
CERTIFICATE OF APPROVAL

No CF 5650

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
HENSOTHERM® 910 KS

TECHNICAL SCHEDULE
**TS15 Intumescent Coatings for
Steelwork**

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



Paul Duggan
Certification Manager



Issued: 17th August 2018
Valid to: 16th August 2023



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Hensotherm 910 KS

1. This approval relates to the use of Hensotherm[®] 910 KS for the fire protection of I/H shaped beam and column sections and hollow columns. The precise scope is given in Tables 1 to 17 which show the total dry film thickness of Hensotherm[®] 910 KS (excluding primer and top sealer) required to provide fire resistance periods in accordance with BS476: Part 21: 1987 of up to 90 minutes for differing sections and section factors.
2. This certification is designed to demonstrate compliance of the product or system specifically with Approved Document B (England and Wales), Section D of the Technical Standards (Scotland), Technical Booklet E (N. Ireland). If compliance is required to other regulatory or guidance documents there may be additional considerations or conflict to be taken into account.'
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: 2008.
 - 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 galvanised or blast cleaned to ISO 8501-1 Sa2.5 or equivalent and primed with a suitable and compatible primer. The data shown is also applicable to steel sections blast cleaned to ISO 8501-1 SA 2.5 or equivalent followed by direct application of Hensotherm[®] 910 KS. Specifications of surface preparations, primers and top sealers are available from Rudolf Hensel GmbH whose responsibility is to ensure Hensotherm[®] 910 KS is compatible for use in respect of both ambient and fire conditions.
6. The data shown is applicable to Hensotherm[®] 910 KS applied by spray or brush 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 ongoing 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.

CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 1: I/H-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	575°C	600°C	620°C	650°C	700°C	750°C
30	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
35	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
40	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
45	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
50	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
55	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
60	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
65	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
70	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
75	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
80	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
85	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
90	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
95	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
100	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
105	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
110	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
115	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
120	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
125	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
130	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
135	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
140	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
145	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
150	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
155	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
160	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
165	0.461	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
170	0.476	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
175	0.491	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
180	0.506	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
185	0.520	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
190	0.535	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
195	0.550	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
200	0.565	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
205	0.580	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
210	0.595	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
215	0.609	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
220	0.624	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
225	0.639	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
230	0.654	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
235	0.669	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
240	0.684	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
245	0.699	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
250	0.713	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
255	0.728	0.463	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
260	0.743	0.476	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
265	0.758	0.489	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
270	0.773	0.502	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
275	0.788	0.515	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
280	0.803	0.528	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
285	0.817	0.541	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
290	0.832	0.553	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
295	0.847	0.566	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
300	0.862	0.579	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
305	0.877	0.592	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
310	0.892	0.605	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
315	0.906	0.618	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
320	0.921	0.631	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
325	0.936	0.644	0.451	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
330	0.951	0.657	0.462	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
335	0.966	0.670	0.472	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
340	0.981	0.683	0.483	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
345	0.996	0.696	0.494	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
350	1.010	0.709	0.505	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
355	1.025	0.722	0.516	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
360	1.040	0.735	0.526	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
365	1.055	0.748	0.537	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
370	1.070	0.761	0.548	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
375	1.085	0.774	0.559	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450

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



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Table 2: I/H-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	575°C	600°C	620°C	650°C	700°C	750°C
30	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
35	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
40	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
45	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
50	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
55	0.459	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
60	0.548	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
65	0.637	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
70	0.726	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
75	0.815	0.488	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
80	0.904	0.528	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
85	0.993	0.567	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
90	1.082	0.607	0.462	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
95	1.171	0.647	0.479	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
100	1.233	0.686	0.496	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
105	1.282	0.726	0.512	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
110	1.331	0.766	0.529	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
115	1.380	0.805	0.545	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
120	1.430	0.845	0.562	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
125	1.479	0.885	0.579	0.461	0.450	0.450	0.450	0.450	0.450	0.450	0.450
130	1.528	0.924	0.595	0.476	0.450	0.450	0.450	0.450	0.450	0.450	0.450
135	1.577	0.964	0.612	0.491	0.450	0.450	0.450	0.450	0.450	0.450	0.450
140	1.626	1.004	0.628	0.506	0.450	0.450	0.450	0.450	0.450	0.450	0.450
145	1.675	1.043	0.645	0.521	0.450	0.450	0.450	0.450	0.450	0.450	0.450
150	1.714	1.083	0.662	0.536	0.450	0.450	0.450	0.450	0.450	0.450	0.450
155	1.745	1.123	0.678	0.551	0.450	0.450	0.450	0.450	0.450	0.450	0.450
160	1.775	1.162	0.695	0.566	0.450	0.450	0.450	0.450	0.450	0.450	0.450
165	1.806	1.201	0.712	0.581	0.450	0.450	0.450	0.450	0.450	0.450	0.450
170	1.837	1.220	0.728	0.596	0.450	0.450	0.450	0.450	0.450	0.450	0.450
175	1.868	1.239	0.745	0.611	0.450	0.450	0.450	0.450	0.450	0.450	0.450
180	1.899	1.258	0.761	0.626	0.450	0.450	0.450	0.450	0.450	0.450	0.450
185	1.930	1.277	0.778	0.641	0.450	0.450	0.450	0.450	0.450	0.450	0.450
190	1.960	1.296	0.795	0.656	0.462	0.450	0.450	0.450	0.450	0.450	0.450
195	1.991	1.315	0.811	0.671	0.476	0.450	0.450	0.450	0.450	0.450	0.450
200	2.022	1.334	0.828	0.686	0.491	0.450	0.450	0.450	0.450	0.450	0.450
205	2.053	1.353	0.845	0.701	0.506	0.450	0.450	0.450	0.450	0.450	0.450
210	2.084	1.372	0.861	0.716	0.521	0.450	0.450	0.450	0.450	0.450	0.450
215	2.115	1.391	0.878	0.731	0.536	0.450	0.450	0.450	0.450	0.450	0.450
220	2.145	1.409	0.894	0.746	0.550	0.459	0.450	0.450	0.450	0.450	0.450
225	2.176	1.428	0.911	0.761	0.565	0.474	0.450	0.450	0.450	0.450	0.450
230	2.207	1.447	0.928	0.776	0.580	0.488	0.450	0.450	0.450	0.450	0.450
235	2.238	1.466	0.944	0.791	0.595	0.502	0.451	0.450	0.450	0.450	0.450
240	2.269	1.485	0.961	0.806	0.610	0.517	0.464	0.450	0.450	0.450	0.450
245	2.300	1.504	0.977	0.821	0.625	0.531	0.477	0.450	0.450	0.450	0.450
250	2.330	1.523	0.994	0.835	0.639	0.545	0.490	0.453	0.450	0.450	0.450
255	2.361	1.542	1.011	0.850	0.654	0.560	0.503	0.465	0.450	0.450	0.450
260	2.392	1.561	1.027	0.865	0.669	0.574	0.516	0.477	0.450	0.450	0.450
265	2.423	1.580	1.044	0.880	0.684	0.588	0.529	0.489	0.450	0.450	0.450
270	2.454	1.599	1.061	0.895	0.699	0.603	0.542	0.501	0.450	0.450	0.450
275	2.485	1.618	1.077	0.910	0.713	0.617	0.555	0.513	0.453	0.450	0.450
280	2.515	1.637	1.094	0.925	0.728	0.631	0.568	0.525	0.463	0.450	0.450
285	2.546	1.656	1.110	0.940	0.743	0.646	0.581	0.537	0.474	0.450	0.450
290	2.577	1.675	1.127	0.955	0.758	0.660	0.594	0.549	0.484	0.450	0.450
295	2.608	1.694	1.144	0.970	0.773	0.674	0.607	0.561	0.495	0.450	0.450
300	2.639	1.743	1.160	0.985	0.787	0.689	0.620	0.573	0.505	0.450	0.450
305	2.670	1.797	1.177	1.000	0.802	0.703	0.633	0.585	0.516	0.450	0.450
310	2.700	1.850	1.194	1.015	0.817	0.717	0.647	0.597	0.526	0.450	0.450
315	2.746	1.903	1.221	1.030	0.832	0.732	0.660	0.609	0.537	0.450	0.450
320	2.794	1.957	1.257	1.045	0.847	0.746	0.673	0.621	0.547	0.450	0.450
325	2.842	2.010	1.292	1.060	0.861	0.760	0.686	0.633	0.558	0.450	0.450
330	2.890	2.063	1.327	1.075	0.876	0.775	0.699	0.645	0.569	0.450	0.450
335	2.938	2.117	1.362	1.090	0.891	0.789	0.712	0.657	0.579	0.455	0.450
340	2.986	2.170	1.397	1.105	0.906	0.804	0.725	0.669	0.590	0.463	0.450
345	3.034	2.223	1.432	1.120	0.921	0.818	0.738	0.681	0.600	0.471	0.450
350	3.082	2.276	1.467	1.135	0.935	0.832	0.751	0.693	0.611	0.480	0.450
355	3.130	2.330	1.503	1.150	0.950	0.847	0.764	0.705	0.621	0.488	0.450
360	3.178	2.383	1.538	1.165	0.965	0.861	0.777	0.717	0.632	0.496	0.450
365	3.226	2.436	1.573	1.180	0.980	0.875	0.790	0.729	0.642	0.504	0.450
370	3.274	2.490	1.608	1.195	0.995	0.890	0.803	0.741	0.653	0.512	0.450
375	3.322	2.543	1.643	1.223	1.009	0.904	0.816	0.753	0.663	0.521	0.450

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



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Table 3: I/H-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	575°C	600°C	620°C	650°C	700°C	750°C
30	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
35	0.526	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
40	0.680	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
45	0.835	0.554	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
50	0.990	0.661	0.481	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
55	1.145	0.767	0.556	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
60	1.264	0.874	0.631	0.480	0.450	0.450	0.450	0.450	0.450	0.450	0.450
65	1.364	0.980	0.705	0.527	0.450	0.450	0.450	0.450	0.450	0.450	0.450
70	1.464	1.087	0.780	0.574	0.467	0.450	0.450	0.450	0.450	0.450	0.450
75	1.564	1.193	0.855	0.621	0.490	0.462	0.450	0.450	0.450	0.450	0.450
80	1.664	1.272	0.930	0.667	0.514	0.478	0.450	0.450	0.450	0.450	0.450
85	1.764	1.349	1.005	0.714	0.538	0.495	0.459	0.450	0.450	0.450	0.450
90	1.864	1.426	1.079	0.761	0.562	0.511	0.474	0.450	0.450	0.450	0.450
95	1.964	1.503	1.154	0.808	0.586	0.528	0.490	0.458	0.450	0.450	0.450
100	2.064	1.581	1.213	0.855	0.610	0.544	0.505	0.473	0.450	0.450	0.450
105	2.164	1.658	1.248	0.902	0.633	0.561	0.521	0.488	0.450	0.450	0.450
110	2.264	1.724	1.282	0.949	0.657	0.577	0.537	0.503	0.450	0.450	0.450
115	2.364	1.780	1.316	0.995	0.681	0.593	0.552	0.518	0.456	0.450	0.450
120	2.464	1.837	1.351	1.042	0.705	0.610	0.568	0.533	0.470	0.450	0.450
125	2.564	1.893	1.385	1.089	0.729	0.626	0.584	0.548	0.485	0.450	0.450
130	2.665	1.949	1.420	1.136	0.753	0.643	0.599	0.563	0.499	0.450	0.450
135	2.754	2.005	1.454	1.183	0.776	0.659	0.615	0.578	0.514	0.450	0.450
140	2.838	2.061	1.488	1.214	0.800	0.676	0.631	0.593	0.528	0.450	0.450
145	2.921	2.117	1.523	1.237	0.824	0.692	0.646	0.608	0.542	0.450	0.450
150	3.005	2.174	1.557	1.259	0.848	0.709	0.662	0.623	0.557	0.450	0.450
155	3.088	2.230	1.592	1.282	0.872	0.725	0.677	0.638	0.571	0.450	0.450
160	3.171	2.286	1.626	1.304	0.896	0.742	0.693	0.653	0.586	0.450	0.450
165	3.255	2.342	1.660	1.327	0.919	0.758	0.709	0.669	0.600	0.458	0.450
170	3.338	2.398	1.695	1.349	0.943	0.774	0.724	0.684	0.615	0.472	0.450
175	3.422	2.454	1.745	1.372	0.967	0.791	0.740	0.699	0.629	0.486	0.450
180	3.505	2.511	1.795	1.395	0.991	0.807	0.756	0.714	0.643	0.499	0.450
185	3.588	2.567	1.846	1.417	1.015	0.824	0.771	0.729	0.658	0.513	0.450
190	3.672	2.623	1.896	1.440	1.039	0.840	0.787	0.744	0.672	0.527	0.450
195	3.755	2.679	1.947	1.462	1.062	0.857	0.803	0.759	0.687	0.540	0.450
200	3.838	2.729	1.998	1.485	1.086	0.873	0.818	0.774	0.701	0.554	0.450
205	3.922	2.774	2.048	1.507	1.110	0.890	0.834	0.789	0.716	0.568	0.450
210	4.005	2.819	2.099	1.530	1.134	0.906	0.849	0.804	0.730	0.582	0.450
215	4.089	2.863	2.149	1.552	1.158	0.923	0.865	0.819	0.744	0.595	0.450
220	4.172	2.908	2.200	1.575	1.182	0.939	0.881	0.834	0.759	0.609	0.450
225	4.255	2.953	2.250	1.597	1.206	0.955	0.896	0.849	0.773	0.623	0.450
230	4.339	2.998	2.301	1.620	1.233	0.972	0.912	0.864	0.788	0.636	0.460
235	-	3.043	2.352	1.642	1.259	0.988	0.928	0.880	0.802	0.650	0.474
240	-	3.088	2.402	1.665	1.286	1.005	0.943	0.895	0.816	0.664	0.488
245	-	3.132	2.453	1.687	1.312	1.021	0.959	0.910	0.831	0.678	0.501
250	-	3.177	2.503	1.728	1.339	1.038	0.975	0.925	0.845	0.691	0.515
255	-	3.222	2.554	1.781	1.365	1.054	0.990	0.940	0.860	0.705	0.529
260	-	3.267	2.604	1.833	1.392	1.071	1.006	0.955	0.874	0.719	0.542
265	-	3.312	2.655	1.885	1.418	1.087	1.021	0.970	0.889	0.732	0.556
270	-	3.357	2.706	1.938	1.445	1.104	1.037	0.985	0.903	0.746	0.570
275	-	3.402	2.758	1.990	1.471	1.120	1.053	1.000	0.917	0.760	0.584
280	-	3.446	2.811	2.042	1.498	1.136	1.068	1.015	0.932	0.774	0.597
285	-	3.491	2.863	2.094	1.524	1.153	1.084	1.030	0.946	0.787	0.611
290	-	3.536	2.915	2.147	1.551	1.169	1.100	1.045	0.961	0.801	0.625
295	-	3.581	2.968	2.199	1.577	1.186	1.115	1.060	0.975	0.815	0.638
300	-	3.626	3.020	2.251	1.604	1.206	1.131	1.075	0.989	0.828	0.652
305	-	3.671	3.073	2.304	1.630	1.254	1.146	1.091	1.004	0.842	0.666
310	-	3.715	3.125	2.356	1.657	1.301	1.162	1.106	1.018	0.856	0.680
315	-	3.760	3.178	2.408	1.683	1.348	1.178	1.121	1.033	0.870	0.693
320	-	3.805	3.230	2.460	1.731	1.395	1.193	1.136	1.047	0.883	0.707
325	-	3.850	3.283	2.513	1.798	1.442	1.226	1.151	1.062	0.897	0.721
330	-	3.895	3.335	2.565	1.866	1.490	1.271	1.166	1.076	0.911	0.735
335	-	3.940	3.388	2.617	1.934	1.537	1.316	1.181	1.090	0.924	0.748
340	-	3.984	3.440	2.669	2.001	1.584	1.360	1.196	1.105	0.938	0.762
345	-	4.029	3.493	2.725	2.069	1.631	1.405	1.231	1.119	0.952	0.776
350	-	4.074	3.545	2.788	2.136	1.678	1.450	1.273	1.134	0.966	0.789
355	-	4.119	3.598	2.850	2.204	1.743	1.495	1.314	1.148	0.979	0.803
360	-	4.164	3.650	2.913	2.272	1.817	1.540	1.356	1.163	0.993	0.817
365	-	4.209	3.703	2.975	2.339	1.892	1.584	1.398	1.177	1.007	0.831
370	-	4.254	3.755	3.038	2.407	1.966	1.629	1.440	1.191	1.020	0.844
375	-	4.298	3.808	3.100	2.474	2.041	1.674	1.482	1.215	1.034	0.858

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



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 4: I/H-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	575°C	600°C	620°C	650°C	700°C	750°C
30	0.757	0.520	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
35	0.974	0.678	0.514	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
40	1.191	0.836	0.631	0.499	0.450	0.450	0.450	0.450	0.450	0.450	0.450
45	1.378	0.994	0.748	0.588	0.469	0.450	0.450	0.450	0.450	0.450	0.450
50	1.563	1.151	0.864	0.677	0.538	0.479	0.450	0.450	0.450	0.450	0.450
55	1.748	1.290	0.981	0.765	0.607	0.540	0.480	0.450	0.450	0.450	0.450
60	1.934	1.421	1.098	0.854	0.676	0.601	0.530	0.484	0.450	0.450	0.450
65	2.119	1.551	1.211	0.943	0.745	0.662	0.581	0.527	0.463	0.450	0.450
70	2.305	1.682	1.302	1.032	0.814	0.722	0.631	0.569	0.495	0.450	0.450
75	2.490	1.813	1.392	1.121	0.883	0.783	0.681	0.612	0.527	0.459	0.450
80	2.676	1.943	1.483	1.206	0.952	0.844	0.731	0.654	0.558	0.476	0.450
85	2.812	2.074	1.573	1.257	1.021	0.905	0.781	0.697	0.590	0.492	0.450
90	2.939	2.204	1.664	1.308	1.090	0.965	0.831	0.739	0.622	0.509	0.450
95	3.066	2.335	1.754	1.359	1.159	1.026	0.882	0.782	0.653	0.525	0.450
100	3.193	2.465	1.844	1.410	1.212	1.087	0.932	0.824	0.685	0.541	0.465
105	3.320	2.596	1.935	1.462	1.241	1.148	0.982	0.867	0.717	0.558	0.481
110	3.447	2.724	2.025	1.513	1.270	1.203	1.032	0.909	0.748	0.574	0.497
115	3.574	2.843	2.116	1.564	1.300	1.226	1.082	0.952	0.780	0.591	0.513
120	3.701	2.962	2.206	1.615	1.329	1.250	1.132	0.995	0.812	0.607	0.529
125	3.828	3.080	2.297	1.666	1.358	1.273	1.183	1.037	0.843	0.623	0.545
130	3.955	3.199	2.387	1.723	1.387	1.296	1.214	1.080	0.875	0.640	0.561
135	4.082	3.318	2.478	1.789	1.417	1.319	1.237	1.122	0.907	0.656	0.577
140	4.210	3.436	2.568	1.854	1.446	1.342	1.259	1.165	0.938	0.673	0.593
145	4.337	3.555	2.659	1.920	1.475	1.365	1.281	1.204	0.970	0.689	0.609
150	-	3.674	2.749	1.986	1.504	1.389	1.303	1.226	1.002	0.705	0.625
155	-	3.792	2.839	2.051	1.533	1.412	1.325	1.248	1.033	0.722	0.641
160	-	3.911	2.928	2.117	1.563	1.435	1.347	1.270	1.065	0.738	0.657
165	-	4.030	3.018	2.182	1.592	1.458	1.369	1.292	1.097	0.755	0.673
170	-	4.148	3.108	2.248	1.621	1.481	1.391	1.314	1.128	0.771	0.690
175	-	4.267	3.198	2.313	1.650	1.504	1.413	1.336	1.160	0.787	0.706
180	-	4.386	3.288	2.379	1.680	1.528	1.435	1.358	1.192	0.804	0.722
185	-	-	3.378	2.444	1.725	1.551	1.457	1.380	1.218	0.820	0.738
190	-	-	3.467	2.510	1.791	1.574	1.479	1.402	1.241	0.837	0.754
195	-	-	3.557	2.575	1.857	1.597	1.501	1.424	1.265	0.853	0.770
200	-	-	3.647	2.641	1.924	1.620	1.524	1.446	1.288	0.869	0.786
205	-	-	3.737	2.706	1.990	1.644	1.546	1.468	1.312	0.886	0.802
210	-	-	3.827	2.764	2.056	1.667	1.568	1.490	1.335	0.902	0.818
215	-	-	3.917	2.821	2.122	1.690	1.590	1.513	1.359	0.919	0.834
220	-	-	4.006	2.879	2.188	1.750	1.612	1.535	1.383	0.935	0.850
225	-	-	4.096	2.937	2.255	1.824	1.634	1.557	1.406	0.951	0.866
230	-	-	4.186	2.995	2.321	1.897	1.656	1.579	1.430	0.968	0.882
235	-	-	4.276	3.052	2.387	1.971	1.678	1.601	1.453	0.984	0.898
240	-	-	4.366	3.110	2.453	2.044	1.709	1.623	1.477	1.001	0.914
245	-	-	-	3.168	2.519	2.118	1.776	1.645	1.500	1.017	0.930
250	-	-	-	3.226	2.586	2.191	1.843	1.667	1.524	1.033	0.947
255	-	-	-	3.283	2.652	2.265	1.911	1.689	1.548	1.050	0.963
260	-	-	-	3.341	2.717	2.338	1.978	1.738	1.571	1.066	0.979
265	-	-	-	3.399	2.778	2.412	2.045	1.800	1.595	1.083	0.995
270	-	-	-	3.457	2.839	2.485	2.112	1.862	1.618	1.099	1.011
275	-	-	-	3.514	2.899	2.559	2.180	1.924	1.642	1.115	1.027
280	-	-	-	3.572	2.960	2.632	2.247	1.986	1.665	1.132	1.043
285	-	-	-	3.630	3.021	2.706	2.314	2.047	1.689	1.148	1.059
290	-	-	-	3.687	3.082	2.769	2.381	2.109	1.741	1.165	1.075
295	-	-	-	3.745	3.143	2.833	2.449	2.171	1.805	1.181	1.091
300	-	-	-	3.803	3.204	2.896	2.516	2.233	1.869	1.197	1.107
305	-	-	-	3.861	3.265	2.960	2.583	2.295	1.933	1.236	1.123
310	-	-	-	3.918	3.326	3.023	2.651	2.357	1.997	1.278	1.139
315	-	-	-	3.976	3.387	3.087	2.718	2.419	2.061	1.320	1.155
320	-	-	-	4.034	3.447	3.151	2.785	2.480	2.125	1.362	1.171
325	-	-	-	4.092	3.508	3.214	2.853	2.542	2.190	1.404	1.187
330	-	-	-	4.149	3.569	3.278	2.921	2.604	2.254	1.447	1.207
335	-	-	-	4.207	3.630	3.341	2.988	2.666	2.318	1.489	1.236
340	-	-	-	4.265	3.691	3.405	3.056	2.731	2.382	1.531	1.266
345	-	-	-	4.323	3.752	3.468	3.124	2.803	2.446	1.573	1.296
350	-	-	-	4.380	3.813	3.532	3.191	2.874	2.510	1.615	1.326
355	-	-	-	-	3.874	3.596	3.259	2.945	2.574	1.657	1.356
360	-	-	-	-	3.934	3.659	3.326	3.017	2.638	1.705	1.385
365	-	-	-	-	3.995	3.723	3.394	3.088	2.702	1.806	1.415
370	-	-	-	-	4.056	3.786	3.462	3.159	2.769	1.908	1.445
375	-	-	-	-	4.117	3.850	3.529	3.231	2.837	2.010	1.475

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



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 5: I/H-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	575°C	600°C	620°C	650°C	700°C	750°C
30	1.138	0.824	0.638	0.510	0.450	0.450	0.450	0.450	0.450	0.450	0.450
35	1.415	1.029	0.795	0.636	0.518	0.463	0.450	0.450	0.450	0.450	0.450
40	1.693	1.234	0.952	0.762	0.622	0.559	0.497	0.450	0.450	0.450	0.450
45	1.971	1.442	1.109	0.887	0.725	0.654	0.585	0.530	0.450	0.450	0.450
50	2.249	1.649	1.265	1.013	0.829	0.750	0.672	0.613	0.523	0.450	0.450
55	2.527	1.856	1.420	1.138	0.933	0.845	0.760	0.696	0.599	0.473	0.450
60	2.756	2.064	1.576	1.259	1.036	0.941	0.847	0.778	0.676	0.538	0.450
65	2.898	2.271	1.731	1.373	1.140	1.036	0.935	0.861	0.752	0.602	0.470
70	3.040	2.478	1.887	1.488	1.225	1.132	1.022	0.944	0.828	0.666	0.518
75	3.182	2.686	2.042	1.603	1.285	1.214	1.110	1.026	0.904	0.731	0.567
80	3.324	2.827	2.198	1.718	1.345	1.262	1.197	1.109	0.980	0.795	0.615
85	3.466	2.961	2.353	1.833	1.405	1.310	1.238	1.192	1.056	0.859	0.664
90	3.608	3.096	2.509	1.947	1.465	1.358	1.278	1.232	1.133	0.923	0.712
95	3.750	3.231	2.664	2.062	1.525	1.407	1.318	1.267	1.204	0.988	0.761
100	3.892	3.366	2.808	2.177	1.585	1.455	1.357	1.302	1.235	1.052	0.810
105	4.034	3.500	2.948	2.292	1.645	1.503	1.397	1.337	1.267	1.116	0.858
110	4.176	3.635	3.088	2.407	1.712	1.551	1.437	1.372	1.298	1.180	0.907
115	4.319	3.770	3.227	2.522	1.816	1.599	1.477	1.407	1.330	1.219	0.955
120	-	3.905	3.367	2.636	1.920	1.647	1.516	1.443	1.361	1.246	1.004
125	-	4.039	3.507	2.741	2.023	1.696	1.556	1.478	1.393	1.273	1.052
130	-	4.174	3.646	2.832	2.127	1.785	1.596	1.513	1.424	1.300	1.101
135	-	4.309	3.786	2.923	2.231	1.875	1.635	1.548	1.456	1.327	1.149
140	-	-	3.926	3.014	2.334	1.965	1.675	1.583	1.487	1.354	1.198
145	-	-	4.066	3.104	2.438	2.055	1.731	1.619	1.518	1.381	1.222
150	-	-	4.205	3.195	2.542	2.145	1.804	1.654	1.550	1.408	1.246
155	-	-	4.345	3.286	2.645	2.235	1.877	1.689	1.581	1.434	1.269
160	-	-	-	3.376	2.737	2.325	1.951	1.749	1.613	1.461	1.293
165	-	-	-	3.467	2.814	2.415	2.024	1.815	1.644	1.488	1.316
170	-	-	-	3.558	2.890	2.505	2.098	1.881	1.676	1.515	1.340
175	-	-	-	3.649	2.967	2.594	2.171	1.948	1.718	1.542	1.363
180	-	-	-	3.739	3.043	2.684	2.244	2.014	1.779	1.569	1.386
185	-	-	-	3.830	3.120	2.760	2.318	2.080	1.841	1.596	1.410
190	-	-	-	3.921	3.196	2.833	2.391	2.146	1.902	1.623	1.433
195	-	-	-	4.012	3.273	2.905	2.464	2.212	1.963	1.650	1.457
200	-	-	-	4.102	3.349	2.977	2.538	2.279	2.024	1.677	1.480
205	-	-	-	4.193	3.426	3.049	2.611	2.345	2.086	1.712	1.504
210	-	-	-	4.284	3.502	3.121	2.685	2.411	2.147	1.766	1.527
215	-	-	-	4.375	3.579	3.193	2.756	2.477	2.208	1.819	1.550
220	-	-	-	-	3.655	3.265	2.827	2.544	2.269	1.873	1.574
225	-	-	-	-	3.732	3.337	2.898	2.610	2.331	1.927	1.597
230	-	-	-	-	3.808	3.409	2.968	2.676	2.392	1.980	1.621
235	-	-	-	-	3.885	3.482	3.039	2.742	2.453	2.034	1.644
240	-	-	-	-	3.961	3.554	3.110	2.808	2.514	2.087	1.668
245	-	-	-	-	4.038	3.626	3.181	2.875	2.576	2.141	1.691
250	-	-	-	-	4.114	3.698	3.252	2.941	2.637	2.195	1.740
255	-	-	-	-	4.191	3.770	3.322	3.007	2.698	2.248	1.795
260	-	-	-	-	4.267	3.842	3.393	3.073	2.763	2.302	1.851
265	-	-	-	-	4.344	3.914	3.464	3.140	2.828	2.355	1.907
270	-	-	-	-	-	3.986	3.535	3.206	2.893	2.409	1.962
275	-	-	-	-	-	4.059	3.606	3.272	2.958	2.463	2.018
280	-	-	-	-	-	4.131	3.676	3.338	3.023	2.516	2.073
285	-	-	-	-	-	4.203	3.747	3.405	3.088	2.570	2.129
290	-	-	-	-	-	4.275	3.818	3.471	3.153	2.623	2.184
295	-	-	-	-	-	4.347	3.889	3.537	3.218	2.677	2.240
300	-	-	-	-	-	-	3.960	3.603	3.283	2.736	2.295
305	-	-	-	-	-	-	4.030	3.670	3.348	2.801	2.351
310	-	-	-	-	-	-	4.101	3.736	3.413	2.866	2.407
315	-	-	-	-	-	-	4.172	3.802	3.478	2.931	2.462
320	-	-	-	-	-	-	4.243	3.868	3.543	2.996	2.518
325	-	-	-	-	-	-	4.314	3.935	3.608	3.061	2.573
330	-	-	-	-	-	-	4.384	4.001	3.673	3.126	2.629
335	-	-	-	-	-	-	-	4.067	3.738	3.191	2.684
340	-	-	-	-	-	-	-	4.133	3.803	3.256	2.744
345	-	-	-	-	-	-	-	4.199	3.868	3.321	2.805
350	-	-	-	-	-	-	-	4.266	3.933	3.386	2.867
355	-	-	-	-	-	-	-	4.332	3.998	3.451	2.929
360	-	-	-	-	-	-	-	-	4.063	3.515	2.990
365	-	-	-	-	-	-	-	-	4.128	3.580	3.052
370	-	-	-	-	-	-	-	-	4.193	3.645	3.113
375	-	-	-	-	-	-	-	-	4.258	3.710	3.175

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



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 6: I/H-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
30	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
35	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
40	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
45	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
50	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
55	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
60	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
65	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
70	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
75	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
80	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
85	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
90	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
95	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
100	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
105	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
110	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
115	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
120	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
125	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
130	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
135	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
140	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
145	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
150	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
155	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
160	0.446	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
165	0.461	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
170	0.476	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
175	0.491	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
180	0.506	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
185	0.520	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
190	0.535	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
195	0.550	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
200	0.565	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
205	0.580	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
210	0.595	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
215	0.609	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
220	0.624	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
225	0.639	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
230	0.654	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
235	0.669	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
240	0.684	0.444	0.442	0.442	0.442	0.442	0.442	0.442	0.442
245	0.699	0.457	0.442	0.442	0.442	0.442	0.442	0.442	0.442
250	0.713	0.471	0.442	0.442	0.442	0.442	0.442	0.442	0.442
255	0.728	0.484	0.442	0.442	0.442	0.442	0.442	0.442	0.442
260	0.743	0.497	0.442	0.442	0.442	0.442	0.442	0.442	0.442
265	0.758	0.511	0.442	0.442	0.442	0.442	0.442	0.442	0.442
270	0.773	0.524	0.442	0.442	0.442	0.442	0.442	0.442	0.442
275	0.788	0.537	0.442	0.442	0.442	0.442	0.442	0.442	0.442
280	0.803	0.550	0.442	0.442	0.442	0.442	0.442	0.442	0.442
285	0.817	0.564	0.442	0.442	0.442	0.442	0.442	0.442	0.442
290	0.832	0.577	0.442	0.442	0.442	0.442	0.442	0.442	0.442
295	0.847	0.590	0.442	0.442	0.442	0.442	0.442	0.442	0.442
300	0.862	0.604	0.442	0.442	0.442	0.442	0.442	0.442	0.442
305	0.877	0.617	0.449	0.442	0.442	0.442	0.442	0.442	0.442
310	0.892	0.630	0.460	0.442	0.442	0.442	0.442	0.442	0.442
315	0.906	0.644	0.472	0.442	0.442	0.442	0.442	0.442	0.442
320	0.921	0.657	0.483	0.442	0.442	0.442	0.442	0.442	0.442
325	0.936	0.670	0.494	0.442	0.442	0.442	0.442	0.442	0.442
330	0.951	0.683	0.505	0.442	0.442	0.442	0.442	0.442	0.442
335	0.966	0.697	0.516	0.442	0.442	0.442	0.442	0.442	0.442
340	0.981	0.710	0.528	0.442	0.442	0.442	0.442	0.442	0.442
345	0.996	0.723	0.539	0.442	0.442	0.442	0.442	0.442	0.442
350	1.010	0.737	0.550	0.442	0.442	0.442	0.442	0.442	0.442
355	1.025	0.750	0.561	0.442	0.442	0.442	0.442	0.442	0.442
360	1.040	0.763	0.572	0.442	0.442	0.442	0.442	0.442	0.442
365	1.055	0.776	0.584	0.442	0.442	0.442	0.442	0.442	0.442
370	1.070	0.790	0.595	0.442	0.442	0.442	0.442	0.442	0.442
375	1.085	0.803	0.606	0.442	0.442	0.442	0.442	0.442	0.442

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 7: I/H-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
30	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
35	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
40	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
45	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
50	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
55	0.459	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
60	0.548	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
65	0.637	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
70	0.726	0.470	0.442	0.442	0.442	0.442	0.442	0.442	0.442
75	0.815	0.516	0.442	0.442	0.442	0.442	0.442	0.442	0.442
80	0.904	0.561	0.456	0.442	0.442	0.442	0.442	0.442	0.442
85	0.993	0.606	0.473	0.442	0.442	0.442	0.442	0.442	0.442
90	1.082	0.651	0.490	0.442	0.442	0.442	0.442	0.442	0.442
95	1.171	0.697	0.508	0.442	0.442	0.442	0.442	0.442	0.442
100	1.233	0.742	0.525	0.442	0.442	0.442	0.442	0.442	0.442
105	1.282	0.787	0.542	0.455	0.442	0.442	0.442	0.442	0.442
110	1.331	0.832	0.559	0.470	0.442	0.442	0.442	0.442	0.442
115	1.380	0.878	0.576	0.485	0.442	0.442	0.442	0.442	0.442
120	1.430	0.923	0.593	0.501	0.442	0.442	0.442	0.442	0.442
125	1.479	0.968	0.610	0.516	0.442	0.442	0.442	0.442	0.442
130	1.528	1.013	0.627	0.531	0.442	0.442	0.442	0.442	0.442
135	1.577	1.059	0.645	0.547	0.442	0.442	0.442	0.442	0.442
140	1.626	1.104	0.662	0.562	0.442	0.442	0.442	0.442	0.442
145	1.675	1.149	0.679	0.578	0.446	0.442	0.442	0.442	0.442
150	1.714	1.194	0.696	0.593	0.460	0.442	0.442	0.442	0.442
155	1.745	1.217	0.713	0.608	0.475	0.442	0.442	0.442	0.442
160	1.775	1.237	0.730	0.624	0.489	0.442	0.442	0.442	0.442
165	1.806	1.257	0.747	0.639	0.504	0.442	0.442	0.442	0.442
170	1.837	1.277	0.765	0.654	0.518	0.442	0.442	0.442	0.442
175	1.868	1.297	0.782	0.670	0.533	0.442	0.442	0.442	0.442
180	1.899	1.317	0.799	0.685	0.547	0.442	0.442	0.442	0.442
185	1.930	1.336	0.816	0.700	0.562	0.442	0.442	0.442	0.442
190	1.960	1.356	0.833	0.716	0.576	0.442	0.442	0.442	0.442
195	1.991	1.376	0.850	0.731	0.590	0.442	0.442	0.442	0.442
200	2.022	1.396	0.867	0.747	0.605	0.442	0.442	0.442	0.442
205	2.053	1.416	0.884	0.762	0.619	0.442	0.442	0.442	0.442
210	2.084	1.436	0.902	0.777	0.634	0.442	0.442	0.442	0.442
215	2.115	1.455	0.919	0.793	0.648	0.453	0.442	0.442	0.442
220	2.145	1.475	0.936	0.808	0.663	0.467	0.442	0.442	0.442
225	2.176	1.495	0.953	0.823	0.677	0.482	0.442	0.442	0.442
230	2.207	1.515	0.970	0.839	0.692	0.496	0.442	0.442	0.442
235	2.238	1.535	0.987	0.854	0.706	0.510	0.442	0.442	0.442
240	2.269	1.555	1.004	0.870	0.720	0.524	0.442	0.442	0.442
245	2.300	1.574	1.021	0.885	0.735	0.538	0.443	0.442	0.442
250	2.330	1.594	1.039	0.900	0.749	0.552	0.455	0.442	0.442
255	2.361	1.614	1.056	0.916	0.764	0.567	0.466	0.442	0.442
260	2.392	1.634	1.073	0.931	0.778	0.581	0.478	0.442	0.442
265	2.423	1.654	1.090	0.946	0.793	0.595	0.489	0.442	0.442
270	2.454	1.674	1.107	0.962	0.807	0.609	0.501	0.442	0.442
275	2.485	1.693	1.124	0.977	0.821	0.623	0.512	0.442	0.442
280	2.515	1.738	1.141	0.992	0.836	0.637	0.523	0.442	0.442
285	2.546	1.787	1.159	1.008	0.850	0.651	0.535	0.442	0.442
290	2.577	1.836	1.176	1.023	0.865	0.666	0.546	0.442	0.442
295	2.608	1.884	1.193	1.039	0.879	0.680	0.558	0.442	0.442
300	2.639	1.933	1.221	1.054	0.894	0.694	0.569	0.444	0.442
305	2.670	1.981	1.258	1.069	0.908	0.708	0.581	0.453	0.442
310	2.700	2.030	1.295	1.085	0.923	0.722	0.592	0.461	0.442
315	2.746	2.079	1.332	1.100	0.937	0.736	0.604	0.470	0.442
320	2.794	2.127	1.369	1.115	0.951	0.751	0.615	0.478	0.442
325	2.842	2.176	1.406	1.131	0.966	0.765	0.627	0.487	0.442
330	2.890	2.225	1.443	1.146	0.980	0.779	0.638	0.496	0.442
335	2.938	2.273	1.480	1.161	0.995	0.793	0.650	0.504	0.442
340	2.986	2.322	1.517	1.177	1.009	0.807	0.661	0.513	0.442
345	3.034	2.370	1.554	1.192	1.024	0.821	0.672	0.521	0.442
350	3.082	2.419	1.591	1.218	1.038	0.835	0.684	0.530	0.442
355	3.130	2.468	1.628	1.255	1.052	0.850	0.695	0.539	0.442
360	3.178	2.516	1.665	1.291	1.067	0.864	0.707	0.547	0.442
365	3.226	2.565	1.708	1.327	1.081	0.878	0.718	0.556	0.442
370	3.274	2.613	1.778	1.364	1.096	0.892	0.730	0.565	0.442
375	3.322	2.662	1.847	1.400	1.110	0.906	0.741	0.573	0.442

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 8: I/H-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
30	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
35	0.526	0.442	0.442	0.442	0.442	0.442	0.442	0.442	0.442
40	0.680	0.478	0.442	0.442	0.442	0.442	0.442	0.442	0.442
45	0.835	0.589	0.453	0.442	0.442	0.442	0.442	0.442	0.442
50	0.990	0.699	0.534	0.442	0.442	0.442	0.442	0.442	0.442
55	1.145	0.810	0.614	0.486	0.442	0.442	0.442	0.442	0.442
60	1.264	0.920	0.695	0.545	0.448	0.442	0.442	0.442	0.442
65	1.364	1.031	0.775	0.603	0.482	0.442	0.442	0.442	0.442
70	1.464	1.142	0.855	0.662	0.516	0.451	0.442	0.442	0.442
75	1.564	1.240	0.936	0.721	0.550	0.468	0.442	0.442	0.442
80	1.664	1.323	1.016	0.780	0.584	0.485	0.442	0.442	0.442
85	1.764	1.407	1.097	0.839	0.618	0.502	0.442	0.442	0.442
90	1.864	1.491	1.177	0.898	0.652	0.519	0.442	0.442	0.442
95	1.964	1.575	1.230	0.957	0.685	0.536	0.457	0.442	0.442
100	2.064	1.659	1.271	1.016	0.719	0.553	0.472	0.442	0.442
105	2.164	1.730	1.312	1.075	0.753	0.570	0.487	0.442	0.442
110	2.264	1.791	1.354	1.134	0.787	0.588	0.503	0.442	0.442
115	2.364	1.851	1.395	1.193	0.821	0.605	0.518	0.442	0.442
120	2.464	1.912	1.437	1.221	0.855	0.622	0.533	0.442	0.442
125	2.564	1.972	1.478	1.244	0.889	0.639	0.548	0.442	0.442
130	2.665	2.033	1.519	1.267	0.923	0.656	0.563	0.442	0.442
135	2.754	2.093	1.561	1.291	0.957	0.673	0.578	0.449	0.442
140	2.838	2.154	1.602	1.314	0.991	0.690	0.593	0.463	0.442
145	2.921	2.214	1.644	1.337	1.025	0.707	0.608	0.477	0.442
150	3.005	2.275	1.685	1.361	1.059	0.724	0.623	0.491	0.442
155	3.088	2.335	1.734	1.384	1.093	0.741	0.639	0.504	0.442
160	3.171	2.396	1.785	1.408	1.126	0.758	0.654	0.518	0.442
165	3.255	2.457	1.837	1.431	1.160	0.775	0.669	0.532	0.442
170	3.338	2.517	1.888	1.454	1.194	0.792	0.684	0.546	0.442
175	3.422	2.578	1.939	1.478	1.219	0.809	0.699	0.559	0.442
180	3.505	2.638	1.991	1.501	1.242	0.826	0.714	0.573	0.442
185	3.588	2.699	2.042	1.524	1.265	0.843	0.729	0.587	0.442
190	3.672	2.744	2.094	1.548	1.288	0.860	0.744	0.601	0.442
195	3.755	2.788	2.145	1.571	1.311	0.877	0.760	0.614	0.442
200	3.838	2.832	2.197	1.594	1.333	0.894	0.775	0.628	0.442
205	3.922	2.876	2.248	1.618	1.356	0.911	0.790	0.642	0.442
210	4.005	2.920	2.299	1.641	1.379	0.928	0.805	0.656	0.442
215	4.089	2.964	2.351	1.664	1.402	0.945	0.820	0.669	0.442
220	4.172	3.008	2.402	1.688	1.425	0.962	0.835	0.683	0.442
225	4.255	3.052	2.454	1.734	1.448	0.979	0.850	0.697	0.456
230	4.339	3.096	2.505	1.793	1.471	0.996	0.865	0.711	0.470
235	-	3.140	2.556	1.852	1.494	1.013	0.880	0.724	0.484
240	-	3.184	2.608	1.910	1.516	1.030	0.896	0.738	0.498
245	-	3.228	2.659	1.969	1.539	1.047	0.911	0.752	0.512
250	-	3.272	2.711	2.028	1.562	1.064	0.926	0.766	0.525
255	-	3.316	2.763	2.087	1.585	1.081	0.941	0.779	0.539
260	-	3.360	2.815	2.146	1.608	1.098	0.956	0.793	0.553
265	-	3.404	2.867	2.204	1.631	1.115	0.971	0.807	0.567
270	-	3.448	2.919	2.263	1.654	1.132	0.986	0.821	0.581
275	-	3.492	2.971	2.322	1.677	1.149	1.001	0.834	0.595
280	-	3.536	3.023	2.381	1.705	1.166	1.016	0.848	0.609
285	-	3.580	3.074	2.439	1.765	1.183	1.032	0.862	0.622
290	-	3.624	3.126	2.498	1.825	1.201	1.047	0.876	0.636
295	-	3.668	3.178	2.557	1.885	1.245	1.062	0.889	0.650
300	-	3.712	3.230	2.616	1.944	1.290	1.077	0.903	0.664
305	-	3.755	3.282	2.675	2.004	1.334	1.092	0.917	0.678
310	-	3.799	3.334	2.733	2.064	1.378	1.107	0.931	0.692
315	-	3.843	3.386	2.792	2.124	1.422	1.122	0.944	0.706
320	-	3.887	3.438	2.851	2.184	1.467	1.137	0.958	0.719
325	-	3.931	3.490	2.909	2.244	1.511	1.153	0.972	0.733
330	-	3.975	3.542	2.968	2.304	1.555	1.168	0.986	0.747
335	-	4.019	3.594	3.027	2.363	1.599	1.183	0.999	0.761
340	-	4.063	3.646	3.086	2.423	1.644	1.198	1.013	0.775
345	-	4.107	3.698	3.144	2.483	1.688	1.235	1.027	0.789
350	-	4.151	3.750	3.203	2.543	1.758	1.275	1.041	0.803
355	-	4.195	3.802	3.262	2.603	1.833	1.316	1.054	0.816
360	-	4.239	3.854	3.320	2.663	1.909	1.356	1.068	0.830
365	-	4.283	3.906	3.379	2.724	1.985	1.396	1.082	0.844
370	-	4.327	3.958	3.438	2.787	2.061	1.437	1.096	0.858
375	-	4.371	4.010	3.496	2.851	2.136	1.477	1.109	0.872

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 9: I/H-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
30	0.757	0.553	0.442	0.442	0.442	0.442	0.442	0.442	0.442
35	0.974	0.716	0.566	0.465	0.442	0.442	0.442	0.442	0.442
40	1.191	0.878	0.690	0.563	0.460	0.442	0.442	0.442	0.442
45	1.378	1.041	0.814	0.661	0.539	0.442	0.442	0.442	0.442
50	1.563	1.203	0.939	0.759	0.618	0.495	0.442	0.442	0.442
55	1.748	1.341	1.063	0.857	0.697	0.558	0.442	0.442	0.442
60	1.934	1.479	1.187	0.954	0.776	0.622	0.482	0.442	0.442
65	2.119	1.617	1.292	1.052	0.855	0.686	0.529	0.442	0.442
70	2.305	1.756	1.394	1.150	0.934	0.749	0.576	0.461	0.442
75	2.490	1.894	1.496	1.230	1.013	0.813	0.623	0.484	0.442
80	2.676	2.032	1.598	1.293	1.092	0.877	0.670	0.508	0.442
85	2.812	2.170	1.701	1.355	1.171	0.941	0.717	0.532	0.442
90	2.939	2.308	1.803	1.417	1.224	1.004	0.764	0.555	0.442
95	3.066	2.446	1.905	1.479	1.261	1.068	0.812	0.579	0.457
100	3.193	2.585	2.007	1.541	1.299	1.132	0.859	0.603	0.473
105	3.320	2.720	2.110	1.603	1.337	1.195	0.906	0.626	0.489
110	3.447	2.840	2.212	1.665	1.374	1.222	0.953	0.650	0.506
115	3.574	2.960	2.314	1.736	1.412	1.245	1.000	0.673	0.522
120	3.701	3.079	2.416	1.816	1.450	1.268	1.047	0.697	0.538
125	3.828	3.199	2.519	1.895	1.487	1.291	1.094	0.721	0.554
130	3.955	3.319	2.621	1.975	1.525	1.315	1.141	0.744	0.570
135	4.082	3.439	2.724	2.055	1.563	1.338	1.188	0.768	0.586
140	4.210	3.558	2.833	2.135	1.601	1.361	1.217	0.792	0.603
145	4.337	3.678	2.941	2.214	1.638	1.385	1.239	0.815	0.619
150	-	3.798	3.049	2.294	1.676	1.408	1.262	0.839	0.635
155	-	3.918	3.158	2.374	1.726	1.431	1.285	0.862	0.651
160	-	4.037	3.266	2.453	1.790	1.454	1.307	0.886	0.667
165	-	4.157	3.374	2.533	1.853	1.478	1.330	0.910	0.683
170	-	4.277	3.482	2.613	1.917	1.501	1.353	0.933	0.700
175	-	4.396	3.591	2.693	1.981	1.524	1.375	0.957	0.716
180	-	-	3.699	2.761	2.044	1.548	1.398	0.981	0.732
185	-	-	3.807	2.827	2.108	1.571	1.421	1.004	0.748
190	-	-	3.916	2.893	2.172	1.594	1.443	1.028	0.764
195	-	-	4.024	2.960	2.235	1.618	1.466	1.051	0.780
200	-	-	4.132	3.026	2.299	1.641	1.489	1.075	0.797
205	-	-	4.241	3.092	2.363	1.664	1.511	1.099	0.813
210	-	-	4.349	3.159	2.427	1.687	1.534	1.122	0.829
215	-	-	-	3.225	2.490	1.746	1.557	1.146	0.845
220	-	-	-	3.291	2.554	1.825	1.579	1.170	0.861
225	-	-	-	3.357	2.618	1.903	1.602	1.193	0.877
230	-	-	-	3.424	2.681	1.982	1.624	1.218	0.893
235	-	-	-	3.490	2.743	2.061	1.647	1.242	0.910
240	-	-	-	3.556	2.805	2.140	1.670	1.267	0.926
245	-	-	-	3.623	2.866	2.219	1.692	1.292	0.942
250	-	-	-	3.689	2.927	2.298	1.747	1.316	0.958
255	-	-	-	3.755	2.988	2.377	1.807	1.341	0.974
260	-	-	-	3.822	3.049	2.455	1.867	1.366	0.990
265	-	-	-	3.888	3.110	2.534	1.927	1.390	1.007
270	-	-	-	3.954	3.171	2.613	1.987	1.415	1.023
275	-	-	-	4.020	3.232	2.692	2.047	1.440	1.039
280	-	-	-	4.087	3.294	2.759	2.107	1.465	1.055
285	-	-	-	4.153	3.355	2.824	2.167	1.489	1.071
290	-	-	-	4.219	3.416	2.888	2.227	1.514	1.087
295	-	-	-	4.286	3.477	2.953	2.287	1.539	1.104
300	-	-	-	4.352	3.538	3.018	2.347	1.563	1.120
305	-	-	-	-	3.599	3.083	2.407	1.588	1.136
310	-	-	-	-	3.660	3.147	2.467	1.613	1.152
315	-	-	-	-	3.721	3.212	2.527	1.637	1.168
320	-	-	-	-	3.783	3.277	2.587	1.662	1.184
325	-	-	-	-	3.844	3.342	2.647	1.687	1.201
330	-	-	-	-	3.905	3.406	2.708	1.751	1.231
335	-	-	-	-	3.966	3.471	2.777	1.840	1.262
340	-	-	-	-	4.027	3.536	2.847	1.929	1.292
345	-	-	-	-	4.088	3.601	2.916	2.018	1.322
350	-	-	-	-	4.149	3.665	2.986	2.106	1.353
355	-	-	-	-	4.210	3.730	3.056	2.195	1.383
360	-	-	-	-	4.272	3.795	3.125	2.284	1.413
365	-	-	-	-	4.333	3.860	3.195	2.373	1.443
370	-	-	-	-	4.394	3.924	3.265	2.462	1.474
375	-	-	-	-	-	3.989	3.334	2.550	1.504

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 10: I/H-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
30	1.138	0.863	0.695	0.578	0.476	0.442	0.442	0.442	0.442
35	1.415	1.074	0.861	0.714	0.592	0.479	0.442	0.442	0.442
40	1.693	1.287	1.027	0.850	0.708	0.581	0.442	0.442	0.442
45	1.971	1.505	1.193	0.985	0.825	0.683	0.533	0.442	0.442
50	2.249	1.722	1.364	1.121	0.941	0.785	0.624	0.467	0.442
55	2.527	1.939	1.535	1.256	1.057	0.887	0.715	0.541	0.442
60	2.756	2.157	1.707	1.389	1.173	0.989	0.806	0.615	0.442
65	2.898	2.374	1.878	1.522	1.256	1.091	0.897	0.688	0.481
70	3.040	2.592	2.050	1.655	1.329	1.193	0.988	0.762	0.533
75	3.182	2.771	2.221	1.789	1.402	1.246	1.080	0.836	0.584
80	3.324	2.908	2.393	1.922	1.475	1.296	1.171	0.910	0.635
85	3.466	3.045	2.564	2.055	1.547	1.345	1.228	0.984	0.687
90	3.608	3.182	2.730	2.189	1.620	1.395	1.269	1.058	0.738
95	3.750	3.320	2.873	2.322	1.693	1.445	1.309	1.132	0.789
100	3.892	3.457	3.016	2.455	1.820	1.495	1.350	1.202	0.841
105	4.034	3.594	3.159	2.588	1.950	1.544	1.391	1.236	0.892
110	4.176	3.732	3.301	2.717	2.079	1.594	1.432	1.269	0.943
115	4.319	3.869	3.444	2.819	2.209	1.644	1.473	1.302	0.995
120	-	4.006	3.587	2.920	2.338	1.693	1.513	1.335	1.046
125	-	4.143	3.730	3.022	2.468	1.793	1.554	1.368	1.097
130	-	4.281	3.872	3.123	2.597	1.896	1.595	1.401	1.148
135	-	-	4.015	3.225	2.719	1.998	1.636	1.434	1.200
140	-	-	4.158	3.326	2.804	2.101	1.677	1.468	1.224
145	-	-	4.301	3.428	2.889	2.203	1.728	1.501	1.248
150	-	-	-	3.529	2.973	2.306	1.787	1.534	1.272
155	-	-	-	3.631	3.058	2.409	1.847	1.567	1.297
160	-	-	-	3.732	3.143	2.511	1.907	1.600	1.321
165	-	-	-	3.834	3.228	2.614	1.967	1.633	1.345
170	-	-	-	3.935	3.312	2.713	2.027	1.666	1.369
175	-	-	-	4.037	3.397	2.788	2.087	1.701	1.393
180	-	-	-	4.138	3.482	2.862	2.147	1.753	1.417
185	-	-	-	4.240	3.567	2.937	2.207	1.805	1.441
190	-	-	-	4.341	3.652	3.012	2.267	1.857	1.466
195	-	-	-	-	3.736	3.086	2.327	1.909	1.490
200	-	-	-	-	3.821	3.161	2.386	1.961	1.514
205	-	-	-	-	3.906	3.236	2.446	2.013	1.538
210	-	-	-	-	3.991	3.310	2.506	2.065	1.562
215	-	-	-	-	4.075	3.385	2.566	2.117	1.586
220	-	-	-	-	4.160	3.460	2.626	2.169	1.611
225	-	-	-	-	4.245	3.535	2.686	2.221	1.635
230	-	-	-	-	4.330	3.609	2.754	2.273	1.659
235	-	-	-	-	-	3.684	2.826	2.325	1.683
240	-	-	-	-	-	3.759	2.898	2.377	1.721
245	-	-	-	-	-	3.833	2.969	2.429	1.776
250	-	-	-	-	-	3.908	3.041	2.481	1.830
255	-	-	-	-	-	3.983	3.113	2.533	1.884
260	-	-	-	-	-	4.057	3.184	2.585	1.939
265	-	-	-	-	-	4.132	3.256	2.637	1.993
270	-	-	-	-	-	4.207	3.328	2.688	2.048
275	-	-	-	-	-	4.281	3.399	2.749	2.102
280	-	-	-	-	-	4.356	3.471	2.812	2.156
285	-	-	-	-	-	-	3.543	2.876	2.211
290	-	-	-	-	-	-	3.614	2.939	2.265
295	-	-	-	-	-	-	3.686	3.003	2.319
300	-	-	-	-	-	-	3.758	3.067	2.374
305	-	-	-	-	-	-	3.829	3.130	2.428
310	-	-	-	-	-	-	3.901	3.194	2.483
315	-	-	-	-	-	-	3.973	3.258	2.537
320	-	-	-	-	-	-	4.044	3.321	2.591
325	-	-	-	-	-	-	4.116	3.385	2.646
330	-	-	-	-	-	-	4.188	3.449	2.700
335	-	-	-	-	-	-	4.260	3.512	2.761
340	-	-	-	-	-	-	4.331	3.576	2.822
345	-	-	-	-	-	-	-	3.639	2.883
350	-	-	-	-	-	-	-	3.703	2.944
355	-	-	-	-	-	-	-	3.767	3.005
360	-	-	-	-	-	-	-	3.830	3.066
365	-	-	-	-	-	-	-	3.894	3.127
370	-	-	-	-	-	-	-	3.958	3.187
375	-	-	-	-	-	-	-	4.021	3.248

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 11: I/H-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
30	-	1.159	0.949	0.803	0.684	0.563	0.442	0.442	0.442
35	-	1.460	1.155	0.973	0.835	0.702	0.548	0.442	0.442
40	-	1.762	1.392	1.144	0.985	0.842	0.681	0.516	0.442
45	-	2.063	1.637	1.334	1.135	0.982	0.814	0.629	0.442
50	-	2.364	1.883	1.533	1.293	1.121	0.947	0.741	0.531
55	-	2.665	2.129	1.733	1.457	1.258	1.080	0.854	0.625
60	-	2.843	2.375	1.932	1.621	1.392	1.207	0.966	0.720
65	-	3.002	2.621	2.131	1.785	1.525	1.276	1.079	0.814
70	-	3.161	2.809	2.331	1.949	1.659	1.344	1.191	0.908
75	-	3.321	2.969	2.530	2.113	1.792	1.413	1.255	1.003
80	-	3.480	3.128	2.723	2.277	1.925	1.482	1.314	1.097
85	-	3.639	3.287	2.867	2.441	2.059	1.550	1.374	1.192
90	-	3.799	3.447	3.012	2.605	2.192	1.619	1.433	1.243
95	-	3.958	3.606	3.157	2.751	2.326	1.688	1.493	1.290
100	-	4.117	3.765	3.302	2.871	2.459	1.821	1.552	1.337
105	-	4.277	3.925	3.447	2.992	2.593	1.962	1.611	1.383
110	-	-	4.084	3.591	3.112	2.719	2.103	1.671	1.430
115	-	-	4.243	3.736	3.232	2.810	2.244	1.742	1.477
120	-	-	-	3.881	3.352	2.901	2.385	1.820	1.524
125	-	-	-	4.026	3.472	2.991	2.526	1.899	1.571
130	-	-	-	4.171	3.592	3.082	2.668	1.978	1.618
135	-	-	-	4.316	3.712	3.173	2.762	2.056	1.665
140	-	-	-	-	3.832	3.264	2.840	2.135	1.713
145	-	-	-	-	3.952	3.354	2.917	2.214	1.765
150	-	-	-	-	4.072	3.445	2.995	2.293	1.817
155	-	-	-	-	4.192	3.536	3.073	2.371	1.869
160	-	-	-	-	4.312	3.627	3.151	2.450	1.921
165	-	-	-	-	-	3.717	3.229	2.529	1.973
170	-	-	-	-	-	3.808	3.307	2.608	2.025
175	-	-	-	-	-	3.899	3.384	2.686	2.077
180	-	-	-	-	-	3.990	3.462	2.757	2.129
185	-	-	-	-	-	4.081	3.540	2.826	2.181
190	-	-	-	-	-	4.171	3.618	2.895	2.233
195	-	-	-	-	-	4.262	3.696	2.964	2.285
200	-	-	-	-	-	4.353	3.774	3.032	2.337
205	-	-	-	-	-	-	3.851	3.101	2.389
210	-	-	-	-	-	-	3.929	3.170	2.441
215	-	-	-	-	-	-	4.007	3.239	2.493
220	-	-	-	-	-	-	4.085	3.307	2.545
225	-	-	-	-	-	-	4.163	3.376	2.597
230	-	-	-	-	-	-	4.241	3.445	2.649
235	-	-	-	-	-	-	4.318	3.514	2.701
240	-	-	-	-	-	-	4.396	3.582	2.759
245	-	-	-	-	-	-	-	3.651	2.818
250	-	-	-	-	-	-	-	3.720	2.877
255	-	-	-	-	-	-	-	3.789	2.936
260	-	-	-	-	-	-	-	3.857	2.994
265	-	-	-	-	-	-	-	3.926	3.053
270	-	-	-	-	-	-	-	3.995	3.112
275	-	-	-	-	-	-	-	4.064	3.170
280	-	-	-	-	-	-	-	4.132	3.229
285	-	-	-	-	-	-	-	4.201	3.288
290	-	-	-	-	-	-	-	4.270	3.347
295	-	-	-	-	-	-	-	4.339	3.405
300	-	-	-	-	-	-	-	-	3.464
305	-	-	-	-	-	-	-	-	3.523
310	-	-	-	-	-	-	-	-	3.582
315	-	-	-	-	-	-	-	-	3.640
320	-	-	-	-	-	-	-	-	3.699
325	-	-	-	-	-	-	-	-	3.758
330	-	-	-	-	-	-	-	-	3.816
335	-	-	-	-	-	-	-	-	3.875
340	-	-	-	-	-	-	-	-	3.934
345	-	-	-	-	-	-	-	-	3.993
350	-	-	-	-	-	-	-	-	4.051
355	-	-	-	-	-	-	-	-	4.110
360	-	-	-	-	-	-	-	-	4.169
365	-	-	-	-	-	-	-	-	4.228
370	-	-	-	-	-	-	-	-	4.286
375	-	-	-	-	-	-	-	-	4.345

Thickness is intumescent only. Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 4.397mm.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 12: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
55	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
60	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
65	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
70	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
75	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
80	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
85	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
90	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
95	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
100	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
105	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
110	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
115	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
120	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
125	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
130	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
135	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
140	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
145	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
150	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
155	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
160	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
165	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
170	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
175	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
180	0.513	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
185	0.557	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
190	0.601	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
195	0.644	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
200	0.688	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
205	0.732	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
210	0.775	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
215	0.819	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
220	0.862	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
225	0.906	0.505	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
230	0.950	0.538	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
235	0.993	0.570	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
240	1.037	0.603	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
245	1.080	0.636	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
250	1.124	0.669	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
255	1.168	0.702	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
260	1.211	0.734	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
265	1.255	0.767	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
270	1.299	0.800	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
275	1.342	0.833	0.506	0.502	0.502	0.502	0.502	0.502	0.502	0.502
280	1.386	0.865	0.533	0.502	0.502	0.502	0.502	0.502	0.502	0.502
285	1.429	0.898	0.559	0.502	0.502	0.502	0.502	0.502	0.502	0.502
290	1.473	0.931	0.586	0.502	0.502	0.502	0.502	0.502	0.502	0.502
295	1.513	0.964	0.612	0.502	0.502	0.502	0.502	0.502	0.502	0.502
300	1.546	0.997	0.639	0.502	0.502	0.502	0.502	0.502	0.502	0.502
305	1.579	1.029	0.666	0.502	0.502	0.502	0.502	0.502	0.502	0.502
310	1.613	1.062	0.692	0.502	0.502	0.502	0.502	0.502	0.502	0.502
315	1.646	1.095	0.719	0.502	0.502	0.502	0.502	0.502	0.502	0.502
320	1.680	1.128	0.745	0.502	0.502	0.502	0.502	0.502	0.502	0.502
325	1.713	1.160	0.772	0.502	0.502	0.502	0.502	0.502	0.502	0.502
330	1.746	1.193	0.799	0.511	0.502	0.502	0.502	0.502	0.502	0.502
335	1.780	1.226	0.825	0.532	0.502	0.502	0.502	0.502	0.502	0.502
340	1.813	1.259	0.852	0.553	0.502	0.502	0.502	0.502	0.502	0.502
345	1.846	1.292	0.878	0.574	0.502	0.502	0.502	0.502	0.502	0.502
350	1.880	1.324	0.905	0.595	0.506	0.502	0.502	0.502	0.502	0.502
355	1.913	1.357	0.931	0.616	0.525	0.502	0.502	0.502	0.502	0.502
360	1.946	1.390	0.958	0.638	0.544	0.502	0.502	0.502	0.502	0.502
365	1.980	1.423	0.985	0.659	0.563	0.502	0.502	0.502	0.502	0.502
370	2.013	1.455	1.011	0.680	0.582	0.502	0.502	0.502	0.502	0.502
375	2.047	1.488	1.038	0.701	0.601	0.502	0.502	0.502	0.502	0.502
380	2.080	1.523	1.064	0.722	0.620	0.502	0.502	0.502	0.502	0.502
385	2.113	1.559	1.091	0.743	0.639	0.502	0.502	0.502	0.502	0.502
390	2.147	1.595	1.117	0.765	0.659	0.502	0.502	0.502	0.502	0.502

Thickness is intumescent only.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 13: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	0.880	0.608	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
55	0.926	0.648	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
60	0.972	0.688	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
65	1.018	0.728	0.502	0.502	0.502	0.502	0.502	0.502	0.502	0.502
70	1.064	0.767	0.524	0.502	0.502	0.502	0.502	0.502	0.502	0.502
75	1.111	0.807	0.562	0.502	0.502	0.502	0.502	0.502	0.502	0.502
80	1.157	0.847	0.600	0.502	0.502	0.502	0.502	0.502	0.502	0.502
85	1.203	0.887	0.638	0.502	0.502	0.502	0.502	0.502	0.502	0.502
90	1.249	0.927	0.676	0.502	0.502	0.502	0.502	0.502	0.502	0.502
95	1.295	0.967	0.714	0.502	0.502	0.502	0.502	0.502	0.502	0.502
100	1.341	1.007	0.752	0.502	0.502	0.502	0.502	0.502	0.502	0.502
105	1.387	1.046	0.790	0.502	0.502	0.502	0.502	0.502	0.502	0.502
110	1.434	1.086	0.828	0.526	0.502	0.502	0.502	0.502	0.502	0.502
115	1.480	1.126	0.866	0.564	0.502	0.502	0.502	0.502	0.502	0.502
120	1.546	1.166	0.904	0.601	0.502	0.502	0.502	0.502	0.502	0.502
125	1.627	1.206	0.942	0.639	0.502	0.502	0.502	0.502	0.502	0.502
130	1.708	1.246	0.980	0.677	0.502	0.502	0.502	0.502	0.502	0.502
135	1.789	1.286	1.018	0.714	0.502	0.502	0.502	0.502	0.502	0.502
140	1.870	1.326	1.056	0.752	0.502	0.502	0.502	0.502	0.502	0.502
145	1.951	1.365	1.094	0.790	0.533	0.502	0.502	0.502	0.502	0.502
150	2.032	1.405	1.132	0.827	0.576	0.502	0.502	0.502	0.502	0.502
155	2.113	1.445	1.170	0.865	0.619	0.502	0.502	0.502	0.502	0.502
160	2.194	1.485	1.208	0.902	0.662	0.502	0.502	0.502	0.502	0.502
165	2.275	1.553	1.246	0.940	0.705	0.502	0.502	0.502	0.502	0.502
170	2.356	1.638	1.284	0.978	0.748	0.502	0.502	0.502	0.502	0.502
175	2.438	1.723	1.322	1.015	0.791	0.540	0.502	0.502	0.502	0.502
180	2.515	1.808	1.360	1.053	0.834	0.583	0.502	0.502	0.502	0.502
185	2.583	1.894	1.398	1.091	0.877	0.625	0.502	0.502	0.502	0.502
190	2.651	1.979	1.436	1.128	0.919	0.668	0.502	0.502	0.502	0.502
195	2.719	2.064	1.474	1.166	0.962	0.711	0.502	0.502	0.502	0.502
200	2.787	2.149	1.525	1.204	1.005	0.753	0.522	0.502	0.502	0.502
205	2.855	2.234	1.602	1.241	1.048	0.796	0.555	0.502	0.502	0.502
210	2.924	2.319	1.678	1.279	1.091	0.838	0.588	0.502	0.502	0.502
215	2.992	2.404	1.755	1.316	1.134	0.881	0.622	0.502	0.502	0.502
220	3.060	2.489	1.831	1.354	1.177	0.923	0.655	0.502	0.502	0.502
225	3.128	2.554	1.908	1.392	1.220	0.966	0.688	0.506	0.502	0.502
230	3.196	2.618	1.984	1.429	1.263	1.009	0.722	0.531	0.502	0.502
235	3.265	2.682	2.061	1.467	1.306	1.051	0.755	0.557	0.502	0.502
240	3.333	2.746	2.137	1.508	1.348	1.094	0.789	0.583	0.502	0.502
245	3.401	2.810	2.214	1.575	1.391	1.136	0.822	0.608	0.502	0.502
250	3.469	2.874	2.290	1.641	1.434	1.179	0.855	0.634	0.502	0.502
255	3.537	2.938	2.367	1.708	1.477	1.221	0.889	0.659	0.502	0.502
260	3.606	3.002	2.444	1.775	1.528	1.264	0.922	0.685	0.502	0.502
265	3.674	3.066	2.514	1.841	1.589	1.307	0.955	0.711	0.508	0.502
270	3.742	3.130	2.573	1.908	1.649	1.349	0.989	0.736	0.526	0.502
275	3.810	3.194	2.632	1.975	1.709	1.392	1.022	0.762	0.545	0.502
280	3.878	3.258	2.691	2.041	1.769	1.434	1.055	0.787	0.563	0.502
285	3.946	3.322	2.750	2.108	1.830	1.477	1.089	0.813	0.582	0.502
290	4.015	3.386	2.808	2.174	1.890	1.525	1.122	0.839	0.600	0.502
295	4.083	3.450	2.867	2.241	1.950	1.581	1.156	0.864	0.619	0.502
300	4.151	3.514	2.926	2.308	2.011	1.637	1.189	0.890	0.637	0.502
305	4.219	3.578	2.985	2.374	2.071	1.692	1.222	0.915	0.656	0.502
310	4.287	3.642	3.044	2.441	2.131	1.748	1.256	0.941	0.674	0.502
315	4.356	3.706	3.103	2.505	2.191	1.804	1.289	0.966	0.693	0.502
320	-	3.770	3.162	2.559	2.252	1.859	1.322	0.992	0.711	0.502
325	-	3.834	3.221	2.613	2.312	1.915	1.356	1.018	0.730	0.502
330	-	3.898	3.280	2.667	2.372	1.971	1.389	1.043	0.748	0.502
335	-	3.962	3.339	2.720	2.433	2.026	1.422	1.069	0.767	0.502
340	-	4.026	3.398	2.774	2.493	2.082	1.456	1.094	0.786	0.502
345	-	4.090	3.457	2.828	2.545	2.138	1.489	1.120	0.804	0.502
350	-	4.154	3.515	2.882	2.598	2.193	1.532	1.146	0.823	0.502
355	-	4.218	3.574	2.936	2.650	2.249	1.580	1.171	0.841	0.502
360	-	4.282	3.633	2.990	2.702	2.305	1.628	1.197	0.860	0.502
365	-	4.346	3.692	3.044	2.754	2.360	1.675	1.222	0.878	0.502
370	-	-	3.751	3.098	2.807	2.416	1.723	1.248	0.897	0.502
375	-	-	3.810	3.152	2.859	2.472	1.771	1.274	0.915	0.502
380	-	-	3.869	3.206	2.911	2.522	1.818	1.299	0.934	0.502
385	-	-	3.928	3.260	2.964	2.570	1.866	1.325	0.952	0.502
390	-	-	3.987	3.314	3.016	2.618	1.914	1.350	0.971	0.502

Thickness is intumescent only.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 14: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	1.512	1.198	0.925	0.705	0.629	0.544	0.502	0.502	0.502	0.502
55	1.653	1.258	0.980	0.754	0.674	0.583	0.502	0.502	0.502	0.502
60	1.793	1.319	1.035	0.803	0.719	0.623	0.502	0.502	0.502	0.502
65	1.934	1.379	1.091	0.851	0.764	0.663	0.504	0.502	0.502	0.502
70	2.074	1.439	1.146	0.900	0.809	0.702	0.541	0.502	0.502	0.502
75	2.215	1.499	1.201	0.948	0.854	0.742	0.578	0.502	0.502	0.502
80	2.355	1.620	1.256	0.997	0.899	0.781	0.616	0.502	0.502	0.502
85	2.496	1.741	1.311	1.045	0.944	0.821	0.653	0.502	0.502	0.502
90	2.617	1.863	1.366	1.094	0.989	0.860	0.691	0.502	0.502	0.502
95	2.739	1.984	1.421	1.143	1.034	0.900	0.728	0.514	0.502	0.502
100	2.860	2.106	1.477	1.191	1.079	0.939	0.766	0.550	0.502	0.502
105	2.982	2.227	1.558	1.240	1.123	0.979	0.803	0.587	0.502	0.502
110	3.103	2.348	1.658	1.288	1.168	1.018	0.841	0.623	0.502	0.502
115	3.225	2.470	1.758	1.337	1.213	1.058	0.878	0.660	0.502	0.502
120	3.346	2.575	1.859	1.385	1.258	1.097	0.916	0.696	0.502	0.502
125	3.468	2.677	1.959	1.434	1.303	1.137	0.953	0.733	0.502	0.502
130	3.589	2.778	2.060	1.482	1.348	1.177	0.991	0.769	0.502	0.502
135	3.711	2.880	2.160	1.561	1.393	1.216	1.028	0.805	0.502	0.502
140	3.832	2.981	2.260	1.655	1.438	1.256	1.066	0.842	0.511	0.502
145	3.954	3.082	2.361	1.750	1.483	1.295	1.103	0.878	0.547	0.502
150	4.076	3.184	2.461	1.845	1.563	1.335	1.141	0.915	0.582	0.502
155	4.197	3.285	2.555	1.940	1.665	1.374	1.178	0.951	0.618	0.502
160	4.319	3.387	2.645	2.035	1.767	1.414	1.216	0.987	0.654	0.502
165	-	3.488	2.736	2.130	1.869	1.453	1.253	1.024	0.689	0.502
170	-	3.590	2.827	2.225	1.971	1.493	1.291	1.060	0.725	0.507
175	-	3.691	2.917	2.320	2.073	1.596	1.328	1.097	0.761	0.532
180	-	3.793	3.008	2.415	2.175	1.714	1.366	1.133	0.796	0.557
185	-	3.894	3.099	2.506	2.276	1.831	1.403	1.170	0.832	0.583
190	-	3.996	3.189	2.576	2.378	1.949	1.441	1.206	0.868	0.608
195	-	4.097	3.280	2.646	2.480	2.067	1.478	1.242	0.903	0.633
200	-	4.199	3.370	2.717	2.551	2.184	1.538	1.279	0.939	0.659
205	-	4.300	3.461	2.787	2.618	2.302	1.629	1.315	0.975	0.684
210	-	4.402	3.552	2.858	2.684	2.419	1.721	1.352	1.010	0.709
215	-	-	3.642	2.928	2.751	2.516	1.813	1.388	1.046	0.735
220	-	-	3.733	2.999	2.818	2.577	1.904	1.424	1.082	0.760
225	-	-	3.824	3.069	2.884	2.637	1.996	1.461	1.118	0.785
230	-	-	3.914	3.140	2.951	2.698	2.087	1.497	1.153	0.811
235	-	-	4.005	3.210	3.017	2.759	2.179	1.551	1.189	0.836
240	-	-	4.095	3.280	3.084	2.820	2.270	1.607	1.225	0.862
245	-	-	4.186	3.351	3.151	2.881	2.362	1.662	1.260	0.887
250	-	-	4.277	3.421	3.217	2.942	2.454	1.717	1.296	0.912
255	-	-	4.367	3.492	3.284	3.003	2.524	1.773	1.332	0.938
260	-	-	-	3.562	3.350	3.064	2.580	1.828	1.367	0.963
265	-	-	-	3.633	3.417	3.125	2.635	1.884	1.403	0.988
270	-	-	-	3.703	3.484	3.185	2.690	1.939	1.439	1.014
275	-	-	-	3.774	3.550	3.246	2.745	1.994	1.474	1.039
280	-	-	-	3.844	3.617	3.307	2.801	2.050	1.511	1.064
285	-	-	-	3.915	3.683	3.368	2.856	2.105	1.553	1.090
290	-	-	-	3.985	3.750	3.429	2.911	2.161	1.594	1.115
295	-	-	-	4.055	3.817	3.490	2.966	2.216	1.635	1.140
300	-	-	-	4.126	3.883	3.551	3.022	2.271	1.676	1.166
305	-	-	-	4.196	3.950	3.612	3.077	2.327	1.717	1.191
310	-	-	-	4.267	4.016	3.673	3.132	2.382	1.758	1.216
315	-	-	-	4.337	4.083	3.733	3.187	2.437	1.800	1.242
320	-	-	-	-	4.150	3.794	3.242	2.493	1.841	1.267
325	-	-	-	-	4.216	3.855	3.298	2.549	1.882	1.292
330	-	-	-	-	4.283	3.916	3.353	2.606	1.923	1.318
335	-	-	-	-	4.349	3.977	3.408	2.662	1.964	1.343
340	-	-	-	-	-	4.038	3.463	2.718	2.005	1.369
345	-	-	-	-	-	4.099	3.519	2.775	2.047	1.394
350	-	-	-	-	-	4.160	3.574	2.831	2.088	1.419
355	-	-	-	-	-	4.221	3.629	2.887	2.129	1.445
360	-	-	-	-	-	4.281	3.684	2.944	2.170	1.470
365	-	-	-	-	-	4.342	3.740	3.000	2.211	1.495
370	-	-	-	-	-	4.403	3.795	3.056	2.252	1.535
375	-	-	-	-	-	-	3.850	3.113	2.294	1.578
380	-	-	-	-	-	-	3.905	3.169	2.335	1.621
385	-	-	-	-	-	-	3.960	3.225	2.376	1.664
390	-	-	-	-	-	-	4.016	3.282	2.417	1.707

Thickness is intumescent only.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 15: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	2.057	1.720	1.443	1.173	1.079	0.945	0.762	0.590	0.502	0.502
55	2.251	1.877	1.544	1.238	1.137	1.006	0.819	0.640	0.516	0.502
60	2.445	2.033	1.665	1.303	1.195	1.066	0.875	0.690	0.560	0.502
65	2.749	2.189	1.786	1.368	1.253	1.127	0.932	0.740	0.604	0.502
70	3.091	2.345	1.906	1.433	1.311	1.187	0.988	0.790	0.647	0.502
75	3.433	2.505	2.027	1.498	1.369	1.248	1.045	0.840	0.691	0.514
80	3.774	2.728	2.148	1.617	1.427	1.308	1.102	0.890	0.735	0.563
85	4.116	2.951	2.269	1.737	1.486	1.368	1.158	0.940	0.779	0.611
90	-	3.173	2.390	1.857	1.595	1.429	1.215	0.990	0.823	0.660
95	-	3.396	2.518	1.978	1.721	1.489	1.271	1.040	0.866	0.709
100	-	3.619	2.686	2.098	1.847	1.597	1.328	1.090	0.910	0.757
105	-	3.842	2.853	2.218	1.973	1.715	1.384	1.140	0.954	0.806
110	-	4.065	3.020	2.339	2.099	1.833	1.441	1.190	0.998	0.855
115	-	4.287	3.187	2.459	2.225	1.951	1.497	1.241	1.042	0.903
120	-	-	3.355	2.586	2.352	2.069	1.595	1.291	1.086	0.952
125	-	-	3.522	2.715	2.478	2.187	1.695	1.341	1.129	1.000
130	-	-	3.689	2.844	2.598	2.304	1.796	1.391	1.173	1.049
135	-	-	3.856	2.973	2.718	2.422	1.896	1.441	1.217	1.098
140	-	-	4.024	3.102	2.838	2.533	1.996	1.491	1.261	1.146
145	-	-	4.191	3.232	2.958	2.633	2.096	1.578	1.305	1.195
150	-	-	4.358	3.361	3.078	2.732	2.196	1.673	1.349	1.244
155	-	-	-	3.490	3.198	2.832	2.296	1.768	1.392	1.292
160	-	-	-	3.619	3.318	2.932	2.396	1.863	1.436	1.341
165	-	-	-	3.748	3.438	3.031	2.495	1.958	1.480	1.389
170	-	-	-	3.877	3.558	3.131	2.562	2.053	1.543	1.438
175	-	-	-	4.007	3.678	3.231	2.629	2.148	1.621	1.487
180	-	-	-	4.136	3.798	3.330	2.695	2.243	1.699	1.534
185	-	-	-	4.265	3.918	3.430	2.762	2.338	1.778	1.581
190	-	-	-	4.394	4.038	3.530	2.828	2.433	1.856	1.629
195	-	-	-	-	4.158	3.629	2.895	2.515	1.935	1.676
200	-	-	-	-	4.278	3.729	2.962	2.574	2.013	1.723
205	-	-	-	-	4.398	3.829	3.028	2.633	2.091	1.770
210	-	-	-	-	-	3.928	3.095	2.692	2.170	1.818
215	-	-	-	-	-	4.028	3.161	2.752	2.248	1.865
220	-	-	-	-	-	4.128	3.228	2.811	2.327	1.912
225	-	-	-	-	-	4.227	3.295	2.870	2.405	1.959
230	-	-	-	-	-	4.327	3.361	2.929	2.483	2.007
235	-	-	-	-	-	-	3.428	2.988	2.540	2.054
240	-	-	-	-	-	-	3.495	3.047	2.594	2.101
245	-	-	-	-	-	-	3.561	3.107	2.649	2.148
250	-	-	-	-	-	-	3.628	3.166	2.703	2.196
255	-	-	-	-	-	-	3.694	3.225	2.757	2.243
260	-	-	-	-	-	-	3.761	3.284	2.811	2.290
265	-	-	-	-	-	-	3.828	3.343	2.865	2.337
270	-	-	-	-	-	-	3.894	3.402	2.919	2.384
275	-	-	-	-	-	-	3.961	3.461	2.973	2.432
280	-	-	-	-	-	-	4.027	3.521	3.027	2.479
285	-	-	-	-	-	-	4.094	3.580	3.081	2.529
290	-	-	-	-	-	-	4.161	3.639	3.135	2.581
295	-	-	-	-	-	-	4.227	3.698	3.189	2.633
300	-	-	-	-	-	-	4.294	3.757	3.243	2.685
305	-	-	-	-	-	-	4.360	3.816	3.297	2.737
310	-	-	-	-	-	-	-	3.876	3.351	2.789
315	-	-	-	-	-	-	-	3.935	3.405	2.841
320	-	-	-	-	-	-	-	3.994	3.459	2.893
325	-	-	-	-	-	-	-	4.053	3.513	2.945
330	-	-	-	-	-	-	-	4.112	3.567	2.997
335	-	-	-	-	-	-	-	4.171	3.621	3.049
340	-	-	-	-	-	-	-	4.230	3.675	3.101
345	-	-	-	-	-	-	-	4.290	3.729	3.153
350	-	-	-	-	-	-	-	4.349	3.783	3.205
355	-	-	-	-	-	-	-	-	3.837	3.257
360	-	-	-	-	-	-	-	-	3.891	3.309
365	-	-	-	-	-	-	-	-	3.945	3.361
370	-	-	-	-	-	-	-	-	3.999	3.413
375	-	-	-	-	-	-	-	-	4.053	3.465
380	-	-	-	-	-	-	-	-	4.107	3.517
385	-	-	-	-	-	-	-	-	4.161	3.569
390	-	-	-	-	-	-	-	-	4.215	3.621

Thickness is intumescent only.



CERTIFICATE No CF 5650

RUDOLF HENSEL GMBH

Table 16: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	2.754	2.233	1.922	1.631	1.511	1.362	1.161	1.004	0.832	0.595
55	3.359	2.440	2.088	1.762	1.635	1.456	1.243	1.075	0.903	0.675
60	3.964	2.813	2.254	1.893	1.759	1.566	1.325	1.146	0.974	0.755
65	-	3.245	2.421	2.023	1.882	1.693	1.407	1.218	1.045	0.836
70	-	3.677	2.667	2.153	2.005	1.819	1.490	1.289	1.115	0.916
75	-	4.109	2.973	2.284	2.129	1.946	1.612	1.361	1.186	0.997
80	-	-	3.280	2.414	2.252	2.072	1.740	1.433	1.257	1.077
85	-	-	3.587	2.594	2.375	2.198	1.869	1.507	1.328	1.158
90	-	-	3.894	2.851	2.504	2.325	1.997	1.630	1.399	1.238
95	-	-	4.201	3.108	2.743	2.451	2.125	1.753	1.470	1.319
100	-	-	-	3.365	2.982	2.624	2.253	1.875	1.557	1.399
105	-	-	-	3.621	3.221	2.819	2.381	1.998	1.656	1.480
110	-	-	-	3.878	3.459	3.015	2.510	2.120	1.755	1.557
115	-	-	-	4.135	3.698	3.210	2.643	2.243	1.854	1.632
120	-	-	-	4.392	3.937	3.405	2.775	2.366	1.953	1.708
125	-	-	-	-	4.176	3.601	2.908	2.488	2.052	1.784
130	-	-	-	-	-	3.796	3.040	2.582	2.151	1.860
135	-	-	-	-	-	3.991	3.173	2.675	2.249	1.935
140	-	-	-	-	-	4.186	3.305	2.768	2.348	2.011
145	-	-	-	-	-	4.381	3.438	2.861	2.447	2.087
150	-	-	-	-	-	-	3.570	2.954	2.523	2.163
155	-	-	-	-	-	-	3.703	3.047	2.580	2.238
160	-	-	-	-	-	-	3.836	3.140	2.636	2.314
165	-	-	-	-	-	-	3.968	3.233	2.692	2.390
170	-	-	-	-	-	-	4.100	3.325	2.749	2.466
175	-	-	-	-	-	-	4.232	3.418	2.805	2.526
180	-	-	-	-	-	-	4.364	3.511	2.861	2.579
185	-	-	-	-	-	-	-	3.604	2.918	2.631
190	-	-	-	-	-	-	-	3.697	2.974	2.683
195	-	-	-	-	-	-	-	3.790	3.030	2.736
200	-	-	-	-	-	-	-	3.883	3.086	2.788
205	-	-	-	-	-	-	-	3.976	3.143	2.840
210	-	-	-	-	-	-	-	4.069	3.199	2.893
215	-	-	-	-	-	-	-	4.162	3.255	2.945
220	-	-	-	-	-	-	-	4.255	3.312	2.997
225	-	-	-	-	-	-	-	4.348	3.368	3.050
230	-	-	-	-	-	-	-	-	3.424	3.102
235	-	-	-	-	-	-	-	-	3.481	3.154
240	-	-	-	-	-	-	-	-	3.537	3.207
245	-	-	-	-	-	-	-	-	3.593	3.259
250	-	-	-	-	-	-	-	-	3.650	3.311
255	-	-	-	-	-	-	-	-	3.706	3.364
260	-	-	-	-	-	-	-	-	3.762	3.416
265	-	-	-	-	-	-	-	-	3.819	3.468
270	-	-	-	-	-	-	-	-	3.875	3.521
275	-	-	-	-	-	-	-	-	3.931	3.573
280	-	-	-	-	-	-	-	-	3.988	3.625
285	-	-	-	-	-	-	-	-	4.044	3.678
290	-	-	-	-	-	-	-	-	4.100	3.730
295	-	-	-	-	-	-	-	-	4.156	3.782
300	-	-	-	-	-	-	-	-	4.212	3.835
305	-	-	-	-	-	-	-	-	4.268	3.887
310	-	-	-	-	-	-	-	-	4.324	3.939
315	-	-	-	-	-	-	-	-	4.380	3.992
320	-	-	-	-	-	-	-	-	-	4.044
325	-	-	-	-	-	-	-	-	-	4.096
330	-	-	-	-	-	-	-	-	-	4.148
335	-	-	-	-	-	-	-	-	-	4.200
340	-	-	-	-	-	-	-	-	-	4.252
345	-	-	-	-	-	-	-	-	-	4.304
350	-	-	-	-	-	-	-	-	-	4.356
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.



CERTIFICATE No CF 5650
RUDOLF HENSEL GMBH

Table 17: Circular and Rectangular/Square Hollow 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	520°C	550°C	600°C	650°C	700°C	750°C
50	-	3.080	2.317	2.116	1.997	1.813	1.564	1.408	1.286	1.136
55	-	3.680	2.775	2.294	2.162	1.973	1.714	1.527	1.390	1.239
60	-	4.280	3.233	2.471	2.328	2.133	1.865	1.666	1.495	1.342
65	-	-	3.691	2.800	2.493	2.293	2.016	1.805	1.624	1.445
70	-	-	4.149	3.151	2.825	2.453	2.167	1.944	1.754	1.559
75	-	-	-	3.501	3.156	2.725	2.318	2.083	1.884	1.686
80	-	-	-	3.851	3.488	3.035	2.468	2.222	2.014	1.814
85	-	-	-	4.201	3.820	3.345	2.711	2.361	2.145	1.941
90	-	-	-	-	4.151	3.654	2.972	2.503	2.275	2.069
95	-	-	-	-	-	3.964	3.232	2.691	2.405	2.196
100	-	-	-	-	-	4.274	3.493	2.879	2.532	2.323
105	-	-	-	-	-	-	3.753	3.067	2.652	2.451
110	-	-	-	-	-	-	4.014	3.255	2.772	2.548
115	-	-	-	-	-	-	4.275	3.443	2.891	2.629
120	-	-	-	-	-	-	-	3.631	3.011	2.711
125	-	-	-	-	-	-	-	3.818	3.131	2.792
130	-	-	-	-	-	-	-	4.006	3.251	2.874
135	-	-	-	-	-	-	-	4.194	3.371	2.955
140	-	-	-	-	-	-	-	4.382	3.491	3.037
145	-	-	-	-	-	-	-	-	3.610	3.118
150	-	-	-	-	-	-	-	-	3.730	3.200
155	-	-	-	-	-	-	-	-	3.850	3.281
160	-	-	-	-	-	-	-	-	3.970	3.363
165	-	-	-	-	-	-	-	-	4.090	3.444
170	-	-	-	-	-	-	-	-	4.210	3.526
175	-	-	-	-	-	-	-	-	4.330	3.607
180	-	-	-	-	-	-	-	-	-	3.689
185	-	-	-	-	-	-	-	-	-	3.771
190	-	-	-	-	-	-	-	-	-	3.852
195	-	-	-	-	-	-	-	-	-	3.934
200	-	-	-	-	-	-	-	-	-	4.015
205	-	-	-	-	-	-	-	-	-	4.097
210	-	-	-	-	-	-	-	-	-	4.178
215	-	-	-	-	-	-	-	-	-	4.260
220	-	-	-	-	-	-	-	-	-	4.341
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	-	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.

