Exova Warringtonfire
Holmesfield Road
Warrington
WA1 2DS
United Kingdom

T : +44 (0) 1925 655 116
F : +44 (0) 1925 655 419
E : warrington@exova.com
W: www.exova.com

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Title:

The Fire Resistance Performance of Steel 'I' and 'H' Section Beams and Columns Protected with CONTEGO Passive Fire Barrier Latex Intumescent in Accordance with BS 476: Part 21: 1987: Analysis at Various Design Temperatures.

WF Report No:

348293 Issue 2

Prepared for:

Contego International Inc.

1013 Arthur Street,
Rochester,
Indiana
United States of America,
IN 46975

Date:

26th January 2016

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Executive Summary

Objective

To provide an assessment of the ability of an intumescent coating system known as CONTEGO Passive Fire Barrier Latex Intumescent to fire protect structural steel I/H-section Beams and Columns in accordance with BS 476: Part 21: 1987 for design temperatures in the range 350°C to 750°C and fire resistance periods up to 120 minutes.

Report Sponsor

Contego International Inc.

Address

1013 Arthur Street, Rochester, Indiana, United States of America, IN 46975

Summary of Conclusions

An assessment of the ability of an intumescent coating system known as CONTEGO Passive Fire Barrier Latex Intumescent to protect structural steel I/H-section Beams and Columns in accordance with BS 476: Part 21: 1987 for periods up to 120 minutes.

The input data for the assessment was generated from tests on sections subjected to the heating conditions in accordance with BS EN 13381-8: 2013.

Because the conditions of furnace temperature which are achieved during the test in accordance to BS EN 13381-8: 2013 represent a more severe exposure to the test specimens, it is considered to be conservative to use the test results for the purpose of this assessment.

The report considers the ability of CONTEGO Passive Fire Barrier Latex Intumescent to fire protect structural steel I/H-section Beams and Columns for design temperatures in the range of 350°C to 750°C and fire resistance periods up to 120 minutes in the light of additional test data.

The assessment utilises a graphical method plotting inverse section factor against time to reach the specified steel temperature for a range of protection thickness.

Appendix 1 shows the test data used in the analyses.

Annexes A and B show the analyses and the results for I/H-section Beams and Columns.

Valid until

1st February 2021

Introduction

This report presents an assessment of the ability of an intumescent coating system known as CONTEGO Passive Fire Barrier Latex Intumescent to protect structural steel I/H-section Beams and Columns in accordance with BS 476: Part 21: 1987 for periods up to 120 minutes in the light of additional test data.

The input data for the assessment was generated from tests on sections subjected to the heating conditions in accordance with BS EN 13381-8: 2013.

Because the conditions of furnace temperature which are achieved during the test in accordance to BS EN 13381-8: 2013 represent a more severe exposure to the test specimens, it is considered to be conservative to use the test results for the purpose of this assessment.

This report sets out three criteria for the assessment to be deemed satisfactory. These criteria for acceptability are:

(a) For each short section the predicted time to reach each design temperature shall not exceed the time for the corrected temperature to reach the design temperature by more than 15%.

(b) The mean value of all percentage differences in time shall be less than zero.

(c) A maximum of 30% of individual values of all percentage differences in time shall be more than zero.

The assessment for beams with 3-sided protection refers to a concrete slab in intimate contact with the top flange.

FTSG

The data referred to in the supporting data section has been considered for the purpose of this appraisal which has been prepared in accordance with the Fire Test Study Group Resolution No. 82: 2001.

Assumptions

Steel preparation

It is assumed that the steel sections will be shot-blast cleaned and primed with a similar paint in a similar manner to that used for the sections tested under the test references given in the original report.

Primer

This report assumes that nominal thickness of the primer paint will be similar to that for the tested sections.

Test Data

Data from the loaded tests and the tests on the tall column

The following tests were carried out on loaded beams and tall column:

Loaded I-section Beams

Test Reference	Section Reference	Section Size mm×mm×kg/m	Actual Section Factor m^{-1}	Coating Thickness mm	Load Bearing Capacity minutes
WF No. 352790	$LB1_{min}$	406 x 178 x 67	162	0.306	26
WF No. 354436	$LB1_{max}$	406 x 178 x 67	167.9	3.551	111

Tall H-section Column

Test Reference	Section Reference	Section Size mm×mm×kg/m	Actual Section Factor m^{-1}	Coating Thickness mm	Time to Reach 550°C minutes
WF No. 343254	TC1	203x203x60	173.9	4.224	108.5

The specimens were subjected to the heating conditions of BS EN 13381-8: 2013. Because the conditions of furnace temperature which are achieved during the test in accordance to BS EN 13381-8: 2013 represent a more severe exposure, it is considered to be conservative to use the test results for the purpose of this assessment.

The tests referred to above demonstrate the ability of the coating to remain attached to a deflecting section and free from slumping at elevated temperatures. The beam sections were loaded to produce the maximum permissible stress for the steel grade.

I/H-section Beams

Typically if the loaded beam achieves within 10% of the maximum required, it is considered acceptable to derive specifications for up to the maximum i.e. 120 minutes in this case.

The loaded beam from the test WF No. 354436 with the maximum protection thickness achieved a minimum fire resistance performance of 111 minutes therefore, it is acceptable to derive specifications for up to 120 minutes.

I/H-section Columns

For the assessment of H-section columns a critical steel temperature of 550°C is considered to be appropriate (the Yellow Book guidelines).

As the tall column from the test WF No. 343254 with the maximum protection thickness achieved a minimum fire resistance performance of 108 minutes therefore, it is acceptable to derive specifications for up to 120 minutes.

Data correction

Data correction was carried out by comparing the time for the loaded beams or tall column to reach each of the specified temperatures with those for the equivalent short reference sections.

It is unlikely that the loaded beam or tall column and its equivalent short reference sections will have identical section factors and protection thickness. Therefore the time for the short beam is adjusted to the same section factor and thickness as the loaded beam or tall column.

Where a correction factor was >1.0, a correction factor of 1 was adopted.

The calculation of the correction factors for the specified steel temperatures is given in Appendix 1.

Analysis Methods

I/H-sections

For this report the thickness of the protection material for I/H-section beams and I/H-section columns was determined by multi-temperature analysis.

The relevant temperature data was derived from short columns therefore, the thermal analysis can be used for both beams (3 sided protection) and columns (4 sided protection). The data used in the analysis across the temperature range of 350°C to 750°C, including those given above, is summarised in Appendix 1.

The details of each specimen, i.e. the section factor (the ratio of the heated perimeter to cross-sectional area – A/V), the protection thickness and duration of heating required for the sections to reach an appropriate design temperature were used as input data for the analysis.

The fire resistance of a protected steel section can be approximated as follows over a limited range of values:

FR α A/V at a constant protection thickness or

d α A/V at a constant fire resistance period

where;

FR - Fire resistance

V - Cross-sectional area

A - Heater perimeter of section

d - Thickness of protection material

The required thickness of protection for a given steel section for a particular fire resistance period is therefore assessed by means of a graphical plot of inverse section factor (V/A) against the time for the section to reach the critical steel temperature.

Assessed Performance

General

Experience shows that data from fire resistance tests on steel sections protected with intumescent coatings, when presented graphically as inverse section factor against time to reach a particular steel temperature, tend to show a curved relationship.

This report adopts a conservative approach when drawing plots by generally drawing straight lines through the data points or by giving equal validity for corresponding data points.

Graphs

The graphs in Annexes A and B represent specified steel temperatures as indicated in this report.

Intercepts

Although some intercepts show high section factors these have only been used to determine the appropriate thickness for the maximum section factor for each section type.

Analysis and Results

Annexes A and B show the graphical plots for the various steel temperatures, the intercepts from the graphs and tables showing the results for I/H-section Beams and Columns respectively.

Scope of Performance

In line with current UK assessment principles it is permitted to extend the scope of the assessment with respect to protection thickness and section factor by approximately 10%.

Permitted extensions

These limitations applied to the analysis are as follows:

I/H-section Beams

Permitted Extension for Protection Thickness			
I/H-Section Beams	Actual mm	Maximum Permitted mm	Minimum Permitted mm
LB1min	0.306	-	0.275
LB1max	3.551	3.906	-

Permitted Extension for Section Factor			
I/H-Section Beams	Actual m^{-1}	Maximum Permitted m^{-1}	Minimum Permitted m^{-1}
SC4	95	-	86
SC10	334	368	-

I/H-section Columns

Permitted Extension for Protection Thickness			
I/H-Section Columns	Actual mm	Maximum Permitted mm	Minimum Permitted mm
SC2	0.289	-	0.260
TC1	4.224	4.646	-

Permitted Extension for Section Factor			
I/H-Section Columns	Actual m^{-1}	Maximum Permitted m^{-1}	Minimum Permitted m^{-1}
SC4	95	-	86
SC10	334	367	-

Four sided beams

The results of the assessment for columns can be applied to beams exposed on all four sides up to the maximum dry film thickness of 3.906mm.

The result of the analysis of the data for I/H-section beams supporting concrete slab as given in WF Nos. 352790 and 354436 is also applicable to beams with web depth up to 610mm.

Design temperatures

Specific results referred to in the Annexes at temperatures of 620°C (I-section beams) and 550°C (H-section columns) relate to steel sections subjected to the maximum design loads in accordance with BS 449: Part 2.

Limits of applicability

The method of protection should be as described in the appropriate test report.

Conclusions

An assessment of the ability of an intumescent coating system known as CONTEGO Passive Fire Barrier Latex Intumescent to fire protect structural steel I/H-section Beams and Columns in accordance with BS 476: Part 21: 1987 for design temperatures in the range 350^{o}C to 750^{o}C and fire resistance periods up to 120 minutes has been undertaken.

The assessment method adopted for this report uses a graphical approach plotting inverse section factor against time to reach a specified steel temperature for a range of protection thickness. This method is commonly used in the UK for assessing the ability of reactive intumescent protection systems to fire protect structural steel.

This report considers steel design temperatures in the range 350^{o}C to 750^{o}C and fire resistance periods up to 120 minutes.

Appendix 1 shows the test data used in the analyses.

Annexes A and B show the graphical plots for the various steel temperatures, the intercepts from the graphs and tables showing the results for I/H-section Beams and Columns respectively.

Validity

This assessment is issued on the basis of test data and information available at the time of issue.

If contradictory evidence becomes available to **Exova Warringtonfire** the assessment will be unconditionally withdrawn and Contego International Inc. will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested because actual test data is deemed to take precedence over an expressed opinion.

The assessment is valid initially for a period of five years i.e. until 1st February 2021 after which time it is recommended that it be returned for re-appraisal.

The appraisal is only valid provided that no other modifications are made to the tested construction other than those described in this report.

Summary of Supporting Data

WF Nos. 343253, 343254, 344018, 354436, 352790 and 352791

Reports on fire resistance tests in accordance with EN 13381-8: 2013 carried out on loaded sections and a number of unloaded 'I' and 'H' sections subjected to the heating conditions specified in this standard.

The appropriate details of the test sections are summarised in the body of this report.

The tests were sponsored by Contego International Inc.

Declaration by Contego International Inc.

We the undersigned confirm that we have read and complied with the obligations placed on us by the UK Fire Test Study Group Resolution No. 82: 2001.

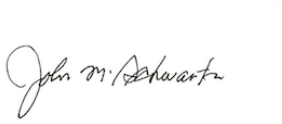
We confirm that the component or element of structure, which is the subject of this assessment, has not to our knowledge been subjected to a fire test to the Standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test to the Standard against which this assessment is being made.

We are not aware of any information that could adversely affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to cease using the assessment and ask **Exova Warringtonfire** to withdraw the assessment.

Signed:



John M. Schwartz* - Director, International Operations

For and on behalf of: Contego International Inc.

Signatories

Responsible Officer

D Podolski* - Certification Engineer

Approved

Jifeng Yuan * – Chief Engineer

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 26th January 2016	2nd Issue presents fire resistance periods up to 120 minutes and additional design temperatures - **3rd February 2016**

The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

Appendix 1

Appendix 1 Test Data: I/H-section Beams

I/H-section Beams Data

Section	Section Factor m^{-1}	Thickness mm		Design Temperature									
				350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
Section SC7	262	1.747	Factor	1.000	0.995	0.997	0.995	0.995	0.995	0.995	0.995	0.995	0.995
			Actual Time	42.8	51.8	60.5	69.1	78.1	87.5	91.5	97.6	108.3	119.5
			Corrected Time	42.7	51.5	60.3	68.7	77.6	87.0	91.0	97.0	107.7	118.8
Section SC2	174	2.319	Factor	1.000	0.997	0.998	0.996	0.996	0.996	0.996	0.996	0.996	0.996
			Actual Time	62.5	74.5	85.2	96.1	107.0	118.7	123.5	131.0	144.0	155.3
			Corrected Time	62.4	74.2	85.0	95.7	106.6	118.2	123.0	130.5	143.4	154.7
Section SC5	95	2.345	Factor	1.000	0.997	0.998	0.996	0.996	0.996	0.996	0.996	0.996	0.996
			Actual Time	84.0	98.7	112.7	126.7	141.5	155.0	160.0	163.3	167.0	171.5
			Corrected Time	83.9	98.4	112.4	126.2	141.0	154.4	159.4	162.7	166.4	170.8
Section SC4	95	1.696	Factor	1.000	0.995	0.997	0.995	0.995	0.995	0.995	0.995	0.995	0.995
			Actual Time	59.2	72.7	85.5	98.2	111.0	124.2	129.7	138.5	152.6	166.0
			Corrected Time	59.1	72.3	85.2	97.6	110.3	123.5	128.9	137.7	151.7	165.0
Section SC8	262	2.333	Factor	1.000	0.997	0.998	0.996	0.996	0.996	0.996	0.996	0.996	0.996
			Actual Time	50.0	59.3	68.1	77.2	86.8	97.1	101.3	107.7	119.0	129.0
			Corrected Time	49.9	59.1	67.9	76.9	86.4	96.7	100.9	107.3	118.5	128.5
Section SC9	262	4.083	Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Actual Time	64.5	73.1	79.1	84.6	90.7	97.6	100.6	105.5	114.0	122.5
			Corrected Time	64.5	73.1	79.1	84.6	90.7	97.6	100.6	105.5	114.0	122.5
Section SC10	334	1.692	Factor	1.000	0.995	0.997	0.995	0.995	0.995	0.995	0.995	0.995	0.995
			Actual Time	36.1	44.6	52.3	60.3	68.7	77.8	81.5	87.3	97.0	107.6
			Corrected Time	36.0	44.3	52.1	59.9	68.3	77.3	81.0	86.8	96.4	107.0
Section SC11	334	2.305	Factor	1.000	0.997	0.998	0.996	0.996	0.996	0.996	0.996	0.996	0.996
			Actual Time	45.5	54.6	62.3	70.0	78.1	86.6	90.2	95.8	105.1	115.0
			Corrected Time	45.4	54.4	62.1	69.7	77.8	86.2	89.8	95.4	104.7	114.5
Section SC12	334	3.956	Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Actual Time	64.3	73.8	81.8	89.6	97.6	106.3	110.0	116.0	127.0	138.1
			Corrected Time	64.3	73.8	81.8	89.6	97.6	106.3	110.0	116.0	127.0	138.1
Section SC6	250	0.598	Factor	1.000	0.993	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	23.5	31.2	38.1	44.7	51.2	57.3	59.8	63.5	69.7	77.3
			Corrected Time	23.4	30.9	37.9	44.3	50.7	56.8	59.2	62.9	69.0	76.6
Section SC3	97	0.627	Factor	1.000	0.993	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	31.2	40.7	50.0	58.6	66.8	74.5	77.6	82.1	90.2	99.6
			Corrected Time	31.1	40.4	49.7	58.0	66.2	73.8	76.9	81.3	89.4	98.7
Section SC1	172	0.637	Factor	1.000	0.993	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	24.2	31.8	39.2	46.5	53.7	60.7	63.5	67.5	74.6	83.0
			Corrected Time	24.1	31.5	39.0	46.1	53.2	60.1	62.9	66.9	73.9	82.2
Section TC1	174	4.224	Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Actual Time	73.7	85.3	93.8	101.1	108.8	116.6	119.6	123.8	128.3	129.9
			Corrected Time	73.7	85.3	93.8	101.1	108.8	116.6	119.6	123.8	128.3	129.9
Section SC1min	96	0.289	Factor	1.000	0.992	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	20.5	26.0	31.1	35.8	40.0	44.2	45.9	48.7	54.0	61.6
			Corrected Time	20.4	25.7	30.9	35.4	39.6	43.7	45.4	48.2	53.4	61.0
Section SC2min	170	0.289	Factor	1.000	0.992	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	14.4	18.8	23.1	27.3	31.8	36.6	38.6	41.5	46.2	52.1
			Corrected Time	14.3	18.6	22.9	27.0	31.4	36.2	38.2	41.1	45.7	51.6
Section SC3min	254	0.309	Factor	1.000	0.992	0.995	0.991	0.991	0.991	0.991	0.991	0.991	0.991
			Actual Time	10.4	14.3	18.4	22.0	25.8	30.0	31.8	34.6	39.5	44.8
			Corrected Time	10.3	14.1	18.3	21.7	25.5	29.7	31.4	34.2	39.1	44.3

I / H-section Beams Correction

Section	LB1min	RB1min
Section Factor (m^{-1})	162.0	161.9
Thickness (mm)	0.306	0.299

Design temperature	Time to reach temperature		RB1min Corrected time	Factor
	LB1min	RB1min		
350	13.7	13.4	13.7	1.000
400	18.2	18.0	18.4	0.992
450	22.8	22.4	22.9	0.995
500	27.3	26.8	27.4	0.991
550	32.1	31.5	32.2	0.991
600	37.1	36.4	37.3	0.991
620	39.1	38.2	39.1	0.991
650	42.0	41.0	41.9	0.991
700	47.4	45.2	46.3	0.991
750	52.1	49.9	51.1	0.991

Section	LB1max	RB1max
Section Factor (m^{-1})	167.9	167.2
Thickness (mm)	3.551	3.398

Design temperature	Time to reach temperature		RB1max Corrected time	Factor
	LB1max	RB1max		
350	72.6	65.3	68.0	1.000
400	84.9	76.4	79.5	1.000
450	97.1	87.0	90.6	1.000
500	109.5	97.8	101.7	1.000
550	122.3	108.6	113.0	1.000
600	136.5	119.5	124.4	1.000
620	142.3	124.2	129.3	1.000
650	151.6	131.3	136.6	1.000
700	170.0	143.9	149.7	1.000
750	186.1	159.3	165.8	1.000

Appendix 2 Test Data: I/H-section Columns

I/H-section Columns Data

Section	Section Factor m^{-1}	Thickness mm		Design Temperature								
				350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
Section SC7	262	1.747	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	42.8	51.8	60.4	69.2	78.1	87.5	97.6	108.3	119.5
			Corrected Time	41.2	50.3	58.9	67.3	75.7	84.4	92.9	99.6	105.2
Section SC2	174	2.319	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	62.5	74.5	85.3	96.1	107.0	118.7	130.9	143.9	155.3
			Corrected Time	60.2	72.4	83.3	93.5	103.8	114.5	124.6	132.4	136.7
Section SC5	95	2.345	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	84.0	98.7	112.8	126.7	141.5	155.0	163.3	167.0	171.4
			Corrected Time	80.9	95.9	110.1	123.3	137.2	149.6	155.5	153.6	150.9
Section SC4	95	1.696	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	59.3	72.7	85.5	98.2	110.9	124.2	138.5	152.6	166.0
			Corrected Time	57.1	70.6	83.5	95.6	107.6	119.8	131.9	140.4	146.1
Section SC8	262	2.333	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	50.0	59.3	68.1	77.2	86.8	97.1	107.8	118.9	128.9
			Corrected Time	48.1	57.6	66.5	75.1	84.2	93.7	102.6	109.4	113.5
Section SC9	262	4.083	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	64.5	73.1	79.1	84.6	90.7	97.6	105.4	114.0	122.4
			Corrected Time	62.1	71.0	77.2	82.3	88.0	94.2	100.3	104.8	107.7
Section SC10	334	1.692	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	36.1	44.7	52.3	60.2	68.7	77.7	87.2	97.1	107.6
			Corrected Time	34.7	43.4	51.0	58.6	66.6	74.9	83.0	89.3	94.7
Section SC11	334	2.305	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	45.5	54.6	62.3	70.0	78.1	86.6	95.8	105.1	114.9
			Corrected Time	43.8	53.0	60.8	68.1	75.7	83.5	91.2	96.7	101.1
Section SC12	334	3.956	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	64.3	73.8	81.8	89.6	97.6	106.2	115.9	126.9	138.1
			Corrected Time	61.9	71.7	79.9	87.2	94.6	102.5	110.3	116.7	121.6
Section SC6	250	0.598	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	23.4	31.2	38.1	44.7	51.2	57.3	63.4	69.7	77.3
			Corrected Time	22.5	30.3	37.2	43.5	49.6	55.3	60.3	64.1	68.0
Section SC3	97	0.627	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	31.2	40.7	49.9	58.6	66.8	74.5	82.2	90.2	99.6
			Corrected Time	30.0	39.5	48.7	57.0	64.8	71.9	78.2	82.9	87.7
SectionSC1	172	0.637	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	24.2	31.9	39.2	46.5	53.7	60.7	67.5	74.6	83.0
			Corrected Time	23.3	31.0	38.2	45.2	52.1	58.5	64.2	68.6	73.0
Section TC1	174	4.224	Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Actual Time	73.7	85.3	93.8	101.2	108.8	116.6	123.8	128.3	129.9
			Corrected Time	73.7	85.3	93.8	101.2	108.8	116.6	123.8	128.3	129.9
Section SC1min	96	0.289	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	20.6	26.0	31.1	35.8	40.0	44.2	48.7	54.0	61.6
			Corrected Time	19.8	25.2	30.3	34.8	38.8	42.6	46.3	49.6	54.2
Section SC2min	170	0.289	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	14.4	18.8	23.1	27.3	31.8	36.6	41.5	46.2	52.1
			Corrected Time	13.8	18.2	22.5	26.5	30.8	35.3	39.5	42.5	45.8
Section SC3min	254	0.309	Factor	0.963	0.972	0.977	0.974	0.970	0.965	0.952	0.920	0.881
			Actual Time	10.4	14.3	18.4	22.0	25.8	30.0	34.6	39.5	44.9
			Corrected Time	10.0	13.8	17.9	21.4	25.0	28.9	32.9	36.3	39.5

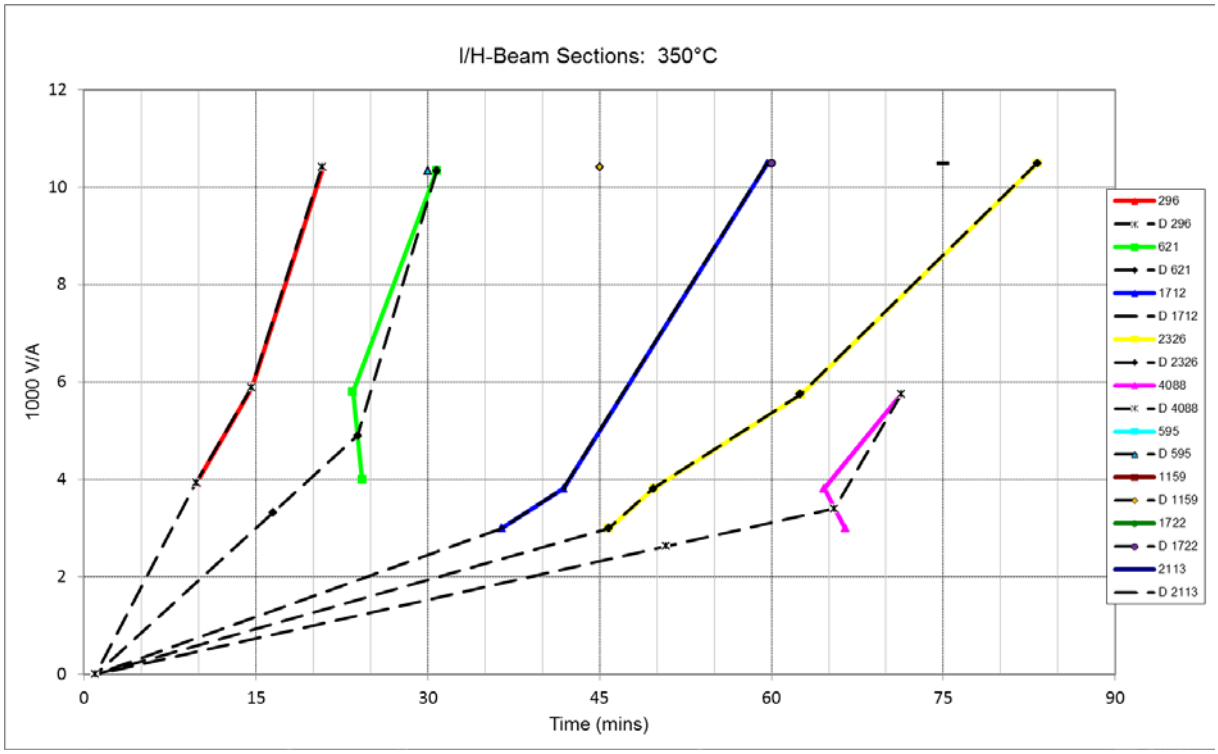
I / H-section Columns Correction

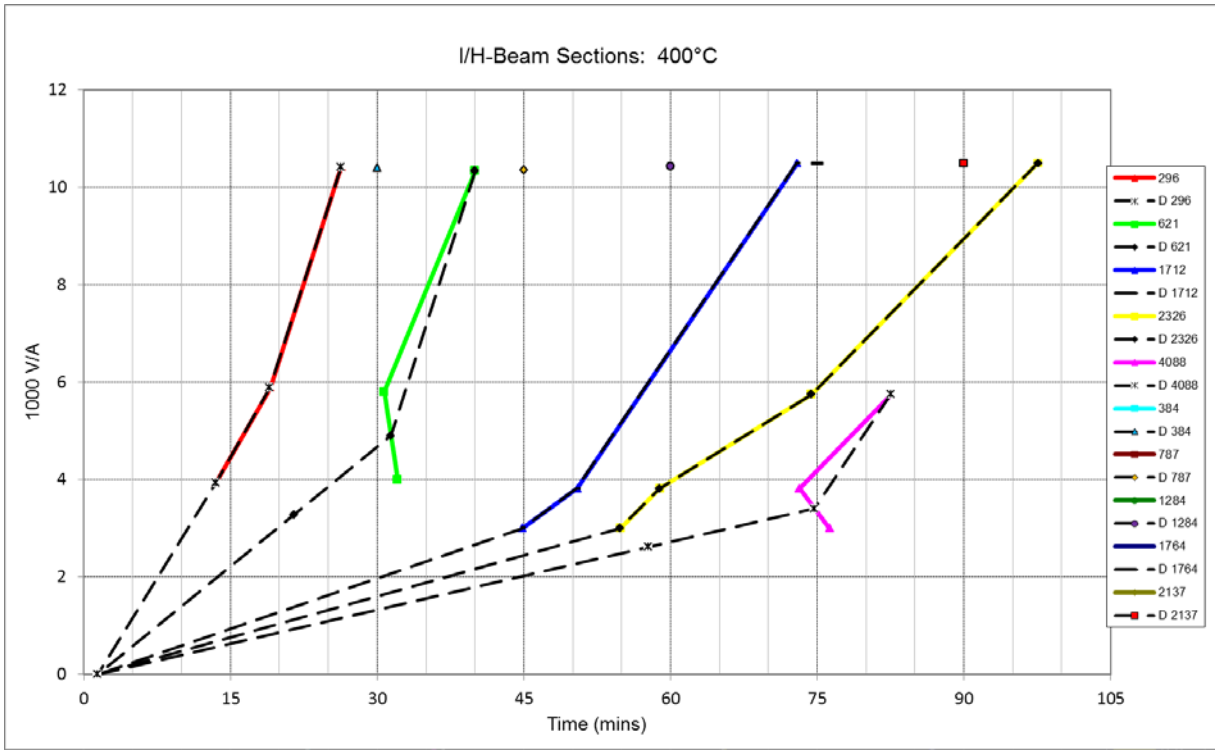
Section	TC1	RC1
Section Factor m-1	173.9	173.9
Thickness (mm)	4.224	4.184

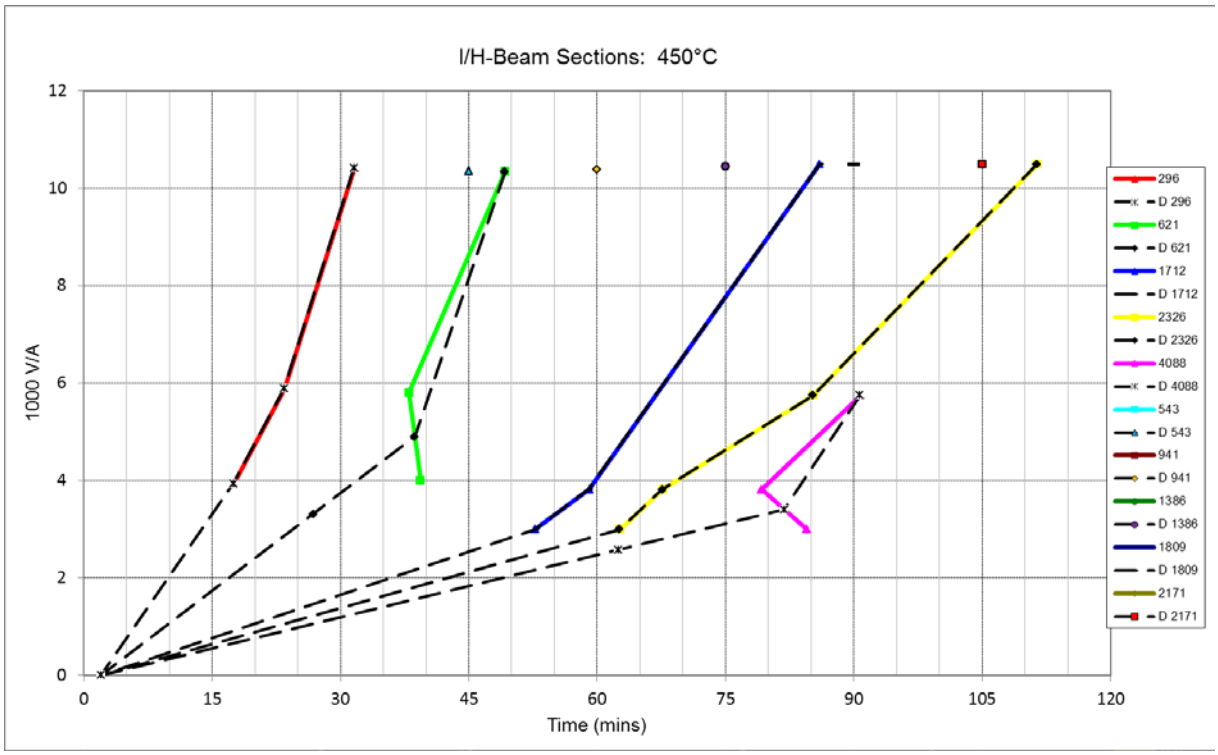
Design temperature	Time to reach temperature		RC1 Corrected time	Factor
	TC1	RC1		
350	73.8	75.8	76.6	0.963
400	85.3	86.9	87.8	0.972
450	93.9	95.2	96.1	0.977
500	101.2	103.0	103.9	0.974
550	108.8	111.1	112.2	0.970
600	116.7	119.7	120.9	0.965
650	123.9	128.8	130.1	0.952
700	128.3	138.2	139.5	0.920
750	129.9	146.2	147.5	0.881

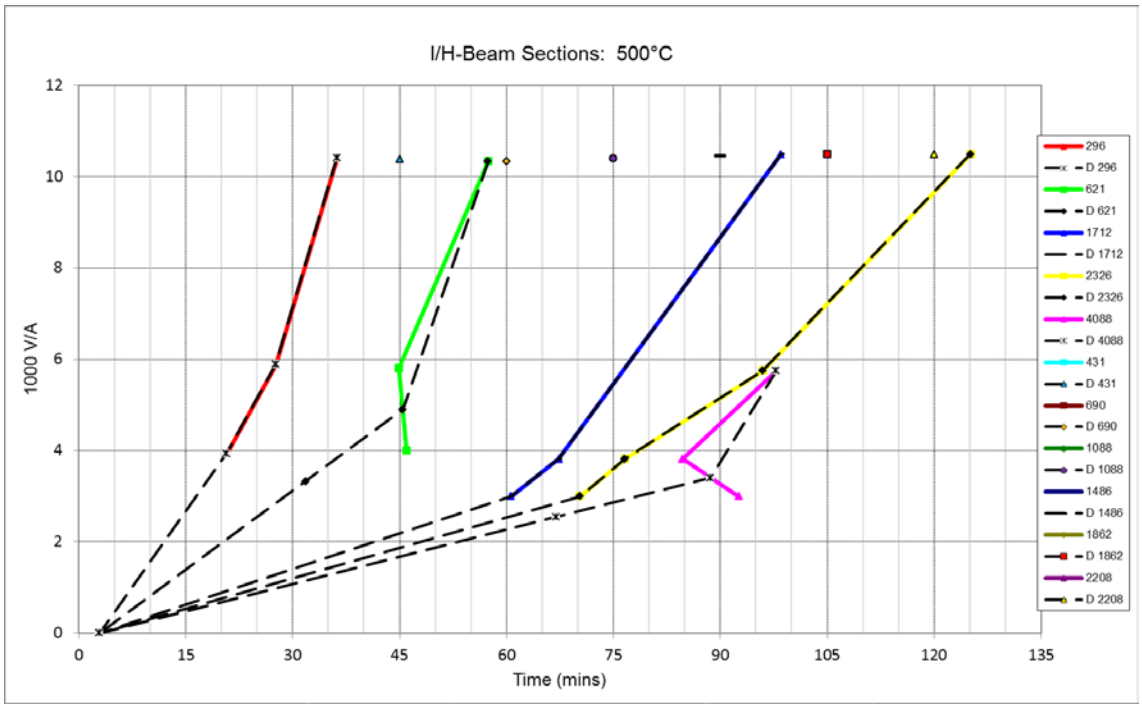
Annex A: I / H-section Beams

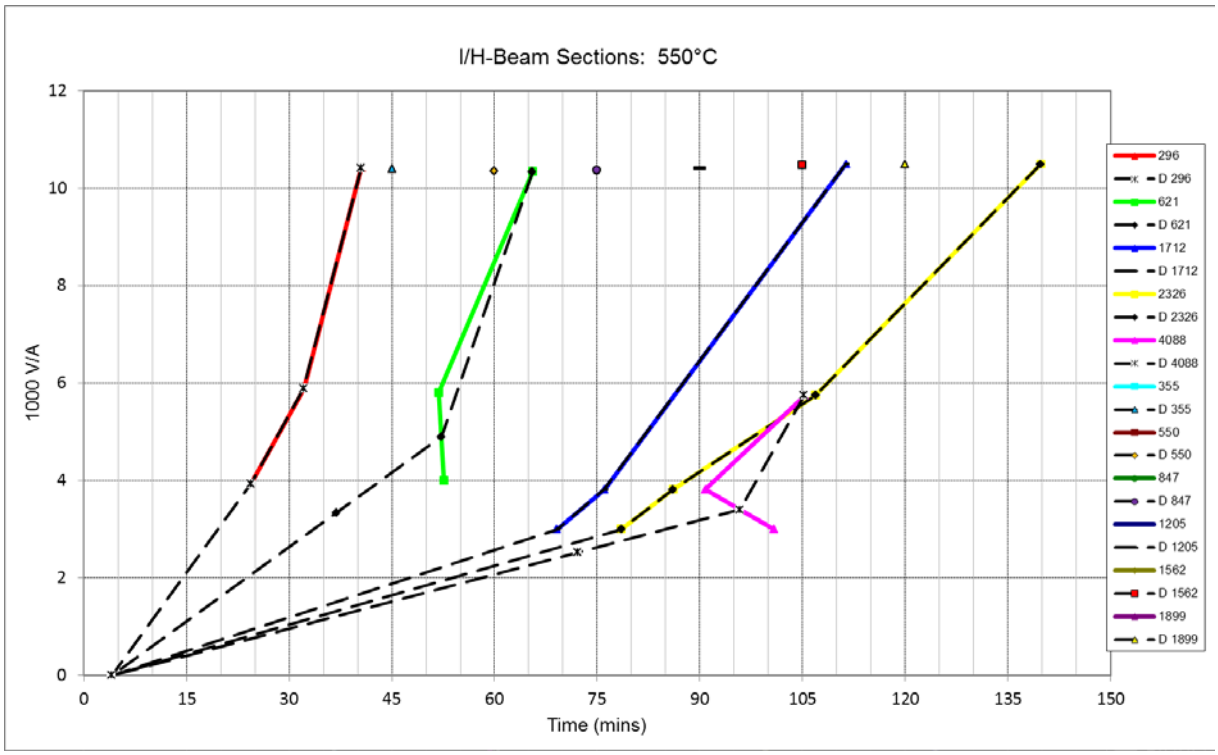
A1 Graphs: I / H-section Beams

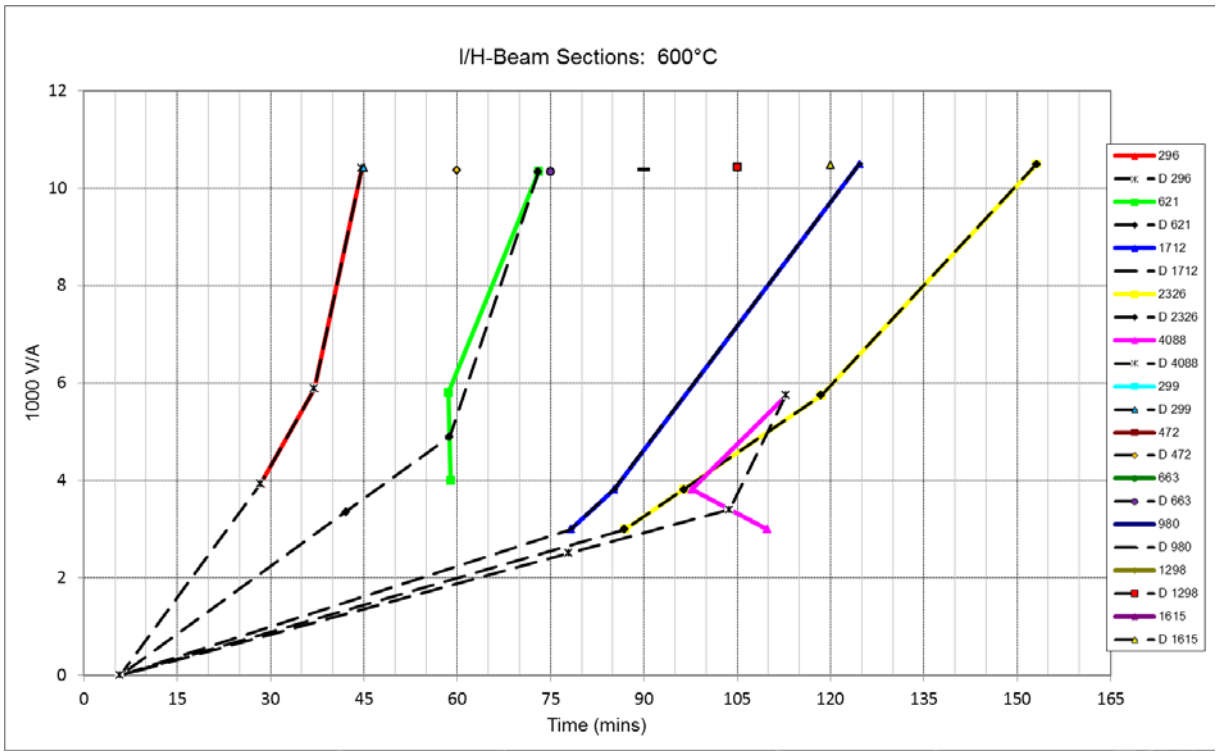


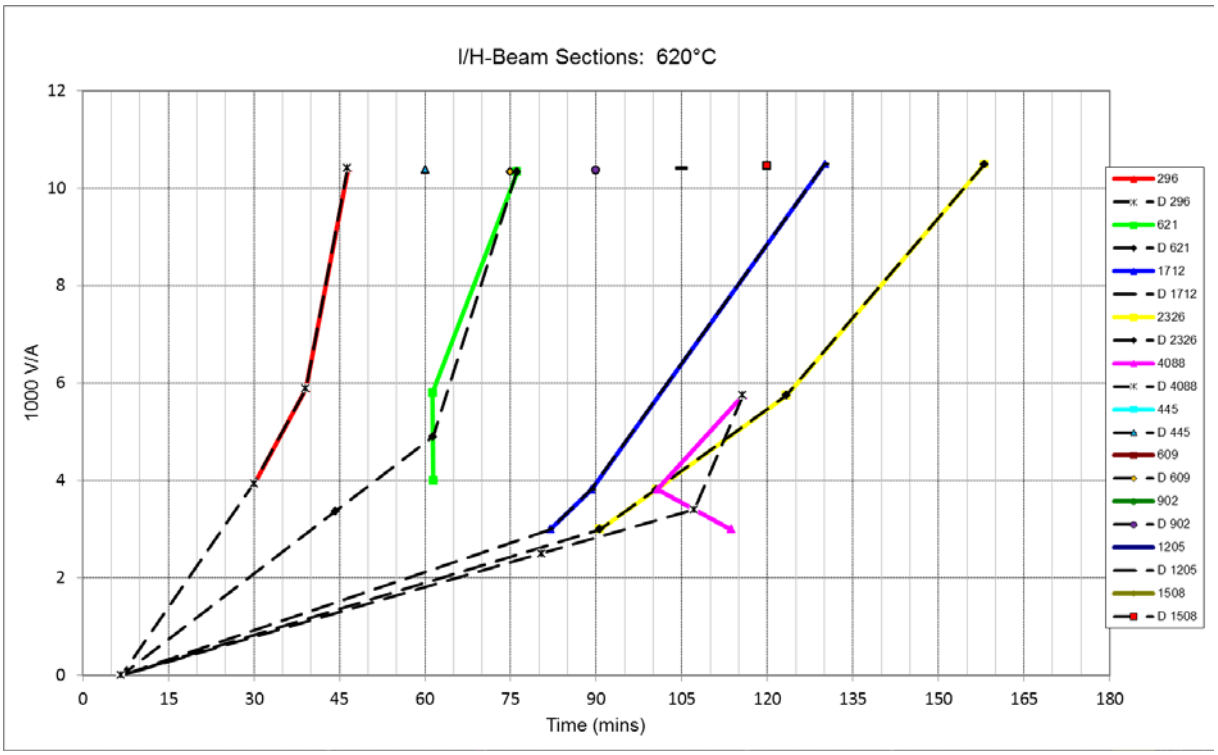


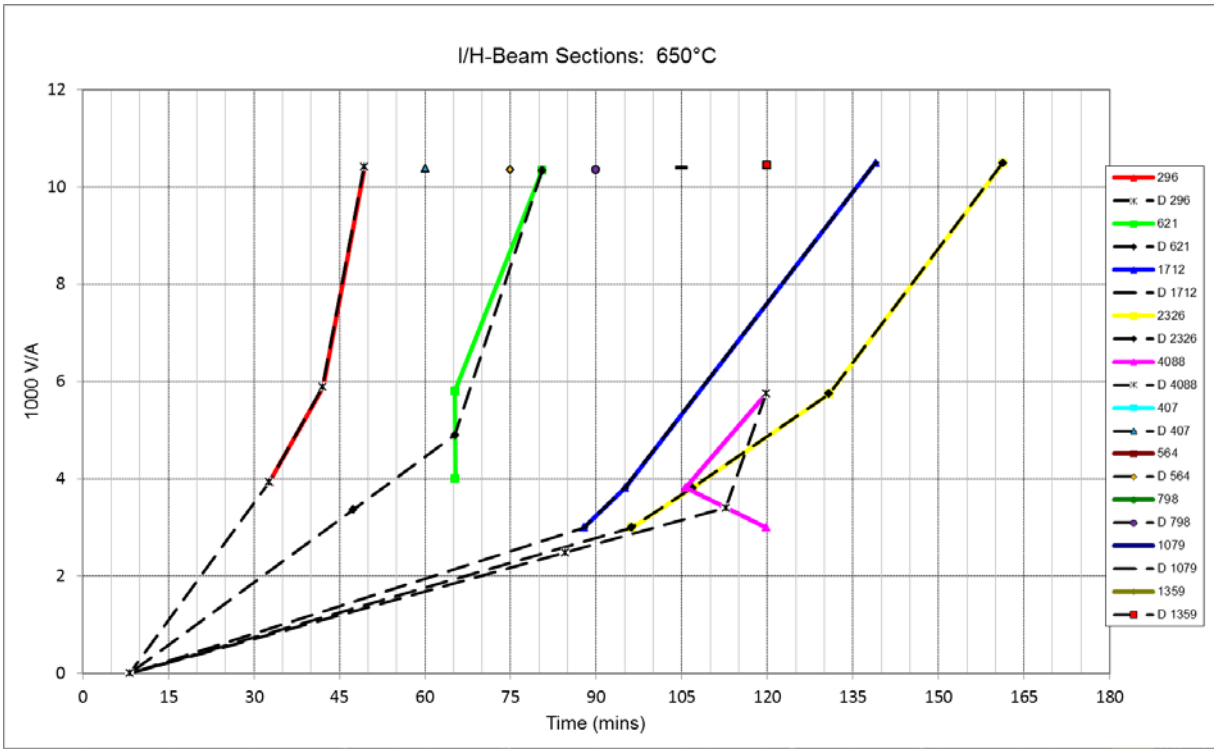

I/H-Beam Sections: 450°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
543
D 543
941
D 941
1386
D 1386
1809
D 1809
2171
D 2171

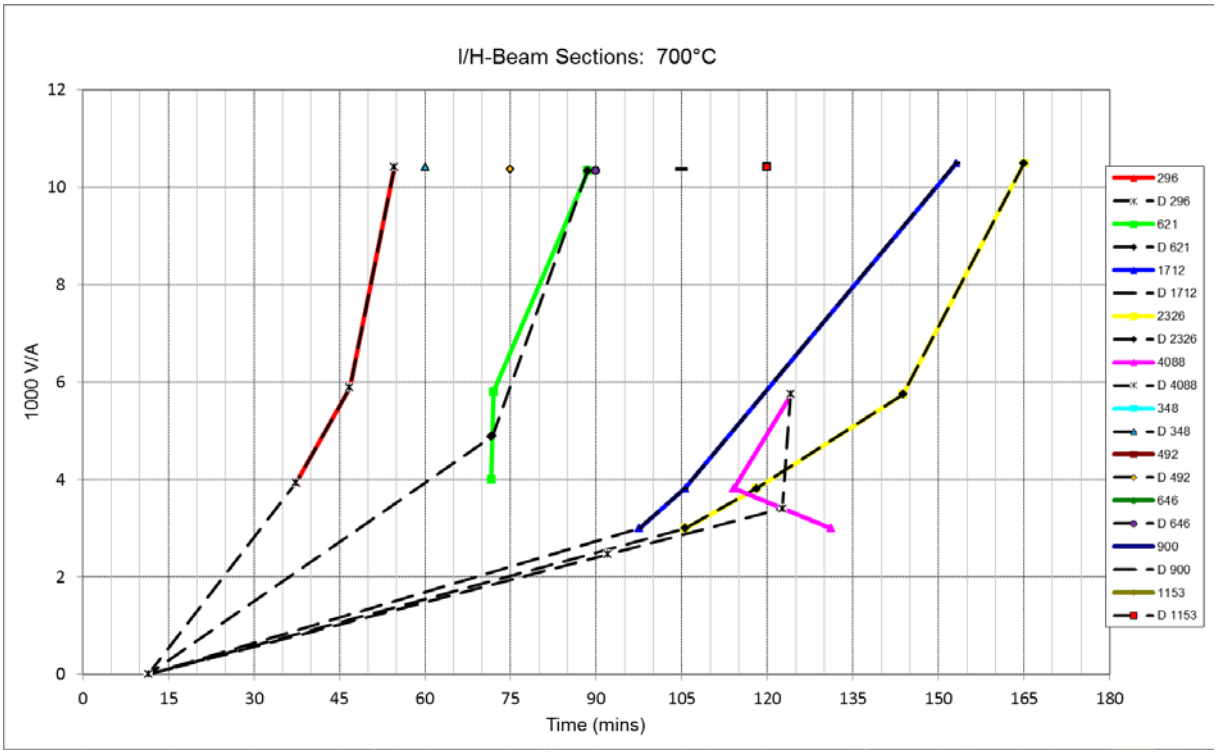

I/H-Beam Sections: 500°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
431
D 431
690
D 690
1088
D 1088
1486
D 1486
1862
D 1862
2208
D 2208

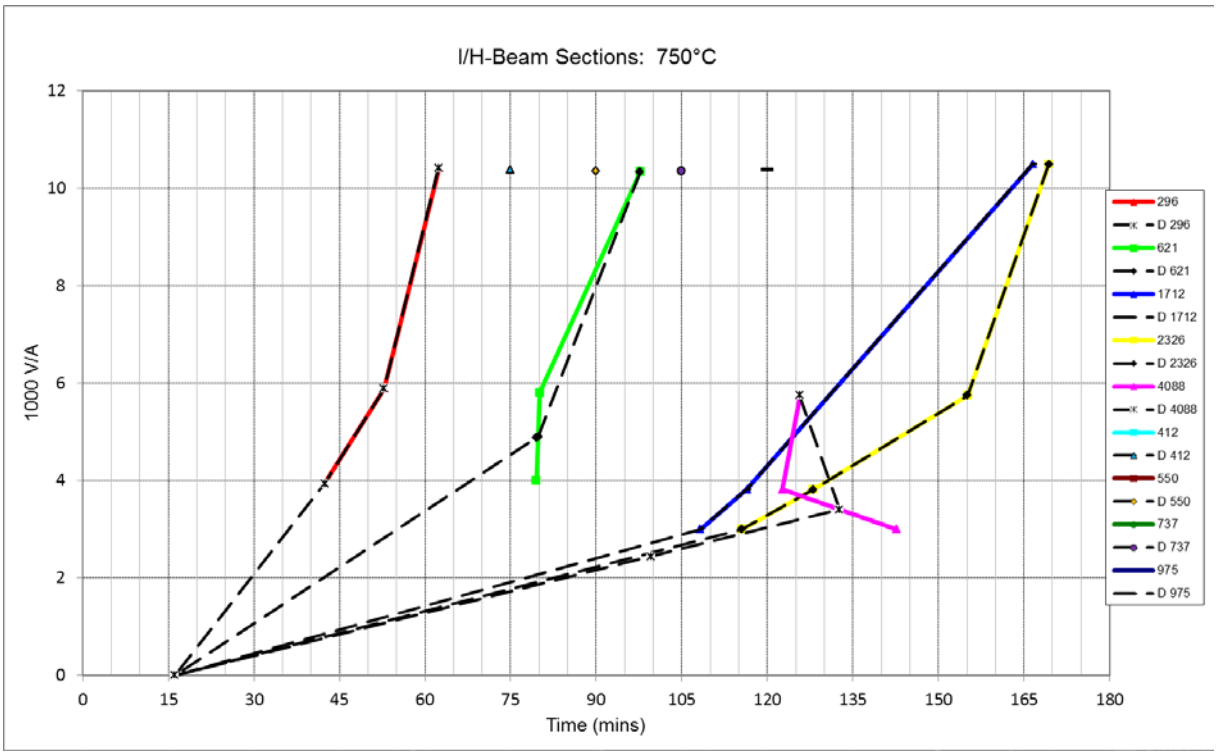

I/H-Beam Sections: 550°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
355
D 355
550
D 550
847
D 847
1205
D 1205
1562
D 1562
1899
D 1899


I/H-Beam Sections: 600°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
299
D 299
472
D 472
663
D 663
980
D 980
1298
D 1298
1615
D 1615


I/H-Beam Sections: 620°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
180
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
445
D 445
609
D 609
902
D 902
1205
D 1205
1508
D 1508


I/H-Beam Sections: 650°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
180
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
407
D 407
564
D 564
798
D 798
1079
D 1079
1359
D 1359


I/H-Beam Sections: 700°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
180
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
348
D 348
492
D 492
646
D 646
900
D 900
1153
D 1153


I/H-Beam Sections: 750°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
180
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
412
D 412
550
D 550
737
D 737
975
D 975

A2 Criteria of Acceptability / Intercepts: I / H-section Beams

A2.1 Criteria of Acceptability

Acceptibility Criteria	% Allowed / Actual	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
Maximum positive variation (%)	15	1.71	2.25	3.37	4.66	5.53	6.21	6.43	6.74	7.49	8.18
Optimistic predictions (%)	30	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50	6.25	6.25
Overall conservative (%)	less than zero	-3.41	-3.38	-3.38	-3.37	-3.31	-3.26	-3.23	-3.19	-1.46	-1.44

A2.2 Intercepts

Dry Film Thickness (mm)	I / H-Beam Sections: Limiting section factor m^{-1} at design temperature 350°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	-	-	-	-	-	-	-
0.595	96.7	-	-	-	-	-	-
0.621	103.1	-	-	-	-	-	-
1.159	-	96.1	-	-	-	-	-
1.712	407.8	199.4	-	-	-	-	-
1.722	-	-	95.3	-	-	-	-
2.113	-	-	-	95.3	-	-	-
2.326	516.1	340.2	186.1	116.1	-	-	-
4.088	653.5	430.7	321.2	-	-	-	-

Dry Film Thickness (mm)	I / H-Beam Sections: Limiting section factor m^{-1} at design temperature 400°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	-	-	-	-	-	-	-
0.384	96.2	-	-	-	-	-	-
0.621	214.1	-	-	-	-	-	-
0.787	-	96.6	-	-	-	-	-
1.284	-	-	95.9	-	-	-	-
1.712	507.0	330.9	150.0	-	-	-	-
1.764	-	-	-	95.3	-	-	-
2.137	-	-	-	-	95.3	-	-
2.326	623.8	409.2	253.0	170.3	111.9	-	-
4.088	753.1	494.0	367.6	286.8	-	-	-

Dry Film Thickness (mm)	I / H-Beam Sections: Limiting section factor m^{-1} at design temperature 450°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	104.9	-	-	-	-	-	-
0.543	-	96.6	-	-	-	-	-
0.621	267.4	122.5	-	-	-	-	-
0.941	-	-	96.4	-	-	-	-
1.386	-	-	-	95.7	-	-	-
1.712	605.0	393.9	246.1	128.7	-	-	-
1.809	-	-	-	-	95.3	-	-
2.171	-	-	-	-	-	95.3	-
2.326	723.1	470.8	349.1	216.0	151.1	107.1	-
4.088	837.9	545.6	404.5	321.4	179.7	-	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 500°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	139.9	-	-	-	-	-	-
0.431	-	96.3	-	-	-	-	-
0.621	320.6	206.4	-	-	-	-	-
0.690	-	-	96.7	-	-	-	-
1.088	-	-	-	96.2	-	-	-
1.486	-	-	-	-	95.6	-	-
1.712	711.3	457.9	337.6	183.0	115.3	-	-
1.862	-	-	-	-	-	95.3	-
2.208	-	-	-	-	-	-	95.3
2.326	830.9	534.9	394.4	277.3	193.8	138.3	103.5
4.088	929.5	598.3	441.1	349.4	266.6	-	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 550°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	186.8	-	-	-	-	-	-
0.355	-	96.1	-	-	-	-	-
0.550	-	-	96.6	-	-	-	-
0.621	379.5	240.3	123.8	-	-	-	-
0.847	-	-	-	96.5	-	-	-
1.205	-	-	-	-	96.0	-	-
1.562	-	-	-	-	-	95.5	-
1.712	838.5	531.0	388.5	270.5	154.7	107.5	-
1.899	-	-	-	-	-	-	95.3
2.326	959.7	607.8	444.7	350.6	239.3	179.4	130.9
4.088	1040.4	658.9	482.1	380.1	313.7	175.4	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 600°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	232.6	-	-	-	-	-	-
0.299	-	96.0	-	-	-	-	-
0.472	-	-	96.4	-	-	-	-
0.621	446.9	275.9	186.5	-	-	-	-
0.663	-	-	-	96.7	-	-	-
0.980	-	-	-	-	96.3	-	-
1.298	-	-	-	-	-	95.9	-
1.615	-	-	-	-	-	-	95.4
1.712	999.5	617.1	446.3	349.5	216.0	139.4	102.9
2.326	1119.6	691.2	499.9	391.6	306.6	218.9	167.9
4.088	1189.4	734.3	531.0	415.9	341.8	268.8	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 620°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	254.0	104.7	-	-	-	-	-
0.445	-	-	96.4	-	-	-	-
0.609	-	-	-	96.8	-	-	-
0.621	479.1	291.5	209.5	100.8	-	-	-
0.902	-	-	-	-	96.4	-	-
1.205	-	-	-	-	-	96.0	-
1.508	-	-	-	-	-	-	95.6
1.712	1078.3	656.0	471.4	367.9	252.4	156.1	113.0
2.326	1203.0	731.9	525.9	410.4	336.5	238.3	182.8
4.088	1267.0	770.8	553.9	432.2	354.4	300.3	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 650°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	285.5	129.1	-	-	-	-	-
0.407	-	-	96.3	-	-	-	-
0.564	-	-	-	96.7	-	-	-
0.621	534.3	316.5	224.9	119.5	-	-	-
0.798	-	-	-	-	96.6	-	-
1.079	-	-	-	-	-	96.2	-
1.359	-	-	-	-	-	-	95.8
1.712	1219.9	722.7	513.4	398.1	308.2	187.4	131.3
2.326	1348.7	798.9	567.6	440.1	359.4	272.5	205.1
4.088	1408.8	834.6	592.9	459.8	375.4	317.3	-

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 700°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	355.7	181.5	-	-	-	-	-
0.348	-	-	96.1	-	-	-	-
0.492	-	-	-	96.5	-	-	-
0.621	665.8	367.7	254.0	168.7	-	-	-
0.646	-	-	-	-	96.8	-	-
0.900	-	-	-	-	-	96.4	-
1.153	-	-	-	-	-	-	96.1
1.712	1553.1	857.7	592.4	452.5	366.0	265.7	171.0
2.326	1699.4	938.5	648.2	495.1	400.5	336.2	252.6
4.088	1765.5	975.0	673.4	514.4	416.1	349.3	301.0

Dry Film Thickness (mm)	I/H-Beam Sections: Limiting section factor m^{-1} at design temperature 750°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	480.7	226.1	107.7	-	-	-	-
0.412	-	-	-	96.3	-	-	-
0.550	-	-	-	-	96.6	-	-
0.621	935.9	450.2	296.3	220.9	125.2	-	-
0.737	-	-	-	-	-	96.6	-
0.975	-	-	-	-	-	-	96.3
1.712	2213.7	1064.7	700.9	522.4	416.4	346.1	232.8
2.326	2389.2	1149.1	756.5	563.8	449.4	373.6	304.3
4.088	2463.7	1185.0	780.1	581.4	463.4	385.2	329.6

Assessment limited to a maximum section factor of 368m^{-1}.

A3 Tables: I/H-section Beams

Table 1: I/H-Beam Sections 30 Minutes										
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
35	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
40	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
45	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
50	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
55	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
60	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
65	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
70	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
75	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
80	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
85	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
90	0.567	0.372	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
95	0.588	0.382	0.276	0.275	0.275	0.275	0.275	0.275	0.275	0.275
100	0.608	0.392	0.286	0.275	0.275	0.275	0.275	0.275	0.275	0.275
105	0.628	0.402	0.296	0.275	0.275	0.275	0.275	0.275	0.275	0.275
110	0.646	0.412	0.306	0.275	0.275	0.275	0.275	0.275	0.275	0.275
115	0.664	0.422	0.316	0.275	0.275	0.275	0.275	0.275	0.275	0.275
120	0.682	0.432	0.326	0.275	0.275	0.275	0.275	0.275	0.275	0.275
125	0.699	0.442	0.336	0.275	0.275	0.275	0.275	0.275	0.275	0.275
130	0.717	0.452	0.346	0.278	0.275	0.275	0.275	0.275	0.275	0.275
135	0.735	0.462	0.356	0.287	0.275	0.275	0.275	0.275	0.275	0.275
140	0.753	0.472	0.366	0.296	0.275	0.275	0.275	0.275	0.275	0.275
145	0.771	0.482	0.376	0.305	0.275	0.275	0.275	0.275	0.275	0.275
150	0.789	0.492	0.386	0.314	0.275	0.275	0.275	0.275	0.275	0.275
155	0.807	0.502	0.396	0.323	0.275	0.275	0.275	0.275	0.275	0.275
160	0.825	0.512	0.406	0.332	0.275	0.275	0.275	0.275	0.275	0.275
165	0.843	0.522	0.416	0.341	0.275	0.275	0.275	0.275	0.275	0.275
170	0.861	0.532	0.426	0.350	0.275	0.275	0.275	0.275	0.275	0.275
175	0.878	0.542	0.436	0.359	0.276	0.275	0.275	0.275	0.275	0.275
180	0.896	0.552	0.446	0.368	0.284	0.275	0.275	0.275	0.275	0.275
185	0.914	0.563	0.456	0.377	0.293	0.275	0.275	0.275	0.275	0.275
190	0.932	0.573	0.466	0.386	0.301	0.275	0.275	0.275	0.275	0.275
195	0.950	0.583	0.476	0.395	0.310	0.275	0.275	0.275	0.275	0.275
200	0.968	0.593	0.486	0.404	0.318	0.275	0.275	0.275	0.275	0.275
205	0.986	0.603	0.496	0.413	0.327	0.275	0.275	0.275	0.275	0.275
210	1.004	0.613	0.506	0.422	0.335	0.275	0.275	0.275	0.275	0.275
215	1.022	0.624	0.516	0.431	0.344	0.275	0.275	0.275	0.275	0.275
220	1.040	0.643	0.526	0.440	0.352	0.277	0.275	0.275	0.275	0.275
225	1.057	0.662	0.536	0.449	0.360	0.284	0.275	0.275	0.275	0.275
230	1.075	0.680	0.546	0.458	0.369	0.292	0.275	0.275	0.275	0.275
235	1.093	0.699	0.556	0.467	0.377	0.300	0.275	0.275	0.275	0.275
240	1.111	0.718	0.566	0.476	0.386	0.307	0.276	0.275	0.275	0.275
245	1.129	0.736	0.576	0.485	0.394	0.315	0.283	0.275	0.275	0.275
250	1.147	0.755	0.586	0.494	0.403	0.322	0.290	0.275	0.275	0.275
255	1.165	0.773	0.596	0.503	0.411	0.330	0.297	0.275	0.275	0.275
260	1.183	0.792	0.606	0.512	0.419	0.338	0.305	0.275	0.275	0.275
265	1.201	0.811	0.616	0.521	0.428	0.345	0.312	0.275	0.275	0.275
270	1.219	0.829	0.629	0.530	0.436	0.353	0.319	0.276	0.275	0.275
275	1.236	0.848	0.645	0.539	0.445	0.360	0.326	0.282	0.275	0.275
280	1.254	0.867	0.662	0.548	0.453	0.368	0.333	0.289	0.275	0.275
285	1.272	0.885	0.678	0.557	0.462	0.375	0.341	0.295	0.275	0.275
290	1.290	0.904	0.694	0.566	0.470	0.383	0.348	0.302	0.275	0.275
295	1.308	0.922	0.710	0.575	0.478	0.391	0.355	0.308	0.275	0.275
300	1.326	0.941	0.726	0.584	0.487	0.398	0.362	0.315	0.275	0.275
305	1.344	0.960	0.742	0.593	0.495	0.406	0.370	0.321	0.275	0.275
310	1.362	0.978	0.759	0.602	0.504	0.413	0.377	0.328	0.275	0.275
315	1.380	0.997	0.775	0.611	0.512	0.421	0.384	0.335	0.275	0.275
320	1.398	1.016	0.791	0.620	0.521	0.429	0.391	0.341	0.275	0.275
325	1.415	1.034	0.807	0.633	0.529	0.436	0.398	0.348	0.275	0.275
330	1.433	1.053	0.823	0.647	0.538	0.444	0.406	0.354	0.275	0.275
335	1.451	1.071	0.839	0.661	0.546	0.451	0.413	0.361	0.275	0.275
340	1.469	1.090	0.856	0.675	0.554	0.459	0.420	0.367	0.280	0.275
345	1.487	1.109	0.872	0.689	0.563	0.466	0.427	0.374	0.285	0.275
350	1.505	1.127	0.888	0.703	0.571	0.474	0.435	0.380	0.290	0.275
355	1.523	1.146	0.904	0.717	0.580	0.482	0.442	0.387	0.295	0.275
360	1.541	1.165	0.920	0.731	0.588	0.489	0.449	0.393	0.301	0.275
365	1.559	1.183	0.936	0.745	0.597	0.497	0.456	0.400	0.306	0.275

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

Table 2: I/H-Beam Sections 45 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
35	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
40	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
45	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
50	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
55	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
60	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
65	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
70	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
75	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
80	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
85	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
90	1.127	0.761	0.523	0.420	0.344	0.288	0.275	0.275	0.275	0.275
95	1.153	0.781	0.538	0.429	0.353	0.297	0.279	0.275	0.275	0.275
100	1.180	0.801	0.553	0.437	0.362	0.306	0.288	0.275	0.275	0.275
105	1.207	0.820	0.568	0.446	0.371	0.315	0.296	0.275	0.275	0.275
110	1.234	0.840	0.583	0.455	0.381	0.324	0.305	0.275	0.275	0.275
115	1.260	0.860	0.598	0.463	0.390	0.333	0.314	0.275	0.275	0.275
120	1.287	0.880	0.613	0.472	0.399	0.342	0.323	0.280	0.275	0.275
125	1.314	0.899	0.631	0.481	0.408	0.351	0.331	0.289	0.275	0.275
130	1.341	0.919	0.651	0.489	0.417	0.360	0.340	0.298	0.275	0.275
135	1.367	0.939	0.671	0.498	0.427	0.369	0.349	0.306	0.275	0.275
140	1.394	0.958	0.691	0.506	0.436	0.378	0.357	0.315	0.275	0.275
145	1.421	0.978	0.711	0.515	0.445	0.387	0.366	0.324	0.275	0.275
150	1.448	0.998	0.731	0.524	0.454	0.396	0.375	0.332	0.275	0.275
155	1.475	1.018	0.751	0.532	0.464	0.405	0.383	0.341	0.275	0.275
160	1.501	1.037	0.772	0.541	0.473	0.414	0.392	0.350	0.275	0.275
165	1.528	1.057	0.792	0.550	0.482	0.423	0.401	0.358	0.275	0.275
170	1.555	1.077	0.812	0.558	0.491	0.431	0.410	0.367	0.276	0.275
175	1.582	1.097	0.832	0.567	0.501	0.440	0.418	0.376	0.285	0.275
180	1.608	1.116	0.852	0.575	0.510	0.449	0.427	0.384	0.293	0.275
185	1.635	1.136	0.872	0.584	0.519	0.458	0.436	0.393	0.302	0.275
190	1.662	1.156	0.892	0.593	0.528	0.467	0.444	0.402	0.311	0.275
195	1.689	1.176	0.912	0.601	0.537	0.476	0.453	0.410	0.320	0.275
200	1.715	1.195	0.932	0.610	0.547	0.485	0.462	0.419	0.328	0.275
205	1.737	1.215	0.952	0.619	0.556	0.494	0.470	0.428	0.337	0.275
210	1.758	1.235	0.973	0.637	0.565	0.503	0.479	0.436	0.346	0.275
215	1.780	1.255	0.993	0.658	0.574	0.512	0.488	0.445	0.355	0.280
220	1.802	1.274	1.013	0.680	0.584	0.521	0.497	0.454	0.363	0.287
225	1.824	1.294	1.033	0.702	0.593	0.530	0.505	0.462	0.372	0.294
230	1.846	1.314	1.053	0.723	0.602	0.539	0.514	0.471	0.381	0.302
235	1.867	1.334	1.073	0.745	0.611	0.548	0.523	0.480	0.389	0.309
240	1.889	1.353	1.093	0.767	0.620	0.557	0.531	0.488	0.398	0.316
245	1.911	1.373	1.113	0.788	0.639	0.566	0.540	0.497	0.407	0.323
250	1.933	1.393	1.133	0.810	0.657	0.575	0.549	0.506	0.416	0.331
255	1.955	1.413	1.153	0.832	0.676	0.584	0.558	0.514	0.424	0.338
260	1.976	1.432	1.174	0.854	0.695	0.593	0.566	0.523	0.433	0.345
265	1.998	1.452	1.194	0.875	0.714	0.602	0.575	0.532	0.442	0.352
270	2.020	1.472	1.214	0.897	0.732	0.610	0.584	0.540	0.451	0.360
275	2.042	1.491	1.234	0.919	0.751	0.619	0.592	0.549	0.459	0.367
280	2.064	1.511	1.254	0.940	0.770	0.634	0.601	0.558	0.468	0.374
285	2.085	1.531	1.274	0.962	0.789	0.650	0.610	0.566	0.477	0.381
290	2.107	1.551	1.294	0.984	0.807	0.666	0.618	0.575	0.485	0.389
295	2.129	1.570	1.314	1.005	0.826	0.682	0.632	0.584	0.494	0.396
300	2.151	1.590	1.334	1.027	0.845	0.698	0.646	0.592	0.503	0.403
305	2.173	1.610	1.355	1.049	0.864	0.714	0.661	0.601	0.512	0.410
310	2.194	1.630	1.375	1.070	0.883	0.730	0.676	0.610	0.520	0.418
315	2.216	1.649	1.395	1.092	0.901	0.746	0.691	0.618	0.529	0.425
320	2.238	1.669	1.415	1.114	0.920	0.762	0.706	0.630	0.538	0.432
325	2.260	1.689	1.435	1.135	0.939	0.778	0.721	0.644	0.547	0.439
330	2.282	1.709	1.455	1.157	0.958	0.794	0.736	0.657	0.555	0.447
335	2.303	1.744	1.475	1.179	0.976	0.810	0.751	0.671	0.564	0.454
340	2.325	1.784	1.495	1.201	0.995	0.826	0.766	0.684	0.573	0.461
345	2.420	1.823	1.515	1.222	1.014	0.842	0.781	0.698	0.581	0.468
350	2.517	1.862	1.535	1.244	1.033	0.858	0.796	0.711	0.590	0.476
355	2.615	1.901	1.556	1.266	1.051	0.874	0.811	0.724	0.599	0.483
360	2.712	1.940	1.576	1.287	1.070	0.890	0.826	0.738	0.608	0.490
365	2.809	1.980	1.596	1.309	1.089	0.906	0.841	0.751	0.616	0.497

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

Table 3: I/H-Beam Sections 60 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
35	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
40	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
45	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
50	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
55	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
60	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
65	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
70	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
75	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
80	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
85	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
90	1.687	1.238	0.908	0.662	0.533	0.461	0.435	0.397	0.337	0.275
95	1.720	1.277	0.934	0.683	0.546	0.470	0.443	0.405	0.346	0.275
100	1.753	1.317	0.960	0.704	0.559	0.478	0.451	0.413	0.355	0.283
105	1.787	1.356	0.985	0.725	0.572	0.486	0.458	0.422	0.363	0.291
110	1.820	1.396	1.011	0.746	0.585	0.494	0.466	0.430	0.372	0.300
115	1.853	1.435	1.037	0.768	0.598	0.503	0.474	0.438	0.381	0.309
120	1.886	1.475	1.063	0.789	0.611	0.511	0.482	0.447	0.389	0.317
125	1.919	1.514	1.088	0.810	0.626	0.519	0.490	0.455	0.398	0.326
130	1.953	1.554	1.114	0.831	0.646	0.528	0.497	0.463	0.407	0.334
135	1.986	1.593	1.140	0.852	0.667	0.536	0.505	0.471	0.415	0.343
140	2.019	1.633	1.166	0.874	0.688	0.544	0.513	0.480	0.424	0.352
145	2.052	1.672	1.191	0.895	0.708	0.552	0.521	0.488	0.433	0.360
150	2.086	1.712	1.217	0.916	0.729	0.561	0.528	0.496	0.441	0.369
155	2.119	1.742	1.243	0.937	0.749	0.569	0.536	0.505	0.450	0.377
160	2.152	1.771	1.269	0.959	0.770	0.577	0.544	0.513	0.458	0.386
165	2.185	1.801	1.294	0.980	0.791	0.585	0.552	0.521	0.467	0.395
170	2.219	1.831	1.320	1.001	0.811	0.594	0.560	0.530	0.476	0.403
175	2.252	1.861	1.346	1.022	0.832	0.602	0.567	0.538	0.484	0.412
180	2.285	1.891	1.372	1.043	0.853	0.610	0.575	0.546	0.493	0.421
185	2.318	1.920	1.397	1.065	0.873	0.619	0.583	0.555	0.502	0.429
190	2.376	1.950	1.423	1.086	0.894	0.636	0.591	0.563	0.510	0.438
195	2.442	1.980	1.449	1.107	0.914	0.657	0.599	0.571	0.519	0.446
200	2.507	2.010	1.474	1.128	0.935	0.678	0.606	0.580	0.528	0.455
205	2.572	2.040	1.500	1.149	0.956	0.699	0.614	0.588	0.536	0.464
210	2.637	2.070	1.526	1.171	0.976	0.720	0.623	0.596	0.545	0.472
215	2.703	2.099	1.552	1.192	0.997	0.741	0.644	0.605	0.554	0.481
220	2.768	2.129	1.577	1.213	1.017	0.762	0.665	0.613	0.562	0.489
225	2.833	2.159	1.603	1.234	1.038	0.783	0.686	0.622	0.571	0.498
230	2.898	2.189	1.629	1.255	1.059	0.804	0.707	0.640	0.580	0.507
235	2.963	2.219	1.655	1.277	1.079	0.825	0.727	0.659	0.588	0.515
240	3.029	2.249	1.680	1.298	1.100	0.846	0.748	0.678	0.597	0.524
245	3.094	2.278	1.706	1.319	1.120	0.867	0.769	0.697	0.605	0.533
250	3.159	2.308	1.735	1.340	1.141	0.888	0.790	0.716	0.614	0.541
255	3.224	2.357	1.765	1.362	1.162	0.909	0.811	0.735	0.624	0.550
260	3.290	2.434	1.795	1.383	1.182	0.930	0.832	0.754	0.640	0.558
265	3.355	2.511	1.824	1.404	1.203	0.951	0.852	0.773	0.657	0.567
270	3.420	2.588	1.854	1.425	1.224	0.972	0.873	0.792	0.673	0.576
275	3.485	2.664	1.884	1.446	1.244	0.993	0.894	0.811	0.689	0.584
280	3.551	2.741	1.914	1.468	1.265	1.014	0.915	0.829	0.705	0.593
285	3.616	2.818	1.944	1.489	1.285	1.035	0.936	0.848	0.721	0.601
290	3.681	2.895	1.974	1.510	1.306	1.056	0.956	0.867	0.737	0.610
295	3.746	2.972	2.003	1.531	1.327	1.077	0.977	0.886	0.753	0.619
300	3.811	3.049	2.033	1.552	1.347	1.098	0.998	0.905	0.769	0.631
305	3.877	3.126	2.063	1.574	1.368	1.119	1.019	0.924	0.786	0.644
310	-	3.203	2.093	1.595	1.388	1.140	1.040	0.943	0.802	0.658
315	-	3.280	2.123	1.616	1.409	1.161	1.061	0.962	0.818	0.671
320	-	3.356	2.153	1.637	1.430	1.182	1.081	0.981	0.834	0.685
325	-	3.433	2.182	1.659	1.450	1.203	1.102	1.000	0.850	0.698
330	-	3.510	2.212	1.680	1.471	1.224	1.123	1.019	0.866	0.712
335	-	3.587	2.242	1.701	1.491	1.245	1.144	1.037	0.882	0.725
340	-	3.664	2.272	1.738	1.512	1.266	1.165	1.056	0.898	0.739
345	-	3.741	2.302	1.792	1.533	1.287	1.186	1.075	0.914	0.752
350	-	3.818	2.355	1.846	1.553	1.308	1.206	1.094	0.931	0.766
355	-	3.895	2.514	1.900	1.574	1.329	1.227	1.113	0.947	0.779
360	-	-	2.673	1.954	1.595	1.350	1.248	1.132	0.963	0.793
365	-	-	2.832	2.008	1.615	1.371	1.269	1.151	0.979	0.806

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

Table 4: I/H-Beam Sections 75 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
35	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
40	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
45	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
50	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
55	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
60	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
65	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
70	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
75	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
80	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
85	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
90	2.059	1.724	1.329	1.044	0.815	0.635	0.589	0.547	0.480	0.401
95	2.110	1.762	1.379	1.080	0.840	0.656	0.604	0.560	0.489	0.410
100	2.161	1.799	1.428	1.116	0.864	0.677	0.609	0.572	0.498	0.418
105	2.212	1.837	1.478	1.152	0.889	0.697	0.638	0.585	0.507	0.427
110	2.264	1.874	1.527	1.187	0.914	0.718	0.659	0.597	0.516	0.435
115	2.315	1.912	1.577	1.223	0.939	0.739	0.679	0.610	0.525	0.443
120	2.366	1.949	1.626	1.259	0.964	0.760	0.700	0.623	0.534	0.452
125	2.417	1.987	1.676	1.295	0.989	0.780	0.720	0.643	0.543	0.460
130	2.469	2.024	1.721	1.331	1.014	0.801	0.740	0.662	0.552	0.469
135	2.520	2.062	1.757	1.367	1.038	0.822	0.761	0.682	0.561	0.477
140	2.571	2.099	1.792	1.403	1.063	0.842	0.781	0.701	0.570	0.485
145	2.622	2.137	1.827	1.439	1.088	0.863	0.802	0.721	0.579	0.494
150	2.674	2.174	1.862	1.475	1.113	0.884	0.822	0.740	0.588	0.502
155	2.725	2.212	1.897	1.511	1.138	0.905	0.843	0.760	0.597	0.511
160	2.776	2.249	1.932	1.547	1.163	0.925	0.863	0.780	0.605	0.519
165	2.827	2.287	1.967	1.582	1.187	0.946	0.883	0.799	0.614	0.527
170	2.879	2.324	2.003	1.618	1.212	0.967	0.904	0.819	0.626	0.536
175	2.930	2.398	2.038	1.654	1.237	0.988	0.924	0.838	0.645	0.544
180	2.981	2.473	2.073	1.690	1.262	1.008	0.945	0.858	0.664	0.552
185	3.032	2.549	2.108	1.725	1.287	1.029	0.965	0.878	0.684	0.561
190	3.083	2.624	2.143	1.757	1.312	1.050	0.986	0.897	0.703	0.569
195	3.135	2.700	2.178	1.790	1.337	1.071	1.006	0.917	0.722	0.578
200	3.186	2.776	2.213	1.823	1.361	1.091	1.026	0.936	0.741	0.586
205	3.237	2.851	2.248	1.855	1.386	1.112	1.047	0.956	0.761	0.594
210	3.288	2.927	2.284	1.888	1.411	1.133	1.067	0.975	0.780	0.603
215	3.340	3.002	2.319	1.920	1.436	1.154	1.088	0.995	0.799	0.611
220	3.391	3.078	2.392	1.953	1.461	1.174	1.108	1.015	0.818	0.620
225	3.442	3.154	2.476	1.985	1.486	1.195	1.128	1.034	0.837	0.636
230	3.493	3.229	2.560	2.018	1.510	1.216	1.149	1.054	0.857	0.654
235	3.545	3.305	2.643	2.051	1.535	1.237	1.169	1.073	0.876	0.672
240	3.596	3.380	2.727	2.083	1.560	1.257	1.190	1.093	0.895	0.690
245	3.647	3.456	2.811	2.116	1.585	1.278	1.210	1.112	0.914	0.708
250	3.698	3.532	2.894	2.148	1.610	1.299	1.231	1.132	0.934	0.726
255	3.750	3.607	2.978	2.181	1.635	1.320	1.251	1.152	0.953	0.744
260	3.801	3.683	3.061	2.213	1.660	1.340	1.271	1.171	0.972	0.763
265	3.852	3.759	3.145	2.246	1.684	1.361	1.292	1.191	0.991	0.781
270	3.903	3.834	3.229	2.279	1.709	1.382	1.312	1.210	1.010	0.799
275	-	-	3.312	2.311	1.746	1.403	1.333	1.230	1.030	0.817
280	-	-	3.396	2.393	1.784	1.423	1.353	1.250	1.049	0.835
285	-	-	3.480	2.515	1.823	1.444	1.374	1.269	1.068	0.853
290	-	-	3.563	2.637	1.861	1.465	1.394	1.289	1.087	0.871
295	-	-	3.647	2.759	1.900	1.486	1.414	1.308	1.107	0.889
300	-	-	3.731	2.882	1.938	1.506	1.435	1.328	1.126	0.907
305	-	-	3.814	3.004	1.976	1.527	1.455	1.347	1.145	0.925
310	-	-	3.898	3.126	2.015	1.548	1.476	1.367	1.164	0.943
315	-	-	-	3.248	2.053	1.569	1.496	1.387	1.183	0.962
320	-	-	-	3.370	2.091	1.589	1.517	1.406	1.203	0.980
325	-	-	-	3.493	2.130	1.610	1.537	1.426	1.222	0.998
330	-	-	-	3.615	2.168	1.631	1.557	1.445	1.241	1.016
335	-	-	-	3.737	2.206	1.652	1.578	1.465	1.260	1.034
340	-	-	-	3.859	2.245	1.672	1.598	1.484	1.280	1.052
345	-	-	-	-	2.283	1.693	1.619	1.504	1.299	1.070
350	-	-	-	-	2.321	1.719	1.639	1.524	1.318	1.088
355	-	-	-	-	2.589	1.792	1.660	1.543	1.337	1.106
360	-	-	-	-	2.888	1.865	1.680	1.563	1.356	1.124
365	-	-	-	-	3.187	1.938	1.700	1.582	1.376	1.142

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

Table 5: I/H-Beam Sections 90 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
35	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
40	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
45	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
50	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
55	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
60	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
65	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
70	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
75	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
80	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
85	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
90	-	2.077	1.760	1.422	1.153	0.941	0.869	0.770	0.619	0.534
95	-	2.134	1.806	1.479	1.196	0.972	0.895	0.791	0.639	0.546
100	-	2.191	1.853	1.536	1.240	1.003	0.921	0.813	0.659	0.558
105	-	2.248	1.899	1.594	1.283	1.033	0.947	0.834	0.679	0.571
110	-	2.305	1.945	1.651	1.326	1.064	0.973	0.856	0.698	0.583
115	-	2.362	1.992	1.709	1.369	1.094	0.999	0.878	0.718	0.596
120	-	2.419	2.038	1.749	1.412	1.125	1.024	0.899	0.738	0.608
125	-	2.476	2.084	1.788	1.455	1.155	1.050	0.921	0.758	0.621
130	-	2.533	2.131	1.827	1.499	1.186	1.076	0.942	0.778	0.639
135	-	2.590	2.177	1.866	1.542	1.217	1.102	0.964	0.797	0.658
140	-	2.647	2.223	1.905	1.585	1.247	1.128	0.986	0.817	0.677
145	-	2.704	2.270	1.944	1.628	1.278	1.154	1.007	0.837	0.695
150	-	2.761	2.316	1.983	1.671	1.308	1.180	1.029	0.857	0.714
155	-	2.818	2.568	2.022	1.714	1.339	1.206	1.050	0.877	0.733
160	-	2.875	2.875	2.061	1.750	1.369	1.232	1.072	0.896	0.751
165	-	3.183	3.183	2.101	1.787	1.400	1.258	1.094	0.916	0.770
170	-	3.491	3.491	2.140	1.823	1.431	1.284	1.115	0.936	0.789
175	-	3.798	3.798	2.179	1.859	1.461	1.310	1.137	0.956	0.808
180	-	-	-	2.218	1.895	1.492	1.336	1.158	0.976	0.826
185	-	-	-	2.257	1.932	1.522	1.362	1.180	0.995	0.845
190	-	-	-	2.296	1.968	1.553	1.388	1.201	1.015	0.864
195	-	-	-	2.354	2.004	1.583	1.414	1.223	1.035	0.883
200	-	-	-	2.475	2.041	1.614	1.440	1.245	1.055	0.901
205	-	-	-	2.596	2.077	1.645	1.466	1.266	1.075	0.920
210	-	-	-	2.717	2.113	1.675	1.492	1.288	1.094	0.939
215	-	-	-	2.839	2.149	1.706	1.518	1.309	1.114	0.958
220	-	-	-	2.960	2.186	1.739	1.544	1.331	1.134	0.976
225	-	-	-	3.081	2.222	1.773	1.570	1.353	1.154	0.995
230	-	-	-	3.202	2.258	1.807	1.596	1.374	1.173	1.014
235	-	-	-	3.323	2.295	1.841	1.622	1.396	1.193	1.032
240	-	-	-	3.444	2.342	1.874	1.648	1.417	1.213	1.051
245	-	-	-	3.565	2.460	1.908	1.674	1.439	1.233	1.070
250	-	-	-	3.686	2.579	1.942	1.700	1.461	1.253	1.089
255	-	-	-	3.807	2.697	1.976	1.731	1.482	1.272	1.107
260	-	-	-	-	2.816	2.010	1.767	1.504	1.292	1.126
265	-	-	-	-	2.934	2.044	1.804	1.525	1.312	1.145
270	-	-	-	-	3.052	2.078	1.840	1.547	1.332	1.164
275	-	-	-	-	3.171	2.112	1.877	1.569	1.352	1.182
280	-	-	-	-	3.289	2.146	1.913	1.590	1.371	1.201
285	-	-	-	-	3.408	2.179	1.950	1.612	1.391	1.220
290	-	-	-	-	3.526	2.213	1.986	1.633	1.411	1.239
295	-	-	-	-	3.645	2.247	2.023	1.655	1.431	1.257
300	-	-	-	-	3.763	2.281	2.059	1.676	1.451	1.276
305	-	-	-	-	3.882	2.315	2.096	1.698	1.470	1.295
310	-	-	-	-	-	2.495	2.132	1.733	1.490	1.313
315	-	-	-	-	-	2.745	2.169	1.793	1.510	1.332
320	-	-	-	-	-	2.996	2.205	1.853	1.530	1.351
325	-	-	-	-	-	3.246	2.242	1.913	1.550	1.370
330	-	-	-	-	-	3.496	2.278	1.973	1.569	1.388
335	-	-	-	-	-	3.746	2.315	2.033	1.589	1.407
340	-	-	-	-	-	-	2.670	2.093	1.609	1.426
345	-	-	-	-	-	-	3.163	2.153	1.629	1.445
350	-	-	-	-	-	-	3.655	2.213	1.649	1.463
355	-	-	-	-	-	-	-	2.273	1.668	1.482
360	-	-	-	-	-	-	-	2.389	1.688	1.501
365	-	-	-	-	-	-	-	2.939	1.708	1.520

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

Table 6: I/H-Beam Sections 105 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
35	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
40	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
45	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
50	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
55	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
60	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
65	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
70	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
75	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
80	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
85	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
90	-	-	2.102	1.805	1.493	1.242	1.154	1.036	0.869	0.711
95	-	-	2.167	1.859	1.556	1.290	1.197	1.071	0.893	0.731
100	-	-	2.233	1.913	1.618	1.337	1.239	1.106	0.917	0.750
105	-	-	2.298	1.967	1.681	1.385	1.281	1.140	0.941	0.770
110	-	-	2.364	2.020	1.799	1.432	1.323	1.175	0.965	0.789
115	-	-	2.429	2.074	1.974	1.480	1.365	1.210	0.989	0.809
120	-	-	2.495	2.149	2.149	1.527	1.407	1.244	1.013	0.828
125	-	-	2.560	2.324	2.324	1.575	1.450	1.279	1.037	0.848
130	-	-	2.626	2.499	2.499	1.622	1.492	1.314	1.061	0.867
135	-	-	2.691	2.674	2.674	1.670	1.534	1.348	1.085	0.887
140	-	-	2.849	2.849	2.849	1.716	1.576	1.383	1.109	0.906
145	-	-	3.024	3.024	3.024	1.755	1.618	1.418	1.133	0.926
150	-	-	3.198	3.198	3.198	1.794	1.660	1.453	1.157	0.946
155	-	-	3.373	3.373	3.373	1.832	1.702	1.487	1.181	0.965
160	-	-	3.548	3.548	3.548	1.871	1.741	1.522	1.205	0.985
165	-	-	3.723	3.723	3.723	1.909	1.778	1.557	1.229	1.004
170	-	-	3.898	3.898	3.898	1.948	1.816	1.591	1.253	1.024
175	-	-	-	-	-	1.987	1.853	1.626	1.277	1.043
180	-	-	-	-	-	2.025	1.890	1.661	1.301	1.063
185	-	-	-	-	-	2.064	1.928	1.695	1.325	1.082
190	-	-	-	-	-	2.103	1.965	1.731	1.349	1.102
195	-	-	-	-	-	2.141	2.003	1.767	1.373	1.121
200	-	-	-	-	-	2.180	2.040	1.803	1.397	1.141
205	-	-	-	-	-	2.219	2.077	1.839	1.421	1.160
210	-	-	-	-	-	2.257	2.115	1.875	1.445	1.180
215	-	-	-	-	-	2.296	2.152	1.911	1.469	1.200
220	-	-	-	-	-	2.365	2.190	1.947	1.493	1.219
225	-	-	-	-	-	2.542	2.227	1.983	1.517	1.239
230	-	-	-	-	-	2.718	2.264	2.019	1.541	1.258
235	-	-	-	-	-	2.895	2.302	2.055	1.565	1.278
240	-	-	-	-	-	3.072	2.376	2.091	1.589	1.297
245	-	-	-	-	-	3.248	2.518	2.127	1.613	1.317
250	-	-	-	-	-	3.425	2.660	2.164	1.637	1.336
255	-	-	-	-	-	3.602	2.801	2.200	1.661	1.356
260	-	-	-	-	-	3.779	2.943	2.236	1.685	1.375
265	-	-	-	-	-	-	3.085	2.272	1.709	1.395
270	-	-	-	-	-	-	3.227	2.308	1.750	1.414
275	-	-	-	-	-	-	3.369	2.423	1.793	1.434
280	-	-	-	-	-	-	3.511	2.620	1.837	1.454
285	-	-	-	-	-	-	3.653	2.817	1.880	1.473
290	-	-	-	-	-	-	3.795	3.014	1.924	1.493
295	-	-	-	-	-	-	-	3.211	1.967	1.512
300	-	-	-	-	-	-	-	3.408	2.011	1.532
305	-	-	-	-	-	-	-	3.605	2.054	1.551
310	-	-	-	-	-	-	-	3.802	2.098	1.571
315	-	-	-	-	-	-	-	-	2.141	1.590
320	-	-	-	-	-	-	-	-	2.185	1.610
325	-	-	-	-	-	-	-	-	2.228	1.629
330	-	-	-	-	-	-	-	-	2.272	1.649
335	-	-	-	-	-	-	-	-	2.315	1.669
340	-	-	-	-	-	-	-	-	2.832	1.688
345	-	-	-	-	-	-	-	-	3.505	1.708
350	-	-	-	-	-	-	-	-	-	1.799
355	-	-	-	-	-	-	-	-	-	1.911
360	-	-	-	-	-	-	-	-	-	2.023
365	-	-	-	-	-	-	-	-	-	2.134

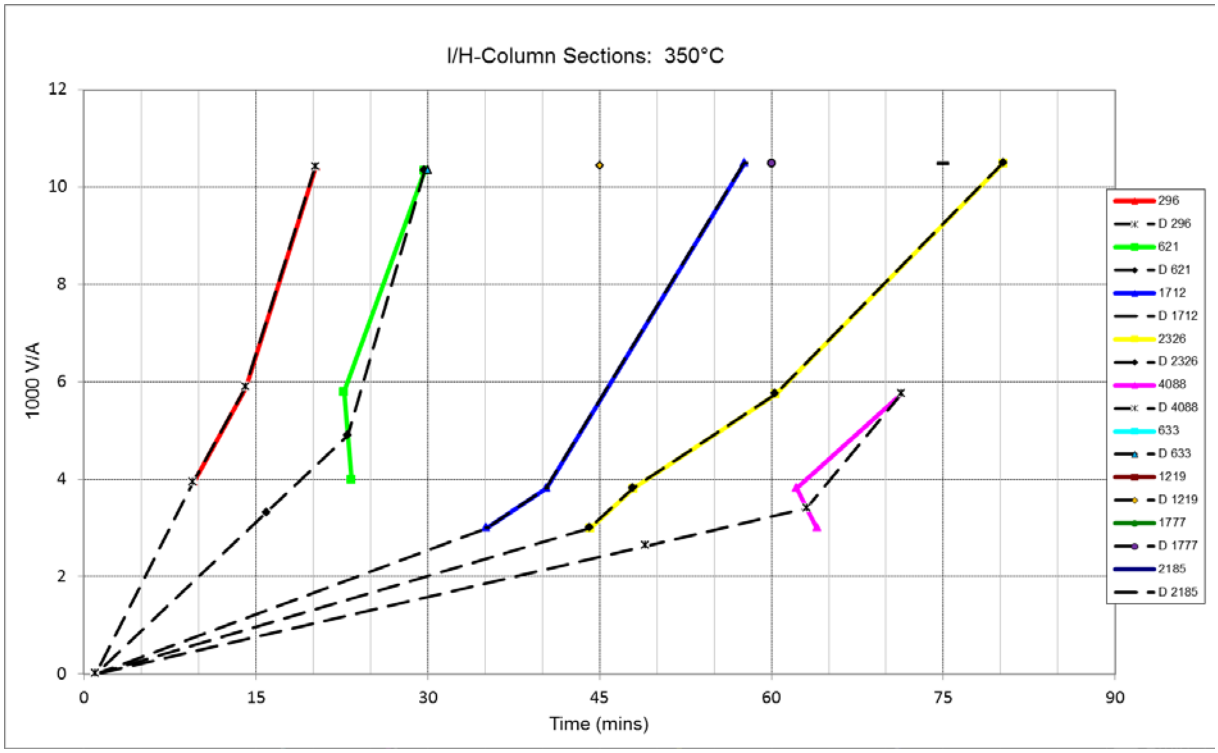
Thickness is intumescent only.
Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

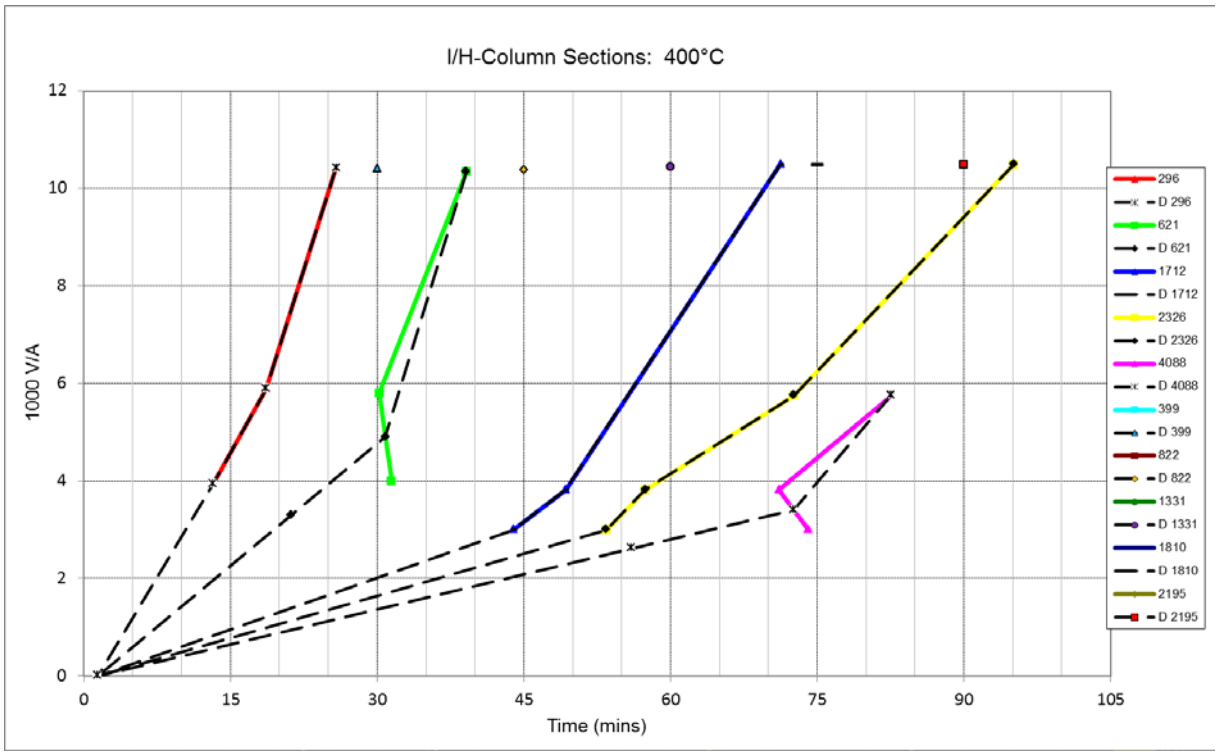
Table 7: I/H-Beam Sections 120 Minutes										
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of									
	350°C	400°C	450°C	500°C	550°C	600°C	620°C	650°C	700°C	750°C
30	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
35	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
40	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
45	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
50	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
55	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
60	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
65	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
70	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
75	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
80	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
85	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
90	-	-	-	2.190	1.835	1.443	1.443	1.301	1.108	0.941
95	-	-	-	2.266	1.895	1.501	1.501	1.351	1.145	0.968
100	-	-	-	2.343	1.955	1.615	1.560	1.401	1.182	0.995
105	-	-	-	2.419	2.015	1.731	1.618	1.451	1.220	1.022
110	-	-	-	2.496	2.075	1.779	1.677	1.500	1.257	1.049
115	-	-	-	2.572	2.135	1.826	1.729	1.550	1.294	1.076
120	-	-	-	2.649	2.195	1.873	1.773	1.600	1.332	1.103
125	-	-	-	2.725	2.255	1.920	1.817	1.650	1.369	1.130
130	-	-	-	2.802	2.315	1.968	1.861	1.699	1.406	1.157
135	-	-	-	2.878	2.375	2.015	1.905	1.743	1.444	1.184
140	-	-	-	2.955	2.435	2.062	1.949	1.785	1.481	1.211
145	-	-	-	3.031	2.495	2.110	1.993	1.826	1.518	1.238
150	-	-	-	3.108	2.555	2.157	2.037	1.868	1.556	1.265
155	-	-	-	3.184	2.615	2.204	2.081	1.909	1.593	1.292
160	-	-	-	3.261	2.675	2.251	2.125	1.951	1.630	1.319
165	-	-	-	3.337	2.735	2.299	2.169	1.993	1.668	1.346
170	-	-	-	3.414	2.795	2.346	2.213	2.034	1.705	1.373
175	-	-	-	3.490	2.855	2.393	2.257	2.076	1.742	1.400
180	-	-	-	3.567	2.915	2.440	2.301	2.117	1.780	1.427
185	-	-	-	3.643	2.975	2.488	2.345	2.159	1.818	1.454
190	-	-	-	3.720	3.035	2.535	2.389	2.201	1.855	1.481
195	-	-	-	3.796	3.095	2.582	2.433	2.242	1.893	1.508
200	-	-	-	3.873	3.154	2.629	2.477	2.284	1.930	1.535
205	-	-	-	-	3.214	2.677	2.521	2.325	1.968	1.562
210	-	-	-	-	3.274	2.724	2.565	2.367	2.006	1.589
215	-	-	-	-	3.334	2.771	2.609	2.408	2.043	1.616
220	-	-	-	-	3.394	2.819	2.653	2.450	2.081	1.643
225	-	-	-	-	3.454	2.866	2.697	2.492	2.118	1.670
230	-	-	-	-	3.514	2.913	2.741	2.533	2.156	1.697
235	-	-	-	-	3.574	2.960	2.785	2.575	2.193	1.731
240	-	-	-	-	3.634	3.008	2.829	2.616	2.231	1.774
245	-	-	-	-	3.694	3.055	2.873	2.658	2.269	1.817
250	-	-	-	-	3.754	3.102	2.917	2.700	2.306	1.860
255	-	-	-	-	3.814	3.149	2.961	2.741	2.412	1.903
260	-	-	-	-	3.874	3.197	3.005	2.783	2.594	1.946
265	-	-	-	-	-	3.244	3.049	2.824	2.776	1.989
270	-	-	-	-	-	3.291	3.093	2.958	2.958	2.032
275	-	-	-	-	-	3.339	3.140	3.140	3.140	2.075
280	-	-	-	-	-	3.386	3.322	3.322	3.322	2.118
285	-	-	-	-	-	3.504	3.504	3.504	3.504	2.161
290	-	-	-	-	-	3.686	3.686	3.686	3.686	2.204
295	-	-	-	-	-	3.868	3.868	3.868	3.868	2.246
300	-	-	-	-	-	-	-	-	-	2.289
305	-	-	-	-	-	-	-	-	-	2.378
310	-	-	-	-	-	-	-	-	-	2.726
315	-	-	-	-	-	-	-	-	-	3.073
320	-	-	-	-	-	-	-	-	-	3.421
325	-	-	-	-	-	-	-	-	-	3.768
330	-	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-	-

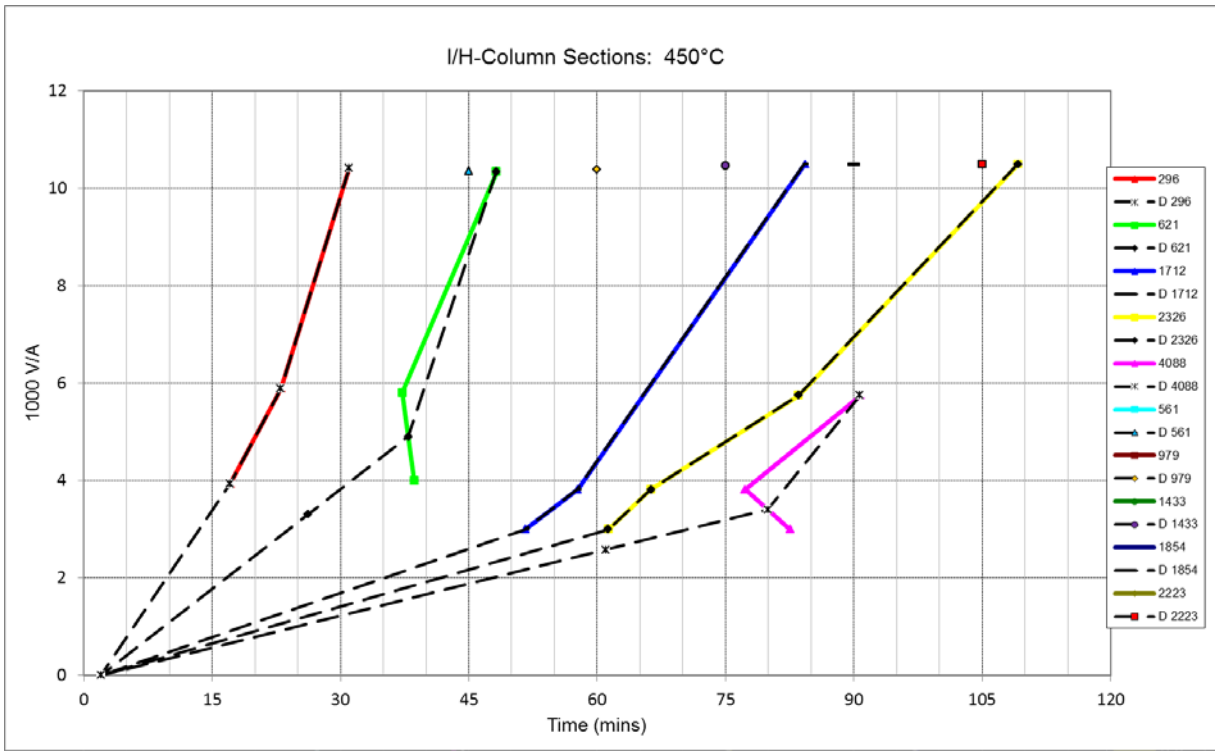
Thickness is intumescent only.
Results apply to I/H-section beams with concrete slabs with 3 sided fire exposure.

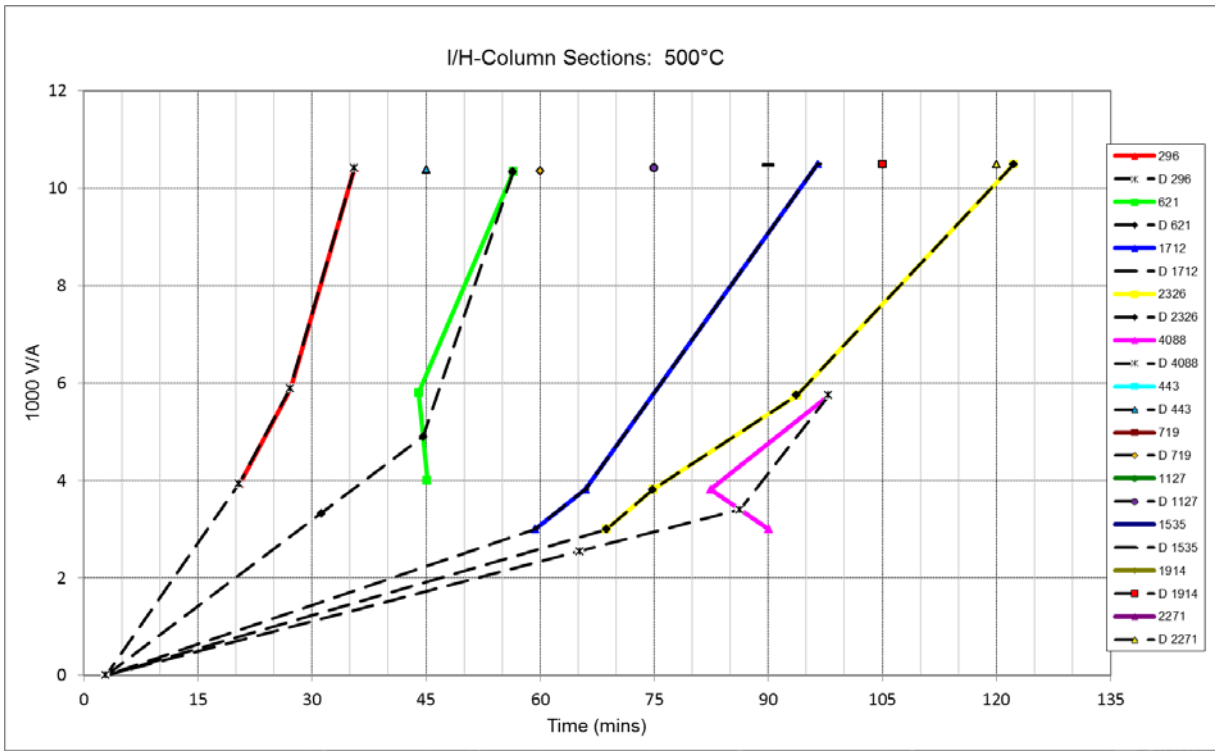
Annex B: I / H-section Columns

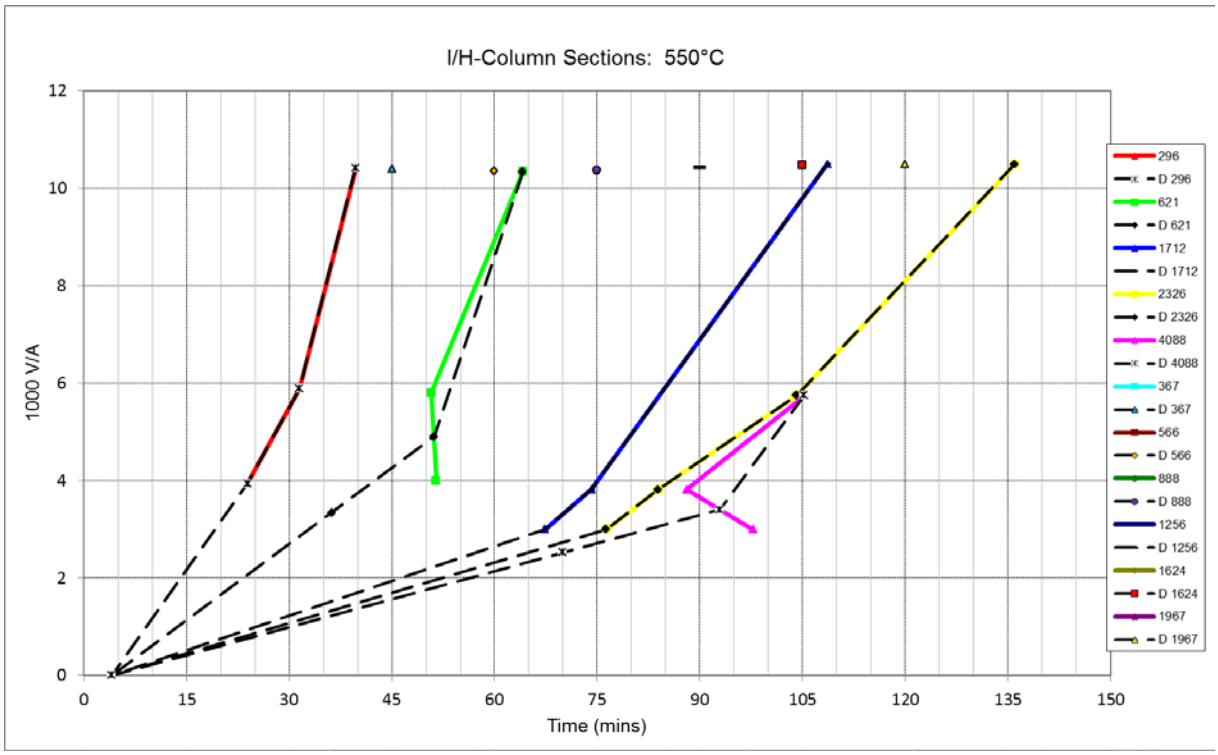
B1 Graphs: I / H-section Columns

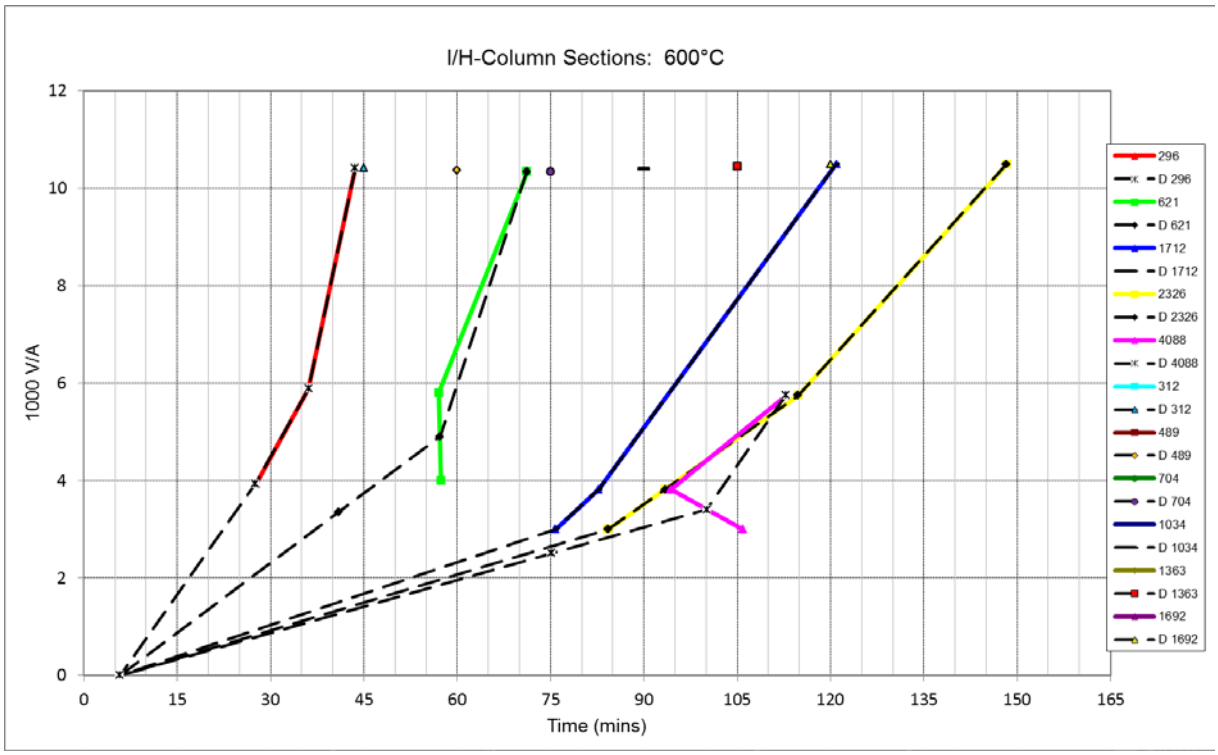


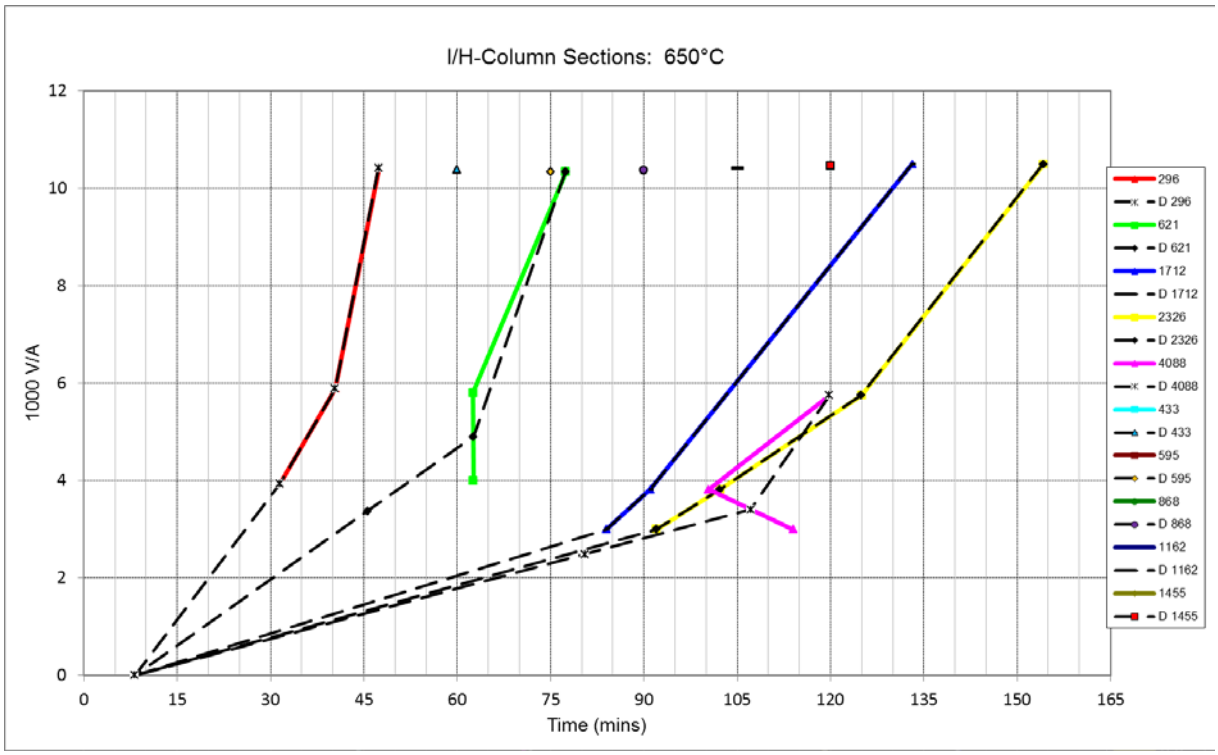


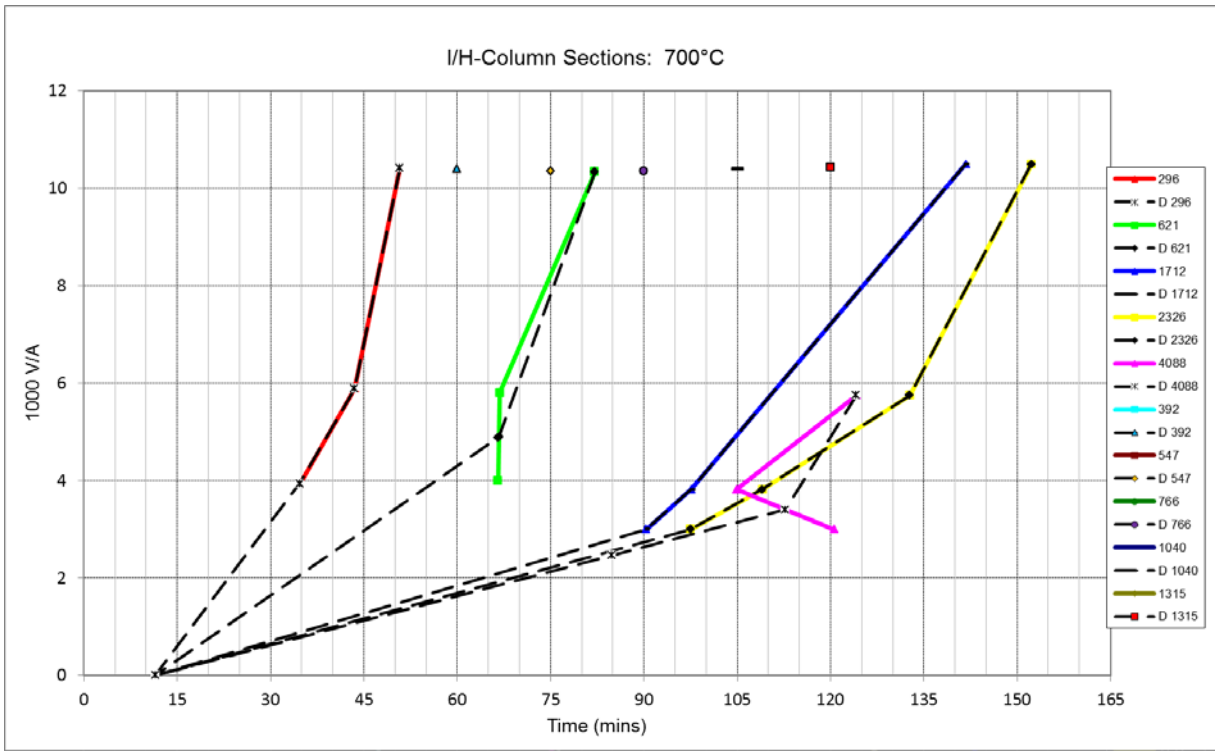

I/H-Column Sections: 450°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
561
D 561
979
D 979
1433
D 1433
1854
D 1854
2223
D 2223

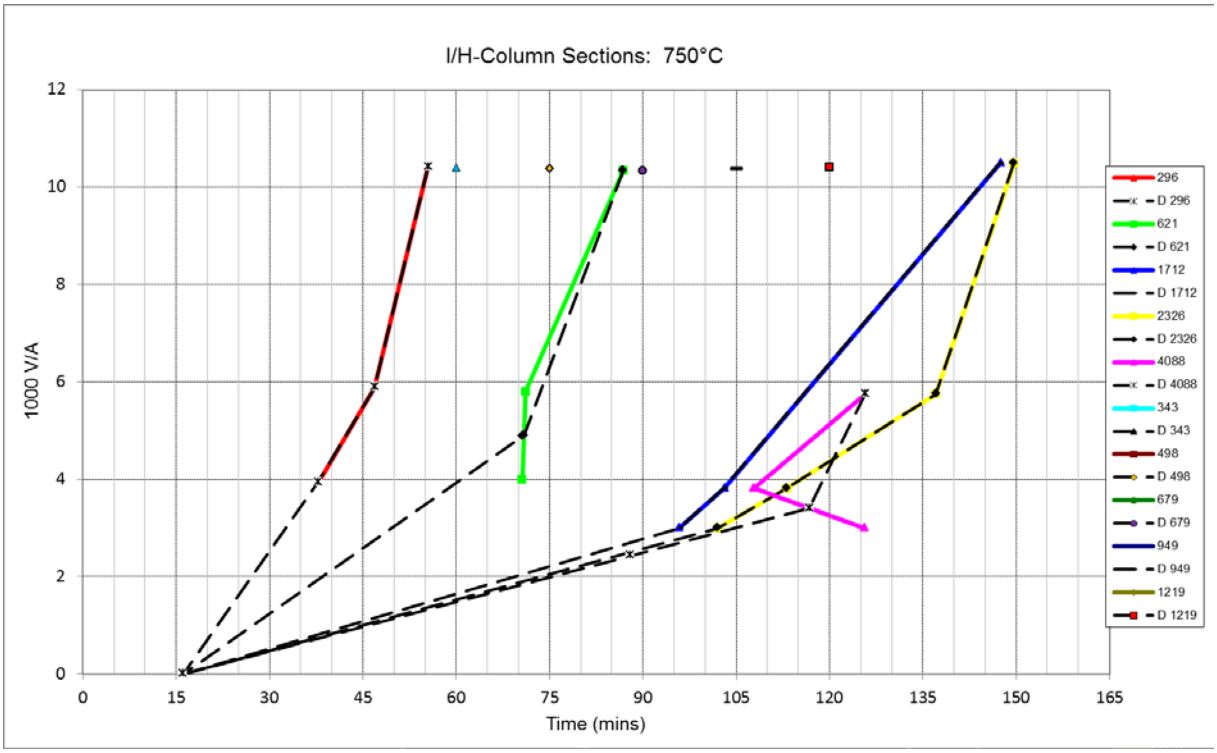

I/H-Column Sections: 500°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
443
D 443
719
D 719
1127
D 1127
1535
D 1535
1914
D 1914
2271
D 2271


I/H-Column Sections: 550°C
1000 V/A
Time (mins)
0
15
30
45
60
75
90
105
120
135
150
0
2
4
6
8
10
12
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
367
D 367
566
D 566
888
D 888
1256
D 1256
1624
D 1624
1967
D 1967


I/H-Column Sections: 600°C
1000 V/A
Time (mins)
0
15
30
45
60
75
90
105
120
135
150
165
0
2
4
6
8
10
12
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
312
D 312
489
D 489
704
D 704
1034
D 1034
1363
D 1363
1692
D 1692


I/H-Column Sections: 650°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
433
D 433
595
D 595
868
D 868
1162
D 1162
1455
D 1455


I/H-Column Sections: 700°C
1000 V/A
Time (mins)
0
2
4
6
8
10
12
0
15
30
45
60
75
90
105
120
135
150
165
296
D 296
621
D 621
1712
D 1712
2326
D 2326
4088
D 4088
392
D 392
547
D 547
766
D 766
1040
D 1040
1315
D 1315



B2 Criteria of Acceptability / Intercepts: I / H-section Columns

B2.1 Criteria of Acceptability

Acceptibility Criteria	% Allowed / Actual	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
Maximum positive variation (%)	15	1.44	2.11	3.41	4.68	5.48	6.15	6.75	7.46	8.27
Optimistic predictions (%)	30	12.50	12.50	12.50	12.50	12.50	12.50	12.50	6.25	6.25
Overall conservative (%)	less than zero	-3.43	-3.37	-3.38	-3.37	-3.32	-3.25	-3.15	-1.45	-1.41

B2.2 Intercepts

Dry Film Thickness (mm)	I / H-Column Sections: Limiting section factor m-1 at design temperature 350°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	-	-	-	-	-	-	-
0.621	-	-	-	-	-	-	-
0.633	96.8	-	-	-	-	-	-
1.219	-	96.0	-	-	-	-	-
1.712	392.9	177.6	-	-	-	-	-
1.777	-	-	95.3	-	-	-	-
2.185	-	-	-	95.3	-	-	-
2.326	496.5	313.7	175.3	108.1	-	-	-
4.088	628.7	414.4	309.0	-	-	-	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 400°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	-	-	-	-	-	-	-
0.399	96.3	-	-	-	-	-	-
0.621	210.1	-	-	-	-	-	-
0.822	-	96.5	-	-	-	-	-
1.331	-	-	95.8	-	-	-	-
1.712	496.5	316.1	141.0	-	-	-	-
1.810	-	-	-	95.3	-	-	-
2.195	-	-	-	-	95.3	-	-
2.326	607.5	398.5	241.2	159.8	106.2	-	-
4.088	731.2	479.6	356.9	251.6	-	-	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 450°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	101.5	-	-	-	-	-	-
0.561	-	96.7	-	-	-	-	-
0.621	261.9	115.8	-	-	-	-	-
0.979	-	-	96.3	-	-	-	-
1.433	-	-	-	95.7	-	-	-
1.712	591.8	385.4	227.5	122.3	-	-	-
1.854	-	-	-	-	95.3	-	-
2.223	-	-	-	-	-	95.3	-
2.326	707.6	460.7	341.6	208.6	143.9	102.9	-
4.088	817.6	532.4	394.7	313.6	178.6	-	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 500°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	134.6	-	-	-	-	-	-
0.443	-	96.4	-	-	-	-	-
0.621	314.2	197.0	-	-	-	-	-
0.719	-	-	96.7	-	-	-	-
1.127	-	-	-	96.1	-	-	-
1.535	-	-	-	-	95.5	-	-
1.712	694.1	446.8	323.5	172.4	110.2	-	-
1.914	-	-	-	-	-	95.3	-
2.271	-	-	-	-	-	-	95.3
2.326	811.2	522.2	385.0	260.7	186.2	131.2	98.9
4.088	903.5	581.6	428.8	339.6	240.5	-	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 550°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	181.9	-	-	-	-	-	-
0.367	-	96.2	-	-	-	-	-
0.566	-	-	96.7	-	-	-	-
0.621	370.8	234.8	116.1	-	-	-	-
0.888	-	-	-	96.4	-	-	-
1.256	-	-	-	-	95.9	-	-
1.624	-	-	-	-	-	95.4	-
1.712	815.3	516.3	377.7	250.7	145.1	102.1	-
1.967	-	-	-	-	-	-	95.3
2.326	931.4	589.8	431.5	340.2	227.3	169.9	123.2
4.088	1007.5	638.0	466.8	368.0	303.8	175.1	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 600°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	222.9	-	-	-	-	-	-
0.312	-	96.0	-	-	-	-	-
0.489	-	-	96.5	-	-	-	-
0.621	433.7	267.8	167.3	-	-	-	-
0.704	-	-	-	96.7	-	-	-
1.034	-	-	-	-	96.2	-	-
1.363	-	-	-	-	-	95.8	-
1.692	-	-	-	-	-	-	95.3
1.712	965.0	595.8	430.9	337.5	196.4	129.6	96.8
2.326	1082.4	668.2	483.3	378.5	284.8	205.6	154.2
4.088	1144.9	706.8	511.2	400.4	329.1	232.2	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 650°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	271.5	112.8	-	-	-	-	-
0.433	-	-	96.3	-	-	-	-
0.595	-	-	-	96.7	-	-	-
0.621	509.3	301.7	214.4	105.8	-	-	-
0.868	-	-	-	-	96.5	-	-
1.162	-	-	-	-	-	96.1	-
1.455	-	-	-	-	-	-	95.6
1.712	1160.2	687.3	488.3	378.6	270.3	165.7	118.8
2.326	1284.3	760.8	540.5	419.1	342.3	246.7	187.5
4.088	1334.0	790.3	561.4	435.4	355.5	300.4	-

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 700°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	318.5	146.8	-	-	-	-	-
0.392	-	-	96.2	-	-	-	-
0.547	-	-	-	96.6	-	-	-
0.621	609.2	336.4	232.4	127.8	-	-	-
0.766	-	-	-	-	96.6	-	-
1.040	-	-	-	-	-	96.2	-
1.315	-	-	-	-	-	-	95.8
1.712	1423.1	785.9	542.8	414.6	335.4	202.6	138.7
2.326	1553.1	857.7	592.4	452.5	366.0	283.3	212.2
4.088	1607.9	887.9	613.3	468.4	378.9	318.1	204.0

Dry Film Thickness (mm)	I/H-Column Sections: Limiting section factor m-1 at design temperature 750°C for a time period of:						
	30 minutes	45 minutes	60 minutes	75 minutes	90 minutes	105 minutes	120 minutes
0.296	396.5	182.6	-	-	-	-	-
0.343	-	-	96.1	-	-	-	-
0.498	-	-	-	96.5	-	-	-
0.621	804.5	387.0	254.7	158.7	-	-	-
0.679	-	-	-	-	96.7	-	-
0.949	-	-	-	-	-	96.3	-
1.219	-	-	-	-	-	-	96.0
1.712	1915.7	921.4	606.6	452.1	360.3	242.9	156.9
2.326	2064.7	993.1	653.7	487.3	388.4	311.0	228.7
4.088	2127.0	1023.0	673.5	501.9	400.1	332.6	234.9

Assessment limited to a maximum section factor of 368m^{-1}.

B3 Tables: I/H-section Columns

Table 8: I/H-Column Sections 30 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
35	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
40	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
45	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
50	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
55	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
60	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
65	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
70	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
75	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
80	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
85	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
90	0.609	0.386	0.273	0.260	0.260	0.260	0.260	0.260	0.260
95	0.627	0.396	0.283	0.260	0.260	0.260	0.260	0.260	0.260
100	0.645	0.406	0.293	0.260	0.260	0.260	0.260	0.260	0.260
105	0.663	0.416	0.303	0.260	0.260	0.260	0.260	0.260	0.260
110	0.681	0.426	0.313	0.260	0.260	0.260	0.260	0.260	0.260
115	0.699	0.436	0.323	0.261	0.260	0.260	0.260	0.260	0.260
120	0.718	0.445	0.333	0.270	0.260	0.260	0.260	0.260	0.260
125	0.736	0.455	0.344	0.279	0.260	0.260	0.260	0.260	0.260
130	0.754	0.465	0.354	0.288	0.260	0.260	0.260	0.260	0.260
135	0.772	0.475	0.364	0.297	0.260	0.260	0.260	0.260	0.260
140	0.790	0.484	0.374	0.306	0.260	0.260	0.260	0.260	0.260
145	0.809	0.494	0.384	0.315	0.260	0.260	0.260	0.260	0.260
150	0.827	0.504	0.394	0.324	0.260	0.260	0.260	0.260	0.260
155	0.845	0.514	0.404	0.333	0.260	0.260	0.260	0.260	0.260
160	0.863	0.523	0.414	0.342	0.260	0.260	0.260	0.260	0.260
165	0.882	0.533	0.425	0.351	0.265	0.260	0.260	0.260	0.260
170	0.900	0.543	0.435	0.360	0.274	0.260	0.260	0.260	0.260
175	0.918	0.553	0.445	0.369	0.283	0.260	0.260	0.260	0.260
180	0.936	0.562	0.455	0.378	0.292	0.260	0.260	0.260	0.260
185	0.954	0.572	0.465	0.387	0.301	0.260	0.260	0.260	0.260
190	0.973	0.582	0.475	0.396	0.310	0.260	0.260	0.260	0.260
195	0.991	0.592	0.485	0.405	0.319	0.260	0.260	0.260	0.260
200	1.009	0.601	0.496	0.414	0.327	0.260	0.260	0.260	0.260
205	1.027	0.611	0.506	0.423	0.336	0.267	0.260	0.260	0.260
210	1.046	0.621	0.516	0.432	0.344	0.275	0.260	0.260	0.260
215	1.064	0.640	0.526	0.441	0.353	0.283	0.260	0.260	0.260
220	1.082	0.659	0.536	0.451	0.362	0.291	0.260	0.260	0.260
225	1.100	0.678	0.546	0.460	0.370	0.299	0.260	0.260	0.260
230	1.118	0.697	0.556	0.469	0.379	0.307	0.260	0.260	0.260
235	1.137	0.716	0.566	0.478	0.387	0.315	0.260	0.260	0.260
240	1.155	0.735	0.577	0.487	0.396	0.322	0.260	0.260	0.260
245	1.173	0.754	0.587	0.496	0.405	0.330	0.260	0.260	0.260
250	1.191	0.773	0.597	0.505	0.413	0.338	0.266	0.260	0.260
255	1.210	0.792	0.607	0.514	0.422	0.345	0.273	0.260	0.260
260	1.228	0.811	0.617	0.523	0.430	0.353	0.280	0.260	0.260
265	1.246	0.830	0.631	0.532	0.439	0.361	0.287	0.260	0.260
270	1.264	0.849	0.648	0.541	0.448	0.369	0.294	0.260	0.260
275	1.282	0.868	0.664	0.550	0.456	0.376	0.301	0.260	0.260
280	1.301	0.887	0.681	0.559	0.465	0.384	0.308	0.260	0.260
285	1.319	0.906	0.697	0.568	0.473	0.392	0.314	0.263	0.260
290	1.337	0.925	0.714	0.577	0.482	0.399	0.321	0.268	0.260
295	1.355	0.944	0.730	0.586	0.491	0.407	0.328	0.273	0.260
300	1.374	0.963	0.747	0.595	0.499	0.415	0.335	0.278	0.260
305	1.392	0.982	0.763	0.604	0.508	0.423	0.342	0.283	0.260
310	1.410	1.002	0.780	0.613	0.516	0.430	0.349	0.288	0.260
315	1.428	1.021	0.796	0.623	0.525	0.438	0.355	0.293	0.260
320	1.446	1.040	0.813	0.638	0.534	0.446	0.362	0.298	0.260
325	1.465	1.059	0.830	0.652	0.542	0.453	0.369	0.303	0.260
330	1.483	1.078	0.846	0.666	0.551	0.461	0.376	0.309	0.260
335	1.501	1.097	0.863	0.681	0.559	0.469	0.383	0.314	0.260
340	1.519	1.116	0.879	0.695	0.568	0.476	0.390	0.320	0.260
345	1.538	1.135	0.896	0.709	0.577	0.484	0.396	0.326	0.260
350	1.556	1.154	0.912	0.724	0.585	0.492	0.403	0.331	0.260
355	1.574	1.173	0.929	0.738	0.594	0.500	0.410	0.337	0.260
360	1.592	1.192	0.945	0.753	0.602	0.507	0.417	0.342	0.260
365	1.610	1.211	0.962	0.767	0.611	0.515	0.424	0.348	0.260

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 9: I/H-Column Sections 45 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
35	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
40	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
45	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
50	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
55	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
60	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
65	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
70	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
75	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
80	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
85	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
90	1.181	0.796	0.542	0.431	0.356	0.301	0.260	0.260	0.260
95	1.212	0.816	0.557	0.440	0.365	0.310	0.268	0.260	0.260
100	1.243	0.836	0.572	0.449	0.374	0.319	0.276	0.260	0.260
105	1.274	0.856	0.587	0.458	0.383	0.328	0.284	0.260	0.260
110	1.304	0.877	0.603	0.467	0.392	0.337	0.292	0.260	0.260
115	1.334	0.897	0.619	0.476	0.401	0.346	0.300	0.260	0.260
120	1.364	0.917	0.638	0.485	0.411	0.355	0.308	0.260	0.260
125	1.394	0.937	0.658	0.494	0.420	0.364	0.317	0.262	0.260
130	1.424	0.958	0.679	0.502	0.429	0.373	0.326	0.270	0.260
135	1.455	0.978	0.699	0.511	0.438	0.382	0.334	0.278	0.260
140	1.485	0.998	0.719	0.520	0.447	0.391	0.343	0.286	0.260
145	1.515	1.019	0.739	0.529	0.456	0.400	0.351	0.294	0.260
150	1.545	1.039	0.759	0.538	0.466	0.409	0.360	0.302	0.260
155	1.575	1.059	0.780	0.547	0.475	0.418	0.369	0.310	0.260
160	1.606	1.079	0.800	0.556	0.484	0.427	0.377	0.319	0.260
165	1.636	1.100	0.820	0.564	0.493	0.436	0.386	0.327	0.268
170	1.666	1.120	0.840	0.573	0.502	0.445	0.394	0.336	0.276
175	1.696	1.140	0.861	0.582	0.511	0.454	0.403	0.344	0.284
180	1.723	1.160	0.881	0.591	0.521	0.463	0.412	0.353	0.292
185	1.745	1.181	0.901	0.600	0.530	0.472	0.420	0.362	0.300
190	1.768	1.201	0.921	0.609	0.539	0.481	0.429	0.370	0.308
195	1.790	1.221	0.942	0.617	0.548	0.490	0.437	0.379	0.316
200	1.813	1.241	0.962	0.634	0.557	0.499	0.446	0.387	0.324
205	1.835	1.262	0.982	0.656	0.566	0.508	0.455	0.396	0.332
210	1.858	1.282	1.002	0.678	0.576	0.517	0.463	0.404	0.340
215	1.881	1.302	1.023	0.699	0.585	0.526	0.472	0.413	0.348
220	1.903	1.323	1.043	0.721	0.594	0.535	0.480	0.421	0.355
225	1.926	1.343	1.063	0.743	0.603	0.544	0.489	0.430	0.363
230	1.948	1.363	1.083	0.765	0.612	0.553	0.498	0.439	0.371
235	1.971	1.383	1.103	0.787	0.622	0.562	0.506	0.447	0.379
240	1.993	1.404	1.124	0.809	0.641	0.571	0.515	0.456	0.387
245	2.016	1.424	1.144	0.831	0.661	0.580	0.523	0.464	0.395
250	2.039	1.444	1.164	0.852	0.680	0.589	0.532	0.473	0.403
255	2.061	1.464	1.184	0.874	0.699	0.598	0.541	0.481	0.411
260	2.084	1.485	1.205	0.896	0.719	0.607	0.549	0.490	0.419
265	2.106	1.505	1.225	0.918	0.738	0.616	0.558	0.499	0.427
270	2.129	1.525	1.245	0.940	0.757	0.628	0.566	0.507	0.435
275	2.151	1.545	1.265	0.962	0.777	0.645	0.575	0.516	0.443
280	2.174	1.566	1.286	0.983	0.796	0.662	0.584	0.524	0.451
285	2.197	1.586	1.306	1.005	0.816	0.678	0.592	0.533	0.459
290	2.219	1.606	1.326	1.027	0.835	0.695	0.601	0.541	0.467
295	2.242	1.627	1.346	1.049	0.854	0.712	0.609	0.550	0.475
300	2.264	1.647	1.366	1.071	0.874	0.728	0.618	0.559	0.483
305	2.287	1.667	1.387	1.093	0.893	0.745	0.630	0.567	0.491
310	2.309	1.687	1.407	1.114	0.913	0.761	0.644	0.576	0.499
315	2.349	1.708	1.427	1.136	0.932	0.778	0.659	0.584	0.507
320	2.436	1.741	1.447	1.158	0.951	0.795	0.673	0.593	0.515
325	2.524	1.778	1.468	1.180	0.971	0.811	0.687	0.601	0.522
330	2.611	1.816	1.488	1.202	0.990	0.828	0.701	0.610	0.530
335	2.699	1.853	1.508	1.224	1.009	0.845	0.715	0.619	0.538
340	2.786	1.890	1.528	1.246	1.029	0.861	0.729	0.630	0.546
345	2.874	1.928	1.549	1.267	1.048	0.878	0.743	0.642	0.554
350	2.961	1.965	1.569	1.289	1.068	0.895	0.758	0.654	0.562
355	3.049	2.002	1.589	1.311	1.087	0.911	0.772	0.666	0.570
360	3.136	2.039	1.609	1.333	1.106	0.928	0.786	0.678	0.578
365	3.224	2.077	1.630	1.355	1.126	0.944	0.800	0.690	0.586

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 10: I/H-Column Sections 60 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
35	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
40	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
45	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
50	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
55	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
60	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
65	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
70	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
75	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
80	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
85	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
90	1.739	1.282	0.944	0.692	0.545	0.478	0.423	0.380	0.332
95	1.774	1.324	0.972	0.713	0.560	0.487	0.431	0.389	0.341
100	1.809	1.366	1.000	0.734	0.575	0.496	0.439	0.398	0.350
105	1.844	1.408	1.028	0.755	0.590	0.505	0.447	0.407	0.359
110	1.878	1.451	1.056	0.777	0.604	0.514	0.455	0.415	0.367
115	1.912	1.493	1.083	0.799	0.618	0.524	0.463	0.424	0.376
120	1.946	1.535	1.111	0.821	0.637	0.533	0.471	0.432	0.385
125	1.981	1.577	1.139	0.843	0.658	0.542	0.479	0.440	0.394
130	2.015	1.619	1.167	0.865	0.679	0.551	0.487	0.449	0.402
135	2.049	1.662	1.195	0.887	0.700	0.561	0.495	0.457	0.411
140	2.084	1.704	1.223	0.909	0.721	0.570	0.503	0.466	0.420
145	2.118	1.737	1.251	0.931	0.741	0.579	0.511	0.474	0.429
150	2.152	1.767	1.279	0.952	0.762	0.589	0.518	0.482	0.437
155	2.187	1.798	1.307	0.974	0.783	0.598	0.526	0.491	0.446
160	2.221	1.829	1.335	0.996	0.804	0.607	0.534	0.499	0.455
165	2.255	1.859	1.363	1.018	0.825	0.617	0.542	0.508	0.464
170	2.289	1.890	1.391	1.040	0.846	0.632	0.550	0.516	0.472
175	2.324	1.921	1.419	1.062	0.867	0.653	0.558	0.524	0.481
180	2.388	1.951	1.446	1.084	0.887	0.674	0.566	0.533	0.490
185	2.453	1.982	1.474	1.106	0.908	0.694	0.574	0.541	0.499
190	2.519	2.012	1.502	1.128	0.929	0.715	0.582	0.550	0.508
195	2.585	2.043	1.530	1.149	0.950	0.736	0.590	0.558	0.516
200	2.651	2.074	1.558	1.171	0.971	0.756	0.598	0.567	0.525
205	2.717	2.104	1.586	1.193	0.992	0.777	0.606	0.575	0.534
210	2.783	2.135	1.614	1.215	1.012	0.798	0.614	0.583	0.543
215	2.849	2.166	1.642	1.237	1.033	0.818	0.624	0.592	0.551
220	2.915	2.196	1.670	1.259	1.054	0.839	0.643	0.600	0.560
225	2.981	2.227	1.698	1.281	1.075	0.860	0.663	0.609	0.569
230	3.046	2.258	1.725	1.303	1.096	0.880	0.683	0.617	0.578
235	3.112	2.288	1.752	1.325	1.117	0.901	0.703	0.630	0.586
240	3.178	2.319	1.779	1.346	1.138	0.922	0.723	0.648	0.595
245	3.244	2.384	1.806	1.368	1.158	0.943	0.743	0.665	0.604
250	3.310	2.460	1.833	1.390	1.179	0.963	0.763	0.683	0.613
255	3.376	2.537	1.860	1.412	1.200	0.984	0.783	0.700	0.622
260	3.442	2.613	1.887	1.434	1.221	1.005	0.803	0.718	0.637
265	3.508	2.689	1.914	1.456	1.242	1.025	0.823	0.736	0.653
270	3.574	2.765	1.941	1.478	1.263	1.046	0.843	0.753	0.668
275	3.639	2.841	1.968	1.500	1.284	1.067	0.863	0.771	0.684
280	3.705	2.917	1.994	1.522	1.304	1.087	0.882	0.788	0.699
285	3.771	2.993	2.021	1.544	1.325	1.108	0.902	0.806	0.715
290	3.837	3.070	2.048	1.565	1.346	1.129	0.922	0.823	0.730
295	3.903	3.146	2.075	1.587	1.367	1.150	0.942	0.841	0.746
300	3.969	3.222	2.102	1.609	1.388	1.170	0.962	0.859	0.761
305	4.035	3.298	2.129	1.631	1.409	1.191	0.982	0.876	0.777
310	4.101	3.374	2.156	1.653	1.430	1.212	1.002	0.894	0.792
315	4.167	3.450	2.183	1.675	1.450	1.232	1.022	0.911	0.808
320	4.233	3.527	2.210	1.697	1.471	1.253	1.042	0.929	0.823
325	4.299	3.603	2.237	1.727	1.492	1.274	1.062	0.946	0.839
330	4.365	3.679	2.264	1.777	1.513	1.294	1.082	0.964	0.854
335	4.431	3.755	2.291	1.827	1.534	1.315	1.102	0.982	0.870
340	4.497	3.831	2.317	1.877	1.555	1.336	1.121	0.999	0.885
345	4.563	3.907	2.439	1.927	1.575	1.357	1.141	1.017	0.901
350	4.629	3.983	2.605	1.977	1.596	1.377	1.161	1.034	0.916
355	-	4.060	2.771	2.027	1.617	1.398	1.181	1.052	0.932
360	-	4.137	2.937	2.076	1.638	1.419	1.201	1.069	0.947
365	-	4.214	3.103	2.126	1.659	1.439	1.221	1.087	0.963

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 11: I/H-Column Sections 75 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
35	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
40	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
45	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
50	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
55	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
60	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
65	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
70	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
75	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
80	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
85	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
90	2.127	1.768	1.372	1.081	0.853	0.676	0.574	0.531	0.485
95	2.182	1.808	1.425	1.119	0.880	0.697	0.589	0.543	0.495
100	2.237	1.848	1.478	1.157	0.907	0.718	0.604	0.555	0.505
105	2.292	1.888	1.531	1.195	0.934	0.739	0.619	0.567	0.515
110	2.347	1.928	1.583	1.234	0.961	0.760	0.638	0.579	0.525
115	2.402	1.968	1.635	1.272	0.987	0.781	0.658	0.591	0.535
120	2.457	2.007	1.688	1.310	1.014	0.802	0.678	0.602	0.544
125	2.512	2.047	1.731	1.349	1.041	0.823	0.698	0.614	0.554
130	2.567	2.087	1.767	1.387	1.067	0.843	0.718	0.629	0.564
135	2.622	2.127	1.802	1.425	1.094	0.864	0.738	0.648	0.574
140	2.677	2.167	1.838	1.464	1.121	0.885	0.758	0.667	0.584
145	2.732	2.207	1.873	1.502	1.148	0.906	0.778	0.686	0.594
150	2.787	2.247	1.909	1.540	1.174	0.927	0.798	0.705	0.604
155	2.842	2.287	1.945	1.579	1.201	0.948	0.818	0.724	0.614
160	2.897	2.329	1.980	1.617	1.228	0.969	0.838	0.743	0.626
165	2.952	2.425	2.016	1.655	1.254	0.990	0.858	0.762	0.645
170	3.007	2.521	2.051	1.694	1.281	1.011	0.878	0.781	0.663
175	3.062	2.617	2.087	1.730	1.308	1.032	0.898	0.800	0.682
180	3.117	2.713	2.123	1.765	1.335	1.053	0.918	0.819	0.700
185	3.172	2.809	2.158	1.800	1.361	1.074	0.938	0.839	0.719
190	3.227	2.905	2.194	1.835	1.388	1.095	0.958	0.858	0.737
195	3.282	3.001	2.229	1.869	1.415	1.116	0.978	0.877	0.756
200	3.337	3.097	2.265	1.904	1.441	1.136	0.998	0.896	0.775
205	3.392	3.193	2.300	1.939	1.468	1.157	1.018	0.915	0.793
210	3.447	3.289	2.350	1.974	1.495	1.178	1.038	0.934	0.812
215	3.502	3.385	2.434	2.008	1.522	1.199	1.058	0.953	0.830
220	3.557	3.481	2.517	2.043	1.548	1.220	1.078	0.972	0.849
225	3.612	3.577	2.601	2.078	1.575	1.241	1.098	0.991	0.868
230	3.674	3.674	2.685	2.113	1.602	1.262	1.118	1.010	0.886
235	3.770	3.770	2.769	2.147	1.628	1.283	1.138	1.029	0.905
240	3.866	3.866	2.853	2.182	1.655	1.304	1.158	1.048	0.923
245	3.962	3.962	2.937	2.217	1.682	1.325	1.178	1.067	0.942
250	4.058	4.058	3.021	2.252	1.708	1.346	1.198	1.086	0.961
255	4.154	4.154	3.105	2.286	1.742	1.367	1.218	1.105	0.979
260	4.250	4.250	3.189	2.321	1.776	1.388	1.238	1.124	0.998
265	4.346	4.346	3.273	2.422	1.810	1.409	1.258	1.143	1.016
270	4.442	4.442	3.357	2.534	1.845	1.430	1.278	1.162	1.035
275	4.538	4.538	3.440	2.645	1.879	1.450	1.298	1.181	1.054
280	4.634	4.634	3.524	2.757	1.913	1.471	1.318	1.200	1.072
285	-	-	3.608	2.869	1.947	1.492	1.338	1.219	1.091
290	-	-	3.692	2.980	1.982	1.513	1.358	1.238	1.109
295	-	-	3.776	3.092	2.016	1.534	1.378	1.257	1.128
300	-	-	3.860	3.204	2.050	1.555	1.398	1.276	1.147
305	-	-	3.944	3.315	2.085	1.576	1.418	1.295	1.165
310	-	-	4.028	3.427	2.119	1.597	1.438	1.314	1.184
315	-	-	4.112	3.538	2.153	1.618	1.458	1.333	1.202
320	-	-	4.196	3.650	2.187	1.639	1.478	1.352	1.221
325	-	-	4.280	3.762	2.222	1.660	1.498	1.371	1.239
330	-	-	4.364	3.873	2.256	1.681	1.518	1.390	1.258
335	-	-	4.448	3.985	2.290	1.702	1.538	1.409	1.277
340	-	-	4.532	4.097	2.324	1.750	1.558	1.428	1.295
345	-	-	4.616	4.209	2.628	1.825	1.578	1.447	1.314
350	-	-	-	4.321	2.945	1.899	1.598	1.466	1.332
355	-	-	-	4.433	3.262	1.974	1.618	1.485	1.351
360	-	-	-	4.545	3.578	2.049	1.638	1.504	1.370
365	-	-	-	-	3.895	2.124	1.658	1.523	1.388

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 12: I/H-Column Sections 90 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
35	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
40	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
45	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
50	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
55	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
60	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
65	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
70	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
75	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
80	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
85	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
90	-	2.131	1.804	1.469	1.202	0.994	0.837	0.739	0.654
95	-	2.191	1.852	1.529	1.248	1.027	0.861	0.759	0.673
100	-	2.252	1.900	1.589	1.294	1.060	0.885	0.779	0.692
105	-	2.312	1.948	1.649	1.340	1.093	0.909	0.799	0.711
110	-	2.372	1.997	1.710	1.387	1.127	0.934	0.819	0.731
115	-	2.432	2.045	1.751	1.433	1.161	0.958	0.839	0.751
120	-	2.492	2.094	1.791	1.479	1.195	0.982	0.859	0.770
125	-	2.553	2.143	1.832	1.526	1.229	1.007	0.879	0.790
130	-	2.613	2.191	1.872	1.572	1.263	1.031	0.898	0.809
135	-	2.673	2.240	1.912	1.619	1.296	1.055	0.918	0.829
140	-	2.733	2.288	1.953	1.665	1.330	1.079	0.938	0.849
145	-	2.794	2.382	1.993	1.711	1.364	1.104	0.958	0.868
150	-	2.854	2.636	2.034	1.749	1.398	1.128	0.978	0.888
155	-	2.914	2.890	2.074	1.786	1.432	1.152	0.997	0.907
160	-	3.143	3.143	2.115	1.823	1.466	1.176	1.017	0.927
165	-	3.397	3.397	2.155	1.861	1.499	1.201	1.037	0.947
170	-	3.650	3.650	2.195	1.898	1.533	1.225	1.057	0.966
175	-	3.904	3.904	2.236	1.935	1.567	1.249	1.077	0.986
180	-	4.158	4.158	2.276	1.973	1.601	1.274	1.096	1.005
185	-	4.412	4.412	2.317	2.010	1.635	1.298	1.116	1.025
190	-	-	-	2.450	2.048	1.669	1.322	1.136	1.045
195	-	-	-	2.613	2.085	1.702	1.346	1.156	1.064
200	-	-	-	2.775	2.122	1.737	1.371	1.176	1.084
205	-	-	-	2.937	2.160	1.772	1.395	1.195	1.103
210	-	-	-	3.100	2.197	1.806	1.419	1.215	1.123
215	-	-	-	3.262	2.234	1.841	1.444	1.235	1.143
220	-	-	-	3.424	2.272	1.876	1.468	1.255	1.162
225	-	-	-	3.586	2.309	1.911	1.492	1.275	1.182
230	-	-	-	3.749	2.388	1.945	1.516	1.295	1.201
235	-	-	-	3.911	2.504	1.980	1.541	1.314	1.221
240	-	-	-	4.073	2.619	2.015	1.565	1.334	1.240
245	-	-	-	4.235	2.734	2.050	1.589	1.354	1.260
250	-	-	-	4.397	2.849	2.084	1.613	1.374	1.280
255	-	-	-	4.559	2.964	2.119	1.638	1.394	1.299
260	-	-	-	-	3.080	2.154	1.662	1.413	1.319
265	-	-	-	-	3.195	2.189	1.686	1.433	1.338
270	-	-	-	-	3.310	2.223	1.711	1.453	1.358
275	-	-	-	-	3.425	2.258	1.752	1.473	1.378
280	-	-	-	-	3.540	2.293	1.795	1.493	1.397
285	-	-	-	-	3.655	2.335	1.837	1.512	1.417
290	-	-	-	-	3.771	2.534	1.880	1.532	1.436
295	-	-	-	-	3.886	2.733	1.923	1.552	1.456
300	-	-	-	-	4.001	2.932	1.965	1.572	1.476
305	-	-	-	-	4.116	3.131	2.008	1.592	1.495
310	-	-	-	-	4.231	3.330	2.051	1.611	1.515
315	-	-	-	-	4.346	3.529	2.093	1.631	1.534
320	-	-	-	-	4.461	3.728	2.136	1.651	1.554
325	-	-	-	-	4.576	3.927	2.179	1.671	1.574
330	-	-	-	-	-	4.126	2.221	1.691	1.593
335	-	-	-	-	-	4.325	2.264	1.711	1.613
340	-	-	-	-	-	4.524	2.307	1.805	1.632
345	-	-	-	-	-	-	2.689	1.905	1.652
350	-	-	-	-	-	-	3.354	2.005	1.672
355	-	-	-	-	-	-	4.018	2.105	1.691
360	-	-	-	-	-	-	-	2.205	1.711
365	-	-	-	-	-	-	-	2.306	1.814

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 13: I/H-Column Sections 105 Minutes									
Section Factor up to m^{-1}	Thickness (mm) Required for a Design Temperature of								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
35	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
40	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
45	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
50	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
55	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
60	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
65	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
70	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
75	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
80	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
85	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
90	-	-	2.151	1.854	1.552	1.305	1.113	1.002	0.916
95	-	-	2.219	1.911	1.618	1.356	1.153	1.033	0.942
100	-	-	2.287	1.968	1.685	1.407	1.193	1.064	0.968
105	-	-	2.354	2.025	1.738	1.458	1.233	1.095	0.994
110	-	-	2.422	2.083	1.784	1.510	1.272	1.127	1.020
115	-	-	2.490	2.140	1.829	1.561	1.312	1.159	1.046
120	-	-	2.558	2.198	1.874	1.613	1.351	1.190	1.072
125	-	-	2.625	2.255	1.919	1.664	1.391	1.222	1.098
130	-	-	2.693	2.313	1.965	1.715	1.430	1.253	1.124
135	-	-	2.761	2.371	2.010	1.755	1.470	1.285	1.150
140	-	-	2.829	2.429	2.055	1.796	1.509	1.317	1.176
145	-	-	2.896	2.487	2.100	1.836	1.549	1.348	1.202
150	-	-	2.964	2.545	2.146	1.877	1.588	1.380	1.228
155	-	-	3.032	2.603	2.191	1.917	1.628	1.411	1.254
160	-	-	3.100	2.661	2.236	1.957	1.667	1.443	1.280
165	-	-	3.168	2.719	2.281	1.998	1.707	1.474	1.306
170	-	-	3.235	2.777	2.345	2.038	1.745	1.506	1.332
175	-	-	4.066	4.066	4.066	2.079	1.783	1.538	1.358
180	-	-	-	-	-	2.119	1.821	1.569	1.384
185	-	-	-	-	-	2.160	1.859	1.601	1.410
190	-	-	-	-	-	2.200	1.896	1.632	1.436
195	-	-	-	-	-	2.240	1.934	1.664	1.462
200	-	-	-	-	-	2.281	1.972	1.696	1.488
205	-	-	-	-	-	2.321	2.010	1.730	1.515
210	-	-	-	-	-	2.619	2.048	1.768	1.541
215	-	-	-	-	-	2.951	2.086	1.806	1.567
220	-	-	-	-	-	3.282	2.124	1.844	1.593
225	-	-	-	-	-	3.614	2.162	1.882	1.619
230	-	-	-	-	-	3.945	2.200	1.920	1.645
235	-	-	-	-	-	4.276	2.238	1.958	1.671
240	-	-	-	-	-	4.607	2.275	1.996	1.697
245	-	-	-	-	-	-	2.313	2.034	1.731
250	-	-	-	-	-	-	2.435	2.072	1.776
255	-	-	-	-	-	-	2.599	2.110	1.821
260	-	-	-	-	-	-	2.763	2.149	1.866
265	-	-	-	-	-	-	2.927	2.187	1.911
270	-	-	-	-	-	-	3.091	2.225	1.956
275	-	-	-	-	-	-	3.254	2.263	2.001
280	-	-	-	-	-	-	3.418	2.301	2.046
285	-	-	-	-	-	-	3.582	2.410	2.091
290	-	-	-	-	-	-	3.746	2.663	2.136
295	-	-	-	-	-	-	3.910	2.916	2.182
300	-	-	-	-	-	-	4.074	3.170	2.227
305	-	-	-	-	-	-	4.238	3.423	2.272
310	-	-	-	-	-	-	4.402	3.676	2.317
315	-	-	-	-	-	-	4.566	3.929	2.652
320	-	-	-	-	-	-	-	4.182	3.061
325	-	-	-	-	-	-	-	4.435	3.470
330	-	-	-	-	-	-	-	-	3.879
335	-	-	-	-	-	-	-	-	4.288
340	-	-	-	-	-	-	-	-	-
345	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
355	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-
365	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.

Table 14: I/H-Column Sections 120 Minutes									
Section Factor up to m^{-1}	**Thickness (mm) Required for a Design Temperature of**								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
30	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
35	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
40	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
45	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
50	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
55	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
60	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
65	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
70	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
75	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
80	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
85	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
90	-	-	-	2.190	1.897	1.637	1.391	1.259	1.172
95	-	-	-	2.266	1.962	1.692	1.447	1.306	1.212
100	-	-	-	2.343	2.027	1.747	1.503	1.353	1.252
105	-	-	-	2.419	2.092	1.800	1.559	1.400	1.292
110	-	-	-	2.496	2.156	1.854	1.614	1.446	1.332
115	-	-	-	2.572	2.220	1.907	1.670	1.492	1.373
120	-	-	-	2.649	2.284	1.961	1.722	1.539	1.413
125	-	-	-	2.725	2.348	2.014	1.767	1.585	1.454
130	-	-	-	2.802	2.412	2.068	1.812	1.631	1.494
135	-	-	-	2.878	2.476	2.121	1.857	1.677	1.535
140	-	-	-	2.955	2.540	2.175	1.901	1.758	1.575
145	-	-	-	3.031	2.604	2.228	1.946	1.940	1.615
150	-	-	-	3.108	2.668	2.281	2.122	2.122	1.656
155	-	-	-	3.184	2.732	2.334	2.304	2.304	1.696
160	-	-	-	3.261	2.796	2.486	2.486	2.486	1.738
165	-	-	-	3.337	2.860	2.668	2.668	2.668	1.781
170	-	-	-	3.414	2.924	2.850	2.850	2.850	1.824
175	-	-	-	3.490	3.032	3.032	3.032	3.032	1.866
180	-	-	-	3.567	3.214	3.214	3.214	3.214	1.909
185	-	-	-	3.643	3.396	3.396	3.396	3.396	1.952
190	-	-	-	3.720	3.578	3.578	3.578	3.578	1.995
195	-	-	-	3.796	3.760	3.760	3.760	3.760	2.037
200	-	-	-	3.943	3.943	3.943	3.943	3.943	2.080
205	-	-	-	4.125	4.125	4.125	4.125	4.125	2.123
210	-	-	-	4.307	4.307	4.307	4.307	4.307	2.166
215	-	-	-	4.489	4.489	4.489	4.489	4.489	2.208
220	-	-	-	-	-	-	-	-	2.251
225	-	-	-	-	-	-	-	-	2.294
230	-	-	-	-	-	-	-	-	2.685
235	-	-	-	-	-	-	-	-	4.116
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	-	-	-	-	-	-	-	-	-

Thickness is intumescent only.
Results also apply to I/H-section beams exposed on all four sides limited to a maximum protection thickness of 3.906mm.