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

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European Technical Assessment

ETA 15/0442 of 10/09/15

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	**TIKKURILA FONTEFIRE ST 60**
Product family to which the construction product belongs	35. Fire Protective Products Reactive Coating for the Fire Protection of Steel Elements
Manufacturer	**TIKKURILA OYJ** **P.O. BOX 53** **KUNINKAALANTIE 1** **FI-01301 VANTAA** **FINLAND**
Manufacturing plant(s)	**E57**
This European Technical Assessment contains	22 pages including 1 Annex which form an integral part of this assessment.
	Annex B Contains confidential information and is 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)

TIKKURILA FONTEFIRE ST 60 is a spray or brush/roller applied intumescent paint formulated for the fire protection of structural steel elements installed in the following environmental conditions:

Internal conditions – ETAG 018-2 Type Z_2

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

The intended use of TIKKURILA FONTEFIRE ST 60 is to fire protect various sizes of structural steel 'H' or 'I' shaped beam and column sections for up to a fire resistance classification of R60, and circular and rectangular/square hollow columns for up to a fire resistance classification of R90, 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 TIKKURILA FONTEFIRE ST 60 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.	**Characteristic**	**Assessment of characteristic**
5.1	**Mechanical resistance and stability**	Not relevant
5.2	**Safety in case of fire**	
5.2.1	Resistance to fire	EN 13501-2
5.2.2	Reaction to fire	EN 13501-1
5.3	**Hygiene, Health and the Environment**	
5.3.2	- 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	**Related aspects of serviceability**	
5.7.2.2	- Primer and top coat compatibility - Type Z_2 Durability	
5.7.3 and Annex E	- Identification	

3.1 Reaction to fire

The fire protection coating without topcoat has a performance determined for a reaction to fire classification in accordance with EN 13501-1 of Class B-s2, d0.

The fire protection coating with topcoats has a performance determined for a reaction to fire classification in accordance with EN 13501-1 of Class D-s2, d0. The tests have been performed with the topcoat Temadur 50 of which the most unfavourable result is to be expected based on indicative tests in accordance with EN 13823. The reaction to fire classification is applicable for the following topcoats: Temadur 50, Fontecryl SC 50, Temalac FD 50, Nova 20.

Annex B summarises the results of the analysis.

3.2 Resistance to fire

The resistance to fire performance according to EN 13501-2 is tested and analysed in accordance with the principles defined in EN 13381-8: 2013. Annex A summarises the results of the analysis.

TIKKURILA FONTEFIRE ST 60 has been tested and analysed to the slowing heating regime defined in EN 13381-8: 2013 and has satisfied the requirements.

In accordance with ETAG 018-2 (foreword), TIKKURILA FONTEFIRE ST 60 may be considered as 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

TIKKURILA FONTEFIRE ST 60 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 primer types:

Generic Primer Type
1-pack solvent based alkyd
1-pack water based acrylic
2-pack solvent based epoxy
2-pack water based epoxy

TIKKURILA FONTEFIRE ST 60 has been assessed as compatible with the specified generic primers for the use on steel substrates.

TIKKURILA FONTEFIRE ST 60 can be used with or without topcoat and has been assessed as having passed the requirements for use in internal conditions defined in ETAG 018-2 for Type Z_2 environmental conditions. TIKKURILA FONTEFIRE ST 60 has passed the Type Z_2 environmental conditions without topcoat or with the following topcoats:

Top Coats	
Name	**Type**
Temadur 50	A two pack solvent based polyurethane
Fontecryl SC 50	A single pack water based alkyd modified acrylic
Temalac FD 50	A single pack solvent based semi-gloss alkyd
Nova 20	A single pack water based acrylic

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.

The manufacturer shall exercise internal control of production in accordance with the provisions laid down in the "Control Plan".

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

As an example the following table is derived from ETAG 018-2 specify properties that should be controlled and minimum frequencies of control.

The exact test method and threshold have been laid down in the factory production control plan, operated by the manufacturer and deposited at Warrington Certification Limited (as annex B of this ETA).

Property	Property Paragraph (ETAG)	Threshold	Minimum frequency of tests
Char depth	Annex G or similar	factor at least 1:40	Every batch
Insulating efficiency	Annex A or alternative(1)	Manufacturer's declaration (2)	Every 10th batch or at least once per month
Sag resistance		> 1300 µm	Every batch
Viscosity	EN ISO 3219	7500-14000 mPas	Every batch
Raw materials(3)		Check specification	Every delivery
Pigment dispersion		visual check on lumps, agglomerates, specks	Every batch
Non- volatile content		67 – 72%	Every batch

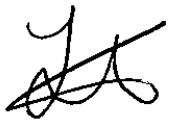
According Table 8.1of ETAG 018-2

(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

N. Stoyanov* - 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 TIKKURILA FONTEFIRE ST 60 for the fire protection of 'H' or 'I' shaped beam and column sections, and circular and rectangular/square hollow column sections. The precise scope is given in Tables 1-12 which show the total dry film thickness of TIKKURILA FONTEFIRE ST 60 (excluding primer and top coat) required to provide classifications of R30 to R60 for 'H' or 'I' shaped beam or column section, and R15 to R90 for rectangular/square hollow column sections, for various design temperatures and section factors. A summary of the salient features of the testing and assessment are shown in A1 of this Annex.

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 and regression 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).

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. The data is also applicable to galvanised steel sections with the compatible primers. 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 the 'H' and 'I' shaped columns applies also to other shaped steel sections that have re-entrant details such as channels, angles and tees.

6. TIKKURILA FONTEFIRE ST 60 has been tested and analysed to the slow heating regime defined in Annex A of EN 13381-8: 2013 and has satisfied the requirements.

Table of Results

Table 1: I-Section Columns 30 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350	400	450	500	550	600	650	700	750
5	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
10	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
15	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
20	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
25	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
30	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
35	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
40	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
45	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
50	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
55	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
60	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
65	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
70	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
75	0.430	0.333	0.289	0.270	0.270	0.270	0.270	0.270	0.270
80	0.430	0.335	0.291	0.270	0.270	0.270	0.270	0.270	0.270
85	0.430	0.341	0.295	0.270	0.270	0.270	0.270	0.270	0.270
90	0.444	0.346	0.299	0.270	0.270	0.270	0.270	0.270	0.270
95	0.471	0.352	0.303	0.273	0.270	0.270	0.270	0.270	0.270
100	0.498	0.358	0.307	0.276	0.270	0.270	0.270	0.270	0.270
105	0.524	0.364	0.311	0.278	0.270	0.270	0.270	0.270	0.270
110	0.551	0.370	0.315	0.281	0.270	0.270	0.270	0.270	0.270
115	0.578	0.376	0.319	0.284	0.270	0.270	0.270	0.270	0.270
120	0.605	0.382	0.324	0.287	0.270	0.270	0.270	0.270	0.270
125	0.638	0.388	0.328	0.290	0.270	0.270	0.270	0.270	0.270
130	0.679	0.393	0.332	0.293	0.270	0.270	0.270	0.270	0.270
135	0.720	0.399	0.336	0.296	0.270	0.270	0.270	0.270	0.270
140	0.762	0.405	0.340	0.298	0.270	0.270	0.270	0.270	0.270
145	0.803	0.411	0.344	0.301	0.270	0.270	0.270	0.270	0.270
150	0.845	0.417	0.348	0.304	0.270	0.270	0.270	0.270	0.270
155	0.886	0.423	0.352	0.307	0.271	0.270	0.270	0.270	0.270
160	0.927	0.429	0.356	0.310	0.273	0.270	0.270	0.270	0.270
165	0.969	0.447	0.360	0.313	0.275	0.270	0.270	0.270	0.270
170	1.010	0.469	0.364	0.316	0.277	0.270	0.270	0.270	0.270
175	1.039	0.491	0.368	0.318	0.279	0.270	0.270	0.270	0.270
180	1.056	0.513	0.372	0.321	0.281	0.270	0.270	0.270	0.270
185	1.073	0.535	0.376	0.324	0.284	0.270	0.270	0.270	0.270
190	1.090	0.556	0.381	0.327	0.286	0.270	0.270	0.270	0.270
195	1.107	0.578	0.385	0.330	0.288	0.270	0.270	0.270	0.270
200	1.124	0.600	0.389	0.333	0.290	0.270	0.270	0.270	0.270
205	1.141	0.624	0.393	0.336	0.292	0.270	0.270	0.270	0.270
210	1.158	0.662	0.397	0.338	0.294	0.270	0.270	0.270	0.270
215	1.175	0.701	0.401	0.341	0.297	0.270	0.270	0.270	0.270
220	1.193	0.739	0.405	0.344	0.299	0.270	0.270	0.270	0.270
225	1.210	0.778	0.409	0.347	0.301	0.270	0.270	0.270	0.270
230	1.227	0.817	0.413	0.350	0.303	0.270	0.270	0.270	0.270
235	1.244	0.855	0.417	0.353	0.305	0.270	0.270	0.270	0.270
240	1.261	0.894	0.421	0.356	0.307	0.270	0.270	0.270	0.270
245	1.278	0.932	0.425	0.358	0.310	0.270	0.270	0.270	0.270
250	1.295	0.971	0.429	0.361	0.312	0.270	0.270	0.270	0.270
255	1.312	1.009	0.449	0.364	0.314	0.270	0.270	0.270	0.270
260	1.329	1.038	0.471	0.367	0.316	0.271	0.270	0.270	0.270
265	1.346	1.054	0.493	0.370	0.318	0.273	0.270	0.270	0.270
270	1.363	1.071	0.515	0.373	0.320	0.274	0.270	0.270	0.270
275		1.087	0.537	0.376	0.323	0.276	0.270	0.270	0.270
280		1.104	0.559	0.378	0.325	0.278	0.270	0.270	0.270
285		1.121	0.581	0.381	0.327	0.279	0.270	0.270	0.270
290		1.137	0.603	0.384	0.329	0.281	0.270	0.270	0.270
295		1.154	0.629	0.387	0.331	0.283	0.270	0.270	0.270
300		1.170	0.665	0.390	0.333	0.284	0.270	0.270	0.270
305		1.187	0.702	0.393	0.336	0.286	0.270	0.270	0.270
310		1.203	0.738	0.396	0.338	0.287	0.270	0.270	0.270
315		1.220	0.775	0.398	0.340	0.289	0.270	0.270	0.270
320		1.237	0.811	0.401	0.342	0.291	0.271	0.270	0.270
325		1.253	0.848	0.404	0.344	0.292	0.272	0.270	0.270
330		1.270	0.884	0.407	0.346	0.294	0.273	0.270	0.270
335		1.286	0.921	0.410	0.349	0.296	0.274	0.270	0.270
340		1.303	0.957	0.413	0.351	0.297	0.275	0.270	0.270
345		1.320	0.994	0.416	0.353	0.299	0.276	0.270	0.270
350		1.336	1.030	0.418	0.355	0.300	0.277	0.270	0.270
355		1.353	1.046	0.421	0.357	0.302	0.278	0.270	0.270
360		1.369	1.062	0.424	0.359	0.304	0.279	0.270	0.270
365			1.078	0.427	0.362	0.305	0.280	0.270	0.270
370			1.094	0.430	0.364	0.307	0.281	0.270	0.270
375			1.110	0.450	0.366	0.308	0.282	0.270	0.270
380			1.126	0.470	0.368	0.310	0.283	0.270	0.270
385			1.142	0.490	0.370	0.312	0.284	0.270	0.270
390			1.158	0.511	0.372	0.313	0.285	0.270	0.270
395			1.174	0.531	0.375	0.315	0.286	0.270	0.270
400			1.190	0.552	0.377	0.317	0.287	0.270	0.270
405			1.206	0.572	0.379	0.318	0.288	0.270	0.270
410			1.222	0.592	0.381	0.320	0.289	0.271	0.270
415			1.238	0.613	0.383	0.321	0.290	0.271	0.270
420			1.254	0.633	0.386	0.323	0.291	0.272	0.270
425			1.270	0.653	0.388	0.325	0.292	0.272	0.270
430			1.286	0.674	0.390	0.326	0.293	0.273	0.270
435			1.302	0.694	0.392	0.328	0.294	0.273	0.270
440			1.318	0.715	0.394	0.329	0.295	0.274	0.270
445			1.335	0.735	0.396	0.331	0.296	0.275	0.270
450			1.351	0.755	0.399	0.333	0.297	0.275	0.270
455			1.367	0.776	0.401	0.334	0.298	0.276	0.270
460				0.796	0.403	0.336	0.299	0.276	0.270
465				0.817	0.405	0.338	0.300	0.277	0.270
470				0.837	0.407	0.339	0.301	0.277	0.270
475				0.857	0.409	0.341	0.302	0.278	0.270
480				0.878	0.412	0.342	0.303	0.278	0.270
485				0.898	0.414	0.344	0.304	0.279	0.270
490				0.918	0.416	0.346	0.305	0.280	0.270

Thickness is intumescent only.

Table 2: I-Section Columns 45 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350	400	450	500	550	600	650	700	750
5	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
10	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
15	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
20	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
25	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
30	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
35	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
40	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
45	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
50	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
55	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
60	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
65	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
70	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
75	1.030	0.620	0.383	0.338	0.304	0.278	0.270	0.270	0.270
80	1.030	0.620	0.386	0.340	0.306	0.280	0.270	0.270	0.270
85	1.030	0.620	0.394	0.346	0.311	0.283	0.270	0.270	0.270
90	1.030	0.632	0.402	0.352	0.315	0.287	0.270	0.270	0.270
95	1.055	0.682	0.409	0.358	0.320	0.290	0.270	0.270	0.270
100	1.083	0.733	0.417	0.364	0.324	0.294	0.270	0.270	0.270
105	1.111	0.783	0.425	0.370	0.329	0.297	0.284	0.270	0.270
110	1.139	0.833	0.451	0.376	0.334	0.301	0.299	0.270	0.270
115	1.167	0.884	0.500	0.382	0.338	0.304	0.314	0.270	0.270
120	1.196	0.934	0.549	0.388	0.343	0.308	0.330	0.270	0.270
125	1.224	0.984	0.598	0.393	0.347	0.311	0.345	0.270	0.270
130	1.252	1.032	0.648	0.399	0.352	0.315	0.360	0.270	0.270
135	1.280	1.056	0.698	0.405	0.357	0.318	0.375	0.270	0.270
140	1.308	1.079	0.749	0.411	0.361	0.322	0.390	0.270	0.270
145	1.336	1.102	0.799	0.417	0.366	0.325	0.405	0.270	0.270
150	1.364	1.126	0.849	0.423	0.370	0.329	0.420	0.270	0.270
155		1.149	0.899	0.429	0.375	0.332	0.435	0.270	0.270
160		1.172	0.949	0.465	0.379	0.336	0.450	0.270	0.270
165		1.196	1.000	0.509	0.384	0.339	0.465	0.270	0.270
170		1.219	1.038	0.554	0.389	0.343	0.480	0.270	0.270
175		1.243	1.059	0.598	0.393	0.346	0.496	0.275	0.270
180		1.266	1.080	0.657	0.398	0.350	0.511	0.281	0.270
185		1.289	1.100	0.730	0.402	0.353	0.526	0.288	0.270
190		1.313	1.121	0.802	0.407	0.357	0.541	0.294	0.270
195		1.336	1.142	0.875	0.412	0.360	0.556	0.301	0.270
200		1.359	1.162	0.947	0.416	0.364	0.571	0.307	0.270
205			1.183	1.019	0.421	0.367	0.586	0.314	0.270
210			1.204	1.046	0.425	0.371	0.601	0.320	0.270
215			1.225	1.066	0.430	0.374	0.616	0.327	0.270
220			1.245	1.085	0.472	0.378	0.631	0.333	0.270
225			1.266	1.104	0.515	0.381	0.647	0.340	0.270
230			1.287	1.124	0.558	0.385	0.662	0.346	0.270
235			1.307	1.143	0.601	0.388	0.677	0.353	0.270
240			1.328	1.162	0.720	0.392	0.692	0.359	0.270
245			1.349	1.181	0.899	0.395	0.707	0.365	0.270
250			1.369	1.201	1.035	0.399	0.722	0.372	0.270
255				1.220	1.052	0.402	0.737	0.378	0.270
260				1.239	1.069	0.406	0.752	0.385	0.270
265				1.258	1.087	0.409	0.767	0.391	0.270
270				1.278	1.104	0.413	0.782	0.398	0.270
275				1.297	1.121	0.416	0.797	0.404	0.270
280				1.316	1.139	0.420	0.813	0.411	0.270
285				1.335	1.156	0.423	0.828	0.417	0.271
290				1.355	1.173	0.427	0.843	0.424	0.275
295				1.374	1.191	0.457	0.858	0.430	0.279
300					1.208	0.903	0.873	0.437	0.283
305					1.225	1.041	0.888	0.443	0.288
310					1.243	1.056	0.903	0.450	0.292
315					1.260	1.071	0.918	0.456	0.296
320					1.277	1.085	0.933	0.463	0.300
325					1.295	1.100	0.948	0.469	0.305
330					1.312	1.115	0.963	0.475	0.309
335					1.330	1.130	0.979	0.482	0.313
340					1.347	1.145	0.994	0.488	0.317
345					1.364	1.160	1.009	0.495	0.322
350						1.175	1.024	0.501	0.326
355						1.190	1.039	0.508	0.330
360						1.205	1.054	0.514	0.334
365						1.220	1.069	0.521	0.339
370						1.235	1.084	0.527	0.343
375						1.250	1.099	0.534	0.347
380						1.265	1.114	0.540	0.351
385						1.280	1.129	0.547	0.355
390						1.294	1.145	0.553	0.360
395						1.309	1.160	0.560	0.364
400						1.324	1.175	0.566	0.368
405						1.339	1.190	0.573	0.372
410						1.354	1.205	0.579	0.377
415						1.369	1.220	0.586	0.381
420							1.235	0.592	0.385
425							1.250	0.598	0.389
430							1.265	0.605	0.394
435							1.280	0.611	0.398
440							1.295	0.618	0.402
445							1.311	0.624	0.406
450							1.326	0.631	0.411
455							1.341	0.637	0.415
460							1.356	0.644	0.419
465							1.371	0.650	0.423
470								0.657	0.428
475								0.663	0.432
480								0.670	0.436
485								0.676	0.440
490								0.683	0.445

Thickness is intumescent only.

Table 3: I-Section Columns 60 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350	400	450	500	550	600	650	700	750
5	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
10	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
15	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
20	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
25	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
30	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
35	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
40	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
45	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
50	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
55	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
60	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
65	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
70	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
75	1.300	1.030	0.671	0.416	0.373	0.339	0.309	0.281	0.270
80	1.300	1.030	0.699	0.420	0.375	0.341	0.311	0.288	0.270
85	1.300	1.030	0.753	0.429	0.383	0.347	0.316	0.308	0.270
90	1.300	1.052	0.807	0.499	0.390	0.352	0.320	0.327	0.270
95	1.300	1.084	0.861	0.577	0.398	0.358	0.325	0.347	0.270
100		1.115	0.915	0.646	0.405	0.364	0.329	0.367	0.271
105		1.147	0.970	0.704	0.413	0.370	0.334	0.386	0.287
110		1.178	1.024	0.762	0.420	0.376	0.339	0.406	0.303
115		1.210	1.055	0.819	0.428	0.382	0.343	0.425	0.320
120		1.241	1.082	0.877	0.484	0.388	0.348	0.445	0.336
125		1.273	1.110	0.935	0.562	0.393	0.353	0.465	0.352
130		1.304	1.137	0.992	0.638	0.399	0.357	0.484	0.369
135		1.336	1.165	1.039	0.708	0.405	0.362	0.504	0.385
140		1.367	1.193	1.064	0.778	0.411	0.366	0.524	0.402
145			1.220	1.089	0.848	0.417	0.371	0.543	0.418
150			1.248	1.115	0.919	0.423	0.376	0.563	0.434
155			1.276	1.140	0.989	0.429	0.380	0.582	0.451
160			1.303	1.165	1.040	0.487	0.385	0.602	0.467
165			1.331	1.191	1.063	0.562	0.389	0.622	0.483
170			1.358	1.216	1.086	0.647	0.394	0.641	0.500
175				1.241	1.109	0.765	0.399	0.661	0.516
180				1.266	1.131	0.882	0.403	0.681	0.533
185				1.292	1.154	1.000	0.408	0.700	0.549
190				1.317	1.177	1.045	0.413	0.720	0.565
195				1.342	1.200	1.066	0.417	0.739	0.582
200				1.368	1.223	1.086	0.422	0.759	0.598
205					1.246	1.106	0.426	0.779	0.614
210					1.269	1.127	0.593	0.798	0.631
215					1.292	1.147	1.037	0.818	0.647
220					1.315	1.168	1.053	0.837	0.664
225					1.338	1.188	1.069	0.857	0.680
230					1.361	1.209	1.086	0.877	0.696
235						1.229	1.102	0.896	0.713
240						1.249	1.118	0.916	0.729
245						1.270	1.135	0.936	0.745
250						1.290	1.151	0.955	0.762
255						1.311	1.167	0.975	0.778
260						1.331	1.184	0.994	0.794
265						1.352	1.200	1.014	0.811
270						1.372	1.216	1.033	0.827
275							1.233	1.048	0.844
280							1.249	1.063	0.860
285							1.266	1.078	0.876
290							1.282	1.093	0.893
295							1.298	1.108	0.909
300							1.315	1.123	0.925
305							1.331	1.138	0.942
310							1.347	1.153	0.958
315							1.364	1.168	0.975
320								1.183	0.991
325								1.198	1.007
330								1.213	1.024
335								1.229	1.038
340								1.244	1.051
345								1.259	1.064
350								1.274	1.078
355								1.289	1.091
360								1.304	1.104
365								1.319	1.117
370								1.334	1.130
375								1.349	1.143
380								1.364	1.157
385									1.170
390									1.183
395									1.196
400									1.209
405									1.222
410									1.235
415									1.249
420									1.262
425									1.275
430									1.288
435									1.301
440									1.314
445									1.328
450									1.341
455									1.354
460									1.367

Thickness is intumescent only.

Table 4: I-Section Beams 30 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**750**
5	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
10	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
15	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
20	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
25	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
30	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
35	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
40	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
45	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
50	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
55	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
60	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
65	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
70	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
75	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
80	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
85	0.530	0.418	0.260	0.260	0.260	0.260	0.260	0.260	0.260
90	0.530	0.418	0.265	0.260	0.260	0.260	0.260	0.260	0.260
95	0.530	0.418	0.275	0.260	0.260	0.260	0.260	0.260	0.260
100	0.536	0.418	0.285	0.260	0.260	0.260	0.260	0.260	0.260
105	0.549	0.418	0.295	0.260	0.260	0.260	0.260	0.260	0.260
110	0.563	0.418	0.305	0.260	0.260	0.260	0.260	0.260	0.260
115	0.577	0.419	0.314	0.260	0.260	0.260	0.260	0.260	0.260
120	0.591	0.429	0.317	0.260	0.260	0.260	0.260	0.260	0.260
125	0.605	0.440	0.320	0.260	0.260	0.260	0.260	0.260	0.260
130	0.619	0.450	0.323	0.261	0.260	0.260	0.260	0.260	0.260
135	0.633	0.461	0.326	0.265	0.260	0.260	0.260	0.260	0.260
140	0.647	0.472	0.329	0.269	0.260	0.260	0.260	0.260	0.260
145	0.662	0.482	0.332	0.273	0.260	0.260	0.260	0.260	0.260
150	0.681	0.493	0.335	0.277	0.260	0.260	0.260	0.260	0.260
155	0.701	0.504	0.338	0.281	0.260	0.260	0.260	0.260	0.260
160	0.720	0.514	0.341	0.285	0.260	0.260	0.260	0.260	0.260
165	0.739	0.525	0.344	0.289	0.260	0.260	0.260	0.260	0.260
170	0.759	0.536	0.347	0.293	0.260	0.260	0.260	0.260	0.260
175	0.778	0.546	0.350	0.297	0.260	0.260	0.260	0.260	0.260
180	0.798	0.557	0.353	0.301	0.260	0.260	0.260	0.260	0.260
185	0.817	0.568	0.356	0.305	0.260	0.260	0.260	0.260	0.260
190	0.837	0.579	0.359	0.309	0.260	0.260	0.260	0.260	0.260
195		0.589	0.364	0.313	0.260	0.260	0.260	0.260	0.260
200		0.600	0.371	0.317	0.260	0.260	0.260	0.260	0.260
205		0.611	0.379	0.322	0.260	0.260	0.260	0.260	0.260
210		0.622	0.387	0.326	0.260	0.260	0.260	0.260	0.260
215		0.633	0.394	0.330	0.260	0.260	0.260	0.260	0.260
220		0.643	0.402	0.334	0.260	0.260	0.260	0.260	0.260
225		0.654	0.410	0.338	0.260	0.260	0.260	0.260	0.260
230		0.667	0.417	0.342	0.260	0.260	0.260	0.260	0.260
235		0.684	0.425	0.346	0.260	0.260	0.260	0.260	0.260
240		0.700	0.433	0.350	0.260	0.260	0.260	0.260	0.260
245		0.717	0.440	0.354	0.260	0.260	0.260	0.260	0.260
250		0.733	0.448	0.358	0.264	0.260	0.260	0.260	0.260
255		0.749	0.455	0.364	0.271	0.260	0.260	0.260	0.260
260		0.766	0.463	0.371	0.278	0.260	0.260	0.260	0.260
265		0.782	0.471	0.379	0.285	0.260	0.260	0.260	0.260
270		0.799	0.478	0.386	0.292	0.260	0.260	0.260	0.260
275		0.815	0.486	0.393	0.299	0.260	0.260	0.260	0.260
280		0.831	0.494	0.401	0.306	0.260	0.260	0.260	0.260
285			0.501	0.408	0.313	0.260	0.260	0.260	0.260
290			0.509	0.416	0.321	0.260	0.260	0.260	0.260
295			0.516	0.423	0.328	0.260	0.260	0.260	0.260
300			0.524	0.430	0.335	0.260	0.260	0.260	0.260
305			0.536	0.438	0.342	0.260	0.260	0.260	0.260
310			0.561	0.445	0.349	0.260	0.260	0.260	0.260
315			0.587	0.453	0.356	0.260	0.260	0.260	0.260
320			0.613	0.460	0.363	0.260	0.260	0.260	0.260
325			0.638	0.467	0.370	0.260	0.260	0.260	0.260

Thickness is intumescent only.

Table 5: I-Section Beams 45 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**750**
5		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
10		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
15		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
20		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
25		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
30		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
35		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
40		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
45		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
50		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
55		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
60		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
65		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
70		0.530	0.530	0.450	0.363	0.260	0.260	0.260	0.260
75		0.535	0.530	0.450	0.363	0.260	0.260	0.260	0.260
80		0.550	0.530	0.450	0.363	0.260	0.260	0.260	0.260
85		0.565	0.530	0.450	0.363	0.260	0.260	0.260	0.260
90		0.580	0.530	0.450	0.363	0.260	0.260	0.260	0.260
95		0.595	0.530	0.450	0.363	0.266	0.260	0.260	0.260
100		0.610	0.530	0.450	0.363	0.274	0.260	0.260	0.260
105		0.626	0.530	0.450	0.363	0.282	0.260	0.260	0.260
110		0.641	0.539	0.450	0.363	0.290	0.260	0.260	0.260
115		0.656	0.549	0.451	0.364	0.298	0.260	0.260	0.260
120		0.674	0.558	0.461	0.370	0.302	0.260	0.260	0.260
125		0.693	0.568	0.471	0.377	0.306	0.260	0.260	0.260
130		0.712	0.578	0.482	0.383	0.310	0.260	0.260	0.260
135		0.731	0.587	0.492	0.390	0.315	0.260	0.260	0.260
140		0.750	0.597	0.502	0.396	0.319	0.264	0.260	0.260
145		0.769	0.606	0.512	0.403	0.323	0.269	0.260	0.260
150		0.788	0.616	0.522	0.409	0.327	0.274	0.260	0.260
155		0.807	0.625	0.532	0.415	0.331	0.279	0.260	0.260
160		0.826	0.635	0.539	0.422	0.335	0.284	0.260	0.260
165			0.645	0.547	0.428	0.339	0.289	0.260	0.260
170			0.654	0.554	0.435	0.343	0.294	0.260	0.260
175			0.668	0.562	0.441	0.348	0.299	0.260	0.260
180			0.687	0.569	0.448	0.352	0.304	0.260	0.260
185			0.707	0.577	0.454	0.356	0.309	0.260	0.260
190			0.726	0.585	0.461	0.360	0.314	0.260	0.260
195			0.746	0.592	0.467	0.367	0.319	0.260	0.260
200			0.765	0.600	0.474	0.373	0.324	0.260	0.260
205			0.785	0.607	0.480	0.380	0.329	0.260	0.260
210			0.804	0.615	0.487	0.386	0.334	0.260	0.260
215			0.824	0.622	0.493	0.393	0.339	0.260	0.260
220				0.630	0.500	0.399	0.344	0.260	0.260
225				0.637	0.506	0.406	0.349	0.260	0.260
230				0.645	0.513	0.412	0.354	0.260	0.260
235				0.652	0.519	0.419	0.359	0.260	0.260
240				0.660	0.525	0.425	0.365	0.260	0.260
245				0.684	0.532	0.432	0.371	0.260	0.260
250				0.709	0.539	0.438	0.377	0.260	0.260
255				0.733	0.550	0.445	0.384	0.265	0.260
260				0.758	0.569	0.452	0.390	0.280	0.260
265				0.782	0.589	0.458	0.396	0.296	0.260
270				0.807	0.608	0.465	0.403	0.311	0.260
275				0.831	0.627	0.471	0.409	0.327	0.260
280					0.646	0.478	0.415	0.342	0.260
285					0.666	0.484	0.421	0.357	0.260
290					0.685	0.491	0.428	0.365	0.260
295					0.704	0.497	0.434	0.370	0.260
300					0.723	0.504	0.440	0.376	0.260
305					0.743	0.510	0.447	0.381	0.260
310					0.762	0.517	0.453	0.387	0.260
315					0.781	0.523	0.459	0.392	0.260
320					0.800	0.530	0.466	0.398	0.260
325					0.820	0.557	0.472	0.403	0.260

Thickness is intumescent only.

Table 6: I-Section Beams 60 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350	**400**	**450**	**500**	**550**	**600**	**650**	**700**	**750**
5			0.660	0.530	0.530	0.464	0.389	0.260	0.260
10			0.660	0.530	0.530	0.464	0.389	0.260	0.260
15			0.660	0.530	0.530	0.464	0.389	0.260	0.260
20			0.660	0.530	0.530	0.464	0.389	0.260	0.260
25			0.660	0.530	0.530	0.464	0.389	0.260	0.260
30			0.660	0.530	0.530	0.464	0.389	0.260	0.260
35			0.660	0.530	0.530	0.464	0.389	0.260	0.260
40			0.660	0.530	0.530	0.464	0.389	0.260	0.260
45			0.660	0.530	0.530	0.464	0.389	0.260	0.260
50			0.660	0.530	0.530	0.464	0.389	0.260	0.260
55			0.660	0.530	0.530	0.464	0.389	0.260	0.260
60			0.660	0.530	0.530	0.464	0.389	0.260	0.260
65			0.660	0.530	0.530	0.464	0.389	0.260	0.260
70			0.660	0.530	0.530	0.464	0.389	0.260	0.260
75			0.660	0.530	0.530	0.464	0.389	0.260	0.260
80			0.660	0.530	0.530	0.464	0.389	0.260	0.260
85			0.660	0.538	0.530	0.464	0.389	0.260	0.260
90			0.660	0.549	0.530	0.464	0.389	0.268	0.260
95			0.660	0.561	0.530	0.464	0.389	0.277	0.260
100			0.660	0.572	0.530	0.464	0.389	0.286	0.260
105			0.660	0.583	0.530	0.464	0.389	0.296	0.260
110			0.668	0.594	0.535	0.464	0.389	0.305	0.260
115			0.689	0.605	0.545	0.464	0.389	0.314	0.260
120			0.710	0.616	0.556	0.475	0.397	0.319	0.260
125			0.731	0.627	0.567	0.486	0.405	0.323	0.265
130			0.752	0.638	0.578	0.497	0.412	0.328	0.271
135			0.773	0.649	0.589	0.507	0.420	0.332	0.278
140			0.794	0.661	0.600	0.518	0.427	0.337	0.284
145			0.815	0.680	0.611	0.529	0.435	0.342	0.290
150			0.836	0.700	0.622	0.539	0.443	0.346	0.297
155				0.719	0.633	0.549	0.450	0.351	0.303
160				0.739	0.644	0.559	0.458	0.355	0.309
165				0.758	0.655	0.569	0.465	0.360	0.316
170				0.777	0.669	0.578	0.473	0.366	0.322
175				0.797	0.684	0.588	0.481	0.372	0.329
180				0.816	0.700	0.598	0.488	0.378	0.335
185				0.836	0.716	0.608	0.496	0.384	0.341
190					0.731	0.618	0.503	0.390	0.348
195					0.747	0.628	0.511	0.397	0.354
200					0.762	0.638	0.519	0.403	0.360
205					0.778	0.648	0.526	0.409	0.366
210					0.794	0.658	0.535	0.415	0.372
215					0.809	0.672	0.544	0.421	0.378
220					0.825	0.688	0.554	0.427	0.384
225					0.840	0.704	0.563	0.433	0.390
230						0.719	0.572	0.440	0.395
235						0.735	0.582	0.446	0.401
240						0.751	0.591	0.452	0.407
245						0.766	0.601	0.458	0.413
250						0.782	0.610	0.464	0.419
255						0.800	0.620	0.470	0.425
260						0.822	0.632	0.477	0.430
265							0.644	0.483	0.436
270							0.655	0.489	0.442
275							0.677	0.495	0.448
280							0.706	0.501	0.454
285							0.735	0.507	0.460
290							0.764	0.513	0.465
295							0.793	0.520	0.471
300							0.822	0.526	0.477
305								0.534	0.483
310								0.548	0.489
315								0.563	0.495
320								0.577	0.500
325								0.591	0.506

Thickness is intumescent only.

Table 7: RHS/CHS sections 15 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
60	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
65	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
70	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
75	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
80	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
85	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
90	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
95	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
100	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
105	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
110	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
115	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
120	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
125	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
130	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
135	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
140	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
145	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
150	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
155	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
160	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
165	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
170	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
175	0.305	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
180	0.322	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
185	0.339	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
190	0.356	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
195	0.373	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
200	0.390	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
205	0.407	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
210	0.425	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
215	0.442	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
220	0.459	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
225	0.476	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
230	0.493	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
235	0.511	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
240	0.528	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
245	0.545	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
250	0.562	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
255	0.580	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
260	0.597	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
265	0.614	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
270	0.632	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
275	0.649	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
280	0.667	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
285	0.684	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
290	0.701	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
295	0.719	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
300	0.736	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
305	0.754	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
310	0.771	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
315	0.789	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
320	0.806	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
325	0.824	0.303	0.293	0.293	0.293	0.293	0.293	0.293	0.293
329	0.836	0.311	0.293	0.293	0.293	0.293	0.293	0.293	0.293

Thickness is intumescent only.

Table 8: RHS/CHS 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
60	0.330	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
65	0.382	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
70	0.433	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
75	0.485	0.302	0.293	0.293	0.293	0.293	0.293	0.293	0.293
80	0.537	0.341	0.293	0.293	0.293	0.293	0.293	0.293	0.293
85	0.588	0.380	0.293	0.293	0.293	0.293	0.293	0.293	0.293
90	0.640	0.420	0.293	0.293	0.293	0.293	0.293	0.293	0.293
95	0.692	0.460	0.293	0.293	0.293	0.293	0.293	0.293	0.293
100	0.744	0.500	0.293	0.293	0.293	0.293	0.293	0.293	0.293
105	0.796	0.540	0.306	0.293	0.293	0.293	0.293	0.293	0.293
110	0.848	0.581	0.335	0.293	0.293	0.293	0.293	0.293	0.293
115	0.900	0.621	0.364	0.293	0.293	0.293	0.293	0.293	0.293
120	0.952	0.662	0.393	0.293	0.293	0.293	0.293	0.293	0.293
125	1.004	0.704	0.423	0.293	0.293	0.293	0.293	0.293	0.293
130	1.056	0.745	0.453	0.293	0.293	0.293	0.293	0.293	0.293
135	1.108	0.786	0.483	0.293	0.293	0.293	0.293	0.293	0.293
137	1.129	0.804	0.496	0.293	0.293	0.293	0.293	0.293	0.293
140		0.828	0.514	0.293	0.293	0.293	0.293	0.293	0.293
145		0.870	0.544	0.295	0.293	0.293	0.293	0.293	0.293
150		0.913	0.575	0.316	0.293	0.293	0.293	0.293	0.293
155		0.955	0.607	0.338	0.293	0.293	0.293	0.293	0.293
160		0.998	0.638	0.360	0.293	0.293	0.293	0.293	0.293
165		1.041	0.670	0.383	0.293	0.293	0.293	0.293	0.293
170		1.084	0.702	0.405	0.293	0.293	0.293	0.293	0.293
175		1.127	0.734	0.428	0.293	0.293	0.293	0.293	0.293
180			0.767	0.451	0.293	0.293	0.293	0.293	0.293
185			0.800	0.475	0.293	0.293	0.293	0.293	0.293
190			0.833	0.499	0.293	0.293	0.293	0.293	0.293
195			0.867	0.523	0.293	0.293	0.293	0.293	0.293
200			0.901	0.547	0.293	0.293	0.293	0.293	0.293
205			0.935	0.571	0.306	0.293	0.293	0.293	0.293
210			0.970	0.596	0.323	0.293	0.293	0.293	0.293
215			1.005	0.622	0.341	0.293	0.293	0.293	0.293
220			1.040	0.647	0.358	0.293	0.293	0.293	0.293
225			1.076	0.673	0.376	0.293	0.293	0.293	0.293
230			1.111	0.699	0.395	0.293	0.293	0.293	0.293
232			1.126	0.710	0.403	0.293	0.293	0.293	0.293
235				0.726	0.413	0.293	0.293	0.293	0.293
240				0.753	0.432	0.293	0.293	0.293	0.293
245				0.780	0.452	0.293	0.293	0.293	0.293
250				0.808	0.471	0.293	0.293	0.293	0.293
255				0.836	0.491	0.293	0.293	0.293	0.293
260				0.864	0.511	0.293	0.293	0.293	0.293
265				0.893	0.532	0.293	0.293	0.293	0.293
270				0.922	0.552	0.293	0.293	0.293	0.293
275				0.952	0.574	0.293	0.293	0.293	0.293
280				0.982	0.595	0.293	0.293	0.293	0.293
285				1.012	0.617	0.293	0.293	0.293	0.293
290				1.043	0.640	0.293	0.293	0.293	0.293
295				1.074	0.662	0.293	0.293	0.293	0.293
300				1.106	0.685	0.293	0.293	0.293	0.293
303				1.126	0.700	0.293	0.293	0.293	0.293
305					0.709	0.297	0.293	0.293	0.293
310					0.733	0.311	0.293	0.293	0.293
315					0.757	0.326	0.293	0.293	0.293
320					0.782	0.341	0.293	0.293	0.293
325					0.807	0.356	0.293	0.293	0.293
329					0.826	0.367	0.293	0.293	0.293

Thickness is intumescent only.

Table 9: RHS/CHS 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
60	0.745	0.544	0.362	0.293	0.293	0.293	0.293	0.293	0.293
65	0.832	0.613	0.416	0.293	0.293	0.293	0.293	0.293	0.293
70	0.918	0.683	0.470	0.314	0.293	0.293	0.293	0.293	0.293
75	1.005	0.753	0.524	0.356	0.293	0.293	0.293	0.293	0.293
80	1.091	0.824	0.579	0.399	0.293	0.293	0.293	0.293	0.293
82	1.126	0.852	0.601	0.417	0.293	0.293	0.293	0.293	0.293
85		0.895	0.634	0.443	0.312	0.293	0.293	0.293	0.293
90		0.966	0.690	0.487	0.348	0.293	0.293	0.293	0.293
95		1.038	0.747	0.531	0.384	0.293	0.293	0.293	0.293
100		1.110	0.803	0.576	0.420	0.293	0.293	0.293	0.293
101		1.125	0.815	0.585	0.428	0.293	0.293	0.293	0.293
105			0.861	0.621	0.457	0.314	0.293	0.293	0.293
110			0.919	0.667	0.494	0.344	0.293	0.293	0.293
115			0.977	0.714	0.532	0.374	0.293	0.293	0.293
120			1.036	0.761	0.571	0.405	0.293	0.293	0.293
125			1.095	0.808	0.610	0.436	0.293	0.293	0.293
127			1.119	0.828	0.626	0.449	0.293	0.293	0.293
130				0.856	0.649	0.467	0.297	0.293	0.293
135				0.905	0.689	0.499	0.322	0.293	0.293
140				0.954	0.730	0.532	0.346	0.293	0.293
145				1.004	0.771	0.565	0.371	0.293	0.293
150				1.054	0.812	0.598	0.397	0.293	0.293
155				1.105	0.855	0.633	0.423	0.293	0.293
157				1.126	0.872	0.647	0.434	0.293	0.293
160					0.898	0.667	0.449	0.293	0.293
165					0.941	0.703	0.476	0.293	0.293
170					0.985	0.738	0.504	0.293	0.293
175					1.030	0.775	0.532	0.295	0.293
180					1.075	0.812	0.560	0.315	0.293
185					1.122	0.849	0.589	0.335	0.293
190						0.888	0.619	0.355	0.293
195						0.927	0.649	0.376	0.293
200						0.966	0.680	0.398	0.293
205						1.007	0.711	0.419	0.293
210						1.048	0.743	0.442	0.293
215						1.089	0.775	0.464	0.293
219						1.124	0.802	0.483	0.293
220							0.809	0.488	0.293
225							0.842	0.511	0.293
230							0.877	0.536	0.293
235							0.912	0.561	0.293
240							0.948	0.586	0.293
245							0.985	0.612	0.293
250							1.022	0.638	0.293
255							1.061	0.666	0.293
260							1.100	0.694	0.293
263							1.124	0.711	0.293
265								0.722	0.293
270								0.751	0.293
275								0.781	0.301
280								0.812	0.317
285								0.843	0.334
290								0.876	0.351
295								0.909	0.369
300								0.943	0.387
305								0.978	0.406
310								1.013	0.425
315								1.050	0.445
320								1.088	0.465
325								1.127	0.486
329									0.502

Thickness is intumescent only.

Table 10: RHS/CHS 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
60		0.902	0.667	0.497	0.383	0.293	0.293	0.293	0.293
65		1.002	0.748	0.562	0.438	0.331	0.293	0.293	0.293
70		1.103	0.829	0.628	0.494	0.378	0.293	0.293	0.293
71		1.124	0.845	0.642	0.505	0.388	0.293	0.293	0.293
75			0.910	0.695	0.550	0.425	0.310	0.293	0.293
80			0.993	0.763	0.607	0.473	0.349	0.293	0.293
85			1.076	0.831	0.665	0.522	0.389	0.293	0.293
88			1.126	0.873	0.701	0.552	0.414	0.293	0.293
90				0.900	0.724	0.571	0.430	0.295	0.293
95				0.970	0.784	0.622	0.471	0.327	0.293
100				1.040	0.844	0.673	0.513	0.361	0.293
105				1.112	0.905	0.724	0.556	0.394	0.293
106				1.126	0.917	0.735	0.565	0.402	0.293
110					0.967	0.777	0.599	0.429	0.293
115					1.029	0.830	0.643	0.464	0.293
120					1.093	0.884	0.688	0.500	0.304
122					1.119	0.906	0.707	0.514	0.315
125						0.939	0.734	0.536	0.330
130						0.994	0.780	0.573	0.357
135						1.051	0.827	0.611	0.385
140						1.109	0.875	0.649	0.413
141						1.120	0.885	0.657	0.419
145							0.924	0.688	0.441
150							0.974	0.728	0.470
155							1.024	0.768	0.500
160							1.076	0.810	0.530
165							1.128	0.852	0.561
170								0.895	0.593
175								0.939	0.625
180								0.983	0.658
185								1.029	0.691
190								1.075	0.726
195								1.123	0.761
200									0.797
205									0.834
210									0.871
215									0.910
220									0.949
225									0.989
230									1.030
235									1.072
240									1.116
241									1.125
245									
250									
255									
260									
265									
270									
275									
280									
285									
290									
295									
300									
305									
310									
315									
320									
325									
329									

Thickness is intumescent only.

Table 11: RHS/CHS 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
60			0.972	0.764	0.624	0.505	0.394	0.293	0.293
65			1.079	0.853	0.701	0.571	0.450	0.335	0.293
67			1.123	0.889	0.733	0.598	0.473	0.354	0.293
70				0.943	0.779	0.638	0.507	0.382	0.293
75				1.034	0.858	0.706	0.565	0.430	0.293
80				1.126	0.938	0.774	0.623	0.479	0.329
85					1.019	0.844	0.683	0.528	0.368
90					1.100	0.915	0.743	0.578	0.407
91					1.117	0.930	0.756	0.588	0.415
95						0.987	0.804	0.629	0.447
100						1.060	0.867	0.681	0.488
104						1.120	0.918	0.723	0.521
105							0.930	0.734	0.529
110							0.994	0.787	0.572
115							1.060	0.842	0.615
120							1.126	0.897	0.658
125								0.954	0.703
130								1.012	0.749
135								1.070	0.795
140								1.130	0.843
145									0.891
150									0.940
155									0.990
160									1.042
165									1.094
168									1.126
170									
175									
180									
185									
190									
195									
200									
205									
210									
215									
220									
225									
230									
235									
240									
245									
250									
255									
260									
265									
270									
275									
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300									
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315									
320									
325									
329									

Thickness is intumescent only.

Table 12: RHS/CHS 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
60				1.030	0.866	0.724	0.594	0.469	0.340
64				1.121	0.945	0.793	0.653	0.519	0.381
65					0.965	0.810	0.668	0.532	0.391
70					1.064	0.898	0.743	0.595	0.443
73					1.125	0.951	0.789	0.635	0.475
75						0.986	0.819	0.660	0.495
80						1.076	0.897	0.726	0.549
82						1.112	0.929	0.753	0.571
85							0.976	0.793	0.603
90							1.056	0.861	0.659
94							1.121	0.917	0.704
95								0.930	0.715
100								1.001	0.773
105								1.073	0.831
108								1.117	0.867
110									0.891
115									0.951
120									1.013
125									1.076
129									1.128
130									
135									
140									
145									
150									
155									
160									
165									
170									
175									
180									
185									
190									
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315									
320									
325									
329									

Thickness is intumescent only.