

Title:

EXTENDED APPLICATION
REPORT IN ACCORDANCE
WITH EN/TS 15117: 2005 and
EN 15725: 2010.

Product Name:

"Proteus SP"

Report No:

WF 503706

Issue No:

1

Prepared for:

Proteus Facades

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Date:

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1. Introduction

This report extends the field of application of test results obtained for “Proteus SP”, a range of faced spandrel panels with Rockwool insulated core. Extended application enables the prediction of fire performance, on the basis of one or more test results to the same test standards and enables the classification of product ranges and product families.

2. Details of Product Family

A product family is a group of products, which differ only in aspects that do not influence the properties required in the relevant product standard and, if relevant, end-use parameters, for which the reaction to fire performance remains unchanged (i.e. does not get worse).

The product family for which extended application is to be used is “Proteus SP”, a range of faced spandrel panels with Rockwool insulated core. The product properties which vary within this family of products are;

- Facing: PPC Steel, PPC Aluminium, Ceramic, Glass
- Insulation Thickness: 20 – 200mm
- Reverse Face: Greencoat Hirc, PPC Aluminium, PPC Steel, Polyester coated Aluminium

These properties were assessed to determine their influence on the fire performance of the product when tested in accordance with EN 13823:2020 and EN ISO 1716:2002, EN ISO 1716:2010, EN ISO 1716:2013, EN ISO 1716:2018, and classified in accordance with EN 13501-1: 2018.

2.1 Product description

The product family, “Proteus SP”, a range of faced spandrel panels with Rockwool insulated core, is fully described below and in the test reports provided in support of classification listed in Clause 3.1.

General description		Polyester powder coated steel/ceramic/polyester powder coated aluminium/glass faced spandrel panel with Rockwool insulated core structurally bonded to a lightweight metal rear skin to be used within a curtain wall system.
Product reference of system		“Proteus SP – PPC Steel”, “Proteus SP – CX”, “Proteus SP – PPC Aluminium”, “Proteus SP – GL”
Overall thickness of composite		21.4mm - 210mm (stated by sponsor)
Overall weight per unit area of composite		8.26kg/m ² – 76.76kg/m ² (stated by sponsor)
Coating for Steel and Aluminium (Front face)	Product reference	“Interpon Polyester”
	Generic type	Polyester powder coating
	Name of manufacturer	Akzo Nobel Powder Coatings SNC
	Colour	“White”
	Number of coats	One
	Application thickness	60-90 microns
	Weight per unit area	0.14 kg/m ²
	Application method	See Note 1 below
	Curing process	See Note 1 below
Flame retardant details	See Note 1 below	

Steel panel (facing type 1)	Product reference	"Zinc Galvanised Steel"		
	Generic type	Hot-dip galvanised steel		
	Name of manufacturer	See Note 2 below		
	Thickness	0.7 - 3mm		
	Weight per unit area	5.50 - 24kg/m ²		
	Flame retardant details	Inherently flame retardant		
Aluminium panel (facing type 2)	Product reference	"1050"		
	Generic type	Aluminium		
	Name of manufacturer	See Note 2 below		
	Thickness	0.9 - 5mm		
	Weight per unit area	2.47 – 13.5kg/m ²		
	Flame retardant details	Inherently flame retardant		
Ceramic panel (facing type 3)	Product reference	"Kerlite"		
	Generic type	Porcelain stoneware		
	Name of manufacturer	Cotto D'Este		
	Thickness	3mm		
	Weight per unit area	6.9kg/m ²		
	Flame retardant details	Inherently flame retardant		
Backcoated Glass Panel (facing type 4)	Glass	Product reference	"Lacobel T"	
		Generic type	Toughened back painted glass	
		Name of manufacturer	AGC	
		Thickness	4mm	
		Weight per unit area	10kg/m ²	
		Flame retardant details	Inherently flame retardant	
	Backcoating	Product reference	"Lacobel T"	
		Generic type	Toughened glass paint	
		Name of manufacturer	AGC	
		Colour	"Black"	
		Thickness	≤ 1mm	
		Weight per unit area	See Note 1 below	
		Application rate	See Note 2 below	
		Application method	See Note 2 below	
		Curing process	Fired into glass surface during toughening process (temp ≥600°C)	
		Flame retardant details	Inherently flame retardant	
		Adhesive for facing	Product reference	"Solfre 2"
			Generic type	Two-part polyurethane adhesive
Name of manufacturer	Chemique Adhesives			
Thickness	<1mm			
Weight per unit area	200g/m ²			
Curing process	Heat cured at 50°C			
Core	Product reference	"Fabrock Clad"		
	Generic type	Rockwool		
	Name of manufacturer	Rockwool		
	Thickness	20 - 200mm		
	Weight per unit area	2.4 - 24kg/m ²		
	Flame retardant details	See Note 2 below		

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Edging	Product reference	"Fabrock Hard"	
	Generic type	Rockwool	
	Name of manufacturer	Rockwool	
	Thickness	20mm	
	Weight per unit area	4kg/m ²	
	Flame retardant details	See Note 2 below	
Adhesive for facing	Product reference	"Solfre 2"	
	Generic type	Two-part polyurethane adhesive	
	Name of manufacturer	Chemique Adhesives	
	Thickness	<1mm	
	Weight per unit area	200g/m ²	
	Curing process	Heat cured at 50°C	
	Flame retardant details	See Note 2 below	
Backing Type 1 (PPC Steel, Ceramic Glass)	Coating	Product reference	"Greencoat Hirac"
		Generic type	Epoxy
		Name of manufacturer	SSAB
		Number of coats	Two
		Application thickness	12µm
		Application method	See Note 1 below
		Curing process	See Note 1 below
		Flame retardant details	See Note 1 below
	Panel	Product reference	"Greencoat Hirac"
		Generic type	Zinc galvanised steel with PVDF coating
		Name of manufacturer	SSAB
		Thickness	0.7mm
		Weight per unit area	5.50kg/m ²
		Flame retardant details	Inherently flame retardant
	Coating	Product reference	"Greencoat Hirac"
		Generic type	PVDF
		Name of manufacturer	SSAB
		Colour	"White"
		Number of coats	Two
		Application thickness	35 microns
		Application method	See Note 1 below
Curing process		See Note 1 below	
	Flame retardant details	See Note 1 below	

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Backing type 2 (PPC Aluminium)	Panel	Product reference	"1050"
		Generic type	Aluminium
		Name of manufacturer	See Note 1 below
		Thickness	5mm
		Weight per unit area	13.5kg/m ²
		Flame retardant details	Inherently flame retardant
	Coating	Product reference	"Interpon Polyester"
		Generic type	Polyester powder coating
		Name of manufacturer	Akzo Nobel Powder Coatings SNC
		Colour	"White"
		Number of coats	One
		Application thickness	60-90 microns
		Application method	See Note 1 below
		Curing process	See Note 1 below
Flame retardant details	See Note 1 below		
Backing type 3 (PPC Steel)	Panel	Product reference	"Zinc Galvanised Steel"
		Generic type	Hot-dip galvanised steel
		Name of manufacturer	See Note 2 below
		Thickness	3mm
		Weight per unit area	24kg/m ²
		Flame retardant details	Inherently flame retardant
	Coating	Product reference	"Interpon Polyester"
		Generic type	Polyester powder coating
		Name of manufacturer	Akzo Nobel Powder Coatings SNC
		Colour	"White"
		Number of coats	One
		Application thickness	60-90 microns
		Application method	See Note 1 below
		Curing process	See Note 1 below
Flame retardant details	See Note 1 below		

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Backing type 4 (PPC Aluminium)	Coating	Product reference	"Eurabuild Polyester"
		Generic type	Epoxy-polyester backcoat
		Name of manufacturer	Euramax Coated Products BV
		Colour	Grey
		Number of coats	One
		Application thickness	5 microns
		Application method	See Note 1 below
		Curing process	See Note 1 below
		Flame retardant details	See Note 1 below
	Panel	Product reference	"Eurabuild Polyester Coated Aluminium Sheet"
		Generic type	Aluminium
		Name of manufacturer	Euramax Coated Products BV
		Thickness	0.9mm
		Weight per unit area	2.55kg/m ²
	Coating	Flame retardant details	Inherently flame retardant
		Product reference	"Eurabuild Polyester"
		Generic type	Polyester
		Name of manufacturer	Euramax Coated Products BV
		Colour	"White"
		Number of coats	Two
		Application thickness	23 microns
		Application method	See Note 1 below
		Curing process	See Note 1 below
	Flame retardant details	See Note 1 below	
Mounting and fixing details		<p>Products have been tested with an 80mm ventilated cavity as well as no ventilated cavity. The lack of a ventilated cavity was a result of testing the maximum possible thickness of insulation.</p> <p>Where a cavity was in situ, the cavity was situated between the reverse face of the specimens and the calcium silicate substrate as defined in EN 13238:2010.</p>	
Brief description of manufacturing process of panel		Adhesive is applied to a preformed steel front skin and a preformed steel rear skin and sandwich assembled with insulation core and hard insulation perimeter frame. Panel is then bonded under pressure at 55°C.	

Note 1: The sponsor was unable to provide this information.

Note 2: The sponsor was unwilling to provide this information.

3. Test reports / classification reports & test results in support of classification

3.1 Test reports / classification reports

Name of Laboratory	Name of sponsor	Test reports/extended application report Nos.	Test method / extended application rules & date
Warringtonfire	Proteus Facades	WF 398914 (issue 2),	EN ISO 1716: 2010 Composite Report
Warringtonfire	ame Facade Engineering Limited	WF 193845	EN ISO 1716: 2002
Warringtonfire	Proteus Facades	WF 502584	EN ISO 1716: 2018
MPA	Rockwool	231001026-2	EN ISO 1716: 2018
CSTB	AkzoNobel Powder Coatings	RA 18-0083	EN ISO 1716:2013
VTT Expert Services Ltd	Rautaruukki Oyj	VTT-S-2032-14	EN ISO 1716: 2010
Warringtonfire	Proteus Facades	WF 435960 (Issue 2) (full) WF 435089 (Issue 2), 435090, 435091 (Issue 2), 435092 (Issue 2), 435957 (Issue 2), 435958, 435961 (Issue 2), 435962 (Issue 2), 435963 (Issue 2), 435964 (Issue 2), 435965 (Issue 2)	EN 13823: 2020
Bodycote	Euramax Coated Products BV	WF 177459, WF 180158	EN ISO 1716: 2002
Warringtonfire	Proteus Facades	WF 503705	EN 13501-1:2018

3.2 Test results

Test method & test number	Parameter	No. tests	Results	
			Continuous parameter - mean (m)	Compliance parameters
EN 13823: 2020	FIGRA _{0.2MJ}	Indicative 1 – PPC Alu WF 435089	34.57 W/s	Compliant
		Indicative 2 – PPC Alu WF 435090	0.00 W/s	
		Indicative 3 – PPC Alu WF 435091	41.99 W/s	
		Indicative 4 – PPC Alu WF 435092	4.44 W/s	
		Indicative 5 – PPC Steel WF 435957	76.72 W/s	
		Indicative 6 – PPC Steel WF 435958	0.00 W/s	
		Indicative 7 – PPC Steel WF 435961	5.75 W/s	
		Indicative 8 – CX WF 435962	16.22 W/s	
		Indicative 9 – CX WF 435963	49.56 W/s	
		Indicative 10 – GL WF 435964	22.42 W/s	
		Indicative 11 – GL WF 435965	0.00 W/s	
		Formal test average WF 435960	49.78 W/s	
	FIGRA _{0.4MJ}	Indicative 1 – PPC Alu WF 435089	0.00 W/s	Compliant
		Indicative 2 – PPC Alu WF 435090	0.00 W/s	
		Indicative 3 – PPC Alu WF 435091	0.00 W/s	
		Indicative 4 – PPC Alu WF 435092	4.44 W/s	
		Indicative 5 – PPC Steel WF 435957	45.54 W/s	
		Indicative 6 – PPC Steel WF 435958	0.00 W/s	
		Indicative 7 – PPC Steel WF 435961	5.75 W/s	
		Indicative 8 – CX WF 435962	14.91 W/s	

		Indicative 9 – CX WF 435963	0.00 W/s		
		Indicative 10 – GL WF 435964	0.00 W/s		
		Indicative 11 – GL WF 435965	0.00 W/s		
		Formal test average WF 435960	37.09 W/s		
	THR _{600s}		Indicative 1 – PPC Alu WF 435089	0.65 MJ	Compliant
			Indicative 2 – PPC Alu WF 435090	0.39 MJ	
			Indicative 3 – PPC Alu WF 435091	0.95 MJ	
			Indicative 4 – PPC Alu WF 435092	0.68 MJ	
			Indicative 5 – PPC Steel WF 435957	1.28 MJ	
			Indicative 6 – PPC Steel WF 435958	0.49 MJ	
			Indicative 7 – PPC Steel WF 435961	1.10 MJ	
			Indicative 8 – CX WF 435962	0.89 MJ	
			Indicative 9 – CX WF 435963	0.98 MJ	
			Indicative 10 – GL WF 435964	0.78 MJ	
			Indicative 11 – GL WF 435965	0.52 MJ	
			Formal test average WF 435960	1.07 MJ	
			LFS		
	Indicative 2 – PPC Alu WF 435090	None			
	Indicative 3 – PPC Alu WF 435091	None			
	Indicative 4 – PPC Alu WF 435092	None			
Indicative 5 – PPC Steel WF 435957	None				
Indicative 6 – PPC Steel WF 435958	None				
Indicative 7 – PPC Steel WF 435961	None				
Indicative 8 – CX WF 435962	None				
Indicative 9 – CX WF 435963	None				
Indicative 10 – GL	None				

		WF 435964		
		Indicative 11 – GL WF 435965	None	
		Formal test average WF 435960	None	
	SMOGRA	Indicative 1 – PPC Alu WF 435089	0.00 m ² /s ²	Compliant
		Indicative 2 – PPC Alu WF 435090	0.00 m ² /s ²	
		Indicative 3 – PPC Alu WF 435091	0.00 m ² /s ²	
		Indicative 4 – PPC Alu WF 435092	0.00 m ² /s ²	
		Indicative 5 – PPC Steel WF 435957	0.00 m ² /s ²	
		Indicative 6 – PPC Steel WF 435958	0.00 m ² /s ²	
		Indicative 7 – PPC Steel WF 435961	0.00 m ² /s ²	
		Indicative 8 – CX WF 435962	0.00 m ² /s ²	
		Indicative 9 – CX WF 435963	0.00 m ² /s ²	
		Indicative 10 – GL WF 435964	0.00 m ² /s ²	
		Indicative 11 – GL WF 435965	0.00 m ² /s ²	
		Formal test average WF 435960	2.06 m ² /s ²	
		TSP _{600s}	Indicative 1 – PPC Alu WF 435089	
	Indicative 2 – PPC Alu WF 435090		10.86 m ²	
	Indicative 3 – PPC Alu WF 435091		38.05 m ²	
	Indicative 4 – PPC Alu WF 435092		7.11 m ²	
	Indicative 5 – PPC Steel WF 435957		27.26 m ²	
	Indicative 6 – PPC Steel WF 435958		19.51 m ²	
	Indicative 7 – PPC Steel WF 435961		17.52 m ²	
	Indicative 8 – CX WF 435962		21.13 m ²	
	Indicative 9 – CX WF 435963		19.29 m ²	
	Indicative 10 – GL WF 435964		20.78m ²	
	Indicative 11 – GL WF 435965		10.10m ²	

		Formal test average WF 435960	31.84 m ²	
Flaming of Fallen Particle Exceeding 10s?	Indicative 1 – PPC Alu WF 435089	None		Compliant
	Indicative 2 – PPC Alu WF 435090	None		
	Indicative 3 – PPC Alu WF 435091	None		
	Indicative 4 – PPC Alu WF 435092	None		
	Indicative 5 – PPC Steel WF 435957	None		
	Indicative 6 – PPC Steel WF 435958	None		
	Indicative 7 – PPC Steel WF 435961	None		
	Indicative 8 – CX WF 435962	None		
	Indicative 9 – CX WF 435963	None		
	Indicative 10 – GL WF 435964	None		
	Indicative 11 – GL WF 435965	None		
EN ISO 1716 (PPC Steel front face, PVDF coated steel backing)	PPC Coating - PCS (b)	3	3.1MJ/m ²	-
	Steel - PCS (a)	Deemed to satisfy (0.00)		-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Epoxy Coating – PCS (d)	3	0.35 MJ/m ²	-
	Internal non substantial – PCS (d)	3.11 MJ/m ²		-
	Steel - PCS (a)	Deemed to satisfy (0.00)		-
	PVDF Reverse coating - PCS (b)	3	0.86 MJ/m ²	-
For the product as a whole PCS (e)	Summary result	1.15 MJ/Kg	-	
EN ISO 1716 (PPC Aluminium front face, PPC aluminium backing)	PPC Coating - PCS (b)	3	3.1 MJ/m ²	-
	Aluminium - PCS (a)	Deemed to satisfy (0.00)		-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Aluminium - PCS (a)	Deemed to satisfy (0.00)		-
	PPC Reverse coating - PCS (b)	3	3.1 MJ/m ²	-

	For the product as a whole PCS (e)	Summary result	0.98 MJ/Kg	-
EN ISO 1716 (Ceramic front face, PVDF Steel backing)	Ceramic - PCS (a)	3	0.11 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Epoxy Coating – PCS (d)	3	0.35 MJ/m ²	-
	Internal non substantial – PCS (d)	3.11 MJ/m ²		-
	Steel - PCS (a)	Deemed to satisfy (0.00)		-
	PVDF Reverse coating - PCS (b)	3	0.86 MJ/m ²	-
	For the product as a whole PCS (e)	Summary result	1.0 MJ/Kg	-
EN ISO 1716 (Glass front face, PVDF steel backing)	Glass - PCS (a)	Deemed to satisfy (0.00)		-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Epoxy Coating – PCS (d)	3	0.35 MJ/m ²	-
	Internal non substantial – PCS (d)	3.11 MJ/m ²		-
	Steel- PCS (a)	Deemed to satisfy (0.00)		-
	PVDF Reverse coating - PCS (b)	3	0.86 MJ/m ²	-
	For the product as a whole PCS (e)	Summary result	0.95 MJ/Kg	-
EN ISO 1716 (PPC Steel front face, PPC steel backing)	PPC Coating - PCS (b)	3	3.1 MJ/m ²	-
	Steel - PCS (a)	Deemed to satisfy (0.00)		-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Steel - PCS (a)	Deemed to satisfy (0.00)		-
	PPC Reverse coating - PCS (b)	3	3.1 MJ/m ²	-
	For the product as a whole PCS (e)	Summary result	0.79 MJ/Kg	-

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EN ISO 1716 (PPC Aluminium front face, Eurabuild aluminium backing)	PPC Coating - PCS (b)	3	3.1 MJ/m ²	-
	Aluminium - PCS (a)	Deemed to satisfy (0.00)		-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Core - PCS (a)	3	1.3 MJ/Kg	-
	Adhesive - PCS (d)	3	2.76 MJ/m ²	-
	Backcoat – PCS (d)	3	0.17 MJ/m ²	-
	Internal non-substantial – PCS (d)	2.93 MJ/m ²		-
	Aluminium - PCS (a)	Deemed to satisfy (0.00)		-
	Eurabuild Reverse coating - PCS (b)	3	0.894 MJ/m ²	-
	For the product as a whole PCS (e)	Summary result	1.00 MJ/Kg	-
	Overall Product Range PCS (e)		0.79 – 1.15 MJ/kg	

4. Classification and field of application

4.1 Definition of Limits of Extended Application

Twelve tests were conducted in accordance with EN 13823, eleven indicative and one formal, and seven in accordance with EN ISO 1716. The initial assessment of this product family was conducted, and the data generated has been used to determine which product specifications gave the worst performance. Initially, indicative EN 13823 testing was conducted on all facings at both the thinnest and thickest panel specifications. The specification with the worst set of results was tested formally in accordance with EN 13823. The component parts were also tested to EN ISO 1716 where applicable.

The EN 13823 reports covering the specific systems are as follows:

- PPC steel front face with PVDF steel backing: WF 435960, WF 435957
- PPC aluminium front face with PPC aluminium backing: WF 435092, WF 435090
- Ceramic front face with PVDF steel backing: WF 435963, WF 435962
- Glass front face with PVDF steel backing: WF 435965, WF 435964
- PPC steel front face with PPC steel backing: WF 435958, WF 435961
- PPC aluminium front face with polyester aluminium backing: WF 435091, WF 435089

4.2 EN ISO 1716

In order to classify the product to A2 in accordance with EN 13501-1 the component parts were tested in accordance with EN ISO 1716 and the values obtained through this testing were used to calculate the overall PCS of the system. All components of the system and overall systems fall within the values for A2 classification.

4.3 EN 13823: 2020

The SBI test measures the following fire parameters, Fire Growth Rate (FIGRA), Total Heat Release (THR600s), Smoke Growth Rate (SMOGRA) and Total Smoke Production (TSP600s).

These parameters were evaluated to assess what influence the product variations have on the fire performance of "Proteus SP", a range of faced spandrel panels with Rockwool insulated core. This evidence is shown in Figures 1 and 2.

The highest FIGRA value was at least 36% below the maximum value allowed for Class A2, (EN 13501-1). The highest THR600s value was at least 83% below the maximum value allowed for Class A2, (EN 13501-1: 2018).

The measured results relating to smoke parameters, SMOGRA and TSP600s, also fall within the s1 criteria, with the highest smoke value being approximately 24% below the maximum allowed for s1, (EN 13501-1).

In no instance were flaming droplets/particles in evidence during the fire tests.

4.4 Reference of classification

This classification has been carried out in accordance with EN 13501-1:2018, EN/TS 15117: 2005 and EN 15725: 2010.

4.5 Classification

The products, "Proteus SP", a range of faced spandrel panels with Rockwool insulated core, in relation to their reaction to fire behaviour are classified:

A2

The additional classification in relation to smoke production is:

s1

The additional classification in relation to flaming droplets / particles is:

d0

The format of the reaction to fire classification for construction applications, excluding flooring and linear pipe thermal insulation is:

Fire Behaviour		Smoke Production			Flaming Droplets	
A2	-	s	1	,	d	0

i.e. A2 – s1 , d0

Reaction to fire classification: A2– s1,d0

4.6 Extended Field of application

This classification is valid for the following end use applications:

- i) Free standing construction applications
- ii) Construction applications mounted with no airspace or with a minimum airspace of 80mm over any substrate with a density equal to or greater than 870kg/m³, having a minimum thickness of 9mm and a fire performance of A2-s1,d0 or better (excluding paper faced gypsum plasterboard).

This classification is also valid for the following product parameters:

Product thickness	21.4mm – 210mm
Insulation thickness	20mm – 200mm
Product weight per unit area	No variation allowed
Product colour/pattern	No variation allowed
Product composition	No variation allowed
Product construction	Permitted product variations: PPC steel front face (test face) with PVDF steel backing PPC aluminium front face (test face) with PPC aluminium backing Ceramic front face (test face) with PVDF steel backing Glass front face (test face) with PVDF steel backing PPC steel front face (test face) with PPC steel backing PPC aluminium front face (test face) with Polyester aluminium backing

5. Limitations

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

SIGNED



.....
Katie Williams
Certification Engineer
Technical Department

APPROVED



.....
Stacey Deeming
Principal Engineer
Technical Department
on behalf of **Warringtonfire**

This assessment represents our opinion as to the performance likely to be demonstrated on a test in accordance with EN 13501-1, on the basis of the evidence referred to above. We express no opinion as to whether that evidence, and/or this assessment, would be regarded by any Building Control authority as sufficient for that or any other purpose. This assessment is provided to the client for its own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.

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Figure 1 - Effect of varying the product specification on FIGRA and TSP600s

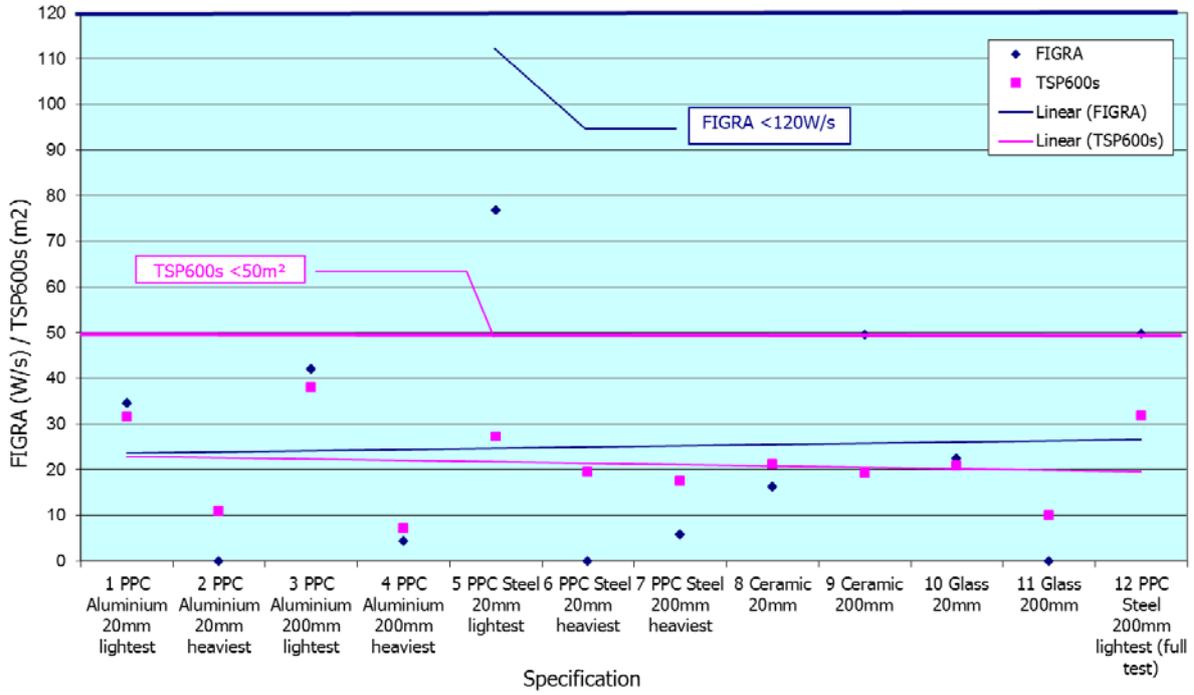


Figure 2 - Effect of varying the product specification on THR600s and SMOGRA

