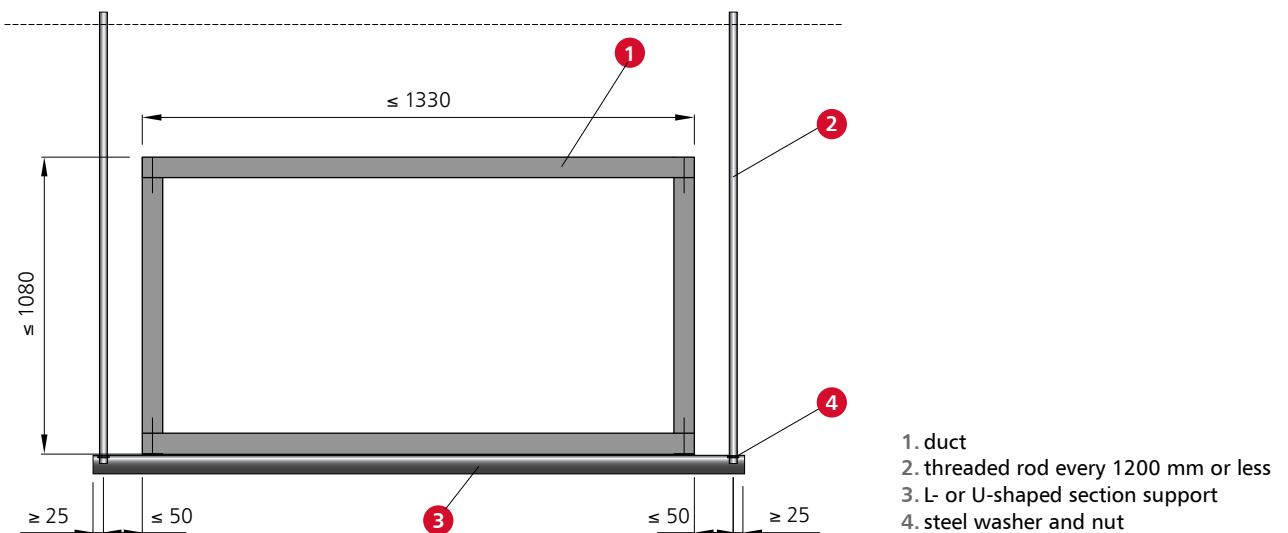
thickness of connected boards	screw spacing ≤ 200 mm	staple spacing ≤ 150 mm
20 mm + 40 mm	5,0 x 50 mm	70 mm
40 mm + 40 mm	5,0 x 70 mm	50 mm

All connections of fire-proof boards should be sealed with mcr Sil-MK adhesive.

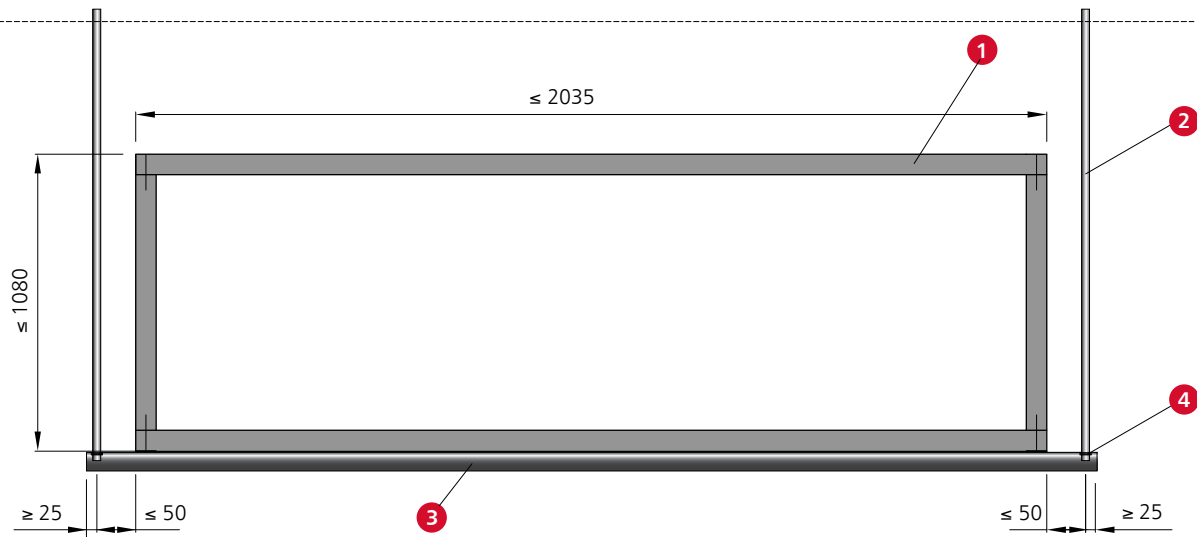
Horizontal ventilation and smoke extract ducts are suspended to the ceilings with hangers consisting of steel support sections, steel threaded rods with nuts and steel expansion anchors. Individual suspension system element sizes are selected so that tensile stresses in vertical suspension elements do not exceed 6 N/mm².

Maximum distance between suspensions is 1200 mm. Suspension elements do not require any additional flame retardant treatments.

» Method for suspending ducts with a cross-section no larger than 1250 × 1000 mm (1.25 m²)



» Method for suspending ducts with a cross-section no larger than 1.955 m²

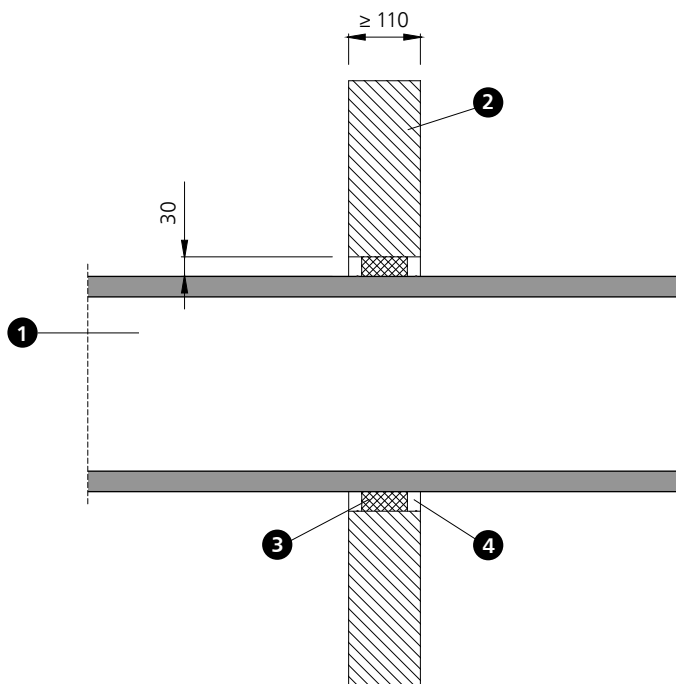


1. duct
2. threaded rod every 1200 mm or less
3. L- or U-shaped section support
4. steel washer and nut

Penetration sites of mcr Silboard board ducts through construction partitions can be provided with a flame retardant treatment by applying:

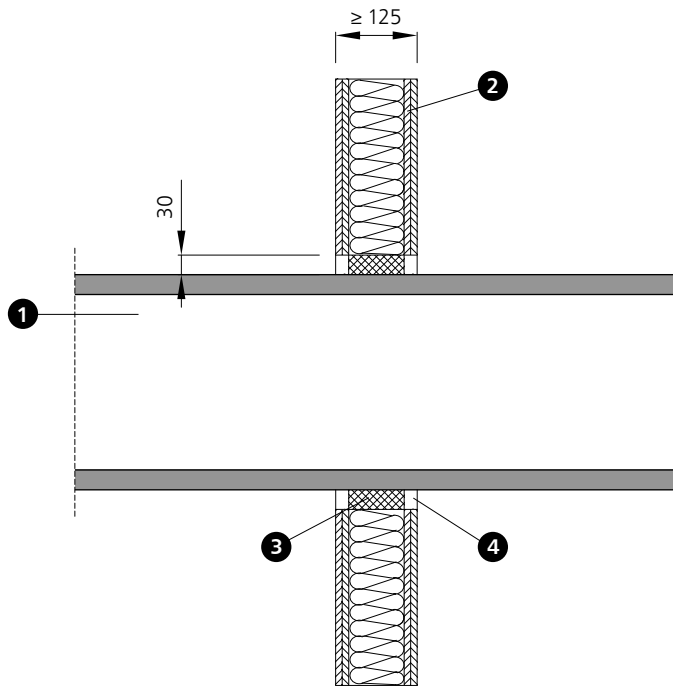
» a layer of non-combustible mineral wool with a density of at least 50 kg/m³, placed between the external duct surface and the edge of the hole in the ceiling/wall. On both sides the penetration is additionally protected with mcr Polylack K or mcr Polylack KG or mcr Polylack Elastic mass.

» Penetration through concrete/masonry walls



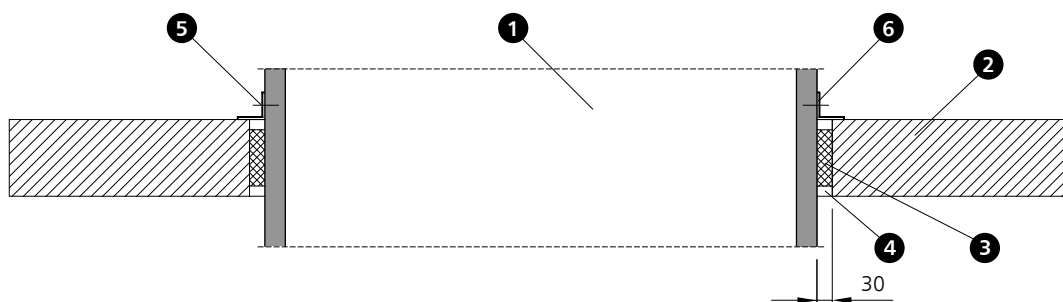
1. duct
2. concrete or masonry wall
3. mineral wool with a density of at least 50 kg/m³
4. mcr Polylack K or mcr Polylack KG or mcr Polylack Elastic mass, on both sides

» Penetration through light walls made of gypsum boards on a steel framework



1. duct
2. gypsum board wall
3. mineral wool with a density of at least 50 kg/m³
4. mcr Polylack K or mcr Polylack KG
or mcr Polylack Elastic mass, on both sides

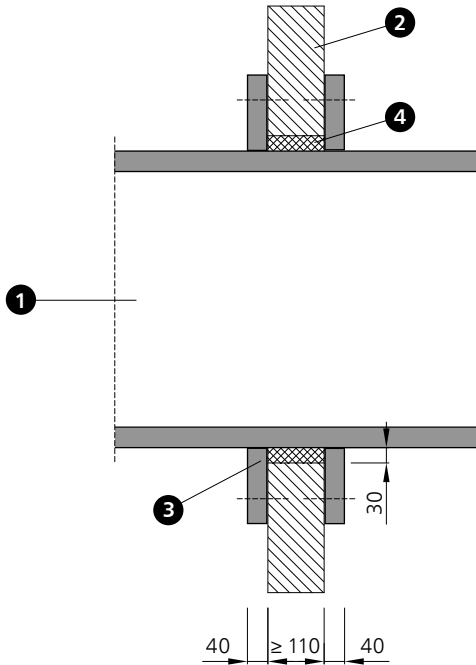
» Penetration through concrete ceilings



1. duct
2. concrete ceiling
3. mineral wool with a density of at least 50 kg/m³
4. mcr Polylack K or mcr Polylack KG or mcr Polylack Elastic mass, on both sides
5. washer and Ø5.0 × 40 steel screw every 10 cm
6. min. 40 × 40 × 2 mm angle section

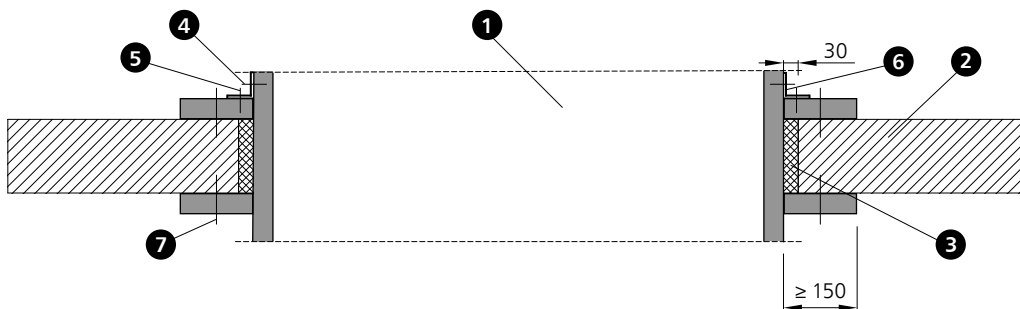
» with strips of mcr Silboard with a 150 × 40 mm cross-section, fixed to a wall/ceiling with 8.0 × 100 mm steel dowels, spaced at no more than 250 mm apart. mcr Silboard strips are fixed along the external perimeter of the ducts, on both sides of the partition. The maximum gap width between the duct and the edge of the opening in the wall/ceiling is 30 mm.

» Penetration through concrete/masonry walls



- 1. duct
- 2. concrete or masonry wall
- 3. board trim
- 4. mineral wool with a density of at least 50 kg/m³

» Penetration through concrete ceilings



- 1. duct
- 2. concrete ceiling
- 3. mineral wool 50 kg/m³
- 4. washer and 5.0 × 40 steel screw every 10 cm
- 5. washer and 5.0 × 40 steel screw every 20 cm
- 6. min. 40 × 40 × 2 angle section
- 7. 8.0 × 100 steel dowels max. every 250 mm

Inspection access openings with max. dimensions of 500 × 400 mm may be made in vertical or horizontal mcr Silboard duct walls. Such openings are covered with inspection covers made of two layers of mcr Silboard boards with a thickness of 40 mm, fixed to the duct with 5.0 × 70 mm steel screws. The gap between the edge of the inspection cover and the edge of the opening in the duct is secured with an mcr Sil-MU intumescent gasket.

9.2 | Supplementary range of products

9.2.1 | mcr Sil-MU gasket

The mcr Sil-MU gasket is designed for use everywhere where reduced mechanical strength is required, e.g. fire doors made of wood, steel, aluminum, fire doors for special application areas, as well as in ventilation and smoke extract ducts, in cable ducts, for window and façade sealing, as well as for other applications.

mcr Sil- MU is an intumescent gasket made of hydrated calcium silicate reinforced with fiberglass, covered on both sides with an epoxy resin layer. It activates at a temperature between 100°C and 120°C, creating a stiff, non-combustible foam which provides a high thermal insulation level. It expands in one direction for at least five times its initial length. The intumescence pressure thus generated may reach 1.5 N/mm². This provides an effective barrier preventing flames, smoke and hot gases from penetrating through the perimeter of the element where the gasket is placed.

GENERAL INFORMATION	
Product type	intumescent gasket
Reaction to fire	A2 non-combustible
Appearance	straps in rolls with a length of 2100 mm, 30 mm width and 2 mm thickness
Dimensions	length: 2100 mm/width: 30 mm ± 0.5 mm/thickness: 2 mm ± 0.4 mm

PHYSICAL	
Intumescence height (10 minutes at 550°C under load)	>5 x initial height
Intumescence pressure	≥0,9 N/mm ²
Thermal conductivity (at 20°C)	0,8 W/mK
Water contents	from 25% to 40% of the mass
Grammage (mean)	3,0 kg/m ²

9.2.2 | mcr Sil-MK adhesive

The mcr Sil-MK adhesive is designed for fixing calcium silicate (cement silicate) boards, e.g. mcr Silboard, gypsum boards and fibrous materials, e.g. mineral wool, glass wool, ceramic fibers, various types of soluble fibers, to various substrates, such as steel, aluminum, galvanized steel and other.

It is an adhesive based on inorganic ingredients, which forms a completely non-combustible coating. mcr Sil-MK is used as a system component (e.g. mcr Silboard system) and it constitutes a sealing.

Product characteristics	
Product type	fireproof adhesive
Reaction to fire	MO non-combustible
Appearance	creamy, ready to use paste
Calorific value	16 kJ/kg
Maximum grain size	0.4 mm
Chemical	binding

Chemical properties (mean)	
SiO ₂	78/80%
Al ₂ O ₃	14%
Fe ₂ O ₃	< 1%

Physical properties	
Density	1.9 g/cm ²
pH	10-11
Lepkość (20` C)	11/15
Temperature limit	1260°C



Approving documents

- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03

Application

mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction, for erecting steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, masonry walls, suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

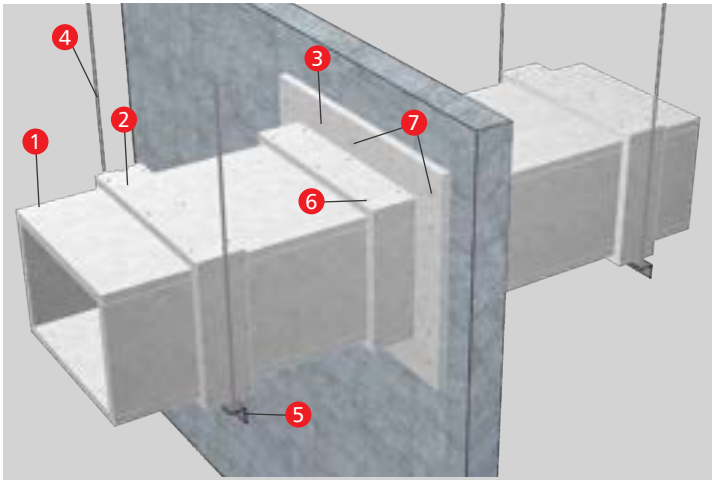
Technical parameters

» physical and mechanical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	Smooth surface in a light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

9.3.1 | Installation

9.3.2 | mcr Tecbor board 30 mm TYPEE A, B, C EI120 horizontal and vertical duct



Approving documents

- » Standard: UNE EN 1366-1
- » Laboratory: TECNALIA
- » Report no.: 14_07739, 14_08681, 14_07738
- » Standard: UNE EN 1366-8
- » Laboratory: APPLUS
- » Report no.: 14/8785-1293 y 14/8785-12377

Installation description

The duct consists of a single layer of 30 mm mcr Tecbor boards. The boards are connected with mcr Tecsel Adhesive. The transversal sections of the ducts are connected with trims made from the mcr Tecbor boards with a thickness of 30 mm and width of 250 mm.

The trims are fixed in two sections with 5 × 60 mm threaded wood screws spaced at every 250 mm on longer sides and every 200 mm on the short sides.

The duct is supported by 50 × 50 × 5 mm horizontal angle sections and suspended to the ceiling slabs with a rod, nut and M16 screw. Distance between the hangers 1200 mm. A partition penetration is protected by sealing it with mineral wool with a thickness of 50 mm and a density of 145 kg/m³ and covering the entirety with an mcr Tecbor board with a thickness of 30 mm.

Technical parameters

» physical and mechanical properties

Available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
External appearance	white/cream color, smooth sanding on one side
Density	550 ± 15% kg/m ³
Compressive strength	≥1,0 MPa
Perpendicular tensile strength	≥0,10 MPa
Parallel tensile strength	≥0,40 MPa
Dimension stability	the boards are dimensionally stable
Heat conductivity	0,095 W/(m·K)
Reaction to fire class	A1
Use category	Y
Use category	Z

Solution

1. mcr Tecbor board 30 mm
2. mcr Tecbor 30 mm board trim
3. mcr Tecbor board 30 mm
4. Hanger
5. Steel section L 50 × 50 × 5 mm
6. 5 × 60 mm threaded wood screws
7. 6 × 80 mm steel anchors

9.4 | **Tecsel Adhesive**



Application

Tecsel Adhesive is a waterborne adhesive composed of inorganic compounds, which creates a non-combustible layer on the element covered with it. It increases the fire rating of the covered elements up to 1200°C.

Tecsel Adhesive can be used for:

- » mcr Tecbor boards
- » Concrete members
- » Iron
- » Galvanized members
- » Aluminum
- » Plywood
- » Polyurethanes
- » Ceramic fibers
- » Mineral wool
- » Polystyrene

Technical parameters

pH	9-11,5
density	1,65 g/mc ³
color	cream
viscosity at 20°C	from 52,000 to 52,000 mPa/s

Application

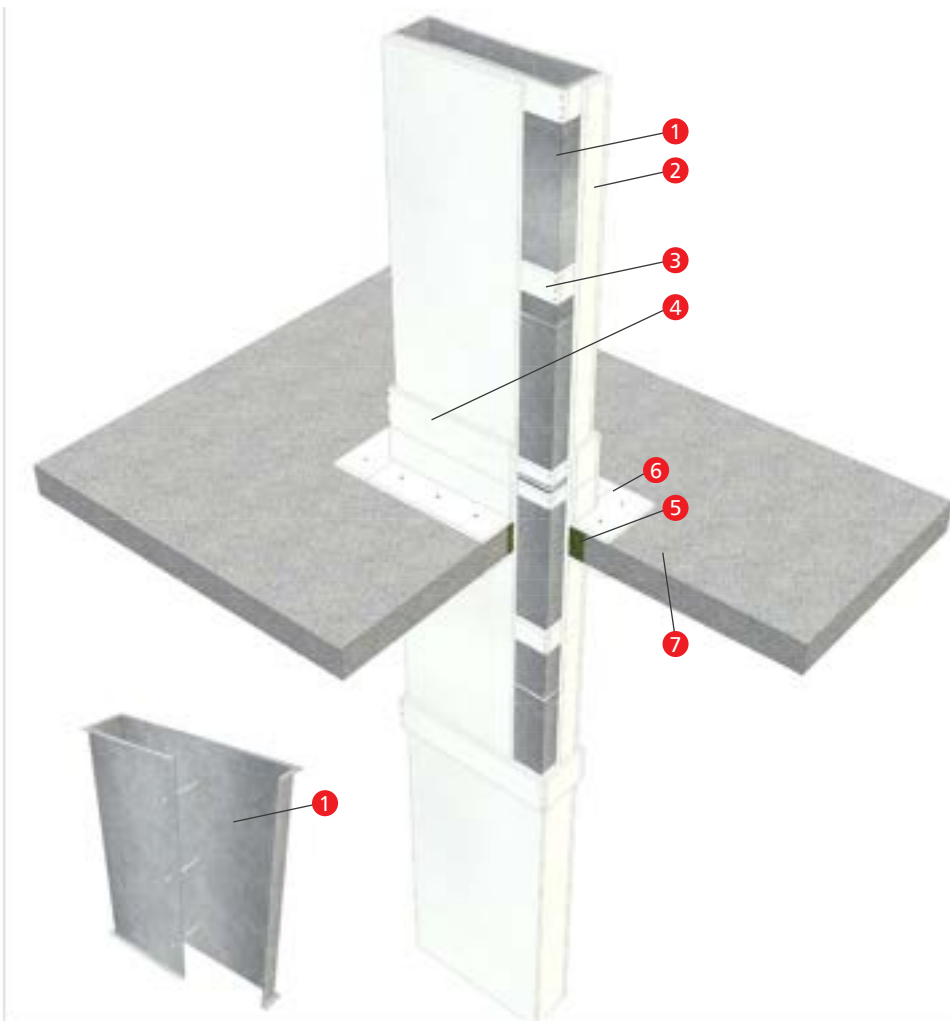
This adhesive is ready to use. To ensure effective adherence, the surface it is applied to must be free of dust. Mix before use to evenly distribute the components. For cold application.

Dedicated for spatula application.

The drying time depends on ambient air relative humidity and material porosity. The drying time may be reduced by well ventilated, dry air and increased ambient temperature (do not exceed 50°C). Clean the application tools with water.

Tecsel Adhesive is designed for indoor use, because it dissolves under constant contact with water.

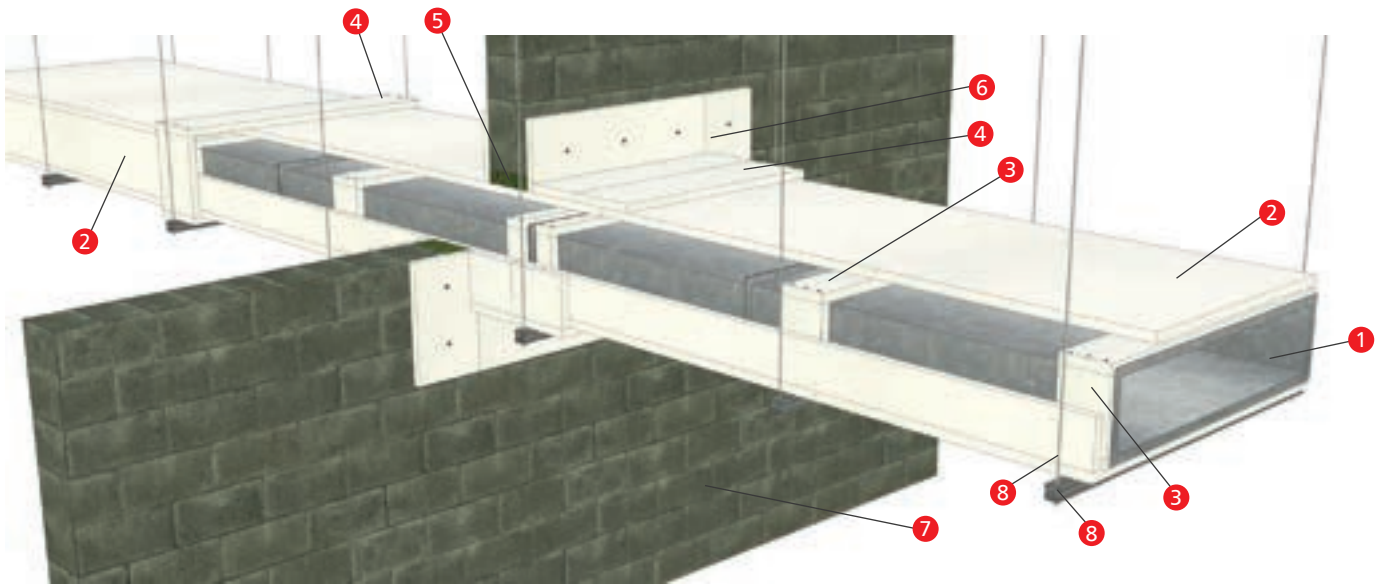
9.5.1 | Metal sheet duct casing



Approving documents

- » Standard UNE EN 1366-1
- » Laboratory: TECNALIA
- » Report no. 083291-004-3-a


1. 1000 × 250 mm metal sheet duct with a thickness of 1 mm
2. mcr Tecbor board 30 mm
3. 30 mm mcr Tecbor board trim with a width of 150 mm
4. 30 mm mcr Tecbor board trim with a width of 250 mm
5. mineral wool covered with mcr Tecsel Adhesive
6. partition penetrations – 30 mm mcr Tecbor board trim
7. ceiling



1. 1000 × 250 mm metal sheet duct with a thickness of 1 mm
2. mcr Tecbor board 30 mm
3. 30 mm mcr Tecbor board trim with a width of 150 mm
4. 30 mm mcr Tecbor board trim with a width of 250 mm
5. mineral wool covered with mcr Tescel Adhesive
6. partition penetrations – 30 mm mcr Tecbor board trim
7. partition
8. hanger



**CABLES ROUTE CASINGS,
FIRE PROTECTION
OF ELECTRICAL INSTALLATIONS**

- 
- Electric cables and wires in fire-protection technology need to be protected in order to:
- » retain cable functionality in case of a fire;
 - » reduce the risk of cable and wire fire;
 - » prevent fire expansion and spreading;
 - » secure the adjacent rooms against the effects of cable and wire fire.

“MERCOR” S.A. offers proven and approved systems ensuring continuous electricity supply or signal transmission for 30–120 minutes and providing fire resistance ratings up to EI120.

10.1 | mcr Silboard



Technical parameters

» physical and chemical properties

Available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
External appearance	white/cream color, smooth sanding on one side
Density	550 ± 15% kg/m ³
Compressive strength	≥1,0 MPa
Perpendicular tensile strength	≥0,10 MPa
Parallel tensile strength	≥0,40 MPa
Dimension stability	the boards are dimensionally stable
Heat conductivity	0,095 W/(m·K)
Reaction to fire class	A1
Use category	Y
Use category	Z

Approving documents

- » National Technical Assessment ITB-KOT-2018/0561 edition 1
- » National Certificate of constancy of performance 020-UWB-2738/W
- » National declaration of performance KDWU/HZ/01/2019

Application

mcr Silboard – a fire-protection calcium silicate board, non-combustible, with a wide range of applications in general and industrial construction, designed for self-supporting firestop general ventilation ducts (comfort ventilation) and multi-zone smoke extract ducts, cable ducts, installation ducts, non-bearing walls (shafts), protecting steel structures and reinforced concrete structural components reinforced with carbon fiber tapes and mats.

Set

The set for providing flame retardant treatment to cable ducts and installation ducts is composed of:

- » mcr Silboard boards with a thickness of 40 mm 20 mm,
- » mcr Sil-MK adhesive,
- » mcr Polylack KG firestop sealing compound,
- » mcr Polylack Elastic firestop sealing compound,
- » mcr Sil-MU intumescent gasket,
- » Tecsel air grille,
- » steel connecting and fixing elements: steel staples, screws and expansion anchors,
- » steel sections and steel threaded rods with nuts and washers for suspension.

Maximum external dimensions of the duct cross-section are (width × height): 1000 × 800 mm (maximum sectional area is 0.80 m²).

» Cable ducts ensuring the continuity of electricity supply or signal transmission:

Vertical and horizontal cable ducts made of mcr Silboard boards ensure the continuity of electricity supply or signal transmission under fire conditions (provided that no short circuit or current flow break occurs in the wire system) in power supply and control systems of fire safety devices, depending on the duct wall thickness, for a time of no less than:

» Two-, three- and four-wall cable ducts

Continuous electricity supply or signal transmission – time, minutes	Wall thickness of two- and four-wall ducts made of mcr Silboard, mm	Wall thickness of three-wall ducts made of mcr Silboard, mm
30	≥ 1 x 30	≥ 1 x 40
60	≥ 2 x 20	≥ 2 x 30
90	≥ 2 x 30	≥ 2 x 40
120	≥ 2 x 40	-

» Installation ducts ensuring the maintenance of fire integrity and fire insulation:

Horizontal single-, two and three-wall installation ducts made of mcr Silboard boards in two-layer arrangement were classified for a fire resistance rating:

» Two-, three- and four-wall cable ducts

Item	Fire resistance rating in accordance with PN-EN 13501-2:2016	Wall thickness of one-, two- and three-wall ducts made of mcr Silboard, mm
1	EI 60	2 x 20
2	EI 120	2 x 30

10.1.1 | Installation

Depending on the required continuous electricity supply or signal transmission maintenance duration under fire conditions, the cable ducts are made of one or two layers of mcr Silboard boards. In the case of two layers, the boards are fixed in a staggered pattern, with the contact portions shift of at least 200 mm.

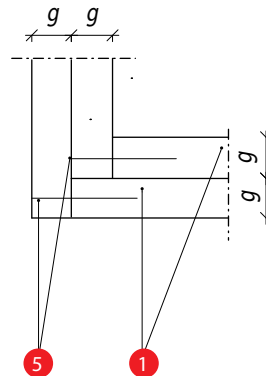
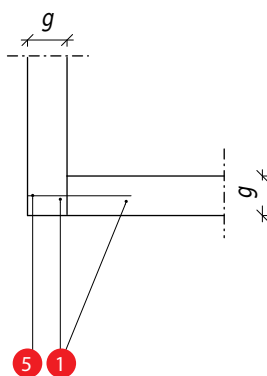
In the case of a single layer of boards, the transversal board connections are covered on the external side with mcr Silboard strips (connecting trims) with a thickness of 20 mm and width of no less than 100 mm, fixed to duct walls with 40/10.5/1.45 mm steel staples spaced at no more than 150 mm.

Installation ducts are made of two layers of mcr Silboard boards.

» Dimensions of fasteners – connecting the boards at the corners

thickness of connected boards	staple spacing = 150 mm
20 mm + 20 mm	80/11,3/1,84 mm
30 mm + 30 mm	80/11,3/1,84 mm
40 mm + 40 mm	90/11,3/1,84 mm

» Board connections at cable duct corners



g – overall board cladding thickness

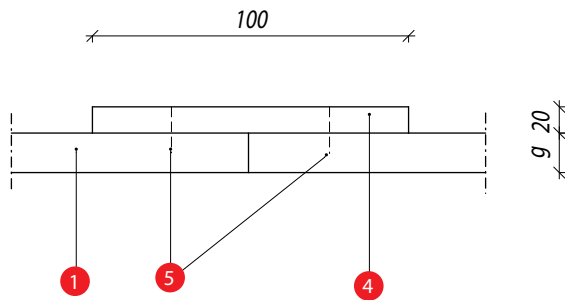
1. mcr Silboard board
5. steel staple

» Dimensions of fasteners – parallel connections

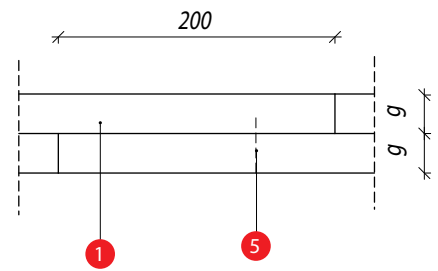
thickness of connected boards	staple spacing = 150 mm
20 mm + 20 mm	50/10,5/1,45 mm
30 mm + 30 mm	50/10,5/1,45 mm
40 mm + 40 mm	70/11,3/1,84 mm

» Duct board connection

» a) in a single-layer arrangement using a connecting trim



» b) in a two-layer arrangement



g – overall board cladding thickness

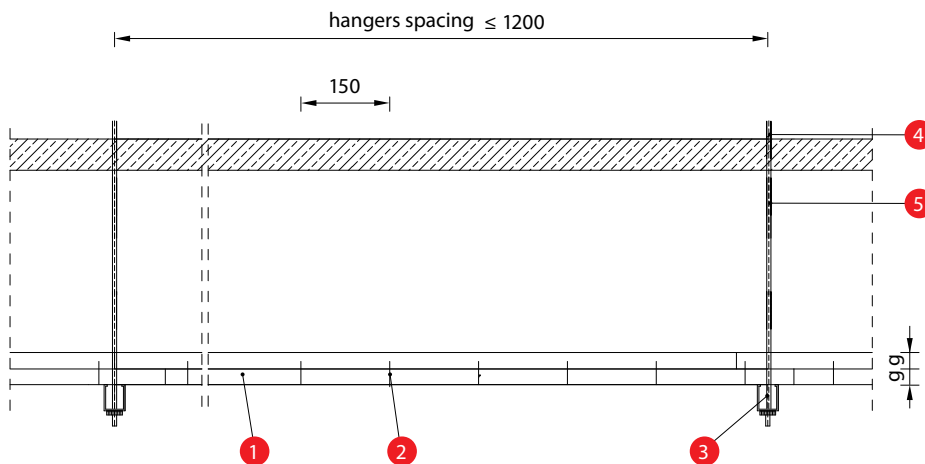
1. mcr Silboard board
2. mcr Silboard strip with a thickness of 20 mm
3. steel staple

Cable ducts and installation ducts are suspended to the ceilings with suspensions consisting of steel support sections, at least M10 steel threaded rods with washers and nuts and steel expansion anchors. Sizes of individual suspension system elements should be selected so that tensile stresses in vertical suspension elements (steel rods, anchors) do not exceed 6 N/mm².

Steel support sections are used for suspension:

- » L 35 × 35 × 2 mm – used for ducts with a cross-section of no more than 0.35 m²;
- » L 35 × 35 × 3 mm – used for ducts with a cross-section of no more than 0.80 m².

Maximum suspension spacing is 1200 mm. Suspension elements do not require any additional flame retardant treatments.



1. mcr Silboard board
2. steel staple
3. hanger
4. steel anchoring ferrule
5. threaded rod

g – overall board cladding thickness

In vertical or horizontal duct walls, inspection access openings may be made with maximum dimensions of: 500 x 400 mm. The opening closure is fixed with installation screws with a length matching the thickness of the duct wall. Depending on the duct structure, inspection openings should be covered with covers made of:

- » mcr Silboard boards with a thickness of 2 × 30 mm +40 mm, fixed to the duct with Ø 5.0 × 70 mm steel screws – for ducts made of boards with a thickness of 2 × 30 mm;
- » mcr Silboard boards with a thickness of 3 × 40 mm, fixed to the duct with Ø 5.0 × 70 mm steel screws – for a duct made of boards with a thickness of 2 × 40 mm;
- » mcr Silboard boards with a thickness of 30 + 40 mm, fixed to the duct with Ø 5.0 × 70 mm steel screws – for a duct made of boards with a thickness of 1 × 30 mm or 1 × 40 mm.

The gap between the edge of the inspection cover and the edge of the opening in the duct should be secured with an mcr Sil-MU intumescent gasket with a 30 × 2.0 mm cross-section.

10.2 | Supplementary range of products

10.2.1 | mcr Sil-MU gasket

The mcr Sil-MU gasket is designed for use everywhere where reduced mechanical strength is required, e.g. fire doors made of wood, steel, aluminum, fire doors for special application areas, as well as in ventilation and smoke extract ducts, in cable ducts, for window and façade sealing, as well as for other applications.

mcr Sil- MU is an intumescent gasket made of hydrated calcium silicate reinforced with fiberglass, covered on both sides with an epoxy resin layer. It activates at a temperature between 100°C and 120°C, creating a stiff, non-combustible foam which provides a high thermal insulation level. It expands in one direction for at least five times its initial length. The intumescence pressure thus generated may reach 1.5 N/mm². This provides an effective barrier preventing flames, smoke and hot gases from penetrating through the perimeter of the element where the gasket is placed.

GENERAL INFORMATION	
Product type	intumescent gasket
Reaction to fire	A2 non-combustible
Appearance	straps in rolls with a length of 2100 mm, 30 mm width and 2 mm thickness
Dimensions	length: 2100 mm/width: 30 mm ± 0.5 mm/thickness: 2 mm ± 0.4 mm

PHYSICAL	
Intumescence height (10 minutes at 550°C under load)	>5 x initial height
Intumescence pressure	≥0,9 N/mm ²
Thermal conductivity (at 20°C)	0,8 W/mK
Water contents	from 25% to 40% of the mass
Grammage (mean)	3,0 kg/m ²

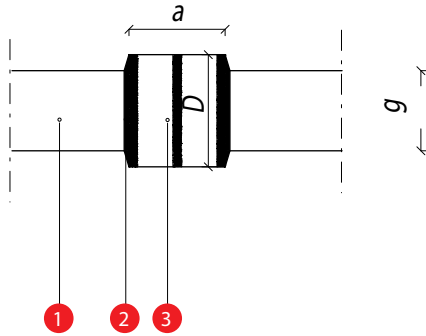
Tecsel intumescent air grilles with dimensions no larger than 150 × 150 mm and the following thickness may be installed in the side walls of the cable ducts:

- » 60 mm – for two-layer arrangement or
- » thickness increased in relation to the thickness of the duct by at least 10 mm and EI 30 fire resistance rating – for single-layer arrangement.
- » thickness increased in relation to the thickness of the duct by at least 10 mm and EI 120 fire resistance rating – for two-layer arrangement.

Tecsel intumescent air grilles with dimensions no larger than 150 × 150 mm, a thickness equal to the thickness of the wall and a fire resistance rating of at least EI 120 may be installed in the side walls of the installation ducts.

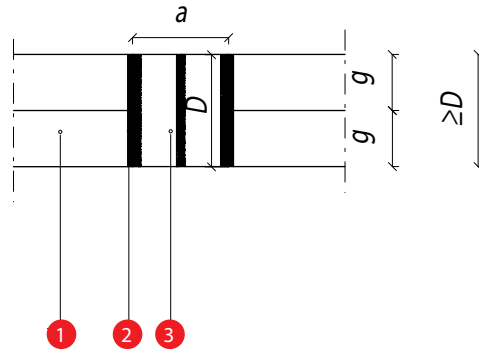
» **Tecsel/mcr SilGrill intumescent air grille in the duct**

» a) in a single-layer arrangement



g – overall board cladding thickness
a – air grille width
D – air grille thickness

» b) in a two-layer arrangement

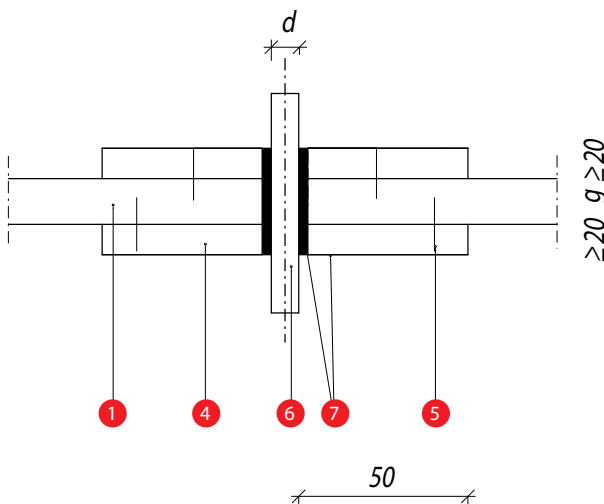


1. mcr Silboard board
2. mcr Sil-MK adhesive
3. Tecsel intumescent air grille

Single cables with diameter of no more than 20 mm may penetrate through the side walls of the ducts. The penetration should be sealed with mcr Polylack KG mass (cable ducts) or mcr Polylack Elastic mass (installation ducts) and reinforced with mcr Silboard strips with a thickness of 20 mm and width of 50 mm.

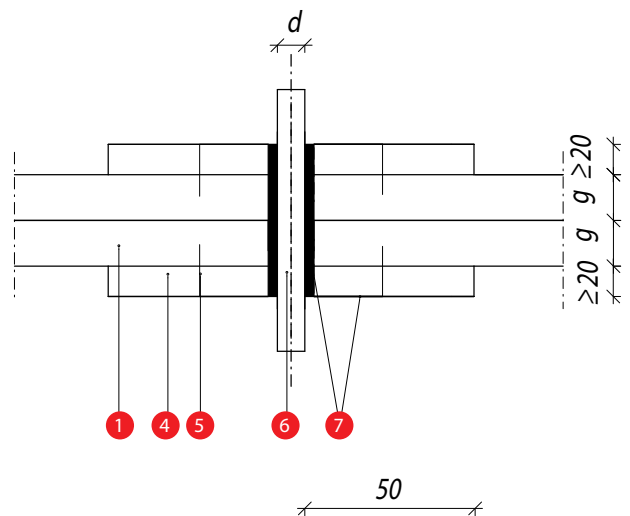
» **Cable penetration through the side wall of the duct**

» a) in a single-layer arrangement



g – overall board cladding thickness
d – cable diameter

» b) in a two-layer arrangement



1. mcr Silboard board
4. mcr Sil-MK adhesive
5. steel staple
6. cable
7. mcr Polylack KG or mcr Polylack Elastic mass

Cables in ducts may be laid:

- » in cable trays on the bottom of the duct or in cable trays fixed to the wall or ceiling with supports – for two-wall ducts;
- » in cable trays on the bottom of the duct or in cable trays fixed to the ceiling with supports – for three-wall ducts;
- » in cable trays on the bottom of the ducts – for four-wall ducts.

Cables in installation ducts may be laid:

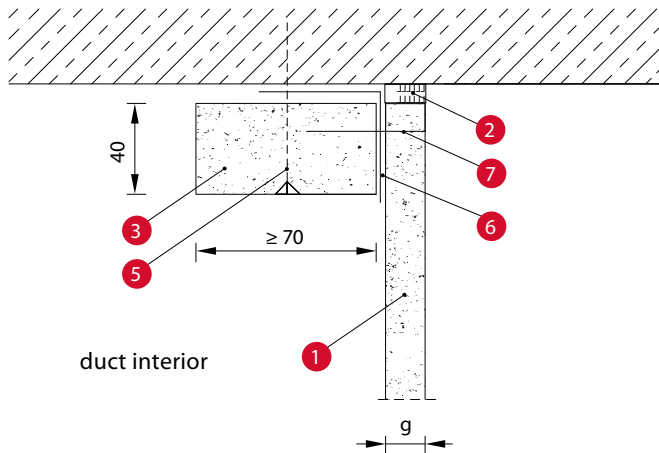
- » in cable trays on the bottom of the duct or in cable trays fixed to the wall or ceiling with supports – for single- and two-wall ducts;
- » in cable trays on the bottom of the duct or in cable trays fixed to the ceiling with supports – for three-wall ducts;

The maximum loading of cable ducts and installation ducts should not exceed 30 kg/lin.m.

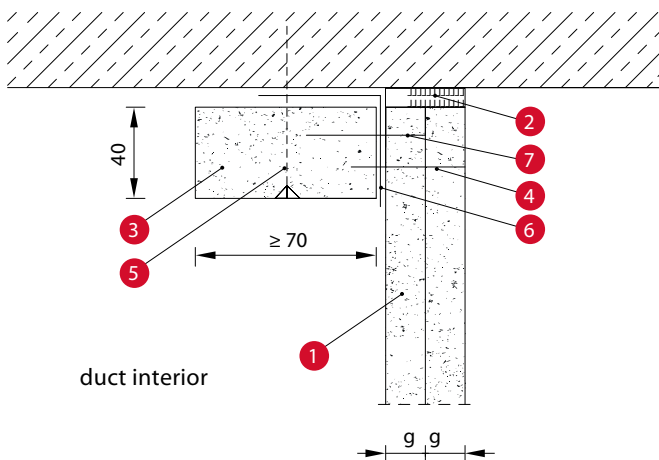
Duct penetrations through construction partitions (walls and ceilings – cable ducts, walls – installation ducts) should be sealed with non-combustible, rock mineral wool with density of at least 50 kg/m³, placed between the external duct surface and the edge of the opening in the partition. The penetration should additionally be secured with a 20 mm thick layer of mcr Polylack KG fire-proof mass on both sides of the partition. Optionally, instead of mcr Polylack KG mass, strips of mcr Silboard boards with a thickness of 40 mm and width of 150 mm, fixed to the wall and/or ceiling with steel dowels \varnothing 8.0 × 100 mm, spaced at no more than 250 mm, may be used. mcr Silboard strips should be fixed on the external perimeter of the ducts, on both sides of the partition. The maximum gap width between the duct and the edge of the opening in the wall and/or ceiling is 30 mm.

» **Cable duct connection with wall or ceiling**

» a) duct in a single-layer arrangement



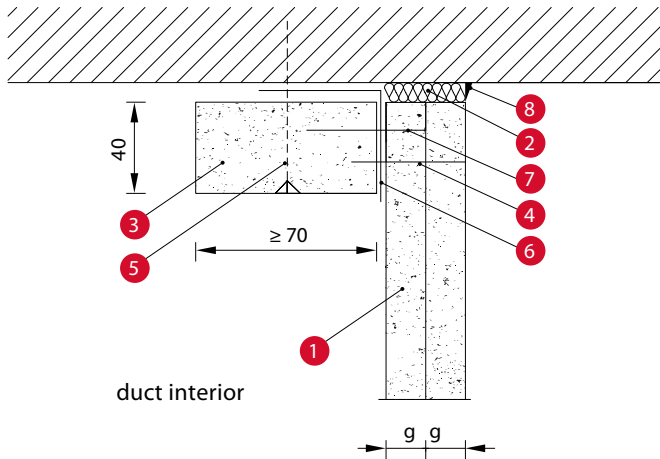
» b) duct in a two-layer arrangement



1. mcr Silboard board
2. mcr Sil-MK adhesive
3. mcr Silboard strips with a thickness of 20 mm
4. steel staple
5. steel expansion anchor or wood screw
6. angle section, at least L 40 × 40 × 3 mm
7. sheet metal screw \varnothing 6 × 80 mm
for a two-layer duct or \varnothing 6 × 50 mm
for a single-layer duct

g – overall board cladding thickness

» Installation duct connection with wall or ceiling

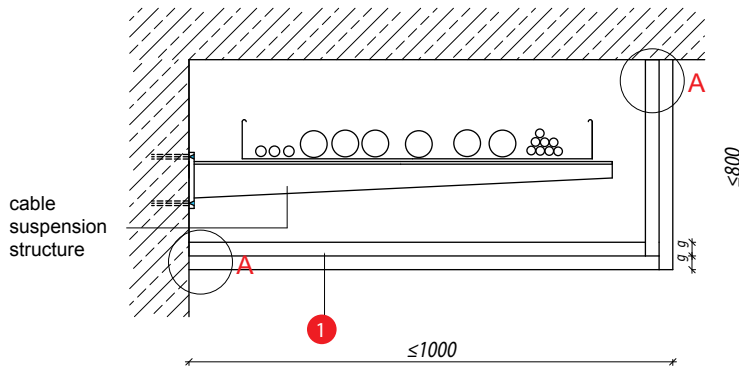


g – overall board cladding thickness

1. mcr Silboard board
2. rock mineral wool with a density of at least 80 kg/m³
3. 40 × 70 mm mcr Silboard strips
4. steel staple
5. steel expansion anchor or wood screw
6. angle section, at least L 40 × 40 × 3 mm
7. sheet metal screw Ø 6 × 80 mm
8. mcr Polylack Elastic mass

» Two-wall cable duct

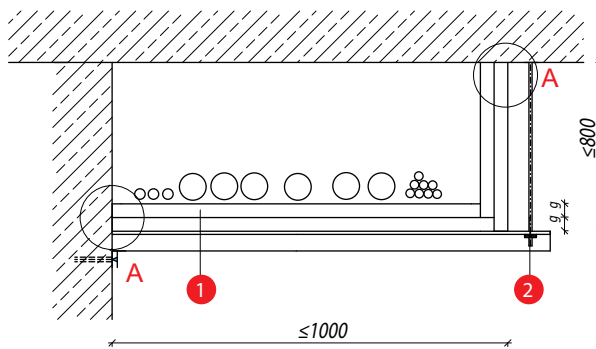
» a) not carrying the cable load



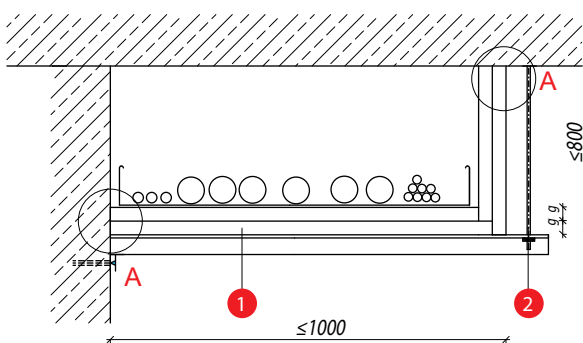
g – overall board cladding thickness

1. mcr Silboard board
2. hanger

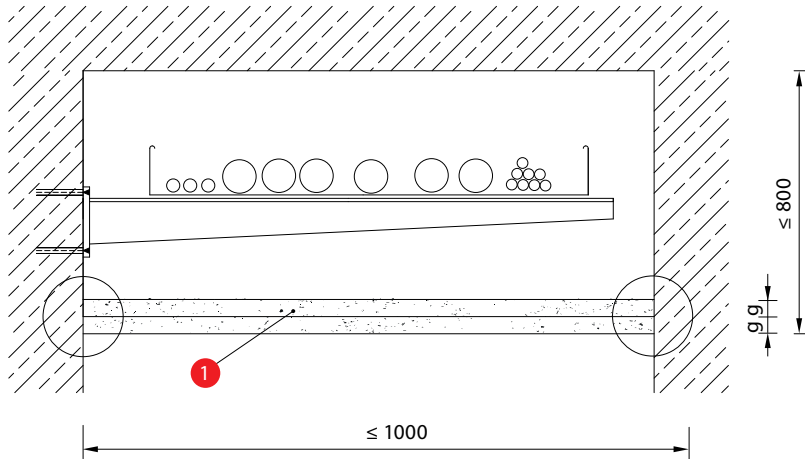
» b) directly carrying the cable load



» c) carrying the cable load through the ladder



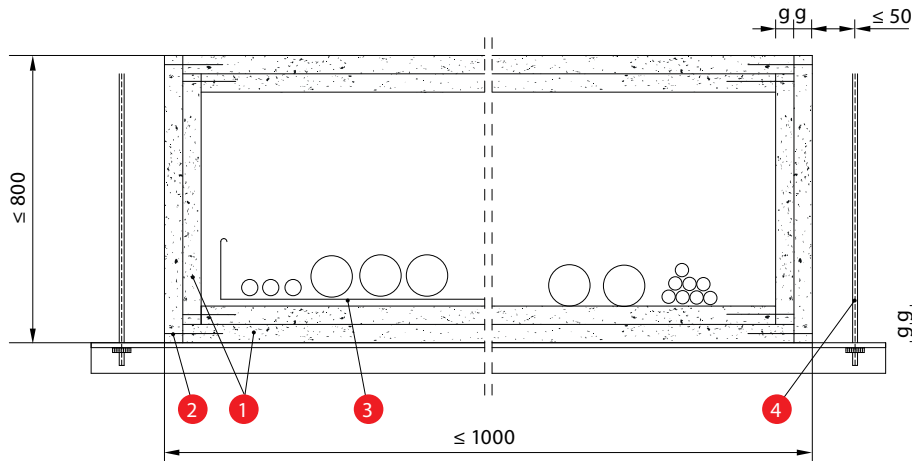
» Single-wall installation duct



g – overall board cladding thickness

1. mcr Silboard board

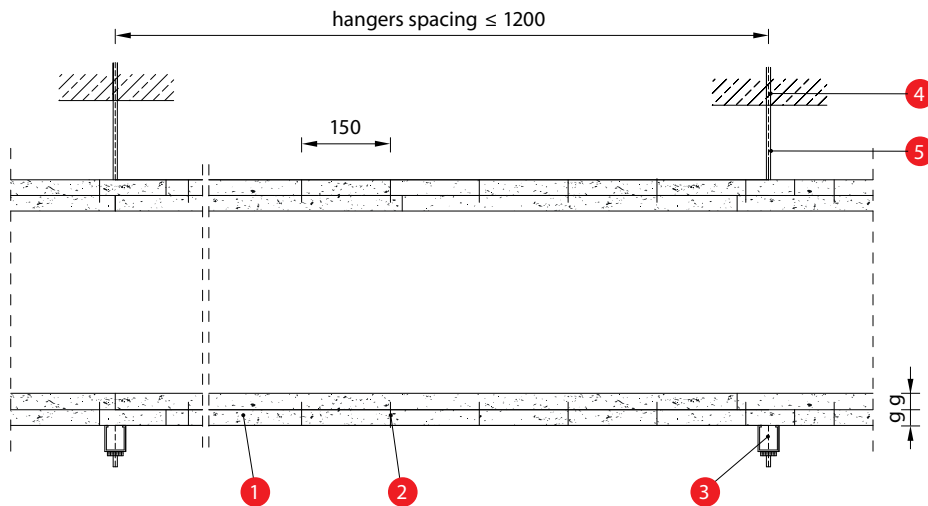
» Four-wall cable duct – cross-section



g – overall board cladding thickness

1. mcr Silboard board
2. steel staple
3. cable rack
4. hangers

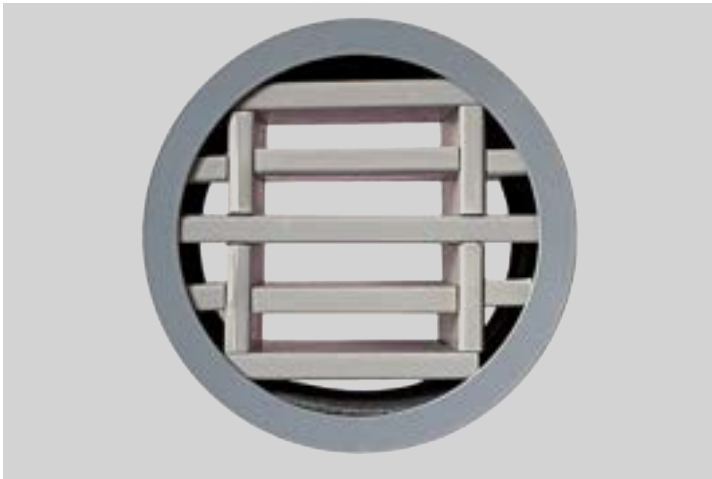
» Four-wall cable duct – longitudinal cross-section



g – overall board cladding thickness

1. mcr Silboard board
2. steel staple
3. hanger
4. steel anchoring ferrule
5. threaded rod

10.3 | Tecsel – intumescent fire grilles



Dimensions

Type	Fire resistive rating
Tecsel VC60 D100	EI 120
Tecsel VC60 D125	EI 120
Tecsel VC60 D150	EI 120
Tecsel VC60 D200	EI 120
Tecsel VC60 D250	EI 120
Tecsel VC60 D300	EI 120
Tecsel V60 100x100 mm	EI 120
Tecsel V60 150x150 mm	EI 120
Tecsel V60 200x200 mm	EI 120
Tecsel V60 250x250 mm	EI 120
Tecsel V60 300x300 mm	EI 120
Tecsel V60 400x400 mm	EI 120
Tecsel V60 450x450 mm	EI 120
Tecsel V60 500x500 mm	EI 120
Tecsel V60 600x600 mm	EI 120

Application

Tecsel intumescent fire grilles allow for free circulation of room temperature air through the structural element (walls, doors etc.), simultaneously offering efficient fire protection. When exposed to high temperature, they intumesce and form a layer of impact-resistant, non-combustible foam, which – as an insulating layer – prevents the penetration of flames, smoke and fire gases to the rest of the building not covered by fire.

The grilles are designed for indoor applications and should not be installed in rooms with high humidity, where the temperature exceeds 40°C.

Tecsel grilles meet the requirements of EN 1363-1: Fire resistance tests – Part 1: General requirements, which is confirmed by the test report No. 23548 issued by the CIDEMCO-TECNALIA laboratory from Spain.

Grille features

- » EI 120 fire resistance
- » reaction at low temperature (from 100°C)
- » rapid blockage of the clearance of the opening where it is installed (usually in the fifth minute, depending on the heat exposure)
- » high aesthetics
- » quick and easy to install

Installation technology

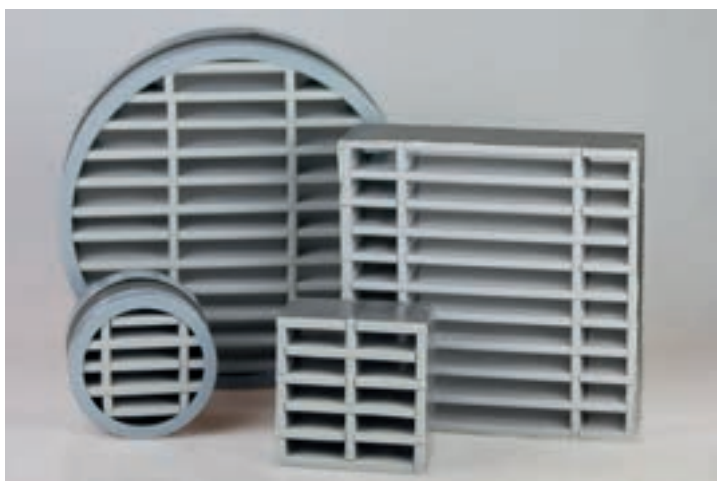
Tecsel grilles should be installed by mechanical means, using screws, bolts, pins or other fasteners (they should have the same fire resistance rating as the elements to which they are attached). It is recommended to leave a 2–3 mm gap around the grille and fill it with a fireproof adhesive, e.g. mcr Sil-MK. For larger ventilation openings, more grilles may be installed, provided that the partition fire resistance and appropriate distance between them are maintained.

Tecsel grilles may be installed in:

- » walls;
- » doors;
- » ventilation systems;
- » cable ducts.

Fire resistive rating EI 120.

10.4 | mcr SilGrill – intumescent fire grilles with masking elements



Wymiary

TYPE	AVAILABLE DIAMETERS [mm]	THICKNESS [mm]	MASKING ELEMENT TYPE
VC61,6	100	61,6	WITHOUT REQUIREMENTS
VC61,6	125	61,6	WITHOUT REQUIREMENTS
VC61,6	150	61,6	WITHOUT REQUIREMENTS
VC61,6	200	61,6	WITHOUT REQUIREMENTS
VC61,6	250	61,6	WITHOUT REQUIREMENTS
VC61,6	300	61,6	WITHOUT REQUIREMENTS

TYPE	DOSTĘPNE WYMIARY [mm]	THICKNESS [mm]	MASKING ELEMENT TYPE
VC60	100x100	60	WITHOUT REQUIREMENTS
VC60	150x150	60	WITHOUT REQUIREMENTS
VC60	200x200	60	WITHOUT REQUIREMENTS
VC60	250x250	60	MK25*
VC60	300x300	60	MK30*
VC60	400x400	60	MK40*
VC60	450x450	60	MK45*
VC60	500x500	60	MK50*
VC60	600x600	60	MK60*

* Masking element MK 25 – 60 (double-sided wall-mount covers) made from steel sheet metal with a thickness of 0.75 mm. Perforation spacing matches the arrangement of elements in the grille insert.

Application

Intumescent fire grilles allow for free circulation of room temperature air through the structural element (including walls and doors), simultaneously offering efficient fire protection.

When exposed to fire, the grilles intumesce under high temperature and form a layer of impact-resistant, non-combustible foam, which constitutes an insulating layer and prevents the penetration of flames, smoke and fire gases to the rest of the building not covered by the fire.

The mcr SilGrill product meets the requirements of PN-EN 1364-5:2017-08: Fire resistance tests for non-loadbearing elements

- » Part 1: Air grilles and PN-EN 13501-2:2016-07: Fire classification of construction products and building elements
- » Part 2: Classification using data from fire resistance tests, excluding ventilation services, certified by assessment report No. 01031/21/Z00NZP issued by the Polish Institute of Construction Technology.

Grille features

- » reaction already at 100°C
- » rapid blockage of the clearance of the opening where it is installed (usually in the fifth minute, depending on the heat exposure)
- » high aesthetics
- » quick and easy to install

Installation technology

Attach using mechanical means, using screws, bolts, pins or other fasteners (they should have the same fire resistance rating as the elements to which they are attached).

It is recommended to leave a 2–3 mm gap around the grille and fill it with Tecsel intumescent sealing compound.

For larger ventilation openings, more grilles may be installed, provided that the fire resistance and appropriate distance between them are maintained.

They may be installed in walls made of full bricks, perforated bricks, checker bricks, cavity brick, aerated concrete, concrete and reinforced concrete blocks.

Fire resistive rating EI 120.



Technical parameters

» physical and chemical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	Smooth surface in a light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

Approving documents

- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03

Application

mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction, for erecting steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, masonry walls, suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

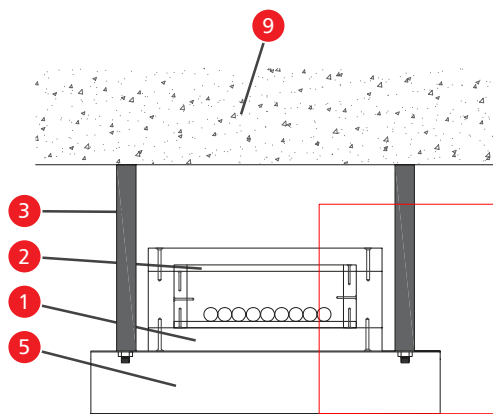
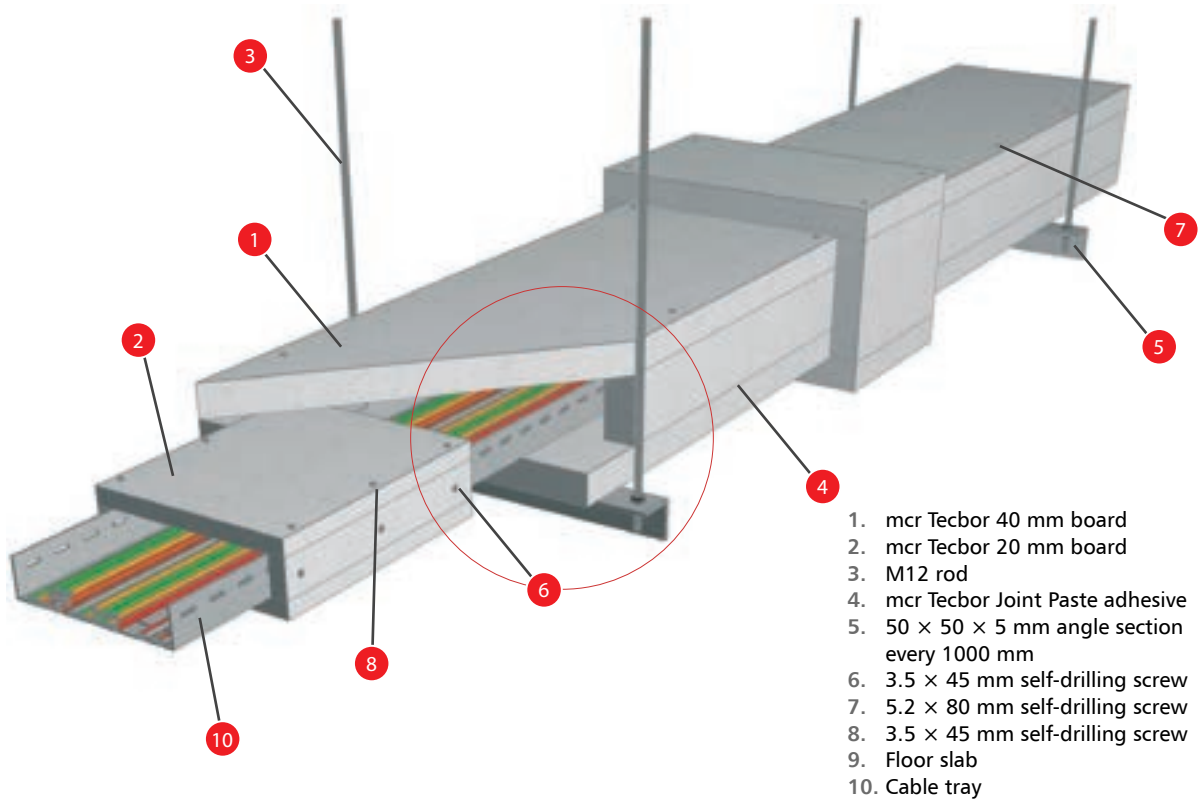
Cable ducts made of mcr Tecbor boards were classified for fire resistance rating

based on test reports No. 25417-a and 21008 issued by CIDEMCO CENTRO TECNOLOGICO.

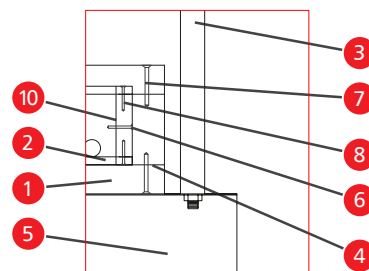
Item	Fire resistance rating in accordance with PN-EN 13501-2:2016	Wall thickness of cable ducts made of mcr Tecbor boardr [mm]
1	EI 30 - EI 60	20 i 40
2	EI 120	40

10.5.1 | Selected examples of installation

» mcr Tecbor 40 mm: EI 120



Cross-section view



Detailed view

» Installation description:

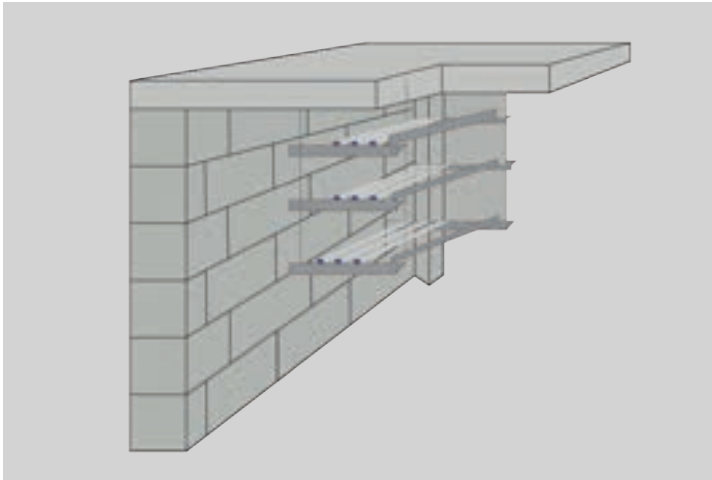
The tray is protected by a layer of 40 mm mcr Tecbor boards connected together with 5.2 × 80 mm self-drilling screws. Place side strips of 20 mm mcr Tecbor boards with a width of 200 mm at the construction joints and fix them to the metal tray and together with 3.5 × 45 mm screws.

Anchor the duct to the ceiling with a 12 mm rod and support with 50 × 50 × 5 mm angle sections. Cover the board joints and screw heads with mcr Tecbor Joint Paste adhesive.

» Opening sealing:

Fill the openings between the duct and the structure with mineral wool with a thickness of 50 mm and a density of 145 kg/m³, then cover them on both sides with mcr Tecbor Joint Paste adhesive.

10.6 | Fire-protection paste systems



In accordance with UNE-EN 1364-1 standard and the UL 1708 curve, cable trays secured with mcr Tecbor Joint Paste obtained the following results in respect of tightness:

Thickness of mcr Tecbor Joint Paste on the cable tray	Thickness of mcr Tecbor Joint Paste on wires	Tightness
2,6 mm	18 mm	90 min
2,7 mm	2,7 mm	30 min – 60 min

Approving documents

» It was tested in respect to wire and opening sealing in accordance with the European UNE-EN 1366-3 standard and in respect to the protection of wiring harnesses in accordance with an internal protocol developed based on the German DIN 4102-2 standard and the heat flux chart as per UL 1709.

Application

mcr Tecbor Joint Paste – ready-to-use product creating an ablative coating containing an aqueous dispersion of polymers which cause an endothermic reaction in case of fire, thus preventing the flames from spreading and limiting the spread of fire and smoke.

mcr Tecbor Joint Paste is the most frequently used to protect cable trays in order to ensure continuous electricity supply or signal transmission. It is also used as a sealant for cable ducts constructed in mcr Tecbor board system.

The solution based on mcr Tecbor Joint Paste can be used anywhere where board installation is not possible.

TCRS-TS-04 Declaration of Performance

Properties and technical parameters	
Color	Greyish-white
Smell	Mild
Viscosity	Thin paste
Flash point	Non-combustible product
Solid particles	66%-76%.
Density	1,55 ± 0,07 g/cm ³ .
Solvent	Water, max. 5% of the weight.
Drying time	From 24 to 72 hours, depending on the temperature, humidity and thickness of the layer applied. Full hardening after one week from application.
Thickener	Special spraying without solvents
Pigments/binders	Non-combustible product

mcr Tecbor Joint Paste | Cables route casings, fire protection of electrical installations

» Application

- » Does not require diluting, but needs to be mechanically mixed. The product may diluted with water, however, in the amount no larger than 5% of the adhesive weight.
- » Before application, check if the surfaces are clear and free of dust and grease.
- » Apply using an airless spray gun; a spatula or paintbrush may also be used for small surfaces.
- » The applied product is resistant to temperature from -40°C to +80°C, without chemical decomposition or losing the color or efficiency.
- » Do not apply at ambient temperature below 5°C or above 30°C.
- » The product is not susceptible to humidity and may be used on exterior surfaces. If the atmospheric humidity is high during application, it is recommended to apply several layers to facilitate drying.

A modern office interior featuring glass partition walls and a view of a city skyline. The scene is brightly lit, with a red rectangular overlay at the bottom containing white text. The office space is clean and minimalist, with a polished floor reflecting the light. The city skyline in the background consists of various skyscrapers and buildings, suggesting a high-rise office environment.

**PARTITION WALLS,
WALL LINING**



In the area of fire safety the following are distinguished: fire division walls, load-bearing walls, partition walls and external curtain walls.

These partitions prevent the fire and smoke from spreading in the case of a fire. Very often, they serve the purpose of stiffening of a construction element. Even in the case of a fire, this function must be maintained for the time set forth under regulations.

„MERCOR“ S.A. offers solutions allowing to achieve fire resistance rating up to EI240 under standard fire conditions.

11.1 | **mcr Silboard**



Approving documents

- » European Technical Assessment ETA-19/0546
- » Certificate of constancy of performance 1488-CPR-0698/W
- » Declaration of performance DOP/HZ/01/2018

Application

mcr Silboard – a fire-protection calcium silicate board, non-combustible, with a wide range of applications in general and industrial construction, designed for self-supporting firestop general ventilation ducts (comfort ventilation) and multi-zone smoke extract ducts, cable ducts, installation ducts, non-bearing walls (shafts), protecting steel structures and reinforced concrete structural components reinforced with carbon fiber tapes and mats.

Technical parameters

» physical and chemical properties

Available thicknesses	20 mm, 30 mm, 40 mm, 50 mm
External appearance	white/cream color, smooth sanding on one side
Density	550 ± 15% kg/m ³
Compressive strength	≥1,0 MPa
Perpendicular tensile strength	≥0,10 MPa
Parallel tensile strength	≥0,40 MPa
Dimension stability	the boards are dimensionally stable
Heat conductivity	0,095 W/(m·K)
Reaction to fire class	A1
Use category	Y
Use category	Z

11.1.1 | Non-bearing walls in a single-layer arrangement

Non-bearing walls in a single-layer arrangement made of mcr Silboard boards meet the requirement of the following fire resistance rating:

- » EI45 – wall with a thickness of 30 mm;
- » EI60 – wall with a thickness of 35 mm exposed to fire on both sides.

In accordance with:

Fire resistance rating classification No. RS-21/T-476

Fire resistance rating classification No. RS-21/T-535

Dimensions:

- » height - 4000 mm
- » width – unlimited

» sections-side view

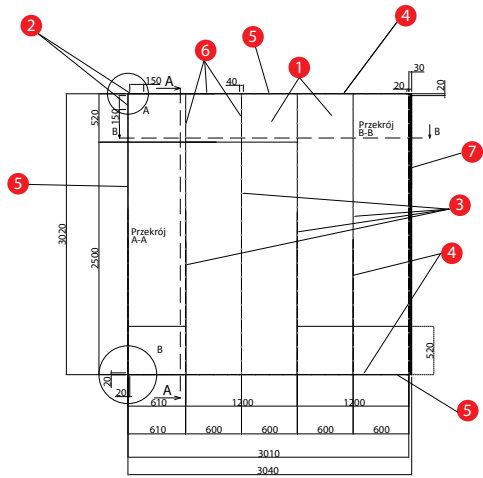


» board-side view



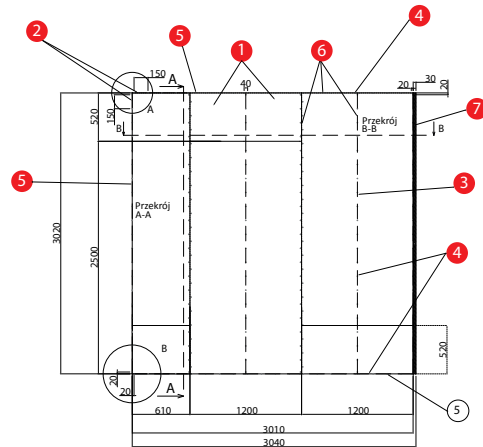
11.1.2 | EI 45 - sample installation

» Board-side view – sample installation



1. mcr Silboard board 30 mm
2. Type CD installation sections, 0.6 mm thickness
3. Type C installation sections, 0.6 mm thickness
4. $\varnothing 4 \times 40$ mm steel screws attaching the board to the section

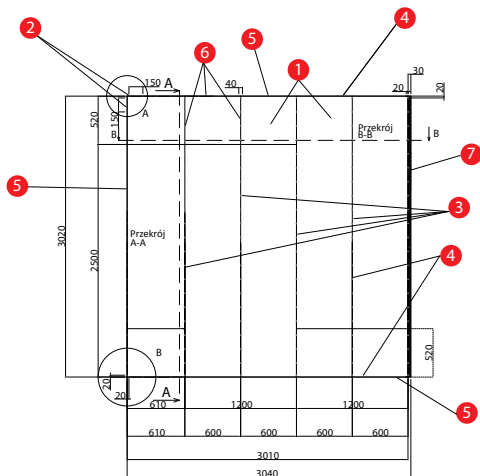
» Sections-side view – sample installation



5. $\varnothing 10 \times 72$ mm steel plugs attaching the section to the wall
6. Mcr Sil-MK adhesive
7. Mineral wool with a density of at least 50 kg/m^3

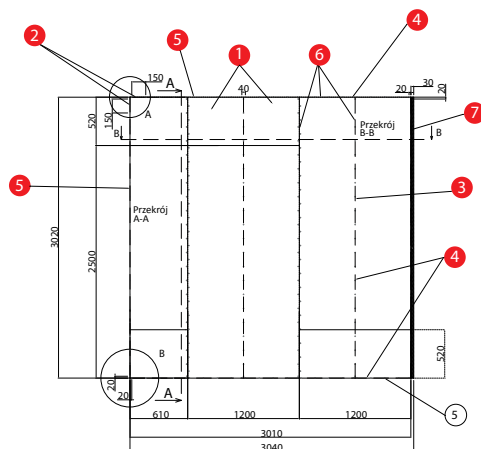
11.1.3 | EI 60 - sample installation

» Board-side view – sample installation



1. 35 mm mcr Silboard board
2. Type CD installation sections, 0.6 mm thickness
3. Type C installation sections, 0.6 mm thickness
4. $\varnothing 4 \times 40$ mm steel screws attaching the board to the section

» Sections-side view – sample installation



5. $\varnothing 10 \times 72$ mm steel plugs attaching the section to the wall
6. Mcr Sil-MK adhesive
7. Mineral wool with a density of at least 50 kg/m^3

» **Sequence of building non-bearing walls made of mcr1 boards:**

1. The side surfaces of the opening are cleared from loose parts and leveled with mcr Sil-MK adhesive or any masonry mortar.
2. A 0.6 mm thick CD steel section is attached to the lower, upper and one side surface of the opening using steel concrete plugs of at least 10×72 mm.
3. The other side edge (on the side of the free edge) and the wall support frame is made of type C installation sections with a thickness of 0.6 mm.
On the structure prepared in such a way, mcr Silboard is installed, with a thickness of:
 - » 30 mm using steel screws of at least 4×40 mm at a distance of 20 mm from the vertical and horizontal edges, spaced no more than 150 mm apart;
 - » 35 mm using steel screws of at least 4×60 mm at a distance of 20 mm from the vertical and horizontal edges, spaced no more than 150 mm apart.
5. Free edge is filled with mineral wool with a density of 50 kg/m^3

11.1.4 | Non-bearing walls in a two-layer arrangement

Non-bearing walls in a two-layer arrangement made of mcr Silboard boards meet the requirement of the following fire resistance rating:

- » walls with a thickness of at least 40 mm, made of boards with a thickness of at least 20 mm – EI120
- » walls with a thickness of at least 60 mm, made of boards with a thickness of at least 30 mm – EI240

In accordance with:

Fire resistance rating classification No. 00990/17/R215NZZ

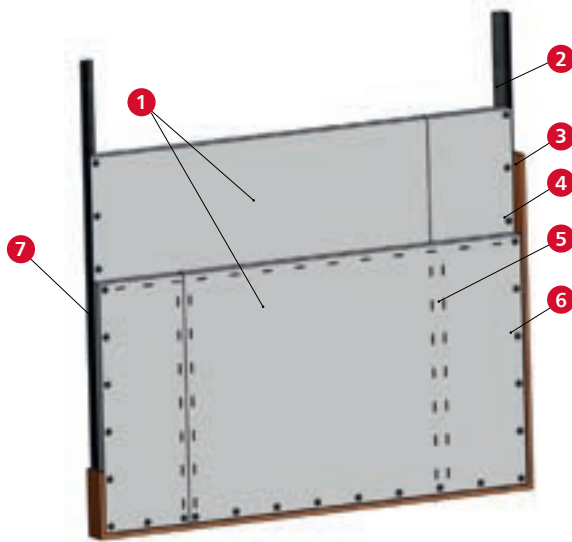
Fire resistance rating classification No. 00990/16/R199NZZ

Partition dimensions:

- » In accordance with ETA-19/0546, should not exceed:
 - height – 4000 mm
 - width – 2000 mm
- » In accordance with fire resistance rating classification No. 00990/17/R215NZZ and 00990/16/R199NZZ
 - height – unlimited
 - width – 2000 mm

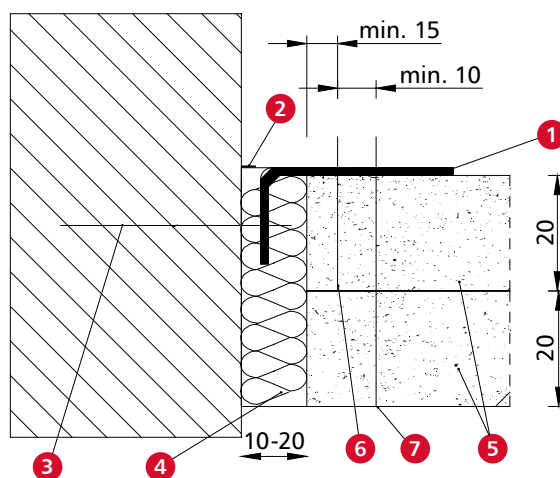
11.1.5 | Installation

» Detail of partition wall connection with support structure



1. mcr Silboard boards with a thickness of at least 20 mm
2. L steel section 40 × 30 × 2.0 mm.
3. mineral wool with a density of at least 50 kg/m³
4. steel screws ≥ Ø4 x 40 mm
5. steel staples ≥ Ø30/10.5/1.48 mm
6. steel screws ≥ Ø4 x 60 mm
7. steel plug or concrete or wood screw ≥ Ø6 x 60 mm

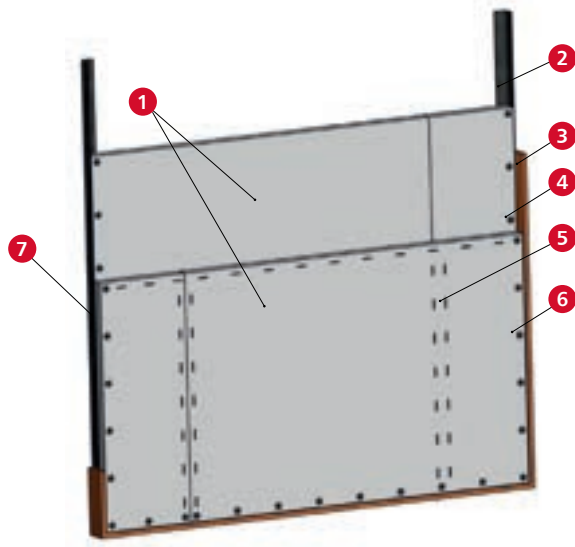
» Details of partition walls rated as EI 120 fire resistance rating



1. L steel section 40 × 30 × 2.0 mm
2. mcr Sil-MK adhesive
3. steel plug or concrete or wood screw ≥ Ø6 x 60 mm
4. mineral wool with a density of at least 50 kg/m³
5. mcr Silboard boards with a thickness of at least 20 mm
6. steel screws ≥ Ø4 x 40 mm
7. steel screws ≥ Ø4 x 60 mm

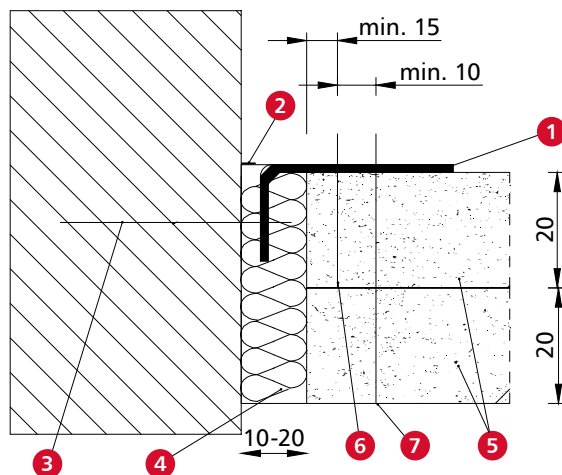
- » The maximum spacing of steel plugs or screws for fixing L angle section is 300 mm.
- » The maximum spacing of steel screws fixing mcr Silboard boards is 150 mm.
- » The maximum staple spacing is 100 mm.
- » The vertical joints of mcr Silboard boards are offset by at least 210 mm in one layer.
- » The vertical joints of mcr Silboard boards are offset by at least 155 mm and the horizontal joints are offset by at least 220 mm in both layers.
- » The number of vertical and horizontal joints is not limited.
- » All edges of the partition wall are fixed to the support structure.

» Detail of partition wall connection with support structure



1. mcr Silboard boards with a thickness of at least 30 mm
2. L steel section 40 × 30 × 2.0 mm.
3. mineral wool with a density of at least 50 kg/m³
4. steel screws ≥ Ø4 × 50 mm
5. steel staples ≥ Ø50/10.5/1.48 mm
6. steel screws ≥ Ø4 × 80 mm
7. steel plug or concrete or wood screw ≥ Ø6 × 60 mm

» Details of partition walls rated as EI 240 fire resistance rating



1. L steel section 40 × 30 × 2.0 mm
2. mcr Sil-MK adhesive
3. steel plug or concrete or wood screw ≥ Ø6 × 60 mm
4. mineral wool with a density of at least 50 kg/m³
5. mcr Silboard boards with a thickness of at least 30 mm
6. ≥ Ø4 × 50 mm steel screws
7. ≥ Ø4 × 80 mm steel screws

- » The maximum spacing of steel plugs or screws for fixing L angle section is 300 mm.
- » The maximum spacing of steel screws fixing mcr Silboard boards is 150 mm.
- » The maximum staple spacing is 100 mm.
- » The vertical joints of mcr Silboard boards are offset by at least 210 mm in one layer.
- » The vertical joints of mcr Silboard boards are offset by at least 155 mm and the horizontal joints are offset by at least 220 mm in both layers.
- » The number of vertical and horizontal joints is not limited.
- » All edges of the partition wall are fixed to the support structure.



Approving documents

- » European Technical Assessment ETA-18/1017
- » Certificate of constancy of performance 1220-CPR-1912
- » Declaration of performance TCRS-TB-03

Application

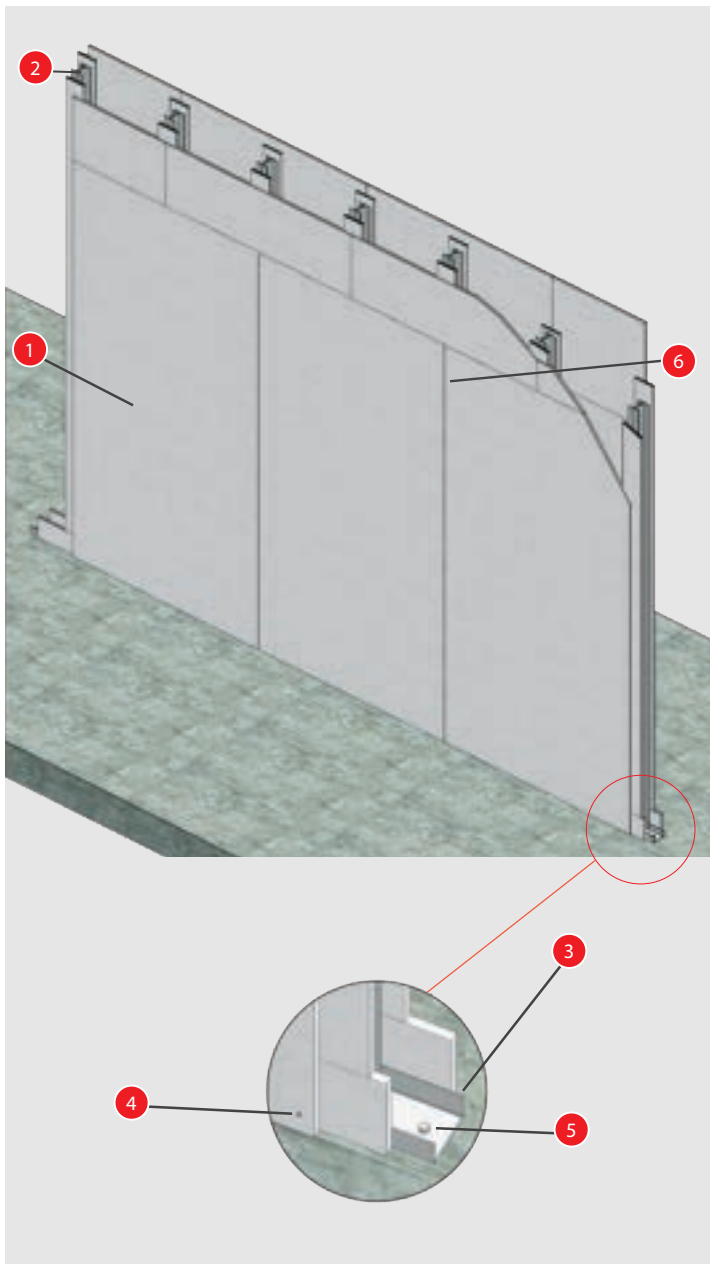
mcr Tecbor – flame retardant magnesium board, non-combustible, with a wide range of application in general and industrial construction, for erecting steel and reinforced concrete structures, cable routes, building ventilation and smoke extract ducts, non-bearing partition walls, masonry walls, suspended ceilings, curtain walls and spandrels, road tunnel structure proofing.

Technical parameters

» physical and chemical properties

Available thicknesses	5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm
External appearance	Smooth, slightly rough surface in light color
Density	900 ± 10% kg/m ³
Compressive strength	9,61 MPa
Perpendicular tensile strength	1,47 MPa
Elastic modulus	475 MPa
Bending strength	4,74 MPa
Dimension stability	≤0,25%
Heat conductivity	0,31 W/(m·K)
Reaction to fire class	A1
Use category	Z ₂

11.2.1 | mcr Tecbor 12 mm EI 60



Approving documents

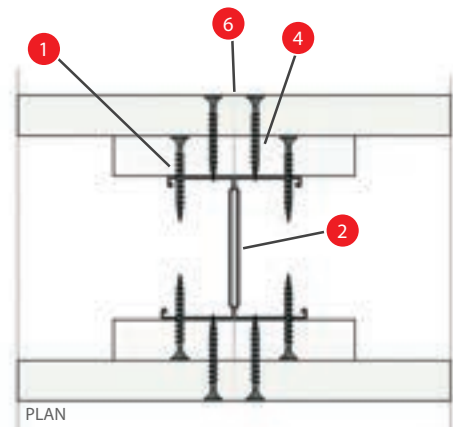
- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 051497-1

Solution

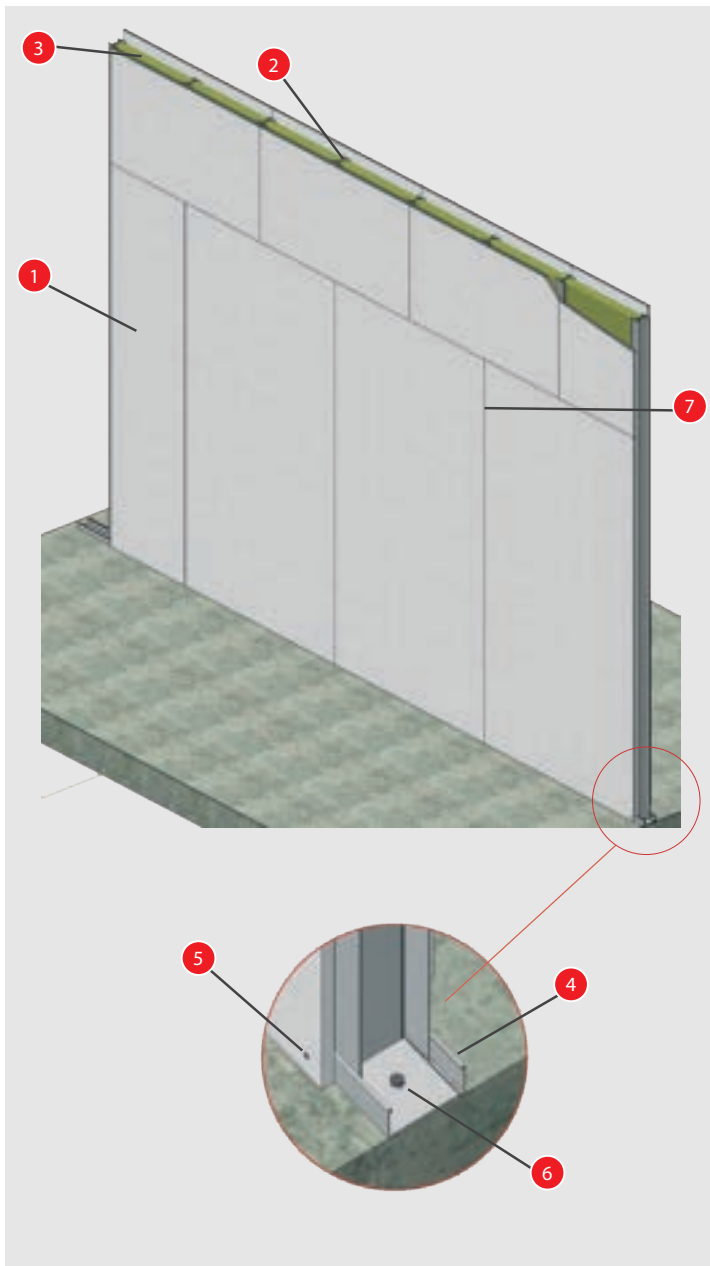
1. mcr Tecbor board 12 mm
2. Two C sections in the shape of the letter H
3. 73 x 30 x 0.5 mm steel section
4. 3.5 x 35 mm self-drilling screw
5. Steel plug M6
6. mcr Tecbor Joint Paste

Installation description

Install a 73 × 30 × 0.5 mm supporting channel section with M6 steel plugs every 250–300 mm. Finish the metal structure with a double 70 × 36 × 0.6 mm double metal plug distributed in the “H” arrangement with the inter-axis distance of 610 mm. Then fix the 12 mm mcr Tecbor boards to both sides, using 3.5 × 35 mm self-drilling screws every 200–250 mm. Cover the board joints and screw heads with mcr Tecbor Joint Paste. Steel wall plugs should be covered with mcr Tecbor board strips, to which the proper 12 mm mcr Tecbor boards will be installed.



11.2.2 | **mcr Tecbor 12 mm EI 120**



Approving documents

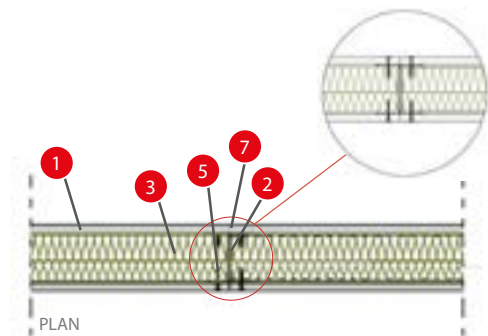
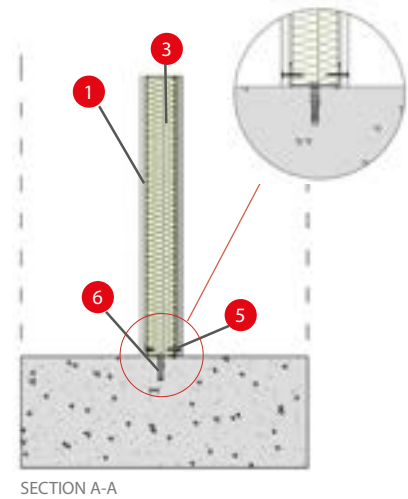
- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 072951-005-1/2

Solution

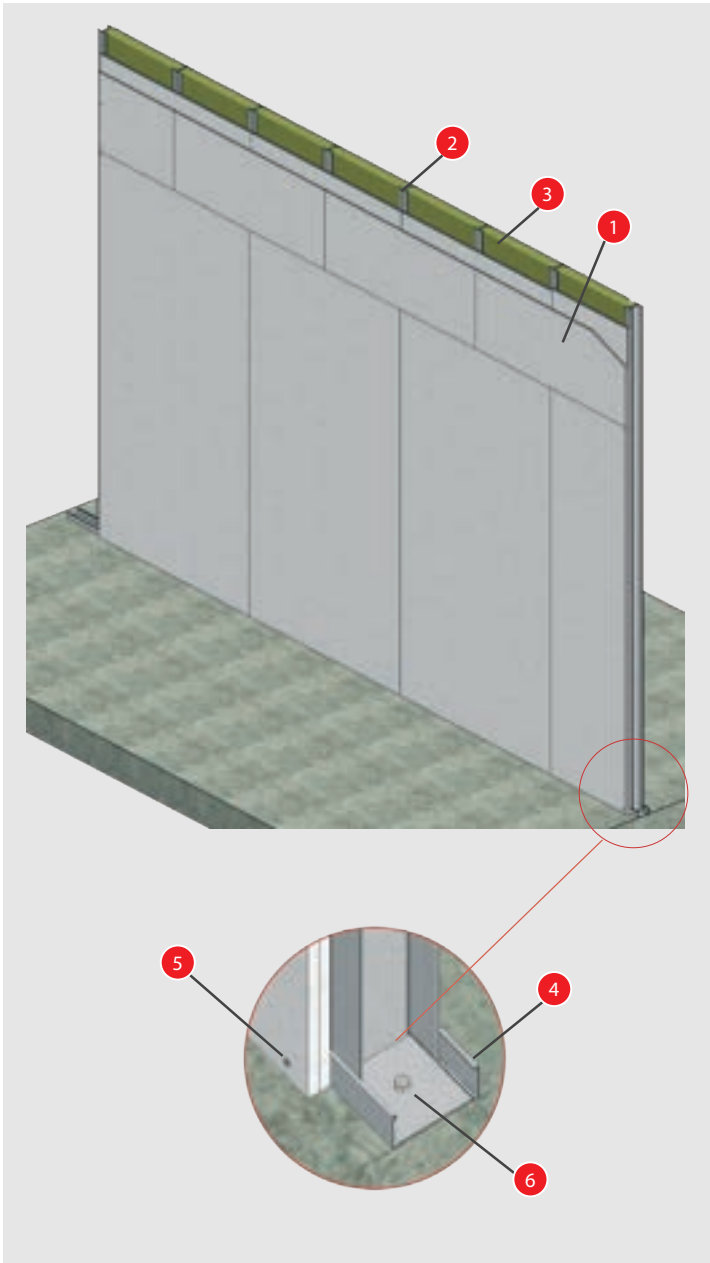
1. mcr Tecbor board 12 mm
2. Two C sections in the shape of the letter H
3. Mineral wool with a density of 40 kg/m³ and thickness of 80 mm (40 mm + 40 mm)
4. 73 x 30 x 0.5 mm steel section
5. 3.5 x 35 mm self-drilling screw (every 250 mm)
6. 6 mm drop-in anchor (every 600 mm)
7. mcr Tecbor Joint Paste

Installation description

Install a 73 x 30 x 0.5 mm supporting channel section with M6 steel plugs every 250–300 mm. Finish the metal structure with a double 70 x 36 x 0.6 mm double metal plug distributed in the "H" arrangement with the inter-axis distance of 610 mm. Place mineral wool panels between the plugs. Then fix the 12 mm mcr Tecbor boards to both sides, using 3.5 x 35 mm self-drilling screws every 200–250 mm. Cover the board joints and screw heads with mcr Tecbor Joint Paste.



11.2.3 | mcr Tecbor 10 mm EI 180



Approving documents

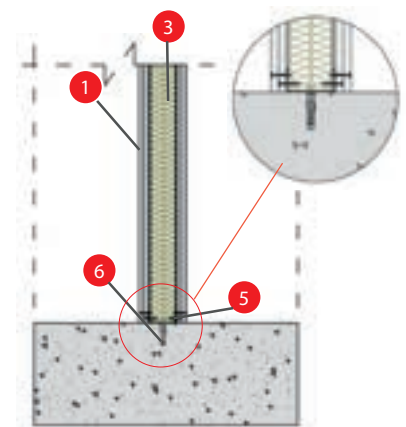
- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 072951-006-1/2

Solution

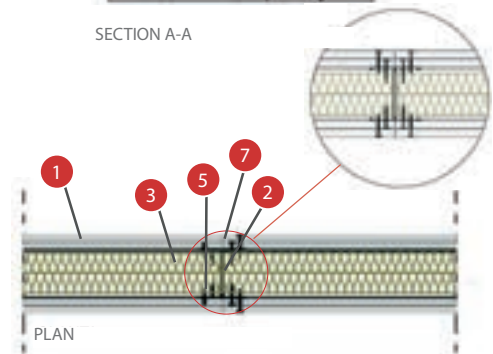
1. mMcrc Tecbor board 10 mm
2. Two C sections in the shape of the letter H
3. Mineral wool with a density of 40 kg/m³ with a thickness of 80 mm (40 mm+40 mm)
4. 73 x 30 x 0.5 mm steel section
5. 3.5 x 35 mm self-drilling screw (every 250 mm)
6. 6 mm drop-in anchor (every 600 mm)
7. mcr Tecbor Joint Paste

Installation description

Install a 73 x 30 x 0.5 mm supporting channel section with M6 steel plugs every 250–300 mm. Finish the metal structure with a double 70 x 36 x 0.6 mm double metal plug distributed in the "H" arrangement with the inter-axis distance of 610 mm. Place mineral wool panels between the posts. Then fix the 10 mm mcr Tecbor boards to both sides, using 3.5 x 35 mm self-drilling screws every 200–250 mm. Cover the board joints and screw heads with mcr Tecbor Joint Paste.

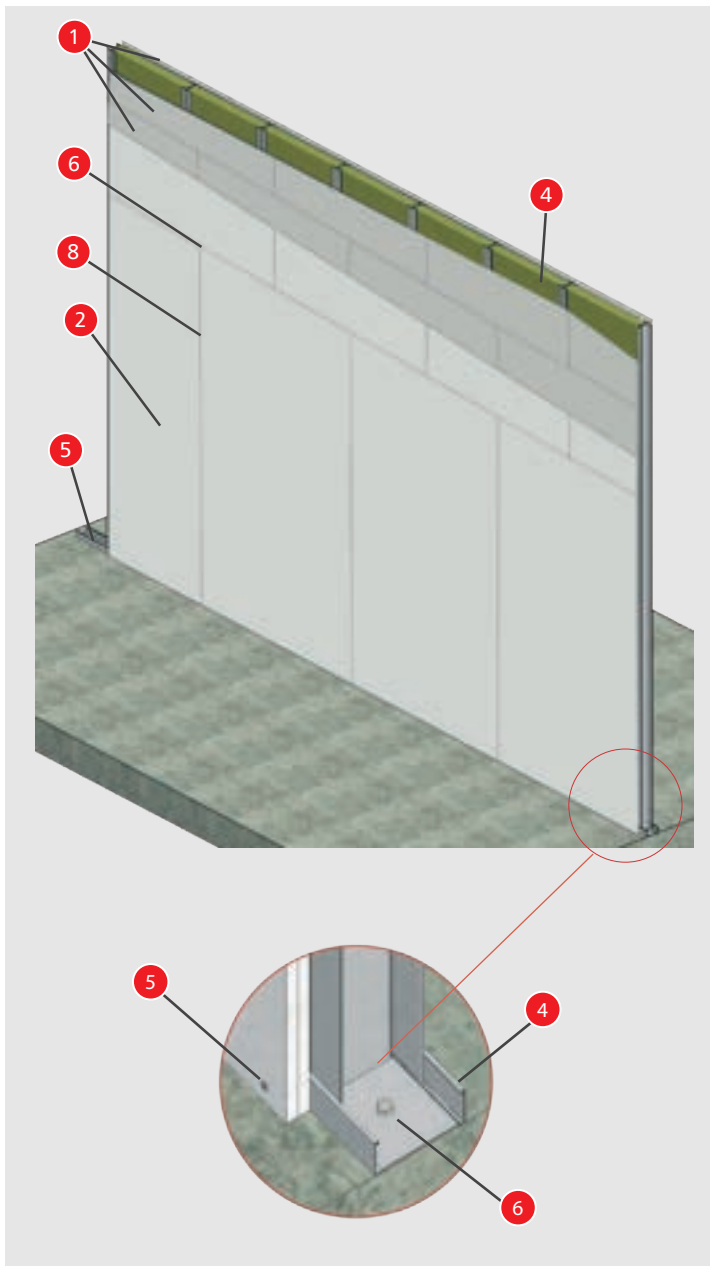


SECTION A-A



PLAN

11.2.4 | mcr Tecbor 15 mm EI 240



Approving documents

- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 0076765-001/2

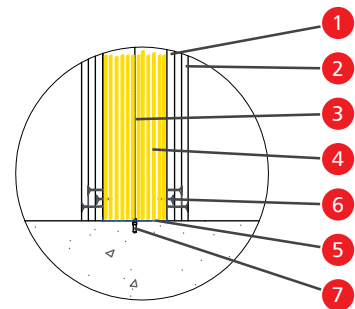
Solution

1. mcr Tecbor board 15 mm
2. 12.5 mm gypsum board
3. Two C sections in the shape of the letter H
4. Mineral wool with a density of 40 kg/m³ with a thickness of 80 mm
5. 83 x 40 x 0.6 mm steel section
6. 3.5 x 35 mm, 3.5 x 45 mm, 3.5 x 55 mm self-drilling screw (every 250 mm)
7. 6 mm drop-in anchor (every 600 mm)
8. mcr Tecbor Joint Paste

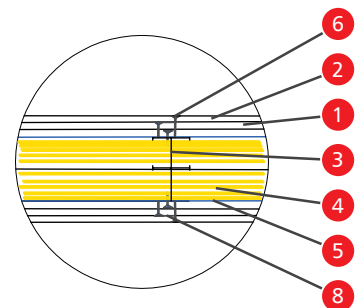
Installation description

Install a 83 x 40 x 0.6 mm supporting channel section with 34.8 x 40 x 0.5 mm steel plugs every 600 mm. Place mineral wool panels between the posts. Then fix the 15 mm mcr Tecbor boards to both sides, using 3.5 x 35 mm self-drilling screws every 250 mm. Cover the board joints and screw heads with mcr Tecbor Joint Paste.

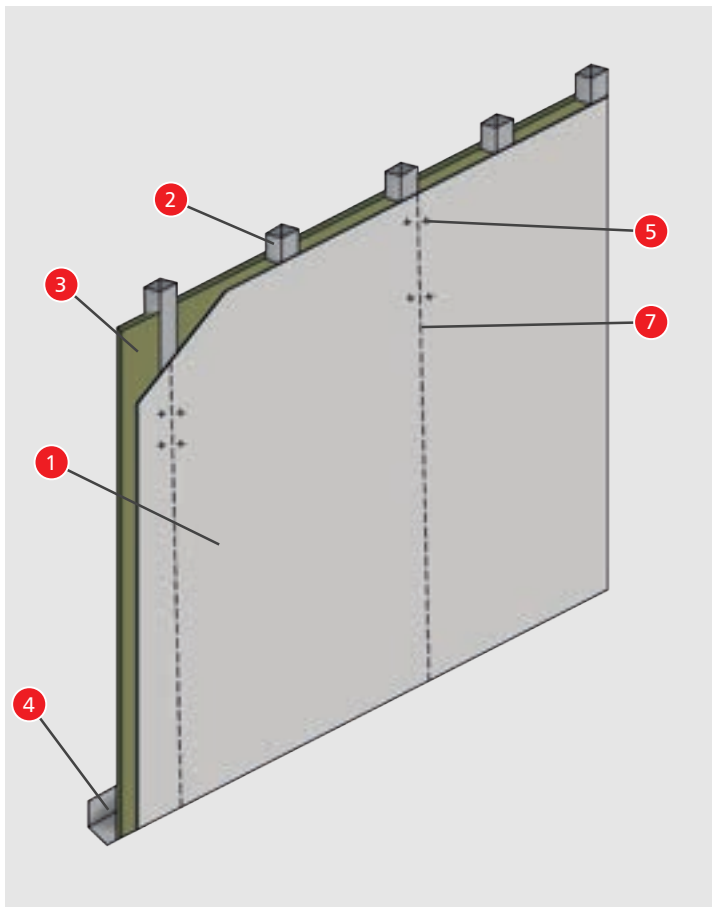
» Detail A N/S



» Detail A N/S



11.2.5 | mcr Tecbor 10 mm + 10 mm – EI 180 partition



Approving documents

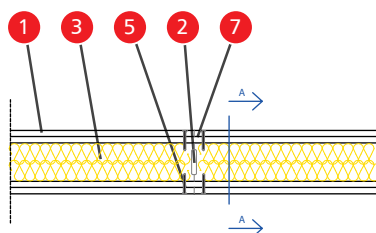
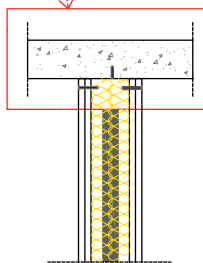
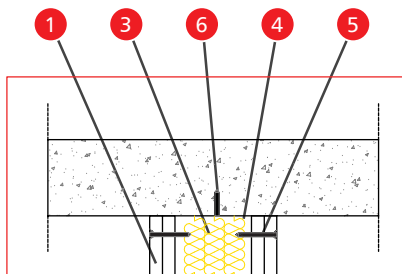
- » Standard: EN 1364-1
- » Laboratory: CIDEMCO
- » Report no.: 16876-1/-2 M1

Solution

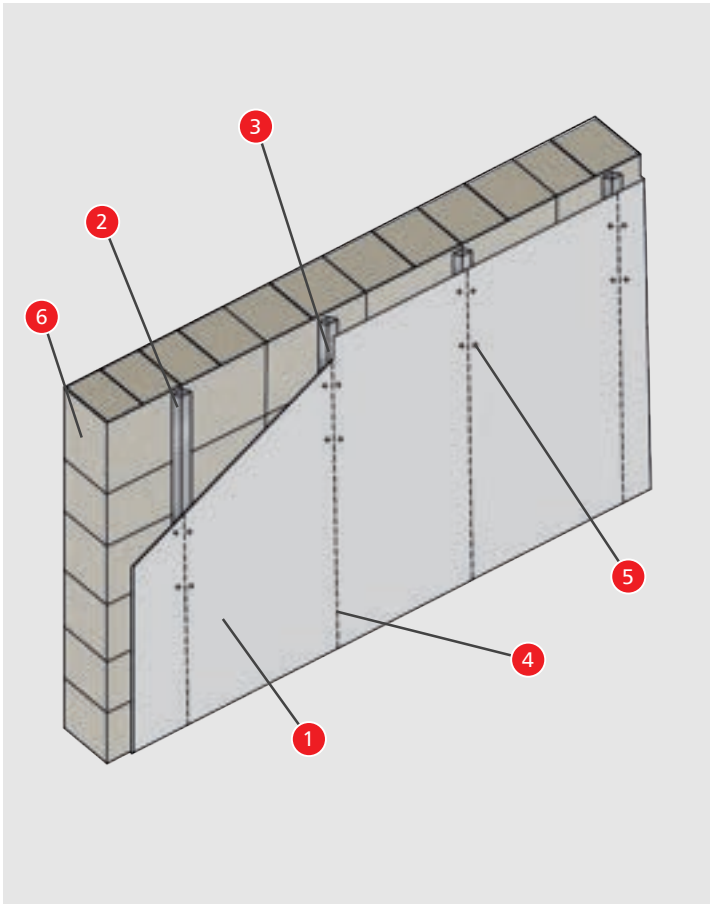
1. mcr Tecbor board 10 mm
2. Double metal 70 × 36 × 0.6 mm H-shaped metal studs
3. Mineral wool with a thickness of 60 mm (30 + 30) and a density of 100 kg/m³
4. 73 × 30 × 0.5 mm connecting section
5. 3.5 × 35 mm self-drilling screw
6. Metal plug M6
7. mcr Tecbor Joint Paste adhesive

Installation description

Fix the 73 × 30 × 0.5 mm connecting sections using M6 metal plugs every 250–300 mm. Finish the metal structure with double metal 70 × 36 × 0.6 mm H-shaped metal studs, keeping 610 mm distance between the axes. Place mineral wool panels between the sections. Then attach two layers of 10 mm mcr Tecbor boards to both sides, using 3.5 × 35 mm every 200–250 mm, making an overlap on the edges of each layer. Finally, secure the board joints and screw heads with mcr Tecbor Joint Paste adhesive.



11.2.6 | mcr Tecbor 10 mm – EI 120 panel on a concrete block



Approving documents

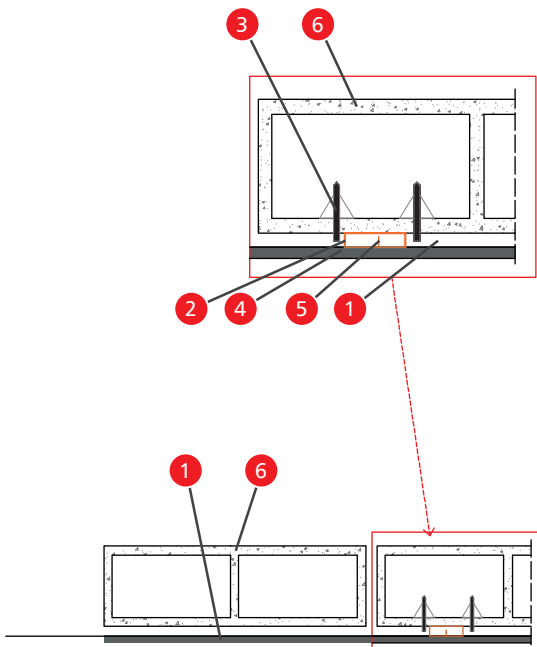
- » Standard: EN 1364-1
- » Laboratory: CIDEMCO
- » Report no.: 14736-1/2 M1

Solution

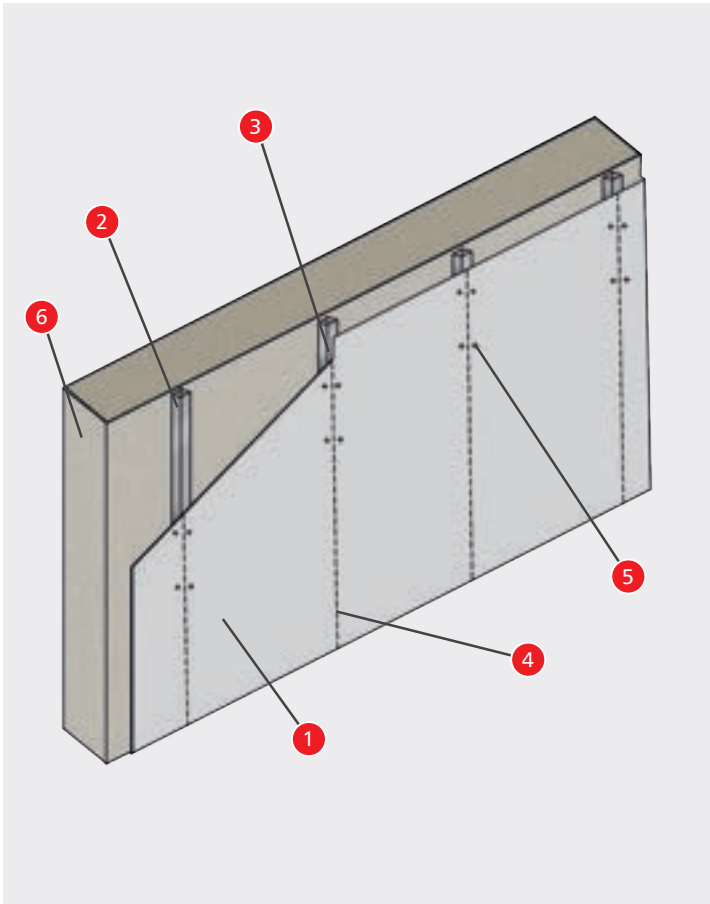
1. mcr Tecbor board 10 mm
2. Omega section 15 × 45 × 0.5 mm
3. 5 × 65 mm steel toggle bolt
4. mcr Tecbor Joint Paste adhesive
5. 3.5 × 25 mm self-drilling screw
6. Wall of concrete blocks

Installation description

Attach the 15 × 45 × 0.5 mm omega sections to 15 cm concrete hollow blocks every 610 mm, using 5 × 65 mm toggle bolts. Then attach 10 mm mcr Tecbor boards with 3.5 × 25 mm self-drilling screws. Spread the mcr Tecbor Joint Paste adhesive between the boards and on the screw heads. The distance between the screws should be approximately 250–300 mm.



11.2.7 | mcr Tecbor 12 mm – EI 180 wall lining on prefabricated concrete block



Approving documents

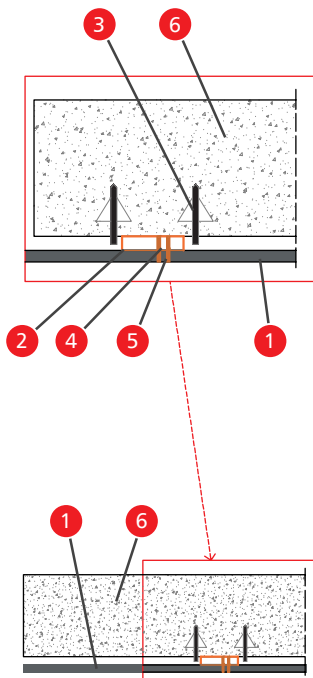
- » Standard: EN 1364-1
- » Laboratory: CIDEMCO
- » Report no.: 16149-1/2 M1

Solution

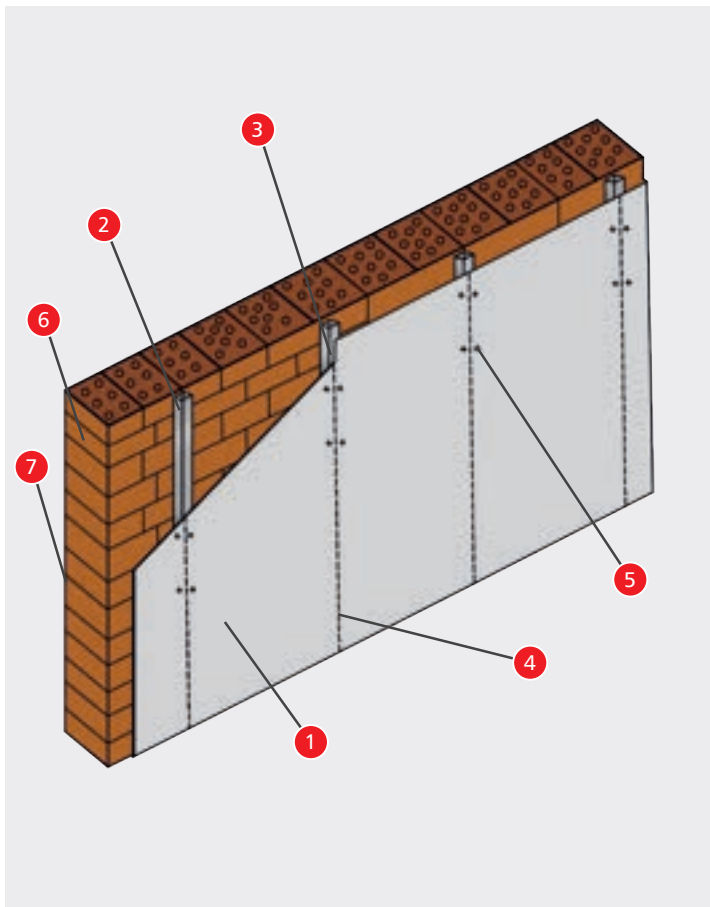
1. mcr Tecbor board 12 mm
2. Omega section 15 × 45 × 0.5 mm.
3. 5 × 65 mm metal plug
4. mcr Tecbor Joint Paste adhesive
5. 3.5 × 25 mm self-drilling screw
6. Prefabricated concrete element

Installation description

15 × 45 × 0.5 mm sections are fixed to 12 cm prefabricated concrete blocks wall every 610 mm using 5 × 65 mm toggle bolts. Then attach 12 mm mcr Tecbor boards with 3.5 × 25 mm self-drilling screws. Spread the mcr Tecbor Joint Paste adhesive between the boards and on the screw heads. The distance between the screws should be approximately 250–300 mm.



11.2.8 | mcr Tecbor 12 mm – EI 240 wall lining on ceramic brick



Approving documents

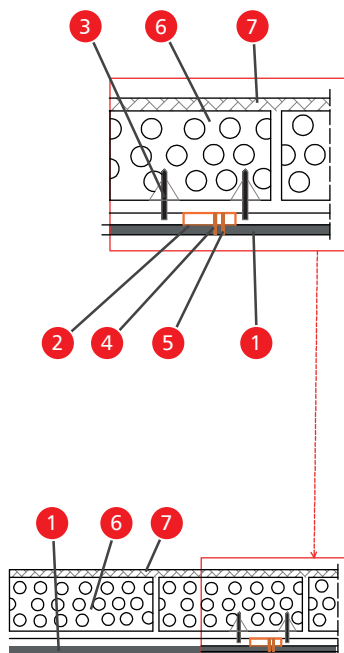
- » Standard: EN 1364-1
- » Laboratory: APPLUS
- » Report no.: 07/32302900

Solution

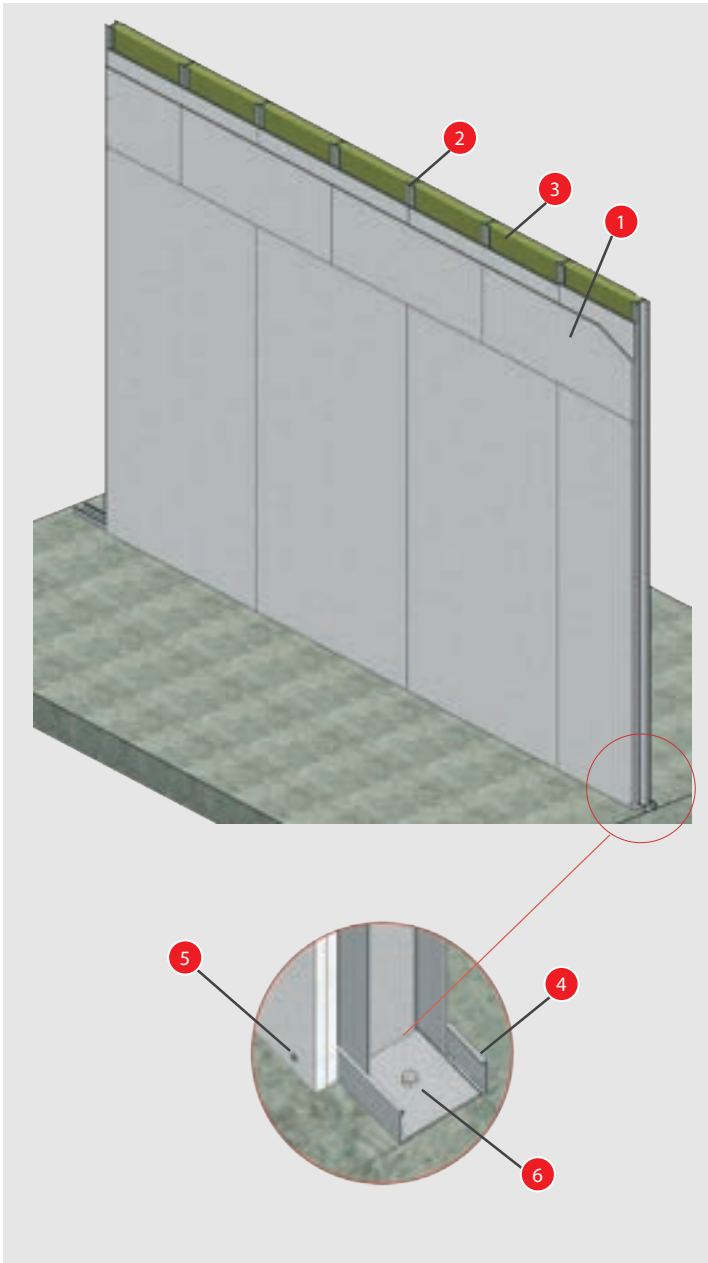
1. mcr Tecbor board 12 mm
2. Omega sections, 15 × 45 × 0.5 mm
3. Anchor, 10 × 60 mm
4. mcr Tecbor Joint Paste adhesive
5. 3.5 × 25 mm self-drilling screw
6. Ceramic brick wall, ≥2.3 cm
7. Plaster 10 mm

Installation description

On a 12 cm ceramic brick wall with 10 mm layer of plaster on the hidden side, install 15 × 45 × 0.5 mm metal omega sections every 610 mm using 10 × 60 mm anchors. Then attach 12 mm mcr Tecbor boards with 3.5 × 25 mm self-drilling screws. Apply the mcr Tecbor Joint Paste adhesive on the screw heads and between the boards. The distance between the screws should be approximately 250–300 mm.



11.2.9 | mcr Tecbor 12 mm – EI 120 free standing wall lining



Approving documents

- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 072951-008-1/2

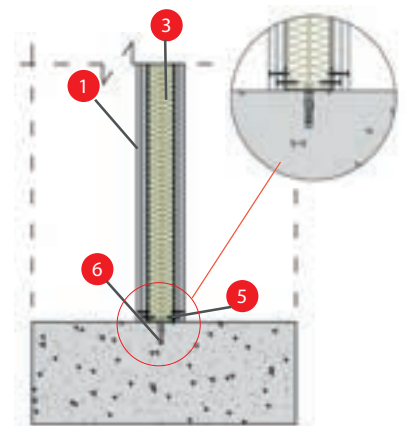
Solution

1. mcr Tecbor board 12 mm
2. 70 × 36 × 0.6 mm H-shaped metal stud
3. Mineral wool with a thickness of 80 mm (40 + 40) and density of 40 kg/m³
4. 73 × 30 × 0.5 mm connecting channel section.
5. mcr Tecbor Joint Paste adhesive
6. Metal plug M6

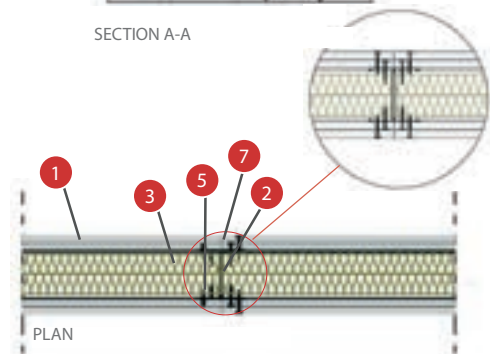
Installation description

Attach 73 × 30 × 0.5 mm connecting sections and attach 70 × 36 × 0.6 mm metal studs every 610 mm. Fill the frame with 80 mm thick mineral wool panels. Attach both layers of 12 mm mcr Tecbor boards with alternate 3.5 × 35 mm self-drilling screws every 200-250 mm, overlaying boards of each layer.

Apply the mcr Tecbor Joint Paste adhesive on the screw heads and between the boards.

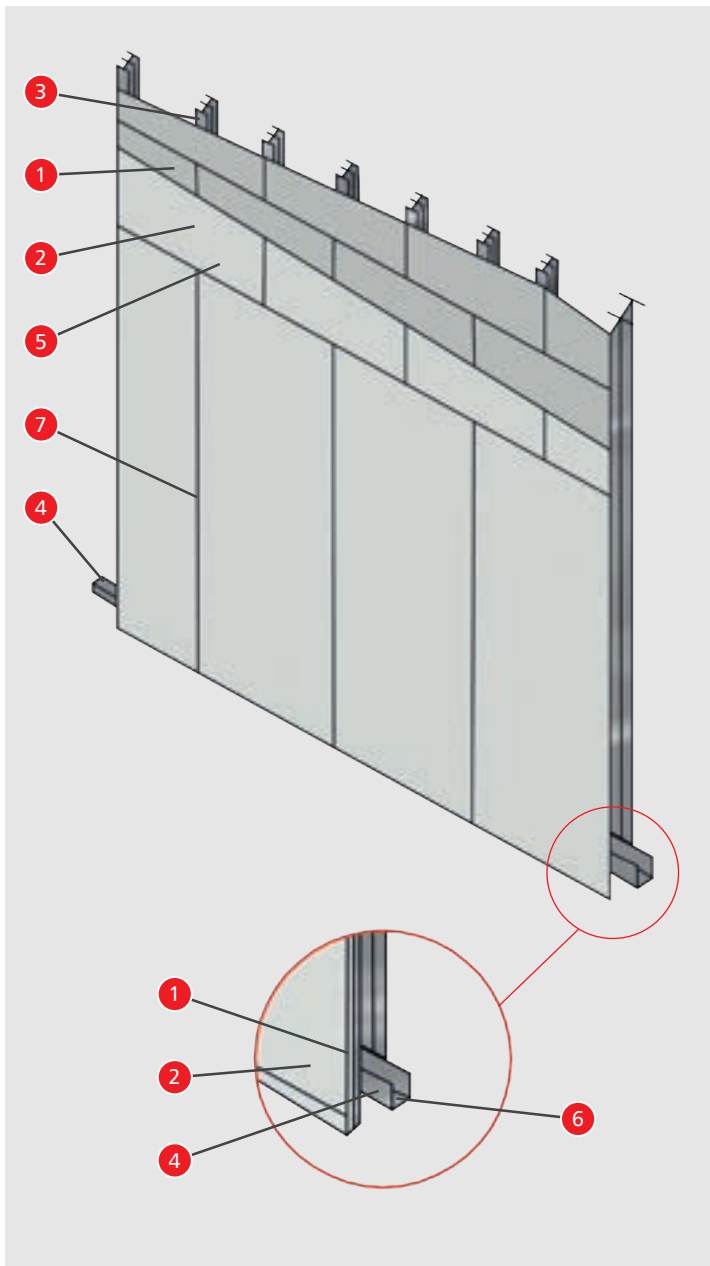


SECTION A-A



PLAN

11.2.10 | mcr Tecbor 15 mm – EI 120 double-sided free standing wall lining



Approving documents

- » Standard: EN 1364-1
- » Laboratory: TECNALIA
- » Report no.: 076765-002-1/2

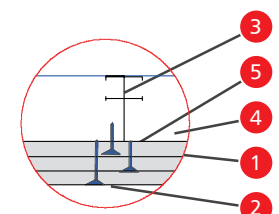
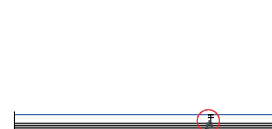
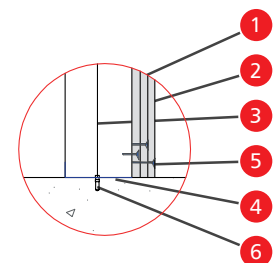
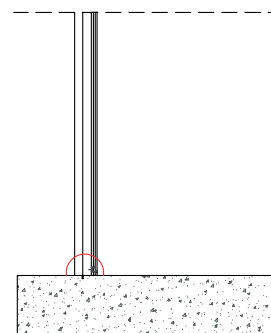
Solution

1. mcr Tecbor board 15 mm
2. 12.5 mm laminated gypsum board
3. 34.8 × 40 × 0.5 mm H-shaped steel stud
4. 83 × 40 × 0.6 mm connecting channel section
5. 3.5 × 35 mm, 3.5 × 45 mm, 3.5 × 55 mm self-drilling screw (every 250 mm)
6. 6 mm drop-in anchor (every 600 mm)
7. mcr Tecbor Joint Paste adhesive

Installation description

Attach the 83 × 40 × 0.6 mm connecting channel sections and install 34.8 × 40 × 0.5 mm metal studs every 600 mm. Attach both layers of 15 mm mcr Tecbor boards with 3.5 × 35 mm self-drilling screws at every 250 mm.

Apply the mcr Tecbor Joint Paste adhesive on the screw heads and between the boards.





SUSPENDED CEILINGS

➤ Fire-resistant suspended ceilings are used mostly in two specific cases.

The first is when two different fire compartments need to be vertically separated. This allows to restrict the fire to its place of origin and stopping its spread to other areas. This solution is extremely useful in skyscrapers, as without it fire can easily spread and create serious problems with evacuation.

The other consists in protecting everything under the ceiling – e.g. systems, structure, ceiling slabs etc.

“MERCOR” S.A. offers a solution based on mcr Silboard and mcr Tecbor boards.

12.1 | Suspended ceiling

Smcr Silboard one-layer suspended ceiling fulfils the resistance requirements for the following class:

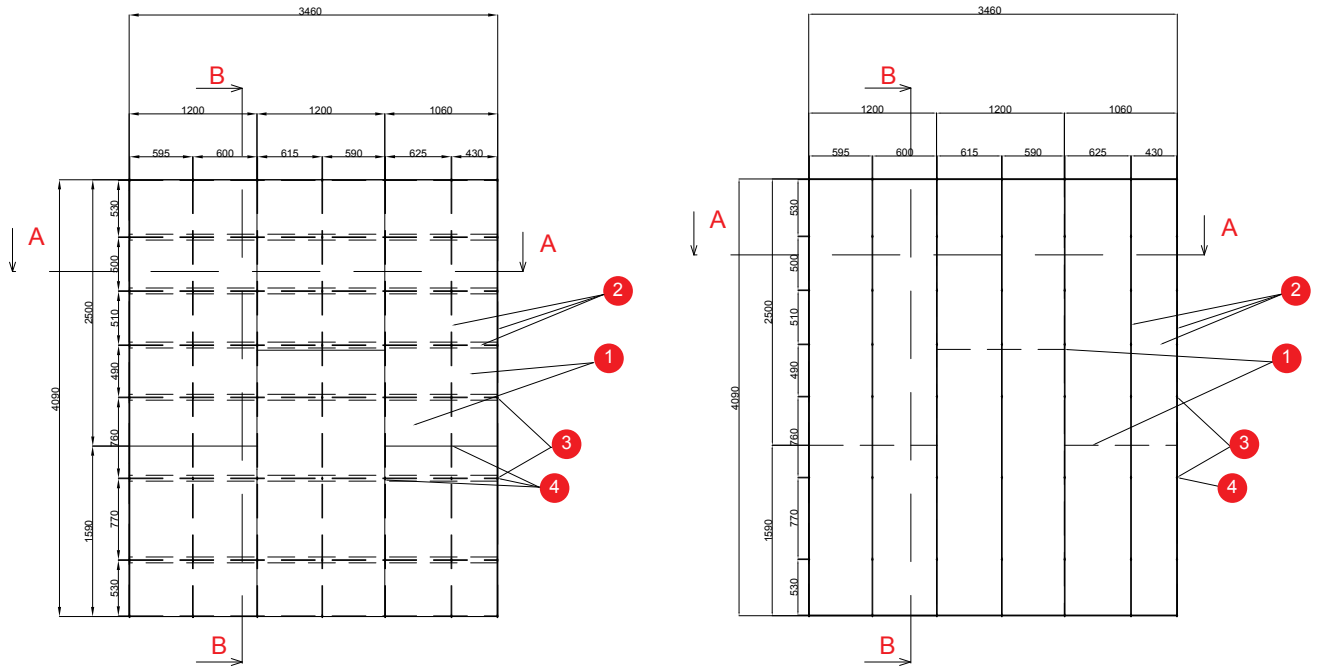
» EI120– 35 mm thick mcr Silboard ceiling.

» board-side view



12.1.1 | Sample installation

» board-side view



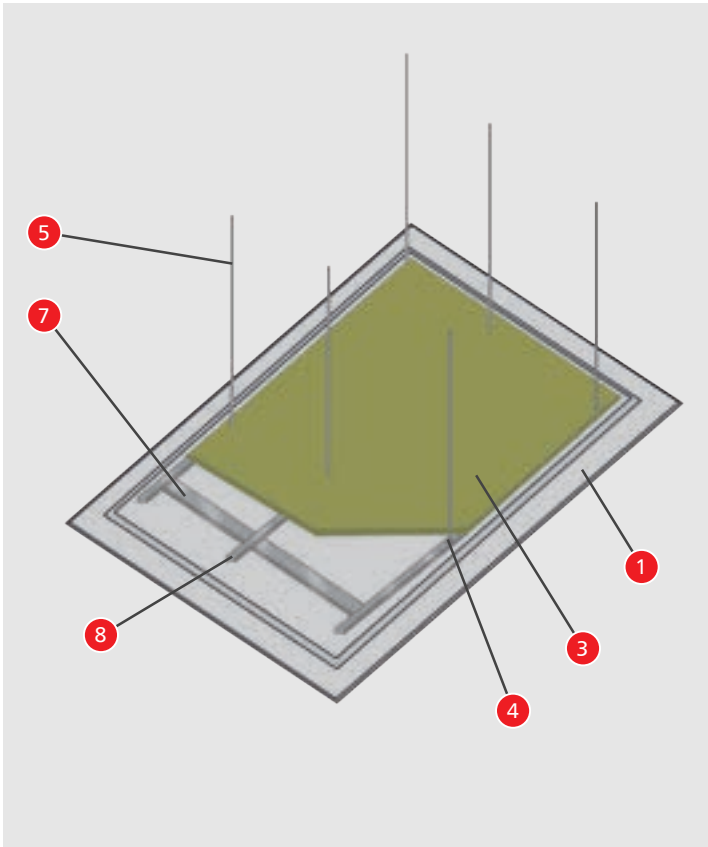
1. 35 mm mcr Silboard board
2. Type CD installation sections, 0.6 mm thickness
3. Swivel hangers
4. $\varnothing 4 \times 60$ mm steel screws attaching the board to the section

» **Sequence for the installation of suspended ceilings using mcr Silboard boards:**

1. The side surfaces of the opening are cleared from loose parts and leveled with mcr Sil-MK adhesive or any masonry mortar.
2. 0.6 mm CD steel section is attached to the side surfaces of the opening using steel concrete plugs.
3. The ceiling cross-frame consists of 0.6 mm thick CD steel sections on swivel hangers. Swivel hanger attaches to the mounting rod by sliding the hanger's expandable component onto the rod. Attach the assembly consisting of the swivel hanger + attaching rod with the CD section using the hanger's swivel in the CD section. The special design of the hanger allows for very stable attachment to the CD 60 section.
4. Attach the 35 mm mcr Silboard to the structure prepared in this way using min. $\varnothing 4 \times 60$ mm steel screws applied 20 mm away from the vertical and horizontal edges, not more than 150 mm away from each other.

All horizontal and vertical joints between boards and between boards and sections should be covered with mcr Sil-MK adhesive. Excess adhesive must be spread over the surface of the board.

12.1.2 | 12 mm+12 mm mcr Tecbor – separate suspended ceiling EI 120



Approving documents

- » Standard: EN 1364-2
- » Laboratory: CIDEMCO
- » Report no.: 20331-1/-2-a-M2

Solution

1. mcr Tecbor board 12 mm
2. 3.5 × 45 mm self-drilling screw
3. Mineral wool with a thickness of 40 mm and density of 40 kg/m³
4. Steel clamp for TC 60/27
5. M16 threaded rod
6. Sinard attachment
7. TC 60/27
8. Steel clamp for TC 60/27
9. Mcr Tecbor Joint Paste adhesive
10. 48 × 30 × 0.5 mm connecting section
11. 10 × 100 mm metal plug.
12. Metal section..

Installation description

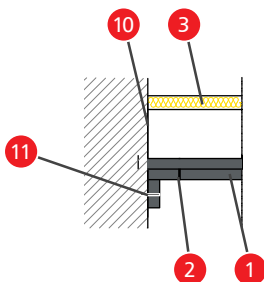
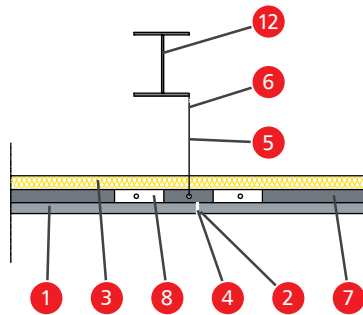
Attach the 48 × 30 × 0.5 mm connecting sections using 10 × 100 mm dowels approximately every 500 mm around the ceiling.

Then install TC 60/27 sections within 610 mm between the axes, crossing the sections using a steel clamp for TC 60/27 and forming 610 × 610 mm frames. Attach the assembly to the structure supporting the ceiling using steel clamps, M6 rod and clamps.

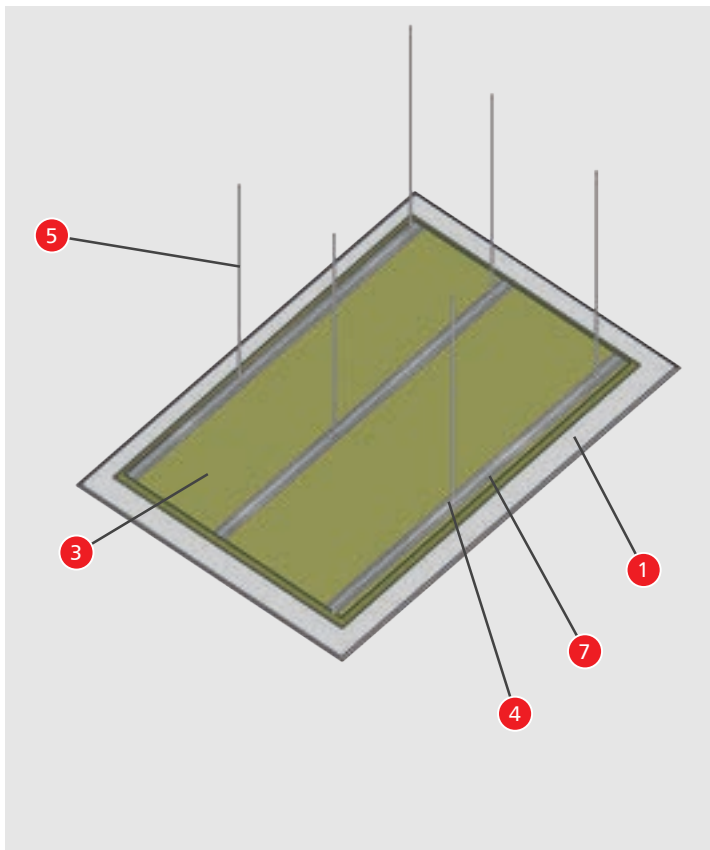
After building the metal structure, attach the first 12 mm mcr Tecbor boards to the first layer, separating them with 40 mm mineral wool with a density of 40 kg/m³ over the structure. Then place the second layer of boards, attaching it with 3.5 × 45 mm self-drilling bolts, alternating with the first layer.

Finish everything with 150 mm Tecbor 12 mm covering strip.

The distance between the screws should be approximately 250–300 mm. Cover the screws heads and construction joints between the boards with mcr Tecbor Joint Paste.



12.1.3 | mcr Tecbor 12 mm - EI 60 fire resistive suspended ceiling



Approving documents

- » Standard: EN 1365-2
- » Laboratory: APPLUS
- » Report no.: 10/1483-1009

Solution

1. mcr Tecbor board 12 mm
2. 3.5 × 35 mm self-drilling screw
3. Mineral wool with a thickness of 40 mm and density of 70 kg/m³
4. Steel clamp for TC 60/27
5. M6 threaded rod
6. Sinard attachment
7. TC 60/27
8. Corrugated sheet e = 0.6 mm
9. 48 × 30 × 0.5 mm connecting section
10. 10 × 100 mm metal plug
11. IPE-140 metal section
12. Double 46 × 36 × 0.6 mm H-shape metal stud
13. 2.9 × 13 mm "MM" self-drilling screw
14. mcr Tecbor Joint Paste adhesive

Installation description

Attach the 48 × 30 × 0.5 mm connecting sections using 10 × 100 mm dowels approximately every 500 mm around the ceiling.

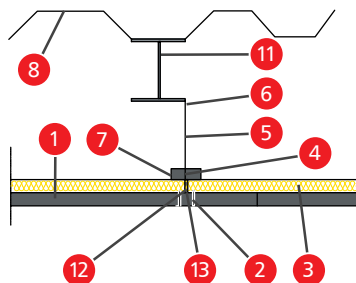
Then install TC 60/27 sections within 610 mm between the axes, crossing the sections using a steel clamp for TC 60/27 and forming 610 × 610 mm frames. Attach the assembly to the structure supporting the ceiling using steel clamps, M6 rod and clamps.

After building the metal structure, attach the first 12 mm mcr Tecbor boards to the first layer, separating them with 40 mm mineral wool with a density of 40 kg/m³ over the structure. Then place the second layer of boards, attaching it with 3.5 × 45 mm self-drilling bolts, alternating with the first layer.

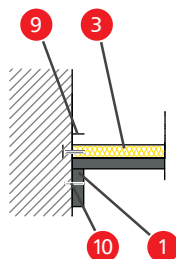
Finish everything with 150 mm Tecbor 12 mm covering strip.

The distance between the screws should be approximately 250–300 mm. Cover the screws heads and construction joints between the boards with mcr Tecbor Joint Paste.

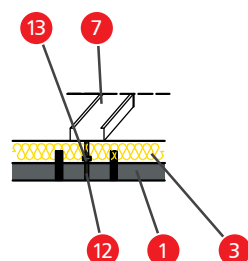
» Vertical view



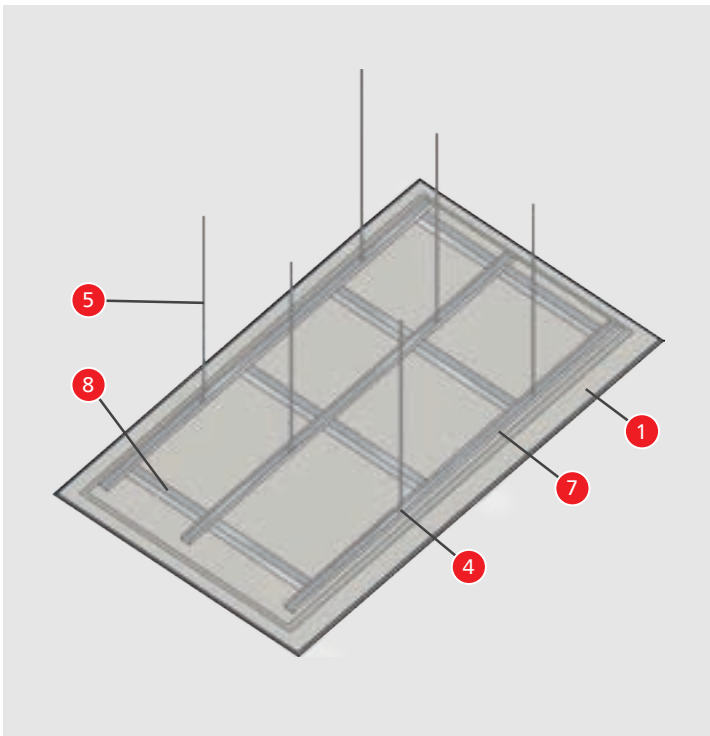
» Vertical attachment



» Detailed view



12.1.5 | 12 mm mcr Tecbor+12 mm - EI 90 fire resistive suspended ceiling



Approving documents

- » Standard: EN 1365-2
- » Laboratory: APPLUS
- » Report no.: 10/1483-1010

Solution

1. mcr Tecbor board 12 mm
2. 3.5 × 45 mm self-drilling screw
3. Metal sheet e = 0.6 m.
4. Steel clamp for TC 60/27
5. M6 threaded rod
6. Sinard attachment
7. TC 60/2.
8. Steel clamp for TC 60/27
9. 73 × 30 × 0.5 mm connecting section
10. 10 × 100 mm metal plug
11. IPE-160 metal section
12. mcr Tecbor Joint Paste adhesive

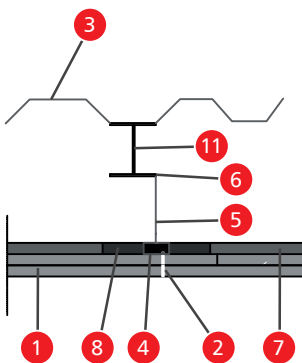
Installation description

Attach the 73 × 30 × 0.5 mm connecting sections using 10 × 100 mm dowels approximately every 500 mm around the ceiling. Then place the TC 60/27 sections within 610 mm between the axes, crossing the sections using steel clamp for TC 60/27 and forming 610 × 610 mm frames. Attach the assembly to the structure supporting the ceiling using a steel clamp, M6 rod and clamps.

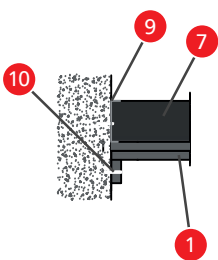
Attach both layers of 12 mm mcr Tecbor boards with 3.5 × 45 mm self-drilling screws. Then cross-attach the second mcr Tecbor board to the first one.

Finish with mcr Tecbor 12 mm board and place 150 mm wide covering strip along the entire circumference. The distance between the screws is approximately 250–300 mm. Cover the screws heads and construction joints between the boards with mcr Tecbor Joint Paste. A 0.6 mm corrugated sheet is placed every 550 mm on top of the suspended ceiling and IPE 160 metal sections.

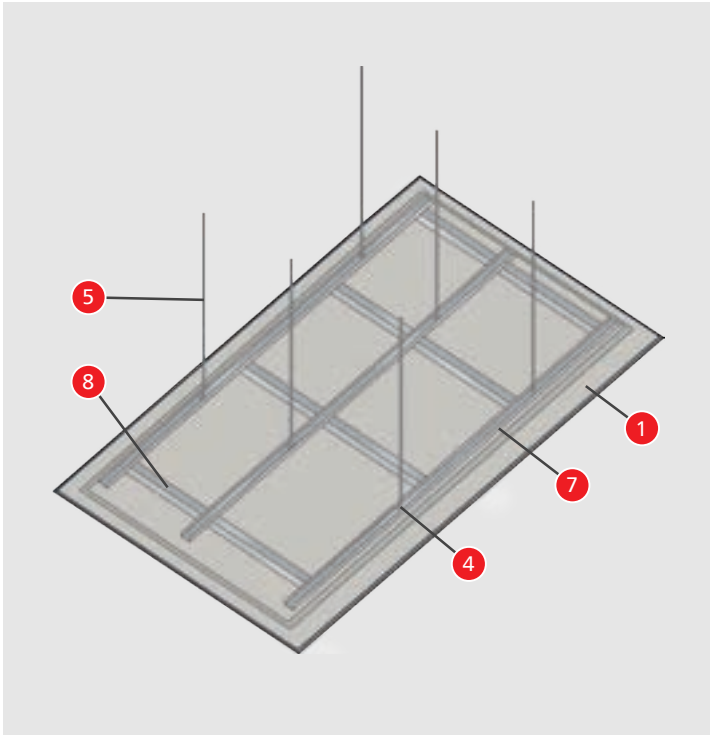
» Vertical view



» Vertical attachment



12.1.6 | mcr Tecbor 15 mm + 15 mm - EI 120 fire resistive suspended ceiling



Approving documents

- » Standard: EN 1365-2
- » Laboratory: APPLUS
- » Report no.: 10/1483-1011

Solution

1. mcr Tecbor board 15 mm
2. 3.5 × 45 mm self-drilling screw
3. Metal sheet e = 0.6 mm
4. Steel clamp for TC 60/27
5. M6 threaded rod
6. Sinard attachment
7. TC 60/27
8. Steel clamp for TC 60/27
9. 73 × 30 × 0.5 mm connecting section
10. 10 × 100 mm metal plug
11. IPE-140 metal section

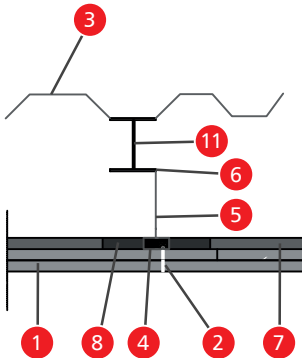
Installation description

Attach 73 × 30 × 0.5 mm connecting sections using 10 × 100 mm plugs approximately every 500 mm around the ceiling. Then place the TC 60/27 sections within 610 mm between the axes, crossing the sections using steel clamp for TC 60/27 and forming 610 × 610 mm frames. Attach the assembly to the structure supporting the ceiling using a steel clamp, M6 rod and clamps.

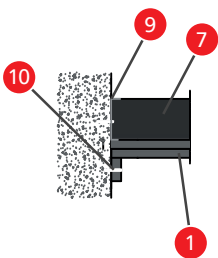
Attach both layers of 15 mm mcr Tecbor boards with 3.5 × 45 mm self-drilling screws. Then cross-attach the second mcr Tecbor board to the first one.

Finish with mcr Tecbor 15 mm board and place 150 mm wide covering strip along the entire circumference. The distance between the screws is approximately 250–300 mm. Cover the screws heads and construction joints between the boards with mcr Tecbor Joint Paste. A 0.6 mm corrugated sheet is placed every 550 mm on top of the suspended ceiling and IPE 160 metal sections.

» Vertical view

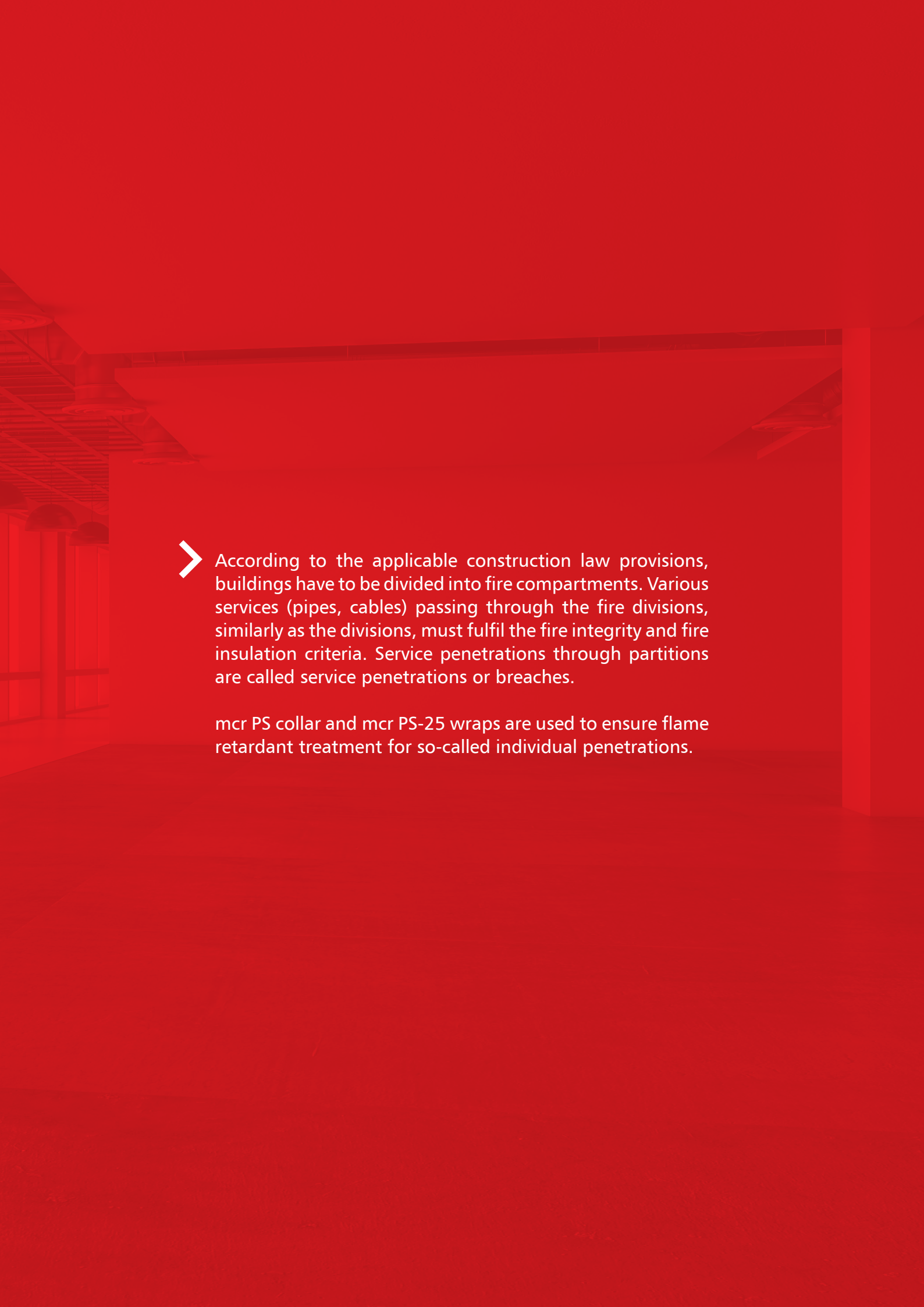


» Vertical attachment





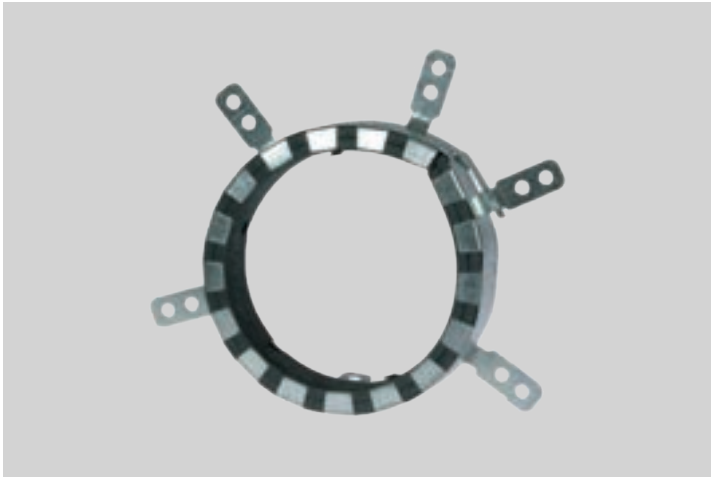
SERVICE PENETRATIONS



> According to the applicable construction law provisions, buildings have to be divided into fire compartments. Various services (pipes, cables) passing through the fire divisions, similarly as the divisions, must fulfil the fire integrity and fire insulation criteria. Service penetrations through partitions are called service penetrations or breaches.

mcr PS collar and mcr PS-25 wraps are used to ensure flame retardant treatment for so-called individual penetrations.

13.1 | mcr PS – flame retardant intumescent collar



Approving documents

- » European Technical Assessment ETA-17/0676 z dn.29/09/2017
- » Certificate of constancy of performance 1488-CPR-0624/W
- » Declaration of performance 84033

Application

mcr PS collars are designed for providing flame retardant treatment of walls and ceilings penetrations:

- » combustible pipes with diameters up to 250 mm (PVC-U, PVC-C, PE-HD, PE, ABS, SAN+PVC, PP-R)
- » pipe bundles 4 × 75 mm
- » combustible pipes with diameter up to up to 160 mm, passing through the partition at an angle
- » combustible pipes in combined penetrations

mcr PS collars are rated EI120 when installed::

- » in rigid walls at least 100 mm thick, made of concrete, reinforced concrete, aerated concrete, full brick, cavity brick or chequer brick, with a density of at least 600 kg/m³,
- » in flexible walls at least 100 mm thick, with framework structure, made of wooden or steel sections, with two-side lining of at least two F or DF gypsum boards acc to EN 520,
- » in rigid ceilings at least 150 mm thick, made of aerated concrete, concrete or reinforced concrete with a density of at least 600 kg/m³.

mcr PS fire collars consist of one or more layers of intumescent inserts within a casing made of galvanized sheet steel or stainless steel sheet. The casing is equipped with a clamp fastening the ends of the collar and stabilizing it on the pipe, and with mounting brackets mounting the collar to the partition. The number of mounting brackets corresponds to the collar size. During a fire at temperatures above 140°C, the intumescent inserts in the collar expand and fill in the opening left by the burnt-out installation.

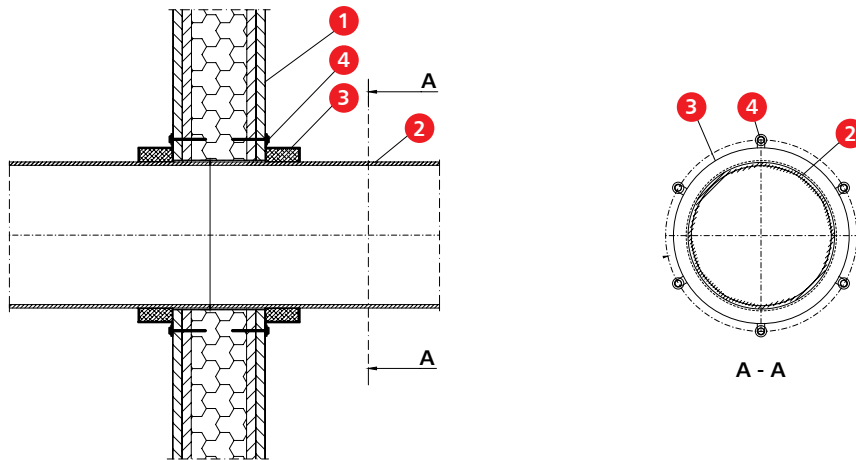
The inserts expand at temperature above 140°C and fill in the opening left by the burnt-out installation.

Technical parameters of the collar

collar	Pipe outer diameter [mm]	Collar outer diameter [mm]	Collar inner diameter [mm]	Height [mm]	Number of brackets
mcr PS 50	50	65	52	30	3
mcr PS 63	63	77	65	30	3
mcr PS 75	75	95	77	30	4
mcr PS 90	90	112	92	30	5
mcr PS 110	110	132	112	30	6
mcr PS 125	125	150	127	30	6
mcr PS 160	160	196	163	30	8
mcr PS 200	200	248	204	60	5
mcr PS 225	225	270	228	60	6
mcr PS 250	250	298	254	60	6

13.1.1 | Selected examples of mcr PS collar installation

13.1.2 | Combustible pipe penetration through a rigid or flexible wall

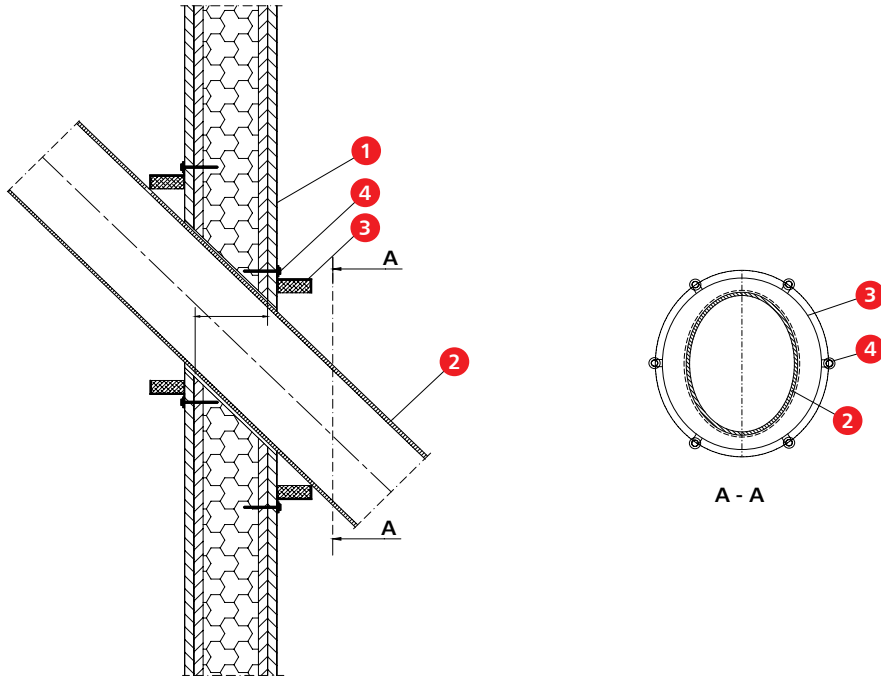


Maximum pipe diameters:
 » PE-HD up to 160 mm
 » PVC-U/PVC-C up to 250 mm
 » PP-R up to 160 mm
 The collar is to be selected according to the table on page 314.

1. rigid or flexible wall with thickness of 100 mm
2. plastic pipe
3. mcr PS collars are located on both sides of the wall
4. M6 × 90 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PE-HD	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160
PVC-U / PVC-C	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160
	$160 < \varnothing \leq 205$	60	17,5	mcr PS 200
	$205 < \varnothing \leq 250$	60	20,0	mcr PS 225, mcr PS 250
PP-R	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
		30	7,5	mcr PS 75, mcr PS 90
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160

13.13 | Combustible pipe penetration at the angle between 0° and 89° through a rigid or flexible wall



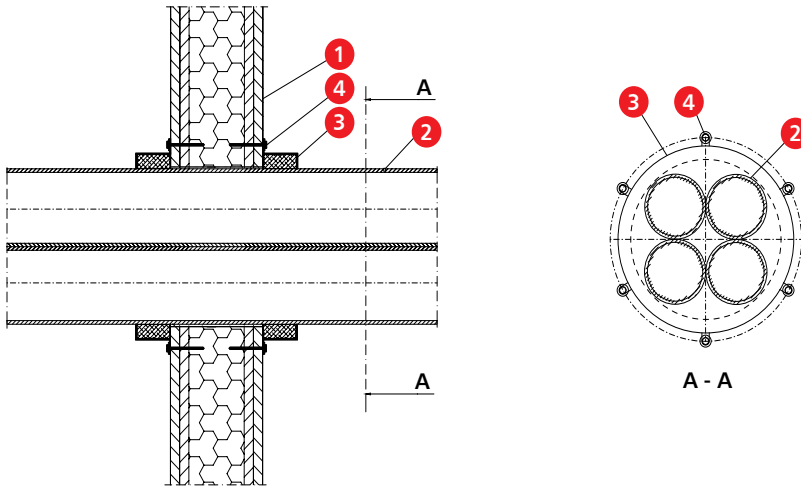
Maximum pipe diameters:
» PVC-U / PVC-C to 160 mm

NOTE: In such case select the collar appropriately larger than the diameter of the protected pipe.

- 1. rigid or flexible wall with thickness of 100 mm
- 2. plastic pipe
- 3. mcr PS collars are located on both sides of the wall
- 4. M6 × 90 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PVC-U / PVC-C	32	30	5,0	mcr PS 63
	50	30	7,5	mcr PS 75, mcr PS 90, mcr PS 110
	63	30	10,0	mcr PS 110, mcr PS 125
	75	30	12,5	mcr PS 125, mcr PS 160
	90	30	12,5	mcr PS 125, mcr PS 160
	110	30	15,0	mcr PS 160
	125	60	17,5	mcr PS 200
	160	60	20,0	mcr PS 225

13.1.4 | Combustible pipe bundle penetration (maximum 4 pipes in a bundle) through a rigid or flexible wall



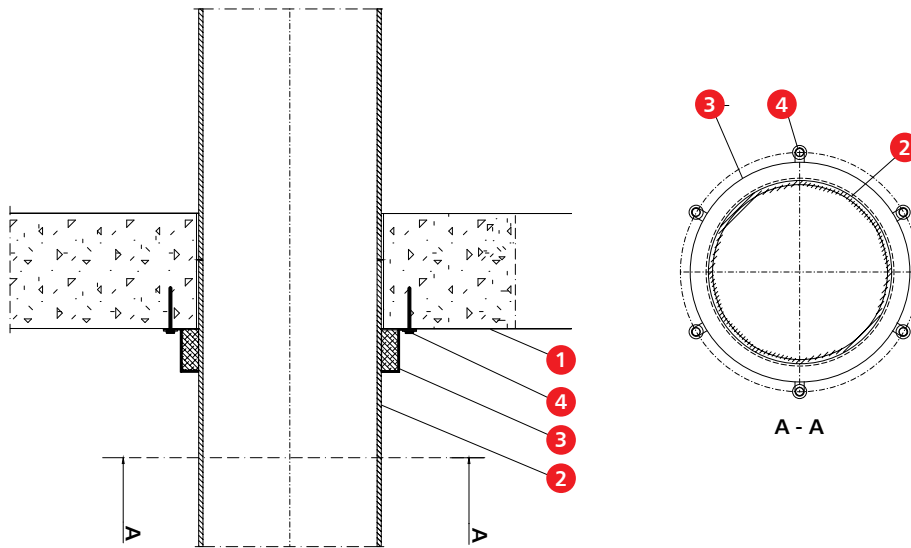
Maximum diameter of a single pipe in the PP-R bundle up to 75 mm.

NOTE: in such case select the collar appropriately larger than the diameter of the individual protected pipe.

- 1. rigid or flexible wall with thickness of 100 mm
- 2. plastic pipe (maximum 4 pipes in the bundle)
- 3. mcr PS collars are located on both sides of the wall
- 4. M6 × 90 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PP-R	$\varnothing \leq 32$	30	7,5	mcr PS 75
	$32 < \varnothing \leq 40$	60	10,0	mcr PS 90, mcr PS110
	$40 < \varnothing \leq 49$	60	12,5	mcr PS 125
	$49 < \varnothing \leq 57$	60	15,0	mcr PS 160
	$57 < \varnothing \leq 66$	60	17,5	mcr PS 200
	$66 < \varnothing \leq 75$	60	20,0	mcr PS 200

13.1.5 | Combustible pipe penetration through a rigid ceiling



Maximum pipe diameters:

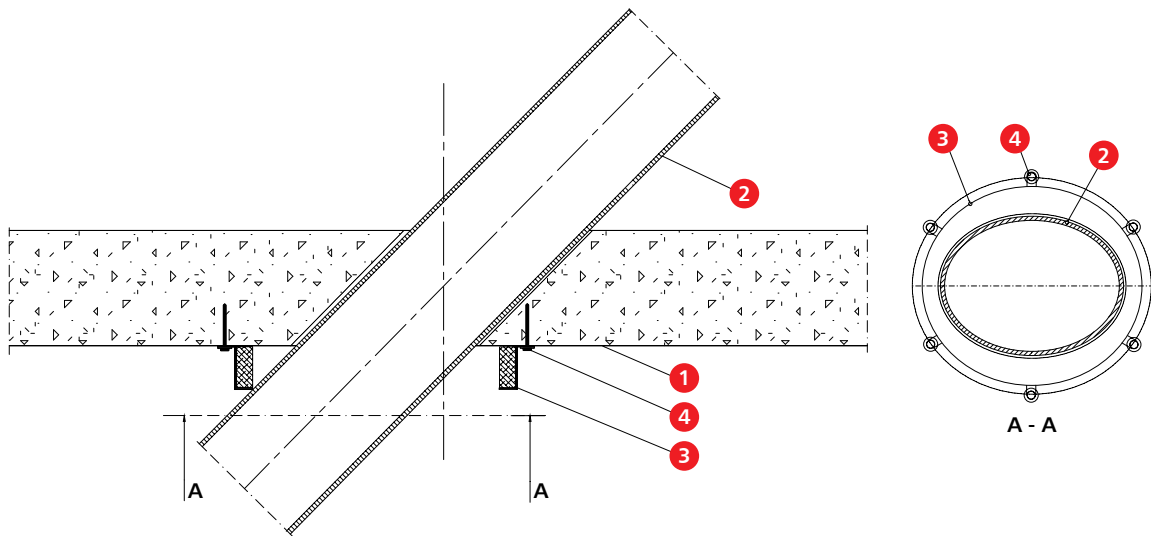
- » PE-HD up to 250 mm
- » PVC-U/PVC-C up to 250 mm
- » PP-R up to 160 mm

1. rigid ceiling, ≥ 150 mm thick and with density ≥ 600 kg/m³
2. plastic pipe
3. mcr PS collar located under the ceiling
4. M6 \times 60 bolt

The collar is to be selected according to Table 1.

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PP-R	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160
PVC-U /PVC-C	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160
	$160 < \varnothing \leq 205$	60	17,5	mcr PS 200
PE-HD	$\varnothing \leq 63$	30	5,0	mcr PS 50, mcr PS 63
	$63 < \varnothing \leq 87$	30	7,5	mcr PS 75, mcr PS 90
	$87 < \varnothing \leq 111$	30	10,0	mcr PS 110
	$111 < \varnothing \leq 135$	30	12,5	mcr PS 125, mcr PS 160
	$135 < \varnothing \leq 160$	30	15,0	mcr PS 160
	$160 < \varnothing \leq 205$	60	17,5	mcr PS 200
	$205 < \varnothing \leq 250$	60	20,0	mcr PS 225, mcr PS 250

13.1.6 | Combustible pipe penetration at the angle between 0° and 89° through a rigid ceiling



Maximum pipe diameters:

» PVC-U / PVC-C up to 160 mm

NOTE: in such case select the collar appropriately larger than the diameter of the individual protected pipe.

1. rigid ceiling, ≥ 150 mm thick and with density ≥ 600 kg/m³

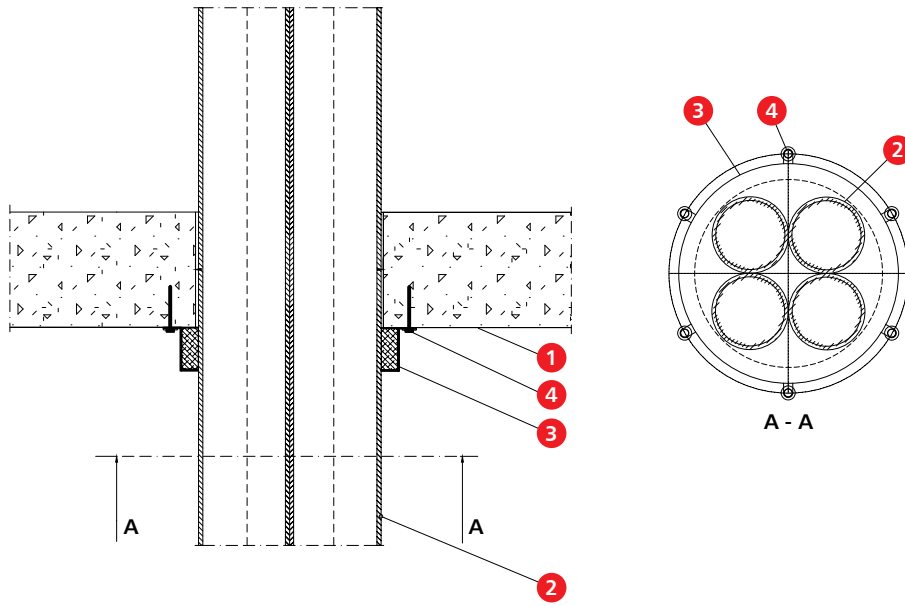
2. plastic pipe

3. mcr PS collar located under the ceiling

4. M6 x 60 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PVC-U / PVC-C	$\varnothing \leq 32$	30	5,0	mcr PS 63
	$32 < \varnothing \leq 51$	30	7,5	mcr PS 75, mcr PS 90, mcr PS 110
	$51 < \varnothing \leq 71$	30	10,0	mcr PS 110, mcr PS 125
	$71 < \varnothing \leq 90$	30	12,5	mcr PS 125, mcr PS 160
	$90 < \varnothing \leq 110$	30	15,0	mcr PS 160
	$110 < \varnothing \leq 135$	60	17,5	mcr PS 200
	$135 < \varnothing \leq 160$	60	20,0	mcr PS 225

13.1.7 | Combustible pipes bundle penetration through rigid ceiling



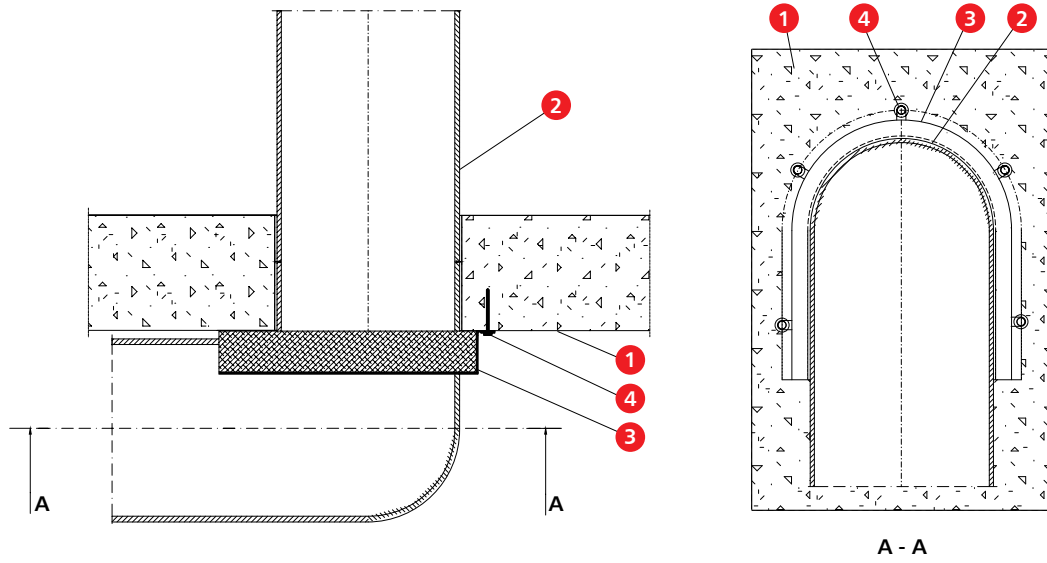
Maximum diameter of a single pipe in the bundle up to 75 mm.

NOTE: in such case select the collar appropriately larger than the diameter of the protected pipe.

- 1. rigid ceiling, ≥ 150 mm thick and with density ≥ 600 kg/m³
- 2. plastic pipe (maximum 4 pipes in the bundle)
- 3. mcr PS collar located under the ceiling
- 4. M6 \times 60 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PP-R	$\varnothing \leq 32$	30	7,5	mcr PS 75
	$32 < \varnothing \leq 40$	60	10,0	mcr PS 90, mcr PS 110
	$40 < \varnothing \leq 49$	60	12,5	mcr PS 125
	$49 < \varnothing \leq 57$	60	15,0	mcr PS 160
	$57 < \varnothing \leq 66$	60	17,5	mcr PS 200
	$66 < \varnothing \leq 75$	60	20,0	mcr PS 200

13.1.8 | Combustible pipe penetration through rigid ceiling – pipe elbow under the ceiling

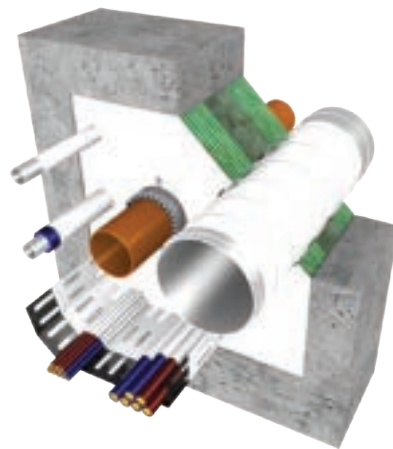
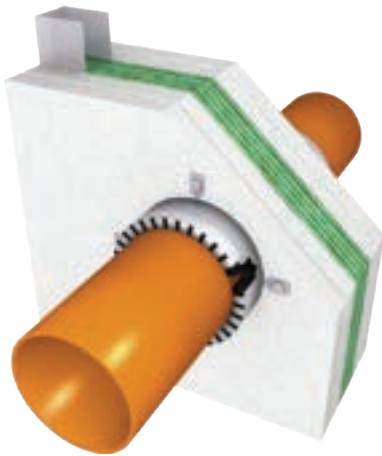


Maximum pipe diameters:
 » PVC-U / PVC-C up to 160 mm

NOTE: The size of the collar should be selected according to the pipe's external diameter.

1. rigid ceiling, ≥ 150 mm thick and with density ≥ 600 kg/m³
2. plastic pipe
3. mcr PS collar located under the ceiling
4. M6 \times 60 bolt

Pipe material	Pipe external diameter [mm]	Intumescent material		Corresponding collar type
		width [mm]	thickness [mm]	
PVC-U / PVC-C	$\varnothing \leq 63$	30	5,0	PS 63
	$63 < \varnothing \leq 86$	30	7,5	PS 75, PS 90
	$86 < \varnothing \leq 110$	30	10,0	PS 110
	$110 < \varnothing \leq 135$	30	12,5	PS 125, PS 160
	$135 < \varnothing \leq 160$	30	15,0	PS 160



13.2 | mcr PS-25 - Intumescent fire wrap



Approving documents

- » European Technical Assessment ETA-17/0676 z dn.29/09/2017
- » Certificate of constancy of performance 1488-CPR-0624/W
- » Declaration of performance 84101

Application

mcr PS-25 wraps are designed for providing flame retardant treatment for walls and ceilings penetrations:

- » combustible pipes with diameters up to 250 mm (PVC-U, PVC-C, PE-HD, PE, ABS, SAN+PVC, PP-R)
- » non-combustible pipes (copper 42 mm diameter, steel 100 mm) in combustible insulation in combined penetrations.

Wraps mcr PS-25 have EI 120 class when installed:

- » in rigid walls at least 100 mm thick, made of concrete, reinforced concrete, aerated concrete, full brick, cavity brick or chequer brick, with a density of at least 600 kg/m³,
- » in rigid ceilings at least 150 mm thick, made of aerated concrete, concrete or reinforced concrete with a density of at least 600 kg/m³.

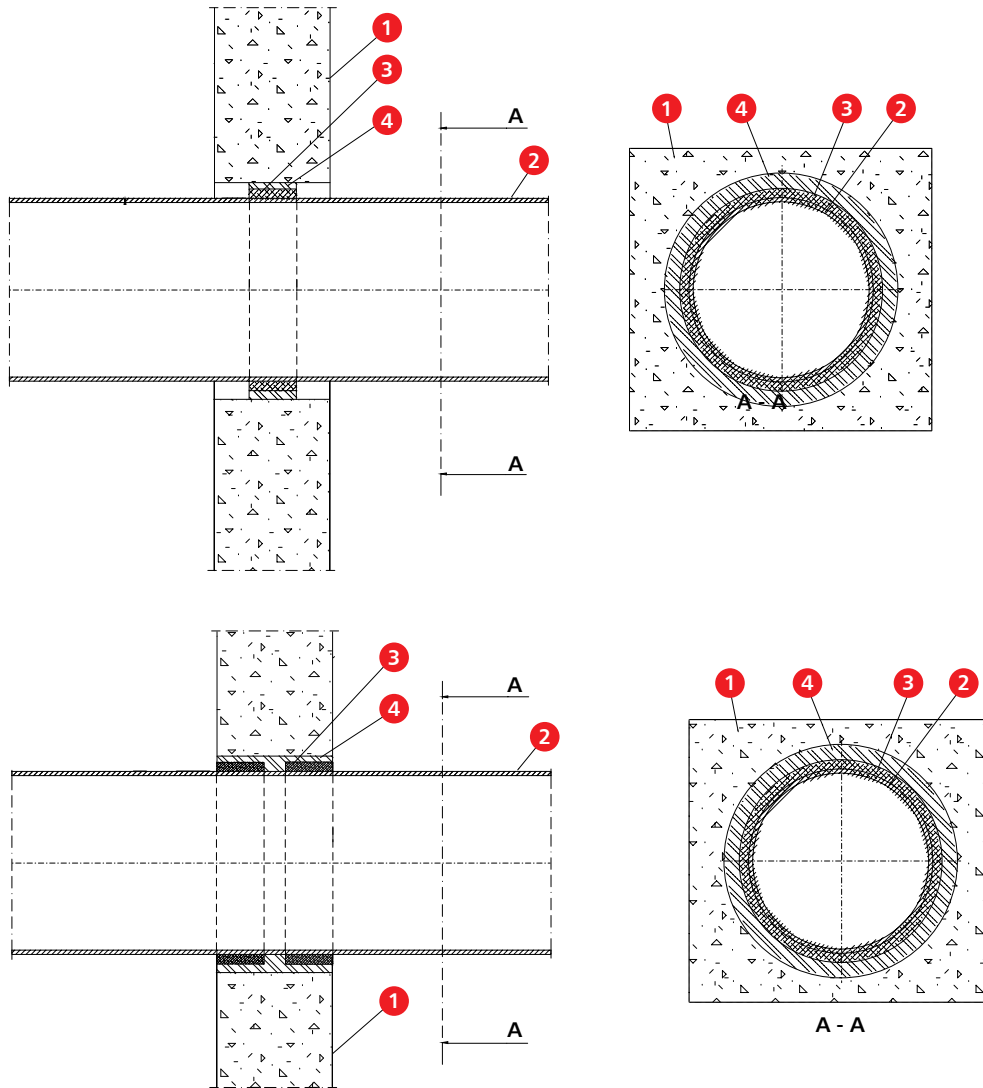
mcr PS-25 firestop wraps are made of elastic thermoplastic material tapes, which are intumescent above 140°C and fill in the opening left by the burnt-out installation. The wrap is sold in 30 m rolls of intumescent material to be dimensioned individually to the specific size of the pipe.

Technical parameters of the firestop wrap

pipe external diameter [mm]	wrap width [mm]	wrap thickness [mm]	number of wrap coils *	total thickness of wrap layers [mm]	approximate length of the wrap for one-sided pipe protection [m]	approximate number of wraps from one 30 m roll [szt.]
15	60	2,5	2	5	0,14	214,3
20	60	2,5	2	5	0,17	176,5
25	60	2,5	2	5	0,21	142,9
32	60	2,5	2	5	0,25	120,0
40	60	2,5	2	5	0,29	103,4
50	60	2,5	2	5	0,35	85,7
63	60	2,5	2	5	0,45	66,7
75	60	2,5	2	5	0,52	57,7
83	60	2,5	3	7,5	0,57	52,6
90	60	2,5	3	7,5	0,62	48,4
110	60	2,5	4	10	1,53	19,6
125	60	2,5	5	12,5	1,73	17,3
140	60	2,5	6	15	3,00	10,0
160	60	2,5	6	15	3,34	9,0
180	60	2,5	7	17,5	3,80	7,9
200	60	2,5	7	17,5	5,60	5,4
225	60	2,5	8	20	6,25	4,8
250	60	2,5	8	20	6,90	4,3

* one coil of the wrap ensures complete coverage of the pipe circumference

13.2.1 | Combustible pipe penetration through a rigid wall



1. rigid wall ≥ 1100 mm thick and with density ≥ 1600 kg/m³
2. plastic pipe
3. mcr PS-25 wrap:
 - one wrap for 110 mm diameter pipes
 - two wraps for > 110 mm diameter pipes
4. 15 mm space between the pipe and the partition, filled with cementitious or limestone mortar

Maximum pipe diameters:

- » PE-HD up to 250 mm
- » PVC-U/PVC-C up to 250 mm
- » PP-R up to 160 mm

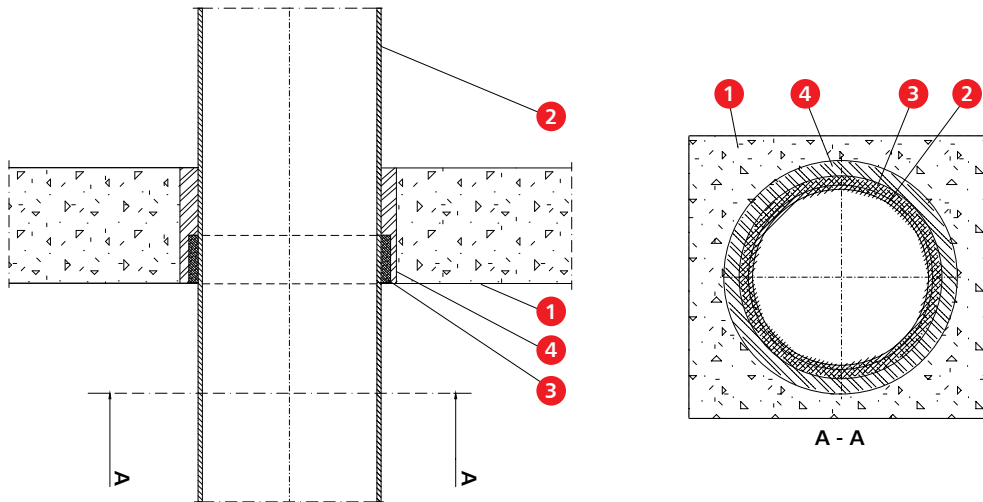
The required number of mcr PS-25 intumescent wrap coils acc. to the Table on page 322.

*) NOTE: when protecting PVC-U and PVC-C pipes with diameters above 75 mm the partition should be at least 150 mm thick. Thinner walls may be thickened to 150 mm using two F gypsum boards acc to EN 520, 12.5 mm thick, placed on both sides of the wall.

Pipe material	Pipe diameter [mm]	Intumescent material		
		width [mm]	thickness [mm]	Number of coils
PP-R	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60	7,5	3
	$96 < \varnothing \leq 117$	60	10,0	4
	$117 < \varnothing \leq 138$	60	12,5	5
	$138 < \varnothing \leq 160$	60	15,0	6
PVC-U /PVC-C	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60 *)	7,5 *)	3
	$96 < \varnothing \leq 117$	60 *)	10,0 *)	4
	$117 < \varnothing \leq 138$	60 *)	12,5 *)	5
	$138 < \varnothing \leq 160$	60 *)	15,0 *)	6
	$160 < \varnothing \leq 205$	60 *)	17,5 *)	7
	$205 < \varnothing \leq 250$	60 *)	20,0 *)	8
PE-HD	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60	7,5	3
	$96 < \varnothing \leq 117$	60	10,0	4
	$117 < \varnothing \leq 138$	60	12,5	5
	$138 < \varnothing \leq 160$	60	15,0	6
	$160 < \varnothing \leq 205$	60	17,5	7
	$205 < \varnothing \leq 250$	60	20,0	8

The wall should be then at least 150 mm thick. Thinner walls may be thickened to ≥ 150 mm using two F gypsum boards acc to EN 520, 12.5 mm thick, placed on both sides of the wall.

13.2.2| Combustible pipe penetration through a rigid ceiling



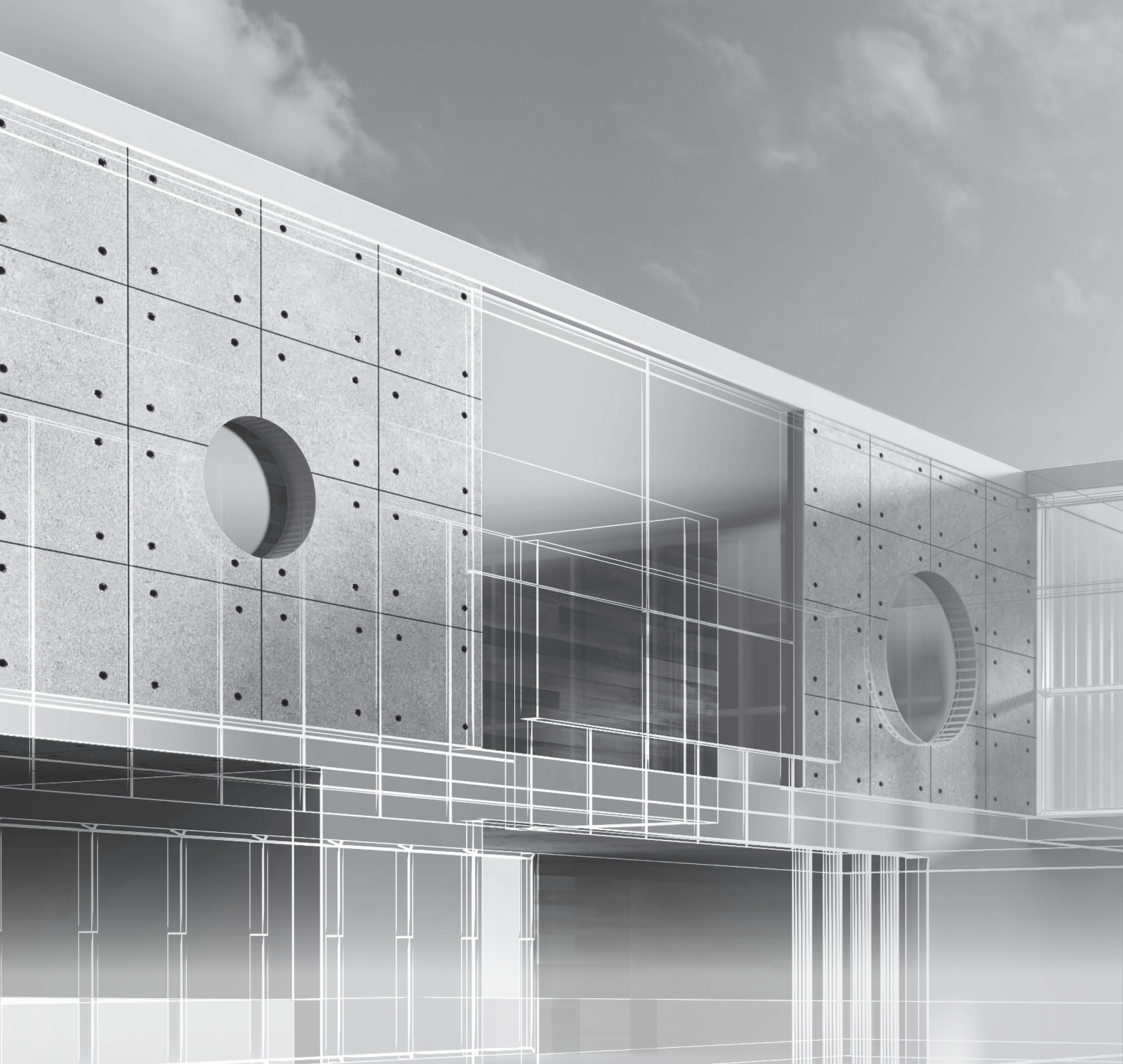
- 1. rigid ceiling, 150 mm thick and with density $\geq 600 \text{ kg/m}^3$
- 2. plastic pipe
- 3. mcr PS-25 wrap placed under the ceiling
- 4. 15 mm space between the pipe and the partition, filled with cementitious or limestone mortar

Maximum pipe diameters:

- » PE-HD up to 250 mm
- » PVC-U/PVC-C up to 250 mm
- » PP-R up to 160 mm

The required number of mcr PS-25 intumescent wrap coils acc. to the table below.

Pipe material	Pipe diameter [mm]	Intumescent material		
		width [mm]	thickness [mm]	Number of coils
PE-HD	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60	7,5	3
	$96 < \varnothing \leq 117$	60	10,0	4
	$117 < \varnothing \leq 138$	60	12,5	5
	$138 < \varnothing \leq 160$	60	15,0	6
	$160 < \varnothing \leq 205$	60	17,5	7
	$205 < \varnothing \leq 250$	60	20,0	8
PP-R	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60	7,5	3
	$96 < \varnothing \leq 117$	60	10,0	4
	$117 < \varnothing \leq 138$	60	12,5	5
	$138 < \varnothing \leq 160$	60	15,0	6
PVC-U /PVC-C	$\varnothing \leq 75$	60	5,0	2
	$75 < \varnothing \leq 96$	60	7,5	3
	$96 < \varnothing \leq 117$	60	10,0	4
	$117 < \varnothing \leq 138$	60	12,5	5
	$138 < \varnothing \leq 160$	60	15,0	6
	$160 < \varnothing \leq 205$	60	17,5	7
	$205 < \varnothing \leq 250$	60	20,0	8



**COMBINED
SERVICE PENETRATIONS**



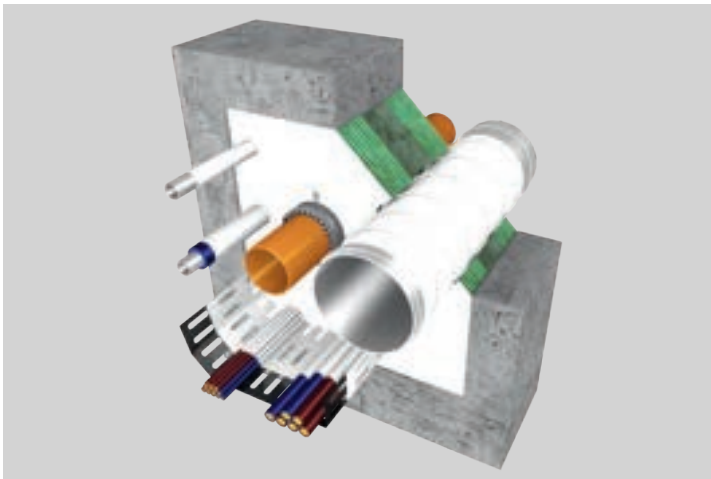
mcr Polylack Elastic, mcr Polylack, Polylack K, mcr Polylack KG, mcr PS Bandage, mcr PS, mcr PS-25 and mcr Dunaboard are products designed for sealing service penetrations of specific combustible pipes, metal pipes, single cables and cables in flexible walls, rigid walls and rigid ceilings.

Sealing service penetrations using the aforementioned products applies both to the individual and combined penetrations.

Maximum dimensions of the protected are 1200 × 1800 mm.

COMBINED SERVICE PENETRATIONS

14.1 | Combined service penetrations



Approving documents

- » European Technical Assessment ETA 17/1040
- » Certificate of constancy of performance 1396-CPR-0158
- » European Technical Assessment ETA-18/0171
- » Certificate of constancy of performance 1488-CPR-0680/W
- » European Technical Assessment ETA-18/0169
- » Certificate of constancy of performance 1488-CPR-0701/W
- » European Technical Assessment ETA 19/0321
- » Certificate of constancy of performance 1396-CPR-0160
- » Declaration of performance mcr Polylack Elastic 81500
- » Declaration of performance mcr Polylack F 81282
- » Declaration of performance mcr Polylack K 81303
- » Declaration of performance mcr Polylack KG 81340
- » Declaration of performance mcr PS Bandage 84151
- » Declaration of performance mcr PS 84033
- » Declaration of performance mcr PS-25 84101
- » Declaration of performance mcr Dunaboard 81070
- » Declaration of performance mcr Dunaboard Elastic 81078

Elementy konstrukcji

Structural elements allowing for sealing service penetrations are the following partitions:

- » rigid walls – walls at least 100 mm thick, made of concrete, reinforced concrete, aerated concrete, full brick, cavity brick or chequer brick, with a density of at least 450 kg/m³,
- » flexible walls – walls at least 100 mm thick, with framework structure, made of wooden or steel sections, with two-side lining of at least two F or DF gypsum boards acc to EN 520 (total thickness of the lining on one side of the wall not less than 25 mm),
- » rigid floor slabs – floor slabs at least 150 mm thick, made of concrete, reinforced concrete, aerated concrete, full brick, cavity brick or chequer brick, with a density of at least 620 kg/m³.

Application

- » fire sealing of wall and ceiling penetrations of plastic pipes made of: PVC-U, PVC-C, PE-HD, PE, ABS, SAN+PVC, PP-R,
- » fire sealing of wall and ceiling penetrations of metal pipes made of steel, cast iron and copper pipes,
- » fire sealing of wall and ceiling penetrations of metal pipes made of steel, cast iron and copper pipes in combustible and non-combustible insulation,
- » fire sealing of wall and ceiling penetrations of cables, cable bundles, cable ducts.

COMBINED SERVICE PENETRATIONS

14.2 | Combined penetration components

» mcr Polylack Elastic - fire-proof elastic intumescent paint



mcr Polylack Elastic is a white ablative coating, used as a paint (for coatings) or as a filler (the material binding or filling in the gaps) for fire sealing of wall and ceiling penetrations of mixed service penetrations of combustible pipes, insulated metal pipes, single cables or cables bundles.

color	white
density	1,25 ± 10% g/cm ³
complete drying	24 h / 1 mm
temperature resistance*	-40°C to 80°C
dry coating thickness	min. 1 mm
storage temperature	5°C to 25°C
storage time	12 months from the production date

* refers to the applied paint when completely bound and dried

» mcr Polylack F - fireproof intumescent paint



mcr Polylack F is an intumescent paint made of fire retardants, carbon- and gas-releasing additives and of water dispersion of synthetic resin. Under high temperature caused by the fire the applied and dried paint forms on the surface a heat-insulating surface carbon foam layer, stopping burning of the polymer insulating surface at an early stage, preventing the flame from spreading over the protected installation surface.

color	white
density	1,33 ± 5% g/cm ³
complete drying	24 h
temperature resistance*	-40°C to 80°C
expansion	≥ 25
dry coating thickness	min. 0,5 mm
storage temperature	5°C to 25°C
storage time	12 months from the production date

* refers to the applied paint when completely bound and dried

COMBINED SERVICE PENETRATIONS

» mcr Polylack K - intumescent fire paste



mcr Polylack K is a intumescent compound, which upon application as a layer or filling, at high temperature forms thermo-insulating carbon foam layer on the surface, stopping the burning of the polymer insulation layer at the early stage and preventing the flames from spreading on the protected surface.

color	white
density	1,38 ± 5% g/cm ³
complete drying	24 h
temperature resistance*	-40°C to 80°C
expansion	≥ 5
dry coating thickness	od 1 do 30 mm
storage temperature	5°C to 25°C
storage time	12 months from the production date

* refers to the applied paint when completely bound and dried

» mcr Polylack KG - fire-retardant intumescent paint with graphite



mcr Polylack KG is a new fire-retardant intumescent putty with added graphite. After application as a coating or fill it intumescent under high temperature, multiplying its volume, and creating a protective coating, filling in the penetration and stopping the fire.

color	light grey
density	1,35-1,49 g/cm ³
complete drying	thickness 1 mm - 24 h
thickness 20-25 mm - 20-30 days	-40°C to 80°C
temperature resistance*	-40°C to 80°C
expansion	≥ 10
dry coating thickness	min. 0,5 mm
storage temperature	5°C to 25°C
storage time	12 months from the production date

* refers to the applied paint when completely bound and dried

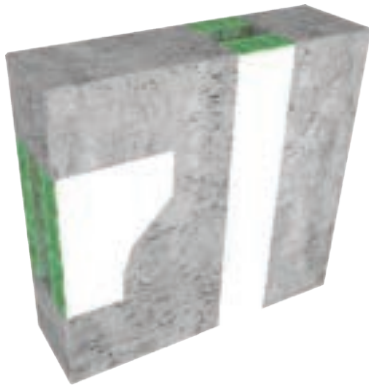
COMBINED SERVICE PENETRATIONS

» mcr PS Bandage - fire retardant intumescent bandage in a roll



mcr PS Bandage is a fire-retardant bandage made of elastic tapes of thermoplastic material on fiberglass tape. Above 140°C it intumescent and fills in the opening left by the burnt-out services. Available as a 125 mm wide and 2 mm thick roll. The roll is 10 m long.

» mcr Dunaboard - mineral wool board covered with intumescent paint



mcr Dunaboard is a board made of 60 mm thick and 150 kg/m³ dense rock mineral wool, used to fill in the opening in the partition. It is manufactured in size 1000 × 600 × 60 mm. The use of pre-fabricated mcr Dunaboard boards accelerates fire protection of service penetrations. mcr Dunaboard F is a board pre-coated with mcr Polylack F paint. mcr Dunaboard Elastic is a board pre-coated with mcr Polylack Elastic.

» mcr PS - ofire-retardant intumescent collar (complementary)



mcr PS is a fire-retardant collar consisting of one or more layers of intumescent inserts within a casing made of galvanized sheet steel or stainless steel sheet. The inserts expand at temperature above 140°C and fill in the opening left by the burnt-out installation.

mcr PS collars are designed for fire-retardant protection of wall and ceiling penetrations:

- » combustible pipes with diameters up to 250 mm (PVC-U, PVC-C, PE-HD, PE, ABS, SAN+PVC, PP-R)
- » bundles of combustible pipes, 75 mm in diameter each,
- » combustible pipes with diameter up to up to 160 mm, passing through the partition at an angle
- » combustible pipes with diameters up to 200 mm in combined penetrations.

» mcr PS-25 - intumescent fire wrap (complementary)



mcr PS-25 is a firestop wrap made of elastic thermoplastic material tapes, which are intumescent above 140°C and fill in the opening left by the burnt-out installation. The wrap is sold in rolls of intumescent material to be dimensioned individually to the specific size of the pipe.

mcr PS-25 wraps are designed for fire-retardant protection of wall and ceiling penetrations:

- » combustible pipes with diameters up to 250 mm (PVC-U, PVC-C, PE-HD, PE, ABS, SAN+PVC, PP-R),
- » non-combustible pipes in combustible insulation in combined penetrations.

COMBINED SERVICE PENETRATIONS

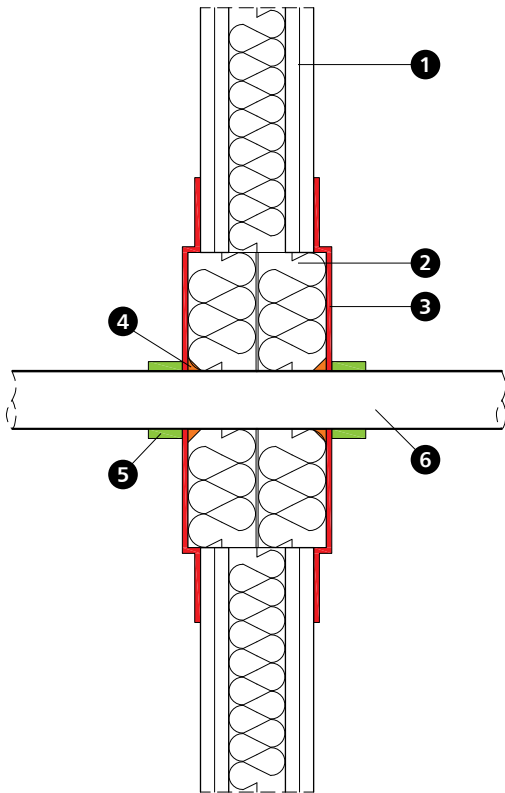
“MERCOR” S.A. offers two service penetrations fire protection systems:

1. the system consisting of mcr Polylack F, mcr Polylack K, mcr Polylack KG and mcr PS Bandage subject to European Technical Assessment ETA-18/0171 (EI120-rated solution) and European Technical Assessment ETA 17/1040 (EI60-rated solution).
2. the mcr Polylack Elastic system subject to ETA-18/0169 (EI120-rated solution in U/C and C/C configuration) and European Technical Assessment ETA 19/0321 (EI120-rated solution in U/U configuration).

The systems may be used interchangeably. However, using the components from the other system is not possible.

14.3 | Selected examples of protection installation

» Combustible pipe penetration through a rigid or flexible wall, in mineral wool insulation



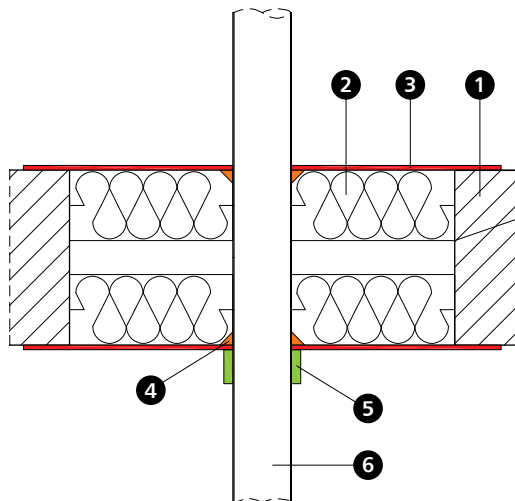
» a) Installation acc to ETA-18/0171

1. rigid or flexible wall with thickness of ≥ 100 mm
2. rock mineral wool board with the thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
3. 0.5 mm thick mcr Polylack F coating
4. sealing with mcr Polylack K
5. mcr PS fire-retardant collar
6. plastic pipe

» b) Installation acc to ETA-18/0169

1. rigid or flexible wall with thickness of ≥ 100 mm
2. rock mineral wool board with the thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
4. mcr Polylack Elastic sealing
5. mcr PS fire-retardant collar
6. plastic pipe

» Combustible pipe penetration through a rigid ceiling, without insulation



» a) Installation acc to ETA-18/0171

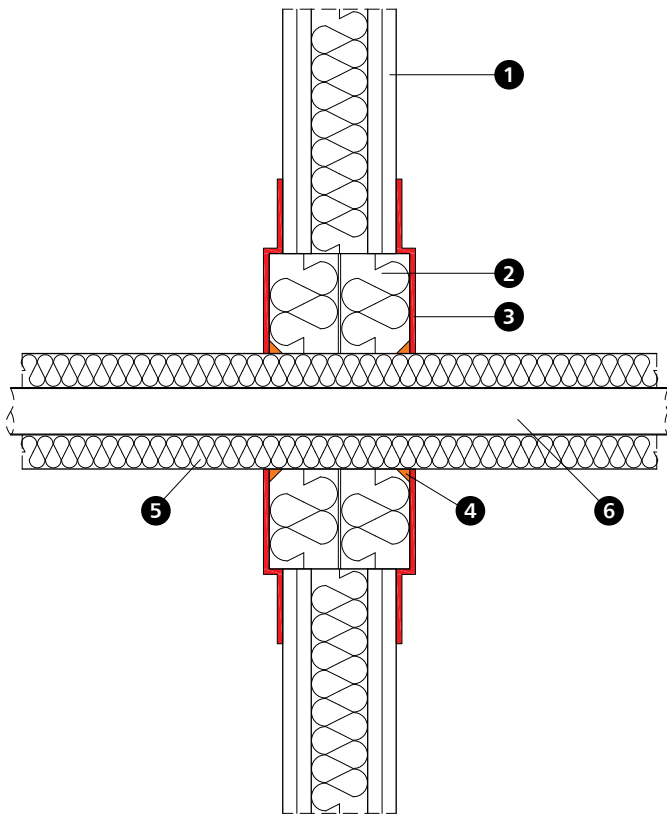
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
2. rock mineral wool board with the thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
3. 0.5 mm thick mcr Polylack F coating
4. sealing with mcr Polylack K
5. mcr PS fire-retardant collar
6. plastic pipe

» b) Installation acc to ETA-18/0169

1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
2. rock mineral wool board with the thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
4. mcr Polylack Elastic sealing
5. mcr PS fire-retardant collar
6. plastic pipe

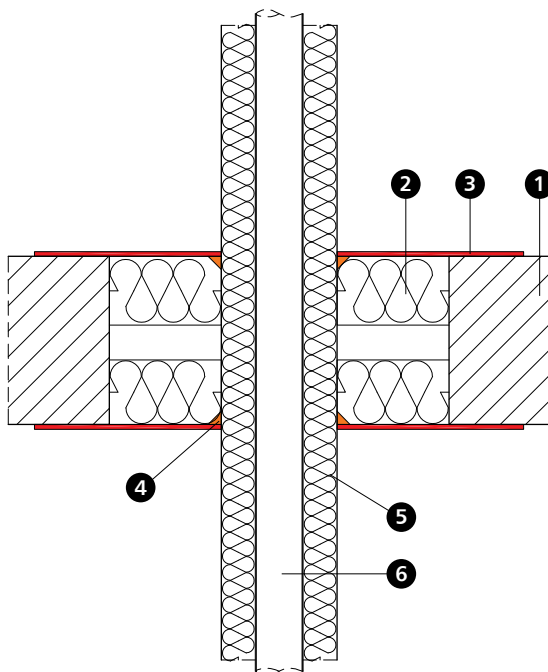
COMBINED SERVICE PENETRATIONS

» Copper pipe penetration through a rigid or flexible wall, in mineral wool insulation



- » a) Installation acc to ETA-18/0171
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. copper pipe
- » b) Installation acc to ETA-18/0169
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm

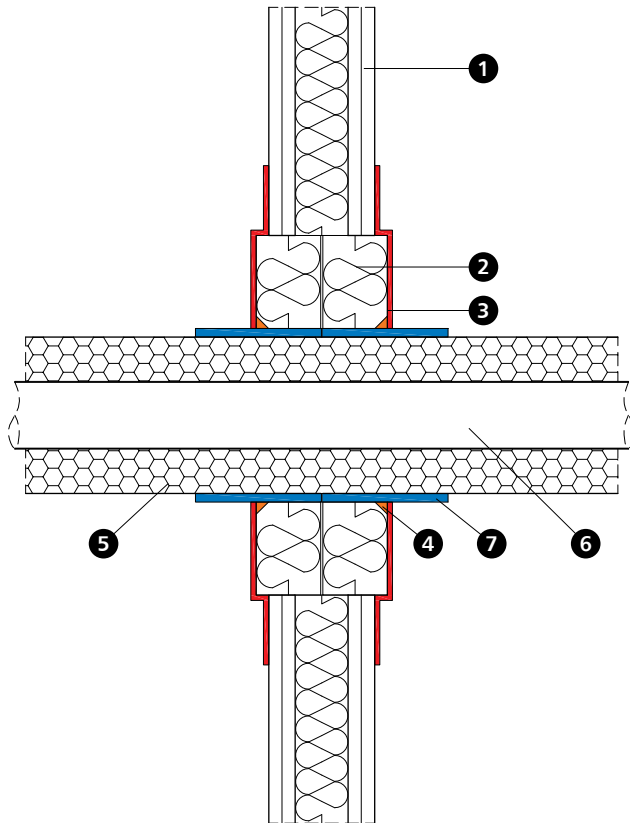
» Copper pipe penetration through a rigid ceiling, with mineral wool insulation



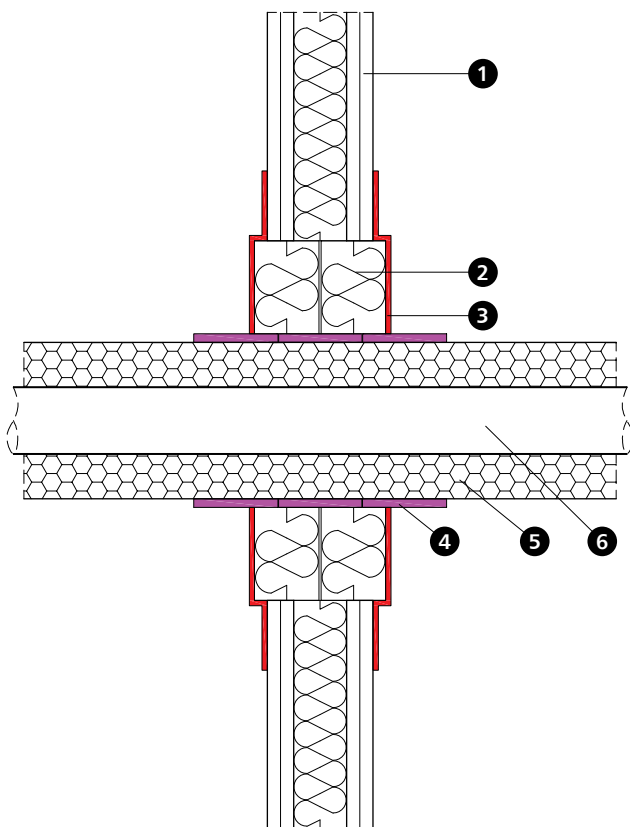
- » a) Installation acc to ETA-18/0171
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. copper pipe
- » b) Installation acc to ETA-18/0169
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr Polylack Elastic sealing
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. copper pipe

COMBINED SERVICE PENETRATIONS

» Insulated combustible steel or copper pipe penetration through a rigid or flexible wall



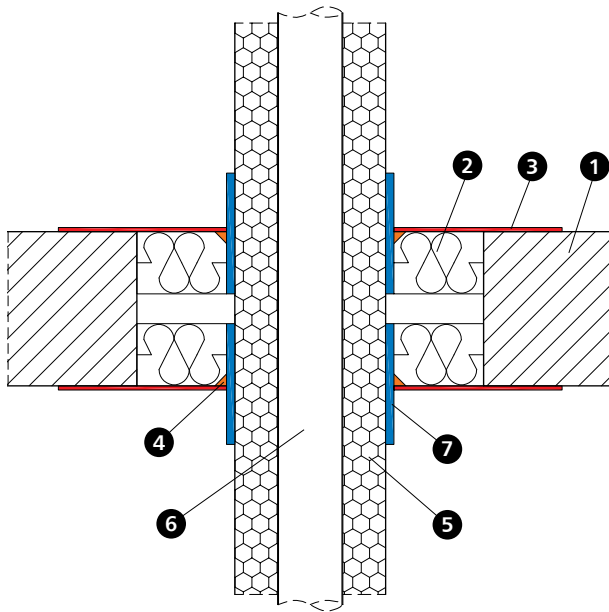
- » a) Installation acc to ETA-18/0171
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with the thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. K-flex ST or NH/Armaflex combustible insulation
 6. steel or copper pipe
 7. mcr PS Bandage fire protection bandage



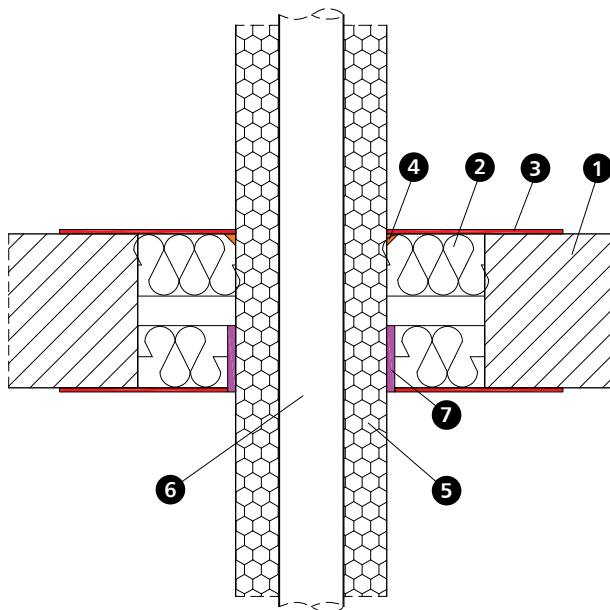
- » b) Installation acc to ETA-18/0169
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr PS-25 firestop wrap
 5. K-flex ST or NH/Armaflex combustible insulation
 6. steel or copper pipe

COMBINED SERVICE PENETRATIONS

» Insulated combustible steel or copper pipe penetration through a rigid ceiling



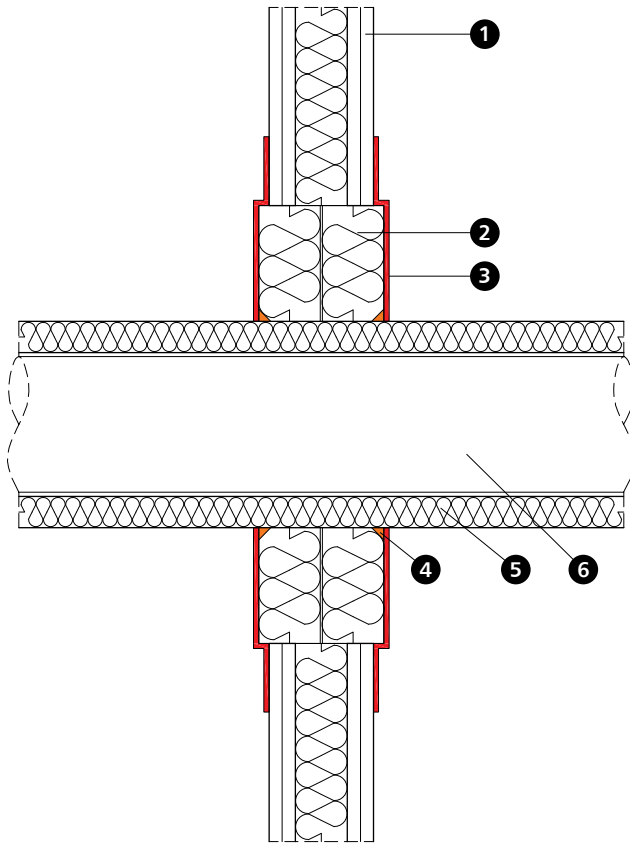
- » a) Installation acc to ETA-18/0171
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. K-flex ST or NH/Armaflex combustible insulation
 6. steel or copper pipe
 7. mcr PS Bandage fire protection bandage



- » b) Installation acc to ETA-18/0169
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr Polylack Elastic sealing
 5. K-flex ST or NH/Armaflex combustible insulation
 6. steel or copper pipe
 7. mcr PS-25 firestop wrap

COMBINED SERVICE PENETRATIONS

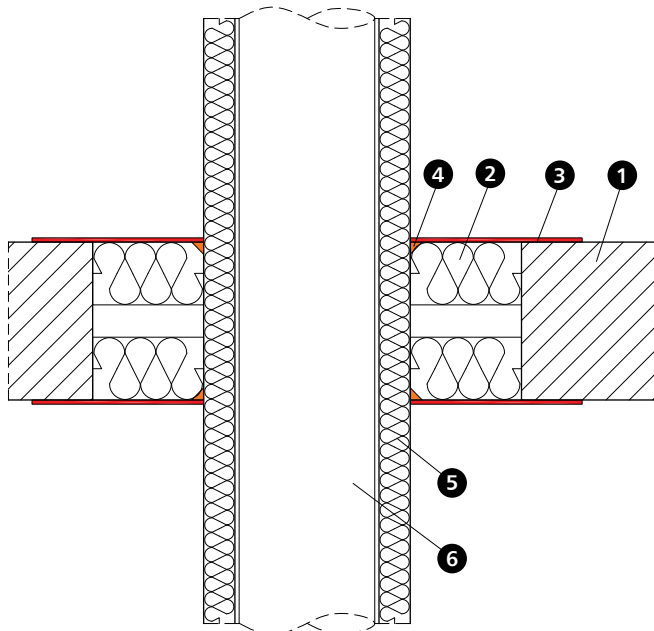
» Insulated non-combustible steel pipe penetration through a rigid or flexible wall



- » a) Installation acc to ETA-18/0171
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. steel pipe

- » b) Installation acc to ETA-18/0169
1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr Polylack Elastic sealing
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. steel pipe

» Insulated non-combustible steel pipe penetration through a rigid ceiling

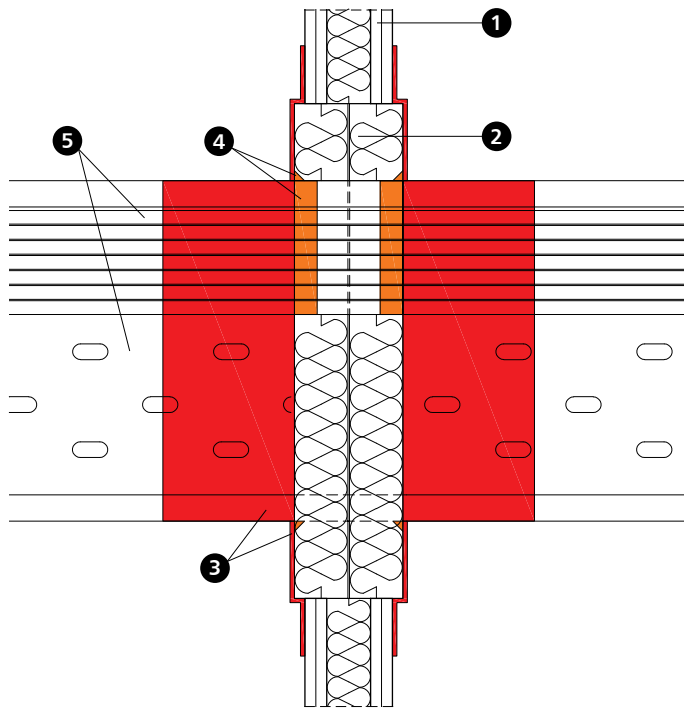


- » a) Installation acc to ETA-18/0171
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack K
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. steel pipe

- » b) Installation acc to ETA-18/0169
1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr Polylack Elastic sealing
 5. rock mineral wool insulation with a density of ≥ 80 kg/m³ on the length of min. 500 mm from the partition
 6. steel pipe

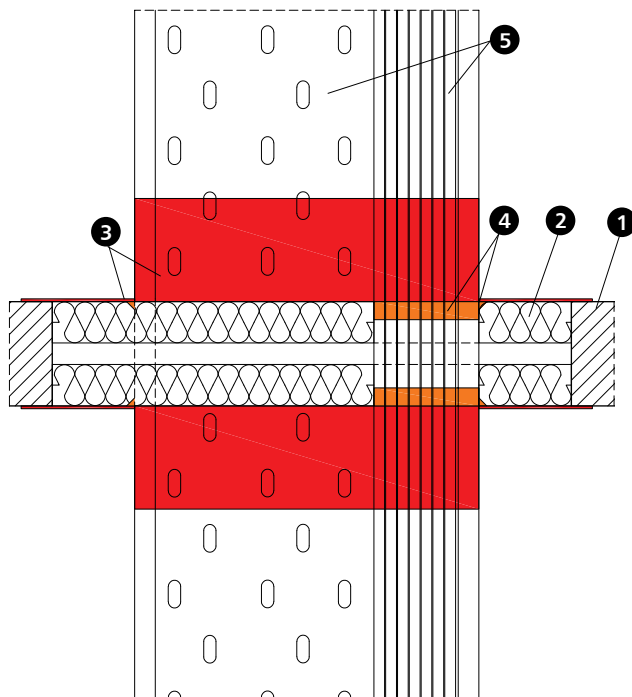
COMBINED SERVICE PENETRATIONS

» Penetration of cables, cable bundles, cable ducts through a rigid or flexible wall



- » a) Installation acc to ETA-18/0171
 1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack KG
 5. cables, cable bundles or cable ducts
- » b) Installation acc to ETA-18/0169
 1. rigid or flexible wall with thickness of ≥ 100 mm
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. sealing with mcr Polylack KG
 5. cables, cable bundles or cable ducts

» Penetration of cables, cable bundles, cable ducts through a rigid ceiling



- » a) Installation acc to ETA-18/0171
 1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. ≥ 0.5 mm thick mcr Polylack F coating
 4. sealing with mcr Polylack KG
 5. cables, cable bundles or cable ducts
- » b) Installation acc to ETA-18/0169
 1. rigid ceiling, ≥ 150 mm thick and with density ≥ 620 kg/m³
 2. rock mineral wool board with a thickness of ≥ 60 mm and a density of ≥ 150 kg/m³
 3. coating with mcr Polylack Elastic with a thickness of ≥ 1.0 mm
 4. mcr Polylack Elastic sealing
 5. cables, cable bundles or cable ducts



**FIRE PROTECTION SEALING
OF SERVICE PENETRATIONS
IN SAFETY BLOCS**



Safety Bloc 120 (3i ND 300 construction board) is a horizontal safety formwork typically used in shafts, but increasingly also in the designed ceilings.

Safety Bloc 120 element covered with mcr Polylack Elastic, in combination with fire sealing provided by mcr PS fire-retardant collar, mcr PS Bandage fire protection bandage, mcr Polylack KG and mcr Polylack Elastic compounds allows to provide EI 120 resistance class to the penetrating services.



Approving documents

- » mcr Polylack Elastic – ETA-19/0321, ETA-18/0169
- » mcr Polylack KG – ETA-18/0171, ETA-17/1040
- » mcr PS collar – ETA-17/0676
- » mcr PS-Bandage – ETA-17/1040, ETA-18/0171
- » mcr PS-25 wrap – ETA-17/0676
- » SAFETY BLOC service penetrations in the partition
- Classification report MA 39 – VFA 2020-0229.02

Installation

SAFETY BLOC are to be drilled without the hammer mode. Preferable devices are:

- » hammer drill,
- » small hand-held diamond coring tools (for small-diameter openings) diamond teeth for abrasive materials,
- » cordless battery screwdrivers (small-diameter openings).

In order to drill more efficiently make sure the teeth have progressive shape. Well fitted for this purpose are holesaws for drilling in: wood, plastics and stainless steel.



- » attaching the SAFETY BLOC blocks to the ceiling



Fire resistive rating EI 120.



- » making openings in SAFETY BLOC blocks for service penetrations

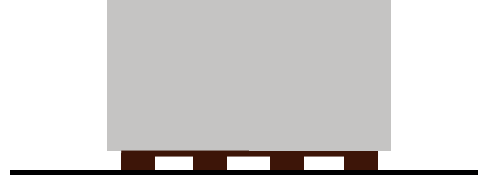


- » penetration of services through SAFETY BLOC blocks



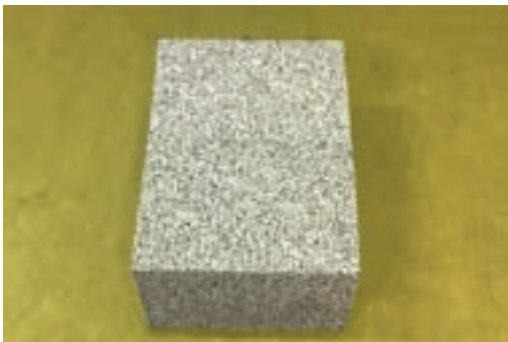
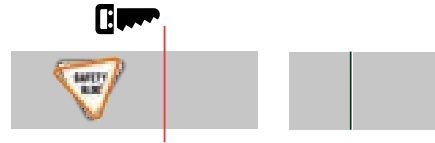
» supply

SAFETY BLOC is available in basic 160 × 60 cm / 120 × 60 cm / 80 × 60 cm formats and delivered on a pallet. It is to be unloaded using a forklift or a construction site hoist (with fork).



» changing dimensions

SAFETY BLOC may be cut into the desired dimensions manually using power saw. The cuts must only be glued together using ENT-VER fire foam and place on the formwork for completing concrete works.



» placing in the formwork

SAFETY BLOC is placed on the formwork and if necessary locked in place using steel pins.



» inserting the reinforcement

When laying SAFETY BLOCs do not use formwork oil, as it may impact adhesion to concrete.








» concrete works

During concrete works SAFETY BLOC must be free of snow, ice and cold. Concrete mix around the SAFETY BLOC should be appropriately vibrated!



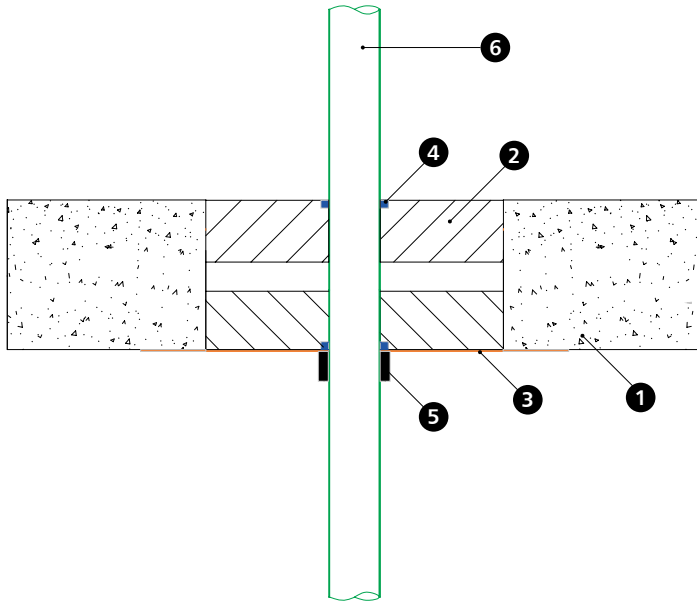
15.3 | Application

Approvals: MA 39 -VFA 2020 - 0229.02

Place of application	Service penetrations								
	Cables		Types of service penetrations						
	Cables	Cable bundle	Pipes plastic (PVC-U, PVC-C, PE, PE-HD, GEBERIT SILENT, REHAU RAUTTAN, ABS, SAN+PVC, PP, PP-R)	Steel pipes (FEF combustible insulation)	Steel pipes (without combustible insulation)	Combined penetrations (cables, steel pipes, plastic pipes)	U-shaped protection and on a oblique pipe	Ventilation duct	Penetration pipe with a single cable or a cable bundle
» mcr PS ceiling collar height 30–60 mm 	–	–	EI 120	–	–	EI 120	EI 120	–	EI 120
» ceiling mcr PS Bandage fire protection bandage 	–	–	–	EI 90 EI120	–	EI 90 EI120	–	–	–
» sceiling mcr Polylack Elastic fire-protection mass 	EI 120	EI 90 EI120	EI 120	EI 90 EI120	EI 90 EI120	EI 90 EI120	–	–	EI 120
» ceiling mcr Polylack KG fire-protection mass 	EI 120	EI 90 EI120	EI 90 EI120	–	–	EI 90 EI120	–	–	EI 120
» sceiling mcr Dunaboard 22 × 50 mm mineral wool board covered with paint layer mcr Polylack F or mcr Polylack Elastic 	EI 120	EI 90 EI120	–	–	–	EI 90 EI120	–	EI 60	–

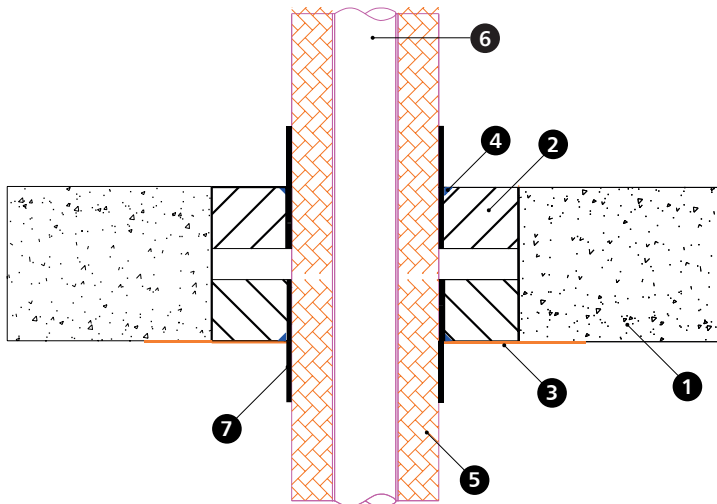
15.4 | Selected examples of installation

» Combustible pipes sealing without insulation using mcr PS collars and mcr Polylack Elastic



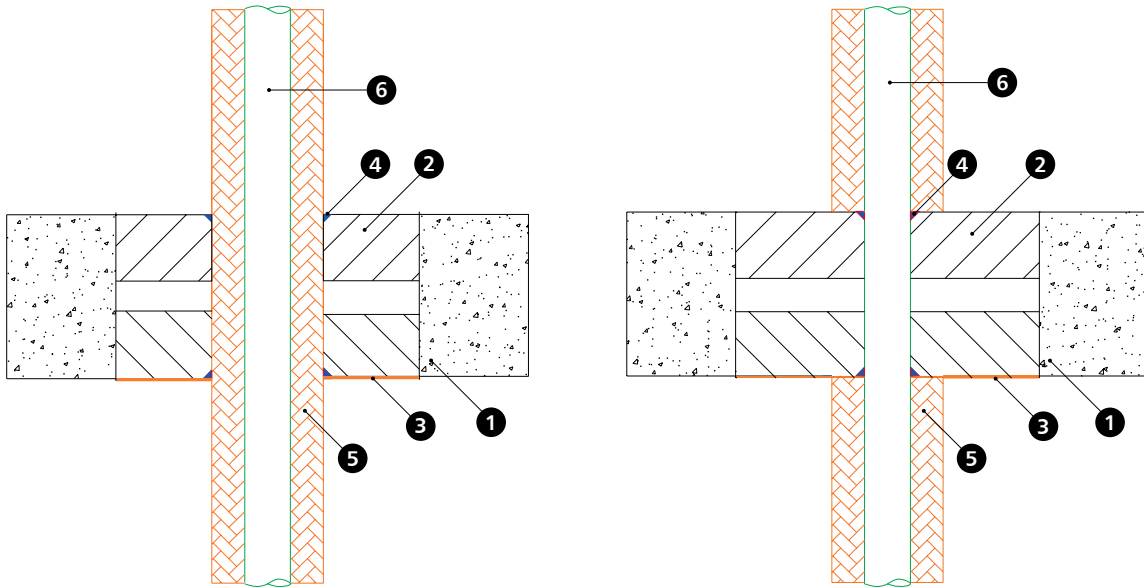
1. SAFETY BLOC block
2. rock mineral wool board with a thickness of ≥ 50 mm and a density of ≥ 150 kg/m³
3. coating with mcr Polylack Elastic with a thickness of ≥ 1 mm
4. min. 10 mm mcr Polylack Elastic sealing
5. mcr PS fire-retardant collar
6. combustible pipe

» Sealing non-combustible pipes in FEF insulation using mcr PS- Bandage and mcr Polylack Elastic



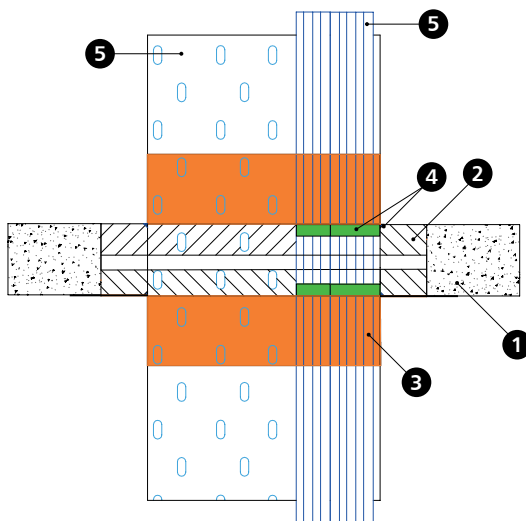
1. SAFETY BLOC block
2. rock mineral wool board with a thickness of ≥ 50 mm and a density of ≥ 150 kg/m³
3. coating with mcr Polylack Elastic with a thickness of ≥ 1 mm
4. min. 10 mm mcr Polylack Elastic sealing
5. FEF combustible insulation
6. non-combustible steel or copper pipe
7. mcr PS Bandage fire protection bandage

» Combustible and non-combustible pipes sealing in non-combustible insulation using mcr Polylack Elastic paint



1. SAFETY BLOC block
2. rock mineral wool board with the thickness of ≥ 50 mm and density ≥ 150 kg/m³
3. coating with mcr Polylack Elastic with a thickness of ≥ 1 mm
4. min. 10 mm mcr Polylack Elastic sealing
5. rock mineral wool insulation with a density of ≥ 80 kg/m³ at the min. length of min. 400 mm from the partition
6. non-combustible steel or copper pipe

» Sealing of cables, cable ducts using mcr Polylack KG and mcr Polylack Elastic



1. SAFETY BLOC block
2. rock mineral wool board with a thickness of ≥ 50 mm and a density of ≥ 150 kg/m³
3. min. 150 mm mcr Polylack Elastic sealing
4. mcr Polylack KG sealing with a thickness of $\geq 10 \times 25$ mm
5. single cable, cable bundle or cables on cable duct

NOTE: The aforementioned examples of installation pertain to cases when the openings in the service penetration are larger than the diameter of the component installed in the penetration. If the opening is drilled for the specific pipe diameter, the empty space around the pipe is filled with mcr Polylack Elastic if there are mcr Polylack KG cables used.



OTHER APPLICATIONS



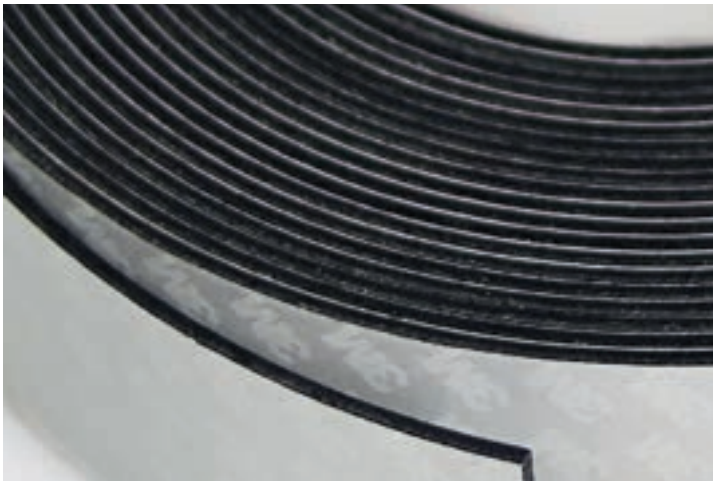
mcr Dunastrip is a high temperature intumescent material. This allows fire and smoke to spread through joints and gaps. It is made of expandable graphite bound and reinforced by a thermoresistant agent.

Designed for:

- » sealing of fire doors, glazings,
- » fire dampers, inspection holes,
- » service penetrations,
- » steel ventilation ducts, sandwich boards joints and other gaps between structural components.

Advantages:

- » Flexible, high quality non-breaking material
- » Quick and easy to install without dedicated tools
- » Rapid closing of the clearance of the opening at the place of installation.
- » At least 15× thermal expansion.
- » Resistance to water, CO₂ and UV radiation.



Technical parameters

Color	Anthracite
Texture	Solid, flexible material
Bulk density	1,20 ÷ 1,35 g/cm ³
Thickness	2,0 ± 0,3 mm
Reaction to fire class	E
Intumescent temperature	Ca. 180°C
Intumescence height	min. 15×
Intumescence pressure	Min. 1,0 N/mm ²
Reaction to moisture	Hygroscopic material
Thermal conductivity coefficient	Approx. 1.2 W/mK
Chemical resistance	In regulator conditions without limitations

Approving documents

- » European Technical Assessment ETA 21/0566
- » Certificate of constancy of performance 1220-CPR-2126
- » Declaration of performance 84106

Scope of application

Sealing of fire doors, glazings, fire dampers, inspection holes, service penetrations, steel ventilation ducts, sandwich boards joints and other gaps between structural components.

Operation

The material intumescent under high temperature, expanding over ten times its volume. It form a thermally stable insulation layer, which is only slightly heat conductive.

Composition

mcr Dunastrip is made of expandable graphite bound and reinforced by a thermoresistant agent.

Processing

May be cut to the required dimensions with simple tools, e.g. scissors. When using in humid rooms remember about protection against rust, which must be provided before mcr Dunastrip is applied. Painting with regular agents available on the market does impact intumescence.

Features

- » Tested for conformity with EAD 350005-00-1104 standard
- » Flexible, high quality non-breaking material
- » Quick and easy to install without dedicated tools
- » Rapid closing of the clearance of the opening at the place of installation
- » At least 15× thermal expansion
- » Resistance to water, CO₂ and UV radiation

16.1.1 | Installation Instructions

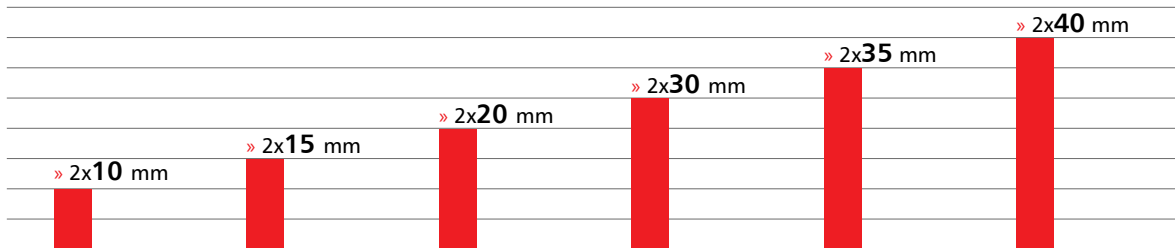
1. Select mcr Dunastrip in appropriate size.
2. mcr Dunastrip must be attached with adhesive to a dry and clean surface. If necessary remove the oils, lubricants and other contamination.
3. After removing protective foil of the adhesive place the product in the intended location and press on its entire length.
4. Install mcr Dunastrip at room temperature (approx. 20°C).

16.1.2 | Storage

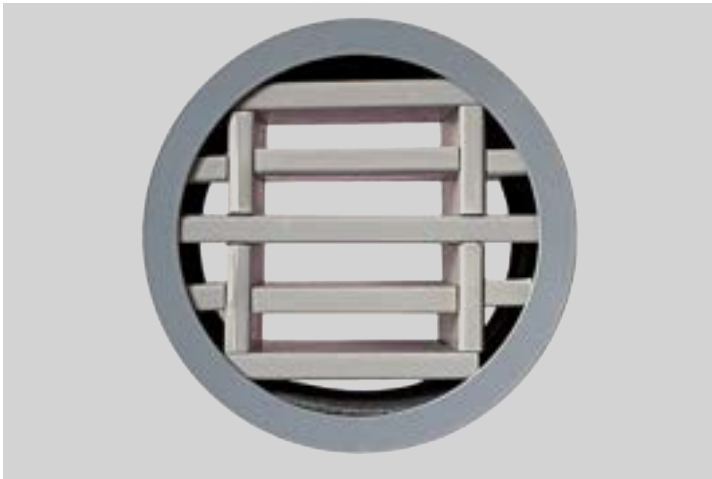
- » Store in dry rooms.
- » Intumescent material in regular conditions may be stored for unlimited period.

16.1.3 | Available sizes

- » Material available in a 30 m long roll or 1.2 m long strip.
- » Other sizes available upon request.



16.2 | Tecsel – intumescent fire grilles



Dimensions

Type	Fire resistive rating
Tecsel VC60 D100	EI 120
Tecsel VC60 D125	EI 120
Tecsel VC60 D150	EI 120
Tecsel VC60 D200	EI 120
Tecsel VC60 D250	EI 120
Tecsel VC60 D300	EI 120
Tecsel V60 100x100 mm	EI 120
Tecsel V60 150x150 mm	EI 120
Tecsel V60 200x200 mm	EI 120
Tecsel V60 250x250 mm	EI 120
Tecsel V60 300x300 mm	EI 120
Tecsel V60 400x400 mm	EI 120
Tecsel V60 450x450 mm	EI 120
Tecsel V60 500x500 mm	EI 120
Tecsel V60 600x600 mm	EI 120

Application

Tecsel intumescent fire grilles allow for free circulation of room temperature air through the structural element (walls, doors etc.), simultaneously offering efficient fire protection. When exposed to high temperature, they intumesce and form a layer of impact-resistant, non-combustible foam, which – as an insulating layer – prevents the penetration of flames, smoke and fire gases to the rest of the building not covered by fire.

The grilles are designed for indoor applications and should not be installed in rooms with high humidity, where the temperature exceeds 40°C.

Tecsel grilles meet the requirements of EN 1363-1: Fire resistance tests – Part 1: General requirements, which is confirmed by the test report No. 23548 issued by the CIDEMCO-TECNALIA laboratory from Spain.

Grille features

- » EI 120 fire resistance
- » reaction at low temperature (from 100°C)
- » rapid blockage of the clearance of the opening where it is installed (usually in the fifth minute, depending on the heat exposure)
- » high aesthetics
- » quick and easy to install

Installation technology

Tecsel grilles should be installed by mechanical means, using screws, bolts, pins or other fasteners (they should have the same fire resistance rating as the elements to which they are attached). It is recommended to leave a 2–3 mm gap around the grille and fill it with a fireproof adhesive, e.g. mcr Sil-MK. For larger ventilation openings, more grilles may be installed, provided that the partition fire resistance and appropriate distance between them are maintained.

Tecsel grilles may be installed in:

- » walls;
- » doors;
- » ventilation systems;
- » cable ducts.

Fire resistive rating EI 120.

16.3 | mcr SilGrill – intumescent fire grilles with masking elements



Wymiary

TYPE	AVAILABLE DIAMETERS [mm]	THICKNESS [mm]	MASKING ELEMENT TYPE
VC61,6	100	61,6	WITHOUT REQUIREMENTS
VC61,6	125	61,6	WITHOUT REQUIREMENTS
VC61,6	150	61,6	WITHOUT REQUIREMENTS
VC61,6	200	61,6	WITHOUT REQUIREMENTS
VC61,6	250	61,6	WITHOUT REQUIREMENTS
VC61,6	300	61,6	WITHOUT REQUIREMENTS

TYPE	DOSTĘPNE WYMIARY [mm]	THICKNESS [mm]	MASKING ELEMENT TYPE
VC60	100x100	60	WITHOUT REQUIREMENTS
VC60	150x150	60	WITHOUT REQUIREMENTS
VC60	200x200	60	WITHOUT REQUIREMENTS
VC60	250x250	60	MK25*
VC60	300x300	60	MK30*
VC60	400x400	60	MK40*
VC60	450x450	60	MK45*
VC60	500x500	60	MK50*
VC60	600x600	60	MK60*

* Masking element MK 25 – 60 (double-sided wall-mount covers) made from steel sheet metal with a thickness of 0.75 mm. Perforation spacing matches the arrangement of elements in the grille insert.

Application

Intumescent fire grilles allow for free circulation of room temperature air through the structural element (including walls and doors), simultaneously offering efficient fire protection.

When exposed to fire, the grilles intumesce under high temperature and form a layer of impact-resistant, non-combustible foam, which constitutes an insulating layer and prevents the penetration of flames, smoke and fire gases to the rest of the building not covered by the fire.

The mcr SilGrill product meets the requirements of PN-EN 1364-5:2017-08: Fire resistance tests for non-loadbearing elements

- » Part 1: Air grilles and PN-EN 13501-2:2016-07: Fire classification of construction products and building elements
- » Part 2: Classification using data from fire resistance tests, excluding ventilation services, certified by assessment report No. 01031/21/Z00NZP issued by the Polish Institute of Construction Technology.

Grille features

- » reaction already at 100°C
- » rapid blockage of the clearance of the opening where it is installed (usually in the fifth minute, depending on the heat exposure)
- » high aesthetics
- » quick and easy to install

Installation technology

Attach using mechanical means, using screws, bolts, pins or other fasteners (they should have the same fire resistance rating as the elements to which they are attached).

It is recommended to leave a 2–3 mm gap around the grille and fill it with Tecsel intumescent sealing compound.

For larger ventilation openings, more grilles may be installed, provided that the fire resistance and appropriate distance between them are maintained.

They may be installed in walls made of full bricks, perforated bricks, checker bricks, cavity brick, aerated concrete, concrete and reinforced concrete blocks.

Fire resistive rating EI 120.



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