



European Technical Assessment

ETA 15/0811
of 04.12.2015



General part

Trade name of the construction product	Knauf Firepaint Steel
Product family to which the construction product belongs	Reactive coatings for fire protection of steel elements
Manufacturer	KNAUF SIA Daugavas str. 4 LV-2118 Sauriesi Latvia
Manufacturing plant(s)	According to Annex N kept by ITeC
This European Technical Assessment contains	39 pages including 1 Annex which forms an integral part of this assessment and Annex N, which contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	ETAG 018, Part 1 edition April 2013 and Part 2 edition November 2011, used as European Assessment Document (EAD)

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es)).

Specific parts of the European Technical Assessment

1 Technical description of the product

Knauf Firepaint Steel is a spray-applied or, for small areas, brush-applied solvent based reactive coating.

The reactive coating systems for fire protection consist of the primer, the intumescent coating and, depending on the environmental use category, the topcoat where appropriate (see section 2).

All the systems shown in Table 1 have been assessed in this ETA under option 3, as described in the foreword of ETAG 018 Part 2.

Table 1: Components of the reactive coating system.

Primer	Reactive coating	Topcoat
Two component epoxy, e.g: Knauf Firepaint primer K2 * Knauf Firepaint primer K3 *	Knauf Firepaint Steel	Knauf Firepaint finish
Short/medium oil alkyd, e.g: Knauf Firepaint primer K4 *		
* solvent borne		

2 Specification of the intended use(s) in accordance with the applicable EAD

Knauf Firepaint Steel is used as reactive coating systems to fire protect beams and columns made of structural steel, as described in section 3.2.5, to achieve a fire resistance duration in accordance with EN 13501-2¹.

Knauf Firepaint Steel is intended to fire protect various sizes of open sections (H and I) and rectangular and circular hollow sections for up to a fire resistance classification in accordance with Annex 1, in the design temperatures range of 350 °C to 750 °C. The detailed field of application regarding fire protection of Knauf Firepaint Steel is given in Annex 1.

Regarding the environmental conditions, the reactive coating systems are intended for the following uses:

- Knauf Firepaint Steel systems with a topcoat as defined in Table 1: use category Type X.
- Knauf Firepaint Steel systems without topcoat: use category Type Y.

The environmental use categories are specified in ETAG 018 Part 2, section 2.2.2:

- Type X: external use (including all other Types)
- Type Y: internal use and semi-exposed conditions (including Type Z₁ and Type Z₂)
- Type Z₁: internal use with high humidity conditions (including Type Z₂)
- Type Z₂: internal use

The provisions made in this ETA are based on a working life of the reactive coating Knauf Firepaint Steel for fire protection of at least 10 years, provided that the conditions laid down in the manufacturer's instructions for the installation, use and maintenance are met. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and reference to the methods used for its assessment

3.1 Performance of the product

The assessment of Knauf Firepaint Steel for the intended use considering the basic requirements for construction works 2 and 3 was performed following the ETAG 018 for *Fire Protective Products, Part 1: General (April 2013) and Part 2: Reactive coatings for fire protection of steel elements (November 2011)*, used as EAD.

Table 2: Performance of the product.

Product: Knauf Firepaint Steel		Intended use: Fire protection of structural steel members	
Basic requirement	Essential characteristic	Performance	
BWR 2 Safety in case of fire	Reaction to fire	D-s2,d0	
	Resistance to fire	See Annex 1	
	Smouldering fire exposure	Compliance with EN 13381-8	
BWR 3 Hygiene, health and the environment	Release of dangerous substances	No dangerous substances (see 3.2.4)	
General aspects relating to the performance of the product	Durability	with topcoat acc. to Table 1	Type X
		without topcoat	Type Y

3.2 Methods used for the assessment

3.2.1 Reaction to fire

The performance of the reactive coating system, including all components listed in Table 1, has been determined according to EN 13501-1². The given Class applies to reactive coating systems on substrates of structural carbon steel.

¹ EN 13501-2:2007+A1:2009. *Fire classification of construction products and building elements Part 2: Classification using data from fire resistance tests, excluding ventilation services implemented.*

² EN 13501-1: 2007+A1:2009. *Fire classification of construction products and building elements. Part 1: Classification using data from reaction to fire tests implemented.*

3.2.2 Fire resistance

Reactive coating system has been tested and assessed according to EN 13381-8³, and the fire resistance classification defined according to EN 13501-2 as given in Annex 1.

3.2.3 Smouldering fire exposure

The verification under exposure to the smouldering fire curve according to EN 13381-8, Annex A, has been carried out and the product meets the requirements established in EN 13381-8.

3.2.4 Release of dangerous substances

According to the manufacturer's declaration, the specification of Knauf Firepaint Steel has been compared with the *Indicative list of regulated dangerous substances possibly associated with construction products under the CPD, DS 041/051 Rev.12, 22 March 2012* of the EC Experts Group, with Annex XVII and Annex XIV of REACH and with the ECHA *Candidate List of Substances of Very High Concern* to verify that the product does not contain such substances.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the product falling within its scope. In order to meet the provisions of the EU Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.2.5 General aspects relating to the performance of the product

Compatibility of primers with the reactive coating has been assessed in accordance with ETAG 018, Part 2, section 5.7.2.2, in relation with the type of steel substrate.

Table 3: Assessed types of structural steel and compatible primers.

Structural steel substrate	Primers
Carbon steel blast cleaned to ISO 8501-1 Sa 2 ½ or equivalent	See Table 1*
Galvanised steel according to EN ISO 1461 ⁴ , 140 µm zinc coating	
Thermally sprayed aluminium (TSA) steel, 250 µm aluminium coating	Knauf Firepaint primer K2
Thermally sprayed zinc (TSZ) steel, 100 µm zinc coating	

* Or other primers of the same families, as specified by the manufacturer, proven to be compatible in accordance with ETAG 018, Part 2.

The topcoat indicated in Table 1 is compatible with the reactive coating and intended for the environmental use category Type X, as well as the reactive coating system without topcoat is intended for use category Type Y, in accordance with ETAG 018, Part 2, section 5.7.2.2.

The ETA is issued for the system on the basis of agreed data/information, deposited with the ITeC, which confirm, according to ETAG 018 Part 2, section 5.7.3, that the products under assessment conform to their declared characteristics.

³ EN 13381-8:2010. *Test methods for determining the contribution to the fire resistance of structural members. Part 8: Applied reactive protection to steel members.*

⁴ EN ISO 1461:2009. *Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.*

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to the decision 1999/454/EC⁵ of the European Commission, the system of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 4: AVCP System.

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire protective products (including coatings)	For fire compartmentation and/or fire protection or fire performance	Any	1

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC⁶ and the factory production control shall be in accordance with it. The following table specifies properties that should be controlled and minimum frequencies of control.

Table 5: FPC test plan for Knauf Firepaint Steel.

Property	Minimum frequency
Incoming material	Every delivery
Fineness of grinding	Every batch
Specific gravity	Every batch
Sag resistance	Every batch
Viscosity	Every batch
Drying	Every batch
Non-volatile content	Every batch
Char depth	Every batch
Insulating efficiency	Every batch

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⁵ Official Journal of the European Communities N° L178, 14.7.1999, p. 52.

⁶ The *Control Plan* is a confidential part of the ETA and only handed over to the notified product certification body involved in the assessment and verification of constancy of performance.

ANNEX 1. Resistance to fire performance

1. This Annex relates to the use of Knauf Firepaint Steel for the fire protection of:

- open sections ('H' and 'I' shaped) steel beams (see Tables A1.1 to A1.7),
- open sections ('H' and 'I' shaped) steel columns (see Tables A1.8 to A1.15),
- circular hollow steel columns (see Tables A1.16 to A1.23).
- rectangular hollow steel columns (see Tables A1.24 to A1.32).

The precise scope is given in the tables which specify the dry film thickness of intumescent coating (without primer and topcoat) required to achieve the classification R for various design temperatures and section factors.

2. The product is assessed on the basis of:

- Testing in accordance with EN 13381-8 and ETAG 018, Part 1 and 2.
- Design of the dry film thickness of intumescent coating for the fire protection of open sections in accordance with Annex E.2 of EN 13381-8.
- Design of the dry film thickness of intumescent coating for the fire protection of hollow sections in accordance with Annex E.5 of EN 13381-8.

3. The data presented in this Annex for beams refer to a three-sided fire exposure and for columns to a four-sided fire exposure.

In case of beams or columns with fewer sides exposed to fire, dry film thickness (DFT) of Knauf Firepaint Steel can be applied, according to the relevant table in this Annex, under consideration of the section factor obtained for the particular case of exposed sides.

4. Dry film thickness (DFT) of Knauf Firepaint Steel for 4-sided open beams can be applied according to the Tables A1.8 to A.1.15 (H- or I-Section Columns), up to the maximum DFT permitted for the appropriate tested loaded beam, i.e. up to a maximum DFT of 4,059 mm.

Dry film thickness (DFT) of Knauf Firepaint Steel for 4-sided circular hollow beams can be applied according to the Tables A1.16 to A.1.23 (Circular hollow section Columns), up to the maximum DFT permitted for the appropriate tested loaded beam, i.e. up to a maximum DFT of 4,181 mm.

Dry film thickness (DFT) of Knauf Firepaint Steel for 4-sided rectangular hollow beams can be applied according to the Tables A1.24 to A.1.32 (Rectangular hollow section Columns), up to the maximum DFT permitted for the appropriate tested loaded beam, i.e. up to a maximum DFT of 4,919 mm.

5. The data presented in this Annex are applicable to structural steel grades (S designation) in accordance with EN 10025⁷, excluding S185.

6. The data are applicable to assemblies with or without topcoat.

7. The thicknesses given for open H- and I-sections also apply to steel sections of other shapes, e.g. U, L and T-sections under consideration of the same section factor.

⁷ EN 10025-1 to 6. *Hot rolled products of structural steels.*

Table A1.2: H- or I-Section Beams.

Section Factor	Resistance to fire period of 30 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
58	0,287	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
60	0,299	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
65	0,329	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
70	0,360	0,232	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
75	0,390	0,250	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
80	0,421	0,269	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
85	0,451	0,287	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
90	0,482	0,306	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
95	0,512	0,325	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
100	0,543	0,343	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
105	0,573	0,362	0,239	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
110	0,604	0,380	0,257	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
115	0,634	0,399	0,275	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
120	0,664	0,417	0,294	0,235	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
125	0,695	0,436	0,312	0,253	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
130	0,725	0,454	0,330	0,272	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
135	0,756	0,473	0,349	0,291	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
140	0,786	0,491	0,367	0,309	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
145	0,817	0,510	0,385	0,328	0,227	0,220	0,220	0,220	0,220	0,220	0,220	0,220
150	0,847	0,529	0,404	0,347	0,247	0,220	0,220	0,220	0,220	0,220	0,220	0,220
155	0,878	0,547	0,422	0,365	0,267	0,220	0,220	0,220	0,220	0,220	0,220	0,220
160	0,908	0,566	0,440	0,384	0,288	0,220	0,220	0,220	0,220	0,220	0,220	0,220
165	0,939	0,584	0,459	0,403	0,308	0,220	0,220	0,220	0,220	0,220	0,220	0,220
170	0,968	0,603	0,477	0,421	0,328	0,220	0,220	0,220	0,220	0,220	0,220	0,220
175	0,997	0,621	0,495	0,440	0,348	0,220	0,220	0,220	0,220	0,220	0,220	0,220
180	1,025	0,640	0,514	0,459	0,369	0,220	0,220	0,220	0,220	0,220	0,220	0,220
185	1,054	0,658	0,532	0,477	0,389	0,220	0,220	0,220	0,220	0,220	0,220	0,220
190	1,083	0,677	0,550	0,496	0,409	0,232	0,220	0,220	0,220	0,220	0,220	0,220
195	1,112	0,695	0,569	0,515	0,430	0,257	0,220	0,220	0,220	0,220	0,220	0,220
200	1,141	0,714	0,587	0,533	0,450	0,281	0,220	0,220	0,220	0,220	0,220	0,220
205	1,169	0,732	0,605	0,552	0,470	0,305	0,220	0,220	0,220	0,220	0,220	0,220
210	1,198	0,751	0,624	0,571	0,491	0,329	0,221	0,220	0,220	0,220	0,220	0,220
215	1,227	0,770	0,642	0,589	0,511	0,354	0,248	0,220	0,220	0,220	0,220	0,220
220	1,256	0,788	0,660	0,608	0,531	0,378	0,276	0,220	0,220	0,220	0,220	0,220
225	1,285	0,807	0,679	0,627	0,552	0,402	0,303	0,220	0,220	0,220	0,220	0,220
230	1,313	0,825	0,697	0,645	0,572	0,426	0,330	0,220	0,220	0,220	0,220	0,220
235	1,342	0,844	0,715	0,664	0,592	0,451	0,357	0,220	0,220	0,220	0,220	0,220
240	1,371	0,862	0,734	0,683	0,613	0,475	0,385	0,220	0,220	0,220	0,220	0,220
245	1,400	0,881	0,752	0,701	0,633	0,499	0,412	0,220	0,220	0,220	0,220	0,220
250	1,429	0,899	0,770	0,720	0,653	0,523	0,439	0,229	0,220	0,220	0,220	0,220
255	1,457	0,918	0,789	0,739	0,673	0,548	0,467	0,265	0,220	0,220	0,220	0,220
260	1,486	0,936	0,807	0,758	0,694	0,572	0,494	0,302	0,220	0,220	0,220	0,220
265	1,515	0,960	0,825	0,776	0,714	0,596	0,521	0,338	0,249	0,220	0,220	0,220
270	1,544	0,987	0,844	0,795	0,734	0,620	0,549	0,375	0,287	0,220	0,220	0,220
275	1,573	1,013	0,862	0,814	0,755	0,645	0,576	0,411	0,326	0,220	0,220	0,220
280	1,602	1,040	0,880	0,832	0,775	0,669	0,603	0,447	0,364	0,220	0,220	0,220
285	1,630	1,067	0,899	0,851	0,795	0,693	0,631	0,484	0,402	0,232	0,220	0,220
290	1,659	1,094	0,917	0,870	0,816	0,717	0,658	0,520	0,440	0,277	0,220	0,220
295	1,688	1,121	0,935	0,888	0,836	0,742	0,685	0,556	0,478	0,322	0,220	0,220
300	1,717	1,148	0,955	0,907	0,856	0,766	0,713	0,593	0,517	0,368	0,220	0,220
305	1,746	1,175	0,978	0,926	0,877	0,790	0,740	0,629	0,555	0,413	0,240	0,220
310	1,774	1,202	1,000	0,944	0,897	0,814	0,767	0,666	0,593	0,458	0,294	0,220
315	1,803	1,228	1,022	0,967	0,917	0,839	0,795	0,702	0,631	0,503	0,348	0,220
320	1,832	1,255	1,045	0,989	0,938	0,863	0,822	0,738	0,670	0,549	0,401	0,233
325	1,860	1,282	1,067	1,011	0,958	0,887	0,849	0,775	0,708	0,594	0,455	0,294
330	1,889	1,309	1,089	1,033	0,978	0,911	0,876	0,811	0,746	0,639	0,509	0,355

Table A1.3: H- or I-Section Beams.

Section Factor	Resistance to fire period of 45 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
58	0,919	0,379	0,246	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
60	0,953	0,395	0,255	0,228	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
65	0,999	0,437	0,278	0,248	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220
70	1,045	0,479	0,301	0,268	0,234	0,220	0,220	0,220	0,220	0,220	0,220	0,220
75	1,091	0,520	0,324	0,288	0,253	0,220	0,220	0,220	0,220	0,220	0,220	0,220
80	1,137	0,562	0,347	0,308	0,271	0,227	0,220	0,220	0,220	0,220	0,220	0,220
85	1,183	0,604	0,370	0,328	0,290	0,245	0,225	0,220	0,220	0,220	0,220	0,220
90	1,229	0,646	0,393	0,348	0,308	0,263	0,243	0,220	0,220	0,220	0,220	0,220
95	1,275	0,687	0,416	0,368	0,327	0,280	0,261	0,232	0,220	0,220	0,220	0,220
100	1,321	0,729	0,440	0,388	0,345	0,298	0,278	0,249	0,220	0,220	0,220	0,220
105	1,367	0,771	0,463	0,409	0,364	0,316	0,296	0,267	0,220	0,220	0,220	0,220
110	1,413	0,813	0,486	0,429	0,382	0,334	0,314	0,285	0,236	0,220	0,220	0,220
115	1,459	0,854	0,509	0,449	0,401	0,352	0,332	0,303	0,254	0,220	0,220	0,220
120	1,505	0,896	0,532	0,469	0,419	0,369	0,349	0,321	0,273	0,220	0,220	0,220
125	1,551	0,938	0,555	0,489	0,438	0,387	0,367	0,339	0,291	0,220	0,220	0,220
130	1,597	0,974	0,578	0,509	0,456	0,405	0,385	0,357	0,309	0,220	0,220	0,220
135	1,643	1,008	0,601	0,529	0,475	0,423	0,402	0,374	0,328	0,220	0,220	0,220
140	1,689	1,043	0,624	0,549	0,493	0,441	0,420	0,392	0,346	0,220	0,220	0,220
145	1,735	1,077	0,647	0,569	0,512	0,458	0,438	0,410	0,364	0,220	0,220	0,220
150	1,781	1,112	0,670	0,589	0,530	0,476	0,456	0,428	0,382	0,228	0,220	0,220
155	1,827	1,146	0,693	0,609	0,549	0,494	0,473	0,446	0,401	0,250	0,220	0,220
160	1,876	1,181	0,716	0,629	0,567	0,512	0,491	0,464	0,419	0,272	0,220	0,220
165	1,930	1,216	0,739	0,650	0,586	0,529	0,509	0,482	0,437	0,294	0,220	0,220
170	1,984	1,250	0,762	0,670	0,604	0,547	0,526	0,499	0,456	0,316	0,220	0,220
175	2,037	1,285	0,786	0,690	0,623	0,565	0,544	0,517	0,474	0,338	0,220	0,220
180	2,091	1,319	0,809	0,710	0,641	0,583	0,562	0,535	0,492	0,360	0,220	0,220
185	2,145	1,354	0,832	0,730	0,660	0,601	0,580	0,553	0,511	0,382	0,220	0,220
190	2,198	1,389	0,855	0,750	0,678	0,618	0,597	0,571	0,529	0,404	0,220	0,220
195	2,252	1,423	0,878	0,770	0,697	0,636	0,615	0,589	0,547	0,426	0,220	0,220
200	2,305	1,458	0,901	0,790	0,715	0,654	0,633	0,607	0,566	0,448	0,220	0,220
205	2,359	1,492	0,924	0,810	0,734	0,672	0,650	0,624	0,584	0,470	0,220	0,220
210	2,413	1,527	0,948	0,830	0,752	0,690	0,668	0,642	0,602	0,493	0,220	0,220
215	2,466	1,562	0,980	0,850	0,771	0,707	0,686	0,660	0,620	0,515	0,220	0,220
220	2,520	1,596	1,012	0,870	0,789	0,725	0,704	0,678	0,639	0,537	0,220	0,220
225	2,574	1,631	1,044	0,891	0,808	0,743	0,721	0,696	0,657	0,559	0,220	0,220
230	2,627	1,665	1,077	0,911	0,826	0,761	0,739	0,714	0,675	0,581	0,236	0,220
235	2,681	1,700	1,109	0,931	0,845	0,778	0,757	0,731	0,694	0,603	0,275	0,220
240	2,735	1,735	1,141	0,954	0,863	0,796	0,774	0,749	0,712	0,625	0,314	0,220
245	2,788	1,769	1,173	0,986	0,882	0,814	0,792	0,767	0,730	0,647	0,353	0,220
250	2,842	1,804	1,205	1,018	0,900	0,832	0,810	0,785	0,749	0,669	0,392	0,220
255	2,896	1,838	1,237	1,050	0,919	0,850	0,828	0,803	0,767	0,691	0,431	0,220
260	2,949	1,867	1,269	1,082	0,937	0,867	0,845	0,821	0,785	0,713	0,470	0,220
265	3,040	1,892	1,301	1,114	0,962	0,885	0,863	0,839	0,803	0,735	0,509	0,253
270	3,357	1,918	1,334	1,146	0,989	0,903	0,881	0,856	0,822	0,757	0,548	0,306
275	3,673	1,943	1,366	1,178	1,017	0,921	0,898	0,874	0,840	0,779	0,587	0,358
280	3,990	1,969	1,398	1,210	1,045	0,939	0,916	0,892	0,858	0,801	0,626	0,411
285	-	1,994	1,430	1,241	1,072	0,960	0,934	0,910	0,877	0,823	0,665	0,464
290	-	2,019	1,462	1,273	1,100	0,985	0,953	0,928	0,895	0,845	0,704	0,517
295	-	2,045	1,494	1,305	1,128	1,009	0,976	0,946	0,913	0,867	0,743	0,570
300	-	2,070	1,526	1,337	1,156	1,033	0,998	0,968	0,932	0,889	0,782	0,623
305	-	2,096	1,558	1,369	1,183	1,057	1,020	0,989	0,950	0,911	0,822	0,676
310	-	2,121	1,591	1,401	1,211	1,081	1,042	1,011	0,970	0,933	0,861	0,729
315	-	2,146	1,623	1,433	1,239	1,105	1,064	1,033	0,990	0,954	0,900	0,782
320	-	2,172	1,655	1,465	1,266	1,129	1,087	1,054	1,010	0,974	0,939	0,835
325	-	2,197	1,687	1,496	1,294	1,153	1,109	1,076	1,030	0,993	0,962	0,888
330	-	2,222	1,719	1,528	1,322	1,177	1,131	1,098	1,050	1,013	0,982	0,940

Table A1.4: H- or I-Section Beams.

Section Factor	Resistance to fire period of 60 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
58	1,414	0,923	0,430	0,359	0,307	0,261	0,246	0,229	0,220	0,220	0,220	0,220
60	1,444	0,955	0,449	0,374	0,319	0,270	0,254	0,237	0,220	0,220	0,220	0,220
65	1,521	1,003	0,497	0,411	0,349	0,294	0,276	0,257	0,233	0,220	0,220	0,220
70	1,598	1,051	0,545	0,448	0,379	0,317	0,297	0,277	0,252	0,220	0,220	0,220
75	1,675	1,100	0,593	0,485	0,408	0,340	0,318	0,296	0,270	0,220	0,220	0,220
80	1,751	1,148	0,641	0,522	0,438	0,364	0,339	0,316	0,288	0,231	0,220	0,220
85	1,828	1,196	0,689	0,559	0,468	0,387	0,361	0,336	0,306	0,249	0,220	0,220
90	1,926	1,244	0,736	0,596	0,497	0,410	0,382	0,356	0,325	0,267	0,220	0,220
95	2,034	1,292	0,784	0,633	0,527	0,433	0,403	0,375	0,343	0,286	0,220	0,220
100	2,142	1,340	0,832	0,670	0,557	0,457	0,424	0,395	0,361	0,304	0,225	0,220
105	2,249	1,389	0,880	0,707	0,587	0,480	0,446	0,415	0,379	0,323	0,245	0,220
110	2,357	1,437	0,928	0,744	0,616	0,503	0,467	0,434	0,398	0,341	0,264	0,220
115	2,464	1,485	0,970	0,781	0,646	0,527	0,488	0,454	0,416	0,359	0,284	0,220
120	2,572	1,533	1,009	0,818	0,676	0,550	0,509	0,474	0,434	0,378	0,304	0,220
125	2,679	1,581	1,047	0,855	0,706	0,573	0,531	0,494	0,452	0,396	0,323	0,220
130	2,787	1,630	1,086	0,892	0,735	0,597	0,552	0,513	0,471	0,415	0,343	0,220
135	2,894	1,678	1,125	0,929	0,765	0,620	0,573	0,533	0,489	0,433	0,363	0,241
140	3,002	1,726	1,164	0,966	0,795	0,643	0,594	0,553	0,507	0,451	0,382	0,264
145	3,110	1,774	1,203	1,004	0,825	0,667	0,616	0,572	0,525	0,470	0,402	0,286
150	3,217	1,822	1,242	1,041	0,854	0,690	0,637	0,592	0,544	0,488	0,422	0,308
155	-	1,873	1,281	1,078	0,884	0,713	0,658	0,612	0,562	0,507	0,442	0,330
160	-	1,926	1,320	1,116	0,914	0,737	0,679	0,632	0,580	0,525	0,461	0,353
165	-	1,979	1,358	1,153	0,944	0,760	0,701	0,651	0,598	0,543	0,481	0,375
170	-	2,032	1,397	1,191	0,978	0,783	0,722	0,671	0,617	0,562	0,501	0,397
175	-	2,085	1,436	1,228	1,012	0,807	0,743	0,691	0,635	0,580	0,520	0,419
180	-	2,138	1,475	1,266	1,046	0,830	0,764	0,710	0,653	0,599	0,540	0,442
185	-	2,191	1,514	1,303	1,080	0,853	0,786	0,730	0,671	0,617	0,560	0,464
190	-	2,245	1,553	1,341	1,115	0,876	0,807	0,750	0,690	0,635	0,579	0,486
195	-	2,298	1,592	1,378	1,149	0,900	0,828	0,770	0,708	0,654	0,599	0,508
200	-	2,351	1,630	1,416	1,183	0,923	0,849	0,789	0,726	0,672	0,619	0,531
205	-	2,404	1,669	1,453	1,217	0,947	0,871	0,809	0,744	0,691	0,638	0,553
210	-	2,457	1,708	1,491	1,251	0,980	0,892	0,829	0,763	0,709	0,658	0,575
215	-	2,510	1,747	1,528	1,286	1,012	0,913	0,849	0,781	0,727	0,678	0,597
220	-	2,563	1,786	1,566	1,320	1,045	0,934	0,868	0,799	0,746	0,697	0,619
225	-	2,617	1,825	1,603	1,354	1,078	0,961	0,888	0,817	0,764	0,717	0,642
230	-	2,670	1,862	1,641	1,388	1,110	0,993	0,908	0,836	0,783	0,737	0,664
235	-	2,723	1,896	1,678	1,422	1,143	1,025	0,927	0,854	0,801	0,757	0,686
240	-	2,776	1,930	1,715	1,457	1,175	1,057	0,949	0,872	0,819	0,776	0,708
245	-	2,829	1,964	1,753	1,491	1,208	1,089	0,981	0,890	0,838	0,796	0,731
250	-	2,882	1,999	1,790	1,525	1,240	1,121	1,013	0,909	0,856	0,816	0,753
255	-	2,935	2,033	1,828	1,559	1,273	1,153	1,045	0,927	0,875	0,835	0,775
260	-	2,989	2,067	1,865	1,593	1,306	1,185	1,078	0,945	0,893	0,855	0,797
265	-	3,042	2,101	1,896	1,628	1,338	1,217	1,110	0,976	0,911	0,875	0,820
270	-	3,095	2,135	1,927	1,662	1,371	1,249	1,142	1,007	0,930	0,894	0,842
275	-	3,148	2,169	1,959	1,696	1,403	1,282	1,174	1,038	0,950	0,914	0,864
280	-	3,201	2,203	1,990	1,730	1,436	1,314	1,206	1,069	0,978	0,934	0,886
285	-	-	2,237	2,021	1,764	1,469	1,346	1,239	1,100	1,007	0,957	0,909
290	-	-	2,272	2,052	1,799	1,501	1,378	1,271	1,131	1,035	0,985	0,931
295	-	-	2,306	2,084	1,833	1,534	1,410	1,303	1,162	1,063	1,013	0,955
300	-	-	2,340	2,115	1,864	1,566	1,442	1,335	1,193	1,091	1,040	0,981
305	-	-	2,374	2,146	1,893	1,599	1,474	1,368	1,224	1,119	1,068	1,008
310	-	-	2,408	2,177	1,922	1,632	1,506	1,400	1,254	1,148	1,096	1,034
315	-	-	2,442	2,209	1,951	1,664	1,538	1,432	1,285	1,176	1,124	1,061
320	-	-	2,476	2,240	1,980	1,697	1,570	1,464	1,316	1,204	1,151	1,088
325	-	-	2,510	2,271	2,009	1,729	1,602	1,497	1,347	1,232	1,179	1,114
330	-	-	2,544	2,303	2,038	1,762	1,634	1,529	1,378	1,260	1,207	1,141

Table A1.5: H- or I-Section Beams.

Section Factor	Resistance to fire period of 90 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
58	-	1,685	1,209	1,071	0,946	0,677	0,592	0,521	0,444	0,343	0,285	0,238
60	-	1,724	1,236	1,094	0,966	0,708	0,619	0,544	0,462	0,356	0,296	0,247
65	-	1,822	1,303	1,153	1,018	0,787	0,686	0,602	0,509	0,390	0,323	0,270
70	-	1,981	1,370	1,213	1,069	0,865	0,753	0,659	0,555	0,423	0,350	0,293
75	-	2,164	1,437	1,272	1,121	0,944	0,820	0,717	0,602	0,457	0,377	0,316
80	-	2,348	1,504	1,331	1,173	0,990	0,887	0,774	0,649	0,490	0,405	0,339
85	-	2,532	1,571	1,390	1,224	1,035	0,951	0,832	0,695	0,524	0,432	0,362
90	-	2,716	1,638	1,449	1,276	1,081	0,996	0,889	0,742	0,557	0,459	0,385
95	-	2,899	1,705	1,508	1,327	1,127	1,040	0,946	0,788	0,591	0,486	0,408
100	-	3,083	1,772	1,567	1,379	1,172	1,085	0,990	0,835	0,624	0,513	0,431
105	-	-	1,839	1,627	1,431	1,218	1,129	1,034	0,882	0,658	0,541	0,454
110	-	-	1,944	1,686	1,482	1,263	1,174	1,078	0,928	0,691	0,568	0,477
115	-	-	2,058	1,745	1,534	1,309	1,219	1,122	0,973	0,725	0,595	0,500
120	-	-	2,172	1,804	1,585	1,355	1,263	1,165	1,017	0,758	0,622	0,523
125	-	-	2,286	1,863	1,637	1,400	1,308	1,209	1,060	0,792	0,649	0,546
130	-	-	2,400	1,966	1,689	1,446	1,353	1,253	1,104	0,825	0,676	0,569
135	-	-	2,514	2,069	1,740	1,491	1,397	1,297	1,148	0,859	0,704	0,592
140	-	-	2,628	2,173	1,792	1,537	1,442	1,341	1,191	0,892	0,731	0,615
145	-	-	2,742	2,276	1,843	1,582	1,486	1,384	1,235	0,926	0,758	0,639
150	-	-	2,856	2,379	1,923	1,628	1,531	1,428	1,279	0,965	0,785	0,662
155	-	-	2,970	2,482	2,007	1,674	1,576	1,472	1,322	1,012	0,812	0,685
160	-	-	3,084	2,585	2,092	1,719	1,620	1,516	1,366	1,059	0,840	0,708
165	-	-	3,198	2,688	2,176	1,765	1,665	1,560	1,410	1,106	0,867	0,731
170	-	-	-	2,791	2,261	1,810	1,709	1,604	1,453	1,152	0,894	0,754
175	-	-	-	2,894	2,345	1,856	1,754	1,647	1,497	1,199	0,921	0,777
180	-	-	-	2,997	2,430	1,921	1,799	1,691	1,541	1,246	0,952	0,800
185	-	-	-	3,100	2,514	1,989	1,843	1,735	1,584	1,293	1,005	0,823
190	-	-	-	3,203	2,599	2,057	1,905	1,779	1,628	1,339	1,059	0,846
195	-	-	-	3,306	2,683	2,125	1,971	1,823	1,672	1,386	1,112	0,869
200	-	-	-	3,409	2,767	2,193	2,037	1,868	1,715	1,433	1,165	0,892
205	-	-	-	3,512	2,852	2,261	2,103	1,926	1,759	1,480	1,218	0,915
210	-	-	-	3,615	2,936	2,329	2,169	1,984	1,803	1,526	1,272	0,938
215	-	-	-	3,718	3,021	2,397	2,234	2,042	1,846	1,573	1,325	0,988
220	-	-	-	3,821	3,105	2,465	2,300	2,100	1,896	1,620	1,378	1,050
225	-	-	-	3,924	3,190	2,533	2,366	2,158	1,945	1,666	1,431	1,111
230	-	-	-	-	-	2,601	2,432	2,217	1,995	1,713	1,485	1,172
235	-	-	-	-	-	2,669	2,497	2,275	2,045	1,760	1,538	1,233
240	-	-	-	-	-	2,737	2,563	2,333	2,095	1,807	1,591	1,295
245	-	-	-	-	-	2,805	2,629	2,391	2,145	1,853	1,644	1,356
250	-	-	-	-	-	2,873	2,695	2,449	2,194	1,891	1,698	1,417
255	-	-	-	-	-	2,941	2,760	2,507	2,244	1,929	1,751	1,478
260	-	-	-	-	-	3,016	2,826	2,565	2,294	1,967	1,804	1,539
265	-	-	-	-	-	3,153	2,892	2,624	2,344	2,005	1,854	1,601
270	-	-	-	-	-	3,291	2,958	2,682	2,394	2,044	1,883	1,662
275	-	-	-	-	-	3,428	3,083	2,740	2,443	2,082	1,912	1,723
280	-	-	-	-	-	3,566	3,288	2,798	2,493	2,120	1,941	1,784
285	-	-	-	-	-	3,703	3,492	2,856	2,543	2,158	1,970	1,846
290	-	-	-	-	-	3,841	3,697	2,914	2,593	2,196	1,999	1,874
295	-	-	-	-	-	3,978	3,901	2,972	2,643	2,234	2,028	1,899
300	-	-	-	-	-	-	-	-	2,692	2,272	2,057	1,924
305	-	-	-	-	-	-	-	-	2,742	2,310	2,086	1,949
310	-	-	-	-	-	-	-	-	2,792	2,349	2,115	1,975
315	-	-	-	-	-	-	-	-	2,842	2,387	2,144	2,000
320	-	-	-	-	-	-	-	-	2,892	2,425	2,173	2,025
325	-	-	-	-	-	-	-	-	2,941	2,463	2,202	2,050
330	-	-	-	-	-	-	-	-	2,991	2,501	2,231	2,075

Table A1.9: H- or I-Section Columns.

Section Factor	Resistance to fire period of 30 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
71	0,386	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
75	0,440	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
80	0,483	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
85	0,526	0,239	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
90	0,569	0,299	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
95	0,612	0,358	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
100	0,655	0,418	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
105	0,699	0,446	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
110	0,742	0,472	0,222	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
115	0,785	0,498	0,251	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
120	0,828	0,523	0,280	0,222	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
125	0,871	0,549	0,310	0,243	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
130	0,914	0,574	0,339	0,265	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
135	0,958	0,600	0,369	0,287	0,223	0,221	0,221	0,221	0,221	0,221	0,221	0,221
140	1,001	0,626	0,398	0,309	0,242	0,221	0,221	0,221	0,221	0,221	0,221	0,221
145	1,044	0,651	0,427	0,331	0,261	0,221	0,221	0,221	0,221	0,221	0,221	0,221
150	1,087	0,677	0,450	0,352	0,280	0,221	0,221	0,221	0,221	0,221	0,221	0,221
155	1,130	0,702	0,474	0,374	0,299	0,231	0,221	0,221	0,221	0,221	0,221	0,221
160	1,187	0,728	0,498	0,396	0,317	0,244	0,221	0,221	0,221	0,221	0,221	0,221
165	1,243	0,753	0,521	0,418	0,336	0,258	0,226	0,221	0,221	0,221	0,221	0,221
170	1,300	0,779	0,545	0,443	0,355	0,271	0,240	0,221	0,221	0,221	0,221	0,221
175	1,357	0,805	0,569	0,468	0,374	0,284	0,254	0,222	0,221	0,221	0,221	0,221
180	1,413	0,830	0,593	0,494	0,393	0,297	0,268	0,236	0,221	0,221	0,221	0,221
185	1,470	0,856	0,616	0,520	0,412	0,310	0,281	0,251	0,221	0,221	0,221	0,221
190	1,526	0,881	0,640	0,546	0,434	0,323	0,295	0,265	0,221	0,221	0,221	0,221
195	1,583	0,907	0,664	0,572	0,462	0,336	0,309	0,280	0,221	0,221	0,221	0,221
200	1,639	0,933	0,687	0,598	0,490	0,349	0,322	0,294	0,221	0,221	0,221	0,221
205	1,696	0,958	0,711	0,623	0,518	0,362	0,336	0,308	0,228	0,221	0,221	0,221
210	1,753	0,984	0,735	0,649	0,546	0,375	0,350	0,323	0,247	0,221	0,221	0,221
215	1,809	1,009	0,758	0,675	0,574	0,388	0,363	0,337	0,266	0,221	0,221	0,221
220	1,866	1,035	0,782	0,701	0,601	0,402	0,377	0,352	0,285	0,221	0,221	0,221
225	1,922	1,060	0,806	0,727	0,629	0,415	0,391	0,366	0,304	0,221	0,221	0,221
230	1,979	1,086	0,830	0,753	0,657	0,435	0,405	0,380	0,323	0,221	0,221	0,221
235	2,035	1,112	0,853	0,778	0,685	0,470	0,418	0,395	0,342	0,221	0,221	0,221
240	2,092	1,155	0,877	0,804	0,713	0,506	0,446	0,409	0,361	0,221	0,221	0,221
245	2,149	1,243	0,901	0,830	0,740	0,541	0,482	0,424	0,380	0,221	0,221	0,221
250	2,205	1,330	0,924	0,856	0,768	0,576	0,518	0,460	0,398	0,221	0,221	0,221
255	2,262	1,418	0,948	0,882	0,796	0,611	0,555	0,497	0,417	0,221	0,221	0,221
260	2,318	1,505	0,972	0,907	0,824	0,647	0,591	0,534	0,449	0,231	0,221	0,221
265	2,375	1,593	0,996	0,933	0,852	0,682	0,627	0,570	0,487	0,334	0,221	0,221
270	2,431	1,680	1,019	0,959	0,880	0,717	0,663	0,607	0,524	0,429	0,221	0,221
275	2,496	1,768	1,043	0,985	0,907	0,753	0,699	0,644	0,562	0,467	0,221	0,221
280	2,574	1,855	1,067	1,011	0,935	0,788	0,735	0,680	0,599	0,505	0,221	0,221
285	2,651	1,943	1,090	1,037	0,963	0,823	0,771	0,717	0,637	0,544	0,221	0,221
290	2,729	2,030	1,114	1,062	0,991	0,859	0,807	0,754	0,675	0,582	0,221	0,221
295	2,806	2,118	1,177	1,088	1,019	0,894	0,844	0,790	0,712	0,621	0,221	0,221
300	2,884	2,205	1,314	1,114	1,046	0,929	0,880	0,827	0,750	0,659	0,221	0,221
305	2,961	2,293	1,452	1,186	1,074	0,965	0,916	0,864	0,787	0,698	0,588	0,221
310	3,038	2,380	1,590	1,328	1,102	1,000	0,952	0,900	0,825	0,736	0,632	0,221
315	3,116	2,469	1,728	1,471	1,130	1,035	0,988	0,937	0,862	0,775	0,675	0,221
320	3,193	2,585	1,866	1,613	1,284	1,071	1,024	0,974	0,900	0,813	0,719	0,538
325	3,271	2,702	2,004	1,756	1,437	1,106	1,060	1,010	0,937	0,851	0,762	0,568
330	3,348	2,819	2,142	1,898	1,590	1,186	1,096	1,047	0,975	0,890	0,806	0,597
335	3,426	2,935	2,280	2,041	1,743	1,359	1,144	1,084	1,012	0,928	0,849	0,627
340	3,503	3,052	2,418	2,183	1,896	1,533	1,332	1,121	1,050	0,967	0,892	0,656
342	3,534	3,099	2,473	2,240	1,957	1,602	1,408	1,161	1,065	0,982	0,910	0,668

Table A1.10: H- or I-Section Columns.

Section Factor	Resistance to fire period of 45 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
71	0,946	0,508	0,224	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
75	1,032	0,547	0,283	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
80	1,137	0,596	0,357	0,267	0,221	0,221	0,221	0,221	0,221	0,221	0,221	0,221
85	1,218	0,645	0,426	0,319	0,225	0,221	0,221	0,221	0,221	0,221	0,221	0,221
90	1,298	0,693	0,456	0,372	0,278	0,221	0,221	0,221	0,221	0,221	0,221	0,221
95	1,379	0,742	0,486	0,424	0,332	0,238	0,221	0,221	0,221	0,221	0,221	0,221
100	1,460	0,791	0,516	0,451	0,385	0,277	0,232	0,221	0,221	0,221	0,221	0,221
105	1,540	0,839	0,546	0,479	0,430	0,317	0,268	0,236	0,221	0,221	0,221	0,221
110	1,621	0,888	0,576	0,507	0,455	0,357	0,303	0,267	0,221	0,221	0,221	0,221
115	1,702	0,937	0,606	0,534	0,479	0,396	0,339	0,297	0,241	0,221	0,221	0,221
120	1,782	0,985	0,636	0,562	0,504	0,431	0,375	0,328	0,267	0,221	0,221	0,221
125	1,863	1,034	0,666	0,590	0,529	0,454	0,410	0,358	0,292	0,221	0,221	0,221
130	1,943	1,083	0,696	0,617	0,553	0,477	0,438	0,389	0,318	0,223	0,221	0,221
135	2,024	1,131	0,726	0,645	0,578	0,500	0,461	0,419	0,343	0,245	0,221	0,221
140	2,105	1,186	0,756	0,672	0,602	0,524	0,485	0,443	0,369	0,266	0,221	0,221
145	2,185	1,240	0,786	0,700	0,627	0,547	0,508	0,467	0,394	0,288	0,222	0,221
150	2,266	1,295	0,816	0,728	0,651	0,570	0,531	0,490	0,420	0,309	0,236	0,221
155	2,346	1,349	0,846	0,755	0,676	0,593	0,555	0,513	0,444	0,331	0,249	0,221
160	2,427	1,403	0,876	0,783	0,700	0,616	0,578	0,536	0,468	0,352	0,263	0,221
165	2,501	1,458	0,906	0,811	0,725	0,640	0,602	0,559	0,492	0,374	0,276	0,221
170	2,569	1,512	0,936	0,838	0,750	0,663	0,625	0,582	0,516	0,395	0,290	0,221
175	2,637	1,567	0,966	0,866	0,774	0,686	0,648	0,605	0,540	0,417	0,304	0,221
180	2,706	1,621	0,997	0,893	0,799	0,709	0,672	0,629	0,565	0,442	0,317	0,232
185	2,774	1,675	1,027	0,921	0,823	0,732	0,695	0,652	0,589	0,469	0,331	0,247
190	2,842	1,730	1,057	0,949	0,848	0,756	0,718	0,675	0,613	0,495	0,345	0,263
195	2,910	1,784	1,087	0,976	0,872	0,779	0,742	0,698	0,637	0,522	0,358	0,278
200	2,978	1,839	1,117	1,004	0,897	0,802	0,765	0,721	0,661	0,548	0,372	0,293
205	3,046	1,893	1,147	1,032	0,922	0,825	0,789	0,744	0,685	0,575	0,385	0,309
210	3,115	1,947	1,252	1,059	0,946	0,848	0,812	0,768	0,709	0,601	0,399	0,324
215	3,183	2,002	1,331	1,087	0,971	0,872	0,835	0,791	0,733	0,628	0,413	0,339
220	3,251	2,056	1,409	1,114	0,995	0,895	0,859	0,814	0,757	0,654	0,431	0,354
225	3,319	2,110	1,488	1,140	1,020	0,918	0,882	0,837	0,781	0,681	0,467	0,370
230	3,387	2,165	1,567	1,261	1,044	0,941	0,905	0,860	0,805	0,707	0,503	0,385
235	3,455	2,219	1,645	1,351	1,069	0,964	0,929	0,883	0,830	0,734	0,539	0,400
240	3,524	2,274	1,724	1,442	1,093	0,988	0,952	0,907	0,854	0,760	0,575	0,416
245	3,592	2,328	1,802	1,532	1,118	1,011	0,975	0,930	0,878	0,787	0,611	0,439
250	3,660	2,382	1,881	1,623	1,189	1,034	0,999	0,953	0,902	0,813	0,648	0,469
255	3,728	2,437	1,960	1,714	1,301	1,057	1,022	0,976	0,926	0,840	0,684	0,500
260	3,796	2,514	2,038	1,804	1,414	1,080	1,046	0,999	0,950	0,866	0,720	0,531
265	3,864	2,616	2,117	1,895	1,527	1,104	1,069	1,022	0,974	0,893	0,756	0,561
270	4,111	2,719	2,195	1,985	1,640	1,127	1,092	1,045	0,998	0,920	0,792	0,592
275	4,372	2,821	2,274	2,076	1,753	1,257	1,116	1,069	1,022	0,946	0,828	0,622
280	4,633	2,924	2,353	2,166	1,866	1,404	1,192	1,092	1,046	0,973	0,864	0,653
285	4,895	3,026	2,431	2,257	1,978	1,550	1,351	1,115	1,070	0,999	0,900	0,684
290	5,156	3,129	2,533	2,347	2,091	1,696	1,509	1,198	1,095	1,026	0,936	0,714
295	-	3,231	2,652	2,438	2,204	1,842	1,667	1,386	1,119	1,052	0,972	0,745
300	-	3,334	2,771	2,556	2,317	1,988	1,826	1,574	1,241	1,079	1,008	0,776
305	-	3,436	2,890	2,686	2,430	2,134	1,984	1,763	1,449	1,105	1,044	0,806
310	-	3,539	3,010	2,815	2,552	2,280	2,142	1,951	1,656	1,149	1,080	0,837
315	-	3,641	3,129	2,945	2,679	2,426	2,300	2,139	1,864	1,406	1,116	0,867
320	-	3,744	3,248	3,075	2,806	2,567	2,459	2,327	2,072	1,662	1,327	0,898
325	-	3,846	3,367	3,205	2,932	2,706	2,590	2,503	2,279	1,919	1,643	0,929
330	-	4,115	3,486	3,334	3,059	2,845	2,720	2,648	2,479	2,176	1,959	0,959
335	-	4,433	3,606	3,464	3,186	2,984	2,850	2,792	2,613	2,433	2,274	0,990
340	-	4,751	3,725	3,594	3,313	3,123	2,980	2,936	2,746	2,574	2,514	1,021
342	-	4,878	3,773	3,646	3,363	3,178	3,032	2,994	2,799	2,624	2,563	1,033

Table A1.11: H- or I-Section Columns.

Section Factor	Resistance to fire period of 60 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
71	2,050	0,950	0,535	0,462	0,413	0,286	0,224	0,221	0,221	0,221	0,221	0,221
75	2,205	1,031	0,575	0,496	0,447	0,347	0,281	0,238	0,221	0,221	0,221	0,221
80	2,399	1,132	0,624	0,538	0,482	0,424	0,351	0,301	0,233	0,221	0,221	0,221
85	2,522	1,206	0,674	0,580	0,516	0,453	0,421	0,365	0,290	0,221	0,221	0,221
90	2,607	1,279	0,724	0,622	0,550	0,482	0,450	0,425	0,347	0,221	0,221	0,221
95	2,692	1,353	0,773	0,664	0,585	0,511	0,478	0,451	0,405	0,264	0,221	0,221
100	2,778	1,426	0,823	0,706	0,619	0,540	0,506	0,477	0,440	0,313	0,221	0,221
105	2,863	1,500	0,872	0,748	0,653	0,569	0,533	0,503	0,464	0,363	0,246	0,221
110	2,948	1,573	0,922	0,790	0,687	0,598	0,561	0,528	0,488	0,413	0,285	0,221
115	3,034	1,647	0,972	0,832	0,722	0,627	0,589	0,554	0,513	0,441	0,324	0,221
120	3,119	1,721	1,021	0,874	0,756	0,656	0,616	0,580	0,537	0,465	0,363	0,235
125	3,204	1,794	1,071	0,916	0,790	0,685	0,644	0,605	0,561	0,488	0,402	0,262
130	3,290	1,868	1,121	0,958	0,825	0,714	0,672	0,631	0,586	0,511	0,435	0,289
135	3,375	1,941	1,176	1,000	0,859	0,743	0,699	0,657	0,610	0,534	0,460	0,317
140	3,460	2,015	1,234	1,042	0,893	0,772	0,727	0,683	0,634	0,557	0,485	0,344
145	3,545	2,088	1,291	1,085	0,927	0,801	0,755	0,708	0,658	0,580	0,510	0,371
150	3,631	2,162	1,348	1,127	0,962	0,830	0,782	0,734	0,683	0,603	0,535	0,398
155	3,716	2,235	1,405	1,188	0,996	0,859	0,810	0,760	0,707	0,626	0,560	0,426
160	3,801	2,309	1,462	1,250	1,030	0,887	0,838	0,785	0,731	0,650	0,585	0,453
165	3,915	2,383	1,520	1,313	1,065	0,916	0,865	0,811	0,756	0,673	0,610	0,480
170	4,141	2,456	1,577	1,375	1,099	0,945	0,893	0,837	0,780	0,696	0,635	0,507
175	4,367	2,534	1,634	1,438	1,137	0,974	0,921	0,863	0,804	0,719	0,660	0,534
180	4,594	2,612	1,691	1,500	1,209	1,003	0,948	0,888	0,829	0,742	0,685	0,561
185	4,820	2,690	1,748	1,562	1,280	1,032	0,976	0,914	0,853	0,765	0,710	0,588
190	5,046	2,769	1,806	1,625	1,352	1,061	1,004	0,940	0,877	0,788	0,735	0,615
195	-	2,847	1,863	1,687	1,423	1,090	1,031	0,965	0,902	0,811	0,760	0,642
200	-	2,925	1,920	1,750	1,495	1,119	1,059	0,991	0,926	0,834	0,785	0,669
205	-	3,003	1,977	1,812	1,567	1,186	1,087	1,017	0,950	0,858	0,810	0,696
210	-	3,082	2,035	1,875	1,638	1,274	1,114	1,043	0,974	0,881	0,835	0,723
215	-	3,160	2,092	1,937	1,710	1,361	1,172	1,068	0,999	0,904	0,860	0,750
220	-	3,238	2,149	2,000	1,782	1,449	1,268	1,094	1,023	0,927	0,886	0,777
225	-	3,316	2,206	2,062	1,853	1,536	1,365	1,120	1,047	0,950	0,911	0,804
230	-	3,395	2,263	2,125	1,925	1,624	1,461	1,199	1,072	0,973	0,936	0,831
235	-	3,473	2,321	2,187	1,996	1,712	1,557	1,313	1,096	0,996	0,961	0,857
240	-	3,551	2,378	2,250	2,068	1,799	1,653	1,426	1,120	1,019	0,986	0,884
245	-	3,629	2,435	2,312	2,140	1,887	1,750	1,539	1,211	1,042	1,011	0,911
250	-	3,708	2,519	2,375	2,211	1,974	1,846	1,653	1,344	1,066	1,036	0,938
255	-	3,786	2,632	2,437	2,283	2,062	1,942	1,766	1,477	1,089	1,061	0,965
260	-	3,864	2,746	2,532	2,355	2,149	2,039	1,879	1,610	1,112	1,086	0,992
265	-	4,028	2,860	2,653	2,426	2,237	2,135	1,992	1,743	1,172	1,111	1,019
270	-	4,197	2,973	2,774	2,518	2,325	2,231	2,106	1,876	1,363	1,180	1,046
275	-	4,367	3,087	2,895	2,635	2,412	2,327	2,219	2,009	1,555	1,384	1,073
280	-	4,537	3,201	3,016	2,751	2,515	2,424	2,332	2,143	1,746	1,589	1,100
285	-	4,707	3,314	3,136	2,868	2,641	2,532	2,446	2,276	1,937	1,794	1,127
290	-	4,877	3,428	3,257	2,984	2,768	2,650	2,573	2,409	2,129	1,998	1,401
295	-	5,047	3,542	3,378	3,101	2,894	2,767	2,703	2,534	2,320	2,203	1,699
300	-	-	3,655	3,499	3,217	3,020	2,885	2,833	2,653	2,492	2,408	1,997
305	-	-	3,769	3,620	3,334	3,147	3,002	2,963	2,772	2,601	2,543	2,296
310	-	-	3,901	3,741	3,450	3,273	3,120	3,094	2,891	2,711	2,651	2,504
315	-	-	4,177	3,862	3,567	3,400	3,237	3,224	3,010	2,821	2,759	2,595
320	-	-	4,454	4,138	3,683	3,526	3,355	3,304	3,129	2,931	2,867	2,685
325	-	-	4,730	4,424	3,800	3,652	3,472	3,424	3,248	3,040	2,975	2,776
330	-	-	5,006	4,711	4,010	3,779	3,590	3,514	3,367	3,150	3,084	2,866
335	-	-	-	4,998	4,364	3,960	3,707	3,645	3,487	3,260	3,192	2,957
340	-	-	-	-	4,718	4,281	3,825	3,784	3,606	3,369	3,300	3,047
342	-	-	-	-	4,859	4,410	3,877	3,827	3,653	3,413	3,343	3,084

Table A1.16: Circular hollow section Columns.

Section Factor	Resistance to fire period of 15 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
45	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
50	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
55	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
60	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
65	0,274	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
70	0,341	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
75	0,404	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
80	0,466	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
85	0,525	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
90	0,581	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
95	0,636	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
100	0,689	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
105	0,740	0,284	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
110	0,789	0,325	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
115	0,837	0,364	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
120	0,883	0,403	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
125	0,928	0,440	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
130	0,971	0,476	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
135	1,012	0,510	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
140	1,053	0,544	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
145	1,092	0,577	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
150	1,130	0,608	0,280	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
155	1,167	0,639	0,308	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
160	1,203	0,669	0,334	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
165	1,238	0,698	0,360	0,259	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
170	1,272	0,726	0,386	0,283	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
175	1,305	0,754	0,410	0,307	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
180	1,337	0,781	0,434	0,330	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
185	1,368	0,807	0,457	0,353	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
190	1,398	0,832	0,480	0,375	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
195	1,428	0,857	0,502	0,396	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
200	1,456	0,881	0,524	0,417	0,265	0,256	0,256	0,256	0,256	0,256	0,256	0,256
205	1,484	0,904	0,545	0,437	0,284	0,256	0,256	0,256	0,256	0,256	0,256	0,256
210	1,512	0,927	0,565	0,457	0,303	0,256	0,256	0,256	0,256	0,256	0,256	0,256
215	1,538	0,949	0,585	0,477	0,322	0,256	0,256	0,256	0,256	0,256	0,256	0,256
220	1,564	0,971	0,605	0,496	0,340	0,256	0,256	0,256	0,256	0,256	0,256	0,256
225	1,589	0,992	0,624	0,514	0,357	0,256	0,256	0,256	0,256	0,256	0,256	0,256
230	1,614	1,013	0,642	0,532	0,374	0,256	0,256	0,256	0,256	0,256	0,256	0,256
235	1,638	1,033	0,661	0,550	0,391	0,256	0,256	0,256	0,256	0,256	0,256	0,256
240	1,662	1,053	0,678	0,567	0,408	0,258	0,256	0,256	0,256	0,256	0,256	0,256
245	1,685	1,072	0,696	0,584	0,424	0,273	0,256	0,256	0,256	0,256	0,256	0,256
250	1,707	1,091	0,713	0,600	0,439	0,289	0,256	0,256	0,256	0,256	0,256	0,256
255	1,729	1,110	0,729	0,616	0,455	0,303	0,267	0,256	0,256	0,256	0,256	0,256
260	1,751	1,128	0,745	0,632	0,470	0,318	0,282	0,256	0,256	0,256	0,256	0,256
265	1,771	1,145	0,761	0,647	0,484	0,332	0,296	0,256	0,256	0,256	0,256	0,256
270	1,792	1,163	0,777	0,662	0,499	0,346	0,310	0,269	0,256	0,256	0,256	0,256
275	1,812	1,179	0,792	0,677	0,513	0,360	0,323	0,282	0,256	0,256	0,256	0,256
280	1,832	1,196	0,807	0,692	0,527	0,373	0,336	0,295	0,256	0,256	0,256	0,256
285	1,851	1,212	0,821	0,706	0,540	0,386	0,349	0,308	0,256	0,256	0,256	0,256
290	1,870	1,228	0,836	0,720	0,553	0,399	0,362	0,321	0,256	0,256	0,256	0,256
295	1,888	1,243	0,849	0,733	0,566	0,411	0,374	0,333	0,256	0,256	0,256	0,256
300	1,906	1,259	0,863	0,746	0,579	0,424	0,386	0,346	0,256	0,256	0,256	0,256
305	1,924	1,273	0,877	0,759	0,591	0,436	0,398	0,358	0,256	0,256	0,256	0,256
310	1,941	1,288	0,890	0,772	0,604	0,447	0,410	0,369	0,256	0,256	0,256	0,256
315	1,958	1,302	0,903	0,785	0,616	0,459	0,422	0,381	0,256	0,256	0,256	0,256
320	1,975	1,316	0,915	0,797	0,627	0,470	0,433	0,392	0,266	0,256	0,256	0,256
325	1,991	1,330	0,928	0,809	0,639	0,481	0,444	0,403	0,277	0,256	0,256	0,256
330	2,007	1,344	0,940	0,821	0,650	0,492	0,455	0,414	0,287	0,256	0,256	0,256
335	2,022	1,357	0,952	0,832	0,661	0,503	0,465	0,424	0,298	0,256	0,256	0,256
340	2,038	1,370	0,963	0,844	0,672	0,514	0,476	0,435	0,308	0,256	0,256	0,256
345	2,053	1,382	0,975	0,855	0,683	0,524	0,486	0,445	0,318	0,256	0,256	0,256
350	2,068	1,395	0,986	0,866	0,693	0,534	0,496	0,455	0,327	0,256	0,256	0,256
355	2,082	1,407	0,997	0,877	0,704	0,544	0,506	0,465	0,337	0,256	0,256	0,256

Table A1.17: Circular hollow section Columns.

Section Factor	Resistance to fire period of 30 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
45	0,798	0,325	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
50	0,948	0,448	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
55	1,091	0,566	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
60	1,228	0,679	0,343	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
65	1,360	0,788	0,440	0,337	0,256	0,256	0,256	0,256	0,256	0,256	0,256	0,256
70	1,487	0,892	0,533	0,427	0,277	0,256	0,256	0,256	0,256	0,256	0,256	0,256
75	1,609	0,993	0,622	0,513	0,359	0,256	0,256	0,256	0,256	0,256	0,256	0,256
80	1,726	1,090	0,708	0,597	0,439	0,293	0,259	0,256	0,256	0,256	0,256	0,256
85	1,839	1,183	0,791	0,677	0,515	0,367	0,332	0,295	0,256	0,256	0,256	0,256
90	1,947	1,273	0,871	0,755	0,589	0,439	0,403	0,366	0,256	0,256	0,256	0,256
95	2,052	1,360	0,949	0,830	0,661	0,508	0,471	0,434	0,312	0,256	0,256	0,256
100	2,153	1,444	1,024	0,902	0,730	0,574	0,538	0,500	0,376	0,256	0,256	0,256
105	2,251	1,524	1,096	0,973	0,796	0,639	0,602	0,564	0,437	0,258	0,256	0,256
110	2,345	1,603	1,166	1,040	0,861	0,701	0,663	0,626	0,497	0,315	0,256	0,256
115	2,436	1,678	1,233	1,106	0,924	0,762	0,723	0,687	0,555	0,370	0,256	0,256
120	2,524	1,751	1,299	1,169	0,984	0,821	0,782	0,745	0,611	0,423	0,256	0,256
125	2,609	1,822	1,362	1,231	1,043	0,877	0,838	0,801	0,665	0,475	0,297	0,256
130	2,692	1,891	1,424	1,291	1,100	0,933	0,893	0,856	0,718	0,525	0,344	0,256
135	2,772	1,958	1,483	1,349	1,155	0,986	0,946	0,909	0,769	0,574	0,390	0,256
140	2,849	2,022	1,541	1,405	1,209	1,038	0,997	0,961	0,819	0,621	0,435	0,256
145	2,924	2,085	1,597	1,459	1,261	1,088	1,047	1,011	0,867	0,667	0,479	0,286
150	2,997	2,145	1,652	1,512	1,312	1,137	1,096	1,060	0,914	0,711	0,521	0,326
155	3,067	2,204	1,705	1,564	1,361	1,185	1,143	1,107	0,960	0,755	0,562	0,365
160	3,136	2,262	1,756	1,614	1,409	1,231	1,189	1,153	1,004	0,797	0,602	0,402
165	3,203	2,317	1,806	1,662	1,455	1,277	1,234	1,198	1,048	0,838	0,641	0,439
170	3,267	2,371	1,855	1,709	1,500	1,320	1,277	1,241	1,090	0,878	0,679	0,475
175	3,330	2,424	1,902	1,755	1,544	1,363	1,320	1,284	1,131	0,917	0,716	0,509
180	3,391	2,475	1,948	1,800	1,587	1,405	1,361	1,325	1,171	0,955	0,753	0,543
185	3,451	2,525	1,993	1,844	1,629	1,445	1,401	1,366	1,210	0,992	0,788	0,576
190	3,509	2,574	2,037	1,886	1,670	1,485	1,440	1,405	1,248	1,029	0,822	0,609
195	3,565	2,621	2,079	1,928	1,709	1,523	1,479	1,443	1,285	1,064	0,856	0,640
200	3,620	2,667	2,121	1,968	1,748	1,561	1,516	1,481	1,321	1,098	0,888	0,671
205	3,674	2,712	2,161	2,007	1,785	1,597	1,552	1,517	1,356	1,132	0,920	0,701
210	3,726	2,755	2,201	2,046	1,822	1,633	1,588	1,553	1,390	1,165	0,951	0,730
215	3,777	2,798	2,239	2,083	1,858	1,668	1,622	1,587	1,424	1,197	0,982	0,759
220	3,826	2,840	2,277	2,120	1,893	1,702	1,656	1,621	1,457	1,228	1,011	0,787
225	3,875	2,880	2,314	2,155	1,927	1,735	1,689	1,654	1,489	1,258	1,040	0,814
230	3,922	2,920	2,349	2,190	1,961	1,768	1,721	1,687	1,520	1,288	1,069	0,841
235	3,968	2,959	2,384	2,224	1,993	1,799	1,753	1,718	1,551	1,317	1,097	0,867
240	4,013	2,997	2,418	2,257	2,025	1,830	1,784	1,749	1,580	1,346	1,124	0,892
245	4,057	3,033	2,452	2,290	2,056	1,861	1,814	1,779	1,610	1,374	1,150	0,917
250	4,100	3,070	2,484	2,322	2,087	1,890	1,843	1,809	1,638	1,401	1,176	0,942
255	4,142	3,105	2,516	2,353	2,117	1,919	1,872	1,838	1,666	1,428	1,202	0,966
260	4,183	3,139	2,548	2,383	2,146	1,948	1,900	1,866	1,694	1,454	1,227	0,989
265	4,223	3,173	2,578	2,413	2,174	1,976	1,928	1,894	1,720	1,479	1,251	1,012
270	4,262	3,206	2,608	2,442	2,202	2,003	1,955	1,921	1,747	1,504	1,275	1,035
275	4,300	3,238	2,637	2,470	2,230	2,029	1,981	1,948	1,772	1,529	1,298	1,057
280	4,338	3,270	2,666	2,498	2,256	2,055	2,007	1,974	1,798	1,553	1,321	1,078
285	4,375	3,301	2,694	2,526	2,283	2,081	2,032	1,999	1,822	1,577	1,344	1,099
290	4,410	3,331	2,721	2,552	2,308	2,106	2,057	2,024	1,846	1,600	1,366	1,120
295	4,446	3,361	2,748	2,579	2,333	2,130	2,082	2,048	1,870	1,622	1,387	1,141
300	4,480	3,390	2,775	2,604	2,358	2,155	2,106	2,072	1,893	1,645	1,408	1,160
305	4,514	3,419	2,800	2,629	2,382	2,178	2,129	2,096	1,916	1,666	1,429	1,180
310	4,547	3,446	2,826	2,654	2,406	2,201	2,152	2,119	1,938	1,688	1,449	1,199
315	4,579	3,474	2,850	2,678	2,429	2,224	2,174	2,142	1,960	1,709	1,469	1,218
320	4,611	3,501	2,875	2,702	2,452	2,246	2,196	2,164	1,982	1,729	1,489	1,236
325	4,642	3,527	2,899	2,725	2,474	2,268	2,218	2,185	2,003	1,749	1,508	1,255
330	4,673	3,553	2,922	2,748	2,496	2,289	2,239	2,207	2,023	1,769	1,527	1,272
335	4,703	3,578	2,945	2,770	2,518	2,310	2,260	2,228	2,044	1,788	1,545	1,290
340	4,732	3,603	2,967	2,792	2,539	2,331	2,281	2,248	2,064	1,807	1,564	1,307
345	4,761	3,627	2,990	2,814	2,559	2,351	2,301	2,269	2,083	1,826	1,581	1,324
350	4,789	3,651	3,011	2,835	2,580	2,371	2,320	2,288	2,102	1,845	1,599	1,340
355	4,817	3,675	3,033	2,856	2,600	2,390	2,340	2,308	2,121	1,863	1,616	1,357

Table A1.18: Circular hollow section Columns.

Section Factor	Resistance to fire period of 45 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
45	1,616	0,993	0,621	0,513	0,360	0,256	0,256	0,256	0,256	0,256	0,256	0,256
50	1,837	1,175	0,783	0,669	0,508	0,362	0,328	0,292	0,256	0,256	0,256	0,256
55	2,048	1,349	0,937	0,819	0,651	0,500	0,464	0,428	0,308	0,256	0,256	0,256
60	2,251	1,516	1,086	0,963	0,788	0,632	0,595	0,560	0,434	0,258	0,256	0,256
65	2,446	1,677	1,229	1,101	0,920	0,759	0,721	0,686	0,555	0,374	0,256	0,256
70	2,633	1,831	1,366	1,235	1,046	0,882	0,843	0,807	0,673	0,485	0,310	0,256
75	2,813	1,980	1,499	1,363	1,169	1,000	0,960	0,925	0,786	0,592	0,411	0,256
80	2,986	2,123	1,626	1,487	1,287	1,114	1,073	1,038	0,895	0,696	0,509	0,319
85	3,153	2,260	1,749	1,606	1,401	1,224	1,182	1,147	1,000	0,796	0,604	0,408
90	3,313	2,393	1,868	1,721	1,510	1,331	1,288	1,253	1,102	0,892	0,696	0,494
95	3,468	2,522	1,983	1,832	1,616	1,433	1,390	1,355	1,200	0,986	0,785	0,577
100	3,617	2,645	2,093	1,940	1,719	1,533	1,488	1,454	1,295	1,076	0,871	0,658
105	3,761	2,765	2,200	2,043	1,818	1,629	1,584	1,549	1,388	1,164	0,954	0,736
110	3,900	2,880	2,304	2,144	1,914	1,722	1,676	1,642	1,477	1,249	1,034	0,812
115	4,035	2,992	2,404	2,241	2,007	1,812	1,765	1,731	1,563	1,331	1,113	0,886
120	4,165	3,100	2,501	2,335	2,097	1,899	1,852	1,818	1,647	1,411	1,189	0,957
125	4,291	3,205	2,595	2,426	2,184	1,984	1,936	1,902	1,729	1,489	1,262	1,026
130	4,413	3,306	2,686	2,515	2,269	2,066	2,017	1,984	1,807	1,564	1,334	1,094
135	4,531	3,405	2,774	2,601	2,351	2,146	2,097	2,063	1,884	1,637	1,403	1,159
140	4,645	3,500	2,860	2,684	2,431	2,223	2,173	2,140	1,958	1,708	1,470	1,223
145	4,756	3,593	2,943	2,765	2,508	2,298	2,248	2,215	2,031	1,777	1,536	1,284
150	4,863	3,682	3,024	2,843	2,583	2,371	2,320	2,288	2,101	1,844	1,600	1,344
155	4,968	3,769	3,102	2,919	2,656	2,442	2,391	2,358	2,169	1,909	1,662	1,403
160	5,069	3,854	3,178	2,994	2,727	2,511	2,459	2,427	2,236	1,972	1,722	1,460
165	5,167	3,936	3,252	3,066	2,796	2,578	2,526	2,494	2,300	2,034	1,781	1,515
170	-	4,016	3,324	3,136	2,863	2,644	2,591	2,559	2,363	2,094	1,838	1,569
175	-	4,094	3,394	3,204	2,929	2,707	2,654	2,623	2,425	2,153	1,894	1,622
180	-	4,170	3,463	3,270	2,992	2,769	2,715	2,684	2,484	2,210	1,948	1,673
185	-	4,243	3,529	3,335	3,054	2,829	2,775	2,744	2,543	2,265	2,001	1,723
190	-	4,315	3,594	3,398	3,115	2,888	2,834	2,803	2,599	2,319	2,053	1,772
195	-	4,385	3,657	3,459	3,173	2,945	2,891	2,860	2,655	2,372	2,104	1,819
200	-	4,453	3,718	3,519	3,231	3,001	2,946	2,916	2,709	2,424	2,153	1,866
205	-	4,519	3,778	3,577	3,287	3,056	3,000	2,970	2,761	2,474	2,201	1,911
210	-	4,584	3,836	3,634	3,341	3,109	3,053	3,024	2,813	2,523	2,248	1,955
215	-	4,647	3,893	3,690	3,395	3,161	3,105	3,075	2,863	2,571	2,293	1,999
220	-	4,708	3,949	3,744	3,447	3,212	3,155	3,126	2,912	2,618	2,338	2,041
225	-	4,768	4,003	3,797	3,497	3,261	3,204	3,175	2,960	2,664	2,382	2,082
230	-	4,827	4,056	3,848	3,547	3,310	3,252	3,224	3,007	2,709	2,425	2,123
235	-	4,884	4,108	3,899	3,596	3,357	3,299	3,271	3,052	2,753	2,466	2,162
240	-	4,940	4,159	3,948	3,643	3,403	3,345	3,317	3,097	2,795	2,507	2,201
245	-	4,995	4,208	3,996	3,689	3,448	3,390	3,362	3,141	2,837	2,547	2,239
250	-	5,048	4,256	4,043	3,734	3,492	3,434	3,406	3,184	2,878	2,586	2,275
255	-	5,100	4,304	4,089	3,779	3,535	3,477	3,449	3,225	2,918	2,625	2,312
260	-	5,151	4,350	4,134	3,822	3,578	3,519	3,492	3,266	2,958	2,662	2,347
265	-	5,201	4,395	4,178	3,864	3,619	3,560	3,533	3,306	2,996	2,699	2,382
270	-	5,250	4,439	4,222	3,906	3,660	3,600	3,573	3,346	3,033	2,735	2,416
275	-	-	4,483	4,264	3,946	3,699	3,639	3,613	3,384	3,070	2,770	2,449
280	-	-	4,525	4,305	3,986	3,738	3,678	3,652	3,422	3,106	2,804	2,482
285	-	-	4,566	4,346	4,025	3,776	3,716	3,690	3,458	3,142	2,838	2,514
290	-	-	4,607	4,385	4,063	3,813	3,753	3,727	3,495	3,176	2,871	2,545
295	-	-	4,647	4,424	4,100	3,850	3,789	3,763	3,530	3,210	2,904	2,576
300	-	-	4,686	4,462	4,137	3,886	3,825	3,799	3,565	3,244	2,936	2,606
305	-	-	4,724	4,499	4,173	3,921	3,859	3,834	3,599	3,276	2,967	2,635
310	-	-	4,762	4,536	4,208	3,955	3,894	3,869	3,632	3,308	2,997	2,664
315	-	-	4,798	4,572	4,243	3,989	3,927	3,902	3,665	3,340	3,027	2,693
320	-	-	4,834	4,607	4,276	4,022	3,960	3,935	3,697	3,370	3,057	2,721
325	-	-	4,870	4,641	4,310	4,054	3,992	3,968	3,728	3,401	3,086	2,748
330	-	-	4,904	4,675	4,342	4,086	4,024	4,000	3,759	3,430	3,114	2,775
335	-	-	4,938	4,708	4,374	4,117	4,055	4,031	3,790	3,459	3,142	2,801
340	-	-	4,972	4,741	4,405	4,148	4,086	4,062	3,819	3,488	3,170	2,827
345	-	-	5,004	4,773	4,436	4,178	4,115	4,092	3,849	3,516	3,196	2,853
350	-	-	5,036	4,804	4,466	4,208	4,145	4,121	3,877	3,544	3,223	2,878
355	-	-	5,068	4,835	4,496	4,237	4,174	4,151	3,906	3,571	3,249	2,902

Table A1.19: Circular hollow section Columns.

Section Factor	Resistance to fire period of 60 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
45	2,433	1,661	1,213	1,086	0,905	0,747	0,709	0,674	0,545	0,365	0,256	0,256
50	2,726	1,901	1,427	1,293	1,102	0,937	0,897	0,862	0,726	0,537	0,361	0,256
55	3,006	2,132	1,632	1,491	1,291	1,119	1,078	1,043	0,901	0,702	0,518	0,328
60	3,274	2,353	1,829	1,682	1,473	1,295	1,252	1,218	1,069	0,862	0,669	0,470
65	3,532	2,565	2,018	1,866	1,648	1,464	1,420	1,386	1,230	1,016	0,814	0,607
70	3,780	2,770	2,200	2,042	1,816	1,627	1,582	1,547	1,386	1,164	0,955	0,739
75	4,018	2,966	2,375	2,212	1,978	1,784	1,737	1,703	1,537	1,307	1,091	0,867
80	4,246	3,156	2,544	2,376	2,135	1,935	1,888	1,854	1,682	1,445	1,222	0,990
85	4,467	3,338	2,707	2,534	2,286	2,082	2,033	1,999	1,822	1,578	1,349	1,110
90	4,679	3,514	2,865	2,687	2,432	2,223	2,173	2,140	1,958	1,707	1,471	1,225
95	4,884	3,683	3,016	2,834	2,572	2,359	2,308	2,275	2,089	1,832	1,590	1,336
100	5,081	3,847	3,163	2,977	2,708	2,491	2,439	2,407	2,215	1,953	1,704	1,444
105	-	4,005	3,305	3,114	2,840	2,619	2,566	2,534	2,338	2,070	1,816	1,549
110	-	4,158	3,442	3,247	2,967	2,742	2,688	2,657	2,457	2,183	1,923	1,651
115	-	4,306	3,575	3,376	3,091	2,862	2,807	2,776	2,572	2,293	2,028	1,749
120	-	4,449	3,703	3,501	3,210	2,978	2,922	2,891	2,684	2,399	2,129	1,845
125	-	4,588	3,827	3,622	3,326	3,091	3,034	3,003	2,792	2,502	2,227	1,937
130	-	4,722	3,948	3,739	3,438	3,200	3,142	3,112	2,897	2,603	2,323	2,027
135	-	4,852	4,065	3,853	3,547	3,305	3,247	3,218	2,999	2,700	2,416	2,115
140	-	4,978	4,178	3,963	3,653	3,408	3,349	3,320	3,098	2,794	2,506	2,200
145	-	5,101	4,288	4,070	3,755	3,508	3,448	3,419	3,194	2,886	2,593	2,283
150	-	5,219	4,395	4,174	3,855	3,605	3,545	3,516	3,288	2,976	2,679	2,363
155	-	-	4,499	4,275	3,952	3,699	3,638	3,610	3,379	3,063	2,761	2,441
160	-	-	4,600	4,373	4,046	3,791	3,729	3,701	3,467	3,147	2,842	2,517
165	-	-	4,698	4,469	4,137	3,880	3,818	3,790	3,553	3,230	2,921	2,592
170	-	-	4,794	4,562	4,226	3,967	3,904	3,877	3,637	3,310	2,997	2,664
175	-	-	4,886	4,652	4,313	4,051	3,988	3,961	3,719	3,388	3,072	2,734
180	-	-	4,977	4,740	4,397	4,133	4,070	4,043	3,798	3,464	3,144	2,803
185	-	-	5,065	4,826	4,480	4,214	4,149	4,123	3,876	3,538	3,215	2,870
190	-	-	5,150	4,909	4,560	4,292	4,227	4,201	3,951	3,610	3,284	2,935
195	-	-	5,234	4,991	4,638	4,368	4,302	4,277	4,025	3,681	3,351	2,999
200	-	-	-	5,070	4,714	4,442	4,376	4,352	4,097	3,750	3,417	3,061
205	-	-	-	5,147	4,788	4,514	4,448	4,424	4,167	3,817	3,481	3,121
210	-	-	-	5,223	4,861	4,585	4,518	4,494	4,235	3,882	3,544	3,181
215	-	-	-	-	4,931	4,654	4,587	4,563	4,302	3,946	3,605	3,239
220	-	-	-	-	5,000	4,721	4,654	4,631	4,367	4,009	3,665	3,295
225	-	-	-	-	5,068	4,787	4,719	4,696	4,431	4,070	3,723	3,350
230	-	-	-	-	5,133	4,851	4,783	4,761	4,493	4,130	3,780	3,404
235	-	-	-	-	5,198	4,914	4,845	4,823	4,554	4,188	3,836	3,457
240	-	-	-	-	-	4,975	4,906	4,885	4,614	4,245	3,891	3,509
245	-	-	-	-	-	5,035	4,966	4,945	4,672	4,301	3,944	3,560
250	-	-	-	-	-	5,094	5,024	5,003	4,729	4,355	3,996	3,609
255	-	-	-	-	-	5,152	5,081	5,061	4,784	4,409	4,048	3,657
260	-	-	-	-	-	5,208	5,137	5,117	4,839	4,461	4,098	3,705
265	-	-	-	-	-	-	5,192	5,172	4,892	4,512	4,147	3,751
270	-	-	-	-	-	-	5,245	5,226	4,944	4,562	4,195	3,797
275	-	-	-	-	-	-	-	-	4,996	4,612	4,242	3,841
280	-	-	-	-	-	-	-	-	5,046	4,660	4,288	3,885
285	-	-	-	-	-	-	-	-	5,095	4,707	4,333	3,928
290	-	-	-	-	-	-	-	-	5,143	4,753	4,377	3,970
295	-	-	-	-	-	-	-	-	5,190	4,798	4,420	4,011
300	-	-	-	-	-	-	-	-	5,236	4,843	4,463	4,051
305	-	-	-	-	-	-	-	-	-	4,886	4,505	4,091
310	-	-	-	-	-	-	-	-	-	4,929	4,546	4,129
315	-	-	-	-	-	-	-	-	-	4,971	4,586	4,167
320	-	-	-	-	-	-	-	-	-	5,012	4,625	4,205
325	-	-	-	-	-	-	-	-	-	5,052	4,664	4,241
330	-	-	-	-	-	-	-	-	-	5,092	4,702	4,277
335	-	-	-	-	-	-	-	-	-	5,130	4,739	4,313
340	-	-	-	-	-	-	-	-	-	5,169	4,775	4,347
345	-	-	-	-	-	-	-	-	-	5,206	4,811	4,382
350	-	-	-	-	-	-	-	-	-	5,243	4,847	4,415
355	-	-	-	-	-	-	-	-	-	-	4,881	4,448

Table A1.24: Rectangular hollow section Columns.

Section Factor	Resistance to fire period of 15 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
50	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
55	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
60	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
65	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
70	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
75	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
80	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
85	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
90	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
95	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
100	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
105	0,239	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
110	0,294	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
115	0,348	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
120	0,400	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
125	0,450	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
130	0,499	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
135	0,547	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
140	0,594	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
145	0,639	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
150	0,683	0,269	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
155	0,726	0,306	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
160	0,768	0,343	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
165	0,810	0,378	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
170	0,850	0,413	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
175	0,889	0,448	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
180	0,927	0,481	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
185	0,964	0,514	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
190	1,001	0,546	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
195	1,036	0,577	0,258	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
200	1,071	0,608	0,285	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
205	1,105	0,638	0,312	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
210	1,139	0,667	0,339	0,248	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
215	1,171	0,696	0,365	0,273	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
220	1,203	0,724	0,391	0,298	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
225	1,234	0,752	0,416	0,323	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
230	1,265	0,779	0,440	0,347	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
235	1,295	0,805	0,465	0,371	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
240	1,324	0,831	0,488	0,394	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
245	1,353	0,857	0,512	0,417	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
250	1,381	0,882	0,535	0,439	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
255	1,409	0,907	0,557	0,461	0,250	0,230	0,230	0,230	0,230	0,230	0,230	0,230
260	1,436	0,931	0,579	0,482	0,270	0,230	0,230	0,230	0,230	0,230	0,230	0,230
265	1,462	0,955	0,601	0,504	0,289	0,230	0,230	0,230	0,230	0,230	0,230	0,230
270	1,488	0,978	0,622	0,525	0,309	0,230	0,230	0,230	0,230	0,230	0,230	0,230
275	1,514	1,001	0,643	0,545	0,328	0,230	0,230	0,230	0,230	0,230	0,230	0,230
280	1,539	1,023	0,664	0,565	0,346	0,230	0,230	0,230	0,230	0,230	0,230	0,230
285	1,563	1,045	0,684	0,585	0,365	0,230	0,230	0,230	0,230	0,230	0,230	0,230
290	1,587	1,067	0,704	0,605	0,383	0,230	0,230	0,230	0,230	0,230	0,230	0,230
295	1,611	1,088	0,724	0,624	0,401	0,230	0,230	0,230	0,230	0,230	0,230	0,230
300	1,634	1,109	0,743	0,643	0,418	0,230	0,230	0,230	0,230	0,230	0,230	0,230
305	1,657	1,129	0,762	0,661	0,436	0,232	0,230	0,230	0,230	0,230	0,230	0,230
310	1,679	1,150	0,780	0,680	0,453	0,248	0,230	0,230	0,230	0,230	0,230	0,230
315	1,701	1,169	0,799	0,698	0,469	0,264	0,230	0,230	0,230	0,230	0,230	0,230
320	1,723	1,189	0,817	0,715	0,486	0,279	0,230	0,230	0,230	0,230	0,230	0,230
325	1,744	1,208	0,835	0,733	0,502	0,295	0,235	0,230	0,230	0,230	0,230	0,230
330	1,765	1,227	0,852	0,750	0,518	0,310	0,250	0,230	0,230	0,230	0,230	0,230
335	1,785	1,246	0,869	0,767	0,534	0,324	0,265	0,230	0,230	0,230	0,230	0,230
340	1,806	1,264	0,886	0,783	0,549	0,339	0,279	0,230	0,230	0,230	0,230	0,230
345	1,825	1,282	0,903	0,800	0,565	0,353	0,293	0,230	0,230	0,230	0,230	0,230
350	1,845	1,299	0,919	0,816	0,580	0,368	0,307	0,230	0,230	0,230	0,230	0,230
355	1,864	1,317	0,935	0,832	0,595	0,382	0,321	0,230	0,230	0,230	0,230	0,230
360	1,883	1,334	0,951	0,847	0,609	0,395	0,334	0,230	0,230	0,230	0,230	0,230

Table A1.25: Rectangular hollow section Columns.

Section Factor	Resistance to fire period of 30 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
50	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
55	0,276	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
60	0,400	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
65	0,520	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
70	0,637	0,232	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
75	0,750	0,328	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
80	0,860	0,422	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
85	0,966	0,513	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
90	1,069	0,602	0,302	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
95	1,169	0,688	0,380	0,303	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
100	1,266	0,772	0,456	0,377	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
105	1,360	0,853	0,529	0,449	0,255	0,230	0,230	0,230	0,230	0,230	0,230	0,230
110	1,452	0,933	0,602	0,520	0,320	0,230	0,230	0,230	0,230	0,230	0,230	0,230
115	1,541	1,011	0,672	0,589	0,384	0,230	0,230	0,230	0,230	0,230	0,230	0,230
120	1,628	1,086	0,741	0,656	0,446	0,276	0,230	0,230	0,230	0,230	0,230	0,230
125	1,712	1,160	0,808	0,722	0,507	0,333	0,282	0,230	0,230	0,230	0,230	0,230
130	1,795	1,232	0,873	0,786	0,567	0,390	0,337	0,242	0,230	0,230	0,230	0,230
135	1,875	1,302	0,937	0,849	0,626	0,445	0,391	0,294	0,230	0,230	0,230	0,230
140	1,953	1,370	1,000	0,910	0,683	0,499	0,445	0,346	0,230	0,230	0,230	0,230
145	2,029	1,437	1,061	0,971	0,739	0,552	0,497	0,396	0,265	0,230	0,230	0,230
150	2,103	1,503	1,121	1,030	0,794	0,604	0,548	0,445	0,311	0,230	0,230	0,230
155	2,175	1,566	1,180	1,087	0,847	0,655	0,598	0,493	0,358	0,230	0,230	0,230
160	2,245	1,629	1,237	1,144	0,900	0,705	0,647	0,541	0,403	0,230	0,230	0,230
165	2,314	1,689	1,293	1,199	0,951	0,754	0,695	0,587	0,447	0,230	0,230	0,230
170	2,381	1,749	1,348	1,253	1,002	0,802	0,742	0,633	0,491	0,254	0,230	0,230
175	2,446	1,807	1,402	1,306	1,052	0,849	0,788	0,678	0,534	0,293	0,230	0,230
180	2,510	1,864	1,455	1,358	1,100	0,895	0,834	0,722	0,576	0,332	0,230	0,230
185	2,573	1,920	1,506	1,409	1,148	0,941	0,878	0,765	0,617	0,370	0,230	0,230
190	2,634	1,974	1,557	1,459	1,195	0,986	0,922	0,807	0,658	0,407	0,230	0,230
195	2,693	2,028	1,606	1,508	1,240	1,029	0,965	0,849	0,698	0,444	0,230	0,230
200	2,752	2,080	1,655	1,556	1,285	1,072	1,008	0,890	0,737	0,480	0,230	0,230
205	2,809	2,131	1,703	1,603	1,330	1,115	1,049	0,930	0,775	0,515	0,243	0,230
210	2,864	2,181	1,749	1,649	1,373	1,156	1,090	0,970	0,813	0,550	0,275	0,230
215	2,919	2,230	1,795	1,694	1,415	1,197	1,130	1,009	0,851	0,585	0,306	0,230
220	2,972	2,278	1,840	1,738	1,457	1,237	1,169	1,047	0,887	0,619	0,336	0,230
225	3,025	2,325	1,884	1,782	1,498	1,276	1,208	1,084	0,923	0,652	0,366	0,230
230	3,076	2,372	1,927	1,825	1,539	1,315	1,246	1,121	0,959	0,685	0,396	0,230
235	3,126	2,417	1,970	1,867	1,578	1,353	1,284	1,158	0,994	0,717	0,425	0,230
240	3,175	2,461	2,012	1,908	1,617	1,390	1,320	1,194	1,028	0,749	0,454	0,230
245	3,223	2,505	2,052	1,949	1,655	1,427	1,357	1,229	1,062	0,780	0,482	0,249
250	3,270	2,547	2,093	1,989	1,693	1,463	1,392	1,263	1,096	0,811	0,510	0,275
255	3,316	2,589	2,132	2,028	1,730	1,499	1,427	1,297	1,128	0,841	0,538	0,300
260	3,361	2,631	2,171	2,066	1,766	1,534	1,462	1,331	1,161	0,871	0,565	0,325
265	3,406	2,671	2,209	2,104	1,802	1,568	1,496	1,364	1,192	0,901	0,591	0,349
270	3,449	2,711	2,246	2,141	1,837	1,602	1,529	1,396	1,224	0,930	0,618	0,374
275	3,492	2,749	2,283	2,178	1,872	1,636	1,562	1,428	1,255	0,959	0,644	0,397
280	3,534	2,788	2,319	2,214	1,906	1,668	1,594	1,460	1,285	0,987	0,669	0,421
285	3,575	2,825	2,355	2,249	1,939	1,701	1,626	1,491	1,315	1,015	0,695	0,444
290	3,615	2,862	2,390	2,284	1,972	1,733	1,658	1,522	1,344	1,042	0,720	0,467
295	3,655	2,898	2,424	2,318	2,004	1,764	1,688	1,552	1,373	1,069	0,744	0,490
300	3,693	2,934	2,458	2,352	2,036	1,795	1,719	1,581	1,402	1,096	0,769	0,512
305	3,731	2,969	2,491	2,385	2,067	1,825	1,749	1,610	1,430	1,122	0,792	0,534
310	3,769	3,003	2,524	2,417	2,098	1,855	1,778	1,639	1,458	1,148	0,816	0,556
315	3,806	3,037	2,556	2,449	2,129	1,885	1,807	1,668	1,486	1,174	0,839	0,577
320	3,842	3,070	2,588	2,481	2,159	1,914	1,836	1,696	1,513	1,199	0,862	0,599
325	3,877	3,103	2,619	2,512	2,188	1,942	1,864	1,723	1,539	1,224	0,885	0,620
330	3,912	3,135	2,650	2,542	2,217	1,970	1,892	1,750	1,566	1,248	0,907	0,640
335	3,946	3,167	2,680	2,573	2,246	1,998	1,920	1,777	1,592	1,273	0,930	0,661
340	3,980	3,198	2,709	2,602	2,274	2,026	1,947	1,803	1,617	1,297	0,951	0,681
345	4,013	3,229	2,739	2,631	2,302	2,053	1,973	1,829	1,642	1,320	0,973	0,701
350	4,046	3,259	2,768	2,660	2,329	2,079	2,000	1,855	1,667	1,343	0,994	0,720
355	4,078	3,288	2,796	2,688	2,356	2,105	2,025	1,880	1,692	1,366	1,015	0,740
360	4,109	3,317	2,824	2,716	2,383	2,131	2,051	1,905	1,716	1,389	1,036	0,759

Table A1.26: Rectangular hollow section Columns.

Section Factor	Resistance to fire period of 45 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
50	0,780	0,354	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
55	0,960	0,507	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
60	1,135	0,656	0,360	0,290	0,230	0,230	0,230	0,230	0,230	0,230	0,230	0,230
65	1,303	0,800	0,490	0,417	0,232	0,230	0,230	0,230	0,230	0,230	0,230	0,230
70	1,467	0,941	0,617	0,541	0,346	0,230	0,230	0,230	0,230	0,230	0,230	0,230
75	1,625	1,077	0,740	0,661	0,457	0,298	0,251	0,230	0,230	0,230	0,230	0,230
80	1,779	1,209	0,860	0,779	0,566	0,401	0,352	0,263	0,230	0,230	0,230	0,230
85	1,928	1,338	0,976	0,893	0,672	0,502	0,451	0,358	0,239	0,230	0,230	0,230
90	2,072	1,463	1,090	1,005	0,776	0,600	0,547	0,451	0,328	0,230	0,230	0,230
95	2,213	1,585	1,201	1,114	0,877	0,696	0,641	0,542	0,415	0,230	0,230	0,230
100	2,349	1,704	1,310	1,220	0,976	0,790	0,733	0,631	0,501	0,283	0,230	0,230
105	2,481	1,819	1,415	1,324	1,073	0,882	0,824	0,719	0,584	0,360	0,230	0,230
110	2,610	1,931	1,518	1,426	1,168	0,972	0,912	0,804	0,666	0,435	0,230	0,230
115	2,735	2,041	1,619	1,525	1,260	1,060	0,999	0,888	0,746	0,509	0,261	0,230
120	2,857	2,148	1,717	1,621	1,350	1,146	1,083	0,970	0,825	0,582	0,327	0,230
125	2,975	2,252	1,813	1,716	1,439	1,231	1,166	1,050	0,902	0,653	0,392	0,230
130	3,090	2,354	1,907	1,809	1,525	1,313	1,247	1,129	0,978	0,723	0,455	0,251
135	3,202	2,453	1,998	1,899	1,610	1,394	1,327	1,206	1,052	0,791	0,517	0,308
140	3,312	2,550	2,088	1,987	1,693	1,474	1,405	1,282	1,125	0,859	0,578	0,365
145	3,418	2,644	2,176	2,074	1,774	1,551	1,482	1,356	1,196	0,925	0,639	0,421
150	3,522	2,736	2,261	2,159	1,853	1,628	1,557	1,429	1,266	0,990	0,698	0,475
155	3,623	2,826	2,345	2,242	1,931	1,702	1,630	1,501	1,335	1,054	0,756	0,529
160	3,722	2,914	2,427	2,323	2,007	1,776	1,702	1,571	1,402	1,117	0,813	0,582
165	3,818	3,000	2,507	2,402	2,082	1,847	1,773	1,640	1,469	1,178	0,870	0,634
170	3,912	3,085	2,586	2,480	2,155	1,918	1,843	1,707	1,534	1,239	0,925	0,686
175	4,004	3,167	2,663	2,556	2,227	1,987	1,911	1,773	1,598	1,299	0,979	0,736
180	4,094	3,247	2,738	2,631	2,298	2,055	1,978	1,839	1,661	1,357	1,033	0,786
185	4,181	3,326	2,812	2,704	2,367	2,122	2,043	1,902	1,722	1,415	1,086	0,835
190	4,267	3,403	2,884	2,776	2,434	2,187	2,108	1,965	1,783	1,472	1,137	0,883
195	4,350	3,478	2,955	2,846	2,501	2,251	2,171	2,027	1,843	1,527	1,189	0,931
200	4,432	3,552	3,025	2,915	2,566	2,314	2,233	2,088	1,901	1,582	1,239	0,977
205	4,512	3,624	3,093	2,983	2,630	2,376	2,294	2,147	1,959	1,636	1,288	1,023
210	4,590	3,695	3,160	3,049	2,693	2,437	2,354	2,206	2,016	1,689	1,337	1,069
215	4,667	3,765	3,225	3,115	2,754	2,497	2,413	2,263	2,071	1,741	1,385	1,114
220	4,741	3,832	3,289	3,179	2,815	2,556	2,471	2,320	2,126	1,793	1,432	1,158
225	4,815	3,899	3,352	3,241	2,874	2,613	2,528	2,375	2,180	1,843	1,479	1,201
230	4,886	3,964	3,414	3,303	2,933	2,670	2,584	2,430	2,233	1,893	1,525	1,244
235	4,957	4,028	3,475	3,363	2,990	2,726	2,639	2,484	2,285	1,942	1,570	1,286
240	5,025	4,091	3,535	3,423	3,047	2,781	2,693	2,537	2,337	1,991	1,614	1,328
245	5,093	4,153	3,593	3,481	3,102	2,835	2,747	2,589	2,387	2,038	1,658	1,369
250	5,159	4,213	3,651	3,539	3,157	2,888	2,799	2,640	2,437	2,085	1,701	1,409
255	5,224	4,272	3,707	3,595	3,210	2,940	2,851	2,690	2,486	2,131	1,744	1,449
260	5,287	4,330	3,763	3,650	3,263	2,991	2,901	2,740	2,534	2,177	1,786	1,489
265	5,349	4,387	3,817	3,705	3,314	3,042	2,951	2,789	2,582	2,222	1,827	1,527
270	-	4,443	3,871	3,758	3,365	3,092	3,000	2,837	2,629	2,266	1,868	1,566
275	-	4,498	3,923	3,811	3,415	3,140	3,049	2,884	2,675	2,309	1,908	1,603
280	-	4,552	3,975	3,862	3,465	3,189	3,096	2,931	2,720	2,352	1,948	1,641
285	-	4,605	4,026	3,913	3,513	3,236	3,143	2,977	2,765	2,395	1,987	1,677
290	-	4,657	4,076	3,963	3,561	3,283	3,189	3,022	2,809	2,436	2,026	1,714
295	-	4,709	4,125	4,012	3,608	3,329	3,235	3,067	2,852	2,477	2,064	1,749
300	-	4,759	4,173	4,061	3,654	3,374	3,279	3,110	2,895	2,518	2,101	1,785
305	-	4,808	4,221	4,108	3,699	3,418	3,323	3,154	2,937	2,558	2,138	1,820
310	-	4,857	4,267	4,155	3,744	3,462	3,367	3,196	2,979	2,597	2,175	1,854
315	-	4,905	4,313	4,201	3,788	3,505	3,410	3,238	3,020	2,636	2,211	1,888
320	-	4,952	4,359	4,246	3,831	3,548	3,452	3,279	3,060	2,674	2,247	1,922
325	-	4,998	4,403	4,291	3,874	3,590	3,493	3,320	3,100	2,712	2,282	1,955
330	-	5,043	4,447	4,335	3,916	3,631	3,534	3,360	3,139	2,750	2,316	1,987
335	-	5,088	4,490	4,378	3,958	3,672	3,574	3,400	3,178	2,786	2,351	2,020
340	-	5,132	4,533	4,421	3,999	3,712	3,614	3,439	3,216	2,823	2,385	2,052
345	-	5,175	4,575	4,463	4,039	3,752	3,653	3,478	3,254	2,859	2,418	2,083
350	-	5,218	4,616	4,504	4,078	3,791	3,692	3,516	3,291	2,894	2,451	2,114
355	-	5,260	4,656	4,545	4,117	3,829	3,730	3,553	3,328	2,929	2,483	2,145
360	-	5,301	4,696	4,585	4,156	3,867	3,768	3,590	3,364	2,963	2,515	2,175

Table A1.27: Rectangular hollow section Columns.

Section Factor	Resistance to fire period of 60 minutes											
	Thickness (mm) required – only intumescent coating											
m ⁻¹	350 °C	400 °C	450 °C	470 °C	500 °C	540 °C	550 °C	570 °C	600 °C	650 °C	700 °C	750 °C
50	1,413	0,891	0,577	0,505	0,316	0,230	0,230	0,230	0,230	0,230	0,230	0,230
55	1,645	1,089	0,755	0,680	0,478	0,324	0,278	0,230	0,230	0,230	0,230	0,230
60	1,869	1,282	0,929	0,850	0,635	0,473	0,424	0,336	0,230	0,230	0,230	0,230
65	2,087	1,468	1,098	1,016	0,789	0,619	0,567	0,474	0,355	0,230	0,230	0,230
70	2,297	1,649	1,262	1,177	0,938	0,761	0,706	0,609	0,484	0,278	0,230	0,230
75	2,501	1,825	1,422	1,334	1,084	0,899	0,842	0,740	0,610	0,394	0,230	0,230
80	2,698	1,997	1,578	1,487	1,227	1,035	0,975	0,869	0,734	0,508	0,272	0,230
85	2,890	2,163	1,730	1,637	1,366	1,167	1,106	0,995	0,855	0,619	0,373	0,230
90	3,076	2,325	1,878	1,782	1,502	1,297	1,233	1,118	0,973	0,729	0,472	0,280
95	3,257	2,482	2,023	1,925	1,635	1,424	1,357	1,239	1,089	0,836	0,570	0,370
100	3,432	2,635	2,163	2,063	1,764	1,547	1,479	1,357	1,202	0,941	0,666	0,459
105	3,602	2,785	2,301	2,199	1,891	1,669	1,598	1,473	1,313	1,044	0,760	0,546
110	3,768	2,930	2,435	2,331	2,015	1,787	1,715	1,586	1,422	1,145	0,852	0,632
115	3,929	3,072	2,566	2,461	2,136	1,903	1,829	1,697	1,529	1,244	0,942	0,716
120	4,085	3,210	2,694	2,587	2,254	2,017	1,941	1,805	1,633	1,342	1,031	0,799
125	4,237	3,344	2,818	2,710	2,370	2,128	2,050	1,912	1,736	1,437	1,119	0,880
130	4,386	3,476	2,940	2,831	2,483	2,237	2,158	2,016	1,837	1,531	1,205	0,960
135	4,530	3,604	3,060	2,949	2,594	2,344	2,263	2,118	1,935	1,623	1,289	1,038
140	4,671	3,729	3,176	3,064	2,703	2,448	2,366	2,219	2,032	1,714	1,372	1,116
145	4,808	3,851	3,290	3,177	2,809	2,551	2,467	2,317	2,127	1,803	1,454	1,192
150	4,941	3,970	3,402	3,288	2,913	2,651	2,566	2,413	2,221	1,890	1,534	1,267
155	5,072	4,087	3,511	3,396	3,015	2,750	2,663	2,508	2,312	1,976	1,612	1,340
160	5,199	4,200	3,617	3,502	3,115	2,846	2,758	2,601	2,402	2,060	1,690	1,413
165	5,323	4,311	3,722	3,606	3,213	2,941	2,851	2,692	2,490	2,143	1,766	1,484
170	-	4,420	3,824	3,707	3,309	3,034	2,943	2,781	2,577	2,224	1,841	1,554
175	-	4,526	3,924	3,807	3,403	3,125	3,033	2,869	2,662	2,304	1,915	1,623
180	-	4,630	4,022	3,904	3,495	3,215	3,121	2,955	2,746	2,383	1,987	1,691
185	-	4,732	4,118	4,000	3,585	3,302	3,208	3,040	2,828	2,460	2,059	1,758
190	-	4,832	4,212	4,093	3,674	3,389	3,293	3,123	2,909	2,536	2,129	1,824
195	-	4,929	4,304	4,185	3,761	3,473	3,377	3,205	2,988	2,611	2,198	1,889
200	-	5,024	4,395	4,275	3,847	3,556	3,459	3,285	3,066	2,684	2,266	1,953
205	-	5,118	4,483	4,364	3,930	3,638	3,539	3,364	3,143	2,757	2,333	2,016
210	-	5,209	4,570	4,450	4,013	3,718	3,619	3,442	3,218	2,828	2,399	2,078
215	-	5,299	4,655	4,535	4,093	3,797	3,696	3,518	3,292	2,898	2,464	2,140
220	-	-	4,739	4,619	4,173	3,875	3,773	3,593	3,365	2,967	2,528	2,200
225	-	-	4,821	4,701	4,251	3,951	3,848	3,666	3,437	3,035	2,591	2,259
230	-	-	4,901	4,781	4,327	4,025	3,922	3,739	3,507	3,102	2,653	2,318
235	-	-	4,980	4,860	4,402	4,099	3,995	3,810	3,577	3,168	2,714	2,376
240	-	-	5,058	4,937	4,476	4,171	4,066	3,880	3,645	3,233	2,775	2,432
245	-	-	5,134	5,014	4,549	4,242	4,137	3,949	3,713	3,296	2,834	2,489
250	-	-	5,209	5,088	4,620	4,312	4,206	4,017	3,779	3,359	2,892	2,544
255	-	-	5,282	5,162	4,690	4,381	4,274	4,083	3,844	3,421	2,950	2,598
260	-	-	5,354	5,234	4,759	4,449	4,341	4,149	3,908	3,482	3,007	2,652
265	-	-	-	5,305	4,827	4,515	4,407	4,214	3,971	3,542	3,063	2,705
270	-	-	-	-	4,894	4,581	4,471	4,277	4,034	3,602	3,118	2,758
275	-	-	-	-	4,959	4,645	4,535	4,340	4,095	3,660	3,173	2,809
280	-	-	-	-	5,024	4,709	4,598	4,402	4,155	3,718	3,227	2,860
285	-	-	-	-	5,087	4,771	4,660	4,463	4,215	3,774	3,280	2,910
290	-	-	-	-	5,150	4,833	4,721	4,522	4,273	3,830	3,332	2,960
295	-	-	-	-	5,211	4,893	4,781	4,581	4,331	3,885	3,383	3,009
300	-	-	-	-	5,272	4,953	4,840	4,639	4,388	3,940	3,434	3,057
305	-	-	-	-	5,331	5,011	4,898	4,697	4,444	3,993	3,484	3,105
310	-	-	-	-	-	5,069	4,955	4,753	4,499	4,046	3,534	3,152
315	-	-	-	-	-	5,126	5,012	4,809	4,554	4,098	3,583	3,199
320	-	-	-	-	-	5,182	5,067	4,863	4,608	4,150	3,631	3,244
325	-	-	-	-	-	5,238	5,122	4,917	4,661	4,201	3,679	3,290
330	-	-	-	-	-	5,292	5,176	4,971	4,713	4,251	3,726	3,334
335	-	-	-	-	-	5,346	5,229	5,023	4,764	4,300	3,772	3,379
340	-	-	-	-	-	-	5,282	5,075	4,815	4,349	3,818	3,422
345	-	-	-	-	-	-	5,334	5,126	4,865	4,397	3,863	3,465
350	-	-	-	-	-	-	-	5,176	4,915	4,444	3,907	3,508
355	-	-	-	-	-	-	-	5,226	4,964	4,491	3,951	3,550
360	-	-	-	-	-	-	-	5,275	5,012	4,537	3,995	3,591

