

CERTIFICATE OF APPROVAL No CF 5627

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

NATIONAL FIRE FIGHTING MFG CO

Jebel Ali Free Zone, Dubai, U.A.E., PO Box 262169 Tel: 009714815 1111

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 NAFFCO PSV-ISW-180

TECHNICAL SCHEDULE
TS15 Intumescent Coatings for Steelwork

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

Paul Duggan

Certification Manager







NAFFCO PSV-ISW-180

- This approval relates to the use of NAFFCO PSV-ISW-180 for the fire protection of I-shaped beam and column sections as well as hollow columns. The precise scope is given in Tables 1 to 30 which show the total dry film thickness of NAFFCO PSV-ISW-180 (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 NATIONAL FIRE FIGHTING MFG CO whose responsibility is to ensure NAFFCO PSV-ISW-180 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 NAFFCO PSV-ISW-180 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-Se	ction Beam	s 15 Minutes	3			
Section Factor up to m ⁻¹			Thic	kness (mm) Required	or a Design	Temperatur	e 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 75	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
130 135	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
195 200	0.323	0.266 0.272	0.257 0.257							
205	0.338	0.272	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
255 260	0.413 0.420	0.336 0.342	0.285 0.288	0.257 0.259	0.257 0.257	0.257 0.257	0.257 0.257	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
310 315	0.495	0.401 0.407	0.319 0.322	0.284 0.286	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257
320	0.502	0.407	0.322	0.289	0.257	0.257	0.257	0.257	0.257	0.257
325	0.517	0.412	0.329	0.289	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
380 385	0.600	0.483 0.489	0.363 0.366	0.319 0.322	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257
390	0.614	0.489	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
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Thickness is intumescent only. Results apply to I section beams with 3 sides fire exposure and a concrete slab on top. fol byg-

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			-	Table 2: I-Se	ction Beams	s 30 Minutes	3			
Section Factor up to m ⁻¹			Thic	kness (mm) Required f	or a Design	Temperatu	re 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 65	0.274	0.257 0.257	0.257	0.257	0.257	0.257	0.257 0.257	0.257	0.257	0.257 0.257
70	0.296	0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257	0.257 0.257	0.257 0.257	0.257
75	0.319	0.264	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
130 135	0.588 0.611	0.396 0.407	0.320 0.326	0.275 0.280	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257	0.257 0.257
140	0.633	0.407	0.326	0.286	0.257	0.257	0.257	0.257	0.257	0.257
145	0.656	0.418	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
200 205	0.886	0.550 0.561	0.409	0.354 0.359	0.318 0.323	0.287 0.291	0.276	0.259 0.262	0.257 0.257	0.257 0.257
210	0.906	0.572	0.415 0.421	0.365	0.323	0.291	0.279 0.283	0.265	0.257	0.257
215	0.948	0.583	0.421	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
270 275	1.173 1.194	0.704 0.722	0.498 0.504	0.432 0.438	0.385 0.389	0.342 0.346	0.326 0.330	0.303 0.306	0.257 0.257	0.257 0.257
280	1.194	0.722	0.504	0.444	0.394	0.346	0.334	0.306	0.257	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
340 345	1.461	1.014 1.036	0.586 0.593	0.511 0.517	0.451 0.456	0.397 0.401	0.377 0.381	0.348 0.351	0.303 0.307	0.257 0.257
350	1.502	1.059	0.593	0.517	0.456	0.401	0.384	0.351	0.307	0.257
355	1.522	1.059	0.605	0.523	0.466	0.405	0.388	0.354	0.310	0.257
360	1.543	1.104	0.612	0.534	0.470	0.403	0.392	0.360	0.314	0.257
365	1.563	1.126	0.618	0.539	0.475	0.417	0.395	0.364	0.310	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 Pol Dyg-

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Section Factor up to m ⁻¹			Thic	kness (mm) Required f	or a Design		e 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 95	0.794 0.821	0.620 0.654	0.484	0.375 0.393	0.303 0.310	0.274 0.280	0.260 0.266	0.257 0.257	0.257 0.257	0.257
100	0.847	0.688	0.538	0.393	0.310	0.286	0.271	0.257	0.257	0.257
105	0.874	0.000	0.566	0.412	0.317	0.292	0.277	0.257	0.257	0.257
110	0.901	0.740	0.593	0.448	0.323	0.298	0.283	0.259	0.257	0.25
115	0.927	0.764	0.620	0.467	0.337	0.304	0.288	0.264	0.257	0.25
120	0.954	0.787	0.648	0.485	0.344	0.310	0.294	0.269	0.257	0.25
125	0.981	0.810	0.675	0.503	0.351	0.316	0.300	0.274	0.257	0.25
130	1.008	0.833	0.702	0.522	0.358	0.322	0.305	0.280	0.257	0.25
135	1.034	0.857	0.724	0.540	0.365	0.328	0.311	0.285	0.257	0.25
140	1.061	0.880	0.745	0.558	0.371	0.334	0.317	0.290	0.257	0.25
145	1.088	0.903	0.766	0.577	0.378	0.340	0.322	0.295	0.257	0.25
150	1.114	0.926	0.786	0.595	0.385	0.346	0.328	0.301	0.257	0.25
155	1.141	0.950	0.807	0.613	0.392	0.352	0.334	0.306	0.259	0.25
160	1.168	0.973	0.828	0.632	0.399	0.358	0.339	0.311	0.266	0.25
165	1.194	0.996	0.849	0.650	0.406	0.364	0.345	0.316	0.273	0.25
170	1.221	1.020	0.870	0.668	0.413	0.370	0.351	0.322	0.279	0.25
175	1.248	1.043	0.890	0.687	0.419	0.376	0.356	0.327	0.286	0.25
180	1.275	1.066	0.911	0.705	0.426	0.382	0.362	0.332	0.293	0.25
185	1.301	1.089	0.932	0.725	0.433	0.388	0.368	0.337	0.299	0.25
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	0.26
200	1.381	1.159	0.994	0.785	0.454	0.406	0.385	0.353	0.319	0.27
205	1.408	1.182	1.015	0.805	0.460	0.411	0.390	0.358	0.326	0.27
210	1.435	1.206	1.036	0.825	0.467	0.417	0.396	0.364	0.333	0.28
215 220	1.461	1.229 1.252	1.056	0.845 0.865	0.474 0.481	0.423 0.429	0.402 0.407	0.369 0.374	0.339 0.346	0.28
225	1.515	1.252	1.077	0.885	0.488	0.429	0.407	0.374	0.346	0.29
230	1.542	1.276	1.119	0.865	0.495	0.433	0.419	0.385	0.359	0.303
235	1.568	1.322	1.119	0.905	0.493	0.447	0.419	0.390	0.366	0.30
240	1.595	1.345	1.160	0.945	0.502	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	0.32
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	0.34
270	1.755	1.485	1.285	1.065	0.550	0.489	0.464	0.427	0.413	0.34
275	1.782	1.508	1.306	1.085	0.556	0.495	0.470	0.432	0.419	0.35
280	1.813	1.532	1.326	1.105	0.563	0.501	0.475	0.437	0.426	0.35
285	1.876	1.555	1.347	1.125	0.570	0.507	0.481	0.443	0.433	0.36
290	1.938	1.578	1.368	1.145	0.577	0.513	0.487	0.448	0.439	0.36
295	2.001	1.601	1.389	1.165	0.584	0.519	0.493	0.453	0.446	0.37
300	2.064	1.625	1.409	1.185	0.591	0.525	0.498	0.458	0.453	0.37
305	2.126	1.648	1.430	1.205	0.597	0.531	0.504	0.464	0.459	0.38
310	2.189	1.671	1.451	1.225	0.604	0.537	0.510	0.469	0.466	0.39
315	2.251	1.694	1.472	1.245	0.611	0.543	0.515	0.474	0.473	0.39
320 325	2.314	1.718 1.741	1.493	1.265 1.285	0.618 0.625	0.549 0.555	0.521 0.527	0.479 0.486	0.479 0.486	0.40
325	2.439		1.513				0.527			
335	2.439	1.764 1.788	1.555	1.305 1.325	0.632 0.639	0.561 0.567	0.532	0.493	0.493 0.499	0.41
340	2.502	1.820	1.576	1.345	0.639	0.567	0.538	0.499	0.499	0.41
345	2.627	1.880	1.596	1.365	0.652	0.579	0.549	0.513	0.513	0.42
350	2.689	1.940	1.617	1.386	0.659	0.585	0.555	0.519	0.519	0.42
355	2.752	2.001	1.638	1.406	0.666	0.590	0.561	0.519	0.519	0.43
360	2.815	2.061	1.659	1.426	0.673	0.596	0.566	0.533	0.533	0.44
365	2.877	2.121	1.679	1.446	0.680	0.602	0.572	0.539	0.539	0.44
370	2.940	2.181	1.700	1.466	0.687	0.608	0.578	0.546	0.546	0.45
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	0.46
385	3.114	2.362	1.763	1.526	0.708	0.626	0.595	0.566	0.566	0.47
390	3.140	2.422	1.783	1.546	0.749	0.632	0.600	0.573	0.573	0.47
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	0.48

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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Section Factor up to m ⁻¹			Thic	kness (mm) Required f	or a Design	Temperatui	e 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 80	1.062	0.776 0.805	0.661 0.707	0.519 0.554	0.457 0.479	0.340 0.358	0.317 0.332	0.291 0.298	0.257 0.257	0.257 0.257
85	1.127	0.835	0.733	0.589	0.502	0.377	0.332	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
140 145	1.868	1.161 1.190	1.016 1.042	0.885	0.745 0.767	0.578 0.596	0.519 0.534	0.379 0.386	0.362 0.370	0.309 0.317
150	1.953	1.190	1.042	0.932	0.767	0.596	0.550	0.393	0.370	0.317
155	1.995	1.250	1.094	0.956	0.730	0.632	0.565	0.400	0.378	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 0.858	0.726	0.474	0.474	0.410
210 215	2.462	1.575 1.605	1.377 1.403	1.215 1.239	1.056 1.078	0.880	0.749 0.771	0.483	0.483 0.492	0.417 0.425
220	2.547	1.634	1.429	1.262	1.100	0.902	0.793	0.501	0.501	0.423
225	2.589	1.664	1.454	1.286	1.122	0.924	0.735	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
275 280	3.014	2.213 2.290	1.712 1.738	1.521 1.545	1.344 1.366	1.143 1.165	1.037 1.059	0.596 0.605	0.596 0.605	0.518 0.526
285	3.056	2.290	1.764	1.545	1.388	1.165	1.059	0.605	0.605	0.526
290	3.134	2.446	1.789	1.592	1.410	1.209	1.104	0.613	0.622	0.533
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
340 345	3.481 3.516	3.154	2.552	1.879	1.632	1.428 1.450	1.326	0.713	0.713 0.738	0.618
350	3.516	3.186 3.218	2.632 2.711	1.957 2.035	1.654 1.676	1.450	1.348 1.370	0.738 0.764	0.738	0.626 0.634
355	3.585	3.250	2.711	2.035	1.698	1.472	1.370	0.789	0.789	0.642
360	3.620	3.282	2.870	2.114	1.720	1.516	1.415	0.705	0.705	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. fol Dyg-

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Section Presenting				Т	able 5: I-Se	ction Beams	75 Minutes				
50	Factor up			Thick	kness (mm)	Required fo	or a Design	Tem peratur	e of		
56											
60											
65											
To 1.480											
Texas											
Bo											
BS											
90											
100				1.004							
105	95	1.908	1.475	1.050	0.842	0.748	0.621	0.567	0.496	0.365	0.320
110											
115											
120											
125											
130 2.237 1.922 1.371 1.039 0.299 0.810 0.753 0.659 0.461 0.381 135 2.284 1.966 1.416 1.086 0.955 0.955 0.835 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.777 0.683 0.775 0.601 0.481 0.416 0.951 0.957 0.976 0.476 0.446 0.416 1.161 1.030 0.980 0.849 0.753 0.751 0.456 1.661 1.661 0.681 1.062 0.987 0.987 0.980 0.525 0.445 1.062 1.062 0.997 0.897 0.800 0.525 0.445 1.662 1.662 1.662 1.662 1.662 1.662 1.662 1.063 0.997 0.897 0.800 0.525 0.045 1.062 0.972 0.776 0.613 0.444 </td <td></td>											
135											
140 2.331 2.009 1.462 1.096 0.981 0.884 0.825 0.730 0.488 0.467 145 2.378 2.053 1.508 1.124 1.007 0.884 0.825 0.733 0.761 0.488 0.481 155 2.472 2.140 1.600 1.181 1.059 0.932 0.873 0.775 0.501 0.426 160 2.519 2.183 1.646 1.209 1.085 0.957 0.897 0.800 0.525 0.455 165 2.566 2.227 1.691 1.237 1.111 0.981 0.847 0.550 0.455 170 2.613 2.270 1.737 1.265 1.136 1.006 0.945 0.847 0.550 0.445 170 2.613 2.277 1.833 1.294 1.162 1.030 0.969 0.870 0.553 0.444 180 2.757 2.237 1.831 1.294 1.103 <											
145											
155	145			1.508							0.416
160											
165											
170 2.613 2.270 1.737 1.265 1.136 1.006 0.949 0.847 0.550 0.445 180 2.707 2.357 1.833 1.322 1.188 1.055 0.999 0.893 0.875 0.484 186 2.754 2.401 1.887 1.350 1.214 1.075 0.993 0.893 0.875 0.484 186 2.754 2.2401 1.887 1.350 1.214 1.075 1.017 0.917 0.587 0.483 199 2.848 2.488 1.985 1.407 1.266 1.128 1.065 0.964 0.612 0.523 200 2.884 2.488 1.495 1.463 1.318 1.177 1.113 1.010 0.624 0.522 205 2.942 2.576 2.103 1.463 1.318 1.177 1.113 1.010 0.637 0.532 210 2.992 2.618 2.157 1.491 1.344											
175											
180 2.707 2.357 1.833 1.322 1.188 1.055 0.993 0.893 0.875 0.484 185 2.754 2.401 1.887 1.350 1.214 1.079 1.017 0.917 0.587 0.493 196 2.848 2.488 1.995 1.407 1.266 1.128 1.065 0.964 0.612 0.513 200 2.891 2.2488 1.995 1.407 1.266 1.168 1.065 0.964 0.612 0.513 200 2.892 2.587 2.039 1.463 1.282 1.162 1.069 0.967 0.624 0.522 205 2.942 2.576 2.103 1.463 1.318 1.177 1.113 1.00 0.624 0.522 210 2.299 2.218 1.360 1.370 1.225 1.161 1.057 0.661 0.501 220 3.083 2.705 2.285 1.548 1.396 1.224 <											
185											
190											
200 2.895 2.531 2.049 1.435 1.292 1.152 1.089 0.887 0.624 0.522 205 2.942 2.2575 2.103 1.463 1.318 1.177 1.137 1.034 0.649 0.532 210 2.889 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 2.792 2.249 1.576 1.422 1.274 1.208 1.104 0.686 0.570 230 3.162 2.749 2.319 1.576 1.422 1.274 1.208 1.104 0.686 0.570 230 3.162 2.282 2.373 1.604 1.448 1.299 1.232 1.174 0.698 235 3.210 2.835 2.427 1.633 1.474 1.522											
205	195	2.848	2.488	1.995	1.407	1.266	1.128	1.065	0.964	0.612	0.513
210	200	2.895	2.531	2.049	1.435	1.292	1.152	1.089	0.987	0.624	0.522
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 0.561 235 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 0.599 240 3.251 2.879 2.481 1.661 1.499 1.348 1.280 1.174 0.609 240 3.231 2.926 2.535 1.689 1.525 1.372 1.304 1.198 0.747 0.609 250 3.334 2.966 2.589 1.771 1.551 1.376 <											
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 3.281 2.892 2.481 1.681 1.499 1.348 1.280 1.174 0.745 0.590 245 3.293 2.922 2.535 1.689 1.525 1.372 1.304 1.198 0.774 0.609 255 3.334 2.966 2.589 1.774 1.551 1.396 1.328 1.224 0.831 0.628 265 3.376 3.009 2.643 1.774 1.603 <											
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 1.126 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 2.925 5.36 1.681 1.499 1.348 1.280 1.174 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 0.628 265 3.459 3.096 2.751 1.802 1.629 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>											
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 0.599 240 3.251 2.879 2.481 1.661 1.499 1.348 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 0.609 255 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 1.228 0.630 260 3.417 3.050 3.138 2.805 1.893 1.655 1.494 <											
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	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. fol byg-

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50 55 56 60 65 77 77 75 80 88 99 95 100 105 110 115 120 125 130 135 140 145 150 166 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250	350°C 1.294 1.452 1.609 1.766 1.902 2.030 2.158 2.286 2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135 3.135	400°C 1.021 1.144 1.268 1.392 1.515 1.639 1.762 1.838 1.887 1.937 1.987 2.036 2.086 2.136 2.185 2.235 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.286 2.334 2.484 2.434 2.434 2.483 2.533 2.583 2.682 2.781 2.831 2.881 2.891 2.980 3.030	450°C 0.809 0.898 0.986 1.075 1.163 1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.157 2.021 2.157 2.248 2.293 2.339 2.384 2.429 2.475 2.566 2.611 2.657 2.702	500°C 0.650 0.711 0.773 0.835 0.896 0.958 1.019 1.081 1.142 1.204 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.066 2.116 2.166 2.216 2.216 2.265 2.315 2.365	550°C 0.544 0.597 0.651 0.704 0.775 0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.225 1.260 1.329 1.363 1.467 1.502 1.537 1.571 1.606 1.641	600°C 0.458 0.501 0.544 0.587 0.630 0.674 0.713 0.741 0.770 0.798 0.826 0.854 0.882 0.910 0.994 1.022 1.051 1.079 1.135 1.163 1.163 1.247 1.275 1.303 1.332 1.360 1.388	620°C 0.427 0.466 0.505 0.544 0.583 0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276	650°C 0.387 0.421 0.454 0.488 0.522 0.556 0.589 0.663 0.657 0.691 0.773 0.773 0.800 0.826 0.852 0.931 0.957 0.991 1.010 1.036 1.063 1.089 1.115 1.1168 1.142 1.168	700°C 0.322 0.345 0.367 0.390 0.413 0.435 0.458 0.503 0.525 0.525 0.548 0.571 0.593 0.661 0.638 0.661 0.638 0.706 0.732 0.759 0.785 0.812 0.812 0.883 0.865 0.891 0.944 0.971 0.997	750°C 0.267 0.284 0.301 0.318 0.351 0.368 0.355 0.402 0.419 0.453 0.453 0.557 0.520 0.571 0.604 0.621 0.632 0.635 0.655 0.672 0.672 0.759 0.759 0.759
55 60 60 65 70 75 80 80 85 90 95 100 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255 250 255	1.452 1.609 1.766 1.902 2.030 2.158 2.286 2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.135 3.135 3.234 3.234 3.333 3.383 3.432 3.531 3.581 3.630 3.680 3.779 3.829 3.878 3.928	1.144 1.268 1.392 1.515 1.639 1.762 1.838 1.887 1.987 2.036 2.136 2.136 2.136 2.135 2.285 2.334 2.434 2.434 2.433 2.583 2.583 2.682 2.732 2.781 2.881 2.980 3.030	0.898 0.986 1.075 1.163 1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.884 1.930 1.884 1.930 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.339 2.342 2.429 2.475 2.566 2.611 2.566 2.611 2.657 2.702	0.711 0.773 0.835 0.896 0.958 1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.817 1.966 2.016 2.066 2.116 2.066 2.216 2.265 2.365	0.597 0.651 0.704 0.774 0.775 0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.363 1.363 1.467 1.571 1.502 1.537 1.571 1.606 1.641	0.501 0.544 0.587 0.630 0.674 0.771 0.771 0.779 0.826 0.854 0.910 0.938 0.966 0.994 1.022 1.051 1.107 1.135 1.191 1.219 1.247 1.275 1.303 1.302 1.360	0.466 0.505 0.504 0.503 0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.421 0.454 0.488 0.522 0.556 0.623 0.657 0.691 0.721 0.747 0.800 0.826 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.142 1.142 1.142 1.148	0.345 0.367 0.390 0.413 0.435 0.480 0.503 0.525 0.548 0.571 0.693 0.616 0.638 0.661 0.683 0.706 0.732 0.785 0.812 0.891 0.891 0.944 0.971 0.997	0.284 0.301 0.318 0.335 0.351 0.362 0.368 0.385 0.402 0.419 0.436 0.453 0.503 0.507 0.554 0.571 0.604 0.621 0.638 0.655 0.672 0.672 0.705 0.732 0.759 0.787
60 65 70 77 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 166 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	1.609 1.766 1.902 2.030 2.158 2.286 2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.185 3.234 3.284 3.333 3.432 3.482 3.482 3.531 3.581 3.630 3.730 3.779 3.878	1.268 1.392 1.515 1.639 1.762 1.887 1.937 1.987 2.036 2.086 2.136 2.136 2.136 2.136 2.235 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.286 2.186 2.186 2.235 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285 2.285	0.986 1.075 1.163 1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.384 2.429 2.475 2.566 2.611 2.566 2.611 2.657 2.702	0.773 0.835 0.896 0.958 1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.573 1.635 1.696 1.758 1.817 1.867 1.916 1.966 2.116 2.066 2.116 2.265 2.216 2.265 2.315	0.651 0.704 0.774 0.775 0.809 0.844 0.879 0.913 0.982 1.017 1.052 1.086 1.121 1.156 1.120 1.225 1.260 1.329 1.363 1.433 1.467 1.502 1.537 1.571 1.606 1.641	0.544 0.587 0.630 0.674 0.713 0.770 0.798 0.826 0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	0.505 0.544 0.583 0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.454 0.488 0.522 0.556 0.589 0.623 0.657 0.691 0.774 0.773 0.800 0.852 0.852 0.852 0.858 0.905 0.931 0.957 1.1063 1.063 1.063 1.115 1.142 1.142 1.168	0.367 0.390 0.413 0.435 0.458 0.458 0.480 0.503 0.525 0.548 0.571 0.593 0.661 0.638 0.661 0.638 0.706 0.732 0.759 0.785 0.812 0.812 0.891 0.997	0.301 0.318 0.318 0.351 0.368 0.402 0.419 0.453 0.469 0.503 0.520 0.571 0.694 0.621 0.632 0.672 0.672 0.672 0.759 0.7732
65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 245 250 255	1.766 1.902 2.030 2.158 2.286 2.2414 2.542 2.670 2.798 3.055 3.135 3.234 3.234 3.333 3.383 3.432 3.531 3.581 3.630 3.680 3.779 3.829 3.878 3.928 3.977	1.392 1.515 1.639 1.762 1.838 1.762 1.837 1.987 1.987 2.036 2.186 2.136 2.185 2.285 2.334 2.434 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.881 2.930 3.030	1.075 1.163 1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.349 2.429 2.475 2.566 2.611 2.5667 2.702	0.835 0.896 0.958 1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.817 1.966 2.216 2.266 2.216 2.265 2.315 2.365	0.704 0.704 0.740 0.775 0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.225 1.260 1.294 1.329 1.363 1.433 1.467 1.502 1.537 1.571 1.606 1.641	0.587 0.630 0.674 0.713 0.741 0.770 0.798 0.826 0.854 0.882 0.910 0.994 1.051 1.079 1.107 1.135 1.163 1.191 1.247 1.247 1.303 1.332 1.360	0.544 0.583 0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.030 1.048 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.488 0.522 0.556 0.589 0.623 0.667 0.691 0.721 0.747 0.773 0.800 0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.063 1.063 1.063 1.115 1.142 1.142 1.168 1.194	0.390 0.413 0.435 0.458 0.458 0.458 0.503 0.525 0.548 0.571 0.593 0.616 0.683 0.706 0.732 0.759 0.785 0.812 0.838 0.866 0.891 0.918 0.918 0.997	0.318 0.335 0.351 0.368 0.385 0.402 0.419 0.436 0.453 0.520 0.537 0.571 0.587 0.604 0.638 0.655 0.672 0.672 0.772 0.773
70 75 80 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	1.902 2.030 2.158 2.286 2.414 2.542 2.670 2.798 3.055 3.135 3.234 3.234 3.234 3.234 3.333 3.383 3.432 3.531 3.531 3.630 3.630 3.630 3.779 3.878 3.878	1.515 1.639 1.762 1.838 1.887 1.987 2.036 2.136 2.136 2.135 2.285 2.334 2.434 2.483 2.533 2.583 2.632 2.732 2.781 2.881 2.980 3.030	1.163 1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.342 2.475 2.266 2.611 2.566 2.611 2.657 2.702	0.896 0.958 1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.966 2.066 2.116 2.066 2.216 2.265 2.265 2.365	0.740 0.775 0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.363 1.467 1.502 1.502 1.502 1.502	0.630 0.674 0.771 0.771 0.771 0.779 0.826 0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.191 1.219 1.247 1.275 1.303 1.303 1.360	0.583 0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.522 0.556 0.589 0.623 0.657 0.691 0.721 0.747 0.800 0.826 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.063 1.142 1.142 1.148 1.194	0.413 0.435 0.4458 0.480 0.503 0.525 0.548 0.571 0.638 0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.891 0.891 0.944 0.971 0.997 1.024	0.335 0.351 0.368 0.385 0.402 0.419 0.436 0.453 0.503 0.520 0.537 0.554 0.621 0.621 0.632 0.632 0.632 0.705 0.705 0.705
75 80 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 165 170 175 180 185 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	2.030 2.158 2.286 2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.185 3.234 3.284 3.333 3.432 3.482 3.531 3.531 3.630 3.730 3.779 3.878 3.878 3.829 3.878	1.639 1.762 1.838 1.887 1.987 2.036 2.086 2.136 2.185 2.235 2.285 2.334 2.384 2.483 2.583 2.632 2.632 2.632 2.732 2.781 2.881 2.930 2.980 3.030	1.252 1.340 1.429 1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.506 2.611 2.657 2.702	0.958 1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.066 2.116 2.166 2.216 2.265 2.315 2.365	0.775 0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.329 1.363 1.433 1.467 1.502 1.537 1.571 1.606 1.606	0.674 0.773 0.7741 0.770 0.798 0.826 0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.077 1.135 1.191 1.219 1.247 1.247 1.303 1.332 1.360	0.622 0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.556 0.589 0.623 0.657 0.691 0.721 0.747 0.800 0.826 0.852 0.905 0.991 0.991 1.010 1.036 1.063 1.142 1.142 1.168 1.194	0.435 0.458 0.458 0.458 0.480 0.503 0.525 0.548 0.671 0.593 0.661 0.638 0.661 0.638 0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.997	0.351 0.368 0.3855 0.402 0.419 0.419 0.453 0.469 0.503 0.520 0.571 0.554 0.672 0.604 0.621 0.672 0.672 0.759 0.732
80 85 90 95 100 105 110 115 120 125 130 135 140 145 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255 25 25 25 25 25 25 25 25 25 25 25 2	2.158 2.286 2.286 2.2414 2.542 2.670 2.798 3.055 3.135 3.234 3.234 3.333 3.383 3.432 3.531 3.531 3.630 3.630 3.630 3.779 3.829 3.878 3.928 3.927	1.762 1.838 1.887 1.937 1.987 2.036 2.086 2.136 2.185 2.285 2.384 2.434 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.980 3.030	1.340 1.429 1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.429 2.475 2.566 2.611 2.566 2.611 2.657 2.702	1.019 1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.966 2.016 2.066 2.116 2.066 2.116 2.265 2.216 2.265 2.315 2.365	0.809 0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.225 1.260 1.294 1.329 1.363 1.467 1.502 1.537 1.571 1.606 1.641	0.713 0.741 0.770 0.798 0.826 0.854 0.882 0.910 0.994 1.022 1.051 1.079 1.107 1.135 1.191 1.219 1.247 1.275 1.303 1.332 1.360	0.661 0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.589 0.623 0.667 0.691 0.721 0.773 0.800 0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.063 1.115 1.142 1.148	0.458 0.480 0.503 0.503 0.525 0.548 0.571 0.593 0.616 0.683 0.661 0.683 0.706 0.732 0.759 0.812 0.838 0.865 0.891 0.918 0.918 0.997	0.368 0.385 0.402 0.419 0.436 0.453 0.503 0.520 0.537 0.571 0.634 0.635 0.635 0.672 0.672 0.732 0.732
85 90 90 95 100 100 105 110 115 120 125 130 135 140 145 150 166 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255 25 5	2.286 2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.135 3.234 3.284 3.333 3.383 3.432 3.432 3.531 3.581 3.630 3.630 3.730 3.779 3.829 3.878 3.928 3.977	1.838 1.887 1.987 1.987 2.036 2.186 2.136 2.185 2.285 2.334 2.434 2.483 2.583 2.583 2.682 2.732 2.781 2.881 2.980 3.030	1.429 1.517 1.606 1.694 1.783 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.081 1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.966 2.016 2.066 2.116 2.266 2.216 2.265 2.315 2.365	0.844 0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.363 1.467 1.537 1.571 1.606 1.606	0.741 0.770 0.798 0.826 0.854 0.910 0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.191 1.219 1.247 1.275 1.303 1.332 1.360	0.700 0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.623 0.657 0.691 0.721 0.747 0.773 0.800 0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.115 1.142 1.168 1.194	0.480 0.503 0.525 0.548 0.571 0.593 0.616 0.638 0.706 0.732 0.732 0.759 0.785 0.812 0.891 0.991 0.991	0.385 0.402 0.419 0.436 0.453 0.503 0.503 0.554 0.651 0.6621 0.672 0.672 0.672 0.705 0.705 0.705 0.705
90 95 100 105 110 115 120 125 130 135 140 145 150 165 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	2.414 2.542 2.670 2.798 2.927 3.055 3.135 3.135 3.234 3.224 3.333 3.383 3.432 3.432 3.432 3.531 3.630 3.630 3.630 3.779 3.829 3.878 3.928 3.977	1.887 1.937 1.987 2.036 2.086 2.185 2.235 2.285 2.285 2.334 2.384 2.434 2.434 2.438 2.533 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.517 1.606 1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.142 1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 1.966 2.116 2.066 2.116 2.216 2.265 2.315 2.365	0.879 0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.329 1.363 1.467 1.502 1.537 1.571 1.606 1.641	0.770 0.798 0.826 0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	0.729 0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.657 0.691 0.721 0.747 0.773 0.800 0.826 0.852 0.878 0.995 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.148	0.503 0.525 0.525 0.548 0.671 0.593 0.616 0.638 0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.865 0.891 0.997 1.024	0.402 0.419 0.436 0.436 0.453 0.469 0.503 0.520 0.571 0.604 0.621 0.637 0.655 0.672 0.705 0.7732 0.759 0.789
95 100 105 110 115 120 125 130 135 140 145 150 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	2.542 2.670 2.798 2.927 3.055 3.135 3.234 3.284 3.333 3.383 3.432 3.531 3.531 3.630 3.630 3.630 3.779 3.829 3.878 3.927	1.937 1.987 2.036 2.086 2.136 2.135 2.235 2.285 2.384 2.434 2.434 2.433 2.533 2.583 2.632 2.632 2.732 2.732 2.781 2.881 2.930 2.980 3.030	1.606 1.694 1.783 1.839 1.884 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.449 2.475 2.566 2.611 2.657 2.702	1.204 1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.896 1.758 1.817 1.966 2.016 2.066 2.116 2.265 2.216 2.265 2.315	0.913 0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.225 1.260 1.294 1.329 1.363 1.433 1.467 1.502 1.537 1.571 1.606 1.641	0.798 0.826 0.854 0.882 0.910 0.993 0.994 1.022 1.051 1.079 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332	0.757 0.784 0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.691 0.721 0.747 0.773 0.800 0.826 0.852 0.878 0.995 0.984 1.010 1.063 1.063 1.115 1.142 1.168 1.194	0.525 0.548 0.571 0.593 0.616 0.638 0.661 0.683 0.706 0.732 0.759 0.812 0.838 0.865 0.891 0.918 0.997 1.024	0.419 0.436 0.453 0.469 0.486 0.503 0.520 0.537 0.554 0.604 0.621 0.638 0.655 0.672 0.672 0.705 0.705 0.732
100 105 110 110 115 120 125 130 135 140 145 150 156 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255 250 255	2.670 2.798 2.798 3.055 3.135 3.135 3.234 3.284 3.234 3.333 3.333 3.432 3.432 3.531 3.630 3.630 3.630 3.630 3.779 3.829 3.878 3.928	1.987 2.036 2.086 2.136 2.135 2.285 2.285 2.334 2.434 2.483 2.583 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.694 1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.265 1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.066 2.116 2.066 2.116 2.265 2.216 2.265 2.315	0.948 0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.329 1.329 1.363 1.398 1.433 1.467 1.571 1.606 1.641	0.826 0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.302 1.360	0.784 0.811 0.839 0.866 0.894 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.721 0.747 0.773 0.800 0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.063 1.115 1.142 1.142 1.168 1.194	0.548 0.571 0.593 0.616 0.638 0.706 0.732 0.759 0.785 0.812 0.891 0.944 0.971 0.997 1.024	0.436 0.453 0.469 0.486 0.503 0.520 0.554 0.571 0.587 0.621 0.638 0.655 0.672 0.672 0.705 0.705
105 110 110 1110 115 120 125 130 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	2.798 2.927 3.055 3.135 3.135 3.234 3.234 3.333 3.883 3.432 3.432 3.531 3.630 3.630 3.630 3.630 3.879 3.879 3.878 3.928	2.036 2.086 2.185 2.185 2.235 2.285 2.334 2.384 2.434 2.434 2.433 2.533 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.783 1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.384 2.429 2.475 2.566 2.611 2.657 2.702	1.327 1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.066 2.116 2.265 2.216 2.265 2.315 2.365	0.982 1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.329 1.363 1.363 1.467 1.502 1.537 1.571 1.606 1.641	0.854 0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.077 1.135 1.191 1.219 1.247 1.275 1.303 1.332 1.360	0.811 0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.747 0.773 0.800 0.826 0.852 0.878 0.995 0.931 0.957 0.984 1.010 1.036 1.063 1.063 1.115 1.142 1.142	0.571 0.593 0.616 0.638 0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.865 0.891 0.944 0.971 0.997	0.453 0.469 0.486 0.520 0.537 0.554 0.571 0.684 0.625 0.638 0.655 0.675 0.689 0.705 0.759 0.759
110 115 115 120 121 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 255	2.927 3.055 3.135 3.135 3.1385 3.234 3.234 3.234 3.333 3.383 3.432 3.531 3.630 3.630 3.630 3.630 3.779 3.829 3.878 3.928 3.977	2.086 2.136 2.136 2.185 2.235 2.285 2.285 2.334 2.384 2.434 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.839 1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.384 2.429 2.475 2.566 2.611 2.657 2.702	1.389 1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.966 2.016 2.066 2.116 2.265 2.216 2.265 2.315 2.365	1.017 1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.329 1.363 1.433 1.467 1.502 1.537 1.502	0.882 0.910 0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.303 1.360	0.839 0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.773 0.800 0.826 0.852 0.878 0.995 0.931 0.957 0.984 1.010 1.036 1.063 1.063 1.115 1.142 1.148 1.194	0.593 0.616 0.638 0.661 0.683 0.706 0.732 0.759 0.812 0.838 0.865 0.891 0.918 0.997 1.024	0.469 0.486 0.503 0.520 0.537 0.554 0.571 0.604 0.621 0.638 0.655 0.675 0.679 0.705 0.705 0.705
115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.055 3.135 3.135 3.234 3.284 3.284 3.333 3.383 3.432 3.432 3.531 3.630 3.630 3.630 3.779 3.829 3.878 3.928	2.136 2.185 2.235 2.285 2.334 2.384 2.434 2.483 2.583 2.632 2.632 2.732 2.732 2.781 2.881 2.881 2.930 2.980 3.030	1.884 1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.339 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.450 1.512 1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.066 2.016 2.166 2.216 2.265 2.315 2.365	1.052 1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606	0.910 0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.302	0.866 0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.304	0.800 0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.142 1.168	0.616 0.638 0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.944 0.971 0.971	0.486 0.503 0.520 0.537 0.554 0.571 0.684 0.621 0.638 0.655 0.672 0.689 0.705 0.705 0.705
120 125 130 130 135 140 145 150 155 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 255	3.135 3.185 3.284 3.284 3.333 3.383 3.432 3.432 3.432 3.581 3.630 3.680 3.779 3.879 3.878 3.977	2.185 2.235 2.285 2.334 2.384 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.930 1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.512 1.573 1.635 1.696 1.758 1.867 1.916 1.966 2.016 2.066 2.116 2.265 2.216 2.265 2.315 2.365	1.086 1.121 1.156 1.190 1.225 1.260 1.294 1.329 1.363 1.467 1.502 1.537 1.571 1.606 1.641	0.938 0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.247 1.275 1.303 1.303 1.360	0.894 0.921 0.948 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.826 0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.638 0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.944 0.971 0.997 1.024	0.503 0.520 0.537 0.554 0.571 0.587 0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.705 0.732
125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.185 3.234 3.234 3.284 3.333 3.333 3.333 3.432 3.531 3.531 3.531 3.630 3.630 3.730 3.779 3.829 3.878 3.928 3.927	2.235 2.285 2.285 2.334 2.384 2.434 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.930 2.980 3.030	1.975 2.021 2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.573 1.635 1.696 1.758 1.817 1.867 1.916 2.016 2.066 2.116 2.216 2.226 2.235 2.365	1.121 1.156 1.190 1.225 1.260 1.294 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606 1.641	0.966 0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.303 1.360	0.921 0.948 0.976 1.003 1.030 1.058 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.852 0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168	0.661 0.683 0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.520 0.537 0.554 0.571 0.604 0.621 0.638 0.655 0.672 0.689 0.735 0.735 0.735
130 135 140 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.234 3.284 3.333 3.383 3.432 3.482 3.531 3.581 3.630 3.680 3.779 3.829 3.878 3.928 3.977	2.285 2.334 2.384 2.483 2.533 2.583 2.632 2.682 2.732 2.781 2.881 2.881 2.980 3.030	2.021 2.066 2.112 2.157 2.202 2.248 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.635 1.696 1.758 1.817 1.867 1.916 2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.156 1.190 1.225 1.260 1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606 1.641	0.994 1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.303 1.360	0.948 0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276	0.878 0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.683 0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.537 0.554 0.571 0.587 0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.739
135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.284 3.333 3.383 3.432 3.531 3.581 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.334 2.384 2.483 2.483 2.533 2.583 2.682 2.732 2.781 2.881 2.831 2.881 2.930 2.980 3.030	2.066 2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.520 2.566 2.611 2.657 2.702	1.696 1.758 1.817 1.867 1.916 2.016 2.016 2.166 2.216 2.216 2.216 2.265 2.315	1.190 1.225 1.260 1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606	1.022 1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.303 1.360	0.976 1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276	0.905 0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.706 0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997	0.554 0.571 0.587 0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.759
140 145 150 150 155 160 165 170 175 180 185 190 205 210 225 230 225 230 235 240 245 255	3.333 3.383 3.432 3.482 3.531 3.531 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.384 2.434 2.483 2.533 2.583 2.632 2.682 2.781 2.881 2.881 2.980 3.030	2.112 2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.758 1.817 1.867 1.916 1.966 2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.225 1.260 1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606 1.641	1.051 1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332	1.003 1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276	0.931 0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.732 0.759 0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997	0.571 0.587 0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.759
145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.383 3.432 3.482 3.531 3.581 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.927	2.434 2.483 2.533 2.583 2.682 2.682 2.732 2.781 2.831 2.831 2.930 2.980 3.030	2.157 2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.817 1.867 1.916 2.016 2.066 2.116 2.166 2.216 2.226 2.315 2.365	1.260 1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606 1.641	1.079 1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	1.030 1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.957 0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.759 0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997	0.587 0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.759
150 155 155 160 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255	3.432 3.482 3.531 3.581 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.483 2.533 2.583 2.632 2.632 2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.202 2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.867 1.916 1.966 2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.294 1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606 1.641	1.107 1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	1.058 1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	0.984 1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.785 0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.604 0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.759 0.787
155 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 240 245 255	3.482 3.531 3.581 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.533 2.583 2.632 2.682 2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.248 2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.916 1.966 2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.329 1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606	1.135 1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	1.085 1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	1.010 1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.812 0.838 0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.621 0.638 0.655 0.672 0.689 0.705 0.732 0.759 0.787
160 165 170 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 255	3.531 3.581 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.583 2.632 2.682 2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.293 2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	1.966 2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.363 1.398 1.433 1.467 1.502 1.537 1.571 1.606	1.163 1.191 1.219 1.247 1.275 1.303 1.332 1.360	1.112 1.140 1.167 1.194 1.222 1.249 1.276 1.304	1.036 1.063 1.089 1.115 1.142 1.168 1.194	0.838 0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.638 0.655 0.672 0.689 0.705 0.732 0.759
165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 255	3.581 3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.632 2.682 2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.339 2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	2.016 2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.398 1.433 1.467 1.502 1.537 1.571 1.606	1.191 1.219 1.247 1.275 1.303 1.332 1.360	1.140 1.167 1.194 1.222 1.249 1.276 1.304	1.063 1.089 1.115 1.142 1.168 1.194	0.865 0.891 0.918 0.944 0.971 0.997 1.024	0.655 0.672 0.689 0.705 0.732 0.759
170 175 180 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	3.630 3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.682 2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.384 2.429 2.475 2.520 2.566 2.611 2.657 2.702	2.066 2.116 2.166 2.216 2.265 2.315 2.365	1.433 1.467 1.502 1.537 1.571 1.606 1.641	1.219 1.247 1.275 1.303 1.332 1.360	1.167 1.194 1.222 1.249 1.276 1.304	1.089 1.115 1.142 1.168 1.194	0.891 0.918 0.944 0.971 0.997 1.024	0.672 0.689 0.705 0.732 0.759 0.787
175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	3.680 3.730 3.779 3.829 3.878 3.928 3.977	2.732 2.781 2.831 2.881 2.930 2.980 3.030	2.429 2.475 2.520 2.566 2.611 2.657 2.702	2.116 2.166 2.216 2.265 2.315 2.365	1.467 1.502 1.537 1.571 1.606 1.641	1.247 1.275 1.303 1.332 1.360	1.194 1.222 1.249 1.276 1.304	1.115 1.142 1.168 1.194	0.918 0.944 0.971 0.997 1.024	0.689 0.705 0.732 0.759 0.787
180 185 190 190 195 200 205 210 215 220 225 230 235 240 245 250 255	3.730 3.779 3.829 3.878 3.928 3.977	2.781 2.831 2.881 2.930 2.980 3.030	2.475 2.520 2.566 2.611 2.657 2.702	2.166 2.216 2.265 2.315 2.365	1.502 1.537 1.571 1.606 1.641	1.275 1.303 1.332 1.360	1.222 1.249 1.276 1.304	1.142 1.168 1.194	0.944 0.971 0.997 1.024	0.705 0.732 0.759 0.787
185 190 195 200 205 210 215 220 225 230 235 240 245 250 255	3.779 3.829 3.878 3.928 3.977	2.831 2.881 2.930 2.980 3.030	2.520 2.566 2.611 2.657 2.702	2.216 2.265 2.315 2.365	1.537 1.571 1.606 1.641	1.303 1.332 1.360	1.249 1.276 1.304	1.168 1.194	0.971 0.997 1.024	0.732 0.759 0.787
190 195 200 205 210 215 220 225 230 235 240 245 250 255	3.829 3.878 3.928 3.977	2.881 2.930 2.980 3.030	2.566 2.611 2.657 2.702	2.265 2.315 2.365	1.571 1.606 1.641	1.332 1.360	1.276 1.304	1.194	0.997 1.024	0.759 0.787
195 200 205 2110 215 220 225 230 235 240 245 250 255	3.878 3.928 3.977	2.930 2.980 3.030	2.611 2.657 2.702	2.315 2.365	1.606 1.641	1.360	1.304		1.024	0.787
200 205 210 215 220 225 230 235 240 245 250 255	3.928 3.977	2.980 3.030	2.657 2.702	2.365	1.641					
205 210 215 220 225 230 235 240 245 250 255	3.977	3.030	2.702				1.331	1.247	1.050	0.814
210 215 220 225 230 235 240 245 250 255					1.675	1.416	1.359	1.273	1.077	0.842
215 220 225 230 235 240 245 250 255			2.747	2.465	1.710	1.444	1.386	1.299	1.103	0.869
220 225 230 235 240 245 250 255	4.076	3.127	2.793	2.515	1.744	1.472	1.413	1.326	1.130	0.897
225 230 235 240 245 250 255	4.126	3.172	2.838	2.564	1.779	1.500	1.441	1.352	1.156	0.924
230 235 240 245 250 255	4.175	3.218	2.884	2.614	1.826	1.528	1.468	1.378	1.183	0.952
235 240 245 250 255	4.225	3.263	2.929	2.664	1.907	1.556	1.495	1.405	1.209	0.979
240 245 250 255	4.275	3.308	2.975	2.714	1.989	1.585	1.523	1.431	1.236	1.007
250 255	4.324	3.354	3.020	2.764	2.070	1.613	1.550	1.457	1.262	1.034
255	4.374	3.399	3.065	2.814	2.152	1.641	1.577	1.484	1.289	1.062
	4.423	3.444	3.111	2.864	2.234	1.669	1.605	1.510	1.315	1.089
	4.473	3.489	3.159	2.913	2.315	1.697	1.632	1.536	1.342	1.117
	-	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
395 400	-	-	4.511	4.264 4.312	4.017 4.066	3.741 3.792	3.614 3.666	3.399 3.453	2.839 2.937	2.046

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

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			Т	able 7: I-Sec	tion Beams	105 Minutes	3			
Section Factor up to m ⁻¹			Thic	kness (mm)	Required f	or a Design	Temperatur	e 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 75	2.778 3.117	1.881 2.016	1.566 1.703	1.228 1.328	0.977 1.053	0.787 0.836	0.732 0.771	0.666 0.709	0.544 0.577	0.454 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
125 130		3.246	2.357	2.063	1.808	1.327	1.165 1.204	1.008	0.877	0.744 0.772
130		3.319 3.392	2.416 2.476	2.113 2.162	1.858 1.908	1.376 1.426	1.204	1.037 1.067	0.906 0.934	0.772
140	.	3.465	2.476	2.162	1.958	1.475	1.243	1.067	0.963	0.799
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
200 205		4.342 4.415	3.212 3.256	2.803	2.559 2.609	2.119 2.179	1.755 1.794	1.455 1.485	1.305 1.334	1.160 1.188
210		4.415	3.300	2.853 2.902	2.659	2.179	1.794	1.465	1.362	1.100
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
265 270	-	-	3.782	3.478	3.222	2.894 2.953	2.680	1.964 2.090	1.676	1.521
275		-	3.826 3.870	3.532 3.586	3.278 3.334	3.013	2.755 2.830	2.090	1.705 1.734	1.549 1.577
280		-	3.914	3.640	3.390	3.073	2.830	2.215	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
340 345		 	4.440 4.484	4.290 4.344	4.062 4.118	3.798 3.858	3.679 3.740	3.478 3.541	3.035 3.132	2.274
350		-	4.404	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 3.337
400	-	-	-	-	-	-	4.418	4.236	3.857	

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

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			Т	able 8: I-Sec	tion Beams	120 Minutes	5			
Section Factor up to m ⁻¹			Thic	kness (mm)) Required fo	or a Design	Temperatur	e 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 70	3.808 4.134	2.261 2.598	1.730 1.887	1.469 1.620	1.186 1.297	0.956 1.043	0.872 0.951	0.764 0.827	0.636 0.678	0.544 0.579
75	4.460	2.935	2.038	1.770	1.409	1.130	1.031	0.827	0.678	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		<u> </u>	3.311	2.454	2.089	1.871	1.748	1.457	1.040	0.899
125 130	<u> </u>	-	3.417 3.524	2.528 2.602	2.141 2.193	1.923 1.976	1.820 1.874	1.520 1.583	1.076 1.112	0.929 0.959
135	-		3.630	2.676	2.193	2.028	1.928	1.646	1.112	0.990
140		-	3.736	2.750	2.297	2.020	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 3.407	2.765 2.817	2.554	2.465	2.230	1.506 1.541	1.291
190 195		-	-	3.465	2.869	2.607 2.659	2.519 2.573	2.287 2.344	1.541	1.321 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
250 255	-	-	-	4.103 4.161	3.501 3.562	3.262 3.325	3.173 3.235	2.970 3.027	2.243 2.338	1.682 1.712
260		-		4.101	3.623	3.387	3.297	3.084	2.432	1.712
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	-	<u> </u>	-	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
305 310		-	-	-	4.174 4.235	3.949 4.012	3.855 3.918	3.676 3.742	3.250 3.326	2.597 2.711
315		-	-	-	4.235	4.012	3.980	3.808	3.403	2.711
320	-	-	-	-	4.290	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	-		-	-	<u> </u>	<u> </u>	4.476	4.338	4.015	3.533
360		-	-	-	-	-	-	4.404	4.092	3.610
365		-	-	-	-	-	-	4.470	4.168	3.687
370 375		-	-	-	-	-	-	-	4.245 4.321	3.765 3.842
380			-	-			-	-	4.321	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. Pol Dyg-

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			T	able 9: I-Sec	tion Beams	150 Minutes	3			
Section Factor up to m ⁻¹			Thick	kness (mm)	Required fo	or a Design	Temperatur	e 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 85		-	-	3.211 3.491	2.308 2.499	1.962 2.070	1.867 1.954	1.687 1.806	1.343 1.447	1.052 1.131
90		-	-	3.772	2.499	2.178	2.042	1.868	1.550	1.131
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	-	-	-	-	í	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
205 210	-	-	-	-	-	-	4.246	3.572	2.931	2.726
215		-	-	-	-	-	4.351 4.456	3.727 3.881	2.985 3.040	2.785 2.845
220		-	-	-	-	-	4.456	4.036	3.040	2.845
225		-	-	-	-	-	-	4.036	3.188	2.963
230		-	-	-	-	-	-	4.191	3.290	3.023
235		-	_	-	-	-	-	4.500	3.392	3.082
240		-	-	-		-	-	4.500	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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Pol agg-



			Ta	able 10: I-Se	ction Beams	180 Minute	s			
Section Factor up to m ⁻¹			Thic	kness (mm)	Required fo	or a Design	Temperatur	e 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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Pol agg-

certifire

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

1			Table 11	: I-Section (Columns 15	Minutes			
Section Factor up to m ⁻¹			Thickness	(mm) Requ	uired for a D	esign Temp	erature 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 95	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
175 180	0.325	0.233 0.233							
185	0.333	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
250 255	0.449	0.233	0.233 0.233	0.233 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 0.233	0.233	0.233 0.233
265	0.465	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
330 335	0.581	0.313	0.246 0.253	0.233	0.233	0.233	0.233	0.233	0.233 0.233
335	0.589	0.322 0.332	0.260	0.233 0.233	0.233 0.233	0.233 0.233	0.233 0.233	0.233 0.233	0.233
340	0.606	0.332	0.260	0.233	0.233	0.233	0.233	0.233	0.233
350	0.614	0.350	0.267	0.233	0.233	0.233	0.233	0.233	0.233
550	0.014	0.000	0.274	0.233	0.233	0.233	0.233	0.233	0.233

Tabulated values continued

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Pol agg-



		Та	ble 11: I-Sed	tion Colum	ns 15 Minute	es (continue	d)		
Section Factor up to m ⁻¹			Thickness	s (mm) Requ	uired for a D	esign Temp	erature 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	2: I-Section (Columns 30	Minutes			
Section Factor up to m ⁻¹			Thickness	s (mm) Requ	uired for a Do	esign Temp	erature 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 90	0.500 0.520	0.374 0.388	0.305 0.315	0.259 0.268	0.233 0.233	0.233 0.233	0.233 0.233	0.233 0.233	0.233 0.233
95	0.540	0.366	0.315	0.266	0.233	0.233	0.233	0.233	0.233
100	0.560	0.414	0.334	0.275	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
150 155	0.760 0.780	0.545 0.558	0.432 0.442	0.370	0.295 0.303	0.233 0.233	0.233	0.233 0.233	0.233 0.233
160	0.800	0.558	0.442	0.379 0.387	0.303	0.233	0.233 0.233	0.233	0.233
165	0.829	0.571	0.462	0.396	0.311	0.233	0.233	0.233	0.233
170	0.859	0.597	0.462	0.404	0.316	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
220 225	1.161 1.192	0.729 0.742	0.569 0.579	0.490 0.498	0.404 0.412	0.233 0.233	0.233 0.233	0.233 0.233	0.233 0.233
230	1.192	0.742	0.579	0.498	0.412	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
285 290	1.491 1.511	1.055 1.089	0.697 0.706	0.601 0.610	0.506 0.514	0.248 0.258	0.233 0.233	0.233 0.233	0.233 0.233
295	1.531	1.123	0.706	0.618	0.514	0.268	0.234	0.233	0.233
300	1.551	1.157	0.716	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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		Та	ble 12: I-Sec	tion Colum	ns 30 Minute	es (continue	ed)							
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	3: I-Section (Columns 45	Minutes			
Section Factor up to m ⁻¹			Thickness	s (mm) Requ	uired for a D	esign Temp	erature 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 95	0.967 1.031	0.694 0.722	0.552 0.572	0.448 0.463	0.373 0.385	0.318 0.327	0.276 0.285	0.233 0.233	0.233 0.233
100	1.095	0.722	0.572	0.463	0.396	0.327	0.203	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
175 180	1.670 1.698	1.239 1.272	0.945 0.976	0.699 0.714	0.571 0.582	0.478 0.488	0.419 0.427	0.336 0.344	0.233 0.233
185	1.727	1.305	1.007	0.714	0.594	0.497	0.427	0.352	0.233
190	1.755	1.338	1.007	0.744	0.606	0.507	0.444	0.352	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
250 255	2.106 2.147	1.631 1.655	1.396 1.419	1.075 1.109	0.745 0.756	0.620 0.630	0.544 0.553	0.451 0.459	0.233 0.233
260	2.147	1.655	1.419	1.109	0.756	0.639	0.553	0.459	0.233
265	2.229	1.702	1.465	1.176	0.780	0.649	0.570	0.474	0.233
270	2.270	1.702	1.488	1.210	0.780	0.658	0.578	0.474	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
330 335	2.762	2.012	1.762	1.523	1.268	0.772	0.679	0.574	0.324
335	2.803 2.844	2.036 2.060	1.785 1.808	1.544 1.566	1.310 1.352	0.781 0.790	0.687 0.695	0.582 0.589	0.332 0.341
345	2.885	2.099	1.831	1.587	1.352	0.790	0.704	0.569	0.350
350	2.926	2.150	1.854	1.608	1.377	0.852	0.704	0.605	0.359
550	2.320	2.100	1.004	1.000	1.051	0.002	0.712	0.000	0.308

Tabulated values continued

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		Та	ble 13: I-Sec	tion Colum	ns 45 Minute	es (continue	ed)							
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	s (mm) Requ	uired for a D	esign Temp	erature 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 95	1.525	1.159	0.828	0.677	0.565	0.466	0.399	0.334 0.344	0.285 0.293
100	1.571 1.617	1.239 1.319	0.878 0.928	0.703 0.730	0.585 0.605	0.481 0.496	0.411 0.423	0.344	0.293
105	1.663	1.379	0.928	0.756	0.626	0.496	0.425	0.363	0.302
110	1.709	1.415	1.028	0.783	0.646	0.517	0.433	0.303	0.318
115	1.755	1.451	1.078	0.703	0.666	0.542	0.460	0.382	0.317
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
175 180	2.293	1.885	1.549	1.219 1.253	0.972 1.004	0.724 0.739	0.605 0.618	0.497 0.507	0.429 0.437
185	2.337	1.921 1.957	1.578 1.607	1.253	1.004	0.739	0.630	0.507	0.446
190	2.424	1.993	1.637	1.321	1.068	0.769	0.630	0.516	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
250 255	2.945	2.513 2.558	1.989 2.019	1.632 1.657	1.431 1.455	1.174 1.212	0.788 0.800	0.641 0.651	0.556 0.565
260	3.032	2.558	2.019	1.682	1.455	1.212	0.800	0.660	0.565
265	3.076	2.647	2.048	1.707	1.504	1.288	0.881	0.670	0.573
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
330 335	3.637 3.680	3.231 3.275	2.792 2.846	2.031 2.056	1.817 1.841	1.610 1.632	1.403 1.423	0.794 0.818	0.692 0.701
340	3.722	3.275	2.846	2.056	1.841	1.654	1.423	0.818	0.701
345	3.765	3.365	2.955	2.184	1.889	1.677	1.464	0.983	0.709
350	3.807	3.410	3.009	2.264	1.913	1.699	1.485	1.066	0.716
JJU	5.007	J.+1U	5.008	2.204	1.313	1.033	1.400	1.000	0.720

Tabulated values continued

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		Та	ble 14: I-Sed	tion Colum	ns 60 Minute	es (continue	d)					
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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Section Factor up	Table 15: I-Section Columns 75 Minutes Thickness (mm) Required for a Design Temperature of											
Factor up to m ⁻¹			Inickness	(mm) Kequ	ired for a De	sign lempe	erature 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			
			0.700	2 5 4 2	0.405	2,221			4 450			
345	-	4.086	3.796	3.543	3.165	2.221	1.892	1.677	1.450			

Tabulated values continued

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		Та	ble 15: I-Sec	tion Columr	ns 75 Minute	s (continue	d)						
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 C	olumns 90 l	/linutes			
Section Factor up to m ⁻¹			Thickness	(mm) Requ	ired for a De	esign Tempe	erature 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
190 195	4.013 4.041	3.460 3.493	2.977	2.518	2.118 2.179	1.775	1.475	1.203	0.902 0.941
			3.038	2.580		1.813	1.504	1.238	
200 205	4.070 4.115	3.525 3.558	3.099 3.160	2.643 2.705	2.240 2.301	1.851 1.888	1.533 1.561	1.273 1.308	0.979 1.018
210	4.115	3.590	3.221	2.767	2.362	1.926	1.590	1.343	1.018
215	4.393	3.623	3.283	2.830	2.423	1.964	1.619	1.343	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	2.040	1.705	1.425	1.173
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

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		Та	ble 16: I-Sec	tion Columi	ns 90 Minute	s (continue	d)							
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.

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			Table 17:	I-Section Co	olumns 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 95	3.975 4.031	3.406 3.440	2.851 2.887	1.760 1.834	1.498 1.554	1.212 1.308	0.923 0.990	0.765 0.795	0.664 0.688				
100	4.088	3.473	2.922	1.908	1.611	1.385	1.058	0.795	0.000				
105	4.199	3.506	2.957	1.982	1.667	1.437	1.126	0.892	0.713				
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				
175 180	5.848 5.966	3.975 4.008	3.451 3.486	3.016 3.090	2.589 2.665	2.193 2.266	1.837 1.882	1.525 1.560	1.188 1.222				
185	6.084	4.008	3.521	3.164	2.741	2.340	1.927	1.594	1.256				
190	0.064	4.042	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				
250 255	-	5.012 5.092	3.980 4.015	3.822 3.862	3.622 3.667	3.293 3.366	2.797 2.871	2.044	1.625 1.652				
260	-	5.092	4.015	3.862	3.712	3.439	2.871	2.094	1.652				
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	ī	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				
330 335	-	-	-	5.791	5.089	4.367	3.911	3.579	2.052				
335	-	-		5.977 6.162	5.271 5.453	4.542 4.717	3.975 4.039	3.641 3.703	2.158 2.436				
340	-	-	-	0.102	5.453	4.717	4.039	3.765	2.436				
350		-	-	-	5.818	5.067	4.116	3.828	2.714				
000					0.010	0.007	7.201	0.020	2.000				

Tabulated values continued

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		Tal	ole 17: I-Sect	ion Column	s 105 Minute	es (continue	ed)						
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.

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			Table 18:	I-Section Co	olumns 120	Minutes			
Section Factor up to m ⁻¹			Thickness	(mm) Requ	ired for a De	esign Tempe	erature 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
	_	-	-	-	_	-	5.881	5.009	4.026
345	-	_							

Tabulated values continued

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Pol agg-



		Tab	ole 18: I-Sect	ion Column	s 120 Minute	es (continue	ed)						
Section Factor up to m ⁻¹			Thickness	ness (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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Pol agg-



r			Table 19:	I-Section C	olumns 150	Minutes			
Section Factor up to m ⁻¹			Thickness	(mm) Requ	ired for a De	esign Tempe	erature 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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Pal agg-



			Table 20:	: I-Section C	olumns 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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Pol agg-

certifire

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

		Po				n 15 minute n Temperati				
Cti Ft		i i i	quireu mic	Kiless (IIIII)	TOT a Design	remperate	ire (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 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 65	0.205	0.205 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 95	0.205	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
125 130	0.277	0.222	0.205	0.205	0.205	0.205 0.205	0.205	0.205	0.205	0.205
135	0.306	0.232	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
160 165	0.378	0.293	0.235	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
190 195	0.463 0.478	0.354	0.284	0.218	0.205 0.205	0.205 0.205	0.205	0.205	0.205	0.205 0.205
200	0.492	0.303	0.300	0.223	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
220 225	0.555	0.416 0.426	0.333	0.260	0.236	0.205	0.205	0.205	0.205	0.205
230	0.573	0.426	0.341	0.267	0.243	0.209	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
255 260	0.681	0.487	0.390	0.310	0.282	0.245 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
285 290	0.790	0.561 0.578	0.439	0.352	0.322	0.280	0.212	0.205	0.205	0.205
295	0.808	0.578	0.447	0.359	0.328	0.286	0.217	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
315 320	0.898	0.660 0.676	0.488	0.394	0.361	0.316 0.322	0.241	0.205 0.205	0.205 0.205	0.205 0.205
325	0.916	0.692	0.496	0.401	0.368	0.322	0.246	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
345 350	1.006	0.758	0.544	0.436	0.401	0.351	0.270	0.205	0.205	0.205
355	1.023	0.774	0.574	0.443	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
380 385	1.133 1.151	0.873 0.889	0.648	0.486	0.447 0.453	0.393	0.303	0.205 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
415 420	1.259 1.277	1.004	0.751 0.766	0.541	0.493	0.434	0.337	0.223	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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Pal agg-



		Re	Table 22 equired Thic	Hollow Sec kness (mm)	tion Colum for a Design	n 30 minut n Temperat	es ure (°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 35	0.376	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
35 40	0.400	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 85	0.660	0.460	0.307	0.224	0.205 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
145	1.131	0.842	0.594	0.406	0.371	0.350	0.288	0.240	0.205	0.205
150	1.168	0.904	0.624	0.421	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
185 190	1.421	1.120	0.832 0.862	0.557 0.586	0.510	0.465 0.479	0.404 0.417	0.343	0.277	0.205
195	1.494	1.151	0.862	0.586	0.526 0.552	0.494	0.417	0.355	0.286	0.212
200	1.530	1.213	0.921	0.644	0.580	0.508	0.443	0.378	0.305	0.218
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
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
285 290	2.104 2.129	1.739 1.770	1.426 1.456	1.135	1.054	0.938 0.964	0.770 0.793	0.606 0.626	0.465 0.474	0.334
290	2.129	1.770	1.486	1.164	1.109	0.964	0.793	0.645	0.474	0.341
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
335 340	2.360	2.045	1.724 1.754	1.425	1.332	1.200 1.226	1.001	0.803	0.581	0.399
340 345	2.386	2.074	1.754	1.453	1.360	1.226	1.024	0.823	0.597	0.405
350	2.411	2.102	1.813	1.511	1.416	1.232	1.047	0.863	0.629	0.412
355	2.462	2.160	1.843	1.540	1.444	1.305	1.093	0.882	0.645	0.415
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 0.757	0.463
390	2.719	2.362	2.051	1.743	1.639	1.488	1.255	1.020		0.470
395 400	2.769 2.819	2.391 2.420	2.081 2.110	1.772	1.666 1.694	1.514 1.540	1.278 1.301	1.040	0.773	0.476 0.483
400	2.819	2.420	2.110	1.801	1.694	1.540	1.301	1.060	0.790	0.483
410	2.869	2.448	2.140	1.858	1.722	1.593	1.324	1.080	0.806	0.489
415	2.970	2.506	2.200	1.887	1.778	1.619	1.370	1.119	0.838	0.502
										0.508
420	3.020	2.535	2.229	1.916	1.806	1.645	1.393	1.139	0.854	0.508

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

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Pol agg-



			Table 23	Hollow Sec	tion Colum	n 45 minute	es (8C)			
		R€	equired Thic	kness (mm)	for a Desig	n Temperati	ure (°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 25	0.387	0.349	0.321	0.319	0.296 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 50	0.713	0.562 0.625	0.485 0.518	0.435	0.407	0.205 0.241	0.205	0.205	0.205	0.205
55	0.797	0.623	0.560	0.438	0.450	0.241	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 75	1.135	0.877	0.700	0.569	0.519 0.553	0.411	0.286 0.317	0.205	0.205	0.205
80	1.304	1.003	0.747	0.610 0.651	0.593	0.454	0.317	0.214	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 1.727	1.255	0.979 1.026	0.814	0.750 0.790	0.650 0.688	0.472	0.326	0.229	0.205
110	1.727	1.318	1.026	0.855	0.790	0.688	0.503	0.348	0.248	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
130 135	2.038	1.633 1.697	1.259	1.060	0.987 1.026	0.876 0.913	0.675 0.710	0.461 0.483	0.342	0.227 0.246
135	2.058	1.697	1.305	1.101	1.026	0.913	0.710	0.483	0.361	0.246
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
160 165	2.160 2.181	2.005	1.538	1.305	1.224	1.101	0.884	0.625 0.657	0.455 0.474	0.341
170	2.201	2.028	1.631	1.346	1.303	1.176	0.954	0.689	0.474	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
190 195	2.283	2.133	1.817	1.551	1.460	1.326	1.094	0.817	0.590	0.455
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
215 220	2.385 2.406	2.239 2.260	2.028	1.755 1.796	1.658 1.697	1.514 1.551	1.268	0.978 1.010	0.737 0.767	0.556 0.579
225	2.426	2.281	2.034	1.837	1.736	1.589	1.338	1.010	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
245 250	2.508 2.528	2.366	2.181	2.001	1.894	1.739 1.776	1.477 1.512	1.170 1.202	0.914	0.694 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
275 280	2.807 2.881	2.493 2.514	2.333	2.167 2.194	2.095 2.124	1.964 2.002	1.687	1.363	1.090 1.119	0.833
285	2.954	2.535	2.384	2.222	2.152	2.031	1.756	1.427	1.119	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
300 305	3.173 3.246	2.693	2.461	2.305	2.238	2.118 2.147	1.861 1.896	1.523	1.237 1.266	0.949
310	3.320	2.843	2.512	2.360	2.295	2.147	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
325 330	3.539 3.612	3.069 3.144	2.634	2.443	2.380	2.263	2.030	1.683 1.716	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
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
355 360	4.003 4.088	3.519 3.594	3.057 3.127	2.672 2.738	2.551 2.601	2.438 2.467	2.208	1.876 1.908	1.560 1.589	1.203 1.226
365	4.088	3.594	3.127	2.738	2.664	2.496	2.237	1.908	1.619	1.226
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
380 385	-	3.894 3.969	3.409 3.480	3.000	2.853 2.916	2.605 2.666	2.355	2.036	1.707 1.736	1.319
385	-	4.044	3.480	3.065	2.916	2.666	2.385	2.068	1.766	1.342
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
410 415	-	-	3.832 3.902	3.392 3.458	3.230 3.293	2.969 3.030	2.533 2.562	2.229	1.883	1.458
415		-	3.902	3.458	3.293	3.030	2.562	2.261	1.913	1.481
425			4.043	3.589	3.419	3.151	2.675	2.325	1.971	1.527
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Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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Pol agg-

certifire

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

		Re		Hollow Sec kness (mm)		n 60 minut n Temperat				
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 40	0.852	0.669	0.538	0.481	0.462	0.437	01120	0.205	0.205	0.205
45	0.996 1.140	0.784	0.631	0.522	0.502 0.551	0.472	0.436	0.205	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 85	2.025	1.708 1.824	1.375 1.468	1.118	1.031	0.915 0.975	0.742	0.594	0.385 0.438	0.205
90	2.048	1.939	1.561	1.193	1.169	1.035	0.730	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 2.201	2.090 2.110	1.941	1.786	1.575	1.267	1.077	0.868	0.570
140 145	2.299	2.201	2.110	2.006	1.854 1.923	1.635 1.695	1.314	1.121	0.909	0.640
150	2.345	2.243	2.151	2.027	1.923	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
190 195	2.527	2.412	2.316	2.215	2.170	2.090	1.791	1.559	1.318	0.955
200	2.550 2.644	2.433	2.336 2.357	2.236 2.257	2.192 2.213	2.112 2.135	1.839 1.887	1.603 1.647	1.359	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
245 250	4.024 4.116	3.110 3.251	2.541 2.562	2.446	2.406	2.338	2.179	2.028	1.767	1.340
255	4.116	3.393	2.562	2.488	2.428	2.383	2.233	2.057	1.808	1.410
260	4.300	3.534	2.782	2.509	2.471	2.406	2.260	2.114	1.890	1.44
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	1.51
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	1.58
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	1.65
295 300	4.946 5.038	4.286 4.379	3.549 3.659	2.939 3.024	2.773 2.849	2.571 2.662	2.449 2.476	2.314	2.136 2.167	1.690
305	5.130	4.472	3.769	3.108	2.849	2.754	2.503	2.343	2.199	1.76
310	5.222	4.565	3.873	3.193	3.002	2.845	2.530	2.400	2.230	1.79
315	5.315	4.659	3.972	3.278	3.079	2.936	2.557	2.429	2.262	1.83
320	5.407	4.752	4.071	3.363	3.156	3.028	2.629	2.457	2.293	1.86
325	5.499	4.845	4.169	3.447	3.232	3.119	2.713	2.486	2.325	1.90
330	5.591	4.938	4.268	3.532	3.309	3.211	2.796	2.515	2.356	1.93
335	-	-	-	3.617	3.385	3.302	2.880	2.543	2.387	1.97
340	-	-	-	3.702	3.462	3.394	2.964	2.588	2.419	2.00
345	-	-	-	3.786	3.538	3.485	3.048	2.663	2.450	2.03
350 355	-	-	-	3.882	3.615 3.691	3.576	3.132	2.738 2.812	2.482	2.07
360	-	-	-	4.097	3.768	3.668 3.759	3.216 3.299	2.812	2.545	2.10
365	-	-	-	4.204	3.852	3.851	3.383	2.962	2.591	2.16
370	-	-	-	-	3.961	3.942	3.467	3.037	2.655	2.19
375	-	-	-	-	4.071	4.034	3.551	3.112	2.719	2.23
380	-	-	-	-	4.180	4.125	3.635	3.186	2.784	2.26
385		-	-	-	-	-	3.719	3.261	2.848	2.29
390		-	-	-	-	-	3.802	3.336	2.912	2.32
395	-	-	-	-	-	-	3.886	3.411	2.976	2.35
400	-	-	-	-	-	-	3.970	3.485	3.040	2.39
405	-	-	-	-	-	-	4.054	3.560	3.105	2.42
410	-	-	-	-	-	-	4.138	3.635	3.169	2.450
415		-	-	-	-	-	-	3.710 3.785	3.233 3.297	2.488
420	-	-								

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

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Pal agg-



		Re			tion Colum for a Design					
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 35	1.011	0.801	0.644 0.786	0.525	0.506 0.594	0.479 0.529	0.436	0.392	0.320	0.205
40	1.422	1.140	0.786	0.642	0.705	0.529	0.479	0.428	0.354	0.205
45	1.627	1.310	1.069	0.701	0.703	0.728	0.598	0.501	0.388	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 85	2.644	2.233	2.011	1.709 1.828	1.589 1.699	1.424	1.179 1.263	1.028	0.749	0.527
90	2.892	2.425	2.055	1.946	1.810	1.623	1.346	1.023	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
130 135	3.863 3.943	3.112 3.198	2.231 2.253	2.161 2.182	2.133 2.154	2.089	2.004	1.647 1.716	1.316	0.965 1.009
140	4.022	3.284	2.275	2.203	2.175	2.110	2.023	1.785	1.430	1.052
145	4.101	3.370	2.273	2.224	2.175	2.151	2.046	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
180 185	4.657 4.736	3.960 4.040	2.451 2.473	2.372 2.394	2.343	2.297 2.318	2.215	2.110 2.132	1.884	1.403
190	4.736	4.119	2.473	2.415	2.385	2.318	2.257	2.154	1.941	1.447
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
230 235	5.451 5.530	4.755 4.835	3.767 3.909	2.732 2.897	2.553 2.647	2.505 2.526	2.426	2.332	2.200 2.225	1.841
240	5.610	4.833	4.017	3.063	2.792	2.547	2.447	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
275 280	6.165 6.245	5.471 5.550	4.772 4.880	4.107 4.225	3.805 3.929	3.333 3.456	2.798 2.891	2.532 2.554	2.425 2.450	2.180 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 2.899	2.447
320 325	-	6.186 6.265	5.743 5.851	5.166 5.284	4.891 5.011	4.463 4.590	3.639 3.732	3.105 3.177	2.899	2.480 2.513
325		6.345	5.851	5.284	5.011	4.590	3.732	3.1//	3.092	2.513
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
370 375	-	-	-	-	-	-	-	3.861 3.960	3.861 3.957	3.205 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.

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fol agg-



Required Thickness (mm) for a Design Temperature (°C) Section Factor (m-1) 15			Re			tion Colum					
(m-1)				quired rine	(11111)	TOT U DESIG	l remperat	u.c (c)			
20		350	400	450	500	520	550	600	650	700	750
25		0.541	0.475	0.433	0.399	0.387	0.370	0.344	0.316	0.288	0.284
30	C	0.889	0.641	0.515					0.363	0.328	0.312
35					0.000						0.340
40				0.00-		0.0.0					0.369
45								0.00.			0.397
50 2.495 2.022 1.646 1.377 1.238 1.156 0.964 0.786 0.614 55 2.672 2.069 1.837 1.540 1.438 1.297 1.084 0.887 0.705 60 2.848 2.116 2.017 1.704 1.591 1.437 1.205 0.989 0.785 60 3.025 2.163 2.125 1.867 1.745 1.577 1.235 1.090 0.875 70 3.201 2.233 2.232 2.206 1.899 1.717 1.445 1.192 0.955 75 3.878 2.450 2.452 2.025 2.093 1.875 1.268 1.293 1.016 1.895 1.126 1.203 1.001 1.068 1.883 3.272 2.667 2.659 2.255 2.293 2.005 1.922 1.989 1.252 1.990 3.872 2.2667 2.667 2.667 2.010 1.003 1.001 1.001 1.001											0.425
55 2,672 2,069 1,837 1,540 1,438 1,297 1,084 0,889 0,785 66 3,025 2,163 2,125 1,267 1,745 1,577 1,325 1,090 0,870 70 3,201 2,233 2,233 2,233 2,016 1,899 1,717 1,445 1,192 0,985 75 3,378 2,342 2,342 2,095 2,099 1,885 1,793 1,192 0,935 80 3,554 2,450 2,450 2,259 2,255 2,094 1,085 1,398 1,916 85 3,731 2,559 2,559 2,255 2,094 2,023 1,805 1,966 1,211 90 3,872 2,675 2,665 2,334 2,070 2,023 1,805 1,198 1,211 100 4,068 2,884 2,489 2,145 2,111 2,052 1,191 1,141 1,11 1,11 1,14 1,14 <td></td> <td>0.453</td>											0.453
60											0.482
65 3.025 2.163 2.125 1.867 1.745 1.577 1.325 1.090 0.870 70 3.201 2.233 2.233 2.016 1.899 1.171 1.445 1.192 0.955 75 3.378 2.342 2.342 2.095 2.090 1.857 1.565 1.293 1.041 80 3.554 2.450 2.450 2.175 2.032 1.998 1.685 1.395 1.126 85 3.731 2.559 2.559 2.255 2.054 2.023 1.805 1.496 1.211 90 3.872 2.667 2.667 2.344 2.100 2.067 2.010 1.699 1.382 95 3.970 2.775 2.775 2.744 2.100 2.067 2.010 1.699 1.382 100 4.068 2.884 2.848 2.493 2.122 2.089 2.031 1.801 1.801 1.671 105 4.166 2.992 2.992 2.573 2.145 2.111 2.052 1.902 1.553 110 4.265 3.123 3.101 2.652 2.167 2.133 2.074 2.002 1.633 115 4.363 3.859 3.209 2.732 2.160 2.155 2.095 2.024 1.723 120 4.461 3.954 3.317 2.812 2.212 2.177 2.116 2.045 1.808 125 4.599 4.050 3.426 2.891 2.235 2.199 2.138 2.066 1.894 130 4.657 4.145 3.354 2.971 2.257 2.221 2.159 2.087 1.979 133 4.755 4.240 3.642 3.050 2.280 2.242 2.180 2.091 2.018 140 4.853 4.356 3.751 3.130 2.303 2.266 2.202 2.130 2.002 140 4.853 4.356 3.751 3.130 2.303 2.266 2.202 2.130 2.002 140 5.050 4.461 3.642 3.508 3.289 3.235 2.286 2.222 2.155 2.062 140 5.050 4.461 3.856 3.780 3.289 2.325 2.286 2.222 2.151 2.062 140 5.050 4.461 4.052 4.050 3.286 3.293 2.352 2.286 2.222 2.151 2.062 140 5.050 4.461 3.684 3.856 3.780 3.293 2.352 2.286 2.222 2.151 2.062 140 5.050 4.461 3.866 3.869 3.309 2.325 2.286 2.222 2.151 2.062 140 5.050 4.461 3.866 3.869 3.289 2.325 2.286 2.222 2.151 2.062 140 5.050 6.864 4.217 4.107 3.868 3.299 2.325 2.286 2.222 2.151 2.062 140 5.050 6.864 4.217 4.107 3.868											0.510
70											0.551 0.611
175											0.671
80											0.731
88 3.731 2.559 2.559 2.255 2.054 2.023 1.805 1.496 1.219 99 3.870 2.775 2.775 2.414 2.100 2.067 2.301 1.699 1.382 100 4.068 2.884 2.893 2.122 2.089 2.031 1.801 1.467 105 4.166 2.992 2.992 2.573 2.145 2.111 2.0574 2.002 1.538 110 4.265 3.123 3.101 2.652 2.167 2.118 2.074 2.002 1.638 115 4.363 3.859 3.079 2.732 2.190 2.155 2.095 2.024 1.723 125 4.559 4.050 3.426 2.891 2.235 2.199 2.138 2.066 1.894 130 4.657 4.435 3.571 3.130 2.302 2.221 2.180 2.209 2.212 2.159 2.029 2.135 2.292 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.791</td></t<>											0.791
99 3.872 2.667 2.667 2.334 2.077 2.045 1.925 1.598 1.297 95 3.970 2.775 2.741 2.102 2.067 2.010 1.699 1.382 100 4.068 2.884 2.884 2.893 2.122 2.089 2.031 1.801 1.467 105 4.166 2.992 2.992 2.573 2.145 2.111 2.052 1.902 1.553 110 4.265 3.123 3.101 2.652 2.167 2.133 2.074 2.002 1.638 115 4.363 3.859 3.079 2.732 2.199 2.155 2.095 2.024 1.723 120 4.461 3.954 3.317 2.812 2.192 2.197 2.115 2.045 1.802 125 4.559 4.050 3.284 2.891 2.235 2.199 2.138 2.066 1.894 135 4.553 4.559 4.050 3.362 2.911 2.257 2.199 2.138 2.066 1.894 130 4.657 4.145 3.534 2.971 2.257 2.221 2.159 2.087 1.979 135 4.755 4.240 3.652 3.052 3.00 2.280 2.242 2.130 2.097 2.018 140 4.853 4.336 3.751 3.130 2.303 2.264 2.202 2.130 2.004 145 4.951 4.431 3.856 3.209 2.325 2.286 2.223 2.151 2.062 150 5.050 4.526 3.953 3.289 2.348 2.308 2.265 2.173 2.062 150 5.050 4.526 3.953 3.289 2.348 2.308 2.265 2.173 2.063 155 5.148 4.622 4.050 3.369 2.370 2.330 2.256 2.174 2.105 160 5.246 4.717 4.147 3.448 2.393 2.352 2.287 2.215 2.174 170 5.442 4.908 4.341 3.607 2.438 2.396 2.390 2.258 2.173 180 5.534 4.812 4.494 3.528 2.415 2.374 2.309 2.236 2.174 170 5.540 5.003 4.383 3.687 2.460 2.374 2.309 2.236 2.215 2.127 170 5.540 5.003 4.383 3.687 2.460 2.374 2.309 2.236 2.258 2.179 180 5.538 5.088 4.535 3.766 2.483 2.440 2.373 2.300 2.258 2.179 180 5.538 5.538 4.826 4.062 3.959 2.250 2.484 2.240 2.252 2.255 2.272 2.255 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2.250 2											0.851
95				2.667							0.911
105								2.010	1.699		0.971
1110) 4	4.068	2.884	2.884	2.493	2.122	2.089	2.031	1.801	1.467	1.031
115					2.573	2.145		2.052	1.902	1.553	1.091
120											1.151
125					2.732			2.095			1.211
130) 4	4.461									1.271
135				3.426							1.331
140							.				1.391
145											1.451
150											1.511
155											1.571
160											1.631 1.691
165											1.691
170											1.811
175											1.871
180											1.931
190								2.373			1.991
195	5 5	5.736	5.194	4.632	3.852	2.506	2.462	2.394	2.321	2.236	2.024
200) 5	5.835	5.289	4.729	3.959	2.528	2.484	2.415	2.343	2.258	2.051
205	5 5	5.933	5.384	4.826	4.066	2.551	2.506	2.437	2.364	2.280	2.078
210) 6	6.031	5.480	4.923	4.172	2.990	2.527	2.458	2.385	2.302	2.105
215	5 6	6.129	5.575	5.020		3.831	2.549			2.323	2.133
220 6.423 5.861 5.311 4.599 4.173 3.083 2.544 2.470 2.389 225 - 5.956 5.408 4.706 4.287 3.297 2.583 2.492 2.411 230 - 6.052 5.505 4.813 4.400 3.512 2.740 2.513 2.433 240 - 6.242 5.699 5.026 4.919 4.514 3.727 2.897 2.536 2.454 240 - 6.242 5.699 5.026 4.919 4.514 3.727 2.897 2.556 2.476 245 - 6.338 5.796 5.133 4.742 4.045 3.211 2.644 2.498 250 - 6.433 5.893 5.239 4.856 4.187 3.367 2.761 2.520 255 - - 5.990 5.346 4.970 4.329 3.524 2.879 2.568 265 -											2.160
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285 - - 5.986 5.654 5.181 4.454 3.583 2.992 290 - - - 6.093 5.768 5.322 4.698 3.700 3.077 295 - - - 6.200 5.882 5.464 4.762 3.818 3.162 300 - - - 6.306 5.996 5.606 4.916 3.983 3.247 305 - - - 6.520 6.224 5.890 5.224 4.322 3.312 310 - - - 6.520 6.224 5.890 5.224 4.322 3.416 315 - - - 6.338 6.032 5.374 4.661 3.586 320 - - - 6.452 6.174 5.532 4.661 3.586 325 - - - - 6.452 6.174 5.532 4.661 3.586 <td>)</td> <td>-</td> <td>-</td> <td></td> <td>5.880</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2.540</td>)	-	-		5.880						2.540
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300 - - - 6.306 5.996 5.606 4.916 3.983 3.247 305 - - - 6.413 6.110 5.748 5.070 4.152 3.332 310 - - - 6.520 6.224 5.890 5.224 4.322 3.416 315 - - - 6.328 6.032 5.378 4.491 3.501 320 - - - 6.452 6.174 5.523 4.661 3.586 325 - - - - 6.316 5.686 4.830 3.671 330 - - - - 6.458 5.840 5.000 3.756 335 - - - - - - 336 340 - - - - - 350 - - - - - 355 - - - - 355 - - - 366 - - - 376 - - - 377 - - - 388 - - - 378 - - - 378 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - 380 - 380 - 380 380 383 3.247 3.332 3.322 3.346 3.325 3.325 3.466 3.328 3.461 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.586 3.56)	-	-	-				4.608		3.077	2.706
305 - - 6.413 6.110 5.748 5.070 4.152 3.332 310 - - 6.520 6.224 5.890 5.224 4.322 3.416 315 - - - 6.338 6.032 5.378 4.491 3.501 320 - - - 6.452 6.174 5.532 4.661 3.586 325 - - - - 6.452 6.174 5.532 4.661 3.586 330 - - - - 6.458 5.840 5.000 3.671 330 - - - - - - - - - 335 - - - - - - - 345 - - - - - - 350 - - - - - 355 - - - - - 355 - - - - - 356 - - - - 366 - - - - 370 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - - 380 - - -		-	-	-							2.827
310 6.520 6.224 5.890 5.224 4.322 3.416 315 6.338 6.032 5.378 4.491 3.501 320 6.452 6.174 5.532 4.661 3.586 325 6.452 6.174 5.532 4.661 3.586 325 6.316 5.686 4.830 3.671 330 6.458 5.840 5.000 3.756 335 6.458 5.840 5.000 3.756 335		-	-	-							2.949
315 - - 6.338 6.032 5.378 4.491 3.501 320 - - - 6.452 6.174 5.532 4.661 3.586 325 - - - 6.458 5.840 5.000 3.671 330 - - - - 6.458 5.840 5.000 3.756 335 - - - - - - - - 3.858 340 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <		-	-	-							3.071
320 6.452 6.174 5.532 4.661 3.586 325 6.316 5.686 4.830 3.671 330 6.458 5.840 5.000 3.756 335 3.353 340		-	-	-	6.520						3.193
325 - - - - 6.316 5.686 4.830 3.671 330 - - - - 6.458 5.840 5.000 3.756 335 - - - - - - - - 3.858 340 - - - - - - - 4.056 345 - - - - - - - - 350 - - - - - - - - 365 - - - - - - - - 366 - - - - - - - - 370 - - - - - - - - 375 - - - - - - - - - 380 - - - - - - - - - - - - - - - - - - - - - - - - - - - - -<		-	-	-	-						3.314
330 6.458 5.840 5.000 3.756 335 3.858 340 4.056 345		-	-	-	-	6.452					3.436
335 3.858 340 4.056 345		-	-	-	-	-					3.558
340 4.056 345		-	-	-		-		5.840	5.000		3.679 3.801
345		-	-	-	-	-		-	-	0.000	3.801
350		-	-	-	-	-	-	-	-		4.045
355		-	-	-	<u> </u>	<u> </u>	- -	-	-	-	4.045
360		-									4.100
365											-
370 375							-				-
375 380											-
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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Pal agg-



		Re				n 105 minut n Temperat				
		i i i	quired Triic	Kiless (IIIII)	TOT & Desig	remperac	lie (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 50	2.830	2.385 2.567	2.017	1.574	1.474	1.335	1.125	0.926	0.739	0.526
55	3.060 3.290	2.749	2.157	1.783	1.671	1.517	1.282	1.061	0.853	0.610
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 4.092	2.534	2.463	2.355
210 215	-	-	6.239 6.353	5.763 5.881	5.538	5.153	4.092	2.556	2.485	2.379
220	-	-	6.467	5.998	5.658 5.779	5.283 5.412	4.412	2.699 2.884	2.507 2.529	2.403
225	-		0.407	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	-		-	0.552	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	-	-	-	-	-	-	-	-		-
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395	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-
405	-	-	-	-	-	-	-	-	-	-
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-			-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	
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Thickness is intumescent only. The results applies 4sided rectangular beams up to 5.5mm.

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Pol Agg-



(m-1)			Re			tion Columi					
(m-1) 350 400 450 500 520 520 600 650 700 155 1.260 C.869 0.541 0.466 0.471 0.460 0.475 0.482 0.482 20 1.824 1.554 0.937 0.707 0.640 0.555 0.494 0.522 0.409 0.52 20 2. 2.196 1.819 1.333 1.1012 0.914 0.788 0.641 0.522 0.409 0.5 30 0.2479 2.142 1.728 1.316 1.187 1.021 0.837 0.683 0.536 0.494 40 3.046 2.602 2.252 1.052 1.734 1.486 1.254 1.033 0.851 0.679 0.694 40 3.046 2.602 2.252 1.055 1.734 1.486 1.254 1.031 0.851 1.80 40 3.046 2.602 2.252 1.055 1.734 1.486 1.259 1.019 0.823 0.69 40 3.046 2.602 2.252 1.055 1.734 1.486 1.259 1.019 0.823 0.69 40 6. 3.046 2.602 2.252 1.055 1.734 1.486 1.259 1.019 0.823 0.69 40 6. 4.622 3.252 2.018 2.353 2.04 2.04 2.00 1.817 1.254 1.254 1.056 0.60 4.622 3.522 3.018 2.354 2.246 2.260 2.125 1.019 1.817 1.524 1.254 1.056 0.60 4.623 3.522 3.018 2.354 2.246 2.260 0.80 1.092 1.397 1.00 55 4.612 3.752 3.209 2.488 2.383 2.383 2.117 1.861 1.541 1.541 70 4.061 4.003 3.401 2.541 2.520 2.500 2.250 2.251 2.19 1.00 56 4.612 3.752 3.209 2.488 2.383 2.383 2.117 1.861 1.541 1.541 70 5.461 4.875 3.738 2.992 2.793 2.793 2.793 2.241 2.250 2.250 2.019 1.00 5.047 4.181 3.453 3.092 2.793 2.793 2.793 2.248 2.00 58 6.010 4.766 3.981 3.218 2.990 2.90 2.550 2.250 2.250 2.00 1.00 5.047 4.181 3.453 3.067 3.067 3.067 2.661 2.348 2.003 1 100 - 5.568 4.580 3.892 3.359 3.340 2.879 2.515 2.269 2.00 1 100 - 5.568 4.580 3.892 3.359 3.340 2.879 2.515 2.00 1 110 - 5.00 4.779 4.181 3.453 3.067 3.067 2.661 2.348 2.033 1 110 - 5.568 4.580 3.892 3.559 3.340 2.879 2.3515 2.00 1 110 - 5.568 4.580 3.892 3.559 3.340 2.879 2.3515 2.00 1 110 - 5.568 4.580 3.892 3.559 3.340 2.879 2.3515 2.00 1 110 - 5.568 4.580 3.892 3.559 3.340 3.233 2.770 2.431 2.066 1 110 - 5.568 4.580 3.893 3.892 3.559 3.340 3.393 2.30 2.770 2.431 2.066 1 110 - 5.568 4.580 3.893 3.892 3.559 3.340 3.343 2.393 2.30 2.70 2.30 2.30 2.70 2.30 2.30 2.70 2.30 2.30 2.70 2.30 2.30 2.30 2.30 2.30 2.30 2.30 2.3					,						
20		350	400	450	500	520	550	600	650	700	750
255 2.196 1.819 1.333 1.012 0.914 0.788 0.641 0.522 0.470 0.536 0.30 3.079 2.479 2.142 1.728 1.316 1.187 1.021 0.837 0.683 0.566 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355 0.355											0.318
30											0.366
35			2.020								0.414
40									0.000		0.462
45							_			0.0.0	0.510
SO											0.599
SS											0.710 0.820
60											0.930
65											1.041
TO											1.151
75											1.262
85		5.311									1.372
90	80	5.661	4.525	3.783	2.982	2.793	2.793	2.443	2.182	1.972	1.482
95	85	6.010	4.786	3.981	3.218	2.930	2.930	2.552	2.265	2.020	1.593
100		-									1.703
105											1.814
110											1.924
115		-									2.009
120		-									2.033
125			6.351								2.057
130			-								2.081
135											2.105
140											2.129
145											2.153
150											2.201
155		-	-	-							2.225
160		-	-	-							2.249
1170		-	-	-							2.273
175		-	-	-					3.596		2.297
180	170	-	-	-	6.067	5.647	5.288	4.636	3.680	2.413	2.321
185	175	-	-	-	6.222		5.428	4.789	3.763	2.436	2.345
190	180	-	-	-	6.378						2.369
195		-	-	-	-	0.000					2.393
200 - - - - 6.492 6.128 5.554 4.613 2.551 2.205 - - - 6.268 5.707 4.799 2.655 2.210 - - - - 6.408 5.860 4.985 2.832 2.215 - - - - 6.548 6.013 5.171 3.009 2.225 - - - - - 6.166 6.319 5.543 3.366 2.225 - - - - - - 6.166 5.577 3.186 2.225 - - - - - - 6.319 5.543 3.364 2.225 - - - - - - - - -		-	-								2.417
205											2.441
210											2.465
215											2.489
220											2.513
225											2.537
230											2.561 2.683
235			-			-		0.319			2.810
240 - - - - 6.102 3.976 3 245 - - - - 6.288 4.366 3 250 - - - - 6.474 4.755 3 255 - - - - - 5.145 3 260 - - - - - - 5.535 3 265 - - - - - - 5.925 3 270 - - - - - 5.925 3 275 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		-	-			-		-			2.936
245 - - - - 6.288 4.366 3 250 - - - - - 6.474 4.755 3 260 - - - - - 5.145 3 265 - - - - - 5.535 3 270 - - - - - - 5.535 3 270 - - - - - - - 6.315 3 275 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		-	-				-	-			3.063
250		-	-	-		-	-	-			3.190
260 - - - - - 5.535 3 265 - - - - - 5.925 3 270 - - - - - - 6.315 3 275 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		-	-	-	-	-	-	-			3.316
26S	255	-	-	-	-	-	-	-	-	5.145	3.443
270 - - - - - 6.315 3 275 - - - - - - 4 280 - - - - - - - - 4 285 - - - - - - - - 4 290 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <td>260</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td> <td>3.570</td>	260	-	-	-	-	-	-	-	-		3.570
275 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		-	-	-	-	-	-	-	-	5.925	3.696
280 4 285 4 290 4 290 5 295 5 300	270	-	-		-	-	-		-	6.315	3.823
285										-	4.180
290 5 295 5 300 5 310											4.548
295 			-	-						-	4.915
300			-	-						-	5.282
305		-	-	-	-	-	-	-	-	-	5.649
310		-		-	-			-	-	-	6.017
315		-		-	-		-	-	-	-	
320		-		-	-			-	-		
325		-	-	-	-	-	-	-	-	-	-
330		-	-	-	-	-	-	-	-	-	-
335		-	-	-	-	-	-	-	-	-	-
345	335	-					-		-	-	-
350	340	-						_	-	-	-
350	345	-	-	-	-	-		-	-	-	-
360		-	-	-	-	-	-	-	-	-	-
365											-
370											-
375											-
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420		-							-		-
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425 - - - - - - -	425	-	-	-	-	-	-	-	-	-	-

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

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Pal agg-



(m-1) 15	350 330 330 5.330 5.330 5.330 5.330 5.717 5.105	400 1.499 2.112 2.558 3.004 3.499 3.895 4.786 5.232	450 1.132 1.700 2.136 2.422 2.708 2.995 3.281 4.378 4.884 5.391 6.403	500 0.827 1.316 1.805 2.154 2.408 2.662 2.916 3.170 3.424 3.678 3.994 4.800 5.203 5.607 6.010	520 0.637 1.127 1.617 2.054 2.294 2.535 2.776 3.017 3.499 3.740 4.062 4.430 4.430 4.799 5.168 5.536 6.274	0.531 0.531 0.963 1.395 2.131 2.347 2.563 2.799 3.212 3.644 3.878 4.217 4.556 4.219 6.249 	0.487 0.740 1.086 1.433 1.779 2.050 2.184 2.318 2.452 2.597 2.795 3.191 3.389 3.587 3.785 4.004 4.004 4.728 5.051 5.374 5.698 6.021	650 0.448 0.568 0.839 1.109 1.380 1.651 1.922 2.037 2.088 2.138 2.189 2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.028 4.300 4.617 4.934 5.5568 5.885 6.202	700 0.409 0.491 0.641 0.843 1.046 1.248 1.450 1.653 1.855 2.036 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.157 3.721 3.879 4.203 4.454 4.700 4.944 4.700 4.944 4.700 4.949 4.949 4.949 4.949 4.949 4.949 4.949 4.949 4.949 4.959 4.949 4.959 4.969 4.969 4.970 4.949 4.959 4.969 4.970 4.949 4.959 5.685	750 0.371 0.437 0.503 0.631 0.792 0.953 1.115 1.276 1.437 1.598 1.760 1.921 2.084 2.247 2.247 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.769
(m-1) 15	5.330 5.330 5.330 5.330 5.330 5.330 5.330 5.330 5.330 5.340 5.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 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6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6.340 6	1.499 2.112 2.558 3.004 3.449 3.895 4.341 4.786 5.232 5.678 6.123	1.132 1.700 2.136 2.422 2.708 2.995 3.872 4.378 4.884 5.391 5.897 6.403	0.827 1.316 1.805 2.154 2.408 2.602 2.916 3.170 3.424 3.678 3.994 4.397 4.800 5.203 5.607 6.010	0.637 1.127 1.617 2.054 2.294 2.535 2.776 3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.536 5.905 6.274	0.531 0.963 1.395 1.827 2.131 2.347 2.563 2.779 2.995 3.212 3.428 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	0.487 0.740 1.086 1.433 1.779 2.050 2.184 2.318 2.452 2.597 2.795 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	0.448 0.568 0.839 1.109 1.380 1.651 1.922 2.037 2.038 2.138 2.138 2.284 2.408 2.532 2.656 2.780 2.904 3.024 3.982 4.617 4.300 4.617 4.934 5.251 5.568	0.409 0.491 0.641 0.843 1.046 1.248 1.450 1.653 1.855 2.036 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.276 4.408 4.408 4.408 4.408 4.408 4.408 4.408 4.408 4.408 4.408 4.408 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20	. 330 . 330 . 330 . 330 . 330 . 330 . 330 . 330 . 330 . 340 . 340	2.112 2.558 3.004 3.409 3.895 4.341 4.786 6.123	1.700 2.136 2.422 2.708 2.995 3.281 3.567 3.872 4.378 4.384 5.391 5.897 6.403	1.316 1.805 2.154 2.408 2.662 2.916 3.170 3.424 3.678 3.994 4.397 6.010	1.127 1.617 2.054 2.294 2.294 2.353 2.776 3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.905 6.274	0.963 1.395 1.827 2.131 2.347 2.563 2.779 2.995 3.212 3.644 3.878 4.217 4.556 4.217 4.556	0.740 1.086 1.433 1.779 2.050 2.184 2.318 2.452 2.597 2.795 2.993 3.191 3.389 3.587 4.081 4.404 4.728 5.051 5.374 6.021	0.568 0.839 1.109 1.380 1.651 1.922 2.037 2.038 2.138 2.284 2.284 2.408 2.532 2.655 2.780 2.904 3.028 3.028 3.028 3.024 4.617 4.309 4.617 4.934 5.251 5.568	0.491 0.641 1.046 1.248 1.450 1.653 1.855 2.036 2.160 2.284 2.408 2.532 2.655 2.780 2.904 3.152 3.276 3.399 4.027 4.208 4.454 4.700 4.946 5.193	0.437 0.503 0.631 0.792 0.953 1.115 1.276 1.296 1.291 2.471 2.411 2.575 2.739 2.902 3.066 3.230 3.394 4.027 4.175 4.323 4.471 4.619 4.767
25	5.330 5.330 5.330 5.330 5.330 5.717 5.105	2.558 3.004 3.449 3.895 4.341 4.786 5.232 5.678 6.123	2.136 2.422 2.708 2.995 3.281 3.567 3.872 4.378 4.884 5.391 5.897 6.403	1.805 2.154 2.408 2.662 2.916 3.170 3.424 3.678 3.994 4.800 5.203 5.607 6.010	1.617 2.054 2.294 2.535 2.776 3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.536 5.905 6.274	1.395 1.827 2.131 2.347 2.563 2.779 2.995 3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572	1.086 1.433 1.779 2.050 2.184 2.318 2.452 2.597 2.795 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	0.839 1.109 1.380 1.651 1.922 2.037 2.088 2.138 2.138 2.284 2.408 2.532 2.656 2.780 2.904 3.028 4.300 4.617 4.934 5.251 5.251 5.568	0.641 0.843 0.843 1.046 1.248 1.450 1.653 1.653 2.036 2.160 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.3152 3.276 3.3879 4.027 4.027 4.027 4.027 4.946 5.193	0.503 0.631 0.792 0.953 1.115 1.276 1.437 1.598 1.760 1.921 2.247 2.411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.879 4.027 4.175 4.423 4.471 4.619 4.767
30	5.330 5.330 5.330 5.330 5.330 5.105 	3.004 3.495 3.895 4.341 4.786 5.232 5.678 6.123	2.422 2.708 2.995 3.281 3.567 3.872 4.378 5.391 5.897 6.403	2.154 2.408 2.662 2.916 3.170 3.424 3.678 3.994 4.397 4.800 5.203 5.6010	2.054 2.294 2.535 2.776 3.017 3.258 3.499 3.740 4.062 4.799 5.168 5.905 6.274	1.827 2.131 2.347 2.563 2.779 2.995 3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	1.433 1.779 2.050 2.184 2.318 2.452 2.597 2.795 2.993 3.191 3.389 3.587 4.081 4.404 4.728 5.051 5.374 6.021	1.109 1.380 1.651 1.922 2.037 2.088 2.138 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568	0.843 1.046 1.248 1.450 1.653 1.855 2.036 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.152 3.278 3.152 3.379 4.027 4.208 4.454 4.700 4.946 5.133	0.631 0.792 0.953 1.115 1.276 1.437 1.598 1.760 1.921 2.084 2.247 2.411 2.575 2.902 3.066 3.230 3.394 3.357 3.721 4.175 4.323 4.471 4.619 4.767
35	5.330 5.330 5.347 5.105 	3.449 3.895 4.341 4.786 5.232 5.678 6.123	2.708 2.908 3.281 3.581 3.587 4.378 4.884 5.391 5.897 6.403	2.408 2.662 2.916 3.170 3.424 3.678 3.994 4.397 4.800 5.203 5.007 6.010	2.294 2.535 2.776 3.017 3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.536 6.274	2.131 2.347 2.563 2.779 2.995 3.212 3.428 3.644 4.217 4.556 4.894 5.233 5.572 5.911 6.249	1.779 2.050 2.184 2.318 2.452 2.597 2.795 3.191 3.389 3.587 3.785 4.001 4.728 5.051 5.374 5.698 6.021	1.380 1.651 1.922 2.037 2.038 2.138 2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.5251 5.588	1.046 1.248 1.450 1.653 1.653 1.855 2.036 2.284 2.408 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.276 4.027 4.027 4.027 4.027 4.027 4.027 5.139	0.792 0.953 1.115 1.276 1.276 1.598 1.760 1.921 2.084 2.247 2.417 2.575 2.790 3.066 3.230 3.394 3.557 3.721 3.879 4.175 4.323 4.471 4.619 4.767
40 5 45 55 6 45 50 5 55 6 60 65 70 75 80 85 90 95 100 110 115 120 125 135 140 145 150 155 160 165 170 175 120 125 130 135 140 145 150 155 160 165 170 175 120 125 125 125 125 125 125 125 125 125 125	5.330 5.310 5.717 5.105 	3.895 4.341 4.786 5.232 5.678 6.123	2.995 3.281 3.567 3.872 4.378 4.884 5.391	2.662 2.916 3.170 3.424 3.678 3.994 4.397 4.800 5.203 5.607 6.010	2.535 2.776 3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.536 5.905 6.274	2.347 2.563 2.779 2.995 3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.050 2.184 2.318 2.452 2.597 2.795 2.993 3.191 3.389 3.587 4.081 4.404 4.728 5.051 5.374 5.698 6.021	1.651 1.922 2.037 2.088 2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.242 4.300 4.617 4.934 4.934 5.251 5.588	1.248 1.450 1.653 1.855 2.036 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.133	0.953 1.115 1.276 1.437 1.598 1.760 1.921 2.084 2.247 2.411 2.575 2.739 2.902 3.394 3.394 3.557 3.721 4.175 4.323 4.471 4.619
45 5 50 6 60 6 60 6 65 70 70 75 80 80 85 90 95 100 105 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 120 125 125 125 125 125 125 125 125 125 125	5.330 5.717 5.105 	4.341 4.786 5.232 5.678 6.123 - - - - - - - - - - - - - - - - - - -	3.281 3.567 3.872 4.378 4.384 5.391 5.897 6.403	2.916 3.170 3.424 3.678 3.994 4.397 4.800 5.203 5.607 6.010	2.776 3.017 3.258 3.499 3.740 4.062 4.439 5.168 5.536 5.905 6.274	2.563 2.779 2.995 3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.184 2.318 2.452 2.597 2.795 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	1.922 2.037 2.088 2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.588	1.450 1.653 1.855 2.036 2.160 2.284 2.408 2.532 2.655 2.780 3.028 3.152 3.276 3.399 4.027 4.208 4.454 4.700 4.946 5.133	1.115 1.276 1.437 1.598 1.760 1.921 2.084 2.2411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.4323 4.471 4.619
50 5 55 6 60 60 65 70 77 75 80 85 90 95 100 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295	5.747 5.105	4.786 5.232 5.678 6.123 	3.872 4.378 4.884 5.391 5.897 6.403	3.170 3.424 3.678 3.994 4.800 5.203 5.607 6.010	3.017 3.258 3.499 3.740 4.062 4.430 4.799 5.168 5.536 5.905 6.274	2.979 2.995 3.212 3.428 3.644 3.644 4.556 4.894 5.233 5.572 5.911 6.249	2.318 2.452 2.597 2.795 2.993 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.037 2.088 2.138 2.138 2.284 2.408 2.532 2.655 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568	1.653 1.855 2.036 2.160 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 4.027 4.208 4.454 4.700 4.946 5.193 5.439	1.276 1.437 1.598 1.760 1.921 2.084 2.247 2.411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619
55 6 60 65 60 65 60 65 70 70 75 80 80 85 90 90 95 110 115 120 125 130 135 140 145 145 155 160 165 175 180 185 190 195 200 205 210 225 230 240 245 250 255 250 255 250 260 267 275 280 285 290		5.232 5.678 6.123 	3.872 4.378 4.884 5.391 5.897 6.403	3.424 3.678 3.994 4.397 4.800 5.203 5.607 6.010	3.258 3.499 3.740 4.062 4.799 5.168 5.536 5.905 6.274	2.995 3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.452 2.597 2.795 2.993 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.051 5.374 5.698 6.021	2.088 2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	1.855 2.036 2.160 2.284 2.408 2.532 2.656 2.780 2.904 3.152 3.278 3.152 3.278 4.208 4.454 4.700 4.946 5.133	1.437 1.598 1.760 1.921 2.084 2.247 2.411 2.575 2.739 3.066 3.230 3.557 3.721 3.879 4.027 4.175 4.423 4.471 4.619
60 65 70 77 75 80 80 85 90 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290		5.678 6.123	4.378 4.884 5.391 5.897 6.403 - - - - - - - - - - - - - - - - - - -	3.678 3.994 4.397 4.800 5.203 5.607 6.010	3.499 3.740 4.062 4.430 4.799 5.168 5.536 6.274	3.212 3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.597 2.795 2.993 3.191 3.389 3.587 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.138 2.189 2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.668 5.885	2.036 2.160 2.160 2.284 2.408 2.408 2.532 2.656 2.780 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.133	1.598 1.760 1.921 2.084 2.247 2.471 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.4323 4.471 4.619
65 65 70 75 80 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295 295		6.123	4.884 5.891 5.897 6.403 	3.994 4.800 5.203 5.607 6.010	3.740 4.062 4.430 4.799 5.168 5.536 5.905 6.274	3.428 3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.795 2.993 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.189 2.284 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	2.160 2.284 2.408 2.532 2.532 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.4700 4.946 5.193 5.439	1.760 1.921 2.084 2.247 2.411 2.575 2.902 3.066 3.230 3.394 3.557 4.027 4.175 4.471 4.619 4.767
70 75 80 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 166 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290			5.391 5.897 6.403	4.307 4.800 5.203 5.607 6.010 - - - - - - - - - - - - -	4.062 4.430 4.799 5.168 5.536 5.905 6.274	3.644 3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	2.993 3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.098 6.021	2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.568 5.885	2.284 2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193	1.921 2.084 2.247 2.411 2.575 2.739 2.902 3.304 3.394 3.3721 3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290			5.897 6.403	4.800 5.203 5.607 6.010 	4.430 4.799 5.168 5.536 5.905 6.274	3.878 4.217 4.556 4.894 5.233 5.572 5.911 6.249	3.191 3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.408 2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.568 5.885	2.408 2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.276 3.399 3.557 3.721 4.027 4.208 4.454 4.700 4.946 5.193 5.439	2.084 2.247 2.411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
80 85 87 88 88 88 89 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 177 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290			6.403 	5.203 5.607 6.010	4.799 5.168 5.536 5.905 6.274	4.217 4.556 4.894 5.233 5.572 5.911 6.249	3.389 3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.532 2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	2.532 2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.202 4.454 4.700 4.946 5.193 5.439	2.247 2.411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767
85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290			-	5.607 6.010	5.168 5.536 5.905 6.274 	4.556 4.894 5.233 5.572 5.911 6.249	3.587 3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.656 2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	2.656 2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.439	2.411 2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 4.027 4.175 4.323 4.471 4.619 4.767
90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290				6.010	5.536 5.905 6.274 	4.894 5.233 5.572 5.911 6.249 	3.785 4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.780 2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	2.780 2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	2.575 2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767
95 100 105 110 115 120 125 130 135 140 145 150 165 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295					5.905 6.274 	5.233 5.572 5.911 6.249 - - - -	4.081 4.404 4.728 5.051 5.374 5.698 6.021	2.904 3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	2.904 3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	2.739 2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767
100 105 110 115 1120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290		-			6.274	5.572 5.911 6.249 - - - -	4.404 4.728 5.051 5.374 5.698 6.021	3.028 3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	3.028 3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	2.902 3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.471 4.619 4.767
105 110 1115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290		-			-	5.911 6.249 - - - - - -	4.728 5.051 5.374 5.698 6.021 - -	3.244 3.982 4.300 4.617 4.934 5.251 5.568 5.885	3.152 3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.066 3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767
110 115 120 125 130 135 140 145 155 160 155 160 165 170 175 180 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295						6.249	5.051 5.374 5.698 6.021 - -	3.982 4.300 4.617 4.934 5.251 5.568 5.885	3.276 3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.230 3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767
115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 200 205 210 215 220 225 230 245 245 250 255 260 265 270 275 280 285 290 295				-		-	5.374 5.698 6.021 - - -	4.300 4.617 4.934 5.251 5.568 5.885	3.399 3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.394 3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
120 125 130 135 140 145 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-			-	-		5.698 6.021 - - -	4.617 4.934 5.251 5.568 5.885	3.557 3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.557 3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
125 130 135 140 145 150 155 160 165 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295							6.021 - - - -	4.934 5.251 5.568 5.885	3.721 3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.721 3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
130 135 140 140 145 150 155 160 165 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 275 280 285 290 295				-		-	1 1 1	5.251 5.568 5.885	3.879 4.027 4.208 4.454 4.700 4.946 5.193 5.439	3.879 4.027 4.175 4.323 4.471 4.619 4.767 4.915
135 140 145 145 150 145 155 160 155 160 170 175 180 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295						-		5.568 5.885	4.027 4.208 4.454 4.700 4.946 5.193 5.439	4.027 4.175 4.323 4.471 4.619 4.767 4.915
140 145 146 150 150 155 160 160 165 170 175 180 185 190 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295			-	-	-	-		5.885	4.208 4.454 4.700 4.946 5.193 5.439	4.175 4.323 4.471 4.619 4.767 4.915
145 150 155 160 165 170 175 180 188 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295			-		-	-	-		4.454 4.700 4.946 5.193 5.439	4.323 4.471 4.619 4.767 4.915
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	-	- - - - - -		-	-			6.202	4.700 4.946 5.193 5.439	4.471 4.619 4.767 4.915
1155 160 165 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-	-		-	-	-	-	-	4.946 5.193 5.439	4.619 4.767 4.915
160 165 170 175 180 188 185 190 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-	-			-	-	-	-	5.193 5.439	4.767 4.915
165 170 175 180 185 190 195 200 205 210 215 220 225 230 245 240 245 250 255 260 265 270 275 280 285 290 295	-	-			-	-	-	-	5.439	4.915
170 175 180 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-	-			-	-	-	-		
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	-	-			-			-	5.685	5.063
180 185 190 190 195 200 205 210 215 220 225 230 235 240 245 255 260 265 270 275 280 285 290 295	-	-				-	-			
185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295	-		-			-		-	5.931	5.211
190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295			-	-	-	-	-	-	6.178	5.359
195 200 205 210 215 220 225 230 235 240 245 255 260 265 270 275 280 285 290 295				-	-	-	-	-	6.424	5.507
195 200 205 210 215 220 225 230 235 240 245 255 260 265 270 275 280 285 290 295			-	-	-	-	-	-	-	5.655
200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295			-	-	-	-	-	-	-	5.803
205 210 215 220 225 230 235 240 245 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	5.951
210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-	-	-	-	-	-	-	-	-	6.099
215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	6.247
220 225 230 235 240 245 250 255 260 265 270 275 280 285 290	-	-	-	-	-	-	-	-	-	6.395
225 230 235 240 245 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	6.542
230 235 240 240 245 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
235 240 245 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
240 245 250 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
245 250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
250 255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
255 260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	
260 265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
265 270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
270 275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
275 280 285 290 295	-	-	-	-	-	-	-	-	-	-
280 285 290 295	-	-	-	-	-	-	-	-	-	-
285 290 295	-	-	-	-	-	-	-	-	-	-
290 295	-	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-	-		-	-		-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-		-	-	-	-	-		-	-
350										<u> </u>
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
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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Pal agg-



		Re	Table 30 equired Thic	Hollow Sec kness (mm)						
Section Factor	350	400	450	500	520	550	600	650	700	750
(m-1)										
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 4.960	3.986 4.286	3.986
75 80	-	-	-	-	-	6.284	5.440 5.836	5.417	4.286	4.286 4.587
85	-	-	-	-	-	-	6.232	5.873	4.587	4.887
90				-		-	-	6.329	5.188	5.188
95				-		-	-	- 0.329	5.489	5.489
100	-	-		-		-	-	-	5.489	5.789
	-	-		-			-	-		
105	-	-	-	-	-	-	-	-	-	6.090
110	-	-		-	-	-	-	-	-	
115	-	-	-	-	-	-	-	-	-	-
120 125	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
130										
135	-	-	-	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	- -	-
145	-	-	-	-	-	-	-	-	- -	-
150	-	-	-	<u> </u>	-		-	-	<u> </u>	-
155	-	-	-	<u> </u>	<u> </u>	-	-	-		-
160	-	-	-		-	-	-	-		<u> </u>
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										

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

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Pal agg-

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

						Beam 15 r				
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 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 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 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 95	0.205	0.205	0.205 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
115 120	0.249	0.205	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
135 140	0.306	0.242	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
145	0.320	0.252	0.205	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
155 160	0.363 0.378	0.283 0.293	0.227 0.235	0.205 0.205						
165	0.378	0.293	0.235	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
180 185	0.435	0.334	0.268 0.276	0.205 0.211	0.205	0.205	0.205	0.205	0.205	0.205
190	0.463	0.354	0.284	0.211	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
200 205	0.492	0.375 0.385	0.300	0.232	0.210 0.216	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
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
225 230	0.573 0.591	0.426	0.341	0.267	0.243	0.209 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
245 250	0.645	0.467	0.374	0.296	0.269	0.233	0.205	0.205	0.205	0.205
255	0.681	0.477	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
265 270	0.718	0.507	0.406	0.324	0.295	0.257	0.205	0.205	0.205	0.205
275	0.754	0.528	0.422	0.338	0.302	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
285 290	0.790 0.808	0.561 0.578	0.439 0.447	0.352	0.322 0.328	0.280	0.212 0.217	0.205	0.205	0.205
295	0.808	0.578	0.447	0.359	0.328	0.286	0.217	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
305 310	0.862	0.627	0.471	0.380	0.348	0.304	0.232	0.205	0.205	0.205
310 315	0.880	0.643	0.480	0.387	0.355	0.310	0.236	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
330 335	0.952	0.709 0.725	0.512 0.520	0.415	0.381	0.333	0.255	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
350 355	1.025	0.774 0.791	0.559 0.574	0.443 0.450	0.407 0.414	0.357	0.275 0.279	0.205	0.205 0.205	0.205 0.205
360	1.043	0.791	0.574	0.450	0.414	0.363	0.279	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
370 375	1.097 1.115	0.840	0.618	0.472	0.434	0.381	0.294	0.205	0.205	0.205
375	1.115	0.856	0.648	0.479	0.440	0.387	0.298	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
395 400	1.187	0.922	0.692	0.507 0.514	0.467 0.473	0.410 0.416	0.317 0.322	0.209	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
415 420	1.259	0.988 1.004	0.751 0.766	0.541 0.554	0.493	0.434	0.337	0.223	0.205 0.205	0.205
425	1.277	1.004	0.780	0.567	0.506	0.446	0.341	0.226	0.205	0.205
	4	Daa	ر مدار		م المما					0 -:-

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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Pol Agg-

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

		Ta Re	able 32 Rec	tangular Ho	llow Section	n Beam 30 r n Temperat	ninutes			
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 25	0.328	0.205 0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205	0.205
30	0.332	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 65	0.519 0.552	0.314	0.225	0.205	0.205 0.205	0.205	0.205 0.205	0.205 0.205	0.205 0.205	0.205 0.205
70	0.588	0.387	0.245	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
100 105	0.805 0.842	0.594 0.625	0.389	0.284	0.247	0.221	0.205	0.205	0.205	0.205
110	0.842	0.656	0.430	0.315	0.203	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
140 145	1.095	0.842	0.564 0.594	0.406	0.371	0.336	0.288	0.240	0.205	0.205
145	1.131 1.168	0.873	0.594	0.421	0.387	0.350	0.301	0.251 0.263	0.205 0.211	0.205 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
180 185	1.385	1.089	0.802	0.528	0.495	0.451	0.391	0.332	0.267	0.205
190	1.421	1.120	0.862	0.586	0.510	0.465	0.404	0.343	0.277	0.205
195	1.494	1.131	0.891	0.615	0.552	0.479	0.417	0.366	0.286	0.212
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
225 230	1.711	1.368	1.070	0.788 0.817	0.720 0.747	0.624	0.508 0.521	0.435 0.447	0.352 0.361	0.257
235	1.783	1.429	1.129	0.817	0.747	0.676	0.539	0.447	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
265 270	2.001	1.615	1.308	1.020	0.942	0.833	0.678	0.527	0.427	0.309
275	2.052	1.677	1.367	1.049	0.970	0.886	0.701	0.567	0.446	0.313
280	2.032	1.708	1.397	1.106	1.026	0.886	0.724	0.586	0.446	0.321
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
305 310	2.206	1.862	1.545 1.575	1.251	1.165	1.043	0.862	0.685	0.502 0.512	0.360
310 315	2.232	1.893	1.575	1.280	1.193	1.069	0.885	0.705	0.512	0.367
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
350 355	2.437 2.462	2.131 2.160	1.813	1.511	1.416	1.279	1.070	0.863	0.629 0.645	0.418
355	2.488	2.160	1.843	1.540	1.444	1.305	1.093	0.882	0.645	0.425
365	2.514	2.218	1.902	1.598	1.471	1.357	1.110	0.902	0.677	0.431
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 2.140	1.801	1.694	1.540	1.301	1.060	0.790 0.806	0.483
405 410	2.869	2.448	2.140	1.829	1.722	1.567	1.324	1.080	0.806	0.489
415	2.920	2.506	2.200	1.887	1.778	1.619	1.347	1.119	0.822	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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Pol Ryg-



		Ta	ible 33 Rect	tangular Hol	low Section	n Beam 45 n	ninutes			
		R€	quired Thic	kness (mm)	tor a Desig	n Temperat I	ure (°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	0.20
55	0.882	0.688	0.560	0.481	0.452	0.284	0.205	0.205	0.205	0.20
60	0.966	0.751	0.607	0.504	0.475	0.326	0.224	0.205	0.205	0.20
65	1.051	0.814	0.654	0.528	0.497	0.369	0.255	0.205	0.205	0.20
70	1.135	0.877	0.700	0.569	0.519	0.411	0.286	0.205	0.205	0.20
75	1.220	0.940	0.747	0.610	0.553	0.454	0.317	0.214	0.205	0.20
80	1.304	1.003	0.793	0.651	0.593	0.497	0.348	0.236	0.205	0.20
85	1.389	1.066	0.840	0.691	0.632	0.538	0.379	0.259	0.205	0.20
90	1.473	1.129	0.886	0.732	0.671	0.575	0.410	0.281	0.205	0.20
95 100	1.558	1.192	0.933	0.773	0.711	0.613	0.441	0.304	0.210	0.20
			0.0.0	0.02.	011.00	0.000		0.000	0.229	
105	1.727	1.318	1.026	0.855	0.790	0.688	0.503	0.348	0.248	0.20
110	1.811	1.381	1.072	0.896	0.829	0.725	0.535	0.371	0.267	0.20
115	1.896	1.444	1.119	0.937	0.869	0.763	0.570	0.393	0.286	0.20
120 125	1.980	1.507 1.570	1.166	0.978	0.908	0.800	0.605	0.416	0.304	0.20
	2.017			1.019		0.838	0.640		0.323	0.20
130 135	2.038	1.633 1.697	1.259	1.060	0.987	0.876	0.675	0.461	0.342	0.22
	2.058		1.305	1.101	1.026		0.710			0.24
140	2.079	1.760	1.352	1.142	1.066	0.951	0.745	0.506	0.380	0.26
145 150	2.099	1.823	1.398	1.183	1.105 1.145	0.988 1.026	0.780 0.814	0.529	0.398	0.28
	2.119	1.886						0.561		
155			1.491	1.264	1.184	1.063	0.849		0.436	0.32
160	2.160	2.005	1.538	1.305	1.224	1.101	0.884	0.625	0.455	0.34
165	2.181	2.026	1.584	1.346	1.263	1.138	0.919	0.657	0.474	0.36
170	2.201	2.048	1.631	1.387	1.303	1.176	0.954	0.689	0.492	0.37
175	2.222	2.069	1.677	1.428	1.342	1.213	0.989	0.721	0.511	0.39
180	2.242	2.090	1.724	1.469	1.381	1.251	1.024	0.753	0.532	0.41
185	2.263	2.111	1.771	1.510	1.421	1.288	1.059	0.785	0.561	0.43
190	2.283	2.133	1.817	1.551	1.460	1.326	1.094	0.817	0.590	0.45
195	2.303	2.154	1.864	1.592	1.500	1.363	1.128	0.849	0.620	0.47
200	2.324	2.175	1.910	1.633	1.539	1.401	1.163	0.881	0.649	0.49
205	2.344	2.196	1.957	1.674	1.579	1.439	1.198	0.914	0.679	0.51
210	2.365	2.217	2.003	1.715	1.618	1.476	1.233	0.946	0.708	0.53
215 220	2.385	2.239	2.028	1.755 1.796	1.658	1.514	1.268	0.978 1.010	0.737 0.767	0.55
		2.260	2.054							0.57
225	2.426	2.281	2.079	1.837	1.736	1.589	1.338	1.042	0.796	0.60
230 235	2.447	2.302	2.104	1.878	1.776 1.815	1.626	1.373	1.074	0.826 0.855	0.62
235	2.467	2.323	2.130	1.919		1.664	1.408	1.106	0.884	0.64
240	2.487	2.345 2.366	2.155 2.181	2.001	1.855 1.894	1.701	1.442	1.138	0.884	0.67
250	2.528	2.387	2.206	2.001	1.934	1.776	1.512	1.202	0.914	0.09
250	2.528	2.408	2.232	2.029	1.934	1.814	1.512	1.202	0.943	0.71
			2.252				210 11		0.0.2	
260 265	2.588	2.429 2.451	2.283	2.084	2.010	1.851	1.582 1.617	1.266	1.002	0.76
270	2.734	2.472	2.308	2.112	2.058	1.927	1.652	1.331	1.061	0.78
275	2.807	2.493	2.333		2.095	1.964	1.687		1.090	0.81
2/5	2.807	2.493	2.333	2.167 2.194	2.095	2.002	1.687	1.363	1.090	0.83
285	2.954	2.535	2.384	2.222	2.152	2.002	1.756	1.427	1.119	0.88
290	3.027	2.557	2.410	2.250	2.132	2.060	1.791	1.459	1.149	0.90
295	3.100	2.618	2.435	2.277	2.209	2.089	1.826	1.491	1.207	0.92
300	3.173	2.693	2.461	2.305	2.238	2.118	1.861	1.523	1.237	0.94
305	3.246	2.768	2.486	2.332	2.266	2.147	1.896	1.555	1.266	0.97
310	3.320	2.843	2.512	2.360	2.295	2.176	1.931	1.587	1.296	0.99
315	3.393	2.919	2.537	2.388	2.323	2.205	1.966	1.619	1.325	1.01
320	3.466	2.994	2.563	2.415	2.352	2.234	2.001	1.651	1.354	1.04
325	3.539	3.069	2.634	2.443	2.380	2.263	2.030	1.683	1.384	1.06
330	3.612	3.144	2.704	2.470	2.409	2.292	2.060	1.716	1.413	1.08
335	3.686	3.219	2.775	2.498	2.437	2.321	2.089	1.748	1.443	1.11
340	3.759	3.294	2.845	2.526	2.466	2.350	2.119	1.780	1.472	1.13
345	3.833	3.369	2.916	2.553	2.494	2.379	2.149	1.812	1.501	1.15
350	3.918	3.444	2.986	2.607	2.523	2.408	2.178	1.844	1.531	1.18
355	4.003	3.519	3.057	2.672	2.551	2.438	2.208	1.876	1.560	1.20
360	4.088	3.594	3.127	2.738	2.601	2.467	2.237	1.908	1.589	1.22
365	4.174	3.669	3.198	2.803	2.664	2.496	2.267	1.940	1.619	1.25
370	-	3.744	3.268	2.869	2.727	2.525	2.296	1.972	1.648	1.27
375	-	3.819	3.339	2.934	2.790	2.554	2.326	2.004	1.678	1.29
380	-	3.894	3.409	3.000	2.853	2.605	2.355	2.036	1.707	1.31
385	-	3.969	3.480	3.065	2.916	2.666	2.385	2.068	1.736	1.34
	-	4.044	3.550	3.131	2.979	2.727	2.414	2.101	1.766	1.36
390	-	4.119	3.620	3.196	3.042	2.787	2.444	2.133	1.795	1.38
		4.194	3.691	3.261	3.104	2.848	2.474	2.165	1.825	1.41
390	-									
390 395	-	-	3.761	3.327	3.167	2.909	2.503	2.197	1.854	1.43
390 395 400	-	-		3.327 3.392	3.167 3.230	2.909 2.969	2.503 2.533	2.197 2.229	1.854 1.883	1.43
390 395 400 405	-	-	3.761 3.832 3.902							
390 395 400 405 410	-		3.761 3.832	3.392	3.230	2.969	2.533	2.229	1.883	1.45

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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Pol Ryg-

CERTIFICATE No CF 5627 NATIONAL FIRE FIGHTING MFG CO

					llow Section					
			quired Triic	Kiless (IIIII)	TOT a Desig	Temperat	ure (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 25	0.473	0.423	0.385	0.355 0.397	0.344	0.332	0.332	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	0.433	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 70	1.717 1.861	1.362	1.096	0.893	0.826	0.735 0.795	0.599	0.420	0.223	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
105 110	2.139 2.162	2.054 2.075	1.840 1.933	1.492 1.567	1.374	1.215 1.275	0.981 1.028	0.813 0.857	0.623	0.310 0.356
115	2.185	2.075	2.007	1.642	1.511	1.335	1.028	0.901	0.705	0.401
120	2.185	2.096	2.007	1.717	1.511	1.335	1.124	0.901	0.705	0.446
125	2.231	2.117	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
155 160	2.368	2.264	2.172 2.192	2.069	2.020	1.815 1.875	1.457	1.252	1.032	0.710 0.745
165	2.413	2.286	2.192	2.090	2.042	1.875	1.505	1.340	1.114	0.745
170	2.413	2.307	2.213	2.111	2.085	1.935	1.600	1.340	1.114	0.780
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
205 210	2.816	2.475	2.377	2.278	2.235	2.157	1.934	1.691	1.440	1.060
210	3.160	2.496	2.398	2.299	2.256	2.180	2.018	1.735 1.779	1.481	1.095
220	3.332	2.538	2.418	2.341	2.278	2.225	2.018	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
255 260	4.208	3.393 3.534	2.672 2.782	2.488	2.449	2.383	2.233 2.260	2.085 2.114	1.849 1.890	1.410
265	4.300	3.675	2.782	2.529	2.471	2.429	2.287	2.114	1.931	1.443
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
300 305	5.038 5.130	4.379 4.472	3.659 3.769	3.024 3.108	2.849	2.662	2.476	2.343	2.167 2.199	1.725 1.761
305	5.222	4.472	3.769	3.108	3.002	2.754	2.530	2.400	2.199	1.761
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
345 350	-	-	-	3.786	3.538	3.485 3.576	3.048	2.663	2.450	2.038
350		<u> </u>		3.882	3.615	3.576	3.132	2.738	2.482	2.070
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
265			1 -	-	-	-	3.886 3.970	3.411	2.976	2.359
395	-	-								
400		-	-	-	-	-		3.485	3.040	
400 405	-	-	-	-	-	-	4.054 4.138	3.485 3.560 3.635	3.040 3.105 3.169	2.423
400	-	-	-	-	-	-	4.054	3.560	3.105	
400 405 410		-	-	-	-	-	4.054	3.560 3.635	3.105 3.169	2.423 2.456

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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Pol Ryg-



		Ta Re	able 35 Reci	tangular Hol kness (mm)	low Section for a Design	Beam 75 n Temperat	ninutes ure (°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 25	0.600	0.497	0.450 0.516	0.412	0.399	0.381	0.352	0.320 0.356	0.252	0.205
30	1.011	0.801	0.644	0.469	0.433	0.430	0.436	0.392	0.320	0.205
35	1.011	0.801	0.786	0.523	0.594	0.529	0.438	0.392	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
125 130	3.759 3.863	3.026	2.209	2.140 2.161	2.112 2.133	2.068	1.927 2.004	1.578 1.647	1.260	0.921 0.965
130	3.863	3.112	2.231	2.161	2.133	2.089	2.004	1.647	1.316	1.009
135	4.022	3.198	2.253	2.182	2.154	2.110	2.025	1.716	1.373	1.009
145	4.022	3.284	2.275	2.224	2.175	2.131	2.046	1.785	1.430	1.052
145	4.101	3.456	2.297	2.224	2.196	2.172	2.088	1.854	1.487	1.140
155	4.161	3.542	2.341	2.246	2.217	2.172	2.109	1.923	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 4.017	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
250	-	5.073	4.123	3.394	3.081	2.717	2.510	2.421	2.300	2.013
255	-	5.153	4.232	3.559	3.226	2.717	2.531	2.443	2.325	2.015
260	-	5.232	4.448	3.725	3.371	2.963	2.552	2.445	2.350	2.046
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
335 340	-	-	-	-	-	-	3.964	3.319	3.188	2.608
340 345	-	-	-	-	-	-	4.104	3.390 3.461	3.284 3.380	2.694 2.779
	-	-	-	-	-	-	-			
350 355	-	-	-	-	-	-	-	3.532 3.604	3.476 3.572	2.864 2.950
355	-	-		-	-	-	-	3.675	3.668	3.035
365	-	-	-	 	-	-	-	3.675	3.568	3.035
370	-	1		 			-	3.764	3.764	3.120
370	-	-	-	 	-	-	-	3.861	3.861	3.205
375	-			-	- 1	-		4.116	4.053	3.376
385				<u> </u>				110	4.149	3.461
390	-	-	-	-	-	-	-	-	4.143	3.546
395	-	-	-	-	-	-	-	-	-	3.632
400	-	-	-	-	-	-	-	-	-	3.717
405	-	-		-	-	-	-	-	-	3.802
410	-	-	-	-	-	-	-	-	-	3.887
415	-	-	-	-	-	-	-	-	-	3.973
420	-	-	-	-	-	-	-	-	-	4.058
								l	_	4.143
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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Pol Ryg-



					llow Section					
		I KE	equirea i nic	kness (mm)	Tor a Design	n remperat	ure (°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 1.297	0.964	0.786	0.614	0.482
55 60	2.672 2.848	2.069 2.116	1.837 2.017	1.540	1.438	1.437	1.084	0.887	0.700 0.785	0.510
	3.025	2.116	2.017	1.704	1.745	1.437	1.325	1.090	0.785	0.551 0.611
65 70	3.025	2.163	2.125	2.016	1.745	1.717	1.325	1.192	0.870	0.611
75	3.201	2.233	2.233	2.016	2.009	1.717	1.565	1.192	1.041	0.671
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	2.052	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
255 260	-	-	-	5.346 5.453	4.970 5.084	4.329 4.471	3.524 3.681	2.879 2.996	2.542	2.404
260	-	-	-	5.453	5.084			3.113	2.568	2.431
	-	-	-	-		4.613 4.755	3.838		2.653	2.458
270 275	-		-		5.312 5.426	4.755 4.897	3.992 4.146	3.231 3.348	2.738 2.822	2.485 2.513
2/5	-	-	-	-	5.426	5.039		3.348	1 2.822	
280	-	H :	1 - 1				4 200	2 166		
290					-		4.300	3.466	2.907	2.540
		-	-	-	-	5.181	4.454	3.583	2.907 2.992	2.540 2.584
295	-	-	-	-	-				2.907	2.540
295 300	-	-	-	-	-	5.181 5.322	4.454 4.608	3.583 3.700 3.818	2.907 2.992 3.077 3.162	2.540 2.584 2.706
	-	-	-	-	-	5.181 5.322	4.454 4.608 4.762	3.583 3.700	2.907 2.992 3.077	2.540 2.584 2.706 2.827
300	-	-	-	-	-	5.181 5.322	4.454 4.608 4.762 4.916 5.070	3.583 3.700 3.818 3.983 4.152	2.907 2.992 3.077 3.162 3.247 3.332	2.540 2.584 2.706 2.827 2.949 3.071
300 305	-		-	-	-	5.181 5.322	4.454 4.608 4.762 4.916 5.070 5.224	3.583 3.700 3.818 3.983	2.907 2.992 3.077 3.162 3.247 3.332 3.416	2.540 2.584 2.706 2.827 2.949 3.071 3.193
300 305 310	-	-	-		-	5.181 5.322 5.464 -	4.454 4.608 4.762 4.916 5.070	3.583 3.700 3.818 3.983 4.152 4.322	2.907 2.992 3.077 3.162 3.247 3.332	2.540 2.584 2.706 2.827 2.949 3.071
300 305 310 315 320	-	-	-		-	5.181 5.322 5.464 - -	4.454 4.608 4.762 4.916 5.070 5.224	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436
300 305 310 315	-	-	-		-	5.181 5.322 5.464 - -	4.454 4.608 4.762 4.916 5.070 5.224	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558
300 305 310 315 320 325	-	-	-		- - - - -	5.181 5.322 5.464 - -	4.454 4.608 4.762 4.916 5.070 5.224	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436
300 305 310 315 320 325 330			-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679
300 305 310 315 320 325 330 335			-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801
300 305 310 315 320 325 330 335 340			-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923
300 305 310 315 320 325 330 335 340 345 350 355	-	-	-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350	-	-	-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 340 345 350 350 365	-	-	-		-	5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350 355 360						5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350 355 360 365 370						5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 225 330 335 340 345 350 355 360 365 370 375						5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350 365 370 375 380		-		-		5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385		-		-		5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 311 315 320 325 330 335 340 345 350 355 360 365 370 370 375 380 385 390		-		-		5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 331 345 350 360 365 370 370 375 380 385 390 395		-		-		5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 340 345 350 365 370 375 380 385 380 395 400 405		-		-		5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 345 350 355 360 370 375 380 385 390 395 400 400		-				5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 311 315 320 325 330 335 340 345 350 355 360 370 375 380 385 390 405 410						5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.322 4.491 4.661 4.830 5.000	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045
300 305 310 315 320 325 330 335 345 350 355 360 370 375 380 385 390 395 400 400		-				5.181 5.322 5.464 	4.454 4.608 4.762 4.916 5.070 5.224 5.378	3.583 3.700 3.818 3.983 4.152 4.491 4.661 4.860 	2.907 2.992 3.077 3.162 3.247 3.332 3.416 3.501 3.586 3.671 3.756 3.858 4.056	2.540 2.584 2.706 2.827 2.949 3.071 3.193 3.314 3.436 3.558 3.679 3.801 3.923 4.045

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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Pol Ryg-



		Та	ble 37 Recta	angular Hol	low Section	Beam 105 r	minutes			
	ı	R€	equired Thic	kness (mm)	for a Desig	n Temperati	ure (°C)	1		
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 45	2.600 2.830	2.202	1.784 2.017	1.365	1.277	1.153	0.967 1.125	0.791 0.926	0.624	0.487
45 50	3.060	2.385	2.017	1.574	1.474	1.335	1.125	1.061	0.739	0.526
55	3.290	2.749	2.157	1.992	1.869	1.698	1.440	1.196	0.855	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 3.056	2.704	2.126	2.069	1.996	1.462
105 110	5.306 5.499	4.367	3.849	3.254	3.056	2.800	2.148	2.091	2.023	1.547
115	3.499	4.498	4.076	3.506	3.169	2.895	2.171	2.113	2.045	1.717
120	-	4.630	4.076	3.632	3.282	3.087	2.194	2.135	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
170 175	-	-	5.328 5.442	4.821 4.939	4.572 4.693	4.120 4.249	2.444 2.467	2.379	2.309 2.331	2.186 2.210
180			3.442	5.057	4.813	4.249	2.490	2.401	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
230 235	-	-	-	-	-	-	4.733 4.893	3.253 3.438	2.625 2.750	2.475 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
285 290	-	-		-	-		-	5.343	4.137 4.361	3.216 3.305
290	H :-	H :-		-	H :-		-	H :	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	-	-	-	-	-	-	-	-	-	-
340	-	<u> </u>	-	-	-	<u> </u>	-	-		-
350	-	-	-	-	-	-	-	-	-	
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-	-
375	-	-	-	-	-	-	-	-	-	-
380	-	-	-	-	-	-	-	-	-	-
385	-	-	-	-	-	-	-	-	-	-
390	-	-	-	-	-	-	-	-	-	-
395 400	-	-	-	-	-	-	-	-	-	
405	-	Li-		-	-		-	-		
410	-	-	-	-	-	-	-	-	-	-
415	-	-	-	-	-	-	-	-	-	-
420	-	-	-	-	-	-	-	-	-	-
425	-	-	-	-	-	-	-	-	-	-
mascant	only	Paci	ılte ar	holy to	holle	NW 60	ction	haam	e with	3 cic

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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Pol agg-



					low Section for a Design					
	ı	K	equirea i nic	kness (mm)	for a Design	n remperat	ure ('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 50	3.329	2.832	2.444	2.072	2.003	1.719 1.952	1.425	1.188	0.966	0.710
55	3.613	3.062	2.635	2.166	2.064		1.621	1.356	1.110	0.820
	3.912	3.292	2.826 3.018	2.260	2.125 2.246	2.109 2.246	1.817 2.008	1.524	1.254	0.930 1.041
60	4.262	3.522								
65 70	4.612 4.961	3.752 4.003	3.209 3.401	2.448 2.541	2.383 2.520	2.383 2.520	2.117	1.861 2.015	1.541 1.684	1.151
75	5.311	4.003	3.401	2.746	2.656	2.656	2.334	2.015	1.828	1.372
80	5.511	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	2.793	2.793	2.443	2.162	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	-	5.507	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	-	-	4.779	4.047	3.958	3.614	3.096	2.681	2.112	2.003
115	-		5.178	4.203	4.099	3.751	3.205	2.764	2.159	2.057
120	⊢÷-		5.178	4.513	4.099	3.751	3.314	2.764	2.159	2.057
125	-	-	3.370	4.669	4.380	4.029	3.423	2.931	2.205	2.105
130	⊢÷-			4.824	4.521	4.029	3.423	3.014	2.228	2.105
135	<u> </u>			4.979	4.662	4.109	3.641	3.097	2.251	2.129
140				5.135	4.803	4.449	3.749	3.180	2.251	2.153
145	-			5.290	4.803	4.449	3.871	3.264	2.297	2.201
150				5.445	5.084	4.728	4.024	3.347	2.320	2.225
155	-	-		5.445	5.225	4.728	4.024	3.430	2.343	2.249
160					5.366	5.008	4.330	3.513	2.345	2.249
165	-			-	3.300	5.148	4.483	3.596	2.389	2.273
170					-	5.288	4.636	3.680	2.413	2.321
175	-		-	-	-	5.428	4.789	3.763	2.415	2.345
180					-	3.420	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		_	_	_	-	-	3.401	4.613	2.551	2.441
205								4.799	2.655	2.489
210	-	-	-	-	-	-	-	4.799	2.832	2.469
215	-		-		-	-	-	5.171	3.009	2.537
220			_		_			5.357	3.186	2.561
			_		_	_	-	3.337		
225	-							_	3 364	2 683
225	-	-	-	-	-	-	-	-	3.364	2.683
230	-	-	-	-	-	-	-	-	3.541	2.810
230 235	-	-	-	-	-	-	-	-	3.541 3.718	2.810 2.936
230 235 240	-	-	-	-	-	-	-	-	3.541 3.718 3.976	2.810 2.936 3.063
230 235	-	-	-	-	-	-	-	-	3.541 3.718	2.810 2.936
230 235 240 245 250	-	-	-						3.541 3.718 3.976 4.366 4.755	2.810 2.936 3.063 3.190 3.316
230 235 240 245 250 255	-	-	-	-	- - -	-	-	-	3.541 3.718 3.976 4.366	2.810 2.936 3.063 3.190 3.316 3.443
230 235 240 245 250	-		-						3.541 3.718 3.976 4.366 4.755	2.810 2.936 3.063 3.190 3.316
230 235 240 245 250 255 260	-	-	-		-	-	-	-	3.541 3.718 3.976 4.366 4.755	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696
230 235 240 245 250 255 260 265		-	-		-	-	-	-	3.541 3.718 3.976 4.366 4.755	2.810 2.936 3.063 3.190 3.316 3.443 3.570
230 235 240 245 250 255 260 265 270		-	-		-	-	-	-	3.541 3.718 3.976 4.366 4.755	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823
230 235 240 245 250 255 260 265 270 275 280 285		-		-	-				3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915
230 235 240 245 250 255 260 265 270 275 280	-				-				3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548
230 235 240 245 250 255 260 265 270 275 280 285 290	-				-				3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915
230 235 240 245 250 255 260 265 270 275 280 285 290 295	-			-	-	-			3.541 3.718 3.976 4.366 4.755 5.145 	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915
230 235 240 245 250 255 260 265 270 275 280 285 290 295 300						-			3.541 3.718 3.976 4.366 4.755 5.145 	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310				-	-		-	-	3.541 3.718 3.976 4.366 4.755 5.145 	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915 5.282
230 235 240 245 255 260 255 265 270 275 280 285 295 295 300 305 315						-			3.541 3.718 3.976 4.366 4.755 5.145 	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915 5.282
230 235 240 245 255 255 260 265 277 280 285 290 295 300 300 305 310				-	-		-	-	3.541 3.718 3.976 4.366 4.755 5.145 	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 300 305 3115 320 325					-		-		3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 300 305 310 315 320 330			-				-		3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 311 312 325 330					-		-		3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 3.823 4.180 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 300 305 310 315 320 330 333			-		-		-		3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 4.180 4.548 4.915 5.282
230 235 240 245 255 255 260 265 277 280 285 290 290 305 310 311 320 325 330 335 345									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.823 4.180 4.548 4.915 5.282
230 235 240 245 246 250 255 260 265 270 275 280 285 290 300 305 310 315 320 325 330 335 340 345			-		-		-		3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.696 4.180 4.548 4.915 5.282
230 235 240 245 255 255 266 277 280 285 290 300 305 315 320 325 330 335 345 355									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.823 4.180 4.548 4.915 5.282
230 235 240 245 250 255 260 255 270 280 285 290 295 300 305 310 315 320 335 340 345 350 356									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.588 4.588 4.915 5.282
230 235 240 245 255 250 255 260 265 270 275 280 285 290 300 310 310 310 325 330 330 335 340 345 355 366									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 3.823 4.180 4.548 4.915 5.282
230 235 240 245 250 255 250 265 270 285 287 280 290 295 300 305 3110 315 320 325 330 345 340 345 350 366 370									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.588 4.180 5.282
230 235 240 245 250 255 260 265 270 275 280 285 290 300 310 315 320 325 330 331 335 340 345 355 366 375									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 245 255 250 255 260 265 277 280 285 290 305 310 315 320 325 330 335 345 355 360 365 370 375									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 240 245 250 255 260 265 270 275 285 290 305 310 315 320 325 330 335 340 345 350 365 375 386									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 240 245 250 255 260 265 277 280 285 290 300 305 310 315 320 325 340 345 350 355 360 370 375 380 385									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 240 245 250 255 260 265 270 275 280 285 290 305 310 310 3115 320 325 330 335 330 345 330 345 350 365 375 380 375 380 385 390									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 255 250 255 260 265 270 275 280 285 290 300 310 310 310 320 325 330 335 340 345 355 366 375 380 385 390 395									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 240 245 250 255 250 265 270 288 289 290 295 300 305 311 311 320 325 330 335 340 345 350 360 365 370 375 380 385 380 385 380 385									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.582 4.180 4.548 4.915 5.282
230 235 240 245 255 250 255 260 265 270 275 280 285 290 300 310 310 315 320 325 330 330 335 340 345 355 365 370 375 380 385 380 385 380 385 380 385 380 385 380 385 385 385 385 385 385 385 385 385 385									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.588 4.180 5.282
230 235 240 245 240 245 250 255 260 265 277 280 285 290 300 305 3110 315 320 325 330 335 340 345 350 360 365 377 375 380 385 390 395 390 405									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.588 4.180 5.282
230 235 240 245 255 250 255 260 265 270 275 280 285 290 300 310 310 315 320 325 330 330 335 340 345 355 365 370 375 380 385 380 385 380 385 380 385 380 385 380 385 385 385 385 385 385 385 385 385 385									3.541 3.718 3.976 4.366 4.755 5.145	2.810 2.936 3.063 3.190 3.316 3.443 3.570 4.588 4.588 4.915 5.282

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 5627 NATIONAL FIRE FIGHTING MFG CO

Table 39 Rectangular Hollow Section Beam 150 minutes Required Thickness (mm) for a Design Temperature ("C)										
		Re	quirea Inic	kness (mm)	for a Design	1 emperat	ure (°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 40	5.330 5.330	3.449 3.895	2.708 2.995	2.408 2.662	2.294 2.535	2.131 2.347	1.779 2.050	1.380 1.651	1.046 1.248	0.792 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	-	J.232	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
120 125	-	-	-	-	-	-	-	4.617 4.934	3.557 3.721	3.557 3.721
130	-	-	-	-	-	-	-	4.934 5.251	3.721 3.879	3.721
130	-	-						5.251	4.027	4.027
140	-			-	-	-	-		4.027	4.027
145	-	-	-	-	-			-	4.454	4.173
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	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-		-	-	-	-
225	-	-	-		-	-		-		-
230				-	-					-
235	-	-	-	-	-	-	-	-	-	-
240	-	-	-		-	-	-	-	-	-
245	-	-	-	-	-	-	-	-	-	-
250	-	-	-		-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-	-
280 285	-	-	-	-	-	-	-	-	-	-
290	-	-		-			-	-		-
290	-	-			-		-	-		-
300	-	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-	-
315	-	-	-		-		-	-	-	-
320	-	-	-	-	-	-	-	-	-	-
325	-	-	-		-		-	-	-	-
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355 360	-	-		-	-	-	-	-		-
360	-	-	-	-	-	-	-	-	-	-
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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