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Designated according to Article 29 of Regulation (EU) No 305/2011

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European Technical Assessment

ETA 15/0691
of 27/11/15

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: Warrington Certification Limited	
Trade name of the construction product	**Firefilm 901 and 902**
Product family to which the construction product belongs	35. Fire Protective Products Reactive Coating for the Fire Protection of Steel Elements
Manufacturer	**Carboline Norge AS** **Husebysletta 7-9,** **3414 Lierstranda,** **Norway**
Manufacturing plant(s)	E/057
This European Technical Assessment contains	27 pages including 1 Annex which form an integral part of this assessment.
	Annex(es) A - C Contain(s) confidential information and is/are not included in the European Technical Assessment when that assessment is publicly available.
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	ETAG 018-1 edition April 2013 and ETAG 018-2 edition November 2011 used as European Assessment Document (EAD)

General Comments

1. This European Technical Assessment is issued by Warrington Certification Limited on the basis ETAG 018 Fire Protective Products Part 1: General and Part 2: Reactive Coatings For Fire Protection of Steel Elements, Used as European Assessment Document.

2. This European Technical Assessment is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1.

1 SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical Description of the Product

(Detailed information and data are given in Annexes)

Firefilm 901 and 902 is a spray applied two pack intumescent paint. The intumescent paint systems work with or without primer, and with or without topcoat where appropriate to suit the following environmental conditions:

Internal conditions – ETAG 018-2 Type Z2

Internal with high humidity – ETAG 018-2 Type Z1

Internal and semi-exposed conditions – ETAG 018-2 Type Y

All conditions – ETAG 018-2 Type X

2 Specification Of The Intended Use In Accordance With The Relevant EAD

Firefilm 901 and 902 is used as reactive coating system to fire protect various sizes of structural steel 'H' or 'I' section beams and columns for up to a fire resistance classification of R120 and circular hollow columns for up to a fire resistance classification of R90 in accordance with EN 13501-2 and for design temperatures in the range of 350^{o}C to 750^{o}C.

The provisions made in this ETA are based on an assumed working life of the applied coating for the intended use of 10 years, provided that it is subject to appropriate use and maintenance according to manufacturer's instruction. The indications given on the intended working life cannot be interpreted as a guarantee given by the producer, but are to be used as a means for selecting the appropriate 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

The assessment of the Firefilm 901 and 902 for the intended use considering the basic requirements for construction works 2 and 3 was performed following the ETAG 018 for Fire Protective Products, Part 1 General (April 2013) and Part 2: Reactive coatings for fire protection of steel elements (November 2011), used as EAD.

ETAG Clause No.	**ETA Clause No.**	**Characteristic**	**Assessment of characteristic**
5.1		**Mechanical resistance and stability**	Not relevant
5.2	**2.1**	**Safety in case of fire**	
5.2.1	2.1.1	Resistance to fire	EN 13501-2
5.2.2	2.1.2	Reaction to fire	EN 13501-1
5.3		**Hygiene, Health and the Environment**	
5.3.2	2.2	- Release of dangerous substances	No dangerous substances
5.4	-	**Safety in use**	Not relevant
5.5	-	**Protection against noise**	Not relevant
5.6	-	**Energy, Economy and Heat Retention**	Not relevant
5.7	2.3	**Related aspects of serviceability**	
5.7.2.2	2.3.1 2.3.2 to 2.3.5	- Primer and top coat compatibility - Type Y Durability - Type X Durability - Type Z_2 Durability - Type Z_1 Durability	
5.7.3 and Annex E	2.3.6	- Identification	

3.1 Reaction to fire

The fire protection coating in conjunction with or without primer and TS818, TS819 and Carboxane2000 topcoats has a performance determined for a reaction to fire classification in accordance with EN 13501-1 of Class C-s2, d0. The fire protection coating in conjunction with or without primer and without topcoat has a performance determined for a reaction to fire classification in accordance with EN 13501-1 of Class B-s2, d0.

3.2 Resistance to fire

The resistance to fire performance according to EN 13501-2 determined in accordance with test principles defined in EN 13381-8: 2013 including Annex A (slow heating curve). The test data was analysed according to EN 13381-8: 2013. Annex A summarises the results of the analysis.

In accordance with ETAG 018-2 (foreword), Firefilm 901 and 902 may be considered as a reactive coating (Option 1) or a reactive coating kit that includes one or more primers and/or topcoats (Option 2).

3.3 Dangerous substances

According to the manufacturer's declaration, the product specification has been compared with Annex XVII of REACH and the ECHA Candidate List of Substances of Very High Concern to verify that that it does not contain such substances.

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.

3.4 Durability and serviceability

Firefilm 901 and 902 has been assessed as being compatible, in accordance with the test procedures defined in ETAG 018-2 Clause 5.7.2.1 with the following generic primers and topcoats:

Primers
Generic Primer Type
2-pack epoxy primer

Top Coats	
Name	**Type**
Nullifire TS818	2-pack water based polyurethane
Torlife TP (Nullifire TS819)	2-pack solvent based polyurethane
Carboxane 2000TC	2-pack solvent based polysiloxane

The Firefilm 901 and 902 reactive coating has been tested in accordance with the test procedures defined in ETAG 018-2 (used as European Assessment Document, EAD) Clause 5.7.2.1 directly on galvanised steel substrates as well as brush cleaned rusty steel substrates and passed the performance requirements for compatibility.

Firefilm 901 and 902 has been assessed as having passed the requirements for Internal and semi-exposed conditions (Type Y) defined in ETAG 018-2 (used as European Assessment Document, EAD) without topcoats.

Firefilm 901 and 902 has been assessed as having passed the requirements for all conditions (Type X) with the above topcoats.

4 Assessment And Verification Of Constancy Of Performance (Hereinafter AVCP) System Applied, With References To Its Legal base

According to the decision 1999/454/EC of the European Commission the system of assessment and verification of constancy of performance (see Annex V to the Regulation (EU) No 305/2011) given in the following table apply:

Products	Intended uses	Level or Class	System
Fire protective products (including coatings)	For fire compartmentation and / or fire protection or fire performance	Any	System 1

4.1 Attestation of Conformity system

According to the decision 1999/454/EC of the European Commission the system 1 of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by a notified certification body on the basis of:

(a) Tasks for the manufacturer:

(1) factory production control;

(2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the notified body

(1) initial type-testing of the product;

(2) initial inspection of factory and of factory production control;

(3) continued surveillance, assessment and approval of factory production control.

5 Technical Details Necessary For The Implementation Of The AVCP System, As Provided For In The Applicable EAD.

In accordance with the provisions laid down in the "Control Plan" deposited with Warrington Certification Limited.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical assessment.

In cases where the provisions of the European technical assessment and its "Control Plan" are no longer fulfilled the certification body shall withdraw the Certificate of Constancy and inform the relevant authorities eg NANDO, EOTA

The following tables derived from ETAG 018-2 specify properties that should be controlled and minimum frequencies of control. The test method and threshold have been laid down in the factory production control plan.

Property	Property Paragraph (ETAG)	Threshold	Minimum frequency of tests
Char depth	Annex G or similar	Manufacturer's declaration, minimum value	Every batch
Insulating efficiency	Annex A or alternative(1)	Manufacturer's declaration (2)	Every 10th batch or at least once

			per month
Sag resistance		Manufacturer's declaration	Every batch
Viscosity	EN ISO 3219		Every batch
Raw materials(3)		Check specification	Every delivery
Pigment dispersion	EN ISO 3219		Every batch
Non- volatile content	ISO 3251		Every batch

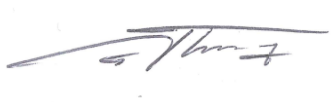
According Table 8.1of ETAG 018-2

(1) agreed with Approvals bodies and manufacturer.

(2) if result of char depth is not sufficient an insulating efficiency test should be carried out.

(3) check test results according to specification.

Signatories



Responsible Officer

D. Podolski* - Certification Engineer

Approved

J. Yuan* - Chief Engineer

* For and on behalf of Warrington Certification Limited.

Annex A - Product Performance: Fire Resistance

1 This Annex relates to the use of Firefilm 901 and 902 for the fire protection of 'H' or 'I' shaped beams and columns and circular hollow columns. The precise scope is given in Tables 1 - 19 which show the total dry film thickness of Firefilm 901 and 902 (excluding primer and top coat) required to provide classifications of up to R120 for I sections and up to R90 for circular hollow columns for various design temperatures and section factors.

2. The product is approved on the basis of:

   i) Approval testing in accordance with the principles of EN 13381-8:2013.

   ii) A design appraisal against this ETA adopting the graphical analysis defined in Annex E of EN 13381-8:2013.

3. The data presented in the tables in this Annex refers to both beams (three-sided fire exposure) and columns (four sided exposure), and also to circular hollow sections.

4. The data shown is applicable to steel sections blast cleaned to ISO 8501-1 SA21/2 or equivalent and primed with the compatible primers and top coats listed in this ETA. Based on the test data the total dry film thickness of primer and top coat together should not exceed 0.20 mm.

5. The data for 'H' and 'I' shaped sections applies also to other shaped steel sections that have re-entrant details such as channels, angles and tees.

6. Firefilm 901 and 902 has been exposed to the slowing heating regime defined in Annex A of EN 13381-8: 2013 and has satisfied the requirements.

Table of Results

Table 1: I-Section Beams 30 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	1.140	0.598	0.477	0.477	0.477	0.477	0.477	0.477	0.477
90	1.160	0.607	0.477	0.477	0.477	0.477	0.477	0.477	0.477
95	1.210	0.630	0.477	0.477	0.477	0.477	0.477	0.477	0.477
100	1.260	0.652	0.477	0.477	0.477	0.477	0.477	0.477	0.477
105	1.311	0.675	0.477	0.477	0.477	0.477	0.477	0.477	0.477
110	1.361	0.698	0.477	0.477	0.477	0.477	0.477	0.477	0.477
115	1.411	0.720	0.480	0.477	0.477	0.477	0.477	0.477	0.477
120	1.461	0.743	0.494	0.477	0.477	0.477	0.477	0.477	0.477
125	1.512	0.765	0.507	0.477	0.477	0.477	0.477	0.477	0.477
130	1.562	0.788	0.521	0.477	0.477	0.477	0.477	0.477	0.477
135	1.612	0.811	0.535	0.477	0.477	0.477	0.477	0.477	0.477
140	1.662	0.833	0.549	0.477	0.477	0.477	0.477	0.477	0.477
145	1.713	0.856	0.562	0.477	0.477	0.477	0.477	0.477	0.477
150	1.763	0.878	0.576	0.477	0.477	0.477	0.477	0.477	0.477
155	1.813	0.901	0.590	0.477	0.477	0.477	0.477	0.477	0.477
160	1.863	0.924	0.604	0.477	0.477	0.477	0.477	0.477	0.477
165	1.913	0.946	0.617	0.477	0.477	0.477	0.477	0.477	0.477
170	1.964	0.969	0.631	0.477	0.477	0.477	0.477	0.477	0.477
175	2.014	0.992	0.645	0.478	0.477	0.477	0.477	0.477	0.477
180	2.052	1.014	0.659	0.488	0.477	0.477	0.477	0.477	0.477
185	2.077	1.037	0.672	0.497	0.477	0.477	0.477	0.477	0.477
190	2.102	1.059	0.686	0.506	0.477	0.477	0.477	0.477	0.477
195	2.128	1.082	0.700	0.515	0.477	0.477	0.477	0.477	0.477
200	2.153	1.105	0.714	0.525	0.477	0.477	0.477	0.477	0.477
205	2.178	1.127	0.727	0.534	0.477	0.477	0.477	0.477	0.477
210	2.203	1.150	0.741	0.543	0.477	0.477	0.477	0.477	0.477
215	2.228	1.172	0.755	0.552	0.477	0.477	0.477	0.477	0.477
220	2.253	1.195	0.769	0.562	0.477	0.477	0.477	0.477	0.477
225	2.278	1.216	0.782	0.571	0.477	0.477	0.477	0.477	0.477
230	2.303	1.232	0.796	0.580	0.477	0.477	0.477	0.477	0.477
235	2.329	1.249	0.810	0.590	0.477	0.477	0.477	0.477	0.477
240	2.354	1.266	0.824	0.599	0.477	0.477	0.477	0.477	0.477
245	2.379	1.283	0.837	0.608	0.477	0.477	0.477	0.477	0.477
250	2.404	1.300	0.851	0.617	0.477	0.477	0.477	0.477	0.477
255	2.429	1.316	0.865	0.627	0.484	0.477	0.477	0.477	0.477
260	2.454	1.333	0.879	0.636	0.490	0.477	0.477	0.477	0.477
265	2.479	1.350	0.892	0.645	0.497	0.477	0.477	0.477	0.477
270	2.504	1.367	0.906	0.654	0.504	0.477	0.477	0.477	0.477
275	2.530	1.383	0.920	0.664	0.510	0.477	0.477	0.477	0.477
280	2.555	1.400	0.934	0.673	0.517	0.477	0.477	0.477	0.477
285	2.580	1.417	0.947	0.682	0.524	0.477	0.477	0.477	0.477
290	2.605	1.434	0.961	0.691	0.531	0.477	0.477	0.477	0.477
295	2.630	1.451	0.975	0.701	0.537	0.477	0.477	0.477	0.477
300	2.655	1.467	0.989	0.710	0.544	0.477	0.477	0.477	0.477
305	2.680	1.484	1.002	0.719	0.551	0.477	0.477	0.477	0.477
310	2.706	1.501	1.016	0.728	0.557	0.477	0.477	0.477	0.477
315	2.731	1.518	1.030	0.738	0.564	0.477	0.477	0.477	0.477
320	2.756	1.534	1.044	0.747	0.571	0.477	0.477	0.477	0.477
325	2.781	1.551	1.057	0.756	0.577	0.477	0.477	0.477	0.477
330	2.806	1.568	1.071	0.766	0.584	0.477	0.477	0.477	0.477
335	2.831	1.585	1.085	0.775	0.591	0.477	0.477	0.477	0.477
340	2.856	1.602	1.099	0.784	0.598	0.482	0.477	0.477	0.477
345	2.881	1.618	1.113	0.793	0.604	0.486	0.477	0.477	0.477
350	2.907	1.635	1.126	0.803	0.611	0.491	0.477	0.477	0.477
355	2.932	1.652	1.140	0.812	0.618	0.495	0.477	0.477	0.477

Thickness is intumescent only.

Table 2: I-Section Beams 45 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	1.903	1.127	0.782	0.565	0.477	0.477	0.477	0.477	0.477
90	1.936	1.145	0.793	0.573	0.477	0.477	0.477	0.477	0.477
95	2.020	1.192	0.823	0.595	0.477	0.477	0.477	0.477	0.477
100	2.104	1.244	0.852	0.617	0.477	0.477	0.477	0.477	0.477
105	2.188	1.300	0.881	0.639	0.492	0.477	0.477	0.477	0.477
110	2.272	1.356	0.910	0.661	0.509	0.477	0.477	0.477	0.477
115	2.356	1.412	0.939	0.682	0.525	0.477	0.477	0.477	0.477
120	2.440	1.468	0.969	0.704	0.542	0.477	0.477	0.477	0.477
125	2.524	1.525	0.998	0.726	0.558	0.477	0.477	0.477	0.477
130	2.608	1.581	1.027	0.748	0.575	0.477	0.477	0.477	0.477
135	2.692	1.637	1.056	0.770	0.592	0.488	0.477	0.477	0.477
140	2.776	1.693	1.085	0.792	0.608	0.501	0.477	0.477	0.477
145	2.860	1.749	1.115	0.814	0.625	0.513	0.477	0.477	0.477
150	2.944	1.805	1.144	0.836	0.642	0.525	0.477	0.477	0.477
155	3.029	1.862	1.173	0.858	0.658	0.537	0.477	0.477	0.477
160	3.113	1.918	1.202	0.879	0.675	0.549	0.477	0.477	0.477
165	3.197	1.974	1.247	0.901	0.692	0.561	0.477	0.477	0.477
170	3.281	2.030	1.298	0.923	0.708	0.573	0.477	0.477	0.477
175	3.365	2.069	1.349	0.945	0.725	0.585	0.478	0.477	0.477
180	3.433	2.103	1.399	0.967	0.742	0.597	0.486	0.477	0.477
185	3.483	2.138	1.450	0.989	0.758	0.609	0.495	0.477	0.477
190	3.533	2.173	1.501	1.011	0.775	0.621	0.504	0.477	0.477
195	3.582	2.208	1.551	1.033	0.792	0.633	0.512	0.477	0.477
200	3.632	2.243	1.602	1.054	0.808	0.645	0.521	0.477	0.477
205	3.682	2.277	1.653	1.076	0.825	0.657	0.529	0.477	0.477
210	3.732	2.312	1.704	1.098	0.842	0.669	0.538	0.477	0.477
215	3.782	2.347	1.754	1.120	0.858	0.681	0.547	0.477	0.477
220	3.831	2.382	1.805	1.142	0.875	0.693	0.555	0.477	0.477
225	3.881	2.416	1.856	1.164	0.892	0.705	0.564	0.477	0.477
230	3.931	2.451	1.906	1.186	0.908	0.717	0.573	0.477	0.477
235	3.981	2.486	1.957	1.208	0.925	0.729	0.581	0.477	0.477
240	4.031	2.521	2.008	1.232	0.942	0.741	0.590	0.477	0.477
245	4.080	2.556	2.050	1.257	0.958	0.753	0.598	0.477	0.477
250	4.130	2.590	2.077	1.282	0.975	0.766	0.607	0.482	0.477
255	4.180	2.625	2.104	1.306	0.992	0.778	0.616	0.488	0.477
260	4.230	2.660	2.132	1.331	1.008	0.790	0.624	0.494	0.477
265	4.280	2.695	2.159	1.356	1.025	0.802	0.633	0.500	0.477
270	4.330	2.729	2.186	1.380	1.041	0.814	0.642	0.507	0.477
275	4.379	2.764	2.213	1.405	1.058	0.826	0.650	0.513	0.477
280	4.429	2.799	2.241	1.430	1.075	0.838	0.659	0.519	0.477
285	4.479	2.834	2.268	1.455	1.091	0.850	0.668	0.525	0.477
290	4.529	2.868	2.295	1.479	1.108	0.862	0.676	0.531	0.477
295	4.579	2.903	2.322	1.504	1.125	0.874	0.685	0.537	0.477
300	4.628	2.938	2.350	1.529	1.141	0.886	0.693	0.543	0.477
305	4.678	2.973	2.377	1.554	1.158	0.898	0.702	0.550	0.477
310	4.728	3.008	2.404	1.578	1.175	0.910	0.711	0.556	0.477
315	4.778	3.042	2.431	1.603	1.191	0.922	0.719	0.562	0.477
320	4.828	3.077	2.459	1.628	1.208	0.934	0.728	0.568	0.477
325	4.877	3.112	2.486	1.652	1.229	0.946	0.737	0.574	0.477
330	4.927	3.147	2.513	1.677	1.251	0.958	0.745	0.580	0.477
335	4.977	3.181	2.540	1.702	1.272	0.970	0.754	0.586	0.477
340	5.027	3.216	2.567	1.727	1.294	0.982	0.762	0.593	0.477
345	5.077	3.251	2.595	1.751	1.315	0.994	0.771	0.599	0.477
350	-	3.286	2.622	1.776	1.337	1.006	0.780	0.605	0.477
355	-	3.321	2.649	1.801	1.358	1.019	0.788	0.611	0.480

Thickness is intumescent only.

Table 3: I-Section Beams 60 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	2.715	1.942	1.247	0.928	0.731	0.588	0.477	0.477	0.477
90	2.773	1.969	1.270	0.942	0.743	0.597	0.479	0.477	0.477
95	2.923	2.039	1.328	0.977	0.771	0.619	0.497	0.477	0.477
100	3.074	2.108	1.385	1.013	0.800	0.642	0.514	0.477	0.477
105	3.224	2.178	1.443	1.048	0.828	0.664	0.531	0.477	0.477
110	3.374	2.248	1.501	1.083	0.857	0.687	0.549	0.477	0.477
115	3.492	2.318	1.559	1.119	0.885	0.709	0.566	0.477	0.477
120	3.599	2.387	1.617	1.154	0.914	0.732	0.583	0.480	0.477
125	3.706	2.457	1.675	1.190	0.942	0.754	0.601	0.492	0.477
130	3.813	2.527	1.732	1.232	0.971	0.776	0.618	0.505	0.477
135	3.920	2.596	1.790	1.285	1.000	0.799	0.635	0.518	0.477
140	4.027	2.666	1.848	1.337	1.028	0.821	0.653	0.531	0.477
145	4.134	2.736	1.906	1.390	1.057	0.844	0.670	0.544	0.477
150	4.241	2.805	1.964	1.442	1.085	0.866	0.687	0.557	0.477
155	4.348	2.875	2.022	1.494	1.114	0.889	0.704	0.570	0.477
160	4.455	2.945	2.074	1.547	1.142	0.911	0.722	0.583	0.479
165	4.563	3.014	2.124	1.599	1.171	0.933	0.739	0.596	0.488
170	4.670	3.084	2.173	1.652	1.199	0.956	0.756	0.609	0.497
175	4.777	3.154	2.223	1.704	1.243	0.978	0.774	0.622	0.505
180	4.884	3.224	2.273	1.757	1.295	1.001	0.791	0.635	0.514
185	4.991	3.293	2.323	1.809	1.347	1.023	0.808	0.648	0.523
190	5.098	3.363	2.372	1.862	1.400	1.046	0.826	0.661	0.532
195	-	3.428	2.422	1.914	1.452	1.068	0.843	0.674	0.541
200	-	3.484	2.472	1.967	1.504	1.091	0.860	0.687	0.550
205	-	3.540	2.521	2.019	1.556	1.113	0.878	0.699	0.559
210	-	3.596	2.571	2.066	1.608	1.135	0.895	0.712	0.567
215	-	3.652	2.621	2.108	1.661	1.158	0.912	0.725	0.576
220	-	3.708	2.671	2.151	1.713	1.180	0.929	0.738	0.585
225	-	3.763	2.720	2.193	1.765	1.203	0.947	0.751	0.594
230	-	3.819	2.770	2.236	1.817	1.242	0.964	0.764	0.603
235	-	3.875	2.820	2.278	1.870	1.290	0.981	0.777	0.612
240	-	3.931	2.870	2.321	1.922	1.337	0.999	0.790	0.620
245	-	3.987	2.919	2.363	1.974	1.385	1.016	0.803	0.629
250	-	4.043	2.969	2.406	2.026	1.433	1.033	0.816	0.638
255	-	4.099	3.019	2.448	2.067	1.480	1.051	0.829	0.647
260	-	4.155	3.069	2.491	2.103	1.528	1.068	0.842	0.656
265	-	4.210	3.118	2.534	2.140	1.576	1.085	0.855	0.665
270	-	4.266	3.168	2.576	2.176	1.623	1.103	0.868	0.674
275	-	4.322	3.218	2.619	2.212	1.671	1.120	0.881	0.682
280	-	4.378	3.268	2.661	2.249	1.719	1.137	0.894	0.691
285	-	4.434	3.317	2.704	2.285	1.766	1.155	0.906	0.700
290	-	4.490	3.367	2.746	2.322	1.814	1.172	0.919	0.709
295	-	4.546	3.418	2.789	2.358	1.862	1.189	0.932	0.718
300	-	4.602	3.474	2.831	2.395	1.909	1.206	0.945	0.727
305	-	4.657	3.530	2.874	2.431	1.957	1.230	0.958	0.736
310	-	4.713	3.586	2.916	2.467	2.005	1.255	0.971	0.744
315	-	4.769	3.642	2.959	2.504	2.047	1.281	0.984	0.753
320	-	4.825	3.698	3.002	2.540	2.076	1.306	0.997	0.762
325	-	4.881	3.755	3.044	2.577	2.104	1.331	1.010	0.771
330	-	4.937	3.811	3.087	2.613	2.133	1.356	1.023	0.780
335	-	4.993	3.867	3.129	2.649	2.161	1.382	1.036	0.789
340	-	5.049	3.923	3.172	2.686	2.190	1.407	1.049	0.797
345	-	5.105	3.979	3.214	2.722	2.218	1.432	1.062	0.806
350	-	-	4.035	3.257	2.759	2.247	1.458	1.075	0.815
355	-	-	4.091	3.299	2.795	2.275	1.483	1.088	0.824

Thickness is intumescent only.

Table 4: I-Section Beams 75 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	2.686	2.029	1.452	1.055	0.875	0.718	0.576	0.477
90	-	2.721	2.058	1.471	1.071	0.888	0.728	0.585	0.477
95	-	2.811	2.133	1.519	1.112	0.921	0.755	0.606	0.492
100	-	2.901	2.208	1.567	1.153	0.954	0.781	0.628	0.509
105	-	2.992	2.283	1.615	1.194	0.987	0.808	0.650	0.525
110	-	3.082	2.358	1.663	1.255	1.020	0.834	0.671	0.541
115	-	3.172	2.434	1.711	1.327	1.053	0.861	0.693	0.557
120	-	3.262	2.509	1.759	1.399	1.086	0.888	0.714	0.573
125	-	3.352	2.584	1.807	1.471	1.119	0.914	0.736	0.589
130	-	3.443	2.659	1.855	1.544	1.152	0.941	0.758	0.605
135	-	3.537	2.734	1.903	1.616	1.185	0.968	0.779	0.621
140	-	3.631	2.810	1.951	1.688	1.222	0.994	0.801	0.637
145	-	3.725	2.885	1.999	1.761	1.273	1.021	0.822	0.653
150	-	3.819	2.960	2.052	1.833	1.323	1.047	0.844	0.669
155	-	3.912	3.035	2.129	1.905	1.374	1.074	0.866	0.685
160	-	4.006	3.110	2.206	1.977	1.425	1.101	0.887	0.701
165	-	4.100	3.186	2.283	2.047	1.475	1.127	0.909	0.717
170	-	4.194	3.261	2.360	2.098	1.526	1.154	0.930	0.733
175	-	4.288	3.336	2.437	2.150	1.576	1.180	0.952	0.749
180	-	4.381	3.411	2.515	2.202	1.627	1.207	0.974	0.765
185	-	4.475	3.491	2.592	2.253	1.678	1.256	0.995	0.781
190	-	4.569	3.571	2.669	2.305	1.728	1.307	1.017	0.797
195	-	4.663	3.651	2.746	2.357	1.779	1.358	1.039	0.813
200	-	4.757	3.731	2.823	2.408	1.829	1.410	1.060	0.829
205	-	4.850	3.811	2.900	2.460	1.880	1.461	1.082	0.845
210	-	4.944	3.891	2.977	2.512	1.931	1.512	1.103	0.861
215	-	5.038	3.971	3.054	2.563	1.981	1.564	1.125	0.877
220	-	-	4.051	3.131	2.615	2.032	1.615	1.147	0.893
225	-	-	4.131	3.208	2.666	2.083	1.666	1.168	0.909
230	-	-	4.211	3.286	2.718	2.135	1.717	1.190	0.925
235	-	-	4.291	3.363	2.770	2.186	1.769	1.213	0.941
240	-	-	4.371	3.437	2.821	2.237	1.820	1.260	0.957
245	-	-	4.451	3.508	2.873	2.289	1.871	1.307	0.973
250	-	-	4.531	3.579	2.925	2.340	1.923	1.354	0.989
255	-	-	4.611	3.650	2.976	2.392	1.974	1.401	1.006
260	-	-	4.691	3.721	3.028	2.443	2.025	1.448	1.022
265	-	-	4.771	3.792	3.080	2.494	2.068	1.496	1.038
270	-	-	4.850	3.863	3.131	2.546	2.108	1.543	1.054
275	-	-	4.930	3.933	3.183	2.597	2.148	1.590	1.070
280	-	-	5.010	4.004	3.234	2.649	2.188	1.637	1.086
285	-	-	5.090	4.075	3.286	2.700	2.227	1.684	1.102
290	-	-	-	4.146	3.338	2.752	2.267	1.731	1.118
295	-	-	-	4.217	3.389	2.803	2.307	1.778	1.134
300	-	-	-	4.288	3.452	2.854	2.347	1.825	1.150
305	-	-	-	4.359	3.523	2.906	2.387	1.872	1.166
310	-	-	-	4.430	3.594	2.957	2.426	1.919	1.182
315	-	-	-	4.501	3.665	3.009	2.466	1.966	1.198
320	-	-	-	4.571	3.735	3.060	2.506	2.013	1.217
325	-	-	-	4.642	3.806	3.111	2.546	2.054	1.247
330	-	-	-	4.713	3.877	3.163	2.585	2.088	1.276
335	-	-	-	4.784	3.948	3.214	2.625	2.121	1.306
340	-	-	-	4.855	4.018	3.266	2.665	2.154	1.335
345	-	-	-	4.926	4.089	3.317	2.705	2.187	1.365
350	-	-	-	4.997	4.160	3.369	2.745	2.220	1.394
355	-	-	-	5.068	4.231	3.420	2.784	2.253	1.424

Thickness is intumescent only.

Table 5: I-Section Beams 90 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	2.734	2.133	1.704	1.164	0.975	0.814	0.668
90	-	-	2.769	2.163	1.716	1.189	0.989	0.826	0.677
95	-	-	2.860	2.243	1.747	1.254	1.026	0.856	0.700
100	-	-	2.950	2.322	1.777	1.319	1.062	0.886	0.724
105	-	-	3.040	2.402	1.808	1.383	1.099	0.916	0.748
110	-	-	3.130	2.481	1.839	1.448	1.135	0.947	0.771
115	-	-	3.221	2.561	1.870	1.513	1.172	0.977	0.795
120	-	-	3.311	2.640	1.901	1.578	1.209	1.007	0.819
125	-	-	3.401	2.719	1.932	1.642	1.273	1.037	0.842
130	-	-	3.516	2.799	1.963	1.707	1.338	1.067	0.866
135	-	-	3.633	2.878	1.994	1.772	1.403	1.098	0.890
140	-	-	3.751	2.958	2.024	1.836	1.468	1.128	0.913
145	-	-	3.868	3.037	2.105	1.901	1.533	1.158	0.937
150	-	-	3.985	3.117	2.235	1.966	1.599	1.188	0.961
155	-	-	4.102	3.196	2.366	2.031	1.664	1.224	0.984
160	-	-	4.219	3.275	2.496	2.096	1.729	1.275	1.008
165	-	-	4.337	3.355	2.627	2.162	1.794	1.325	1.032
170	-	-	4.454	3.444	2.758	2.228	1.859	1.376	1.055
175	-	-	4.571	3.554	2.888	2.294	1.924	1.426	1.079
180	-	-	4.688	3.664	3.019	2.360	1.990	1.476	1.103
185	-	-	4.805	3.774	3.149	2.426	2.053	1.527	1.126
190	-	-	4.923	3.885	3.280	2.491	2.110	1.577	1.150
195	-	-	5.040	3.995	3.410	2.557	2.166	1.627	1.174
200	-	-	-	4.105	3.501	2.623	2.223	1.678	1.197
205	-	-	-	4.215	3.592	2.689	2.280	1.728	1.232
210	-	-	-	4.325	3.682	2.755	2.337	1.778	1.278
215	-	-	-	4.436	3.773	2.821	2.394	1.829	1.324
220	-	-	-	4.546	3.864	2.887	2.450	1.879	1.371
225	-	-	-	4.656	3.955	2.952	2.507	1.929	1.417
230	-	-	-	4.766	4.045	3.018	2.564	1.980	1.463
235	-	-	-	4.876	4.136	3.084	2.621	2.030	1.509
240	-	-	-	4.986	4.227	3.150	2.677	2.084	1.556
245	-	-	-	5.097	4.317	3.216	2.734	2.138	1.602
250	-	-	-	-	4.408	3.282	2.791	2.193	1.648
255	-	-	-	-	4.499	3.347	2.848	2.247	1.695
260	-	-	-	-	4.589	3.415	2.904	2.302	1.741
265	-	-	-	-	4.680	3.514	2.961	2.356	1.787
270	-	-	-	-	4.771	3.614	3.018	2.411	1.833
275	-	-	-	-	4.862	3.713	3.075	2.466	1.880
280	-	-	-	-	4.952	3.813	3.132	2.520	1.926
285	-	-	-	-	5.043	3.912	3.188	2.575	1.972
290	-	-	-	-	-	4.011	3.245	2.629	2.019
295	-	-	-	-	-	4.111	3.302	2.684	2.064
300	-	-	-	-	-	4.210	3.359	2.738	2.108
305	-	-	-	-	-	4.310	3.417	2.793	2.153
310	-	-	-	-	-	4.409	3.486	2.848	2.197
315	-	-	-	-	-	4.508	3.555	2.902	2.242
320	-	-	-	-	-	4.608	3.624	2.957	2.286
325	-	-	-	-	-	4.707	3.693	3.011	2.331
330	-	-	-	-	-	4.806	3.763	3.066	2.375
335	-	-	-	-	-	4.906	3.832	3.120	2.419
340	-	-	-	-	-	5.005	3.901	3.175	2.464
345	-	-	-	-	-	5.105	3.970	3.229	2.508
350	-	-	-	-	-	-	4.039	3.284	2.553
355	-	-	-	-	-	-	4.109	3.339	2.597

Thickness is intumescent only.

Table 6: I-Section Beams 105 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	-	2.799	2.297	1.912	1.373	1.050	0.881
90	-	-	-	2.837	2.330	1.924	1.394	1.066	0.893
95	-	-	-	2.935	2.416	1.955	1.447	1.105	0.925
100	-	-	-	3.032	2.501	1.985	1.501	1.145	0.956
105	-	-	-	3.130	2.587	2.016	1.554	1.184	0.988
110	-	-	-	3.227	2.672	2.060	1.608	1.236	1.020
115	-	-	-	3.325	2.758	2.157	1.661	1.309	1.051
120	-	-	-	3.427	2.843	2.254	1.715	1.382	1.083
125	-	-	-	3.566	2.929	2.351	1.768	1.455	1.115
130	-	-	-	3.705	3.014	2.448	1.822	1.528	1.146
135	-	-	-	3.844	3.100	2.545	1.875	1.601	1.178
140	-	-	-	3.983	3.185	2.642	1.928	1.675	1.209
145	-	-	-	4.122	3.271	2.739	1.982	1.748	1.258
150	-	-	-	4.261	3.356	2.836	2.035	1.821	1.306
155	-	-	-	4.400	3.468	2.933	2.150	1.894	1.355
160	-	-	-	4.539	3.625	3.030	2.271	1.967	1.403
165	-	-	-	4.678	3.782	3.127	2.392	2.040	1.452
170	-	-	-	4.817	3.940	3.224	2.513	2.099	1.500
175	-	-	-	4.955	4.097	3.321	2.634	2.157	1.549
180	-	-	-	5.094	4.254	3.420	2.755	2.215	1.597
185	-	-	-	-	4.411	3.539	2.875	2.274	1.646
190	-	-	-	-	4.569	3.658	2.996	2.332	1.694
195	-	-	-	-	4.726	3.777	3.117	2.390	1.743
200	-	-	-	-	4.883	3.896	3.238	2.449	1.791
205	-	-	-	-	5.040	4.015	3.359	2.507	1.840
210	-	-	-	-	-	4.134	3.459	2.565	1.888
215	-	-	-	-	-	4.253	3.543	2.624	1.937
220	-	-	-	-	-	4.373	3.627	2.682	1.985
225	-	-	-	-	-	4.492	3.711	2.740	2.034
230	-	-	-	-	-	4.611	3.795	2.799	2.101
235	-	-	-	-	-	4.730	3.880	2.857	2.171
240	-	-	-	-	-	4.849	3.964	2.915	2.241
245	-	-	-	-	-	4.968	4.048	2.973	2.311
250	-	-	-	-	-	5.087	4.132	3.032	2.382
255	-	-	-	-	-	-	4.217	3.090	2.452
260	-	-	-	-	-	-	4.301	3.148	2.522
265	-	-	-	-	-	-	4.385	3.207	2.592
270	-	-	-	-	-	-	4.469	3.265	2.662
275	-	-	-	-	-	-	4.554	3.323	2.732
280	-	-	-	-	-	-	4.638	3.382	2.803
285	-	-	-	-	-	-	4.722	3.466	2.873
290	-	-	-	-	-	-	4.806	3.575	2.943
295	-	-	-	-	-	-	4.891	3.683	3.013
300	-	-	-	-	-	-	4.975	3.792	3.083
305	-	-	-	-	-	-	5.059	3.901	3.154
310	-	-	-	-	-	-	-	4.009	3.224
315	-	-	-	-	-	-	-	4.118	3.294
320	-	-	-	-	-	-	-	4.227	3.364
325	-	-	-	-	-	-	-	4.335	3.434
330	-	-	-	-	-	-	-	4.444	3.504
335	-	-	-	-	-	-	-	4.553	3.575
340	-	-	-	-	-	-	-	4.661	3.645
345	-	-	-	-	-	-	-	4.770	3.715
350	-	-	-	-	-	-	-	4.878	3.785
355	-	-	-	-	-	-	-	4.987	3.855

Thickness is intumescent only.

Table 7: I-Section Beams 120 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	-	-	2.920	2.458	1.976	1.549	1.093
90	-	-	-	-	2.963	2.492	2.009	1.565	1.109
95	-	-	-	-	3.075	2.580	2.094	1.606	1.149
100	-	-	-	-	3.187	2.668	2.179	1.647	1.189
105	-	-	-	-	3.299	2.755	2.263	1.689	1.243
110	-	-	-	-	3.411	2.843	2.348	1.730	1.313
115	-	-	-	-	3.583	2.931	2.433	1.771	1.382
120	-	-	-	-	3.754	3.019	2.518	1.812	1.452
125	-	-	-	-	3.926	3.107	2.603	1.854	1.521
130	-	-	-	-	4.098	3.195	2.688	1.895	1.590
135	-	-	-	-	4.270	3.283	2.773	1.936	1.660
140	-	-	-	-	4.441	3.371	2.858	1.978	1.729
145	-	-	-	-	4.613	3.514	2.943	2.019	1.798
150	-	-	-	-	4.785	3.702	3.027	2.105	1.868
155	-	-	-	-	4.956	3.889	3.112	2.237	1.937
160	-	-	-	-	-	4.077	3.197	2.368	2.007
165	-	-	-	-	-	4.264	3.282	2.500	2.072
170	-	-	-	-	-	4.452	3.367	2.632	2.133
175	-	-	-	-	-	4.639	3.488	2.764	2.194
180	-	-	-	-	-	4.827	3.647	2.896	2.255
185	-	-	-	-	-	5.014	3.806	3.028	2.316
190	-	-	-	-	-	-	3.965	3.160	2.377
195	-	-	-	-	-	-	4.123	3.292	2.439
200	-	-	-	-	-	-	4.282	3.422	2.500
205	-	-	-	-	-	-	4.441	3.538	2.561
210	-	-	-	-	-	-	4.599	3.654	2.622
215	-	-	-	-	-	-	4.758	3.770	2.683
220	-	-	-	-	-	-	4.917	3.887	2.744
225	-	-	-	-	-	-	5.075	4.003	2.805
230	-	-	-	-	-	-	-	4.119	2.867
235	-	-	-	-	-	-	-	4.235	2.928
240	-	-	-	-	-	-	-	4.351	2.989
245	-	-	-	-	-	-	-	4.467	3.050
250	-	-	-	-	-	-	-	4.583	3.111
255	-	-	-	-	-	-	-	4.700	3.172
260	-	-	-	-	-	-	-	4.816	3.233
265	-	-	-	-	-	-	-	4.932	3.295
270	-	-	-	-	-	-	-	5.048	3.356
275	-	-	-	-	-	-	-	-	3.431
280	-	-	-	-	-	-	-	-	3.622
285	-	-	-	-	-	-	-	-	3.813
290	-	-	-	-	-	-	-	-	4.003
295	-	-	-	-	-	-	-	-	4.194
300	-	-	-	-	-	-	-	-	4.385
305	-	-	-	-	-	-	-	-	4.575
310	-	-	-	-	-	-	-	-	4.766
315	-	-	-	-	-	-	-	-	4.957
320	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.

Table 8: I-Section Columns 30 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	1.140	0.598	0.510	0.510	0.510	0.510	0.510	0.510	0.510
90	1.160	0.607	0.510	0.510	0.510	0.510	0.510	0.510	0.510
95	1.210	0.630	0.510	0.510	0.510	0.510	0.510	0.510	0.510
100	1.260	0.652	0.510	0.510	0.510	0.510	0.510	0.510	0.510
105	1.311	0.675	0.510	0.510	0.510	0.510	0.510	0.510	0.510
110	1.361	0.698	0.510	0.510	0.510	0.510	0.510	0.510	0.510
115	1.411	0.720	0.510	0.510	0.510	0.510	0.510	0.510	0.510
120	1.461	0.743	0.510	0.510	0.510	0.510	0.510	0.510	0.510
125	1.512	0.765	0.510	0.510	0.510	0.510	0.510	0.510	0.510
130	1.562	0.788	0.521	0.510	0.510	0.510	0.510	0.510	0.510
135	1.612	0.811	0.535	0.510	0.510	0.510	0.510	0.510	0.510
140	1.662	0.833	0.549	0.510	0.510	0.510	0.510	0.510	0.510
145	1.713	0.856	0.562	0.510	0.510	0.510	0.510	0.510	0.510
150	1.763	0.878	0.576	0.510	0.510	0.510	0.510	0.510	0.510
155	1.813	0.901	0.590	0.510	0.510	0.510	0.510	0.510	0.510
160	1.863	0.924	0.604	0.510	0.510	0.510	0.510	0.510	0.510
165	1.913	0.946	0.617	0.510	0.510	0.510	0.510	0.510	0.510
170	1.964	0.969	0.631	0.510	0.510	0.510	0.510	0.510	0.510
175	2.014	0.992	0.645	0.510	0.510	0.510	0.510	0.510	0.510
180	2.052	1.014	0.659	0.510	0.510	0.510	0.510	0.510	0.510
185	2.077	1.037	0.672	0.510	0.510	0.510	0.510	0.510	0.510
190	2.102	1.059	0.686	0.510	0.510	0.510	0.510	0.510	0.510
195	2.128	1.082	0.700	0.515	0.510	0.510	0.510	0.510	0.510
200	2.153	1.105	0.714	0.525	0.510	0.510	0.510	0.510	0.510
205	2.178	1.127	0.727	0.534	0.510	0.510	0.510	0.510	0.510
210	2.203	1.150	0.741	0.543	0.510	0.510	0.510	0.510	0.510
215	2.228	1.172	0.755	0.552	0.510	0.510	0.510	0.510	0.510
220	2.253	1.195	0.769	0.562	0.510	0.510	0.510	0.510	0.510
225	2.278	1.216	0.782	0.571	0.510	0.510	0.510	0.510	0.510
230	2.303	1.232	0.796	0.580	0.510	0.510	0.510	0.510	0.510
235	2.329	1.249	0.810	0.590	0.510	0.510	0.510	0.510	0.510
240	2.354	1.266	0.824	0.599	0.510	0.510	0.510	0.510	0.510
245	2.379	1.283	0.837	0.608	0.510	0.510	0.510	0.510	0.510
250	2.404	1.300	0.851	0.617	0.510	0.510	0.510	0.510	0.510
255	2.429	1.316	0.865	0.627	0.510	0.510	0.510	0.510	0.510
260	2.454	1.333	0.879	0.636	0.510	0.510	0.510	0.510	0.510
265	2.479	1.350	0.892	0.645	0.510	0.510	0.510	0.510	0.510
270	2.504	1.367	0.906	0.654	0.510	0.510	0.510	0.510	0.510
275	2.530	1.383	0.920	0.664	0.510	0.510	0.510	0.510	0.510
280	2.555	1.400	0.934	0.673	0.517	0.510	0.510	0.510	0.510
285	2.580	1.417	0.947	0.682	0.524	0.510	0.510	0.510	0.510
290	2.605	1.434	0.961	0.691	0.531	0.510	0.510	0.510	0.510
295	2.630	1.451	0.975	0.701	0.537	0.510	0.510	0.510	0.510
300	2.655	1.467	0.989	0.710	0.544	0.510	0.510	0.510	0.510
305	2.680	1.484	1.002	0.719	0.551	0.510	0.510	0.510	0.510
310	2.706	1.501	1.016	0.728	0.557	0.510	0.510	0.510	0.510
315	2.731	1.518	1.030	0.738	0.564	0.510	0.510	0.510	0.510
320	2.756	1.534	1.044	0.747	0.571	0.510	0.510	0.510	0.510
325	2.781	1.551	1.057	0.756	0.577	0.510	0.510	0.510	0.510
330	2.806	1.568	1.071	0.766	0.584	0.510	0.510	0.510	0.510
335	2.831	1.585	1.085	0.775	0.591	0.510	0.510	0.510	0.510
340	2.856	1.602	1.099	0.784	0.598	0.510	0.510	0.510	0.510
345	2.881	1.618	1.113	0.793	0.604	0.510	0.510	0.510	0.510
350	2.907	1.635	1.126	0.803	0.611	0.510	0.510	0.510	0.510
355	2.932	1.652	1.140	0.812	0.618	0.510	0.510	0.510	0.510

Thickness is intumescent only.

Table 9: I-Section Columns 45 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	1.903	1.127	0.782	0.565	0.510	0.510	0.510	0.510	0.510
90	1.936	1.145	0.793	0.573	0.510	0.510	0.510	0.510	0.510
95	2.020	1.192	0.823	0.595	0.510	0.510	0.510	0.510	0.510
100	2.104	1.244	0.852	0.617	0.510	0.510	0.510	0.510	0.510
105	2.188	1.300	0.881	0.639	0.510	0.510	0.510	0.510	0.510
110	2.272	1.356	0.910	0.661	0.510	0.510	0.510	0.510	0.510
115	2.356	1.412	0.939	0.682	0.525	0.510	0.510	0.510	0.510
120	2.440	1.468	0.969	0.704	0.542	0.510	0.510	0.510	0.510
125	2.524	1.525	0.998	0.726	0.558	0.510	0.510	0.510	0.510
130	2.608	1.581	1.027	0.748	0.575	0.510	0.510	0.510	0.510
135	2.692	1.637	1.056	0.770	0.592	0.510	0.510	0.510	0.510
140	2.776	1.693	1.085	0.792	0.608	0.510	0.510	0.510	0.510
145	2.860	1.749	1.115	0.814	0.625	0.513	0.510	0.510	0.510
150	2.944	1.805	1.144	0.836	0.642	0.525	0.510	0.510	0.510
155	3.029	1.862	1.173	0.858	0.658	0.537	0.510	0.510	0.510
160	3.113	1.918	1.202	0.879	0.675	0.549	0.510	0.510	0.510
165	3.197	1.974	1.247	0.901	0.692	0.561	0.510	0.510	0.510
170	3.281	2.030	1.298	0.923	0.708	0.573	0.510	0.510	0.510
175	3.365	2.069	1.349	0.945	0.725	0.585	0.510	0.510	0.510
180	3.433	2.103	1.399	0.967	0.742	0.597	0.510	0.510	0.510
185	3.483	2.138	1.450	0.989	0.758	0.609	0.510	0.510	0.510
190	3.533	2.173	1.501	1.011	0.775	0.621	0.510	0.510	0.510
195	3.582	2.208	1.551	1.033	0.792	0.633	0.512	0.510	0.510
200	3.632	2.243	1.602	1.054	0.808	0.645	0.521	0.510	0.510
205	3.682	2.277	1.653	1.076	0.825	0.657	0.529	0.510	0.510
210	3.732	2.312	1.704	1.098	0.842	0.669	0.538	0.510	0.510
215	3.782	2.347	1.754	1.120	0.858	0.681	0.547	0.510	0.510
220	3.831	2.382	1.805	1.142	0.875	0.693	0.555	0.510	0.510
225	3.881	2.416	1.856	1.164	0.892	0.705	0.564	0.510	0.510
230	3.931	2.451	1.906	1.186	0.908	0.717	0.573	0.510	0.510
235	3.981	2.486	1.957	1.208	0.925	0.729	0.581	0.510	0.510
240	4.031	2.521	2.008	1.232	0.942	0.741	0.590	0.510	0.510
245	4.080	2.556	2.050	1.257	0.958	0.753	0.598	0.510	0.510
250	4.130	2.590	2.077	1.282	0.975	0.766	0.607	0.510	0.510
255	4.180	2.625	2.104	1.306	0.992	0.778	0.616	0.510	0.510
260	4.230	2.660	2.132	1.331	1.008	0.790	0.624	0.510	0.510
265	4.280	2.695	2.159	1.356	1.025	0.802	0.633	0.510	0.510
270	4.330	2.729	2.186	1.380	1.041	0.814	0.642	0.510	0.510
275	4.379	2.764	2.213	1.405	1.058	0.826	0.650	0.513	0.510
280	4.429	2.799	2.241	1.430	1.075	0.838	0.659	0.519	0.510
285	4.479	2.834	2.268	1.455	1.091	0.850	0.668	0.525	0.510
290	4.529	2.868	2.295	1.479	1.108	0.862	0.676	0.531	0.510
295	4.579	2.903	2.322	1.504	1.125	0.874	0.685	0.537	0.510
300	4.628	2.938	2.350	1.529	1.141	0.886	0.693	0.543	0.510
305	4.678	2.973	2.377	1.554	1.158	0.898	0.702	0.550	0.510
310	4.728	3.008	2.404	1.578	1.175	0.910	0.711	0.556	0.510
315	4.778	3.042	2.431	1.603	1.191	0.922	0.719	0.562	0.510
320	4.828	3.077	2.459	1.628	1.208	0.934	0.728	0.568	0.510
325	4.877	3.112	2.486	1.652	1.229	0.946	0.737	0.574	0.510
330	4.927	3.147	2.513	1.677	1.251	0.958	0.745	0.580	0.510
335	4.977	3.181	2.540	1.702	1.272	0.970	0.754	0.586	0.510
340	5.027	3.216	2.567	1.727	1.294	0.982	0.762	0.593	0.510
345	5.077	3.251	2.595	1.751	1.315	0.994	0.771	0.599	0.510
350	-	3.286	2.622	1.776	1.337	1.006	0.780	0.605	0.510
355	-	3.321	2.649	1.801	1.358	1.019	0.788	0.611	0.510

Thickness is intumescent only.

Table 10: I-Section Columns 60 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	2.715	1.942	1.247	0.928	0.731	0.588	0.510	0.510	0.510
90	2.773	1.969	1.270	0.942	0.743	0.597	0.510	0.510	0.510
95	2.923	2.039	1.328	0.977	0.771	0.619	0.510	0.510	0.510
100	3.074	2.108	1.385	1.013	0.800	0.642	0.514	0.510	0.510
105	3.224	2.178	1.443	1.048	0.828	0.664	0.531	0.510	0.510
110	3.374	2.248	1.501	1.083	0.857	0.687	0.549	0.510	0.510
115	3.492	2.318	1.559	1.119	0.885	0.709	0.566	0.510	0.510
120	3.599	2.387	1.617	1.154	0.914	0.732	0.583	0.510	0.510
125	3.706	2.457	1.675	1.190	0.942	0.754	0.601	0.510	0.510
130	3.813	2.527	1.732	1.232	0.971	0.776	0.618	0.510	0.510
135	3.920	2.596	1.790	1.285	1.000	0.799	0.635	0.518	0.510
140	4.027	2.666	1.848	1.337	1.028	0.821	0.653	0.531	0.510
145	4.134	2.736	1.906	1.390	1.057	0.844	0.670	0.544	0.510
150	4.241	2.805	1.964	1.442	1.085	0.866	0.687	0.557	0.510
155	4.348	2.875	2.022	1.494	1.114	0.889	0.704	0.570	0.510
160	4.455	2.945	2.074	1.547	1.142	0.911	0.722	0.583	0.510
165	4.563	3.014	2.124	1.599	1.171	0.933	0.739	0.596	0.510
170	4.670	3.084	2.173	1.652	1.199	0.956	0.756	0.609	0.510
175	4.777	3.154	2.223	1.704	1.243	0.978	0.774	0.622	0.510
180	4.884	3.224	2.273	1.757	1.295	1.001	0.791	0.635	0.514
185	4.991	3.293	2.323	1.809	1.347	1.023	0.808	0.648	0.523
190	5.098	3.363	2.372	1.862	1.400	1.046	0.826	0.661	0.532
195	-	3.428	2.422	1.914	1.452	1.068	0.843	0.674	0.541
200	-	3.484	2.472	1.967	1.504	1.091	0.860	0.687	0.550
205	-	3.540	2.521	2.019	1.556	1.113	0.878	0.699	0.559
210	-	3.596	2.571	2.066	1.608	1.135	0.895	0.712	0.567
215	-	3.652	2.621	2.108	1.661	1.158	0.912	0.725	0.576
220	-	3.708	2.671	2.151	1.713	1.180	0.929	0.738	0.585
225	-	3.763	2.720	2.193	1.765	1.203	0.947	0.751	0.594
230	-	3.819	2.770	2.236	1.817	1.242	0.964	0.764	0.603
235	-	3.875	2.820	2.278	1.870	1.290	0.981	0.777	0.612
240	-	3.931	2.870	2.321	1.922	1.337	0.999	0.790	0.620
245	-	3.987	2.919	2.363	1.974	1.385	1.016	0.803	0.629
250	-	4.043	2.969	2.406	2.026	1.433	1.033	0.816	0.638
255	-	4.099	3.019	2.448	2.067	1.480	1.051	0.829	0.647
260	-	4.155	3.069	2.491	2.103	1.528	1.068	0.842	0.656
265	-	4.210	3.118	2.534	2.140	1.576	1.085	0.855	0.665
270	-	4.266	3.168	2.576	2.176	1.623	1.103	0.868	0.674
275	-	4.322	3.218	2.619	2.212	1.671	1.120	0.881	0.682
280	-	4.378	3.268	2.661	2.249	1.719	1.137	0.894	0.691
285	-	4.434	3.317	2.704	2.285	1.766	1.155	0.906	0.700
290	-	4.490	3.367	2.746	2.322	1.814	1.172	0.919	0.709
295	-	4.546	3.418	2.789	2.358	1.862	1.189	0.932	0.718
300	-	4.602	3.474	2.831	2.395	1.909	1.206	0.945	0.727
305	-	4.657	3.530	2.874	2.431	1.957	1.230	0.958	0.736
310	-	4.713	3.586	2.916	2.467	2.005	1.255	0.971	0.744
315	-	4.769	3.642	2.959	2.504	2.047	1.281	0.984	0.753
320	-	4.825	3.698	3.002	2.540	2.076	1.306	0.997	0.762
325	-	4.881	3.755	3.044	2.577	2.104	1.331	1.010	0.771
330	-	4.937	3.811	3.087	2.613	2.133	1.356	1.023	0.780
335	-	4.993	3.867	3.129	2.649	2.161	1.382	1.036	0.789
340	-	5.049	3.923	3.172	2.686	2.190	1.407	1.049	0.797
345	-	5.105	3.979	3.214	2.722	2.218	1.432	1.062	0.806
350	-	-	4.035	3.257	2.759	2.247	1.458	1.075	0.815
355	-	-	4.091	3.299	2.795	2.275	1.483	1.088	0.824

Thickness is intumescent only.

Table 11: I-Section Columns 75 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	2.686	2.029	1.452	1.055	0.875	0.718	0.576	0.510
90	-	2.721	2.058	1.471	1.071	0.888	0.728	0.585	0.510
95	-	2.811	2.133	1.519	1.112	0.921	0.755	0.606	0.510
100	-	2.901	2.208	1.567	1.153	0.954	0.781	0.628	0.510
105	-	2.992	2.283	1.615	1.194	0.987	0.808	0.650	0.525
110	-	3.082	2.358	1.663	1.255	1.020	0.834	0.671	0.541
115	-	3.172	2.434	1.711	1.327	1.053	0.861	0.693	0.557
120	-	3.262	2.509	1.759	1.399	1.086	0.888	0.714	0.573
125	-	3.352	2.584	1.807	1.471	1.119	0.914	0.736	0.589
130	-	3.443	2.659	1.855	1.544	1.152	0.941	0.758	0.605
135	-	3.537	2.734	1.903	1.616	1.185	0.968	0.779	0.621
140	-	3.631	2.810	1.951	1.688	1.222	0.994	0.801	0.637
145	-	3.725	2.885	1.999	1.761	1.273	1.021	0.822	0.653
150	-	3.819	2.960	2.052	1.833	1.323	1.047	0.844	0.669
155	-	3.912	3.035	2.129	1.905	1.374	1.074	0.866	0.685
160	-	4.006	3.110	2.206	1.977	1.425	1.101	0.887	0.701
165	-	4.100	3.186	2.283	2.047	1.475	1.127	0.909	0.717
170	-	4.194	3.261	2.360	2.098	1.526	1.154	0.930	0.733
175	-	4.288	3.336	2.437	2.150	1.576	1.180	0.952	0.749
180	-	4.381	3.411	2.515	2.202	1.627	1.207	0.974	0.765
185	-	4.475	3.491	2.592	2.253	1.678	1.256	0.995	0.781
190	-	4.569	3.571	2.669	2.305	1.728	1.307	1.017	0.797
195	-	4.663	3.651	2.746	2.357	1.779	1.358	1.039	0.813
200	-	4.757	3.731	2.823	2.408	1.829	1.410	1.060	0.829
205	-	4.850	3.811	2.900	2.460	1.880	1.461	1.082	0.845
210	-	4.944	3.891	2.977	2.512	1.931	1.512	1.103	0.861
215	-	5.038	3.971	3.054	2.563	1.981	1.564	1.125	0.877
220	-	-	4.051	3.131	2.615	2.032	1.615	1.147	0.893
225	-	-	4.131	3.208	2.666	2.083	1.666	1.168	0.909
230	-	-	4.211	3.286	2.718	2.135	1.717	1.190	0.925
235	-	-	4.291	3.363	2.770	2.186	1.769	1.213	0.941
240	-	-	4.371	3.437	2.821	2.237	1.820	1.260	0.957
245	-	-	4.451	3.508	2.873	2.289	1.871	1.307	0.973
250	-	-	4.531	3.579	2.925	2.340	1.923	1.354	0.989
255	-	-	4.611	3.650	2.976	2.392	1.974	1.401	1.006
260	-	-	4.691	3.721	3.028	2.443	2.025	1.448	1.022
265	-	-	4.771	3.792	3.080	2.494	2.068	1.496	1.038
270	-	-	4.850	3.863	3.131	2.546	2.108	1.543	1.054
275	-	-	4.930	3.933	3.183	2.597	2.148	1.590	1.070
280	-	-	5.010	4.004	3.234	2.649	2.188	1.637	1.086
285	-	-	5.090	4.075	3.286	2.700	2.227	1.684	1.102
290	-	-	-	4.146	3.338	2.752	2.267	1.731	1.118
295	-	-	-	4.217	3.389	2.803	2.307	1.778	1.134
300	-	-	-	4.288	3.452	2.854	2.347	1.825	1.150
305	-	-	-	4.359	3.523	2.906	2.387	1.872	1.166
310	-	-	-	4.430	3.594	2.957	2.426	1.919	1.182
315	-	-	-	4.501	3.665	3.009	2.466	1.966	1.198
320	-	-	-	4.571	3.735	3.060	2.506	2.013	1.217
325	-	-	-	4.642	3.806	3.111	2.546	2.054	1.247
330	-	-	-	4.713	3.877	3.163	2.585	2.088	1.276
335	-	-	-	4.784	3.948	3.214	2.625	2.121	1.306
340	-	-	-	4.855	4.018	3.266	2.665	2.154	1.335
345	-	-	-	4.926	4.089	3.317	2.705	2.187	1.365
350	-	-	-	4.997	4.160	3.369	2.745	2.220	1.394
355	-	-	-	5.068	4.231	3.420	2.784	2.253	1.424

Thickness is intumescent only.

Table 12: I-Section Columns 90 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	2.734	2.133	1.704	1.164	0.975	0.814	0.668
90	-	-	2.769	2.163	1.716	1.189	0.989	0.826	0.677
95	-	-	2.860	2.243	1.747	1.254	1.026	0.856	0.700
100	-	-	2.950	2.322	1.777	1.319	1.062	0.886	0.724
105	-	-	3.040	2.402	1.808	1.383	1.099	0.916	0.748
110	-	-	3.130	2.481	1.839	1.448	1.135	0.947	0.771
115	-	-	3.221	2.561	1.870	1.513	1.172	0.977	0.795
120	-	-	3.311	2.640	1.901	1.578	1.209	1.007	0.819
125	-	-	3.401	2.719	1.932	1.642	1.273	1.037	0.842
130	-	-	3.516	2.799	1.963	1.707	1.338	1.067	0.866
135	-	-	3.633	2.878	1.994	1.772	1.403	1.098	0.890
140	-	-	3.751	2.958	2.024	1.836	1.468	1.128	0.913
145	-	-	3.868	3.037	2.105	1.901	1.533	1.158	0.937
150	-	-	3.985	3.117	2.235	1.966	1.599	1.188	0.961
155	-	-	4.102	3.196	2.366	2.031	1.664	1.224	0.984
160	-	-	4.219	3.275	2.496	2.096	1.729	1.275	1.008
165	-	-	4.337	3.355	2.627	2.162	1.794	1.325	1.032
170	-	-	4.454	3.444	2.758	2.228	1.859	1.376	1.055
175	-	-	4.571	3.554	2.888	2.294	1.924	1.426	1.079
180	-	-	4.688	3.664	3.019	2.360	1.990	1.476	1.103
185	-	-	4.805	3.774	3.149	2.426	2.053	1.527	1.126
190	-	-	4.923	3.885	3.280	2.491	2.110	1.577	1.150
195	-	-	5.040	3.995	3.410	2.557	2.166	1.627	1.174
200	-	-	-	4.105	3.501	2.623	2.223	1.678	1.197
205	-	-	-	4.215	3.592	2.689	2.280	1.728	1.232
210	-	-	-	4.325	3.682	2.755	2.337	1.778	1.278
215	-	-	-	4.436	3.773	2.821	2.394	1.829	1.324
220	-	-	-	4.546	3.864	2.887	2.450	1.879	1.371
225	-	-	-	4.656	3.955	2.952	2.507	1.929	1.417
230	-	-	-	4.766	4.045	3.018	2.564	1.980	1.463
235	-	-	-	4.876	4.136	3.084	2.621	2.030	1.509
240	-	-	-	4.986	4.227	3.150	2.677	2.084	1.556
245	-	-	-	5.097	4.317	3.216	2.734	2.138	1.602
250	-	-	-	-	4.408	3.282	2.791	2.193	1.648
255	-	-	-	-	4.499	3.347	2.848	2.247	1.695
260	-	-	-	-	4.589	3.415	2.904	2.302	1.741
265	-	-	-	-	4.680	3.514	2.961	2.356	1.787
270	-	-	-	-	4.771	3.614	3.018	2.411	1.833
275	-	-	-	-	4.862	3.713	3.075	2.466	1.880
280	-	-	-	-	4.952	3.813	3.132	2.520	1.926
285	-	-	-	-	5.043	3.912	3.188	2.575	1.972
290	-	-	-	-	-	4.011	3.245	2.629	2.019
295	-	-	-	-	-	4.111	3.302	2.684	2.064
300	-	-	-	-	-	4.210	3.359	2.738	2.108
305	-	-	-	-	-	4.310	3.417	2.793	2.153
310	-	-	-	-	-	4.409	3.486	2.848	2.197
315	-	-	-	-	-	4.508	3.555	2.902	2.242
320	-	-	-	-	-	4.608	3.624	2.957	2.286
325	-	-	-	-	-	4.707	3.693	3.011	2.331
330	-	-	-	-	-	4.806	3.763	3.066	2.375
335	-	-	-	-	-	4.906	3.832	3.120	2.419
340	-	-	-	-	-	5.005	3.901	3.175	2.464
345	-	-	-	-	-	5.105	3.970	3.229	2.508
350	-	-	-	-	-	-	4.039	3.284	2.553
355	-	-	-	-	-	-	4.109	3.339	2.597

Thickness is intumescent only.

Table 13: I-Section Columns 105 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	-	2.799	2.297	1.912	1.373	1.050	0.881
90	-	-	-	2.837	2.330	1.924	1.394	1.066	0.893
95	-	-	-	2.935	2.416	1.955	1.447	1.105	0.925
100	-	-	-	3.032	2.501	1.985	1.501	1.145	0.956
105	-	-	-	3.130	2.587	2.016	1.554	1.184	0.988
110	-	-	-	3.227	2.672	2.060	1.608	1.236	1.020
115	-	-	-	3.325	2.758	2.157	1.661	1.309	1.051
120	-	-	-	3.427	2.843	2.254	1.715	1.382	1.083
125	-	-	-	3.566	2.929	2.351	1.768	1.455	1.115
130	-	-	-	3.705	3.014	2.448	1.822	1.528	1.146
135	-	-	-	3.844	3.100	2.545	1.875	1.601	1.178
140	-	-	-	3.983	3.185	2.642	1.928	1.675	1.209
145	-	-	-	4.122	3.271	2.739	1.982	1.748	1.258
150	-	-	-	4.261	3.356	2.836	2.035	1.821	1.306
155	-	-	-	4.400	3.468	2.933	2.150	1.894	1.355
160	-	-	-	4.539	3.625	3.030	2.271	1.967	1.403
165	-	-	-	4.678	3.782	3.127	2.392	2.040	1.452
170	-	-	-	4.817	3.940	3.224	2.513	2.099	1.500
175	-	-	-	4.955	4.097	3.321	2.634	2.157	1.549
180	-	-	-	5.094	4.254	3.420	2.755	2.215	1.597
185	-	-	-	-	4.411	3.539	2.875	2.274	1.646
190	-	-	-	-	4.569	3.658	2.996	2.332	1.694
195	-	-	-	-	4.726	3.777	3.117	2.390	1.743
200	-	-	-	-	4.883	3.896	3.238	2.449	1.791
205	-	-	-	-	5.040	4.015	3.359	2.507	1.840
210	-	-	-	-	-	4.134	3.459	2.565	1.888
215	-	-	-	-	-	4.253	3.543	2.624	1.937
220	-	-	-	-	-	4.373	3.627	2.682	1.985
225	-	-	-	-	-	4.492	3.711	2.740	2.034
230	-	-	-	-	-	4.611	3.795	2.799	2.101
235	-	-	-	-	-	4.730	3.880	2.857	2.171
240	-	-	-	-	-	4.849	3.964	2.915	2.241
245	-	-	-	-	-	4.968	4.048	2.973	2.311
250	-	-	-	-	-	5.087	4.132	3.032	2.382
255	-	-	-	-	-	-	4.217	3.090	2.452
260	-	-	-	-	-	-	4.301	3.148	2.522
265	-	-	-	-	-	-	4.385	3.207	2.592
270	-	-	-	-	-	-	4.469	3.265	2.662
275	-	-	-	-	-	-	4.554	3.323	2.732
280	-	-	-	-	-	-	4.638	3.382	2.803
285	-	-	-	-	-	-	4.722	3.466	2.873
290	-	-	-	-	-	-	4.806	3.575	2.943
295	-	-	-	-	-	-	4.891	3.683	3.013
300	-	-	-	-	-	-	4.975	3.792	3.083
305	-	-	-	-	-	-	5.059	3.901	3.154
310	-	-	-	-	-	-	-	4.009	3.224
315	-	-	-	-	-	-	-	4.118	3.294
320	-	-	-	-	-	-	-	4.227	3.364
325	-	-	-	-	-	-	-	4.335	3.434
330	-	-	-	-	-	-	-	4.444	3.504
335	-	-	-	-	-	-	-	4.553	3.575
340	-	-	-	-	-	-	-	4.661	3.645
345	-	-	-	-	-	-	-	4.770	3.715
350	-	-	-	-	-	-	-	4.878	3.785
355	-	-	-	-	-	-	-	4.987	3.855

Thickness is intumescent only.

Table 14: I-Section Columns 120 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
85	-	-	-	-	2.920	2.458	1.976	1.549	1.093
90	-	-	-	-	2.963	2.492	2.009	1.565	1.109
95	-	-	-	-	3.075	2.580	2.094	1.606	1.149
100	-	-	-	-	3.187	2.668	2.179	1.647	1.189
105	-	-	-	-	3.299	2.755	2.263	1.689	1.243
110	-	-	-	-	3.411	2.843	2.348	1.730	1.313
115	-	-	-	-	3.583	2.931	2.433	1.771	1.382
120	-	-	-	-	3.754	3.019	2.518	1.812	1.452
125	-	-	-	-	3.926	3.107	2.603	1.854	1.521
130	-	-	-	-	4.098	3.195	2.688	1.895	1.590
135	-	-	-	-	4.270	3.283	2.773	1.936	1.660
140	-	-	-	-	4.441	3.371	2.858	1.978	1.729
145	-	-	-	-	4.613	3.514	2.943	2.019	1.798
150	-	-	-	-	4.785	3.702	3.027	2.105	1.868
155	-	-	-	-	4.956	3.889	3.112	2.237	1.937
160	-	-	-	-	-	4.077	3.197	2.368	2.007
165	-	-	-	-	-	4.264	3.282	2.500	2.072
170	-	-	-	-	-	4.452	3.367	2.632	2.133
175	-	-	-	-	-	4.639	3.488	2.764	2.194
180	-	-	-	-	-	4.827	3.647	2.896	2.255
185	-	-	-	-	-	5.014	3.806	3.028	2.316
190	-	-	-	-	-	-	3.965	3.160	2.377
195	-	-	-	-	-	-	4.123	3.292	2.439
200	-	-	-	-	-	-	4.282	3.422	2.500
205	-	-	-	-	-	-	4.441	3.538	2.561
210	-	-	-	-	-	-	4.599	3.654	2.622
215	-	-	-	-	-	-	4.758	3.770	2.683
220	-	-	-	-	-	-	4.917	3.887	2.744
225	-	-	-	-	-	-	5.075	4.003	2.805
230	-	-	-	-	-	-	-	4.119	2.867
235	-	-	-	-	-	-	-	4.235	2.928
240	-	-	-	-	-	-	-	4.351	2.989
245	-	-	-	-	-	-	-	4.467	3.050
250	-	-	-	-	-	-	-	4.583	3.111
255	-	-	-	-	-	-	-	4.700	3.172
260	-	-	-	-	-	-	-	4.816	3.233
265	-	-	-	-	-	-	-	4.932	3.295
270	-	-	-	-	-	-	-	5.048	3.356
275	-	-	-	-	-	-	-	-	3.431
280	-	-	-	-	-	-	-	-	3.622
285	-	-	-	-	-	-	-	-	3.813
290	-	-	-	-	-	-	-	-	4.003
295	-	-	-	-	-	-	-	-	4.194
300	-	-	-	-	-	-	-	-	4.385
305	-	-	-	-	-	-	-	-	4.575
310	-	-	-	-	-	-	-	-	4.766
315	-	-	-	-	-	-	-	-	4.957
320	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.

Table 15: Circular Hollow Sections 30 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
40	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
45	0.568	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
50	0.705	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
55	0.842	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
60	0.979	0.520	0.520	0.520	0.520	0.520	0.520	0.520	0.520
65	1.117	0.590	0.520	0.520	0.520	0.520	0.520	0.520	0.520
70	1.254	0.672	0.520	0.520	0.520	0.520	0.520	0.520	0.520
75	1.372	0.755	0.520	0.520	0.520	0.520	0.520	0.520	0.520
80	1.491	0.837	0.520	0.520	0.520	0.520	0.520	0.520	0.520
85	1.609	0.919	0.536	0.520	0.520	0.520	0.520	0.520	0.520
90	1.728	1.002	0.599	0.520	0.520	0.520	0.520	0.520	0.520
95	1.846	1.084	0.662	0.520	0.520	0.520	0.520	0.520	0.520
100	1.965	1.166	0.725	0.520	0.520	0.520	0.520	0.520	0.520
105	2.053	1.249	0.788	0.520	0.520	0.520	0.520	0.520	0.520
110	2.095	1.338	0.852	0.520	0.520	0.520	0.520	0.520	0.520
115	2.138	1.427	0.915	0.553	0.520	0.520	0.520	0.520	0.520
120	2.181	1.516	0.978	0.598	0.520	0.520	0.520	0.520	0.520
125	2.224	1.605	1.041	0.643	0.520	0.520	0.520	0.520	0.520
130	2.267	1.695	1.105	0.688	0.520	0.520	0.520	0.520	0.520
135	2.309	1.784	1.168	0.733	0.520	0.520	0.520	0.520	0.520
140	2.352	1.873	1.231	0.778	0.520	0.520	0.520	0.520	0.520
145	2.395	1.962	1.321	0.823	0.520	0.520	0.520	0.520	0.520
150	2.438	2.039	1.425	0.868	0.539	0.520	0.520	0.520	0.520
155	2.481	2.061	1.530	0.913	0.569	0.520	0.520	0.520	0.520
160	2.524	2.082	1.635	0.958	0.598	0.520	0.520	0.520	0.520
165	2.566	2.104	1.740	1.002	0.628	0.520	0.520	0.520	0.520
170	2.609	2.126	1.844	1.047	0.657	0.520	0.520	0.520	0.520
175	2.652	2.147	1.949	1.092	0.687	0.520	0.520	0.520	0.520
180	2.695	2.169	2.038	1.137	0.716	0.520	0.520	0.520	0.520
185	2.738	2.191	2.056	1.182	0.746	0.520	0.520	0.520	0.520
190	2.781	2.212	2.073	1.227	0.775	0.520	0.520	0.520	0.520
195	2.823	2.234	2.090	1.292	0.805	0.520	0.520	0.520	0.520
200	2.866	2.256	2.108	1.388	0.834	0.535	0.520	0.520	0.520
205	2.909	2.277	2.125	1.483	0.864	0.559	0.520	0.520	0.520
210	2.952	2.299	2.142	1.579	0.893	0.583	0.520	0.520	0.520
215	2.995	2.321	2.160	1.675	0.923	0.607	0.520	0.520	0.520
220	3.037	2.342	2.177	1.770	0.952	0.631	0.520	0.520	0.520
225	3.080	2.364	2.195	1.866	0.982	0.656	0.520	0.520	0.520
230	3.123	2.386	2.212	1.961	1.011	0.680	0.520	0.520	0.520
235	3.166	2.407	2.229	2.038	1.041	0.704	0.520	0.520	0.520
240	3.209	2.429	2.247	2.052	1.070	0.728	0.526	0.520	0.520
245	3.252	2.451	2.264	2.065	1.100	0.752	0.547	0.520	0.520
250	3.294	2.472	2.281	2.079	1.129	0.776	0.568	0.520	0.520
255	3.337	2.494	2.299	2.093	1.159	0.801	0.589	0.520	0.520
260	3.380	2.516	2.316	2.106	1.188	0.825	0.610	0.520	0.520
265	3.423	2.537	2.334	2.120	1.218	0.849	0.631	0.520	0.520
270	3.466	2.559	2.351	2.133	1.248	0.873	0.652	0.520	0.520
275	3.508	2.581	2.368	2.147	1.342	0.897	0.673	0.520	0.520
280	3.549	2.602	2.386	2.160	1.454	0.921	0.693	0.520	0.520
285	3.590	2.624	2.403	2.174	1.566	0.945	0.714	0.520	0.520
290	3.632	2.646	2.420	2.188	1.678	0.970	0.735	0.520	0.520
295	3.673	2.668	2.438	2.201	1.790	0.994	0.756	0.527	0.520
300	3.714	2.689	2.455	2.215	1.903	1.018	0.777	0.542	0.520
305	3.755	2.711	2.472	2.228	2.015	1.042	0.798	0.557	0.520
310	3.797	2.733	2.490	2.242	2.044	1.066	0.819	0.572	0.520
315	3.838	2.754	2.507	2.256	2.056	1.090	0.840	0.587	0.520
320	3.879	2.776	2.525	2.269	2.067	1.115	0.861	0.602	0.520
325	3.921	2.798	2.542	2.283	2.078	1.139	0.882	0.617	0.520
330	3.962	2.819	2.559	2.296	2.089	1.163	0.903	0.632	0.520
335	4.003	2.841	2.577	2.310	2.101	1.187	0.924	0.647	0.520
340	4.044	2.863	2.594	2.324	2.112	1.211	0.945	0.662	0.520
345	4.086	2.884	2.611	2.337	2.123	1.235	0.966	0.677	0.520
350	4.127	2.906	2.629	2.351	2.135	1.277	0.987	0.692	0.520
355	4.168	2.928	2.646	2.364	2.146	1.380	1.008	0.707	0.520
360	4.210	2.949	2.664	2.378	2.157	1.482	1.029	0.722	0.520
365	4.251	2.971	2.681	2.392	2.169	1.585	1.050	0.737	0.520
370	4.292	2.993	2.698	2.405	2.180	1.687	1.071	0.752	0.520
375	4.333	3.014	2.716	2.419	2.191	1.790	1.092	0.767	0.520
380	4.375	3.036	2.733	2.432	2.202	1.892	1.113	0.782	0.520
385	4.416	3.058	2.750	2.446	2.214	1.995	1.134	0.797	0.520
390	4.457	3.079	2.768	2.460	2.225	2.041	1.155	0.812	0.520
395	4.498	3.101	2.785	2.473	2.236	2.050	1.176	0.827	0.520
400	4.540	3.123	2.803	2.487	2.248	2.059	1.197	0.842	0.520
405	4.581	3.144	2.820	2.500	2.259	2.068	1.218	0.857	0.520
410	4.622	3.166	2.837	2.514	2.270	2.078	1.239	0.872	0.520
415	4.664	3.188	2.855	2.528	2.282	2.087	1.278	0.886	0.520
420	4.705	3.209	2.872	2.541	2.293	2.096	1.363	0.901	0.520
425	4.746	3.231	2.889	2.555	2.304	2.105	1.449	0.916	0.520
430	4.787	3.253	2.907	2.568	2.315	2.115	1.535	0.931	0.520
435	4.829	3.274	2.924	2.582	2.327	2.124	1.620	0.946	0.520

Thickness is intumescent only.

Table 16: Circular Hollow Sections 45 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
40	1.637	0.863	0.520	0.520	0.520	0.520	0.520	0.520	0.520
45	1.737	1.000	0.520	0.520	0.520	0.520	0.520	0.520	0.520
50	1.837	1.137	0.593	0.520	0.520	0.520	0.520	0.520	0.520
55	1.936	1.275	0.731	0.520	0.520	0.520	0.520	0.520	0.520
60	2.036	1.412	0.868	0.556	0.520	0.520	0.520	0.520	0.520
65	2.136	1.550	1.006	0.656	0.520	0.520	0.520	0.520	0.520
70	2.236	1.687	1.143	0.755	0.520	0.520	0.520	0.520	0.520
75	2.336	1.824	1.276	0.854	0.578	0.520	0.520	0.520	0.520
80	2.435	1.962	1.386	0.954	0.655	0.520	0.520	0.520	0.520
85	2.535	2.059	1.496	1.053	0.732	0.520	0.520	0.520	0.520
90	2.635	2.111	1.607	1.152	0.809	0.547	0.520	0.520	0.520
95	2.735	2.163	1.717	1.252	0.886	0.601	0.520	0.520	0.520
100	2.835	2.215	1.828	1.345	0.963	0.656	0.520	0.520	0.520
105	2.934	2.267	1.938	1.438	1.040	0.710	0.520	0.520	0.520
110	3.034	2.319	2.040	1.530	1.117	0.764	0.540	0.520	0.520
115	3.134	2.371	2.083	1.623	1.194	0.818	0.578	0.520	0.520
120	3.234	2.423	2.126	1.716	1.281	0.872	0.616	0.520	0.520
125	3.334	2.475	2.169	1.809	1.399	0.926	0.653	0.520	0.520
130	3.433	2.526	2.212	1.902	1.518	0.980	0.691	0.520	0.520
135	3.528	2.578	2.254	1.994	1.637	1.035	0.728	0.524	0.520
140	3.616	2.630	2.297	2.054	1.755	1.089	0.766	0.544	0.520
145	3.704	2.682	2.340	2.087	1.874	1.143	0.804	0.563	0.520
150	3.792	2.734	2.383	2.120	1.993	1.197	0.841	0.582	0.520
155	3.880	2.786	2.426	2.153	2.051	1.251	0.879	0.602	0.520
160	3.968	2.838	2.469	2.186	2.076	1.614	0.917	0.621	0.520
165	4.056	2.890	2.511	2.219	2.101	1.994	0.954	0.641	0.520
170	4.144	2.942	2.554	2.253	2.127	2.052	0.992	0.660	0.520
175	4.232	2.994	2.597	2.286	2.152	2.071	1.029	0.680	0.520
180	4.320	3.046	2.640	2.319	2.177	2.091	1.067	0.699	0.520
185	4.408	3.098	2.683	2.352	2.202	2.110	1.105	0.718	0.520
190	4.496	3.149	2.726	2.385	2.227	2.129	1.142	0.738	0.520
195	4.584	3.201	2.769	2.418	2.252	2.148	1.254	0.757	0.520
200	4.672	3.253	2.811	2.451	2.278	2.168	2.047	0.777	0.534
205	4.761	3.305	2.854	2.485	2.303	2.187	2.062	0.796	0.555
210	4.849	3.357	2.897	2.518	2.328	2.206	2.077	0.815	0.576
215	-	3.409	2.940	2.551	2.353	2.225	2.092	0.835	0.597
220	-	3.461	2.983	2.584	2.378	2.245	2.107	0.854	0.618
225	-	3.521	3.026	2.617	2.403	2.264	2.122	0.874	0.640
230	-	3.591	3.068	2.650	2.428	2.283	2.137	0.893	0.661
235	-	3.661	3.111	2.684	2.454	2.302	2.152	0.912	0.682
240	-	3.731	3.154	2.717	2.479	2.322	2.167	0.932	0.703
245	-	3.800	3.197	2.750	2.504	2.341	2.182	0.951	0.724
250	-	3.870	3.240	2.783	2.529	2.360	2.197	0.971	0.745
255	-	3.940	3.283	2.816	2.554	2.379	2.212	0.990	0.767
260	-	4.010	3.325	2.849	2.579	2.399	2.227	1.254	0.788
265	-	4.080	3.368	2.882	2.605	2.418	2.242	2.044	0.809
270	-	4.150	3.411	2.916	2.630	2.437	2.257	2.056	0.830
275	-	4.220	3.454	2.949	2.655	2.457	2.272	2.068	0.851
280	-	4.289	3.499	2.982	2.680	2.476	2.287	2.079	0.872
285	-	4.359	3.551	3.015	2.705	2.495	2.302	2.091	0.894
290	-	4.429	3.604	3.048	2.730	2.514	2.317	2.103	0.915
295	-	4.499	3.657	3.081	2.755	2.534	2.332	2.115	0.936
300	-	4.569	3.710	3.114	2.781	2.553	2.347	2.127	0.957
305	-	4.639	3.763	3.148	2.806	2.572	2.362	2.139	0.978
310	-	4.708	3.815	3.181	2.831	2.591	2.377	2.151	0.999
315	-	4.778	3.868	3.214	2.856	2.611	2.392	2.163	1.021
320	-	4.848	3.921	3.247	2.881	2.630	2.407	2.175	1.042
325	-	-	3.974	3.280	2.906	2.649	2.422	2.187	1.063
330	-	-	4.027	3.313	2.931	2.668	2.437	2.198	1.084
335	-	-	4.079	3.347	2.957	2.688	2.452	2.210	1.105
340	-	-	4.132	3.380	2.982	2.707	2.467	2.222	1.126
345	-	-	4.185	3.413	3.007	2.726	2.481	2.234	1.148
350	-	-	4.238	3.446	3.032	2.745	2.496	2.246	1.169
355	-	-	4.291	3.479	3.057	2.765	2.511	2.258	1.190
360	-	-	4.343	3.522	3.082	2.784	2.526	2.270	1.211
365	-	-	4.396	3.570	3.108	2.803	2.541	2.282	1.232
370	-	-	4.449	3.617	3.133	2.822	2.556	2.294	1.253
375	-	-	4.502	3.665	3.158	2.842	2.571	2.305	1.382
380	-	-	4.555	3.712	3.183	2.861	2.586	2.317	1.514
385	-	-	4.607	3.760	3.208	2.880	2.601	2.329	1.646
390	-	-	4.660	3.807	3.233	2.899	2.616	2.341	1.778
395	-	-	4.713	3.855	3.258	2.919	2.631	2.353	1.909
400	-	-	4.766	3.902	3.284	2.938	2.646	2.365	2.035
405	-	-	4.819	3.950	3.309	2.957	2.661	2.377	2.044
410	-	-	-	3.997	3.334	2.976	2.676	2.389	2.052
415	-	-	-	4.045	3.359	2.996	2.691	2.401	2.061
420	-	-	-	4.092	3.384	3.015	2.706	2.413	2.069
425	-	-	-	4.140	3.409	3.034	2.721	2.424	2.078
430	-	-	-	4.187	3.435	3.053	2.736	2.436	2.086
435	-	-	-	4.235	3.460	3.073	2.751	2.448	2.095

Thickness is intumescent only.

Table 17: Circular Hollow Sections 60 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
40	2.321	1.736	1.076	0.763	0.520	0.520	0.520	0.520	0.520
45	2.474	1.836	1.241	0.901	0.520	0.520	0.520	0.520	0.520
50	2.626	1.936	1.406	1.039	0.600	0.520	0.520	0.520	0.520
55	2.779	2.037	1.571	1.177	0.745	0.520	0.520	0.520	0.520
60	2.931	2.137	1.736	1.315	0.890	0.593	0.520	0.520	0.520
65	3.083	2.237	1.901	1.453	1.036	0.703	0.520	0.520	0.520
70	3.236	2.337	2.050	1.592	1.181	0.813	0.551	0.520	0.520
75	3.388	2.438	2.129	1.730	1.309	0.924	0.632	0.520	0.520
80	3.541	2.538	2.208	1.868	1.420	1.034	0.713	0.520	0.520
85	3.693	2.638	2.287	2.006	1.530	1.144	0.794	0.543	0.520
90	3.845	2.738	2.366	2.083	1.641	1.254	0.875	0.588	0.520
95	3.998	2.839	2.445	2.145	1.751	1.343	0.956	0.634	0.520
100	4.150	2.939	2.524	2.206	1.862	1.433	1.036	0.679	0.520
105	4.303	3.039	2.603	2.267	1.973	1.522	1.117	0.724	0.520
110	4.455	3.140	2.682	2.328	2.057	1.611	1.198	0.770	0.535
115	4.607	3.240	2.761	2.389	2.107	1.701	1.291	0.815	0.571
120	4.760	3.340	2.841	2.450	2.157	1.790	1.410	0.861	0.608
125	-	3.440	2.920	2.511	2.206	1.880	1.530	0.906	0.644
130	-	3.552	2.999	2.573	2.256	1.969	1.649	0.951	0.680
135	-	3.674	3.078	2.634	2.306	2.046	1.769	0.997	0.717
140	-	3.796	3.157	2.695	2.356	2.086	1.888	1.042	0.753
145	-	3.918	3.236	2.756	2.406	2.127	2.008	1.087	0.789
150	-	4.040	3.315	2.817	2.456	2.168	2.058	1.133	0.826
155	-	4.162	3.394	2.878	2.506	2.209	2.088	1.178	0.862
160	-	4.284	3.473	2.940	2.556	2.250	2.118	1.254	0.898
165	-	4.406	3.564	3.001	2.606	2.290	2.149	2.056	0.935
170	-	4.528	3.659	3.062	2.655	2.331	2.179	2.078	0.971
175	-	4.650	3.753	3.123	2.705	2.372	2.209	2.100	1.007
180	-	4.772	3.848	3.184	2.755	2.413	2.239	2.122	1.044
185	-	-	3.942	3.245	2.805	2.454	2.269	2.144	1.080
190	-	-	4.037	3.307	2.855	2.494	2.299	2.166	1.254
195	-	-	4.131	3.368	2.905	2.535	2.329	2.188	2.047
200	-	-	4.226	3.429	2.955	2.576	2.359	2.210	2.062
205	-	-	4.320	3.490	3.005	2.617	2.389	2.232	2.077
210	-	-	4.415	3.574	3.055	2.658	2.419	2.254	2.092
215	-	-	4.509	3.658	3.104	2.698	2.449	2.276	2.107
220	-	-	4.604	3.742	3.154	2.739	2.480	2.298	2.122
225	-	-	4.698	3.826	3.204	2.780	2.510	2.320	2.137
230	-	-	4.793	3.910	3.254	2.821	2.540	2.342	2.152
235	-	-	-	3.994	3.304	2.862	2.570	2.364	2.168
240	-	-	-	4.078	3.354	2.902	2.600	2.386	2.183
245	-	-	-	4.162	3.404	2.943	2.630	2.408	2.198
250	-	-	-	4.246	3.454	2.984	2.660	2.430	2.213
255	-	-	-	4.330	3.515	3.025	2.690	2.452	2.228
260	-	-	-	4.414	3.604	3.066	2.720	2.474	2.243
265	-	-	-	4.498	3.693	3.106	2.750	2.496	2.258
270	-	-	-	4.582	3.782	3.147	2.780	2.518	2.273
275	-	-	-	4.666	3.872	3.188	2.811	2.540	2.288
280	-	-	-	4.750	3.961	3.229	2.841	2.562	2.303
285	-	-	-	4.833	4.050	3.270	2.871	2.584	2.318
290	-	-	-	-	4.139	3.310	2.901	2.606	2.333
295	-	-	-	-	4.228	3.351	2.931	2.628	2.348
300	-	-	-	-	4.317	3.392	2.961	2.650	2.363
305	-	-	-	-	4.407	3.433	2.991	2.672	2.378
310	-	-	-	-	4.496	3.473	3.021	2.694	2.393
315	-	-	-	-	4.585	3.550	3.051	2.716	2.408
320	-	-	-	-	4.674	3.647	3.081	2.738	2.423
325	-	-	-	-	4.763	3.745	3.112	2.760	2.438
330	-	-	-	-	4.852	3.843	3.142	2.782	2.453
335	-	-	-	-	-	3.940	3.172	2.804	2.469
340	-	-	-	-	-	4.038	3.202	2.826	2.484
345	-	-	-	-	-	4.136	3.232	2.848	2.499
350	-	-	-	-	-	4.233	3.262	2.870	2.514
355	-	-	-	-	-	4.331	3.292	2.892	2.529
360	-	-	-	-	-	4.429	3.322	2.915	2.544
365	-	-	-	-	-	4.526	3.352	2.937	2.559
370	-	-	-	-	-	4.624	3.382	2.959	2.574
375	-	-	-	-	-	4.722	3.412	2.981	2.589
380	-	-	-	-	-	4.820	3.443	3.003	2.604
385	-	-	-	-	-	-	3.473	3.025	2.619
390	-	-	-	-	-	-	3.537	3.047	2.634
395	-	-	-	-	-	-	3.643	3.069	2.649
400	-	-	-	-	-	-	3.748	3.091	2.664
405	-	-	-	-	-	-	3.854	3.113	2.679
410	-	-	-	-	-	-	3.959	3.135	2.694
415	-	-	-	-	-	-	4.065	3.157	2.709
420	-	-	-	-	-	-	4.170	3.179	2.724
425	-	-	-	-	-	-	4.276	3.201	2.739
430	-	-	-	-	-	-	4.382	3.223	2.754
435	-	-	-	-	-	-	4.487	3.245	2.769

Thickness is intumescent only.

Table 18: Circular Hollow Sections 75 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
40	3.552	2.559	2.004	1.559	1.235	0.948	0.694	0.520	0.520
45	3.851	2.766	2.190	1.793	1.438	1.121	0.841	0.520	0.520
50	4.150	2.974	2.376	2.027	1.640	1.295	0.987	0.520	0.520
55	4.448	3.181	2.562	2.175	1.843	1.468	1.134	0.683	0.520
60	4.747	3.388	2.748	2.319	2.041	1.642	1.280	0.846	0.520
65	-	3.614	2.934	2.463	2.153	1.815	1.427	1.009	0.596
70	-	3.857	3.120	2.608	2.266	1.989	1.573	1.172	0.709
75	-	4.100	3.306	2.752	2.378	2.100	1.720	1.312	0.822
80	-	4.343	3.492	2.896	2.490	2.189	1.866	1.428	0.935
85	-	4.586	3.697	3.041	2.603	2.278	2.013	1.545	1.049
90	-	4.829	3.903	3.185	2.715	2.367	2.095	1.661	1.162
95	-	-	4.108	3.330	2.828	2.456	2.166	1.778	1.272
100	-	-	4.314	3.474	2.940	2.545	2.237	1.895	1.367
105	-	-	4.519	3.639	3.052	2.634	2.307	2.011	1.462
110	-	-	4.725	3.807	3.165	2.723	2.378	2.080	1.557
115	-	-	-	3.975	3.277	2.812	2.449	2.136	1.652
120	-	-	-	4.143	3.390	2.901	2.520	2.192	1.747
125	-	-	-	4.311	3.509	2.990	2.591	2.248	1.842
130	-	-	-	4.479	3.677	3.079	2.661	2.304	1.937
135	-	-	-	4.647	3.846	3.168	2.732	2.360	2.032
140	-	-	-	4.815	4.015	3.257	2.803	2.416	2.075
145	-	-	-	-	4.184	3.346	2.874	2.472	2.116
150	-	-	-	-	4.352	3.435	2.945	2.528	2.158
155	-	-	-	-	4.521	3.556	3.015	2.584	2.199
160	-	-	-	-	4.690	3.729	3.086	2.640	2.240
165	-	-	-	-	4.858	3.902	3.157	2.696	2.282
170	-	-	-	-	-	4.075	3.228	2.752	2.323
175	-	-	-	-	-	4.248	3.298	2.807	2.364
180	-	-	-	-	-	4.421	3.369	2.863	2.406
185	-	-	-	-	-	4.594	3.440	2.919	2.447
190	-	-	-	-	-	4.767	3.540	2.975	2.488
195	-	-	-	-	-	-	3.707	3.031	2.529
200	-	-	-	-	-	-	3.873	3.087	2.571
205	-	-	-	-	-	-	4.040	3.143	2.612
210	-	-	-	-	-	-	4.207	3.199	2.653
215	-	-	-	-	-	-	4.373	3.255	2.695
220	-	-	-	-	-	-	4.540	3.311	2.736
225	-	-	-	-	-	-	4.706	3.367	2.777
230	-	-	-	-	-	-	-	3.423	2.819
235	-	-	-	-	-	-	-	3.479	2.860
240	-	-	-	-	-	-	-	3.600	2.901
245	-	-	-	-	-	-	-	3.734	2.943
250	-	-	-	-	-	-	-	3.868	2.984
255	-	-	-	-	-	-	-	4.003	3.025
260	-	-	-	-	-	-	-	4.137	3.066
265	-	-	-	-	-	-	-	4.271	3.108
270	-	-	-	-	-	-	-	4.405	3.149
275	-	-	-	-	-	-	-	4.539	3.190
280	-	-	-	-	-	-	-	4.673	3.232
285	-	-	-	-	-	-	-	4.808	3.273
290	-	-	-	-	-	-	-	-	3.314
295	-	-	-	-	-	-	-	-	3.356
300	-	-	-	-	-	-	-	-	3.397
305	-	-	-	-	-	-	-	-	3.438
310	-	-	-	-	-	-	-	-	3.480
315	-	-	-	-	-	-	-	-	3.567
320	-	-	-	-	-	-	-	-	3.669
325	-	-	-	-	-	-	-	-	3.770
330	-	-	-	-	-	-	-	-	3.872
335	-	-	-	-	-	-	-	-	3.973
340	-	-	-	-	-	-	-	-	4.074
345	-	-	-	-	-	-	-	-	4.176
350	-	-	-	-	-	-	-	-	4.277
355	-	-	-	-	-	-	-	-	4.379
360	-	-	-	-	-	-	-	-	4.480
365	-	-	-	-	-	-	-	-	4.582
370	-	-	-	-	-	-	-	-	4.683
375	-	-	-	-	-	-	-	-	4.785

Thickness is intumescent only.

Table 19: Circular Hollow Sections 90 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
40	-	3.251	2.723	2.194	1.813	1.376	1.062	0.793	0.520
45	-	3.596	2.964	2.408	1.991	1.606	1.265	0.961	0.520
50	-	3.942	3.204	2.621	2.169	1.836	1.468	1.129	0.592
55	-	4.288	3.445	2.835	2.348	2.054	1.672	1.297	0.786
60	-	4.633	3.730	3.049	2.526	2.192	1.875	1.466	0.979
65	-	-	4.024	3.262	2.704	2.330	2.058	1.634	1.173
70	-	-	4.319	3.476	2.883	2.469	2.166	1.802	1.327
75	-	-	4.614	3.716	3.061	2.607	2.275	1.971	1.452
80	-	-	-	3.959	3.239	2.745	2.383	2.087	1.577
85	-	-	-	4.202	3.418	2.884	2.491	2.171	1.703
90	-	-	-	4.444	3.632	3.022	2.599	2.256	1.828
95	-	-	-	4.687	3.870	3.160	2.708	2.340	1.953
100	-	-	-	-	4.108	3.299	2.816	2.424	2.057
105	-	-	-	-	4.347	3.437	2.924	2.508	2.121
110	-	-	-	-	4.585	3.637	3.032	2.593	2.186
115	-	-	-	-	4.824	3.876	3.141	2.677	2.250
120	-	-	-	-	-	4.114	3.249	2.761	2.314
125	-	-	-	-	-	4.352	3.357	2.846	2.378
130	-	-	-	-	-	4.591	3.465	2.930	2.442
135	-	-	-	-	-	4.829	3.665	3.014	2.506
140	-	-	-	-	-	-	3.889	3.098	2.570
145	-	-	-	-	-	-	4.114	3.183	2.635
150	-	-	-	-	-	-	4.339	3.267	2.699
155	-	-	-	-	-	-	4.564	3.351	2.763
160	-	-	-	-	-	-	4.789	3.435	2.827
165	-	-	-	-	-	-	-	3.557	2.891
170	-	-	-	-	-	-	-	3.743	2.955
175	-	-	-	-	-	-	-	3.930	3.020
180	-	-	-	-	-	-	-	4.117	3.084
185	-	-	-	-	-	-	-	4.303	3.148
190	-	-	-	-	-	-	-	4.490	3.212
195	-	-	-	-	-	-	-	4.676	3.276
200	-	-	-	-	-	-	-	4.863	3.340
205	-	-	-	-	-	-	-	-	3.405
210	-	-	-	-	-	-	-	-	3.469
215	-	-	-	-	-	-	-	-	3.590
220	-	-	-	-	-	-	-	-	3.737
225	-	-	-	-	-	-	-	-	3.885
230	-	-	-	-	-	-	-	-	4.033
235	-	-	-	-	-	-	-	-	4.180
240	-	-	-	-	-	-	-	-	4.328
245	-	-	-	-	-	-	-	-	4.475
250	-	-	-	-	-	-	-	-	4.623
255	-	-	-	-	-	-	-	-	4.770

Thickness is intumescent only.