

## CLASSIFICATION OF FIRE RESISTANCE PERFORMANCE IN ACCORDANCE WITH BS EN 13501-2:2016

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Product name: GYPLYNER ENCASE STEEL PROTECTION  
SYSTEM CLAD WITH A SINGLE, DOUBLE  
OR TRIPLE LAYER OF GYPROC FIRELINE

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This classification report consists of 21 pages and may only be reproduced in its entirety.

# The Building Test Centre

## Fire Acoustics Structures

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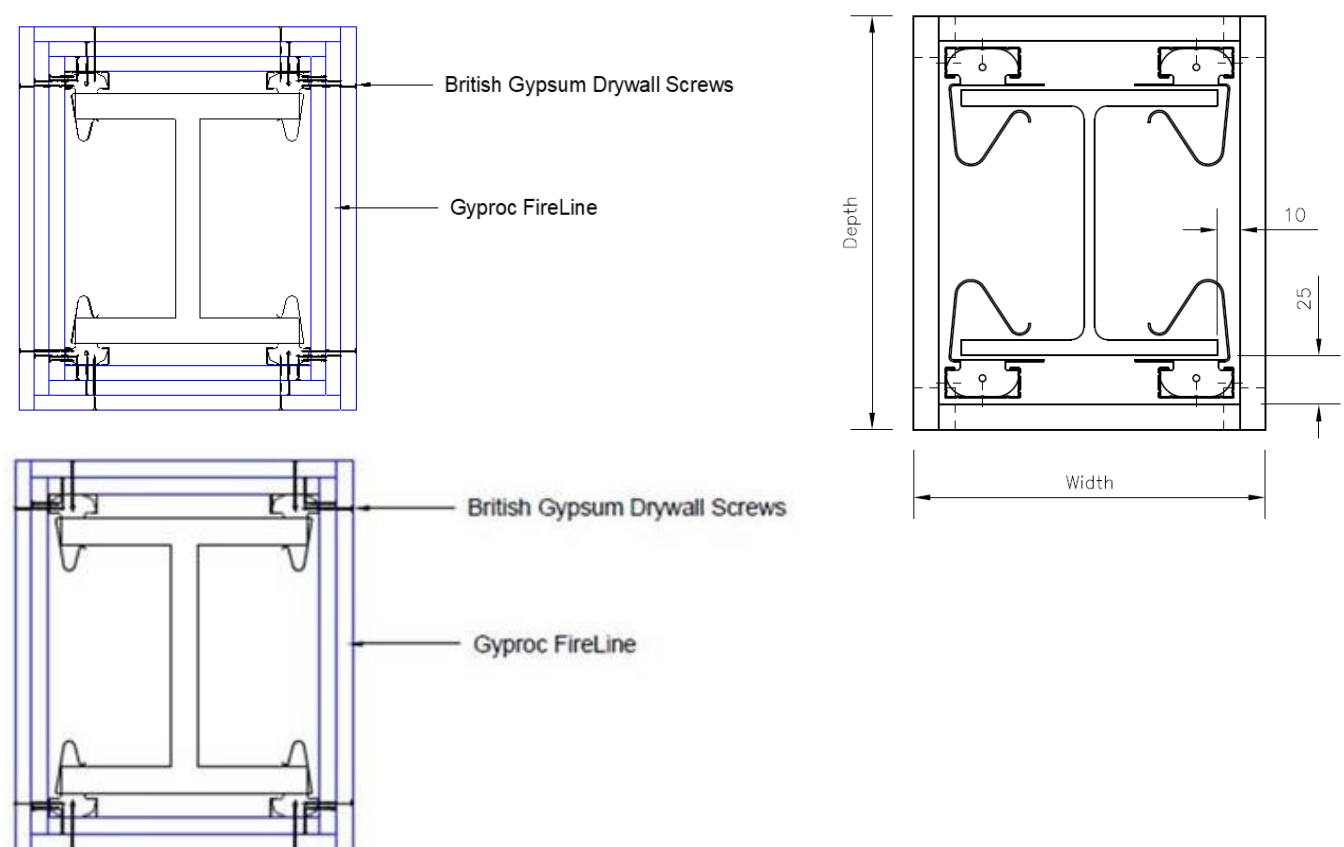
## 1. Introduction

This classification report defines the classification assigned to element GypLyner Encase steel protection system clad with a single, double or triple layer of Gyproc FireLine, in accordance with the procedures given in BS EN 13501-2:2016.

## 2. Details of Classified Product

### 2.1 Product Description

The element, GypLyner Encase steel protection system clad with a single, double or triple layer of Gyproc FireLine, fully described below, is provided in support of the classification, listed in Clause 3.1.



**Figure 1.** Horizontal cross section – GypLyner Encase steel protection system clad with a single, double or triple layer of Gyproc FireLine.

### Construction Details

#### Loaded Beam

The specimen was constructed in a refractory concrete lined steel restraint test frame with an opening of 4000 mm (long) x 3000 mm (wide).

A 4398 mm long steel beam (serial size 406 mm x 178 mm x 67 kg) was located in the restraint frame and was prepared as follows:

The beam included web stiffeners in the form of 10 mm thick steel plates welded in line with each load point. The beam also included 10 mm thick trapezoidal web stiffeners at each support point to provide additional torsional restraint.

A lightweight concrete topping was provided, such that only the two sides and the soffit of the beam were exposed to the heating conditions. The eight separate elements of the lightweight topping were nominally 150 mm thick x 600 mm wide.

A layer of 25 mm rock mineral wool gasket was sandwiched between the top flange of the beam and the lightweight concrete topping.

The elements of the topping were secured in position by 100 mm x 100 mm x 6 mm steel plates and nuts fastened to 10 mm diameter threaded studs welded to the top flange of the beam. The studs were located within the gaps between each element of topping. The gap between each element of topping was filled with 25 mm rock mineral gasket.

To allow for thermal expansion the beam rested at each end on a 50 mm diameter steel roller, which in turn rested on a structurally strengthened part of the restraint frame. The ends of the beam and steel rollers were protected by rock mineral wool.

The fire protection system was installed as follows:

Gypframe GA2 Steel Angle was riveted to the lower side of the top flange of the beam at 600 mm nominal centres using 14 mm stainless steel rivets. The angle was positioned such that the face of the angle was 10 mm outside of the edge of the beam flange.

Gypframe GL10 GypLyner Steel Framing Clips were fitted to each lower flange at 800 mm centres symmetrically about the centre of the beam.

Gypframe GL1 Lining Channels were engaged onto the clips. Where two lengths of Gypframe GL1 Lining Channels abutted, two additional Gypframe GL10 Steel Framing Clips were used to support the channel either side of the joint.

Sections were clad with either a singler layer of 12.5 mm Gyproc FireLine 12.5mm, double layer of 12.5 mm Gyproc FireLine 12.5mm, a single layer of 15 mm Gyproc FireLine 15mm, a double

layer of 15 mm Gyproc FireLine 15mm or a triple layer of 15 mm Gyproc FireLine 15mm that was fixed to all framing members at 300 mm centres using British Gypsum Drywall Screws.

Gypframe GFS1 Fixing Strap was used to back the outer layer board joints.

All board joints were left unfinished.

### Reference Beam

The serial size of the beam was 406 mm x 178 mm x 67 kg.

The reference beam was bolted horizontally to the furnace cover slabs via two 10 mm diameter threaded studs bolted to the top flange of the beam and secured with 100 mm x 100 mm x 6 mm steel plates and locking nuts. A 25 mm rock mineral wool gasket was sandwiched between the top flange of the beam and the cover slab.

The fire protection system was installed as follows:

Gypframe GA2 Steel Angle was shot fired to the lower side of the top flange of the beam at 600 mm nominal centres. The angle was positioned such that the face of the angle was 10 mm outside of the edge of the beam flange.

Gypframe GL10 GypLyner Steel Framing Clips were fitted to each lower flange at 800 mm centres symmetrically about the centre of the beam.

Gypframe GL1 Lining Channels were engaged onto the clips.

Sections were clad with either a singler layer of 12.5 mm Gyproc FireLine 12.5mm, double layer of 12.5 mm Gyproc FireLine 12.5mm, a single layer of 15 mm Gyproc FireLine 15mm, a double layer of 15 mm Gyproc FireLine 15mm or a triple layer of 15 mm Gyproc FireLine 15mm that was fixed to all framing members at 300 mm centres using British Gypsum Drywall Screws.

All board joints were left unfinished.

The two end details on the beam consisted of 50 mm rock mineral wool followed by 3 layers of 15 mm Glasroc F FireCase 15mm. These were secured firmly in position with M10 nuts and 40 mm diameter washers fastened to four M10 threaded bars welded to the internal edges of the beam flanges. A further layer of 50 mm rock mineral wool was secured over the exposed washers and the nuts and fixed into the other layers with five 90 mm long wood screws and 50 mm diameter penny washers to reduce heat transfer to the steel sections through the threaded bars during the test.

### Short Section

Gypframe GL10 GypLyner Steel Framing Clips were fitted to each flange at 100 mm from the top and bottom ends of each steel section, e.g. at 800 mm centres. 1000 mm long lengths of Gypframe GL1 Lining Channels were engaged onto the clips.

Sections were clad with either a singler layer of 12.5 mm Gyproc FireLine 12.5mm, double layer of 12.5 mm Gyproc FireLine 12.5mm, a single layer of 15 mm Gyproc FireLine 15mm, a double layer of 15 mm Gyproc FireLine 15mm or a triple layer of 15 mm Gyproc FireLine 15mm that was fixed to all framing members at 300 mm centres using British Gypsum Drywall Screws.

All board joints were left unfinished.

Cladding thickness	Screw lengths
2 x 12.5 mm	25 mm & 35 mm
2 x 15 mm	25 mm & 40 mm
3 x 15 mm	25 mm, 40 mm and 55 mm
12.5 mm	25 mm
15 mm	25 mm

### 3. Test Reports / Extended Application Reports and Test Results in Support of Classification

#### 3.1 Test Reports / Extended Application Reports

Name of Laboratory	Name of Sponsor	Test Reports / Extended Application Report Nos.	Test Method / Extended Application Rules & Date
The Building Test Centre	British Gypsum	BTC 21719FA	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21597F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21471F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21604F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21527F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21472F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21532F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21530F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21667F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21648FA	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21622F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21449F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21453F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21507F	BS EN 13381-4: 2013
The Building Test Centre	British Gypsum	BTC 21469F	BS EN 13381-4: 2013

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### 3.2 Test Results

Test Method & Test Number	Parameter	Results
BS EN 13381-4: 2013 BTC 21597F	Loadbearing Capacity	121.0 minutes
BS EN 13381-4: 2013 BTC 21471F	Loadbearing Capacity	159.0 minutes
BS EN 13381-4: 2013 BTC 21622F	Loadbearing Capacity	70.5 minutes
BS EN 13381-4: 2013 BTC 21449F	Loadbearing Capacity	83.5 minutes

All data can be found in the relevant test report.



#### 4. Classification and Field of Application

##### 4.1 Reference of Classification

This classification has been carried out in accordance with clause 7.4.6 of BS EN 13501-2:2016.

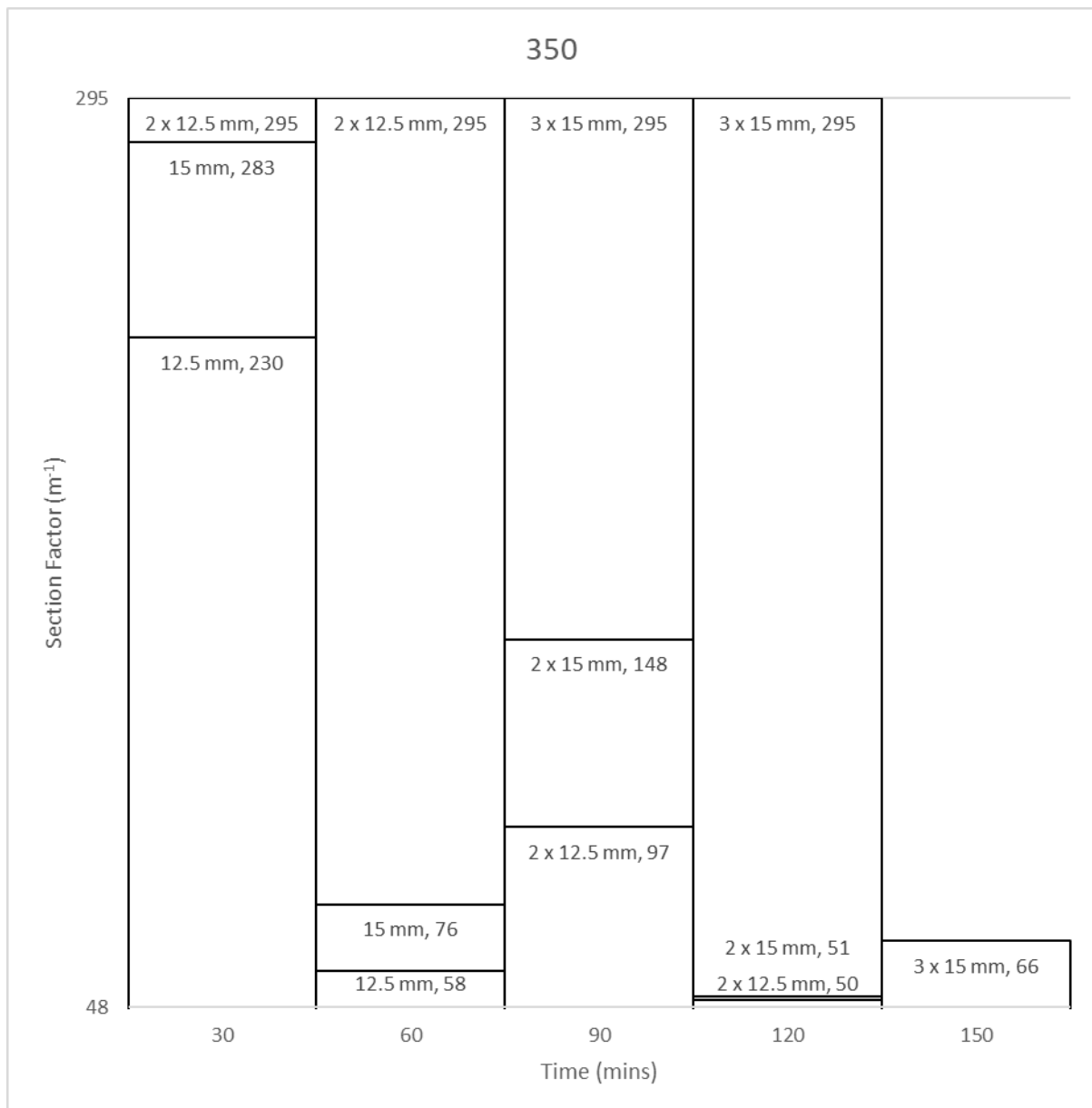
##### 4.2 Classification

The element, GypLyner Encase steel protection system clad with a single, double or triple layer of Gyproc FireLine, is classified according to the following combinations of performance parameters and classes as appropriate.

R	E	I	W		t	t	-	M	S	C	IncSlow	sn	ef	r	G	K
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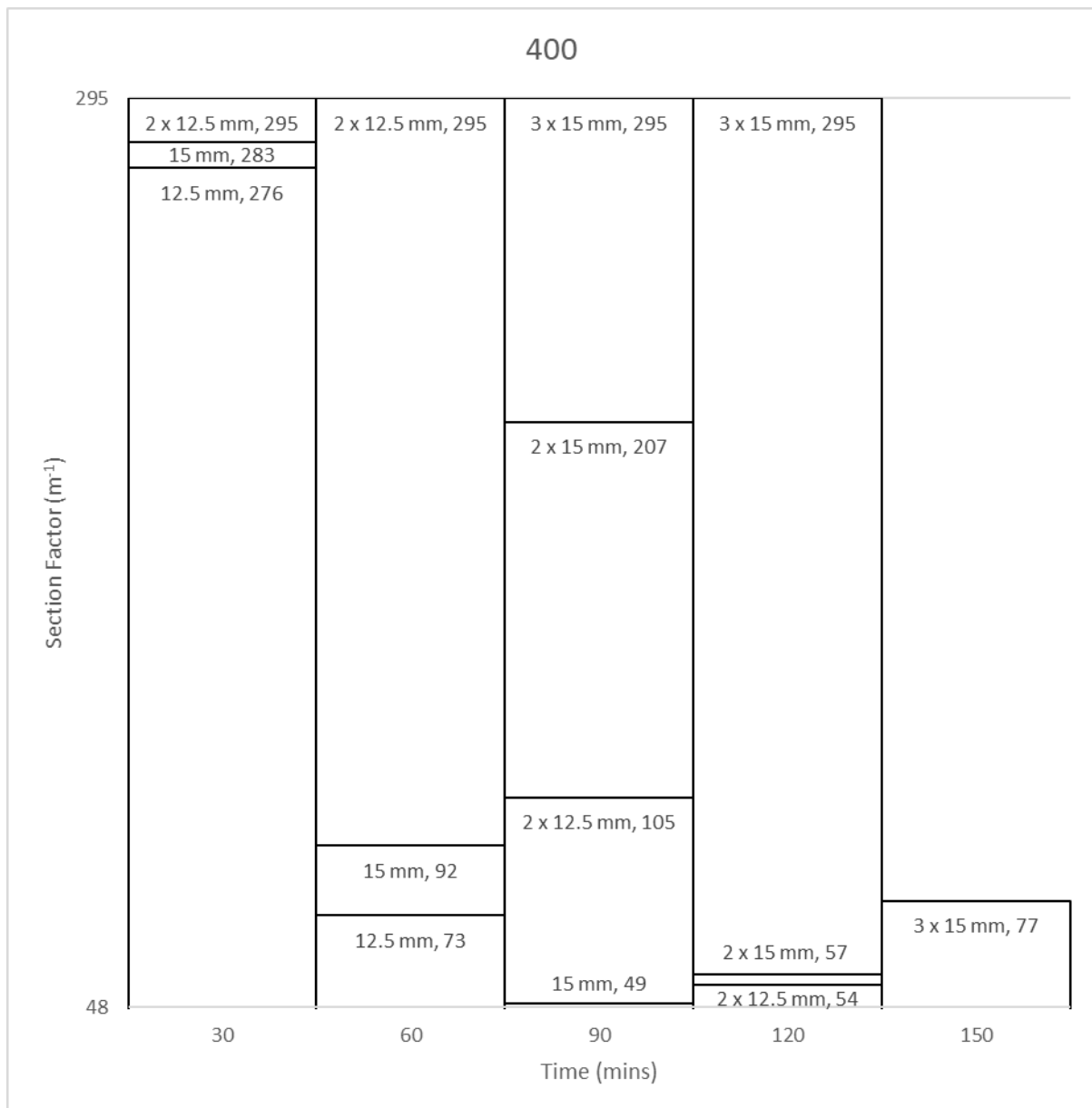
**Fire resistance classification: R (see Figures 2-11)**

### 350°C A/V TABLE



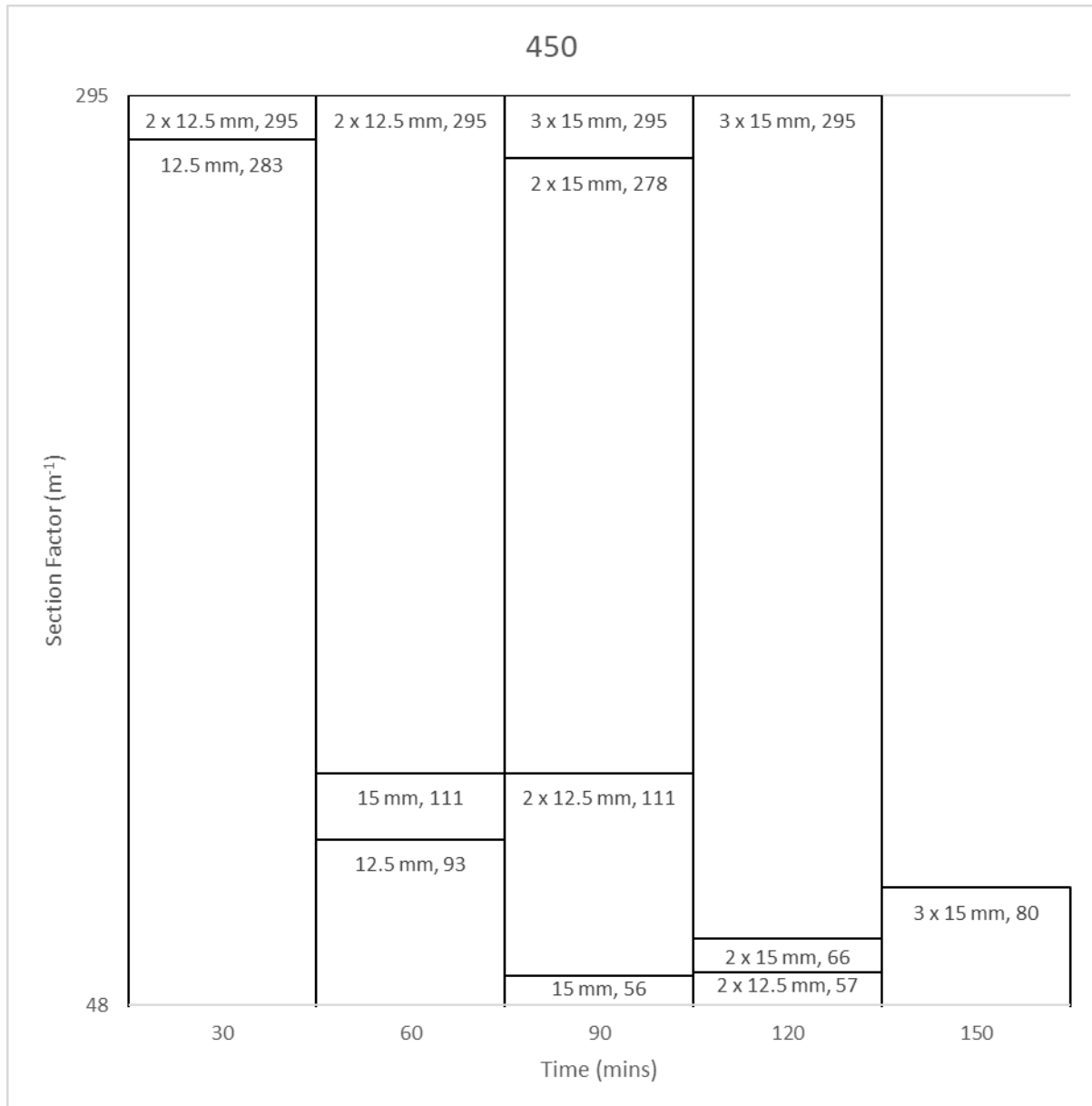
**Figure 2.** 350°C A/V table.

### 400°C A/V TABLE



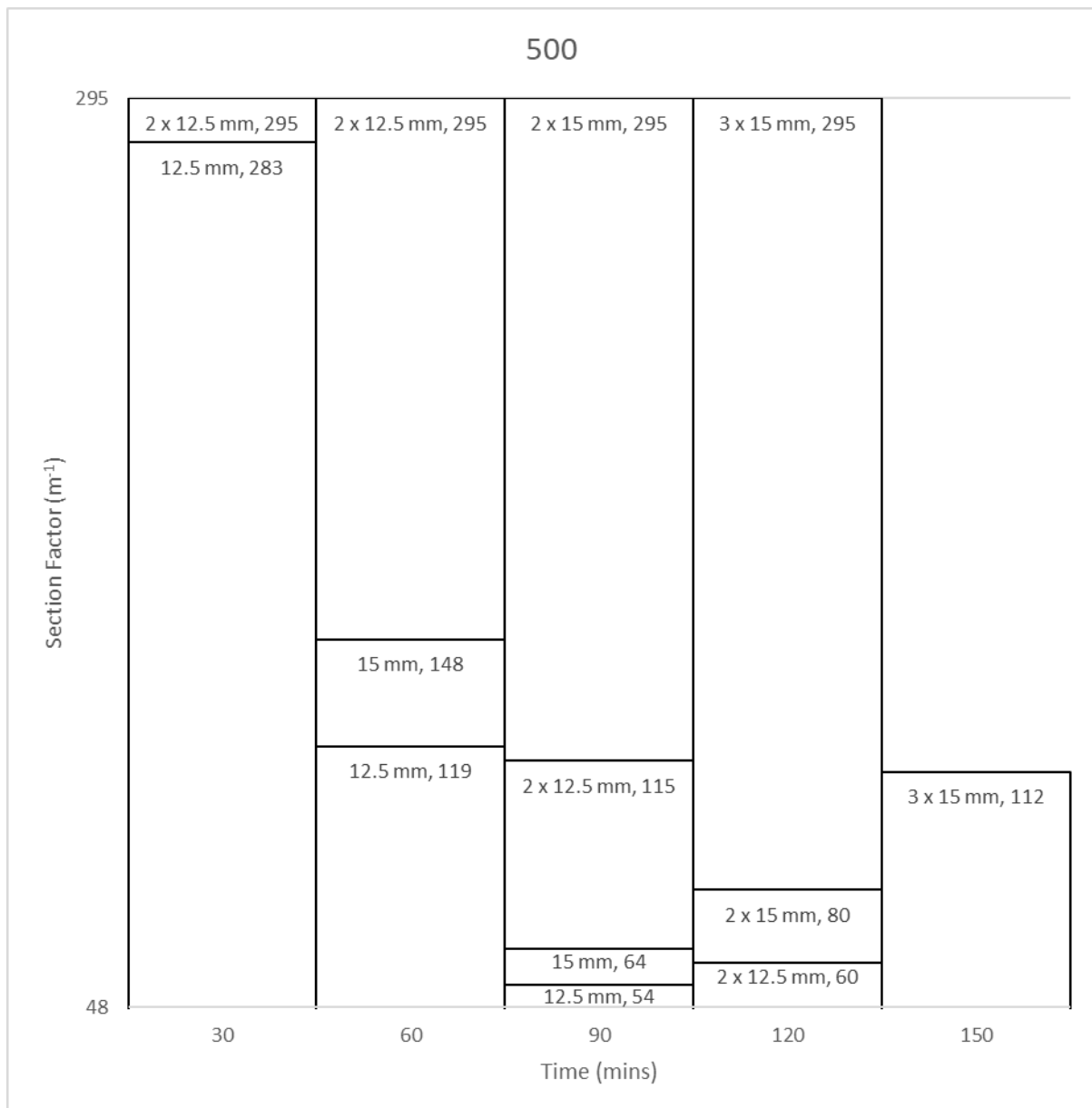
**Figure 3.** 400°C A/V table.

### 450°C A/V TABLE



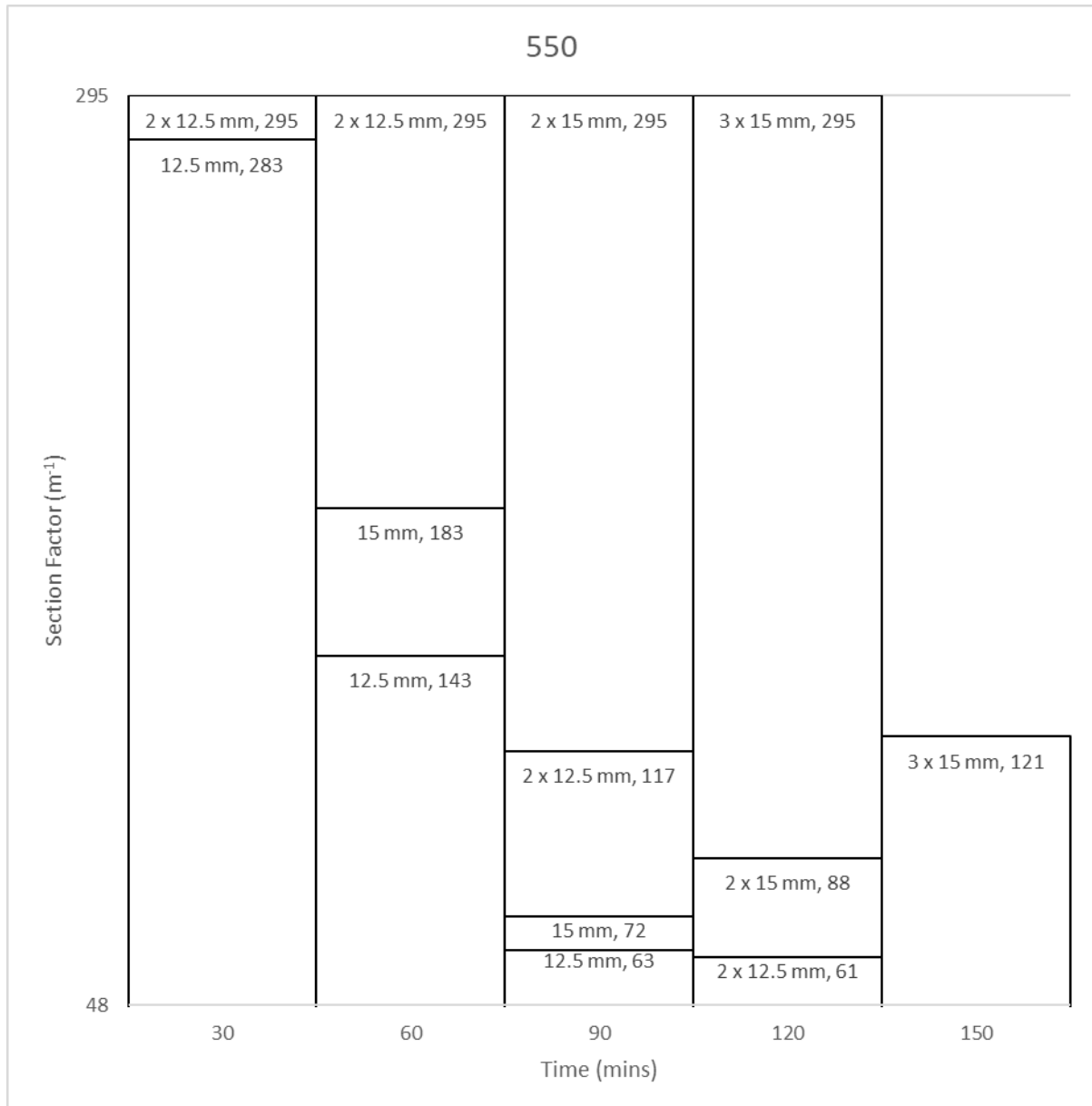
**Figure 4.** 450°C A/V table.

### 500°C A/V TABLE



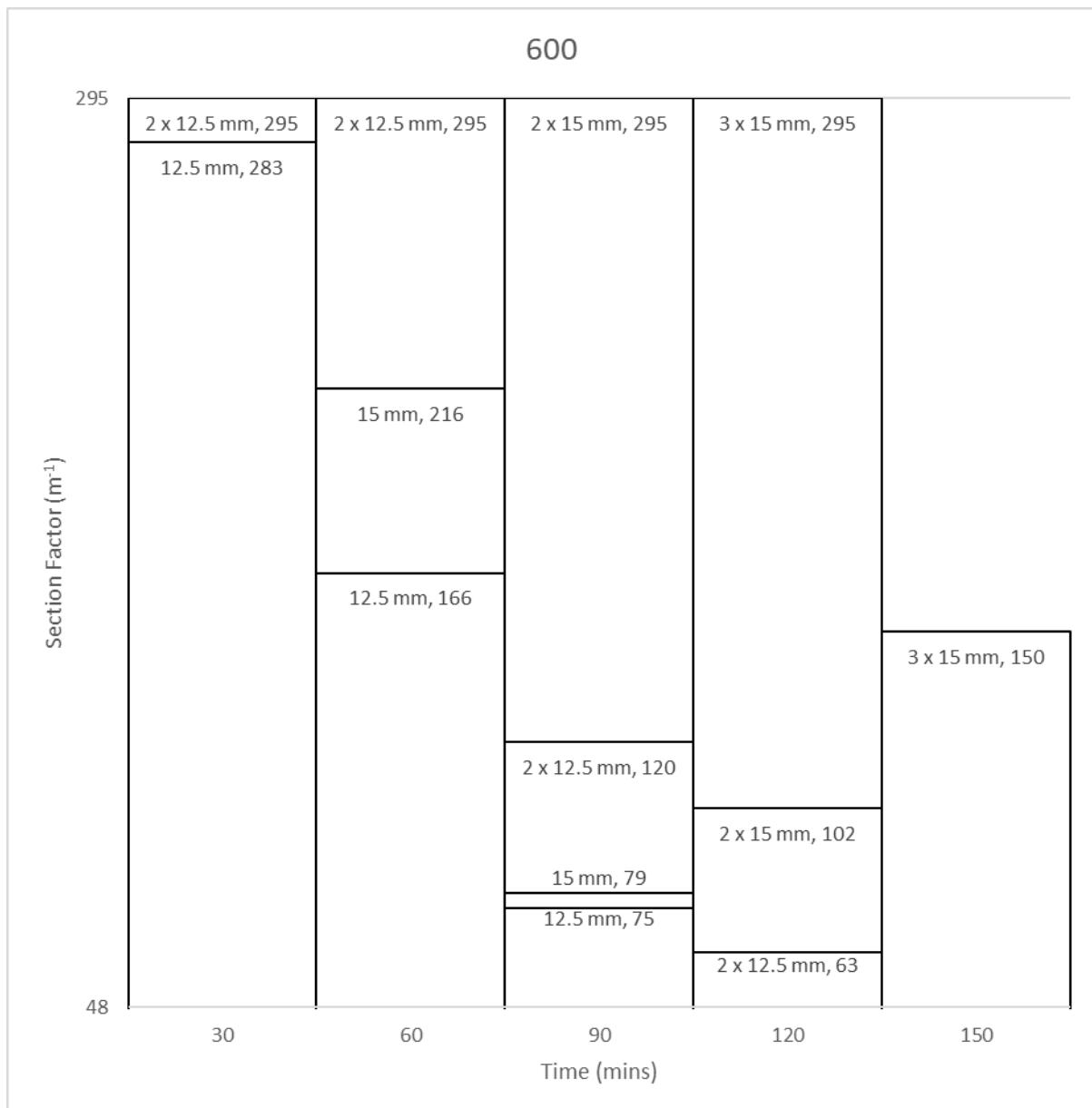
**Figure 5.** 500°C A/V table.

### 550°C A/V TABLE



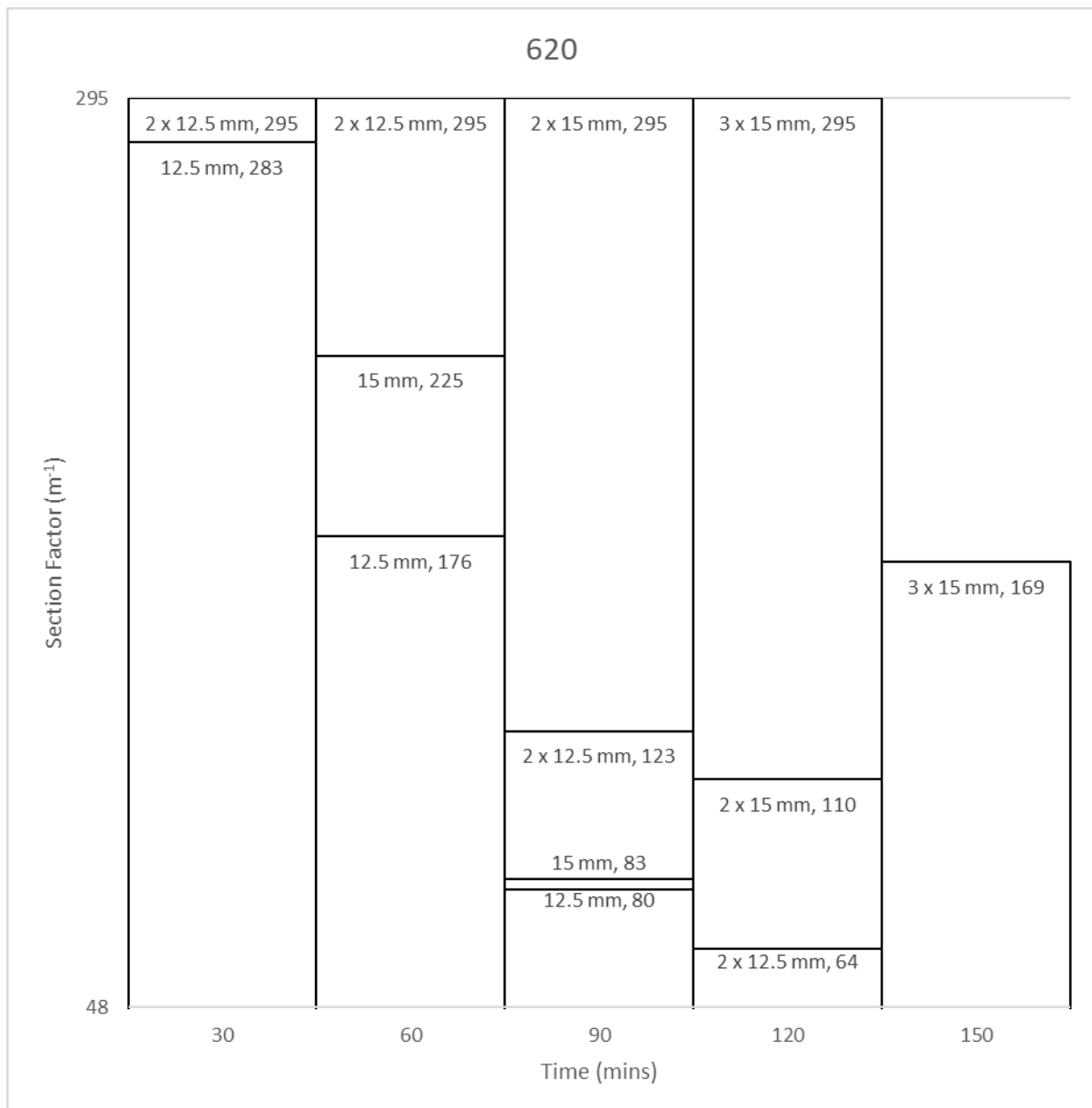
**Figure 6.** 550°C A/V table.

### 600°C A/V TABLE



**Figure 7.** 600°C A/V table.

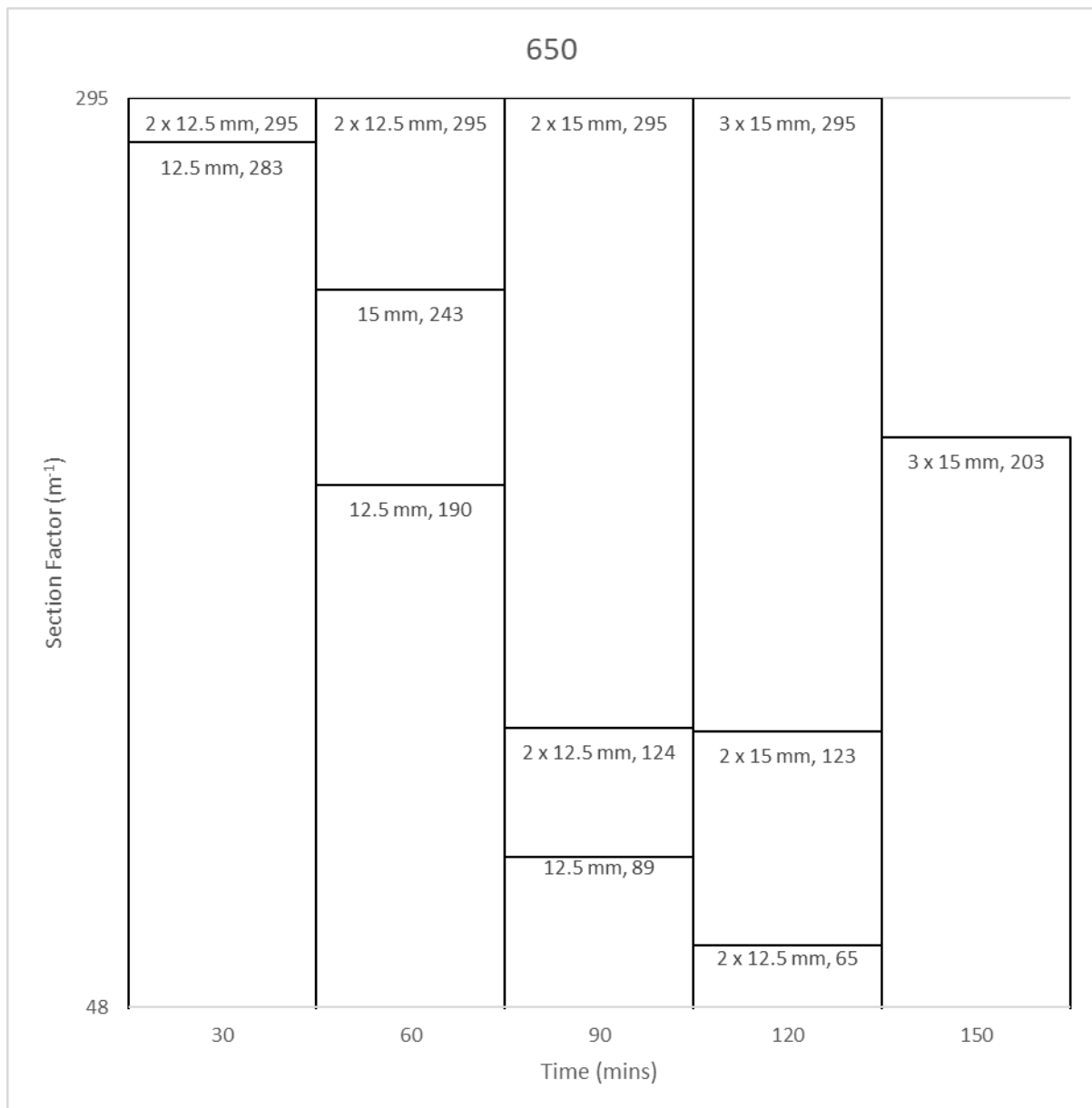
### 620°C A/V TABLE



**Figure 8.** 620°C A/V table.

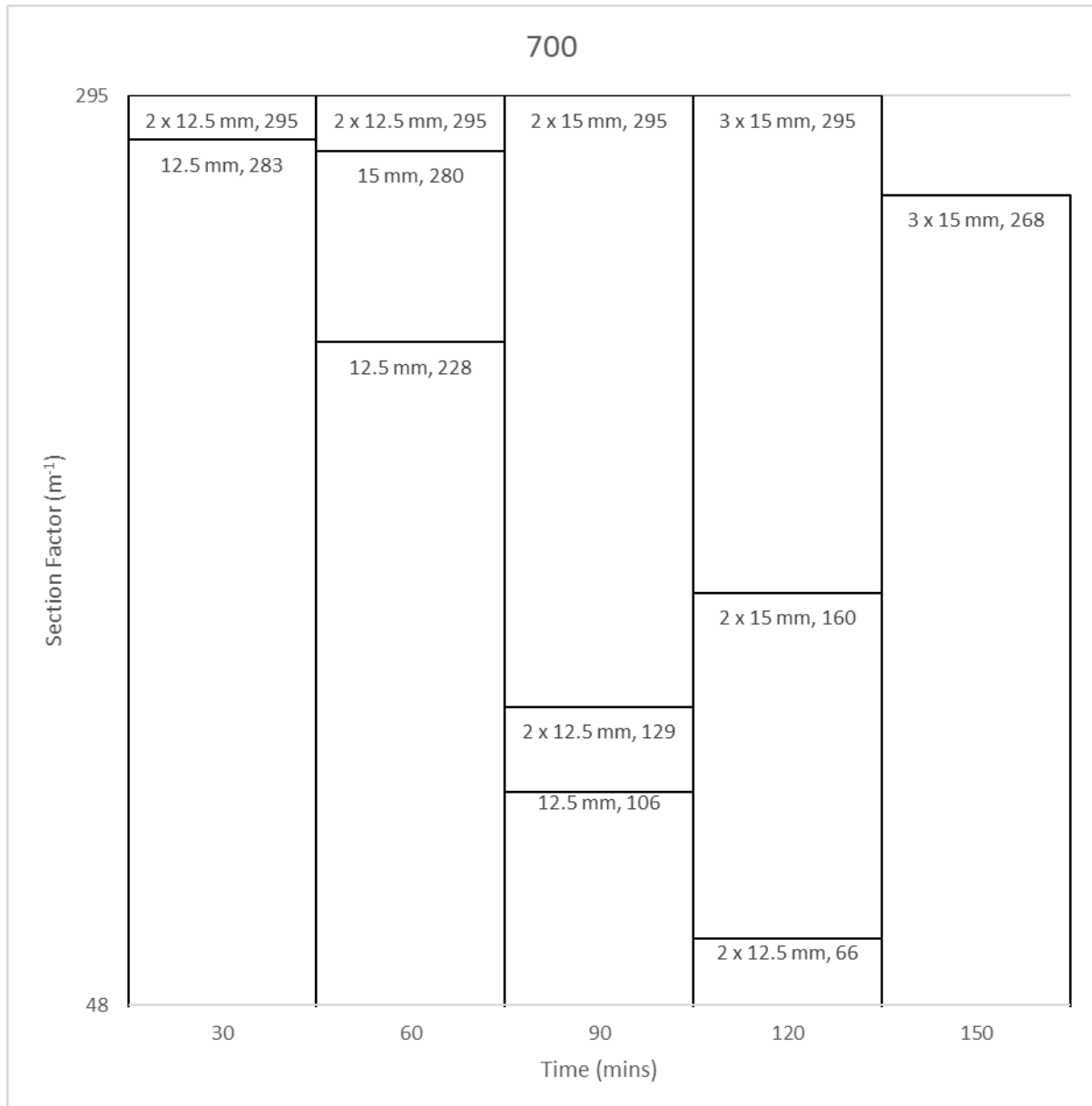


### 650°C A/V TABLE



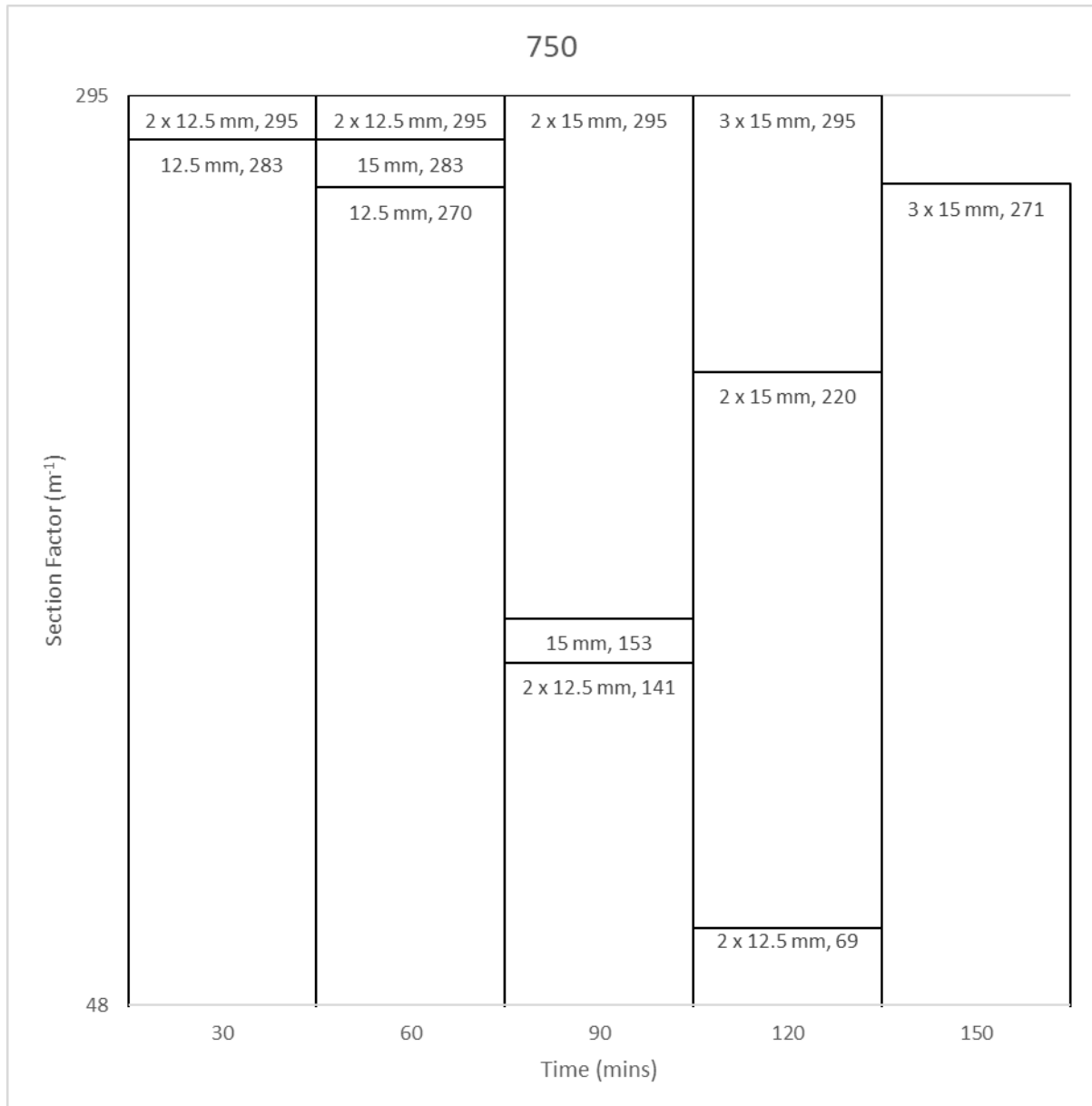
**Figure 9.** 650°C A/V table.

### 700°C A/V TABLE



**Figure 10.** 700°C A/V table.

### 750°C A/V TABLE



**Figure 11.** 750°C A/V table.

### 4.3 Field of Direct Application

This classification is valid for any of the following end use applications, as specified in BS EN 13381-4: 2013.

#### Boxed systems

No change in thickness is required, i.e. the thickness for a structural hollow section of a given A/V value is equal to that for the 'I' or 'H' section of the same 'box' A/V value.

#### Profiled systems

For profiled systems, a correction to the thickness is required; see BS EN 13381-4:2013 Annex A.3.

The rules outlined above may be used providing that the different section shape does not require new fixing techniques and does not affect the physical performance of the fire protection system.

## 5. Limitations

This classification document does not represent type approval or certification of the product.

## 6. Authorisation

SIGNED



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### 7. Report Amendments

Page	Amendments	Date
1	Report amendment title added to title page	08/08/23
2	Contents page updated	08/08/23
1-21	Page numbers updated	08/08/23
3	Figures updated to include single layer	08/08/23
1, 3, 9	Product name updated to include both single and multiple layers of Gyproc FireLine	08/08/23
4, 5, 6	Description updated to include single layer of both 12.5 mm and 15 mm Gyproc FireLine	08/08/23
7	Test reports used updated to include single layer test reports	08/08/23
8	Single layer test results added to table	08/08/23
9	Figure numbers corrected from 10 to 11	08/08/23
10-19	Figures updated to include single layer plots	08/08/23
21	Report amendment table added and updated	08/08/23

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