CERTIFICATE OF APPROVAL
No CF 5344

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

RUDOLF HENSEL GMBH

Lauenburger Landstrasse 11, Börnsen, 21039, Germany
Tel: +49 40 72106210 Fax: +49 40 72106252

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
HENSOTHERM® 471 KS	**TS15 Intumescent Coatings for Steelwork**

Signed and sealed for and on behalf of Warringtonfire Testing and Certification Limited

Paul Duggan
Certification Manager

Issued:	14th July 2015
Reissued:	25th June 2020
Valid to:	1st December 2024

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HENSOTHERM® 471 KS

1. This approval relates to the use of HENSOTHERM® 471 KS for the fire protection of I-shaped beam and column sections and hollow columns. The precise scope is given in Tables 1 to 30 which show the total dry film thickness of HENSOTHERM® 471 KS (excluding primer and top sealer) required to provide fire resistance periods in accordance with BS476: Part 21: 1987 of up to 180 minutes for differing sections and section factors.

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

3. The products are approved on the basis of:

   i) Initial type testing.
   ii) A design appraisal against TS15.
   iii) Production surveillance under ISO 9001: 2015.
   iv) Inspection and surveillance of factory production control.
   v) Audit testing

4. 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.

5. The data shown is applicable to steel sections blast cleaned to ISO 8501-1 Sa $2^1/_2$ or equivalent and primed with a suitable and compatible primer. Specifications of surface preparations, primers and top sealers are available from Rudolf Hensel GmbH whose responsibility is to ensure HENSOTHERM®471 KS is compatible for use in respect of both ambient and fire conditions. The total dry film thickness of primer and top sealer together should not exceed that tested.

6. The data shown is applicable to HENSOTHERM® 471 KS applied by spray to horizontal, vertical, flexural and compression members supporting loads up to the maximum design loads specified in BS449: Part 2.

7. 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.

8. The data shown in the tables is based on an assessment which complies with the criteria for acceptability now incorporated within the Certifire scheme.

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Table 1: I-Section Beams 15 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
55	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
60	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
65	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
70	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
75	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
80	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
85	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
90	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
95	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
100	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
105	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
110	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
115	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
120	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
125	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
130	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
135	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
140	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
145	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
150	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
155	0.263	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
160	0.271	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
165	0.278	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
170	0.286	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
175	0.293	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
180	0.301	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
185	0.308	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
190	0.316	0.260	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
195	0.323	0.266	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
200	0.331	0.272	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
205	0.338	0.277	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
210	0.346	0.283	0.258	0.257	0.257	0.257	0.257	0.257	0.257	0.257
215	0.353	0.289	0.261	0.257	0.257	0.257	0.257	0.257	0.257	0.257
220	0.360	0.295	0.264	0.257	0.257	0.257	0.257	0.257	0.257	0.257
225	0.368	0.301	0.267	0.257	0.257	0.257	0.257	0.257	0.257	0.257
230	0.375	0.307	0.270	0.257	0.257	0.257	0.257	0.257	0.257	0.257
235	0.383	0.313	0.273	0.257	0.257	0.257	0.257	0.257	0.257	0.257
240	0.390	0.319	0.276	0.257	0.257	0.257	0.257	0.257	0.257	0.257
245	0.398	0.324	0.279	0.257	0.257	0.257	0.257	0.257	0.257	0.257
250	0.405	0.330	0.282	0.257	0.257	0.257	0.257	0.257	0.257	0.257
255	0.413	0.336	0.285	0.257	0.257	0.257	0.257	0.257	0.257	0.257
260	0.420	0.342	0.288	0.259	0.257	0.257	0.257	0.257	0.257	0.257
265	0.428	0.348	0.292	0.261	0.257	0.257	0.257	0.257	0.257	0.257
270	0.435	0.354	0.295	0.264	0.257	0.257	0.257	0.257	0.257	0.257
275	0.443	0.360	0.298	0.266	0.257	0.257	0.257	0.257	0.257	0.257
280	0.450	0.365	0.301	0.269	0.257	0.257	0.257	0.257	0.257	0.257
285	0.458	0.371	0.304	0.271	0.257	0.257	0.257	0.257	0.257	0.257
290	0.465	0.377	0.307	0.274	0.257	0.257	0.257	0.257	0.257	0.257
295	0.473	0.383	0.310	0.276	0.257	0.257	0.257	0.257	0.257	0.257
300	0.480	0.389	0.313	0.279	0.257	0.257	0.257	0.257	0.257	0.257
305	0.487	0.395	0.316	0.281	0.257	0.257	0.257	0.257	0.257	0.257
310	0.495	0.401	0.319	0.284	0.257	0.257	0.257	0.257	0.257	0.257
315	0.502	0.407	0.322	0.286	0.257	0.257	0.257	0.257	0.257	0.257
320	0.510	0.412	0.326	0.289	0.257	0.257	0.257	0.257	0.257	0.257
325	0.517	0.418	0.329	0.291	0.257	0.257	0.257	0.257	0.257	0.257
330	0.525	0.424	0.332	0.294	0.257	0.257	0.257	0.257	0.257	0.257
335	0.532	0.430	0.335	0.296	0.257	0.257	0.257	0.257	0.257	0.257
340	0.540	0.436	0.338	0.299	0.257	0.257	0.257	0.257	0.257	0.257
345	0.547	0.442	0.341	0.301	0.257	0.257	0.257	0.257	0.257	0.257
350	0.555	0.448	0.344	0.304	0.257	0.257	0.257	0.257	0.257	0.257
355	0.562	0.453	0.347	0.306	0.257	0.257	0.257	0.257	0.257	0.257
360	0.570	0.459	0.350	0.309	0.257	0.257	0.257	0.257	0.257	0.257
365	0.577	0.465	0.353	0.311	0.257	0.257	0.257	0.257	0.257	0.257
370	0.585	0.471	0.356	0.314	0.257	0.257	0.257	0.257	0.257	0.257
375	0.592	0.477	0.360	0.317	0.257	0.257	0.257	0.257	0.257	0.257
380	0.600	0.483	0.363	0.319	0.257	0.257	0.257	0.257	0.257	0.257
385	0.607	0.489	0.366	0.322	0.257	0.257	0.257	0.257	0.257	0.257
390	0.614	0.495	0.369	0.324	0.257	0.257	0.257	0.257	0.257	0.257
395	0.622	0.500	0.372	0.327	0.257	0.257	0.257	0.257	0.257	0.257
400	0.629	0.506	0.375	0.329	0.257	0.257	0.257	0.257	0.257	0.257

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 2: I-Section Beams 30 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
55	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
60	0.274	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
65	0.296	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
70	0.319	0.264	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
75	0.341	0.275	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
80	0.364	0.286	0.257	0.257	0.257	0.257	0.257	0.257	0.257	0.257
85	0.386	0.297	0.263	0.257	0.257	0.257	0.257	0.257	0.257	0.257
90	0.409	0.308	0.269	0.257	0.257	0.257	0.257	0.257	0.257	0.257
95	0.431	0.319	0.275	0.257	0.257	0.257	0.257	0.257	0.257	0.257
100	0.454	0.330	0.282	0.257	0.257	0.257	0.257	0.257	0.257	0.257
105	0.476	0.341	0.288	0.257	0.257	0.257	0.257	0.257	0.257	0.257
110	0.499	0.352	0.294	0.257	0.257	0.257	0.257	0.257	0.257	0.257
115	0.521	0.363	0.301	0.258	0.257	0.257	0.257	0.257	0.257	0.257
120	0.543	0.374	0.307	0.264	0.257	0.257	0.257	0.257	0.257	0.257
125	0.566	0.385	0.314	0.269	0.257	0.257	0.257	0.257	0.257	0.257
130	0.588	0.396	0.320	0.275	0.257	0.257	0.257	0.257	0.257	0.257
135	0.611	0.407	0.326	0.280	0.257	0.257	0.257	0.257	0.257	0.257
140	0.633	0.418	0.333	0.286	0.261	0.257	0.257	0.257	0.257	0.257
145	0.656	0.429	0.339	0.292	0.265	0.257	0.257	0.257	0.257	0.257
150	0.678	0.440	0.345	0.297	0.270	0.257	0.257	0.257	0.257	0.257
155	0.701	0.451	0.352	0.303	0.275	0.257	0.257	0.257	0.257	0.257
160	0.722	0.462	0.358	0.309	0.280	0.257	0.257	0.257	0.257	0.257
165	0.742	0.473	0.364	0.314	0.284	0.260	0.257	0.257	0.257	0.257
170	0.763	0.484	0.371	0.320	0.289	0.264	0.257	0.257	0.257	0.257
175	0.783	0.495	0.377	0.325	0.294	0.268	0.258	0.257	0.257	0.257
180	0.804	0.506	0.383	0.331	0.299	0.271	0.261	0.257	0.257	0.257
185	0.824	0.517	0.390	0.337	0.304	0.275	0.265	0.257	0.257	0.257
190	0.845	0.528	0.396	0.342	0.308	0.279	0.269	0.257	0.257	0.257
195	0.865	0.539	0.402	0.348	0.313	0.283	0.272	0.257	0.257	0.257
200	0.886	0.550	0.409	0.354	0.318	0.287	0.276	0.259	0.257	0.257
205	0.906	0.561	0.415	0.359	0.323	0.291	0.279	0.262	0.257	0.257
210	0.927	0.572	0.421	0.365	0.327	0.295	0.283	0.265	0.257	0.257
215	0.948	0.583	0.428	0.371	0.332	0.299	0.287	0.268	0.257	0.257
220	0.968	0.594	0.434	0.376	0.337	0.303	0.290	0.272	0.257	0.257
225	0.989	0.605	0.440	0.382	0.342	0.307	0.294	0.275	0.257	0.257
230	1.009	0.616	0.447	0.387	0.346	0.311	0.298	0.278	0.257	0.257
235	1.030	0.627	0.453	0.393	0.351	0.315	0.301	0.281	0.257	0.257
240	1.050	0.638	0.459	0.399	0.356	0.319	0.305	0.284	0.257	0.257
245	1.071	0.649	0.466	0.404	0.361	0.323	0.308	0.287	0.257	0.257
250	1.091	0.660	0.472	0.410	0.366	0.327	0.312	0.291	0.257	0.257
255	1.112	0.671	0.479	0.416	0.370	0.331	0.316	0.294	0.257	0.257
260	1.132	0.682	0.485	0.421	0.375	0.334	0.319	0.297	0.257	0.257
265	1.153	0.693	0.491	0.427	0.380	0.338	0.323	0.300	0.257	0.257
270	1.173	0.704	0.498	0.432	0.385	0.342	0.326	0.303	0.257	0.257
275	1.194	0.722	0.504	0.438	0.389	0.346	0.330	0.306	0.257	0.257
280	1.214	0.745	0.510	0.444	0.394	0.350	0.334	0.310	0.259	0.257
285	1.235	0.767	0.517	0.449	0.399	0.354	0.337	0.313	0.262	0.257
290	1.255	0.790	0.523	0.455	0.404	0.358	0.341	0.316	0.266	0.257
295	1.276	0.812	0.529	0.461	0.408	0.362	0.345	0.319	0.270	0.257
300	1.297	0.834	0.536	0.466	0.413	0.366	0.348	0.322	0.273	0.257
305	1.317	0.857	0.542	0.472	0.418	0.370	0.352	0.326	0.277	0.257
310	1.338	0.879	0.548	0.477	0.423	0.374	0.355	0.329	0.281	0.257
315	1.358	0.902	0.555	0.483	0.428	0.378	0.359	0.332	0.285	0.257
320	1.379	0.924	0.561	0.489	0.432	0.382	0.363	0.335	0.288	0.257
325	1.399	0.947	0.567	0.494	0.437	0.386	0.366	0.338	0.292	0.257
330	1.420	0.969	0.574	0.500	0.442	0.390	0.370	0.341	0.296	0.257
335	1.440	0.991	0.580	0.506	0.447	0.393	0.374	0.345	0.299	0.257
340	1.461	1.014	0.586	0.511	0.451	0.397	0.377	0.348	0.303	0.257
345	1.481	1.036	0.593	0.517	0.456	0.401	0.381	0.351	0.307	0.257
350	1.502	1.059	0.599	0.523	0.461	0.405	0.384	0.354	0.310	0.257
355	1.522	1.081	0.605	0.528	0.466	0.409	0.388	0.357	0.314	0.257
360	1.543	1.104	0.612	0.534	0.470	0.413	0.392	0.360	0.318	0.257
365	1.563	1.126	0.618	0.539	0.475	0.417	0.395	0.364	0.321	0.257
370	1.584	1.148	0.624	0.545	0.480	0.421	0.399	0.367	0.325	0.257
375	1.605	1.171	0.631	0.551	0.485	0.425	0.402	0.370	0.329	0.257
380	1.625	1.193	0.637	0.556	0.490	0.429	0.406	0.373	0.332	0.257
385	1.646	1.216	0.644	0.562	0.494	0.433	0.410	0.376	0.336	0.257
390	1.666	1.238	0.650	0.568	0.499	0.437	0.413	0.380	0.340	0.257
395	1.687	1.261	0.656	0.573	0.504	0.441	0.417	0.383	0.343	0.257
400	1.707	1.283	0.663	0.579	0.509	0.445	0.421	0.386	0.347	0.257

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top

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Table 3: I-Section Beams 45 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	0.476	0.350	0.265	0.257	0.257	0.257	0.257	0.257	0.257	0.257
55	0.525	0.384	0.292	0.257	0.257	0.257	0.257	0.257	0.257	0.257
60	0.573	0.417	0.320	0.265	0.262	0.257	0.257	0.257	0.257	0.257
65	0.622	0.451	0.347	0.283	0.269	0.257	0.257	0.257	0.257	0.257
70	0.671	0.485	0.374	0.302	0.275	0.257	0.257	0.257	0.257	0.257
75	0.714	0.519	0.402	0.320	0.282	0.257	0.257	0.257	0.257	0.257
80	0.741	0.553	0.429	0.338	0.289	0.262	0.257	0.257	0.257	0.257
85	0.767	0.586	0.456	0.357	0.296	0.268	0.257	0.257	0.257	0.257
90	0.794	0.620	0.484	0.375	0.303	0.274	0.260	0.257	0.257	0.257
95	0.821	0.654	0.511	0.393	0.310	0.280	0.266	0.257	0.257	0.257
100	0.847	0.688	0.538	0.412	0.317	0.286	0.271	0.257	0.257	0.257
105	0.874	0.717	0.566	0.430	0.323	0.292	0.277	0.257	0.257	0.257
110	0.901	0.740	0.593	0.448	0.330	0.298	0.283	0.259	0.257	0.257
115	0.927	0.764	0.620	0.467	0.337	0.304	0.288	0.264	0.257	0.257
120	0.954	0.787	0.648	0.485	0.344	0.310	0.294	0.269	0.257	0.257
125	0.981	0.810	0.675	0.503	0.351	0.316	0.300	0.274	0.257	0.257
130	1.008	0.833	0.702	0.522	0.358	0.322	0.305	0.280	0.257	0.257
135	1.034	0.857	0.724	0.540	0.365	0.328	0.311	0.285	0.257	0.257
140	1.061	0.880	0.745	0.558	0.371	0.334	0.317	0.290	0.257	0.257
145	1.088	0.903	0.766	0.577	0.378	0.340	0.322	0.295	0.257	0.257
150	1.114	0.926	0.786	0.595	0.385	0.346	0.328	0.301	0.257	0.257
155	1.141	0.950	0.807	0.613	0.392	0.352	0.334	0.306	0.259	0.257
160	1.168	0.973	0.828	0.632	0.399	0.358	0.339	0.311	0.266	0.257
165	1.194	0.996	0.849	0.650	0.406	0.364	0.345	0.316	0.273	0.257
170	1.221	1.020	0.870	0.668	0.413	0.370	0.351	0.322	0.279	0.257
175	1.248	1.043	0.890	0.687	0.419	0.376	0.356	0.327	0.286	0.257
180	1.275	1.066	0.911	0.705	0.426	0.382	0.362	0.332	0.293	0.257
185	1.301	1.089	0.932	0.725	0.433	0.388	0.368	0.337	0.299	0.257
190	1.328	1.113	0.953	0.745	0.440	0.394	0.373	0.343	0.306	0.260
195	1.355	1.136	0.973	0.765	0.447	0.400	0.379	0.348	0.313	0.265
200	1.381	1.159	0.994	0.785	0.454	0.406	0.385	0.353	0.319	0.271
205	1.408	1.182	1.015	0.805	0.460	0.411	0.390	0.358	0.326	0.276
210	1.435	1.206	1.036	0.825	0.467	0.417	0.396	0.364	0.333	0.281
215	1.461	1.229	1.056	0.845	0.474	0.423	0.402	0.369	0.339	0.287
220	1.488	1.252	1.077	0.865	0.481	0.429	0.407	0.374	0.346	0.292
225	1.515	1.276	1.098	0.885	0.488	0.435	0.413	0.380	0.353	0.298
230	1.542	1.299	1.119	0.905	0.495	0.441	0.419	0.385	0.359	0.303
235	1.568	1.322	1.139	0.925	0.502	0.447	0.424	0.390	0.366	0.308
240	1.595	1.345	1.160	0.945	0.508	0.453	0.430	0.395	0.373	0.314
245	1.622	1.369	1.181	0.965	0.515	0.459	0.436	0.401	0.379	0.319
250	1.648	1.392	1.202	0.985	0.522	0.465	0.441	0.406	0.386	0.325
255	1.675	1.415	1.223	1.005	0.529	0.471	0.447	0.411	0.393	0.330
260	1.702	1.438	1.243	1.025	0.536	0.477	0.453	0.416	0.399	0.336
265	1.728	1.462	1.264	1.045	0.543	0.483	0.458	0.422	0.406	0.341
270	1.755	1.485	1.285	1.065	0.550	0.489	0.464	0.427	0.413	0.346
275	1.782	1.508	1.306	1.085	0.556	0.495	0.470	0.432	0.419	0.352
280	1.813	1.532	1.326	1.105	0.563	0.501	0.475	0.437	0.426	0.357
285	1.876	1.555	1.347	1.125	0.570	0.507	0.481	0.443	0.433	0.363
290	1.938	1.578	1.368	1.145	0.577	0.513	0.487	0.448	0.439	0.368
295	2.001	1.601	1.389	1.165	0.584	0.519	0.493	0.453	0.446	0.373
300	2.064	1.625	1.409	1.185	0.591	0.525	0.498	0.458	0.453	0.379
305	2.126	1.648	1.430	1.205	0.597	0.531	0.504	0.464	0.459	0.384
310	2.189	1.671	1.451	1.225	0.604	0.537	0.510	0.469	0.466	0.390
315	2.251	1.694	1.472	1.245	0.611	0.543	0.515	0.474	0.473	0.395
320	2.314	1.718	1.493	1.265	0.618	0.549	0.521	0.479	0.479	0.400
325	2.377	1.741	1.513	1.285	0.625	0.555	0.527	0.486	0.486	0.406
330	2.439	1.764	1.534	1.305	0.632	0.561	0.532	0.493	0.493	0.411
335	2.502	1.788	1.555	1.325	0.639	0.567	0.538	0.499	0.499	0.417
340	2.564	1.820	1.576	1.345	0.645	0.573	0.544	0.506	0.506	0.422
345	2.627	1.880	1.596	1.365	0.652	0.579	0.549	0.513	0.513	0.427
350	2.689	1.940	1.617	1.386	0.659	0.585	0.555	0.519	0.519	0.433
355	2.752	2.001	1.638	1.406	0.666	0.590	0.561	0.526	0.526	0.438
360	2.815	2.061	1.659	1.426	0.673	0.596	0.566	0.533	0.533	0.444
365	2.877	2.121	1.679	1.446	0.680	0.602	0.572	0.539	0.539	0.449
370	2.940	2.181	1.700	1.466	0.687	0.608	0.578	0.546	0.546	0.455
375	3.002	2.241	1.721	1.486	0.693	0.614	0.583	0.553	0.553	0.460
380	3.065	2.302	1.742	1.506	0.700	0.620	0.589	0.559	0.559	0.465
385	3.114	2.362	1.763	1.526	0.708	0.626	0.595	0.566	0.566	0.471
390	3.140	2.422	1.783	1.546	0.749	0.632	0.600	0.573	0.573	0.476
395	3.166	2.482	1.804	1.566	0.790	0.638	0.606	0.579	0.579	0.482
400	3.192	2.542	1.825	1.586	0.831	0.644	0.612	0.586	0.586	0.487

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 4: I-Section Beams 60 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	0.740	0.558	0.433	0.346	0.346	0.257	0.257	0.257	0.257	0.257
55	0.805	0.614	0.478	0.381	0.369	0.267	0.264	0.264	0.257	0.257
60	0.869	0.669	0.524	0.416	0.391	0.285	0.270	0.270	0.257	0.257
65	0.934	0.717	0.570	0.450	0.413	0.304	0.285	0.277	0.257	0.257
70	0.998	0.746	0.616	0.485	0.435	0.322	0.301	0.284	0.257	0.257
75	1.062	0.776	0.661	0.519	0.457	0.340	0.317	0.291	0.257	0.257
80	1.127	0.805	0.707	0.554	0.479	0.358	0.332	0.298	0.257	0.257
85	1.191	0.835	0.733	0.589	0.502	0.377	0.348	0.304	0.266	0.257
90	1.256	0.865	0.759	0.623	0.524	0.395	0.363	0.311	0.275	0.257
95	1.320	0.894	0.784	0.658	0.546	0.413	0.379	0.318	0.283	0.257
100	1.385	0.924	0.810	0.692	0.568	0.431	0.394	0.325	0.292	0.257
105	1.449	0.953	0.836	0.721	0.590	0.450	0.410	0.332	0.301	0.257
110	1.514	0.983	0.862	0.744	0.612	0.468	0.425	0.338	0.309	0.263
115	1.578	1.013	0.887	0.768	0.634	0.486	0.441	0.345	0.318	0.270
120	1.643	1.042	0.913	0.791	0.657	0.505	0.456	0.352	0.327	0.278
125	1.707	1.072	0.939	0.815	0.679	0.523	0.472	0.359	0.336	0.286
130	1.771	1.102	0.965	0.838	0.701	0.541	0.488	0.366	0.344	0.294
135	1.825	1.131	0.990	0.862	0.723	0.559	0.503	0.372	0.353	0.301
140	1.868	1.161	1.016	0.885	0.745	0.578	0.519	0.379	0.362	0.309
145	1.910	1.190	1.042	0.909	0.767	0.596	0.534	0.386	0.370	0.317
150	1.953	1.220	1.068	0.932	0.790	0.614	0.550	0.393	0.379	0.325
155	1.995	1.250	1.094	0.956	0.812	0.632	0.565	0.400	0.388	0.332
160	2.038	1.279	1.119	0.980	0.834	0.651	0.581	0.406	0.396	0.340
165	2.080	1.309	1.145	1.003	0.856	0.669	0.596	0.413	0.405	0.348
170	2.122	1.338	1.171	1.027	0.878	0.687	0.612	0.420	0.414	0.356
175	2.165	1.368	1.197	1.050	0.900	0.705	0.627	0.427	0.422	0.363
180	2.207	1.398	1.222	1.074	0.923	0.727	0.643	0.434	0.431	0.371
185	2.250	1.427	1.248	1.097	0.945	0.749	0.658	0.440	0.440	0.379
190	2.292	1.457	1.274	1.121	0.967	0.771	0.674	0.448	0.448	0.386
195	2.335	1.486	1.300	1.144	0.989	0.793	0.690	0.457	0.457	0.394
200	2.377	1.516	1.326	1.168	1.011	0.815	0.705	0.466	0.466	0.402
205	2.419	1.546	1.351	1.191	1.033	0.836	0.726	0.474	0.474	0.410
210	2.462	1.575	1.377	1.215	1.056	0.858	0.749	0.483	0.483	0.417
215	2.504	1.605	1.403	1.239	1.078	0.880	0.771	0.492	0.492	0.425
220	2.547	1.634	1.429	1.262	1.100	0.902	0.793	0.501	0.501	0.433
225	2.589	1.664	1.454	1.286	1.122	0.924	0.815	0.509	0.509	0.441
230	2.632	1.694	1.480	1.309	1.144	0.946	0.837	0.518	0.518	0.448
235	2.674	1.723	1.506	1.333	1.166	0.968	0.860	0.527	0.527	0.456
240	2.717	1.753	1.532	1.356	1.188	0.990	0.882	0.535	0.535	0.464
245	2.759	1.783	1.557	1.380	1.211	1.012	0.904	0.544	0.544	0.472
250	2.801	1.824	1.583	1.403	1.233	1.034	0.926	0.553	0.553	0.479
255	2.844	1.902	1.609	1.427	1.255	1.056	0.948	0.561	0.561	0.487
260	2.886	1.979	1.635	1.450	1.277	1.078	0.971	0.570	0.570	0.495
265	2.929	2.057	1.661	1.474	1.299	1.099	0.993	0.579	0.579	0.502
270	2.971	2.135	1.686	1.498	1.321	1.121	1.015	0.587	0.587	0.510
275	3.014	2.213	1.712	1.521	1.344	1.143	1.037	0.596	0.596	0.518
280	3.056	2.290	1.738	1.545	1.366	1.165	1.059	0.605	0.605	0.526
285	3.098	2.368	1.764	1.568	1.388	1.187	1.082	0.613	0.613	0.533
290	3.134	2.446	1.789	1.592	1.410	1.209	1.104	0.622	0.622	0.541
295	3.169	2.524	1.837	1.615	1.432	1.231	1.126	0.631	0.631	0.549
300	3.204	2.601	1.916	1.639	1.454	1.253	1.148	0.639	0.639	0.557
305	3.238	2.679	1.996	1.662	1.477	1.275	1.170	0.648	0.648	0.564
310	3.273	2.757	2.075	1.686	1.499	1.297	1.193	0.657	0.657	0.572
315	3.308	2.835	2.155	1.709	1.521	1.319	1.215	0.666	0.666	0.580
320	3.342	2.912	2.234	1.733	1.543	1.340	1.237	0.674	0.674	0.588
325	3.377	2.990	2.314	1.757	1.565	1.362	1.259	0.683	0.683	0.595
330	3.412	3.068	2.393	1.780	1.587	1.384	1.281	0.692	0.692	0.603
335	3.446	3.122	2.473	1.804	1.609	1.406	1.304	0.700	0.700	0.611
340	3.481	3.154	2.552	1.879	1.632	1.428	1.326	0.713	0.713	0.618
345	3.516	3.186	2.632	1.957	1.654	1.450	1.348	0.738	0.738	0.626
350	3.550	3.218	2.711	2.035	1.676	1.472	1.370	0.764	0.764	0.634
355	3.585	3.250	2.791	2.114	1.698	1.494	1.392	0.789	0.789	0.642
360	3.620	3.282	2.870	2.192	1.720	1.516	1.415	0.815	0.815	0.649
365	3.655	3.314	2.950	2.270	1.742	1.538	1.437	0.840	0.840	0.657
370	3.689	3.346	3.029	2.349	1.765	1.560	1.459	0.866	0.866	0.665
375	3.724	3.379	3.106	2.427	1.787	1.581	1.481	0.891	0.891	0.673
380	3.759	3.411	3.138	2.505	1.818	1.603	1.503	0.917	0.917	0.680
385	3.793	3.443	3.169	2.583	1.893	1.625	1.526	0.942	0.942	0.688
390	3.828	3.475	3.200	2.662	1.967	1.647	1.548	0.968	0.968	0.696
395	3.863	3.507	3.231	2.740	2.042	1.669	1.570	0.993	0.993	0.704
400	3.897	3.539	3.262	2.818	2.117	1.691	1.592	1.019	1.019	0.711

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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RUDOLF HENSEL GMBH

Table 5: I-Section Beams 75 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	1.016	0.783	0.531	0.494	0.412	0.343	0.319	0.285	0.257	0.257
55	1.132	0.860	0.630	0.544	0.451	0.374	0.347	0.309	0.266	0.257
60	1.248	0.937	0.729	0.595	0.491	0.405	0.375	0.332	0.278	0.257
65	1.364	1.014	0.775	0.645	0.531	0.436	0.402	0.355	0.291	0.263
70	1.480	1.090	0.821	0.695	0.571	0.467	0.430	0.379	0.303	0.272
75	1.596	1.167	0.866	0.729	0.610	0.498	0.457	0.402	0.315	0.282
80	1.712	1.244	0.912	0.757	0.650	0.529	0.485	0.425	0.328	0.291
85	1.814	1.321	0.958	0.785	0.690	0.560	0.512	0.449	0.340	0.301
90	1.861	1.398	1.004	0.813	0.722	0.591	0.540	0.472	0.353	0.311
95	1.908	1.475	1.050	0.842	0.748	0.621	0.567	0.496	0.365	0.320
100	1.955	1.552	1.096	0.870	0.773	0.652	0.595	0.519	0.377	0.330
105	2.002	1.628	1.141	0.898	0.799	0.683	0.623	0.542	0.390	0.339
110	2.049	1.705	1.187	0.926	0.825	0.713	0.650	0.566	0.402	0.349
115	2.096	1.782	1.233	0.955	0.851	0.737	0.678	0.589	0.414	0.359
120	2.143	1.835	1.279	0.983	0.877	0.762	0.705	0.613	0.427	0.368
125	2.190	1.879	1.325	1.011	0.903	0.786	0.729	0.636	0.439	0.378
130	2.237	1.922	1.371	1.039	0.929	0.810	0.753	0.659	0.451	0.388
135	2.284	1.966	1.416	1.068	0.955	0.835	0.777	0.683	0.464	0.397
140	2.331	2.009	1.462	1.096	0.981	0.859	0.801	0.706	0.476	0.407
145	2.378	2.053	1.508	1.124	1.007	0.884	0.825	0.730	0.488	0.416
150	2.425	2.096	1.554	1.152	1.033	0.908	0.849	0.753	0.501	0.426
155	2.472	2.140	1.600	1.181	1.059	0.932	0.873	0.776	0.513	0.436
160	2.519	2.183	1.646	1.209	1.085	0.957	0.897	0.800	0.525	0.445
165	2.566	2.227	1.691	1.237	1.111	0.981	0.921	0.823	0.538	0.455
170	2.613	2.270	1.737	1.265	1.136	1.006	0.945	0.847	0.550	0.465
175	2.660	2.314	1.783	1.294	1.162	1.030	0.969	0.870	0.563	0.474
180	2.707	2.357	1.833	1.322	1.188	1.055	0.993	0.893	0.575	0.484
185	2.754	2.401	1.887	1.350	1.214	1.079	1.017	0.917	0.587	0.493
190	2.801	2.444	1.941	1.378	1.240	1.103	1.041	0.940	0.600	0.503
195	2.848	2.488	1.995	1.407	1.266	1.128	1.065	0.964	0.612	0.513
200	2.895	2.531	2.049	1.435	1.292	1.152	1.089	0.987	0.624	0.522
205	2.942	2.575	2.103	1.463	1.318	1.177	1.113	1.010	0.637	0.532
210	2.989	2.618	2.157	1.491	1.344	1.201	1.137	1.034	0.649	0.541
215	3.036	2.662	2.211	1.520	1.370	1.225	1.161	1.057	0.661	0.551
220	3.083	2.705	2.265	1.548	1.396	1.250	1.185	1.081	0.674	0.561
225	3.127	2.749	2.319	1.576	1.422	1.274	1.208	1.104	0.686	0.570
230	3.168	2.792	2.373	1.604	1.448	1.299	1.232	1.127	0.698	0.580
235	3.210	2.835	2.427	1.633	1.474	1.323	1.256	1.151	0.716	0.590
240	3.251	2.879	2.481	1.661	1.499	1.348	1.280	1.174	0.745	0.599
245	3.293	2.922	2.535	1.689	1.525	1.372	1.304	1.198	0.774	0.609
250	3.334	2.966	2.589	1.717	1.551	1.396	1.328	1.221	0.802	0.618
255	3.376	3.009	2.643	1.746	1.577	1.421	1.352	1.244	0.831	0.628
260	3.417	3.053	2.697	1.774	1.603	1.445	1.376	1.268	0.860	0.638
265	3.459	3.096	2.751	1.802	1.629	1.470	1.400	1.291	0.889	0.647
270	3.500	3.138	2.805	1.893	1.655	1.494	1.424	1.315	0.918	0.657
275	3.542	3.178	2.859	1.992	1.681	1.518	1.448	1.338	0.947	0.666
280	3.583	3.219	2.913	2.091	1.707	1.543	1.472	1.361	0.976	0.676
285	3.625	3.260	2.967	2.190	1.733	1.567	1.496	1.385	1.005	0.686
290	3.666	3.301	3.021	2.289	1.759	1.592	1.520	1.408	1.034	0.695
295	3.708	3.341	3.075	2.388	1.785	1.616	1.544	1.432	1.063	0.705
300	3.749	3.382	3.122	2.486	1.826	1.641	1.568	1.455	1.092	0.731
305	3.791	3.423	3.162	2.585	1.920	1.665	1.592	1.478	1.121	0.761
310	3.832	3.464	3.201	2.684	2.015	1.689	1.616	1.502	1.149	0.792
315	3.874	3.505	3.240	2.783	2.109	1.714	1.640	1.525	1.178	0.822
320	3.915	3.545	3.279	2.882	2.204	1.738	1.663	1.549	1.207	0.852
325	3.957	3.586	3.318	2.981	2.299	1.763	1.687	1.572	1.236	0.883
330	3.998	3.627	3.357	3.080	2.393	1.787	1.711	1.595	1.265	0.913
335	4.040	3.668	3.396	3.134	2.488	1.829	1.735	1.619	1.294	0.943
340	4.081	3.708	3.436	3.174	2.583	1.920	1.759	1.642	1.323	0.974
345	4.123	3.749	3.475	3.214	2.677	2.011	1.783	1.666	1.352	1.004
350	4.164	3.790	3.514	3.254	2.772	2.101	1.813	1.689	1.381	1.034
355	4.206	3.831	3.553	3.293	2.867	2.192	1.902	1.712	1.410	1.065
360	4.247	3.871	3.592	3.333	2.961	2.283	1.992	1.736	1.439	1.095
365	4.289	3.912	3.631	3.373	3.056	2.374	2.081	1.759	1.468	1.125
370	4.330	3.953	3.671	3.412	3.125	2.464	2.170	1.783	1.496	1.156
375	4.372	3.994	3.710	3.452	3.166	2.555	2.260	1.808	1.525	1.186
380	4.413	4.034	3.749	3.492	3.207	2.646	2.349	1.895	1.554	1.216
385	4.455	4.075	3.788	3.532	3.248	2.737	2.438	1.981	1.583	1.247
390	4.496	4.116	3.827	3.571	3.289	2.828	2.528	2.068	1.612	1.277
395	-	4.157	3.866	3.611	3.330	2.918	2.617	2.154	1.641	1.307
400	-	4.198	3.905	3.651	3.371	3.009	2.706	2.241	1.670	1.338

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 6: I-Section Beams 90 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	1.294	1.021	0.809	0.650	0.544	0.458	0.427	0.387	0.322	0.267
55	1.452	1.144	0.898	0.711	0.597	0.501	0.466	0.421	0.345	0.284
60	1.609	1.268	0.986	0.773	0.651	0.544	0.505	0.454	0.367	0.301
65	1.766	1.392	1.075	0.835	0.704	0.587	0.544	0.488	0.390	0.318
70	1.902	1.515	1.163	0.896	0.740	0.630	0.583	0.522	0.413	0.335
75	2.030	1.639	1.252	0.958	0.775	0.674	0.622	0.556	0.435	0.351
80	2.158	1.762	1.340	1.019	0.809	0.713	0.661	0.589	0.458	0.368
85	2.286	1.838	1.429	1.081	0.844	0.741	0.700	0.623	0.480	0.385
90	2.414	1.887	1.517	1.142	0.879	0.770	0.729	0.657	0.503	0.402
95	2.542	1.937	1.606	1.204	0.913	0.798	0.757	0.691	0.525	0.419
100	2.670	1.987	1.694	1.265	0.948	0.826	0.784	0.721	0.548	0.436
105	2.798	2.036	1.783	1.327	0.982	0.854	0.811	0.747	0.571	0.453
110	2.927	2.086	1.839	1.389	1.017	0.882	0.839	0.773	0.593	0.469
115	3.055	2.136	1.884	1.450	1.052	0.910	0.866	0.800	0.616	0.486
120	3.135	2.185	1.930	1.512	1.086	0.938	0.894	0.826	0.638	0.503
125	3.185	2.235	1.975	1.573	1.121	0.966	0.921	0.852	0.661	0.520
130	3.234	2.285	2.021	1.635	1.156	0.994	0.948	0.878	0.683	0.537
135	3.284	2.334	2.066	1.696	1.190	1.022	0.976	0.905	0.706	0.554
140	3.333	2.384	2.112	1.758	1.225	1.051	1.003	0.931	0.732	0.571
145	3.383	2.434	2.157	1.817	1.260	1.079	1.030	0.957	0.759	0.587
150	3.432	2.483	2.202	1.867	1.294	1.107	1.058	0.984	0.785	0.604
155	3.482	2.533	2.248	1.916	1.329	1.135	1.085	1.010	0.812	0.621
160	3.531	2.583	2.293	1.966	1.363	1.163	1.112	1.036	0.838	0.638
165	3.581	2.632	2.339	2.016	1.398	1.191	1.140	1.063	0.865	0.655
170	3.630	2.682	2.384	2.066	1.433	1.219	1.167	1.089	0.891	0.672
175	3.680	2.732	2.429	2.116	1.467	1.247	1.194	1.115	0.918	0.689
180	3.730	2.781	2.475	2.166	1.502	1.275	1.222	1.142	0.944	0.705
185	3.779	2.831	2.520	2.216	1.537	1.303	1.249	1.168	0.971	0.732
190	3.829	2.881	2.566	2.265	1.571	1.332	1.276	1.194	0.997	0.759
195	3.878	2.930	2.611	2.315	1.606	1.360	1.304	1.221	1.024	0.787
200	3.928	2.980	2.657	2.365	1.641	1.388	1.331	1.247	1.050	0.814
205	3.977	3.030	2.702	2.415	1.675	1.416	1.359	1.273	1.077	0.842
210	4.027	3.079	2.747	2.465	1.710	1.444	1.386	1.299	1.103	0.869
215	4.076	3.127	2.793	2.515	1.744	1.472	1.413	1.326	1.130	0.897
220	4.126	3.172	2.838	2.564	1.779	1.500	1.441	1.352	1.156	0.924
225	4.175	3.218	2.884	2.614	1.826	1.528	1.468	1.378	1.183	0.952
230	4.225	3.263	2.929	2.664	1.907	1.556	1.495	1.405	1.209	0.979
235	4.275	3.308	2.975	2.714	1.989	1.585	1.523	1.431	1.236	1.007
240	4.324	3.354	3.020	2.764	2.070	1.613	1.550	1.457	1.262	1.034
245	4.374	3.399	3.065	2.814	2.152	1.641	1.577	1.484	1.289	1.062
250	4.423	3.444	3.111	2.864	2.234	1.669	1.605	1.510	1.315	1.089
255	4.473	3.489	3.159	2.913	2.315	1.697	1.632	1.536	1.342	1.117
260	-	3.535	3.208	2.963	2.397	1.725	1.659	1.563	1.368	1.144
265	-	3.580	3.256	3.013	2.478	1.753	1.687	1.589	1.395	1.172
270	-	3.625	3.304	3.063	2.560	1.781	1.714	1.615	1.421	1.199
275	-	3.671	3.353	3.113	2.641	1.822	1.742	1.641	1.448	1.227
280	-	3.716	3.401	3.161	2.723	1.933	1.769	1.668	1.474	1.254
285	-	3.761	3.449	3.209	2.805	2.043	1.796	1.694	1.501	1.282
290	-	3.807	3.497	3.256	2.886	2.153	1.879	1.720	1.527	1.309
295	-	3.852	3.546	3.304	2.968	2.264	1.988	1.747	1.554	1.337
300	-	3.897	3.594	3.352	3.049	2.374	2.097	1.773	1.580	1.364
305	-	3.943	3.642	3.400	3.121	2.485	2.206	1.799	1.607	1.392
310	-	3.988	3.690	3.448	3.171	2.595	2.315	1.888	1.633	1.419
315	-	4.033	3.739	3.496	3.220	2.706	2.424	1.994	1.660	1.447
320	-	4.078	3.787	3.544	3.270	2.816	2.533	2.100	1.686	1.474
325	-	4.124	3.835	3.592	3.320	2.926	2.642	2.206	1.712	1.502
330	-	4.169	3.883	3.640	3.370	3.037	2.750	2.312	1.739	1.529
335	-	4.214	3.932	3.688	3.419	3.125	2.859	2.418	1.765	1.557
340	-	4.260	3.980	3.736	3.469	3.176	2.968	2.524	1.792	1.584
345	-	4.305	4.028	3.784	3.519	3.227	3.077	2.630	1.855	1.611
350	-	4.350	4.077	3.832	3.569	3.279	3.144	2.735	1.953	1.639
355	-	4.396	4.125	3.880	3.619	3.330	3.196	2.841	2.052	1.666
360	-	4.441	4.173	3.928	3.668	3.381	3.248	2.947	2.150	1.694
365	-	4.486	4.221	3.976	3.718	3.433	3.300	3.053	2.249	1.721
370	-	-	4.270	4.024	3.768	3.484	3.353	3.132	2.347	1.749
375	-	-	4.318	4.072	3.818	3.535	3.405	3.186	2.445	1.776
380	-	-	4.366	4.120	3.867	3.587	3.457	3.239	2.544	1.804
385	-	-	4.414	4.168	3.917	3.638	3.509	3.293	2.642	1.883
390	-	-	4.463	4.216	3.967	3.689	3.561	3.346	2.741	1.964
395	-	-	4.511	4.264	4.017	3.741	3.614	3.399	2.839	2.046
400	-	-	-	4.312	4.066	3.792	3.666	3.453	2.937	2.127

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 7: I-Section Beams 105 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	1.370	1.262	1.018	0.828	0.675	0.576	0.537	0.488	0.415	0.350
55	1.722	1.420	1.155	0.928	0.750	0.631	0.587	0.533	0.448	0.376
60	2.074	1.578	1.292	1.028	0.826	0.686	0.638	0.577	0.480	0.402
65	2.426	1.736	1.429	1.128	0.902	0.738	0.689	0.621	0.512	0.428
70	2.778	1.881	1.566	1.228	0.977	0.787	0.732	0.666	0.544	0.454
75	3.117	2.016	1.703	1.328	1.053	0.836	0.771	0.709	0.577	0.480
80	3.287	2.151	1.820	1.428	1.129	0.885	0.811	0.739	0.609	0.507
85	3.457	2.286	1.880	1.528	1.204	0.934	0.850	0.769	0.641	0.533
90	3.626	2.421	1.940	1.628	1.280	0.983	0.889	0.799	0.674	0.559
95	3.796	2.555	1.999	1.729	1.355	1.033	0.929	0.828	0.706	0.585
100	3.966	2.690	2.059	1.817	1.431	1.082	0.968	0.858	0.735	0.611
105	4.136	2.825	2.118	1.866	1.507	1.131	1.007	0.888	0.763	0.637
110	4.306	2.960	2.178	1.915	1.582	1.180	1.047	0.918	0.792	0.663
115	4.475	3.095	2.237	1.965	1.658	1.229	1.086	0.948	0.820	0.689
120	-	3.172	2.297	2.014	1.733	1.278	1.125	0.978	0.849	0.716
125	-	3.246	2.357	2.063	1.808	1.327	1.165	1.008	0.877	0.744
130	-	3.319	2.416	2.113	1.858	1.376	1.204	1.037	0.906	0.772
135	-	3.392	2.476	2.162	1.908	1.426	1.243	1.067	0.934	0.799
140	-	3.465	2.535	2.211	1.958	1.475	1.283	1.097	0.963	0.827
145	-	3.538	2.595	2.261	2.008	1.524	1.322	1.127	0.991	0.855
150	-	3.611	2.654	2.310	2.058	1.573	1.361	1.157	1.020	0.883
155	-	3.684	2.714	2.359	2.108	1.622	1.401	1.187	1.049	0.910
160	-	3.757	2.774	2.409	2.158	1.671	1.440	1.216	1.077	0.938
165	-	3.830	2.833	2.458	2.208	1.720	1.479	1.246	1.106	0.966
170	-	3.904	2.893	2.507	2.258	1.769	1.519	1.276	1.134	0.994
175	-	3.977	2.952	2.557	2.308	1.821	1.558	1.306	1.163	1.022
180	-	4.050	3.012	2.606	2.359	1.881	1.597	1.336	1.191	1.049
185	-	4.123	3.072	2.655	2.409	1.940	1.637	1.366	1.220	1.077
190	-	4.196	3.124	2.705	2.459	2.000	1.676	1.395	1.248	1.105
195	-	4.269	3.168	2.754	2.509	2.060	1.715	1.425	1.277	1.133
200	-	4.342	3.212	2.803	2.559	2.119	1.755	1.455	1.305	1.160
205	-	4.415	3.256	2.853	2.609	2.179	1.794	1.485	1.334	1.188
210	-	4.488	3.300	2.902	2.659	2.238	1.859	1.515	1.362	1.216
215	-	-	3.344	2.951	2.709	2.298	1.934	1.545	1.391	1.244
220	-	-	3.387	3.001	2.759	2.358	2.008	1.574	1.420	1.271
225	-	-	3.431	3.050	2.809	2.417	2.083	1.604	1.448	1.299
230	-	-	3.475	3.099	2.859	2.477	2.158	1.634	1.477	1.327
235	-	-	3.519	3.153	2.909	2.536	2.232	1.664	1.505	1.355
240	-	-	3.563	3.207	2.960	2.596	2.307	1.694	1.534	1.383
245	-	-	3.607	3.261	3.010	2.655	2.382	1.724	1.562	1.410
250	-	-	3.651	3.315	3.060	2.715	2.456	1.753	1.591	1.438
255	-	-	3.695	3.370	3.110	2.775	2.531	1.783	1.619	1.466
260	-	-	3.738	3.424	3.166	2.834	2.606	1.839	1.648	1.494
265	-	-	3.782	3.478	3.222	2.894	2.680	1.964	1.676	1.521
270	-	-	3.826	3.532	3.278	2.953	2.755	2.090	1.705	1.549
275	-	-	3.870	3.586	3.334	3.013	2.830	2.215	1.734	1.577
280	-	-	3.914	3.640	3.390	3.073	2.904	2.340	1.762	1.605
285	-	-	3.958	3.695	3.446	3.133	2.979	2.466	1.791	1.633
290	-	-	4.002	3.749	3.502	3.193	3.054	2.591	1.863	1.660
295	-	-	4.046	3.803	3.558	3.254	3.124	2.716	1.980	1.688
300	-	-	4.089	3.857	3.614	3.314	3.186	2.842	2.098	1.716
305	-	-	4.133	3.911	3.670	3.374	3.247	2.967	2.215	1.744
310	-	-	4.177	3.965	3.726	3.435	3.309	3.092	2.332	1.771
315	-	-	4.221	4.019	3.782	3.495	3.371	3.162	2.449	1.799
320	-	-	4.265	4.074	3.838	3.556	3.432	3.225	2.566	1.882
325	-	-	4.309	4.128	3.894	3.616	3.494	3.288	2.684	1.980
330	-	-	4.353	4.182	3.950	3.677	3.555	3.351	2.801	2.078
335	-	-	4.396	4.236	4.006	3.737	3.617	3.415	2.918	2.176
340	-	-	4.440	4.290	4.062	3.798	3.679	3.478	3.035	2.274
345	-	-	4.484	4.344	4.118	3.858	3.740	3.541	3.132	2.372
350	-	-	-	4.399	4.174	3.919	3.802	3.604	3.198	2.470
355	-	-	-	4.453	4.230	3.979	3.863	3.667	3.264	2.568
360	-	-	-	4.507	4.286	4.040	3.925	3.731	3.330	2.666
365	-	-	-	-	4.342	4.100	3.987	3.794	3.396	2.764
370	-	-	-	-	4.397	4.161	4.048	3.857	3.462	2.862
375	-	-	-	-	4.453	4.221	4.110	3.920	3.528	2.960
380	-	-	-	-	4.509	4.282	4.172	3.983	3.594	3.058
385	-	-	-	-	-	4.342	4.233	4.047	3.660	3.139
390	-	-	-	-	-	4.402	4.295	4.110	3.726	3.205
395	-	-	-	-	-	4.463	4.356	4.173	3.792	3.271
400	-	-	-	-	-	-	4.418	4.236	3.857	3.337

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 8: I-Section Beams 120 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	2.830	1.234	1.234	1.018	0.850	0.694	0.633	0.591	0.510	0.438
55	3.156	1.552	1.399	1.168	0.962	0.781	0.712	0.646	0.552	0.473
60	3.482	1.925	1.564	1.319	1.074	0.869	0.792	0.701	0.594	0.508
65	3.808	2.261	1.730	1.469	1.186	0.956	0.872	0.764	0.636	0.544
70	4.134	2.598	1.887	1.620	1.297	1.043	0.951	0.827	0.678	0.579
75	4.460	2.935	2.038	1.770	1.409	1.130	1.031	0.890	0.718	0.614
80	-	3.208	2.189	1.862	1.521	1.217	1.111	0.953	0.754	0.650
85	-	3.418	2.340	1.936	1.633	1.304	1.190	1.016	0.790	0.685
90	-	3.627	2.491	2.010	1.745	1.391	1.270	1.079	0.826	0.719
95	-	3.836	2.643	2.084	1.829	1.478	1.350	1.142	0.861	0.749
100	-	4.045	2.794	2.158	1.881	1.566	1.429	1.205	0.897	0.779
105	-	4.254	2.945	2.232	1.933	1.653	1.509	1.268	0.933	0.809
110	-	4.463	3.096	2.306	1.985	1.740	1.589	1.331	0.969	0.839
115	-	-	3.205	2.380	2.037	1.818	1.668	1.394	1.005	0.869
120	-	-	3.311	2.454	2.089	1.871	1.748	1.457	1.040	0.899
125	-	-	3.417	2.528	2.141	1.923	1.820	1.520	1.076	0.929
130	-	-	3.524	2.602	2.193	1.976	1.874	1.583	1.112	0.959
135	-	-	3.630	2.676	2.245	2.028	1.928	1.646	1.148	0.990
140	-	-	3.736	2.750	2.297	2.081	1.982	1.709	1.184	1.020
145	-	-	3.842	2.824	2.349	2.134	2.035	1.772	1.219	1.050
150	-	-	3.949	2.898	2.401	2.186	2.089	1.832	1.255	1.080
155	-	-	4.055	2.972	2.453	2.239	2.143	1.889	1.291	1.110
160	-	-	4.161	3.046	2.505	2.291	2.196	1.946	1.327	1.140
165	-	-	4.268	3.116	2.557	2.344	2.250	2.003	1.362	1.170
170	-	-	4.374	3.175	2.609	2.396	2.304	2.059	1.398	1.200
175	-	-	4.480	3.233	2.661	2.449	2.358	2.116	1.434	1.230
180	-	-	-	3.291	2.713	2.501	2.411	2.173	1.470	1.261
185	-	-	-	3.349	2.765	2.554	2.465	2.230	1.506	1.291
190	-	-	-	3.407	2.817	2.607	2.519	2.287	1.541	1.321
195	-	-	-	3.465	2.869	2.659	2.573	2.344	1.577	1.351
200	-	-	-	3.523	2.921	2.712	2.626	2.401	1.613	1.381
205	-	-	-	3.581	2.973	2.764	2.680	2.458	1.649	1.411
210	-	-	-	3.639	3.025	2.817	2.734	2.515	1.685	1.441
215	-	-	-	3.697	3.077	2.869	2.787	2.572	1.720	1.471
220	-	-	-	3.755	3.134	2.922	2.841	2.628	1.756	1.501
225	-	-	-	3.813	3.195	2.974	2.895	2.685	1.792	1.531
230	-	-	-	3.871	3.256	3.027	2.949	2.742	1.865	1.562
235	-	-	-	3.929	3.317	3.080	3.002	2.799	1.960	1.592
240	-	-	-	3.987	3.378	3.137	3.056	2.856	2.054	1.622
245	-	-	-	4.045	3.439	3.200	3.111	2.913	2.149	1.652
250	-	-	-	4.103	3.501	3.262	3.173	2.970	2.243	1.682
255	-	-	-	4.161	3.562	3.325	3.235	3.027	2.338	1.712
260	-	-	-	4.219	3.623	3.387	3.297	3.084	2.432	1.742
265	-	-	-	4.278	3.684	3.450	3.359	3.146	2.527	1.772
270	-	-	-	4.336	3.745	3.512	3.421	3.213	2.622	1.802
275	-	-	-	4.394	3.806	3.574	3.483	3.279	2.716	1.910
280	-	-	-	4.452	3.868	3.637	3.545	3.345	2.811	2.024
285	-	-	-	-	3.929	3.699	3.607	3.411	2.905	2.139
290	-	-	-	-	3.990	3.762	3.669	3.477	3.000	2.253
295	-	-	-	-	4.051	3.824	3.731	3.544	3.094	2.368
300	-	-	-	-	4.112	3.887	3.793	3.610	3.173	2.482
305	-	-	-	-	4.174	3.949	3.855	3.676	3.250	2.597
310	-	-	-	-	4.235	4.012	3.918	3.742	3.326	2.711
315	-	-	-	-	4.296	4.074	3.980	3.808	3.403	2.826
320	-	-	-	-	4.357	4.136	4.042	3.875	3.479	2.940
325	-	-	-	-	4.418	4.199	4.104	3.941	3.556	3.054
330	-	-	-	-	4.479	4.261	4.166	4.007	3.632	3.148
335	-	-	-	-	-	4.324	4.228	4.073	3.709	3.225
340	-	-	-	-	-	4.386	4.290	4.139	3.786	3.302
345	-	-	-	-	-	4.449	4.352	4.205	3.862	3.379
350	-	-	-	-	-	-	4.414	4.272	3.939	3.456
355	-	-	-	-	-	-	4.476	4.338	4.015	3.533
360	-	-	-	-	-	-	-	4.404	4.092	3.610
365	-	-	-	-	-	-	-	4.470	4.168	3.687
370	-	-	-	-	-	-	-	-	4.245	3.765
375	-	-	-	-	-	-	-	-	4.321	3.842
380	-	-	-	-	-	-	-	-	4.398	3.919
385	-	-	-	-	-	-	-	-	4.475	3.996
390	-	-	-	-	-	-	-	-	-	4.073
395	-	-	-	-	-	-	-	-	-	4.150
400	-	-	-	-	-	-	-	-	-	4.227

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 9: I-Section Beams 150 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	-	-	1.414	1.414	1.207	1.117	1.063	0.965	0.721	0.535
55	-	-	2.116	1.606	1.384	1.268	1.203	1.085	0.825	0.635
60	-	-	3.027	1.797	1.561	1.420	1.343	1.205	0.928	0.735
65	-	-	3.105	2.153	1.737	1.571	1.483	1.326	1.032	0.814
70	-	-	3.183	2.516	1.924	1.723	1.624	1.446	1.136	0.893
75	-	-	3.260	2.879	2.116	1.854	1.764	1.567	1.239	0.973
80	-	-	-	3.211	2.308	1.962	1.867	1.687	1.343	1.052
85	-	-	-	3.491	2.499	2.070	1.954	1.806	1.447	1.131
90	-	-	-	3.772	2.691	2.178	2.042	1.868	1.550	1.210
95	-	-	-	4.052	2.883	2.286	2.129	1.930	1.654	1.290
100	-	-	-	4.332	3.075	2.393	2.217	1.992	1.757	1.369
105	-	-	-	-	3.260	2.501	2.304	2.054	1.835	1.448
110	-	-	-	-	3.443	2.609	2.392	2.116	1.889	1.528
115	-	-	-	-	3.625	2.717	2.479	2.178	1.944	1.607
120	-	-	-	-	3.808	2.825	2.567	2.240	1.999	1.686
125	-	-	-	-	3.991	2.932	2.654	2.302	2.054	1.765
130	-	-	-	-	4.174	3.040	2.742	2.363	2.109	1.835
135	-	-	-	-	4.357	3.154	2.829	2.425	2.163	1.894
140	-	-	-	-	-	3.277	2.917	2.487	2.218	1.954
145	-	-	-	-	-	3.401	3.004	2.549	2.273	2.013
150	-	-	-	-	-	3.524	3.092	2.611	2.328	2.072
155	-	-	-	-	-	3.647	3.194	2.673	2.383	2.132
160	-	-	-	-	-	3.771	3.299	2.735	2.437	2.191
165	-	-	-	-	-	3.894	3.405	2.797	2.492	2.251
170	-	-	-	-	-	4.017	3.510	2.859	2.547	2.310
175	-	-	-	-	-	4.140	3.615	2.921	2.602	2.369
180	-	-	-	-	-	4.264	3.720	2.983	2.657	2.429
185	-	-	-	-	-	4.387	3.825	3.044	2.711	2.488
190	-	-	-	-	-	4.510	3.930	3.108	2.766	2.548
195	-	-	-	-	-	-	4.036	3.263	2.821	2.607
200	-	-	-	-	-	-	4.141	3.418	2.876	2.666
205	-	-	-	-	-	-	4.246	3.572	2.931	2.726
210	-	-	-	-	-	-	4.351	3.727	2.985	2.785
215	-	-	-	-	-	-	4.456	3.881	3.040	2.845
220	-	-	-	-	-	-	-	4.036	3.095	2.904
225	-	-	-	-	-	-	-	4.191	3.188	2.963
230	-	-	-	-	-	-	-	4.345	3.290	3.023
235	-	-	-	-	-	-	-	4.500	3.392	3.082
240	-	-	-	-	-	-	-	-	3.494	3.151
245	-	-	-	-	-	-	-	-	3.595	3.225
250	-	-	-	-	-	-	-	-	3.697	3.299
255	-	-	-	-	-	-	-	-	3.799	3.373
260	-	-	-	-	-	-	-	-	3.901	3.447
265	-	-	-	-	-	-	-	-	4.003	3.521
270	-	-	-	-	-	-	-	-	4.105	3.595
275	-	-	-	-	-	-	-	-	4.207	3.669
280	-	-	-	-	-	-	-	-	4.308	3.743
285	-	-	-	-	-	-	-	-	4.410	3.817
290	-	-	-	-	-	-	-	-	-	3.892
295	-	-	-	-	-	-	-	-	-	3.966
300	-	-	-	-	-	-	-	-	-	4.040
305	-	-	-	-	-	-	-	-	-	4.114
310	-	-	-	-	-	-	-	-	-	4.188
315	-	-	-	-	-	-	-	-	-	4.262
320	-	-	-	-	-	-	-	-	-	4.336
325	-	-	-	-	-	-	-	-	-	4.410
330	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 10: I-Section Beams 180 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
50	-	-	-	-	1.449	1.433	1.433	1.433	1.433	1.274
55	-	-	-	-	1.627	1.596	1.577	1.553	1.553	1.446
60	-	-	-	-	2.027	2.027	1.941	1.842	1.673	1.617
65	-	-	-	-	3.390	2.362	2.200	2.028	1.794	1.789
70	-	-	-	-	3.961	2.697	2.460	2.213	1.909	1.868
75	-	-	-	-	-	3.032	2.719	2.399	2.025	1.937
80	-	-	-	-	-	3.448	2.979	2.584	2.140	2.006
85	-	-	-	-	-	3.887	3.300	2.770	2.255	2.075
90	-	-	-	-	-	4.326	3.681	2.956	2.370	2.144
95	-	-	-	-	-	-	4.062	3.171	2.485	2.213
100	-	-	-	-	-	-	4.442	3.510	2.600	2.283

Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top.

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Table 11: I-Section Columns 15 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
55	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
60	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
65	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
70	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
75	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
80	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
85	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
90	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
95	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
100	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
105	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
110	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
115	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
120	0.234	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
125	0.242	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
130	0.250	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
135	0.258	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
140	0.267	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
145	0.275	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
150	0.283	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
155	0.291	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
160	0.300	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
165	0.308	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
170	0.316	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
175	0.325	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
180	0.333	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
185	0.341	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
190	0.349	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
195	0.358	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
200	0.366	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
205	0.374	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
210	0.382	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
215	0.391	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
220	0.399	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
225	0.407	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
230	0.416	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
235	0.424	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
240	0.432	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
245	0.440	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
250	0.449	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
255	0.457	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
260	0.465	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
265	0.474	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
270	0.482	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
275	0.490	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
280	0.498	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
285	0.507	0.233	0.233	0.233	0.233	0.233	0.233	0.233	0.233
290	0.515	0.241	0.233	0.233	0.233	0.233	0.233	0.233	0.233
295	0.523	0.250	0.233	0.233	0.233	0.233	0.233	0.233	0.233
300	0.531	0.259	0.233	0.233	0.233	0.233	0.233	0.233	0.233
305	0.540	0.268	0.233	0.233	0.233	0.233	0.233	0.233	0.233
310	0.548	0.277	0.233	0.233	0.233	0.233	0.233	0.233	0.233
315	0.556	0.286	0.233	0.233	0.233	0.233	0.233	0.233	0.233
320	0.565	0.295	0.233	0.233	0.233	0.233	0.233	0.233	0.233
325	0.573	0.304	0.240	0.233	0.233	0.233	0.233	0.233	0.233
330	0.581	0.313	0.246	0.233	0.233	0.233	0.233	0.233	0.233
335	0.589	0.322	0.253	0.233	0.233	0.233	0.233	0.233	0.233
340	0.598	0.332	0.260	0.233	0.233	0.233	0.233	0.233	0.233
345	0.606	0.341	0.267	0.233	0.233	0.233	0.233	0.233	0.233
350	0.614	0.350	0.274	0.233	0.233	0.233	0.233	0.233	0.233

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Tabulated values continued

Table 11: I-Section Columns 15 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	0.622	0.359	0.281	0.233	0.233	0.233	0.233	0.233	0.233
360	0.631	0.368	0.287	0.233	0.233	0.233	0.233	0.233	0.233
365	0.639	0.377	0.294	0.233	0.233	0.233	0.233	0.233	0.233
370	0.647	0.386	0.301	0.233	0.233	0.233	0.233	0.233	0.233
375	0.656	0.395	0.308	0.233	0.233	0.233	0.233	0.233	0.233
380	0.664	0.404	0.315	0.233	0.233	0.233	0.233	0.233	0.233
385	0.672	0.413	0.322	0.233	0.233	0.233	0.233	0.233	0.233
390	0.680	0.422	0.328	0.233	0.233	0.233	0.233	0.233	0.233
395	0.689	0.431	0.335	0.238	0.233	0.233	0.233	0.233	0.233
400	0.697	0.440	0.342	0.243	0.233	0.233	0.233	0.233	0.233
405	0.705	0.449	0.349	0.249	0.233	0.233	0.233	0.233	0.233
410	0.714	0.459	0.356	0.254	0.233	0.233	0.233	0.233	0.233
415	0.722	0.468	0.363	0.260	0.233	0.233	0.233	0.233	0.233
420	0.730	0.477	0.370	0.265	0.233	0.233	0.233	0.233	0.233
425	0.738	0.486	0.376	0.271	0.233	0.233	0.233	0.233	0.233
430	0.747	0.495	0.383	0.277	0.233	0.233	0.233	0.233	0.233
435	0.755	0.504	0.390	0.282	0.233	0.233	0.233	0.233	0.233
440	0.763	0.513	0.397	0.288	0.233	0.233	0.233	0.233	0.233
445	0.771	0.522	0.404	0.293	0.233	0.233	0.233	0.233	0.233
450	0.780	0.531	0.411	0.299	0.233	0.233	0.233	0.233	0.233
455	0.788	0.540	0.417	0.304	0.233	0.233	0.233	0.233	0.233
460	0.796	0.549	0.424	0.310	0.233	0.233	0.233	0.233	0.233
465	0.812	0.558	0.431	0.316	0.233	0.233	0.233	0.233	0.233
470	0.846	0.567	0.438	0.321	0.233	0.233	0.233	0.233	0.233

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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Table 12: I-Section Columns 30 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	0.360	0.283	0.236	0.233	0.233	0.233	0.233	0.233	0.233
55	0.380	0.296	0.246	0.233	0.233	0.233	0.233	0.233	0.233
60	0.400	0.309	0.256	0.233	0.233	0.233	0.233	0.233	0.233
65	0.420	0.322	0.266	0.233	0.233	0.233	0.233	0.233	0.233
70	0.440	0.335	0.276	0.233	0.233	0.233	0.233	0.233	0.233
75	0.460	0.348	0.285	0.242	0.233	0.233	0.233	0.233	0.233
80	0.480	0.361	0.295	0.251	0.233	0.233	0.233	0.233	0.233
85	0.500	0.374	0.305	0.259	0.233	0.233	0.233	0.233	0.233
90	0.520	0.388	0.315	0.268	0.233	0.233	0.233	0.233	0.233
95	0.540	0.401	0.325	0.276	0.233	0.233	0.233	0.233	0.233
100	0.560	0.414	0.334	0.285	0.233	0.233	0.233	0.233	0.233
105	0.580	0.427	0.344	0.293	0.233	0.233	0.233	0.233	0.233
110	0.600	0.440	0.354	0.302	0.233	0.233	0.233	0.233	0.233
115	0.620	0.453	0.364	0.310	0.240	0.233	0.233	0.233	0.233
120	0.640	0.466	0.374	0.319	0.248	0.233	0.233	0.233	0.233
125	0.660	0.479	0.383	0.327	0.256	0.233	0.233	0.233	0.233
130	0.680	0.493	0.393	0.336	0.264	0.233	0.233	0.233	0.233
135	0.700	0.506	0.403	0.345	0.271	0.233	0.233	0.233	0.233
140	0.720	0.519	0.413	0.353	0.279	0.233	0.233	0.233	0.233
145	0.740	0.532	0.422	0.362	0.287	0.233	0.233	0.233	0.233
150	0.760	0.545	0.432	0.370	0.295	0.233	0.233	0.233	0.233
155	0.780	0.558	0.442	0.379	0.303	0.233	0.233	0.233	0.233
160	0.800	0.571	0.452	0.387	0.311	0.233	0.233	0.233	0.233
165	0.829	0.584	0.462	0.396	0.318	0.233	0.233	0.233	0.233
170	0.859	0.597	0.471	0.404	0.326	0.233	0.233	0.233	0.233
175	0.889	0.611	0.481	0.413	0.334	0.233	0.233	0.233	0.233
180	0.920	0.624	0.491	0.421	0.342	0.233	0.233	0.233	0.233
185	0.950	0.637	0.501	0.430	0.350	0.233	0.233	0.233	0.233
190	0.980	0.650	0.511	0.439	0.357	0.233	0.233	0.233	0.233
195	1.010	0.663	0.520	0.447	0.365	0.233	0.233	0.233	0.233
200	1.040	0.676	0.530	0.456	0.373	0.233	0.233	0.233	0.233
205	1.071	0.689	0.540	0.464	0.381	0.233	0.233	0.233	0.233
210	1.101	0.702	0.550	0.473	0.389	0.233	0.233	0.233	0.233
215	1.131	0.715	0.559	0.481	0.396	0.233	0.233	0.233	0.233
220	1.161	0.729	0.569	0.490	0.404	0.233	0.233	0.233	0.233
225	1.192	0.742	0.579	0.498	0.412	0.233	0.233	0.233	0.233
230	1.222	0.755	0.589	0.507	0.420	0.233	0.233	0.233	0.233
235	1.252	0.768	0.599	0.516	0.428	0.233	0.233	0.233	0.233
240	1.282	0.781	0.608	0.524	0.436	0.233	0.233	0.233	0.233
245	1.312	0.794	0.618	0.533	0.443	0.233	0.233	0.233	0.233
250	1.343	0.816	0.628	0.541	0.451	0.233	0.233	0.233	0.233
255	1.370	0.850	0.638	0.550	0.459	0.233	0.233	0.233	0.233
260	1.390	0.884	0.648	0.558	0.467	0.233	0.233	0.233	0.233
265	1.410	0.918	0.657	0.567	0.475	0.233	0.233	0.233	0.233
270	1.430	0.952	0.667	0.575	0.482	0.233	0.233	0.233	0.233
275	1.450	0.986	0.677	0.584	0.490	0.233	0.233	0.233	0.233
280	1.471	1.021	0.687	0.592	0.498	0.238	0.233	0.233	0.233
285	1.491	1.055	0.697	0.601	0.506	0.248	0.233	0.233	0.233
290	1.511	1.089	0.706	0.610	0.514	0.258	0.233	0.233	0.233
295	1.531	1.123	0.716	0.618	0.521	0.268	0.234	0.233	0.233
300	1.551	1.157	0.726	0.627	0.529	0.278	0.241	0.233	0.233
305	1.571	1.191	0.736	0.635	0.537	0.288	0.249	0.233	0.233
310	1.592	1.225	0.745	0.644	0.545	0.298	0.256	0.233	0.233
315	1.612	1.260	0.755	0.652	0.553	0.308	0.263	0.233	0.233
320	1.632	1.294	0.765	0.661	0.561	0.318	0.271	0.233	0.233
325	1.652	1.328	0.775	0.669	0.568	0.328	0.278	0.233	0.233
330	1.672	1.362	0.785	0.678	0.576	0.338	0.285	0.233	0.233
335	1.693	1.381	0.794	0.686	0.584	0.348	0.293	0.233	0.233
340	1.713	1.399	0.814	0.695	0.592	0.358	0.300	0.233	0.233
345	1.733	1.418	0.865	0.704	0.600	0.368	0.307	0.233	0.233
350	1.753	1.436	0.917	0.712	0.607	0.378	0.315	0.233	0.233

Tabulated values continued

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Table 12: I-Section Columns 30 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	1.773	1.455	0.968	0.721	0.615	0.388	0.322	0.233	0.233
360	1.793	1.473	1.020	0.729	0.623	0.398	0.329	0.236	0.233
365	1.814	1.492	1.072	0.738	0.631	0.408	0.337	0.242	0.233
370	1.834	1.510	1.123	0.746	0.639	0.418	0.344	0.247	0.233
375	1.854	1.529	1.175	0.755	0.646	0.428	0.351	0.253	0.233
380	1.874	1.547	1.226	0.763	0.654	0.438	0.359	0.258	0.233
385	1.894	1.566	1.278	0.772	0.662	0.448	0.366	0.264	0.233
390	1.915	1.584	1.330	0.781	0.670	0.458	0.374	0.270	0.233
395	1.935	1.602	1.369	0.789	0.678	0.468	0.381	0.275	0.233
400	1.955	1.621	1.385	0.798	0.686	0.478	0.388	0.281	0.233
405	1.975	1.639	1.401	0.825	0.693	0.488	0.396	0.286	0.233
410	1.995	1.658	1.418	0.872	0.701	0.498	0.403	0.292	0.233
415	2.016	1.676	1.434	0.920	0.709	0.508	0.410	0.298	0.233
420	2.036	1.695	1.450	0.967	0.717	0.518	0.418	0.303	0.233
425	2.056	1.713	1.466	1.014	0.725	0.528	0.425	0.309	0.233
430	2.080	1.732	1.483	1.062	0.732	0.539	0.432	0.314	0.233
435	2.115	1.750	1.499	1.109	0.740	0.549	0.440	0.320	0.233
440	2.149	1.769	1.515	1.156	0.748	0.559	0.447	0.325	0.233
445	2.184	1.787	1.532	1.203	0.756	0.569	0.454	0.331	0.233
450	2.218	1.806	1.548	1.251	0.764	0.579	0.462	0.337	0.233
455	2.253	1.824	1.564	1.298	0.771	0.589	0.469	0.342	0.233
460	2.287	1.842	1.581	1.345	0.779	0.599	0.477	0.348	0.233
465	2.321	1.861	1.597	1.372	0.787	0.609	0.484	0.353	0.233
470	2.356	1.879	1.613	1.386	0.795	0.619	0.491	0.359	0.233

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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Table 13: I-Section Columns 45 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	0.581	0.467	0.390	0.330	0.280	0.242	0.233	0.233	0.233
55	0.622	0.495	0.410	0.345	0.292	0.252	0.233	0.233	0.233
60	0.662	0.523	0.430	0.360	0.304	0.261	0.233	0.233	0.233
65	0.703	0.552	0.451	0.375	0.315	0.270	0.234	0.233	0.233
70	0.743	0.580	0.471	0.389	0.327	0.280	0.243	0.233	0.233
75	0.784	0.609	0.491	0.404	0.338	0.289	0.251	0.233	0.233
80	0.838	0.637	0.511	0.419	0.350	0.299	0.259	0.233	0.233
85	0.902	0.665	0.532	0.434	0.362	0.308	0.268	0.233	0.233
90	0.967	0.694	0.552	0.448	0.373	0.318	0.276	0.233	0.233
95	1.031	0.722	0.572	0.463	0.385	0.327	0.285	0.233	0.233
100	1.095	0.751	0.592	0.478	0.396	0.337	0.293	0.233	0.233
105	1.160	0.779	0.613	0.493	0.408	0.346	0.301	0.233	0.233
110	1.224	0.808	0.633	0.507	0.420	0.356	0.310	0.236	0.233
115	1.289	0.841	0.653	0.522	0.431	0.365	0.318	0.244	0.233
120	1.353	0.874	0.673	0.537	0.443	0.374	0.327	0.252	0.233
125	1.387	0.908	0.694	0.552	0.455	0.384	0.335	0.259	0.233
130	1.415	0.941	0.714	0.566	0.466	0.393	0.343	0.267	0.233
135	1.444	0.974	0.734	0.581	0.478	0.403	0.352	0.275	0.233
140	1.472	1.007	0.754	0.596	0.489	0.412	0.360	0.282	0.233
145	1.500	1.040	0.775	0.611	0.501	0.422	0.368	0.290	0.233
150	1.528	1.073	0.795	0.626	0.513	0.431	0.377	0.298	0.233
155	1.557	1.106	0.822	0.640	0.524	0.441	0.385	0.305	0.233
160	1.585	1.139	0.853	0.655	0.536	0.450	0.394	0.313	0.233
165	1.613	1.172	0.884	0.670	0.547	0.460	0.402	0.321	0.233
170	1.642	1.206	0.914	0.685	0.559	0.469	0.410	0.329	0.233
175	1.670	1.239	0.945	0.699	0.571	0.478	0.419	0.336	0.233
180	1.698	1.272	0.976	0.714	0.582	0.488	0.427	0.344	0.233
185	1.727	1.305	1.007	0.729	0.594	0.497	0.436	0.352	0.233
190	1.755	1.338	1.038	0.744	0.606	0.507	0.444	0.359	0.233
195	1.783	1.369	1.069	0.758	0.617	0.516	0.452	0.367	0.233
200	1.811	1.393	1.100	0.773	0.629	0.526	0.461	0.375	0.233
205	1.840	1.416	1.130	0.788	0.640	0.535	0.469	0.382	0.233
210	1.868	1.440	1.161	0.804	0.652	0.545	0.477	0.390	0.233
215	1.896	1.464	1.192	0.838	0.664	0.554	0.486	0.398	0.233
220	1.925	1.488	1.223	0.871	0.675	0.564	0.494	0.405	0.233
225	1.953	1.512	1.254	0.905	0.687	0.573	0.503	0.413	0.233
230	1.981	1.536	1.285	0.939	0.698	0.582	0.511	0.421	0.233
235	2.010	1.559	1.315	0.973	0.710	0.592	0.519	0.428	0.233
240	2.038	1.583	1.346	1.007	0.722	0.601	0.528	0.436	0.233
245	2.066	1.607	1.374	1.041	0.733	0.611	0.536	0.444	0.233
250	2.106	1.631	1.396	1.075	0.745	0.620	0.544	0.451	0.233
255	2.147	1.655	1.419	1.109	0.756	0.630	0.553	0.459	0.233
260	2.188	1.679	1.442	1.143	0.768	0.639	0.561	0.467	0.233
265	2.229	1.702	1.465	1.176	0.780	0.649	0.570	0.474	0.233
270	2.270	1.726	1.488	1.210	0.791	0.658	0.578	0.482	0.233
275	2.311	1.750	1.511	1.244	0.805	0.668	0.586	0.490	0.233
280	2.352	1.774	1.534	1.278	0.847	0.677	0.595	0.497	0.234
285	2.393	1.798	1.556	1.312	0.889	0.686	0.603	0.505	0.243
290	2.434	1.821	1.579	1.346	0.931	0.696	0.612	0.513	0.252
295	2.475	1.845	1.602	1.374	0.973	0.705	0.620	0.520	0.261
300	2.516	1.869	1.625	1.395	1.016	0.715	0.628	0.528	0.270
305	2.557	1.893	1.648	1.416	1.058	0.724	0.637	0.536	0.279
310	2.598	1.917	1.671	1.438	1.100	0.734	0.645	0.543	0.288
315	2.639	1.941	1.694	1.459	1.142	0.743	0.653	0.551	0.297
320	2.680	1.964	1.716	1.480	1.184	0.753	0.662	0.559	0.306
325	2.721	1.988	1.739	1.502	1.226	0.762	0.670	0.566	0.315
330	2.762	2.012	1.762	1.523	1.268	0.772	0.679	0.574	0.324
335	2.803	2.036	1.785	1.544	1.310	0.781	0.687	0.582	0.332
340	2.844	2.060	1.808	1.566	1.352	0.790	0.695	0.589	0.341
345	2.885	2.099	1.831	1.587	1.377	0.800	0.704	0.597	0.350
350	2.926	2.150	1.854	1.608	1.397	0.852	0.712	0.605	0.359

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Tabulated values continued

Table 13: I-Section Columns 45 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	2.967	2.201	1.876	1.630	1.416	0.917	0.721	0.612	0.368
360	3.008	2.252	1.899	1.651	1.436	0.981	0.729	0.620	0.377
365	3.049	2.303	1.922	1.672	1.455	1.045	0.737	0.628	0.386
370	3.090	2.354	1.945	1.694	1.475	1.109	0.746	0.635	0.395
375	3.131	2.405	1.968	1.715	1.494	1.174	0.754	0.643	0.404
380	3.172	2.455	1.991	1.737	1.514	1.238	0.762	0.651	0.413
385	3.213	2.506	2.014	1.758	1.533	1.302	0.771	0.658	0.422
390	3.254	2.557	2.036	1.779	1.552	1.364	0.779	0.666	0.430
395	3.295	2.608	2.059	1.801	1.572	1.381	0.788	0.674	0.439
400	3.336	2.659	2.098	1.822	1.591	1.398	0.796	0.681	0.448
405	3.377	2.710	2.151	1.843	1.611	1.415	0.819	0.689	0.457
410	3.418	2.761	2.204	1.865	1.630	1.432	0.878	0.697	0.466
415	3.459	2.812	2.257	1.886	1.650	1.449	0.937	0.704	0.475
420	3.494	2.863	2.310	1.907	1.669	1.466	0.996	0.712	0.484
425	3.526	2.914	2.363	1.929	1.689	1.482	1.056	0.720	0.493
430	3.558	2.965	2.417	1.950	1.708	1.499	1.115	0.727	0.502
435	3.590	3.016	2.470	1.971	1.728	1.516	1.174	0.735	0.511
440	3.621	3.067	2.523	1.993	1.747	1.533	1.233	0.743	0.520
445	3.653	3.117	2.576	2.014	1.767	1.550	1.293	0.750	0.528
450	3.685	3.168	2.629	2.035	1.786	1.567	1.352	0.758	0.537
455	3.717	3.219	2.682	2.057	1.805	1.584	1.375	0.766	0.546
460	3.748	3.270	2.735	2.092	1.825	1.601	1.389	0.773	0.555
465	3.780	3.321	2.788	2.150	1.844	1.618	1.404	0.781	0.564
470	3.812	3.372	2.841	2.209	1.864	1.635	1.419	0.789	0.573

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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Table 14: I-Section Columns 60 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	0.807	0.644	0.543	0.464	0.404	0.345	0.302	0.258	0.233
55	0.931	0.689	0.578	0.491	0.424	0.360	0.314	0.267	0.233
60	1.056	0.734	0.612	0.517	0.444	0.375	0.326	0.277	0.234
65	1.180	0.779	0.647	0.544	0.464	0.390	0.338	0.287	0.242
70	1.305	0.840	0.682	0.570	0.484	0.405	0.350	0.296	0.251
75	1.387	0.920	0.716	0.597	0.505	0.420	0.362	0.306	0.259
80	1.433	1.000	0.751	0.623	0.525	0.436	0.374	0.315	0.268
85	1.479	1.079	0.785	0.650	0.545	0.451	0.387	0.325	0.276
90	1.525	1.159	0.828	0.677	0.565	0.466	0.399	0.334	0.285
95	1.571	1.239	0.878	0.703	0.585	0.481	0.411	0.344	0.293
100	1.617	1.319	0.928	0.730	0.605	0.496	0.423	0.354	0.302
105	1.663	1.379	0.978	0.756	0.626	0.511	0.435	0.363	0.310
110	1.709	1.415	1.028	0.783	0.646	0.527	0.447	0.373	0.318
115	1.755	1.451	1.078	0.811	0.666	0.542	0.460	0.382	0.327
120	1.801	1.487	1.129	0.845	0.686	0.557	0.472	0.392	0.335
125	1.847	1.524	1.179	0.879	0.706	0.572	0.484	0.401	0.344
130	1.892	1.560	1.229	0.913	0.727	0.587	0.496	0.411	0.352
135	1.938	1.596	1.279	0.947	0.747	0.602	0.508	0.421	0.361
140	1.984	1.632	1.329	0.981	0.767	0.618	0.520	0.430	0.369
145	2.030	1.668	1.372	1.015	0.787	0.633	0.532	0.440	0.378
150	2.076	1.704	1.402	1.049	0.811	0.648	0.545	0.449	0.386
155	2.119	1.740	1.431	1.083	0.843	0.663	0.557	0.459	0.395
160	2.163	1.776	1.460	1.117	0.875	0.678	0.569	0.469	0.403
165	2.206	1.813	1.490	1.151	0.907	0.693	0.581	0.478	0.412
170	2.250	1.849	1.519	1.185	0.939	0.709	0.593	0.488	0.420
175	2.293	1.885	1.549	1.219	0.972	0.724	0.605	0.497	0.429
180	2.337	1.921	1.578	1.253	1.004	0.739	0.618	0.507	0.437
185	2.380	1.957	1.607	1.287	1.036	0.754	0.630	0.516	0.446
190	2.424	1.993	1.637	1.321	1.068	0.769	0.642	0.526	0.454
195	2.467	2.029	1.666	1.355	1.100	0.784	0.654	0.536	0.463
200	2.511	2.065	1.695	1.382	1.133	0.800	0.666	0.545	0.471
205	2.554	2.109	1.725	1.407	1.165	0.834	0.678	0.555	0.480
210	2.597	2.154	1.754	1.432	1.197	0.872	0.690	0.564	0.488
215	2.641	2.199	1.784	1.457	1.229	0.910	0.703	0.574	0.497
220	2.684	2.244	1.813	1.482	1.261	0.947	0.715	0.584	0.505
225	2.728	2.289	1.842	1.507	1.293	0.985	0.727	0.593	0.514
230	2.771	2.333	1.872	1.532	1.326	1.023	0.739	0.603	0.522
235	2.815	2.378	1.901	1.557	1.358	1.061	0.751	0.612	0.531
240	2.858	2.423	1.930	1.582	1.383	1.099	0.763	0.622	0.539
245	2.902	2.468	1.960	1.607	1.407	1.137	0.776	0.631	0.548
250	2.945	2.513	1.989	1.632	1.431	1.174	0.788	0.641	0.556
255	2.989	2.558	2.019	1.657	1.455	1.212	0.800	0.651	0.565
260	3.032	2.603	2.048	1.682	1.480	1.250	0.838	0.660	0.573
265	3.076	2.647	2.084	1.707	1.504	1.288	0.881	0.670	0.582
270	3.119	2.692	2.138	1.732	1.528	1.326	0.925	0.679	0.590
275	3.163	2.737	2.192	1.757	1.552	1.363	0.968	0.689	0.599
280	3.206	2.782	2.247	1.781	1.576	1.386	1.012	0.698	0.607
285	3.250	2.827	2.301	1.806	1.600	1.408	1.055	0.708	0.616
290	3.293	2.872	2.356	1.831	1.624	1.430	1.099	0.718	0.624
295	3.336	2.917	2.410	1.856	1.648	1.453	1.142	0.727	0.633
300	3.380	2.961	2.465	1.881	1.672	1.475	1.186	0.737	0.641
305	3.423	3.006	2.519	1.906	1.696	1.498	1.229	0.746	0.650
310	3.467	3.051	2.574	1.931	1.720	1.520	1.273	0.756	0.658
315	3.510	3.096	2.628	1.956	1.744	1.542	1.316	0.766	0.667
320	3.552	3.141	2.683	1.981	1.768	1.565	1.360	0.775	0.675
325	3.595	3.186	2.737	2.006	1.792	1.587	1.382	0.785	0.684
330	3.637	3.231	2.792	2.031	1.817	1.610	1.403	0.794	0.692
335	3.680	3.275	2.846	2.056	1.841	1.632	1.423	0.818	0.701
340	3.722	3.320	2.900	2.105	1.865	1.654	1.444	0.901	0.709
345	3.765	3.365	2.955	2.184	1.889	1.677	1.464	0.983	0.718
350	3.807	3.410	3.009	2.264	1.913	1.699	1.485	1.066	0.726

Tabulated values continued

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 14: I-Section Columns 60 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	3.850	3.455	3.064	2.343	1.937	1.721	1.505	1.148	0.735
360	3.893	3.497	3.118	2.422	1.961	1.744	1.526	1.231	0.743
365	3.935	3.537	3.173	2.501	1.985	1.766	1.547	1.313	0.752
370	3.978	3.577	3.227	2.580	2.009	1.789	1.567	1.370	0.760
375	4.020	3.617	3.282	2.659	2.033	1.811	1.588	1.388	0.769
380	4.063	3.657	3.336	2.738	2.057	1.833	1.608	1.405	0.777
385	4.094	3.697	3.391	2.818	2.111	1.856	1.629	1.423	0.786
390	4.125	3.737	3.445	2.897	2.199	1.878	1.649	1.441	0.794
395	4.156	3.777	3.492	2.976	2.286	1.901	1.670	1.458	0.807
400	4.188	3.818	3.531	3.055	2.374	1.923	1.691	1.476	0.880
405	4.219	3.858	3.570	3.134	2.462	1.945	1.711	1.494	0.953
410	4.250	3.898	3.608	3.213	2.549	1.968	1.732	1.512	1.026
415	4.281	3.938	3.647	3.292	2.637	1.990	1.752	1.529	1.099
420	4.312	3.978	3.686	3.371	2.724	2.012	1.773	1.547	1.173
425	-	4.018	3.725	3.451	2.812	2.035	1.793	1.565	1.246
430	-	4.058	3.763	3.501	2.900	2.057	1.814	1.582	1.319
435	-	4.105	3.802	3.538	2.987	2.112	1.834	1.600	1.369
440	-	4.213	3.841	3.576	3.075	2.212	1.855	1.618	1.383
445	-	4.321	3.880	3.614	3.162	2.311	1.876	1.635	1.398
450	-	4.429	3.918	3.652	3.250	2.410	1.896	1.653	1.413
455	-	4.537	3.957	3.690	3.337	2.509	1.917	1.671	1.427
460	-	4.644	3.996	3.728	3.425	2.608	1.937	1.688	1.442
465	-	4.752	4.034	3.765	3.490	2.707	1.958	1.706	1.456
470	-	4.860	4.073	3.803	3.527	2.806	1.978	1.724	1.471

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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Table 15: I-Section Columns 75 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	2.554	0.863	0.594	0.594	0.521	0.445	0.396	0.349	0.294
55	2.584	0.993	0.662	0.633	0.553	0.470	0.415	0.364	0.305
60	2.614	1.123	0.766	0.672	0.584	0.494	0.434	0.378	0.316
65	2.644	1.252	0.870	0.711	0.615	0.519	0.453	0.393	0.328
70	2.674	1.371	0.962	0.749	0.647	0.543	0.472	0.407	0.339
75	2.704	1.422	1.055	0.788	0.678	0.567	0.491	0.422	0.350
80	2.734	1.474	1.148	0.842	0.709	0.592	0.510	0.436	0.362
85	2.764	1.525	1.240	0.905	0.741	0.616	0.529	0.450	0.373
90	2.794	1.577	1.333	0.968	0.772	0.640	0.548	0.465	0.384
95	2.824	1.628	1.393	1.031	0.804	0.665	0.567	0.479	0.396
100	2.855	1.680	1.437	1.094	0.849	0.689	0.587	0.494	0.407
105	2.885	1.732	1.481	1.156	0.894	0.713	0.606	0.508	0.418
110	2.915	1.783	1.525	1.219	0.940	0.738	0.625	0.523	0.430
115	2.945	1.835	1.569	1.282	0.985	0.762	0.644	0.537	0.441
120	2.975	1.886	1.613	1.345	1.030	0.786	0.663	0.552	0.452
125	3.005	1.938	1.657	1.390	1.075	0.814	0.682	0.566	0.464
130	3.035	1.990	1.701	1.427	1.121	0.848	0.701	0.581	0.475
135	3.065	2.041	1.745	1.465	1.166	0.882	0.720	0.595	0.486
140	3.095	2.093	1.789	1.502	1.211	0.916	0.739	0.609	0.498
145	3.125	2.146	1.833	1.540	1.257	0.950	0.758	0.624	0.509
150	3.156	2.199	1.877	1.577	1.302	0.984	0.777	0.638	0.520
155	3.186	2.251	1.921	1.615	1.347	1.018	0.796	0.653	0.532
160	3.216	2.304	1.964	1.652	1.383	1.052	0.826	0.667	0.543
165	3.246	2.357	2.008	1.690	1.413	1.086	0.861	0.682	0.554
170	3.276	2.410	2.052	1.727	1.443	1.120	0.897	0.696	0.566
175	3.306	2.463	2.100	1.765	1.473	1.155	0.932	0.711	0.577
180	3.336	2.515	2.150	1.802	1.503	1.189	0.967	0.725	0.588
185	3.366	2.568	2.200	1.840	1.533	1.223	1.003	0.740	0.600
190	3.396	2.621	2.251	1.877	1.563	1.257	1.038	0.754	0.611
195	3.426	2.674	2.301	1.915	1.593	1.291	1.073	0.768	0.622
200	3.457	2.726	2.351	1.952	1.623	1.325	1.109	0.783	0.634
205	3.487	2.779	2.401	1.990	1.653	1.359	1.144	0.797	0.645
210	3.517	2.832	2.451	2.027	1.683	1.386	1.179	0.830	0.656
215	3.547	2.885	2.501	2.065	1.713	1.413	1.215	0.872	0.668
220	3.577	2.937	2.551	2.119	1.743	1.439	1.250	0.913	0.679
225	3.607	2.990	2.602	2.177	1.773	1.466	1.285	0.955	0.690
230	3.637	3.043	2.652	2.234	1.803	1.492	1.321	0.997	0.702
235	3.667	3.096	2.702	2.292	1.833	1.519	1.356	1.038	0.713
240	3.697	3.148	2.752	2.349	1.863	1.545	1.383	1.080	0.724
245	3.727	3.201	2.802	2.407	1.893	1.572	1.407	1.122	0.736
250	3.758	3.254	2.852	2.464	1.923	1.598	1.431	1.163	0.747
255	3.788	3.307	2.903	2.522	1.953	1.625	1.455	1.205	0.758
260	3.818	3.359	2.953	2.579	1.983	1.651	1.480	1.246	0.770
265	3.848	3.412	3.003	2.637	2.013	1.678	1.504	1.288	0.781
270	3.878	3.465	3.053	2.695	2.044	1.704	1.528	1.330	0.792
275	3.908	3.508	3.103	2.752	2.079	1.731	1.552	1.367	0.811
280	3.938	3.549	3.153	2.810	2.157	1.757	1.577	1.390	0.869
285	3.968	3.591	3.203	2.867	2.234	1.784	1.601	1.412	0.927
290	3.998	3.632	3.254	2.925	2.312	1.810	1.625	1.434	0.985
295	4.028	3.673	3.304	2.982	2.390	1.837	1.649	1.456	1.042
300	4.059	3.715	3.354	3.040	2.467	1.863	1.674	1.478	1.100
305	4.094	3.756	3.404	3.097	2.545	1.890	1.698	1.500	1.158
310	4.129	3.797	3.454	3.155	2.622	1.916	1.722	1.522	1.216
315	4.165	3.838	3.504	3.212	2.700	1.943	1.746	1.544	1.273
320	4.200	3.880	3.552	3.270	2.778	1.969	1.771	1.567	1.331
325	4.236	3.921	3.601	3.327	2.855	1.996	1.795	1.589	1.372
330	4.271	3.962	3.650	3.385	2.933	2.022	1.819	1.611	1.391
335	-	4.004	3.699	3.442	3.010	2.049	1.843	1.633	1.411
340	-	4.045	3.747	3.495	3.088	2.095	1.868	1.655	1.431
345	-	4.086	3.796	3.543	3.165	2.221	1.892	1.677	1.450
350	-	4.204	3.845	3.591	3.243	2.348	1.916	1.699	1.470

Tabulated values continued

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Table 15: I-Section Columns 75 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	-	4.340	3.894	3.639	3.321	2.474	1.940	1.722	1.489
360	-	4.475	3.942	3.687	3.398	2.601	1.965	1.744	1.509
365	-	4.611	3.991	3.734	3.475	2.727	1.989	1.766	1.528
370	-	4.746	4.040	3.782	3.522	2.854	2.013	1.788	1.548
375	-	4.882	4.089	3.830	3.569	2.980	2.037	1.810	1.568
380	-	5.017	4.213	3.878	3.616	3.107	2.062	1.832	1.587
385	-	5.153	4.347	3.925	3.663	3.234	2.166	1.854	1.607
390	-	5.288	4.481	3.973	3.710	3.360	2.312	1.877	1.626
395	-	5.424	4.616	4.021	3.757	3.479	2.459	1.899	1.646
400	-	5.559	4.750	4.069	3.804	3.525	2.606	1.921	1.666
405	-	5.695	4.884	4.156	3.851	3.571	2.752	1.943	1.685
410	-	5.830	5.018	4.287	3.898	3.617	2.899	1.965	1.705
415	-	5.966	5.152	4.418	3.945	3.663	3.045	1.987	1.724
420	-	6.101	5.286	4.549	3.992	3.709	3.192	2.009	1.744
425	-	-	5.420	4.680	4.040	3.755	3.339	2.032	1.763
430	-	-	5.555	4.812	4.087	3.801	3.477	2.054	1.783
435	-	-	5.689	4.943	4.202	3.847	3.522	2.117	1.803
440	-	-	5.823	5.074	4.330	3.893	3.567	2.293	1.822
445	-	-	5.957	5.205	4.458	3.939	3.612	2.469	1.842
450	-	-	6.091	5.336	4.586	3.985	3.656	2.645	1.861
455	-	-	-	5.468	4.714	4.031	3.701	2.822	1.881
460	-	-	-	5.599	4.842	4.076	3.746	2.998	1.901
465	-	-	-	5.730	4.970	4.170	3.790	3.174	1.920
470	-	-	-	5.861	5.098	4.292	3.835	3.350	1.940

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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Table 16: I-Section Columns 90 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	3.213	2.549	0.930	0.636	0.636	0.544	0.487	0.438	0.383
55	3.242	2.581	1.066	0.737	0.678	0.578	0.515	0.460	0.400
60	3.270	2.614	1.203	0.846	0.721	0.612	0.542	0.482	0.416
65	3.299	2.647	1.339	0.955	0.763	0.645	0.570	0.504	0.433
70	3.328	2.679	1.422	1.064	0.808	0.679	0.598	0.526	0.449
75	3.356	2.712	1.492	1.173	0.880	0.713	0.626	0.548	0.466
80	3.385	2.744	1.563	1.281	0.952	0.747	0.653	0.570	0.482
85	3.413	2.777	1.634	1.376	1.025	0.780	0.681	0.592	0.499
90	3.442	2.809	1.704	1.426	1.097	0.823	0.709	0.614	0.515
95	3.470	2.842	1.775	1.476	1.169	0.882	0.736	0.636	0.532
100	3.499	2.874	1.846	1.526	1.241	0.942	0.764	0.658	0.548
105	3.527	2.907	1.917	1.577	1.314	1.001	0.792	0.680	0.565
110	3.556	2.939	1.987	1.627	1.377	1.060	0.830	0.702	0.581
115	3.584	2.972	2.058	1.677	1.423	1.120	0.874	0.724	0.598
120	3.613	3.005	2.121	1.727	1.469	1.179	0.918	0.746	0.614
125	3.642	3.037	2.182	1.778	1.514	1.239	0.962	0.769	0.631
130	3.670	3.070	2.243	1.828	1.560	1.298	1.006	0.791	0.647
135	3.699	3.102	2.304	1.878	1.605	1.357	1.050	0.819	0.663
140	3.727	3.135	2.365	1.929	1.651	1.397	1.095	0.854	0.680
145	3.756	3.167	2.427	1.979	1.696	1.435	1.139	0.889	0.696
150	3.784	3.200	2.488	2.029	1.742	1.473	1.183	0.924	0.713
155	3.813	3.232	2.549	2.082	1.787	1.510	1.227	0.959	0.729
160	3.841	3.265	2.610	2.144	1.833	1.548	1.271	0.994	0.746
165	3.870	3.297	2.671	2.206	1.878	1.586	1.315	1.029	0.762
170	3.898	3.330	2.732	2.269	1.924	1.624	1.359	1.064	0.779
175	3.927	3.363	2.793	2.331	1.970	1.662	1.389	1.099	0.795
180	3.956	3.395	2.855	2.393	2.015	1.699	1.418	1.133	0.825
185	3.984	3.428	2.916	2.456	2.061	1.737	1.447	1.168	0.863
190	4.013	3.460	2.977	2.518	2.118	1.775	1.475	1.203	0.902
195	4.041	3.493	3.038	2.580	2.179	1.813	1.504	1.238	0.941
200	4.070	3.525	3.099	2.643	2.240	1.851	1.533	1.273	0.979
205	4.115	3.558	3.160	2.705	2.301	1.888	1.561	1.308	1.018
210	4.254	3.590	3.221	2.767	2.362	1.926	1.590	1.343	1.057
215	4.393	3.623	3.283	2.830	2.423	1.964	1.619	1.374	1.096
220	4.533	3.655	3.344	2.892	2.484	2.002	1.647	1.400	1.134
225	4.672	3.688	3.405	2.954	2.545	2.040	1.676	1.425	1.173
230	4.811	3.721	3.466	3.017	2.606	2.084	1.705	1.451	1.212
235	4.950	3.753	3.507	3.079	2.667	2.158	1.733	1.477	1.250
240	5.090	3.786	3.546	3.141	2.728	2.232	1.762	1.502	1.289
245	5.229	3.818	3.584	3.204	2.789	2.306	1.791	1.528	1.328
250	5.368	3.851	3.622	3.266	2.850	2.379	1.819	1.553	1.365
255	5.507	3.883	3.661	3.328	2.911	2.453	1.848	1.579	1.388
260	5.647	3.916	3.699	3.391	2.972	2.527	1.877	1.605	1.412
265	5.786	3.948	3.737	3.453	3.033	2.601	1.906	1.630	1.435
270	5.925	3.981	3.776	3.505	3.094	2.674	1.934	1.656	1.458
275	6.064	4.013	3.814	3.551	3.155	2.748	1.963	1.682	1.482
280	-	4.046	3.852	3.598	3.216	2.822	1.992	1.707	1.505
285	-	4.079	3.891	3.644	3.277	2.896	2.020	1.733	1.528
290	-	4.180	3.929	3.691	3.338	2.969	2.049	1.758	1.552
295	-	4.343	3.967	3.737	3.399	3.043	2.102	1.784	1.575
300	-	4.506	4.006	3.784	3.460	3.117	2.225	1.810	1.598
305	-	4.669	4.044	3.831	3.518	3.191	2.348	1.835	1.622
310	-	4.832	4.082	3.877	3.575	3.264	2.471	1.861	1.645
315	-	4.995	4.206	3.924	3.632	3.338	2.594	1.887	1.668
320	-	5.159	4.368	3.970	3.689	3.412	2.717	1.912	1.692
325	-	5.322	4.529	4.017	3.746	3.483	2.839	1.938	1.715
330	-	5.485	4.691	4.063	3.803	3.539	2.962	1.963	1.738
335	-	5.648	4.853	4.148	3.860	3.595	3.085	1.989	1.762
340	-	5.811	5.014	4.306	3.917	3.651	3.208	2.015	1.785
345	-	5.974	5.176	4.465	3.974	3.707	3.331	2.040	1.808
350	-	6.137	5.338	4.623	4.031	3.763	3.453	2.066	1.832

Tabulated values continued

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 16: I-Section Columns 90 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	-	-	5.499	4.782	4.088	3.819	3.520	2.253	1.855
360	-	-	5.661	4.940	4.232	3.874	3.574	2.471	1.878
365	-	-	5.823	5.099	4.387	3.930	3.629	2.688	1.902
370	-	-	5.985	5.257	4.542	3.986	3.684	2.906	1.925
375	-	-	6.146	5.416	4.697	4.042	3.738	3.124	1.948
380	-	-	-	5.574	4.852	4.105	3.793	3.342	1.972
385	-	-	-	5.733	5.007	4.254	3.848	3.495	1.995
390	-	-	-	5.891	5.163	4.403	3.903	3.547	2.018
395	-	-	-	6.050	5.318	4.551	3.957	3.599	2.042
400	-	-	-	-	5.473	4.700	4.012	3.651	2.065
405	-	-	-	-	5.628	4.849	4.067	3.704	2.250
410	-	-	-	-	5.783	4.997	4.164	3.756	2.482
415	-	-	-	-	5.938	5.146	4.304	3.808	2.713
420	-	-	-	-	6.093	5.295	4.443	3.860	2.944
425	-	-	-	-	-	5.443	4.583	3.912	3.176
430	-	-	-	-	-	5.592	4.722	3.965	3.407
435	-	-	-	-	-	5.741	4.862	4.017	3.511
440	-	-	-	-	-	5.889	5.001	4.069	3.562
445	-	-	-	-	-	6.038	5.141	4.163	3.614
450	-	-	-	-	-	6.187	5.280	4.296	3.665
455	-	-	-	-	-	-	5.420	4.429	3.717
460	-	-	-	-	-	-	5.559	4.562	3.768
465	-	-	-	-	-	-	5.699	4.695	3.820
470	-	-	-	-	-	-	5.838	4.828	3.871

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 17: I-Section Columns 105 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	3.520	3.138	2.569	0.727	0.705	0.642	0.576	0.524	0.468
55	3.577	3.172	2.604	0.948	0.823	0.685	0.613	0.554	0.492
60	3.634	3.205	2.640	1.169	0.940	0.728	0.649	0.584	0.517
65	3.691	3.239	2.675	1.390	1.057	0.770	0.685	0.614	0.541
70	3.747	3.272	2.710	1.464	1.174	0.827	0.721	0.644	0.566
75	3.804	3.306	2.745	1.538	1.291	0.923	0.758	0.675	0.590
80	3.861	3.339	2.781	1.612	1.385	1.020	0.794	0.705	0.615
85	3.918	3.373	2.816	1.686	1.441	1.116	0.855	0.735	0.639
90	3.975	3.406	2.851	1.760	1.498	1.212	0.923	0.765	0.664
95	4.031	3.440	2.887	1.834	1.554	1.308	0.990	0.795	0.688
100	4.088	3.473	2.922	1.908	1.611	1.385	1.058	0.841	0.713
105	4.199	3.506	2.957	1.982	1.667	1.437	1.126	0.892	0.737
110	4.317	3.540	2.992	2.055	1.723	1.488	1.194	0.942	0.762
115	4.435	3.573	3.028	2.129	1.780	1.540	1.262	0.993	0.786
120	4.553	3.607	3.063	2.203	1.836	1.591	1.330	1.044	0.814
125	4.670	3.640	3.098	2.277	1.893	1.642	1.386	1.094	0.848
130	4.788	3.674	3.133	2.351	1.949	1.694	1.431	1.145	0.882
135	4.906	3.707	3.169	2.425	2.006	1.745	1.476	1.196	0.916
140	5.024	3.741	3.204	2.499	2.062	1.797	1.521	1.246	0.950
145	5.142	3.774	3.239	2.573	2.135	1.848	1.566	1.297	0.984
150	5.259	3.808	3.275	2.647	2.211	1.899	1.611	1.348	1.018
155	5.377	3.841	3.310	2.721	2.286	1.951	1.657	1.387	1.052
160	5.495	3.875	3.345	2.795	2.362	2.002	1.702	1.422	1.086
165	5.613	3.908	3.380	2.869	2.438	2.054	1.747	1.456	1.120
170	5.730	3.942	3.416	2.942	2.514	2.120	1.792	1.491	1.154
175	5.848	3.975	3.451	3.016	2.589	2.193	1.837	1.525	1.188
180	5.966	4.008	3.486	3.090	2.665	2.266	1.882	1.560	1.222
185	6.084	4.042	3.521	3.164	2.741	2.340	1.927	1.594	1.256
190	-	4.075	3.557	3.238	2.817	2.413	1.972	1.629	1.290
195	-	4.130	3.592	3.312	2.892	2.486	2.017	1.664	1.324
200	-	4.210	3.627	3.386	2.968	2.560	2.063	1.698	1.358
205	-	4.290	3.663	3.460	3.044	2.633	2.132	1.733	1.386
210	-	4.370	3.698	3.506	3.119	2.706	2.206	1.767	1.412
215	-	4.450	3.733	3.546	3.195	2.780	2.280	1.802	1.439
220	-	4.531	3.768	3.585	3.271	2.853	2.354	1.836	1.465
225	-	4.611	3.804	3.625	3.347	2.926	2.428	1.871	1.492
230	-	4.691	3.839	3.664	3.422	2.999	2.502	1.905	1.519
235	-	4.771	3.874	3.704	3.488	3.073	2.576	1.940	1.545
240	-	4.851	3.909	3.743	3.533	3.146	2.649	1.974	1.572
245	-	4.932	3.945	3.783	3.578	3.219	2.723	2.009	1.599
250	-	5.012	3.980	3.822	3.622	3.293	2.797	2.044	1.625
255	-	5.092	4.015	3.862	3.667	3.366	2.871	2.094	1.652
260	-	5.172	4.050	3.901	3.712	3.439	2.945	2.198	1.679
265	-	5.252	4.086	3.941	3.757	3.501	3.019	2.302	1.705
270	-	5.332	4.239	3.981	3.801	3.553	3.093	2.405	1.732
275	-	5.413	4.428	4.020	3.846	3.605	3.167	2.509	1.759
280	-	5.493	4.617	4.060	3.891	3.657	3.241	2.612	1.785
285	-	5.573	4.807	4.118	3.936	3.708	3.315	2.716	1.812
290	-	5.653	4.996	4.304	3.980	3.760	3.389	2.820	1.839
295	-	5.733	5.185	4.490	4.025	3.812	3.463	2.923	1.865
300	-	5.814	5.374	4.676	4.070	3.864	3.528	3.027	1.892
305	-	5.894	5.564	4.862	4.178	3.916	3.592	3.130	1.918
310	-	5.974	5.753	5.047	4.360	3.967	3.656	3.234	1.945
315	-	6.054	5.942	5.233	4.542	4.019	3.720	3.338	1.972
320	-	-	6.132	5.419	4.724	4.071	3.783	3.441	1.998
325	-	-	-	5.605	4.907	4.192	3.847	3.517	2.025
330	-	-	-	5.791	5.089	4.367	3.911	3.579	2.052
335	-	-	-	5.977	5.271	4.542	3.975	3.641	2.158
340	-	-	-	6.162	5.453	4.717	4.039	3.703	2.436
345	-	-	-	-	5.636	4.892	4.116	3.765	2.714
350	-	-	-	-	5.818	5.067	4.281	3.828	2.993

Tabulated values continued

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 17: I-Section Columns 105 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	-	-	-	-	6.000	5.242	4.446	3.890	3.271
360	-	-	-	-	6.182	5.418	4.611	3.952	3.491
365	-	-	-	-	-	5.593	4.776	4.014	3.553
370	-	-	-	-	-	5.768	4.941	4.076	3.615
375	-	-	-	-	-	5.943	5.106	4.207	3.677
380	-	-	-	-	-	6.118	5.272	4.366	3.739
385	-	-	-	-	-	-	5.437	4.524	3.801
390	-	-	-	-	-	-	5.602	4.682	3.863
395	-	-	-	-	-	-	5.767	4.840	3.925
400	-	-	-	-	-	-	5.932	4.998	3.987
405	-	-	-	-	-	-	6.097	5.157	4.049
410	-	-	-	-	-	-	-	5.315	4.141
415	-	-	-	-	-	-	-	5.473	4.316
420	-	-	-	-	-	-	-	5.631	4.492
425	-	-	-	-	-	-	-	5.789	4.668
430	-	-	-	-	-	-	-	5.948	4.843
435	-	-	-	-	-	-	-	6.106	5.019
440	-	-	-	-	-	-	-	-	5.194
445	-	-	-	-	-	-	-	-	5.370
450	-	-	-	-	-	-	-	-	5.546
455	-	-	-	-	-	-	-	-	5.721
460	-	-	-	-	-	-	-	-	5.897
465	-	-	-	-	-	-	-	-	6.073
470	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 18: I-Section Columns 120 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	3.563	3.438	3.103	2.281	0.814	0.666	0.666	0.607	0.552
55	3.717	3.501	3.146	2.331	1.019	0.778	0.710	0.646	0.584
60	3.870	3.563	3.190	2.382	1.224	0.935	0.754	0.684	0.617
65	4.024	3.625	3.234	2.433	1.429	1.093	0.799	0.722	0.649
70	4.178	3.688	3.278	2.483	1.511	1.250	0.904	0.761	0.681
75	4.305	3.750	3.321	2.534	1.593	1.381	1.014	0.799	0.714
80	4.432	3.812	3.365	2.585	1.675	1.446	1.125	0.867	0.746
85	4.559	3.875	3.409	2.635	1.757	1.511	1.235	0.938	0.778
90	4.686	3.937	3.452	2.686	1.839	1.576	1.345	1.008	0.816
95	4.813	3.999	3.496	2.737	1.922	1.641	1.411	1.079	0.867
100	4.940	4.062	3.540	2.787	2.004	1.706	1.468	1.150	0.918
105	5.067	4.148	3.583	2.838	2.086	1.771	1.525	1.220	0.969
110	5.194	4.259	3.627	2.889	2.168	1.836	1.583	1.291	1.021
115	5.321	4.370	3.671	2.939	2.250	1.901	1.640	1.362	1.072
120	5.448	4.482	3.714	2.990	2.332	1.966	1.697	1.414	1.123
125	5.575	4.593	3.758	3.041	2.414	2.031	1.754	1.466	1.175
130	5.702	4.704	3.802	3.091	2.496	2.103	1.811	1.518	1.226
135	5.829	4.815	3.846	3.142	2.578	2.187	1.869	1.569	1.277
140	5.956	4.927	3.889	3.193	2.660	2.270	1.926	1.621	1.328
145	6.083	5.038	3.933	3.243	2.743	2.354	1.983	1.673	1.376
150	-	5.149	3.977	3.294	2.825	2.437	2.040	1.725	1.414
155	-	5.261	4.020	3.345	2.907	2.521	2.110	1.777	1.453
160	-	5.372	4.064	3.395	2.989	2.604	2.193	1.829	1.492
165	-	5.483	4.128	3.446	3.071	2.688	2.276	1.881	1.531
170	-	5.594	4.236	3.497	3.153	2.771	2.359	1.932	1.569
175	-	5.706	4.344	3.547	3.235	2.855	2.442	1.984	1.608
180	-	5.817	4.452	3.598	3.317	2.938	2.525	2.036	1.647
185	-	5.928	4.560	3.649	3.399	3.022	2.608	2.099	1.686
190	-	6.039	4.668	3.699	3.478	3.106	2.691	2.183	1.724
195	-	6.151	4.776	3.750	3.520	3.189	2.774	2.267	1.763
200	-	-	4.884	3.801	3.562	3.273	2.857	2.350	1.802
205	-	-	4.992	3.851	3.603	3.356	2.940	2.434	1.841
210	-	-	5.100	3.902	3.645	3.440	3.023	2.518	1.879
215	-	-	5.209	3.953	3.687	3.501	3.106	2.602	1.918
220	-	-	5.317	4.003	3.729	3.547	3.189	2.686	1.957
225	-	-	5.425	4.054	3.771	3.592	3.272	2.769	1.996
230	-	-	5.533	4.123	3.813	3.638	3.355	2.853	2.035
235	-	-	5.641	4.261	3.855	3.684	3.438	2.937	2.078
240	-	-	5.749	4.398	3.897	3.729	3.503	3.021	2.175
245	-	-	5.857	4.535	3.939	3.775	3.554	3.105	2.272
250	-	-	5.965	4.673	3.981	3.821	3.604	3.188	2.370
255	-	-	6.073	4.810	4.023	3.866	3.655	3.272	2.467
260	-	-	-	4.947	4.064	3.912	3.706	3.356	2.564
265	-	-	-	5.084	4.156	3.958	3.757	3.440	2.661
270	-	-	-	5.222	4.365	4.004	3.808	3.508	2.758
275	-	-	-	5.359	4.574	4.049	3.859	3.567	2.855
280	-	-	-	5.496	4.784	4.098	3.910	3.625	2.952
285	-	-	-	5.634	4.993	4.300	3.960	3.684	3.049
290	-	-	-	5.771	5.202	4.502	4.011	3.742	3.146
295	-	-	-	5.908	5.412	4.703	4.062	3.801	3.243
300	-	-	-	6.046	5.621	4.905	4.165	3.859	3.341
305	-	-	-	6.183	5.830	5.106	4.356	3.918	3.438
310	-	-	-	-	6.040	5.308	4.546	3.976	3.519
315	-	-	-	-	-	5.510	4.737	4.035	3.592
320	-	-	-	-	-	5.711	4.928	4.093	3.664
325	-	-	-	-	-	5.913	5.118	4.275	3.737
330	-	-	-	-	-	6.115	5.309	4.459	3.809
335	-	-	-	-	-	-	5.500	4.642	3.881
340	-	-	-	-	-	-	5.690	4.826	3.954
345	-	-	-	-	-	-	5.881	5.009	4.026
350	-	-	-	-	-	-	6.072	5.193	4.108

Tabulated values continued

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 18: I-Section Columns 120 Minutes (continued)									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
355	-	-	-	-	-	-	-	5.377	4.313
360	-	-	-	-	-	-	-	5.560	4.518
365	-	-	-	-	-	-	-	5.744	4.723
370	-	-	-	-	-	-	-	5.927	4.929
375	-	-	-	-	-	-	-	6.111	5.134
380	-	-	-	-	-	-	-	-	5.339
385	-	-	-	-	-	-	-	-	5.544
390	-	-	-	-	-	-	-	-	5.750
395	-	-	-	-	-	-	-	-	5.955
400	-	-	-	-	-	-	-	-	6.160
405	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 19: I-Section Columns 150 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	-	4.258	3.436	3.355	3.039	2.700	1.194	0.769	0.756
55	-	4.370	3.612	3.434	3.104	2.754	1.300	0.923	0.788
60	-	4.482	3.787	3.513	3.170	2.808	1.406	1.077	0.820
65	-	4.594	3.963	3.592	3.235	2.862	1.500	1.231	0.926
70	-	4.706	4.139	3.671	3.301	2.916	1.594	1.374	1.031
75	-	4.818	4.256	3.751	3.366	2.971	1.689	1.449	1.137
80	-	4.930	4.373	3.830	3.432	3.025	1.783	1.525	1.243
85	-	5.042	4.491	3.909	3.497	3.079	1.877	1.601	1.348
90	-	5.154	4.608	3.988	3.563	3.133	1.971	1.676	1.419
95	-	5.266	4.725	4.067	3.628	3.187	2.065	1.752	1.483
100	-	5.377	4.843	4.172	3.694	3.241	2.159	1.828	1.548
105	-	5.489	4.960	4.289	3.759	3.296	2.253	1.903	1.613
110	-	5.601	5.077	4.405	3.825	3.350	2.347	1.979	1.677
115	-	5.713	5.195	4.522	3.890	3.404	2.441	2.055	1.742
120	-	-	5.312	4.639	3.956	3.458	2.535	2.147	1.806
125	-	-	5.430	4.756	4.022	3.512	2.629	2.243	1.871
130	-	-	5.547	4.873	4.087	3.566	2.723	2.339	1.936
135	-	-	5.664	4.990	4.197	3.621	2.818	2.435	2.000
140	-	-	5.782	5.106	4.313	3.675	2.912	2.531	2.065
145	-	-	5.899	5.223	4.428	3.729	3.006	2.627	2.157
150	-	-	6.016	5.340	4.543	3.783	3.100	2.723	2.252
155	-	-	6.134	5.457	4.659	3.837	3.194	2.818	2.346
160	-	-	-	5.574	4.774	3.891	3.288	2.914	2.441
165	-	-	-	5.691	4.889	3.946	3.382	3.010	2.536
170	-	-	-	5.807	5.005	4.000	3.476	3.106	2.630
175	-	-	-	5.924	5.120	4.054	3.543	3.202	2.725
180	-	-	-	6.041	5.236	4.133	3.610	3.298	2.819
185	-	-	-	6.158	5.351	4.284	3.677	3.394	2.914
190	-	-	-	-	5.466	4.435	3.744	3.484	3.008
195	-	-	-	-	5.582	4.585	3.811	3.541	3.103
200	-	-	-	-	5.697	4.736	3.878	3.598	3.198
205	-	-	-	-	5.812	4.887	3.946	3.655	3.292
210	-	-	-	-	5.928	5.037	4.013	3.712	3.387
215	-	-	-	-	6.043	5.188	4.080	3.769	3.478
220	-	-	-	-	6.159	5.339	4.243	3.826	3.533
225	-	-	-	-	-	5.489	4.433	3.883	3.588
230	-	-	-	-	-	5.640	4.622	3.940	3.642
235	-	-	-	-	-	5.791	4.812	3.997	3.697
240	-	-	-	-	-	5.941	5.001	4.054	3.752
245	-	-	-	-	-	6.092	5.190	4.151	3.806
250	-	-	-	-	-	-	5.380	4.341	3.861
255	-	-	-	-	-	-	5.569	4.531	3.915
260	-	-	-	-	-	-	5.759	4.722	3.970
265	-	-	-	-	-	-	5.948	4.912	4.025
270	-	-	-	-	-	-	6.137	5.102	4.079
275	-	-	-	-	-	-	-	5.293	4.288
280	-	-	-	-	-	-	-	5.483	4.553
285	-	-	-	-	-	-	-	5.673	4.817
290	-	-	-	-	-	-	-	5.864	5.082
295	-	-	-	-	-	-	-	6.054	5.346
300	-	-	-	-	-	-	-	-	5.611
305	-	-	-	-	-	-	-	-	5.875
310	-	-	-	-	-	-	-	-	6.140
315	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 20: I-Section Columns 180 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
50	-	-	-	4.073	3.613	3.231	2.836	2.325	1.185
55	-	-	-	4.198	3.725	3.344	2.940	2.421	1.290
60	-	-	-	4.324	3.837	3.456	3.044	2.517	1.395
65	-	-	-	4.449	3.949	3.568	3.149	2.614	1.501
70	-	-	-	4.575	4.060	3.681	3.253	2.710	1.606
75	-	-	-	4.701	4.185	3.793	3.357	2.807	1.712
80	-	-	-	4.826	4.316	3.906	3.462	2.903	1.818
85	-	-	-	4.952	4.447	4.018	3.566	2.999	1.923
90	-	-	-	5.077	4.578	4.134	3.670	3.096	2.029
95	-	-	-	5.203	4.709	4.256	3.775	3.192	2.135
100	-	-	-	5.329	4.840	4.379	3.879	3.289	2.241
105	-	-	-	5.454	4.971	4.501	3.983	3.385	2.346
110	-	-	-	5.580	5.102	4.623	4.088	3.481	2.452
115	-	-	-	5.705	5.233	4.745	4.202	3.578	2.558
120	-	-	-	5.831	5.363	4.868	4.317	3.674	2.663
125	-	-	-	5.957	5.494	4.990	4.432	3.770	2.769
130	-	-	-	-	5.625	5.112	4.547	3.867	2.875
135	-	-	-	-	5.756	5.235	4.662	3.963	2.980
140	-	-	-	-	5.887	5.357	4.777	4.060	3.086
145	-	-	-	-	6.018	5.479	4.892	4.168	3.192
150	-	-	-	-	-	5.602	5.008	4.284	3.297
155	-	-	-	-	-	5.724	5.123	4.400	3.403
160	-	-	-	-	-	5.846	5.238	4.515	3.506
165	-	-	-	-	-	5.968	5.353	4.631	3.603
170	-	-	-	-	-	-	5.468	4.747	3.699
175	-	-	-	-	-	-	5.583	4.863	3.796
180	-	-	-	-	-	-	5.698	4.978	3.893
185	-	-	-	-	-	-	5.813	5.094	3.990
190	-	-	-	-	-	-	5.928	5.210	4.086
195	-	-	-	-	-	-	6.043	5.325	4.271
200	-	-	-	-	-	-	-	5.441	4.464
205	-	-	-	-	-	-	-	5.557	4.657
210	-	-	-	-	-	-	-	5.672	4.850
215	-	-	-	-	-	-	-	5.788	5.043
220	-	-	-	-	-	-	-	5.904	5.236
225	-	-	-	-	-	-	-	6.019	5.429
230	-	-	-	-	-	-	-	-	5.622
235	-	-	-	-	-	-	-	-	5.815
240	-	-	-	-	-	-	-	-	6.008
245	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results also apply to I section beams with 4 sides fire exposure subject to a maximum DFT of 4.511mm.

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RUDOLF HENSEL GMBH

Table 21 Hollow Section Column 15 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
20	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
25	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
30	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
35	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
40	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
45	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
50	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
55	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
60	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
65	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
70	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
75	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
80	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
85	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
90	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
95	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
100	0.206	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
105	0.220	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
110	0.235	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
115	0.249	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
120	0.263	0.212	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
125	0.277	0.222	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
130	0.292	0.232	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
135	0.306	0.242	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
140	0.320	0.252	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
145	0.335	0.263	0.210	0.205	0.205	0.205	0.205	0.205	0.205	0.205
150	0.349	0.273	0.219	0.205	0.205	0.205	0.205	0.205	0.205	0.205
155	0.363	0.283	0.227	0.205	0.205	0.205	0.205	0.205	0.205	0.205
160	0.378	0.293	0.235	0.205	0.205	0.205	0.205	0.205	0.205	0.205
165	0.392	0.303	0.243	0.205	0.205	0.205	0.205	0.205	0.205	0.205
170	0.406	0.314	0.251	0.205	0.205	0.205	0.205	0.205	0.205	0.205
175	0.420	0.324	0.259	0.205	0.205	0.205	0.205	0.205	0.205	0.205
180	0.435	0.334	0.268	0.205	0.205	0.205	0.205	0.205	0.205	0.205
185	0.449	0.344	0.276	0.211	0.205	0.205	0.205	0.205	0.205	0.205
190	0.463	0.354	0.284	0.218	0.205	0.205	0.205	0.205	0.205	0.205
195	0.478	0.365	0.292	0.225	0.205	0.205	0.205	0.205	0.205	0.205
200	0.492	0.375	0.300	0.232	0.210	0.205	0.205	0.205	0.205	0.205
205	0.506	0.385	0.308	0.239	0.216	0.205	0.205	0.205	0.205	0.205
210	0.521	0.395	0.316	0.246	0.223	0.205	0.205	0.205	0.205	0.205
215	0.537	0.405	0.325	0.253	0.230	0.205	0.205	0.205	0.205	0.205
220	0.555	0.416	0.333	0.260	0.236	0.205	0.205	0.205	0.205	0.205
225	0.573	0.426	0.341	0.267	0.243	0.209	0.205	0.205	0.205	0.205
230	0.591	0.436	0.349	0.274	0.249	0.215	0.205	0.205	0.205	0.205
235	0.609	0.446	0.357	0.282	0.256	0.221	0.205	0.205	0.205	0.205
240	0.627	0.456	0.365	0.289	0.262	0.227	0.205	0.205	0.205	0.205
245	0.645	0.467	0.374	0.296	0.269	0.233	0.205	0.205	0.205	0.205
250	0.663	0.477	0.382	0.303	0.276	0.239	0.205	0.205	0.205	0.205
255	0.681	0.487	0.390	0.310	0.282	0.245	0.205	0.205	0.205	0.205
260	0.699	0.497	0.398	0.317	0.289	0.251	0.205	0.205	0.205	0.205
265	0.718	0.507	0.406	0.324	0.295	0.257	0.205	0.205	0.205	0.205
270	0.736	0.518	0.414	0.331	0.302	0.262	0.205	0.205	0.205	0.205
275	0.754	0.528	0.422	0.338	0.309	0.268	0.205	0.205	0.205	0.205
280	0.772	0.545	0.431	0.345	0.315	0.274	0.208	0.205	0.205	0.205
285	0.790	0.561	0.439	0.352	0.322	0.280	0.212	0.205	0.205	0.205
290	0.808	0.578	0.447	0.359	0.328	0.286	0.217	0.205	0.205	0.205
295	0.826	0.594	0.455	0.366	0.335	0.292	0.222	0.205	0.205	0.205
300	0.844	0.610	0.463	0.373	0.341	0.298	0.227	0.205	0.205	0.205
305	0.862	0.627	0.471	0.380	0.348	0.304	0.232	0.205	0.205	0.205
310	0.880	0.643	0.480	0.387	0.355	0.310	0.236	0.205	0.205	0.205
315	0.898	0.660	0.488	0.394	0.361	0.316	0.241	0.205	0.205	0.205
320	0.916	0.676	0.496	0.401	0.368	0.322	0.246	0.205	0.205	0.205
325	0.934	0.692	0.504	0.408	0.374	0.328	0.251	0.205	0.205	0.205
330	0.952	0.709	0.512	0.415	0.381	0.333	0.255	0.205	0.205	0.205
335	0.970	0.725	0.520	0.422	0.388	0.339	0.260	0.205	0.205	0.205
340	0.988	0.742	0.530	0.429	0.394	0.345	0.265	0.205	0.205	0.205
345	1.006	0.758	0.544	0.436	0.401	0.351	0.270	0.205	0.205	0.205
350	1.025	0.774	0.559	0.443	0.407	0.357	0.275	0.205	0.205	0.205
355	1.043	0.791	0.574	0.450	0.414	0.363	0.279	0.205	0.205	0.205
360	1.061	0.807	0.589	0.457	0.421	0.369	0.284	0.205	0.205	0.205
365	1.079	0.824	0.603	0.464	0.427	0.375	0.289	0.205	0.205	0.205
370	1.097	0.840	0.618	0.472	0.434	0.381	0.294	0.205	0.205	0.205
375	1.115	0.856	0.633	0.479	0.440	0.387	0.298	0.205	0.205	0.205
380	1.133	0.873	0.648	0.486	0.447	0.393	0.303	0.205	0.205	0.205
385	1.151	0.889	0.662	0.493	0.453	0.399	0.308	0.205	0.205	0.205
390	1.169	0.906	0.677	0.500	0.460	0.404	0.313	0.206	0.205	0.205
395	1.187	0.922	0.692	0.507	0.467	0.410	0.317	0.209	0.205	0.205
400	1.205	0.938	0.707	0.514	0.473	0.416	0.322	0.212	0.205	0.205
405	1.223	0.955	0.721	0.521	0.480	0.422	0.327	0.216	0.205	0.205
410	1.241	0.971	0.736	0.528	0.486	0.428	0.332	0.219	0.205	0.205
415	1.259	0.988	0.751	0.541	0.493	0.434	0.337	0.223	0.205	0.205
420	1.277	1.004	0.766	0.554	0.500	0.440	0.341	0.226	0.205	0.205
425	1.295	1.020	0.780	0.567	0.506	0.446	0.346	0.230	0.205	0.205

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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RUDOLF HENSEL GMBH

Table 22 Hollow Section Column 30 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.304	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
20	0.328	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
25	0.352	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
30	0.376	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
35	0.400	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
40	0.424	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
45	0.448	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
50	0.472	0.240	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
55	0.496	0.277	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
60	0.519	0.314	0.225	0.205	0.205	0.205	0.205	0.205	0.205	0.205
65	0.552	0.350	0.245	0.205	0.205	0.205	0.205	0.205	0.205	0.205
70	0.588	0.387	0.266	0.205	0.205	0.205	0.205	0.205	0.205	0.205
75	0.624	0.424	0.286	0.209	0.205	0.205	0.205	0.205	0.205	0.205
80	0.660	0.460	0.307	0.224	0.205	0.205	0.205	0.205	0.205	0.205
85	0.697	0.497	0.327	0.239	0.205	0.205	0.205	0.205	0.205	0.205
90	0.733	0.533	0.348	0.254	0.217	0.205	0.205	0.205	0.205	0.205
95	0.769	0.563	0.368	0.269	0.232	0.206	0.205	0.205	0.205	0.205
100	0.805	0.594	0.389	0.284	0.247	0.221	0.205	0.205	0.205	0.205
105	0.842	0.625	0.409	0.300	0.263	0.235	0.205	0.205	0.205	0.205
110	0.878	0.656	0.430	0.315	0.278	0.249	0.210	0.205	0.205	0.205
115	0.914	0.687	0.450	0.330	0.294	0.264	0.223	0.205	0.205	0.205
120	0.950	0.718	0.471	0.345	0.309	0.278	0.236	0.205	0.205	0.205
125	0.987	0.749	0.491	0.360	0.325	0.292	0.249	0.205	0.205	0.205
130	1.023	0.780	0.512	0.376	0.340	0.307	0.262	0.217	0.205	0.205
135	1.059	0.811	0.534	0.391	0.356	0.321	0.275	0.228	0.205	0.205
140	1.095	0.842	0.564	0.406	0.371	0.336	0.288	0.240	0.205	0.205
145	1.131	0.873	0.594	0.421	0.387	0.350	0.301	0.251	0.205	0.205
150	1.168	0.904	0.624	0.436	0.402	0.364	0.314	0.263	0.211	0.205
155	1.204	0.935	0.653	0.452	0.417	0.379	0.326	0.274	0.220	0.205
160	1.240	0.965	0.683	0.467	0.433	0.393	0.339	0.286	0.230	0.205
165	1.276	0.996	0.713	0.482	0.448	0.408	0.352	0.297	0.239	0.205
170	1.313	1.027	0.743	0.497	0.464	0.422	0.365	0.309	0.248	0.205
175	1.349	1.058	0.772	0.512	0.479	0.436	0.378	0.320	0.258	0.205
180	1.385	1.089	0.802	0.528	0.495	0.451	0.391	0.332	0.267	0.205
185	1.421	1.120	0.832	0.557	0.510	0.465	0.404	0.343	0.277	0.205
190	1.457	1.151	0.862	0.586	0.526	0.479	0.417	0.355	0.286	0.212
195	1.494	1.182	0.891	0.615	0.552	0.494	0.430	0.366	0.296	0.218
200	1.530	1.213	0.921	0.644	0.580	0.508	0.443	0.378	0.305	0.225
205	1.566	1.244	0.951	0.673	0.608	0.523	0.456	0.389	0.314	0.231
210	1.602	1.275	0.980	0.701	0.636	0.545	0.469	0.401	0.324	0.238
215	1.639	1.306	1.010	0.730	0.664	0.571	0.482	0.412	0.333	0.244
220	1.675	1.337	1.040	0.759	0.692	0.598	0.495	0.424	0.343	0.250
225	1.711	1.368	1.070	0.788	0.720	0.624	0.508	0.435	0.352	0.257
230	1.747	1.398	1.099	0.817	0.747	0.650	0.521	0.447	0.361	0.263
235	1.783	1.429	1.129	0.846	0.775	0.676	0.539	0.458	0.371	0.270
240	1.820	1.460	1.159	0.875	0.803	0.702	0.562	0.470	0.380	0.276
245	1.856	1.491	1.189	0.904	0.831	0.729	0.585	0.481	0.390	0.283
250	1.892	1.522	1.218	0.933	0.859	0.755	0.608	0.493	0.399	0.289
255	1.928	1.553	1.248	0.962	0.887	0.781	0.631	0.504	0.408	0.296
260	1.965	1.584	1.278	0.991	0.914	0.807	0.654	0.516	0.418	0.302
265	2.001	1.615	1.308	1.020	0.942	0.833	0.678	0.527	0.427	0.309
270	2.027	1.646	1.337	1.049	0.970	0.860	0.701	0.547	0.437	0.315
275	2.052	1.677	1.367	1.077	0.998	0.886	0.724	0.567	0.446	0.321
280	2.078	1.708	1.397	1.106	1.026	0.912	0.747	0.586	0.455	0.328
285	2.104	1.739	1.426	1.135	1.054	0.938	0.770	0.606	0.465	0.334
290	2.129	1.770	1.456	1.164	1.082	0.964	0.793	0.626	0.474	0.341
295	2.155	1.800	1.486	1.193	1.109	0.990	0.816	0.645	0.484	0.347
300	2.181	1.831	1.516	1.222	1.137	1.017	0.839	0.665	0.493	0.354
305	2.206	1.862	1.545	1.251	1.165	1.043	0.862	0.685	0.502	0.360
310	2.232	1.893	1.575	1.280	1.193	1.069	0.885	0.705	0.512	0.367
315	2.257	1.924	1.605	1.309	1.221	1.095	0.908	0.724	0.521	0.373
320	2.283	1.955	1.635	1.338	1.249	1.121	0.932	0.744	0.533	0.379
325	2.309	1.986	1.664	1.367	1.277	1.148	0.955	0.764	0.549	0.386
330	2.334	2.016	1.694	1.396	1.304	1.174	0.978	0.784	0.565	0.392
335	2.360	2.045	1.724	1.425	1.332	1.200	1.001	0.803	0.581	0.399
340	2.386	2.074	1.754	1.453	1.360	1.226	1.024	0.823	0.597	0.405
345	2.411	2.102	1.783	1.482	1.388	1.252	1.047	0.843	0.613	0.412
350	2.437	2.131	1.813	1.511	1.416	1.279	1.070	0.863	0.629	0.418
355	2.462	2.160	1.843	1.540	1.444	1.305	1.093	0.882	0.645	0.425
360	2.488	2.189	1.872	1.569	1.471	1.331	1.116	0.902	0.661	0.431
365	2.514	2.218	1.902	1.598	1.499	1.357	1.139	0.922	0.677	0.438
370	2.539	2.247	1.932	1.627	1.527	1.383	1.163	0.942	0.693	0.444
375	2.568	2.275	1.962	1.656	1.555	1.410	1.186	0.961	0.709	0.450
380	2.618	2.304	1.991	1.685	1.583	1.436	1.209	0.981	0.725	0.457
385	2.668	2.333	2.021	1.714	1.611	1.462	1.232	1.001	0.741	0.463
390	2.719	2.362	2.051	1.743	1.639	1.488	1.255	1.020	0.757	0.470
395	2.769	2.391	2.081	1.772	1.666	1.514	1.278	1.040	0.773	0.476
400	2.819	2.420	2.110	1.801	1.694	1.540	1.301	1.060	0.790	0.483
405	2.869	2.448	2.140	1.829	1.722	1.567	1.324	1.080	0.806	0.489
410	2.920	2.477	2.170	1.858	1.750	1.593	1.347	1.099	0.822	0.496
415	2.970	2.506	2.200	1.887	1.778	1.619	1.370	1.119	0.838	0.502
420	3.020	2.535	2.229	1.916	1.806	1.645	1.393	1.139	0.854	0.508
425	3.070	2.565	2.259	1.945	1.833	1.671	1.417	1.159	0.870	0.515

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 23 Hollow Section Column 45 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.337	0.309	0.296	0.296	0.273	0.205	0.205	0.205	0.205	0.205
20	0.387	0.349	0.321	0.319	0.296	0.205	0.205	0.205	0.205	0.205
25	0.437	0.389	0.354	0.342	0.318	0.205	0.205	0.205	0.205	0.205
30	0.487	0.429	0.387	0.365	0.340	0.205	0.205	0.205	0.205	0.205
35	0.544	0.469	0.419	0.389	0.363	0.205	0.205	0.205	0.205	0.205
40	0.628	0.509	0.452	0.412	0.385	0.205	0.205	0.205	0.205	0.205
45	0.713	0.562	0.485	0.435	0.407	0.205	0.205	0.205	0.205	0.205
50	0.797	0.625	0.518	0.458	0.430	0.241	0.205	0.205	0.205	0.205
55	0.882	0.688	0.560	0.481	0.452	0.284	0.205	0.205	0.205	0.205
60	0.966	0.751	0.607	0.504	0.475	0.326	0.224	0.205	0.205	0.205
65	1.051	0.814	0.654	0.528	0.497	0.369	0.255	0.205	0.205	0.205
70	1.135	0.877	0.700	0.569	0.519	0.411	0.286	0.205	0.205	0.205
75	1.220	0.940	0.747	0.610	0.553	0.454	0.317	0.214	0.205	0.205
80	1.304	1.003	0.793	0.651	0.593	0.497	0.348	0.236	0.205	0.205
85	1.389	1.066	0.840	0.691	0.632	0.538	0.379	0.259	0.205	0.205
90	1.473	1.129	0.886	0.732	0.671	0.575	0.410	0.281	0.205	0.205
95	1.558	1.192	0.933	0.773	0.711	0.613	0.441	0.304	0.210	0.205
100	1.642	1.255	0.979	0.814	0.750	0.650	0.472	0.326	0.229	0.205
105	1.727	1.318	1.026	0.855	0.790	0.688	0.503	0.348	0.248	0.205
110	1.811	1.381	1.072	0.896	0.829	0.725	0.535	0.371	0.267	0.205
115	1.896	1.444	1.119	0.937	0.869	0.763	0.570	0.393	0.286	0.205
120	1.980	1.507	1.166	0.978	0.908	0.800	0.605	0.416	0.304	0.205
125	2.017	1.570	1.212	1.019	0.948	0.838	0.640	0.438	0.323	0.208
130	2.038	1.633	1.259	1.060	0.987	0.876	0.675	0.461	0.342	0.227
135	2.058	1.697	1.305	1.101	1.026	0.913	0.710	0.483	0.361	0.246
140	2.079	1.760	1.352	1.142	1.066	0.951	0.745	0.506	0.380	0.265
145	2.099	1.823	1.398	1.183	1.105	0.988	0.780	0.529	0.398	0.284
150	2.119	1.886	1.445	1.223	1.145	1.026	0.814	0.561	0.417	0.303
155	2.140	1.949	1.491	1.264	1.184	1.063	0.849	0.593	0.436	0.322
160	2.160	2.005	1.538	1.305	1.224	1.101	0.884	0.625	0.455	0.341
165	2.181	2.026	1.584	1.346	1.263	1.138	0.919	0.657	0.474	0.360
170	2.201	2.048	1.631	1.387	1.303	1.176	0.954	0.689	0.492	0.379
175	2.222	2.069	1.677	1.428	1.342	1.213	0.989	0.721	0.511	0.398
180	2.242	2.090	1.724	1.469	1.381	1.251	1.024	0.753	0.532	0.417
185	2.263	2.111	1.771	1.510	1.421	1.288	1.059	0.785	0.561	0.436
190	2.283	2.133	1.817	1.551	1.460	1.326	1.094	0.817	0.590	0.455
195	2.303	2.154	1.864	1.592	1.500	1.363	1.128	0.849	0.620	0.475
200	2.324	2.175	1.910	1.633	1.539	1.401	1.163	0.881	0.649	0.494
205	2.344	2.196	1.957	1.674	1.579	1.439	1.198	0.914	0.679	0.513
210	2.365	2.217	2.003	1.715	1.618	1.476	1.233	0.946	0.708	0.533
215	2.385	2.239	2.028	1.755	1.658	1.514	1.268	0.978	0.737	0.556
220	2.406	2.260	2.054	1.796	1.697	1.551	1.303	1.010	0.767	0.579
225	2.426	2.281	2.079	1.837	1.736	1.589	1.338	1.042	0.796	0.602
230	2.447	2.302	2.104	1.878	1.776	1.626	1.373	1.074	0.826	0.625
235	2.467	2.323	2.130	1.919	1.815	1.664	1.408	1.106	0.855	0.648
240	2.487	2.345	2.155	1.960	1.855	1.701	1.442	1.138	0.884	0.671
245	2.508	2.366	2.181	2.001	1.894	1.739	1.477	1.170	0.914	0.694
250	2.528	2.387	2.206	2.029	1.934	1.776	1.512	1.202	0.943	0.718
255	2.549	2.408	2.232	2.057	1.973	1.814	1.547	1.234	0.972	0.741
260	2.588	2.429	2.257	2.084	2.010	1.851	1.582	1.266	1.002	0.764
265	2.661	2.451	2.283	2.112	2.038	1.889	1.617	1.299	1.031	0.787
270	2.734	2.472	2.308	2.139	2.067	1.927	1.652	1.331	1.061	0.810
275	2.807	2.493	2.333	2.167	2.095	1.964	1.687	1.363	1.090	0.833
280	2.881	2.514	2.359	2.194	2.124	2.002	1.722	1.395	1.119	0.856
285	2.954	2.535	2.384	2.222	2.152	2.031	1.756	1.427	1.149	0.880
290	3.027	2.557	2.410	2.250	2.181	2.060	1.791	1.459	1.178	0.903
295	3.100	2.618	2.435	2.277	2.209	2.089	1.826	1.491	1.207	0.926
300	3.173	2.693	2.461	2.305	2.238	2.118	1.861	1.523	1.237	0.949
305	3.246	2.768	2.486	2.332	2.266	2.147	1.896	1.555	1.266	0.972
310	3.320	2.843	2.512	2.360	2.295	2.176	1.931	1.587	1.296	0.995
315	3.393	2.919	2.537	2.388	2.323	2.205	1.966	1.619	1.325	1.018
320	3.466	2.994	2.563	2.415	2.352	2.234	2.001	1.651	1.354	1.041
325	3.539	3.069	2.634	2.443	2.380	2.263	2.030	1.683	1.384	1.065
330	3.612	3.144	2.704	2.470	2.409	2.292	2.060	1.716	1.413	1.088
335	3.686	3.219	2.775	2.498	2.437	2.321	2.089	1.748	1.443	1.111
340	3.759	3.294	2.845	2.526	2.466	2.350	2.119	1.780	1.472	1.134
345	3.833	3.369	2.916	2.553	2.494	2.379	2.149	1.812	1.501	1.157
350	3.918	3.444	2.986	2.607	2.523	2.408	2.178	1.844	1.531	1.180
355	4.003	3.519	3.057	2.672	2.551	2.438	2.208	1.876	1.560	1.203
360	4.088	3.594	3.127	2.738	2.601	2.467	2.237	1.908	1.589	1.226
365	4.174	3.669	3.198	2.803	2.664	2.496	2.267	1.940	1.619	1.250
370	-	3.744	3.268	2.869	2.727	2.525	2.296	1.972	1.648	1.273
375	-	3.819	3.339	2.934	2.790	2.554	2.326	2.004	1.678	1.296
380	-	3.894	3.409	3.000	2.853	2.605	2.355	2.036	1.707	1.319
385	-	3.969	3.480	3.065	2.916	2.666	2.385	2.068	1.736	1.342
390	-	4.044	3.550	3.131	2.979	2.727	2.414	2.101	1.766	1.365
395	-	4.119	3.620	3.196	3.042	2.787	2.444	2.133	1.795	1.388
400	-	4.194	3.691	3.261	3.104	2.848	2.474	2.165	1.825	1.411
405	-	-	3.761	3.327	3.167	2.909	2.503	2.197	1.854	1.435
410	-	-	3.832	3.392	3.230	2.969	2.533	2.229	1.883	1.458
415	-	-	3.902	3.458	3.293	3.030	2.562	2.261	1.913	1.481
420	-	-	3.973	3.523	3.356	3.091	2.618	2.293	1.942	1.504
425	-	-	4.043	3.589	3.419	3.151	2.675	2.325	1.971	1.527

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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RUDOLF HENSEL GMBH

Table 24 Hollow Section Column 60 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.401	0.364	0.336	0.313	0.306	0.306	0.306	0.205	0.205	0.205
20	0.473	0.423	0.385	0.355	0.344	0.332	0.332	0.205	0.205	0.205
25	0.563	0.482	0.434	0.397	0.384	0.365	0.358	0.205	0.205	0.205
30	0.708	0.553	0.484	0.439	0.423	0.401	0.384	0.205	0.205	0.205
35	0.852	0.669	0.538	0.481	0.462	0.437	0.410	0.205	0.205	0.205
40	0.996	0.784	0.631	0.522	0.502	0.472	0.436	0.205	0.205	0.205
45	1.140	0.900	0.724	0.594	0.551	0.508	0.462	0.205	0.205	0.205
50	1.285	1.015	0.817	0.668	0.620	0.555	0.488	0.205	0.205	0.205
55	1.429	1.131	0.910	0.743	0.689	0.615	0.514	0.275	0.205	0.205
60	1.573	1.246	1.003	0.818	0.757	0.675	0.551	0.347	0.205	0.205
65	1.717	1.362	1.096	0.893	0.826	0.735	0.599	0.420	0.223	0.205
70	1.861	1.477	1.189	0.968	0.894	0.795	0.647	0.493	0.277	0.205
75	2.003	1.593	1.282	1.043	0.963	0.855	0.694	0.550	0.331	0.205
80	2.025	1.708	1.375	1.118	1.031	0.915	0.742	0.594	0.385	0.205
85	2.048	1.824	1.468	1.193	1.100	0.975	0.790	0.638	0.438	0.205
90	2.071	1.939	1.561	1.267	1.169	1.035	0.837	0.682	0.492	0.205
95	2.094	2.012	1.654	1.342	1.237	1.095	0.885	0.726	0.541	0.220
100	2.117	2.033	1.747	1.417	1.306	1.155	0.933	0.770	0.582	0.265
105	2.139	2.054	1.840	1.492	1.374	1.215	0.981	0.813	0.623	0.310
110	2.162	2.075	1.933	1.567	1.443	1.275	1.028	0.857	0.664	0.356
115	2.185	2.096	2.007	1.642	1.511	1.335	1.076	0.901	0.705	0.401
120	2.208	2.117	2.028	1.717	1.580	1.395	1.124	0.945	0.746	0.446
125	2.231	2.138	2.048	1.791	1.649	1.455	1.171	0.989	0.787	0.492
130	2.253	2.159	2.069	1.866	1.717	1.515	1.219	1.033	0.827	0.535
135	2.276	2.180	2.090	1.941	1.786	1.575	1.267	1.077	0.868	0.570
140	2.299	2.201	2.110	2.006	1.854	1.635	1.314	1.121	0.909	0.605
145	2.322	2.222	2.131	2.027	1.923	1.695	1.362	1.164	0.950	0.640
150	2.345	2.243	2.151	2.048	1.991	1.755	1.410	1.208	0.991	0.675
155	2.368	2.264	2.172	2.069	2.020	1.815	1.457	1.252	1.032	0.710
160	2.390	2.286	2.192	2.090	2.042	1.875	1.505	1.296	1.073	0.745
165	2.413	2.307	2.213	2.111	2.063	1.935	1.553	1.340	1.114	0.780
170	2.436	2.328	2.233	2.132	2.085	1.995	1.600	1.384	1.154	0.815
175	2.459	2.349	2.254	2.153	2.106	2.022	1.648	1.428	1.195	0.850
180	2.482	2.370	2.274	2.173	2.127	2.044	1.696	1.472	1.236	0.885
185	2.504	2.391	2.295	2.194	2.149	2.067	1.744	1.515	1.277	0.920
190	2.527	2.412	2.316	2.215	2.170	2.090	1.791	1.559	1.318	0.955
195	2.550	2.433	2.336	2.236	2.192	2.112	1.839	1.603	1.359	0.990
200	2.644	2.454	2.357	2.257	2.213	2.135	1.887	1.647	1.400	1.025
205	2.816	2.475	2.377	2.278	2.235	2.157	1.934	1.691	1.440	1.060
210	2.988	2.496	2.398	2.299	2.256	2.180	1.982	1.735	1.481	1.095
215	3.160	2.517	2.418	2.320	2.278	2.203	2.018	1.779	1.522	1.130
220	3.332	2.538	2.439	2.341	2.299	2.225	2.045	1.823	1.563	1.165
225	3.504	2.559	2.459	2.362	2.321	2.248	2.072	1.866	1.604	1.200
230	3.677	2.686	2.480	2.383	2.342	2.270	2.098	1.910	1.645	1.235
235	3.839	2.828	2.500	2.404	2.364	2.293	2.125	1.954	1.686	1.270
240	3.931	2.969	2.521	2.425	2.385	2.316	2.152	1.998	1.726	1.305
245	4.024	3.110	2.541	2.446	2.406	2.338	2.179	2.028	1.767	1.340
250	4.116	3.251	2.562	2.467	2.428	2.361	2.206	2.057	1.808	1.375
255	4.208	3.393	2.672	2.488	2.449	2.383	2.233	2.085	1.849	1.410
260	4.300	3.534	2.782	2.509	2.471	2.406	2.260	2.114	1.890	1.445
265	4.392	3.675	2.891	2.529	2.492	2.429	2.287	2.143	1.931	1.480
270	4.485	3.817	3.001	2.550	2.514	2.451	2.314	2.171	1.972	1.515
275	4.577	3.914	3.111	2.600	2.535	2.474	2.341	2.200	2.010	1.550
280	4.669	4.007	3.220	2.685	2.557	2.496	2.368	2.228	2.042	1.585
285	4.761	4.100	3.330	2.769	2.620	2.519	2.395	2.257	2.073	1.620
290	4.854	4.193	3.440	2.854	2.696	2.542	2.422	2.286	2.104	1.655
295	4.946	4.286	3.549	2.939	2.773	2.571	2.449	2.314	2.136	1.690
300	5.038	4.379	3.659	3.024	2.849	2.662	2.476	2.343	2.167	1.725
305	5.130	4.472	3.769	3.108	2.926	2.754	2.503	2.372	2.199	1.761
310	5.222	4.565	3.873	3.193	3.002	2.845	2.530	2.400	2.230	1.796
315	5.315	4.659	3.972	3.278	3.079	2.936	2.557	2.429	2.262	1.831
320	5.407	4.752	4.071	3.363	3.156	3.028	2.629	2.457	2.293	1.866
325	5.499	4.845	4.169	3.447	3.232	3.119	2.713	2.486	2.325	1.901
330	5.591	4.938	4.268	3.532	3.309	3.211	2.796	2.515	2.356	1.936
335	-	-	-	3.617	3.385	3.302	2.880	2.543	2.387	1.971
340	-	-	-	3.702	3.462	3.394	2.964	2.588	2.419	2.005
345	-	-	-	3.786	3.538	3.485	3.048	2.663	2.450	2.038
350	-	-	-	3.882	3.615	3.576	3.132	2.738	2.482	2.070
355	-	-	-	3.990	3.691	3.668	3.216	2.812	2.513	2.102
360	-	-	-	4.097	3.768	3.759	3.299	2.887	2.545	2.134
365	-	-	-	4.204	3.852	3.851	3.383	2.962	2.591	2.166
370	-	-	-	-	3.961	3.942	3.467	3.037	2.655	2.198
375	-	-	-	-	4.071	4.034	3.551	3.112	2.719	2.230
380	-	-	-	-	4.180	4.125	3.635	3.186	2.784	2.263
385	-	-	-	-	-	-	3.719	3.261	2.848	2.295
390	-	-	-	-	-	-	3.802	3.336	2.912	2.327
395	-	-	-	-	-	-	3.886	3.411	2.976	2.359
400	-	-	-	-	-	-	3.970	3.485	3.040	2.391
405	-	-	-	-	-	-	4.054	3.560	3.105	2.423
410	-	-	-	-	-	-	4.138	3.635	3.169	2.456
415	-	-	-	-	-	-	-	3.710	3.233	2.488
420	-	-	-	-	-	-	-	3.785	3.297	2.520
425	-	-	-	-	-	-	-	3.859	3.362	2.552

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

Issued: 14th July 2015
Reissued: 25th June 2020
Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 25 Hollow Section Column 75 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.466	0.419	0.384	0.356	0.346	0.332	0.309	0.283	0.205	0.205
20	0.600	0.497	0.450	0.412	0.399	0.381	0.352	0.320	0.252	0.205
25	0.805	0.631	0.516	0.469	0.453	0.430	0.394	0.356	0.286	0.205
30	1.011	0.801	0.644	0.525	0.506	0.479	0.436	0.392	0.320	0.205
35	1.216	0.971	0.786	0.642	0.594	0.529	0.479	0.428	0.354	0.205
40	1.422	1.140	0.927	0.761	0.705	0.628	0.521	0.464	0.388	0.205
45	1.627	1.310	1.069	0.879	0.815	0.728	0.598	0.501	0.422	0.205
50	1.833	1.480	1.210	0.998	0.926	0.827	0.681	0.546	0.456	0.205
55	2.024	1.649	1.352	1.116	1.036	0.927	0.764	0.615	0.490	0.205
60	2.148	1.819	1.493	1.235	1.147	1.026	0.847	0.684	0.524	0.229
65	2.272	1.988	1.635	1.353	1.257	1.125	0.930	0.752	0.578	0.303
70	2.396	2.081	1.777	1.472	1.368	1.225	1.013	0.821	0.635	0.378
75	2.520	2.167	1.918	1.591	1.478	1.324	1.096	0.890	0.692	0.452
80	2.644	2.253	2.011	1.709	1.589	1.424	1.179	0.959	0.749	0.527
85	2.768	2.339	2.033	1.828	1.699	1.523	1.263	1.028	0.805	0.571
90	2.892	2.425	2.055	1.946	1.810	1.623	1.346	1.097	0.862	0.614
95	3.016	2.511	2.077	2.013	1.920	1.722	1.429	1.165	0.919	0.658
100	3.139	2.597	2.099	2.034	2.007	1.822	1.512	1.234	0.976	0.702
105	3.263	2.682	2.121	2.055	2.028	1.921	1.595	1.303	1.033	0.746
110	3.387	2.768	2.143	2.077	2.049	2.006	1.678	1.372	1.089	0.790
115	3.511	2.854	2.165	2.098	2.070	2.027	1.761	1.441	1.146	0.833
120	3.635	2.940	2.187	2.119	2.091	2.047	1.844	1.510	1.203	0.877
125	3.759	3.026	2.209	2.140	2.112	2.068	1.927	1.578	1.260	0.921
130	3.863	3.112	2.231	2.161	2.133	2.089	2.004	1.647	1.316	0.965
135	3.943	3.198	2.253	2.182	2.154	2.110	2.025	1.716	1.373	1.009
140	4.022	3.284	2.275	2.203	2.175	2.131	2.046	1.785	1.430	1.052
145	4.101	3.370	2.297	2.224	2.196	2.151	2.067	1.854	1.487	1.096
150	4.181	3.456	2.319	2.246	2.217	2.172	2.088	1.923	1.543	1.140
155	4.260	3.542	2.341	2.267	2.238	2.193	2.109	1.991	1.600	1.184
160	4.340	3.628	2.363	2.288	2.259	2.214	2.131	2.021	1.657	1.228
165	4.419	3.713	2.385	2.309	2.280	2.235	2.152	2.043	1.714	1.271
170	4.498	3.799	2.407	2.330	2.301	2.255	2.173	2.065	1.770	1.315
175	4.578	3.881	2.429	2.351	2.322	2.276	2.194	2.087	1.827	1.359
180	4.657	3.960	2.451	2.372	2.343	2.297	2.215	2.110	1.884	1.403
185	4.736	4.040	2.473	2.394	2.364	2.318	2.236	2.132	1.941	1.447
190	4.816	4.119	2.495	2.415	2.385	2.339	2.257	2.154	1.997	1.491
195	4.895	4.199	2.517	2.436	2.406	2.359	2.278	2.176	2.025	1.534
200	4.975	4.278	2.539	2.457	2.427	2.380	2.299	2.199	2.050	1.578
205	5.054	4.358	2.561	2.478	2.448	2.401	2.320	2.221	2.075	1.622
210	5.133	4.437	2.797	2.499	2.469	2.422	2.341	2.243	2.100	1.666
215	5.213	4.517	3.039	2.520	2.490	2.443	2.362	2.265	2.125	1.710
220	5.292	4.596	3.282	2.541	2.511	2.463	2.383	2.287	2.150	1.753
225	5.372	4.676	3.525	2.567	2.532	2.484	2.404	2.310	2.175	1.797
230	5.451	4.755	3.767	2.732	2.553	2.505	2.426	2.332	2.200	1.841
235	5.530	4.835	3.909	2.897	2.647	2.526	2.447	2.354	2.225	1.885
240	5.610	4.914	4.017	3.063	2.792	2.547	2.468	2.376	2.250	1.929
245	5.689	4.994	4.125	3.228	2.937	2.593	2.489	2.398	2.275	1.972
250	5.768	5.073	4.232	3.394	3.081	2.717	2.510	2.421	2.300	2.013
255	5.848	5.153	4.340	3.559	3.226	2.840	2.531	2.443	2.325	2.046
260	5.927	5.232	4.448	3.725	3.371	2.963	2.552	2.465	2.350	2.080
265	6.007	5.312	4.556	3.872	3.515	3.086	2.611	2.487	2.375	2.113
270	6.086	5.391	4.664	3.990	3.660	3.209	2.704	2.510	2.400	2.146
275	6.165	5.471	4.772	4.107	3.805	3.333	2.798	2.532	2.425	2.180
280	6.245	5.550	4.880	4.225	3.929	3.456	2.891	2.554	2.450	2.213
285	6.324	5.630	4.988	4.343	4.049	3.579	2.985	2.607	2.475	2.246
290	6.403	5.709	5.096	4.460	4.169	3.702	3.078	2.678	2.500	2.280
295	-	5.789	5.203	4.578	4.290	3.825	3.171	2.750	2.525	2.313
300	-	5.868	5.311	4.696	4.410	3.953	3.265	2.821	2.550	2.347
305	-	5.948	5.419	4.813	4.530	4.080	3.358	2.892	2.611	2.380
310	-	6.027	5.527	4.931	4.650	4.208	3.452	2.963	2.707	2.413
315	-	6.106	5.635	5.048	4.771	4.335	3.545	3.034	2.803	2.447
320	-	6.186	5.743	5.166	4.891	4.463	3.639	3.105	2.899	2.480
325	-	6.265	5.851	5.284	5.011	4.590	3.732	3.177	2.995	2.513
330	-	6.345	5.959	5.401	5.131	4.718	3.826	3.248	3.092	2.547
335	-	-	-	-	-	-	3.964	3.319	3.188	2.608
340	-	-	-	-	-	-	4.104	3.390	3.284	2.694
345	-	-	-	-	-	-	-	3.461	3.380	2.779
350	-	-	-	-	-	-	-	3.532	3.476	2.864
355	-	-	-	-	-	-	-	3.604	3.572	2.950
360	-	-	-	-	-	-	-	3.675	3.668	3.035
365	-	-	-	-	-	-	-	3.764	3.764	3.120
370	-	-	-	-	-	-	-	3.861	3.861	3.205
375	-	-	-	-	-	-	-	3.960	3.957	3.291
380	-	-	-	-	-	-	-	4.116	4.053	3.376
385	-	-	-	-	-	-	-	-	4.149	3.461
390	-	-	-	-	-	-	-	-	-	3.546
395	-	-	-	-	-	-	-	-	-	3.632
400	-	-	-	-	-	-	-	-	-	3.717
405	-	-	-	-	-	-	-	-	-	3.802
410	-	-	-	-	-	-	-	-	-	3.887
415	-	-	-	-	-	-	-	-	-	3.973
420	-	-	-	-	-	-	-	-	-	4.058
425	-	-	-	-	-	-	-	-	-	4.143

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 26 Hollow Section Column 90 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.541	0.475	0.433	0.399	0.387	0.370	0.344	0.316	0.288	0.284
20	0.889	0.641	0.515	0.470	0.455	0.433	0.399	0.363	0.328	0.312
25	1.236	0.884	0.691	0.560	0.522	0.495	0.453	0.411	0.368	0.340
30	1.584	1.128	0.882	0.723	0.670	0.595	0.508	0.458	0.408	0.369
35	1.931	1.372	1.073	0.887	0.824	0.736	0.604	0.506	0.448	0.397
40	2.143	1.616	1.264	1.050	0.977	0.876	0.724	0.583	0.488	0.425
45	2.319	1.860	1.455	1.213	1.131	1.016	0.844	0.684	0.529	0.453
50	2.495	2.022	1.646	1.377	1.284	1.156	0.964	0.786	0.614	0.482
55	2.672	2.069	1.837	1.540	1.438	1.297	1.084	0.887	0.700	0.510
60	2.848	2.116	2.017	1.704	1.591	1.437	1.205	0.989	0.785	0.551
65	3.025	2.163	2.125	1.867	1.745	1.577	1.325	1.090	0.870	0.611
70	3.201	2.233	2.233	2.016	1.899	1.717	1.445	1.192	0.955	0.671
75	3.378	2.342	2.342	2.095	2.009	1.857	1.565	1.293	1.041	0.731
80	3.554	2.450	2.450	2.175	2.032	1.998	1.685	1.395	1.126	0.791
85	3.731	2.559	2.559	2.255	2.054	2.023	1.805	1.496	1.211	0.851
90	3.872	2.667	2.667	2.334	2.077	2.045	1.925	1.598	1.297	0.911
95	3.970	2.775	2.775	2.414	2.100	2.067	2.010	1.699	1.382	0.971
100	4.068	2.884	2.884	2.493	2.122	2.089	2.031	1.801	1.467	1.031
105	4.166	2.992	2.992	2.573	2.145	2.111	2.052	1.902	1.553	1.091
110	4.265	3.123	3.101	2.652	2.167	2.133	2.074	2.002	1.638	1.151
115	4.363	3.859	3.209	2.732	2.190	2.155	2.095	2.024	1.723	1.211
120	4.461	3.954	3.317	2.812	2.212	2.177	2.116	2.045	1.808	1.271
125	4.559	4.050	3.426	2.891	2.235	2.199	2.138	2.066	1.894	1.331
130	4.657	4.145	3.534	2.971	2.257	2.221	2.159	2.087	1.979	1.391
135	4.755	4.240	3.642	3.050	2.280	2.242	2.180	2.109	2.018	1.451
140	4.853	4.336	3.751	3.130	2.303	2.264	2.202	2.130	2.040	1.511
145	4.951	4.431	3.856	3.209	2.325	2.286	2.223	2.151	2.062	1.571
150	5.050	4.526	3.953	3.289	2.348	2.308	2.245	2.173	2.083	1.631
155	5.148	4.622	4.050	3.369	2.370	2.330	2.266	2.194	2.105	1.691
160	5.246	4.717	4.147	3.448	2.393	2.352	2.287	2.215	2.127	1.751
165	5.344	4.812	4.244	3.528	2.415	2.374	2.309	2.236	2.149	1.811
170	5.442	4.908	4.341	3.607	2.438	2.396	2.330	2.258	2.171	1.871
175	5.540	5.003	4.438	3.687	2.460	2.418	2.351	2.279	2.193	1.931
180	5.638	5.098	4.535	3.766	2.483	2.440	2.373	2.300	2.214	1.991
185	5.736	5.194	4.632	3.852	2.506	2.462	2.394	2.321	2.236	2.024
190	5.835	5.289	4.729	3.959	2.528	2.484	2.415	2.343	2.258	2.051
195	5.933	5.384	4.826	4.066	2.551	2.506	2.437	2.364	2.280	2.078
200	6.031	5.480	4.923	4.172	2.990	2.527	2.458	2.385	2.302	2.105
205	6.129	5.575	5.020	4.279	3.831	2.549	2.479	2.407	2.323	2.133
210	6.227	5.670	5.117	4.386	3.945	2.653	2.501	2.428	2.345	2.160
215	6.325	5.766	5.214	4.492	4.059	2.868	2.522	2.449	2.367	2.187
220	6.423	5.861	5.311	4.599	4.173	3.083	2.544	2.470	2.389	2.214
225	-	5.956	5.408	4.706	4.287	3.297	2.583	2.492	2.411	2.241
230	-	6.052	5.505	4.813	4.400	3.512	2.740	2.513	2.433	2.268
235	-	6.147	5.602	4.919	4.514	3.727	2.897	2.534	2.454	2.295
240	-	6.242	5.699	5.026	4.628	3.903	3.054	2.556	2.476	2.323
245	-	6.338	5.796	5.133	4.742	4.045	3.211	2.644	2.498	2.350
250	-	6.433	5.893	5.239	4.856	4.187	3.367	2.761	2.520	2.377
255	-	-	5.990	5.346	4.970	4.329	3.524	2.879	2.542	2.404
260	-	-	6.087	5.453	5.084	4.471	3.681	2.996	2.568	2.431
265	-	-	6.184	5.559	5.198	4.613	3.838	3.113	2.653	2.458
270	-	-	6.281	5.666	5.312	4.755	3.992	3.231	2.738	2.485
275	-	-	6.378	5.773	5.426	4.897	4.146	3.348	2.822	2.513
280	-	-	6.475	5.880	5.540	5.039	4.300	3.466	2.907	2.540
285	-	-	-	5.986	5.654	5.181	4.454	3.583	2.992	2.584
290	-	-	-	6.093	5.768	5.322	4.608	3.700	3.077	2.706
295	-	-	-	6.200	5.882	5.464	4.762	3.818	3.162	2.827
300	-	-	-	6.306	5.996	5.606	4.916	3.983	3.247	2.949
305	-	-	-	6.413	6.110	5.748	5.070	4.152	3.332	3.071
310	-	-	-	6.520	6.224	5.890	5.224	4.322	3.416	3.193
315	-	-	-	-	6.338	6.032	5.378	4.491	3.501	3.314
320	-	-	-	-	6.452	6.174	5.532	4.661	3.586	3.436
325	-	-	-	-	-	6.316	5.686	4.830	3.671	3.558
330	-	-	-	-	-	6.458	5.840	5.000	3.756	3.679
335	-	-	-	-	-	-	-	-	3.858	3.801
340	-	-	-	-	-	-	-	-	4.056	3.923
345	-	-	-	-	-	-	-	-	-	4.045
350	-	-	-	-	-	-	-	-	-	4.166
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

Issued: 14th July 2015
Reissued: 25th June 2020
Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 27 Hollow Section Column 105 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.921	0.542	0.482	0.442	0.429	0.409	0.380	0.349	0.318	0.292
20	1.372	0.916	0.678	0.530	0.511	0.485	0.446	0.407	0.368	0.331
25	1.823	1.290	0.954	0.739	0.685	0.608	0.513	0.466	0.419	0.370
30	2.140	1.665	1.231	0.948	0.882	0.790	0.651	0.525	0.469	0.409
35	2.370	2.020	1.507	1.157	1.079	0.972	0.809	0.657	0.519	0.448
40	2.600	2.202	1.784	1.365	1.277	1.153	0.967	0.791	0.624	0.487
45	2.830	2.385	2.017	1.574	1.474	1.335	1.125	0.926	0.739	0.526
50	3.060	2.567	2.087	1.783	1.671	1.517	1.282	1.061	0.853	0.610
55	3.290	2.749	2.157	1.992	1.869	1.698	1.440	1.196	0.967	0.696
60	3.520	2.932	2.226	2.122	2.039	1.880	1.598	1.330	1.082	0.781
65	3.749	3.114	2.296	2.248	2.152	2.033	1.756	1.465	1.196	0.866
70	3.955	3.296	2.373	2.373	2.265	2.129	1.913	1.600	1.310	0.951
75	4.148	3.479	2.499	2.499	2.378	2.225	2.012	1.734	1.425	1.036
80	4.341	3.661	2.625	2.625	2.491	2.321	2.035	1.869	1.539	1.121
85	4.534	3.839	2.751	2.751	2.604	2.417	2.057	2.002	1.653	1.207
90	4.727	3.971	2.939	2.877	2.717	2.512	2.080	2.024	1.768	1.292
95	4.920	4.103	3.254	3.003	2.830	2.608	2.103	2.047	1.882	1.377
100	5.113	4.235	3.570	3.128	2.943	2.704	2.126	2.069	1.996	1.462
105	5.306	4.367	3.849	3.254	3.056	2.800	2.148	2.091	2.023	1.547
110	5.499	4.498	3.963	3.380	3.169	2.895	2.171	2.113	2.045	1.632
115	5.692	4.630	4.076	3.506	3.282	2.991	2.194	2.135	2.067	1.717
120	5.886	4.762	4.190	3.632	3.395	3.087	2.217	2.157	2.089	1.803
125	6.079	4.894	4.304	3.757	3.508	3.183	2.239	2.180	2.111	1.888
130	6.272	5.026	4.418	3.880	3.621	3.278	2.262	2.202	2.133	1.973
135	6.465	5.158	4.532	3.997	3.734	3.374	2.285	2.224	2.155	2.018
140	-	5.290	4.645	4.115	3.848	3.470	2.308	2.246	2.177	2.042
145	-	5.422	4.759	4.233	3.969	3.566	2.330	2.268	2.199	2.066
150	-	5.554	4.873	4.351	4.089	3.661	2.353	2.290	2.221	2.090
155	-	5.686	4.987	4.468	4.210	3.757	2.376	2.312	2.243	2.114
160	-	5.817	5.101	4.586	4.331	3.862	2.399	2.335	2.265	2.138
165	-	5.949	5.215	4.704	4.451	3.991	2.421	2.357	2.287	2.162
170	-	6.081	5.328	4.821	4.572	4.120	2.444	2.379	2.309	2.186
175	-	6.213	5.442	4.939	4.693	4.249	2.467	2.401	2.331	2.210
180	-	6.345	5.556	5.057	4.813	4.378	2.490	2.423	2.353	2.234
185	-	6.477	5.670	5.174	4.934	4.508	2.512	2.445	2.375	2.258
190	-	-	5.784	5.292	5.055	4.637	2.535	2.468	2.397	2.282
195	-	-	5.897	5.410	5.176	4.766	2.558	2.490	2.419	2.306
200	-	-	6.011	5.528	5.296	4.895	3.446	2.512	2.441	2.331
205	-	-	6.125	5.645	5.417	5.024	3.931	2.534	2.463	2.355
210	-	-	6.239	5.763	5.538	5.153	4.092	2.556	2.485	2.379
215	-	-	6.353	5.881	5.658	5.283	4.252	2.699	2.507	2.403
220	-	-	6.467	5.998	5.779	5.412	4.412	2.884	2.529	2.427
225	-	-	-	6.116	5.900	5.541	4.572	3.068	2.551	2.451
230	-	-	-	6.234	6.020	5.670	4.733	3.253	2.625	2.475
235	-	-	-	6.352	6.141	5.799	4.893	3.438	2.750	2.499
240	-	-	-	-	6.262	5.928	5.053	3.623	2.875	2.523
245	-	-	-	-	6.382	6.057	5.213	3.808	3.000	2.547
250	-	-	-	-	-	6.187	5.374	3.999	3.125	2.595
255	-	-	-	-	-	6.316	5.534	4.191	3.250	2.684
260	-	-	-	-	-	6.445	5.694	4.383	3.375	2.773
265	-	-	-	-	-	-	5.854	4.575	3.500	2.861
270	-	-	-	-	-	-	6.014	4.767	3.625	2.950
275	-	-	-	-	-	-	6.175	4.959	3.750	3.039
280	-	-	-	-	-	-	6.335	5.151	3.913	3.127
285	-	-	-	-	-	-	-	5.343	4.137	3.216
290	-	-	-	-	-	-	-	5.535	4.361	3.305
295	-	-	-	-	-	-	-	5.727	4.585	3.393
300	-	-	-	-	-	-	-	5.919	4.808	3.482
305	-	-	-	-	-	-	-	6.111	5.032	3.571
310	-	-	-	-	-	-	-	6.303	5.256	3.660
315	-	-	-	-	-	-	-	6.495	5.480	3.748
320	-	-	-	-	-	-	-	-	5.704	3.860
325	-	-	-	-	-	-	-	-	5.928	4.182
330	-	-	-	-	-	-	-	-	6.152	4.503
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

Issued: 14th July 2015
Reissued: 25th June 2020
Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 28 Hollow Section Column 120 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	1.260	0.889	0.541	0.486	0.471	0.449	0.415	0.382	0.348	0.318
20	1.824	1.354	0.937	0.707	0.640	0.556	0.494	0.452	0.409	0.366
25	2.196	1.819	1.333	1.012	0.914	0.788	0.641	0.522	0.470	0.414
30	2.479	2.142	1.728	1.316	1.187	1.021	0.837	0.683	0.536	0.462
35	2.763	2.372	2.061	1.620	1.461	1.254	1.033	0.851	0.679	0.510
40	3.046	2.602	2.252	1.925	1.734	1.486	1.229	1.019	0.823	0.599
45	3.329	2.832	2.444	2.072	2.003	1.719	1.425	1.188	0.966	0.710
50	3.613	3.062	2.635	2.166	2.064	1.952	1.621	1.356	1.110	0.820
55	3.912	3.292	2.826	2.260	2.125	2.109	1.817	1.524	1.254	0.930
60	4.262	3.522	3.018	2.354	2.246	2.246	2.008	1.692	1.397	1.041
65	4.612	3.752	3.209	2.448	2.383	2.383	2.117	1.861	1.541	1.151
70	4.961	4.003	3.401	2.541	2.520	2.520	2.226	2.015	1.684	1.262
75	5.311	4.264	3.592	2.746	2.656	2.656	2.334	2.099	1.828	1.372
80	5.661	4.525	3.783	2.982	2.793	2.793	2.443	2.182	1.972	1.482
85	6.010	4.786	3.981	3.218	2.930	2.930	2.552	2.265	2.020	1.593
90	-	5.047	4.181	3.453	3.067	3.067	2.661	2.348	2.043	1.703
95	-	5.307	4.380	3.689	3.203	3.203	2.770	2.431	2.066	1.814
100	-	5.568	4.580	3.892	3.359	3.340	2.879	2.515	2.089	1.924
105	-	5.829	4.779	4.047	3.795	3.477	2.987	2.598	2.112	2.009
110	-	6.090	4.979	4.203	3.958	3.614	3.096	2.681	2.136	2.033
115	-	6.351	5.178	4.358	4.099	3.751	3.205	2.764	2.159	2.057
120	-	-	5.378	4.513	4.240	3.889	3.314	2.847	2.182	2.081
125	-	-	5.577	4.669	4.380	4.029	3.423	2.931	2.205	2.105
130	-	-	5.777	4.824	4.521	4.169	3.532	3.014	2.228	2.129
135	-	-	5.976	4.979	4.662	4.309	3.641	3.097	2.251	2.153
140	-	-	6.176	5.135	4.803	4.449	3.749	3.180	2.274	2.177
145	-	-	6.375	5.290	4.943	4.589	3.871	3.264	2.297	2.201
150	-	-	-	5.445	5.084	4.728	4.024	3.347	2.320	2.225
155	-	-	-	5.601	5.225	4.868	4.177	3.430	2.343	2.249
160	-	-	-	5.756	5.366	5.008	4.330	3.513	2.366	2.273
165	-	-	-	5.912	5.506	5.148	4.483	3.596	2.389	2.297
170	-	-	-	6.067	5.647	5.288	4.636	3.680	2.413	2.321
175	-	-	-	6.222	5.788	5.428	4.789	3.763	2.436	2.345
180	-	-	-	6.378	5.929	5.568	4.942	3.868	2.459	2.369
185	-	-	-	-	6.069	5.708	5.095	4.054	2.482	2.393
190	-	-	-	-	6.210	5.848	5.248	4.240	2.505	2.417
195	-	-	-	-	6.351	5.988	5.401	4.427	2.528	2.441
200	-	-	-	-	6.492	6.128	5.554	4.613	2.551	2.465
205	-	-	-	-	-	6.268	5.707	4.799	2.655	2.489
210	-	-	-	-	-	6.408	5.860	4.985	2.832	2.513
215	-	-	-	-	-	6.548	6.013	5.171	3.009	2.537
220	-	-	-	-	-	-	6.166	5.357	3.186	2.561
225	-	-	-	-	-	-	6.319	5.543	3.364	2.683
230	-	-	-	-	-	-	-	5.729	3.541	2.810
235	-	-	-	-	-	-	-	5.916	3.718	2.936
240	-	-	-	-	-	-	-	6.102	3.976	3.063
245	-	-	-	-	-	-	-	6.288	4.366	3.190
250	-	-	-	-	-	-	-	6.474	4.755	3.316
255	-	-	-	-	-	-	-	-	5.145	3.443
260	-	-	-	-	-	-	-	-	5.535	3.570
265	-	-	-	-	-	-	-	-	5.925	3.696
270	-	-	-	-	-	-	-	-	6.315	3.823
275	-	-	-	-	-	-	-	-	-	4.180
280	-	-	-	-	-	-	-	-	-	4.548
285	-	-	-	-	-	-	-	-	-	4.915
290	-	-	-	-	-	-	-	-	-	5.282
295	-	-	-	-	-	-	-	-	-	5.649
300	-	-	-	-	-	-	-	-	-	6.017
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

Issued: 14th July 2015
Reissued: 25th June 2020
Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 29 Hollow Section Column 150 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	5.330	1.499	1.132	0.827	0.637	0.531	0.487	0.448	0.409	0.371
20	5.330	2.112	1.700	1.316	1.127	0.963	0.740	0.568	0.491	0.437
25	5.330	2.558	2.136	1.805	1.617	1.395	1.086	0.839	0.641	0.503
30	5.330	3.004	2.422	2.154	2.054	1.827	1.433	1.109	0.843	0.631
35	5.330	3.449	2.708	2.408	2.294	2.131	1.779	1.380	1.046	0.792
40	5.330	3.895	2.995	2.662	2.535	2.347	2.050	1.651	1.248	0.953
45	5.330	4.341	3.281	2.916	2.776	2.563	2.184	1.922	1.450	1.115
50	5.717	4.786	3.567	3.170	3.017	2.779	2.318	2.037	1.653	1.276
55	6.105	5.232	3.872	3.424	3.258	2.995	2.452	2.088	1.855	1.437
60	-	5.678	4.378	3.678	3.499	3.212	2.597	2.138	2.036	1.598
65	-	6.123	4.884	3.994	3.740	3.428	2.795	2.189	2.160	1.760
70	-	-	5.391	4.397	4.062	3.644	2.993	2.284	2.284	1.921
75	-	-	5.897	4.800	4.430	3.878	3.191	2.408	2.408	2.084
80	-	-	6.403	5.203	4.799	4.217	3.389	2.532	2.532	2.247
85	-	-	-	5.607	5.168	4.556	3.587	2.656	2.656	2.411
90	-	-	-	6.010	5.536	4.894	3.785	2.780	2.780	2.575
95	-	-	-	-	5.905	5.233	4.081	2.904	2.904	2.739
100	-	-	-	-	6.274	5.572	4.404	3.028	3.028	2.902
105	-	-	-	-	-	5.911	4.728	3.244	3.152	3.066
110	-	-	-	-	-	6.249	5.051	3.982	3.276	3.230
115	-	-	-	-	-	-	5.374	4.300	3.399	3.394
120	-	-	-	-	-	-	5.698	4.617	3.557	3.557
125	-	-	-	-	-	-	6.021	4.934	3.721	3.721
130	-	-	-	-	-	-	-	5.251	3.879	3.879
135	-	-	-	-	-	-	-	5.568	4.027	4.027
140	-	-	-	-	-	-	-	5.885	4.208	4.175
145	-	-	-	-	-	-	-	6.202	4.454	4.323
150	-	-	-	-	-	-	-	-	4.700	4.471
155	-	-	-	-	-	-	-	-	4.946	4.619
160	-	-	-	-	-	-	-	-	5.193	4.767
165	-	-	-	-	-	-	-	-	5.439	4.915
170	-	-	-	-	-	-	-	-	5.685	5.063
175	-	-	-	-	-	-	-	-	5.931	5.211
180	-	-	-	-	-	-	-	-	6.178	5.359
185	-	-	-	-	-	-	-	-	6.424	5.507
190	-	-	-	-	-	-	-	-	-	5.655
195	-	-	-	-	-	-	-	-	-	5.803
200	-	-	-	-	-	-	-	-	-	5.951
205	-	-	-	-	-	-	-	-	-	6.099
210	-	-	-	-	-	-	-	-	-	6.247
215	-	-	-	-	-	-	-	-	-	6.395
220	-	-	-	-	-	-	-	-	-	6.542
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	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 30 Hollow Section Column 180 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	-	-	1.682	1.334	1.212	1.038	0.763	0.476	0.471	0.424
20	-	-	2.324	1.991	1.835	1.617	1.276	0.993	0.720	0.509
25	-	-	2.883	2.478	2.334	2.141	1.789	1.510	1.142	0.694
30	-	-	3.443	2.962	2.787	2.555	2.196	2.015	1.565	0.906
35	-	-	4.003	3.445	3.241	2.970	2.527	2.293	1.987	1.119
40	-	-	4.562	3.929	3.694	3.384	2.859	2.572	2.092	1.331
45	-	-	5.122	4.413	4.148	3.798	3.190	2.850	2.186	1.543
50	-	-	5.681	4.897	4.601	4.213	3.521	3.128	2.279	1.756
55	-	-	6.241	5.381	5.055	4.627	3.857	3.406	2.373	1.968
60	-	-	-	5.865	5.508	5.041	4.253	3.684	2.665	2.665
65	-	-	-	6.348	5.962	5.455	4.649	4.047	3.453	3.453
70	-	-	-	-	6.415	5.870	5.045	4.504	3.986	3.986
75	-	-	-	-	-	6.284	5.440	4.960	4.286	4.286
80	-	-	-	-	-	-	5.836	5.417	4.587	4.587
85	-	-	-	-	-	-	6.232	5.873	4.887	4.887
90	-	-	-	-	-	-	-	6.329	5.188	5.188
95	-	-	-	-	-	-	-	-	5.489	5.489
100	-	-	-	-	-	-	-	-	-	5.789
105	-	-	-	-	-	-	-	-	-	6.090
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	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 31 Rectangular Hollow Section Beam 15 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
20	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
25	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
30	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
35	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
40	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
45	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
50	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
55	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
60	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
65	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
70	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
75	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
80	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
85	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
90	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
95	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
100	0.206	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
105	0.220	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
110	0.235	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
115	0.249	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
120	0.263	0.212	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
125	0.277	0.222	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
130	0.292	0.232	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
135	0.306	0.242	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
140	0.320	0.252	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
145	0.335	0.263	0.210	0.205	0.205	0.205	0.205	0.205	0.205	0.205
150	0.349	0.273	0.219	0.205	0.205	0.205	0.205	0.205	0.205	0.205
155	0.363	0.283	0.227	0.205	0.205	0.205	0.205	0.205	0.205	0.205
160	0.378	0.293	0.235	0.205	0.205	0.205	0.205	0.205	0.205	0.205
165	0.392	0.303	0.243	0.205	0.205	0.205	0.205	0.205	0.205	0.205
170	0.406	0.314	0.251	0.205	0.205	0.205	0.205	0.205	0.205	0.205
175	0.420	0.324	0.259	0.205	0.205	0.205	0.205	0.205	0.205	0.205
180	0.435	0.334	0.268	0.205	0.205	0.205	0.205	0.205	0.205	0.205
185	0.449	0.344	0.276	0.211	0.205	0.205	0.205	0.205	0.205	0.205
190	0.463	0.354	0.284	0.218	0.205	0.205	0.205	0.205	0.205	0.205
195	0.478	0.365	0.292	0.225	0.205	0.205	0.205	0.205	0.205	0.205
200	0.492	0.375	0.300	0.232	0.210	0.205	0.205	0.205	0.205	0.205
205	0.506	0.385	0.308	0.239	0.216	0.205	0.205	0.205	0.205	0.205
210	0.521	0.395	0.316	0.246	0.223	0.205	0.205	0.205	0.205	0.205
215	0.537	0.405	0.325	0.253	0.230	0.205	0.205	0.205	0.205	0.205
220	0.555	0.416	0.333	0.260	0.236	0.205	0.205	0.205	0.205	0.205
225	0.573	0.426	0.341	0.267	0.243	0.209	0.205	0.205	0.205	0.205
230	0.591	0.436	0.349	0.274	0.249	0.215	0.205	0.205	0.205	0.205
235	0.609	0.446	0.357	0.282	0.256	0.221	0.205	0.205	0.205	0.205
240	0.627	0.456	0.365	0.289	0.262	0.227	0.205	0.205	0.205	0.205
245	0.645	0.467	0.374	0.296	0.269	0.233	0.205	0.205	0.205	0.205
250	0.663	0.477	0.382	0.303	0.276	0.239	0.205	0.205	0.205	0.205
255	0.681	0.487	0.390	0.310	0.282	0.245	0.205	0.205	0.205	0.205
260	0.699	0.497	0.398	0.317	0.289	0.251	0.205	0.205	0.205	0.205
265	0.718	0.507	0.406	0.324	0.295	0.257	0.205	0.205	0.205	0.205
270	0.736	0.518	0.414	0.331	0.302	0.262	0.205	0.205	0.205	0.205
275	0.754	0.528	0.422	0.338	0.309	0.268	0.205	0.205	0.205	0.205
280	0.772	0.545	0.431	0.345	0.315	0.274	0.208	0.205	0.205	0.205
285	0.790	0.561	0.439	0.352	0.322	0.280	0.212	0.205	0.205	0.205
290	0.808	0.578	0.447	0.359	0.328	0.286	0.217	0.205	0.205	0.205
295	0.826	0.594	0.455	0.366	0.335	0.292	0.222	0.205	0.205	0.205
300	0.844	0.610	0.463	0.373	0.341	0.298	0.227	0.205	0.205	0.205
305	0.862	0.627	0.471	0.380	0.348	0.304	0.232	0.205	0.205	0.205
310	0.880	0.643	0.480	0.387	0.355	0.310	0.236	0.205	0.205	0.205
315	0.898	0.660	0.488	0.394	0.361	0.316	0.241	0.205	0.205	0.205
320	0.916	0.676	0.496	0.401	0.368	0.322	0.246	0.205	0.205	0.205
325	0.934	0.692	0.504	0.408	0.374	0.328	0.251	0.205	0.205	0.205
330	0.952	0.709	0.512	0.415	0.381	0.333	0.255	0.205	0.205	0.205
335	0.970	0.725	0.520	0.422	0.388	0.339	0.260	0.205	0.205	0.205
340	0.988	0.742	0.530	0.429	0.394	0.345	0.265	0.205	0.205	0.205
345	1.006	0.758	0.544	0.436	0.401	0.351	0.270	0.205	0.205	0.205
350	1.025	0.774	0.559	0.443	0.407	0.357	0.275	0.205	0.205	0.205
355	1.043	0.791	0.574	0.450	0.414	0.363	0.279	0.205	0.205	0.205
360	1.061	0.807	0.589	0.457	0.421	0.369	0.284	0.205	0.205	0.205
365	1.079	0.824	0.603	0.464	0.427	0.375	0.289	0.205	0.205	0.205
370	1.097	0.840	0.618	0.472	0.434	0.381	0.294	0.205	0.205	0.205
375	1.115	0.856	0.633	0.479	0.440	0.387	0.298	0.205	0.205	0.205
380	1.133	0.873	0.648	0.486	0.447	0.393	0.303	0.205	0.205	0.205
385	1.151	0.889	0.662	0.493	0.453	0.399	0.308	0.205	0.205	0.205
390	1.169	0.906	0.677	0.500	0.460	0.404	0.313	0.206	0.205	0.205
395	1.187	0.922	0.692	0.507	0.467	0.410	0.317	0.209	0.205	0.205
400	1.205	0.938	0.707	0.514	0.473	0.416	0.322	0.212	0.205	0.205
405	1.223	0.955	0.721	0.521	0.480	0.422	0.327	0.216	0.205	0.205
410	1.241	0.971	0.736	0.528	0.486	0.428	0.332	0.219	0.205	0.205
415	1.259	0.988	0.751	0.541	0.493	0.434	0.337	0.223	0.205	0.205
420	1.277	1.004	0.766	0.554	0.500	0.440	0.341	0.226	0.205	0.205
425	1.295	1.020	0.780	0.567	0.506	0.446	0.346	0.230	0.205	0.205

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 32 Rectangular Hollow Section Beam 30 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.304	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
20	0.328	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
25	0.352	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
30	0.376	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
35	0.400	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
40	0.424	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
45	0.448	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
50	0.472	0.240	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
55	0.496	0.277	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
60	0.519	0.314	0.225	0.205	0.205	0.205	0.205	0.205	0.205	0.205
65	0.552	0.350	0.245	0.205	0.205	0.205	0.205	0.205	0.205	0.205
70	0.588	0.387	0.266	0.205	0.205	0.205	0.205	0.205	0.205	0.205
75	0.624	0.424	0.286	0.209	0.205	0.205	0.205	0.205	0.205	0.205
80	0.660	0.460	0.307	0.224	0.205	0.205	0.205	0.205	0.205	0.205
85	0.697	0.497	0.327	0.239	0.205	0.205	0.205	0.205	0.205	0.205
90	0.733	0.533	0.348	0.254	0.217	0.205	0.205	0.205	0.205	0.205
95	0.769	0.563	0.368	0.269	0.232	0.206	0.205	0.205	0.205	0.205
100	0.805	0.594	0.389	0.284	0.247	0.221	0.205	0.205	0.205	0.205
105	0.842	0.625	0.409	0.300	0.263	0.235	0.205	0.205	0.205	0.205
110	0.878	0.656	0.430	0.315	0.278	0.249	0.210	0.205	0.205	0.205
115	0.914	0.687	0.450	0.330	0.294	0.264	0.223	0.205	0.205	0.205
120	0.950	0.718	0.471	0.345	0.309	0.278	0.236	0.205	0.205	0.205
125	0.987	0.749	0.491	0.360	0.325	0.292	0.249	0.205	0.205	0.205
130	1.023	0.780	0.512	0.376	0.340	0.307	0.262	0.217	0.205	0.205
135	1.059	0.811	0.534	0.391	0.356	0.321	0.275	0.228	0.205	0.205
140	1.095	0.842	0.564	0.406	0.371	0.336	0.288	0.240	0.205	0.205
145	1.131	0.873	0.594	0.421	0.387	0.350	0.301	0.251	0.205	0.205
150	1.168	0.904	0.624	0.436	0.402	0.364	0.314	0.263	0.211	0.205
155	1.204	0.935	0.653	0.452	0.417	0.379	0.326	0.274	0.220	0.205
160	1.240	0.965	0.683	0.467	0.433	0.393	0.339	0.286	0.230	0.205
165	1.276	0.996	0.713	0.482	0.448	0.408	0.352	0.297	0.239	0.205
170	1.313	1.027	0.743	0.497	0.464	0.422	0.365	0.309	0.248	0.205
175	1.349	1.058	0.772	0.512	0.479	0.436	0.378	0.320	0.258	0.205
180	1.385	1.089	0.802	0.528	0.495	0.451	0.391	0.332	0.267	0.205
185	1.421	1.120	0.832	0.557	0.510	0.465	0.404	0.343	0.277	0.205
190	1.457	1.151	0.862	0.586	0.526	0.479	0.417	0.355	0.286	0.212
195	1.494	1.182	0.891	0.615	0.552	0.494	0.430	0.366	0.296	0.218
200	1.530	1.213	0.921	0.644	0.580	0.508	0.443	0.378	0.305	0.225
205	1.566	1.244	0.951	0.673	0.608	0.523	0.456	0.389	0.314	0.231
210	1.602	1.275	0.980	0.701	0.636	0.545	0.469	0.401	0.324	0.238
215	1.639	1.306	1.010	0.730	0.664	0.571	0.482	0.412	0.333	0.244
220	1.675	1.337	1.040	0.759	0.692	0.598	0.495	0.424	0.343	0.250
225	1.711	1.368	1.070	0.788	0.720	0.624	0.508	0.435	0.352	0.257
230	1.747	1.398	1.099	0.817	0.747	0.650	0.521	0.447	0.361	0.263
235	1.783	1.429	1.129	0.846	0.775	0.676	0.539	0.458	0.371	0.270
240	1.820	1.460	1.159	0.875	0.803	0.702	0.562	0.470	0.380	0.276
245	1.856	1.491	1.189	0.904	0.831	0.729	0.585	0.481	0.390	0.283
250	1.892	1.522	1.218	0.933	0.859	0.755	0.608	0.493	0.399	0.289
255	1.928	1.553	1.248	0.962	0.887	0.781	0.631	0.504	0.408	0.296
260	1.965	1.584	1.278	0.991	0.914	0.807	0.654	0.516	0.418	0.302
265	2.001	1.615	1.308	1.020	0.942	0.833	0.678	0.527	0.427	0.309
270	2.027	1.646	1.337	1.049	0.970	0.860	0.701	0.547	0.437	0.315
275	2.052	1.677	1.367	1.077	0.998	0.886	0.724	0.567	0.446	0.321
280	2.078	1.708	1.397	1.106	1.026	0.912	0.747	0.586	0.455	0.328
285	2.104	1.739	1.426	1.135	1.054	0.938	0.770	0.606	0.465	0.334
290	2.129	1.770	1.456	1.164	1.082	0.964	0.793	0.626	0.474	0.341
295	2.155	1.800	1.486	1.193	1.109	0.990	0.816	0.645	0.484	0.347
300	2.181	1.831	1.516	1.222	1.137	1.017	0.839	0.665	0.493	0.354
305	2.206	1.862	1.545	1.251	1.165	1.043	0.862	0.685	0.502	0.360
310	2.232	1.893	1.575	1.280	1.193	1.069	0.885	0.705	0.512	0.367
315	2.257	1.924	1.605	1.309	1.221	1.095	0.908	0.724	0.521	0.373
320	2.283	1.955	1.635	1.338	1.249	1.121	0.932	0.744	0.533	0.379
325	2.309	1.986	1.664	1.367	1.277	1.148	0.955	0.764	0.549	0.386
330	2.334	2.016	1.694	1.396	1.304	1.174	0.978	0.784	0.565	0.392
335	2.360	2.045	1.724	1.425	1.332	1.200	1.001	0.803	0.581	0.399
340	2.386	2.074	1.754	1.453	1.360	1.226	1.024	0.823	0.597	0.405
345	2.411	2.102	1.783	1.482	1.388	1.252	1.047	0.843	0.613	0.412
350	2.437	2.131	1.813	1.511	1.416	1.279	1.070	0.863	0.629	0.418
355	2.462	2.160	1.843	1.540	1.444	1.305	1.093	0.882	0.645	0.425
360	2.488	2.189	1.872	1.569	1.471	1.331	1.116	0.902	0.661	0.431
365	2.514	2.218	1.902	1.598	1.499	1.357	1.139	0.922	0.677	0.438
370	2.539	2.247	1.932	1.627	1.527	1.383	1.163	0.942	0.693	0.444
375	2.568	2.275	1.962	1.656	1.555	1.410	1.186	0.961	0.709	0.450
380	2.618	2.304	1.991	1.685	1.583	1.436	1.209	0.981	0.725	0.457
385	2.668	2.333	2.021	1.714	1.611	1.462	1.232	1.001	0.741	0.463
390	2.719	2.362	2.051	1.743	1.639	1.488	1.255	1.020	0.757	0.470
395	2.769	2.391	2.081	1.772	1.666	1.514	1.278	1.040	0.773	0.476
400	2.819	2.420	2.110	1.801	1.694	1.540	1.301	1.060	0.790	0.483
405	2.869	2.448	2.140	1.829	1.722	1.567	1.324	1.080	0.806	0.489
410	2.920	2.477	2.170	1.858	1.750	1.593	1.347	1.099	0.822	0.496
415	2.970	2.506	2.200	1.887	1.778	1.619	1.370	1.119	0.838	0.502
420	3.020	2.535	2.229	1.916	1.806	1.645	1.393	1.139	0.854	0.508
425	3.070	2.565	2.259	1.945	1.833	1.671	1.417	1.159	0.870	0.515

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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Table 33 Rectangular Hollow Section Beam 45 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.337	0.309	0.296	0.296	0.273	0.205	0.205	0.205	0.205	0.205
20	0.387	0.349	0.321	0.319	0.296	0.205	0.205	0.205	0.205	0.205
25	0.437	0.389	0.354	0.342	0.318	0.205	0.205	0.205	0.205	0.205
30	0.487	0.429	0.387	0.365	0.340	0.205	0.205	0.205	0.205	0.205
35	0.544	0.469	0.419	0.389	0.363	0.205	0.205	0.205	0.205	0.205
40	0.628	0.509	0.452	0.412	0.385	0.205	0.205	0.205	0.205	0.205
45	0.713	0.562	0.485	0.435	0.407	0.205	0.205	0.205	0.205	0.205
50	0.797	0.625	0.518	0.458	0.430	0.241	0.205	0.205	0.205	0.205
55	0.882	0.688	0.560	0.481	0.452	0.284	0.205	0.205	0.205	0.205
60	0.966	0.751	0.607	0.504	0.475	0.326	0.224	0.205	0.205	0.205
65	1.051	0.814	0.654	0.528	0.497	0.369	0.255	0.205	0.205	0.205
70	1.135	0.877	0.700	0.569	0.519	0.411	0.286	0.205	0.205	0.205
75	1.220	0.940	0.747	0.610	0.553	0.454	0.317	0.214	0.205	0.205
80	1.304	1.003	0.793	0.651	0.593	0.497	0.348	0.236	0.205	0.205
85	1.389	1.066	0.840	0.691	0.632	0.538	0.379	0.259	0.205	0.205
90	1.473	1.129	0.886	0.732	0.671	0.575	0.410	0.281	0.205	0.205
95	1.558	1.192	0.933	0.773	0.711	0.613	0.441	0.304	0.210	0.205
100	1.642	1.255	0.979	0.814	0.750	0.650	0.472	0.326	0.229	0.205
105	1.727	1.318	1.026	0.855	0.790	0.688	0.503	0.348	0.248	0.205
110	1.811	1.381	1.072	0.896	0.829	0.725	0.535	0.371	0.267	0.205
115	1.896	1.444	1.119	0.937	0.869	0.763	0.570	0.393	0.286	0.205
120	1.980	1.507	1.166	0.978	0.908	0.800	0.605	0.416	0.304	0.205
125	2.017	1.570	1.212	1.019	0.948	0.838	0.640	0.438	0.323	0.208
130	2.038	1.633	1.259	1.060	0.987	0.876	0.675	0.461	0.342	0.227
135	2.058	1.697	1.305	1.101	1.026	0.913	0.710	0.483	0.361	0.246
140	2.079	1.760	1.352	1.142	1.066	0.951	0.745	0.506	0.380	0.265
145	2.099	1.823	1.398	1.183	1.105	0.988	0.780	0.529	0.398	0.284
150	2.119	1.886	1.445	1.223	1.145	1.026	0.814	0.561	0.417	0.303
155	2.140	1.949	1.491	1.264	1.184	1.063	0.849	0.593	0.436	0.322
160	2.160	2.005	1.538	1.305	1.224	1.101	0.884	0.625	0.455	0.341
165	2.181	2.026	1.584	1.346	1.263	1.138	0.919	0.657	0.474	0.360
170	2.201	2.048	1.631	1.387	1.303	1.176	0.954	0.689	0.492	0.379
175	2.222	2.069	1.677	1.428	1.342	1.213	0.989	0.721	0.511	0.398
180	2.242	2.090	1.724	1.469	1.381	1.251	1.024	0.753	0.532	0.417
185	2.263	2.111	1.771	1.510	1.421	1.288	1.059	0.785	0.561	0.436
190	2.283	2.133	1.817	1.551	1.460	1.326	1.094	0.817	0.590	0.455
195	2.303	2.154	1.864	1.592	1.500	1.363	1.128	0.849	0.620	0.475
200	2.324	2.175	1.910	1.633	1.539	1.401	1.163	0.881	0.649	0.494
205	2.344	2.196	1.957	1.674	1.579	1.439	1.198	0.914	0.679	0.513
210	2.365	2.217	2.003	1.715	1.618	1.476	1.233	0.946	0.708	0.533
215	2.385	2.239	2.028	1.755	1.658	1.514	1.268	0.978	0.737	0.556
220	2.406	2.260	2.054	1.796	1.697	1.551	1.303	1.010	0.767	0.579
225	2.426	2.281	2.079	1.837	1.736	1.589	1.338	1.042	0.796	0.602
230	2.447	2.302	2.104	1.878	1.776	1.626	1.373	1.074	0.826	0.625
235	2.467	2.323	2.130	1.919	1.815	1.664	1.408	1.106	0.855	0.648
240	2.487	2.345	2.155	1.960	1.855	1.701	1.442	1.138	0.884	0.671
245	2.508	2.366	2.181	2.001	1.894	1.739	1.477	1.170	0.914	0.694
250	2.528	2.387	2.206	2.029	1.934	1.776	1.512	1.202	0.943	0.718
255	2.549	2.408	2.232	2.057	1.973	1.814	1.547	1.234	0.972	0.741
260	2.588	2.429	2.257	2.084	2.010	1.851	1.582	1.266	1.002	0.764
265	2.661	2.451	2.283	2.112	2.038	1.889	1.617	1.299	1.031	0.787
270	2.734	2.472	2.308	2.139	2.067	1.927	1.652	1.331	1.061	0.810
275	2.807	2.493	2.333	2.167	2.095	1.964	1.687	1.363	1.090	0.833
280	2.881	2.514	2.359	2.194	2.124	2.002	1.722	1.395	1.119	0.856
285	2.954	2.535	2.384	2.222	2.152	2.031	1.756	1.427	1.149	0.880
290	3.027	2.557	2.410	2.250	2.181	2.060	1.791	1.459	1.178	0.903
295	3.100	2.618	2.435	2.277	2.209	2.089	1.826	1.491	1.207	0.926
300	3.173	2.693	2.461	2.305	2.238	2.118	1.861	1.523	1.237	0.949
305	3.246	2.768	2.486	2.332	2.266	2.147	1.896	1.555	1.266	0.972
310	3.320	2.843	2.512	2.360	2.295	2.176	1.931	1.587	1.296	0.995
315	3.393	2.919	2.537	2.388	2.323	2.205	1.966	1.619	1.325	1.018
320	3.466	2.994	2.563	2.415	2.352	2.234	2.001	1.651	1.354	1.041
325	3.539	3.069	2.634	2.443	2.380	2.263	2.030	1.683	1.384	1.065
330	3.612	3.144	2.704	2.470	2.409	2.292	2.060	1.716	1.413	1.088
335	3.686	3.219	2.775	2.498	2.437	2.321	2.089	1.748	1.443	1.111
340	3.759	3.294	2.845	2.526	2.466	2.350	2.119	1.780	1.472	1.134
345	3.833	3.369	2.916	2.553	2.494	2.379	2.149	1.812	1.501	1.157
350	3.918	3.444	2.986	2.607	2.523	2.408	2.178	1.844	1.531	1.180
355	4.003	3.519	3.057	2.672	2.551	2.438	2.208	1.876	1.560	1.203
360	4.088	3.594	3.127	2.738	2.601	2.467	2.237	1.908	1.589	1.226
365	4.174	3.669	3.198	2.803	2.664	2.496	2.267	1.940	1.619	1.250
370	-	3.744	3.268	2.869	2.727	2.525	2.296	1.972	1.648	1.273
375	-	3.819	3.339	2.934	2.790	2.554	2.326	2.004	1.678	1.296
380	-	3.894	3.409	3.000	2.853	2.605	2.355	2.036	1.707	1.319
385	-	3.969	3.480	3.065	2.916	2.666	2.385	2.068	1.736	1.342
390	-	4.044	3.550	3.131	2.979	2.727	2.414	2.101	1.766	1.365
395	-	4.119	3.620	3.196	3.042	2.787	2.444	2.133	1.795	1.388
400	-	4.194	3.691	3.261	3.104	2.848	2.474	2.165	1.825	1.411
405	-	-	3.761	3.327	3.167	2.909	2.503	2.197	1.854	1.435
410	-	-	3.832	3.392	3.230	2.969	2.533	2.229	1.883	1.458
415	-	-	3.902	3.458	3.293	3.030	2.562	2.261	1.913	1.481
420	-	-	3.973	3.523	3.356	3.091	2.618	2.293	1.942	1.504
425	-	-	4.043	3.589	3.419	3.151	2.675	2.325	1.971	1.527

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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Table 34 Rectangular Hollow Section Beam 60 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.401	0.364	0.336	0.313	0.306	0.306	0.306	0.205	0.205	0.205
20	0.473	0.423	0.385	0.355	0.344	0.332	0.332	0.205	0.205	0.205
25	0.563	0.482	0.434	0.397	0.384	0.365	0.358	0.205	0.205	0.205
30	0.708	0.553	0.484	0.439	0.423	0.401	0.384	0.205	0.205	0.205
35	0.852	0.669	0.538	0.481	0.462	0.437	0.410	0.205	0.205	0.205
40	0.996	0.784	0.631	0.522	0.502	0.472	0.436	0.205	0.205	0.205
45	1.140	0.900	0.724	0.594	0.551	0.508	0.462	0.205	0.205	0.205
50	1.285	1.015	0.817	0.668	0.620	0.555	0.488	0.205	0.205	0.205
55	1.429	1.131	0.910	0.743	0.689	0.615	0.514	0.275	0.205	0.205
60	1.573	1.246	1.003	0.818	0.757	0.675	0.551	0.347	0.205	0.205
65	1.717	1.362	1.096	0.893	0.826	0.735	0.599	0.420	0.223	0.205
70	1.861	1.477	1.189	0.968	0.894	0.795	0.647	0.493	0.277	0.205
75	2.003	1.593	1.282	1.043	0.963	0.855	0.694	0.550	0.331	0.205
80	2.025	1.708	1.375	1.118	1.031	0.915	0.742	0.594	0.385	0.205
85	2.048	1.824	1.468	1.193	1.100	0.975	0.790	0.638	0.438	0.205
90	2.071	1.939	1.561	1.267	1.169	1.035	0.837	0.682	0.492	0.205
95	2.094	2.012	1.654	1.342	1.237	1.095	0.885	0.726	0.541	0.220
100	2.117	2.033	1.747	1.417	1.306	1.155	0.933	0.770	0.582	0.265
105	2.139	2.054	1.840	1.492	1.374	1.215	0.981	0.813	0.623	0.310
110	2.162	2.075	1.933	1.567	1.443	1.275	1.028	0.857	0.664	0.356
115	2.185	2.096	2.007	1.642	1.511	1.335	1.076	0.901	0.705	0.401
120	2.208	2.117	2.028	1.717	1.580	1.395	1.124	0.945	0.746	0.446
125	2.231	2.138	2.048	1.791	1.649	1.455	1.171	0.989	0.787	0.492
130	2.253	2.159	2.069	1.866	1.717	1.515	1.219	1.033	0.827	0.535
135	2.276	2.180	2.090	1.941	1.786	1.575	1.267	1.077	0.868	0.570
140	2.299	2.201	2.110	2.006	1.854	1.635	1.314	1.121	0.909	0.605
145	2.322	2.222	2.131	2.027	1.923	1.695	1.362	1.164	0.950	0.640
150	2.345	2.243	2.151	2.048	1.991	1.755	1.410	1.208	0.991	0.675
155	2.368	2.264	2.172	2.069	2.020	1.815	1.457	1.252	1.032	0.710
160	2.390	2.286	2.192	2.090	2.042	1.875	1.505	1.296	1.073	0.745
165	2.413	2.307	2.213	2.111	2.063	1.935	1.553	1.340	1.114	0.780
170	2.436	2.328	2.233	2.132	2.085	1.995	1.600	1.384	1.154	0.815
175	2.459	2.349	2.254	2.153	2.106	2.022	1.648	1.428	1.195	0.850
180	2.482	2.370	2.274	2.173	2.127	2.044	1.696	1.472	1.236	0.885
185	2.504	2.391	2.295	2.194	2.149	2.067	1.744	1.515	1.277	0.920
190	2.527	2.412	2.316	2.215	2.170	2.090	1.791	1.559	1.318	0.955
195	2.550	2.433	2.336	2.236	2.192	2.112	1.839	1.603	1.359	0.990
200	2.644	2.454	2.357	2.257	2.213	2.135	1.887	1.647	1.400	1.025
205	2.816	2.475	2.377	2.278	2.235	2.157	1.934	1.691	1.440	1.060
210	2.988	2.496	2.398	2.299	2.256	2.180	1.982	1.735	1.481	1.095
215	3.160	2.517	2.418	2.320	2.278	2.203	2.018	1.779	1.522	1.130
220	3.332	2.538	2.439	2.341	2.299	2.225	2.045	1.823	1.563	1.165
225	3.504	2.559	2.459	2.362	2.321	2.248	2.072	1.866	1.604	1.200
230	3.677	2.686	2.480	2.383	2.342	2.270	2.098	1.910	1.645	1.235
235	3.839	2.828	2.500	2.404	2.364	2.293	2.125	1.954	1.686	1.270
240	3.931	2.969	2.521	2.425	2.385	2.316	2.152	1.998	1.726	1.305
245	4.024	3.110	2.541	2.446	2.406	2.338	2.179	2.028	1.767	1.340
250	4.116	3.251	2.562	2.467	2.428	2.361	2.206	2.057	1.808	1.375
255	4.208	3.393	2.672	2.488	2.449	2.383	2.233	2.085	1.849	1.410
260	4.300	3.534	2.782	2.509	2.471	2.406	2.260	2.114	1.890	1.445
265	4.392	3.675	2.891	2.529	2.492	2.429	2.287	2.143	1.931	1.480
270	4.485	3.817	3.001	2.550	2.514	2.451	2.314	2.171	1.972	1.515
275	4.577	3.914	3.111	2.600	2.535	2.474	2.341	2.200	2.010	1.550
280	4.669	4.007	3.220	2.685	2.557	2.496	2.368	2.228	2.042	1.585
285	4.761	4.100	3.330	2.769	2.620	2.519	2.395	2.257	2.073	1.620
290	4.854	4.193	3.440	2.854	2.696	2.542	2.422	2.286	2.104	1.655
295	4.946	4.286	3.549	2.939	2.773	2.571	2.449	2.314	2.136	1.690
300	5.038	4.379	3.659	3.024	2.849	2.662	2.476	2.343	2.167	1.725
305	5.130	4.472	3.769	3.108	2.926	2.754	2.503	2.372	2.199	1.761
310	5.222	4.565	3.873	3.193	3.002	2.845	2.530	2.400	2.230	1.796
315	5.315	4.659	3.972	3.278	3.079	2.936	2.557	2.429	2.262	1.831
320	5.407	4.752	4.071	3.363	3.156	3.028	2.629	2.457	2.293	1.866
325	5.499	4.845	4.169	3.447	3.232	3.119	2.713	2.486	2.325	1.901
330	-	4.938	4.268	3.532	3.309	3.211	2.796	2.515	2.356	1.936
335	-	-	-	3.617	3.385	3.302	2.880	2.543	2.387	1.971
340	-	-	-	3.702	3.462	3.394	2.964	2.588	2.419	2.005
345	-	-	-	3.786	3.538	3.485	3.048	2.663	2.450	2.038
350	-	-	-	3.882	3.615	3.576	3.132	2.738	2.482	2.070
355	-	-	-	3.990	3.691	3.668	3.216	2.812	2.513	2.102
360	-	-	-	4.097	3.768	3.759	3.299	2.887	2.545	2.134
365	-	-	-	4.204	3.852	3.851	3.383	2.962	2.591	2.166
370	-	-	-	-	3.961	3.942	3.467	3.037	2.655	2.198
375	-	-	-	-	4.071	4.034	3.551	3.112	2.719	2.230
380	-	-	-	-	4.180	4.125	3.635	3.186	2.784	2.263
385	-	-	-	-	-	-	3.719	3.261	2.848	2.295
390	-	-	-	-	-	-	3.802	3.336	2.912	2.327
395	-	-	-	-	-	-	3.886	3.411	2.976	2.359
400	-	-	-	-	-	-	3.970	3.485	3.040	2.391
405	-	-	-	-	-	-	4.054	3.560	3.105	2.423
410	-	-	-	-	-	-	4.138	3.635	3.169	2.456
415	-	-	-	-	-	-	-	3.710	3.233	2.488
420	-	-	-	-	-	-	-	3.785	3.297	2.520
425	-	-	-	-	-	-	-	3.859	3.362	2.552

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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Table 35 Rectangular Hollow Section Beam 75 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.466	0.419	0.384	0.356	0.346	0.332	0.309	0.283	0.205	0.205
20	0.600	0.497	0.450	0.412	0.399	0.381	0.352	0.320	0.252	0.205
25	0.805	0.631	0.516	0.469	0.453	0.430	0.394	0.356	0.286	0.205
30	1.011	0.801	0.644	0.525	0.506	0.479	0.436	0.392	0.320	0.205
35	1.216	0.971	0.786	0.642	0.594	0.529	0.479	0.428	0.354	0.205
40	1.422	1.140	0.927	0.761	0.705	0.628	0.521	0.464	0.388	0.205
45	1.627	1.310	1.069	0.879	0.815	0.728	0.598	0.501	0.422	0.205
50	1.833	1.480	1.210	0.998	0.926	0.827	0.681	0.546	0.456	0.205
55	2.024	1.649	1.352	1.116	1.036	0.927	0.764	0.615	0.490	0.205
60	2.148	1.819	1.493	1.235	1.147	1.026	0.847	0.684	0.524	0.229
65	2.272	1.988	1.635	1.353	1.257	1.125	0.930	0.752	0.578	0.303
70	2.396	2.081	1.777	1.472	1.368	1.225	1.013	0.821	0.635	0.378
75	2.520	2.167	1.918	1.591	1.478	1.324	1.096	0.890	0.692	0.452
80	2.644	2.253	2.011	1.709	1.589	1.424	1.179	0.959	0.749	0.527
85	2.768	2.339	2.033	1.828	1.699	1.523	1.263	1.028	0.805	0.571
90	2.892	2.425	2.055	1.946	1.810	1.623	1.346	1.097	0.862	0.614
95	3.016	2.511	2.077	2.013	1.920	1.722	1.429	1.165	0.919	0.658
100	3.139	2.597	2.099	2.034	2.007	1.822	1.512	1.234	0.976	0.702
105	3.263	2.682	2.121	2.055	2.028	1.921	1.595	1.303	1.033	0.746
110	3.387	2.768	2.143	2.077	2.049	2.006	1.678	1.372	1.089	0.790
115	3.511	2.854	2.165	2.098	2.070	2.027	1.761	1.441	1.146	0.833
120	3.635	2.940	2.187	2.119	2.091	2.047	1.844	1.510	1.203	0.877
125	3.759	3.026	2.209	2.140	2.112	2.068	1.927	1.578	1.260	0.921
130	3.863	3.112	2.231	2.161	2.133	2.089	2.004	1.647	1.316	0.965
135	3.943	3.198	2.253	2.182	2.154	2.110	2.025	1.716	1.373	1.009
140	4.022	3.284	2.275	2.203	2.175	2.131	2.046	1.785	1.430	1.052
145	4.101	3.370	2.297	2.224	2.196	2.151	2.067	1.854	1.487	1.096
150	4.181	3.456	2.319	2.246	2.217	2.172	2.088	1.923	1.543	1.140
155	4.260	3.542	2.341	2.267	2.238	2.193	2.109	1.991	1.600	1.184
160	4.340	3.628	2.363	2.288	2.259	2.214	2.131	2.021	1.657	1.228
165	4.419	3.713	2.385	2.309	2.280	2.235	2.152	2.043	1.714	1.271
170	4.498	3.799	2.407	2.330	2.301	2.255	2.173	2.065	1.770	1.315
175	4.578	3.881	2.429	2.351	2.322	2.276	2.194	2.087	1.827	1.359
180	4.657	3.960	2.451	2.372	2.343	2.297	2.215	2.110	1.884	1.403
185	4.736	4.040	2.473	2.394	2.364	2.318	2.236	2.132	1.941	1.447
190	4.816	4.119	2.495	2.415	2.385	2.339	2.257	2.154	1.997	1.491
195	4.895	4.199	2.517	2.436	2.406	2.359	2.278	2.176	2.025	1.534
200	4.975	4.278	2.539	2.457	2.427	2.380	2.299	2.199	2.050	1.578
205	5.054	4.358	2.561	2.478	2.448	2.401	2.320	2.221	2.075	1.622
210	5.133	4.437	2.797	2.499	2.469	2.422	2.341	2.243	2.100	1.666
215	5.213	4.517	3.039	2.520	2.490	2.443	2.362	2.265	2.125	1.710
220	5.292	4.596	3.282	2.541	2.511	2.463	2.383	2.287	2.150	1.753
225	5.372	4.676	3.525	2.567	2.532	2.484	2.404	2.310	2.175	1.797
230	5.451	4.755	3.767	2.732	2.553	2.505	2.426	2.332	2.200	1.841
235	-	4.835	3.909	2.897	2.647	2.526	2.447	2.354	2.225	1.885
240	-	4.914	4.017	3.063	2.792	2.547	2.468	2.376	2.250	1.929
245	-	4.994	4.125	3.228	2.937	2.593	2.489	2.398	2.275	1.972
250	-	5.073	4.232	3.394	3.081	2.717	2.510	2.421	2.300	2.013
255	-	5.153	4.340	3.559	3.226	2.840	2.531	2.443	2.325	2.046
260	-	5.232	4.448	3.725	3.371	2.963	2.552	2.465	2.350	2.080
265	-	5.312	4.556	3.872	3.515	3.086	2.611	2.487	2.375	2.113
270	-	5.391	4.664	3.990	3.660	3.209	2.704	2.510	2.400	2.146
275	-	5.471	4.772	4.107	3.805	3.333	2.798	2.532	2.425	2.180
280	-	-	4.880	4.225	3.929	3.456	2.891	2.554	2.450	2.213
285	-	-	4.988	4.343	4.049	3.579	2.985	2.607	2.475	2.246
290	-	-	5.096	4.460	4.169	3.702	3.078	2.678	2.500	2.280
295	-	-	5.203	4.578	4.290	3.825	3.171	2.750	2.525	2.313
300	-	-	5.311	4.696	4.410	3.953	3.265	2.821	2.550	2.347
305	-	-	5.419	4.813	4.530	4.080	3.358	2.892	2.611	2.380
310	-	-	-	4.931	4.650	4.208	3.452	2.963	2.707	2.413
315	-	-	-	5.048	4.771	4.335	3.545	3.034	2.803	2.447
320	-	-	-	5.166	4.891	4.463	3.639	3.105	2.899	2.480
325	-	-	-	5.284	5.011	4.590	3.732	3.177	2.995	2.513
330	-	-	-	5.401	5.131	4.718	3.826	3.248	3.092	2.547
335	-	-	-	-	-	-	3.964	3.319	3.188	2.608
340	-	-	-	-	-	-	4.104	3.390	3.284	2.694
345	-	-	-	-	-	-	-	3.461	3.380	2.779
350	-	-	-	-	-	-	-	3.532	3.476	2.864
355	-	-	-	-	-	-	-	3.604	3.572	2.950
360	-	-	-	-	-	-	-	3.675	3.668	3.035
365	-	-	-	-	-	-	-	3.764	3.764	3.120
370	-	-	-	-	-	-	-	3.861	3.861	3.205
375	-	-	-	-	-	-	-	3.960	3.957	3.291
380	-	-	-	-	-	-	-	4.116	4.053	3.376
385	-	-	-	-	-	-	-	-	4.149	3.461
390	-	-	-	-	-	-	-	-	-	3.546
395	-	-	-	-	-	-	-	-	-	3.632
400	-	-	-	-	-	-	-	-	-	3.717
405	-	-	-	-	-	-	-	-	-	3.802
410	-	-	-	-	-	-	-	-	-	3.887
415	-	-	-	-	-	-	-	-	-	3.973
420	-	-	-	-	-	-	-	-	-	4.058
425	-	-	-	-	-	-	-	-	-	4.143

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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Table 36 Rectangular Hollow Section Beam 90 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.541	0.475	0.433	0.399	0.387	0.370	0.344	0.316	0.288	0.284
20	0.889	0.641	0.515	0.470	0.455	0.433	0.399	0.363	0.328	0.312
25	1.236	0.884	0.691	0.560	0.522	0.495	0.453	0.411	0.368	0.340
30	1.584	1.128	0.882	0.723	0.670	0.595	0.508	0.458	0.408	0.369
35	1.931	1.372	1.073	0.887	0.824	0.736	0.604	0.506	0.448	0.397
40	2.143	1.616	1.264	1.050	0.977	0.876	0.724	0.583	0.488	0.425
45	2.319	1.860	1.455	1.213	1.131	1.016	0.844	0.684	0.529	0.453
50	2.495	2.022	1.646	1.377	1.284	1.156	0.964	0.786	0.614	0.482
55	2.672	2.069	1.837	1.540	1.438	1.297	1.084	0.887	0.700	0.510
60	2.848	2.116	2.017	1.704	1.591	1.437	1.205	0.989	0.785	0.551
65	3.025	2.163	2.125	1.867	1.745	1.577	1.325	1.090	0.870	0.611
70	3.201	2.233	2.233	2.016	1.899	1.717	1.445	1.192	0.955	0.671
75	3.378	2.342	2.342	2.095	2.009	1.857	1.565	1.293	1.041	0.731
80	3.554	2.450	2.450	2.175	2.032	1.998	1.685	1.395	1.126	0.791
85	3.731	2.559	2.559	2.255	2.054	2.023	1.805	1.496	1.211	0.851
90	3.872	2.667	2.667	2.334	2.077	2.045	1.925	1.598	1.297	0.911
95	3.970	2.775	2.775	2.414	2.100	2.067	2.010	1.699	1.382	0.971
100	4.068	2.884	2.884	2.493	2.122	2.089	2.031	1.801	1.467	1.031
105	4.166	2.992	2.992	2.573	2.145	2.111	2.052	1.902	1.553	1.091
110	4.265	3.123	3.101	2.652	2.167	2.133	2.074	2.002	1.638	1.151
115	4.363	3.859	3.209	2.732	2.190	2.155	2.095	2.024	1.723	1.211
120	4.461	3.954	3.317	2.812	2.212	2.177	2.116	2.045	1.808	1.271
125	4.559	4.050	3.426	2.891	2.235	2.199	2.138	2.066	1.894	1.331
130	4.657	4.145	3.534	2.971	2.257	2.221	2.159	2.087	1.979	1.391
135	4.755	4.240	3.642	3.050	2.280	2.242	2.180	2.109	2.018	1.451
140	4.853	4.336	3.751	3.130	2.303	2.264	2.202	2.130	2.040	1.511
145	4.951	4.431	3.856	3.209	2.325	2.286	2.223	2.151	2.062	1.571
150	5.050	4.526	3.953	3.289	2.348	2.308	2.245	2.173	2.083	1.631
155	5.148	4.622	4.050	3.369	2.370	2.330	2.266	2.194	2.105	1.691
160	5.246	4.717	4.147	3.448	2.393	2.352	2.287	2.215	2.127	1.751
165	5.344	4.812	4.244	3.528	2.415	2.374	2.309	2.236	2.149	1.811
170	5.442	4.908	4.341	3.607	2.438	2.396	2.330	2.258	2.171	1.871
175	-	5.003	4.438	3.687	2.460	2.418	2.351	2.279	2.193	1.931
180	-	5.098	4.535	3.766	2.483	2.440	2.373	2.300	2.214	1.991
185	-	5.194	4.632	3.852	2.506	2.462	2.394	2.321	2.236	2.024
190	-	5.289	4.729	3.959	2.528	2.484	2.415	2.343	2.258	2.051
195	-	5.384	4.826	4.066	2.551	2.506	2.437	2.364	2.280	2.078
200	-	5.480	4.923	4.172	2.990	2.527	2.458	2.385	2.302	2.105
205	-	-	5.020	4.279	3.831	2.549	2.479	2.407	2.323	2.133
210	-	-	5.117	4.386	3.945	2.653	2.501	2.428	2.345	2.160
215	-	-	5.214	4.492	4.059	2.868	2.522	2.449	2.367	2.187
220	-	-	5.311	4.599	4.173	3.083	2.544	2.470	2.389	2.214
225	-	-	5.408	4.706	4.287	3.297	2.583	2.492	2.411	2.241
230	-	-	-	4.813	4.400	3.512	2.740	2.513	2.433	2.268
235	-	-	-	4.919	4.514	3.727	2.897	2.534	2.454	2.295
240	-	-	-	5.026	4.628	3.903	3.054	2.556	2.476	2.323
245	-	-	-	5.133	4.742	4.045	3.211	2.644	2.498	2.350
250	-	-	-	5.239	4.856	4.187	3.367	2.761	2.520	2.377
255	-	-	-	5.346	4.970	4.329	3.524	2.879	2.542	2.404
260	-	-	-	5.453	5.084	4.471	3.681	2.996	2.568	2.431
265	-	-	-	-	5.198	4.613	3.838	3.113	2.653	2.458
270	-	-	-	-	5.312	4.755	3.992	3.231	2.738	2.485
275	-	-	-	-	5.426	4.897	4.146	3.348	2.822	2.513
280	-	-	-	-	-	5.039	4.300	3.466	2.907	2.540
285	-	-	-	-	-	5.181	4.454	3.583	2.992	2.584
290	-	-	-	-	-	5.322	4.608	3.700	3.077	2.706
295	-	-	-	-	-	5.464	4.762	3.818	3.162	2.827
300	-	-	-	-	-	-	4.916	3.983	3.247	2.949
305	-	-	-	-	-	-	5.070	4.152	3.332	3.071
310	-	-	-	-	-	-	5.224	4.322	3.416	3.193
315	-	-	-	-	-	-	5.378	4.491	3.501	3.314
320	-	-	-	-	-	-	-	4.661	3.586	3.436
325	-	-	-	-	-	-	-	4.830	3.671	3.558
330	-	-	-	-	-	-	-	5.000	3.756	3.679
335	-	-	-	-	-	-	-	-	3.858	3.801
340	-	-	-	-	-	-	-	-	4.056	3.923
345	-	-	-	-	-	-	-	-	-	4.045
350	-	-	-	-	-	-	-	-	-	4.166
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

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Table 37 Rectangular Hollow Section Beam 105 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	0.921	0.542	0.482	0.442	0.429	0.409	0.380	0.349	0.318	0.292
20	1.372	0.916	0.678	0.530	0.511	0.485	0.446	0.407	0.368	0.331
25	1.823	1.290	0.954	0.739	0.685	0.608	0.513	0.466	0.419	0.370
30	2.140	1.665	1.231	0.948	0.882	0.790	0.651	0.525	0.469	0.409
35	2.370	2.020	1.507	1.157	1.079	0.972	0.809	0.657	0.519	0.448
40	2.600	2.202	1.784	1.365	1.277	1.153	0.967	0.791	0.624	0.487
45	2.830	2.385	2.017	1.574	1.474	1.335	1.125	0.926	0.739	0.526
50	3.060	2.567	2.087	1.783	1.671	1.517	1.282	1.061	0.853	0.610
55	3.290	2.749	2.157	1.992	1.869	1.698	1.440	1.196	0.967	0.696
60	3.520	2.932	2.226	2.122	2.039	1.880	1.598	1.330	1.082	0.781
65	3.749	3.114	2.296	2.248	2.152	2.033	1.756	1.465	1.196	0.866
70	3.955	3.296	2.373	2.373	2.265	2.129	1.913	1.600	1.310	0.951
75	4.148	3.479	2.499	2.499	2.378	2.225	2.012	1.734	1.425	1.036
80	4.341	3.661	2.625	2.625	2.491	2.321	2.035	1.869	1.539	1.121
85	4.534	3.839	2.751	2.751	2.604	2.417	2.057	2.002	1.653	1.207
90	4.727	3.971	2.939	2.877	2.717	2.512	2.080	2.024	1.768	1.292
95	4.920	4.103	3.254	3.003	2.830	2.608	2.103	2.047	1.882	1.377
100	5.113	4.235	3.570	3.128	2.943	2.704	2.126	2.069	1.996	1.462
105	5.306	4.367	3.849	3.254	3.056	2.800	2.148	2.091	2.023	1.547
110	5.499	4.498	3.963	3.380	3.169	2.895	2.171	2.113	2.045	1.632
115	-	4.630	4.076	3.506	3.282	2.991	2.194	2.135	2.067	1.717
120	-	4.762	4.190	3.632	3.395	3.087	2.217	2.157	2.089	1.803
125	-	4.894	4.304	3.757	3.508	3.183	2.239	2.180	2.111	1.888
130	-	5.026	4.418	3.880	3.621	3.278	2.262	2.202	2.133	1.973
135	-	5.158	4.532	3.997	3.734	3.374	2.285	2.224	2.155	2.018
140	-	5.290	4.645	4.115	3.848	3.470	2.308	2.246	2.177	2.042
145	-	5.422	4.759	4.233	3.969	3.566	2.330	2.268	2.199	2.066
150	-	-	4.873	4.351	4.089	3.661	2.353	2.290	2.221	2.090
155	-	-	4.987	4.468	4.210	3.757	2.376	2.312	2.243	2.114
160	-	-	5.101	4.586	4.331	3.862	2.399	2.335	2.265	2.138
165	-	-	5.215	4.704	4.451	3.991	2.421	2.357	2.287	2.162
170	-	-	5.328	4.821	4.572	4.120	2.444	2.379	2.309	2.186
175	-	-	5.442	4.939	4.693	4.249	2.467	2.401	2.331	2.210
180	-	-	-	5.057	4.813	4.378	2.490	2.423	2.353	2.234
185	-	-	-	5.174	4.934	4.508	2.512	2.445	2.375	2.258
190	-	-	-	5.292	5.055	4.637	2.535	2.468	2.397	2.282
195	-	-	-	5.410	5.176	4.766	2.558	2.490	2.419	2.306
200	-	-	-	-	5.296	4.895	3.446	2.512	2.441	2.331
205	-	-	-	-	5.417	5.024	3.931	2.534	2.463	2.355
210	-	-	-	-	-	5.153	4.092	2.556	2.485	2.379
215	-	-	-	-	-	5.283	4.252	2.699	2.507	2.403
220	-	-	-	-	-	5.412	4.412	2.884	2.529	2.427
225	-	-	-	-	-	-	4.572	3.068	2.551	2.451
230	-	-	-	-	-	-	4.733	3.253	2.625	2.475
235	-	-	-	-	-	-	4.893	3.438	2.750	2.499
240	-	-	-	-	-	-	5.053	3.623	2.875	2.523
245	-	-	-	-	-	-	5.213	3.808	3.000	2.547
250	-	-	-	-	-	-	5.374	3.999	3.125	2.595
255	-	-	-	-	-	-	-	4.191	3.250	2.684
260	-	-	-	-	-	-	-	4.383	3.375	2.773
265	-	-	-	-	-	-	-	4.575	3.500	2.861
270	-	-	-	-	-	-	-	4.767	3.625	2.950
275	-	-	-	-	-	-	-	4.959	3.750	3.039
280	-	-	-	-	-	-	-	5.151	3.913	3.127
285	-	-	-	-	-	-	-	5.343	4.137	3.216
290	-	-	-	-	-	-	-	-	4.361	3.305
295	-	-	-	-	-	-	-	-	4.585	3.393
300	-	-	-	-	-	-	-	-	4.808	3.482
305	-	-	-	-	-	-	-	-	5.032	3.571
310	-	-	-	-	-	-	-	-	5.256	3.660
315	-	-	-	-	-	-	-	-	5.480	3.748
320	-	-	-	-	-	-	-	-	-	3.860
325	-	-	-	-	-	-	-	-	-	4.182
330	-	-	-	-	-	-	-	-	-	4.503
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

Issued: 14th July 2015
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Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 38 Rectangular Hollow Section Beam 120 minutes Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	1.260	0.889	0.541	0.486	0.471	0.449	0.415	0.382	0.348	0.318
20	1.824	1.354	0.937	0.707	0.640	0.556	0.494	0.452	0.409	0.366
25	2.196	1.819	1.333	1.012	0.914	0.788	0.641	0.522	0.470	0.414
30	2.479	2.142	1.728	1.316	1.187	1.021	0.837	0.683	0.536	0.462
35	2.763	2.372	2.061	1.620	1.461	1.254	1.033	0.851	0.679	0.510
40	3.046	2.602	2.252	1.925	1.734	1.486	1.229	1.019	0.823	0.599
45	3.329	2.832	2.444	2.072	2.003	1.719	1.425	1.188	0.966	0.710
50	3.613	3.062	2.635	2.166	2.064	1.952	1.621	1.356	1.110	0.820
55	3.912	3.292	2.826	2.260	2.125	2.109	1.817	1.524	1.254	0.930
60	4.262	3.522	3.018	2.354	2.246	2.246	2.008	1.692	1.397	1.041
65	4.612	3.752	3.209	2.448	2.383	2.383	2.117	1.861	1.541	1.151
70	4.961	4.003	3.401	2.541	2.520	2.520	2.226	2.015	1.684	1.262
75	5.311	4.264	3.592	2.746	2.656	2.656	2.334	2.099	1.828	1.372
80	-	4.525	3.783	2.982	2.793	2.793	2.443	2.182	1.972	1.482
85	-	4.786	3.981	3.218	2.930	2.930	2.552	2.265	2.020	1.593
90	-	5.047	4.181	3.453	3.067	3.067	2.661	2.348	2.043	1.703
95	-	5.307	4.380	3.689	3.203	3.203	2.770	2.431	2.066	1.814
100	-	-	4.580	3.892	3.359	3.340	2.879	2.515	2.089	1.924
105	-	-	4.779	4.047	3.795	3.477	2.987	2.598	2.112	2.009
110	-	-	4.979	4.203	3.958	3.614	3.096	2.681	2.136	2.033
115	-	-	5.178	4.358	4.099	3.751	3.205	2.764	2.159	2.057
120	-	-	5.378	4.513	4.240	3.889	3.314	2.847	2.182	2.081
125	-	-	-	4.669	4.380	4.029	3.423	2.931	2.205	2.105
130	-	-	-	4.824	4.521	4.169	3.532	3.014	2.228	2.129
135	-	-	-	4.979	4.662	4.309	3.641	3.097	2.251	2.153
140	-	-	-	5.135	4.803	4.449	3.749	3.180	2.274	2.177
145	-	-	-	5.290	4.943	4.589	3.871	3.264	2.297	2.201
150	-	-	-	5.445	5.084	4.728	4.024	3.347	2.320	2.225
155	-	-	-	-	5.225	4.868	4.177	3.430	2.343	2.249
160	-	-	-	-	5.366	5.008	4.330	3.513	2.366	2.273
165	-	-	-	-	-	5.148	4.483	3.596	2.389	2.297
170	-	-	-	-	-	5.288	4.636	3.680	2.413	2.321
175	-	-	-	-	-	5.428	4.789	3.763	2.436	2.345
180	-	-	-	-	-	-	4.942	3.868	2.459	2.369
185	-	-	-	-	-	-	5.095	4.054	2.482	2.393
190	-	-	-	-	-	-	5.248	4.240	2.505	2.417
195	-	-	-	-	-	-	5.401	4.427	2.528	2.441
200	-	-	-	-	-	-	-	4.613	2.551	2.465
205	-	-	-	-	-	-	-	4.799	2.655	2.489
210	-	-	-	-	-	-	-	4.985	2.832	2.513
215	-	-	-	-	-	-	-	5.171	3.009	2.537
220	-	-	-	-	-	-	-	5.357	3.186	2.561
225	-	-	-	-	-	-	-	-	3.364	2.683
230	-	-	-	-	-	-	-	-	3.541	2.810
235	-	-	-	-	-	-	-	-	3.718	2.936
240	-	-	-	-	-	-	-	-	3.976	3.063
245	-	-	-	-	-	-	-	-	4.366	3.190
250	-	-	-	-	-	-	-	-	4.755	3.316
255	-	-	-	-	-	-	-	-	5.145	3.443
260	-	-	-	-	-	-	-	-	-	3.570
265	-	-	-	-	-	-	-	-	-	3.696
270	-	-	-	-	-	-	-	-	-	3.823
275	-	-	-	-	-	-	-	-	-	4.180
280	-	-	-	-	-	-	-	-	-	4.548
285	-	-	-	-	-	-	-	-	-	4.915
290	-	-	-	-	-	-	-	-	-	5.282
295	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

Issued: 14th July 2015
Reissued: 25th June 2020
Valid to: 1st December 2024

CERTIFICATE No CF 5344
RUDOLF HENSEL GMBH

Table 39 Rectangular Hollow Section Beam 150 minutes										
Required Thickness (mm) for a Design Temperature (°C)										
Section Factor (m-1)	350	400	450	500	520	550	600	650	700	750
15	5.330	1.499	1.132	0.827	0.637	0.531	0.487	0.448	0.409	0.371
20	5.330	2.112	1.700	1.316	1.127	0.963	0.740	0.568	0.491	0.437
25	5.330	2.558	2.136	1.805	1.617	1.395	1.086	0.839	0.641	0.503
30	5.330	3.004	2.422	2.154	2.054	1.827	1.433	1.109	0.843	0.631
35	5.330	3.449	2.708	2.408	2.294	2.131	1.779	1.380	1.046	0.792
40	5.330	3.895	2.995	2.662	2.535	2.347	2.050	1.651	1.248	0.953
45	5.330	4.341	3.281	2.916	2.776	2.563	2.184	1.922	1.450	1.115
50	5.330	4.786	3.567	3.170	3.017	2.779	2.318	2.037	1.653	1.276
55	5.330	5.232	3.872	3.424	3.258	2.995	2.452	2.088	1.855	1.437
60	-	-	4.378	3.678	3.499	3.212	2.597	2.138	2.036	1.598
65	-	-	4.884	3.994	3.740	3.428	2.795	2.189	2.160	1.760
70	-	-	5.391	4.397	4.062	3.644	2.993	2.284	2.284	1.921
75	-	-	-	4.800	4.430	3.878	3.191	2.408	2.408	2.084
80	-	-	-	5.203	4.799	4.217	3.389	2.532	2.532	2.247
85	-	-	-	-	5.168	4.556	3.587	2.656	2.656	2.411
90	-	-	-	-	-	4.894	3.785	2.780	2.780	2.575
95	-	-	-	-	-	5.233	4.081	2.904	2.904	2.739
100	-	-	-	-	-	-	4.404	3.028	3.028	2.902
105	-	-	-	-	-	-	4.728	3.244	3.152	3.066
110	-	-	-	-	-	-	5.051	3.982	3.276	3.230
115	-	-	-	-	-	-	5.374	4.300	3.399	3.394
120	-	-	-	-	-	-	-	4.617	3.557	3.557
125	-	-	-	-	-	-	-	4.934	3.721	3.721
130	-	-	-	-	-	-	-	5.251	3.879	3.879
135	-	-	-	-	-	-	-	-	4.027	4.027
140	-	-	-	-	-	-	-	-	4.208	4.175
145	-	-	-	-	-	-	-	-	4.454	4.323
150	-	-	-	-	-	-	-	-	4.700	4.471
155	-	-	-	-	-	-	-	-	4.946	4.619
160	-	-	-	-	-	-	-	-	5.193	4.767
165	-	-	-	-	-	-	-	-	5.439	4.915
170	-	-	-	-	-	-	-	-	-	5.063
175	-	-	-	-	-	-	-	-	-	5.211
180	-	-	-	-	-	-	-	-	-	5.359
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	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only. Results apply to hollow section beams with 3 sided fire exposure and a concrete slab on top

Issued: 14th July 2015
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Valid to: 1st December 2024