

FIRE ASSESSMENT REPORT

FC15622-01-4

FIRE RESISTANCE OF PERLIFOC HP ECO+ STRUCTURAL STEEL PROTECTION IN ACCORDANCE WITH AS 4100:2020, INC AMD 1:2021 USING THE TESTING AND ASSESSMENT METHODOLOGY OF EN13381-4:2013

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ASSESSMENT OBJECTIVE

This report gives BRANZ's assessment of structural steel members using PERLIFOC HP ECO+, with a fire resistance of 15, 30, 45, 60, 90, 120, 180 and 240 minutes for I and H-section beams and columns and hollow sections depending on the size of the steel section and thickness of coating in accordance with AS 4100:2020, inc, AMD 1:2021, Steel Structures, Section 12, Fire.

CONCLUSION

It is considered that if tested in accordance with AS 1530.4:2014, and analysed in accordance with AS 4100:2020, inc, AMD 1:2021, Steel Structures, Section 12, Fire, PERLIFOC HP ECO+ would provide a fire resistance of up to 240 minutes for I and H-section beams and columns and rectangular, square and circular hollow sections for various thicknesses and critical temperatures as shown in Table 3 to Table 29.

The results from the for I and H-section beams (three sided protection) and columns (four sided protection) are also applicable to any re-entrant section, e.g. T sections, angles, C sections etc, depending on the number of sides protected.

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this assessment if information becomes available which indicates the stated fire performance may not be achieved.

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The results reported here relate only to the item/s described in this report.

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02	10 February 2022	Change of product name to PERLIFOC HP ECO. Reference added to AS 1530.4:2014 in Conclusion.
03	14 April 2023	Updated to AS 4100:2020. Change of product name to PERLIFOC HP ECO+ - FC17613
04	14 February 2024	Clarification of equivalency of supporting test evidence - Section 3.1.

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1. INTRODUCTION

This report gives BRANZ's assessment of structural steel members using PERLIFOC HP ECO+, a gypsum base mortar, with a fire resistance of 15, 30, 45, 60, 90, 120, 180 and 240 minutes for I and H-section beams and columns and hollow sections depending on the size of the steel section and thickness of coating in accordance with AS 4100:2020, inc, AMD 1:2021, Steel Structures, Section 12, Fire. It considers critical steel temperatures of 350°C to 750°C at 50°C intervals.

The methodology used in the analysis is the graphical method defined in EN 13381-4:2013.

2. BACKGROUND

The client has provided fire resistance assessment and test reports which included data on loaded I-section beams and short H-section columns. The tests were carried out by Fundacion Technalia Research & Innovation, Spain and AFITI LICOF, Spain, under the heating conditions of EN 13381-4:2013. Table 1 gives the test report numbers, section factors, and thickness of coating for the I-section beams and columns used in this analysis. Analysis of the test data from this testing has been documented in the International Fire Consultants Limited, IFC Group, IFC assessment report PAR/18799/01.

Table 1 - Tested Sections

Test No.	Section	Section factor A/V [m^{-1}]	PERLIFOC HP ECO+ Thickness [mm]
Tecnalia No. 069502-001-a	SC1	75.5	10
	SC8	211.4	25
	SC14	338.8	9
	SC15	337.2	34
Tecnalia No. 069502-002-a	SC2	77	25
	SC3	76.5	35
	SC9	211.4	36
Tecnalia No. 074359-001-a	SC18	214.8	17.1
	SC21	336.2	16.4
	SC22	427.2	9.6
	SC23	425.5	16.6
	SC24	432.6	23
	SC25	429.6	34.7
AFITI LICOF NO. 3407T18	*LB1/T3407A	164.0	10.5
	*LB2/T3407B	164.0	41.1
	*RB1/T3407C	164.0	10.7
	*RB2T3407d	164.0	40.8

Note: *LB1/2 are loaded beams and RB1, 2 are short reference beams. All others are short columns.

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3. DISCUSSION

3.1 Test Standards

The fire resistance tests shown in Table 1 were carried out in accordance with EN 13381-4:2013. The similarities between the furnace exposure conditions in this test method and that given in AS 1530.4:2014 are considered to be sufficiently similar for the test data to be used to provide an assessment in accordance with AS 1530.4:2014 for application to an analysis in accordance with AS 4100.

The placement of the specimen thermocouples between that tested and AS 1530.4:2014 are slightly different.

For the loadbearing beams, AS 1530.4:2014 specifies a minimum of two thermocouples positioned at four locations along the length of the beam. The tested specimens had eight thermocouples positioned along the bottom flange and three at mid height of the web. Although the thermocouple locations were not grouped as defined in AS 1530.4:2014 they were positioned as suggested in the test standard and complied with the minimum number of thermocouples required. Based on this it is considered that the measured temperatures would be sufficiently similar had they been positioned in accordance with AS 1530.4:2014 to be used in this analysis.

The short I and H-section thermocouples were also not as defined in AS 1530.4:2014 however they were positioned on the lower flanges and web at three locations along the length of the beams and flanges and web at two locations over the height of the columns. The thermocouples were not grouped as defined in AS 1530.4 but were located in similar positions. Based on this it is considered that the measured temperatures would be sufficiently similar had they been positioned in accordance with AS 1530.4:2014 to be used in this analysis.

For the EN 13381-4: 2013 tests, plate thermocouples are used which are considered to give a more onerous heating condition than the 3 mm mineral insulated metal sheathed thermocouples used in AS 1530.4. However AS 1530.4 does allow for the use of plate thermocouples. Therefore, it is considered that the measured temperatures are suitable to be used in this analysis.

The tests referenced in Section 2 are equivalent to the Standard Fire Test (AS 1530.4:2014) as referenced in the NCC.

3.2 Assessment Procedure

The assessment method used is that specified in EN 13381-4:2013 *"Test methods for determining the contribution to the fire resistance of structural members Part 4: Applied passive protection to steel members"* section E.2 Graphical Approach.

3.3 Hollow sections

As discussed in International Fire Consultants Limited, IFC Group, IFC assessment report PAR/18799/01, in accordance with EN13381-4, Annex A, Clause A.3, provides a method of determining the coating thickness on hollow sections, based on the A/V and coating thickness applied to I-sections. This is calculated as follows:

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For A/V of up to 250 m^{-1}:

$$\text{modified thickness} = \text{dp}\left(1 + \frac{A/V}{1000}\right)$$

For values of A/V higher than 250 m^{-1}

$$\text{modified thickness} = 1.25\ \text{dp}$$

Where dp = thickness of the coating on an I or H-section.

3.4 Permitted Extensions

The assessment principles of EN 13381-4:2013 allows for extrapolation in thickness and section factor therefore the assessment is considered appropriate within the following range of thickness and section factors:

Table 2: Applicable limits of coating thickness and section factor

Section Type	A/V (m^{-1})		Coating Thickness (mm)	
	Min	Max	Min	Max
H-columns	68	476	9	41
I-beams	68	476	10	41
Hollow Sections	68	476	10	41

3.5 Use of Data in Table 3 to Table 29

The results of the analysis are given in Table 3 to Table 29.

- The tables are rounded down to the nearest section factor of 5 m^{-1}.
- Thicknesses shown are intumescent only.
- I-section beam thicknesses apply to I-section beams with three-sided fire exposure with concrete slabs.
- I and H-section column thicknesses also apply to I-section beams with four-sided fire exposure.
- Results for I or H sections are directly applicable to angles, channels and T-sections for the same section factor, whether used as individual elements or as bracing as specified in the Scope of EN 13381-4:2013.
- The hollow section thicknesses apply to rectangular, square and circular hollow sections.

4. CONCLUSION

It is considered that if tested in accordance with AS 1530.4:2014, and analysed in accordance with AS 4100:2020, inc, AMD 1:2021, Steel Structures, Section 12, Fire, PERLIFOC HP ECO+ would provide a fire resistance of up to 240 minutes for I and H-section beams and columns and rectangular, square and circular hollow sections for various thicknesses and critical temperatures as shown in Table 3 to Table 29.

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The results from the for I and H-section beams (three sided protection) and columns (four sided protection) are also applicable to any re-entrant section, e.g. T sections, angles, C sections etc, depending on the number of sides protected.

Table 3: PERLIFOC HP ECO+ H-Section Columns – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	10	15	25	-
70	9	9	9	9	10	15	26	-
75	9	9	9	9	11	16	26	-
80	9	9	9	9	11	16	26	-
85	9	9	9	9	11	17	27	-
90	9	9	9	9	12	17	27	-
95	9	9	9	9	12	18	27	-
100	9	9	9	9	12	18	28	-
105	9	9	9	9	12	19	28	-
110	9	9	9	10	13	19	28	-
115	9	9	9	10	13	20	29	-
120	9	9	9	10	13	20	29	-
125	9	9	9	10	14	21	30	-
130	9	9	9	10	14	21	30	-
135	9	9	9	10	14	22	30	-
140	9	9	9	10	14	22	31	-
145	9	9	9	10	15	23	31	-
150	9	9	9	10	15	24	31	-
155	9	9	9	10	15	24	32	-
160	9	9	9	11	16	25	32	-
165	9	9	9	11	16	25	32	-
170	9	9	9	11	16	25	33	-
175	9	9	9	11	16	25	33	-
180	9	9	9	11	17	25	34	-
185	9	9	9	11	17	25	34	-
190	9	9	9	11	17	26	34	-
195	9	9	9	11	18	26	35	-
200	9	9	9	11	18	26	35	-
205	9	9	9	12	18	26	35	-
210	9	9	9	12	18	26	36	-
215	9	9	10	12	19	26	37	-
220	9	9	10	12	19	26	38	-
225	9	9	10	12	19	26	39	-
230	9	9	10	12	19	26	40	-
235	9	9	10	12	19	27	40	-
240	9	9	10	12	19	27	41	-
245	9	9	10	12	20	27	-	-
250	9	9	10	13	20	27	-	-
255	9	9	10	13	20	27	-	-
260	9	9	10	13	20	27	-	-
265	9	9	10	13	20	27	-	-
270	9	9	11	13	20	27	-	-
275	9	9	11	13	20	28	-	-
280	9	9	11	13	21	28	-	-
285	9	9	11	13	21	28	-	-
290	9	9	11	13	21	28	-	-

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295	9	9	11	14	21	28	-	-

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Table 3/cont: PERLIFOC HP ECO+ H-Section Columns – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
300	9	9	11	14	21	28	-	-
305	9	9	11	14	21	28	-	-
310	9	9	11	14	21	28	-	-
315	9	9	11	14	22	29	-	-
320	9	9	12	14	22	29	-	-
325	9	9	12	14	22	29	-	-
330	9	9	12	14	22	29	-	-
335	9	9	12	14	22	29	-	-
340	9	9	12	14	22	29	-	-
345	9	9	12	15	22	29	-	-
350	9	9	12	15	22	29	-	-
355	9	9	12	15	23	30	-	-
360	9	9	12	15	23	30	-	-
365	9	9	12	15	23	30	-	-
370	9	9	12	15	23	30	-	-
375	9	9	13	15	23	30	-	-
380	9	9	13	15	23	30	-	-
385	9	9	13	15	23	30	-	-
390	9	9	13	16	24	30	-	-
395	9	9	13	16	24	31	-	-
400	9	9	13	16	24	31	-	-
405	9	9	13	16	24	31	-	-
410	9	9	13	16	24	31	-	-
415	9	9	13	16	24	31	-	-
420	9	9	13	16	24	31	-	-
425	9	9	13	16	25	31	-	-
430	9	9	14	16	25	31	-	-
435	9	9	14	17	25	31	-	-
440	9	9	14	17	25	32	-	-
445	9	9	14	17	25	32	-	-
450	9	9	14	17	25	32	-	-
455	9	9	14	17	25	32	-	-
460	9	9	14	17	26	32	-	-
465	9	9	14	17	26	32	-	-
470	9	9	14	17	26	32	-	-
475	9	9	14	18	26	32	-	-

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Table 4: PERLIFOC HP ECO+ H-Section Columns – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	22	32
70	9	9	9	9	9	9	22	33
75	9	9	9	9	9	9	23	34
80	9	9	9	9	10	9	24	35
85	9	9	9	9	10	10	25	37
90	9	9	9	9	10	11	25	39
95	9	9	9	9	11	11	26	41
100	9	9	9	9	11	12	26	-
105	9	9	9	9	11	13	26	-
110	9	9	9	9	11	13	27	-
115	9	9	9	9	12	14	27	-
120	9	9	9	9	12	15	27	-
125	9	9	9	9	12	15	28	-
130	9	9	9	9	12	16	28	-
135	9	9	9	9	13	17	28	-
140	9	9	9	9	13	17	29	-
145	9	9	9	9	13	18	29	-
150	9	9	9	10	14	19	29	-
155	9	9	9	10	14	19	30	-
160	9	9	9	10	14	20	30	-
165	9	9	9	10	14	21	30	-
170	9	9	9	10	15	21	31	-
175	9	9	9	10	15	22	31	-
180	9	9	9	10	15	23	32	-
185	9	9	9	10	15	24	32	-
190	9	9	9	10	16	24	32	-
195	9	9	9	11	16	25	33	-
200	9	9	9	11	16	25	33	-
205	9	9	9	11	17	25	33	-
210	9	9	9	11	17	25	34	-
215	9	9	9	11	17	25	34	-
220	9	9	9	11	17	25	34	-
225	9	9	9	11	17	26	35	-
230	9	9	9	11	18	26	35	-
235	9	9	9	11	18	26	35	-
240	9	9	9	12	18	26	36	-
245	9	9	9	12	18	26	37	-
250	9	9	9	12	18	26	37	-
255	9	9	9	12	18	26	38	-
260	9	9	9	12	19	26	39	-
265	9	9	9	12	19	27	40	-
270	9	9	9	12	19	27	40	-
275	9	9	9	12	19	27	41	-
280	9	9	9	12	19	27	-	-
285	9	9	9	13	19	27	-	-
290	9	9	9	13	19	27	-	-
295	9	9	9	13	20	27	-	-
300	9	9	9	13	20	28	-	-
305	9	9	9	13	20	28	-	-
310	9	9	9	13	20	28	-	-

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Table 4/cont: PERLIFOC HP ECO+ H-Section Columns – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	13	20	28	-	-
320	9	9	10	13	20	28	-	-
325	9	9	10	13	21	28	-	-
330	9	9	10	14	21	28	-	-
335	9	9	10	14	21	28	-	-
340	9	9	10	14	21	29	-	-
345	9	9	10	14	21	29	-	-
350	9	9	10	14	21	29	-	-
355	9	9	10	14	22	29	-	-
360	9	9	10	14	22	29	-	-
365	9	9	10	14	22	29	-	-
370	9	9	11	14	22	29	-	-
375	9	9	11	14	22	29	-	-
380	9	9	11	15	22	30	-	-
385	9	9	11	15	22	30	-	-
390	9	9	11	15	23	30	-	-
395	9	9	11	15	23	30	-	-
400	9	9	11	15	23	30	-	-
405	9	9	11	15	23	30	-	-
410	9	9	11	15	23	30	-	-
415	9	9	12	15	23	30	-	-
420	9	9	12	15	24	31	-	-
425	9	9	12	16	24	31	-	-
430	9	9	12	16	24	31	-	-
435	9	9	12	16	24	31	-	-
440	9	9	12	16	24	31	-	-
445	9	9	12	16	24	31	-	-
450	9	9	12	16	25	31	-	-
455	9	9	12	16	25	31	-	-
460	9	9	13	16	25	32	-	-
465	9	9	13	16	25	32	-	-
470	9	9	13	17	25	32	-	-
475	9	9	13	17	25	32	-	-

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Table 5: PERLIFOC HP ECO+ H-Section Columns – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	11	20	29
70	9	9	9	9	9	11	20	30
75	9	9	9	9	9	12	21	31
80	9	9	9	9	9	12	22	32
85	9	9	9	9	9	13	23	33
90	9	9	9	9	10	13	24	34
95	9	9	9	9	10	14	25	35
100	9	9	9	9	10	14	25	36
105	9	9	9	9	10	14	25	38
110	9	9	9	9	11	15	26	40
115	9	9	9	9	11	15	26	-
120	9	9	9	9	11	16	26	-
125	9	9	9	9	11	16	26	-
130	9	9	9	9	11	17	26	-
135	9	9	9	9	12	17	27	-
140	9	9	9	9	12	17	27	-
145	9	9	9	9	12	18	27	-
150	9	9	9	9	12	18	27	-
155	9	9	9	9	13	19	28	-
160	9	9	9	9	13	19	28	-
165	9	9	9	9	13	20	28	-
170	9	9	9	9	13	20	28	-
175	9	9	9	9	14	20	29	-
180	9	9	9	9	14	21	29	-
185	9	9	9	10	14	21	29	-
190	9	9	9	10	14	22	29	-
195	9	9	9	10	14	22	30	-
200	9	9	9	10	15	23	30	-
205	9	9	9	10	15	23	30	-
210	9	9	9	10	15	23	30	-
215	9	9	9	10	15	24	31	-
220	9	9	9	10	16	24	31	-
225	9	9	9	10	16	24	31	-
230	9	9	9	11	16	25	31	-
235	9	9	9	11	16	25	32	-
240	9	9	9	11	17	25	32	-
245	9	9	9	11	17	25	32	-
250	9	9	9	11	17	25	32	-
255	9	9	9	11	17	25	32	-
260	9	9	9	11	17	26	33	-
265	9	9	9	11	18	26	33	-
270	9	9	9	11	18	26	33	-
275	9	9	9	12	18	26	33	-
280	9	9	9	12	18	26	34	-
285	9	9	9	12	18	26	34	-
290	9	9	9	12	18	26	34	-
295	9	9	9	12	19	26	34	-
300	9	9	9	12	19	27	35	-
305	9	9	9	12	19	27	35	-
310	9	9	9	12	19	27	35	-

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Table 5/cont: PERLIFOC HP ECO+ H-Section Columns – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	12	19	27	35	-
320	9	9	9	13	19	27	36	-
325	9	9	9	13	20	27	36	-
330	9	9	9	13	20	27	37	-
335	9	9	9	13	20	27	37	-
340	9	9	9	13	20	28	38	-
345	9	9	9	13	20	28	39	-
350	9	9	9	13	20	28	39	-
355	9	9	9	13	21	28	40	-
360	9	9	9	13	21	28	40	-
365	9	9	9	14	21	28	41	-
370	9	9	9	14	21	28	41	-
375	9	9	9	14	21	29	-	-
380	9	9	9	14	21	29	-	-
385	9	9	9	14	22	29	-	-
390	9	9	9	14	22	29	-	-
395	9	9	9	14	22	29	-	-
400	9	9	9	14	22	29	-	-
405	9	9	9	14	22	29	-	-
410	9	9	9	15	22	29	-	-
415	9	9	9	15	23	30	-	-
420	9	9	10	15	23	30	-	-
425	9	9	10	15	23	30	-	-
430	9	9	10	15	23	30	-	-
435	9	9	10	15	23	30	-	-
440	9	9	10	15	23	30	-	-
445	9	9	10	15	24	30	-	-
450	9	9	10	15	24	30	-	-
455	9	9	10	16	24	31	-	-
460	9	9	11	16	24	31	-	-
465	9	9	11	16	24	31	-	-
470	9	9	11	16	24	31	-	-
475	9	9	11	16	25	31	-	-

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Table 6: PERLIFOC HP ECO+ H-Section Columns – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	10	17	26
70	9	9	9	9	9	10	18	27
75	9	9	9	9	9	10	19	28
80	9	9	9	9	9	11	20	28
85	9	9	9	9	9	11	20	29
90	9	9	9	9	9	12	21	30
95	9	9	9	9	9	12	22	31
100	9	9	9	9	10	12	23	32
105	9	9	9	9	10	13	24	33
110	9	9	9	9	10	13	25	33
115	9	9	9	9	10	14	25	34
120	9	9	9	9	10	14	25	35
125	9	9	9	9	11	14	25	36
130	9	9	9	9	11	15	25	38
135	9	9	9	9	11	15	26	39
140	9	9	9	9	11	16	26	41
145	9	9	9	9	11	16	26	-
150	9	9	9	9	12	16	26	-
155	9	9	9	9	12	17	26	-
160	9	9	9	9	12	17	26	-
165	9	9	9	9	12	18	27	-
170	9	9	9	9	12	18	27	-
175	9	9	9	9	12	18	27	-
180	9	9	9	9	13	19	27	-
185	9	9	9	9	13	19	27	-
190	9	9	9	9	13	20	27	-
195	9	9	9	9	13	20	27	-
200	9	9	9	9	13	20	28	-
205	9	9	9	10	14	21	28	-
210	9	9	9	10	14	21	28	-
215	9	9	9	10	14	22	28	-
220	9	9	9	10	14	22	28	-
225	9	9	9	10	14	22	28	-
230	9	9	9	10	15	22	29	-
235	9	9	9	10	15	23	29	-
240	9	9	9	10	15	23	29	-
245	9	9	9	10	15	23	29	-
250	9	9	9	10	15	23	29	-
255	9	9	9	11	16	24	29	-
260	9	9	9	11	16	24	29	-
265	9	9	9	11	16	24	30	-
270	9	9	9	11	16	25	30	-
275	9	9	9	11	16	25	30	-
280	9	9	9	11	17	25	30	-
285	9	9	9	11	17	25	30	-
290	9	9	9	11	17	25	30	-
295	9	9	9	11	17	25	31	-
300	9	9	9	12	17	25	31	-
305	9	9	9	12	17	26	31	-
310	9	9	9	12	18	26	31	-

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Table 6/cont: PERLIFOC HP ECO+ H-Section Columns – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	12	18	26	31	-
320	9	9	9	12	18	26	31	-
325	9	9	9	12	18	26	31	-
330	9	9	9	12	18	26	32	-
335	9	9	9	12	19	26	32	-
340	9	9	9	12	19	26	32	-
345	9	9	9	12	19	27	32	-
350	9	9	9	13	19	27	32	-
355	9	9	9	13	19	27	32	-
360	9	9	9	13	19	27	33	-
365	9	9	9	13	20	27	33	-
370	9	9	9	13	20	27	33	-
375	9	9	9	13	20	27	33	-
380	9	9	9	13	20	27	33	-
385	9	9	9	13	20	28	33	-
390	9	9	9	13	21	28	33	-
395	9	9	9	14	21	28	34	-
400	9	9	9	14	21	28	34	-
405	9	9	9	14	21	28	34	-
410	9	9	9	14	21	28	34	-
415	9	9	9	14	21	28	34	-
420	9	9	9	14	22	28	34	-
425	9	9	10	14	22	29	35	-
430	9	9	10	14	22	29	35	-
435	9	9	10	14	22	29	35	-
440	9	9	10	14	22	29	35	-
445	9	9	10	15	22	29	35	-
450	9	9	10	15	23	29	35	-
455	9	9	10	15	23	29	35	-
460	9	9	10	15	23	29	36	-
465	9	9	10	15	23	30	36	-
470	9	9	10	15	23	30	37	-
475	9	9	11	15	24	30	37	-

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Table 7: PERLIFOC HP ECO+ H-Section Columns – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	16	24
70	9	9	9	9	9	9	16	24
75	9	9	9	9	9	9	17	25
80	9	9	9	9	9	10	18	26
85	9	9	9	9	9	10	18	27
90	9	9	9	9	9	10	19	27
95	9	9	9	9	9	11	20	28
100	9	9	9	9	9	11	21	29
105	9	9	9	9	9	12	22	30
110	9	9	9	9	9	12	23	31
115	9	9	9	9	10	12	23	32
120	9	9	9	9	10	13	24	33
125	9	9	9	9	10	13	25	33
130	9	9	9	9	10	13	25	34
135	9	9	9	9	10	14	25	35
140	9	9	9	9	10	14	25	36
145	9	9	9	9	11	14	26	37
150	9	9	9	9	11	15	26	39
155	9	9	9	9	11	15	26	40
160	9	9	9	9	11	15	26	41
165	9	9	9	9	11	16	26	-
170	9	9	9	9	11	16	26	-
175	9	9	9	9	12	16	26	-
180	9	9	9	9	12	17	27	-
185	9	9	9	9	12	17	27	-
190	9	9	9	9	12	18	27	-
195	9	9	9	9	12	18	27	-
200	9	9	9	9	12	18	27	-
205	9	9	9	9	13	19	27	-
210	9	9	9	9	13	19	28	-
215	9	9	9	9	13	19	28	-
220	9	9	9	9	13	20	28	-
225	9	9	9	9	13	20	28	-
230	9	9	9	9	13	20	28	-
235	9	9	9	9	13	20	28	-
240	9	9	9	9	14	21	28	-
245	9	9	9	9	14	21	29	-
250	9	9	9	9	14	21	29	-
255	9	9	9	9	14	21	29	-
260	9	9	9	9	14	22	29	-
265	9	9	9	9	14	22	29	-
270	9	9	9	10	15	22	29	-
275	9	9	9	10	15	22	30	-
280	9	9	9	10	15	23	30	-
285	9	9	9	10	15	23	30	-
290	9	9	9	10	15	23	30	-
295	9	9	9	10	15	23	30	-
300	9	9	9	10	16	24	30	-
305	9	9	9	10	16	24	30	-
310	9	9	9	11	16	24	31	-

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Table 7/cont: PERLIFOC HP ECO+ H-Section Columns – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	11	16	24	31	-
320	9	9	9	11	16	25	31	-
325	9	9	9	11	16	25	31	-
330	9	9	9	11	17	25	31	-
335	9	9	9	11	17	25	31	-
340	9	9	9	11	17	25	32	-
345	9	9	9	11	17	25	32	-
350	9	9	9	11	17	26	32	-
355	9	9	9	12	18	26	32	-
360	9	9	9	12	18	26	32	-
365	9	9	9	12	18	26	32	-
370	9	9	9	12	18	26	32	-
375	9	9	9	12	18	26	33	-
380	9	9	9	12	19	26	33	-
385	9	9	9	12	19	26	33	-
390	9	9	9	12	19	27	33	-
395	9	9	9	12	19	27	33	-
400	9	9	9	13	19	27	33	-
405	9	9	9	13	20	27	34	-
410	9	9	9	13	20	27	34	-
415	9	9	9	13	20	27	34	-
420	9	9	9	13	20	27	34	-
425	9	9	9	13	20	28	34	-
430	9	9	9	13	21	28	34	-
435	9	9	9	13	21	28	34	-
440	9	9	9	13	21	28	35	-
445	9	9	9	14	21	28	35	-
450	9	9	9	14	21	28	35	-
455	9	9	9	14	22	28	35	-
460	9	9	9	14	22	28	35	-
465	9	9	9	14	22	29	35	-
470	9	9	9	14	22	29	36	-
475	9	9	9	14	22	29	36	-

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Table 8: PERLIFOC HP ECO+ H-Section Columns – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	14	21
70	9	9	9	9	9	9	14	21
75	9	9	9	9	9	9	15	22
80	9	9	9	9	9	9	16	23
85	9	9	9	9	9	9	16	25
90	9	9	9	9	9	10	17	25
95	9	9	9	9	9	10	18	26
100	9	9	9	9	9	10	19	27
105	9	9	9	9	9	11	19	27
110	9	9	9	9	9	11	20	28
115	9	9	9	9	9	11	21	29
120	9	9	9	9	9	11	22	30
125	9	9	9	9	9	12	22	30
130	9	9	9	9	9	12	23	31
135	9	9	9	9	10	12	24	32
140	9	9	9	9	10	13	25	32
145	9	9	9	9	10	13	25	33
150	9	9	9	9	10	13	25	34
155	9	9	9	9	10	13	25	34
160	9	9	9	9	10	14	25	35
165	9	9	9	9	10	14	26	36
170	9	9	9	9	11	14	26	37
175	9	9	9	9	11	15	26	38
180	9	9	9	9	11	15	26	39
185	9	9	9	9	11	15	26	40
190	9	9	9	9	11	15	26	41
195	9	9	9	9	11	16	26	-
200	9	9	9	9	11	16	27	-
205	9	9	9	9	12	16	27	-
210	9	9	9	9	12	17	27	-
215	9	9	9	9	12	17	27	-
220	9	9	9	9	12	17	27	-
225	9	9	9	9	12	17	27	-
230	9	9	9	9	12	18	27	-
235	9	9	9	9	12	18	28	-
240	9	9	9	9	13	18	28	-
245	9	9	9	9	13	18	28	-
250	9	9	9	9	13	18	28	-
255	9	9	9	9	13	19	28	-
260	9	9	9	9	13	19	28	-
265	9	9	9	9	13	19	29	-
270	9	9	9	9	13	19	29	-
275	9	9	9	9	14	19	29	-
280	9	9	9	9	14	20	29	-
285	9	9	9	9	14	20	29	-
290	9	9	9	9	14	20	29	-
295	9	9	9	9	14	20	29	-
300	9	9	9	9	14	20	30	-
305	9	9	9	9	14	21	30	-

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Table 8/cont: PERLIFOC HP ECO+ H-Section Columns – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
310	9	9	9	9	15	21	30	-
315	9	9	9	9	15	21	30	-
320	9	9	9	9	15	21	30	-
325	9	9	9	9	15	21	30	-
330	9	9	9	9	15	22	31	-
335	9	9	9	10	15	22	31	-
340	9	9	9	10	15	22	31	-
345	9	9	9	10	15	22	31	-
350	9	9	9	10	16	22	31	-
355	9	9	9	10	16	23	31	-
360	9	9	9	10	16	23	31	-
365	9	9	9	10	16	23	32	-
370	9	9	9	10	16	23	32	-
375	9	9	9	10	16	23	32	-
380	9	9	9	11	16	24	32	-
385	9	9	9	11	17	24	32	-
390	9	9	9	11	17	24	32	-
395	9	9	9	11	17	24	32	-
400	9	9	9	11	17	24	33	-
405	9	9	9	11	17	25	33	-
410	9	9	9	11	17	25	33	-
415	9	9	9	11	18	25	33	-
420	9	9	9	12	18	25	33	-
425	9	9	9	12	18	25	33	-
430	9	9	9	12	18	25	34	-
435	9	9	9	12	18	25	34	-
440	9	9	9	12	19	26	34	-
445	9	9	9	12	19	26	34	-
450	9	9	9	12	19	26	34	-
455	9	9	9	12	19	26	34	-
460	9	9	9	13	20	26	34	-
465	9	9	9	13	20	26	35	-
470	9	9	9	13	20	27	35	-
475	9	9	9	13	20	27	35	-

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Table 9: PERLIFOC HP ECO+ H-Section Columns – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	13	19
70	9	9	9	9	9	9	13	19
75	9	9	9	9	9	9	14	20
80	9	9	9	9	9	9	14	21
85	9	9	9	9	9	9	15	23
90	9	9	9	9	9	9	16	24
95	9	9	9	9	9	9	16	25
100	9	9	9	9	9	9	17	25
105	9	9	9	9	9	10	17	25
110	9	9	9	9	9	10	18	26
115	9	9	9	9	9	10	19	26
120	9	9	9	9	9	10	19	26
125	9	9	9	9	9	11	20	27
130	9	9	9	9	9	11	21	27
135	9	9	9	9	9	11	21	27
140	9	9	9	9	9	11	22	28
145	9	9	9	9	9	12	23	28
150	9	9	9	9	9	12	23	28
155	9	9	9	9	9	12	24	29
160	9	9	9	9	10	12	25	29
165	9	9	9	9	10	13	25	29
170	9	9	9	9	10	13	25	29
175	9	9	9	9	10	13	25	30
180	9	9	9	9	10	13	25	30
185	9	9	9	9	10	14	25	30
190	9	9	9	9	10	14	26	31
195	9	9	9	9	10	14	26	31
200	9	9	9	9	11	14	26	31
205	9	9	9	9	11	15	26	32
210	9	9	9	9	11	15	26	32
215	9	9	9	9	11	15	26	32
220	9	9	9	9	11	15	26	33
225	9	9	9	9	11	16	26	33
230	9	9	9	9	11	16	27	33
235	9	9	9	9	12	16	27	34
240	9	9	9	9	12	16	27	34
245	9	9	9	9	12	17	27	34
250	9	9	9	9	12	17	27	34
255	9	9	9	9	12	17	27	35
260	9	9	9	9	12	17	27	35
265	9	9	9	9	12	17	27	35
270	9	9	9	9	12	18	28	36
275	9	9	9	9	13	18	28	37
280	9	9	9	9	13	18	28	37
285	9	9	9	9	13	18	28	38
290	9	9	9	9	13	18	28	39
295	9	9	9	9	13	18	28	39
300	9	9	9	9	13	18	28	40
305	9	9	9	9	13	19	28	41

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Table 9/cont: PERLIFOC HP ECO+ H-Section Columns – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
310	9	9	9	9	13	19	29	41
315	9	9	9	9	14	19	29	-
320	9	9	9	9	14	19	29	-
325	9	9	9	9	14	19	29	-
330	9	9	9	9	14	19	29	-
335	9	9	9	9	14	19	29	-
340	9	9	9	9	14	19	29	-
345	9	9	9	9	14	20	29	-
350	9	9	9	9	14	20	30	-
355	9	9	9	9	15	20	30	-
360	9	9	9	9	15	20	30	-
365	9	9	9	9	15	20	30	-
370	9	9	9	9	15	20	30	-
375	9	9	9	9	15	20	30	-
380	9	9	9	9	15	21	30	-
385	9	9	9	9	15	21	30	-
390	9	9	9	9	16	21	31	-
395	9	9	9	9	16	21	31	-
400	9	9	9	9	16	21	31	-
405	9	9	9	9	16	21	31	-
410	9	9	9	9	16	21	31	-
415	9	9	9	9	16	21	31	-
420	9	9	9	9	16	22	31	-
425	9	9	9	9	16	22	31	-
430	9	9	9	9	17	22	32	-
435	9	9	9	9	17	22	32	-
440	9	9	9	10	17	22	32	-
445	9	9	9	10	17	22	32	-
450	9	9	9	10	17	22	32	-
455	9	9	9	10	17	23	32	-
460	9	9	9	10	17	23	32	-
465	9	9	9	10	18	23	32	-
470	9	9	9	10	18	23	33	-
475	9	9	9	10	18	23	33	-

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Table 10: PERLIFOC HP ECO+ H-Section Columns – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	10	17
70	9	9	9	9	9	9	10	17
75	9	9	9	9	9	9	11	18
80	9	9	9	9	9	9	11	19
85	9	9	9	9	9	9	12	21
90	9	9	9	9	9	9	13	22
95	9	9	9	9	9	9	13	23
100	9	9	9	9	9	9	14	24
105	9	9	9	9	9	9	15	25
110	9	9	9	9	9	9	15	25
115	9	9	9	9	9	9	16	25
120	9	9	9	9	9	10	17	26
125	9	9	9	9	9	10	17	26
130	9	9	9	9	9	10	18	26
135	9	9	9	9	9	10	19	27
140	9	9	9	9	9	10	19	27
145	9	9	9	9	9	11	20	27
150	9	9	9	9	9	11	21	27
155	9	9	9	9	9	11	21	28
160	9	9	9	9	9	11	22	28
165	9	9	9	9	9	11	23	28
170	9	9	9	9	9	12	24	29
175	9	9	9	9	9	12	24	29
180	9	9	9	9	9	12	25	29
185	9	9	9	9	9	12	25	29
190	9	9	9	9	9	13	25	30
195	9	9	9	9	9	13	25	30
200	9	9	9	9	10	13	25	30
205	9	9	9	9	10	13	26	31
210	9	9	9	9	10	13	26	31
215	9	9	9	9	10	14	26	31
220	9	9	9	9	10	14	26	31
225	9	9	9	9	10	14	26	32
230	9	9	9	9	10	14	26	32
235	9	9	9	9	10	14	26	32
240	9	9	9	9	11	15	27	33
245	9	9	9	9	11	15	27	33
250	9	9	9	9	11	15	27	33
255	9	9	9	9	11	15	27	33
260	9	9	9	9	11	15	27	34
265	9	9	9	9	11	16	27	34
270	9	9	9	9	11	16	27	34
275	9	9	9	9	12	16	27	35
280	9	9	9	9	12	16	28	35
285	9	9	9	9	12	17	28	35
290	9	9	9	9	12	17	28	36
295	9	9	9	9	12	17	28	36
300	9	9	9	9	12	17	28	37
305	9	9	9	9	12	17	28	37
310	9	9	9	9	12	18	28	38

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Table 10/cont: PERLIFOC HP ECO+ H-Section Columns – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	9	13	18	29	39
320	9	9	9	9	13	18	29	39
325	9	9	9	9	13	18	29	40
330	9	9	9	9	13	18	29	40
335	9	9	9	9	13	19	29	41
340	9	9	9	9	13	19	29	-
345	9	9	9	9	13	19	29	-
350	9	9	9	9	13	19	30	-
355	9	9	9	9	14	19	30	-
360	9	9	9	9	14	20	30	-
365	9	9	9	9	14	20	30	-
370	9	9	9	9	14	20	30	-
375	9	9	9	9	14	20	30	-
380	9	9	9	9	14	21	30	-
385	9	9	9	9	14	21	31	-
390	9	9	9	9	14	21	31	-
395	9	9	9	9	15	21	31	-
400	9	9	9	9	15	21	31	-
405	9	9	9	9	15	22	31	-
410	9	9	9	9	15	22	31	-
415	9	9	9	9	15	22	31	-
420	9	9	9	9	15	22	31	-
425	9	9	9	9	15	22	32	-
430	9	9	9	9	16	23	32	-
435	9	9	9	9	16	23	32	-
440	9	9	9	9	16	23	32	-
445	9	9	9	9	16	23	32	-
450	9	9	9	9	16	23	32	-
455	9	9	9	9	16	24	32	-
460	9	9	9	9	16	24	33	-
465	9	9	9	9	16	24	33	-
470	9	9	9	9	17	24	33	-
475	9	9	9	9	17	25	33	-

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Table 11: PERLIFOC HP ECO+ H-Section Columns – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	9	9	9	9	9	9	9	14
70	9	9	9	9	9	9	9	14
75	9	9	9	9	9	9	9	15
80	9	9	9	9	9	9	9	17
85	9	9	9	9	9	9	10	18
90	9	9	9	9	9	9	10	19
95	9	9	9	9	9	9	11	20
100	9	9	9	9	9	9	12	21
105	9	9	9	9	9	9	12	22
110	9	9	9	9	9	9	13	23
115	9	9	9	9	9	9	13	25
120	9	9	9	9	9	9	14	25
125	9	9	9	9	9	9	15	25
130	9	9	9	9	9	9	15	25
135	9	9	9	9	9	9	16	26
140	9	9	9	9	9	9	16	26
145	9	9	9	9	9	10	17	26
150	9	9	9	9	9	10	18	26
155	9	9	9	9	9	10	18	27
160	9	9	9	9	9	10	19	27
165	9	9	9	9	9	10	19	27
170	9	9	9	9	9	10	20	27
175	9	9	9	9	9	11	20	27
180	9	9	9	9	9	11	21	28
185	9	9	9	9	9	11	22	28
190	9	9	9	9	9	11	22	28
195	9	9	9	9	9	11	23	28
200	9	9	9	9	9	11	23	28
205	9	9	9	9	9	12	24	29
210	9	9	9	9	9	12	25	29
215	9	9	9	9	9	12	25	29
220	9	9	9	9	9	12	25	29
225	9	9	9	9	9	12	25	30
230	9	9	9	9	9	13	25	30
235	9	9	9	9	9	13	25	30
240	9	9	9	9	9	13	26	30
245	9	9	9	9	9	13	26	30
250	9	9	9	9	9	13	26	31
255	9	9	9	9	9	13	26	31
260	9	9	9	9	10	14	26	31
265	9	9	9	9	10	14	26	31
270	9	9	9	9	10	14	26	32
275	9	9	9	9	10	14	26	32
280	9	9	9	9	10	14	27	32
285	9	9	9	9	10	14	27	32
290	9	9	9	9	10	15	27	32
295	9	9	9	9	11	15	27	33
300	9	9	9	9	11	15	27	33
305	9	9	9	9	11	15	27	33
310	9	9	9	9	11	15	27	33

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Table 11/cont: PERLIFOC HP ECO+ H-Section Columns – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	9	9	9	9	11	15	27	34
320	9	9	9	9	11	16	28	34
325	9	9	9	9	11	16	28	34
330	9	9	9	9	11	16	28	34
335	9	9	9	9	12	16	28	34
340	9	9	9	9	12	16	28	35
345	9	9	9	9	12	17	28	35
350	9	9	9	9	12	17	28	35
355	9	9	9	9	12	17	28	35
360	9	9	9	9	12	17	29	36
365	9	9	9	9	12	17	29	36
370	9	9	9	9	12	17	29	37
375	9	9	9	9	13	18	29	37
380	9	9	9	9	13	18	29	38
385	9	9	9	9	13	18	29	38
390	9	9	9	9	13	18	29	39
395	9	9	9	9	13	19	29	39
400	9	9	9	9	13	19	30	39
405	9	9	9	9	13	19	30	40
410	9	9	9	9	13	19	30	40
415	9	9	9	9	14	20	30	41
420	9	9	9	9	14	20	30	41
425	9	9	9	9	14	20	30	-
430	9	9	9	9	14	20	30	-
435	9	9	9	9	14	20	30	-
440	9	9	9	9	14	21	31	-
445	9	9	9	9	14	21	31	-
450	9	9	9	9	15	21	31	-
455	9	9	9	9	15	21	31	-
460	9	9	9	9	15	22	31	-
465	9	9	9	9	15	22	31	-
470	9	9	9	9	15	22	31	-
475	9	9	9	9	15	22	31	-

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Table 12: PERLIFOC HP ECO+ I-Section Beams – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	15	25	-
70	10	10	10	10	10	15	26	-
75	10	10	10	10	11	16	26	-
80	10	10	10	10	11	16	26	-
85	10	10	10	10	11	17	27	-
90	10	10	10	10	12	17	27	-
95	10	10	10	10	12	18	27	-
100	10	10	10	10	12	18	28	-
105	10	10	10	10	12	19	28	-
110	10	10	10	10	13	19	28	-
115	10	10	10	10	13	20	29	-
120	10	10	10	10	13	20	29	-
125	10	10	10	10	14	21	30	-
130	10	10	10	10	14	21	30	-
135	10	10	10	10	14	22	30	-
140	10	10	10	10	14	22	31	-
145	10	10	10	10	15	23	31	-
150	10	10	10	10	15	24	31	-
155	10	10	10	10	15	24	32	-
160	10	10	10	11	16	25	32	-
165	10	10	10	11	16	25	32	-
170	10	10	10	11	16	25	33	-
175	10	10	10	11	16	25	33	-
180	10	10	10	11	17	25	34	-
185	10	10	10	11	17	25	34	-
190	10	10	10	11	17	26	34	-
195	10	10	10	11	18	26	35	-
200	10	10	10	11	18	26	35	-
205	10	10	10	12	18	26	35	-
210	10	10	10	12	18	26	36	-
215	10	10	10	12	19	26	37	-
220	10	10	10	12	19	26	38	-
225	10	10	10	12	19	26	39	-
230	10	10	10	12	19	26	40	-
235	10	10	10	12	19	27	40	-
240	10	10	10	12	19	27	41	-
245	10	10	10	12	20	27	-	-
250	10	10	10	13	20	27	-	-
255	10	10	10	13	20	27	-	-
260	10	10	10	13	20	27	-	-
265	10	10	10	13	20	27	-	-
270	10	10	11	13	20	27	-	-
275	10	10	11	13	20	28	-	-
280	10	10	11	13	21	28	-	-
285	10	10	11	13	21	28	-	-
290	10	10	11	13	21	28	-	-
295	10	10	11	14	21	28	-	-
300	10	10	11	14	21	28	-	-
305	10	10	11	14	21	28	-	-
310	10	10	11	14	21	28	-	-

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Table 12/cont: PERLIFOC HP ECO+ I-Section Beams – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	11	14	22	29	-	-
320	10	10	12	14	22	29	-	-
325	10	10	12	14	22	29	-	-
330	10	10	12	14	22	29	-	-
335	10	10	12	14	22	29	-	-
340	10	10	12	14	22	29	-	-
345	10	10	12	15	22	29	-	-
350	10	10	12	15	22	29	-	-
355	10	10	12	15	23	30	-	-
360	10	10	12	15	23	30	-	-
365	10	10	12	15	23	30	-	-
370	10	10	12	15	23	30	-	-
375	10	10	13	15	23	30	-	-
380	10	10	13	15	23	30	-	-
385	10	10	13	15	23	30	-	-
390	10	10	13	16	24	30	-	-
395	10	10	13	16	24	31	-	-
400	10	10	13	16	24	31	-	-
405	10	10	13	16	24	31	-	-
410	10	10	13	16	24	31	-	-
415	10	10	13	16	24	31	-	-
420	10	10	13	16	24	31	-	-
425	10	10	13	16	25	31	-	-
430	10	10	14	16	25	31	-	-
435	10	10	14	17	25	31	-	-
440	10	10	14	17	25	32	-	-
445	10	10	14	17	25	32	-	-
450	10	10	14	17	25	32	-	-
455	10	10	14	17	25	32	-	-
460	10	10	14	17	26	32	-	-
465	10	10	14	17	26	32	-	-
470	10	10	14	17	26	32	-	-
475	10	10	14	18	26	32	-	-

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Table 13: PERLIFOC HP ECO+ I-Section Beams – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	22	32
70	10	10	10	10	10	10	22	33
75	10	10	10	10	10	10	23	34
80	10	10	10	10	10	10	24	35
85	10	10	10	10	10	10	25	37
90	10	10	10	10	10	11	25	39
95	10	10	10	10	11	11	26	41
100	10	10	10	10	11	12	26	-
105	10	10	10	10	11	13	26	-
110	10	10	10	10	11	13	27	-
115	10	10	10	10	12	14	27	-
120	10	10	10	10	12	15	27	-
125	10	10	10	10	12	15	28	-
130	10	10	10	10	12	16	28	-
135	10	10	10	10	13	17	28	-
140	10	10	10	10	13	17	29	-
145	10	10	10	10	13	18	29	-
150	10	10	10	10	14	19	29	-
155	10	10	10	10	14	19	30	-
160	10	10	10	10	14	20	30	-
165	10	10	10	10	14	21	30	-
170	10	10	10	10	15	21	31	-
175	10	10	10	10	15	22	31	-
180	10	10	10	10	15	23	32	-
185	10	10	10	10	15	24	32	-
190	10	10	10	10	16	24	32	-
195	10	10	10	11	16	25	33	-
200	10	10	10	11	16	25	33	-
205	10	10	10	11	17	25	33	-
210	10	10	10	11	17	25	34	-
215	10	10	10	11	17	25	34	-
220	10	10	10	11	17	25	34	-
225	10	10	10	11	17	26	35	-
230	10	10	10	11	18	26	35	-
235	10	10	10	11	18	26	35	-
240	10	10	10	12	18	26	36	-
245	10	10	10	12	18	26	37	-
250	10	10	10	12	18	26	37	-
255	10	10	10	12	18	26	38	-
260	10	10	10	12	19	26	39	-
265	10	10	10	12	19	27	40	-
270	10	10	10	12	19	27	40	-
275	10	10	10	12	19	27	41	-
280	10	10	10	12	19	27	-	-
285	10	10	10	13	19	27	-	-
290	10	10	10	13	19	27	-	-
295	10	10	10	13	20	27	-	-
300	10	10	10	13	20	28	-	-
305	10	10	10	13	20	28	-	-
310	10	10	10	13	20	28	-	-

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Table 13/cont: PERLIFOC HP ECO+ I-Section Beams – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	13	20	28	-	-
320	10	10	10	13	20	28	-	-
325	10	10	10	13	21	28	-	-
330	10	10	10	14	21	28	-	-
335	10	10	10	14	21	28	-	-
340	10	10	10	14	21	29	-	-
345	10	10	10	14	21	29	-	-
350	10	10	10	14	21	29	-	-
355	10	10	10	14	22	29	-	-
360	10	10	10	14	22	29	-	-
365	10	10	10	14	22	29	-	-
370	10	10	11	14	22	29	-	-
375	10	10	11	14	22	29	-	-
380	10	10	11	15	22	30	-	-
385	10	10	11	15	22	30	-	-
390	10	10	11	15	23	30	-	-
395	10	10	11	15	23	30	-	-
400	10	10	11	15	23	30	-	-
405	10	10	11	15	23	30	-	-
410	10	10	11	15	23	30	-	-
415	10	10	12	15	23	30	-	-
420	10	10	12	15	24	31	-	-
425	10	10	12	16	24	31	-	-
430	10	10	12	16	24	31	-	-
435	10	10	12	16	24	31	-	-
440	10	10	12	16	24	31	-	-
445	10	10	12	16	24	31	-	-
450	10	10	12	16	25	31	-	-
455	10	10	12	16	25	31	-	-
460	10	10	13	16	25	32	-	-
465	10	10	13	16	25	32	-	-
470	10	10	13	17	25	32	-	-
475	10	10	13	17	25	32	-	-

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Table 14: PERLIFOC HP ECO+ I-Section Beams – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	11	20	29
70	10	10	10	10	10	11	20	30
75	10	10	10	10	10	12	21	31
80	10	10	10	10	10	12	22	32
85	10	10	10	10	10	13	23	33
90	10	10	10	10	10	13	24	34
95	10	10	10	10	10	14	25	35
100	10	10	10	10	10	14	25	36
105	10	10	10	10	10	14	25	38
110	10	10	10	10	11	15	26	40
115	10	10	10	10	11	15	26	-
120	10	10	10	10	11	16	26	-
125	10	10	10	10	11	16	26	-
130	10	10	10	10	11	17	26	-
135	10	10	10	10	12	17	27	-
140	10	10	10	10	12	17	27	-
145	10	10	10	10	12	18	27	-
150	10	10	10	10	12	18	27	-
155	10	10	10	10	13	19	28	-
160	10	10	10	10	13	19	28	-
165	10	10	10	10	13	20	28	-
170	10	10	10	10	13	20	28	-
175	10	10	10	10	14	20	29	-
180	10	10	10	10	14	21	29	-
185	10	10	10	10	14	21	29	-
190	10	10	10	10	14	22	29	-
195	10	10	10	10	14	22	30	-
200	10	10	10	10	15	23	30	-
205	10	10	10	10	15	23	30	-
210	10	10	10	10	15	23	30	-
215	10	10	10	10	15	24	31	-
220	10	10	10	10	16	24	31	-
225	10	10	10	10	16	24	31	-
230	10	10	10	11	16	25	31	-
235	10	10	10	11	16	25	32	-
240	10	10	10	11	17	25	32	-
245	10	10	10	11	17	25	32	-
250	10	10	10	11	17	25	32	-
255	10	10	10	11	17	25	32	-
260	10	10	10	11	17	26	33	-
265	10	10	10	11	18	26	33	-
270	10	10	10	11	18	26	33	-
275	10	10	10	12	18	26	33	-
280	10	10	10	12	18	26	34	-
285	10	10	10	12	18	26	34	-
290	10	10	10	12	18	26	34	-
295	10	10	10	12	19	26	34	-
300	10	10	10	12	19	27	35	-
305	10	10	10	12	19	27	35	-
310	10	10	10	12	19	27	35	-

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Table 14/cont: PERLIFOC HP ECO+ I-Section Beams – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	12	19	27	35	.
320	10	10	10	13	19	27	36	.
325	10	10	10	13	20	27	36	.
330	10	10	10	13	20	27	37	.
335	10	10	10	13	20	27	37	.
340	10	10	10	13	20	28	38	.
345	10	10	10	13	20	28	39	.
350	10	10	10	13	20	28	39	.
355	10	10	10	13	21	28	40	.
360	10	10	10	13	21	28	40	.
365	10	10	10	14	21	28	41	.
370	10	10	10	14	21	28	41	.
375	10	10	10	14	21	29	.	.
380	10	10	10	14	21	29	.	.
385	10	10	10	14	22	29	.	.
390	10	10	10	14	22	29	.	.
395	10	10	10	14	22	29	.	.
400	10	10	10	14	22	29	.	.
405	10	10	10	14	22	29	.	.
410	10	10	10	15	22	29		.
415	10	10	10	15	23	30	.	.
420	10	10	10	15	23	30	.	.
425	10	10	10	15	23	30	.	.
430	10	10	10	15	23	30	.	.
435	10	10	10	15	23	30	.	.
440	10	10	10	15	23	30	.	.
445	10	10	10	15	24	30	.	.
450	10	10	10	15	24	30	.	.
455	10	10	10	16	24	31	.	.
460	10	10	11	16	24	31	.	.
465	10	10	11	16	24	31	.	.
470	10	10	11	16	24	31	.	.
475	10	10	11	16	25	31	.	.

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Table 15: PERLIFOC HP ECO+ I-Section Beams – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	17	26
70	10	10	10	10	10	10	18	27
75	10	10	10	10	10	10	19	28
80	10	10	10	10	10	11	20	28
85	10	10	10	10	10	11	20	29
90	10	10	10	10	10	12	21	30
95	10	10	10	10	10	12	22	31
100	10	10	10	10	10	12	23	32
105	10	10	10	10	10	13	24	33
110	10	10	10	10	10	13	25	33
115	10	10	10	10	10	14	25	34
120	10	10	10	10	10	14	25	35
125	10	10	10	10	11	14	25	36
130	10	10	10	10	11	15	25	38
135	10	10	10	10	11	15	26	39
140	10	10	10	10	11	16	26	41
145	10	10	10	10	11	16	26	-
150	10	10	10	10	12	16	26	-
155	10	10	10	10	12	17	26	-
160	10	10	10	10	12	17	26	-
165	10	10	10	10	12	18	27	-
170	10	10	10	10	12	18	27	-
175	10	10	10	10	12	18	27	-
180	10	10	10	10	13	19	27	-
185	10	10	10	10	13	19	27	-
190	10	10	10	10	13	20	27	-
195	10	10	10	10	13	20	27	-
200	10	10	10	10	13	20	28	-
205	10	10	10	10	14	21	28	-
210	10	10	10	10	14	21	28	-
215	10	10	10	10	14	22	28	-
220	10	10	10	10	14	22	28	-
225	10	10	10	10	14	22	28	-
230	10	10	10	10	15	22	29	-
235	10	10	10	10	15	23	29	-
240	10	10	10	10	15	23	29	-
245	10	10	10	10	15	23	29	-
250	10	10	10	10	15	23	29	-
255	10	10	10	11	16	24	29	-
260	10	10	10	11	16	24	29	-
265	10	10	10	11	16	24	30	-
270	10	10	10	11	16	25	30	-
275	10	10	10	11	16	25	30	-
280	10	10	10	11	17	25	30	-
285	10	10	10	11	17	25	30	-
290	10	10	10	11	17	25	30	-
295	10	10	10	11	17	25	31	-
300	10	10	10	12	17	25	31	-
305	10	10	10	12	17	26	31	-
310	10	10	10	12	18	26	31	-

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Table 15/cont: PERLIFOC HP ECO+ I-Section Beams – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	12	18	26	31	-
320	10	10	10	12	18	26	31	-
325	10	10	10	12	18	26	31	-
330	10	10	10	12	18	26	32	-
335	10	10	10	12	19	26	32	-
340	10	10	10	12	19	26	32	-
345	10	10	10	12	19	27	32	-
350	10	10	10	13	19	27	32	-
355	10	10	10	13	19	27	32	-
360	10	10	10	13	19	27	33	-
365	10	10	10	13	20	27	33	-
370	10	10	10	13	20	27	33	-
375	10	10	10	13	20	27	33	-
380	10	10	10	13	20	27	33	-
385	10	10	10	13	20	28	33	-
390	10	10	10	13	21	28	33	-
395	10	10	10	14	21	28	34	-
400	10	10	10	14	21	28	34	-
405	10	10	10	14	21	28	34	-
410	10	10	10	14	21	28	34	-
415	10	10	10	14	21	28	34	-
420	10	10	10	14	22	28	34	-
425	10	10	10	14	22	29	35	-
430	10	10	10	14	22	29	35	-
435	10	10	10	14	22	29	35	-
440	10	10	10	14	22	29	35	-
445	10	10	10	15	22	29	35	-
450	10	10	10	15	23	29	35	-
455	10	10	10	15	23	29	35	-
460	10	10	10	15	23	29	36	-
465	10	10	10	15	23	30	36	-
470	10	10	10	15	23	30	37	-
475	10	10	11	15	24	30	37	-

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Table 16: PERLIFOC HP ECO+ I-Section Beams – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	16	24
70	10	10	10	10	10	10	16	24
75	10	10	10	10	10	10	17	25
80	10	10	10	10	10	10	18	26
85	10	10	10	10	10	10	18	27
90	10	10	10	10	10	10	19	27
95	10	10	10	10	10	11	20	28
100	10	10	10	10	10	11	21	29
105	10	10	10	10	10	12	22	30
110	10	10	10	10	10	12	23	31
115	10	10	10	10	10	12	23	32
120	10	10	10	10	10	13	24	33
125	10	10	10	10	10	13	25	33
130	10	10	10	10	10	13	25	34
135	10	10	10	10	10	14	25	35
140	10	10	10	10	10	14	25	36
145	10	10	10	10	11	14	26	37
150	10	10	10	10	11	15	26	39
155	10	10	10	10	11	15	26	40
160	10	10	10	10	11	15	26	41
165	10	10	10	10	11	16	26	-
170	10	10	10	10	11	16	26	-
175	10	10	10	10	12	16	26	-
180	10	10	10	10	12	17	27	-
185	10	10	10	10	12	17	27	-
190	10	10	10	10	12	18	27	-
195	10	10	10	10	12	18	27	-
200	10	10	10	10	12	18	27	-
205	10	10	10	10	13	19	27	-
210	10	10	10	10	13	19	28	-
215	10	10	10	10	13	19	28	-
220	10	10	10	10	13	20	28	-
225	10	10	10	10	13	20	28	-
230	10	10	10	10	13	20	28	-
235	10	10	10	10	13	20	28	-
240	10	10	10	10	14	21	28	-
245	10	10	10	10	14	21	29	-
250	10	10	10	10	14	21	29	-
255	10	10	10	10	14	21	29	-
260	10	10	10	10	14	22	29	-
265	10	10	10	10	14	22	29	-
270	10	10	10	10	15	22	29	-
275	10	10	10	10	15	22	30	-
280	10	10	10	10	15	23	30	-
285	10	10	10	10	15	23	30	-
290	10	10	10	10	15	23	30	-
295	10	10	10	10	15	23	30	-
300	10	10	10	10	16	24	30	-
305	10	10	10	10	16	24	30	-
310	10	10	10	11	16	24	31	-

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Table 16/cont: PERLIFOC HP ECO+ I-Section Beams – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	11	16	24	31	-
320	10	10	10	11	16	25	31	-
325	10	10	10	11	16	25	31	-
330	10	10	10	11	17	25	31	-
335	10	10	10	11	17	25	31	-
340	10	10	10	11	17	25	32	-
345	10	10	10	11	17	25	32	-
350	10	10	10	11	17	26	32	-
355	10	10	10	12	18	26	32	-
360	10	10	10	12	18	26	32	-
365	10	10	10	12	18	26	32	-
370	10	10	10	12	18	26	32	-
375	10	10	10	12	18	26	33	-
380	10	10	10	12	19	26	33	-
385	10	10	10	12	19	26	33	-
390	10	10	10	12	19	27	33	-
395	10	10	10	12	19	27	33	-
400	10	10	10	13	19	27	33	-
405	10	10	10	13	20	27	34	-
410	10	10	10	13	20	27	34	-
415	10	10	10	13	20	27	34	-
420	10	10	10	13	20	27	34	-
425	10	10	10	13	20	28	34	-
430	10	10	10	13	21	28	34	-
435	10	10	10	13	21	28	34	-
440	10	10	10	13	21	28	35	-
445	10	10	10	14	21	28	35	-
450	10	10	10	14	21	28	35	-
455	10	10	10	14	22	28	35	-
460	10	10	10	14	22	28	35	-
465	10	10	10	14	22	29	35	-
470	10	10	10	14	22	29	36	-
475	10	10	10	14	22	29	36	-

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Table 17: PERLIFOC HP ECO+ I-Section Beams – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	14	21
70	10	10	10	10	10	10	14	21
75	10	10	10	10	10	10	15	22
80	10	10	10	10	10	10	16	23
85	10	10	10	10	10	10	16	25
90	10	10	10	10	10	10	17	25
95	10	10	10	10	10	10	18	26
100	10	10	10	10	10	10	19	27
105	10	10	10	10	10	11	19	27
110	10	10	10	10	10	11	20	28
115	10	10	10	10	10	11	21	29
120	10	10	10	10	10	11	22	30
125	10	10	10	10	10	12	22	30
130	10	10	10	10	10	12	23	31
135	10	10	10	10	10	12	24	32
140	10	10	10	10	10	13	25	32
145	10	10	10	10	10	13	25	33
150	10	10	10	10	10	13	25	34
155	10	10	10	10	10	13	25	34
160	10	10	10	10	10	14	25	35
165	10	10	10	10	10	14	26	36
170	10	10	10	10	11	14	26	37
175	10	10	10	10	11	15	26	38
180	10	10	10	10	11	15	26	39
185	10	10	10	10	11	15	26	40
190	10	10	10	10	11	15	26	41
195	10	10	10	10	11	16	26	-
200	10	10	10	10	11	16	27	-
205	10	10	10	10	12	16	27	-
210	10	10	10	10	12	17	27	-
215	10	10	10	10	12	17	27	-
220	10	10	10	10	12	17	27	-
225	10	10	10	10	12	17	27	-
230	10	10	10	10	12	18	27	-
235	10	10	10	10	12	18	28	-
240	10	10	10	10	13	18	28	-
245	10	10	10	10	13	18	28	-
250	10	10	10	10	13	18	28	-
255	10	10	10	10	13	19	28	-
260	10	10	10	10	13	19	28	-
265	10	10	10	10	13	19	29	-
270	10	10	10	10	13	19	29	-
275	10	10	10	10	14	19	29	-
280	10	10	10	10	14	20	29	-
285	10	10	10	10	14	20	29	-
290	10	10	10	10	14	20	29	-
295	10	10	10	10	14	20	29	-
300	10	10	10	10	14	20	30	-
305	10	10	10	10	14	21	30	-
310	10	10	10	10	15	21	30	-

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Table 17/cont: PERLIFOC HP ECO+ I-Section Beams – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	10	15	21	30	-
320	10	10	10	10	15	21	30	-
325	10	10	10	10	15	21	30	-
330	10	10	10	10	15	22	31	-
335	10	10	10	10	15	22	31	-
340	10	10	10	10	15	22	31	-
345	10	10	10	10	15	22	31	-
350	10	10	10	10	16	22	31	
355	10	10	10	10	16	23	31	-
360	10	10	10	10	16	23	31	-
365	10	10	10	10	16	23	32	-
370	10	10	10	10	16	23	32	-
375	10	10	10	10	16	23	32	-
380	10	10	10	11	16	24	32	-
385	10	10	10	11	17	24	32	-
390	10	10	10	11	17	24	32	-
395	10	10	10	11	17	24	32	-
400	10	10	10	11	17	24	33	-
405	10	10	10	11	17	25	33	-
410	10	10	10	11	17	25	33	-
415	10	10	10	11	18	25	33	-
420	10	10	10	12	18	25	33	-
425	10	10	10	12	18	25	33	-
430	10	10	10	12	18	25	34	-
435	10	10	10	12	18	25	34	.
440	10	10	10	12	19	26	34	-
445	10	10	10	12	19	26	34	.
450	10	10	10	12	19	26	34	.
455	10	10	10	12	19	26	34	.
460	10	10	10	13	20	26	34	-
465	10	10	10	13	20	26	35	-
470	10	10	10	13	20	27	35	-
475	10	10	10	13	20	27	35	.

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Table 18: PERLIFOC HP ECO+ I-Section Beams – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	9	13	19
70	10	10	10	10	10	9	13	19
75	10	10	10	10	10	9	14	20
80	10	10	10	10	10	9	14	21
85	10	10	10	10	10	9	15	23
90	10	10	10	10	10	9	16	24
95	10	10	10	10	10	9	16	25
100	10	10	10	10	10	9	17	25
105	10	10	10	10	10	10	17	25
110	10	10	10	10	10	10	18	26
115	10	10	10	10	10	10	19	26
120	10	10	10	10	10	10	19	26
125	10	10	10	10	10	11	20	27
130	10	10	10	10	10	11	21	27
135	10	10	10	10	10	11	21	27
140	10	10	10	10	10	11	22	28
145	10	10	10	10	10	12	23	28
150	10	10	10	10	10	12	23	28
155	10	10	10	10	10	12	24	29
160	10	10	10	10	10	12	25	29
165	10	10	10	10	10	13	25	29
170	10	10	10	10	10	13	25	29
175	10	10	10	10	10	13	25	30
180	10	10	10	10	10	13	25	30
185	10	10	10	10	10	14	25	30
190	10	10	10	10	10	14	26	31
195	10	10	10	10	10	14	26	31
200	10	10	10	10	11	14	26	31
205	10	10	10	10	11	15	26	32
210	10	10	10	10	11	15	26	32
215	10	10	10	10	11	15	26	32
220	10	10	10	10	11	15	26	33
225	10	10	10	10	11	16	26	33
230	10	10	10	10	11	16	27	33
235	10	10	10	10	12	16	27	34
240	10	10	10	10	12	16	27	34
245	10	10	10	10	12	17	27	34
250	10	10	10	10	12	17	27	34
255	10	10	10	10	12	17	27	35
260	10	10	10	10	12	17	27	35
265	10	10	10	10	12	17	27	35
270	10	10	10	10	12	18	28	36
275	10	10	10	10	13	18	28	37
280	10	10	10	10	13	18	28	37
285	10	10	10	10	13	18	28	38
290	10	10	10	10	13	18	28	39
295	10	10	10	10	13	18	28	39
300	10	10	10	10	13	18	28	40
305	10	10	10	10	13	19	28	41
310	10	10	10	10	13	19	29	41

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Table 18/cont: PERLIFOC HP ECO+ I-Section Beams – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	10	14	19	29	-
320	10	10	10	10	14	19	29	-
325	10	10	10	10	14	19	29	-
330	10	10	10	10	14	19	29	-
335	10	10	10	10	14	19	29	-
340	10	10	10	10	14	19	29	-
345	10	10	10	10	14	20	29	-
350	10	10	10	10	14	20	30	-
355	10	10	10	10	15	20	30	-
360	10	10	10	10	15	20	30	-
365	10	10	10	10	15	20	30	-
370	10	10	10	10	15	20	30	-
375	10	10	10	10	15	20	30	-
380	10	10	10	10	15	21	30	-
385	10	10	10	10	15	21	30	-
390	10	10	10	10	16	21	31	-
395	10	10	10	10	16	21	31	-
400	10	10	10	10	16	21	31	-
405	10	10	10	10	16	21	31	-
410	10	10	10	10	16	21	31	-
415	10	10	10	10	16	21	31	-
420	10	10	10	10	16	22	31	-
425	10	10	10	10	16	22	31	-
430	10	10	10	10	17	22	32	-
435	10	10	10	10	17	22	32	-
440	10	10	10	10	17	22	32	-
445	10	10	10	10	17	22	32	-
450	10	10	10	10	17	22	32	-
455	10	10	10	10	17	23	32	-
460	10	10	10	10	17	23	32	-
465	10	10	10	10	18	23	32	-
470	10	10	10	10	18	23	33	-
475	10	10	10	10	18	23	33	-

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Table 19: PERLIFOC HP ECO+ I-Section Beams – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	10	17
70	10	10	10	10	10	10	10	17
75	10	10	10	10	10	10	11	18
80	10	10	10	10	10	10	11	19
85	10	10	10	10	10	10	12	21
90	10	10	10	10	10	10	13	22
95	10	10	10	10	10	10	13	23
100	10	10	10	10	10	10	14	24
105	10	10	10	10	10	10	15	25
110	10	10	10	10	10	10	15	25
115	10	10	10	10	10	10	16	25
120	10	10	10	10	10	10	17	26
125	10	10	10	10	10	10	17	26
130	10	10	10	10	10	10	18	26
135	10	10	10	10	10	10	19	27
140	10	10	10	10	10	10	19	27
145	10	10	10	10	10	11	20	27
150	10	10	10	10	10	11	21	27
155	10	10	10	10	10	11	21	28
160	10	10	10	10	10	11	22	28
165	10	10	10	10	10	11	23	28
170	10	10	10	10	10	12	24	29
175	10	10	10	10	10	12	24	29
180	10	10	10	10	10	12	25	29
185	10	10	10	10	10	12	25	29
190	10	10	10	10	10	13	25	30
195	10	10	10	10	10	13	25	30
200	10	10	10	10	10	13	25	30
205	10	10	10	10	10	13	26	31
210	10	10	10	10	10	13	26	31
215	10	10	10	10	10	14	26	31
220	10	10	10	10	10	14	26	31
225	10	10	10	10	10	14	26	32
230	10	10	10	10	10	14	26	32
235	10	10	10	10	10	14	26	32
240	10	10	10	10	11	15	27	33
245	10	10	10	10	11	15	27	33
250	10	10	10	10	11	15	27	33
255	10	10	10	10	11	15	27	33
260	10	10	10	10	11	15	27	34
265	10	10	10	10	11	16	27	34
270	10	10	10	10	11	16	27	34
275	10	10	10	10	12	16	27	35
280	10	10	10	10	12	16	28	35
285	10	10	10	10	12	17	28	35
290	10	10	10	10	12	17	28	36
295	10	10	10	10	12	17	28	36
300	10	10	10	10	12	17	28	37
305	10	10	10	10	12	17	28	37
310	10	10	10	10	12	18	28	38

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Table 19/cont: PERLIFOC HP ECO+ I-Section Beams – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	10	13	18	29	39
320	10	10	10	10	13	18	29	39
325	10	10	10	10	13	18	29	40
330	10	10	10	10	13	18	29	40
335	10	10	10	10	13	19	29	41
340	10	10	10	10	13	19	29	-
345	10	10	10	10	13	19	29	-
350	10	10	10	10	13	19	30	-
355	10	10	10	10	14	19	30	-
360	10	10	10	10	14	20	30	-
365	10	10	10	10	14	20	30	-
370	10	10	10	10	14	20	30	-
375	10	10	10	10	14	20	30	-
380	10	10	10	10	14	21	30	-
385	10	10	10	10	14	21	31	-
390	10	10	10	10	14	21	31	-
395	10	10	10	10	15	21	31	-
400	10	10	10	10	15	21	31	-
405	10	10	10	10	15	22	31	-
410	10	10	10	10	15	22	31	-
415	10	10	10	10	15	22	31	-
420	10	10	10	10	15	22	31	-
425	10	10	10	10	15	22	32	-
430	10	10	10	10	16	23	32	-
435	10	10	10	10	16	23	32	-
440	10	10	10	10	16	23	32	-
445	10	10	10	10	16	23	32	-
450	10	10	10	10	16	23	32	-
455	10	10	10	10	16	24	32	-
460	10	10	10	10	16	24	33	-
465	10	10	10	10	16	24	33	-
470	10	10	10	10	17	24	33	-
475	10	10	10	10	17	25	33	-

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Table 20: PERLIFOC HP ECO+ I-Section Beams – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	10	14
70	10	10	10	10	10	10	10	14
75	10	10	10	10	10	10	10	15
80	10	10	10	10	10	10	10	17
85	10	10	10	10	10	10	10	18
90	10	10	10	10	10	10	10	19
95	10	10	10	10	10	10	11	20
100	10	10	10	10	10	10	12	21
105	10	10	10	10	10	10	12	22
110	10	10	10	10	10	10	13	23
115	10	10	10	10	10	10	13	25
120	10	10	10	10	10	10	14	25
125	10	10	10	10	10	10	15	25
130	10	10	10	10	10	10	15	25
135	10	10	10	10	10	10	16	26
140	10	10	10	10	10	10	16	26
145	10	10	10	10	10	10	17	26
150	10	10	10	10	10	10	18	26
155	10	10	10	10	10	10	18	27
160	10	10	10	10	10	10	19	27
165	10	10	10	10	10	10	19	27
170	10	10	10	10	10	10	20	27
175	10	10	10	10	10	11	20	27
180	10	10	10	10	10	11	21	28
185	10	10	10	10	10	11	22	28
190	10	10	10	10	10	11	22	28
195	10	10	10	10	10	11	23	28
200	10	10	10	10	10	11	23	28
205	10	10	10	10	10	12	24	29
210	10	10	10	10	10	12	25	29
215	10	10	10	10	10	12	25	29
220	10	10	10	10	10	12	25	29
225	10	10	10	10	10	12	25	30
230	10	10	10	10	10	13	25	30
235	10	10	10	10	10	13	25	30
240	10	10	10	10	10	13	26	30
245	10	10	10	10	10	13	26	30
250	10	10	10	10	10	13	26	31
255	10	10	10	10	10	13	26	31
260	10	10	10	10	10	14	26	31
265	10	10	10	10	10	14	26	31
270	10	10	10	10	10	14	26	32
275	10	10	10	10	10	14	26	32
280	10	10	10	10	10	14	27	32
285	10	10	10	10	10	14	27	32
290	10	10	10	10	10	15	27	32
295	10	10	10	10	11	15	27	33
300	10	10	10	10	11	15	27	33
305	10	10	10	10	11	15	27	33
310	10	10	10	10	11	15	27	33

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Table 20/cont: PERLIFOC HP ECO+ I-Section Beams – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
315	10	10	10	10	11	15	27	34
320	10	10	10	10	11	16	28	34
325	10	10	10	10	11	16	28	34
330	10	10	10	10	11	16	28	34
335	10	10	10	10	12	16	28	34
340	10	10	10	10	12	16	28	35
345	10	10	10	10	12	17	28	35
350	10	10	10	10	12	17	28	35
355	10	10	10	10	12	17	28	35
360	10	10	10	10	12	17	29	36
365	10	10	10	10	12	17	29	36
370	10	10	10	10	12	17	29	37
375	10	10	10	10	13	18	29	37
380	10	10	10	10	13	18	29	38
385	10	10	10	10	13	18	29	38
390	10	10	10	10	13	18	29	39
395	10	10	10	10	13	19	29	39
400	10	10	10	10	13	19	30	39
405	10	10	10	10	13	19	30	40
410	10	10	10	10	13	19	30	40
415	10	10	10	10	14	20	30	41
420	10	10	10	10	14	20	30	41
425	10	10	10	10	14	20	30	-
430	10	10	10	10	14	20	30	-
435	10	10	10	10	14	20	30	-
440	10	10	10	10	14	21	31	-
445	10	10	10	10	14	21	31	-
450	10	10	10	10	15	21	31	-
455	10	10	10	10	15	21	31	-
460	10	10	10	10	15	22	31	-
465	10	10	10	10	15	22	31	-
470	10	10	10	10	15	22	31	-
475	10	10	10	10	15	22	31	-

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Table 21: PERLIFOC HP ECO+ Hollow-Section – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	11	16	27	-
70	10	10	10	10	11	16	27	-
75	10	10	10	10	11	17	28	-
80	10	10	10	10	12	17	28	-
85	10	10	10	10	12	18	29	-
90	10	10	10	10	13	19	29	-
95	10	10	10	10	13	19	30	-
100	10	10	10	10	13	20	30	-
105	10	10	10	10	14	21	31	-
110	10	10	10	11	14	21	32	-
115	11	11	11	11	14	22	32	-
120	11	11	11	11	15	23	33	-
125	11	11	11	11	15	23	33	-
130	11	11	11	11	16	24	34	-
135	11	11	11	11	16	25	34	-
140	11	11	11	12	16	26	35	-
145	11	11	11	12	17	26	35	-
150	11	11	11	12	17	27	36	-
155	11	11	11	12	18	28	37	-
160	11	11	11	12	18	28	37	-
165	11	11	11	12	18	29	38	-
170	11	11	11	13	19	29	38	-
175	11	11	11	13	19	29	39	-
180	11	11	11	13	20	30	40	-
185	11	11	11	13	20	30	40	-
190	11	11	11	13	20	30	41	-
195	11	11	11	13	21	31	41	-
200	11	11	11	14	21	31	-	-
205	11	11	11	14	22	31	-	-
210	11	11	11	14	22	31	-	-
215	11	11	12	14	23	32	-	-
220	11	11	12	14	23	32	-	-
225	12	12	12	15	23	32	-	-
230	12	12	12	15	23	32	-	-
235	12	12	12	15	24	33	-	-
240	12	12	12	15	24	33	-	-
245	12	12	12	15	24	33	-	-
250	12	12	13	16	24	34	-	-
255	12	12	13	16	24	34	-	-
260	12	12	13	16	25	34	-	-
265	12	12	13	16	25	34	-	-
270	12	12	13	16	25	34	-	-
275	12	12	13	16	25	34	-	-
280	12	12	13	16	26	34	-	-
285	12	12	13	16	26	35	-	-

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Table 21/cont: PERLIFOC HP ECO+ Hollow Sections – 350 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
290	12	12	14	17	26	35	-	-
295	12	12	14	17	26	35	-	-
300	12	12	14	17	26	35	-	-
305	12	12	14	17	26	35	-	-
310	12	12	14	17	27	35	-	-
315	12	12	14	17	27	36	-	-
320	12	12	14	17	27	36	-	-
325	12	12	14	18	27	36	-	-
330	12	12	15	18	27	36	-	-
335	12	12	15	18	27	36	-	-
340	12	12	15	18	28	36	-	-
345	12	12	15	18	28	36	-	-
350	12	12	15	18	28	37	-	-
355	12	12	15	18	28	37	-	-
360	12	12	15	19	28	37	-	-
365	12	12	15	19	29	37	-	-
370	12	12	15	19	29	37	-	-
375	12	12	16	19	29	37	-	-
380	12	12	16	19	29	38	-	-
385	12	12	16	19	29	38	-	-
390	12	12	16	19	29	38	-	-
395	12	12	16	19	30	38	-	-
400	12	12	16	20	30	38	-	-
405	12	12	16	20	30	38	-	-
410	12	12	16	20	30	38	-	-
415	12	12	16	20	30	39	-	-
420	12	12	17	20	30	39	-	-
425	12	12	17	20	31	39	-	-
430	12	12	17	20	31	39	-	-
435	12	12	17	21	31	39	-	-
440	12	12	17	21	31	39	-	-
445	12	12	17	21	31	40	-	-
450	12	12	17	21	31	40	-	-
455	12	12	17	21	32	40	-	-
460	12	12	18	21	32	40	-	-
465	12	12	18	21	32	40	-	-
470	12	12	18	22	32	40	-	-
475	12	12	18	22	32	40	-	-

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Table 22: PERLIFOC HP ECO+ Hollow-Section – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	23	35
70	10	10	10	10	10	10	23	35
75	10	10	10	10	10	10	25	36
80	10	10	10	10	10	10	26	38
85	10	10	10	10	11	11	27	40
90	10	10	10	10	11	12	28	-
95	10	10	10	10	12	12	28	-
100	10	10	10	10	12	13	29	-
105	10	10	10	10	12	14	29	-
110	10	10	10	10	13	15	30	-
115	11	11	11	11	13	16	30	-
120	11	11	11	11	13	16	31	-
125	11	11	11	11	14	17	31	-
130	11	11	11	11	14	18	32	-
135	11	11	11	11	14	19	32	-
140	11	11	11	11	15	20	33	-
145	11	11	11	11	15	21	33	-
150	11	11	11	11	15	22	34	-
155	11	11	11	11	16	22	34	-
160	11	11	11	11	16	23	35	-
165	11	11	11	11	17	24	35	-
170	11	11	11	12	17	25	36	-
175	11	11	11	12	17	26	37	-
180	11	11	11	12	18	27	37	-
185	11	11	11	12	18	28	38	-
190	11	11	11	12	19	29	38	-
195	11	11	11	13	19	30	39	-
200	11	11	11	13	19	30	39	-
205	11	11	11	13	20	30	40	-
210	11	11	11	13	20	30	41	-
215	11	11	11	13	21	31	41	-
220	11	11	11	13	21	31	-	-
225	12	12	12	14	21	31	-	-
230	12	12	12	14	22	32	-	-
235	12	12	12	14	22	32	-	-
240	12	12	12	14	22	32	-	-
245	12	12	12	14	22	32	-	-
250	12	12	12	15	23	33	-	-
255	12	12	12	15	23	33	-	-
260	12	12	12	15	23	33	-	-
265	12	12	12	15	23	33	-	-
270	12	12	12	15	23	33	-	-
275	12	12	12	15	24	33	-	-
280	12	12	12	15	24	34	-	-
285	12	12	12	16	24	34	-	-
290	12	12	12	16	24	34	-	-
295	12	12	12	16	24	34	-	-
300	12	12	12	16	25	34	-	-

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Table 22/cont: PERLIFOC HP ECO+ Hollow Sections – 400 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	16	25	34	-	-
310	12	12	12	16	25	35	-	-
315	12	12	12	16	25	35	-	-
320	12	12	12	16	25	35	-	-
325	12	12	12	17	26	35	-	-
330	12	12	12	17	26	35	-	-
335	12	12	12	17	26	35	-	-
340	12	12	12	17	26	36	-	-
345	12	12	12	17	26	36	-	-
350	12	12	13	17	27	36	-	-
355	12	12	13	17	27	36	-	-
360	12	12	13	18	27	36	-	-
365	12	12	13	18	27	36	-	-
370	12	12	13	18	27	37	-	-
375	12	12	13	18	28	37	-	-
380	12	12	13	18	28	37	-	-
385	12	12	14	18	28	37	-	-
390	12	12	14	18	28	37	-	-
395	12	12	14	19	28	37	-	-
400	12	12	14	19	29	37	-	-
405	12	12	14	19	29	38	-	-
410	12	12	14	19	29	38	-	-
415	12	12	14	19	29	38	-	-
420	12	12	15	19	29	38	-	-
425	12	12	15	19	30	38	-	-
430	12	12	15	20	30	38	-	-
435	12	12	15	20	30	39	-	-
440	12	12	15	20	30	39	-	-
445	12	12	15	20	30	39	-	-
450	12	12	15	20	31	39	-	-
455	12	12	15	20	31	39	-	-
460	12	12	16	20	31	39	-	-
465	12	12	16	20	31	40	-	-
470	12	12	16	21	31	40	-	-
475	12	12	16	21	32	40	-	-

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Table 23: PERLIFOC HP ECO+ Hollow-Section – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	12	21	31
70	10	10	10	10	10	12	21	32
75	10	10	10	10	10	13	22	33
80	10	10	10	10	10	13	24	34
85	10	10	10	10	10	14	25	36
90	10	10	10	10	10	14	26	37
95	10	10	10	10	11	15	27	38
100	10	10	10	10	11	15	27	40
105	10	10	10	10	11	16	28	-
110	10	10	10	10	12	16	28	-
115	11	11	11	11	12	17	29	-
120	11	11	11	11	12	18	29	-
125	11	11	11	11	13	18	29	-
130	11	11	11	11	13	19	30	-
135	11	11	11	11	13	19	30	-
140	11	11	11	11	14	20	31	-
145	11	11	11	11	14	20	31	-
150	11	11	11	11	14	21	31	-
155	11	11	11	11	14	22	32	-
160	11	11	11	11	15	22	32	-
165	11	11	11	11	15	23	33	-
170	11	11	11	11	15	23	33	-
175	11	11	11	11	16	24	34	-
180	11	11	11	11	16	25	34	-
185	11	11	11	11	16	25	34	-
190	11	11	11	11	17	26	35	-
195	11	11	11	12	17	26	35	-
200	11	11	11	12	18	27	36	-
205	11	11	11	12	18	28	36	-
210	11	11	11	12	18	28	37	-
215	11	11	11	12	19	29	37	-
220	11	11	11	13	19	29	37	-
225	12	12	12	13	19	30	38	-
230	12	12	12	13	20	30	38	-
235	12	12	12	13	20	31	39	-
240	12	12	12	13	20	31	39	-
245	12	12	12	13	21	31	40	-
250	12	12	12	14	21	32	40	-
255	12	12	12	14	21	32	40	-
260	12	12	12	14	22	32	41	-
265	12	12	12	14	22	32	41	-
270	12	12	12	14	22	32	41	-
275	12	12	12	14	22	32	-	-
280	12	12	12	14	22	32	-	-
285	12	12	12	15	23	33	-	-
290	12	12	12	15	23	33	-	-
295	12	12	12	15	23	33	-	-
300	12	12	12	15	23	33	-	-

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Table 23/cont: PERLIFOC HP ECO+ Hollow Sections – 450 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	15	23	33	-	-
310	12	12	12	15	24	33	-	-
315	12	12	12	15	24	34	-	-
320	12	12	12	16	24	34	-	-
325	12	12	12	16	24	34	-	-
330	12	12	12	16	24	34	-	-
335	12	12	12	16	25	34	-	-
340	12	12	12	16	25	34	-	-
345	12	12	12	16	25	35	-	-
350	12	12	12	16	25	35	-	-
355	12	12	12	17	26	35	-	-
360	12	12	12	17	26	35	-	-
365	12	12	12	17	26	35	-	-
370	12	12	12	17	26	35	-	-
375	12	12	12	17	26	36	-	-
380	12	12	12	17	27	36	-	-
385	12	12	12	17	27	36	-	-
390	12	12	12	17	27	36	-	-
395	12	12	12	18	27	36	-	-
400	12	12	12	18	27	36	-	-
405	12	12	12	18	28	37	-	-
410	12	12	12	18	28	37	-	-
415	12	12	12	18	28	37	-	-
420	12	12	12	18	28	37	-	-
425	12	12	12	18	28	37	-	-
430	12	12	12	19	29	37	-	-
435	12	12	12	19	29	37	-	-
440	12	12	12	19	29	38	-	-
445	12	12	13	19	29	38	-	-
450	12	12	13	19	30	38	-	-
455	12	12	13	19	30	38	-	-
460	12	12	13	19	30	38	-	-
465	12	12	13	20	30	38	-	-
470	12	12	13	20	30	39	-	-
475	12	12	14	20	31	39	-	-

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Table 24: PERLIFOC HP ECO+ Hollow-Section – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	19	28
70	10	10	10	10	10	11	19	29
75	10	10	10	10	10	11	20	30
80	10	10	10	10	10	12	21	31
85	10	10	10	10	10	12	22	32
90	10	10	10	10	10	13	23	33
95	10	10	10	10	10	13	24	34
100	10	10	10	10	11	14	25	35
105	10	10	10	10	11	14	27	36
110	10	10	10	10	11	15	28	37
115	11	11	11	11	11	15	28	38
120	11	11	11	11	12	16	28	39
125	11	11	11	11	12	16	28	41
130	11	11	11	11	12	17	29	-
135	11	11	11	11	12	17	29	-
140	11	11	11	11	13	18	29	-
145	11	11	11	11	13	18	30	-
150	11	11	11	11	13	19	30	-
155	11	11	11	11	13	19	30	-
160	11	11	11	11	14	20	31	-
165	11	11	11	11	14	20	31	-
170	11	11	11	11	14	21	31	-
175	11	11	11	11	15	22	31	-
180	11	11	11	11	15	22	32	-
185	11	11	11	11	15	23	32	-
190	11	11	11	11	15	23	32	-
195	11	11	11	11	16	24	33	-
200	11	11	11	11	16	24	33	-
205	11	11	11	11	16	25	33	-
210	11	11	11	12	17	26	34	-
215	11	11	11	12	17	26	34	-
220	11	11	11	12	17	27	34	-
225	12	12	12	12	18	27	35	-
230	12	12	12	12	18	27	35	-
235	12	12	12	12	18	28	35	-
240	12	12	12	13	18	28	36	-
245	12	12	12	13	19	29	36	-
250	12	12	12	13	19	29	36	-
255	12	12	12	13	19	30	37	-
260	12	12	12	13	20	30	37	-
265	12	12	12	13	20	30	37	-
270	12	12	12	14	20	31	37	-
275	12	12	12	14	20	31	37	-
280	12	12	12	14	21	31	37	-
285	12	12	12	14	21	31	38	-
290	12	12	12	14	21	31	38	-
295	12	12	12	14	21	32	38	-
300	12	12	12	14	21	32	38	-

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Table 24/cont: PERLIFOC HP ECO+ Hollow Sections – 500 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	14	22	32	38	-
310	12	12	12	15	22	32	39	-
315	12	12	12	15	22	32	39	-
320	12	12	12	15	22	32	39	-
325	12	12	12	15	23	32	39	-
330	12	12	12	15	23	33	39	-
335	12	12	12	15	23	33	40	-
340	12	12	12	15	23	33	40	-
345	12	12	12	15	23	33	40	-
350	12	12	12	16	24	33	40	-
355	12	12	12	16	24	33	40	-
360	12	12	12	16	24	34	41	-
365	12	12	12	16	24	34	41	-
370	12	12	12	16	25	34	41	-
375	12	12	12	16	25	34	41	-
380	12	12	12	16	25	34	41	-
385	12	12	12	17	25	34	41	-
390	12	12	12	17	26	35	-	-
395	12	12	12	17	26	35	-	-
400	12	12	12	17	26	35	-	-
405	12	12	12	17	26	35	-	-
410	12	12	12	17	26	35	-	-
415	12	12	12	17	27	35	-	-
420	12	12	12	17	27	35	-	-
425	12	12	12	18	27	36	-	-
430	12	12	12	18	27	36	-	-
435	12	12	12	18	28	36	-	-
440	12	12	12	18	28	36	-	-
445	12	12	12	18	28	36	-	-
450	12	12	12	18	28	36	-	-
455	12	12	13	18	28	37	-	-
460	12	12	13	19	29	37	-	-
465	12	12	13	19	29	37	-	-
470	12	12	13	19	29	37	-	-
475	12	12	13	19	29	37	-	-

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Table 25: PERLIFOC HP ECO+ Hollow-Section – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	17	25
70	10	10	10	10	10	10	17	26
75	10	10	10	10	10	10	18	27
80	10	10	10	10	10	10	19	28
85	10	10	10	10	10	11	20	29
90	10	10	10	10	10	11	21	30
95	10	10	10	10	10	12	22	31
100	10	10	10	10	10	12	23	32
105	10	10	10	10	10	13	24	33
110	10	10	10	10	10	13	25	34
115	11	11	11	11	11	14	26	35
120	11	11	11	11	11	14	27	36
125	11	11	11	11	11	15	28	37
130	11	11	11	11	11	15	28	39
135	11	11	11	11	12	15	29	40
140	11	11	11	11	12	16	29	41
145	11	11	11	11	12	16	29	-
150	11	11	11	11	12	17	29	-
155	11	11	11	11	12	17	30	-
160	11	11	11	11	13	18	30	-
165	11	11	11	11	13	18	30	-
170	11	11	11	11	13	19	31	-
175	11	11	11	11	13	19	31	-
180	11	11	11	11	14	20	31	-
185	11	11	11	11	14	20	32	-
190	11	11	11	11	14	21	32	-
195	11	11	11	11	14	21	32	-
200	11	11	11	11	15	22	33	-
205	11	11	11	11	15	22	33	-
210	11	11	11	11	15	23	33	-
215	11	11	11	11	15	23	34	-
220	11	11	11	11	16	24	34	-
225	12	12	12	12	16	24	34	-
230	12	12	12	12	16	25	34	-
235	12	12	12	12	17	25	35	-
240	12	12	12	12	17	25	35	-
245	12	12	12	12	17	26	35	-
250	12	12	12	12	17	26	36	-
255	12	12	12	12	18	27	36	-
260	12	12	12	12	18	27	36	-
265	12	12	12	12	18	27	36	-
270	12	12	12	12	18	28	37	-
275	12	12	12	12	18	28	37	-
280	12	12	12	12	19	28	37	-
285	12	12	12	12	19	28	37	-
290	12	12	12	12	19	29	37	-
295	12	12	12	13	19	29	38	-
300	12	12	12	13	19	29	38	-

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Table 25/cont: PERLIFOC HP ECO+ Hollow Sections – 550 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	13	20	30	38	-
310	12	12	12	13	20	30	38	-
315	12	12	12	13	20	30	38	-
320	12	12	12	13	20	31	38	-
325	12	12	12	13	20	31	39	-
330	12	12	12	14	21	31	39	-
335	12	12	12	14	21	31	39	-
340	12	12	12	14	21	31	39	-
345	12	12	12	14	21	32	39	-
350	12	12	12	14	22	32	40	-
355	12	12	12	14	22	32	40	-
360	12	12	12	14	22	32	40	-
365	12	12	12	15	22	32	40	-
370	12	12	12	15	23	32	40	-
375	12	12	12	15	23	33	41	-
380	12	12	12	15	23	33	41	-
385	12	12	12	15	23	33	41	-
390	12	12	12	15	24	33	41	-
395	12	12	12	15	24	33	41	-
400	12	12	12	16	24	33	-	-
405	12	12	12	16	24	34	-	-
410	12	12	12	16	25	34	-	-
415	12	12	12	16	25	34	-	-
420	12	12	12	16	25	34	-	-
425	12	12	12	16	25	34	-	-
430	12	12	12	16	26	34	-	-
435	12	12	12	17	26	35	-	-
440	12	12	12	17	26	35	-	-
445	12	12	12	17	26	35	-	-
450	12	12	12	17	27	35	-	-
455	12	12	12	17	27	35	-	-
460	12	12	12	17	27	35	-	-
465	12	12	12	17	27	36	-	-
470	12	12	12	17	28	36	-	-
475	12	12	12	18	28	36	-	-

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Table 26: PERLIFOC HP ECO+ Hollow-Section – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	15	22
70	10	10	10	10	10	10	15	22
75	10	10	10	10	10	10	16	24
80	10	10	10	10	10	10	17	25
85	10	10	10	10	10	10	18	27
90	10	10	10	10	10	11	19	28
95	10	10	10	10	10	11	19	29
100	10	10	10	10	10	11	20	29
105	10	10	10	10	10	12	21	30
110	10	10	10	10	10	12	22	31
115	11	11	11	11	11	12	23	32
120	11	11	11	11	11	13	24	33
125	11	11	11	11	11	13	25	34
130	11	11	11	11	11	13	26	35
135	11	11	11	11	11	14	27	36
140	11	11	11	11	11	14	28	37
145	11	11	11	11	11	15	28	38
150	11	11	11	11	11	15	29	39
155	11	11	11	11	12	15	29	40
160	11	11	11	11	12	16	29	40
165	11	11	11	11	12	16	30	-
170	11	11	11	11	12	17	30	-
175	11	11	11	11	12	17	30	-
180	11	11	11	11	13	17	31	-
185	11	11	11	11	13	18	31	-
190	11	11	11	11	13	18	31	-
195	11	11	11	11	13	19	31	-
200	11	11	11	11	14	19	32	-
205	11	11	11	11	14	20	32	-
210	11	11	11	11	14	20	32	-
215	11	11	11	11	14	20	33	-
220	11	11	11	11	14	21	33	-
225	12	12	12	12	15	21	33	-
230	12	12	12	12	15	22	34	-
235	12	12	12	12	15	22	34	-
240	12	12	12	12	15	22	34	-
245	12	12	12	12	16	23	35	-
250	12	12	12	12	16	23	35	-
255	12	12	12	12	16	23	35	-
260	12	12	12	12	16	23	35	-
265	12	12	12	12	16	24	36	-
270	12	12	12	12	17	24	36	-
275	12	12	12	12	17	24	36	-
280	12	12	12	12	17	24	36	-
285	12	12	12	12	17	25	36	-
290	12	12	12	12	17	25	37	-
295	12	12	12	12	17	25	37	-
300	12	12	12	12	18	25	37	-

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Table 26/cont: PERLIFOC HP ECO+ Hollow Sections – 600 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	12	18	26	37	-
310	12	12	12	12	18	26	37	-
315	12	12	12	12	18	26	37	-
320	12	12	12	12	18	26	38	-
325	12	12	12	12	19	27	38	-
330	12	12	12	12	19	27	38	-
335	12	12	12	12	19	27	38	-
340	12	12	12	12	19	27	38	-
345	12	12	12	12	19	28	39	-
350	12	12	12	12	19	28	39	-
355	12	12	12	12	20	28	39	-
360	12	12	12	13	20	28	39	-
365	12	12	12	13	20	29	39	-
370	12	12	12	13	20	29	40	-
375	12	12	12	13	20	29	40	-
380	12	12	12	13	20	29	40	-
385	12	12	12	13	21	30	40	-
390	12	12	12	13	21	30	40	-
395	12	12	12	14	21	30	40	-
400	12	12	12	14	21	30	41	-
405	12	12	12	14	21	31	41	-
410	12	12	12	14	22	31	41	-
415	12	12	12	14	22	31	41	-
420	12	12	12	14	22	31	41	-
425	12	12	12	14	22	31	-	-
430	12	12	12	15	23	32	-	-
435	12	12	12	15	23	32	-	-
440	12	12	12	15	23	32	-	-
445	12	12	12	15	24	32	-	-
450	12	12	12	15	24	32	-	-
455	12	12	12	15	24	32	-	-
460	12	12	12	16	24	33	-	-
465	12	12	12	16	25	33	-	-
470	12	12	12	16	25	33	-	-
475	12	12	12	16	25	33	-	-

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Table 27: PERLIFOC HP ECO+ Hollow-Section – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	13	20
70	10	10	10	10	10	10	14	20
75	10	10	10	10	10	10	15	22
80	10	10	10	10	10	10	15	23
85	10	10	10	10	10	10	16	24
90	10	10	10	10	10	10	17	26
95	10	10	10	10	10	10	18	27
100	10	10	10	10	10	10	18	28
105	10	10	10	10	10	11	19	28
110	10	10	10	10	10	11	20	29
115	11	11	11	11	11	11	21	29
120	11	11	11	11	11	12	22	30
125	11	11	11	11	11	12	23	30
130	11	11	11	11	11	12	23	30
135	11	11	11	11	11	13	24	31
140	11	11	11	11	11	13	25	31
145	11	11	11	11	11	13	26	32
150	11	11	11	11	11	14	27	32
155	11	11	11	11	11	14	28	33
160	11	11	11	11	11	14	29	33
165	11	11	11	11	11	15	29	34
170	11	11	11	11	11	15	29	34
175	11	11	11	11	12	15	29	35
180	11	11	11	11	12	16	30	35
185	11	11	11	11	12	16	30	36
190	11	11	11	11	12	17	30	36
195	11	11	11	11	12	17	31	37
200	11	11	11	11	13	17	31	38
205	11	11	11	11	13	18	31	38
210	11	11	11	11	13	18	31	39
215	11	11	11	11	13	18	32	39
220	11	11	11	11	13	19	32	40
225	12	12	12	12	14	19	32	40
230	12	12	12	12	14	19	33	41
235	12	12	12	12	14	20	33	41
240	12	12	12	12	14	20	33	-
245	12	12	12	12	15	21	33	-
250	12	12	12	12	15	21	34	-
255	12	12	12	12	15	21	34	-
260	12	12	12	12	15	22	34	-
265	12	12	12	12	15	22	34	-
270	12	12	12	12	15	22	34	-
275	12	12	12	12	16	22	34	-
280	12	12	12	12	16	22	35	-
285	12	12	12	12	16	22	35	-
290	12	12	12	12	16	23	35	-
295	12	12	12	12	16	23	35	-
300	12	12	12	12	16	23	35	-

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Table 27/cont: PERLIFOC HP ECO+ Hollow Sections – 650 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	12	17	23	35	-
310	12	12	12	12	17	23	36	-
315	12	12	12	12	17	23	36	-
320	12	12	12	12	17	24	36	-
325	12	12	12	12	17	24	36	-
330	12	12	12	12	17	24	36	-
335	12	12	12	12	18	24	36	-
340	12	12	12	12	18	24	36	-
345	12	12	12	12	18	24	37	-
350	12	12	12	12	18	25	37	-
355	12	12	12	12	18	25	37	-
360	12	12	12	12	18	25	37	-
365	12	12	12	12	18	25	37	-
370	12	12	12	12	19	25	37	-
375	12	12	12	12	19	25	38	-
380	12	12	12	12	19	26	38	-
385	12	12	12	12	19	26	38	-
390	12	12	12	12	19	26	38	-
395	12	12	12	12	19	26	38	-
400	12	12	12	12	20	26	38	-
405	12	12	12	12	20	26	39	-
410	12	12	12	12	20	27	39	-
415	12	12	12	12	20	27	39	-
420	12	12	12	12	20	27	39	-
425	12	12	12	12	20	27	39	-
430	12	12	12	12	21	27	39	-
435	12	12	12	12	21	27	39	-
440	12	12	12	12	21	28	40	-
445	12	12	12	12	21	28	40	-
450	12	12	12	12	21	28	40	-
455	12	12	12	12	21	28	40	-
460	12	12	12	12	22	28	40	-
465	12	12	12	13	22	28	40	-
470	12	12	12	13	22	29	41	-
475	12	12	12	13	23	29	41	-

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Table 28: PERLIFOC HP ECO+ Hollow-Section – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	10	18
70	10	10	10	10	10	10	11	18
75	10	10	10	10	10	10	11	20
80	10	10	10	10	10	10	12	21
85	10	10	10	10	10	10	13	22
90	10	10	10	10	10	10	14	24
95	10	10	10	10	10	10	15	25
100	10	10	10	10	10	10	15	26
105	10	10	10	10	10	10	16	27
110	10	10	10	10	10	10	17	28
115	11	11	11	11	11	11	18	28
120	11	11	11	11	11	11	19	29
125	11	11	11	11	11	11	20	29
130	11	11	11	11	11	11	20	30
135	11	11	11	11	11	12	21	30
140	11	11	11	11	11	12	22	31
145	11	11	11	11	11	12	23	31
150	11	11	11	11	11	12	24	32
155	11	11	11	11	11	13	25	32
160	11	11	11	11	11	13	26	32
165	11	11	11	11	11	13	27	33
170	11	11	11	11	11	14	27	33
175	11	11	11	11	11	14	28	34
180	11	11	11	11	11	14	29	34
185	11	11	11	11	11	15	30	35
190	11	11	11	11	11	15	30	35
195	11	11	11	11	11	15	30	36
200	11	11	11	11	11	15	30	36
205	11	11	11	11	12	16	31	37
210	11	11	11	11	12	16	31	37
215	11	11	11	11	12	16	31	38
220	11	11	11	11	12	17	32	38
225	12	12	12	12	12	17	32	39
230	12	12	12	12	13	17	32	39
235	12	12	12	12	13	18	32	40
240	12	12	12	12	13	18	33	40
245	12	12	12	12	13	18	33	41
250	12	12	12	12	13	19	33	41
255	12	12	12	12	14	19	34	-
260	12	12	12	12	14	19	34	-
265	12	12	12	12	14	20	34	-
270	12	12	12	12	14	20	34	-
275	12	12	12	12	14	20	34	-
280	12	12	12	12	14	20	34	-
285	12	12	12	12	15	21	35	-
290	12	12	12	12	15	21	35	-
295	12	12	12	12	15	21	35	-
300	12	12	12	12	15	21	35	-

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Table 28/cont: PERLIFOC HP ECO+ Hollow Sections – 700 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	12	15	22	35	-
310	12	12	12	12	15	22	35	-
315	12	12	12	12	16	22	36	-
320	12	12	12	12	16	22	36	-
325	12	12	12	12	16	23	36	-
330	12	12	12	12	16	23	36	-
335	12	12	12	12	16	23	36	-
340	12	12	12	12	16	23	36	-
345	12	12	12	12	17	24	37	-
350	12	12	12	12	17	24	37	-
355	12	12	12	12	17	24	37	-
360	12	12	12	12	17	25	37	-
365	12	12	12	12	17	25	37	-
370	12	12	12	12	17	25	38	-
375	12	12	12	12	17	25	38	-
380	12	12	12	12	18	26	38	-
385	12	12	12	12	18	26	38	-
390	12	12	12	12	18	26	38	-
395	12	12	12	12	18	26	38	-
400	12	12	12	12	18	27	39	-
405	12	12	12	12	18	27	39	-
410	12	12	12	12	19	27	39	-
415	12	12	12	12	19	27	39	-
420	12	12	12	12	19	28	39	-
425	12	12	12	12	19	28	39	-
430	12	12	12	12	19	28	40	-
435	12	12	12	12	19	28	40	-
440	12	12	12	12	20	29	40	-
445	12	12	12	12	20	29	40	-
450	12	12	12	12	20	29	40	-
455	12	12	12	12	20	29	40	-
460	12	12	12	12	20	30	41	-
465	12	12	12	12	20	30	41	-
470	12	12	12	12	21	30	41	-
475	12	12	12	12	21	31	41	-

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Table 29: PERLIFOC HP ECO+ Hollow-Section – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
68	10	10	10	10	10	10	10	15
70	10	10	10	10	10	10	10	15
75	10	10	10	10	10	10	10	17
80	10	10	10	10	10	10	10	18
85	10	10	10	10	10	10	11	19
90	10	10	10	10	10	10	11	20
95	10	10	10	10	10	10	12	22
100	10	10	10	10	10	10	13	23
105	10	10	10	10	10	10	13	25
110	10	10	10	10	10	10	14	26
115	11	11	11	11	11	11	15	27
120	11	11	11	11	11	11	16	28
125	11	11	11	11	11	11	16	28
130	11	11	11	11	11	11	17	29
135	11	11	11	11	11	11	18	29
140	11	11	11	11	11	11	19	29
145	11	11	11	11	11	11	19	30
150	11	11	11	11	11	11	20	30
155	11	11	11	11	11	11	21	31
160	11	11	11	11	11	12	22	31
165	11	11	11	11	11	12	22	31
170	11	11	11	11	11	12	23	32
175	11	11	11	11	11	12	24	32
180	11	11	11	11	11	13	25	33
185	11	11	11	11	11	13	26	33
190	11	11	11	11	11	13	26	33
195	11	11	11	11	11	13	27	34
200	11	11	11	11	11	14	28	34
205	11	11	11	11	11	14	29	35
210	11	11	11	11	11	14	30	35
215	11	11	11	11	11	14	30	35
220	11	11	11	11	11	15	30	36
225	12	12	12	12	12	15	31	36
230	12	12	12	12	12	15	31	37
235	12	12	12	12	12	16	31	37
240	12	12	12	12	12	16	32	37
245	12	12	12	12	12	16	32	38
250	12	12	12	12	12	16	32	38
255	12	12	12	12	12	17	32	39
260	12	12	12	12	12	17	32	39
265	12	12	12	12	12	17	33	39
270	12	12	12	12	12	17	33	39
275	12	12	12	12	12	17	33	40
280	12	12	12	12	13	18	33	40
285	12	12	12	12	13	18	33	40
290	12	12	12	12	13	18	33	40
295	12	12	12	12	13	18	33	41
300	12	12	12	12	13	19	34	41

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Table 29/cont: PERLIFOC HP ECO+ Hollow Sections – 750 °C

Section Factor (m^{-1})	Required Thickness (mm) for a Design FRL (minutes) x/-/-							
	15	30	45	60	90	120	180	240
305	12	12	12	12	13	19	34	41
310	12	12	12	12	14	19	34	-
315	12	12	12	12	14	19	34	-
320	12	12	12	12	14	19	34	-
325	12	12	12	12	14	20	34	-
330	12	12	12	12	14	20	35	-
335	12	12	12	12	14	20	35	-
340	12	12	12	12	14	20	35	-
345	12	12	12	12	15	21	35	-
350	12	12	12	12	15	21	35	-
355	12	12	12	12	15	21	35	-
360	12	12	12	12	15	21	36	-
365	12	12	12	12	15	21	36	-
370	12	12	12	12	15	22	36	-
375	12	12	12	12	16	22	36	-
380	12	12	12	12	16	22	36	-
385	12	12	12	12	16	23	36	-
390	12	12	12	12	16	23	36	-
395	12	12	12	12	16	23	37	-
400	12	12	12	12	16	23	37	-
405	12	12	12	12	17	24	37	-
410	12	12	12	12	17	24	37	-
415	12	12	12	12	17	24	37	-
420	12	12	12	12	17	25	37	-
425	12	12	12	12	17	25	38	-
430	12	12	12	12	17	25	38	-
435	12	12	12	12	18	25	38	-
440	12	12	12	12	18	26	38	-
445	12	12	12	12	18	26	38	-
450	12	12	12	12	18	26	38	-
455	12	12	12	12	18	27	38	-
460	12	12	12	12	18	27	39	-
465	12	12	12	12	18	27	39	-
470	12	12	12	12	19	27	39	-
475	12	12	12	12	19	28	39	-

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