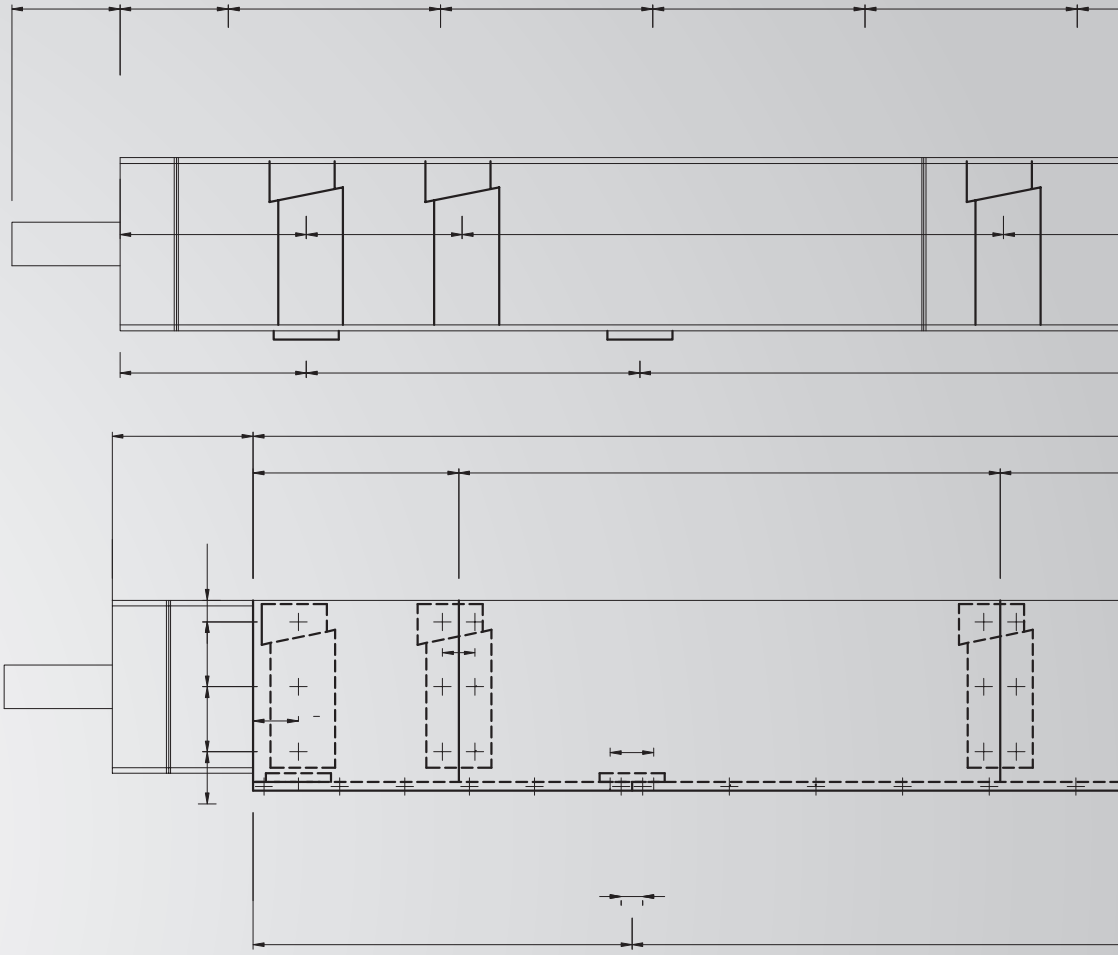
1

2020



# TECHNICAL CATALOGUE

## FIRE PROTECTION OF BUILDING STRUCTURES

### STEEL STRUCTURES

mercor

# Technical Catalogue 2020

Dear Customers,

Please accept our Technical Catalogue of fire protection systems designed for building structures, which contains detailed information on the application, features, technical parameters, fire protection properties and technology of delivery of the fireproof systems dedicated to steel structures.

Every product dispatched from „MERCOR" S.A. factories to a Customer is thoroughly verified in accordance with the highest quality management standards and subject to a range of approval tests. We are proud to provide safety through our operations.

We are looking forward to doing business with you

The "MERCOR" S.A. Team

The electronic version of our Technical Catalogue is available at www.mercor.com.pl

mercor®

FIRE PROTECTION OF BUILDING STRUCTURES

Fire protection of building structures

Technical Catalogue 2020

Edition: "MERCOR" S.A. – Fire Protection of Building Structures Department

"MERCOR" S.A. seated in Gdańsk reserves the right to introduce any changes to the content of this Technical Catalogue 2020 at any time and without giving any reasons. The introduction of any changes does not require at any stage to inform the users of the Technical Catalogue 2020 about it.

The content of this Technical Catalogue 2020 is not an offer under art. 66 of the Civil Code.

Desktop publishing: Bliskie strony

# FIRE PROTECTION OF BUILDING STRUCTURES

## STEEL STRUCTURES

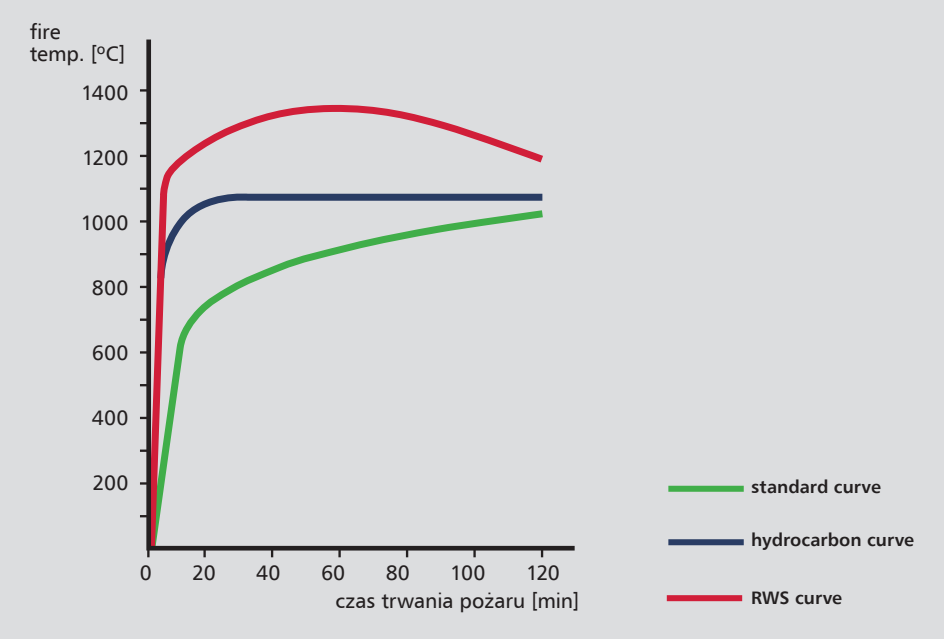
table of contents



mercor®

## 1.1. curves determining fire resistance of construction elements

Adoption of a fire model for the purposes of testing fire resistance of elements, suitable for designed use of the fireproof system, creates opportunities to assess material behaviour during actual fire incidents.




**Standard (cellulosic) curve** is defined (according to EN 1363-1) to illustrate burning of cellulosic materials (paper, wood, etc.).

**Hydrocarbon curve** is defined (according to EN 1363-2) to illustrate fires of very high intensity. Such fires occur most frequently in chemical and petrochemical industry plants and at the oil platforms. These fires are specific for their steep temperature increase and rapid spreading

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

## 1.2. fire protection of steel columns and beams

The fire safety of objects with a steel load-bearing structure depends on preventive activities and applied active and passive fire protection measures. Active protection measures (monitoring and alarm devices and fire extinguishing installations) and passive protection measures (appropriate design solutions) aim at mitigating the effects of thermal impact during fire and/or limiting their range.

Steel structures are specific for their low fire endurance R. In the designing process, in order to reduce the fire risk, suitable fire protection measures ensuring proper resistance of the object in fire conditions should be applied.

"MERCOR" S.A. offers the solutions that enable obtaining the R15-R360 fire resistance class by steel structures, both in standard and hydrocarbon fire conditions.

## 1.3. calculation of the section factor for steel profiles

Fire protection for structures acts as a barrier causing slower heating of an element, which allows it to the bearing function in fire conditions for a longer time period. Minimum thickness of a fireproof material is selected depending on a type of fire, fire resistance class of a structure and critical temperature. In addition, it depends on section factor of the element (exposure in fire conditions).

As a general rule, massive profiles have low section factor at identical circumference, in opposite to thin-walled profiles featuring high section factor. Thin-walled profiles achieve critical temperature of approx. 500°C during profile in shorter time-period and therefore require thicker lining comparing to massive profiles.

## 1.3.1. section factor of profiles protected with contour method

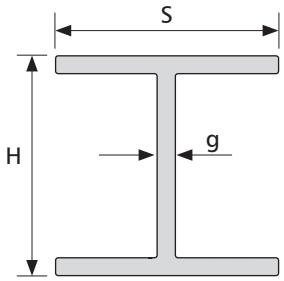
Profile section factor calculated for the purposes of fireproofing with the use of the contour method applies to fire protection by means of intumescent paints and fireproof spraying.

Section factor U/A is a ratio of heated profile circumference to its section area U/A ($m^{-1}$):

U – heated circumference [m]

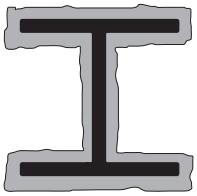
A – cross-section area [$m^2$]

$$\frac{U}{A} = \frac{\text{heated circumference}}{\text{section area}} \quad [\frac{m}{m^2} = m^{-1}]$$

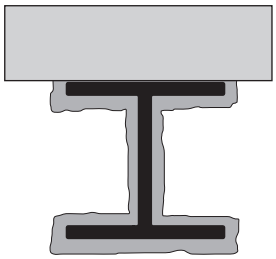



H – total profile height [m]
S – profile flange width [m]
g – profile web thickness [m]

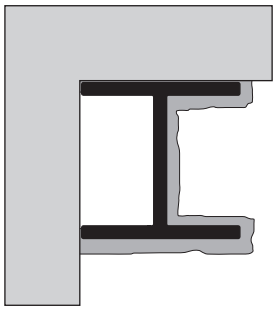
**Examples of formulas for calculating the length of the heated U circuit for an I-profile for various insulation variants:**



Insulation on four sides of the profile:
**U = 2H + 4S – 2g [m]**



Insulation on three sides of the profile:
**U = 2H + 3S – 2g [m]**



Insulation on two sides of the profile:
**U = H + 2S – 2g [m]**

## 1.3.2. section factor of profiles protected with box method

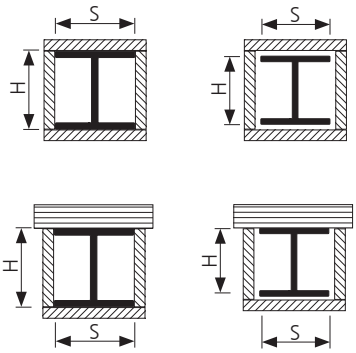
Profile section factor calculated for the purposes of fireproofing with the use of the box method applies to fire protection by means of fireproof boards.

Section factor U/A is a ratio of heated profile circumference to its section area U/A ($m^{-1}$):

U – heated circumference [m]

A – cross-section area [$m^2$]

$$\frac{U}{A} = \frac{\text{heated circumference}}{\text{section area}} \quad [\frac{m}{m^2} = m^{-1}]$$



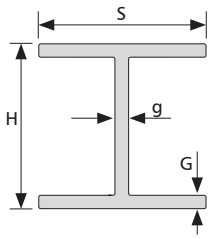

$$\frac{U}{A} = \frac{2(S + H)}{\text{steel section area}}$$

$$\frac{U}{A} = \frac{2H + S}{\text{steel section area}}$$

H – total profile height [m]
S – profile flange width [m]

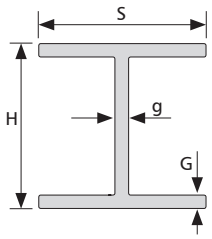
## 1.4. section factors for steel profiles

### 1.4.1. section factors for I open profiles



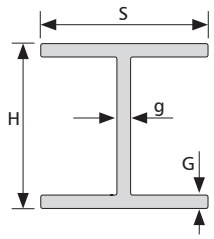

| symbol | profile dimensions | | thickness | | weight [kg/m] | cross-section area [cm²] | section factors U/A for | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | contour protection | | box protection | |
| | | | | | | | 3-side | 4-side | 3-side | 4-side |
| | height H [mm] | width S [mm] | web g [mm] | flange G [mm] | | | [m⁻¹] | [m⁻¹] | [m⁻¹] | [m⁻¹] |
| **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 |

## 1.4.2. section factors for IPE open profiles



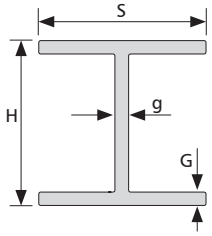

| symbol | profile dimensions | | thickness | | weight [kg/m] | cross-section area [cm²] | section factors U/A for | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | contour protection | | box protection | |
| | | | | | | | 3-side | 4-side | 3-side | 4-side |
| | height H [mm] | width S [mm] | web g [mm] | flange G [mm] | | | [m⁻¹] | [m⁻¹] | [m⁻¹] | [m⁻¹] |
| **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 |

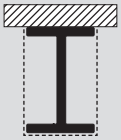
## 1.4.3. section factors for HEA open profiles



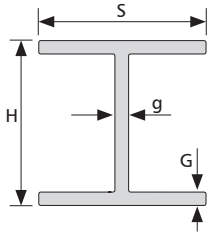

| symbol | profile dimensions | | thickness | | weight [kg/m] | cross-section area [cm²] | section factors U/A for | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | contour protection | | box protection | |
| | | | | | | | 3-side | 4-side | 3-side | 4-side |
| | height H [mm] | width S [mm] | web g [mm] | flange G [mm] | | | [m⁻¹] | [m⁻¹] | [m⁻¹] | [m⁻¹] |
| **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 |

## 1.4.4. section factors for HEB open profiles



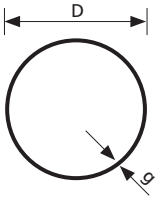

| symbol | profile dimensions | | thickness | | weight [kg/m] | cross-section area [cm²] | section factors U/A for | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | contour protection | | box protection | |
| | | | | | | | 3-side | 4-side | 3-side | 4-side |
| | | | | | | |  |  |  |  |
| | height H [mm] | width S [mm] | web g [mm] | flange G [mm] | | | [m$^{-1}$] | [m$^{-1}$] | [m$^{-1}$] | [m$^{-1}$] |
| **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 |

## 1.4.5. section factors for HEM open profiles



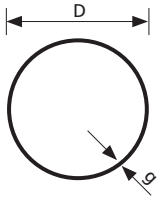

| symbol | profile dimensions | | thickness | | weight [kg/m] | cross-section area [cm²] | section factors U/A for | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | contour protection | | box protection | |
| | | | | | | | 3-side | 4-side | 3-side | 4-side |
| | height H [mm] | width S [mm] | web g [mm] | flange G [mm] | | | [m⁻¹] | [m⁻¹] | [m⁻¹] | [m⁻¹] |
| **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 |

## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



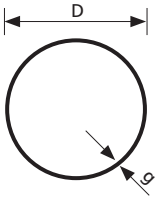

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| **21.3** | 2.0 | 0.95 | 1.21 | 554 | 705 |
| | 2.3 | 1.08 | 1.37 | 489 | 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 |
| | 5.0 | 5.34 | 6.80 | 224 | 285 |
| **60.3** | 2.0 | 2.88 | 3.66 | 518 | 660 |
| | 2.5 | 3.56 | 4.54 | 418 | 532 |
| | 2.6 | 3.70 | 4.71 | 403 | 513 |

## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



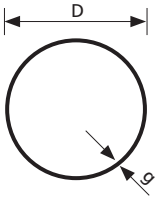

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| | 3.0 | 4.24 | 5.40 | 351 | 447 |
| | 3.2 | 4.51 | 5.74 | 331 | 421 |
| | 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 |

## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



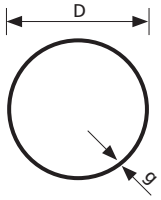

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| | 5.0 | 13.5 | 17.2 | 209 | 266 |
| | 6.0 | 16.0 | 20.4 | 177 | 225 |
| | 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 |

## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



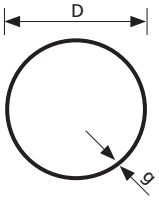

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| | 8.0 | 36.6 | 46.7 | 131 | 166 |
| | 10.0 | 45.3 | 57.7 | 106 | 135 |
| | 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 |

## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



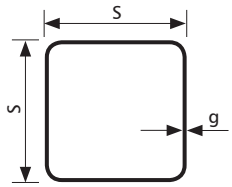

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| **323.9** | 5.0 | 39.3 | 50.1 | 204 | 259 |
| | 6.0 | 47.0 | 59.9 | 170 | 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 | 216 |
| | 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 | 216 |
| | 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 |
| | 40.0 | 361 | 460 | 28 | 36 |
| **457.0** | 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 |

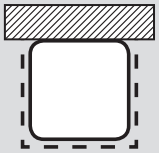
## 1.4.6. section factors for circular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



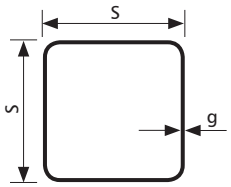

| outer diameter D [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | section factors U/A for contour protection [m$^{-1}$] | section factors U/A for box protection [m$^{-1}$] |
|---|---|---|---|---|---|
| | 12.0 | 132 | 168 | 86 | 109 |
| | 12.5 | 137 | 175 | 83 | 105 |
| | 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 |

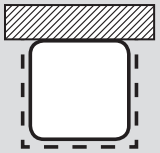
## 1.4.7. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



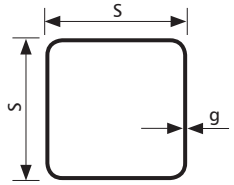

| | | | | section factors U/A for | |
|---|---|---|---|---|---|
| | | | | 3-side protection | 4-side protection |
| | | | |  |  |
| diameter S [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | [m$^{-1}$] | [m$^{-1}$] |
| **40 x 40** | 2.5 | 2.89 | 3.68 | 327 | 435 |
| | 3.0 | 3.41 | 4.34 | 277 | 369 |
| | 4.0 | 4.39 | 5.59 | 215 | 287 |
| | 5.0 | 5.28 | 6.73 | 179 | 238 |
| **50 x 50** | 2.5 | 3.68 | 4.68 | 321 | 428 |
| | 3.0 | 4.35 | 5.54 | 271 | 362 |
| | 4.0 | 5.64 | 7.19 | 209 | 279 |
| | 5.0 | 6.85 | 8.73 | 172 | 230 |
| | 6.0 | 7.99 | 10.2 | 148 | 197 |
| | 6.3 | 8.31 | 10.6 | 142 | 189 |
| **60 x 60** | 2.5 | 4.46 | 5.68 | 317 | 423 |
| | 3.0 | 5.29 | 6.74 | 268 | 357 |
| | 4.0 | 6.9 | 8.79 | 205 | 274 |
| | 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 |
| **70 x 70** | 3.0 | 6.24 | 7.94 | 265 | 353 |
| | 4.0 | 8.15 | 10.4 | 202 | 270 |
| | 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 |
| **80 x 80** | 3.0 | 7.18 | 9.14 | 263 | 351 |
| | 4.0 | 9.41 | 12.0 | 200 | 267 |
| | 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 |
| **90 x 90** | 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 |

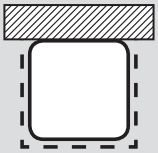
## 1.4.7. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



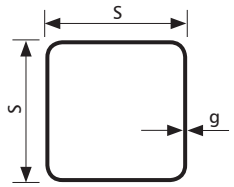

| | | | | section factors U/A for | |
|---|---|---|---|---|---|
| | | | | 3-side protection | 4-side protection |
| | | | |  |  |
| diameter S [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | [m$^{-1}$] | [m$^{-1}$] |
| **100 x 100** | 4.0 | 11.9 | 15.2 | 198 | 264 |
| | 5.0 | 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 |
| | 10.0 | 27.0 | 34.9 | 86 | 115 |
| **120 x 120** | 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 |
| | 10.0 | 33.7 | 42.9 | 84 | 112 |
| | 12.0 | 39.5 | 50.3 | 72 | 96 |
| | 12.5 | 40.9 | 52.1 | 70 | 93 |
| **140 x 140** | 5.0 | 21.0 | 26.7 | 158 | 210 |
| | 6.0 | 24.9 | 31.8 | 133 | 177 |
| | 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 |
| **150 x 150** | 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 |
| | 12.0 | 50.8 | 64.7 | 70 | 93 |
| | 12.5 | 52.7 | 67.1 | 68 | 90 |
| | 16.0 | 65.2 | 83.0 | 55 | 73 |
| **160 x 160** | 5.0 | 24.1 | 30.7 | 157 | 209 |
| | 6.0 | 28.7 | 36.6 | 132 | 175 |
| | 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 |

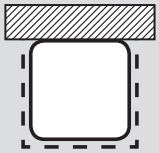
## 1.4.7. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



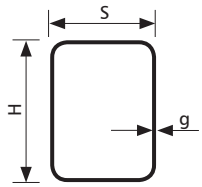

| | | | | section factors U/A for | |
|---|---|---|---|---|---|
| | | | | 3-side protection | 4-side protection |
| | | | |  |  |
| diameter S [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | [m$^{-1}$] | [m$^{-1}$] |
| | 12.5 | 56.6 | 72.1 | 67 | 89 |
| | 16.0 | 70.2 | 89.4 | 54 | 72 |
| **180 x 180** | 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 |
| | 12.5 | 64.4 | 82.1 | 66 | 88 |
| | 16.0 | 80.2 | 102.2 | 53 | 71 |
| **200 x 200** | 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 |
| | 12.5 | 72.3 | 92.1 | 66 | 87 |
| | 16.0 | 90.3 | 115 | 53 | 70 |
| **220 x 220** | 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 |
| | 16.0 | 100 | 128 | 52 | 69 |
| **250 x 250** | 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 |

## 1.4.7. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



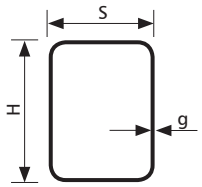

| | | | | section factors U/A for | |
|---|---|---|---|---|---|
| | | | | 3-side protection | 4-side protection |
| | | | |  |  |
| diameter S [mm] | wall thickness g [mm] | weight [kg/m] | cross-section area [cm$^2$] | [m$^{-1}$] | [m$^{-1}$] |
| | 8.0 | 62.8 | 80.0 | 98 | 130 |
| | 10.0 | 77.7 | 98.9 | 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 |

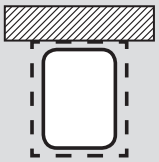
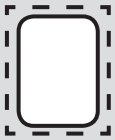
## 1.4.8. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



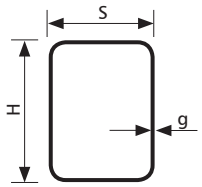

| outer diameter H x S [mm] | wall thickness g [mm] | cross-section area [cm$^2$] | weight [kg/m] | section factors U/A for 3-side protection [m$^{-1}$] | 3-side protection [m$^{-1}$] | 4-side protection [m$^{-1}$] |
|---|---|---|---|---|---|---|
| **50 x 25** | 2.5 | 3.43 | 2.69 | 292 | 365 | 438 |
| | 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 |

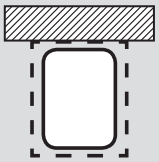
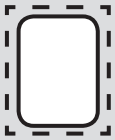
## 1.4.8. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007



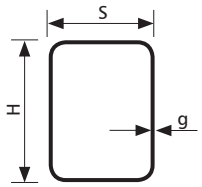

| | | | | section factors U/A for | | |
|---|---|---|---|---|---|---|
| | | | | 3-side protection | 3-side protection | 4-side protection |
| | | | |  |  |  |
| outer diameter H x S [mm] | wall thickness g [mm] | cross-section area [cm²] | weight [kg/m] | [m⁻¹] | [m⁻¹] | [m⁻¹] |
| | 6.3 | 18.1 | 14.2 | 122 | 144 | 177 |
| | 8.0 | 22.4 | 17.5 | 99 | 117 | 143 |
| **120 x 60** | 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 |
| | 8.0 | 25.6 | 20.1 | 94 | 118 | 141 |
| | 10.0 | 30.9 | 24.3 | 78 | 98 | 117 |
| **120 x 80** | 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 |
| | 8.0 | 28.8 | 22.6 | 98 | 112 | 139 |
| | 10.0 | 34.9 | 27.4 | 81 | 92 | 115 |
| **140 x 80** | 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 |
| | 8.0 | 32.0 | 25.1 | 94 | 113 | 138 |
| | 10.0 | 38.9 | 30.6 | 78 | 93 | 114 |
| **150 x 100** | 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 |
| | 8.0 | 36.8 | 28.9 | 96 | 109 | 136 |
| | 10.0 | 44.9 | 35.3 | 78 | 90 | 112 |
| | 12.0 | 52.7 | 41.4 | 67 | 76 | 95 |
| | 12.5 | 54.6 | 42.8 | 65 | 74 | 92 |
| **160 x 80** | 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 |

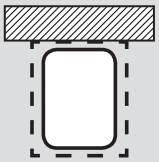
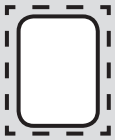
## 1.4.8. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007




| | | | | section factors U/A for | | |
|---|---|---|---|---|---|---|
| | | | | 3-side protection | 3-side protection | 4-side protection |
| | | | |  |  |  |
| outer diameter H x S [mm] | wall thickness g [mm] | cross-section area [cm$^2$] | weight [kg/m] | [m$^{-1}$] | [m$^{-1}$] | [m$^{-1}$] |
| | 12.0 | 50.3 | 39.5 | 64 | 80 | 96 |
| | 12.5 | 52.1 | 40.9 | 62 | 77 | 93 |
| **180 x 100** | 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 |
| **200 x 120** | 6.0 | 36.6 | 28.7 | 121 | 143 | 175 |
| | 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 |
| **250 x 150** | 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 |
| | 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 |
| **260 x 180** | 6.0 | 51.0 | 40.0 | 122 | 138 | 173 |
| | 6.3 | 53.4 | 41.9 | 117 | 132 | 165 |

## 1.4.8. section factors for rectangular hollow profiles, according to PN-EN 10210-2:2007 and PN-EN 10219-2:2007




| | | | | section factors U/A for | | |
|---|---|---|---|---|---|---|
| | | | | 3-side protection | 3-side protection | 4-side protection |
| | | | |  |  |  |
| **outer diameter H x S [mm]** | **wall thickness g [mm]** | **cross-section area [cm²]** | **weight [kg/m]** | **[m⁻¹]** | **[m⁻¹]** | **[m⁻¹]** |
| | 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 |

# mcr Tecwool F

fireproof mortar system

- **R30-R240**
- **European Technical Assessment ETA 11/0185 of 05.08.2019**
- **Certificate of Constancy of Performance 1220-CPR-1110**
- **Declaration of Performance TCRS-TW-01**

## 2.1. application

mcr Tecwool F spray mortar system is used for fire protection of steel structure elements of open and closed profiles, reinforced-concrete elements, trapezoidal steel sheet reinforced-concrete ceilings as well as beam and block ceilings with such bearing elements as reinforced-concrete, pre-tensioned concrete and steel beams filled with ceramic blocks, concrete blocks or lightweight concrete, solid or hollow.

mcr Tecwool F belongs to the group of so called light fire protection sprays i.e. of low density of spray mass. It is dedicated to general civil engineering structures requiring the increased fire resistance of structures at risk of standard fires.

mcr Tecwool F provides structural components with a U / A section ratio □ 495 m-1 with fire resistance classes from R30 to R240.

Apart from excellent fireproof properties of mcr Tecwool F, the system features also good thermal insulation – thermal conductivity coefficient □ is 0.061 W/mK.

Due to excellent sound absorption parameters, mcr Tecwool F can be additionally applied as acoustic/sound absorbing insulation for interiors requiring correction of reverberation time, that is, for example, in the conference rooms, lecture or concert halls.

The system should not be used to fireproof the construction elements exposed to direct impact of weather elements (rain, snow).

## 2.2. system features

- high durability
- quick and simple application
- own weight of fireproof insulation negligible in static calculations
- biologically neutral, non-toxic and health-friendly
- resistant to flaking, dust, rotting or fungi
- nonporous – provides perfect covering
- high thermal insulation
- excellent acoustic properties (sound absorption)
- no corrosive effect on unprotected steel surface
- „lamb" type external surface texture, light grey
- can be painted with finish paints
- free from heavy metals

## 2.3. physical and mechanical mortar properties

| mcr Tecwool F, dry mixture | |
|---|---|
| appearance | dry, grey mixture, no lumping and pollution |
| bulk density | 250 ± 10% kg/m$^3$ |
| **mcr Tecwool F, cured mortar** | |
| dry bulk density | 328 ± 10% kg/m$^3$ |
| linear shrinkage | ≤ 0.07 % |
| steel substrate adherence | ≥ 0.05 MPa or coating strength |
| concrete substrate adherence | ≥ 0.05 MPa or coating strength |
| reaction to fire class | A1 |

Continuous quality monitoring in the production of mcr Tecwool F mixture guarantees maintenance of adequate physical and mechanical properties ensuring fireproof properties.

## 2.4. fireproof properties

**Fire resistance of the system is ensured by proper selection of sprayed mass thickness depending on section factor U/A [m-1] of fire protected steel profile.**

## 2.4.1. open profiles

FIRE RESISTANCE – 30 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE – 45 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE – 60 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE – 90 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE – 120 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE – 180 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.1. open profiles

FIRE RESISTANCE - 240 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 30 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 45 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 60 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 90 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 120 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE – 180 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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 |

## 2.4.2. closed profiles

FIRE RESISTANCE - 240 MINUTES

| section factor U/A [$m^{-1}$] | minimal 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** | – | – | – | – | – | – | – | – | – |

## 2.5. mcr Tecwool F fire protection spraying technology

mcr Tecwool F mortar is supplied to the construction site in powdered form, in 25 kg bags. Fireproof mortar is applied with the use of specialist spraying machines. Dry mass is poured into the spraying machine tank and fed – under pressure - with hoses to a dedicated spray nozzle, in which it is mixed with water. Water is fed to the nozzle with a separate hose.

- Before applying the mcr Tecwool F mass, the elements to be protected must be cleaned of dirt, oils, greases and flaking paint and rust – everything that can impair the adhesion.
- Surface must be chemically compatible or resistant to sprayed elements (high pH).
- Ready-to-use mortar should be applied immediately upon moistening the protected element with water to ensure possibly highest substrate adherence.
- The mass is applied with layers of thickness not exceeding 25 mm until the required target total thickness is achieved. Spraying should be performed at right angle to the fireproofed surface, maintaining the distance between the nozzle and surface of approx. 500-600 mm.
- Upon applying the target thickness of fireproof insulation, it should be moistened with water to increase its hardness
- As the spraying is complete, the protected profiles and surfaces maintain their natural shapes and simultaneously gain the specific gray „lamb" texture.
- All works should be performed at ambient temperatures not below +3°C and not above +40°C, at relative air humidity not exceeding 85%.

# mcr Isoverm 825 fireproof mortar system

- **R15-R360**
- **Technical Approval: ITB AT-15-8196/2016**
- **Certificate of Conformity ITB-1918/W**
- **National Declaration of Performance KDWU/HZ/01/2017**

## 3.1. application

The mcr Isoverm 825 product range is dedicated to fireproofing of steel structure elements of open, profiles and closed round and rectangular profiles.

Fireproof insulation in the mcr Isoverm 825 system, in which the steel elements are protected with corrosion resistant or zinc coating, can be applied in the conditions corresponding to category X according to ETAG 018-3, i.e. in outdoor and indoor conditions.

Thanks to optimum density of spray mass, the mcr Isoverm 825 system is a perfect solution for industry, in specialist buildings such as: power plants, refineries, chemical plants, oil platforms etc., where there is a risk of hydrocarbon fires, as well as for general construction applications as a protection against standard fires of constructions at risk of weather impact.

For general construction structures at risk of standard fires, a light mcr Tecwool F spray system is recommended.

mcr Isoverm 825 provides structural components of section factor U/A ≤ 453 m-1 with R15 to R360 fire resistance class.

**The mcr Isoverm 825 product range includes:**

- mcr Tecwool 825 mortar designed for basic fireproof insulation,
- steel net of hexagonal or parallelepiped mesh (optionally),
- steel pins with clamp caps for net mounting (optionally).

When the protected structure is at risk of direct weather impact, additional protective layer of surface paints is possible.

## 3.2. system features

- high durability
- fast application
- own weight of fireproof insulation negligible in static calculations
- biologically neutral, non-toxic
- resistant to flaking, rotting or fungi
- no corrosive impact on steel surface
- "lamb" type external surface texture, light grey
- possibility of fireproofing in the form of so called box

## 3.3. physical and mechanical properties of mcr Tecwool 825 mortar within the mcr Isoverm 825 system

| | |
|---|---|
| **dry mixture** | |
| appearance | dry. light grey mixture, no lumping and pollution |
| bulk density | 385 ± 10% kg/m$^3$ |
| **fresh mortar** | |
| appearance | uniform grey past with beige inclusions, no lumping and pollution |
| **cured mortar** | |
| dry bulk density | 402 ± 10% kg/m$^3$ |
| bending strength | ≥ 1.0 MPa |
| compressive strength | ≥ 1,. MPa |
| steel substrate adherence, substrate protected with corrosion resistant. dual epoxy paint | ≥ 0.1 MPa or coating strength |
| steel substrate adherence, substrate protected with corrosion resistant. polyurethane paint | ≥ 0.1 MPa or coating strength |
| steel substrate adherence, substrate galvanized | ≥ 0.1 MPa or coating strength |
| linear shrinkage | ≤ 0.03 % |

Continuous quality monitoring in the production of mcr Tecwool 825 - mixture guarantees maintenance of adequate physical and mechanical properties ensuring fireproof properties.

## 3.4. fireproof properties

**Fire resistance of the system is ensured by proper selection of sprayed mass thickness depending on section factor of fire protected element, required fire resistance class and critical temperature of steel.**

## 3.4.1. open profiles

FIRE RESISTANCE – 15 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 15 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 21 | 20 | 19 | 19 | 18 | 18 | 17 | 16 | 16 |
| 453 | 21 | 20 | 19 | 19 | 18 | 18 | 17 | 16 | 16 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 30 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 30 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 24 | 23 | 22 | 21 | 21 | 20 | 19 | 19 | 18 |
| 453 | 24 | 23 | 22 | 21 | 21 | 20 | 19 | 19 | 18 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 45 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 45 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 26 | 26 | 25 | 24 | 23 | 23 | 22 | 21 | 21 |
| 453 | 27 | 26 | 25 | 24 | 23 | 23 | 22 | 21 | 21 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 60 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 60 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 29 | 28 | 27 | 27 | 26 | 25 | 24 | 24 | 23 |
| 453 | 29 | 28 | 27 | 27 | 26 | 25 | 24 | 24 | 23 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 90 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 90 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 28 |
| 453 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 28 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 120 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 120 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 41 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| 453 | 41 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 180 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 180 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 52 | 50 | 49 | 47 | 46 | 45 | 44 | 43 | 41 |
| 453 | 52 | 50 | 49 | 47 | 46 | 45 | 44 | 43 | 42 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 240 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 240 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 63 | 61 | 59 | 58 | 56 | 55 | 53 | 52 | 51 |
| 453 | 63 | 61 | 59 | 58 | 56 | 55 | 53 | 52 | 51 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.1. open profiles

FIRE RESISTANCE – 360 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 360 minutes - open profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 | - | - | - | - | - | - | - | - | - |

## 3.4.2. closed profiles

FIRE RESISTANCE – 15 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 15 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 26 | 25 | 24 | 23 | 23 | 22 | 21 | 20 | 20 |
| 453 | 26 | 25 | 24 | 23 | 23 | 22 | 21 | 20 | 20 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 30 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 30 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 29 | 28 | 28 | 27 | 26 | 25 | 24 | 23 | 23 |
| 453 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 23 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 45 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 45 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 26 |
| 453 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 26 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 60 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 60 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 37 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 |
| 453 | 37 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 90 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 90 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 44 | 42 | 41 | 40 | 38 | 37 | 36 | 35 | 34 |
| 453 | 44 | 42 | 41 | 40 | 38 | 37 | 36 | 35 | 34 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 120 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 120 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 51 | 49 | 48 | 46 | 45 | 44 | 42 | 41 | 40 |
| 453 | 51 | 49 | 48 | 46 | 45 | 44 | 42 | 41 | 40 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 180 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 180 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | 64.9 | 63 | 61 | 59 | 58 | 56 | 55 | 53 | 52 |
| 453 | 64.9 | 63 | 61 | 59 | 58 | 56 | 55 | 53 | 52 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE – 240 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 240 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 |
| 450 | – | – | – | – | – | – | – | 64.9 | 63 |
| 453 | – | – | – | – | – | – | – | 64.9 | 63 |
| > 453 | – | – | – | – | – | – | – | – | – |

## 3.4.2. closed profiles

FIRE RESISTANCE - 360 MINUTES

**Minimal thicknesses of mcr Tecwool 825 mortar when protected with the mcr Isoverm 825 system at hydrocarbon fire in 360 minutes - closed profiles.**

| section factor U/A [$m^{-1}$] | minimal thickness of fire protection, upon mortar setting [mm] at the 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 | - | - | - | - | - | - | - | - | - |

## 3.5. fireproofing technology

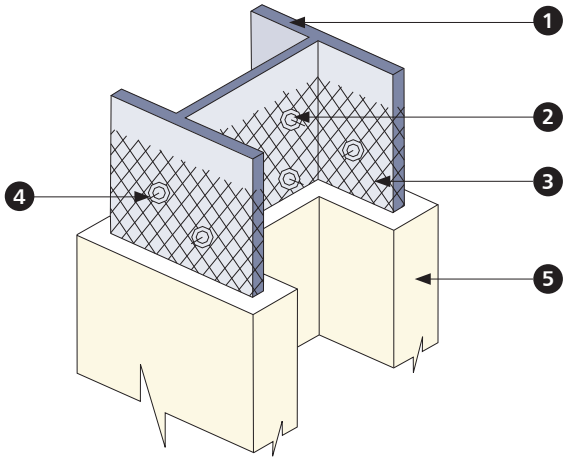
Fireproofing is performed with the use of specialist spraying machines. Dry mass is poured into the spraying machine tank and fed – under pressure - with hoses to a dedicated spray nozzle, in which it is mixed with water. Water is fed to the nozzle with a separate hose.

Before applying the mcr Tecwool 825 mortar, the elements to be fireproofed must be cleaned of dirt, oils, greases and flaking paint and rust as well as any other pollution that can impair the adhesion. Surface must be chemically compatible or resistant to sprayed mortar elements.

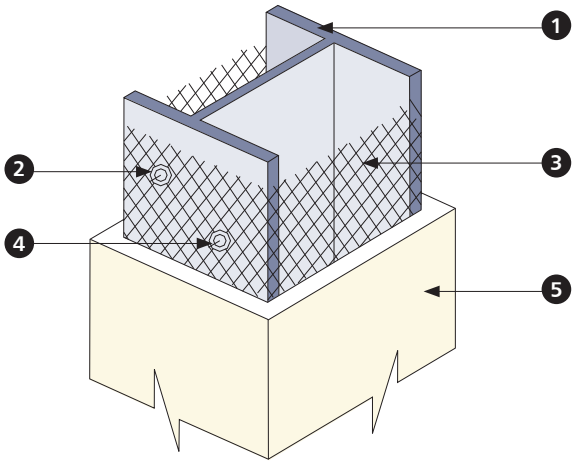
The mcr Isoverm 825 system may be applied when reinforced with steel mesh and without reinforcement. In the case of reinforcement with steel net, preparation of substrate should include mounting of lathing net with the use of steel pins at the elements to be fireproofed.

**Protection of steel post when using the reinforcing mesh. Location of meshes is illustrative.**

a) mesh assembly to profile shape




b) box-shaped net assembly




1. steel column
2. caps
3. steel mesh
4. steel pins
5. mcr Tecwool 825

### Assembly of steel pins

Steel pins should be assembled in a way to ensure that the net tightened over them is placed evenly at the surface of elements. Pin length must be selected in a way that the pins do not protrude over the insulation surface after mounting the net. Pins should be assembled with the use of steel surface sealers in a spacing not exceeding 500 m. After assembling all pins, anti-corrosive coating should be replenished to avoid corrosion spots.

In specific cases, use of substrate-adhesive pins is allowed.

### Assembly of lathing mesh

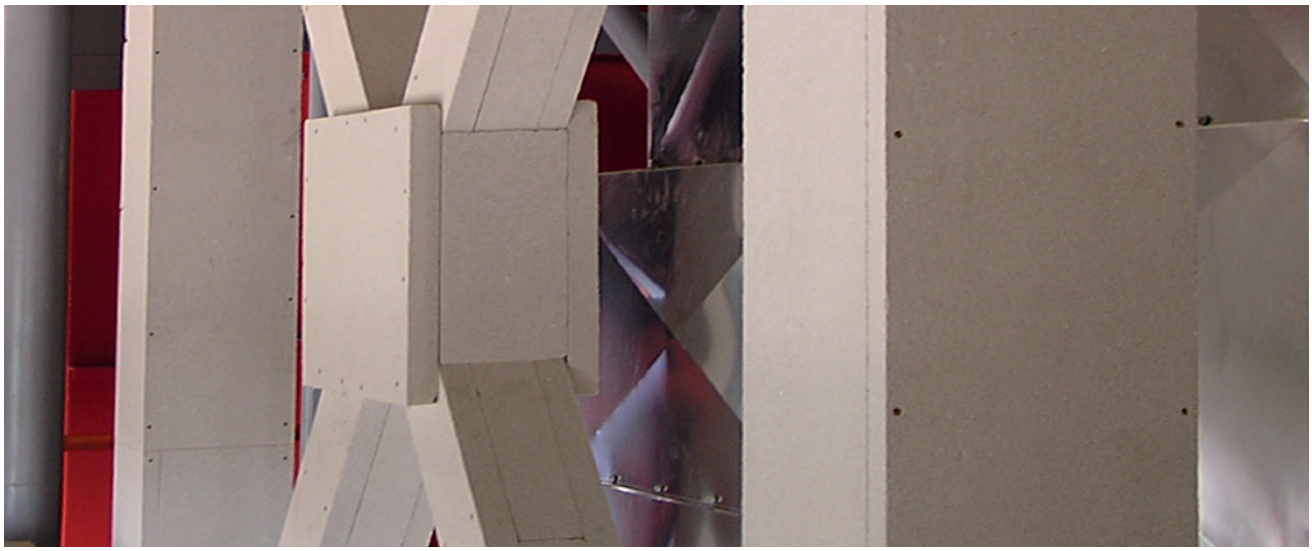
Mesh should be tightened evenly at individual elements fitting to their shape. For profiles of cross-section height exceeding or equal to 290 mm, the net can be mounted to the outer contour of profile (forming so called box) and apply insulation in a form of a cuboid. Mesh is tightened over the pins mounted in advance in a way to ensure its adherence to the element surface and to avoid protrusion exceeding 1/3 - 1/2 of target insulation thickness. Over-stretching of net causing mesh deformation should be avoided.

- mcr Tecwool 825 mortar should be applied immediately upon moistening the protected element with water to ensure possibly highest substrate adherence.
- The mortar is applied with layers of thickness not exceeding 25 mm until the required target total thickness is achieved. Spraying should be performed at right angle to the fireproofed surface, maintaining the distance between the nozzle and surface of approx. 500-800 mm.
- Upon applying the target thickness of fireproof insulation, it should be moistened with water to increase its hardness.
- As the spraying is complete, fireproofed profiles and surfaces maintain their natural shapes and simultaneously gain the specific gray „lamb" texture.
- All works should be performed at ambient temperatures not below +3°C and not above +40°C, at relative air humidity not exceeding 85%.
- Upon setting and curing of mcr Tecwool 825 mortar, a fireproof insulation is obtained, which can be covered with protective coating of surface paints. Such coating aims at additional protection of the performed fireproofing against destructive weather impacts (precipitations, low temperatures, large temperature fluctuations) and aggressive environment, etc.

tailed selection of surface paints should be each time consulted with the technical division of "MERCOR" S.A.

# mcr Silboard

fireproof board system (CaSil)



- **R15-R180 - single-layer system**
- **R15-R360 - double-layer system**
- **European Technical Approval ETA-18/0546**
- **Certificate of Constancy of Performance 1488-CPR-0698/W**
- **Declaration of Performance DOP/HZ/01/2018**

## 4.1. application

mcr Silboard, fireproof calcium-silicate board, non-flammable, of comprehensive application in general and industrial construction. It is designed for self-supporting fireproof ventilation ducts and multizone smoke extraction ducts, cable ducts, installation ducts, non-supporting walls (shafts), fireproofing of steel structures and elements of reinforced concrete structures reinforced with tapes and mats made of carbon fibres.

## 4.2. board features

- high mechanical strength
- easy processing, fast, easy and clean assembly
- smooth and clean surface of fireproof insulation
- no need to insulate steel slings supporting ventilation nd smoke extraction ducts as well as cable ducts
- lack of toxic and harmful to health substances
- completely resistant to biodegradation (fungi, bacteria)
- weather exposure category Y – indoor applications and partial exposure to weather conditions according to ETAG 018-4

20 mm

30 mm

40 mm

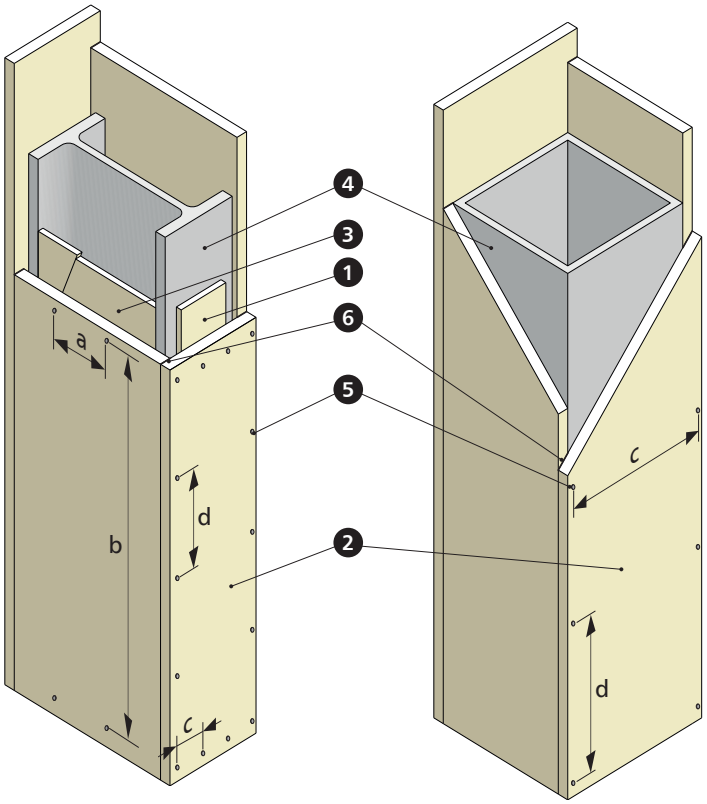
50 mm

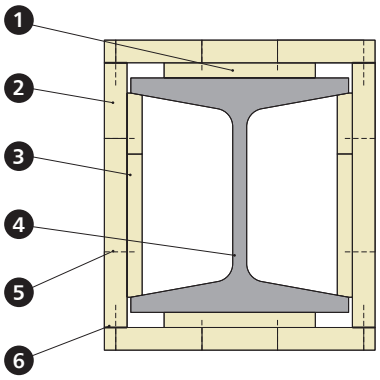
## 4.3. physical and chemical properties of the boards

| | |
|---|---|
| available thicknesses | 20 mm, 30 mm, 40 mm, 50 mm |
| appearance | white/cream colour, surface layers with closed finish |
| density | 550 kg/m$^3$ ± 15% |
| compressive strength | ≥ 1.0 MPa |
| tensile strength perpendicular to surface | ≥ 0.10 MPa |
| tensile strength parallel o surface | ≥ 0.40 MPa |
| dimensional stability | dimensionally stable boards |
| heat conductivity | 0.095 W/(m•K) |
| reaction to fire class | A1 |
| functional category | Y |

## 4.4. assembly

### 4.4.1. single-layer mcr Silboard system – assembly details



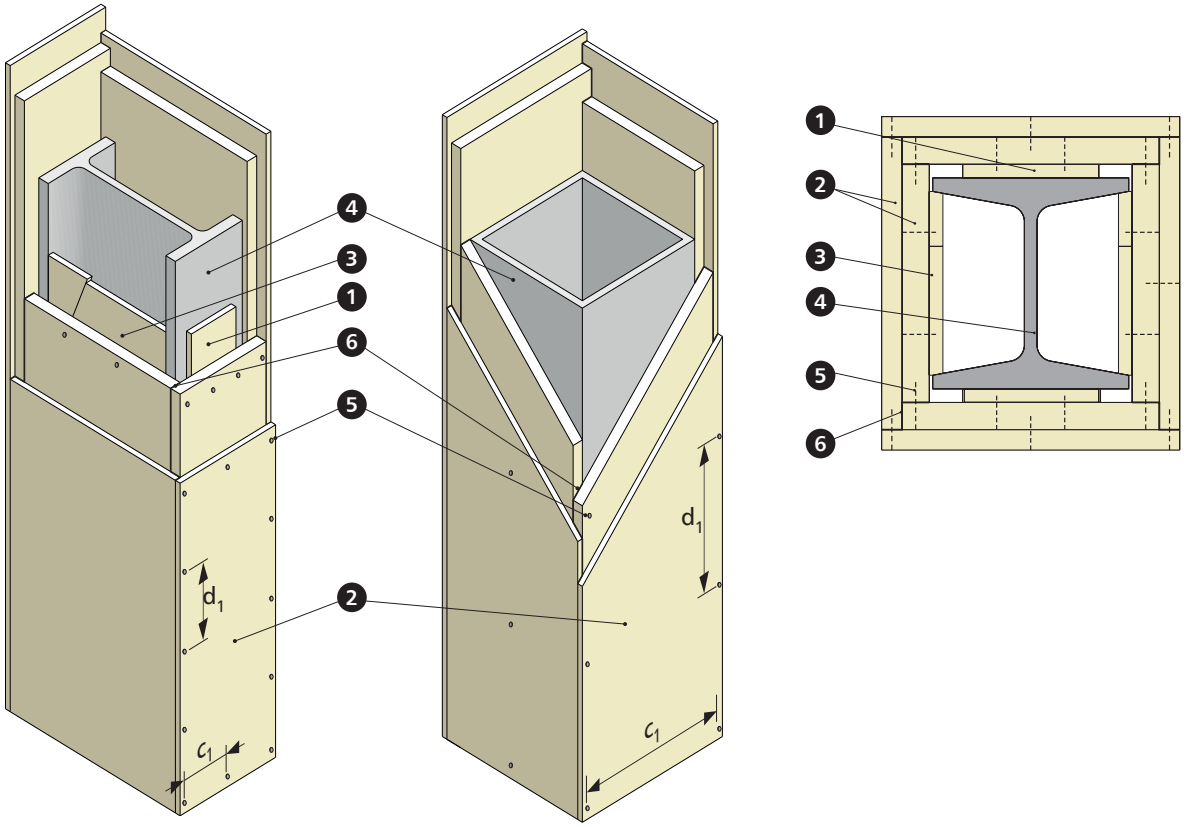

a ≤ 150 mm
b = spacer distance
c ≤ 150 mm
d ≤ 200 mm

1. one-piece spacer of mcr Silboard board of 20 mm thickness and width of at least of 150 mm; spacing ≤ 1250 mm
2. mcr Silboard boards of 20, 30, 40 and 50 mm thickness
3. two-piece spacer of mcr Silboard board of 20 mm thickness and width of at least of 150 mm; spacing ≤ 1250 mm
4. steel element
5. steel screws according to the table below
6. mcr Sil-MK glue

Steel screws used in the mcr Silboard system.

| thickness of mcr Silboard boards [mm] | Minimum dimensions of steel screws. diameter x length [mm] | |
|---|---|---|
| | corner joints | spacer joints |
| **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 |

## 4.4.2. double-layer mcr Silboard system – assembly details




1. One-piece spacer of mcr Silboard board of 20 mm thickness and width of at least of 150 mm; spacing ≤ 1250 mm
2. mcr Silboard boards of thickness according to the table below
3. Two-piece spacer of mcr Silboard board of 20 mm thickness and width of at least of 150 mm; spacing ≤ 1250 mm
4. Steel element
5. Steel screws according to the table below
6. mcr Sil-MK glue

Assembly of the first layer of mcr Silboard boards to steel elements is illustrated on figure in point 4.4.1.

c1 ≤ 200 mm

d1 ≤ 200 mm - to a single row of joints (steel screws)

d1 ≤ 425 mm - to two rows of joints (steel screws)

Connecting the boards in subsequent layers should pass by at least 400 mm.

Board thickness in double-layer mcr Silboard system.

| fire protection thickness [mm] | thickness of mcr Silboard boards [mm] | |
|---|---|---|
| | inner layer | outer layer |
| **40** | 20 | 20 |
| **50** | 30 | 20 |
| **60** | 30 | 30 |
| **70** | 40 | 30 |
| **80** | 40 | 40 |

Steel screws used in the mcr Silboard system

| thickness of mcr Silboard boards [mm] | minimum dimensions of steel screws. diameter x length [mm] | | | |
|---|---|---|---|---|
| | corner joints | spacer joints | 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 |

## 4.5. fireproof properties

**Thickness of fireproof cladding of steel elements results from the required fire resistance class, adopted critical temperature and value of section factor U/A.**

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R15

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R20

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R30

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R45

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R60

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R90

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R120

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.1. single-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R180

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R15

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R20

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R30

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R45

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R60

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R90

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R120

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

FIRE RESISTANCE CLASS R180

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

## 4.5.2. double-layer fire protection of mcr Silboard system

### R240 FIRE RESISTANCE CLASS

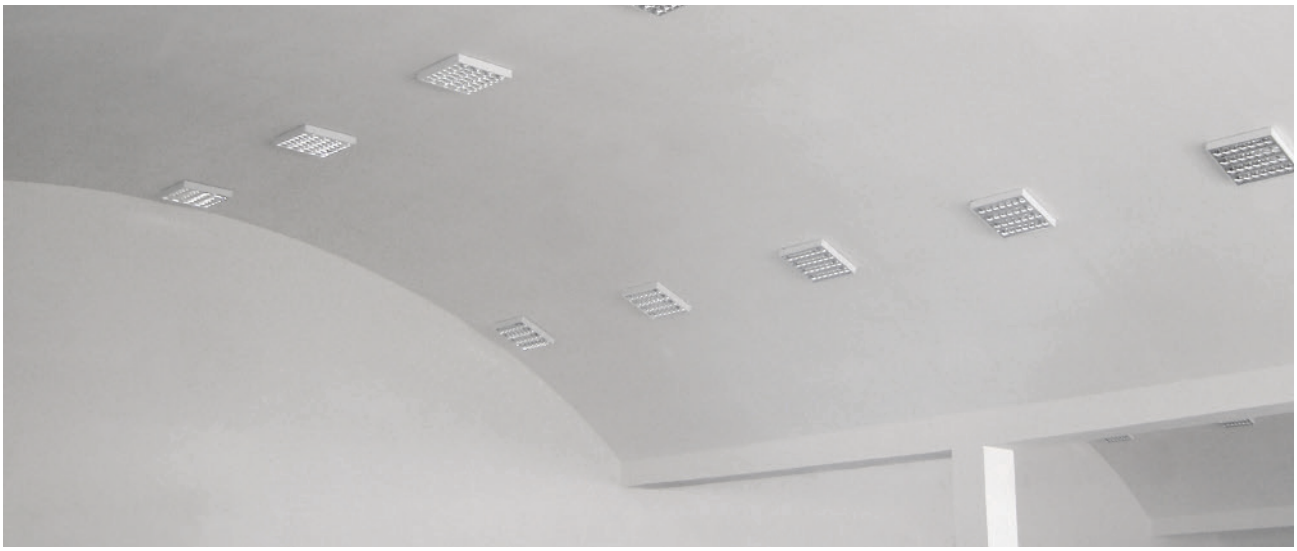
| section factor U/A [m$^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the design temperature | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 350°C | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| ≤ 55 | 52 | 46 | 40 | 40 | 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 | – | – | – | – | – | – | – | – | – |

### R360

| section factor U/A [m$^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 | – | – | – | – | – | – | – | – | – |

# mcr Tecbor

fireproof board system (MgO)



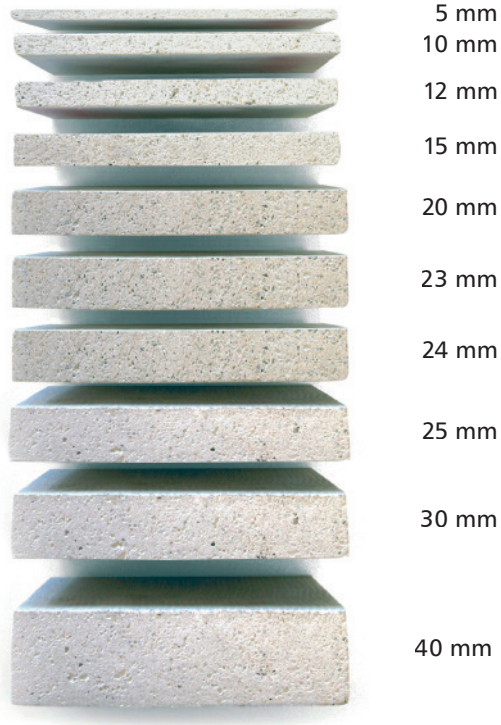
- **R15-R240 - multi-layer system**
- **European Technical Assessment ETA-18/1017**
- **Certificate of Constancy of Performance 1220-CPR-1912**
- **Declaration of Performance TCRS-TB-03**

## 5.1. application

mcr Tecbor is a fireproof magnesium board, non-flammable, of comprehensive application in general and industrial construction. It is designed for cladding of steel and reinforced concrete structures, cable ducts, construction of ventilation and smoke extraction ducts, construction of non-bearing partition walls, lining of brick walls, construction of suspended ceilings, curtain walls and inter-storey strips as well as protection of communication tunnel structures.

## 5.2. board features

- high fire resistance, non-flammability
- good thermal insulation
- fast and easy assembly
- mechanical strength
- absence of substances harmful to health
- resistance to fungi, insects and rodents

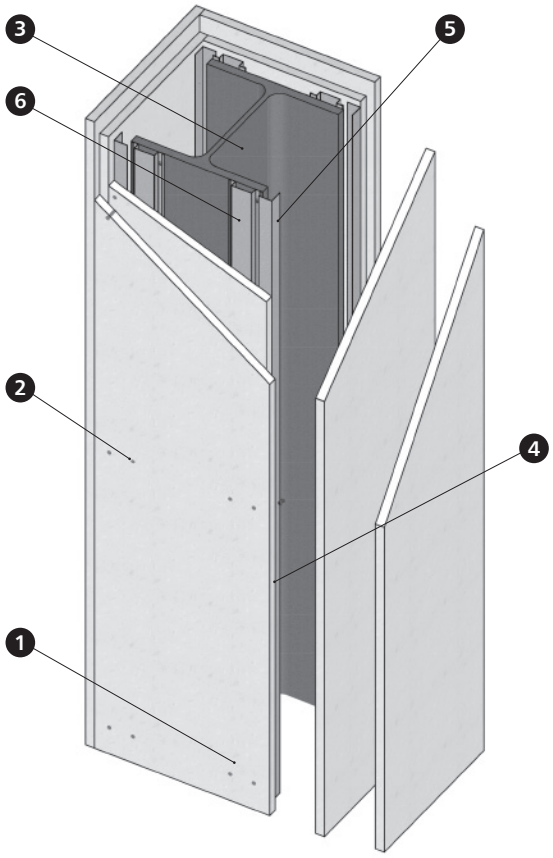


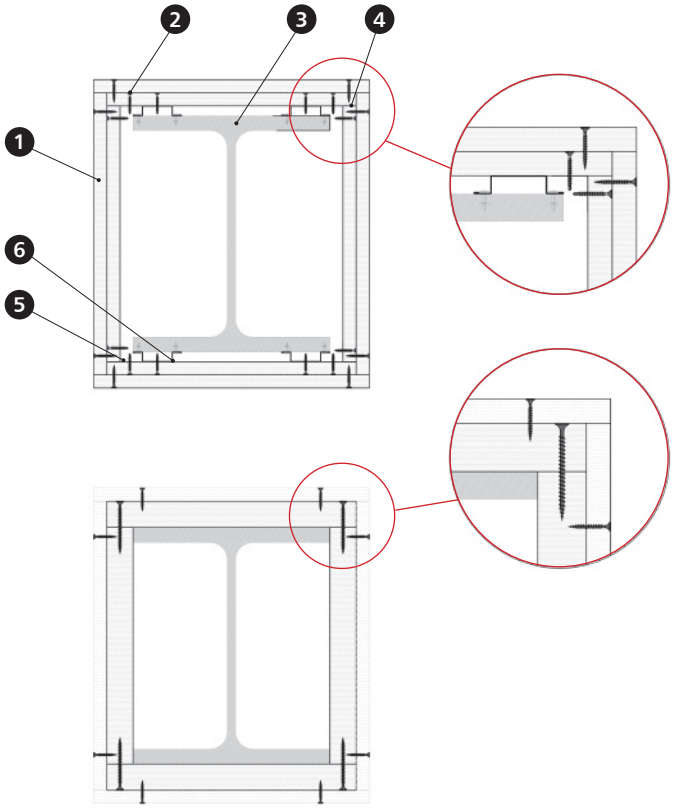
## 5.3. physical and chemical properties of the boards

| | |
|---|---|
| available thicknesses | 5 mm, 10 mm, 12 mm, 15 mm, 20 mm, 23 mm, 24 mm, 25 mm, 30 mm, 40 mm |
| appearance | smooth light surface |
| density | 900 kg/m$^3$ ± 10% |
| compressive strength | 9.61 MPa |
| tensile strength perpendicular to surface | 1.47 MPa |
| modulus of elasticity | 475 MPa |
| tensile strength | 4.74 MPa |
| dimensional stability | ≤ 0.25% |
| heat conductivity | 0.31 W/(m•K) |
| reaction to fire class | A1 |
| functional category | $Z_2$ |

## 5.4. board assembly

### 5.4.1. columns



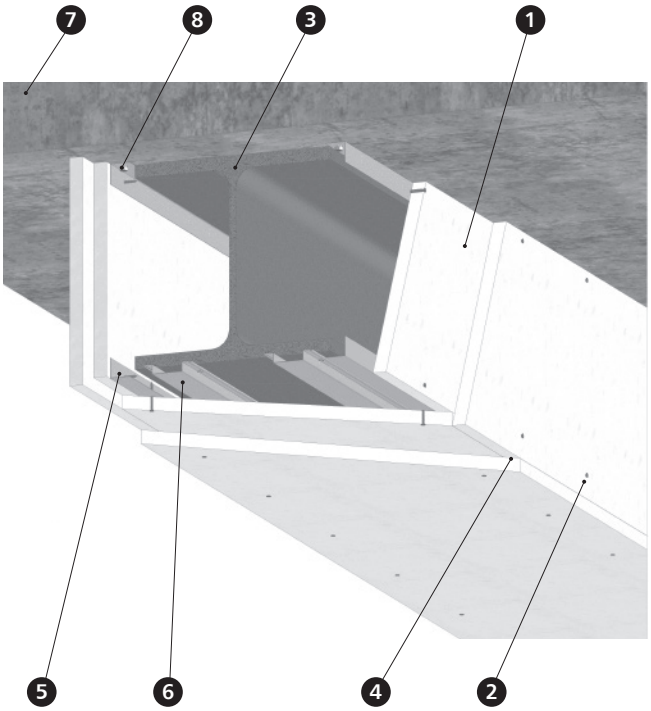

1. mcr Tecbor board
2. self-tapping screw (size according to the table below)
3. steel element
4. mcr Tecbor Joint Paste glue
5. angle profile
6. omega profile

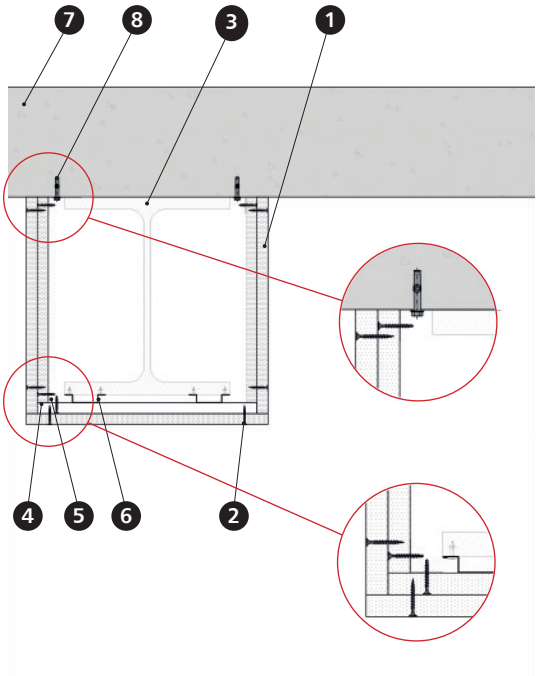
**Multi-layer fireproof systems.**

| general board thickness [mm] | mcr Tecbor* layer thickness [mm] | inner layer screws [mm] | intermediate layer screws [mm] | outer layer screws [mm] |
|---|---|---|---|---|
| **10** | 5 + 5 | ∅ 3.5 x 25 | - | ∅ 3.5 x 25 |
| **15** | 10 + 5 | ∅ 3.5 x 25 | - | ∅ 3.5 x 25 |
| **20** | 10 + 10 | ∅ 3.5 x 25 | - | ∅ 3.5 x 25 |
| **25** | 15 + 10 | ∅ 3.5 x 25 | - | ∅ 3.5 x 35 |
| **30** | 15 + 15 | ∅ 3.5 x 25 | - | ∅ 3.5 x 45 |
| **30** | 20 + 10 | ∅ 3.5 x 35 | - | ∅ 3.5 x 45 |
| **30** | 10 + 10 + 10 | ∅ 3.5 x 25 | ∅ 3.5 x 35 | ∅ 3.5 x 45 |
| **35** | 20 + 15 | ∅ 3.5 x 35 | - | ∅ 3.5 x 45 |
| **35** | 15 + 10 + 10 | ∅ 3.5 x 25 | ∅ 3.5 x 35 | ∅ 3.5 x 45 |
| **40** | 20 + 20 | ∅ 3.5 x 35 | - | ∅ 3.5 x 55 |
| **40** | 20 + 10 + 10 | ∅ 3.5 x 35 | ∅ 3.5 x 45 | ∅ 3.5 x 55 |
| **40** | 30 + 10 | ∅ 3.5 x 45 | - | ∅ 3.5 x 55 |
| **45** | 30 + 15 | ∅ 3.5 x 45 | - | ∅ 3.5 x 55 |
| **45** | 15 + 15 + 15 | ∅ 3.5 x 25 | ∅ 3.5 x 45 | ∅ 3.5 x 55 |
| **50** | 30 + 20 | ∅ 3.5 x 45 | - | ∅ 4.2 x 70 |
| **50** | 20 + 20 + 10 | ∅ 3.5 x 35 | ∅ 3.5 x 55 | ∅ 4.2 x 70 |
| **50** | 20 + 15 + 15 | ∅ 3.5 x 35 | ∅ 3.5 x 45 | ∅ 4.2 x 70 |
| **55** | 20 + 20 +15 | ∅ 3.5 x 35 | ∅ 3.5 x 55 | ∅ 4.2 x 70 |
| **60** | 30 + 30 | ∅ 3.5 x 45 | - | ∅ 4.2 x 70 |
| **60** | 30 + 15 + 15 | ∅ 3.5 x 45 | ∅ 3.5 x 55 | ∅ 4.2 x 70 |

* board thicknesses specified in the following order: inner layer + intermediate layer (if any) + outer layer

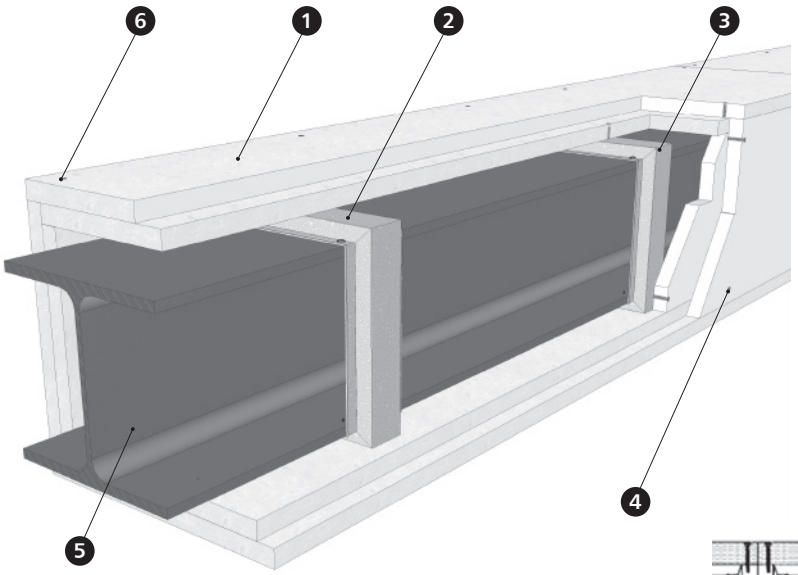
## 5.4.2. beams

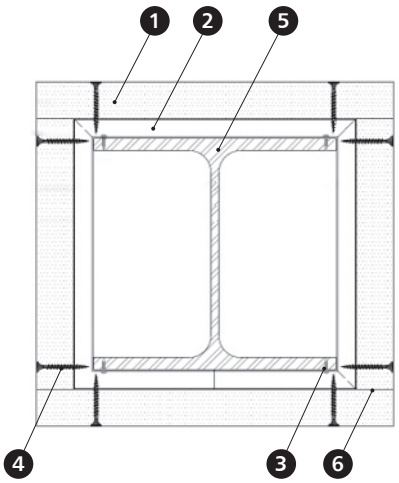


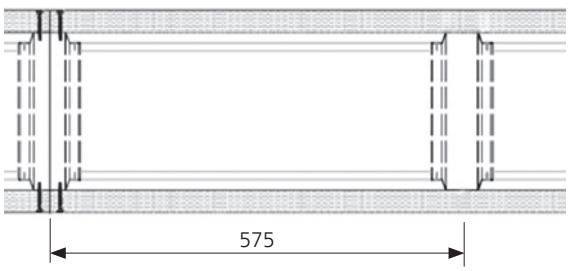




1. mcr Tecbor board
2. self-tapping screw (size according to the table)
3. steel element
4. mcr Tecbor Joint Paste glue
5. angle profile
6. omega profile
7. floor slab
8. steel anchor

## 5.4.3. ring system

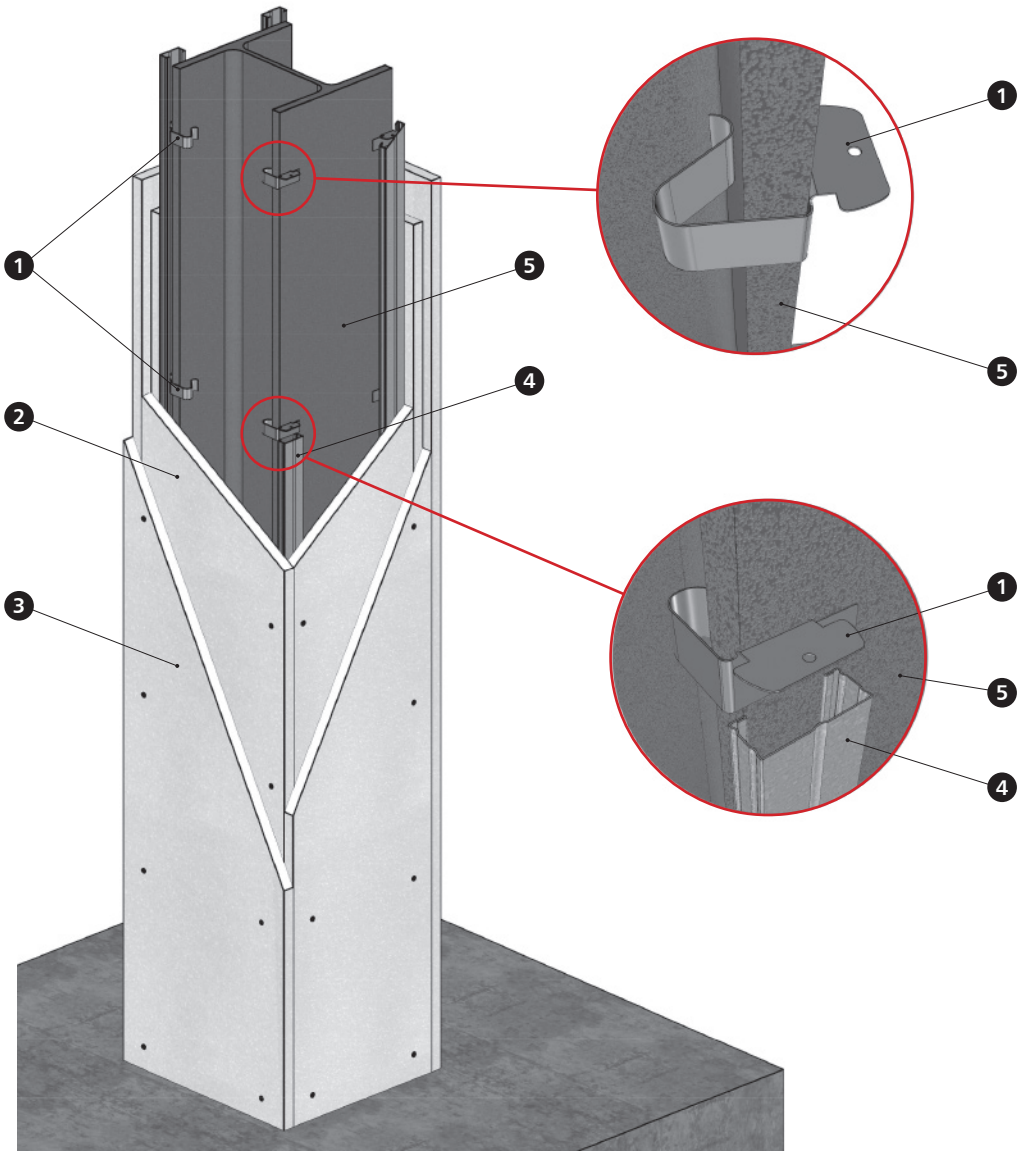


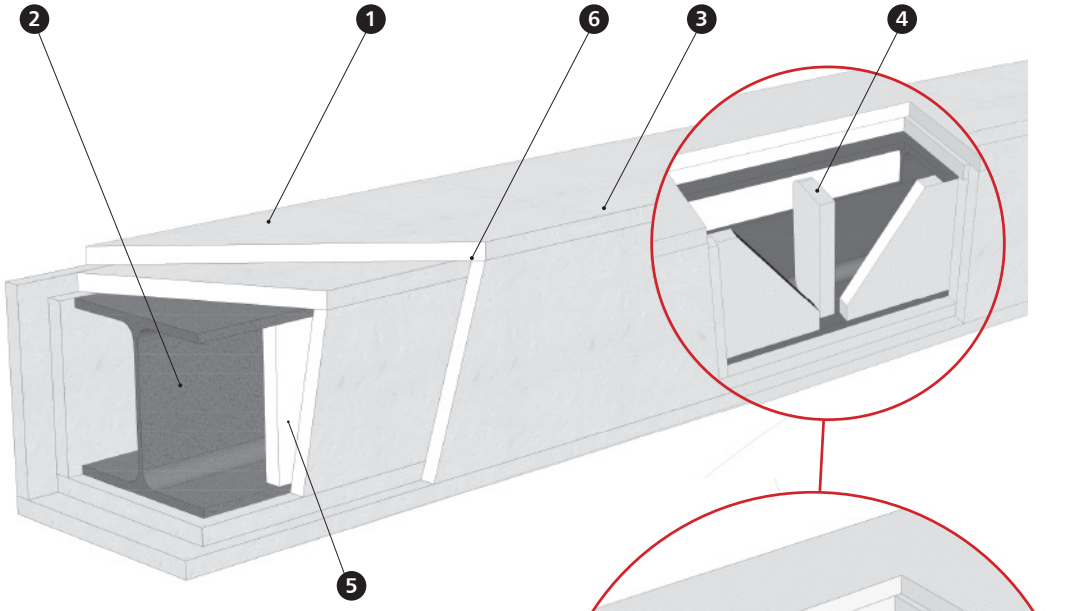

1. mcr Tecbor board
2. omega profile
3. X-dnl type nail or similar
4. self-tapping screw (size according to the table)
5. steel element
6. mcr Tecbor Joint Paste glue

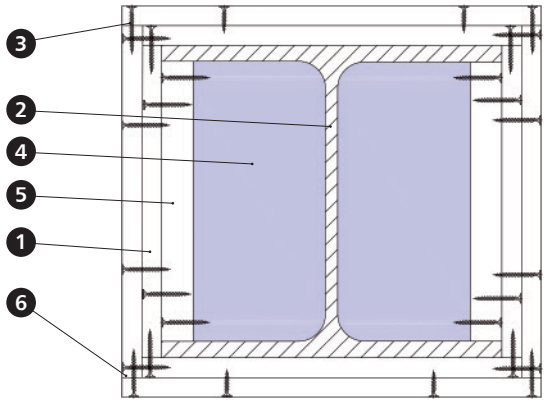
## 5.4.4. clip system



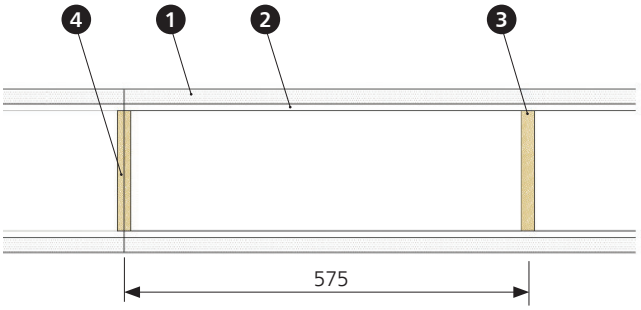

1. Tecbor clip
2. mcr Tecbor board
3. self-tapping screw (size according to the table)
4. TC profile
5. steel element

## 5.4.5. board mounting system

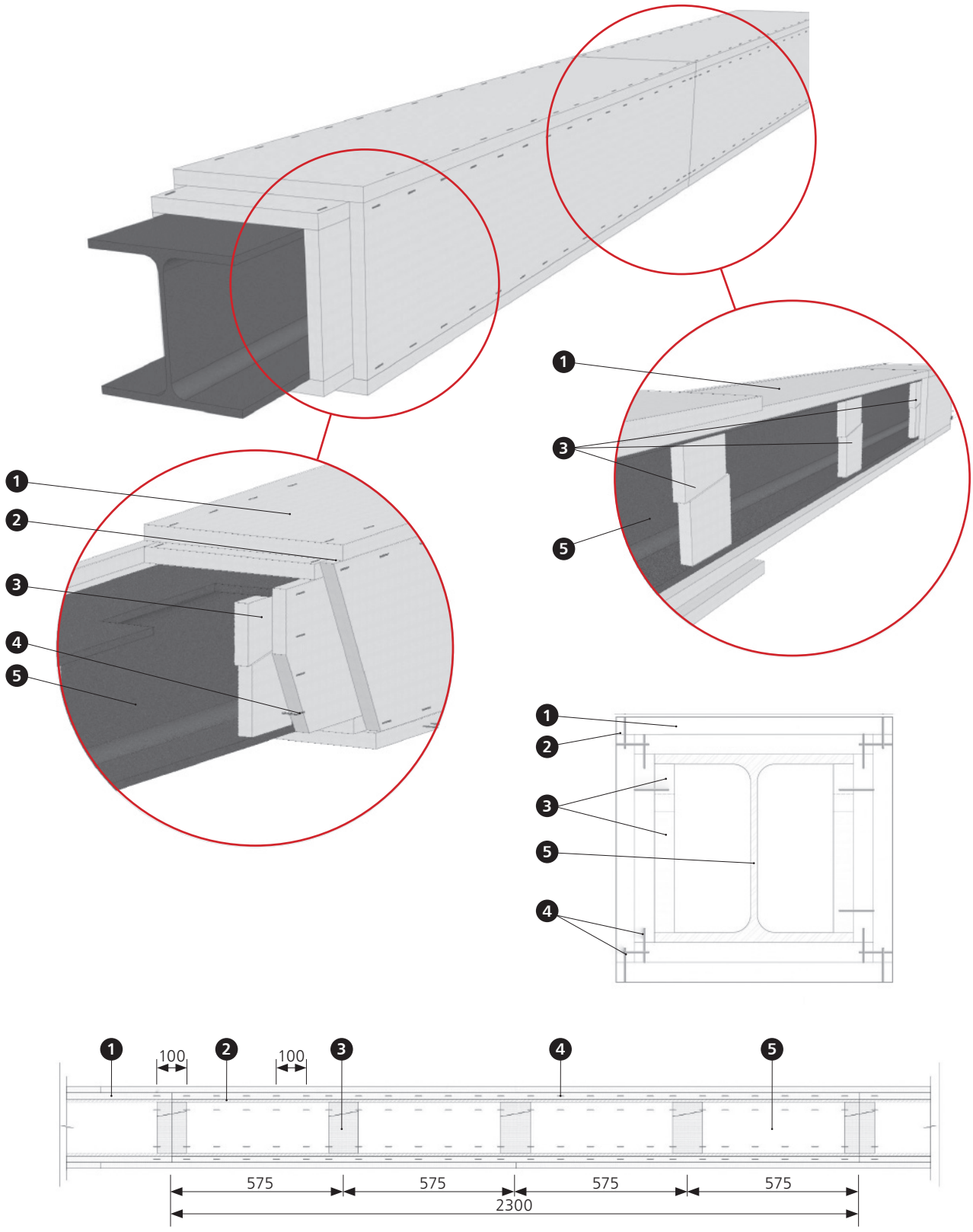



1. mcr Tecbor board
2. steel element
3. self-tapping screw (size according to the table)
4. mcr Tecbor board spacer
5. mcr Tecbor board
6. mcr Tecbor Joint Paste glue



## 5.4.6. spacer system




1. mcr Tecbor board
2. mcr Tecbor Joint Paste glue
3. mcr Tecbor 20 mm board spacer
4. self-tapping screw (size according to the table)

## 5.5. fire resistance properties of steel profiles

**Thickness of fireproof cladding of steel elements results from the required fire resistance class, adopted critical temperature and value of section factor U/A.**

### 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R15

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R30

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R45

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R60

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R90

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R120

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R180

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

## 5.5.1. multi-layer fire protection of mcr Tecbor system

FIRE RESISTANCE CLASS R240

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Tecbor system [mm] at the 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 |

# mcr Polylack W

fireproof intumescent water-based paint system


- **R15-R60**
- **European Technical Assessment -15/0801**
- **Certificate of Constancy of Performance 1301-CPR-1145**
- **Declaration of Performance 81230**

## 6.1. application

mcr Polylack W Intumescent water-based paint is designed for fire protection of steel structures in the construction industry. It can be applied inside and outside the premises with partial exposure, including in particular at the sites requiring high aesthetics of the performed fire protection.

Steel elements of open and closed profiles protected with mcr Polylack W intumescent paint are classified according to EN 13501-2:2007+A1:2009 and are assigned with R15 to R60 fire resistance class.

mcr Polylack W paint can be applied to fireproof the following elements of steel structures:

- open profiles – columns and beams
  - fire-resistance class R15-R60
  - protection thickness between 0.230 and 1.397 mmm
  - cross-section factor U/A up to 440 $m^{-1}$
  - critical temperatures in the range from 350°C do 700°C
- sed round and rectangular profiles - columns
  - fire-resistance class R15-R45
  - protection thickness between 0.262 do 1.391 mm
  - cross-section factor U/A up to 467 $m^{-1}$
  - critical temperatures in the range from 350°C do 750°C
- closed rectangular profiles - beams
  - resistance class R15-R120 R15-R120
  - protection thickness between 0.250 and 3.469 mm
  - cross-section factor U/A up to 400 $m^{-1}$
  - critical temperatures in the range from 350°C do 700°C

## 6.2. system features

- high aesthetic values
- high durability
- fast and easy application
- resistant to flaking, abrasion and dust
- environmentally friendly, non-toxic
- ability to apply fireproof coating on the elements previously coated with other epoxy primers without the need of their removal

## 6.3. technical parameters

- density: 1.34 ± 0,06 g/cm$^3$
- intumescent paint colour: white
- solids content: 70 ± 2 m/m %
- theoretical consumption: 1.95 kg/m$^2$ / 1 mm of dry layer

## 6.4. fireproofing technology

Performance of fireproof insulation consists in covering the individual construction elements with mcr Polylack W system coatings. The performed works cause no changes to shape of fireproofed profiles.

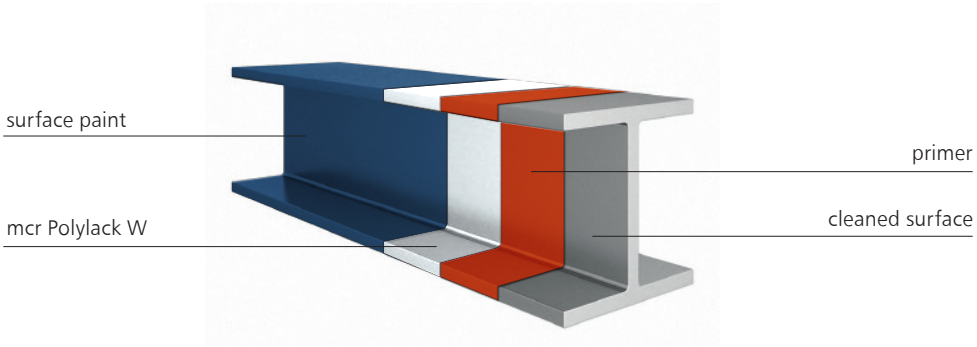
Prior to application of mcr Polylack W paint, the protected elements should be carefully cleaned of dirt, oils, greases, flaking paint and rust..

The system layers are coated in the following order:

- epoxy or alkyd primer
  - layer thickness depends of environmental corrosiveness category basic
- intumescent layer
  - during fire, this layer produces – under the influence of fire and radiating heat - an insulating foam coating, which protects the structure against high temperature and ensures the required fire resistance class.
  - thickness of applied coating depends of cross section factor /A, the required fire resistance class and critical temperature of steel
- surface epoxy layer
  - protects the intumescent layer against humidity, mechanical damage and dirt and acts as decorative finish
  - coating thickness depends on environmental corrosiveness category

mcr Polylack W paints can be applied on substrate with a roller, brush (300-500 $\mu$m of wet paint/layer) or using a spraying machine (800-1000 $\mu$m of wet paint/layer; hydrodynamic spraying – recommended nozzles of 0.43-0.53 mm).

mcr Polylack W can be applied without diluting or diluted, upon careful mixing. Recommended diluent: water (max. 3%). Paint drying time depends on temperature, ventilation, air circulation, dryness of previous layer.




Surface layer can be applied after 24 hours.

Application conditions: Temperature of fireproofed surface should fall within the range between 5 and 40°C, relative humidity of 70% and must be at any time at least 3°C higher than dew point temperature.

Painting in ambient temperature below 5°C is not recommended

## 6.5. fire resistance properties

**Fire resistance of the system is ensured by proper selection of protection thickness depending on:**

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

## 6.5.1. open profiles

The tables concerning columns fireproofing apply both to columns and beams protected on four sides, while the tables concerning beam fireproofing apply to beams protected on three sides.

R15 - COLUMNS

KFIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

R30 - COLUMNS

FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

FIRE RESISTANCE CLASS R45 - COLUMNS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

FIRE RESISTANCE CLASS **R60 - COLUMNS**

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

R15 - BEAMS
FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

FIRE RESISTANCE CLASS R30 - BEAMS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles



| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.1. open profiles

FIRE RESISTANCE CLASS **R60 - BEAMS**

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.2. closed round profiles

FIRE RESISTANCE CLASS R15 - COLUMNS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.2. closed round profiles

R15 - COLUMNS

FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.2. closed round profiles

R30 - COLUMNS

FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.2. closed round profiles

### FIRE RESISTANCE CLASS R30 - COLUMNS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the design temperature | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 350°C | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 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 RESISTANCE CLASS R45 - COLUMNS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 | - | - | - | - | - | - | - | - | - |

## 6.5.3. closed rectangular profiles

R15 - BEAMS
FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.3. closed rectangular profiles

R30 - BEAMS

FIRE RESISTANCE CLASS

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.3. closed rectangular profiles



| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R60 - BEAMS**

| section factoru U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

## 6.5.3. closed rectangular profiles

### R90 - BEAMS

| section factoru U/A [m$^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

### R120 - BEAMS

| section factoru U/A [m$^{-1}$] | minimum required thickness of fire protection in the mcr Polylack W system [mm] at the 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 |

# mcr Polylack A

fireproof intumescent solvent-based paint system


- **R15-R90**
- **European Technical Assessment ETA-17/0735**
- **Certificate of Constancy of Performance 1301-CPR-1376**
- **Declaration of Performance (DoP) 81250**

## 7.1. application

mcr Polylack A itumescent solvent-based paint is designed for fire protection of steel structures in the construction industry. It can be applied inside and outside the premises with partial exposure, including in particular at the sites requiring high aesthetics of the performed fire protection.

Steel elements of open and closed profiles protected with mcr Polylack A intumescent paint are classified according to EN13501-2:2016 and are assigned with R15 to R90 fire resistance class.

mcr Polylack W paint can be applied to fireproof the following elements of steel structures.

- open profiles – columns and beams
  - fire-resistance class R15-R90
  - protection thickness between 0.236 and 1.883 mm
  - cross-section factor U/A up 388 $m^{-1}$
  - critical temperatures in the range from 350°C do 750°C
- closed round and rectangular profiles – columns
  - fire-resistance class R15-R600
  - protection thickness between 0.410 and 2.525 mm
  - cross-section factor U/A up 468 $m^{-1}$
  - temperatures in the range from 350°C do 750°C
- closed rectangular profiles – beams
  - fire-resistance class R15-R60
  - protection thickness between 0.377 and 2.511 mm
  - cross-section factor U/A up 345 $m^{-1}$
  - critical temperatures in the range from 350°C do 750°C

## 7.2. system features

- high aesthetic values
- high durability
- fast and easy application
- resistant to flaking, abrasion and dust
- environment-friendly, non-toxic
- ability to apply fireproof coating on the elements previously coated with other epoxy primers without the need of their removal

## 7.3. technical parameters

- density: 1.36 ± 0.06 g/cm$^3$
- intumescent paint colour: white
- solids content: 76 ± 2 m/m %
- theoretical consumption: 1.8 kg/m$^2$ / 1 mm of dry mass

## 7.4. fireproofing technology

Performance of fireproof insulation consists in covering the individual construction elements with mcr Polylack A system coatings. The performed works cause no changes to shape of fireproofed profiles.

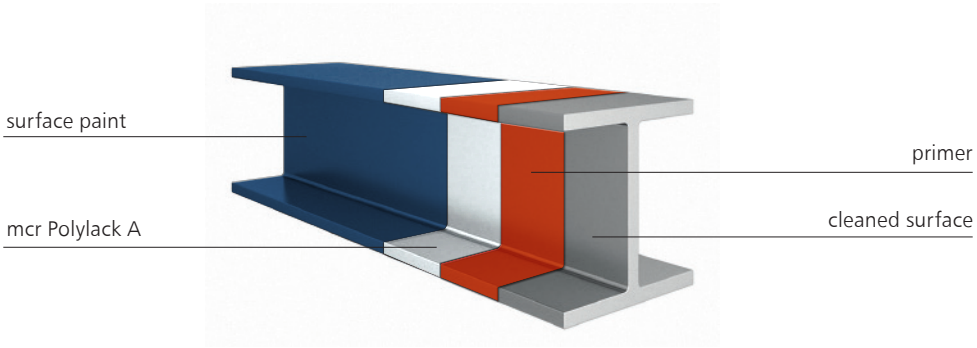
Prior to application of mcr Polylack A fireproof paints, the protected elements should be carefully cleaned of dirt, oils, greases, flaking paint and rust.

The system layers are coated in the following order:

- epoxy or alkyd primer
  - layer thickness depends of environmental corrosiveness category
- basic intumescent layer
  - during fire, this layer produces – under the influence of fire and radiating heat - an insulating foam coating, which protects the structure against high temperature and ensures the required fire resistance class.
  - thickness of applied coating depends of cross section factor /A, the required fire resistance class and critical temperature of steel
- surface epoxy layer
  - protects the intumescent layer against humidity, mechanical damage and dirt and acts as decorative finish
  - coating thickness depends on environmental corrosiveness category

- mcr Polylack A paints can be applied on substrate with a roller, brush (300-500 $\mu$m of wet paint/layer) or using a spraying machine (800-1000 $\mu$m of wet paint/layer; hydrodynamic spraying – recommended nozzles of 0.48-0.63 mm).
- mcr Polylack W can be applied without diluting or diluted, upon careful mixing. Recommended diluent: containing max. 5% of aromatic compounds.

Paint drying time depends on temperature, ventilation, air exchange and dryness of previous layer.




Surface layer can be applied after 24 hours.

Application conditions: Temperature of fireproofed surface should fall within the range between 5 and 40°C, relative humidity of 70% and must be at any time at least 3°C higher than dew point temperature.

Painting in ambient temperature below 5°C is not recommended.

## 7.5. fire resistance properties

**Fire resistance of the system is ensured by proper selection of protection thickness depending on:**

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

## 7.5.1. open profiles

The tables concerning columns fireproofing apply both to columns and beams protected on four sides, while the tables concerning beam fireproofing apply to beams protected on three sides.

R15 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R30 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R30 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R45 - COLUMNS
FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R45 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R60 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R60 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R90 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 | - | - | - | - | - | - | - | - | - |

## 7.5.1. open profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R15 - BEAMS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS R30 - BEAMS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R30 - BEAMS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R45 - BEAMS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R60 - BEAMS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

FIRE RESISTANCE CLASS **R60 - BEAMS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.1. open profiles

R90 - BEAMS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.2. closed round profiles

FIRE RESISTANCE CLASS **R15 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.2. closed round profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.2. closed round profiles

R30 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.2. closed round profiles

FIRE RESISTANCE CLASS **R30 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.2. closed round profiles

R45 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.2. closed round profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R15 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R30 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

R30 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R45 - POSTS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R60 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.3. closed rectangular profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

R15 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R30 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles

FIRE RESISTANCE CLASS **R30 - COLUMNS**

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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 |

## 7.5.3. closed rectangular profiles



| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

## 7.5.3. closed rectangular profiles

R60 - COLUMNS

FIRE RESISTANCE CLASS

| section factor U/A [$m^{-1}$] | minimum required thickness of fire protection in the mcr Polylack A system [mm] at the 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** | - | - | - | - | - | - | - | - | - |

„MERCOR" S.A.
HEADOFFICE GDAŃSK
Grzegorza z Sanoka 2 Street
80-408 Gdańsk
tel. +48 58 341 42 45
mercor@mercor.com.pl

SALES OFFICE WARSAW
Grzybowska 2/79 Street
00-131 Warsaw
tel. +48 22 654 26 55
warszawa@mercor.com.pl

SALES OFFICE MIKOŁÓW
Kolejowa 4 Street
43-190 Mikołów
tel. +48 32 328 43 71
mikolow@mercor.com.pl

www.mercor.com.pl