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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-24/0172 of 2024/03/27

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	Protecta Steel Paint FR-120
Product family to which the above construction product belongs:	Intumescent paint for protection of structural steel
Manufacturer:	Polyseam Ltd, 15 St. Andrews Road Huddersfield West Yorkshire UK-HD1 6SB Telephone: 0044 1487 421036 Internet: www.polyseam.com
Manufacturing plant:	Polyseam Ltd 15 St Andrews Road Huddersfield HD1 6SB, UK
This European Technical Assessment contains:	37 pages including 2 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 350402-00-1106 – Reactive coating for fire protection of structural steel.
This version replaces:	-

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

The Protecta Steel Paint FR-120 is a is a single component water based intumescent with special properties to protect against the spread of fire, designed for use on load bearing structural steel.

A transport primer is often not a satisfactory corrosion protection primer. It is recommended, as a minimum, to use a corrosion protection primer at 30µm DFT (microns dry film thickness). Steel Paint FR-120 cannot be applied directly upon galvanized steel or a primer rich with zinc.

Protecta Steel Paint FR-120 should be mixed well before application. However, it is important to use a low-speed mixing drill, to avoid air being mixed into the paint. In most cases, mixing for one minute is sufficient.

Detailed specifications for identification and performance criteria relevant for fire safety with regard to the construction products are given in Annex A. The results are valid for all shades as specified by Protecta Steel Paint FR-120.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

The Protecta Steel Paint FR-120 is designed for use on load bearing structural steel.

The paint is not intended for application on bituminous substrates or substrates that can exude certain oils and plasticizers or solvents and is not recommended for use in constant humid areas without a top-coat.

Application
Temperature and climate are important for the end result. Ensure the area and the steel is heated to minimum 10 °C and preferably approx. 20 °C, but it should be possible to paint at temperatures approaching 5 °C. The paint should be at minimum the same temperature as the ambient temperature in the area of which it is applied. If the pails, when stored, have become cold, place them in a heated area over night before application proceeds.

The relative air moisture should not exceed 80 % to secure a proper curing of the film. Within climates with high relative air moisture, it is important to ensure that there is proper ventilation. The surface application temperature must be at least 3 °C above the dew point and always minimum 0 °C.

At lower temperatures down towards 10 °C, it is important to apply the paint in thin layers. Especially the first layer which should be less than 500µ WFT (microns wet film thickness). The second layer can often be applied thicker.

In ideal conditions (stable temperature around 20 °C in air, on steel and in the paint combined with low air moisture), the paint can be spray applied at 1250 µm WFT and brush applied at 500 µm WFT.

Drying process
Low temperatures delay the drying process significantly, and one must wait until the paint is completely dry before applying the next layer. Under poor conditions this requires a minimum of 24 hours drying time.
If the underlying layer is not completely dry before the next layer is applied, this will cause cracks in the finished painted surface.

Average drying times are:

	At 15 °C	At 23 °C
Touch dry	3 hours	1.5 hours
For the next layer	6 hours	4 hours

These drying times are guidelines for typical wet film thicknesses 400-750µ. Air movement, temperature and moisture will have a significant influence. A maximum of 2 layers spray applied per 24 hours should not be exceeded.

Cracking of the paint can in many cases be caused by incorrect drying of the paint. Drying of the paint must occur from the inside out. If the paint dries on the outside first, drying of the inner paint against the steel may cause the already dried outer paint to crack, due to movement during cure.

This can be avoided by not accelerating the curing process with heaters or fans, but rather letting the paint dry under normal conditions. After heating the area that the paint is to be applied in, the heaters should be placed at some distance away from where the painting is to commence.

Topcoat

If the painted steelwork is in an interior area with condition C1 or C2 according to BS-EN ISO 12944-2, a topcoat is not necessary, and the paint can be supplied tinted. For other conditions, a topcoat should be applied.

Topcoats with a type X durability (intended for all conditions) are recommended, but as a minimum, coatings for C3 environments (humidity) can be used. In general polyurethane topcoats offer the greater durability.

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of at least 10 years.

The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment.

Characteristic	Assessment of characteristic
3.2 Safety in case of fire (BWR 2)	
Reaction to fire	The Protecta Steel Paint FR-120 is classified as Euroclass **B-s1,d0** in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364. See annex B for field of application
Resistance to fire	See information in Annex A
3.3 Hygiene, health and the environment (BWR 3)	
Content, emission and/or release of dangerous substances*	No performance assessed
3.4 Safety and accessibility in use (BWR 4)	
Adhesion	**Passed**
Durability	Use conditions: **Type Z_2**

*In addition to the specific clauses relating to dangerous substances contained in this European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g., transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 General aspects

The verification of durability is part of testing the essential characteristics. Protecta Steel Paint FR-120 may be used in end-use applications according to the provisions for use category Z_2 (internal conditions, with humidity lower than 85% RH, excluding temperatures below 0 °C) without expecting significant changes of the characteristics relevant for fire protection.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base.

4.1 AVCP system

According to the decision 1999/454/EC of the European Commission, as amended by 2001/596/EC, the system(s) of assessment and verification of constancy of performance (see Annex III to Regulation (EU) No 305/2011) is 1.

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD.

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2024-03-27 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Fire resistance performance

This Annex relates to the use of Protecta Steel Paint FR-120 for the fire protection of ‘H’ or ‘I’ shaped steel beam and columns and rectangular/square and circular hollow columns.
The precise scope is given in the following tables which show the total dry film thickness of Protecta Steel Paint FR-120 (excluding primer and topcoat) required to provide classifications of R15 to R60 for various design temperatures and section factors. The product is approved on the basis of:
Assessment testing in accordance with the principles of EN 13381-8.

Based on the test data the total dry film thickness of primer and topcoat together should not exceed the maximum tested.

I/H Beams: 15 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
55	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
60	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
65	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
70	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
75	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
80	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
85	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
90	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
95	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
100	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
105	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
110	0.204	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
115	0.216	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
120	0.229	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
125	0.241	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
130	0.253	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
135	0.265	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
140	0.277	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
145	0.290	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
150	0.302	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
155	0.314	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
160	0.326	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
165	0.339	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
170	0.351	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
175	0.363	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
180	0.375	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
185	0.387	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
190	0.400	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
195	0.412	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
200	0.424	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
205	0.436	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
210	0.449	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
215	0.461	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
220	0.473	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
225	0.485	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
230	0.498	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
235	0.510	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
240	0.522	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
245	0.534	0.193	0.193	0.193	0.193	0.193	0.193	0.193	0.193
250	0.546	0.194	0.193	0.193	0.193	0.193	0.193	0.193	0.193
255	0.559	0.205	0.193	0.193	0.193	0.193	0.193	0.193	0.193
260	0.571	0.216	0.193	0.193	0.193	0.193	0.193	0.193	0.193
265	0.583	0.226	0.193	0.193	0.193	0.193	0.193	0.193	0.193
270	0.595	0.237	0.193	0.193	0.193	0.193	0.193	0.193	0.193
275	0.608	0.247	0.193	0.193	0.193	0.193	0.193	0.193	0.193
280	0.620	0.258	0.193	0.193	0.193	0.193	0.193	0.193	0.193
285	0.632	0.268	0.193	0.193	0.193	0.193	0.193	0.193	0.193
290	0.644	0.279	0.193	0.193	0.193	0.193	0.193	0.193	0.193
295	0.656	0.290	0.193	0.193	0.193	0.193	0.193	0.193	0.193
300	0.669	0.300	0.193	0.193	0.193	0.193	0.193	0.193	0.193
305	0.681	0.311	0.193	0.193	0.193	0.193	0.193	0.193	0.193
310	0.693	0.321	0.193	0.193	0.193	0.193	0.193	0.193	0.193
315	0.705	0.332	0.193	0.193	0.193	0.193	0.193	0.193	0.193
320	0.718	0.342	0.193	0.193	0.193	0.193	0.193	0.193	0.193
325	0.730	0.353	0.193	0.193	0.193	0.193	0.193	0.193	0.193
330	0.742	0.363	0.193	0.193	0.193	0.193	0.193	0.193	0.193

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 30 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.443	0.255	0.193	0.193	0.193	0.193	0.193	0.193	0.193
55	0.463	0.272	0.193	0.193	0.193	0.193	0.193	0.193	0.193
60	0.484	0.289	0.193	0.193	0.193	0.193	0.193	0.193	0.193
65	0.504	0.306	0.203	0.193	0.193	0.193	0.193	0.193	0.193
70	0.525	0.323	0.218	0.193	0.193	0.193	0.193	0.193	0.193
75	0.545	0.340	0.232	0.193	0.193	0.193	0.193	0.193	0.193
80	0.565	0.357	0.247	0.193	0.193	0.193	0.193	0.193	0.193
85	0.586	0.374	0.262	0.193	0.193	0.193	0.193	0.193	0.193
90	0.606	0.391	0.276	0.199	0.193	0.193	0.193	0.193	0.193
95	0.627	0.408	0.291	0.211	0.193	0.193	0.193	0.193	0.193
100	0.647	0.425	0.306	0.223	0.193	0.193	0.193	0.193	0.193
105	0.668	0.442	0.320	0.236	0.193	0.193	0.193	0.193	0.193
110	0.688	0.459	0.335	0.248	0.193	0.193	0.193	0.193	0.193
115	0.709	0.476	0.350	0.261	0.193	0.193	0.193	0.193	0.193
120	0.729	0.493	0.364	0.273	0.193	0.193	0.193	0.193	0.193
125	0.750	0.510	0.379	0.285	0.193	0.193	0.193	0.193	0.193
130	0.770	0.527	0.394	0.298	0.193	0.193	0.193	0.193	0.193
135	0.791	0.544	0.408	0.310	0.193	0.193	0.193	0.193	0.193
140	0.811	0.561	0.423	0.323	0.202	0.193	0.193	0.193	0.193
145	0.831	0.578	0.438	0.335	0.213	0.193	0.193	0.193	0.193
150	0.852	0.596	0.452	0.347	0.224	0.193	0.193	0.193	0.193
155	0.872	0.613	0.467	0.360	0.235	0.193	0.193	0.193	0.193
160	0.893	0.630	0.482	0.372	0.246	0.193	0.193	0.193	0.193
165	0.913	0.647	0.496	0.385	0.257	0.193	0.193	0.193	0.193
170	0.934	0.664	0.511	0.397	0.268	0.193	0.193	0.193	0.193
175	0.954	0.681	0.526	0.409	0.279	0.193	0.193	0.193	0.193
180	0.975	0.698	0.540	0.422	0.290	0.193	0.193	0.193	0.193
185	0.995	0.715	0.555	0.434	0.301	0.193	0.193	0.193	0.193
190	1.016	0.732	0.570	0.447	0.312	0.193	0.193	0.193	0.193
195	1.036	0.749	0.584	0.459	0.323	0.193	0.193	0.193	0.193
200	1.056	0.766	0.599	0.471	0.334	0.193	0.193	0.193	0.193
205	1.077	0.783	0.614	0.484	0.345	0.193	0.193	0.193	0.193
210	1.097	0.800	0.628	0.496	0.356	0.193	0.193	0.193	0.193
215	1.118	0.817	0.643	0.509	0.367	0.193	0.193	0.193	0.193
220	1.138	0.834	0.658	0.521	0.378	0.193	0.193	0.193	0.193
225	1.159	0.851	0.672	0.533	0.389	0.193	0.193	0.193	0.193
230	1.179	0.868	0.687	0.546	0.400	0.193	0.193	0.193	0.193
235	1.200	0.885	0.702	0.558	0.411	0.193	0.193	0.193	0.193
240	1.220	0.902	0.716	0.571	0.422	0.193	0.193	0.193	0.193
245	1.241	0.919	0.731	0.583	0.433	0.193	0.193	0.193	0.193
250	1.261	0.936	0.746	0.595	0.444	0.193	0.193	0.193	0.193
255	1.281	0.953	0.760	0.608	0.455	0.193	0.193	0.193	0.193
260	1.302	0.970	0.775	0.620	0.466	0.202	0.193	0.193	0.193
265	1.322	0.987	0.790	0.633	0.477	0.213	0.193	0.193	0.193
270	1.343	1.004	0.804	0.645	0.488	0.224	0.193	0.193	0.193
275	1.363	1.021	0.819	0.657	0.499	0.235	0.193	0.193	0.193
280	1.384	1.038	0.834	0.670	0.510	0.246	0.193	0.193	0.193
285	1.404	1.055	0.848	0.682	0.521	0.257	0.193	0.193	0.193
290	1.425	1.072	0.863	0.695	0.532	0.268	0.193	0.193	0.193
295	1.447	1.089	0.878	0.707	0.543	0.280	0.193	0.193	0.193
300	1.478	1.106	0.892	0.719	0.554	0.291	0.193	0.193	0.193
305	1.509	1.123	0.907	0.732	0.565	0.302	0.193	0.193	0.193
310	1.539	1.140	0.922	0.744	0.576	0.313	0.193	0.193	0.193
315	1.570	1.157	0.936	0.757	0.587	0.324	0.193	0.193	0.193
320	1.601	1.174	0.951	0.769	0.598	0.335	0.193	0.193	0.193
325	1.631	1.191	0.966	0.781	0.609	0.347	0.193	0.193	0.193
330	1.662	1.208	0.980	0.794	0.620	0.358	0.193	0.193	0.193

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 45 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.860	0.608	0.452	0.325	0.215	0.193	0.193	0.193	0.193
55	0.922	0.640	0.470	0.342	0.230	0.193	0.193	0.193	0.193
60	0.985	0.671	0.489	0.359	0.246	0.193	0.193	0.193	0.193
65	1.047	0.703	0.507	0.375	0.261	0.193	0.193	0.193	0.193
70	1.109	0.734	0.526	0.392	0.277	0.206	0.193	0.193	0.193
75	1.171	0.765	0.545	0.409	0.292	0.220	0.193	0.193	0.193
80	1.233	0.797	0.563	0.426	0.308	0.235	0.193	0.193	0.193
85	1.296	0.828	0.582	0.443	0.323	0.249	0.193	0.193	0.193
90	1.358	0.860	0.600	0.460	0.339	0.263	0.193	0.193	0.193
95	1.420	0.891	0.619	0.477	0.354	0.277	0.204	0.193	0.193
100	1.460	0.922	0.637	0.494	0.370	0.292	0.216	0.193	0.193
105	1.488	0.954	0.656	0.511	0.385	0.306	0.229	0.193	0.193
110	1.516	0.985	0.674	0.528	0.401	0.320	0.241	0.193	0.193
115	1.544	1.017	0.693	0.544	0.416	0.334	0.254	0.193	0.193
120	1.573	1.048	0.711	0.561	0.432	0.349	0.267	0.193	0.193
125	1.601	1.079	0.730	0.578	0.448	0.363	0.279	0.193	0.193
130	1.629	1.111	0.748	0.595	0.463	0.377	0.292	0.193	0.193
135	1.657	1.142	0.767	0.612	0.479	0.391	0.305	0.193	0.193
140	1.685	1.174	0.785	0.629	0.494	0.406	0.317	0.195	0.193
145	1.714	1.205	0.804	0.646	0.510	0.420	0.330	0.205	0.193
150	1.742	1.236	0.822	0.663	0.525	0.434	0.342	0.216	0.193
155	1.770	1.268	0.841	0.680	0.541	0.448	0.355	0.227	0.193
160	1.798	1.299	0.860	0.697	0.556	0.463	0.368	0.238	0.193
165	1.827	1.331	0.878	0.714	0.572	0.477	0.380	0.249	0.193
170	1.855	1.362	0.897	0.730	0.587	0.491	0.393	0.259	0.193
175	1.883	1.393	0.915	0.747	0.603	0.505	0.405	0.270	0.193
180	1.911	1.425	0.934	0.764	0.618	0.520	0.418	0.281	0.193
185	1.939	1.454	0.952	0.781	0.634	0.534	0.431	0.292	0.193
190	1.968	1.482	0.971	0.798	0.649	0.548	0.443	0.303	0.193
195	1.996	1.509	0.989	0.815	0.665	0.563	0.456	0.313	0.193
200	2.024	1.536	1.008	0.832	0.680	0.577	0.469	0.324	0.193
205	2.052	1.564	1.026	0.849	0.696	0.591	0.481	0.335	0.193
210	2.081	1.591	1.045	0.866	0.712	0.605	0.494	0.346	0.193
215	2.109	1.618	1.063	0.883	0.727	0.620	0.506	0.357	0.193
220	2.137	1.646	1.082	0.899	0.743	0.634	0.519	0.367	0.193
225	2.165	1.673	1.100	0.916	0.758	0.648	0.532	0.378	0.193
230	2.194	1.700	1.119	0.933	0.774	0.662	0.544	0.389	0.193
235	2.222	1.728	1.137	0.950	0.789	0.677	0.557	0.400	0.193
240	2.250	1.755	1.156	0.967	0.805	0.691	0.570	0.410	0.200
245	2.278	1.783	1.175	0.984	0.820	0.705	0.582	0.421	0.211
250	2.306	1.810	1.193	1.001	0.836	0.719	0.595	0.432	0.221
255	2.335	1.837	1.212	1.018	0.851	0.734	0.607	0.443	0.232
260	2.363	1.865	1.230	1.035	0.867	0.748	0.620	0.454	0.243
265	2.391	1.892	1.249	1.052	0.882	0.762	0.633	0.464	0.253
270	2.419	1.919	1.267	1.069	0.898	0.776	0.645	0.475	0.264
275	2.448	1.947	1.286	1.085	0.913	0.791	0.658	0.486	0.274
280	2.476	1.974	1.304	1.102	0.929	0.805	0.670	0.497	0.285
285	2.504	2.001	1.323	1.119	0.944	0.819	0.683	0.508	0.295
290	2.532	2.029	1.341	1.136	0.960	0.833	0.696	0.518	0.306
295	2.560	2.056	1.360	1.153	0.976	0.848	0.708	0.529	0.316
300	2.589	2.084	1.378	1.170	0.991	0.862	0.721	0.540	0.327
305	2.617	2.111	1.397	1.187	1.007	0.876	0.734	0.551	0.337
310	2.645	2.138	1.415	1.204	1.022	0.890	0.746	0.562	0.348
315	2.673	2.166	1.434	1.221	1.038	0.905	0.759	0.572	0.358
320	2.702	2.193	1.463	1.238	1.053	0.919	0.771	0.583	0.369
325	2.730	2.220	1.499	1.255	1.069	0.933	0.784	0.594	0.379
330	2.758	2.248	1.535	1.271	1.084	0.948	0.797	0.605	0.390

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 60 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	1.278	0.946	0.750	0.606	0.477	0.354	0.239	0.193	0.193
55	1.381	1.011	0.793	0.630	0.494	0.372	0.256	0.193	0.193
60	1.472	1.076	0.836	0.654	0.512	0.389	0.272	0.193	0.193
65	1.545	1.141	0.878	0.678	0.529	0.406	0.288	0.201	0.193
70	1.618	1.206	0.921	0.702	0.547	0.424	0.305	0.216	0.193
75	1.692	1.271	0.964	0.727	0.564	0.441	0.321	0.230	0.193
80	1.765	1.337	1.007	0.751	0.582	0.458	0.338	0.245	0.193
85	1.838	1.402	1.050	0.775	0.600	0.476	0.354	0.259	0.193
90	1.911	1.453	1.093	0.799	0.617	0.493	0.371	0.273	0.201
95	1.984	1.482	1.136	0.823	0.635	0.510	0.387	0.288	0.215
100	2.057	1.511	1.179	0.848	0.652	0.528	0.403	0.302	0.229
105	2.130	1.541	1.222	0.872	0.670	0.545	0.420	0.317	0.242
110	2.203	1.570	1.265	0.896	0.687	0.562	0.436	0.331	0.256
115	2.276	1.599	1.308	0.920	0.705	0.580	0.453	0.345	0.269
120	2.350	1.629	1.351	0.944	0.722	0.597	0.469	0.360	0.283
125	2.423	1.658	1.393	0.968	0.740	0.614	0.486	0.374	0.297
130	2.496	1.688	1.436	0.993	0.757	0.632	0.502	0.389	0.310
135	2.569	1.717	1.466	1.017	0.775	0.649	0.518	0.403	0.324
140	2.642	1.746	1.494	1.041	0.792	0.666	0.535	0.418	0.338
145	2.715	1.776	1.522	1.065	0.810	0.684	0.551	0.432	0.351
150	2.788	1.805	1.550	1.089	0.827	0.701	0.568	0.446	0.365
155	2.845	1.834	1.579	1.113	0.845	0.718	0.584	0.461	0.378
160	2.878	1.864	1.607	1.138	0.862	0.736	0.601	0.475	0.392
165	2.911	1.893	1.635	1.162	0.880	0.753	0.617	0.490	0.406
170	2.945	1.922	1.663	1.186	0.897	0.770	0.633	0.504	0.419
175	2.978	1.952	1.691	1.210	0.915	0.787	0.650	0.518	0.433
180	3.011	1.981	1.719	1.234	0.932	0.805	0.666	0.533	0.446
185	3.044	2.010	1.747	1.258	0.950	0.822	0.683	0.547	0.460
190	3.078	2.040	1.775	1.283	0.967	0.839	0.699	0.562	0.474
195	3.111	2.069	1.803	1.307	0.985	0.857	0.716	0.576	0.487
200	3.144	2.099	1.832	1.331	1.002	0.874	0.732	0.590	0.501
205	3.177	2.128	1.860	1.355	1.020	0.891	0.749	0.605	0.515
210	3.210	2.157	1.888	1.379	1.037	0.909	0.765	0.619	0.528
215	3.244	2.187	1.916	1.404	1.055	0.926	0.781	0.634	0.542
220	3.277	2.216	1.944	1.428	1.072	0.943	0.798	0.648	0.555
225	3.310	2.245	1.972	1.457	1.090	0.961	0.814	0.662	0.569
230	3.343	2.275	2.000	1.492	1.107	0.978	0.831	0.677	0.583
235	3.377	2.304	2.028	1.526	1.125	0.995	0.847	0.691	0.596
240	3.410	2.333	2.057	1.561	1.142	1.013	0.864	0.706	0.610
245	3.443	2.363	2.085	1.596	1.160	1.030	0.880	0.720	0.623
250	3.476	2.392	2.113	1.631	1.177	1.047	0.896	0.734	0.637
255	3.510	2.422	2.141	1.666	1.195	1.065	0.913	0.749	0.651
260	3.543	2.451	2.169	1.701	1.212	1.082	0.929	0.763	0.664
265	3.576	2.480	2.197	1.736	1.230	1.099	0.946	0.778	0.678
270	3.609	2.510	2.225	1.771	1.247	1.117	0.962	0.792	0.692
275	3.643	2.539	2.253	1.806	1.265	1.134	0.979	0.806	0.705
280	3.676	2.568	2.281	1.841	1.282	1.151	0.995	0.821	0.719
285	3.709	2.598	2.310	1.875	1.300	1.169	1.011	0.835	0.732
290	3.742	2.627	2.338	1.910	1.317	1.186	1.028	0.850	0.746
295	3.776	2.656	2.366	1.945	1.335	1.203	1.044	0.864	0.760
300	3.809	2.686	2.394	1.980	1.352	1.221	1.061	0.878	0.773
305	3.842	2.715	2.422	2.015	1.370	1.238	1.077	0.893	0.787
310	3.875	2.744	2.450	2.050	1.387	1.255	1.094	0.907	0.800
315	3.909	2.774	2.478	2.085	1.405	1.273	1.110	0.922	0.814
320	3.942	2.803	2.506	2.120	1.422	1.290	1.126	0.936	0.828
325	3.975	2.834	2.534	2.155	1.440	1.307	1.143	0.950	0.841
330	4.008	2.900	2.563	2.189	1.486	1.325	1.159	0.965	0.855

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 75 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	1.926	1.283	1.043	0.871	0.728	0.594	0.463	0.320	0.193
55	2.068	1.382	1.116	0.922	0.761	0.617	0.481	0.337	0.203
60	2.210	1.470	1.188	0.972	0.795	0.640	0.499	0.354	0.221
65	2.352	1.543	1.260	1.023	0.829	0.663	0.517	0.371	0.239
70	2.494	1.616	1.333	1.074	0.863	0.685	0.535	0.389	0.256
75	2.636	1.689	1.405	1.125	0.897	0.708	0.553	0.406	0.274
80	2.778	1.762	1.457	1.175	0.930	0.731	0.571	0.423	0.291
85	2.861	1.835	1.488	1.226	0.964	0.754	0.589	0.440	0.309
90	2.908	1.908	1.519	1.277	0.998	0.776	0.607	0.457	0.327
95	2.955	1.981	1.550	1.327	1.032	0.799	0.625	0.474	0.344
100	3.002	2.054	1.582	1.378	1.065	0.822	0.642	0.491	0.362
105	3.050	2.126	1.613	1.429	1.099	0.845	0.660	0.508	0.380
110	3.097	2.199	1.644	1.464	1.133	0.867	0.678	0.525	0.397
115	3.144	2.272	1.675	1.495	1.167	0.890	0.696	0.542	0.415
120	3.191	2.345	1.707	1.525	1.201	0.913	0.714	0.559	0.432
125	3.238	2.418	1.738	1.556	1.234	0.936	0.732	0.576	0.450
130	3.286	2.491	1.769	1.586	1.268	0.958	0.750	0.593	0.468
135	3.333	2.564	1.800	1.617	1.302	0.981	0.768	0.611	0.485
140	3.380	2.637	1.831	1.647	1.336	1.004	0.786	0.628	0.503
145	3.427	2.710	1.863	1.678	1.370	1.027	0.804	0.645	0.521
150	3.475	2.782	1.894	1.708	1.403	1.049	0.822	0.662	0.538
155	3.522	2.843	1.925	1.739	1.437	1.072	0.840	0.679	0.556
160	3.569	2.879	1.956	1.769	1.470	1.095	0.858	0.696	0.573
165	3.616	2.915	1.988	1.800	1.502	1.118	0.876	0.713	0.591
170	3.663	2.951	2.019	1.830	1.534	1.140	0.894	0.730	0.609
175	3.711	2.987	2.050	1.861	1.566	1.163	0.912	0.747	0.626
180	3.758	3.023	2.081	1.891	1.599	1.186	0.930	0.764	0.644
185	3.805	3.059	2.113	1.922	1.631	1.209	0.948	0.781	0.662
190	3.852	3.095	2.144	1.952	1.663	1.231	0.966	0.798	0.679
195	3.899	3.131	2.175	1.983	1.695	1.254	0.984	0.815	0.697
200	3.947	3.167	2.206	2.013	1.728	1.277	1.002	0.833	0.714
205	3.994	3.203	2.237	2.044	1.760	1.300	1.020	0.850	0.732
210	4.041	3.239	2.269	2.074	1.792	1.322	1.038	0.867	0.750
215	4.088	3.275	2.300	2.105	1.824	1.345	1.056	0.884	0.767
220	4.136	3.311	2.331	2.135	1.857	1.368	1.074	0.901	0.785
225	4.185	3.347	2.362	2.166	1.889	1.391	1.092	0.918	0.803
230	4.241	3.383	2.394	2.196	1.921	1.413	1.109	0.935	0.820
235	4.298	3.419	2.425	2.227	1.953	1.436	1.127	0.952	0.838
240	4.354	3.455	2.456	2.257	1.986	1.470	1.145	0.969	0.855
245	4.410	3.491	2.487	2.288	2.018	1.508	1.163	0.986	0.873
250	4.466	3.527	2.519	2.318	2.050	1.546	1.181	1.003	0.891
255	4.522	3.563	2.550	2.349	2.082	1.584	1.199	1.020	0.908
260	4.579	3.599	2.581	2.379	2.115	1.622	1.217	1.037	0.926
265	4.635	3.635	2.612	2.410	2.147	1.660	1.235	1.055	0.944
270	4.691	3.671	2.643	2.440	2.179	1.697	1.253	1.072	0.961
275	4.747	3.707	2.675	2.471	2.211	1.735	1.271	1.089	0.979
280	4.803	3.743	2.706	2.501	2.244	1.773	1.289	1.106	0.996
285	4.860	3.779	2.737	2.532	2.276	1.811	1.307	1.123	1.014
290	4.916	3.815	2.768	2.562	2.308	1.849	1.325	1.140	1.032
295	4.972	3.851	2.800	2.593	2.340	1.887	1.343	1.157	1.049
300	5.028	3.887	2.831	2.623	2.373	1.924	1.361	1.174	1.067
305	5.084	3.922	2.919	2.654	2.405	1.962	1.379	1.191	1.085
310	5.141	3.958	3.007	2.684	2.437	2.000	1.397	1.208	1.102
315	5.197	3.994	3.096	2.715	2.469	2.038	1.415	1.225	1.120
320	5.253	4.030	3.184	2.745	2.502	2.076	1.433	1.242	1.137
325	5.309	4.066	3.272	2.776	2.534	2.113	1.468	1.259	1.155
330	5.366	4.102	3.361	2.806	2.566	2.151	1.518	1.277	1.173

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 90 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	2.589	1.824	1.337	1.136	0.972	0.820	0.677	0.512	0.359
55	2.795	1.957	1.439	1.214	1.030	0.866	0.708	0.530	0.379
60	2.925	2.089	1.529	1.291	1.088	0.911	0.740	0.548	0.398
65	3.040	2.222	1.619	1.368	1.146	0.956	0.771	0.566	0.418
70	3.155	2.355	1.709	1.444	1.204	1.002	0.803	0.584	0.438
75	3.269	2.487	1.799	1.498	1.262	1.047	0.834	0.602	0.458
80	3.384	2.620	1.889	1.552	1.321	1.092	0.865	0.621	0.477
85	3.499	2.752	1.979	1.605	1.379	1.138	0.897	0.639	0.497
90	3.613	2.852	2.069	1.659	1.437	1.183	0.928	0.657	0.517
95	3.728	2.903	2.158	1.713	1.471	1.228	0.960	0.675	0.537
100	3.843	2.955	2.248	1.767	1.503	1.274	0.991	0.693	0.557
105	3.957	3.006	2.338	1.820	1.535	1.319	1.023	0.711	0.576
110	4.072	3.058	2.428	1.874	1.568	1.364	1.054	0.730	0.596
115	4.177	3.109	2.518	1.928	1.600	1.410	1.085	0.748	0.616
120	4.229	3.161	2.608	1.982	1.632	1.451	1.117	0.766	0.636
125	4.281	3.212	2.698	2.035	1.664	1.481	1.148	0.784	0.655
130	4.332	3.264	2.788	2.089	1.696	1.512	1.180	0.802	0.675
135	4.384	3.315	2.850	2.143	1.729	1.543	1.211	0.820	0.695
140	4.436	3.367	2.888	2.197	1.761	1.573	1.243	0.839	0.715
145	4.487	3.418	2.925	2.251	1.793	1.604	1.274	0.857	0.735
150	4.539	3.470	2.962	2.304	1.825	1.635	1.306	0.875	0.754
155	4.591	3.521	3.000	2.358	1.857	1.665	1.337	0.893	0.774
160	4.642	3.573	3.037	2.412	1.890	1.696	1.368	0.911	0.794
165	4.694	3.624	3.074	2.466	1.922	1.727	1.400	0.929	0.814
170	4.745	3.676	3.112	2.519	1.954	1.757	1.431	0.948	0.833
175	4.797	3.727	3.149	2.573	1.986	1.788	1.464	0.966	0.853
180	4.849	3.779	3.186	2.627	2.018	1.819	1.498	0.984	0.873
185	4.900	3.830	3.224	2.681	2.050	1.849	1.532	1.002	0.893
190	4.952	3.882	3.261	2.735	2.083	1.880	1.566	1.020	0.913
195	5.004	3.933	3.299	2.788	2.115	1.911	1.600	1.038	0.932
200	5.055	3.985	3.336	2.841	2.147	1.941	1.634	1.057	0.952
205	5.107	4.036	3.373	2.891	2.179	1.972	1.668	1.075	0.972
210	5.158	4.088	3.411	2.941	2.211	2.003	1.702	1.093	0.992
215	5.210	4.139	3.448	2.991	2.244	2.033	1.735	1.111	1.011
220	5.262	4.194	3.485	3.041	2.276	2.064	1.769	1.129	1.031
225	5.313	4.252	3.523	3.091	2.308	2.095	1.803	1.147	1.051
230	5.365	4.310	3.560	3.141	2.340	2.125	1.837	1.166	1.071
235	5.417	4.368	3.597	3.190	2.372	2.156	1.871	1.184	1.091
240	5.468	4.426	3.635	3.240	2.405	2.187	1.905	1.202	1.110
245	5.520	4.484	3.672	3.290	2.437	2.217	1.939	1.220	1.130
250	5.601	4.542	3.709	3.340	2.469	2.248	1.973	1.238	1.150
255	5.786	4.600	3.747	3.390	2.501	2.279	2.007	1.256	1.170
260	5.971	4.659	3.784	3.440	2.533	2.309	2.040	1.275	1.189
265	6.156	4.717	3.821	3.490	2.566	2.340	2.074	1.293	1.209
270	6.341	4.775	3.859	3.540	2.598	2.371	2.108	1.311	1.229
275	6.526	4.833	3.896	3.590	2.630	2.402	2.142	1.329	1.249
280	6.711	4.891	3.933	3.639	2.662	2.432	2.176	1.347	1.269
285	6.895	4.949	3.971	3.689	2.694	2.463	2.210	1.365	1.288
290	7.080	5.007	4.008	3.739	2.727	2.494	2.244	1.383	1.308
295	7.265	5.065	4.045	3.789	2.759	2.524	2.278	1.402	1.328
300	-	5.124	4.083	3.839	2.791	2.555	2.312	1.420	1.348
305	-	5.182	4.120	3.889	2.823	2.586	2.345	1.438	1.368
310	-	5.240	4.157	3.939	2.928	2.616	2.379	1.490	1.387
315	-	5.298	4.256	3.989	3.057	2.647	2.413	1.548	1.407
320	-	5.356	4.385	4.039	3.186	2.678	2.447	1.607	1.427
325	-	5.414	4.515	4.088	3.315	2.708	2.481	1.665	1.454
330	-	5.472	4.645	4.138	3.444	2.739	2.515	1.723	1.500

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 105 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	3.251	2.393	1.858	1.436	1.216	1.046	0.885	0.691	0.525
55	3.423	2.581	2.000	1.549	1.298	1.114	0.937	0.725	0.555
60	3.594	2.768	2.143	1.663	1.381	1.182	0.989	0.759	0.585
65	3.766	2.908	2.285	1.776	1.461	1.250	1.041	0.792	0.615
70	3.938	3.025	2.427	1.890	1.536	1.318	1.094	0.826	0.645
75	4.110	3.142	2.569	2.004	1.612	1.386	1.146	0.859	0.674
80	4.255	3.258	2.711	2.117	1.687	1.448	1.198	0.893	0.704
85	4.385	3.375	2.843	2.231	1.762	1.485	1.250	0.927	0.734
90	4.515	3.491	2.921	2.344	1.837	1.522	1.303	0.960	0.764
95	4.645	3.608	2.998	2.458	1.912	1.559	1.355	0.994	0.793
100	4.775	3.724	3.075	2.572	1.987	1.596	1.407	1.028	0.823
105	4.906	3.841	3.153	2.685	2.063	1.633	1.452	1.061	0.853
110	5.036	3.957	3.230	2.799	2.138	1.670	1.485	1.095	0.883
115	5.166	4.074	3.308	2.872	2.213	1.707	1.517	1.129	0.912
120	5.296	4.179	3.385	2.928	2.288	1.744	1.549	1.162	0.942
125	5.426	4.234	3.462	2.985	2.363	1.781	1.582	1.196	0.972
130	5.556	4.288	3.540	3.041	2.439	1.818	1.614	1.229	1.002
135	5.647	4.342	3.617	3.098	2.514	1.855	1.646	1.263	1.031
140	5.737	4.396	3.695	3.155	2.589	1.892	1.679	1.297	1.061
145	5.827	4.450	3.772	3.211	2.664	1.929	1.711	1.330	1.091
150	5.917	4.504	3.849	3.268	2.739	1.966	1.743	1.364	1.121
155	6.007	4.558	3.927	3.325	2.814	2.004	1.776	1.398	1.150
160	6.097	4.612	4.004	3.381	2.866	2.041	1.808	1.431	1.180
165	6.187	4.666	4.082	3.438	2.911	2.078	1.840	1.466	1.210
170	6.277	4.720	4.159	3.494	2.956	2.115	1.873	1.502	1.240
175	6.367	4.774	4.212	3.551	3.001	2.152	1.905	1.537	1.269
180	6.457	4.828	4.261	3.608	3.046	2.189	1.937	1.573	1.299
185	6.547	4.882	4.310	3.664	3.091	2.226	1.970	1.609	1.329
190	6.637	4.936	4.360	3.721	3.136	2.263	2.002	1.644	1.359
195	6.727	4.991	4.409	3.778	3.181	2.300	2.034	1.680	1.389
200	6.817	5.045	4.458	3.834	3.226	2.337	2.066	1.715	1.418
205	6.907	5.099	4.507	3.891	3.271	2.374	2.099	1.751	1.450
210	6.997	5.153	4.556	3.947	3.316	2.411	2.131	1.787	1.486
215	7.087	5.207	4.606	4.004	3.361	2.448	2.163	1.822	1.523
220	7.177	5.261	4.655	4.061	3.406	2.485	2.196	1.858	1.559
225	7.267	5.315	4.704	4.117	3.451	2.522	2.228	1.894	1.595
230	-	5.369	4.753	4.175	3.496	2.559	2.260	1.929	1.632
235	-	5.423	4.802	4.248	3.541	2.596	2.293	1.965	1.668
240	-	5.477	4.851	4.321	3.586	2.633	2.325	2.000	1.705
245	-	5.531	4.901	4.394	3.631	2.670	2.357	2.036	1.741
250	-	5.703	4.950	4.467	3.676	2.707	2.390	2.072	1.778
255	-	6.009	4.999	4.540	3.721	2.744	2.422	2.107	1.814
260	-	6.315	5.048	4.612	3.766	2.781	2.454	2.143	1.851
265	-	6.620	5.097	4.685	3.811	2.818	2.487	2.178	1.887
270	-	6.926	5.146	4.758	3.856	2.896	2.519	2.214	1.924
275	-	7.232	5.196	4.831	3.901	2.996	2.551	2.250	1.960
280	-	-	5.245	4.904	3.946	3.096	2.584	2.285	1.996
285	-	-	5.294	4.977	3.991	3.196	2.616	2.321	2.033
290	-	-	5.343	5.050	4.036	3.296	2.648	2.356	2.069
295	-	-	5.392	5.123	4.081	3.396	2.681	2.392	2.106
300	-	-	5.442	5.196	4.126	3.496	2.713	2.428	2.142
305	-	-	5.491	5.268	4.175	3.596	2.745	2.463	2.179
310	-	-	5.540	5.341	4.360	3.696	2.778	2.499	2.215
315	-	-	5.589	5.414	4.545	3.796	2.810	2.534	2.252
320	-	-	5.638	5.487	4.730	3.896	2.882	2.570	2.288
325	-	-	5.687	5.560	4.915	3.996	3.028	2.606	2.325
330	-	-	5.737	5.633	5.099	4.096	3.175	2.641	2.361

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 120 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	3.815	3.020	2.379	1.942	1.541	1.272	1.093	0.869	0.687
55	4.044	3.200	2.572	2.104	1.670	1.363	1.166	0.920	0.733
60	4.272	3.380	2.764	2.267	1.800	1.452	1.239	0.972	0.779
65	4.501	3.560	2.925	2.429	1.929	1.536	1.312	1.023	0.825
70	4.730	3.740	3.070	2.592	2.058	1.619	1.385	1.075	0.871
75	4.959	3.920	3.215	2.754	2.187	1.702	1.454	1.126	0.917
80	5.189	4.099	3.359	2.893	2.316	1.785	1.510	1.177	0.963
85	5.418	4.245	3.504	3.012	2.445	1.868	1.565	1.229	1.009
90	5.596	4.369	3.649	3.130	2.574	1.952	1.621	1.280	1.055
95	5.690	4.493	3.794	3.249	2.704	2.035	1.677	1.332	1.100
100	5.783	4.617	3.938	3.367	2.832	2.118	1.732	1.383	1.146
105	5.877	4.741	4.083	3.486	2.923	2.201	1.788	1.435	1.192
110	5.971	4.865	4.204	3.605	3.013	2.285	1.844	1.471	1.238
115	6.065	4.988	4.290	3.723	3.104	2.368	1.899	1.506	1.284
120	6.159	5.112	4.376	3.842	3.194	2.451	1.955	1.540	1.330
125	6.253	5.236	4.462	3.960	3.284	2.534	2.011	1.575	1.376
130	6.347	5.360	4.548	4.079	3.375	2.618	2.066	1.609	1.422
135	6.441	5.484	4.634	4.187	3.465	2.701	2.122	1.643	1.461
140	6.535	5.602	4.719	4.260	3.556	2.784	2.178	1.678	1.495
145	6.629	5.713	4.805	4.334	3.646	2.856	2.233	1.712	1.528
150	6.723	5.823	4.891	4.408	3.737	2.915	2.289	1.747	1.562
155	6.816	5.933	4.977	4.481	3.827	2.974	2.345	1.781	1.596
160	6.910	6.043	5.063	4.555	3.917	3.032	2.400	1.816	1.630
165	7.004	6.153	5.149	4.628	4.008	3.091	2.456	1.850	1.664
170	7.098	6.263	5.235	4.702	4.098	3.149	2.512	1.885	1.698
175	7.192	6.373	5.320	4.775	4.203	3.208	2.567	1.919	1.732
180	-	6.484	5.406	4.849	4.359	3.266	2.623	1.954	1.765
185	-	6.594	5.492	4.922	4.516	3.325	2.679	1.988	1.799
190	-	6.704	5.596	4.996	4.673	3.383	2.734	2.023	1.833
195	-	6.814	5.765	5.069	4.830	3.442	2.790	2.057	1.867
200	-	6.924	5.935	5.143	4.986	3.501	2.846	2.091	1.901
205	-	7.034	6.105	5.216	5.143	3.559	2.904	2.126	1.935
210	-	7.144	6.275	5.300	5.300	3.618	2.961	2.160	1.968
215	-	7.255	6.445	5.457	5.457	3.676	3.019	2.195	2.002
220	-	7.365	6.615	5.613	5.613	3.735	3.076	2.229	2.036
225	-	-	6.785	5.770	5.770	3.793	3.134	2.264	2.070
230	-	-	6.954	5.927	5.927	3.852	3.191	2.298	2.104
235	-	-	7.124	6.449	6.084	3.910	3.249	2.333	2.138
240	-	-	-	-	6.240	3.969	3.306	2.367	2.171
245	-	-	-	-	6.397	4.028	3.364	2.402	2.205
250	-	-	-	-	6.554	4.086	3.421	2.436	2.239
255	-	-	-	-	6.711	4.145	3.479	2.471	2.273
260	-	-	-	-	6.868	4.228	3.536	2.505	2.307
265	-	-	-	-	7.024	4.330	3.594	2.539	2.341
270	-	-	-	-	7.181	4.432	3.651	2.574	2.374
275	-	-	-	-	7.338	4.535	3.709	2.608	2.408
280	-	-	-	-	-	4.637	3.766	2.643	2.442
285	-	-	-	-	-	4.739	3.824	2.677	2.476
290	-	-	-	-	-	4.841	3.881	2.712	2.510
295	-	-	-	-	-	4.943	3.939	2.746	2.544
300	-	-	-	-	-	5.046	3.996	2.781	2.578
305	-	-	-	-	-	5.148	4.054	2.815	2.611
310	-	-	-	-	-	5.250	4.111	2.930	2.645
315	-	-	-	-	-	5.352	4.169	3.114	2.679
320	-	-	-	-	-	5.454	4.436	3.298	2.713
325	-	-	-	-	-	5.557	4.708	3.482	2.747
330	-	-	-	-	-	5.659	4.980	3.666	2.781

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 135 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	4.524	3.582	2.958	2.441	2.012	1.611	1.301	1.047	0.849
55	4.836	3.818	3.167	2.652	2.186	1.739	1.395	1.116	0.911
60	5.148	4.053	3.376	2.859	2.360	1.868	1.493	1.185	0.973
65	5.460	4.276	3.585	3.049	2.535	1.996	1.595	1.254	1.035
70	5.773	4.485	3.794	3.240	2.709	2.124	1.698	1.324	1.097
75	-	4.694	4.003	3.430	2.878	2.253	1.801	1.393	1.159
80	-	4.903	4.202	3.620	3.032	2.381	1.904	1.461	1.221
85	-	5.112	4.363	3.810	3.187	2.510	2.006	1.527	1.283
90	-	5.321	4.523	4.001	3.341	2.638	2.109	1.594	1.346
95	-	5.530	4.683	4.186	3.496	2.766	2.212	1.660	1.408
100	-	5.653	4.843	4.334	3.650	2.887	2.314	1.726	1.459
105	-	5.761	5.003	4.483	3.805	3.000	2.417	1.792	1.497
110	-	5.870	5.164	4.631	3.959	3.112	2.520	1.859	1.536
115	-	5.978	5.324	4.779	4.114	3.225	2.622	1.925	1.574
120	-	6.087	5.484	4.927	4.252	3.338	2.725	1.991	1.613
125	-	6.195	5.629	5.076	4.381	3.451	2.828	2.057	1.651
130	-	6.303	5.760	5.224	4.511	3.563	2.903	2.124	1.690
135	-	6.412	5.892	5.372	4.640	3.676	2.977	2.190	1.728
140	-	6.520	6.023	5.520	4.769	3.789	3.051	2.256	1.767
145	-	6.629	6.154	5.715	4.898	3.902	3.125	2.323	1.805
150	-	6.737	6.285	5.926	5.027	4.014	3.199	2.389	1.844
155	-	6.846	6.417	6.137	5.156	4.127	3.274	2.455	1.882
160	-	6.954	6.548	6.348	5.285	4.350	3.348	2.521	1.921
165	-	7.062	6.679	6.559	5.415	4.641	3.422	2.588	1.959
170	-	7.171	6.810	6.770	5.544	4.931	3.496	2.654	1.998
175	-	7.279	6.981	6.981	5.673	5.221	3.570	2.720	2.036
180	-	-	7.192	7.192	5.802	5.512	3.644	2.786	2.075
185	-	-	-	-	5.931	5.802	3.719	2.850	2.113
190	-	-	-	-	6.060	6.093	3.793	2.906	2.152
195	-	-	-	-	-	6.383	3.867	2.962	2.190
200	-	-	-	-	-	6.674	3.941	3.019	2.229
205	-	-	-	-	-	6.964	4.015	3.075	2.267
210	-	-	-	-	-	7.255	4.089	3.132	2.306
215	-	-	-	-	-	-	4.164	3.188	2.344
220	-	-	-	-	-	-	4.329	3.245	2.383
225	-	-	-	-	-	-	4.503	3.301	2.421
230	-	-	-	-	-	-	4.676	3.358	2.460
235	-	-	-	-	-	-	4.850	3.414	2.498
240	-	-	-	-	-	-	5.024	3.471	2.537
245	-	-	-	-	-	-	5.197	3.527	2.575
250	-	-	-	-	-	-	5.371	3.584	2.614
255	-	-	-	-	-	-	5.545	3.640	2.652
260	-	-	-	-	-	-	5.719	3.697	2.691
265	-	-	-	-	-	-	5.892	3.753	2.729
270	-	-	-	-	-	-	6.066	3.810	2.768
275	-	-	-	-	-	-	6.240	3.866	2.806
280	-	-	-	-	-	-	6.414	3.922	2.878
285	-	-	-	-	-	-	6.587	3.979	3.010
290	-	-	-	-	-	-	6.761	4.035	3.141
295	-	-	-	-	-	-	6.935	4.092	3.272
300	-	-	-	-	-	-	7.109	4.148	3.403
305	-	-	-	-	-	-	7.282	4.645	3.534
310	-	-	-	-	-	-	-	5.415	3.665
315	-	-	-	-	-	-	-	-	3.797
320	-	-	-	-	-	-	-	-	3.928
325	-	-	-	-	-	-	-	-	4.059
330	-	-	-	-	-	-	-	-	4.228

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Beams: 150 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	-	4.202	3.520	3.004	2.476	2.023	1.632	1.225	1.010
55	-	4.494	3.785	3.258	2.695	2.191	1.777	1.311	1.089
60	-	4.786	4.050	3.511	2.916	2.359	1.922	1.398	1.167
65	-	5.078	4.305	3.765	3.140	2.527	2.067	1.500	1.245
70	-	5.370	4.551	4.019	3.365	2.695	2.212	1.615	1.323
75	-	5.662	4.797	4.266	3.589	2.864	2.357	1.730	1.402
80	-	-	5.044	4.503	3.814	3.036	2.502	1.845	1.483
85	-	-	5.290	4.739	4.039	3.209	2.647	1.960	1.567
90	-	-	5.536	4.976	4.262	3.381	2.792	2.075	1.650
95	-	-	5.783	5.213	4.484	3.553	2.921	2.190	1.734
100	-	-	6.029	5.449	4.705	3.726	3.044	2.305	1.818
105	-	-	-	5.686	4.927	3.898	3.167	2.421	1.902
110	-	-	-	5.923	5.148	4.070	3.291	2.536	1.986
115	-	-	-	-	5.370	4.251	3.414	2.651	2.070
120	-	-	-	-	5.592	4.444	3.537	2.766	2.153
125	-	-	-	-	5.813	4.636	3.660	2.872	2.237
130	-	-	-	-	-	4.829	3.784	2.968	2.321
135	-	-	-	-	-	5.022	3.907	3.063	2.405
140	-	-	-	-	-	5.214	4.030	3.159	2.489
145	-	-	-	-	-	5.407	4.153	3.254	2.573
150	-	-	-	-	-	5.599	4.377	3.350	2.656
155	-	-	-	-	-	5.792	4.616	3.445	2.740
160	-	-	-	-	-	-	4.856	3.541	2.824
165	-	-	-	-	-	-	5.095	3.636	2.888
170	-	-	-	-	-	-	5.334	3.732	2.950
175	-	-	-	-	-	-	5.587	3.827	3.013
180	-	-	-	-	-	-	6.079	3.923	3.075
185	-	-	-	-	-	-	6.571	4.019	3.137
190	-	-	-	-	-	-	7.063	4.114	3.199
195	-	-	-	-	-	-	-	4.537	3.262
200	-	-	-	-	-	-	-	5.422	3.324
205	-	-	-	-	-	-	-	-	3.386
210	-	-	-	-	-	-	-	-	3.448
215	-	-	-	-	-	-	-	-	3.511
220	-	-	-	-	-	-	-	-	3.573
225	-	-	-	-	-	-	-	-	3.635
230	-	-	-	-	-	-	-	-	3.697
235	-	-	-	-	-	-	-	-	3.759
240	-	-	-	-	-	-	-	-	3.822
245	-	-	-	-	-	-	-	-	3.884
250	-	-	-	-	-	-	-	-	3.946
255	-	-	-	-	-	-	-	-	4.008
260	-	-	-	-	-	-	-	-	4.071
265	-	-	-	-	-	-	-	-	4.133
270	-	-	-	-	-	-	-	-	4.239
275	-	-	-	-	-	-	-	-	4.409
280	-	-	-	-	-	-	-	-	4.579
285	-	-	-	-	-	-	-	-	4.749
290	-	-	-	-	-	-	-	-	4.919
295	-	-	-	-	-	-	-	-	5.089
300	-	-	-	-	-	-	-	-	5.259
305	-	-	-	-	-	-	-	-	5.429
310	-	-	-	-	-	-	-	-	5.599
315	-	-	-	-	-	-	-	-	5.769
320	-	-	-	-	-	-	-	-	5.939
325	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

I/H Columns: 15 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
55	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
60	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
65	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
70	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
75	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
80	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
85	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
90	0.189	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
95	0.201	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
100	0.213	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
105	0.224	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
110	0.236	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
115	0.248	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
120	0.260	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
125	0.272	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
130	0.284	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
135	0.296	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
140	0.307	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
145	0.319	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
150	0.331	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
155	0.343	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
160	0.355	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
165	0.367	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
170	0.379	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
175	0.390	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
180	0.402	0.186	0.182	0.182	0.182	0.182	0.182	0.182	0.182
185	0.414	0.195	0.182	0.182	0.182	0.182	0.182	0.182	0.182
190	0.426	0.205	0.182	0.182	0.182	0.182	0.182	0.182	0.182
195	0.438	0.214	0.182	0.182	0.182	0.182	0.182	0.182	0.182
200	0.450	0.223	0.182	0.182	0.182	0.182	0.182	0.182	0.182
205	0.461	0.232	0.182	0.182	0.182	0.182	0.182	0.182	0.182
210	0.473	0.242	0.182	0.182	0.182	0.182	0.182	0.182	0.182
215	0.485	0.251	0.182	0.182	0.182	0.182	0.182	0.182	0.182
220	0.497	0.260	0.182	0.182	0.182	0.182	0.182	0.182	0.182
225	0.509	0.270	0.182	0.182	0.182	0.182	0.182	0.182	0.182
230	0.521	0.279	0.182	0.182	0.182	0.182	0.182	0.182	0.182
235	0.533	0.288	0.182	0.182	0.182	0.182	0.182	0.182	0.182
240	0.544	0.297	0.182	0.182	0.182	0.182	0.182	0.182	0.182
245	0.556	0.307	0.182	0.182	0.182	0.182	0.182	0.182	0.182
250	0.568	0.316	0.182	0.182	0.182	0.182	0.182	0.182	0.182
255	0.580	0.325	0.182	0.182	0.182	0.182	0.182	0.182	0.182
260	0.592	0.334	0.182	0.182	0.182	0.182	0.182	0.182	0.182
265	0.604	0.344	0.182	0.182	0.182	0.182	0.182	0.182	0.182
270	0.616	0.353	0.182	0.182	0.182	0.182	0.182	0.182	0.182
275	0.627	0.362	0.182	0.182	0.182	0.182	0.182	0.182	0.182
280	0.639	0.371	0.182	0.182	0.182	0.182	0.182	0.182	0.182
285	0.651	0.381	0.182	0.182	0.182	0.182	0.182	0.182	0.182
290	0.663	0.390	0.182	0.182	0.182	0.182	0.182	0.182	0.182
295	0.675	0.399	0.182	0.182	0.182	0.182	0.182	0.182	0.182
300	0.687	0.408	0.182	0.182	0.182	0.182	0.182	0.182	0.182
305	0.699	0.418	0.182	0.182	0.182	0.182	0.182	0.182	0.182
310	0.710	0.427	0.182	0.182	0.182	0.182	0.182	0.182	0.182
315	0.722	0.436	0.182	0.182	0.182	0.182	0.182	0.182	0.182
320	0.734	0.445	0.182	0.182	0.182	0.182	0.182	0.182	0.182
325	0.746	0.455	0.182	0.182	0.182	0.182	0.182	0.182	0.182
330	0.758	0.464	0.182	0.182	0.182	0.182	0.182	0.182	0.182
335	0.770	0.473	0.182	0.182	0.182	0.182	0.182	0.182	0.182
340	0.782	0.483	0.182	0.182	0.182	0.182	0.182	0.182	0.182
345	0.793	0.492	0.182	0.182	0.182	0.182	0.182	0.182	0.182
350	0.805	0.501	0.182	0.182	0.182	0.182	0.182	0.182	0.182
355	0.817	0.510	0.182	0.182	0.182	0.182	0.182	0.182	0.182
360	0.829	0.520	0.182	0.182	0.182	0.182	0.182	0.182	0.182
365	0.841	0.529	0.182	0.182	0.182	0.182	0.182	0.182	0.182
370	0.853	0.538	0.182	0.182	0.182	0.182	0.182	0.182	0.182
375	0.865	0.547	0.182	0.182	0.182	0.182	0.182	0.182	0.182

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 30 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.421	0.249	0.182	0.182	0.182	0.182	0.182	0.182	0.182
55	0.442	0.266	0.182	0.182	0.182	0.182	0.182	0.182	0.182
60	0.462	0.283	0.188	0.182	0.182	0.182	0.182	0.182	0.182
65	0.483	0.300	0.202	0.182	0.182	0.182	0.182	0.182	0.182
70	0.504	0.317	0.217	0.182	0.182	0.182	0.182	0.182	0.182
75	0.525	0.333	0.231	0.182	0.182	0.182	0.182	0.182	0.182
80	0.546	0.350	0.245	0.182	0.182	0.182	0.182	0.182	0.182
85	0.566	0.367	0.260	0.187	0.182	0.182	0.182	0.182	0.182
90	0.587	0.384	0.274	0.201	0.182	0.182	0.182	0.182	0.182
95	0.608	0.401	0.288	0.214	0.182	0.182	0.182	0.182	0.182
100	0.629	0.418	0.303	0.228	0.182	0.182	0.182	0.182	0.182
105	0.649	0.434	0.317	0.241	0.182	0.182	0.182	0.182	0.182
110	0.670	0.451	0.331	0.255	0.185	0.182	0.182	0.182	0.182
115	0.691	0.468	0.346	0.269	0.197	0.182	0.182	0.182	0.182
120	0.712	0.485	0.360	0.282	0.209	0.182	0.182	0.182	0.182
125	0.733	0.502	0.374	0.296	0.220	0.182	0.182	0.182	0.182
130	0.753	0.519	0.389	0.310	0.232	0.182	0.182	0.182	0.182
135	0.774	0.536	0.403	0.323	0.244	0.182	0.182	0.182	0.182
140	0.795	0.552	0.417	0.337	0.255	0.182	0.182	0.182	0.182
145	0.816	0.569	0.432	0.351	0.267	0.182	0.182	0.182	0.182
150	0.836	0.586	0.446	0.364	0.278	0.182	0.182	0.182	0.182
155	0.857	0.603	0.461	0.378	0.290	0.182	0.182	0.182	0.182
160	0.878	0.620	0.475	0.392	0.302	0.182	0.182	0.182	0.182
165	0.899	0.637	0.489	0.405	0.313	0.182	0.182	0.182	0.182
170	0.920	0.653	0.504	0.419	0.325	0.182	0.182	0.182	0.182
175	0.940	0.670	0.518	0.433	0.337	0.182	0.182	0.182	0.182
180	0.961	0.687	0.532	0.446	0.348	0.187	0.182	0.182	0.182
185	0.982	0.704	0.547	0.460	0.360	0.198	0.182	0.182	0.182
190	1.003	0.721	0.561	0.473	0.372	0.208	0.182	0.182	0.182
195	1.023	0.738	0.575	0.487	0.383	0.218	0.182	0.182	0.182
200	1.044	0.755	0.590	0.501	0.395	0.228	0.182	0.182	0.182
205	1.065	0.771	0.604	0.514	0.406	0.239	0.182	0.182	0.182
210	1.086	0.788	0.618	0.528	0.418	0.249	0.182	0.182	0.182
215	1.106	0.805	0.633	0.542	0.430	0.259	0.182	0.182	0.182
220	1.127	0.822	0.647	0.555	0.441	0.269	0.182	0.182	0.182
225	1.148	0.839	0.661	0.569	0.453	0.280	0.182	0.182	0.182
230	1.169	0.856	0.676	0.583	0.465	0.290	0.182	0.182	0.182
235	1.190	0.872	0.690	0.596	0.476	0.300	0.182	0.182	0.182
240	1.210	0.889	0.704	0.610	0.488	0.310	0.182	0.182	0.182
245	1.231	0.906	0.719	0.624	0.500	0.321	0.182	0.182	0.182
250	1.252	0.923	0.733	0.637	0.511	0.331	0.182	0.182	0.182
255	1.273	0.940	0.748	0.651	0.523	0.341	0.182	0.182	0.182
260	1.293	0.957	0.762	0.664	0.534	0.351	0.182	0.182	0.182
265	1.314	0.973	0.776	0.678	0.546	0.361	0.182	0.182	0.182
270	1.335	0.990	0.791	0.692	0.558	0.372	0.182	0.182	0.182
275	1.356	1.007	0.805	0.705	0.569	0.382	0.182	0.182	0.182
280	1.377	1.024	0.819	0.719	0.581	0.392	0.182	0.182	0.182
285	1.397	1.041	0.834	0.733	0.593	0.402	0.182	0.182	0.182
290	1.418	1.058	0.848	0.746	0.604	0.413	0.182	0.182	0.182
295	1.439	1.075	0.862	0.760	0.616	0.423	0.182	0.182	0.182
300	1.460	1.091	0.877	0.774	0.628	0.433	0.182	0.182	0.182
305	1.480	1.108	0.891	0.787	0.639	0.443	0.182	0.182	0.182
310	1.501	1.125	0.905	0.801	0.651	0.454	0.182	0.182	0.182
315	1.526	1.142	0.920	0.815	0.663	0.464	0.182	0.182	0.182
320	1.569	1.159	0.934	0.828	0.674	0.474	0.182	0.182	0.182
325	1.612	1.176	0.948	0.842	0.686	0.484	0.182	0.182	0.182
330	1.655	1.192	0.963	0.856	0.697	0.495	0.182	0.182	0.182
335	1.698	1.209	0.977	0.869	0.709	0.505	0.182	0.182	0.182
340	1.741	1.226	0.992	0.883	0.721	0.515	0.192	0.182	0.182
345	1.784	1.243	1.006	0.896	0.732	0.525	0.201	0.182	0.182
350	1.827	1.260	1.020	0.910	0.744	0.535	0.211	0.182	0.182
355	1.870	1.277	1.035	0.924	0.756	0.546	0.220	0.182	0.182
360	1.913	1.294	1.049	0.937	0.767	0.556	0.230	0.182	0.182
365	1.956	1.310	1.063	0.951	0.779	0.566	0.240	0.182	0.182
370	1.999	1.327	1.078	0.965	0.791	0.576	0.249	0.182	0.182
375	2.042	1.344	1.092	0.978	0.802	0.587	0.259	0.182	0.182

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 45 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	0.817	0.584	0.432	0.318	0.236	0.182	0.182	0.182	0.182
55	0.878	0.614	0.450	0.337	0.253	0.182	0.182	0.182	0.182
60	0.938	0.644	0.469	0.356	0.270	0.192	0.182	0.182	0.182
65	0.998	0.673	0.488	0.375	0.287	0.207	0.182	0.182	0.182
70	1.059	0.703	0.507	0.394	0.304	0.222	0.182	0.182	0.182
75	1.119	0.732	0.525	0.413	0.320	0.236	0.186	0.182	0.182
80	1.179	0.762	0.544	0.431	0.337	0.251	0.199	0.182	0.182
85	1.239	0.792	0.563	0.450	0.354	0.266	0.211	0.182	0.182
90	1.300	0.821	0.581	0.469	0.371	0.280	0.223	0.182	0.182
95	1.360	0.851	0.600	0.488	0.387	0.295	0.236	0.182	0.182
100	1.420	0.881	0.619	0.507	0.404	0.310	0.248	0.182	0.182
105	1.481	0.910	0.637	0.526	0.421	0.324	0.261	0.182	0.182
110	1.533	0.940	0.656	0.544	0.438	0.339	0.273	0.183	0.182
115	1.573	0.970	0.675	0.563	0.455	0.354	0.286	0.193	0.182
120	1.613	0.999	0.694	0.582	0.471	0.368	0.298	0.204	0.182
125	1.652	1.029	0.712	0.601	0.488	0.383	0.311	0.214	0.182
130	1.692	1.059	0.731	0.620	0.505	0.398	0.323	0.225	0.182
135	1.732	1.088	0.750	0.639	0.522	0.412	0.335	0.235	0.182
140	1.771	1.118	0.768	0.657	0.539	0.427	0.348	0.246	0.182
145	1.811	1.148	0.787	0.676	0.555	0.442	0.360	0.256	0.182
150	1.851	1.177	0.806	0.695	0.572	0.456	0.373	0.267	0.182
155	1.891	1.207	0.824	0.714	0.589	0.471	0.385	0.277	0.182
160	1.930	1.236	0.843	0.733	0.606	0.486	0.398	0.288	0.182
165	1.970	1.266	0.862	0.752	0.622	0.500	0.410	0.298	0.182
170	2.010	1.296	0.880	0.770	0.639	0.515	0.422	0.309	0.182
175	2.050	1.325	0.899	0.789	0.656	0.530	0.435	0.320	0.182
180	2.089	1.355	0.918	0.808	0.673	0.544	0.447	0.330	0.182
185	2.129	1.385	0.937	0.827	0.690	0.559	0.460	0.341	0.182
190	2.169	1.414	0.955	0.846	0.706	0.574	0.472	0.351	0.182
195	2.208	1.444	0.974	0.865	0.723	0.588	0.485	0.362	0.182
200	2.248	1.474	0.993	0.883	0.740	0.603	0.497	0.372	0.190
205	2.288	1.503	1.011	0.902	0.757	0.618	0.510	0.383	0.199
210	2.328	1.537	1.030	0.921	0.773	0.632	0.522	0.393	0.208
215	2.367	1.574	1.049	0.940	0.790	0.647	0.534	0.404	0.217
220	2.407	1.611	1.067	0.959	0.807	0.662	0.547	0.414	0.227
225	2.447	1.648	1.086	0.978	0.824	0.676	0.559	0.425	0.236
230	2.486	1.685	1.105	0.996	0.841	0.691	0.572	0.435	0.245
235	2.526	1.722	1.124	1.015	0.857	0.706	0.584	0.446	0.254
240	2.566	1.759	1.142	1.034	0.874	0.720	0.597	0.456	0.263
245	2.606	1.796	1.161	1.053	0.891	0.735	0.609	0.467	0.272
250	2.645	1.833	1.180	1.072	0.908	0.750	0.621	0.477	0.282
255	2.685	1.870	1.198	1.091	0.925	0.764	0.634	0.488	0.291
260	2.725	1.907	1.217	1.110	0.941	0.779	0.646	0.498	0.300
265	2.765	1.944	1.236	1.128	0.958	0.794	0.659	0.509	0.309
270	2.804	1.982	1.254	1.147	0.975	0.808	0.671	0.519	0.318
275	2.844	2.019	1.273	1.166	0.992	0.823	0.684	0.530	0.327
280	2.884	2.056	1.292	1.185	1.008	0.838	0.696	0.540	0.337
285	2.923	2.093	1.310	1.204	1.025	0.852	0.709	0.551	0.346
290	2.961	2.130	1.329	1.223	1.042	0.867	0.721	0.562	0.355
295	2.998	2.167	1.348	1.241	1.059	0.882	0.733	0.572	0.364
300	3.036	2.204	1.367	1.260	1.076	0.897	0.746	0.583	0.373
305	3.074	2.241	1.385	1.279	1.092	0.911	0.758	0.593	0.382
310	3.112	2.278	1.404	1.298	1.109	0.926	0.771	0.604	0.392
315	3.149	2.315	1.423	1.317	1.126	0.941	0.783	0.614	0.401
320	3.187	2.352	1.441	1.336	1.143	0.955	0.796	0.625	0.410
325	3.225	2.389	1.460	1.354	1.160	0.970	0.808	0.635	0.419
330	3.262	2.426	1.479	1.373	1.176	0.985	0.820	0.646	0.428
335	3.300	2.464	1.497	1.392	1.193	0.999	0.833	0.656	0.437
340	3.338	2.501	1.516	1.411	1.210	1.014	0.845	0.667	0.447
345	3.376	2.538	1.574	1.430	1.227	1.029	0.858	0.677	0.456
350	3.413	2.575	1.636	1.449	1.243	1.043	0.870	0.688	0.465
355	3.451	2.612	1.698	1.467	1.260	1.058	0.883	0.698	0.474
360	3.489	2.649	1.760	1.486	1.277	1.073	0.895	0.709	0.483
365	3.526	2.686	1.822	1.505	1.294	1.087	0.907	0.719	0.492
370	3.564	2.723	1.884	1.534	1.311	1.102	0.920	0.730	0.502
375	3.602	2.760	1.946	1.585	1.327	1.117	0.932	0.740	0.511

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 60 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	1.214	0.904	0.714	0.595	0.492	0.373	0.271	0.182	0.182
55	1.314	0.965	0.754	0.628	0.512	0.390	0.288	0.187	0.182
60	1.413	1.027	0.795	0.662	0.531	0.408	0.304	0.201	0.182
65	1.513	1.088	0.835	0.696	0.550	0.426	0.320	0.216	0.182
70	1.628	1.150	0.875	0.729	0.569	0.444	0.336	0.230	0.182
75	1.743	1.212	0.915	0.763	0.589	0.462	0.353	0.245	0.183
80	1.858	1.273	0.955	0.797	0.608	0.480	0.369	0.259	0.195
85	1.973	1.335	0.995	0.830	0.627	0.498	0.385	0.274	0.208
90	2.088	1.396	1.035	0.864	0.647	0.516	0.401	0.288	0.220
95	2.203	1.458	1.076	0.898	0.666	0.534	0.418	0.303	0.233
100	2.318	1.519	1.116	0.931	0.685	0.552	0.434	0.317	0.245
105	2.434	1.576	1.156	0.965	0.705	0.569	0.450	0.332	0.258
110	2.549	1.633	1.196	0.999	0.724	0.587	0.466	0.346	0.270
115	2.664	1.690	1.236	1.033	0.743	0.605	0.483	0.361	0.283
120	2.779	1.747	1.276	1.066	0.762	0.623	0.499	0.375	0.295
125	2.894	1.804	1.316	1.100	0.782	0.641	0.515	0.390	0.308
130	2.940	1.861	1.357	1.134	0.801	0.659	0.531	0.404	0.321
135	2.970	1.918	1.397	1.167	0.820	0.677	0.548	0.419	0.333
140	3.001	1.975	1.437	1.201	0.840	0.695	0.564	0.433	0.346
145	3.031	2.032	1.477	1.235	0.859	0.713	0.580	0.448	0.358
150	3.062	2.089	1.517	1.268	0.878	0.731	0.596	0.462	0.371
155	3.092	2.146	1.555	1.302	0.897	0.748	0.613	0.477	0.383
160	3.122	2.203	1.592	1.336	0.917	0.766	0.629	0.491	0.396
165	3.153	2.260	1.630	1.369	0.936	0.784	0.645	0.506	0.408
170	3.183	2.317	1.668	1.403	0.955	0.802	0.661	0.520	0.421
175	3.214	2.374	1.705	1.437	0.975	0.820	0.678	0.535	0.433
180	3.244	2.431	1.743	1.470	0.994	0.838	0.694	0.549	0.446
185	3.275	2.488	1.780	1.504	1.013	0.856	0.710	0.564	0.458
190	3.305	2.545	1.818	1.540	1.033	0.874	0.726	0.578	0.471
195	3.336	2.602	1.856	1.578	1.052	0.892	0.743	0.593	0.483
200	3.366	2.659	1.893	1.616	1.071	0.910	0.759	0.607	0.496
205	3.396	2.716	1.931	1.653	1.090	0.927	0.775	0.622	0.509
210	3.427	2.773	1.968	1.691	1.110	0.945	0.791	0.636	0.521
215	3.457	2.830	2.006	1.729	1.129	0.963	0.808	0.651	0.534
220	3.488	2.887	2.044	1.767	1.148	0.981	0.824	0.665	0.546
225	3.518	2.934	2.081	1.805	1.168	0.999	0.840	0.680	0.559
230	3.549	2.972	2.119	1.842	1.187	1.017	0.857	0.694	0.571
235	3.579	3.009	2.156	1.880	1.206	1.035	0.873	0.709	0.584
240	3.609	3.047	2.194	1.918	1.226	1.053	0.889	0.723	0.596
245	3.640	3.085	2.232	1.956	1.245	1.071	0.905	0.738	0.609
250	3.670	3.123	2.269	1.993	1.264	1.089	0.922	0.752	0.621
255	3.701	3.160	2.307	2.031	1.283	1.106	0.938	0.767	0.634
260	3.731	3.198	2.345	2.069	1.303	1.124	0.954	0.781	0.646
265	3.762	3.236	2.382	2.107	1.322	1.142	0.970	0.796	0.659
270	3.792	3.274	2.420	2.145	1.341	1.160	0.987	0.810	0.671
275	3.822	3.311	2.457	2.182	1.361	1.178	1.003	0.825	0.684
280	3.853	3.349	2.495	2.220	1.380	1.196	1.019	0.839	0.697
285	3.883	3.387	2.533	2.258	1.399	1.214	1.035	0.854	0.709
290	3.914	3.425	2.570	2.296	1.419	1.232	1.052	0.868	0.722
295	3.944	3.462	2.608	2.333	1.438	1.250	1.068	0.883	0.734
300	3.975	3.500	2.645	2.371	1.457	1.268	1.084	0.897	0.747
305	4.005	3.538	2.683	2.409	1.476	1.285	1.100	0.912	0.759
310	4.035	3.576	2.721	2.447	1.496	1.303	1.117	0.926	0.772
315	4.066	3.614	2.758	2.485	1.515	1.321	1.133	0.941	0.784
320	4.096	3.651	2.796	2.522	1.578	1.339	1.149	0.955	0.797
325	4.127	3.689	2.833	2.560	1.648	1.357	1.165	0.970	0.809
330	4.157	3.727	2.871	2.598	1.719	1.375	1.182	0.984	0.822
335	4.188	3.765	2.909	2.636	1.789	1.393	1.198	0.999	0.834
340	4.218	3.802	2.988	2.673	1.860	1.411	1.214	1.013	0.847
345	4.274	3.840	3.075	2.711	1.930	1.429	1.230	1.028	0.859
350	4.339	3.878	3.163	2.749	2.001	1.447	1.247	1.042	0.872
355	4.405	3.916	3.250	2.787	2.071	1.464	1.263	1.057	0.884
360	4.471	3.953	3.338	2.824	2.142	1.482	1.279	1.071	0.897
365	4.537	3.991	3.425	2.862	2.212	1.500	1.295	1.086	0.910
370	4.603	4.029	3.513	2.900	2.283	1.519	1.312	1.100	0.922
375	4.668	4.067	3.600	2.961	2.353	1.591	1.328	1.115	0.935

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 75 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	1.725	1.223	0.992	0.861	0.731	0.600	0.481	0.348	0.222
55	1.918	1.317	1.059	0.921	0.774	0.626	0.500	0.365	0.238
60	2.110	1.410	1.127	0.982	0.816	0.653	0.518	0.382	0.254
65	2.303	1.504	1.195	1.042	0.859	0.679	0.536	0.399	0.270
70	2.496	1.627	1.263	1.103	0.901	0.706	0.554	0.416	0.286
75	2.688	1.756	1.331	1.163	0.944	0.732	0.572	0.433	0.302
80	2.881	1.885	1.399	1.223	0.986	0.759	0.590	0.451	0.319
85	2.985	2.014	1.467	1.284	1.029	0.785	0.608	0.468	0.335
90	3.071	2.143	1.540	1.344	1.072	0.812	0.626	0.485	0.351
95	3.157	2.272	1.631	1.404	1.114	0.838	0.645	0.502	0.367
100	3.243	2.401	1.721	1.465	1.157	0.864	0.663	0.519	0.383
105	3.328	2.531	1.812	1.525	1.199	0.891	0.681	0.536	0.399
110	3.414	2.660	1.902	1.583	1.242	0.917	0.699	0.553	0.415
115	3.500	2.789	1.993	1.641	1.284	0.944	0.717	0.570	0.431
120	3.586	2.916	2.083	1.700	1.327	0.970	0.735	0.587	0.447
125	3.671	2.953	2.174	1.758	1.369	0.997	0.753	0.604	0.463
130	3.757	2.990	2.265	1.816	1.412	1.023	0.771	0.621	0.479
135	3.843	3.028	2.355	1.875	1.454	1.050	0.789	0.638	0.496
140	3.928	3.065	2.446	1.933	1.497	1.076	0.808	0.656	0.512
145	4.014	3.102	2.536	1.991	1.537	1.103	0.826	0.673	0.528
150	4.100	3.140	2.627	2.050	1.575	1.129	0.844	0.690	0.544
155	4.186	3.177	2.717	2.108	1.613	1.156	0.862	0.707	0.560
160	4.257	3.214	2.808	2.166	1.651	1.182	0.880	0.724	0.576
165	4.316	3.251	2.898	2.225	1.689	1.209	0.898	0.741	0.592
170	4.374	3.289	2.948	2.283	1.726	1.235	0.916	0.758	0.608
175	4.433	3.326	2.989	2.341	1.764	1.262	0.934	0.775	0.624
180	4.491	3.363	3.030	2.399	1.802	1.288	0.952	0.792	0.640
185	4.550	3.401	3.071	2.458	1.840	1.315	0.971	0.809	0.656
190	4.608	3.438	3.112	2.516	1.878	1.341	0.989	0.826	0.673
195	4.667	3.475	3.153	2.574	1.916	1.367	1.007	0.843	0.689
200	4.725	3.513	3.194	2.633	1.954	1.394	1.025	0.861	0.705
205	4.784	3.550	3.235	2.691	1.991	1.420	1.043	0.878	0.721
210	4.842	3.587	3.276	2.749	2.029	1.447	1.061	0.895	0.737
215	4.901	3.624	3.317	2.808	2.067	1.473	1.079	0.912	0.753
220	4.959	3.662	3.357	2.866	2.105	1.500	1.097	0.929	0.769
225	5.018	3.699	3.398	2.923	2.143	1.533	1.116	0.946	0.785
230	5.076	3.736	3.439	2.970	2.181	1.583	1.134	0.963	0.801
235	5.135	3.774	3.480	3.018	2.219	1.632	1.152	0.980	0.817
240	5.193	3.811	3.521	3.065	2.256	1.681	1.170	0.997	0.833
245	5.252	3.848	3.562	3.112	2.294	1.730	1.188	1.014	0.850
250	5.310	3.886	3.603	3.160	2.332	1.779	1.206	1.031	0.866
255	5.369	3.923	3.644	3.207	2.370	1.828	1.224	1.048	0.882
260	5.427	3.960	3.685	3.255	2.408	1.877	1.242	1.066	0.898
265	5.486	3.997	3.726	3.302	2.446	1.927	1.260	1.083	0.914
270	5.544	4.035	3.766	3.350	2.483	1.976	1.279	1.100	0.930
275	5.603	4.072	3.807	3.397	2.521	2.025	1.297	1.117	0.946
280	5.661	4.109	3.848	3.445	2.559	2.074	1.315	1.134	0.962
285	5.699	4.147	3.889	3.492	2.597	2.123	1.333	1.151	0.978
290	5.738	4.184	3.930	3.540	2.635	2.172	1.351	1.168	0.994
295	5.777	4.221	3.971	3.587	2.673	2.221	1.369	1.185	1.010
300	5.815	4.283	4.012	3.635	2.711	2.271	1.387	1.202	1.027
305	5.854	4.349	4.053	3.682	2.748	2.320	1.405	1.219	1.043
310	5.892	4.415	4.094	3.729	2.786	2.369	1.423	1.236	1.059
315	5.931	4.481	4.135	3.777	2.824	2.418	1.442	1.253	1.075
320	5.969	4.546	4.175	3.824	2.862	2.467	1.460	1.271	1.091
325	6.008	4.612	4.216	3.872	2.900	2.516	1.478	1.288	1.107
330	6.047	4.678	4.280	3.919	2.991	2.565	1.496	1.305	1.123
335	6.085	4.744	4.351	3.967	3.117	2.614	1.514	1.322	1.139
340	6.124	4.810	4.423	4.014	3.243	2.664	1.588	1.339	1.155
345	6.162	4.876	4.494	4.062	3.370	2.713	1.678	1.356	1.171
350	6.201	4.942	4.566	4.109	3.496	2.762	1.768	1.373	1.187
355	6.239	5.008	4.637	4.157	3.622	2.811	1.859	1.390	1.204
360	6.278	5.074	4.709	4.204	3.749	2.860	1.949	1.407	1.220
365	6.317	5.140	4.780	4.273	3.875	2.909	2.039	1.424	1.236
370	6.355	5.206	4.851	4.363	4.001	3.055	2.129	1.441	1.252
375	6.394	5.272	4.923	4.453	4.127	3.213	2.219	1.459	1.268

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 90 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	2.419	1.612	1.269	1.128	0.969	0.816	0.682	0.537	0.397
55	2.678	1.815	1.365	1.215	1.036	0.864	0.714	0.556	0.415
60	2.931	2.018	1.460	1.302	1.102	0.912	0.745	0.574	0.433
65	3.126	2.222	1.582	1.389	1.169	0.961	0.777	0.592	0.451
70	3.322	2.425	1.743	1.476	1.235	1.009	0.809	0.611	0.469
75	3.517	2.628	1.905	1.577	1.301	1.057	0.840	0.629	0.487
80	3.712	2.831	2.066	1.693	1.368	1.105	0.872	0.647	0.505
85	3.907	2.978	2.227	1.808	1.434	1.153	0.904	0.666	0.523
90	4.102	3.085	2.389	1.923	1.501	1.201	0.935	0.684	0.541
95	4.273	3.192	2.550	2.039	1.581	1.249	0.967	0.702	0.559
100	4.398	3.298	2.711	2.154	1.666	1.297	0.999	0.721	0.577
105	4.524	3.405	2.873	2.269	1.752	1.346	1.031	0.739	0.595
110	4.650	3.512	2.991	2.385	1.837	1.394	1.062	0.757	0.613
115	4.776	3.619	3.094	2.500	1.922	1.442	1.094	0.776	0.631
120	4.902	3.726	3.198	2.615	2.008	1.490	1.126	0.794	0.649
125	5.028	3.832	3.301	2.731	2.093	1.543	1.157	0.812	0.667
130	5.154	3.939	3.404	2.846	2.178	1.601	1.189	0.831	0.686
135	5.279	4.046	3.507	2.973	2.263	1.660	1.221	0.849	0.704
140	5.405	4.153	3.610	3.117	2.349	1.719	1.252	0.867	0.722
145	5.531	4.260	3.713	3.262	2.434	1.778	1.284	0.886	0.740
150	5.657	4.369	3.817	3.406	2.519	1.837	1.316	0.904	0.758
155	5.687	4.478	3.920	3.551	2.605	1.896	1.348	0.922	0.776
160	5.715	4.586	4.023	3.695	2.690	1.955	1.379	0.941	0.794
165	5.743	4.695	4.126	3.839	2.775	2.014	1.411	0.959	0.812
170	5.771	4.804	4.230	3.984	2.861	2.073	1.443	0.977	0.830
175	5.798	4.913	4.362	4.128	2.963	2.132	1.474	0.996	0.848
180	5.826	5.021	4.494	4.273	3.094	2.190	1.506	1.014	0.866
185	5.854	5.130	4.625	4.417	3.225	2.249	1.546	1.032	0.884
190	5.882	5.239	4.757	4.561	3.356	2.308	1.591	1.051	0.902
195	5.910	5.348	4.889	4.706	3.487	2.367	1.635	1.069	0.920
200	5.937	5.456	5.021	4.850	3.618	2.426	1.680	1.088	0.938
205	5.965	5.565	5.153	4.995	3.749	2.485	1.725	1.106	0.956
210	5.993	5.664	5.284	5.139	3.880	2.544	1.770	1.124	0.974
215	6.021	5.692	5.416	5.283	4.011	2.603	1.815	1.143	0.992
220	6.049	5.721	5.548	5.428	4.142	2.662	1.860	1.161	1.010
225	6.076	5.750	5.664	5.572	4.273	2.721	1.904	1.179	1.028
230	6.104	5.779	5.694	5.672	4.404	2.780	1.949	1.198	1.046
235	6.132	5.808	5.723	5.702	4.535	2.838	1.994	1.216	1.064
240	6.160	5.837	5.752	5.732	4.666	2.897	2.039	1.234	1.082
245	6.188	5.866	5.781	5.762	4.797	2.964	2.084	1.253	1.101
250	6.215	5.894	5.811	5.792	4.928	3.035	2.128	1.271	1.119
255	6.243	5.923	5.840	5.822	5.059	3.106	2.173	1.289	1.137
260	6.271	5.952	5.869	5.852	5.191	3.176	2.218	1.308	1.155
265	6.299	5.981	5.898	5.882	5.322	3.247	2.263	1.326	1.173
270	6.327	6.010	5.927	5.912	5.453	3.317	2.308	1.344	1.191
275	6.354	6.039	5.957	5.942	5.584	3.388	2.353	1.363	1.209
280	6.382	6.067	5.986	5.972	5.676	3.459	2.397	1.381	1.227
285	6.410	6.096	6.015	6.002	5.714	3.529	2.442	1.399	1.245
290	6.438	6.125	6.044	6.032	5.753	3.600	2.487	1.418	1.263
295	6.466	6.154	6.074	6.062	5.791	3.670	2.532	1.436	1.281
300	6.493	6.183	6.103	6.092	5.829	3.741	2.577	1.454	1.299
305	6.521	6.212	6.132	6.123	5.868	3.812	2.621	1.473	1.317
310	6.549	6.240	6.161	6.153	5.906	3.882	2.666	1.491	1.335
315	6.577	6.269	6.190	6.183	5.945	3.953	2.711	1.509	1.353
320	6.605	6.298	6.220	6.213	5.983	4.023	2.756	1.575	1.371
325	6.632	6.327	6.249	6.243	6.021	4.094	2.801	1.684	1.389
330	6.660	6.356	6.278	6.273	6.060	4.165	2.846	1.793	1.407
335	6.688	6.385	6.307	6.303	6.098	4.239	2.890	1.902	1.425
340	6.716	6.413	6.337	6.333	6.136	4.343	3.053	2.010	1.443
345	6.744	6.442	6.366	6.363	6.175	4.446	3.359	2.119	1.461
350	6.771	6.471	6.395	6.393	6.213	4.549	3.665	2.228	1.479
355	6.799	6.500	6.424	6.423	6.251	4.653	3.972	2.336	1.497
360	6.827	6.529	6.453	6.453	6.290	4.756	4.243	2.445	1.515
365	6.855	6.558	6.483	6.483	6.328	4.860	4.337	2.554	1.689
370	6.883	6.586	6.513	6.513	6.367	4.963	4.431	2.663	1.887
375	6.910	6.615	6.543	6.543	6.405	5.067	4.525	2.771	2.085

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 105 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	3.268	2.263	1.635	1.394	1.208	1.033	0.877	0.714	0.569
55	3.564	2.524	1.848	1.508	1.298	1.102	0.929	0.749	0.592
60	3.860	2.789	2.078	1.681	1.388	1.172	0.980	0.784	0.615
65	4.157	3.022	2.308	1.859	1.479	1.242	1.031	0.819	0.638
70	4.377	3.225	2.538	2.038	1.597	1.312	1.082	0.854	0.661
75	4.574	3.427	2.768	2.217	1.737	1.382	1.134	0.888	0.685
80	4.771	3.630	2.985	2.396	1.877	1.451	1.185	0.923	0.708
85	4.968	3.833	3.179	2.574	2.017	1.523	1.236	0.958	0.731
90	5.165	4.036	3.374	2.753	2.158	1.628	1.287	0.993	0.754
95	5.362	4.237	3.569	2.927	2.298	1.734	1.339	1.028	0.777
100	5.559	4.405	3.763	3.053	2.438	1.840	1.390	1.063	0.800
105	5.695	4.573	3.958	3.179	2.578	1.946	1.441	1.098	0.823
110	5.766	4.740	4.152	3.305	2.718	2.052	1.492	1.132	0.846
115	5.837	4.908	4.338	3.431	2.859	2.158	1.555	1.167	0.869
120	5.909	5.076	4.519	3.557	2.987	2.264	1.630	1.202	0.892
125	5.980	5.244	4.699	3.684	3.108	2.369	1.704	1.237	0.915
130	6.051	5.411	4.879	3.810	3.229	2.475	1.779	1.272	0.938
135	6.123	5.579	5.059	3.936	3.349	2.581	1.853	1.307	0.961
140	6.194	5.674	5.240	4.062	3.470	2.687	1.927	1.342	0.984
145	6.265	5.701	5.420	4.188	3.591	2.793	2.002	1.376	1.007
150	6.337	5.728	5.600	4.643	3.711	2.899	2.076	1.411	1.030
155	6.408	5.755	5.678	5.245	3.832	3.104	2.151	1.446	1.054
160	6.479	5.782	5.706	5.669	3.953	3.327	2.225	1.481	1.077
165	6.550	5.809	5.734	5.698	4.073	3.551	2.300	1.516	1.100
170	6.622	5.837	5.761	5.727	4.194	3.774	2.374	1.690	1.123
175	6.693	5.864	5.789	5.755	4.564	3.998	2.448	1.872	1.146
180	6.764	5.891	5.817	5.784	5.028	4.221	2.523	2.055	1.169
185	6.836	5.918	5.844	5.813	5.491	4.444	2.597	2.237	1.192
190	6.907	5.945	5.872	5.842	5.681	4.668	2.672	2.420	1.215
195	6.978	5.972	5.899	5.871	5.713	4.891	2.746	2.602	1.238
200	-	5.999	5.927	5.900	5.745	5.115	2.821	2.785	1.261
205	-	6.026	5.955	5.928	5.778	5.338	2.967	2.967	1.284
210	-	6.053	5.982	5.957	5.810	5.561	3.169	3.150	1.307
215	-	6.080	6.010	5.986	5.843	5.678	3.516	3.332	1.330
220	-	6.107	6.038	6.015	5.875	5.710	3.863	3.515	1.353
225	-	6.134	6.065	6.044	5.907	5.743	4.210	3.697	1.376
230	-	6.162	6.093	6.073	5.940	5.775	4.558	3.880	1.399
235	-	6.189	6.121	6.101	5.972	5.807	4.905	4.062	1.423
240	-	6.216	6.148	6.130	6.005	5.840	5.252	4.245	1.446
245	-	6.243	6.176	6.159	6.037	5.872	5.599	4.428	1.469
250	-	6.270	6.203	6.188	6.069	5.904	5.687	4.610	1.492
255	-	6.297	6.231	6.217	6.102	5.936	5.720	4.793	1.515
260	-	6.324	6.259	6.246	6.134	5.969	5.753	4.975	1.634
265	-	6.351	6.286	6.274	6.166	6.001	5.786	5.158	1.768
270	-	6.378	6.314	6.303	6.199	6.033	5.819	5.340	1.902
275	-	6.405	6.342	6.332	6.231	6.066	5.853	5.523	2.036
280	-	6.432	6.369	6.361	6.264	6.098	5.886	5.668	2.171
285	-	6.460	6.397	6.390	6.296	6.130	5.919	5.701	2.305
290	-	6.487	6.424	6.419	6.328	6.163	5.952	5.734	2.439
295	-	6.514	6.452	6.447	6.361	6.195	5.985	5.767	2.574
300	-	6.541	6.480	6.476	6.393	6.227	6.018	5.800	2.708
305	-	6.568	6.507	6.505	6.426	6.259	6.051	5.833	2.842
310	-	6.595	6.535	6.534	6.458	6.292	6.084	5.866	2.976
315	-	6.622	6.563	6.563	6.490	6.324	6.117	5.899	3.111
320	-	6.649	6.592	6.592	6.523	6.356	6.150	5.932	3.245
325	-	6.676	6.621	6.621	6.555	6.389	6.183	5.965	3.379
330	-	6.703	6.649	6.649	6.588	6.421	6.216	5.998	3.514
335	-	6.730	6.678	6.678	6.620	6.453	6.249	6.031	3.648
340	-	6.757	6.707	6.707	6.652	6.486	6.282	6.064	3.782
345	-	6.785	6.736	6.736	6.685	6.518	6.315	6.097	3.916
350	-	6.812	6.765	6.765	6.717	6.550	6.348	6.130	4.051
355	-	6.839	6.794	6.794	6.750	6.582	6.381	6.163	4.185
360	-	6.866	6.822	6.822	6.782	6.615	6.414	6.196	4.290
365	-	6.893	6.851	6.851	6.814	6.647	6.447	6.229	4.381
370	-	6.920	6.880	6.880	6.847	6.679	6.480	6.262	4.473
375	-	6.947	6.909	6.909	6.879	6.712	6.513	6.295	4.564

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 120 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	4.170	2.987	2.258	1.841	1.408	1.249	1.073	0.890	0.732
55	4.437	3.287	2.520	2.069	1.598	1.341	1.144	0.942	0.772
60	4.704	3.587	2.808	2.300	1.796	1.432	1.215	0.995	0.811
65	4.971	3.887	3.106	2.531	1.993	1.527	1.285	1.047	0.850
70	5.239	4.186	3.410	2.761	2.190	1.683	1.356	1.100	0.890
75	5.506	4.423	3.714	2.984	2.388	1.838	1.427	1.152	0.929
80	5.773	4.650	4.018	3.192	2.585	1.994	1.498	1.205	0.969
85	6.040	4.877	4.299	3.400	2.783	2.150	1.602	1.257	1.008
90	-	5.104	4.529	3.608	2.980	2.305	1.719	1.310	1.047
95	-	5.330	4.759	3.816	3.178	2.461	1.836	1.362	1.087
100	-	5.557	4.989	4.024	3.376	2.616	1.953	1.415	1.126
105	-	5.696	5.219	4.237	3.574	2.772	2.070	1.467	1.165
110	-	5.761	5.450	4.671	3.772	2.929	2.187	1.520	1.205
115	-	5.826	5.664	5.105	3.970	3.102	2.304	1.609	1.244
120	-	5.891	5.712	5.538	4.168	3.275	2.422	1.698	1.283
125	-	5.956	5.760	5.695	4.489	3.447	2.539	1.786	1.323
130	-	6.021	5.808	5.744	4.862	3.620	2.656	1.875	1.362
135	-	6.086	5.855	5.793	5.235	3.793	2.773	1.964	1.402
140	-	6.151	5.903	5.841	5.608	3.966	2.890	2.052	1.441
145	-	6.216	5.951	5.890	5.701	4.139	3.219	2.141	1.480
150	-	6.281	5.999	5.939	5.749	4.629	3.604	2.229	1.531
155	-	6.346	6.047	5.988	5.797	5.452	3.989	2.318	1.826
160	-	6.411	6.095	6.036	5.845	5.684	4.374	2.407	2.120
165	-	6.476	6.142	6.085	5.893	5.715	4.759	2.495	2.415
170	-	6.541	6.190	6.134	5.940	5.746	5.145	2.710	2.710
175	-	6.606	6.238	6.183	5.988	5.778	5.530	3.004	3.004
180	-	6.671	6.286	6.231	6.036	5.809	5.680	3.299	3.299
185	-	6.736	6.334	6.280	6.084	5.841	5.711	3.594	3.594
190	-	6.801	6.382	6.329	6.132	5.872	5.742	3.889	3.889
195	-	6.866	6.429	6.378	6.180	5.904	5.773	5.358	4.183
200	-	6.931	6.477	6.426	6.228	5.935	5.803	5.685	4.478
205	-	6.996	6.525	6.475	6.275	5.967	5.834	5.714	4.773
210	-	-	6.573	6.524	6.323	5.998	5.865	5.744	5.068
215	-	-	6.621	6.573	6.371	6.030	5.896	5.773	5.362
220	-	-	6.668	6.621	6.419	6.061	5.926	5.803	5.657
225	-	-	6.716	6.670	6.467	6.092	5.957	5.832	5.688
230	-	-	6.764	6.719	6.515	6.124	5.988	5.862	5.715
235	-	-	6.812	6.768	6.563	6.155	6.019	5.891	5.743
240	-	-	6.860	6.816	6.610	6.187	6.049	5.921	5.771
245	-	-	6.908	6.865	6.658	6.218	6.080	5.951	5.799
250	-	-	6.955	6.914	6.706	6.250	6.111	5.980	5.827
255	-	-	-	6.963	6.754	6.281	6.142	6.010	5.855
260	-	-	-	-	6.802	6.313	6.172	6.039	5.883
265	-	-	-	-	6.850	6.344	6.203	6.069	5.910
270	-	-	-	-	6.898	6.376	6.234	6.098	5.938
275	-	-	-	-	6.946	6.407	6.265	6.128	5.966
280	-	-	-	-	6.993	6.439	6.296	6.157	5.994
285	-	-	-	-	-	6.470	6.326	6.187	6.022
290	-	-	-	-	-	6.501	6.357	6.216	6.050
295	-	-	-	-	-	6.533	6.388	6.246	6.078
300	-	-	-	-	-	6.564	6.419	6.275	6.105
305	-	-	-	-	-	6.596	6.449	6.305	6.133
310	-	-	-	-	-	6.627	6.480	6.334	6.161
315	-	-	-	-	-	6.659	6.511	6.364	6.189
320	-	-	-	-	-	6.690	6.542	6.393	6.217
325	-	-	-	-	-	6.722	6.572	6.423	6.245
330	-	-	-	-	-	6.753	6.603	6.452	6.273
335	-	-	-	-	-	6.785	6.634	6.482	6.300
340	-	-	-	-	-	6.816	6.665	6.511	6.328
345	-	-	-	-	-	6.847	6.695	6.541	6.356
350	-	-	-	-	-	6.879	6.726	6.570	6.384
355	-	-	-	-	-	6.910	6.757	6.600	6.412
360	-	-	-	-	-	6.942	6.788	6.629	6.440
365	-	-	-	-	-	6.973	6.818	6.659	6.467
370	-	-	-	-	-	-	6.849	6.688	6.495
375	-	-	-	-	-	-	6.880	6.718	6.523

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 135 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	4.810	3.748	2.966	2.371	1.901	1.444	1.268	1.066	0.895
55	5.143	4.124	3.285	2.641	2.136	1.639	1.359	1.136	0.951
60	5.475	4.434	3.694	2.921	2.380	1.844	1.449	1.206	1.007
65	5.807	4.720	4.103	3.223	2.624	2.049	1.556	1.276	1.062
70	-	5.006	4.422	3.524	2.867	2.254	1.718	1.346	1.118
75	-	5.292	4.703	3.825	3.143	2.460	1.879	1.416	1.174
80	-	5.578	4.983	4.127	3.427	2.665	2.040	1.486	1.229
85	-	5.864	5.264	4.513	3.711	2.870	2.201	1.589	1.285
90	-	-	5.544	4.941	3.994	3.107	2.362	1.718	1.341
95	-	-	5.716	5.369	4.295	3.353	2.523	1.847	1.396
100	-	-	5.812	5.689	4.678	3.598	2.684	1.976	1.452
105	-	-	5.908	5.781	5.060	3.844	2.846	2.105	1.508
110	-	-	6.004	5.872	5.442	4.090	3.053	2.235	1.798
115	-	-	6.100	5.964	5.699	4.518	3.295	2.364	2.140
120	-	-	6.196	6.055	5.789	5.177	3.537	2.493	2.482
125	-	-	6.292	6.147	5.880	5.676	3.780	2.824	2.824
130	-	-	6.388	6.238	5.970	5.736	4.022	3.166	3.166
135	-	-	6.484	6.330	6.061	5.797	4.530	3.508	3.508
140	-	-	6.580	6.421	6.151	5.857	5.677	3.850	3.850
145	-	-	6.675	6.513	6.241	5.917	5.719	4.552	4.192
150	-	-	6.771	6.604	6.332	5.978	5.760	5.496	4.534
155	-	-	6.867	6.696	6.422	6.038	5.802	5.685	4.876
160	-	-	6.963	6.787	6.513	6.098	5.843	5.715	5.218
165	-	-	-	6.879	6.603	6.158	5.885	5.744	5.560
170	-	-	-	6.970	6.694	6.219	5.926	5.774	5.680
175	-	-	-	-	6.784	6.279	5.968	5.804	5.708
180	-	-	-	-	6.874	6.339	6.009	5.834	5.735
185	-	-	-	-	6.965	6.400	6.051	5.864	5.763
190	-	-	-	-	-	6.460	6.092	5.894	5.791
195	-	-	-	-	-	6.520	6.134	5.924	5.819
200	-	-	-	-	-	6.580	6.175	5.954	5.847
205	-	-	-	-	-	6.641	6.216	5.984	5.875
210	-	-	-	-	-	6.701	6.258	6.014	5.903
215	-	-	-	-	-	6.761	6.299	6.043	5.931
220	-	-	-	-	-	6.822	6.341	6.073	5.958
225	-	-	-	-	-	6.882	6.382	6.103	5.986
230	-	-	-	-	-	6.942	6.424	6.133	6.014
235	-	-	-	-	-	-	6.465	6.163	6.042
240	-	-	-	-	-	-	6.507	6.193	6.070
245	-	-	-	-	-	-	6.548	6.223	6.098
250	-	-	-	-	-	-	6.590	6.253	6.126
255	-	-	-	-	-	-	6.631	6.283	6.154
260	-	-	-	-	-	-	6.673	6.312	6.182
265	-	-	-	-	-	-	6.714	6.342	6.209
270	-	-	-	-	-	-	6.755	6.372	6.237
275	-	-	-	-	-	-	6.797	6.402	6.265
280	-	-	-	-	-	-	6.838	6.432	6.293
285	-	-	-	-	-	-	6.880	6.462	6.321
290	-	-	-	-	-	-	6.921	6.492	6.349
295	-	-	-	-	-	-	6.963	6.522	6.377
300	-	-	-	-	-	-	-	6.552	6.405
305	-	-	-	-	-	-	-	6.582	6.432
310	-	-	-	-	-	-	-	6.611	6.460
315	-	-	-	-	-	-	-	6.641	6.488
320	-	-	-	-	-	-	-	6.671	6.516
325	-	-	-	-	-	-	-	6.701	6.544
330	-	-	-	-	-	-	-	6.731	6.572
335	-	-	-	-	-	-	-	6.761	6.600
340	-	-	-	-	-	-	-	6.791	6.628
345	-	-	-	-	-	-	-	6.821	6.655
350	-	-	-	-	-	-	-	6.851	6.683
355	-	-	-	-	-	-	-	6.880	6.711
360	-	-	-	-	-	-	-	6.910	6.739
365	-	-	-	-	-	-	-	6.940	6.767
370	-	-	-	-	-	-	-	6.970	6.795
375	-	-	-	-	-	-	-	-	6.823

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

I/H Columns: 150 minutes									
Required Thickness (mm) for a Design Temperature (°C)									
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
50	-	4.442	3.795	2.990	2.394	1.894	1.435	1.242	1.058
55	-	4.787	4.197	3.312	2.665	2.128	1.630	1.329	1.130
60	-	5.132	4.538	3.698	2.967	2.376	1.834	1.417	1.202
65	-	5.477	4.869	4.083	3.342	2.624	2.039	1.505	1.274
70	-	5.822	5.200	4.510	3.717	2.871	2.244	1.663	1.346
75	-	-	5.531	4.962	4.092	3.180	2.449	1.833	1.418
80	-	-	5.862	5.414	4.491	3.501	2.653	2.004	1.490
85	-	-	-	5.866	4.903	3.823	2.858	2.174	1.610
90	-	-	-	-	5.314	4.144	3.139	2.345	1.759
95	-	-	-	-	5.726	4.709	3.450	2.515	1.908
100	-	-	-	-	-	5.359	3.761	2.686	2.057
105	-	-	-	-	-	5.713	4.072	2.857	2.205
110	-	-	-	-	-	5.810	4.872	3.478	2.354
115	-	-	-	-	-	5.908	5.687	4.336	2.503
120	-	-	-	-	-	6.006	5.757	5.194	2.652
125	-	-	-	-	-	6.104	5.827	5.683	2.824
130	-	-	-	-	-	6.202	5.897	5.732	3.556
135	-	-	-	-	-	6.299	5.967	5.782	5.667
140	-	-	-	-	-	6.397	6.037	5.831	5.700
145	-	-	-	-	-	6.495	6.107	5.881	5.732
150	-	-	-	-	-	6.593	6.177	5.931	5.765
155	-	-	-	-	-	6.691	6.247	5.980	5.797
160	-	-	-	-	-	6.789	6.317	6.030	5.830
165	-	-	-	-	-	6.886	6.387	6.079	5.862
170	-	-	-	-	-	6.984	6.457	6.129	5.894
175	-	-	-	-	-	-	6.527	6.179	5.927
180	-	-	-	-	-	-	6.596	6.228	5.959
185	-	-	-	-	-	-	6.666	6.278	5.992
190	-	-	-	-	-	-	6.736	6.327	6.024
195	-	-	-	-	-	-	6.806	6.377	6.056
200	-	-	-	-	-	-	6.876	6.427	6.089
205	-	-	-	-	-	-	6.946	6.476	6.121
210	-	-	-	-	-	-	-	6.526	6.154
215	-	-	-	-	-	-	-	6.575	6.186
220	-	-	-	-	-	-	-	6.625	6.219
225	-	-	-	-	-	-	-	6.675	6.251
230	-	-	-	-	-	-	-	6.724	6.283
235	-	-	-	-	-	-	-	6.774	6.316
240	-	-	-	-	-	-	-	6.823	6.348
245	-	-	-	-	-	-	-	6.873	6.381
250	-	-	-	-	-	-	-	6.923	6.413
255	-	-	-	-	-	-	-	6.972	6.446
260	-	-	-	-	-	-	-	-	6.478
265	-	-	-	-	-	-	-	-	6.510
270	-	-	-	-	-	-	-	-	6.543
275	-	-	-	-	-	-	-	-	6.575
280	-	-	-	-	-	-	-	-	6.608
285	-	-	-	-	-	-	-	-	6.640
290	-	-	-	-	-	-	-	-	6.673
295	-	-	-	-	-	-	-	-	6.705
300	-	-	-	-	-	-	-	-	6.737
305	-	-	-	-	-	-	-	-	6.770
310	-	-	-	-	-	-	-	-	6.802
315	-	-	-	-	-	-	-	-	6.835
320	-	-	-	-	-	-	-	-	6.867
325	-	-	-	-	-	-	-	-	6.900
330	-	-	-	-	-	-	-	-	6.932
335	-	-	-	-	-	-	-	-	6.964
340	-	-	-	-	-	-	-	-	6.997
345	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to I/H columns with 4 sided fire exposure. Results also apply to I/H beams exposed on all four sides.

Hollow Columns: 15 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
55	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
60	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
65	0.182	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
70	0.201	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
75	0.221	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
80	0.240	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
85	0.259	0.189	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
90	0.279	0.206	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
95	0.298	0.224	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
100	0.317	0.242	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
105	0.337	0.259	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
110	0.356	0.277	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
115	0.375	0.295	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
120	0.395	0.313	0.179	0.176	0.176	0.176	0.176	0.176	0.176	0.176
125	0.414	0.330	0.195	0.176	0.176	0.176	0.176	0.176	0.176	0.176
130	0.433	0.348	0.211	0.176	0.176	0.176	0.176	0.176	0.176	0.176
135	0.453	0.366	0.226	0.176	0.176	0.176	0.176	0.176	0.176	0.176
140	0.472	0.383	0.242	0.176	0.176	0.176	0.176	0.176	0.176	0.176
145	0.491	0.401	0.258	0.176	0.176	0.176	0.176	0.176	0.176	0.176
150	0.511	0.419	0.273	0.176	0.176	0.176	0.176	0.176	0.176	0.176
155	0.530	0.437	0.289	0.176	0.176	0.176	0.176	0.176	0.176	0.176
160	0.549	0.454	0.305	0.176	0.176	0.176	0.176	0.176	0.176	0.176
165	0.569	0.472	0.320	0.176	0.176	0.176	0.176	0.176	0.176	0.176
170	0.588	0.490	0.336	0.176	0.176	0.176	0.176	0.176	0.176	0.176
175	0.607	0.507	0.352	0.176	0.176	0.176	0.176	0.176	0.176	0.176
180	0.627	0.525	0.367	0.176	0.176	0.176	0.176	0.176	0.176	0.176
185	0.646	0.543	0.383	0.176	0.176	0.176	0.176	0.176	0.176	0.176
190	0.665	0.561	0.399	0.176	0.176	0.176	0.176	0.176	0.176	0.176
195	0.685	0.578	0.414	0.176	0.176	0.176	0.176	0.176	0.176	0.176
200	0.704	0.596	0.430	0.176	0.176	0.176	0.176	0.176	0.176	0.176
205	0.723	0.614	0.446	0.176	0.176	0.176	0.176	0.176	0.176	0.176
210	0.743	0.631	0.461	0.191	0.176	0.176	0.176	0.176	0.176	0.176
215	0.762	0.649	0.477	0.205	0.176	0.176	0.176	0.176	0.176	0.176
220	0.782	0.667	0.493	0.220	0.176	0.176	0.176	0.176	0.176	0.176
225	0.801	0.685	0.509	0.235	0.176	0.176	0.176	0.176	0.176	0.176
230	0.820	0.702	0.524	0.249	0.176	0.176	0.176	0.176	0.176	0.176
235	0.840	0.720	0.540	0.264	0.176	0.176	0.176	0.176	0.176	0.176
240	0.859	0.738	0.556	0.279	0.176	0.176	0.176	0.176	0.176	0.176
245	0.878	0.755	0.571	0.294	0.176	0.176	0.176	0.176	0.176	0.176
250	0.898	0.773	0.587	0.308	0.176	0.176	0.176	0.176	0.176	0.176
255	0.917	0.791	0.603	0.323	0.176	0.176	0.176	0.176	0.176	0.176
260	0.936	0.809	0.618	0.338	0.176	0.176	0.176	0.176	0.176	0.176
265	0.956	0.826	0.634	0.352	0.176	0.176	0.176	0.176	0.176	0.176
270	0.975	0.844	0.650	0.367	0.176	0.176	0.176	0.176	0.176	0.176
275	0.994	0.862	0.665	0.382	0.176	0.176	0.176	0.176	0.176	0.176
280	1.014	0.879	0.681	0.396	0.180	0.176	0.176	0.176	0.176	0.176
285	1.033	0.897	0.697	0.411	0.194	0.176	0.176	0.176	0.176	0.176
290	1.052	0.915	0.712	0.426	0.209	0.176	0.176	0.176	0.176	0.176
295	1.072	0.933	0.728	0.440	0.224	0.176	0.176	0.176	0.176	0.176
300	1.091	0.950	0.744	0.455	0.239	0.176	0.176	0.176	0.176	0.176
305	1.110	0.968	0.759	0.470	0.254	0.176	0.176	0.176	0.176	0.176
310	1.130	0.986	0.775	0.484	0.269	0.176	0.176	0.176	0.176	0.176
315	1.149	1.003	0.791	0.499	0.284	0.176	0.176	0.176	0.176	0.176
320	1.168	1.021	0.806	0.514	0.299	0.176	0.176	0.176	0.176	0.176
325	1.188	1.039	0.822	0.528	0.314	0.176	0.176	0.176	0.176	0.176
330	1.207	1.057	0.838	0.543	0.328	0.176	0.176	0.176	0.176	0.176
335	1.226	1.074	0.854	0.558	0.343	0.176	0.176	0.176	0.176	0.176
340	1.246	1.092	0.869	0.572	0.358	0.176	0.176	0.176	0.176	0.176
345	1.265	1.110	0.885	0.587	0.373	0.176	0.176	0.176	0.176	0.176
350	1.284	1.127	0.901	0.602	0.388	0.176	0.176	0.176	0.176	0.176
355	1.304	1.145	0.916	0.617	0.403	0.176	0.176	0.176	0.176	0.176
360	1.323	1.163	0.932	0.631	0.418	0.176	0.176	0.176	0.176	0.176
365	1.343	1.181	0.948	0.646	0.433	0.176	0.176	0.176	0.176	0.176
370	1.362	1.198	0.963	0.661	0.448	0.176	0.176	0.176	0.176	0.176
375	1.381	1.216	0.979	0.675	0.462	0.176	0.176	0.176	0.176	0.176
380	1.401	1.234	0.995	0.690	0.477	0.176	0.176	0.176	0.176	0.176
385	1.420	1.251	1.010	0.705	0.492	0.176	0.176	0.176	0.176	0.176
390	1.439	1.269	1.026	0.719	0.507	0.186	0.176	0.176	0.176	0.176
395	1.459	1.287	1.042	0.734	0.522	0.201	0.176	0.176	0.176	0.176
400	1.478	1.305	1.057	0.749	0.537	0.216	0.176	0.176	0.176	0.176
405	1.497	1.322	1.073	0.763	0.552	0.231	0.176	0.176	0.176	0.176
410	1.517	1.340	1.089	0.778	0.567	0.246	0.176	0.176	0.176	0.176
415	1.536	1.358	1.104	0.793	0.581	0.261	0.176	0.176	0.176	0.176
420	1.555	1.375	1.120	0.807	0.596	0.276	0.176	0.176	0.176	0.176
425	1.575	1.393	1.136	0.822	0.611	0.292	0.176	0.176	0.176	0.176
430	1.594	1.411	1.151	0.837	0.626	0.307	0.176	0.176	0.176	0.176
435	1.613	1.429	1.167	0.851	0.641	0.322	0.176	0.176	0.176	0.176

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 30 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	0.841	0.648	0.417	0.209	0.176	0.176	0.176	0.176	0.176	0.176
55	0.908	0.701	0.450	0.238	0.197	0.176	0.176	0.176	0.176	0.176
60	0.975	0.754	0.484	0.266	0.224	0.179	0.176	0.176	0.176	0.176
65	1.042	0.807	0.517	0.295	0.252	0.205	0.176	0.176	0.176	0.176
70	1.109	0.860	0.551	0.323	0.279	0.231	0.176	0.176	0.176	0.176
75	1.177	0.913	0.584	0.352	0.307	0.257	0.176	0.176	0.176	0.176
80	1.244	0.966	0.618	0.380	0.334	0.284	0.181	0.176	0.176	0.176
85	1.311	1.019	0.651	0.409	0.361	0.310	0.206	0.176	0.176	0.176
90	1.378	1.072	0.685	0.437	0.389	0.336	0.231	0.176	0.176	0.176
95	1.445	1.125	0.718	0.466	0.416	0.362	0.256	0.176	0.176	0.176
100	1.513	1.178	0.751	0.494	0.444	0.388	0.281	0.176	0.176	0.176
105	1.580	1.231	0.785	0.522	0.471	0.415	0.306	0.176	0.176	0.176
110	1.647	1.284	0.818	0.551	0.498	0.441	0.331	0.176	0.176	0.176
115	1.714	1.337	0.852	0.579	0.526	0.467	0.356	0.187	0.176	0.176
120	1.781	1.390	0.885	0.608	0.553	0.493	0.381	0.208	0.176	0.176
125	1.849	1.443	0.919	0.636	0.581	0.520	0.406	0.228	0.176	0.176
130	1.916	1.496	0.952	0.665	0.608	0.546	0.431	0.248	0.176	0.176
135	1.983	1.549	0.986	0.693	0.636	0.572	0.456	0.268	0.176	0.176
140	2.050	1.602	1.019	0.722	0.663	0.598	0.481	0.288	0.176	0.176
145	2.117	1.655	1.052	0.750	0.690	0.624	0.506	0.308	0.176	0.176
150	2.162	1.708	1.086	0.779	0.718	0.651	0.531	0.328	0.176	0.176
155	2.196	1.761	1.119	0.807	0.745	0.677	0.556	0.348	0.176	0.176
160	2.230	1.814	1.153	0.835	0.773	0.703	0.581	0.368	0.176	0.176
165	2.263	1.867	1.186	0.864	0.800	0.729	0.606	0.388	0.176	0.176
170	2.297	1.920	1.220	0.892	0.827	0.755	0.631	0.408	0.176	0.176
175	2.331	1.973	1.253	0.921	0.855	0.782	0.656	0.428	0.176	0.176
180	2.365	2.026	1.287	0.949	0.882	0.808	0.681	0.449	0.176	0.176
185	2.398	2.079	1.320	0.978	0.910	0.834	0.706	0.469	0.176	0.176
190	2.432	2.132	1.353	1.006	0.937	0.860	0.731	0.489	0.176	0.176
195	2.466	2.171	1.387	1.035	0.964	0.886	0.756	0.509	0.180	0.176
200	2.500	2.208	1.420	1.063	0.992	0.913	0.781	0.529	0.198	0.176
205	2.534	2.245	1.454	1.091	1.019	0.939	0.806	0.549	0.215	0.176
210	2.567	2.282	1.487	1.120	1.047	0.965	0.831	0.569	0.233	0.176
215	2.601	2.319	1.521	1.148	1.074	0.991	0.856	0.589	0.250	0.176
220	2.635	2.356	1.554	1.177	1.101	1.018	0.881	0.609	0.268	0.176
225	2.669	2.393	1.588	1.205	1.129	1.044	0.906	0.629	0.285	0.176
230	2.703	2.430	1.621	1.234	1.156	1.070	0.931	0.649	0.303	0.176
235	2.736	2.466	1.654	1.262	1.184	1.096	0.956	0.669	0.320	0.176
240	2.770	2.503	1.688	1.291	1.211	1.122	0.981	0.690	0.338	0.176
245	2.804	2.540	1.721	1.319	1.238	1.149	1.006	0.710	0.355	0.176
250	2.838	2.577	1.755	1.348	1.266	1.175	1.031	0.730	0.373	0.176
255	2.871	2.614	1.788	1.376	1.293	1.201	1.056	0.750	0.390	0.176
260	2.905	2.651	1.822	1.404	1.321	1.227	1.081	0.770	0.408	0.176
265	2.939	2.688	1.855	1.433	1.348	1.253	1.106	0.790	0.425	0.176
270	2.973	2.725	1.889	1.461	1.375	1.280	1.131	0.810	0.443	0.176
275	3.007	2.762	1.922	1.490	1.403	1.306	1.156	0.830	0.461	0.176
280	3.040	2.799	1.955	1.518	1.430	1.332	1.181	0.850	0.478	0.176
285	3.074	2.836	1.989	1.547	1.458	1.358	1.206	0.870	0.496	0.176
290	3.108	2.873	2.022	1.575	1.485	1.384	1.231	0.890	0.513	0.176
295	3.142	2.910	2.056	1.604	1.512	1.411	1.256	0.910	0.531	0.176
300	3.175	2.947	2.089	1.632	1.540	1.437	1.281	0.931	0.548	0.176
305	3.209	2.984	2.123	1.661	1.567	1.463	1.306	0.951	0.566	0.176
310	3.243	3.021	2.167	1.689	1.595	1.489	1.331	0.971	0.583	0.176
315	3.277	3.058	2.220	1.717	1.622	1.515	1.356	0.991	0.601	0.176
320	3.311	3.095	2.274	1.746	1.649	1.542	1.381	1.011	0.618	0.176
325	3.344	3.132	2.328	1.774	1.677	1.568	1.406	1.031	0.636	0.176
330	3.378	3.169	2.382	1.803	1.704	1.594	1.431	1.051	0.653	0.176
335	3.412	3.206	2.436	1.831	1.732	1.620	1.456	1.071	0.671	0.176
340	3.446	3.243	2.490	1.860	1.759	1.647	1.481	1.091	0.688	0.176
345	3.480	3.280	2.543	1.888	1.786	1.673	1.506	1.111	0.706	0.176
350	3.513	3.317	2.597	1.917	1.814	1.699	1.531	1.131	0.723	0.176
355	3.547	3.354	2.651	1.945	1.841	1.725	1.556	1.152	0.741	0.176
360	3.581	3.390	2.705	1.974	1.869	1.751	1.581	1.172	0.758	0.176
365	3.615	3.427	2.759	2.002	1.896	1.778	1.606	1.192	0.776	0.176
370	3.648	3.464	2.813	2.030	1.924	1.804	1.631	1.212	0.793	0.176
375	3.682	3.501	2.866	2.059	1.951	1.830	1.656	1.232	0.811	0.176
380	3.716	3.538	2.920	2.087	1.978	1.856	1.681	1.252	0.828	0.176
385	3.750	3.575	2.974	2.116	2.006	1.882	1.706	1.272	0.846	0.176
390	3.784	3.612	3.028	2.152	2.033	1.909	1.731	1.292	0.863	0.176
395	3.817	3.649	3.082	2.221	2.061	1.935	1.756	1.312	0.881	0.176
400	3.851	3.686	3.136	2.290	2.088	1.961	1.781	1.332	0.898	0.176
405	3.885	3.723	3.190	2.360	2.115	1.987	1.806	1.352	0.916	0.176
410	3.919	3.760	3.243	2.429	2.149	2.013	1.831	1.372	0.934	0.176
415	3.953	3.797	3.297	2.498	2.218	2.040	1.857	1.393	0.951	0.186
420	3.986	3.834	3.351	2.568	2.288	2.066	1.882	1.413	0.969	0.201
425	4.020	3.871	3.405	2.637	2.358	2.092	1.907	1.433	0.986	0.215
430	4.057	3.908	3.459	2.706	2.428	2.118	1.932	1.453	1.004	0.230
435	4.102	3.945	3.513	2.775	2.497	2.153	1.957	1.473	1.021	0.245

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 45 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	1.745	1.493	1.176	0.925	0.833	0.685	0.459	0.239	0.176	0.176
55	1.902	1.630	1.285	1.014	0.914	0.757	0.522	0.270	0.176	0.176
60	2.058	1.766	1.394	1.102	0.995	0.830	0.585	0.302	0.186	0.176
65	2.170	1.903	1.502	1.191	1.076	0.902	0.648	0.333	0.214	0.176
70	2.232	2.040	1.611	1.279	1.156	0.974	0.711	0.364	0.241	0.176
75	2.295	2.154	1.720	1.367	1.237	1.046	0.774	0.396	0.269	0.176
80	2.358	2.209	1.828	1.456	1.318	1.118	0.837	0.427	0.296	0.176
85	2.421	2.264	1.937	1.544	1.399	1.191	0.900	0.458	0.324	0.176
90	2.484	2.319	2.046	1.633	1.480	1.263	0.963	0.490	0.351	0.195
95	2.547	2.375	2.146	1.721	1.561	1.335	1.026	0.521	0.378	0.218
100	2.610	2.430	2.192	1.810	1.642	1.407	1.090	0.552	0.406	0.241
105	2.672	2.485	2.238	1.898	1.723	1.480	1.153	0.584	0.433	0.263
110	2.735	2.540	2.284	1.987	1.804	1.552	1.216	0.615	0.461	0.286
115	2.798	2.595	2.330	2.075	1.885	1.624	1.279	0.646	0.488	0.308
120	2.861	2.650	2.376	2.151	1.966	1.696	1.342	0.678	0.516	0.331
125	2.924	2.705	2.422	2.196	2.046	1.768	1.405	0.709	0.543	0.353
130	2.987	2.760	2.468	2.241	2.127	1.841	1.468	0.740	0.571	0.376
135	3.050	2.815	2.514	2.285	2.177	1.913	1.531	0.772	0.598	0.399
140	3.113	2.870	2.560	2.330	2.221	1.985	1.594	0.803	0.625	0.421
145	3.175	2.926	2.606	2.374	2.265	2.057	1.657	0.834	0.653	0.444
150	3.238	2.981	2.652	2.419	2.309	2.130	1.720	0.866	0.680	0.466
155	3.301	3.036	2.699	2.464	2.354	2.177	1.783	0.897	0.708	0.489
160	3.364	3.091	2.745	2.508	2.398	2.222	1.846	0.928	0.735	0.511
165	3.427	3.146	2.791	2.553	2.442	2.266	1.909	0.960	0.763	0.534
170	3.490	3.201	2.837	2.597	2.486	2.310	1.972	0.991	0.790	0.557
175	3.553	3.256	2.883	2.642	2.530	2.354	2.035	1.022	0.818	0.579
180	3.615	3.311	2.929	2.687	2.575	2.398	2.098	1.054	0.845	0.602
185	3.678	3.366	2.975	2.731	2.619	2.443	2.155	1.085	0.872	0.624
190	3.741	3.422	3.021	2.776	2.663	2.487	2.199	1.116	0.900	0.647
195	3.804	3.477	3.067	2.820	2.707	2.531	2.243	1.148	0.927	0.669
200	3.867	3.532	3.113	2.865	2.751	2.575	2.287	1.179	0.955	0.692
205	3.930	3.587	3.159	2.910	2.795	2.619	2.331	1.210	0.982	0.714
210	3.993	3.642	3.205	2.954	2.840	2.663	2.375	1.242	1.010	0.737
215	4.052	3.697	3.251	2.999	2.884	2.708	2.419	1.273	1.037	0.760
220	4.099	3.752	3.297	3.043	2.928	2.752	2.463	1.304	1.065	0.782
225	4.145	3.807	3.344	3.088	2.972	2.796	2.507	1.336	1.092	0.805
230	4.192	3.862	3.390	3.133	3.016	2.840	2.552	1.367	1.119	0.827
235	4.239	3.917	3.436	3.177	3.061	2.884	2.596	1.398	1.147	0.850
240	4.285	3.973	3.482	3.222	3.105	2.929	2.640	1.430	1.174	0.872
245	4.332	4.028	3.528	3.266	3.149	2.973	2.684	1.461	1.202	0.895
250	4.379	4.079	3.574	3.311	3.193	3.017	2.728	1.492	1.229	0.918
255	4.425	4.129	3.620	3.356	3.237	3.061	2.772	1.524	1.257	0.940
260	4.472	4.179	3.666	3.400	3.282	3.105	2.816	1.555	1.284	0.963
265	4.518	4.228	3.712	3.445	3.326	3.149	2.860	1.586	1.312	0.985
270	4.565	4.278	3.758	3.489	3.370	3.194	2.904	1.618	1.339	1.008
275	4.612	4.328	3.804	3.534	3.414	3.238	2.948	1.649	1.366	1.030
280	4.658	4.378	3.850	3.578	3.458	3.282	2.992	1.680	1.394	1.053
285	4.705	4.428	3.896	3.623	3.502	3.326	3.037	1.712	1.421	1.076
290	4.751	4.477	3.943	3.668	3.547	3.370	3.081	1.743	1.449	1.098
295	4.798	4.527	3.989	3.712	3.591	3.415	3.125	1.774	1.476	1.121
300	4.845	4.577	4.035	3.757	3.635	3.459	3.169	1.806	1.504	1.143
305	4.891	4.627	4.089	3.801	3.679	3.503	3.213	1.837	1.531	1.166
310	4.938	4.677	4.145	3.846	3.723	3.547	3.257	1.868	1.559	1.188
315	4.985	4.726	4.201	3.891	3.768	3.591	3.301	1.900	1.586	1.211
320	5.031	4.776	4.257	3.935	3.812	3.635	3.345	1.931	1.613	1.234
325	5.078	4.826	4.313	3.980	3.856	3.680	3.389	1.962	1.641	1.256
330	5.124	4.876	4.369	4.024	3.900	3.724	3.433	1.994	1.668	1.279
335	5.171	4.926	4.425	4.075	3.944	3.768	3.477	2.025	1.696	1.301
340	5.218	4.975	4.481	4.129	3.988	3.812	3.522	2.056	1.723	1.324
345	5.264	5.025	4.537	4.184	4.033	3.856	3.566	2.088	1.751	1.346
350	5.311	5.075	4.593	4.238	4.084	3.901	3.610	2.119	1.778	1.369
355	5.358	5.125	4.649	4.293	4.138	3.945	3.654	2.177	1.806	1.391
360	5.404	5.175	4.705	4.347	4.192	3.989	3.698	2.283	1.833	1.414
365	5.451	5.224	4.761	4.402	4.246	4.033	3.742	2.389	1.861	1.437
370	5.497	5.274	4.817	4.456	4.300	4.083	3.786	2.496	1.888	1.459
375	5.544	5.324	4.873	4.511	4.353	4.136	3.830	2.602	1.915	1.482
380	5.591	5.374	4.929	4.565	4.407	4.188	3.874	2.708	1.943	1.504
385	5.637	5.424	4.985	4.620	4.461	4.240	3.918	2.814	1.970	1.527
390	5.684	5.473	5.041	4.675	4.515	4.292	3.962	2.921	1.998	1.549
395	5.730	5.523	5.097	4.729	4.569	4.344	4.007	3.027	2.025	1.572
400	5.777	5.573	5.153	4.784	4.623	4.396	4.051	3.133	2.053	1.595
405	5.824	5.623	5.209	4.838	4.676	4.448	4.099	3.239	2.080	1.617
410	5.870	5.673	5.265	4.893	4.730	4.500	4.147	3.346	2.108	1.640
415	5.917	5.722	5.321	4.947	4.784	4.553	4.195	3.452	2.135	1.662
420	5.964	5.772	5.377	5.002	4.838	4.605	4.244	3.558	2.227	1.685
425	6.010	5.822	5.433	5.056	4.892	4.657	4.292	3.664	2.331	1.707
430	6.057	5.872	5.489	5.111	4.945	4.709	4.340	3.770	2.435	1.730
435	6.104	5.922	5.545	5.165	4.999	4.761	4.388	3.877	2.538	1.753

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 60 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	2.565	2.318	1.931	1.634	1.531	1.355	1.100	0.807	0.562	0.263
55	2.686	2.412	2.114	1.793	1.681	1.493	1.226	0.895	0.626	0.301
60	2.807	2.505	2.194	1.952	1.831	1.632	1.353	0.983	0.690	0.338
65	2.928	2.599	2.258	2.111	1.981	1.770	1.479	1.070	0.755	0.376
70	3.049	2.693	2.322	2.189	2.131	1.909	1.606	1.158	0.819	0.413
75	3.170	2.786	2.386	2.249	2.195	2.047	1.732	1.245	0.883	0.450
80	3.291	2.880	2.449	2.310	2.255	2.159	1.859	1.333	0.947	0.488
85	3.412	2.974	2.513	2.371	2.314	2.216	1.985	1.421	1.011	0.525
90	3.533	3.067	2.577	2.431	2.373	2.274	2.112	1.508	1.076	0.563
95	3.654	3.161	2.641	2.492	2.433	2.332	2.181	1.595	1.140	0.600
100	3.775	3.254	2.705	2.553	2.492	2.389	2.235	1.684	1.204	0.637
105	3.896	3.348	2.769	2.613	2.552	2.447	2.289	1.771	1.268	0.675
110	4.016	3.442	2.832	2.674	2.611	2.505	2.343	1.859	1.333	0.712
115	4.105	3.535	2.896	2.735	2.670	2.562	2.397	1.946	1.397	0.750
120	4.185	3.629	2.960	2.795	2.730	2.620	2.451	2.034	1.461	0.787
125	4.265	3.723	3.024	2.856	2.789	2.678	2.504	2.122	1.525	0.824
130	4.344	3.816	3.088	2.916	2.848	2.735	2.558	2.183	1.589	0.862
135	4.424	3.910	3.152	2.977	2.908	2.793	2.612	2.238	1.654	0.899
140	4.504	4.004	3.215	3.038	2.967	2.851	2.666	2.292	1.718	0.936
145	4.584	4.085	3.279	3.098	3.027	2.908	2.720	2.347	1.782	0.974
150	4.663	4.158	3.343	3.159	3.086	2.966	2.774	2.402	1.846	1.011
155	4.743	4.231	3.407	3.220	3.145	3.024	2.828	2.456	1.910	1.049
160	4.823	4.304	3.471	3.280	3.205	3.081	2.881	2.511	1.975	1.086
165	4.902	4.377	3.535	3.341	3.264	3.139	2.935	2.566	2.039	1.123
170	4.982	4.450	3.598	3.402	3.324	3.197	2.989	2.620	2.103	1.161
175	5.062	4.522	3.662	3.462	3.383	3.254	3.043	2.675	2.163	1.198
180	5.142	4.595	3.726	3.523	3.442	3.312	3.097	2.730	2.217	1.236
185	5.221	4.668	3.790	3.583	3.502	3.370	3.151	2.785	2.272	1.273
190	5.301	4.741	3.854	3.644	3.561	3.427	3.205	2.839	2.326	1.310
195	5.381	4.814	3.917	3.705	3.621	3.485	3.258	2.894	2.380	1.348
200	5.461	4.887	3.981	3.765	3.680	3.543	3.312	2.949	2.435	1.385
205	5.540	4.960	4.045	3.826	3.739	3.600	3.366	3.003	2.489	1.423
210	5.620	5.032	4.112	3.887	3.799	3.658	3.420	3.058	2.543	1.460
215	5.700	5.105	4.179	3.947	3.858	3.716	3.474	3.113	2.598	1.497
220	5.779	5.178	4.245	4.008	3.918	3.773	3.528	3.168	2.652	1.535
225	5.859	5.251	4.312	4.070	3.977	3.831	3.581	3.222	2.707	1.572
230	5.939	5.324	4.379	4.134	4.036	3.889	3.635	3.277	2.761	1.609
235	6.019	5.397	4.445	4.198	4.099	3.946	3.689	3.332	2.815	1.647
240	6.098	5.470	4.512	4.262	4.161	4.004	3.743	3.386	2.870	1.684
245	6.148	5.542	4.579	4.326	4.224	4.063	3.797	3.441	2.924	1.722
250	6.196	5.615	4.646	4.390	4.286	4.124	3.851	3.496	2.978	1.759
255	6.244	5.688	4.712	4.454	4.349	4.185	3.905	3.550	3.033	1.796
260	6.292	5.761	4.779	4.517	4.412	4.246	3.958	3.605	3.087	1.834
265	6.340	5.834	4.846	4.581	4.474	4.307	4.012	3.660	3.141	1.871
270	6.388	5.907	4.912	4.645	4.537	4.368	4.068	3.715	3.196	1.909
275	6.436	5.980	4.979	4.709	4.599	4.429	4.127	3.769	3.250	1.946
280	6.484	6.052	5.046	4.773	4.662	4.490	4.185	3.824	3.305	1.983
285	6.532	6.120	5.113	4.837	4.725	4.551	4.244	3.879	3.359	2.021
290	6.580	6.176	5.179	4.901	4.787	4.612	4.303	3.933	3.413	2.058
295	6.628	6.232	5.246	4.965	4.850	4.673	4.361	3.988	3.468	2.096
300	6.676	6.289	5.313	5.029	4.912	4.734	4.420	4.043	3.522	2.133
305	6.724	6.345	5.379	5.093	4.975	4.795	4.479	4.097	3.576	2.221
310	6.772	6.401	5.446	5.157	5.038	4.856	4.537	4.150	3.631	2.319
315	6.820	6.457	5.513	5.221	5.100	4.917	4.596	4.204	3.685	2.418
320	6.868	6.513	5.580	5.285	5.163	4.978	4.655	4.258	3.739	2.516
325	6.916	6.569	5.646	5.349	5.225	5.039	4.713	4.312	3.794	2.614
330	6.964	6.626	5.713	5.412	5.288	5.100	4.772	4.366	3.848	2.712
335	7.012	6.682	5.780	5.476	5.351	5.161	4.831	4.419	3.902	2.810
340	7.060	6.738	5.846	5.540	5.413	5.222	4.889	4.473	3.957	2.909
345	7.108	6.794	5.913	5.604	5.476	5.283	4.948	4.527	4.011	3.007
350	7.156	6.850	5.980	5.668	5.538	5.344	5.006	4.581	4.064	3.105
355	7.204	6.906	6.047	5.732	5.601	5.405	5.065	4.635	4.115	3.203
360	7.252	6.962	6.115	5.796	5.664	5.465	5.124	4.688	4.165	3.301
365	7.300	7.019	6.196	5.860	5.726	5.526	5.182	4.742	4.216	3.400
370	7.348	7.075	6.276	5.924	5.789	5.587	5.241	4.796	4.267	3.498
375	7.396	7.131	6.357	5.988	5.851	5.648	5.300	4.850	4.317	3.596
380	7.444	7.187	6.437	6.052	5.914	5.709	5.358	4.904	4.368	3.694
385	7.491	7.243	6.517	6.119	5.977	5.770	5.417	4.957	4.419	3.792
390	7.539	7.299	6.598	6.198	6.039	5.831	5.476	5.011	4.470	3.891
395	7.587	7.356	6.678	6.277	6.102	5.892	5.534	5.065	4.520	3.989
400	7.635	7.412	6.759	6.356	6.181	5.953	5.593	5.119	4.571	4.063
405	7.683	7.468	6.839	6.435	6.260	6.014	5.652	5.173	4.622	4.106
410	7.731	7.524	6.920	6.515	6.339	6.075	5.710	5.226	4.672	4.150
415	7.779	7.580	7.000	6.594	6.418	6.146	5.769	5.280	4.723	4.194
420	7.827	7.636	7.080	6.673	6.497	6.224	5.828	5.334	4.774	4.238
425	7.875	7.693	7.161	6.752	6.576	6.302	5.886	5.388	4.824	4.282
430	7.923	7.749	7.241	6.831	6.655	6.380	5.945	5.442	4.875	4.325
435	7.971	7.805	7.322	6.911	6.734	6.458	6.003	5.495	4.926	4.369

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 75 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	3.266	2.971	2.603	2.321	2.229	2.020	1.737	1.373	1.091	0.775
55	3.511	3.186	2.761	2.429	2.320	2.169	1.927	1.516	1.207	0.863
60	3.756	3.400	2.918	2.536	2.411	2.242	2.117	1.660	1.324	0.951
65	4.001	3.615	3.076	2.643	2.503	2.314	2.199	1.804	1.441	1.039
70	4.188	3.830	3.234	2.751	2.594	2.387	2.268	1.947	1.557	1.127
75	4.362	4.044	3.392	2.858	2.685	2.459	2.336	2.091	1.674	1.216
80	4.536	4.194	3.549	2.965	2.776	2.531	2.404	2.185	1.790	1.304
85	4.711	4.343	3.707	3.073	2.868	2.604	2.472	2.253	1.907	1.392
90	4.885	4.493	3.865	3.180	2.959	2.676	2.541	2.321	2.024	1.480
95	5.060	4.643	4.023	3.287	3.050	2.749	2.609	2.390	2.140	1.568
100	5.234	4.793	4.155	3.394	3.141	2.821	2.677	2.458	2.205	1.656
105	5.408	4.942	4.283	3.502	3.233	2.893	2.746	2.527	2.269	1.744
110	5.583	5.092	4.411	3.609	3.324	2.966	2.814	2.595	2.334	1.832
115	5.757	5.242	4.539	3.716	3.415	3.038	2.882	2.663	2.399	1.920
120	5.931	5.391	4.667	3.824	3.506	3.111	2.951	2.732	2.464	2.008
125	6.104	5.541	4.795	3.931	3.598	3.183	3.019	2.800	2.529	2.096
130	6.192	5.691	4.923	4.038	3.689	3.255	3.087	2.869	2.594	2.172
135	6.280	5.841	5.051	4.159	3.780	3.328	3.156	2.937	2.659	2.236
140	6.368	5.990	5.179	4.280	3.871	3.400	3.224	3.005	2.724	2.300
145	6.456	6.122	5.308	4.401	3.963	3.473	3.292	3.074	2.789	2.365
150	6.544	6.197	5.436	4.522	4.057	3.545	3.360	3.142	2.854	2.429
155	6.632	6.273	5.564	4.644	4.179	3.617	3.429	3.211	2.919	2.493
160	6.720	6.348	5.692	4.765	4.301	3.690	3.497	3.279	2.984	2.557
165	6.808	6.423	5.820	4.886	4.423	3.762	3.565	3.347	3.049	2.621
170	6.896	6.499	5.948	5.007	4.545	3.835	3.634	3.416	3.114	2.685
175	6.984	6.574	6.076	5.129	4.667	3.907	3.702	3.484	3.179	2.749
180	7.072	6.650	6.150	5.250	4.789	3.979	3.770	3.553	3.244	2.813
185	7.160	6.725	6.209	5.371	4.911	4.059	3.839	3.621	3.308	2.878
190	7.248	6.801	6.268	5.492	5.033	4.186	3.907	3.689	3.373	2.942
195	7.336	6.876	6.328	5.613	5.155	4.314	3.975	3.758	3.438	3.006
200	7.424	6.951	6.387	5.735	5.277	4.442	4.044	3.826	3.503	3.070
205	7.512	7.027	6.446	5.856	5.399	4.570	4.124	3.895	3.568	3.134
210	7.600	7.102	6.506	5.977	5.521	4.698	4.205	3.963	3.633	3.198
215	7.688	7.178	6.565	6.098	5.643	4.826	4.286	4.032	3.698	3.262
220	7.775	7.253	6.624	6.153	5.765	4.954	4.366	4.095	3.763	3.327
225	7.863	7.329	6.683	6.205	5.887	5.081	4.447	4.157	3.828	3.391
230	7.951	7.404	6.743	6.256	6.009	5.209	4.528	4.220	3.893	3.455
235	8.038	7.479	6.802	6.308	6.116	5.337	4.608	4.282	3.958	3.519
240	8.121	7.555	6.861	6.360	6.171	5.465	4.689	4.344	4.023	3.583
245	8.205	7.630	6.921	6.412	6.225	5.593	4.769	4.407	4.083	3.647
250	8.288	7.706	6.980	6.464	6.280	5.721	4.850	4.469	4.140	3.711
255	8.371	7.781	7.039	6.515	6.335	5.849	4.931	4.531	4.197	3.775
260	8.455	7.857	7.098	6.567	6.390	5.976	5.011	4.594	4.255	3.840
265	8.538	7.932	7.158	6.619	6.445	6.104	5.092	4.656	4.312	3.904
270	8.622	8.007	7.217	6.671	6.500	6.165	5.173	4.718	4.370	3.968
275	8.705	8.110	7.276	6.723	6.555	6.226	5.253	4.781	4.427	4.032
280	8.788	8.214	7.336	6.774	6.609	6.287	5.334	4.843	4.485	4.087
285	8.872	8.319	7.395	6.826	6.664	6.348	5.415	4.906	4.542	4.139
290	8.955	8.423	7.454	6.878	6.719	6.409	5.495	4.968	4.600	4.192
295	9.038	8.527	7.514	6.930	6.774	6.470	5.576	5.030	4.657	4.245
300	9.122	8.632	7.573	6.982	6.829	6.531	5.656	5.093	4.715	4.297
305	9.205	8.736	7.632	7.033	6.884	6.592	5.737	5.155	4.772	4.350
310	9.289	8.840	7.691	7.085	6.939	6.653	5.818	5.217	4.830	4.403
315	9.372	8.945	7.751	7.137	6.994	6.714	5.898	5.280	4.887	4.455
320	9.455	9.049	7.810	7.189	7.048	6.775	5.979	5.342	4.944	4.508
325	9.539	9.153	7.869	7.241	7.103	6.836	6.060	5.404	5.002	4.561
330	9.622	9.258	7.929	7.292	7.158	6.897	6.140	5.467	5.059	4.613
335	9.705	9.362	7.988	7.344	7.213	6.958	6.220	5.529	5.117	4.666
340	9.789	9.467	8.126	7.396	7.268	7.019	6.300	5.591	5.174	4.718
345	9.872	9.571	8.321	7.448	7.323	7.080	6.380	5.654	5.232	4.771
350	9.955	9.675	8.517	7.500	7.378	7.141	6.460	5.716	5.289	4.824
355	10.039	9.780	8.712	7.551	7.432	7.202	6.540	5.778	5.347	4.876
360	10.122	9.884	8.908	7.603	7.487	7.263	6.619	5.841	5.404	4.929
365	10.206	9.988	9.104	7.655	7.542	7.324	6.699	5.903	5.462	4.982
370	10.289	10.093	9.299	7.707	7.597	7.385	6.779	5.966	5.519	5.034
375	10.372	10.197	9.495	7.759	7.652	7.446	6.859	6.028	5.577	5.087
380	10.456	10.302	9.690	7.810	7.707	7.507	6.939	6.090	5.634	5.140
385	-	10.406	9.886	7.862	7.762	7.568	7.019	6.180	5.691	5.192
390	-	-	10.082	7.914	7.817	7.629	7.099	6.278	5.749	5.245
395	-	-	10.277	7.966	7.871	7.691	7.179	6.375	5.806	5.298
400	-	-	-	8.089	7.926	7.752	7.259	6.473	5.864	5.350
405	-	-	-	8.921	7.981	7.813	7.339	6.570	5.921	5.403
410	-	-	-	9.753	8.331	7.874	7.418	6.667	5.979	5.456
415	-	-	-	-	9.090	7.935	7.498	6.765	6.036	5.508
420	-	-	-	-	9.849	7.996	7.578	6.862	6.094	5.561
425	-	-	-	-	-	8.500	7.658	6.959	6.182	5.614
430	-	-	-	-	-	9.179	7.738	7.057	6.275	5.666
435	-	-	-	-	-	9.858	7.818	7.154	6.369	5.719

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 90 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	4.001	3.639	3.215	2.873	2.756	2.577	2.330	1.936	1.617	1.285
55	4.307	3.921	3.454	3.069	2.934	2.725	2.444	2.135	1.786	1.423
60	4.612	4.192	3.693	3.265	3.112	2.874	2.558	2.238	1.955	1.562
65	4.918	4.455	3.932	3.461	3.290	3.022	2.671	2.340	2.123	1.700
70	5.223	4.718	4.157	3.657	3.468	3.170	2.785	2.441	2.218	1.839
75	5.529	4.982	4.370	3.853	3.645	3.319	2.899	2.542	2.304	1.978
80	5.834	5.245	4.584	4.048	3.823	3.467	3.013	2.644	2.390	2.116
85	6.162	5.508	4.797	4.226	4.001	3.615	3.127	2.745	2.477	2.203
90	6.648	5.771	5.010	4.404	4.171	3.764	3.240	2.846	2.563	2.279
95	7.135	6.035	5.223	4.582	4.339	3.912	3.354	2.947	2.650	2.355
100	7.622	6.292	5.436	4.760	4.506	4.061	3.468	3.049	2.736	2.432
105	8.029	6.546	5.650	4.938	4.674	4.221	3.582	3.150	2.823	2.508
110	8.113	6.801	5.863	5.116	4.841	4.381	3.696	3.251	2.909	2.584
115	8.197	7.056	6.076	5.294	5.008	4.541	3.809	3.353	2.996	2.661
120	8.281	7.311	6.210	5.472	5.176	4.701	3.923	3.454	3.082	2.737
125	8.365	7.565	6.333	5.650	5.343	4.861	4.037	3.555	3.169	2.813
130	8.449	7.820	6.455	5.828	5.511	5.021	4.184	3.657	3.255	2.890
135	8.532	8.035	6.578	6.006	5.678	5.181	4.333	3.758	3.342	2.966
140	8.616	8.127	6.700	6.148	5.846	5.341	4.482	3.859	3.428	3.042
145	8.700	8.218	6.823	6.246	6.013	5.501	4.632	3.961	3.515	3.119
150	8.784	8.310	6.945	6.345	6.145	5.661	4.781	4.066	3.601	3.195
155	8.868	8.402	7.068	6.443	6.237	5.821	4.930	4.190	3.688	3.271
160	8.952	8.493	7.190	6.542	6.328	5.981	5.079	4.313	3.774	3.347
165	9.035	8.585	7.313	6.641	6.420	6.122	5.228	4.437	3.861	3.424
170	9.119	8.676	7.435	6.739	6.511	6.205	5.378	4.561	3.947	3.500
175	9.203	8.768	7.558	6.838	6.603	6.288	5.527	4.685	4.034	3.576
180	9.287	8.860	7.680	6.937	6.694	6.371	5.676	4.808	4.117	3.653
185	9.371	8.951	7.803	7.035	6.786	6.454	5.825	4.932	4.200	3.729
190	9.455	9.043	7.925	7.134	6.877	6.537	5.974	5.056	4.283	3.805
195	9.538	9.134	8.046	7.232	6.969	6.620	6.113	5.180	4.366	3.882
200	9.622	9.226	8.165	7.331	7.060	6.702	6.184	5.303	4.450	3.958
205	9.706	9.318	8.283	7.430	7.152	6.785	6.256	5.427	4.533	4.034
210	9.790	9.409	8.401	7.528	7.243	6.868	6.327	5.551	4.616	4.097
215	9.874	9.501	8.519	7.627	7.335	6.951	6.398	5.674	4.699	4.157
220	9.958	9.592	8.637	7.726	7.426	7.034	6.470	5.798	4.782	4.218
225	10.041	9.684	8.755	7.824	7.518	7.117	6.541	5.922	4.865	4.278
230	10.125	9.776	8.873	7.923	7.609	7.200	6.613	6.046	4.948	4.339
235	10.209	9.867	8.992	8.023	7.701	7.282	6.684	6.137	5.031	4.400
240	10.293	9.959	9.110	8.145	7.793	7.365	6.756	6.199	5.114	4.460
245	10.377	10.050	9.228	8.266	7.884	7.448	6.827	6.262	5.197	4.521
250	-	10.142	9.346	8.387	7.976	7.531	6.898	6.325	5.280	4.581
255	-	10.233	9.464	8.508	8.085	7.614	6.970	6.388	5.363	4.642
260	-	10.325	9.582	8.629	8.206	7.697	7.041	6.450	5.447	4.702
265	-	10.417	9.700	8.750	8.327	7.780	7.113	6.513	5.530	4.763
270	-	-	9.819	8.872	8.448	7.862	7.184	6.576	5.613	4.823
275	-	-	9.937	8.993	8.569	7.945	7.256	6.638	5.696	4.884
280	-	-	10.055	9.114	8.690	8.036	7.327	6.701	5.779	4.945
285	-	-	10.173	9.235	8.811	8.164	7.398	6.764	5.862	5.005
290	-	-	10.291	9.356	8.932	8.292	7.470	6.827	5.945	5.066
295	-	-	10.409	9.477	9.053	8.419	7.541	6.889	6.028	5.126
300	-	-	-	9.599	9.175	8.547	7.613	6.952	6.111	5.187
305	-	-	-	9.720	9.296	8.675	7.684	7.015	6.188	5.247
310	-	-	-	9.841	9.417	8.802	7.756	7.078	6.266	5.308
315	-	-	-	9.962	9.538	8.930	7.827	7.140	6.343	5.369
320	-	-	-	10.083	9.659	9.058	7.898	7.203	6.421	5.429
325	-	-	-	10.204	9.780	9.185	7.970	7.266	6.498	5.490
330	-	-	-	10.326	9.901	9.313	8.089	7.328	6.575	5.550
335	-	-	-	10.447	10.022	9.441	8.280	7.391	6.653	5.611
340	-	-	-	-	10.143	9.569	8.472	7.454	6.730	5.671
345	-	-	-	-	10.264	9.696	8.663	7.517	6.808	5.732
350	-	-	-	-	10.386	9.824	8.855	7.579	6.885	5.792
355	-	-	-	-	-	9.952	9.046	7.642	6.963	5.853
360	-	-	-	-	-	10.079	9.238	7.705	7.040	5.914
365	-	-	-	-	-	10.207	9.429	7.768	7.118	5.974
370	-	-	-	-	-	10.335	9.621	7.830	7.195	6.035
375	-	-	-	-	-	-	9.812	7.893	7.273	6.095
380	-	-	-	-	-	-	10.003	7.956	7.350	6.190
385	-	-	-	-	-	-	10.195	8.050	7.428	6.289
390	-	-	-	-	-	-	10.386	8.482	7.505	6.389
395	-	-	-	-	-	-	-	8.913	7.582	6.489
400	-	-	-	-	-	-	-	9.345	7.660	6.588
405	-	-	-	-	-	-	-	9.777	7.737	6.688
410	-	-	-	-	-	-	-	10.208	7.815	6.787
415	-	-	-	-	-	-	-	-	7.892	6.887
420	-	-	-	-	-	-	-	-	7.970	6.986
425	-	-	-	-	-	-	-	-	8.244	7.086
430	-	-	-	-	-	-	-	-	8.767	7.185
435	-	-	-	-	-	-	-	-	9.290	7.285

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 105 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	4.994	4.443	3.832	3.434	3.292	3.084	2.788	2.436	2.156	1.792
55	5.398	4.814	4.137	3.685	3.525	3.296	2.964	2.582	2.273	1.981
60	5.802	5.184	4.454	3.937	3.758	3.508	3.140	2.728	2.391	2.156
65	6.302	5.555	4.770	4.196	3.992	3.719	3.317	2.874	2.508	2.260
70	7.083	5.926	5.086	4.458	4.235	3.931	3.493	3.020	2.626	2.365
75	7.864	6.668	5.402	4.721	4.481	4.149	3.670	3.166	2.743	2.469
80	8.106	7.753	5.718	4.984	4.728	4.373	3.846	3.312	2.861	2.573
85	8.221	8.093	6.034	5.247	4.974	4.597	4.022	3.458	2.978	2.678
90	8.335	8.199	6.697	5.510	5.220	4.821	4.216	3.604	3.096	2.782
95	8.450	8.304	7.456	5.773	5.466	5.046	4.412	3.750	3.213	2.887
100	8.565	8.410	8.040	6.036	5.713	5.270	4.608	3.896	3.331	2.991
105	8.680	8.516	8.140	6.271	5.959	5.494	4.805	4.041	3.449	3.095
110	8.794	8.621	8.240	6.498	6.163	5.718	5.001	4.249	3.566	3.200
115	8.909	8.727	8.340	6.725	6.308	5.943	5.197	4.457	3.684	3.304
120	9.024	8.832	8.440	6.951	6.453	6.138	5.393	4.665	3.801	3.408
125	9.139	8.938	8.540	7.178	6.598	6.261	5.589	4.874	3.919	3.513
130	9.254	9.043	8.640	7.404	6.742	6.385	5.785	5.082	4.036	3.617
135	9.368	9.149	8.740	7.631	6.887	6.508	5.981	5.290	4.245	3.721
140	9.483	9.254	8.841	7.857	7.032	6.631	6.142	5.498	4.460	3.826
145	9.598	9.360	8.941	8.052	7.177	6.755	6.246	5.706	4.675	3.930
150	9.713	9.466	9.041	8.175	7.322	6.878	6.350	5.914	4.889	4.035
155	9.827	9.571	9.141	8.298	7.467	7.001	6.453	6.111	5.104	4.172
160	9.942	9.677	9.241	8.421	7.611	7.124	6.557	6.195	5.319	4.313
165	10.057	9.782	9.341	8.545	7.756	7.248	6.661	6.280	5.533	4.453
170	10.172	9.888	9.441	8.668	7.901	7.371	6.764	6.364	5.748	4.594
175	10.287	9.993	9.541	8.791	8.049	7.494	6.868	6.448	5.963	4.734
180	10.401	10.099	9.641	8.915	8.210	7.617	6.972	6.533	6.127	4.875
185	-	10.205	9.741	9.038	8.370	7.741	7.075	6.617	6.198	5.015
190	-	10.310	9.842	9.161	8.530	7.864	7.179	6.701	6.268	5.156
195	-	10.416	9.942	9.284	8.690	7.987	7.283	6.786	6.339	5.296
200	-	-	10.042	9.408	8.851	8.149	7.386	6.870	6.409	5.437
205	-	-	10.142	9.531	9.011	8.321	7.490	6.954	6.480	5.577
210	-	-	10.242	9.654	9.171	8.494	7.594	7.039	6.550	5.717
215	-	-	10.342	9.777	9.331	8.666	7.697	7.123	6.621	5.858
220	-	-	10.442	9.901	9.492	8.838	7.801	7.207	6.691	5.998
225	-	-	-	10.024	9.652	9.010	7.905	7.292	6.762	6.118
230	-	-	-	10.147	9.812	9.182	8.008	7.376	6.832	6.175
235	-	-	-	10.271	9.972	9.355	8.179	7.460	6.902	6.233
240	-	-	-	10.394	10.133	9.527	8.353	7.545	6.973	6.291
245	-	-	-	-	10.293	9.699	8.527	7.629	7.043	6.348
250	-	-	-	-	10.453	9.871	8.701	7.713	7.114	6.406
255	-	-	-	-	-	10.043	8.875	7.798	7.184	6.464
260	-	-	-	-	-	10.216	9.050	7.882	7.255	6.521
265	-	-	-	-	-	10.388	9.224	7.966	7.325	6.579
270	-	-	-	-	-	-	9.398	8.085	7.396	6.637
275	-	-	-	-	-	-	9.572	8.246	7.466	6.694
280	-	-	-	-	-	-	9.746	8.408	7.537	6.752
285	-	-	-	-	-	-	9.920	8.569	7.607	6.810
290	-	-	-	-	-	-	10.094	8.730	7.678	6.867
295	-	-	-	-	-	-	10.268	8.891	7.748	6.925
300	-	-	-	-	-	-	10.442	9.052	7.818	6.982
305	-	-	-	-	-	-	-	9.213	7.889	7.040
310	-	-	-	-	-	-	-	9.374	7.959	7.098
315	-	-	-	-	-	-	-	9.536	8.056	7.155
320	-	-	-	-	-	-	-	9.697	8.236	7.213
325	-	-	-	-	-	-	-	9.858	8.415	7.271
330	-	-	-	-	-	-	-	10.019	8.595	7.328
335	-	-	-	-	-	-	-	10.180	8.775	7.386
340	-	-	-	-	-	-	-	10.341	8.954	7.444
345	-	-	-	-	-	-	-	-	9.134	7.501
350	-	-	-	-	-	-	-	-	9.314	7.559
355	-	-	-	-	-	-	-	-	9.493	7.617
360	-	-	-	-	-	-	-	-	9.673	7.674
365	-	-	-	-	-	-	-	-	9.853	7.732
370	-	-	-	-	-	-	-	-	10.032	7.790
375	-	-	-	-	-	-	-	-	10.212	7.847
380	-	-	-	-	-	-	-	-	10.392	7.905
385	-	-	-	-	-	-	-	-	-	7.963
390	-	-	-	-	-	-	-	-	-	8.073
395	-	-	-	-	-	-	-	-	-	8.552
400	-	-	-	-	-	-	-	-	-	9.032
405	-	-	-	-	-	-	-	-	-	9.512
410	-	-	-	-	-	-	-	-	-	9.991
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-
435	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 120 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	5.918	5.364	4.609	3.995	3.827	3.594	3.250	2.872	2.550	2.250
55	6.592	5.826	5.012	4.346	4.125	3.857	3.473	3.072	2.716	2.387
60	7.265	6.411	5.414	4.696	4.454	4.130	3.696	3.273	2.881	2.524
65	7.939	7.180	5.816	5.046	4.783	4.430	3.919	3.473	3.046	2.661
70	8.154	7.949	6.408	5.396	5.113	4.730	4.160	3.673	3.211	2.799
75	8.313	8.148	7.475	5.747	5.442	5.029	4.421	3.873	3.376	2.936
80	8.471	8.295	8.077	6.097	5.771	5.329	4.683	4.086	3.542	3.073
85	8.629	8.442	8.206	8.028	6.101	5.629	4.945	4.368	3.707	3.210
90	8.788	8.589	8.335	8.141	7.450	5.929	5.207	4.650	3.872	3.347
95	8.946	8.736	8.464	8.253	8.079	6.311	5.468	4.932	4.037	3.485
100	9.105	8.883	8.593	8.366	8.191	6.809	5.730	5.214	4.356	3.622
105	9.263	9.031	8.722	8.478	8.303	7.308	5.992	5.496	4.681	3.759
110	9.422	9.178	8.851	8.591	8.416	7.806	6.185	5.778	5.006	3.896
115	9.580	9.325	8.980	8.704	8.528	8.084	6.327	6.060	5.330	4.033
120	9.739	9.472	9.109	8.816	8.640	8.206	6.469	6.193	5.655	4.333
125	9.897	9.619	9.238	8.929	8.753	8.328	6.611	6.300	5.980	4.644
130	10.056	9.766	9.367	9.041	8.865	8.450	6.754	6.406	6.157	4.956
135	10.214	9.913	9.496	9.154	8.977	8.572	6.896	6.513	6.243	5.268
140	10.373	10.060	9.625	9.266	9.089	8.695	7.038	6.620	6.329	5.580
145	-	10.208	9.754	9.379	9.202	8.817	7.180	6.726	6.416	5.891
150	-	10.355	9.883	9.491	9.314	8.939	7.322	6.833	6.502	6.123
155	-	-	10.012	9.604	9.426	9.061	7.464	6.939	6.588	6.183
160	-	-	10.141	9.716	9.539	9.183	7.606	7.046	6.675	6.244
165	-	-	10.270	9.829	9.651	9.305	7.749	7.152	6.761	6.305
170	-	-	10.400	9.941	9.763	9.427	7.891	7.259	6.847	6.365
175	-	-	-	10.054	9.876	9.549	8.045	7.366	6.934	6.426
180	-	-	-	10.166	9.988	9.671	8.270	7.472	7.020	6.487
185	-	-	-	10.279	10.100	9.793	8.495	7.579	7.106	6.548
190	-	-	-	10.391	10.213	9.915	8.720	7.685	7.193	6.608
195	-	-	-	-	10.325	10.037	8.945	7.792	7.279	6.669
200	-	-	-	-	10.437	10.159	9.170	7.898	7.365	6.730
205	-	-	-	-	-	10.281	9.395	8.005	7.452	6.791
210	-	-	-	-	-	10.403	9.620	8.238	7.538	6.851
215	-	-	-	-	-	-	9.845	8.481	7.624	6.912
220	-	-	-	-	-	-	10.071	8.724	7.711	6.973
225	-	-	-	-	-	-	10.296	8.967	7.797	7.034
230	-	-	-	-	-	-	-	9.210	7.883	7.094
235	-	-	-	-	-	-	-	9.453	7.970	7.155
240	-	-	-	-	-	-	-	9.697	8.123	7.216
245	-	-	-	-	-	-	-	9.940	8.345	7.277
250	-	-	-	-	-	-	-	10.183	8.566	7.337
255	-	-	-	-	-	-	-	10.426	8.788	7.398
260	-	-	-	-	-	-	-	-	9.009	7.459
265	-	-	-	-	-	-	-	-	9.230	7.520
270	-	-	-	-	-	-	-	-	9.452	7.580
275	-	-	-	-	-	-	-	-	9.673	7.641
280	-	-	-	-	-	-	-	-	9.895	7.702
285	-	-	-	-	-	-	-	-	10.116	7.762
290	-	-	-	-	-	-	-	-	10.338	7.823
295	-	-	-	-	-	-	-	-	-	7.884
300	-	-	-	-	-	-	-	-	-	7.945
305	-	-	-	-	-	-	-	-	-	8.005
310	-	-	-	-	-	-	-	-	-	8.239
315	-	-	-	-	-	-	-	-	-	8.498
320	-	-	-	-	-	-	-	-	-	8.757
325	-	-	-	-	-	-	-	-	-	9.015
330	-	-	-	-	-	-	-	-	-	9.274
335	-	-	-	-	-	-	-	-	-	9.533
340	-	-	-	-	-	-	-	-	-	9.791
345	-	-	-	-	-	-	-	-	-	10.050
350	-	-	-	-	-	-	-	-	-	10.309
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-
435	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Hollow Columns: 135 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m^{-1})	350	400	450	500	520	550	600	650	700	750
50	6.841	6.195	5.429	4.730	4.480	4.135	3.711	3.311	2.945	2.580
55	7.607	6.942	5.912	5.153	4.883	4.508	3.981	3.555	3.156	2.760
60	-	7.689	6.597	5.576	5.286	4.881	4.295	3.799	3.367	2.939
65	-	8.436	7.414	5.999	5.688	5.254	4.624	4.043	3.577	3.118
70	-	-	-	7.095	6.091	5.627	4.953	4.417	3.788	3.298
75	-	-	-	8.057	7.840	6.000	5.282	4.791	3.999	3.477
80	-	-	-	8.204	8.138	8.029	5.610	5.165	4.405	3.656
85	-	-	-	8.351	8.277	8.158	5.939	5.538	4.864	3.836
90	-	-	-	8.497	8.415	8.286	6.756	5.912	5.322	4.015
95	-	-	-	8.644	8.554	8.415	8.017	6.206	5.781	4.473
100	-	-	-	8.791	8.693	8.543	8.142	6.415	6.134	4.982
105	-	-	-	8.938	8.831	8.672	8.268	6.624	6.237	5.491
110	-	-	-	9.084	8.970	8.800	8.393	6.834	6.340	6.000
115	-	-	-	9.231	9.108	8.929	8.518	7.043	6.443	6.157
120	-	-	-	9.378	9.247	9.057	8.643	7.253	6.546	6.225
125	-	-	-	9.525	9.386	9.186	8.768	7.462	6.650	6.293
130	-	-	-	9.671	9.524	9.314	8.893	7.671	6.753	6.361
135	-	-	-	9.818	9.663	9.443	9.018	7.881	6.856	6.429
140	-	-	-	9.965	9.801	9.571	9.143	8.077	6.959	6.497
145	-	-	-	10.112	9.940	9.700	9.268	8.251	7.062	6.565
150	-	-	-	10.259	10.079	9.828	9.393	8.424	7.166	6.633
155	-	-	-	10.405	10.217	9.957	9.518	8.598	7.269	6.701
160	-	-	-	-	10.356	10.085	9.643	8.771	7.372	6.769
165	-	-	-	-	-	10.214	9.769	8.945	7.475	6.837
170	-	-	-	-	-	10.342	9.894	9.119	7.578	6.905
175	-	-	-	-	-	-	10.019	9.292	7.681	6.973
180	-	-	-	-	-	-	10.144	9.466	7.785	7.041
185	-	-	-	-	-	-	10.269	9.639	7.888	7.109
190	-	-	-	-	-	-	10.394	9.813	7.991	7.177
195	-	-	-	-	-	-	-	9.987	8.269	7.245
200	-	-	-	-	-	-	-	10.160	8.594	7.313
205	-	-	-	-	-	-	-	10.334	8.920	7.381
210	-	-	-	-	-	-	-	-	9.245	7.449
215	-	-	-	-	-	-	-	-	9.570	7.517
220	-	-	-	-	-	-	-	-	9.896	7.585
225	-	-	-	-	-	-	-	-	10.221	7.652
230	-	-	-	-	-	-	-	-	-	7.720
235	-	-	-	-	-	-	-	-	-	7.788
240	-	-	-	-	-	-	-	-	-	7.856
245	-	-	-	-	-	-	-	-	-	7.924
250	-	-	-	-	-	-	-	-	-	7.992
255	-	-	-	-	-	-	-	-	-	8.793
260	-	-	-	-	-	-	-	-	-	9.913
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-
430	-	-	-	-	-	-	-	-	-	-
435	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to circular and rectangular/square hollow columns exposed on all sides.

Annex B
Field of application for the reaction to fire classification.

The reaction to fire classification stated in section 3 of this ETA is valid for:

i. An intumescent reactive coating for the fire protection of steel elements

And the following product and mounting and fixing parameters:

Parameter	Field of application
Build-up and ordering of layers	Valid for the build-up tested. No variation in build-up allowed. No variation in ordering of layers.
Method of application of coatings	Airless spray.
Product orientation and geometry	Non-directional.
Joints and exposed edges	Not applicable.
Primer	
Primer	Temaprime EUR. Valid for all other primers that can be shown to have a Q_{PCS} for the dried product that is less than or equal to that of the primer tested.
Dry film thickness of primer	Mean 66 µm (range 62 µm to 70 µm). Valid for primer dry film thicknesses of less than or equal to 62 µm.
Heat of combustion (Q_{PCS}) of tested primer	10.42 MJ/kg. Valid for all primers with a Q_{PCS} (dried) value less than or equal to 10.42 MJ/kg.
Intumescent coating	
Intumescent coating	Protecta Steel Paint FR-2. No variation in intumescent coating allowed.
Type of coating	Water-based intumescent paint.
Composition of intumescent, including additives and flame retardants	Valid for the composition tested. No variation in composition allowed.
Colour of intumescent coating	White. Valid as tested, no variation allowed.
Dry film thickness of intumescent coating	Mean 9,936 µm (range 9,927 µm to 9,945 µm) Valid for dry film thicknesses less than or equal to 9,927 µm.
Specific gravity/density	1.42 g/cm³. Valid as tested, no variation allowed.
Heat of combustion (Q_{PCS}) of tested intumescent	11.04 MJ/kg.
Topcoat/facing	
Topcoat	None. Valid for intumescent coating applications without a topcoat.
Facing	None. Valid for intumescent coating applications without a facing.

The classification is valid for the following end-use applications:

i. Applies over prepared steel substrates with nominal thickness of greater than or equal to 2 mm primed as detailed above
ii. Uncoated/without topcoat

Note that the product was tested and classified under the product name Protecta Steel Paint FR-2, but is placed now on the marked with the trade name Protecta Steel Paint FR-120