certifire

CERTIFICATE OF APPROVAL
No CF 5601

**This is to certify that, in accordance with
TS00 General Requirements for Certification of Fire Protection Products
The undermentioned products of**

KCC CORPORATION

**764 Gwahak-ro, Bongdong-eup, Wanju-gun, Jeonbuk, 55323, Korea
TEL: 82-62-260-7000**

**Have been assessed against the requirements of the Technical Schedule(s)
denoted below and are approved for use subject to the conditions
appended hereto:**

CERTIFIED PRODUCT	**TECHNICAL SCHEDULE**
Firemask SQ476	**TS 15 INTUMESCENT COATINGS FOR STEELWORK**

**Signed and sealed for and on behalf of Exova (UK) Limited trading as
Warrington Certification**

Paul Duggan
Certification Manager

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

Page 1 of 34

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Firemask SQ476

1. This approval relates to the use of FIREMASK SQ476 for the fire protection of I/H-shaped and hollow steel beam and column sections. The precise scope is given in Tables 1 to 32 which show the total dry film thickness of Firemask SQ476 (excluding primer and top sealer) required to provide fire resistance periods in accordance with BS476: Part 21: 1987 for differing sections, section factors and design temperatures.

2. The products are approved on the basis of:
   i) Initial type testing
   ii) A design appraisal against TS15
   iii) Certification of quality management system to ISO 9001
   iv) Inspection and surveillance of factory production control
   v) Audit testing

3. The data referring to three-sided fire exposure of beams relate to beams supporting concrete floor slabs. Separate consideration is required where this is not the case.

4. The data shown is applicable to steel sections blast cleaned to ISO 8501-1 Sa2.5 or equivalent and primed with a suitable and compatible primer. Specifications of surface preparations, primers and top sealers are available from KCC CORPORATION whose responsibility it is to ensure that Firemask SQ476 is compatible for use in respect of both ambient and fire conditions.

5. The data shown is applicable to FIREMASK SQ476 applied by spray or brush or roller to horizontal, vertical, flexural and compression steel members supporting loads up to the maximum design loads specified in BS449: Part 2.

6. The approval relates to on-going production. Product and/or its immediate packaging is identified with the manufacturers' name, the product name or number, the CERTIFIRE name or name and mark, together with the CERTIFIRE certificate number and application where appropriate.

7. The data shown in the tables is based on assessments which comply with the criteria for acceptability now incorporated within the CERTIFIRE scheme.

8. Tables relating to I/H-sections also apply to structural sections with re-entrant details including channels, angles and Tees.

9. This certification is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 1: I/H Beam 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
45	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
50	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
55	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
60	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
65	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
70	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
75	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
80	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
85	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
90	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
95	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
100	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
105	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
110	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
115	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
120	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
125	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
130	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
135	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
140	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
145	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
150	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
155	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
160	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
165	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
170	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
175	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
180	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
185	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
190	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
195	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
200	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
205	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
210	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
215	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
220	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
225	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
230	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
235	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
240	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
245	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
250	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
255	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
260	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
265	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
270	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
275	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
280	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
285	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
290	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
295	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
300	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
305	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
310	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
315	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
320	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
325	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
330	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
335	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
340	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
345	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
350	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
355	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
360	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
365	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
370	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
375	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324

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

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 2: I/H Beam 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
45	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
50	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
55	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
60	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
65	0.334	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
70	0.347	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
75	0.360	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
80	0.373	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
85	0.387	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
90	0.400	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
95	0.413	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
100	0.426	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
105	0.439	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
110	0.452	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
115	0.466	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
120	0.479	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
125	0.492	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
130	0.505	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
135	0.518	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
140	0.531	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
145	0.545	0.328	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
150	0.558	0.340	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
155	0.571	0.352	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
160	0.584	0.364	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
165	0.597	0.377	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
170	0.610	0.389	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
175	0.624	0.401	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
180	0.637	0.413	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
185	0.650	0.426	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
190	0.663	0.438	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
195	0.676	0.450	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
200	0.689	0.462	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
205	0.703	0.475	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
210	0.716	0.487	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
215	0.729	0.499	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
220	0.742	0.511	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
225	0.755	0.524	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
230	0.768	0.536	0.326	0.324	0.324	0.324	0.324	0.324	0.324	0.324
235	0.782	0.548	0.338	0.324	0.324	0.324	0.324	0.324	0.324	0.324
240	0.795	0.560	0.349	0.324	0.324	0.324	0.324	0.324	0.324	0.324
245	0.808	0.573	0.361	0.324	0.324	0.324	0.324	0.324	0.324	0.324
250	0.821	0.585	0.372	0.324	0.324	0.324	0.324	0.324	0.324	0.324
255	0.834	0.597	0.384	0.324	0.324	0.324	0.324	0.324	0.324	0.324
260	0.847	0.609	0.395	0.324	0.324	0.324	0.324	0.324	0.324	0.324
265	0.860	0.622	0.406	0.324	0.324	0.324	0.324	0.324	0.324	0.324
270	0.874	0.634	0.418	0.324	0.324	0.324	0.324	0.324	0.324	0.324
275	0.887	0.646	0.429	0.324	0.324	0.324	0.324	0.324	0.324	0.324
280	0.900	0.658	0.441	0.324	0.324	0.324	0.324	0.324	0.324	0.324
285	0.913	0.671	0.452	0.324	0.324	0.324	0.324	0.324	0.324	0.324
290	0.926	0.683	0.464	0.324	0.324	0.324	0.324	0.324	0.324	0.324
295	0.939	0.695	0.475	0.324	0.324	0.324	0.324	0.324	0.324	0.324
300	0.953	0.707	0.486	0.324	0.324	0.324	0.324	0.324	0.324	0.324
305	0.966	0.720	0.498	0.324	0.324	0.324	0.324	0.324	0.324	0.324
310	0.979	0.732	0.509	0.324	0.324	0.324	0.324	0.324	0.324	0.324
315	0.992	0.744	0.521	0.324	0.324	0.324	0.324	0.324	0.324	0.324
320	1.005	0.756	0.532	0.324	0.324	0.324	0.324	0.324	0.324	0.324
325	1.018	0.769	0.544	0.324	0.324	0.324	0.324	0.324	0.324	0.324
330	1.032	0.781	0.555	0.324	0.324	0.324	0.324	0.324	0.324	0.324
335	1.045	0.793	0.566	0.324	0.324	0.324	0.324	0.324	0.324	0.324
340	1.058	0.805	0.578	0.331	0.324	0.324	0.324	0.324	0.324	0.324
345	1.071	0.818	0.589	0.341	0.324	0.324	0.324	0.324	0.324	0.324
350	1.084	0.830	0.601	0.352	0.324	0.324	0.324	0.324	0.324	0.324
355	1.097	0.842	0.612	0.363	0.324	0.324	0.324	0.324	0.324	0.324
360	1.111	0.854	0.624	0.373	0.324	0.324	0.324	0.324	0.324	0.324
365	1.124	0.866	0.635	0.384	0.324	0.324	0.324	0.324	0.324	0.324
370	1.137	0.879	0.646	0.394	0.324	0.324	0.324	0.324	0.324	0.324
375	1.150	0.891	0.658	0.405	0.324	0.324	0.324	0.324	0.324	0.324

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

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 3: I/H Beam 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.536	0.335	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
45	0.553	0.351	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
50	0.570	0.367	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
55	0.586	0.383	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
60	0.603	0.399	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
65	0.620	0.415	0.338	0.324	0.324	0.324	0.324	0.324	0.324	0.324
70	0.637	0.431	0.353	0.324	0.324	0.324	0.324	0.324	0.324	0.324
75	0.653	0.447	0.367	0.324	0.324	0.324	0.324	0.324	0.324	0.324
80	0.670	0.463	0.381	0.324	0.324	0.324	0.324	0.324	0.324	0.324
85	0.687	0.479	0.395	0.324	0.324	0.324	0.324	0.324	0.324	0.324
90	0.704	0.495	0.410	0.324	0.324	0.324	0.324	0.324	0.324	0.324
95	0.721	0.512	0.424	0.324	0.324	0.324	0.324	0.324	0.324	0.324
100	0.737	0.528	0.438	0.324	0.324	0.324	0.324	0.324	0.324	0.324
105	0.754	0.544	0.452	0.324	0.324	0.324	0.324	0.324	0.324	0.324
110	0.771	0.560	0.466	0.324	0.324	0.324	0.324	0.324	0.324	0.324
115	0.788	0.576	0.481	0.336	0.324	0.324	0.324	0.324	0.324	0.324
120	0.804	0.592	0.495	0.349	0.324	0.324	0.324	0.324	0.324	0.324
125	0.821	0.608	0.509	0.362	0.324	0.324	0.324	0.324	0.324	0.324
130	0.838	0.624	0.523	0.375	0.324	0.324	0.324	0.324	0.324	0.324
135	0.855	0.640	0.537	0.388	0.324	0.324	0.324	0.324	0.324	0.324
140	0.872	0.656	0.552	0.401	0.324	0.324	0.324	0.324	0.324	0.324
145	0.888	0.672	0.566	0.414	0.324	0.324	0.324	0.324	0.324	0.324
150	0.905	0.688	0.580	0.427	0.324	0.324	0.324	0.324	0.324	0.324
155	0.922	0.705	0.594	0.440	0.324	0.324	0.324	0.324	0.324	0.324
160	0.939	0.721	0.608	0.453	0.324	0.324	0.324	0.324	0.324	0.324
165	0.955	0.737	0.623	0.466	0.324	0.324	0.324	0.324	0.324	0.324
170	0.972	0.753	0.637	0.479	0.324	0.324	0.324	0.324	0.324	0.324
175	0.989	0.769	0.651	0.492	0.333	0.324	0.324	0.324	0.324	0.324
180	1.006	0.785	0.665	0.505	0.346	0.324	0.324	0.324	0.324	0.324
185	1.022	0.801	0.680	0.519	0.359	0.327	0.324	0.324	0.324	0.324
190	1.039	0.817	0.694	0.532	0.371	0.339	0.324	0.324	0.324	0.324
195	1.056	0.833	0.708	0.545	0.384	0.352	0.324	0.324	0.324	0.324
200	1.073	0.849	0.722	0.558	0.397	0.364	0.324	0.324	0.324	0.324
205	1.090	0.865	0.736	0.571	0.410	0.377	0.324	0.324	0.324	0.324
210	1.106	0.881	0.751	0.584	0.422	0.389	0.324	0.324	0.324	0.324
215	1.123	0.897	0.765	0.597	0.435	0.401	0.324	0.324	0.324	0.324
220	1.140	0.914	0.779	0.610	0.448	0.414	0.324	0.324	0.324	0.324
225	1.157	0.930	0.793	0.623	0.460	0.426	0.324	0.324	0.324	0.324
230	1.173	0.946	0.807	0.636	0.473	0.439	0.324	0.324	0.324	0.324
235	1.190	0.962	0.822	0.649	0.486	0.451	0.324	0.324	0.324	0.324
240	1.207	0.978	0.836	0.662	0.498	0.463	0.324	0.324	0.324	0.324
245	1.224	0.994	0.850	0.675	0.511	0.476	0.324	0.324	0.324	0.324
250	1.241	1.010	0.864	0.688	0.524	0.488	0.324	0.324	0.324	0.324
255	1.257	1.026	0.878	0.701	0.536	0.501	0.324	0.324	0.324	0.324
260	1.274	1.042	0.893	0.715	0.549	0.513	0.340	0.324	0.324	0.324
265	1.291	1.058	0.907	0.728	0.562	0.525	0.363	0.324	0.324	0.324
270	1.308	1.074	0.921	0.741	0.574	0.538	0.386	0.324	0.324	0.324
275	1.324	1.090	0.935	0.754	0.587	0.550	0.408	0.324	0.324	0.324
280	1.341	1.107	0.950	0.767	0.600	0.563	0.431	0.324	0.324	0.324
285	1.358	1.123	0.964	0.780	0.612	0.575	0.454	0.324	0.324	0.324
290	1.375	1.139	0.978	0.793	0.625	0.587	0.476	0.336	0.324	0.324
295	1.392	1.155	0.992	0.806	0.638	0.600	0.499	0.358	0.324	0.324
300	1.408	1.171	1.006	0.819	0.650	0.612	0.522	0.380	0.324	0.324
305	1.425	1.187	1.021	0.832	0.663	0.625	0.545	0.402	0.324	0.324
310	1.442	1.203	1.035	0.845	0.676	0.637	0.567	0.425	0.324	0.324
315	1.459	1.219	1.049	0.858	0.688	0.649	0.590	0.447	0.324	0.324
320	1.475	1.235	1.063	0.871	0.701	0.662	0.613	0.469	0.324	0.324
325	1.492	1.251	1.077	0.884	0.714	0.674	0.635	0.491	0.324	0.324
330	1.509	1.267	1.092	0.898	0.726	0.687	0.658	0.513	0.324	0.324
335	1.526	1.283	1.106	0.911	0.739	0.699	0.681	0.535	0.324	0.324
340	1.543	1.300	1.120	0.924	0.752	0.711	0.704	0.557	0.324	0.324
345	1.559	1.316	1.134	0.937	0.764	0.726	0.726	0.580	0.333	0.324
350	1.576	1.332	1.148	0.950	0.777	0.749	0.749	0.602	0.355	0.324
355	1.593	1.348	1.163	0.963	0.790	0.772	0.772	0.624	0.376	0.324
360	1.610	1.364	1.177	0.976	0.802	0.794	0.794	0.646	0.398	0.324
365	1.626	1.380	1.191	0.989	0.817	0.817	0.817	0.668	0.419	0.324
370	1.643	1.396	1.205	1.002	0.840	0.840	0.840	0.690	0.440	0.324
375	1.700	1.412	1.220	1.015	0.863	0.863	0.863	0.712	0.462	0.324

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

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	0.983	0.674	0.430	0.324	0.324	0.324	0.324	0.324	0.324	0.324
45	1.038	0.693	0.447	0.338	0.324	0.324	0.324	0.324	0.324	0.324
50	1.093	0.711	0.465	0.354	0.324	0.324	0.324	0.324	0.324	0.324
55	1.147	0.730	0.482	0.370	0.324	0.324	0.324	0.324	0.324	0.324
60	1.202	0.748	0.499	0.386	0.337	0.324	0.324	0.324	0.324	0.324
65	1.257	0.767	0.517	0.402	0.352	0.324	0.324	0.324	0.324	0.324
70	1.311	0.785	0.534	0.418	0.367	0.348	0.324	0.324	0.324	0.324
75	1.366	0.804	0.552	0.434	0.381	0.362	0.324	0.324	0.324	0.324
80	1.421	0.822	0.569	0.450	0.396	0.376	0.324	0.324	0.324	0.324
85	1.475	0.841	0.587	0.466	0.410	0.391	0.324	0.324	0.324	0.324
90	1.530	0.859	0.604	0.482	0.425	0.405	0.324	0.324	0.324	0.324
95	1.585	0.877	0.621	0.498	0.440	0.419	0.324	0.324	0.324	0.324
100	1.639	0.896	0.639	0.514	0.454	0.434	0.324	0.324	0.324	0.324
105	1.682	0.914	0.656	0.530	0.469	0.448	0.324	0.324	0.324	0.324
110	1.718	0.933	0.674	0.546	0.484	0.462	0.324	0.324	0.324	0.324
115	1.754	0.951	0.691	0.562	0.498	0.477	0.343	0.324	0.324	0.324
120	1.791	0.970	0.709	0.578	0.513	0.491	0.370	0.324	0.324	0.324
125	1.827	0.988	0.726	0.594	0.527	0.505	0.396	0.324	0.324	0.324
130	1.863	1.007	0.743	0.610	0.542	0.519	0.423	0.324	0.324	0.324
135	1.900	1.025	0.761	0.626	0.557	0.534	0.450	0.324	0.324	0.324
140	1.936	1.044	0.778	0.642	0.571	0.548	0.476	0.324	0.324	0.324
145	1.972	1.062	0.796	0.658	0.586	0.562	0.503	0.330	0.324	0.324
150	2.009	1.081	0.813	0.674	0.601	0.577	0.529	0.357	0.324	0.324
155	2.045	1.099	0.831	0.690	0.615	0.591	0.556	0.384	0.324	0.324
160	2.081	1.117	0.848	0.706	0.630	0.605	0.583	0.411	0.324	0.324
165	2.118	1.136	0.865	0.722	0.644	0.620	0.609	0.437	0.324	0.324
170	2.154	1.154	0.883	0.738	0.659	0.636	0.636	0.464	0.324	0.324
175	2.190	1.173	0.900	0.754	0.674	0.663	0.663	0.491	0.324	0.324
180	2.226	1.191	0.918	0.770	0.689	0.689	0.689	0.518	0.324	0.324
185	2.263	1.210	0.935	0.786	0.716	0.716	0.716	0.545	0.346	0.324
190	2.299	1.228	0.953	0.802	0.743	0.743	0.743	0.572	0.372	0.324
195	2.335	1.247	0.970	0.818	0.769	0.769	0.769	0.598	0.399	0.324
200	2.372	1.265	0.987	0.834	0.796	0.796	0.796	0.625	0.425	0.324
205	2.408	1.284	1.005	0.850	0.822	0.822	0.822	0.652	0.451	0.324
210	2.444	1.302	1.022	0.866	0.849	0.849	0.849	0.679	0.478	0.324
215	2.481	1.321	1.040	0.882	0.876	0.876	0.876	0.706	0.504	0.324
220	2.517	1.339	1.057	0.902	0.902	0.902	0.902	0.732	0.530	0.324
225	2.553	1.358	1.074	0.929	0.929	0.929	0.929	0.759	0.557	0.324
230	2.590	1.376	1.092	0.956	0.956	0.956	0.956	0.786	0.583	0.324
235	2.626	1.394	1.109	0.982	0.982	0.982	0.982	0.813	0.609	0.324
240	2.662	1.413	1.127	1.009	1.009	1.009	1.009	0.840	0.635	0.337
245	2.699	1.431	1.144	1.035	1.035	1.035	1.035	0.867	0.662	0.362
250	2.735	1.450	1.162	1.062	1.062	1.062	1.062	0.893	0.688	0.387
255	2.771	1.468	1.179	1.089	1.089	1.089	1.089	0.920	0.714	0.411
260	2.808	1.487	1.196	1.115	1.115	1.115	1.115	0.947	0.741	0.436
265	2.844	1.505	1.214	1.142	1.142	1.142	1.142	0.974	0.767	0.460
270	2.880	1.524	1.231	1.169	1.169	1.169	1.169	1.001	0.793	0.485
275	2.917	1.542	1.249	1.195	1.195	1.195	1.195	1.028	0.820	0.509
280	2.995	1.561	1.266	1.222	1.222	1.222	1.222	1.054	0.846	0.534
285	3.076	1.579	1.284	1.248	1.248	1.248	1.248	1.081	0.872	0.558
290	3.156	1.598	1.301	1.275	1.275	1.275	1.275	1.108	0.899	0.583
295	3.237	1.616	1.318	1.302	1.302	1.302	1.302	1.135	0.925	0.607
300	3.317	1.634	1.336	1.328	1.328	1.328	1.328	1.162	0.951	0.632
305	3.397	1.653	1.355	1.355	1.355	1.355	1.355	1.188	0.978	0.656
310	3.478	1.743	1.382	1.382	1.382	1.382	1.382	1.215	1.004	0.681
315	3.558	1.854	1.408	1.408	1.408	1.408	1.408	1.242	1.030	0.705
320	3.639	1.964	1.435	1.435	1.435	1.435	1.435	1.269	1.057	0.730
325	3.719	2.075	1.462	1.462	1.462	1.462	1.462	1.296	1.083	0.754
330	3.800	2.185	1.488	1.488	1.488	1.488	1.488	1.323	1.109	0.779
335	3.880	2.296	1.515	1.515	1.515	1.515	1.515	1.349	1.136	0.803
340	3.961	2.406	1.541	1.541	1.541	1.541	1.541	1.376	1.162	0.828
345	4.041	2.517	1.568	1.568	1.568	1.568	1.568	1.403	1.188	0.852
350	4.122	2.628	1.595	1.595	1.595	1.595	1.595	1.430	1.214	0.877
355	4.202	2.738	1.621	1.621	1.621	1.621	1.621	1.457	1.241	0.901
360	4.282	2.849	1.648	1.648	1.648	1.648	1.648	1.484	1.267	0.926
365	4.363	2.953	1.675	1.675	1.675	1.675	1.675	1.510	1.293	0.951
370	4.443	3.047	1.701	1.701	1.701	1.701	1.701	1.537	1.320	0.975
375	4.524	3.142	1.728	1.728	1.728	1.728	1.728	1.564	1.346	1.000

Table 4: I/H Beam Sections 60 Minutes

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

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 5: I/H Beam 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	538°C	550°C	600°C	620°C	650°C	700°C
40	1.425	1.060	0.780	0.551	0.397	0.352	0.324	0.324	0.324	0.324
45	1.534	1.113	0.804	0.568	0.414	0.369	0.324	0.324	0.324	0.324
50	1.644	1.166	0.828	0.585	0.431	0.386	0.335	0.324	0.324	0.324
55	1.699	1.218	0.852	0.602	0.449	0.404	0.358	0.324	0.324	0.324
60	1.746	1.271	0.876	0.619	0.466	0.421	0.382	0.347	0.324	0.324
65	1.793	1.324	0.900	0.637	0.483	0.439	0.406	0.377	0.324	0.324
70	1.840	1.377	0.925	0.654	0.501	0.456	0.429	0.407	0.324	0.324
75	1.888	1.430	0.949	0.671	0.518	0.473	0.453	0.437	0.346	0.324
80	1.935	1.482	0.973	0.688	0.535	0.491	0.476	0.467	0.375	0.324
85	1.982	1.535	0.997	0.705	0.553	0.508	0.500	0.497	0.404	0.324
90	2.030	1.588	1.021	0.722	0.570	0.527	0.527	0.527	0.432	0.324
95	2.077	1.641	1.045	0.740	0.588	0.557	0.557	0.557	0.461	0.324
100	2.124	1.685	1.069	0.757	0.605	0.587	0.587	0.587	0.490	0.324
105	2.172	1.726	1.093	0.774	0.622	0.616	0.616	0.616	0.518	0.324
110	2.219	1.767	1.117	0.791	0.646	0.646	0.646	0.646	0.547	0.324
115	2.266	1.807	1.141	0.808	0.676	0.676	0.676	0.676	0.576	0.324
120	2.314	1.848	1.165	0.825	0.706	0.706	0.706	0.706	0.605	0.324
125	2.361	1.889	1.189	0.843	0.736	0.736	0.736	0.736	0.633	0.324
130	2.408	1.930	1.213	0.860	0.766	0.766	0.766	0.766	0.662	0.343
135	2.456	1.970	1.237	0.877	0.796	0.796	0.796	0.796	0.691	0.371
140	2.503	2.011	1.261	0.894	0.826	0.826	0.826	0.826	0.720	0.400
145	2.550	2.052	1.285	0.911	0.856	0.856	0.856	0.856	0.748	0.428
150	2.598	2.092	1.309	0.928	0.886	0.886	0.886	0.886	0.777	0.456
155	2.645	2.133	1.333	0.945	0.916	0.916	0.916	0.916	0.806	0.485
160	2.692	2.174	1.357	0.963	0.946	0.946	0.946	0.946	0.835	0.513
165	2.740	2.214	1.381	0.980	0.976	0.976	0.976	0.976	0.863	0.541
170	2.787	2.255	1.405	1.005	1.005	1.005	1.005	1.005	0.892	0.569
175	2.834	2.296	1.429	1.035	1.035	1.035	1.035	1.035	0.921	0.598
180	2.881	2.337	1.453	1.065	1.065	1.065	1.065	1.065	0.950	0.626
185	3.046	2.377	1.477	1.095	1.095	1.095	1.095	1.095	0.978	0.654
190	3.609	2.418	1.501	1.125	1.125	1.125	1.125	1.125	1.007	0.683
195	4.171	2.459	1.525	1.155	1.155	1.155	1.155	1.155	1.036	0.711
200	-	2.499	1.549	1.185	1.185	1.185	1.185	1.185	1.065	0.739
205	-	2.540	1.573	1.215	1.215	1.215	1.215	1.215	1.093	0.767
210	-	2.581	1.597	1.245	1.245	1.245	1.245	1.245	1.122	0.796
215	-	2.622	1.621	1.275	1.275	1.275	1.275	1.275	1.151	0.824
220	-	2.662	1.645	1.305	1.305	1.305	1.305	1.305	1.180	0.852
225	-	2.703	1.687	1.335	1.335	1.335	1.335	1.335	1.208	0.880
230	-	2.744	1.745	1.365	1.365	1.365	1.365	1.365	1.237	0.909
235	-	2.784	1.803	1.394	1.394	1.394	1.394	1.394	1.266	0.937
240	-	2.825	1.861	1.424	1.424	1.424	1.424	1.424	1.295	0.965
245	-	2.866	1.920	1.454	1.454	1.454	1.454	1.454	1.323	0.994
250	-	2.907	1.978	1.484	1.484	1.484	1.484	1.484	1.352	1.022
255	-	2.968	2.036	1.514	1.514	1.514	1.514	1.514	1.381	1.050
260	-	3.036	2.094	1.544	1.544	1.544	1.544	1.544	1.410	1.078
265	-	3.105	2.152	1.574	1.574	1.574	1.574	1.574	1.438	1.107
270	-	3.174	2.210	1.604	1.604	1.604	1.604	1.604	1.467	1.135
275	-	3.243	2.268	1.634	1.634	1.634	1.634	1.634	1.496	1.163
280	-	3.312	2.326	1.664	1.664	1.664	1.664	1.664	1.525	1.192
285	-	3.381	2.384	1.694	1.694	1.694	1.694	1.694	1.553	1.220
290	-	3.450	2.442	1.724	1.724	1.724	1.724	1.724	1.582	1.248
295	-	3.519	2.500	1.753	1.753	1.753	1.753	1.753	1.611	1.276
300	-	3.587	2.559	1.783	1.783	1.783	1.783	1.783	1.640	1.305
305	-	3.656	2.617	1.813	1.813	1.813	1.813	1.813	1.668	1.333
310	-	3.725	2.675	1.843	1.843	1.843	1.843	1.843	1.697	1.361
315	-	3.794	2.733	1.873	1.873	1.873	1.873	1.873	1.726	1.390
320	-	3.863	2.791	1.903	1.903	1.903	1.903	1.903	1.755	1.418
325	-	3.932	2.849	1.933	1.933	1.933	1.933	1.933	1.783	1.446
330	-	4.001	2.907	1.963	1.963	1.963	1.963	1.963	1.812	1.474
335	-	4.070	3.014	1.993	1.993	1.993	1.993	1.993	1.841	1.503
340	-	4.139	3.133	2.023	2.023	2.023	2.023	2.023	1.870	1.531
345	-	4.207	3.252	2.053	2.053	2.053	2.053	2.053	1.898	1.559
350	-	4.276	3.370	2.083	2.083	2.083	2.083	2.083	1.927	1.588
355	-	4.345	3.489	2.113	2.113	2.113	2.113	2.113	1.956	1.616
360	-	4.414	3.607	2.142	2.142	2.142	2.142	2.142	1.984	1.644
365	-	4.483	3.726	2.172	2.172	2.172	2.172	2.172	2.013	1.672
370	-	-	3.844	2.202	2.202	2.202	2.202	2.202	2.042	1.701
375	-	-	3.963	2.232	2.232	2.232	2.232	2.232	2.071	1.729

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

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 6: I/H Beam 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	538°C	550°C	600°C	620°C	650°C	700°C
40	2.199	1.441	1.123	0.871	0.703	0.654	0.462	0.396	0.324	0.324
45	2.348	1.541	1.178	0.896	0.722	0.671	0.498	0.431	0.358	0.324
50	2.496	1.641	1.232	0.921	0.740	0.687	0.533	0.466	0.391	0.324
55	2.644	1.699	1.287	0.947	0.758	0.704	0.569	0.501	0.425	0.324
60	2.793	1.750	1.341	0.972	0.776	0.720	0.604	0.536	0.458	0.350
65	2.974	1.800	1.396	0.997	0.795	0.640	0.640	0.571	0.492	0.381
70	3.340	1.850	1.450	1.023	0.813	0.753	0.676	0.606	0.525	0.412
75	3.706	1.901	1.505	1.048	0.831	0.770	0.711	0.641	0.559	0.443
80	4.071	1.951	1.559	1.073	0.850	0.786	0.747	0.676	0.593	0.474
85	4.437	2.001	1.614	1.098	0.868	0.803	0.782	0.710	0.626	0.505
90	-	2.052	1.666	1.124	0.886	0.819	0.818	0.745	0.660	0.536
95	-	2.102	1.711	1.149	0.904	0.853	0.853	0.780	0.693	0.567
100	-	2.152	1.757	1.174	0.923	0.889	0.889	0.815	0.727	0.599
105	-	2.203	1.802	1.200	0.941	0.925	0.925	0.850	0.760	0.630
110	-	2.253	1.847	1.225	0.960	0.960	0.960	0.885	0.794	0.661
115	-	2.304	1.893	1.250	0.996	0.996	0.996	0.920	0.827	0.692
120	-	2.354	1.938	1.275	1.031	1.031	1.031	0.955	0.861	0.723
125	-	2.404	1.983	1.301	1.067	1.067	1.067	0.989	0.894	0.754
130	-	2.455	2.029	1.326	1.102	1.102	1.102	1.024	0.928	0.785
135	-	2.505	2.074	1.351	1.138	1.138	1.138	1.059	0.962	0.816
140	-	2.555	2.119	1.377	1.174	1.174	1.174	1.094	0.995	0.847
145	-	2.606	2.164	1.402	1.209	1.209	1.209	1.129	1.029	0.878
150	-	2.656	2.210	1.427	1.245	1.245	1.245	1.164	1.062	0.909
155	-	2.706	2.255	1.452	1.280	1.280	1.280	1.199	1.096	0.940
160	-	2.757	2.300	1.478	1.316	1.316	1.316	1.234	1.129	0.971
165	-	2.807	2.346	1.503	1.351	1.351	1.351	1.269	1.163	1.002
170	-	2.857	2.391	1.528	1.387	1.387	1.387	1.303	1.196	1.033
175	-	2.908	2.436	1.554	1.423	1.423	1.423	1.338	1.230	1.064
180	-	3.288	2.482	1.579	1.458	1.458	1.458	1.373	1.264	1.096
185	-	3.755	2.527	1.604	1.494	1.494	1.494	1.408	1.297	1.127
190	-	4.223	2.572	1.629	1.529	1.529	1.529	1.443	1.331	1.158
195	-	-	2.617	1.655	1.565	1.565	1.565	1.478	1.364	1.189
200	-	-	2.663	1.716	1.600	1.600	1.600	1.513	1.398	1.220
205	-	-	2.708	1.780	1.636	1.636	1.636	1.548	1.431	1.251
210	-	-	2.753	1.845	1.671	1.671	1.671	1.582	1.465	1.282
215	-	-	2.799	1.909	1.707	1.707	1.707	1.617	1.498	1.313
220	-	-	2.844	1.973	1.743	1.743	1.743	1.652	1.532	1.344
225	-	-	2.889	2.038	1.778	1.778	1.778	1.687	1.565	1.375
230	-	-	2.955	2.102	1.814	1.814	1.814	1.722	1.599	1.406
235	-	-	3.057	2.167	1.849	1.849	1.849	1.757	1.633	1.437
240	-	-	3.159	2.231	1.885	1.885	1.885	1.792	1.666	1.468
245	-	-	3.261	2.296	1.920	1.920	1.920	1.827	1.700	1.499
250	-	-	3.363	2.360	1.956	1.956	1.956	1.862	1.733	1.530
255	-	-	3.465	2.425	1.992	1.992	1.992	1.896	1.767	1.561
260	-	-	3.567	2.489	2.027	2.027	2.027	1.931	1.800	1.593
265	-	-	3.669	2.554	2.063	2.063	2.063	1.966	1.834	1.624
270	-	-	3.771	2.618	2.098	2.098	2.098	2.001	1.867	1.655
275	-	-	3.873	2.683	2.134	2.134	2.134	2.036	1.901	1.686
280	-	-	3.975	2.747	2.169	2.169	2.169	2.071	1.934	1.717
285	-	-	4.077	2.812	2.205	2.205	2.205	2.106	1.968	1.748
290	-	-	4.179	2.876	2.241	2.241	2.241	2.141	2.002	1.779
295	-	-	4.281	2.957	2.276	2.276	2.276	2.175	2.035	1.810
300	-	-	4.383	3.069	2.312	2.312	2.312	2.210	2.069	1.841
305	-	-	4.485	3.180	2.347	2.347	2.347	2.245	2.102	1.872
310	-	-	-	3.291	2.383	2.383	2.383	2.280	2.136	1.903
315	-	-	-	3.402	2.418	2.418	2.418	2.315	2.169	1.934
320	-	-	-	3.514	2.454	2.454	2.454	2.350	2.203	1.965
325	-	-	-	3.625	2.490	2.490	2.490	2.385	2.236	1.996
330	-	-	-	3.736	2.664	2.525	2.525	2.420	2.270	2.027
335	-	-	-	3.847	2.839	2.561	2.561	2.455	2.303	2.058
340	-	-	-	3.959	3.012	2.596	2.596	2.489	2.337	2.090
345	-	-	-	4.070	3.185	2.632	2.632	2.524	2.371	2.121
350	-	-	-	4.181	3.358	3.061	2.667	2.559	2.404	2.152
355	-	-	-	4.293	3.531	3.238	2.703	2.594	2.438	2.183
360	-	-	-	4.404	3.704	3.416	2.738	2.629	2.471	2.214
365	-	-	-	4.515	3.877	3.594	2.774	2.664	2.505	2.245
370	-	-	-	-	4.050	3.771	2.810	2.699	2.538	2.276
375	-	-	-	-	4.223	3.949	2.845	2.734	2.572	2.307

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

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

CERTIFICATE No CF 5601
KCC CORPORATION

Table 7: I/H Beam Sections 105 Minutes										
Section Factor up to m⁻¹	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	3.372	2.129	1.462	1.184	1.007	0.953	0.743	0.671	0.559	0.378
45	3.892	2.292	1.559	1.240	1.035	0.978	0.781	0.708	0.596	0.414
50	4.412	2.456	1.655	1.295	1.064	1.004	0.745	0.632	0.632	0.449
55	-	2.619	1.708	1.351	1.092	1.029	0.857	0.783	0.669	0.485
60	-	2.783	1.760	1.407	1.121	1.054	0.895	0.820	0.706	0.520
65	-	2.981	1.812	1.462	1.149	1.080	0.933	0.858	0.743	0.556
70	-	3.342	1.864	1.518	1.178	1.105	0.971	0.895	0.780	0.591
75	-	3.703	1.916	1.574	1.207	1.130	1.009	0.933	0.816	0.627
80	-	4.063	1.968	1.629	1.235	1.156	1.046	0.970	0.853	0.662
85	-	4.424	2.020	1.681	1.264	1.181	1.084	1.007	0.890	0.698
90	-	-	2.072	1.729	1.292	1.207	1.122	1.045	0.927	0.734
95	-	-	2.124	1.777	1.321	1.232	1.160	1.082	0.964	0.769
100	-	-	2.176	1.824	1.349	1.257	1.198	1.120	1.000	0.805
105	-	-	2.228	1.872	1.378	1.283	1.236	1.157	1.037	0.840
110	-	-	2.280	1.920	1.406	1.308	1.274	1.195	1.074	0.876
115	-	-	2.332	1.968	1.435	1.333	1.312	1.232	1.111	0.911
120	-	-	2.384	2.016	1.464	1.359	1.350	1.269	1.148	0.947
125	-	-	2.436	2.064	1.492	1.387	1.387	1.307	1.184	0.982
130	-	-	2.488	2.111	1.521	1.425	1.425	1.344	1.221	1.018
135	-	-	2.540	2.159	1.549	1.463	1.463	1.382	1.258	1.053
140	-	-	2.592	2.207	1.578	1.501	1.501	1.419	1.295	1.089
145	-	-	2.644	2.255	1.606	1.539	1.539	1.457	1.332	1.124
150	-	-	2.696	2.303	1.635	1.577	1.577	1.494	1.369	1.160
155	-	-	2.749	2.351	1.671	1.615	1.615	1.532	1.405	1.195
160	-	-	2.801	2.398	1.735	1.653	1.653	1.569	1.442	1.231
165	-	-	2.918	2.446	1.799	1.691	1.691	1.606	1.479	1.266
170	-	-	2.905	2.494	1.863	1.728	1.728	1.644	1.516	1.302
175	-	-	2.891	2.542	1.927	1.766	1.766	1.681	1.553	1.338
180	-	-	2.878	2.590	1.991	1.804	1.804	1.719	1.589	1.373
185	-	-	2.864	2.638	2.055	1.842	1.842	1.756	1.626	1.409
190	-	-	2.851	2.685	2.119	1.880	1.880	1.794	1.663	1.444
195	-	-	2.837	2.733	2.183	1.918	1.918	1.831	1.700	1.480
200	-	-	2.824	2.781	2.247	1.966	1.956	1.868	1.737	1.515
205	-	-	2.829	2.829	2.311	2.039	1.994	1.906	1.773	1.551
210	-	-	2.877	2.877	2.375	2.112	2.032	1.943	1.810	1.586
215	-	-	2.977	2.977	2.438	2.185	2.069	1.981	1.847	1.622
220	-	-	3.417	3.417	2.502	2.258	2.107	2.018	1.884	1.657
225	-	-	3.857	3.857	2.566	2.331	2.145	2.056	1.921	1.693
230	-	-	4.297	4.297	2.630	2.404	2.183	2.093	1.957	1.728
235	-	-	-	-	2.694	2.477	2.221	2.131	1.994	1.764
240	-	-	-	-	2.758	2.550	2.259	2.168	2.031	1.799
245	-	-	-	-	2.822	2.623	2.297	2.205	2.068	1.835
250	-	-	-	-	2.886	2.696	2.335	2.243	2.105	1.870
255	-	-	-	-	2.997	2.769	2.373	2.280	2.141	1.906
260	-	-	-	-	3.154	2.842	2.410	2.318	2.178	1.942
265	-	-	-	-	3.312	2.915	2.448	2.355	2.215	1.977
270	-	-	-	-	3.469	3.034	2.486	2.393	2.252	2.013
275	-	-	-	-	3.627	3.156	2.524	2.430	2.289	2.048
280	-	-	-	-	3.785	3.277	2.562	2.467	2.326	2.084
285	-	-	-	-	3.942	3.399	2.600	2.505	2.362	2.119
290	-	-	-	-	4.100	3.520	2.638	2.542	2.399	2.155
295	-	-	-	-	4.258	3.641	2.676	2.580	2.436	2.190
300	-	-	-	-	4.415	3.763	2.714	2.617	2.473	2.226
305	-	-	-	-	-	3.884	2.751	2.655	2.510	2.261
310	-	-	-	-	-	4.006	2.789	2.692	2.546	2.297
315	-	-	-	-	-	4.127	2.827	2.729	2.583	2.332
320	-	-	-	-	-	4.249	2.865	2.767	2.620	2.368
325	-	-	-	-	-	4.370	2.903	2.804	2.657	2.403
330	-	-	-	-	-	4.491	3.059	2.842	2.694	2.439
335	-	-	-	-	-	-	3.292	2.879	2.730	2.474
340	-	-	-	-	-	-	3.525	2.917	2.767	2.510
345	-	-	-	-	-	-	3.759	3.149	2.804	2.546
350	-	-	-	-	-	-	3.992	3.388	2.841	2.581
355	-	-	-	-	-	-	4.226	3.627	2.878	2.617
360	-	-	-	-	-	-	4.459	3.866	2.914	2.652
365	-	-	-	-	-	-	-	4.105	3.144	2.688
370	-	-	-	-	-	-	-	4.345	3.394	2.723
375	-	-	-	-	-	-	-	-	3.644	2.759

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

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

CERTIFICATE No CF 5601
KCC CORPORATION

Table 8: I/H Beam Sections 120 Minutes

Section Factor up to m⁻¹	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	-	3.186	1.494	1.494	1.301	1.243	1.030	0.950	0.828	0.622
45	-	3.744	1.588	1.588	1.366	1.301	1.058	0.974	0.849	0.660
50	-	4.303	1.785	1.699	1.431	1.358	1.085	0.999	0.870	0.698
55	-	-	2.163	1.856	1.496	1.416	1.112	1.023	0.891	0.736
60	-	-	2.542	2.012	1.561	1.473	1.140	1.047	0.912	0.774
65	-	-	2.923	2.169	1.626	1.531	1.167	1.071	0.933	0.812
70	-	-	3.519	2.325	1.713	1.589	1.194	1.095	0.954	0.850
75	-	-	4.116	2.482	1.819	1.646	1.222	1.120	0.975	0.888
80	-	-	-	2.639	1.925	1.741	1.249	1.144	0.996	0.926
85	-	-	-	2.795	2.031	1.844	1.277	1.168	1.017	0.964
90	-	-	-	2.952	2.137	1.947	1.304	1.192	1.038	1.002
95	-	-	-	3.108	2.243	2.051	1.331	1.216	1.059	1.040
100	-	-	-	3.265	2.349	2.154	1.359	1.241	1.080	1.078
105	-	-	-	3.422	2.455	2.257	1.386	1.265	1.116	1.116
110	-	-	-	3.578	2.561	2.361	1.413	1.289	1.154	1.154
115	-	-	-	3.735	2.666	2.464	1.441	1.313	1.192	1.192
120	-	-	-	3.891	2.772	2.567	1.468	1.337	1.230	1.230
125	-	-	-	4.048	2.878	2.670	1.496	1.361	1.267	1.267
130	-	-	-	4.205	2.984	2.774	1.523	1.386	1.305	1.305
135	-	-	-	4.361	3.090	2.877	1.550	1.410	1.343	1.343
140	-	-	-	4.518	3.196	2.980	1.578	1.434	1.381	1.381
145	-	-	-	-	3.302	3.084	1.605	1.458	1.419	1.419
150	-	-	-	-	3.408	3.187	1.633	1.482	1.457	1.457
155	-	-	-	-	3.514	3.290	1.664	1.507	1.495	1.495
160	-	-	-	-	3.620	3.393	1.733	1.533	1.533	1.533
165	-	-	-	-	3.726	3.497	1.802	1.571	1.571	1.571
170	-	-	-	-	3.832	3.600	1.872	1.609	1.609	1.609
175	-	-	-	-	3.937	3.703	1.941	1.647	1.647	1.647
180	-	-	-	-	4.043	3.807	2.010	1.685	1.685	1.685
185	-	-	-	-	4.149	3.910	2.079	1.723	1.723	1.723
190	-	-	-	-	4.255	4.013	2.148	1.761	1.761	1.761
195	-	-	-	-	4.361	4.117	2.217	1.799	1.799	1.799
200	-	-	-	-	4.467	4.220	2.286	1.878	1.837	1.837
205	-	-	-	-	-	4.323	2.355	1.958	1.875	1.875
210	-	-	-	-	-	4.426	2.424	2.038	1.913	1.913
215	-	-	-	-	-	4.530	2.493	2.117	1.951	1.951
220	-	-	-	-	-	-	2.562	2.197	1.988	1.988
225	-	-	-	-	-	-	2.631	2.276	2.026	2.026
230	-	-	-	-	-	-	2.700	2.356	2.064	2.064
235	-	-	-	-	-	-	2.769	2.436	2.102	2.102
240	-	-	-	-	-	-	2.838	2.515	2.140	2.140
245	-	-	-	-	-	-	2.907	2.595	2.178	2.178
250	-	-	-	-	-	-	3.308	2.674	2.216	2.216
255	-	-	-	-	-	-	3.768	2.754	2.254	2.254
260	-	-	-	-	-	-	4.228	2.834	2.292	2.292
265	-	-	-	-	-	-	-	2.913	2.330	2.330
270	-	-	-	-	-	-	-	3.132	2.368	2.368
275	-	-	-	-	-	-	-	3.359	2.414	2.406
280	-	-	-	-	-	-	-	3.587	2.516	2.444
285	-	-	-	-	-	-	-	3.814	2.618	2.482
290	-	-	-	-	-	-	-	4.042	2.720	2.520
295	-	-	-	-	-	-	-	4.269	2.822	2.558
300	-	-	-	-	-	-	-	4.497	2.929	2.596
305	-	-	-	-	-	-	-	-	3.112	2.634
310	-	-	-	-	-	-	-	-	3.295	2.672
315	-	-	-	-	-	-	-	-	3.478	2.709
320	-	-	-	-	-	-	-	-	3.661	2.747
325	-	-	-	-	-	-	-	-	3.844	2.785
330	-	-	-	-	-	-	-	-	4.027	2.823
335	-	-	-	-	-	-	-	-	4.210	2.861
340	-	-	-	-	-	-	-	-	4.393	2.899
345	-	-	-	-	-	-	-	-	-	3.073
350	-	-	-	-	-	-	-	-	-	3.379
355	-	-	-	-	-	-	-	-	-	3.685
360	-	-	-	-	-	-	-	-	-	3.991
365	-	-	-	-	-	-	-	-	-	4.298
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-

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

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 9: I/H Beam Sections 150 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	-	-	-	2.835	2.254	2.007	1.570	1.479	1.339	1.112
45	-	-	-	3.533	2.430	2.418	1.677	1.562	1.406	1.154
50	-	-	-	4.469	2.828	2.828	1.912	1.646	1.473	1.195
55	-	-	-	-	3.239	3.239	2.147	1.821	1.541	1.237
60	-	-	-	-	3.649	3.649	2.382	2.009	1.608	1.278
65	-	-	-	-	-	4.060	2.617	2.198	1.692	1.320
70	-	-	-	-	-	4.470	2.853	2.386	1.820	1.361
75	-	-	-	-	-	-	3.088	2.575	1.948	1.403
80	-	-	-	-	-	-	3.323	2.763	2.076	1.444
85	-	-	-	-	-	-	3.558	2.952	2.204	1.486
90	-	-	-	-	-	-	3.793	3.140	2.331	1.527
95	-	-	-	-	-	-	4.028	3.329	2.459	1.569
100	-	-	-	-	-	-	4.263	3.518	2.587	1.610
105	-	-	-	-	-	-	4.498	3.706	2.715	1.652
110	-	-	-	-	-	-	-	3.895	2.843	1.766
115	-	-	-	-	-	-	-	4.083	2.971	1.891
120	-	-	-	-	-	-	-	4.272	3.098	2.015
125	-	-	-	-	-	-	-	4.460	3.226	2.140
130	-	-	-	-	-	-	-	-	3.354	2.265
135	-	-	-	-	-	-	-	-	3.482	2.390
140	-	-	-	-	-	-	-	-	3.610	2.515
145	-	-	-	-	-	-	-	-	3.738	2.639
150	-	-	-	-	-	-	-	-	3.865	2.764
155	-	-	-	-	-	-	-	-	3.993	2.889
160	-	-	-	-	-	-	-	-	4.121	3.014
165	-	-	-	-	-	-	-	-	4.249	3.138
170	-	-	-	-	-	-	-	-	4.377	3.263
175	-	-	-	-	-	-	-	-	4.505	3.388
180	-	-	-	-	-	-	-	-	-	3.513
185	-	-	-	-	-	-	-	-	-	3.637
190	-	-	-	-	-	-	-	-	-	3.762
195	-	-	-	-	-	-	-	-	-	3.887
200	-	-	-	-	-	-	-	-	-	4.012
205	-	-	-	-	-	-	-	-	-	4.136
210	-	-	-	-	-	-	-	-	-	4.261
215	-	-	-	-	-	-	-	-	-	4.386
220	-	-	-	-	-	-	-	-	-	4.511
225	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-

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

CERTIFICATE No CF 5601
KCC CORPORATION

Table 10: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
45	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
50	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
55	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
60	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
65	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
70	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
75	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
80	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
85	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
90	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
95	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
100	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
105	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
110	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
115	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
120	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
125	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
130	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
135	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
140	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
145	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
150	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
155	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
160	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
165	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
170	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
175	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
180	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
185	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
190	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
195	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
200	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
205	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
210	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
215	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
220	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
225	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
230	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
235	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
240	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
245	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
250	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
255	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
260	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
265	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
270	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
275	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
280	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
285	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
290	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
295	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
300	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
305	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
310	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
315	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
320	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
325	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
330	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
335	0.320	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
340	0.329	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
345	0.338	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
350	0.347	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
355	0.356	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
360	0.365	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
365	0.374	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
370	0.383	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
375	0.392	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 11: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
45	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
50	0.327	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
55	0.341	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
60	0.355	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
65	0.369	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
70	0.383	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
75	0.397	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
80	0.411	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
85	0.425	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
90	0.439	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
95	0.453	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
100	0.467	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
105	0.481	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
110	0.495	0.321	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
115	0.509	0.334	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
120	0.523	0.346	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
125	0.537	0.358	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
130	0.552	0.371	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
135	0.566	0.383	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
140	0.580	0.396	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
145	0.594	0.408	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
150	0.608	0.420	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
155	0.622	0.433	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
160	0.636	0.445	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
165	0.650	0.457	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
170	0.664	0.470	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
175	0.678	0.482	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
180	0.692	0.495	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
185	0.706	0.507	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
190	0.720	0.519	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
195	0.734	0.532	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
200	0.748	0.544	0.315	0.313	0.313	0.313	0.313	0.313	0.313	0.313
205	0.762	0.557	0.327	0.313	0.313	0.313	0.313	0.313	0.313	0.313
210	0.776	0.569	0.338	0.313	0.313	0.313	0.313	0.313	0.313	0.313
215	0.790	0.581	0.350	0.313	0.313	0.313	0.313	0.313	0.313	0.313
220	0.804	0.594	0.362	0.313	0.313	0.313	0.313	0.313	0.313	0.313
225	0.818	0.606	0.374	0.313	0.313	0.313	0.313	0.313	0.313	0.313
230	0.832	0.618	0.386	0.313	0.313	0.313	0.313	0.313	0.313	0.313
235	0.846	0.631	0.398	0.313	0.313	0.313	0.313	0.313	0.313	0.313
240	0.860	0.643	0.409	0.313	0.313	0.313	0.313	0.313	0.313	0.313
245	0.874	0.656	0.421	0.313	0.313	0.313	0.313	0.313	0.313	0.313
250	0.888	0.668	0.433	0.313	0.313	0.313	0.313	0.313	0.313	0.313
255	0.902	0.680	0.445	0.313	0.313	0.313	0.313	0.313	0.313	0.313
260	0.916	0.693	0.457	0.313	0.313	0.313	0.313	0.313	0.313	0.313
265	0.930	0.705	0.468	0.313	0.313	0.313	0.313	0.313	0.313	0.313
270	0.944	0.717	0.480	0.313	0.313	0.313	0.313	0.313	0.313	0.313
275	0.958	0.730	0.492	0.313	0.313	0.313	0.313	0.313	0.313	0.313
280	0.972	0.742	0.504	0.313	0.313	0.313	0.313	0.313	0.313	0.313
285	0.986	0.755	0.516	0.313	0.313	0.313	0.313	0.313	0.313	0.313
290	1.000	0.767	0.527	0.313	0.313	0.313	0.313	0.313	0.313	0.313
295	1.014	0.779	0.539	0.313	0.313	0.313	0.313	0.313	0.313	0.313
300	1.028	0.792	0.551	0.321	0.313	0.313	0.313	0.313	0.313	0.313
305	1.042	0.804	0.563	0.332	0.313	0.313	0.313	0.313	0.313	0.313
310	1.057	0.816	0.575	0.344	0.313	0.313	0.313	0.313	0.313	0.313
315	1.071	0.829	0.586	0.355	0.313	0.313	0.313	0.313	0.313	0.313
320	1.085	0.841	0.598	0.366	0.313	0.313	0.313	0.313	0.313	0.313
325	1.099	0.854	0.610	0.377	0.313	0.313	0.313	0.313	0.313	0.313
330	1.113	0.866	0.622	0.388	0.313	0.313	0.313	0.313	0.313	0.313
335	1.127	0.878	0.634	0.399	0.313	0.313	0.313	0.313	0.313	0.313
340	1.141	0.891	0.645	0.410	0.313	0.313	0.313	0.313	0.313	0.313
345	1.155	0.903	0.657	0.421	0.313	0.313	0.313	0.313	0.313	0.313
350	1.169	0.915	0.669	0.432	0.318	0.313	0.313	0.313	0.313	0.313
355	1.183	0.928	0.681	0.443	0.328	0.313	0.313	0.313	0.313	0.313
360	1.197	0.940	0.693	0.454	0.338	0.313	0.313	0.313	0.313	0.313
365	1.211	0.953	0.704	0.465	0.348	0.313	0.313	0.313	0.313	0.313
370	1.225	0.965	0.716	0.476	0.358	0.313	0.313	0.313	0.313	0.313
375	1.239	0.977	0.728	0.487	0.368	0.313	0.313	0.313	0.313	0.313

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Page 13 of 34 Signed
AP/002

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 12: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C
40	0.650	0.349	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
45	0.667	0.366	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
50	0.683	0.383	0.320	0.313	0.313	0.313	0.313	0.313	0.313	0.313
55	0.700	0.400	0.334	0.313	0.313	0.313	0.313	0.313	0.313	0.313
60	0.716	0.417	0.349	0.313	0.313	0.313	0.313	0.313	0.313	0.313
65	0.732	0.434	0.364	0.313	0.313	0.313	0.313	0.313	0.313	0.313
70	0.749	0.450	0.379	0.313	0.313	0.313	0.313	0.313	0.313	0.313
75	0.765	0.467	0.394	0.313	0.313	0.313	0.313	0.313	0.313	0.313
80	0.782	0.484	0.409	0.313	0.313	0.313	0.313	0.313	0.313	0.313
85	0.798	0.501	0.424	0.324	0.313	0.313	0.313	0.313	0.313	0.313
90	0.815	0.518	0.438	0.338	0.313	0.313	0.313	0.313	0.313	0.313
95	0.831	0.535	0.453	0.351	0.313	0.313	0.313	0.313	0.313	0.313
100	0.848	0.552	0.468	0.364	0.313	0.313	0.313	0.313	0.313	0.313
105	0.864	0.569	0.483	0.378	0.313	0.313	0.313	0.313	0.313	0.313
110	0.881	0.586	0.498	0.391	0.313	0.313	0.313	0.313	0.313	0.313
115	0.897	0.603	0.513	0.405	0.313	0.313	0.313	0.313	0.313	0.313
120	0.914	0.620	0.527	0.418	0.313	0.313	0.313	0.313	0.313	0.313
125	0.930	0.637	0.542	0.432	0.313	0.313	0.313	0.313	0.313	0.313
130	0.947	0.654	0.557	0.445	0.313	0.313	0.313	0.313	0.313	0.313
135	0.963	0.671	0.572	0.458	0.313	0.313	0.313	0.313	0.313	0.313
140	0.980	0.688	0.587	0.472	0.321	0.313	0.313	0.313	0.313	0.313
145	0.996	0.705	0.602	0.485	0.334	0.313	0.313	0.313	0.313	0.313
150	1.013	0.722	0.617	0.499	0.347	0.313	0.313	0.313	0.313	0.313
155	1.029	0.738	0.631	0.512	0.360	0.313	0.313	0.313	0.313	0.313
160	1.046	0.755	0.646	0.526	0.373	0.325	0.313	0.313	0.313	0.313
165	1.062	0.772	0.661	0.539	0.386	0.338	0.313	0.313	0.313	0.313
170	1.079	0.789	0.676	0.552	0.400	0.351	0.313	0.313	0.313	0.313
175	1.095	0.806	0.691	0.566	0.413	0.364	0.313	0.313	0.313	0.313
180	1.112	0.823	0.706	0.579	0.426	0.377	0.313	0.313	0.313	0.313
185	1.128	0.840	0.721	0.593	0.439	0.390	0.313	0.313	0.313	0.313
190	1.145	0.857	0.735	0.606	0.452	0.403	0.313	0.313	0.313	0.313
195	1.161	0.874	0.750	0.619	0.465	0.416	0.313	0.313	0.313	0.313
200	1.178	0.891	0.765	0.633	0.478	0.429	0.313	0.313	0.313	0.313
205	1.194	0.908	0.780	0.646	0.491	0.442	0.313	0.313	0.313	0.313
210	1.211	0.925	0.795	0.660	0.505	0.455	0.313	0.313	0.313	0.313
215	1.227	0.942	0.810	0.673	0.518	0.468	0.315	0.313	0.313	0.313
220	1.244	0.959	0.824	0.687	0.531	0.481	0.339	0.313	0.313	0.313
225	1.260	0.976	0.839	0.700	0.544	0.494	0.363	0.313	0.313	0.313
230	1.277	0.993	0.854	0.713	0.557	0.507	0.387	0.313	0.313	0.313
235	1.293	1.010	0.869	0.727	0.570	0.520	0.411	0.313	0.313	0.313
240	1.310	1.026	0.884	0.740	0.583	0.533	0.434	0.319	0.313	0.313
245	1.326	1.043	0.899	0.754	0.596	0.547	0.458	0.342	0.313	0.313
250	1.343	1.060	0.914	0.767	0.610	0.560	0.482	0.365	0.313	0.313
255	1.359	1.077	0.928	0.780	0.623	0.573	0.506	0.388	0.313	0.313
260	1.375	1.094	0.943	0.794	0.636	0.586	0.530	0.411	0.313	0.313
265	1.392	1.111	0.958	0.807	0.649	0.599	0.553	0.435	0.313	0.313
270	1.408	1.128	0.973	0.821	0.662	0.612	0.577	0.458	0.313	0.313
275	1.425	1.145	0.988	0.834	0.675	0.625	0.601	0.481	0.313	0.313
280	1.441	1.162	1.003	0.848	0.688	0.638	0.625	0.504	0.313	0.313
285	1.458	1.179	1.017	0.861	0.701	0.651	0.649	0.527	0.313	0.313
290	1.474	1.196	1.032	0.874	0.715	0.672	0.672	0.550	0.322	0.313
295	1.491	1.213	1.047	0.888	0.728	0.696	0.696	0.573	0.345	0.313
300	1.507	1.230	1.062	0.901	0.741	0.720	0.720	0.596	0.367	0.313
305	1.524	1.247	1.077	0.915	0.754	0.744	0.744	0.619	0.389	0.313
310	1.540	1.264	1.092	0.928	0.768	0.768	0.768	0.643	0.412	0.313
315	1.557	1.281	1.107	0.942	0.792	0.792	0.792	0.666	0.434	0.313
320	1.573	1.298	1.121	0.955	0.815	0.815	0.815	0.689	0.457	0.313
325	1.590	1.314	1.136	0.968	0.839	0.839	0.839	0.712	0.479	0.313
330	1.606	1.331	1.151	0.982	0.863	0.863	0.863	0.735	0.502	0.313
335	1.623	1.348	1.166	0.995	0.887	0.887	0.887	0.758	0.524	0.313
340	1.639	1.365	1.181	1.009	0.911	0.911	0.911	0.781	0.546	0.313
345	1.656	1.382	1.196	1.022	0.934	0.934	0.934	0.804	0.569	0.313
350	1.896	1.399	1.211	1.035	0.958	0.958	0.958	0.828	0.591	0.313
355	2.156	1.416	1.225	1.049	0.982	0.982	0.982	0.851	0.614	0.313
360	2.415	1.433	1.240	1.062	1.006	1.006	1.006	0.874	0.636	0.313
365	2.674	1.450	1.255	1.076	1.030	1.030	1.030	0.897	0.658	0.321
370	2.923	1.467	1.270	1.089	1.054	1.054	1.054	0.920	0.681	0.341
375	3.016	1.484	1.285	1.103	1.077	1.077	1.077	0.943	0.703	0.362

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 13: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C
40	1.127	0.757	0.504	0.342	0.313	0.313	0.313	0.313	0.313	0.313
45	1.200	0.781	0.521	0.359	0.323	0.313	0.313	0.313	0.313	0.313
50	1.272	0.805	0.539	0.376	0.338	0.326	0.313	0.313	0.313	0.313
55	1.345	0.829	0.556	0.393	0.354	0.341	0.313	0.313	0.313	0.313
60	1.418	0.853	0.573	0.410	0.369	0.356	0.313	0.313	0.313	0.313
65	1.490	0.877	0.591	0.427	0.385	0.371	0.313	0.313	0.313	0.313
70	1.563	0.901	0.608	0.444	0.400	0.386	0.313	0.313	0.313	0.313
75	1.636	0.925	0.626	0.461	0.416	0.401	0.313	0.313	0.313	0.313
80	1.685	0.950	0.643	0.477	0.431	0.416	0.318	0.313	0.313	0.313
85	1.724	0.974	0.661	0.494	0.447	0.432	0.346	0.313	0.313	0.313
90	1.763	0.998	0.678	0.511	0.462	0.447	0.373	0.313	0.313	0.313
95	1.803	1.022	0.695	0.528	0.478	0.462	0.401	0.313	0.313	0.313
100	1.842	1.046	0.713	0.545	0.493	0.477	0.428	0.333	0.313	0.313
105	1.881	1.070	0.730	0.562	0.509	0.492	0.456	0.361	0.313	0.313
110	1.921	1.094	0.748	0.579	0.524	0.507	0.484	0.388	0.313	0.313
115	1.960	1.118	0.765	0.596	0.540	0.522	0.511	0.415	0.313	0.313
120	1.999	1.142	0.783	0.613	0.555	0.539	0.539	0.442	0.313	0.313
125	2.039	1.166	0.800	0.630	0.571	0.566	0.566	0.469	0.313	0.313
130	2.078	1.190	0.817	0.647	0.594	0.594	0.594	0.496	0.313	0.313
135	2.117	1.214	0.835	0.663	0.622	0.622	0.622	0.523	0.313	0.313
140	2.156	1.238	0.852	0.680	0.649	0.649	0.649	0.550	0.313	0.313
145	2.196	1.262	0.870	0.697	0.677	0.677	0.677	0.578	0.325	0.313
150	2.235	1.286	0.887	0.714	0.705	0.705	0.705	0.605	0.353	0.313
155	2.274	1.310	0.904	0.732	0.732	0.732	0.732	0.632	0.380	0.313
160	2.314	1.334	0.922	0.760	0.760	0.760	0.760	0.659	0.408	0.313
165	2.353	1.358	0.939	0.787	0.787	0.787	0.787	0.686	0.435	0.313
170	2.392	1.382	0.957	0.815	0.815	0.815	0.815	0.713	0.463	0.313
175	2.432	1.406	0.974	0.843	0.843	0.843	0.843	0.740	0.490	0.313
180	2.471	1.430	0.992	0.870	0.870	0.870	0.870	0.767	0.517	0.313
185	2.510	1.454	1.009	0.898	0.898	0.898	0.898	0.795	0.545	0.313
190	2.549	1.478	1.026	0.925	0.925	0.925	0.925	0.822	0.572	0.313
195	2.589	1.502	1.044	0.953	0.953	0.953	0.953	0.849	0.600	0.313
200	2.628	1.526	1.061	0.981	0.981	0.981	0.981	0.876	0.627	0.333
205	2.667	1.550	1.079	1.008	1.008	1.008	1.008	0.903	0.655	0.359
210	2.707	1.574	1.096	1.036	1.036	1.036	1.036	0.930	0.682	0.385
215	2.746	1.598	1.114	1.064	1.064	1.064	1.064	0.957	0.709	0.411
220	2.785	1.622	1.131	1.091	1.091	1.091	1.091	0.984	0.737	0.437
225	2.825	1.646	1.148	1.119	1.119	1.119	1.119	1.012	0.764	0.464
230	2.864	1.687	1.166	1.146	1.146	1.146	1.146	1.039	0.792	0.490
235	2.903	1.741	1.183	1.174	1.174	1.174	1.174	1.066	0.819	0.516
240	2.963	1.796	1.202	1.202	1.202	1.202	1.202	1.093	0.847	0.542
245	3.034	1.851	1.229	1.229	1.229	1.229	1.229	1.120	0.874	0.568
250	3.106	1.905	1.257	1.257	1.257	1.257	1.257	1.147	0.902	0.594
255	3.177	1.960	1.285	1.285	1.285	1.285	1.285	1.174	0.929	0.620
260	3.249	2.014	1.312	1.312	1.312	1.312	1.312	1.201	0.956	0.646
265	3.320	2.069	1.340	1.340	1.340	1.340	1.340	1.229	0.984	0.673
270	3.392	2.124	1.367	1.367	1.367	1.367	1.367	1.256	1.011	0.699
275	3.463	2.178	1.395	1.395	1.395	1.395	1.395	1.283	1.039	0.725
280	3.535	2.233	1.423	1.423	1.423	1.423	1.423	1.310	1.066	0.751
285	3.606	2.288	1.450	1.450	1.450	1.450	1.450	1.337	1.094	0.777
290	3.678	2.342	1.478	1.478	1.478	1.478	1.478	1.364	1.121	0.803
295	3.749	2.397	1.505	1.505	1.505	1.505	1.505	1.391	1.148	0.829
300	3.821	2.451	1.533	1.533	1.533	1.533	1.533	1.418	1.176	0.855
305	3.892	2.506	1.561	1.561	1.561	1.561	1.561	1.446	1.203	0.881
310	3.964	2.561	1.588	1.588	1.588	1.588	1.588	1.473	1.231	0.908
315	4.035	2.615	1.616	1.616	1.616	1.616	1.616	1.500	1.258	0.934
320	4.107	2.670	1.644	1.644	1.644	1.644	1.644	1.527	1.286	0.960
325	4.178	2.724	1.671	1.671	1.671	1.671	1.671	1.554	1.313	0.986
330	4.250	2.779	1.699	1.699	1.699	1.699	1.699	1.581	1.341	1.012
335	4.321	2.834	1.726	1.726	1.726	1.726	1.726	1.608	1.368	1.038
340	4.393	2.888	1.754	1.754	1.754	1.754	1.754	1.635	1.395	1.064
345	4.464	2.965	1.782	1.782	1.782	1.782	1.782	1.663	1.423	1.090
350	4.536	3.067	1.809	1.809	1.809	1.809	1.809	1.690	1.450	1.117
355	-	3.170	1.837	1.837	1.837	1.837	1.837	1.717	1.478	1.143
360	-	3.272	1.864	1.864	1.864	1.864	1.864	1.744	1.505	1.169
365	-	3.375	1.892	1.892	1.892	1.892	1.892	1.771	1.533	1.195
370	-	3.477	1.920	1.920	1.920	1.920	1.920	1.798	1.560	1.221
375	-	3.580	1.947	1.947	1.947	1.947	1.947	1.825	1.588	1.247

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 14: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C
40	1.600	1.163	0.874	0.654	0.501	0.458	0.320	0.313	0.313	0.313
45	1.701	1.229	0.902	0.671	0.518	0.475	0.354	0.322	0.313	0.313
50	1.775	1.295	0.930	0.688	0.535	0.492	0.387	0.354	0.313	0.313
55	1.849	1.361	0.957	0.705	0.552	0.510	0.420	0.386	0.326	0.313
60	1.923	1.427	0.985	0.723	0.570	0.527	0.453	0.418	0.357	0.313
65	1.997	1.493	1.013	0.740	0.587	0.544	0.486	0.450	0.387	0.313
70	2.071	1.560	1.041	0.757	0.604	0.562	0.520	0.483	0.418	0.313
75	2.145	1.626	1.068	0.774	0.621	0.553	0.553	0.515	0.448	0.313
80	2.219	1.680	1.096	0.791	0.639	0.596	0.586	0.547	0.479	0.313
85	2.293	1.723	1.124	0.809	0.656	0.619	0.619	0.579	0.510	0.340
90	2.367	1.766	1.152	0.826	0.673	0.652	0.652	0.611	0.540	0.369
95	2.441	1.809	1.180	0.843	0.690	0.686	0.686	0.643	0.571	0.398
100	2.515	1.852	1.207	0.860	0.719	0.719	0.719	0.675	0.601	0.427
105	2.589	1.896	1.235	0.877	0.752	0.752	0.752	0.707	0.632	0.456
110	2.663	1.939	1.263	0.895	0.785	0.785	0.785	0.739	0.662	0.485
115	2.737	1.982	1.291	0.912	0.818	0.818	0.818	0.771	0.693	0.514
120	2.811	2.025	1.318	0.929	0.851	0.851	0.851	0.803	0.724	0.543
125	2.885	2.068	1.346	0.946	0.885	0.885	0.885	0.835	0.754	0.572
130	2.975	2.111	1.374	0.963	0.918	0.918	0.918	0.867	0.785	0.601
135	3.078	2.155	1.402	0.981	0.951	0.951	0.951	0.899	0.815	0.629
140	3.181	2.198	1.429	0.998	0.984	0.984	0.984	0.931	0.846	0.658
145	3.283	2.241	1.457	1.017	1.017	1.017	1.017	0.963	0.876	0.687
150	3.386	2.284	1.485	1.051	1.051	1.051	1.051	0.996	0.907	0.716
155	3.489	2.327	1.513	1.084	1.084	1.084	1.084	1.028	0.938	0.745
160	3.592	2.370	1.541	1.117	1.117	1.117	1.117	1.060	0.968	0.774
165	3.695	2.414	1.568	1.150	1.150	1.150	1.150	1.092	0.999	0.803
170	3.798	2.457	1.596	1.183	1.183	1.183	1.183	1.124	1.029	0.832
175	3.901	2.500	1.624	1.217	1.217	1.217	1.217	1.156	1.060	0.861
180	4.003	2.543	1.652	1.250	1.250	1.250	1.250	1.188	1.091	0.890
185	4.106	2.586	1.701	1.283	1.283	1.283	1.283	1.220	1.121	0.919
190	4.209	2.630	1.755	1.316	1.316	1.316	1.316	1.252	1.152	0.948
195	4.312	2.673	1.810	1.349	1.349	1.349	1.349	1.284	1.182	0.976
200	4.415	2.716	1.864	1.382	1.382	1.382	1.382	1.316	1.213	1.005
205	4.518	2.759	1.919	1.416	1.416	1.416	1.416	1.348	1.243	1.034
210	-	2.802	1.973	1.449	1.449	1.449	1.449	1.380	1.274	1.063
215	-	2.845	2.027	1.482	1.482	1.482	1.482	1.412	1.305	1.092
220	-	2.889	2.082	1.515	1.515	1.515	1.515	1.444	1.335	1.121
225	-	2.941	2.136	1.548	1.548	1.548	1.548	1.476	1.366	1.150
230	-	3.015	2.191	1.582	1.582	1.582	1.582	1.508	1.396	1.179
235	-	3.089	2.245	1.615	1.615	1.615	1.615	1.541	1.427	1.208
240	-	3.162	2.299	1.648	1.648	1.648	1.648	1.573	1.457	1.237
245	-	3.236	2.354	1.681	1.681	1.681	1.681	1.605	1.488	1.266
250	-	3.309	2.408	1.714	1.714	1.714	1.714	1.637	1.519	1.295
255	-	3.383	2.462	1.747	1.747	1.747	1.747	1.669	1.549	1.324
260	-	3.456	2.517	1.781	1.781	1.781	1.781	1.701	1.580	1.352
265	-	3.530	2.571	1.814	1.814	1.814	1.814	1.733	1.610	1.381
270	-	3.603	2.626	1.847	1.847	1.847	1.847	1.765	1.641	1.410
275	-	3.677	2.680	1.880	1.880	1.880	1.880	1.797	1.672	1.439
280	-	3.750	2.734	1.913	1.913	1.913	1.913	1.829	1.702	1.468
285	-	3.824	2.789	1.947	1.947	1.947	1.947	1.861	1.733	1.497
290	-	3.897	2.843	1.980	1.980	1.980	1.980	1.893	1.763	1.526
295	-	3.971	2.898	2.013	2.013	2.013	2.013	1.925	1.794	1.555
300	-	4.045	2.980	2.046	2.046	2.046	2.046	1.957	1.824	1.584
305	-	4.118	3.078	2.079	2.079	2.079	2.079	1.989	1.855	1.613
310	-	4.192	3.176	2.113	2.113	2.113	2.113	2.021	1.886	1.642
315	-	4.265	3.274	2.146	2.146	2.146	2.146	2.054	1.916	1.671
320	-	4.339	3.373	2.179	2.179	2.179	2.179	2.086	1.947	1.699
325	-	4.412	3.471	2.212	2.212	2.212	2.212	2.118	1.977	1.728
330	-	4.486	3.569	2.245	2.245	2.245	2.245	2.150	2.008	1.757
335	-	4.559	3.668	2.278	2.278	2.278	2.278	2.182	2.038	1.786
340	-	-	3.766	2.312	2.312	2.312	2.312	2.214	2.069	1.815
345	-	-	3.864	2.631	2.345	2.345	2.345	2.246	2.100	1.844
350	-	-	3.963	2.947	2.378	2.378	2.378	2.278	2.130	1.873
355	-	-	4.061	3.090	2.411	2.411	2.411	2.310	2.161	1.902
360	-	-	4.159	3.232	2.444	2.444	2.444	2.342	2.191	1.931
365	-	-	4.258	3.374	2.478	2.478	2.478	2.374	2.222	1.960
370	-	-	4.356	3.516	2.511	2.511	2.511	2.406	2.253	1.989
375	-	-	4.454	3.658	2.544	2.544	2.544	2.438	2.283	2.018

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

CERTIFICATE No CF 5601
KCC CORPORATION

Table 15: I/H Column 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	538°C	550°C	600°C	620°C	650°C	700°C

Section Factor up to m^{-1}	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	2.680	1.567	1.233	0.993	0.829	0.780	0.591	0.522	0.421	0.313
45	2.889	1.676	1.302	1.025	0.852	0.801	0.628	0.558	0.457	0.339
50	3.154	1.760	1.371	1.057	0.874	0.823	0.665	0.595	0.492	0.372
55	3.428	1.844	1.440	1.089	0.897	0.844	0.702	0.631	0.528	0.406
60	3.702	1.928	1.509	1.121	0.920	0.865	0.739	0.668	0.563	0.439
65	3.976	2.012	1.578	1.153	0.943	0.886	0.776	0.704	0.599	0.473
70	4.250	2.096	1.647	1.186	0.965	0.907	0.813	0.740	0.635	0.506
75	4.523	2.180	1.697	1.218	0.988	0.928	0.850	0.777	0.670	0.540
80	-	2.264	1.745	1.250	1.011	0.949	0.887	0.813	0.706	0.573
85	-	2.348	1.792	1.282	1.034	0.970	0.924	0.850	0.741	0.607
90	-	2.432	1.839	1.314	1.056	0.991	0.961	0.886	0.777	0.641
95	-	2.516	1.887	1.346	1.079	1.012	0.998	0.923	0.812	0.674
100	-	2.600	1.934	1.378	1.102	1.035	1.035	0.959	0.848	0.708
105	-	2.684	1.981	1.410	1.125	1.072	1.072	0.996	0.884	0.741
110	-	2.768	2.029	1.442	1.147	1.109	1.109	1.032	0.919	0.775
115	-	2.852	2.076	1.474	1.170	1.146	1.146	1.068	0.955	0.808
120	-	2.939	2.123	1.506	1.193	1.183	1.183	1.105	0.990	0.842
125	-	3.034	2.171	1.538	1.220	1.220	1.220	1.141	1.026	0.876
130	-	3.129	2.218	1.570	1.257	1.257	1.257	1.178	1.061	0.909
135	-	3.224	2.265	1.602	1.294	1.294	1.294	1.214	1.097	0.943
140	-	3.320	2.313	1.634	1.331	1.331	1.331	1.251	1.133	0.976
145	-	3.415	2.360	1.672	1.368	1.368	1.368	1.287	1.168	1.010
150	-	3.510	2.407	1.729	1.405	1.405	1.405	1.323	1.204	1.043
155	-	3.606	2.455	1.786	1.442	1.442	1.442	1.360	1.239	1.077
160	-	3.701	2.502	1.842	1.479	1.479	1.479	1.396	1.275	1.110
165	-	3.796	2.549	1.899	1.516	1.516	1.516	1.433	1.310	1.144
170	-	3.892	2.597	1.956	1.553	1.553	1.553	1.469	1.346	1.178
175	-	3.987	2.644	2.013	1.590	1.590	1.590	1.506	1.381	1.211
180	-	4.082	2.691	2.069	1.627	1.627	1.627	1.542	1.417	1.245
185	-	4.178	2.739	2.126	1.664	1.664	1.664	1.578	1.453	1.278
190	-	4.273	2.786	2.183	1.701	1.701	1.701	1.615	1.488	1.312
195	-	4.368	2.833	2.240	1.738	1.738	1.738	1.651	1.524	1.345
200	-	4.464	2.881	2.296	1.775	1.775	1.775	1.688	1.559	1.379
205	-	4.559	2.948	2.353	1.812	1.812	1.812	1.724	1.595	1.413
210	-	-	3.089	2.410	1.849	1.849	1.849	1.761	1.630	1.446
215	-	-	3.230	2.467	1.886	1.886	1.886	1.797	1.666	1.480
220	-	-	3.371	2.523	1.923	1.923	1.923	1.834	1.702	1.513
225	-	-	3.512	2.580	1.960	1.960	1.960	1.870	1.737	1.547
230	-	-	3.653	2.637	1.997	1.997	1.997	1.906	1.773	1.580
235	-	-	3.794	2.694	2.034	2.034	2.034	1.943	1.808	1.614
240	-	-	3.935	2.750	2.071	2.071	2.071	1.979	1.844	1.647
245	-	-	4.076	2.807	2.108	2.108	2.108	2.016	1.879	1.681
250	-	-	4.216	2.864	2.145	2.145	2.145	2.052	1.915	1.715
255	-	-	4.357	2.923	2.182	2.182	2.182	2.089	1.951	1.748
260	-	-	4.498	3.016	2.253	2.219	2.219	2.125	1.986	1.782
265	-	-	-	3.110	2.331	2.256	2.256	2.161	2.022	1.815
270	-	-	-	3.203	2.410	2.293	2.293	2.198	2.057	1.849
275	-	-	-	3.297	2.488	2.330	2.330	2.234	2.093	1.882
280	-	-	-	3.390	2.566	2.367	2.367	2.271	2.128	1.916
285	-	-	-	3.484	2.645	2.404	2.404	2.307	2.164	1.950
290	-	-	-	3.577	2.723	2.441	2.441	2.344	2.200	1.983
295	-	-	-	3.671	2.802	2.498	2.478	2.380	2.235	2.017
300	-	-	-	3.764	2.880	2.588	2.515	2.416	2.271	2.050
305	-	-	-	3.858	2.991	2.678	2.552	2.453	2.306	2.084
310	-	-	-	3.951	3.133	2.767	2.589	2.489	2.342	2.117
315	-	-	-	4.045	3.274	2.857	2.626	2.526	2.377	2.151
320	-	-	-	4.138	3.416	2.976	2.663	2.562	2.413	2.184
325	-	-	-	4.232	3.558	3.156	2.700	2.599	2.448	2.218
330	-	-	-	4.326	3.700	3.337	2.737	2.635	2.484	2.252
335	-	-	-	4.419	3.841	3.518	2.774	2.672	2.520	2.285
340	-	-	-	4.513	3.983	3.698	2.811	2.708	2.555	2.319
345	-	-	-	-	4.125	3.879	2.848	2.744	2.591	2.352
350	-	-	-	-	4.267	4.060	2.885	2.781	2.626	2.386
355	-	-	-	-	4.408	4.240	2.939	2.817	2.662	2.419
360	-	-	-	-	4.550	4.421	3.156	2.854	2.697	2.453
365	-	-	-	-	-	-	3.372	2.890	2.733	2.487
370	-	-	-	-	-	-	3.589	2.927	2.769	2.520
375	-	-	-	-	-	-	3.805	3.205	2.804	2.554

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	-	2.508	1.591	1.325	1.150	1.098	0.902	0.825	0.714	0.528
45	-	2.723	1.700	1.398	1.197	1.137	0.925	0.847	0.731	0.565
50	-	2.945	1.803	1.471	1.243	1.177	0.948	0.868	0.747	0.602
55	-	3.238	1.906	1.544	1.290	1.217	0.972	0.889	0.764	0.639
60	-	3.531	2.009	1.618	1.337	1.257	0.995	0.910	0.781	0.677
65	-	3.823	2.113	1.680	1.383	1.297	1.018	0.931	0.797	0.714
70	-	4.116	2.216	1.730	1.430	1.336	1.042	0.952	0.814	0.751
75	-	4.409	2.319	1.779	1.477	1.376	1.065	0.973	0.831	0.789
80	-	-	2.422	1.829	1.523	1.416	1.088	0.994	0.847	0.826
85	-	-	2.525	1.878	1.570	1.456	1.112	1.016	0.864	0.863
90	-	-	2.628	1.928	1.617	1.496	1.135	1.037	0.901	0.901
95	-	-	2.731	1.978	1.664	1.535	1.158	1.058	0.938	0.938
100	-	-	2.834	2.027	1.714	1.575	1.182	1.079	0.975	0.975
105	-	-	2.937	2.077	1.764	1.615	1.205	1.100	1.013	1.013
110	-	-	3.038	2.126	1.814	1.655	1.228	1.121	1.050	1.050
115	-	-	3.140	2.176	1.864	1.707	1.252	1.142	1.087	1.087
120	-	-	3.241	2.226	1.914	1.759	1.275	1.163	1.124	1.124
125	-	-	3.343	2.275	1.965	1.812	1.298	1.185	1.162	1.162
130	-	-	3.444	2.325	2.015	1.865	1.322	1.206	1.199	1.199
135	-	-	3.546	2.374	2.065	1.918	1.345	1.236	1.236	1.236
140	-	-	3.648	2.424	2.115	1.971	1.369	1.274	1.274	1.274
145	-	-	3.749	2.474	2.165	2.023	1.392	1.311	1.311	1.311
150	-	-	3.851	2.523	2.215	2.076	1.415	1.348	1.348	1.348
155	-	-	3.952	2.573	2.265	2.129	1.439	1.386	1.386	1.386
160	-	-	4.054	2.622	2.316	2.182	1.462	1.423	1.423	1.423
165	-	-	4.155	2.672	2.366	2.235	1.485	1.460	1.460	1.460
170	-	-	4.257	2.722	2.416	2.287	1.509	1.497	1.497	1.497
175	-	-	4.358	2.771	2.466	2.340	1.535	1.535	1.535	1.535
180	-	-	4.460	2.821	2.516	2.393	1.572	1.572	1.572	1.572
185	-	-	4.562	2.871	2.566	2.446	1.609	1.609	1.609	1.609
190	-	-	-	2.931	2.616	2.498	1.647	1.647	1.647	1.647
195	-	-	-	3.234	2.666	2.551	1.684	1.684	1.684	1.684
200	-	-	-	3.538	2.717	2.604	1.721	1.721	1.721	1.721
205	-	-	-	3.841	2.767	2.657	1.759	1.759	1.759	1.759
210	-	-	-	4.145	2.817	2.710	1.796	1.796	1.796	1.796
215	-	-	-	4.448	2.867	2.762	1.880	1.833	1.833	1.833
220	-	-	-	-	2.917	2.815	1.964	1.870	1.870	1.870
225	-	-	-	-	3.140	2.868	2.048	1.908	1.908	1.908
230	-	-	-	-	3.365	2.929	2.132	1.945	1.945	1.945
235	-	-	-	-	3.591	3.134	2.217	1.982	1.982	1.982
240	-	-	-	-	3.816	3.339	2.301	2.020	2.020	2.020
245	-	-	-	-	4.042	3.544	2.385	2.057	2.057	2.057
250	-	-	-	-	4.267	3.749	2.469	2.094	2.094	2.094
255	-	-	-	-	4.493	3.954	2.554	2.132	2.132	2.132
260	-	-	-	-	-	4.159	2.638	2.169	2.169	2.169
265	-	-	-	-	-	4.364	2.722	2.222	2.206	2.206
270	-	-	-	-	-	4.569	2.806	2.322	2.243	2.243
275	-	-	-	-	-	-	2.891	2.422	2.281	2.281
280	-	-	-	-	-	-	3.010	2.522	2.318	2.318
285	-	-	-	-	-	-	3.145	2.623	2.355	2.355
290	-	-	-	-	-	-	3.281	2.723	2.393	2.393
295	-	-	-	-	-	-	3.417	2.823	2.430	2.430
300	-	-	-	-	-	-	3.553	2.927	2.467	2.467
305	-	-	-	-	-	-	3.688	3.102	2.505	2.505
310	-	-	-	-	-	-	3.824	3.277	2.542	2.542
315	-	-	-	-	-	-	3.960	3.452	2.579	2.579
320	-	-	-	-	-	-	4.096	3.627	2.617	2.617
325	-	-	-	-	-	-	4.231	3.802	2.654	2.654
330	-	-	-	-	-	-	4.367	3.977	2.847	2.691
335	-	-	-	-	-	-	4.503	4.153	3.179	2.728
340	-	-	-	-	-	-	-	4.328	3.464	2.766
345	-	-	-	-	-	-	-	4.503	3.748	2.803
350	-	-	-	-	-	-	-	-	4.033	2.840
355	-	-	-	-	-	-	-	-	4.318	2.878
360	-	-	-	-	-	-	-	-	-	2.915
365	-	-	-	-	-	-	-	-	-	3.198
370	-	-	-	-	-	-	-	-	-	3.504
375	-	-	-	-	-	-	-	-	-	3.809

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	538°C	550°C	600°C	620°C	650°C	700°C
40	-	-	2.484	1.711	1.466	1.409	1.197	1.117	0.998	0.801
45	-	-	2.707	1.829	1.552	1.487	1.246	1.156	1.023	0.823
50	-	-	2.941	1.947	1.638	1.566	1.295	1.195	1.049	0.844
55	-	-	3.347	2.065	1.697	1.644	1.344	1.233	1.074	0.865
60	-	-	3.754	2.183	1.749	1.699	1.393	1.272	1.099	0.886
65	-	-	4.161	2.301	1.801	1.750	1.442	1.311	1.125	0.908
70	-	-	4.568	2.419	1.852	1.801	1.491	1.350	1.150	0.929
75	-	-	-	2.537	1.904	1.852	1.540	1.389	1.175	0.950
80	-	-	-	2.655	1.956	1.903	1.589	1.427	1.201	0.971
85	-	-	-	2.773	2.008	1.954	1.638	1.466	1.226	0.992
90	-	-	-	2.891	2.059	2.005	1.688	1.505	1.252	1.014
95	-	-	-	3.086	2.111	2.056	1.739	1.544	1.277	1.035
100	-	-	-	3.306	2.163	2.107	1.790	1.583	1.302	1.056
105	-	-	-	3.525	2.215	2.158	1.841	1.621	1.328	1.077
110	-	-	-	3.744	2.266	2.208	1.892	1.661	1.353	1.099
115	-	-	-	3.963	2.318	2.259	1.943	1.716	1.378	1.120
120	-	-	-	4.182	2.370	2.310	1.994	1.771	1.404	1.141
125	-	-	-	4.402	2.421	2.361	2.045	1.825	1.429	1.162
130	-	-	-	-	2.473	2.412	2.096	1.880	1.455	1.184
135	-	-	-	-	2.525	2.463	2.147	1.935	1.480	1.205
140	-	-	-	-	2.577	2.514	2.199	1.990	1.505	1.226
145	-	-	-	-	2.628	2.565	2.250	2.044	1.531	1.247
150	-	-	-	-	2.680	2.616	2.301	2.099	1.556	1.268
155	-	-	-	-	2.732	2.667	2.352	2.154	1.581	1.290
160	-	-	-	-	2.784	2.717	2.403	2.208	1.607	1.311
165	-	-	-	-	2.835	2.768	2.454	2.263	1.632	1.332
170	-	-	-	-	2.887	2.819	2.505	2.318	1.659	1.353
175	-	-	-	-	3.226	2.870	2.556	2.372	1.735	1.375
180	-	-	-	-	3.993	2.957	2.607	2.427	1.812	1.396
185	-	-	-	-	-	3.610	2.658	2.482	1.889	1.417
190	-	-	-	-	-	4.262	2.709	2.536	1.966	1.438
195	-	-	-	-	-	-	2.760	2.591	2.042	1.460
200	-	-	-	-	-	-	2.811	2.646	2.119	1.481
205	-	-	-	-	-	-	2.862	2.700	2.196	1.502
210	-	-	-	-	-	-	2.913	2.755	2.273	1.523
215	-	-	-	-	-	-	3.244	2.810	2.350	1.544
220	-	-	-	-	-	-	3.603	2.864	2.426	1.566
225	-	-	-	-	-	-	3.961	2.923	2.503	1.587
230	-	-	-	-	-	-	4.319	3.237	2.580	1.608
235	-	-	-	-	-	-	-	3.551	2.657	1.629
240	-	-	-	-	-	-	-	3.865	2.733	1.651
245	-	-	-	-	-	-	-	4.178	2.810	1.736
250	-	-	-	-	-	-	-	4.492	2.887	1.850
255	-	-	-	-	-	-	-	-	3.084	1.963
260	-	-	-	-	-	-	-	-	3.362	2.077
265	-	-	-	-	-	-	-	-	3.641	2.190
270	-	-	-	-	-	-	-	-	3.919	2.304
275	-	-	-	-	-	-	-	-	4.197	2.417
280	-	-	-	-	-	-	-	-	4.476	2.531
285	-	-	-	-	-	-	-	-	-	2.644
290	-	-	-	-	-	-	-	-	-	2.757
295	-	-	-	-	-	-	-	-	-	2.871
300	-	-	-	-	-	-	-	-	-	3.035
305	-	-	-	-	-	-	-	-	-	3.235
310	-	-	-	-	-	-	-	-	-	3.435
315	-	-	-	-	-	-	-	-	-	3.635
320	-	-	-	-	-	-	-	-	-	3.836
325	-	-	-	-	-	-	-	-	-	4.036
330	-	-	-	-	-	-	-	-	-	4.236
335	-	-	-	-	-	-	-	-	-	4.436
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.541mm.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									

Table 18: Rectangular/Square Hollow Beams: 30 Minutes

Section Factor up to m^{-1}	350	400	450	500	520	550	600	650	700	750
40	327	327	327	327	327	327	327	327	327	327
45	327	327	327	327	327	327	327	327	327	327
50	327	327	327	327	327	327	327	327	327	327
55	327	327	327	327	327	327	327	327	327	327
60	370	327	327	327	327	327	327	327	327	327
65	416	327	327	327	327	327	327	327	327	327
70	462	327	327	327	327	327	327	327	327	327
75	508	327	327	327	327	327	327	327	327	327
80	554	327	327	327	327	327	327	327	327	327
85	600	332	327	327	327	327	327	327	327	327
90	646	369	327	327	327	327	327	327	327	327
95	692	407	327	327	327	327	327	327	327	327
100	738	445	327	327	327	327	327	327	327	327
105	784	482	327	327	327	327	327	327	327	327
110	829	520	327	327	327	327	327	327	327	327
115	875	557	327	327	327	327	327	327	327	327
120	921	595	327	327	327	327	327	327	327	327
125	967	633	327	327	327	327	327	327	327	327
130	1013	670	327	327	327	327	327	327	327	327
135	1059	708	327	327	327	327	327	327	327	327
140	1105	745	355	327	327	327	327	327	327	327
145	1151	783	389	327	327	327	327	327	327	327
150	1197	821	423	327	327	327	327	327	327	327
155	1243	858	457	327	327	327	327	327	327	327
160	1289	896	490	327	327	327	327	327	327	327
165	1335	933	524	327	327	327	327	327	327	327
170	1380	971	558	327	327	327	327	327	327	327
175	1426	1009	592	327	327	327	327	327	327	327
180	1472	1046	626	327	327	327	327	327	327	327
185	1518	1084	659	327	327	327	327	327	327	327
190	1564	1121	693	327	327	327	327	327	327	327
195	1610	1159	727	327	327	327	327	327	327	327
200	1656	1197	761	330	327	327	327	327	327	327
205	1702	1234	794	368	327	327	327	327	327	327
210	1741	1272	828	405	327	327	327	327	327	327
215	1777	1310	862	442	327	327	327	327	327	327
220	1813	1347	896	480	327	327	327	327	327	327
225	1849	1385	930	517	350	327	327	327	327	327
230	1886	1422	963	555	388	327	327	327	327	327
235	1922	1460	997	592	427	327	327	327	327	327
240	1958	1498	1031	629	466	327	327	327	327	327
245	1994	1535	1065	667	504	327	327	327	327	327
250	2031	1573	1098	704	543	327	327	327	327	327
255	2067	1610	1132	741	581	327	327	327	327	327
260	2103	1648	1166	779	620	330	327	327	327	327
265	2139	1686	1200	816	658	370	327	327	327	327
270	2175	1724	1234	854	697	411	327	327	327	327
275	2212	1765	1267	891	735	451	327	327	327	327
280	2248	1806	1301	928	774	492	327	327	327	327
285	2284	1847	1335	966	812	532	327	327	327	327
290	2320	1888	1369	1003	851	573	327	327	327	327
295	2356	1929	1402	1040	889	614	327	327	327	327
300	2393	1970	1436	1078	928	654	327	327	327	327
305	2429	2011	1470	1115	966	695	327	327	327	327
310	2465	2052	1504	1153	1005	735	327	327	327	327
315	2501	2093	1538	1190	1043	776	327	327	327	327
320	2538	2134	1571	1227	1082	817	327	327	327	327
325	2574	2175	1605	1265	1120	857	327	327	327	327
330	2610	2216	1639	1302	1159	898	327	327	327	327
335	2646	2257	1673	1339	1198	938	327	327	327	327
340	2682	2298	1707	1377	1236	979	327	327	327	327
345	2719	2339	1754	1414	1275	1019	327	327	327	327
350	2755	2380	1806	1452	1313	1060	327	327	327	327
355	2791	2421	1858	1489	1352	1101	327	327	327	327
360	2827	2462	1910	1526	1390	1141	327	327	327	327
365	2864	2503	1962	1564	1429	1182	378	327	327	327
370	2900	2544	2014	1601	1467	1222	430	327	327	327
375	2936	2585	2067	1638	1506	1263	483	327	327	327
380	2972	2626	2119	1676	1544	1304	535	327	327	327
385	3008	2667	2171	1713	1583	1344	588	327	327	327
390	3045	2708	2223	1766	1621	1385	640	327	327	327
395	3076	2749	2275	1819	1660	1425	693	327	327	327
400	3099	2790	2327	1872	1698	1466	745	327	327	327

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 19: Rectangular/Square Hollow Beams: 45 Minutes									
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of								
	350	400	450	500	520	550	600	650	700	750
40	618	328	327	327	327	327	327	327	327	327
45	717	404	327	327	327	327	327	327	327	327
50	827	494	327	327	327	327	327	327	327	327
55	938	585	342	327	327	327	327	327	327	327
60	1049	675	417	327	327	327	327	327	327	327
65	1159	765	493	327	327	327	327	327	327	327
70	1270	856	568	327	327	327	327	327	327	327
75	1381	946	644	370	327	327	327	327	327	327
80	1492	1036	719	435	327	327	327	327	327	327
85	1602	1127	795	501	381	327	327	327	327	327
90	1713	1217	870	566	443	327	327	327	327	327
95	1770	1308	946	631	506	327	327	327	327	327
100	1825	1398	1021	696	569	368	327	327	327	327
105	1881	1488	1097	762	631	427	327	327	327	327
110	1937	1579	1172	827	694	487	327	327	327	327
115	1992	1669	1248	892	757	546	327	327	327	327
120	2048	1739	1323	957	819	605	327	327	327	327
125	2104	1788	1399	1023	882	664	327	327	327	327
130	2160	1836	1474	1088	945	723	327	327	327	327
135	2215	1885	1550	1153	1007	782	327	327	327	327
140	2271	1934	1625	1218	1070	841	378	327	327	327
145	2327	1983	1701	1284	1133	900	432	327	327	327
150	2383	2031	1753	1349	1195	959	487	327	327	327
155	2438	2080	1800	1414	1258	1018	541	327	327	327
160	2494	2129	1846	1479	1320	1077	596	327	327	327
165	2550	2178	1893	1544	1383	1136	651	327	327	327
170	2606	2227	1940	1610	1446	1195	705	327	327	327
175	2661	2275	1987	1675	1508	1254	760	327	327	327
180	2717	2324	2033	1733	1571	1314	815	327	327	327
185	2773	2373	2080	1780	1634	1373	869	327	327	327
190	2828	2422	2127	1826	1696	1432	924	334	327	327
195	2884	2470	2174	1873	1748	1491	978	382	327	327
200	2940	2519	2221	1919	1795	1550	1033	430	327	327
205	2996	2568	2267	1966	1842	1609	1088	478	327	327
210	3051	2617	2314	2013	1889	1668	1142	526	327	327
215	3087	2666	2361	2059	1936	1725	1197	574	327	327
220	3115	2714	2408	2106	1983	1773	1252	622	327	327
225	3143	2763	2455	2152	2030	1822	1306	670	327	327
230	3171	2812	2501	2199	2077	1871	1361	717	327	327
235	3199	2861	2548	2246	2124	1919	1415	765	327	327
240	3227	2909	2595	2292	2171	1968	1470	813	327	327
245	3255	2958	2642	2339	2218	2016	1525	861	327	327
250	3283	3007	2689	2385	2265	2065	1579	909	327	327
255	3311	3056	2735	2432	2312	2113	1634	957	327	327
260	3339	3086	2782	2479	2359	2162	1689	1005	355	327
265	3366	3110	2829	2525	2406	2211	1744	1053	404	327
270	3394	3134	2876	2572	2453	2259	1801	1101	452	327
275	3422	3158	2923	2618	2500	2308	1858	1148	500	327
280	3450	3182	2969	2665	2547	2356	1915	1196	549	327
285	3478	3206	3016	2712	2594	2405	1972	1244	597	327
290	3506	3230	3063	2758	2641	2453	2028	1292	645	327
295	3534	3254	3088	2805	2688	2502	2085	1340	693	327
300	3562	3278	3110	2852	2735	2551	2142	1388	742	327
305	3590	3302	3132	2898	2782	2599	2199	1436	790	327
310	3618	3326	3154	2945	2829	2648	2256	1484	838	327
315	3645	3350	3176	2991	2876	2696	2312	1532	886	327
320	3673	3374	3199	3038	2923	2745	2369	1580	935	327
325	3701	3398	3221	3075	2970	2794	2426	1627	983	327
330	3729	3422	3243	3095	3017	2842	2483	1675	1031	327
335	3757	3446	3265	3115	3064	2891	2540	1729	1079	327
340	3785	3470	3287	3135	3085	2939	2596	1808	1128	327
345	3813	3494	3310	3155	3104	2988	2653	1887	1176	327
350	3841	3518	3332	3175	3124	3036	2710	1966	1224	327
355	3869	3542	3354	3195	3143	3074	2767	2046	1273	327
360	3897	3566	3376	3215	3162	3092	2824	2125	1321	327
365	3924	3590	3398	3236	3181	3109	2880	2204	1369	327
370	3952	3614	3421	3256	3200	3127	2937	2283	1417	327
375	3980	3638	3443	3276	3219	3145	2994	2362	1466	327
380	4008	3662	3465	3296	3238	3163	3051	2442	1514	327
385	4036	3686	3487	3316	3257	3180	3078	2521	1562	327
390	4064	3710	3509	3336	3277	3198	3094	2600	1610	331
395	4092	3734	3532	3356	3296	3216	3109	2679	1659	398
400	4120	3758	3554	3376	3315	3233	3125	2758	1707	465

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

CERTIFICATE No CF 5601
KCC CORPORATION

Table 20: Rectangular/Square Hollow Beams: 60 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	1127	775	520	327	327	327	327	327	327	327
45	1299	900	611	391	327	327	327	327	327	327
50	1474	1045	735	498	413	327	327	327	327	327
55	1649	1190	858	604	514	390	327	327	327	327
60	1799	1335	982	711	615	482	327	327	327	327
65	1934	1480	1106	818	715	574	350	327	327	327
70	2068	1625	1230	925	816	666	428	327	327	327
75	2202	1742	1354	1031	917	758	507	327	327	327
80	2337	1814	1478	1138	1018	850	585	327	327	327
85	2471	1886	1601	1245	1119	943	664	387	327	327
90	2606	1957	1720	1352	1219	1035	742	452	327	327
95	2740	2029	1782	1459	1320	1127	821	518	327	327
100	2874	2101	1845	1565	1421	1219	899	584	327	327
105	3009	2173	1907	1672	1522	1311	978	649	327	327
110	3087	2245	1970	1750	1623	1404	1056	715	338	327
115	3121	2317	2032	1808	1720	1496	1134	781	394	327
120	3155	2389	2094	1867	1777	1588	1213	846	449	327
125	3189	2461	2157	1925	1835	1680	1291	912	505	327
130	3223	2532	2219	1984	1892	1750	1370	978	561	327
135	3257	2604	2282	2042	1950	1806	1448	1043	617	327
140	3291	2676	2344	2101	2007	1863	1527	1109	672	327
145	3325	2748	2407	2160	2064	1919	1605	1175	728	327
150	3359	2820	2469	2218	2122	1976	1683	1240	784	327
155	3393	2892	2531	2277	2179	2032	1749	1306	840	327
160	3427	2964	2594	2335	2237	2089	1806	1372	896	327
165	3461	3036	2656	2394	2294	2145	1863	1437	951	327
170	3495	3084	2719	2452	2352	2202	1920	1503	1007	327
175	3529	3113	2781	2511	2409	2258	1977	1569	1063	327
180	3563	3142	2843	2569	2467	2315	2034	1634	1119	341
185	3597	3171	2906	2628	2524	2371	2090	1700	1174	395
190	3631	3200	2968	2686	2582	2428	2147	1762	1230	449
195	3665	3229	3031	2745	2639	2484	2204	1823	1286	503
200	3699	3259	3079	2803	2697	2541	2261	1883	1342	557
205	3733	3288	3107	2862	2754	2597	2318	1944	1398	611
210	3767	3317	3135	2920	2812	2654	2375	2005	1453	666
215	3801	3346	3163	2979	2869	2710	2432	2066	1509	720
220	3835	3375	3191	3037	2926	2767	2489	2127	1565	774
225	3869	3404	3218	3080	2984	2823	2546	2187	1621	828
230	3903	3433	3246	3106	3041	2879	2603	2248	1676	882
235	3937	3463	3274	3131	3081	2936	2660	2309	1736	936
240	3971	3492	3302	3157	3106	2992	2716	2370	1805	990
245	4005	3521	3330	3183	3131	3049	2773	2430	1874	1044
250	4039	3550	3358	3208	3155	3083	2830	2491	1943	1098
255	4073	3579	3386	3234	3180	3106	2887	2552	2012	1153
260	4107	3608	3414	3260	3205	3130	2944	2613	2081	1207
265	4141	3637	3441	3285	3229	3153	3001	2674	2150	1261
270	4175	3666	3469	3311	3254	3176	3058	2734	2219	1315
275	4210	3696	3497	3337	3279	3200	3085	2795	2288	1369
280	4244	3725	3525	3362	3304	3223	3106	2856	2357	1423
285	4278	3754	3553	3388	3328	3246	3127	2917	2426	1477
290	4312	3783	3581	3414	3353	3269	3148	2977	2494	1531
295	4346	3812	3609	3439	3378	3293	3169	3038	2563	1585
300	4380	3841	3637	3465	3402	3316	3190	3077	2632	1640
305	4414	3870	3665	3491	3427	3339	3211	3096	2701	1694
310	4448	3900	3692	3516	3452	3363	3232	3115	2770	1767
315	4482	3929	3720	3542	3477	3386	3253	3134	2839	1852
320	4516	3958	3748	3568	3501	3409	3274	3152	2908	1938
325	4550	3987	3776	3593	3526	3432	3295	3171	2977	2023
330	4584	4016	3804	3619	3551	3456	3315	3190	3046	2109
335	4618	4045	3832	3645	3575	3479	3336	3209	3079	2194
340	4652	4074	3860	3670	3600	3502	3357	3227	3096	2279
345	4686	4104	3888	3696	3625	3525	3378	3246	3112	2365
350	-	4133	3915	3722	3650	3549	3399	3265	3129	2450
355	-	4162	3943	3747	3674	3572	3420	3284	3146	2536
360	-	4191	3971	3773	3699	3595	3441	3302	3162	2621
365	-	4220	3999	3799	3724	3619	3462	3321	3179	2706
370	-	4249	4027	3824	3748	3642	3483	3340	3196	2792
375	-	4278	4055	3850	3773	3665	3504	3359	3212	2877
380	-	4307	4083	3876	3798	3688	3525	3377	3229	2963
385	-	4337	4111	3901	3823	3712	3546	3396	3246	3048
390	-	4366	4138	3927	3847	3735	3567	3415	3262	3079
395	-	4395	4166	3953	3872	3758	3588	3434	3279	3093
400	-	4424	4194	3978	3897	3781	3609	3452	3296	3107

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 21: Rectangular/Square Hollow Beams: 75 Minutes									
Section Factor up to m⁻¹	**Thickness (µm) Required for a Design Temperature of**								
	350	400	450	500	520	550	600	650	700	750
40	1626	1205	896	662	583	482	328	327	327	327
45	1913	1393	1041	775	686	570	404	327	327	327
50	2199	1593	1213	925	827	700	515	333	327	327
55	2485	1785	1384	1074	969	829	626	427	327	327
60	2772	1968	1556	1224	1110	959	737	521	327	327
65	3058	2150	1724	1373	1252	1089	848	615	378	327
70	3150	2332	1844	1523	1394	1219	959	708	453	327
75	3236	2514	1965	1672	1535	1349	1069	802	529	327
80	3322	2696	2086	1772	1677	1479	1180	896	604	327
85	3408	2879	2206	1852	1766	1608	1291	990	679	327
90	3493	3061	2327	1933	1836	1727	1402	1084	755	373
95	3579	3112	2447	2013	1906	1794	1513	1178	830	435
100	3665	3159	2568	2093	1977	1862	1624	1272	906	497
105	3750	3205	2688	2174	2047	1929	1726	1366	981	558
110	3836	3251	2809	2254	2117	1996	1791	1459	1057	620
115	3922	3297	2930	2334	2187	2064	1855	1553	1132	682
120	4007	3344	3050	2415	2258	2131	1919	1647	1207	744
125	4093	3390	3093	2495	2328	2199	1984	1733	1283	805
130	4179	3436	3123	2575	2398	2266	2048	1796	1358	867
135	4265	3483	3152	2656	2468	2333	2112	1860	1434	929
140	4350	3529	3182	2736	2539	2401	2177	1923	1509	990
145	4436	3575	3212	2816	2609	2468	2241	1987	1584	1052
150	4522	3621	3241	2897	2679	2535	2306	2050	1660	1114
155	4607	3668	3271	2977	2749	2603	2370	2114	1733	1175
160	4693	3714	3301	3057	2820	2670	2434	2177	1800	1237
165	4779	3760	3330	3094	2890	2738	2499	2241	1866	1299
170	-	3807	3360	3124	2960	2805	2563	2304	1933	1361
175	-	3853	3390	3154	3030	2872	2627	2368	2000	1422
180	-	3899	3419	3185	3082	2940	2692	2431	2066	1484
185	-	3946	3449	3215	3112	3007	2756	2495	2133	1546
190	-	3992	3478	3245	3143	3071	2820	2558	2200	1607
195	-	4038	3508	3275	3173	3100	2885	2622	2266	1669
200	-	4084	3538	3306	3204	3128	2949	2685	2333	1734
205	-	4131	3567	3336	3234	3157	3013	2749	2400	1806
210	-	4177	3597	3366	3265	3186	3072	2812	2466	1879
215	-	4223	3627	3396	3295	3215	3098	2876	2533	1952
220	-	4270	3656	3426	3326	3244	3125	2939	2600	2024
225	-	4316	3686	3457	3356	3273	3151	3003	2666	2097
230	-	4362	3716	3487	3386	3302	3178	3066	2733	2169
235	-	4409	3745	3517	3417	3331	3204	3091	2800	2242
240	-	4455	3775	3547	3447	3360	3231	3115	2866	2315
245	-	4501	3805	3578	3478	3389	3257	3139	2933	2387
250	-	4547	3834	3608	3508	3418	3283	3164	3000	2460
255	-	4594	3864	3638	3539	3447	3310	3188	3066	2533
260	-	4640	3894	3668	3569	3476	3336	3212	3089	2605
265	-	4686	3923	3698	3600	3504	3363	3236	3111	2678
270	-	-	3953	3729	3630	3533	3389	3260	3133	2750
275	-	-	3983	3759	3660	3562	3416	3284	3155	2823
280	-	-	4012	3789	3691	3591	3442	3309	3177	2896
285	-	-	4042	3819	3721	3620	3469	3333	3199	2968
290	-	-	4071	3850	3752	3649	3495	3357	3221	3041
295	-	-	4101	3880	3782	3678	3522	3381	3243	3080
300	-	-	4131	3910	3813	3707	3548	3405	3265	3099
305	-	-	4160	3940	3843	3736	3575	3429	3287	3119
310	-	-	4190	3970	3874	3765	3601	3453	3309	3138
315	-	-	4220	4001	3904	3794	3628	3478	3331	3158
320	-	-	4249	4031	3935	3823	3654	3502	3353	3177
325	-	-	4279	4061	3965	3852	3680	3526	3374	3197
330	-	-	4309	4091	3995	3881	3707	3550	3396	3216
335	-	-	4338	4122	4026	3909	3733	3574	3418	3236
340	-	-	4368	4152	4056	3938	3760	3598	3440	3256
345	-	-	4398	4182	4087	3967	3786	3622	3462	3275
350	-	-	4427	4212	4117	3996	3813	3647	3484	3295
355	-	-	4457	4242	4148	4025	3839	3671	3506	3314
360	-	-	4487	4273	4178	4054	3866	3695	3528	3334
365	-	-	4516	4303	4209	4083	3892	3719	3550	3353
370	-	-	4546	4333	4239	4112	3919	3743	3572	3373
375	-	-	4576	4363	4270	4141	3945	3767	3594	3392
380	-	-	4605	4394	4300	4170	3972	3791	3616	3412
385	-	-	4635	4424	4330	4199	3998	3816	3638	3431
390	-	-	4665	4454	4361	4228	4024	3840	3660	3451
395	-	-	4694	4484	4391	4257	4051	3864	3682	3470
400	-	-	-	4514	4422	4285	4077	3888	3704	3490

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 22: Rectangular/Square Hollow Beams: 90 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	2546	1605	1272	997	906	785	611	427	327	327
45	2929	1941	1472	1160	1055	918	718	551	368	327
50	3217	2277	1691	1352	1238	1086	864	675	471	327
55	3451	2614	1922	1544	1420	1255	1010	798	574	327
60	3685	2950	2155	1733	1603	1423	1156	922	676	388
65	3919	3130	2388	1895	1769	1592	1302	1045	779	471
70	4154	3226	2621	2057	1910	1746	1448	1169	882	554
75	4388	3322	2854	2219	2051	1861	1594	1292	985	637
80	4622	3418	3073	2381	2192	1976	1729	1416	1088	720
85	-	3514	3138	2543	2333	2091	1811	1540	1191	803
90	-	3610	3203	2705	2474	2206	1893	1663	1294	886
95	-	3706	3268	2867	2615	2321	1975	1756	1397	969
100	-	3801	3333	3029	2756	2436	2056	1827	1500	1052
105	-	3897	3398	3102	2896	2551	2138	1898	1603	1135
110	-	3993	3463	3146	3037	2666	2220	1968	1706	1218
115	-	4089	3528	3191	3098	2781	2302	2039	1779	1300
120	-	4185	3593	3236	3136	2896	2384	2110	1849	1383
125	-	4281	3658	3280	3174	3011	2466	2181	1918	1466
130	-	4377	3723	3325	3213	3083	2548	2251	1988	1549
135	-	4473	3788	3370	3251	3114	2630	2322	2058	1632
140	-	4569	3853	3415	3289	3144	2712	2393	2128	1715
145	-	4664	3918	3459	3327	3175	2794	2464	2198	1786
150	-	-	3983	3504	3366	3206	2876	2535	2268	1857
155	-	-	4048	3549	3404	3236	2958	2605	2338	1927
160	-	-	4113	3593	3442	3267	3040	2676	2407	1998
165	-	-	4178	3638	3481	3297	3088	2747	2477	2069
170	-	-	4244	3683	3519	3328	3119	2818	2547	2140
175	-	-	4309	3728	3557	3359	3149	2888	2617	2210
180	-	-	4374	3772	3596	3389	3180	2959	2687	2281
185	-	-	4439	3817	3634	3420	3211	3030	2757	2352
190	-	-	4504	3862	3672	3450	3242	3081	2826	2423
195	-	-	4569	3906	3710	3481	3272	3111	2896	2494
200	-	-	4634	3951	3749	3512	3303	3141	2966	2564
205	-	-	4699	3996	3787	3542	3334	3170	3036	2635
210	-	-	-	4040	3825	3573	3365	3200	3083	2706
215	-	-	-	4085	3864	3603	3395	3229	3110	2777
220	-	-	-	4130	3902	3634	3426	3259	3137	2847
225	-	-	-	4175	3940	3665	3457	3288	3164	2918
230	-	-	-	4219	3978	3695	3488	3318	3191	2989
235	-	-	-	4264	4017	3726	3519	3347	3219	3060
240	-	-	-	4309	4055	3756	3549	3377	3246	3090
245	-	-	-	4353	4093	3787	3580	3406	3273	3114
250	-	-	-	4398	4132	3818	3611	3436	3300	3139
255	-	-	-	4443	4170	3848	3642	3466	3328	3164
260	-	-	-	4488	4208	3879	3672	3495	3355	3189
265	-	-	-	4532	4246	3910	3703	3525	3382	3213
270	-	-	-	4577	4285	3940	3734	3554	3409	3238
275	-	-	-	4622	4323	3971	3765	3584	3437	3263
280	-	-	-	4666	4361	4001	3795	3613	3464	3288
285	-	-	-	4711	4400	4032	3826	3643	3491	3312
290	-	-	-	-	4438	4063	3857	3672	3518	3337
295	-	-	-	-	4476	4093	3888	3702	3546	3362
300	-	-	-	-	4515	4124	3918	3731	3573	3387
305	-	-	-	-	4553	4154	3949	3761	3600	3411
310	-	-	-	-	4591	4185	3980	3790	3627	3436
315	-	-	-	-	4629	4216	4011	3820	3654	3461
320	-	-	-	-	4668	4246	4041	3850	3682	3485
325	-	-	-	-	-	4277	4072	3879	3709	3510
330	-	-	-	-	-	4307	4103	3909	3736	3535
335	-	-	-	-	-	4338	4134	3938	3763	3560
340	-	-	-	-	-	4369	4164	3968	3791	3584
345	-	-	-	-	-	4399	4195	3997	3818	3609
350	-	-	-	-	-	4430	4226	4027	3845	3634
355	-	-	-	-	-	4460	4257	4056	3872	3659
360	-	-	-	-	-	4491	4287	4086	3900	3683
365	-	-	-	-	-	4522	4318	4115	3927	3708
370	-	-	-	-	-	4552	4349	4145	3954	3733
375	-	-	-	-	-	4583	4380	4174	3981	3758
380	-	-	-	-	-	4613	4410	4204	4009	3782
385	-	-	-	-	-	4644	4441	4234	4036	3807
390	-	-	-	-	-	4675	4472	4263	4063	3832
395	-	-	-	-	-	4705	4503	4293	4090	3857
400	-	-	-	-	-	-	4533	4322	4117	3881

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 23: Rectangular/Square Hollow Beams: 120 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	-	3286	2463	1623	1543	1393	1161	957	762	538
45	-	3797	2857	2021	1820	1613	1348	1113	890	634
50	-	4308	3224	2418	2171	1890	1564	1301	1051	768
55	-	-	3517	2816	2522	2187	1785	1489	1211	903
60	-	-	3810	3128	2873	2484	2019	1678	1372	1038
65	-	-	4103	3291	3125	2781	2253	1861	1533	1173
70	-	-	4396	3454	3252	3071	2486	2044	1694	1308
75	-	-	4689	3618	3380	3163	2720	2226	1834	1443
80	-	-	-	3781	3508	3256	2954	2409	1972	1578
85	-	-	-	3944	3636	3348	3101	2591	2110	1713
90	-	-	-	4107	3763	3440	3165	2774	2248	1803
95	-	-	-	4271	3891	3532	3229	2956	2386	1893
100	-	-	-	4434	4019	3624	3293	3087	2524	1983
105	-	-	-	4597	4147	3717	3357	3138	2662	2073
110	-	-	-	4761	4274	3809	3421	3188	2799	2163
115	-	-	-	-	4402	3901	3485	3238	2937	2253
120	-	-	-	-	4530	3993	3549	3289	3070	2343
125	-	-	-	-	4658	4085	3613	3339	3109	2433
130	-	-	-	-	4785	4178	3677	3389	3148	2522
135	-	-	-	-	-	4270	3741	3439	3187	2612
140	-	-	-	-	-	4362	3805	3490	3226	2702
145	-	-	-	-	-	4454	3870	3540	3265	2792
150	-	-	-	-	-	4546	3934	3590	3304	2882
155	-	-	-	-	-	4639	3998	3641	3344	2972
160	-	-	-	-	-	4731	4062	3691	3383	3062
165	-	-	-	-	-	4823	4126	3741	3422	3099
170	-	-	-	-	-	-	4190	3792	3461	3133
175	-	-	-	-	-	-	4254	3842	3500	3166
180	-	-	-	-	-	-	4318	3892	3539	3200
185	-	-	-	-	-	-	4382	3943	3578	3233
190	-	-	-	-	-	-	4446	3993	3617	3267
195	-	-	-	-	-	-	4510	4043	3657	3301
200	-	-	-	-	-	-	4574	4094	3696	3334
205	-	-	-	-	-	-	4638	4144	3735	3368
210	-	-	-	-	-	-	4703	4194	3774	3401
215	-	-	-	-	-	-	-	4245	3813	3435
220	-	-	-	-	-	-	-	4295	3852	3469
225	-	-	-	-	-	-	-	4345	3891	3502
230	-	-	-	-	-	-	-	4396	3930	3536
235	-	-	-	-	-	-	-	4446	3969	3569
240	-	-	-	-	-	-	-	4496	4009	3603
245	-	-	-	-	-	-	-	4546	4048	3637
250	-	-	-	-	-	-	-	4597	4087	3670
255	-	-	-	-	-	-	-	4647	4126	3704
260	-	-	-	-	-	-	-	4697	4165	3737
265	-	-	-	-	-	-	-	-	4204	3771
270	-	-	-	-	-	-	-	-	4243	3805
275	-	-	-	-	-	-	-	-	4282	3838
280	-	-	-	-	-	-	-	-	4321	3872
285	-	-	-	-	-	-	-	-	4361	3905
290	-	-	-	-	-	-	-	-	4400	3939
295	-	-	-	-	-	-	-	-	4439	3973
300	-	-	-	-	-	-	-	-	4478	4006
305	-	-	-	-	-	-	-	-	4517	4040
310	-	-	-	-	-	-	-	-	4556	4073
315	-	-	-	-	-	-	-	-	4595	4107
320	-	-	-	-	-	-	-	-	4634	4141
325	-	-	-	-	-	-	-	-	4673	4174
330	-	-	-	-	-	-	-	-	4713	4208
335	-	-	-	-	-	-	-	-	-	4241
340	-	-	-	-	-	-	-	-	-	4275
345	-	-	-	-	-	-	-	-	-	4309
350	-	-	-	-	-	-	-	-	-	4342
355	-	-	-	-	-	-	-	-	-	4376
360	-	-	-	-	-	-	-	-	-	4409
365	-	-	-	-	-	-	-	-	-	4443
370	-	-	-	-	-	-	-	-	-	4477
375	-	-	-	-	-	-	-	-	-	4510
380	-	-	-	-	-	-	-	-	-	4544
385	-	-	-	-	-	-	-	-	-	4577
390	-	-	-	-	-	-	-	-	-	4611
395	-	-	-	-	-	-	-	-	-	4645
400	-	-	-	-	-	-	-	-	-	4678

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 24: Rectangular/Square Hollow Beams: 150 Minutes										
Section Factor up to m^{-1}	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	-	-	-	2977	2754	2394	1678	1456	1217	954
45	-	-	-	3541	3182	2784	2132	1685	1411	1110
50	-	-	-	4106	3637	3195	2586	2045	1629	1298
55	-	-	-	-	4091	3525	3040	2419	1898	1486
60	-	-	-	-	-	3856	3254	2794	2199	1674
65	-	-	-	-	-	-	4186	3453	3100	2500	1883
70	-	-	-	-	-	4516	3652	3219	2801	2098
75	-	-	-	-	-	-	3851	3339	3077	2313
80	-	-	-	-	-	-	4050	3459	3159	2527
85	-	-	-	-	-	-	4249	3578	3241	2742
90	-	-	-	-	-	-	4448	3698	3323	2957
95	-	-	-	-	-	-	4647	3818	3406	3098
100	-	-	-	-	-	-	4846	3937	3488	3162
105	-	-	-	-	-	-	-	4057	3570	3225
110	-	-	-	-	-	-	-	4177	3652	3288
115	-	-	-	-	-	-	-	4296	3734	3352
120	-	-	-	-	-	-	-	4416	3816	3415
125	-	-	-	-	-	-	-	4536	3898	3478
130	-	-	-	-	-	-	-	4655	3980	3541
135	-	-	-	-	-	-	-	4775	4063	3605
140	-	-	-	-	-	-	-	-	4145	3668
145	-	-	-	-	-	-	-	-	4227	3731
150	-	-	-	-	-	-	-	-	4309	3794
155	-	-	-	-	-	-	-	-	4391	3858
160	-	-	-	-	-	-	-	-	4473	3921
165	-	-	-	-	-	-	-	-	4555	3984
170	-	-	-	-	-	-	-	-	4637	4047
175	-	-	-	-	-	-	-	-	4719	4111
180	-	-	-	-	-	-	-	-	-	4174
185	-	-	-	-	-	-	-	-	-	4237
190	-	-	-	-	-	-	-	-	-	4301
195	-	-	-	-	-	-	-	-	-	4364
200	-	-	-	-	-	-	-	-	-	4427
205	-	-	-	-	-	-	-	-	-	4490
210	-	-	-	-	-	-	-	-	-	4554
215	-	-	-	-	-	-	-	-	-	4617
220	-	-	-	-	-	-	-	-	-	4680
225	-	-	-	-	-	-	-	-	-	4743
230	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 25: Rectangular/Square Hollow Beams: 180 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	-	-	-	-	-	3877	2900	2432	1602	1370
45	-	-	-	-	-	-	3419	2843	2126	1586
50	-	-	-	-	-	-	3939	3265	2649	1896
55	-	-	-	-	-	-	4458	3608	3112	2285
60	-	-	-	-	-	-	-	3950	3333	2674
65	-	-	-	-	-	-	-	4293	3555	3062
70	-	-	-	-	-	-	-	4636	3776	3199
75	-	-	-	-	-	-	-	-	3997	3333
80	-	-	-	-	-	-	-	-	4218	3466
85	-	-	-	-	-	-	-	-	4439	3600
90	-	-	-	-	-	-	-	-	4660	3734
95	-	-	-	-	-	-	-	-	4882	3867
100	-	-	-	-	-	-	-	-	-	4001
105	-	-	-	-	-	-	-	-	-	4134
110	-	-	-	-	-	-	-	-	-	4268
115	-	-	-	-	-	-	-	-	-	4401
120	-	-	-	-	-	-	-	-	-	4535
125	-	-	-	-	-	-	-	-	-	4668
130	-	-	-	-	-	-	-	-	-	4802
135	-	-	-	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

![certifire]

CERTIFICATE No CF 5601
KCC CORPORATION

Table 26: Rectangular/Square Hollow Beams: 210 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	-	-	-	-	-	-	-	3459	2829	1828
45	-	-	-	-	-	-	-	4215	3334	2438
50	-	-	-	-	-	-	-	-	3840	3048
55	-	-	-	-	-	-	-	-	4346	3381
60	-	-	-	-	-	-	-	-	-	3705
65	-	-	-	-	-	-	-	-	-	4029
70	-	-	-	-	-	-	-	-	-	4352
75	-	-	-	-	-	-	-	-	-	4676
80	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to rectangular/square hollow beams with concrete slabs with 3 sided fire exposure.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 27: Circular and Rectangular/Square Hollow Columns: 30 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	327	327	327	327	327	327	327	327	327	327
45	327	327	327	327	327	327	327	327	327	327
50	336	327	327	327	327	327	327	327	327	327
55	390	327	327	327	327	327	327	327	327	327
60	444	327	327	327	327	327	327	327	327	327
65	498	327	327	327	327	327	327	327	327	327
70	552	327	327	327	327	327	327	327	327	327
75	606	347	327	327	327	327	327	327	327	327
80	660	392	327	327	327	327	327	327	327	327
85	713	436	327	327	327	327	327	327	327	327
90	767	481	327	327	327	327	327	327	327	327
95	821	525	327	327	327	327	327	327	327	327
100	875	569	327	327	327	327	327	327	327	327
105	929	614	327	327	327	327	327	327	327	327
110	983	658	327	327	327	327	327	327	327	327
115	1037	702	359	327	327	327	327	327	327	327
120	1091	747	399	327	327	327	327	327	327	327
125	1145	791	438	327	327	327	327	327	327	327
130	1199	835	478	327	327	327	327	327	327	327
135	1253	880	517	327	327	327	327	327	327	327
140	1306	924	557	327	327	327	327	327	327	327
145	1360	968	596	327	327	327	327	327	327	327
150	1414	1013	636	327	327	327	327	327	327	327
155	1468	1057	675	327	327	327	327	327	327	327
160	1522	1101	715	327	327	327	327	327	327	327
165	1576	1146	754	327	327	327	327	327	327	327
170	1630	1190	794	327	327	327	327	327	327	327
175	1684	1235	833	327	327	327	327	327	327	327
180	1730	1279	873	360	327	327	327	327	327	327
185	1766	1323	913	399	327	327	327	327	327	327
190	1803	1368	952	437	327	327	327	327	327	327
195	1839	1412	992	476	332	327	327	327	327	327
200	1875	1456	1031	514	371	327	327	327	327	327
205	1912	1501	1071	553	410	327	327	327	327	327
210	1948	1545	1110	591	450	327	327	327	327	327
215	1984	1589	1150	630	489	327	327	327	327	327
220	2020	1634	1189	668	528	327	327	327	327	327
225	2057	1678	1229	706	567	327	327	327	327	327
230	2093	1721	1268	745	607	360	327	327	327	327
235	2129	1760	1308	783	646	401	327	327	327	327
240	2165	1799	1347	822	685	441	327	327	327	327
245	2202	1838	1387	860	724	481	327	327	327	327
250	2238	1877	1426	899	763	522	327	327	327	327
255	2274	1917	1466	937	803	562	327	327	327	327
260	2310	1956	1505	976	842	602	327	327	327	327
265	2347	1995	1545	1014	881	643	327	327	327	327
270	2383	2034	1584	1053	920	683	327	327	327	327
275	2419	2073	1624	1091	960	723	327	327	327	327
280	2455	2112	1663	1130	999	764	327	327	327	327
285	2492	2151	1703	1168	1038	804	327	327	327	327
290	2528	2190	1746	1207	1077	845	327	327	327	327
295	2564	2229	1791	1245	1117	885	327	327	327	327
300	2600	2268	1836	1284	1156	925	327	327	327	327
305	2637	2307	1881	1322	1195	966	327	327	327	327
310	2673	2346	1926	1361	1234	1006	357	327	327	327
315	2709	2385	1971	1399	1274	1046	403	327	327	327
320	2745	2424	2016	1438	1313	1087	449	327	327	327
325	2782	2463	2061	1476	1352	1127	496	327	327	327
330	2818	2502	2106	1515	1391	1167	542	327	327	327
335	2854	2541	2151	1553	1431	1208	588	327	327	327
340	2890	2580	2196	1592	1470	1248	634	327	327	327
345	2927	2619	2241	1630	1509	1288	680	327	327	327
350	2963	2658	2286	1669	1329	1329	726	327	327	327
355	2999	2697	2331	1707	1588	1369	772	327	327	327
360	3035	2736	2376	1761	1627	1410	818	327	327	327
365	3070	2775	2421	1818	1666	1450	864	327	327	327
370	3095	2814	2466	1875	1705	1490	910	327	327	327
375	3119	2853	2511	1932	1758	1531	956	327	327	327
380	3144	2892	2556	1989	1815	1571	1003	327	327	327
385	3168	2931	2601	2046	1872	1611	1049	327	327	327
390	3193	2970	2646	2103	1929	1652	1095	327	327	327
395	3217	3009	2691	2160	1986	1692	1141	327	327	327
400	3242	3048	2736	2217	2042	1740	1187	327	327	327

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902µm.

Page 29 of 34 Signed
AP/002

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Thickness (μm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	735	398	327	327	327	327	327	327	327	327
45	850	502	327	327	327	327	327	327	327	327
50	975	606	367	327	327	327	327	327	327	327
55	1101	709	454	327	327	327	327	327	327	327
60	1226	813	540	327	327	327	327	327	327	327
65	1352	917	626	372	327	327	327	327	327	327
70	1477	1020	713	447	342	327	327	327	327	327
75	1603	1124	799	521	412	327	327	327	327	327
80	1721	1228	885	595	482	327	327	327	327	327
85	1783	1331	972	669	552	377	327	327	327	327
90	1845	1435	1058	744	623	442	327	327	327	327
95	1906	1539	1144	818	693	506	327	327	327	327
100	1968	1642	1231	892	763	571	327	327	327	327
105	2029	1731	1317	967	833	636	327	327	327	327
110	2091	1784	1403	1041	903	701	327	327	327	327
115	2153	1837	1490	1115	973	766	372	327	327	327
120	2214	1890	1576	1190	1044	831	430	327	327	327
125	2276	1943	1662	1264	1114	895	488	327	327	327
130	2338	1996	1734	1338	1184	960	546	327	327	327
135	2399	2049	1784	1413	1254	1025	604	327	327	327
140	2461	2102	1834	1487	1324	1090	661	327	327	327
145	2522	2154	1884	1561	1394	1155	719	327	327	327
150	2584	2207	1935	1636	1465	1219	777	327	327	327
155	2646	2260	1985	1710	1535	1284	835	327	327	327
160	2707	2313	2035	1760	1605	1349	893	327	327	327
165	2769	2366	2085	1809	1675	1414	950	327	327	327
170	2830	2419	2135	1858	1736	1479	1008	360	327	327
175	2892	2472	2185	1907	1785	1543	1066	414	327	327
180	2954	2525	2235	1956	1835	1608	1124	468	327	327
185	3015	2578	2285	2005	1884	1673	1181	522	327	327
190	3072	2631	2335	2054	1933	1733	1239	576	327	327
195	3101	2684	2385	2103	1982	1783	1297	630	327	327
200	3130	2737	2435	2152	2032	1833	1355	684	327	327
205	3160	2790	2485	2200	2081	1883	1413	738	327	327
210	3189	2843	2535	2249	2130	1933	1470	792	327	327
215	3218	2896	2585	2298	2179	1984	1528	846	327	327
220	3247	2949	2635	2347	2229	2034	1586	900	327	327
225	3276	3002	2685	2396	2278	2084	1644	954	327	327
230	3306	3055	2735	2445	2327	2134	1702	1008	349	327
235	3335	3087	2786	2494	2376	2184	1757	1062	395	327
240	3364	3112	2836	2543	2426	2235	1811	1116	441	327
245	3393	3137	2886	2592	2475	2285	1866	1170	487	327
250	3422	3162	2936	2640	2524	2335	1921	1224	533	327
255	3452	3188	2986	2689	2573	2385	1975	1278	579	327
260	3481	3213	3036	2738	2622	2435	2030	1333	625	327
265	3510	3238	3076	2787	2672	2486	2084	1387	671	327
270	3539	3263	3100	2836	2721	2536	2139	1441	717	327
275	3568	3288	3123	2885	2770	2586	2193	1495	764	327
280	3598	3314	3146	2934	2819	2636	2248	1549	810	327
285	3627	3339	3170	2983	2869	2686	2302	1603	856	327
290	3656	3364	3193	3032	2918	2736	2357	1657	902	327
295	3685	3389	3216	3073	2967	2787	2412	1711	948	327
300	3714	3414	3240	3094	3016	2837	2466	1779	994	327
305	3743	3440	3263	3116	3066	2887	2521	1848	1040	327
310	3773	3465	3286	3137	3087	2937	2575	1917	1086	327
315	3802	3490	3310	3158	3107	2987	2630	1986	1132	327
320	3831	3515	3333	3179	3128	3038	2684	2054	1179	327
325	3860	3540	3356	3200	3148	3075	2739	2123	1225	327
330	3889	3566	3380	3222	3168	3094	2794	2192	1271	327
335	3919	3591	3403	3243	3188	3113	2848	2261	1317	327
340	3948	3616	3426	3264	3209	3132	2903	2330	1363	327
345	3977	3641	3450	3285	3229	3150	2957	2399	1409	327
350	4006	3666	3473	3306	3249	3169	3012	2468	1455	327
355	4035	3692	3496	3328	3269	3188	3066	2537	1501	327
360	4065	3717	3520	3349	3290	3207	3084	2606	1547	391
365	4094	3742	3543	3370	3310	3225	3100	2675	1594	458
370	4123	3767	3567	3391	3330	3244	3116	2744	1640	525
375	4152	3792	3590	3412	3350	3263	3133	2813	1686	592
380	4181	3818	3613	3434	3371	3282	3149	2882	1748	659
385	4211	3843	3637	3455	3391	3301	3165	2950	1838	726
390	4240	3868	3660	3476	3411	3319	3182	3019	1928	793
395	4269	3893	3683	3497	3431	3338	3198	3072	2018	860
400	4298	3918	3707	3518	3452	3357	3215	3086	2109	927

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902μm.

Page 30 of 34 Signed AP/002

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 29: Circular and Rectangular/Square Hollow Columns: 60 Minutes

Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	1282	903	631	388	328	327	327	327	327	327
45	1476	1046	738	508	428	327	327	327	327	327
50	1671	1208	876	627	540	419	327	327	327	327
55	1852	1369	1014	746	653	522	327	327	327	327
60	2028	1530	1152	865	765	625	398	327	327	327
65	2203	1692	1290	984	878	728	485	327	327	327
70	2379	1800	1428	1103	991	830	572	327	327	327
75	2555	1901	1566	1222	1103	933	659	387	327	327
80	2731	2001	1704	1341	1216	1036	746	458	327	327
85	2907	2101	1777	1461	1328	1139	832	529	327	327
90	3072	2201	1844	1580	1441	1241	919	600	327	327
95	3120	2301	1911	1699	1553	1344	1006	671	327	327
100	3168	2401	1979	1769	1666	1447	1093	741	377	327
105	3216	2501	2046	1832	1749	1550	1179	812	436	327
110	3265	2601	2113	1894	1810	1652	1266	883	494	327
115	3313	2701	2181	1957	1872	1738	1353	954	552	327
120	3361	2801	2248	2019	1933	1798	1440	1025	611	327
125	3409	2901	2315	2082	1994	1857	1527	1096	669	327
130	3457	3001	2383	2144	2055	1916	1613	1167	727	327
135	3505	3077	2450	2207	2116	1976	1700	1238	786	327
140	3554	3106	2517	2269	2177	2035	1763	1309	844	327
145	3602	3134	2584	2332	2238	2095	1822	1380	902	327
150	3650	3163	2652	2395	2299	2154	1880	1451	961	338
155	3698	3191	2719	2457	2361	2213	1938	1522	1019	393
160	3746	3220	2786	2520	2422	2273	1997	1593	1077	448
165	3794	3248	2854	2582	2483	2332	2055	1664	1136	503
170	3843	3277	2921	2645	2544	2392	2114	1732	1194	558
175	3891	3305	2988	2707	2605	2451	2172	1793	1252	612
180	3939	3334	3056	2770	2666	2510	2230	1854	1311	667
185	3987	3362	3092	2832	2727	2570	2289	1915	1369	722
190	4035	3391	3122	2895	2788	2629	2347	1976	1427	777
195	4084	3420	3151	2958	2850	2689	2406	2037	1486	832
200	4132	3448	3181	3020	2911	2748	2464	2098	1544	887
205	4180	3477	3210	3074	2972	2808	2522	2159	1602	942
210	4228	3505	3240	3102	3033	2867	2581	2220	1661	997
215	4276	3534	3270	3129	3079	2926	2639	2281	1720	1052
220	4324	3562	3299	3156	3105	2986	2697	2342	1787	1106
225	4373	3591	3329	3184	3132	3045	2756	2403	1855	1161
230	4421	3619	3359	3211	3158	3083	2814	2464	1923	1216
235	4469	3648	3388	3238	3184	3108	2873	2525	1990	1271
240	4517	3676	3418	3266	3211	3133	2931	2586	2058	1326
245	4565	3705	3447	3293	3237	3158	2989	2647	2126	1381
250	4613	3733	3477	3320	3264	3182	3048	2708	2194	1436
255	4662	3762	3507	3348	3290	3207	3082	2769	2261	1491
260	-	3790	3536	3375	3316	3232	3105	2830	2329	1545
265	-	3819	3566	3402	3343	3257	3127	2891	2397	1600
270	-	3847	3596	3430	3369	3282	3149	2952	2465	1655
275	-	3876	3625	3457	3395	3307	3171	3013	2532	1710
280	-	3904	3655	3484	3422	3331	3194	3070	2600	1788
285	-	3933	3684	3512	3448	3356	3216	3090	2668	1867
290	-	3961	3714	3539	3474	3381	3238	3110	2736	1947
295	-	3990	3744	3566	3501	3406	3261	3129	2803	2027
300	-	4019	3773	3594	3527	3431	3283	3149	2871	2106
305	-	4047	3803	3621	3554	3456	3305	3169	2939	2186
310	-	4076	3832	3648	3580	3480	3327	3189	3007	2266
315	-	4104	3862	3676	3606	3505	3350	3209	3069	2345
320	-	4133	3892	3703	3633	3530	3372	3228	3087	2425
325	-	4161	3921	3730	3659	3555	3394	3248	3104	2504
330	-	4190	3951	3758	3685	3580	3416	3268	3122	2584
335	-	4218	3981	3785	3712	3605	3439	3288	3139	2664
340	-	4247	4010	3812	3738	3629	3461	3308	3157	2743
345	-	4275	4040	3840	3764	3654	3483	3327	3174	2823
350	-	4304	4069	3867	3791	3679	3506	3347	3192	2903
355	-	4332	4099	3894	3817	3704	3528	3367	3209	2982
360	-	4361	4129	3922	3844	3729	3550	3387	3226	3062
365	-	4389	4158	3949	3870	3754	3572	3407	3244	3082
370	-	4418	4188	3976	3896	3778	3595	3426	3261	3097
375	-	4446	4218	4004	3923	3803	3617	3446	3279	3112
380	-	4475	4247	4031	3949	3828	3639	3466	3296	3127
385	-	4503	4277	4058	3975	3853	3661	3486	3314	3142
390	-	4532	4306	4085	4002	3878	3684	3506	3331	3157
395	-	4560	4336	4113	4028	3903	3706	3525	3349	3172
400	-	4589	4366	4140	4054	3927	3728	3545	3366	3187

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902µm.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 30: Circular and Rectangular/Square Hollow Columns: 75 Minutes										
Section Factor up to m^{-1}	Thickness (μm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	2020	1366	1035	786	703	591	391	327	327	327
45	2328	1576	1201	917	823	695	513	328	327	327
50	2645	1802	1390	1083	980	839	634	430	327	327
55	2961	2036	1579	1248	1137	983	756	532	327	327
60	3122	2271	1760	1413	1293	1127	877	634	390	327
65	3204	2505	1918	1579	1450	1270	999	736	472	327
70	3286	2740	2076	1734	1607	1414	1120	838	553	327
75	3368	2974	2234	1841	1744	1558	1242	940	635	327
80	3450	3106	2393	1949	1836	1702	1363	1042	717	384
85	3532	3169	2551	2057	1929	1781	1485	1144	798	450
90	3613	3232	2709	2164	2021	1854	1606	1246	880	515
95	3695	3295	2867	2272	2114	1927	1722	1348	962	580
100	3777	3358	3025	2380	2206	2000	1789	1450	1043	646
105	3859	3421	3098	2487	2299	2073	1857	1552	1125	711
110	3941	3484	3140	2595	2392	2146	1924	1654	1206	776
115	4023	3547	3181	2703	2484	2219	1991	1741	1288	842
120	4105	3611	3223	2810	2577	2292	2059	1807	1370	907
125	4187	3674	3264	2918	2669	2365	2126	1872	1451	972
130	4269	3737	3306	3026	2762	2438	2193	1937	1533	1037
135	4351	3800	3347	3086	2854	2511	2261	2002	1615	1103
140	4433	3863	3389	3116	2947	2584	2328	2068	1696	1168
145	4515	3926	3430	3146	3040	2657	2395	2133	1766	1233
150	4597	3989	3472	3176	3089	2730	2463	2198	1833	1299
155	4678	4052	3513	3207	3119	2803	2530	2263	1900	1364
160	-	4115	3555	3237	3149	2876	2597	2329	1967	1429
165	-	4179	3596	3267	3179	2949	2665	2394	2034	1495
170	-	4242	3638	3297	3210	3022	2732	2459	2100	1560
175	-	4305	3680	3327	3240	3079	2800	2524	2167	1625
180	-	4368	3721	3357	3270	3110	2867	2590	2234	1690
185	-	4431	3763	3387	3300	3141	2934	2655	2301	1761
190	-	4494	3804	3418	3330	3171	3002	2720	2367	1834
195	-	4557	3846	3448	3361	3202	3068	2785	2434	1906
200	-	4620	3887	3478	3391	3233	3096	2851	2501	1979
205	-	4683	3929	3508	3421	3263	3125	2916	2568	2052
210	-	-	3970	3538	3451	3294	3153	2981	2635	2125
215	-	-	4012	3568	3481	3325	3181	3046	2701	2198
220	-	-	4053	3598	3512	3356	3209	3085	2768	2271
225	-	-	4095	3628	3542	3386	3237	3110	2835	2344
230	-	-	4136	3659	3572	3417	3266	3136	2902	2417
235	-	-	4178	3689	3602	3448	3294	3161	2968	2490
240	-	-	4219	3719	3632	3478	3322	3187	3035	2563
245	-	-	4261	3749	3663	3509	3350	3213	3080	2636
250	-	-	4302	3779	3693	3540	3378	3238	3103	2709
255	-	-	4344	3809	3723	3571	3407	3264	3126	2782
260	-	-	4386	3839	3753	3601	3435	3289	3149	2855
265	-	-	4427	3869	3783	3632	3463	3315	3172	2927
270	-	-	4469	3900	3814	3663	3491	3340	3195	3000
275	-	-	4510	3930	3844	3693	3519	3366	3218	3069
280	-	-	4552	3960	3874	3724	3548	3391	3241	3090
285	-	-	4593	3990	3904	3755	3576	3417	3264	3111
290	-	-	4635	4020	3934	3786	3604	3442	3287	3131
295	-	-	4676	4050	3965	3816	3632	3468	3310	3152
300	-	-	-	4080	3995	3847	3660	3494	3333	3173
305	-	-	-	4110	4025	3878	3689	3519	3356	3193
310	-	-	-	4141	4055	3908	3717	3545	3379	3214
315	-	-	-	4171	4086	3939	3745	3570	3402	3235
320	-	-	-	4201	4116	3970	3773	3596	3425	3255
325	-	-	-	4231	4146	4001	3801	3621	3448	3276
330	-	-	-	4261	4176	4031	3830	3647	3471	3297
335	-	-	-	4291	4206	4062	3858	3672	3494	3317
340	-	-	-	4321	4237	4093	3886	3698	3517	3338
345	-	-	-	4352	4267	4123	3914	3724	3540	3359
350	-	-	-	4382	4297	4154	3942	3749	3563	3379
355	-	-	-	4412	4327	4185	3970	3775	3586	3400
360	-	-	-	4442	4357	4216	3999	3800	3609	3420
365	-	-	-	4472	4388	4246	4027	3826	3632	3441
370	-	-	-	4502	4418	4277	4055	3851	3655	3462
375	-	-	-	4532	4448	4308	4083	3877	3678	3482
380	-	-	-	4562	4478	4338	4111	3902	3701	3503
385	-	-	-	4593	4508	4369	4140	3928	3724	3524
390	-	-	-	4623	4539	4400	4168	3953	3747	3544
395	-	-	-	4653	4569	4431	4196	3979	3770	3565
400	-	-	-	4683	4599	4461	4224	4005	3793	3586

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902μm.

Page 32 of 34 Signed AP/002

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Table 31: Circular and Rectangular/Square Hollow Columns: 90 Minutes										
Section Factor up to m⁻¹	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	2990	2071	1439	1146	1050	917	718	539	332	327
45	3253	2399	1663	1330	1220	1068	840	635	443	327
50	3517	2766	1945	1541	1421	1254	999	771	553	327
55	3780	3083	2239	1752	1622	1439	1159	906	664	404
60	4043	3170	2532	1958	1811	1624	1319	1041	774	495
65	4306	3258	2826	2164	1992	1790	1478	1176	885	586
70	4569	3345	3081	2370	2172	1938	1638	1311	995	677
75	-	3433	3156	2576	2353	2087	1769	1446	1105	768
80	-	3520	3231	2783	2533	2235	1875	1581	1216	859
85	-	3607	3306	2989	2713	2383	1981	1716	1326	950
90	-	3695	3382	3104	2894	2531	2087	1789	1437	1041
95	-	3782	3457	3162	3070	2679	2193	1863	1547	1132
100	-	3869	3532	3221	3121	2827	2299	1936	1658	1223
105	-	3957	3607	3279	3172	2975	2405	2010	1749	1313
110	-	4044	3682	3338	3223	3083	2511	2083	1821	1404
115	-	4132	3757	3396	3274	3124	2617	2157	1892	1495
120	-	4219	3833	3455	3325	3165	2722	2231	1964	1586
125	-	4306	3908	3513	3376	3206	2828	2304	2035	1677
130	-	4394	3983	3572	3427	3247	2934	2378	2107	1757
135	-	4481	4058	3630	3478	3288	3040	2451	2178	1828
140	-	4569	4133	3689	3529	3329	3090	2525	2250	1899
145	-	4656	4208	3747	3580	3370	3121	2598	2321	1970
150	-	-	4284	3806	3631	3410	3152	2672	2393	2041
155	-	-	4359	3864	3682	3451	3183	2746	2464	2113
160	-	-	4434	3923	3733	3492	3213	2819	2536	2184
165	-	-	4509	3981	3784	3533	3244	2893	2607	2255
170	-	-	4584	4040	3835	3574	3275	2966	2678	2326
175	-	-	4659	4098	3886	3615	3305	3040	2750	2397
180	-	-	4735	4157	3937	3656	3336	3087	2821	2469
185	-	-	-	4215	3988	3697	3367	3118	2893	2540
190	-	-	-	4274	4039	3738	3397	3150	2964	2611
195	-	-	-	4332	4090	3779	3428	3181	3036	2682
200	-	-	-	4391	4141	3820	3459	3212	3084	2753
205	-	-	-	4449	4192	3861	3490	3244	3112	2825
210	-	-	-	4508	4243	3902	3520	3275	3141	2896
215	-	-	-	4566	4294	3943	3551	3306	3169	2967
220	-	-	-	4625	4345	3984	3582	3337	3198	3038
225	-	-	-	4683	4396	4024	3612	3369	3227	3083
230	-	-	-	4742	4447	4065	3643	3400	3255	3109
235	-	-	-	-	4498	4106	3674	3431	3284	3136
240	-	-	-	-	4549	4147	3705	3463	3312	3162
245	-	-	-	-	4600	4188	3735	3494	3341	3188
250	-	-	-	-	4651	4229	3766	3525	3370	3214
255	-	-	-	-	4702	4270	3797	3556	3398	3241
260	-	-	-	-	-	4311	3827	3588	3427	3267
265	-	-	-	-	-	4352	3858	3619	3455	3293
270	-	-	-	-	-	4393	3889	3650	3484	3319
275	-	-	-	-	-	4434	3920	3682	3513	3346
280	-	-	-	-	-	4475	3950	3713	3541	3372
285	-	-	-	-	-	4516	3981	3744	3570	3398
290	-	-	-	-	-	4557	4012	3775	3598	3424
295	-	-	-	-	-	4598	4042	3807	3627	3451
300	-	-	-	-	-	4638	4073	3838	3656	3477
305	-	-	-	-	-	4679	4104	3869	3684	3503
310	-	-	-	-	-	-	4135	3901	3713	3529
315	-	-	-	-	-	-	4165	3932	3742	3556
320	-	-	-	-	-	-	4196	3963	3770	3582
325	-	-	-	-	-	-	4227	3994	3799	3608
330	-	-	-	-	-	-	4257	4026	3827	3634
335	-	-	-	-	-	-	4288	4057	3856	3661
340	-	-	-	-	-	-	4319	4088	3885	3687
345	-	-	-	-	-	-	4350	4120	3913	3713
350	-	-	-	-	-	-	4380	4151	3942	3739
355	-	-	-	-	-	-	4411	4182	3970	3766
360	-	-	-	-	-	-	4442	4214	3999	3792
365	-	-	-	-	-	-	4472	4245	4028	3818
370	-	-	-	-	-	-	4503	4276	4056	3844
375	-	-	-	-	-	-	4534	4307	4085	3871
380	-	-	-	-	-	-	4565	4339	4113	3897
385	-	-	-	-	-	-	4595	4370	4142	3923
390	-	-	-	-	-	-	4626	4401	4171	3949
395	-	-	-	-	-	-	4657	4433	4199	3976
400	-	-	-	-	-	-	4687	4464	4228	4002

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902µm.

Issued: 2nd November 2017
Revised: 14th January 2019
Valid to: 1st November 2022

certifire

CERTIFICATE No CF 5601
KCC CORPORATION

Section Factor up to m⁻¹	Table 32: Circular and Rectangular/Square Hollow Columns: 120 Minutes									
	Thickness (µm) Required for a Design Temperature of									
	350	400	450	500	520	550	600	650	700	750
40	-	-	2913	2151	1729	1543	1303	1066	845	625
45	-	-	3256	2504	2158	1850	1510	1239	984	734
50	-	-	3599	2928	2588	2213	1751	1441	1156	880
55	-	-	3941	3178	3017	2577	2035	1643	1327	1026
60	-	-	4284	3342	3175	2941	2319	1856	1498	1172
65	-	-	4626	3506	3296	3125	2604	2076	1669	1318
70	-	-	-	3670	3417	3213	2888	2295	1834	1464
75	-	-	-	3834	3538	3300	3095	2514	1997	1610
80	-	-	-	3998	3660	3388	3170	2733	2160	1746
85	-	-	-	4162	3781	3476	3244	2952	2323	1858
90	-	-	-	4326	3902	3564	3319	3096	2486	1971
95	-	-	-	4490	4024	3652	3394	3156	2649	2083
100	-	-	-	4654	4145	3739	3468	3215	2812	2195
105	-	-	-	-	4266	3827	3543	3275	2975	2307
110	-	-	-	-	4387	3915	3618	3335	3088	2419
115	-	-	-	-	4509	4003	3692	3395	3134	2531
120	-	-	-	-	4630	4091	3767	3454	3180	2643
125	-	-	-	-	4751	4178	3842	3514	3226	2755
130	-	-	-	-	-	4266	3916	3574	3272	2867
135	-	-	-	-	-	4354	3991	3634	3318	2979
140	-	-	-	-	-	4442	4065	3693	3364	3075
145	-	-	-	-	-	4530	4140	3753	3410	3111
150	-	-	-	-	-	4617	4215	3813	3456	3147
155	-	-	-	-	-	4705	4289	3873	3502	3183
160	-	-	-	-	-	-	4364	3932	3548	3219
165	-	-	-	-	-	-	4439	3992	3594	3255
170	-	-	-	-	-	-	4513	4052	3640	3291
175	-	-	-	-	-	-	4588	4111	3686	3327
180	-	-	-	-	-	-	4663	4171	3733	3363
185	-	-	-	-	-	-	4737	4231	3779	3399
190	-	-	-	-	-	-	-	4291	3825	3435
195	-	-	-	-	-	-	-	4350	3871	3471
200	-	-	-	-	-	-	-	4410	3917	3507
205	-	-	-	-	-	-	-	4470	3963	3542
210	-	-	-	-	-	-	-	4530	4009	3578
215	-	-	-	-	-	-	-	4589	4055	3614
220	-	-	-	-	-	-	-	4649	4101	3650
225	-	-	-	-	-	-	-	4709	4147	3686
230	-	-	-	-	-	-	-	-	4193	3722
235	-	-	-	-	-	-	-	-	4239	3758
240	-	-	-	-	-	-	-	-	4285	3794
245	-	-	-	-	-	-	-	-	4331	3830
250	-	-	-	-	-	-	-	-	4378	3866
255	-	-	-	-	-	-	-	-	4424	3902
260	-	-	-	-	-	-	-	-	4470	3938
265	-	-	-	-	-	-	-	-	4516	3974
270	-	-	-	-	-	-	-	-	4562	4010
275	-	-	-	-	-	-	-	-	4608	4046
280	-	-	-	-	-	-	-	-	4654	4082
285	-	-	-	-	-	-	-	-	4700	4118
290	-	-	-	-	-	-	-	-	-	4154
295	-	-	-	-	-	-	-	-	-	4190
300	-	-	-	-	-	-	-	-	-	4225
305	-	-	-	-	-	-	-	-	-	4261
310	-	-	-	-	-	-	-	-	-	4297
315	-	-	-	-	-	-	-	-	-	4333
320	-	-	-	-	-	-	-	-	-	4369
325	-	-	-	-	-	-	-	-	-	4405
330	-	-	-	-	-	-	-	-	-	4441
335	-	-	-	-	-	-	-	-	-	4477
340	-	-	-	-	-	-	-	-	-	4513
345	-	-	-	-	-	-	-	-	-	4549
350	-	-	-	-	-	-	-	-	-	4585
355	-	-	-	-	-	-	-	-	-	4621
360	-	-	-	-	-	-	-	-	-	4657
365	-	-	-	-	-	-	-	-	-	4693
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to rectangular/square hollow beams exposed on all four sides limited to a maximum protection thickness of 4902µm.

Issued: 2ⁿᵈ November 2017
Revised: 14ᵗʰ January 2019
Valid to: 1ˢᵗ November 2022