

European Technical Assessment

**ETA-21/1097
of 10/01/2022**

English translation prepared by CSTB - Original version in French language

General Part

Nom commercial
Trade name

PROTEC® FLAMME

Famille de produit
Product family

Produits de protection au feu :
- Enduits projetés et kits d'enduits projetés résistant au feu
Fire protective products
- Renderings and Rendering Kits intended for Fire Resisting Applications

Titulaire
Manufacturer

RUAUD INDUSTRIES
ZI de la Croix Saint-Nicolas
18 rue Gustave Eiffel
94510 LA QUEUE EN BRIE

Usine de fabrication
Manufacturing plants

RUAUD INDUSTRIES
ZI de la Croix Saint-Nicolas
18 rue Gustave Eiffel
94510 LA QUEUE EN BRIE

Cette évaluation contient:
This Assessment contains

36 pages incluant 7 annexes qui font partie intégrante de cette évaluation
36 pages including 7 annexs which form an integral part of this assessment

Base de l'ETE
Basis of ETA

DEE 350140-00-1106
EAD 350140-00-1106

Cette évaluation remplace
This assessment replaces

ETE 11/0495 délivrée le 29/01/2016
ETA 11/0495 issued on 29/01/2016

SPECIFIC PART

1 Technical description of the product

PROTEC® FLAMME fire protective product is a sprayed fibrous product made of :

Biosoluble mineral fibers, white cement, gypsum (calcium hemihydrate).

The nature of building constructions to be protected are concrete structures, steel structures, concrete / profiled sheet steel composite slabs, timber floors.

PROTEC® FLAMME must be applied by using a bonding primer. See the components list in Table 1.1:

Name	Trade reference	Characteristics	Supplier
Primer (corrosion protection)	Alkyd family Epoxy family Galvanised steel		Market
Bonding agent	BRL	150 to 200 g/m ²	RUAUD
Expanded metal rib lath	Galvanised Z275 DX51D steel	Lath: 2510 mmx606 mm Thickness: 0,3 mm	Market
Fixing of expanded metal rib lath	Resined galvanised steel staples	Length : 25 mm Width : 10,5 mm	Market
Protective material	PROTEC® FLAMME	$\rho = (250 + 15\%) \text{ kg/m}^3$ e = 15 to 88 mm	RUAUD

Table 1.1: Component list

The rendering kit comprises the protective material PROTEC® FLAMME and the bonding agent BRL as given in Table 1.1 above, correspond to “Option 2” as described in the foreword in EAD 350140-00-1106. The rendering kit has been evaluated in the end use application, and is covered by CE marking of the kit.

The other additional components are not supplied by the ETA holder and are considered to be a final assembly under as in “Option 3”. Primers (corrosion protection) and a metal rib lath are used for some application of PROTEC® FLAMME. Primers are described in annex 4 and are used with steel structures. Metal rib lath is described in annex 6 and is used with timber structure. They are not part of the kit but have to be considered as additional components in the sense of the Note in the Foreword in EAD 350140-00-1106.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

2.1 Intended use

Related to environmental conditions the rendering product is intended for internal and semi-exposed environmental conditions; use category Type Y , Z1 and Z2 as defined in EAD 350140-00-1106. This includes temperatures below 0 °C, but no exposure to rain and limited exposure to UV.

Related to use categories as defined in EAD 350140-00-1106, Section 1.2.2, the fire protective performance of PROTEC® FLAMME has been assessed for the following applications:

Table 1-2: Intended use category	
Protection of	Reference
Load-bearing concrete elements	Type 3
Load bearing steel elements	Type 4
Load-bearing flat concrete profiled sheet composite elements	Type 5
Load bearing timber floors (not covered by types 1 – 9)	Type 10

2.2 Assumed working life

The provisions made in this ETA are based on an assumed intended working life of the product of 25 years, provided that the assembled product is subject to appropriate use and maintenance.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a mean for choosing the right products in relation to the expected economically reasonable working life of the works. The user of the product must ensure, that the durability assessment that has been made, is relevant to the local conditions of use.

2.3 Manufacturing

The European Technical Assessment is issued for PROTEC® FLAMME on the basis of agreed data/information, deposited with CSTB, which identifies the product that has been assessed and judged.

Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to CSTB before the changes are introduced. CSTB will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA, and if so whether further assessment or alterations to the ETA shall be necessary.

The raw materials are mixed in a continuous process. The mix is put into bags. Each bag is marked. Bags are examined for visual defects and non-compliant bags are rejected.

2.4 Installation

The product shall be installed and used as described in this European Technical Assessment.

The arrangement and installation of the PROTEC® FLAMME shall be done in accordance with the details given in Annex 7.

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

Nr	Product characteristic	Method of verification	Performance
BWR 1 : Mechanical resistance and stability			
	None	Not relevant	Not relevant
ER 2 : Safety in case of fire			
1	Reaction to fire	EN 13501-1	See §3.2.1
2	Resistance to fire	EN 13501-2	See §3.2.2 and Annexes 3 to 6
BWR 3 : Hygiene, health and environment			
3	Release of dangerous substances	Declaration of manufacturer	Declaration of conformity by the manufacturer
4	Water vapour permeability	EN 12572 or EN 10456	No performance determined
BWR 4: Safety in use			
5	Mechanical resistance and stability	EAD 350140-00-1106	No performance determined
6	Resistance to impact/movement	EAD 350140-00-1106	See §2.2.6
7	Adhesion	EAD 350140-00-1106	See §2.2.7
BWR 5: Protection against noise			
8	Sound absorption performance	EAD 350140-00-1106	See §2.2.9
9	Sound insulation and impact sound insulation	EAD 350140-00-1106	No performance determined
BWR 6: Energy economy and heat retention			
10	Thermal properties	EN 12664, EN 12667 or EN 12939	No performance determined
11	Water vapour permeability	EN 12572 or EN 10456	No performance determined
General aspects relating to fitness for use			
	Durability and serviceability	EAD 350140-00-1106, §1.2.4	Y, Z ₁ and Z ₂ and see §3.7

3.1 Mechanical resistance and stability (BWR 1)

Not relevant.

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

PROTEC® FLAMME is A1 classified without further testing.

3.2.2 Fire resistance

The resistance to fire performance according to EAD 350140-00-1106. The fire resistance performances according to EN 13501-2 for various intended uses and various thicknesses are presented in annexes 3, 4, 5, 6.

3.3 Hygiene, health and the environment (BWR 3)

3.3.1 Release of dangerous substances

According to the manufacturer's declaration the component PROTEC® FLAMME does not contain dangerous substances detailed in Council Directive 67/548/EEC and Regulation (EC) no 1272/2008 as well as EOTA TR 034 (General BWR 3 Checklist for EADs/CUAPs/ETAs- Content and/or release of dangerous substances in products/kits), edition March 2012.

A written declaration in this respect was submitted by the ETA-holder.

In addition to the specific clauses relating to dangerous substances contained in this European technical assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to

meet the provisions of the Construction Product Regulation, these requirements need also to be complied with, when and where they apply

3.3.2 Water vapour permeability

No Performance Determined

3.4 Safety in use (BWR 4)

3.4.1 Mechanical resistance and stability

No Performance Determined.

3.4.2 Resistance to impact/movement

No Performance Determined.

3.4.3 Adhesion

See §3.7.

3.5 Protection against noise (BWR 5)

3.5.1 Sound absorption performance

Sound absorption measurement results according to EN ISO 354 and EN ISO 11654 are given in annex 2.

3.5.2 Sound insulation and impact sound insulation

No Performance Determined.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal properties

No Performance Determined.

3.6.2 Water vapour permeability

No Performance Determined.

3.7 General aspects relating to fitness for use and durability

PROTEC® FLAMME has been tested for an intended use category Y , Z1 and Z2 and the tests results have shown a compliance for temperatures below 0 °C, but no exposure to rain and limited exposure to UV.

3.7.1 Durability

Resistance to UV-exposure

This characteristic is not relevant for the intended use (semi-exposed, type Y).

Resistance to deterioration caused by heat and rain

This characteristic is not relevant for the intended use (semi-exposed, type Y).

Resistance to deterioration caused by high humidity

In accordance with EAD 350140-00-1106, the PROTEC® FLAMME fire protective product are resistant to high humidity.

Resistance to deterioration caused by heat and cold

In accordance with EAD 350140-00-1106, the PROTEC® FLAMME fire protective product are resistant to heat/cold cycles.

Resistance to deterioration caused by freezing and thawing

In accordance with EAD 350140-00-1106, the PROTEC® FLAMME fire protective product are resistant to freeze/thaw cycles.

Resistance to corrosion of a steel substrate by the rendering

No performance determined.

Resistance to corrosion of the fixings by the rendering

Not relevant.

3.7.2 Serviceability requirements

3.7.2.1 Mechanical resistance and stability:

- Pull out resistance of discontinuous fixings

Not relevant.

- Bending resistance of discontinuous fixings (for steel)

Not relevant.

- Pull out resistance of keying mesh

Not relevant.

- Pull out resistance of rendering

See clause adhesion.

3.7.2.2 Resistance to impact/movement

- Resistance to functional failure from hard body impact load – 0,5 kg steel ball

No performance determined.

- Resistance to functional failure from soft body impact – 50 kg bag

No performance determined.

- Flexural performance

No performance determined.

3.7.2.3 Air erosion

No performance determined.

3.7.2.4 Water vapour permeability

No performance determined.

3.7.2.5 Water absorption (capillarity test)

Not relevant for the intended use (semi-exposed type Y).

3.7.2.6 Adhesion

In accordance with EAD 350140-00-1106 and EGOLF method SM/5.

The adhesion/cohesion of the PROTEC® FLAMME fire protective product was measured on numerous conditions of installed thickness and preparation of the substrates. See Annex 2, in this ETA for a tensile bond strength guidance value.

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 1999/454/EC of the European Commission¹, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Fire protective products	Renderings and Rendering Kits intended for Fire Resisting Applications	any	1

¹ Official Journal of the European Communities L 178 of 14.7.1999, p. 52

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at the CSTB.

As the control plan contains confidential information, it is not included in the published parts of this ETA.

The original French version is signed by

Anca Cronopol
Head of the Structure, Masonry, Partition division

Overview of the fire resistance performance for PROTEC® FLAMME applications

The fire protective assemblies given in Table A1.1 have been assessed within the framework of this ETA.

Table A1.1				
Assemblies assessed within the framework of this ETA	Classification according to EN 13501-2	Test Standard	Intended use category according to EAD 350140-00-1106	Installation details
Protection of load-bearing concrete elements	Assessment: See Annex 3	ENV 13381-3	Type 3	Annex 3
Protection of load bearing steel elements	Assessment: See Annex 4	ENV 13381-4	Type 4	Annex 4
Protection of load-bearing flat concrete profiled sheet composite elements	Assessment: See Annex 5	ENV 13381-5	Type 5	Annex 5
Timber floors	Assessment: See Annex 6	EN 1365-2	Type 10	Annex 6

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Annex 2: Additional properties

A.2.1 - Acoustical properties

A.2.1.1. Sound absorption tests

A.2.1.1.1 Assemblies description

Test	PROTEC® FLAMME thickness	Topcoat	Sub Layer
1	12,5 mm	None	Plywood board 20mm
2	80 mm	None	Plywood board 20mm
3	45 mm	None	Plywood board 20mm

A.2.1.1.2 Measurement procedure

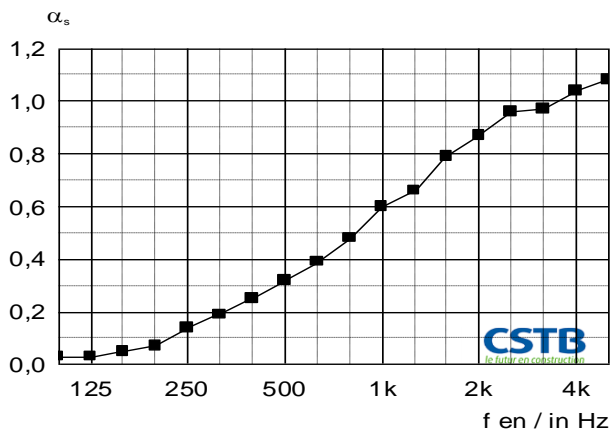
The assemblies were tested for sound absorption according to the following standards:

- EN ISO 354 (2004)
- EN ISO 11654 (1997)

A.2.1.1.3 Test Results

The test results are given in CSTB Report AC09-26018045/1-REV01, AC09-26018045/2-REV01 and AC09-26021062/1-REV01. Extracts from these reports are given in the following pages.

Test 1



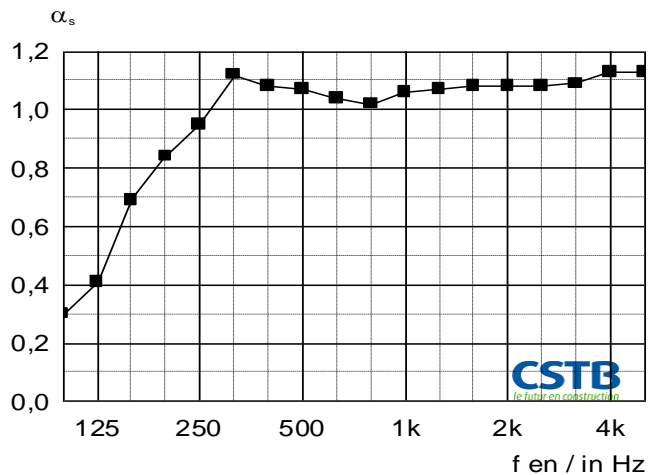
f	α_s
100	0,03
125	0,03
160	0,05
200	0,07
250	0,14
315	0,19
400	0,25
500	0,32
630	0,39
800	0,48
1000	0,60
1250	0,66
1600	0,79
2000	0,87
2500	0,96
3150	0,97
4000	1,04
5000	1,08
Hz	

$\alpha_w = 0,35(\text{MH})$ *
classement / class: D

Test 2

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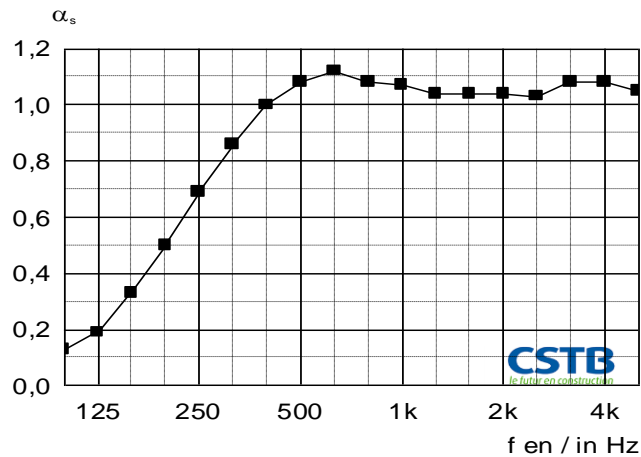
Annexes 1 to 6



f	α_s
100	0,30
125	0,41
160	0,69
200	0,84
250	0,95
315	1,12
400	1,08
500	1,07
630	1,04
800	1,02
1000	1,06
1250	1,07
1600	1,08
2000	1,08
2500	1,08
3150	1,09
4000	1,13
5000	1,13
Hz	

$\alpha_w = 1,00$
classement / class: A

Test 3



f	α_s
100	0,13
125	0,19
160	0,33
200	0,50
250	0,69
315	0,86
400	1,00
500	1,08
630	1,12
800	1,08
1000	1,07
1250	1,04
1600	1,04
2000	1,04
2500	1,03
3150	1,08
4000	1,08
5000	1,05
Hz	

$\alpha_w = 1,00$
classement / class: A

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A.2.2 – Method for determination of tensile bond strength on site

A.2.2.1 Introduction

This document describes methods for onsite measurement of the tensile bond strength of the rendering kit BRL and PROTEC® FLAMME, at room temperature.

These methods derive from the EGOLF SM5 method.

A.2.2.2 Tensile bond strength

The tensile bond strength of the rendering kit BRL and PROTEC® FLAMME is determined by measuring pull off force that is necessary to cause a failure :

- of the bond between the support and the rendering kit BRL and PROTEC® FLAMME (adhesive failure),
- within the depth of the sprayed the rendering kit BRL and PROTEC® FLAMME (cohesive failure).

A.2.2.3 Preparation of the test

This test shall be carried out when the rendering kit BRL and PROTEC® FLAMME is properly stable. Depending on the temperature and relative humidity, this should be around one month after the spraying of PROTEC® FLAMME.

Square pieces (10 x 10 cm) shall be cut in the rendering kit up to the support. Those elements shall not be located at less than 50mm from the edge of the support, or from another test element. The cutting of those elements shall be carried out with great care to prevent any damage that would reduce the tensile bonding strength of the system.

The plywood piece shall be glued onto the cut elements. Wait 24 hours.

A.2.2.4 Test Method

Hang the bucket with the tie up. Insert water into the bucket until failure of rendering.

Count the water volume used.

A.2.2.5 Results interpretation

The test shall end when a failure occurs in the adherence between the rendering kit BRL and PROTEC® FLAMME and the support or when the cohesion within PROTEC® FLAMME fails.

The applied force at the time of the failure shall be recorded. The type of failure : adhesive or cohesive shall also be recorded.

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A.2.2.6 Number of tests

At least 8 elements shall be tested for each support and each thickness.

A.2.2.7 Acceptability of the tensile bond strength

In accordance with the test method described in EGOLF SM5.

Bonding properties of PROTEC® FLAMME on concrete structures

The rendering kit has a tensile bond strength of $\geq 3,56$ kPa. This is a guidance value and does not reflect a statistical evaluation, nor a minimum guaranteed value. All results have shown a cohesion failure.

The rendering has sufficient cohesion to support its own mass. The rendering is not intended to support additional loads.

Bonding properties of PROTEC® FLAMME on steel structures

The rendering kit has a tensile bond strength of $\geq 6,58$ kPa. This is a guidance value and does not reflect a statistical evaluation, nor a minimum guaranteed value. All results have shown a cohesion failure.

Bonding properties of PROTEC® FLAMME on flat concrete profiled sheet steel composite structures

The rendering kit has a tensile bond strength of $\geq 2,94$ kPa. This is a guidance value and does not reflect a statistical evaluation, nor a minimum guaranteed value. All results have shown a cohesion failure.

The rendering has sufficient cohesion to support its own mass. The rendering is not intended to support additional loads.

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Annex 3 :

Specification and assessment of fire protection of a load bearing concrete assembly (intended use type 3) protected by PROTEC® FLAMME rendering

A.3.1 Classification

The assembly described in this annex has been tested and assessed according to ENV 13381-3 and classified in accordance with EN 13501-2.

The maximum duration of the exposure to the standard time temperature curve as defined in EN 1363-1, section 5.1.1, is 360 min depending on the type of concrete structures and the thickness of the PROTEC® FLAMME applied.

The assessment of the insulation efficiency and the equivalent thickness of concrete are given in clause A.3.3.

A.3.2 Installation requirements

A.3.2.1. Supporting structure

PROTEC® FLAMME is applicable to all concrete slabs and walls with fire exposure from one side only, in both horizontal and vertical orientation.

PROTEC® FLAMME is applicable to concrete beams and columns exposed to fire from more than one side, in both horizontal and vertical orientation.

Specifications for the components are given in Table A.3.1.

Table A.3.1			
Element	Identification	Characteristics	Mounting and fixing
Load bearing concrete beam	Concrete, silicious aggregates	<ul style="list-style-type: none"> - Density 2330 kg/m³ ± 15 % - Width of the beam ≥ 150 mm 	<ul style="list-style-type: none"> - Casted with release agent applied in the mould, belonging to the families of mineral oil or emulsions. - Surface shall be free of dust and bare.
Load bearing concrete slab or wall	Concrete silicious aggregates	<ul style="list-style-type: none"> - Density 2330 kg/m³ ± 15 % - Thickness: ≥ 140 mm 	<ul style="list-style-type: none"> - Casted with release agent applied in the mould, belonging to the families of mineral oil or emulsions. - Surface shall be free of dust and bare.

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A.3.2.2 – Bonding primer prior to application of PROTEC® FLAMME

If the concrete support is sound, then, whatever the release agent used to cast the concrete as mentioned above is, the concrete structures are treated with bonding primer BRL before the application of PROTEC® FLAMME.

The BRL is applied with a roll and/or a brush on all parts to be protected with PROTEC® FLAMME.

Applied ratio : 150 to 200 g/m² around.

Then, PROTEC® FLAMME spray material is applied some minutes after the application of BRL, once the bonding primer tacks.

Specifications for the components are given in Table A.3.2

Table A.3.2			
Element	Identification	Characteristics	Mounting and fixing
Primer	BRL	150 to 200 g/m ²	<ul style="list-style-type: none"> - Roll or brush applied to all parts to be protected by PROTEC® FLAMME. - Applied quantity: 150 to 200 g/m²

A.3.2.3 – Fire protective rendering

Product PROTEC® FLAMME is applied on the apparent sides of concrete structures to be protected, following their shape.

PROTEC® FLAMME is continuously applied with a spraying machine. During the application, the thickness of protective material is regularly controlled with a pin calibre. When the required thickness is reached, PROTEC® FLAMME is rolled to have a smooth surface and to level outstanding fibres.

Specifications for the components are given in Table A.3.3

Table A.3.3			
Element	Identification	Characteristics	Mounting and fixing
Rendering	PROTEC® FLAMME	<ul style="list-style-type: none"> - Average thicknesses: from 15 to 88 mm, according to the assessment rules. Density : 250 kg/m³ ± 15 % 	<ul style="list-style-type: none"> - Sprayed in 1 layer - After application the PROTEC® FLAMME is rolled to smooth and level the surface

Sprayed fire protective product
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A.3.3 Assessment of the fire performance of PROTEC® FLAMME on concrete structures

A.3.3.1 Assessment report

The assessment method used to assess the fire protection performances of product PROTEC® FLAMME when applied on concrete structures is as follows :

Type of structure	Standard used for assessment	Assessment report reference
Concrete	ENV 13381-3	RS09-156

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A.3.3.2 Protection of slabs and walls

The insulation efficiency of the protective material when applied on slabs is determined in function of :

- the thickness of protective material applied (mm) ;
- the standard concrete temperature comprised between [300,650] (°C) ;

the duration of the thermal exposure under the standard time temperature curve as defined in EN 1363-1, section 5.1.1.

A.3.3.2.1 - Protection with minimum applicable thickness 17 mm

Duration of exposure	Temperature inside concrete							
	300 °C	350°C	400°C	450°C	500°C	550°C	600°C	650°C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	8	2	No value	No value	No value	No value	No value	No value
150 min.	33	19	10	5	No value	No value	No value	No value

A.3.3.2.2 - Protection with maximum applicable thickness 84 mm

Duration of exposure	Temperature inside concrete							
	300 °C	350°C	400°C	450°C	500°C	550°C	600°C	650°C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	No value	No value	No value	No value	No value	No value	No value	No value
150 min.	No value	No value	No value	No value	No value	No value	No value	No value
180 min.	No value	No value	No value	No value	No value	No value	No value	No value
210 min.	No value	No value	No value	No value	No value	No value	No value	No value
240 min.	No value	No value	No value	No value	No value	No value	No value	No value
270 min.	No value	No value	No value	No value	No value	No value	No value	No value
300 min.	No value	No value	No value	No value	No value	No value	No value	No value
330 min.	No value	No value	No value	No value	No value	No value	No value	No value
360 min.	No value	No value	No value	No value	No value	No value	No value	No value

A.3.3.3 - Protection of rectangular concrete beams and columns of minimum 150 x 150 mm

The insulation efficiency of the protective material when applied on rectangular beams or columns of minimum 150 x 150 mm is determined in function of :

- the thickness of protective material applied (mm) ;
- the standard concrete temperature comprised between [300,650] (°C) ;
- along a vertical, horizontal and diagonal axis ;
- the duration of the thermal exposure under the standard time temperature curve as defined in EN 1363-1, section 5.1.1.

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A.3.3.3.1 - Protection with minimum applicable thickness 15 mm

Along axis n°1

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	6	3	No value	No value	No value	No value	No value	No value
90 min.	26	7	11	8	4	1	No value	No value
120 min.	46	38	30	23	16	11	7	4
150 min.	67	56	46	38	30	22	15	10
180 min.	102	81	66	55	45	37	28	21

Along axis n°2

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	6	4	2	No value	No value	No value	No value	No value
90 min.	9	8	6	5	3	1	No value	No value
120 min.	12	10	8	7	6	4	3	1
150 min.	16	13	11	9	8	6	5	4
180 min.	36	23	18	14	12	10	8	7

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Along axis n°3

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	51	40	28	No value	No value	No value	No value	No value
150 min.	70	63	53	41	27	No value	No value	No value
180 min.	No value	No value	70	62	51	38	No value	No value

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A.3.3.3.2 - Protection with maximum applicable thickness 88 mm

Along axis n°1

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	No value	No value	No value	No value	No value	No value	No value	No value
150 min.	2	No value	No value	No value	No value	No value	No value	No value
180 min.	6	3	No value	No value	No value	No value	No value	No value
210 min.	10	7	4	1	No value	No value	No value	No value
240 min.	19	13	9	6	2	No value	No value	No value
270 min.	31	21	14	10	7	4	1	No value
300 min.	43	32	22	15	11	8	5	2
330 min.	57	43	32	22	15	11	8	5
360 min.	74	57	43	31	22	15	11	8

Along axis n°2

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	No value	No value	No value	No value	No value	No value	No value	No value
150 min.	No value	No value	No value	No value	No value	No value	No value	No value
180 min.	No value	No value	No value	No value	No value	No value	No value	No value
210 min.	No value	No value	No value	No value	No value	No value	No value	No value
240 min.	No value	No value	No value	No value	No value	No value	No value	No value
270 min.	No value	No value	No value	No value	No value	No value	No value	No value
300 min.	No value	No value	No value	No value	No value	No value	No value	No value
330 min.	4	No value	No value	No value	No value	No value	No value	No value
360 min.	10	7	4	1	No value	No value	No value	No value

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Along axis n°3

Duration of exposure	Temperature inside concrete							
	300° C	350° C	400° C	450° C	500° C	550° C	600° C	650° C
30 min.	No value	No value	No value	No value	No value	No value	No value	No value
60 min.	No value	No value	No value	No value	No value	No value	No value	No value
90 min.	No value	No value	No value	No value	No value	No value	No value	No value
120 min.	No value	No value	No value	No value	No value	No value	No value	No value
150 min.	No value	No value	No value	No value	No value	No value	No value	No value
180 min.	No value	No value	No value	No value	No value	No value	No value	No value
210 min.	No value	No value	No value	No value	No value	No value	No value	No value
240 min.	No value	No value	No value	No value	No value	No value	No value	No value
270 min.	28	No value	No value	No value	No value	No value	No value	No value
300 min.	48	29	No value	No value	No value	No value	No value	No value
330 min.	63	47	29	No value	No value	No value	No value	No value
360 min.	74	62	46	28	No value	No value	No value	No value

A.3.3.4 – Equivalent thickness of concrete for PROTEC® FLAMME

The equivalent thicknesses of concrete induced by the protective material PROTEC® FLAMME is determined according to requirements of Annex C of standard ENV 13381-3.

A.3.3.4.1 – Equivalent thickness of concrete for PROTEC® FLAMME (17 mm) for slabs

Duration in minutes	Temperature measured at 15 mm from bottom of concrete	Equivalent thickness of concrete
30 minutes	65 [°C]	51 [mm]
60 minutes	117 [°C]	57 [mm]
90 minutes	164 [°C]	63 [mm]
120 minutes	265 [°C]	57 [mm]
150 minutes	390 [°C]	45 [mm]

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

A.3.3.4.2 – Equivalent thickness of concrete for PROTEC® FLAMME (84 mm) for slabs

Duration in minutes	Temperature measured at 15 mm from bottom of concrete	Equivalent thickness of concrete
30 minutes	27 [°C]	97 [mm]
60 minutes	34 [°C]	130 [mm]
90 minutes	51 [°C]	134 [mm]
120 minutes	66 [°C]	138 [mm]
150 minutes	84 [°C]	139 [mm]
180 minutes	98 [°C]	141 [mm]
210 minutes	109 [°C]	144 [mm]
240 minutes	117 [°C]	150 [mm]
270 minutes	125 [°C]	156 [mm]
300 minutes.	133 [°C]	160 [mm]
330 minutes	143 [°C]	164 [mm]
360 minutes	155 [°C]	165 m]

A.3.3.4.3 – Equivalent thickness of concrete for PROTEC® FLAMME (15 mm) for beams

Duration in minutes	Temperature measured at 55 mm from bottom of concrete	Equivalent thickness of concrete
30 minutes	66 [°C]	35 [mm]
60 minutes	120 [°C]	45 [mm]
90 minutes	201 [°C]	40 [mm]
120 minutes	316 [°C]	35 [mm]
150 minutes	425 [°C]	30 [mm]
180 minutes	514 [°C]	25 [mm]

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

A.3.3.4.4 – Equivalent thickness of concrete for PROTEC® FLAMME (88 mm) for beams

Duration in minutes	Temperature measured at 55 mm from bottom of concrete	Equivalent thickness of concrete
30 minutes	16 [°C]	160 [mm]
60 minutes	26 [°C]	145 [mm]
90 minutes	48 [°C]	135 [mm]
120 minutes	86 [°C]	125 [mm]
150 minutes	110 [°C]	125 [mm]
180 minutes	128 [°C]	125 [mm]
210 minutes	158 [°C]	125 [mm]
240 minutes	199 [°C]	120 [mm]
270 minutes	247 [°C]	110 [mm]
300 minutes	297 [°C]	102 [mm]
330 minutes	346 [°C]	100 [mm]
360 minutes	392 [°C]	95 [mm]

A.3.3.5 – Stickability of PROTEC® FLAMME

The stickability of PROTEC® FLAMME when applied on concrete structures is determined according to requirements of paragraph 13.5. of standard ENV 13381-3, in function of :

- the thickness of protective material applied (mm) ;
- the concrete structure, beam or slab ;
- the type of release agent used to cast the concrete.

⇒ Stickability criteria for slab with PROTEC® FLAMME 17 mm

Variation of temperature according § 13.5 (ENV 13381-3) reached at 150 minutes (without failure)

Significant detachment of protection : 76 minutes

⇒ Stickability criteria for slab with PROTEC® FLAMME 84 mm

Variation of temperature according § 13.5 (ENV 13381-3) reached at 360 minutes (without failure)

Significant detachment of protection : 360 minutes (without failure)

⇒ Stickability criteria for beam with PROTEC® FLAMME 15 mm

Variation of temperature according § 13.5 (ENV 13381-3) reached at 170 minutes until 181 minutes

Significant detachment of protection : 175 minutes

⇒ Stickability criteria for beam with PROTEC® FLAMME 88 mm

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Variation of temperature according § 13.5 (ENV 13381-3) reached at 360minutes (without failure)
Significant detachment of protection: 360 minutes (without failure)

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Annex 4 :

Specification and assessment of fire protection of a load bearing steel elements (intended use type 4) protected by PROTEC® FLAMME rendering

A.4.1 Classification

The assembly described in this annex has been tested and assessed according to ENV 13381-4 and classified in accordance with EN 13501-2.

The maximum duration of the exposure to the standard time temperature curve as defined in EN 1363-1, section 5.1.1, is 240 min depending on the section factor of the load bearing steel element, the critical temperature and the thickness of the PROTEC® FLAMME applied.

The assessment of the required thickness of PROTEC® FLAMME in function of the section factor, the critical temperature of steel and the exposure duration are given in clause A.4.3.

A.4.2 Installation requirements

A.4.2.1. Supporting structure

PROTEC FLAMME is applicable on I / H steel beams and columns, with section factors between 50 and 400 m⁻¹, exposed on three or four sides.

PROTEC® FLAMME is also applicable to rectangular, square or circular hollows sections, under conditions that the required thickness is corrected according EN 13381-4, annexe B, chap B.1.1.3

Specifications for the components are given in Table A.4.1.

Table A.4.1			
Element	Identification	Characteristics	Mounting and fixing
Load bearing steel section	Steel, grade according to EN 10025-1 and EN 13381-4	- Section factor from 50 m ⁻¹ to 400 m ⁻¹ - I / H sections - Circular, rectangular and square hollow sections	- Surface of steel: see A.4.2.2 - Surface shall be free of dust

A.4.2.2 – Surface of steel

PROTEC® FLAMME can be applied on steel members with the following surface conditions :

- Steel protected with a primer (corrosion protection)
- Galvanized steel

Acceptable primers against corrosion have characteristics according table A.4.2

Table A.4.2		
Primer	Type	Dry film thickness (µm)
1 st family	Alkyd	21
2 nd family	Epoxy	21

Maximum thickness of zinc is 250 µm for galvanized steel.

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

A.4.2.3 – Bonding primer prior to application of PROTEC® FLAMME

The steel profiles are treated with bonding primer BRL before the application of PROTEC® FLAMME.

The BRL is applied with a roll and/or a brush on all parts to be protected with PROTEC® FLAMME.

Applied ratio : 150 to 200 g/m² around.

Then, PROTEC® FLAMME spray material is applied some minutes after the application of BRL, once the bonding primer tacks.

Specifications for the components are given in Table A.4.3

Table A.4.3			
Element	Identification	Characteristics	Mounting and fixing
Primer	BRL	150 to 200 g/m ²	- Roll or brush applied to all parts to be protected by PROTEC® FLAMME. - Applied quantity: 150 to 200 g/m ²

A.4.2.4 - Fire protective rendering

Product PROTEC® FLAMME is applied on the apparent sides of the steel profil to be protected, following their shape.

PROTEC® FLAMME is continuously applied with a spraying machine. During the application, the thickness of protective material is regularly controlled with a pin calibre. When the required thickness is reached, PROTEC® FLAMME is rolled to have a smooth surface and to level outstanding fibres.

Specifications for the components are given in Table A.4.4

Table A.4.4			
Element	Identification	Characteristics	Mounting and fixing
Rendering	PROTEC® FLAMME	- Average thicknesses: from 15 to 84 mm, according to the assessment rules. Density : 250 kg/m ³ ± 15 %	- Sprayed in 1 layer - After application the PROTEC® FLAMME is rolled to smooth and level the surface

A.4.3 Assessment of the fire performance of PROTEC® FLAMME on steel structure

A.4.3.1 Assessment report

The assessment method used to assess the fire protection performances of product PROTEC® FLAMME when applied on steel structures is as follows :

Type of structure	Standard used for assessment	Assessment report reference
Steel structure	ENV 13381-4	RS09-133

The evaluation has been done according annex F – differential equation analysis – variable thermal conductivity.

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

	Thickness (mm) of protection to justify classification R15								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
100	15	15	15	15	15	15	15	15	15
120	15	15	15	15	15	15	15	15	15
140	15	15	15	15	15	15	15	15	15
160	15	15	15	15	15	15	15	15	15
180	15	15	15	15	15	15	15	15	15
200	15	15	15	15	15	15	15	15	15
220	15	15	15	15	15	15	15	15	15
240	15	15	15	15	15	15	15	15	15
260	15	15	15	15	15	15	15	15	15
280	15	15	15	15	15	15	15	15	15
300	15	15	15	15	15	15	15	15	15
320	15	15	15	15	15	15	15	15	15
340	15	15	15	15	15	15	15	15	15
360	15	15	15	15	15	15	15	15	15
380	15	15	15	15	15	15	15	15	15
400	15	15	15	15	15	15	15	15	15

	Thickness (mm) of protection to justify classification R30								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
100	15	15	15	15	15	15	15	15	15
120	15	15	15	15	15	15	15	15	15
140	15	15	15	15	15	15	15	15	15
160	15	15	15	15	15	15	15	15	15
180	25	15	15	15	15	15	15	15	15
200	25	15	15	15	15	15	15	15	15
220	25	25	15	15	15	15	15	15	15
240	25	25	15	15	15	15	15	15	15
260	25	25	25	15	15	15	15	15	15
280	25	25	25	25	15	15	15	15	15
300	25	25	25	25	15	15	15	15	15
320	25	25	25	25	25	15	15	15	15
340	35	25	25	25	25	15	15	15	15
360	35	25	25	25	25	15	15	15	15
380	35	25	25	25	25	15	15	15	15
400	35	35	25	25	25	25	15	15	15

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

	Thickness (mm) of protection to justify classification R60								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
80	25	25	15	15	15	15	15	15	15
100	25	25	25	25	15	15	15	15	15
120	35	25	25	25	25	15	15	15	15
140	35	35	25	25	25	25	25	15	15
160	35	35	35	25	25	25	25	15	15
180	45	35	35	35	25	25	25	25	15
200	45	45	35	35	25	25	25	25	15
220	45	45	35	35	35	25	25	25	25
240	55	45	45	35	35	35	25	25	25
260	55	45	45	35	35	35	25	25	25
280	55	45	45	45	35	35	35	25	25
300	55	55	45	45	35	35	35	25	25
320	55	55	45	45	35	35	35	35	25
340	55	55	45	45	45	35	35	35	25
360	65	55	55	45	45	35	35	35	25
380	65	55	55	45	45	45	35	35	25
400	65	55	55	45	45	45	35	35	25

	Thickness (mm) of protection to justify classification R90								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	25	15	15	15	15	15	15	15	15
60	35	25	25	25	15	15	15	15	15
80	35	35	25	25	25	25	15	15	15
100	45	35	35	35	25	25	25	25	15
120	45	45	35	35	35	25	25	25	25
140	55	45	45	35	35	35	25	25	25
160	65	55	45	45	35	35	35	25	25
180	65	55	55	45	45	35	35	35	25
200	65	65	55	55	45	45	35	35	35
220	75	65	55	55	45	45	45	35	35
240	75	65	65	55	55	45	45	35	35
260	75	65	65	55	55	45	45	45	35
280	75	75	65	65	55	55	45	45	35
300	85	75	65	65	55	55	45	45	45
320	85	75	75	65	65	55	55	45	45
340	85	75	75	65	65	55	55	45	45
360	85	75	75	65	65	55	55	55	45
380	85	85	75	65	65	65	55	55	45
400	85	85	75	75	65	65	55	55	45

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

	Thickness (mm) of protection to justify classification R120								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	35	25	25	25	25	15	15	15	15
60	45	35	35	25	25	25	25	25	15
80	55	45	45	35	35	35	25	25	25
100	65	55	45	45	35	35	35	25	25
120	65	65	55	45	45	45	35	35	25
140	75	65	65	55	55	45	45	35	35
160	85	75	65	65	55	45	45	45	35
180	85	75	75	65	55	55	45	45	45
200	85	85	75	65	65	55	55	45	45
220		85	75	75	65	65	55	55	45
240		85	85	75	65	65	55	55	45
260			85	75	75	65	65	55	55
280			85	85	75	65	65	55	55
300			85	85	75	75	65	65	55
320				85	75	75	65	65	55
340				85	85	75	75	65	55
360				85	85	75	75	65	65
380					85	75	75	65	65
400					85	85	75	75	65

	Thickness (mm) of protection to justify classification R180								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	45	45	35	35	35	25	25	25	25
60	65	55	55	45	45	35	35	35	25
80	85	75	65	55	55	45	45	45	35
100		85	75	65	65	55	55	45	45
120			85	75	75	65	55	55	45
140				85	75	75	65	65	55
160					85	75	75	65	65
180						85	75	75	65
200						85	85	75	75
220							85	85	75
240								85	75
260								85	85
280									85
300									85
320									
340									
360									
380									
400									

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

	Thickness (mm) of protection to justify classification R240								
Steel temperatures (°C)	350	400	450	500	550	600	650	700	>750
Shape factor (m-1)									
40	65	55	55	45	45	35	35	35	25
60		85	75	65	55	55	45	45	45
80				85	75	65	65	55	55
100					85	85	75	65	65
120							85	75	75
140								85	75
160									85
180									
200									
220									
240									
260									
280									
300									
320									
340									
360									
380									
400									

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Annex 5 :

Specification and assessment of fire protection of a load bearing flat concrete profiled sheet composite elements assembly (intended use type 5) protected by PROTEC® FLAMME rendering

A.5.1 Classification

The assembly described in this annex has been tested and assessed according to ENV 13381-5 and classified in accordance with EN 13501-2.

The maximum duration of the exposure to the standard time temperature curve as defined in EN 1363-1, section 5.1.1, is 360 min depending on the type of concrete structures and the thickness of the PROTEC® FLAMME applied.

The assessment of the required thickness of PROTEC® FLAMME in function of type of profiled steel sheet and the exposure time for the characteristic steel sheet temperature rise to 350°C, the equivalent thickness of concrete and the insulation performances are given in clause A.5.3.

A.5.2 Installation requirements

A.5.2.1. Supporting structure

PROTEC® FLAMME is applicable on profiled steel sheets of composite slabs cast with dens concrete.

Specifications for the components are given in Table A.5.1.

Table A.5.1			
Element	Identification	Characteristics	Mounting and fixing
Profiled steel sheet	Trapezoïdal COFRAPLUS 60	<ul style="list-style-type: none"> - Thickness of steel sheet > 0,75 mm - Width of the rib < 151 mm - Height of the rib < 87 mm 	- Surface shall be free of dust.
Concrete	Concrete silicious aggregates	- Density 2330 kg/m ³ ± 15 %	

A.5.2.2 – Bonding primer prior to application of PROTEC® FLAMME

The steel sheet are treated with bonding primer BRL before the application of PROTEC® FLAMME.

The BRL is applied with a roll and/or a brush on all parts to be protected with PROTEC® FLAMME.

Applied ratio : 150 to 200 g/m² around.

Then, PROTEC® FLAMME spray material is applied some minutes after the application of BRL, once the bonding primer tacks.

Specifications for the components are given in Table A.5.2

Table A.5.2			
Element	Identification	Characteristics	Mounting and fixing
Primer	BRL	150 to 200 g/m ²	<ul style="list-style-type: none"> - Roll or brush applied to all parts to be protected by PROTEC® FLAMME. - Applied quantity: 150 to 200 g/m²

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

A.5.2.3 - Fire protective rendering

Product PROTEC® FLAMME is applied on the apparent sides of the profiled steel sheet to be protected, following their shape.

PROTEC® FLAMME is continuously applied with a spraying machine. During the application, the thickness of protective material is regularly controlled with a pin calibre. When the required thickness is reached, PROTEC® FLAMME is rolled to have a smooth surface and to level outstanding fibres.

Specifications for the components are given in Table A.5.3

Table A.5.3				
Element		Identification	Characteristics	Mounting and fixing
Rendering	PROTEC® FLAMME	- Average thicknesses: from 18 to 77 mm, according to the assessment rules. Density : 250 kg/m ³ ± 15 %	- Sprayed in 1 layer - After application the PROTEC® FLAMME is rolled to smooth and level the surface	

A.5.3 Assessment of the fire performance of PROTEC® FLAMME on flat concrete profiled sheet composite elements assembly

A.5.3.1 Assessment report

The assessment method used to assess the fire protection performances of product PROTEC® FLAMME when applied on concrete structures is as follows :

Type of structure	Standard used for assessment	Assessment report reference
Flat concrete profiled sheet	ENV 13381-5	RS09-156

A.5.3.2 Time to reach 350°C in steel sheet

The duration to reach 350°C in steel sheet has been determined according to ENV 13381-5 chap 13.2 and are given in table A.5.4

Table A.5.4	
Thickness of PROTEC® FLAMME	Time to reach 350°C
18 mm	44 min
77 mm	111 min

A.5.3.3 Equivalent thickness of concrete

H_{eff}, T_r, H_e, H_{eq} have been determined according to ENV 13381-5 chap 13.3 and are given in table A.5.5

Table A.5.5				
Thickness of PROTEC® FLAMME	H _{eff}	T _r	H _e	H _{eq}
18 mm	83 mm	90 min	102 mm	19 mm
77 mm		220 min	167 mm	84 mm

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

A.5.3.4 Limiting exposition duration

The limiting exposition duration has been determined according to ENV 13381-5 chap 13.4 and are given in table A.5.6

Table A.5.6	
Thickness of PROTEC® FLAMME	Limiting exposition duration
18 mm	90 min
77 mm	220 min

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Annex 6 :

Specification and assessment of fire protection of a timber floor (intended use type 10) protected by PROTEC® FLAMME rendering

A.6.1 Classification

The assembly described in this annex has been tested and assessed according to EN 1365-2 and classified in accordance with EN 13501-2.

A.5.2 Installation requirements

A.6.2.1. Supporting structure

The supporting structure is a timber floor consisting of fir tree timber joists (minimum section 150 x 50 mm), spacing of 415 mm connected with fir tree cross members (minimum section 150 x 50 mm) spacing (maximum 2000 mm), and a fir tree floor (minimum section 70 (width) x 23 (thickness) mm) with tongue and groove, fastened to the timber joists.

A metallic lath NERGALTO NG1 in galvanised (Z275) steel (DX51D) fixed on the bottom of joists with staples installed every 150 mm.

The value longitudinal overlapping between two breadth is corresponding to one rib of the lath.

The average value transverse overlapping between two breadth is 410 mm.

Size of lath : 2510 mm (length) x 606 mm (width) x 0,3 mm (thickness).

Fasteners are made of resined galvanised steel (sizes : 25 mm (length) x 10,5 mm (width) x 1,5 mm (thickness))

The height of the cavity is minimum 150 mm.

The span is 4300 mm, the regular applied load is 150 kg/m².

A.6.2.2 - Fire protective rendering

Product PROTEC® FLAMME is applied directly on the metallic lath.

PROTEC® FLAMME is continuously applied with a spraying machine. During the application, the thickness of protective material is regularly controlled with a pin calibre. When the required thickness is reached, PROTEC® FLAMME is rolled to have a smooth surface and to level outstanding fibres.

Specifications for the components are given in Table A.6.1

Table A.6.1				
Element		Identification	Characteristics	Mounting and fixing
Rendering	PROTEC® FLAMME	<div>- Average thicknesses: from 41 to 85 mm, according to the assessment rules.</div> <div>Density : 250 kg/m³ ± 15 %</div>	<div>- Sprayed in 1 layer</div> <div>- After application the PROTEC® FLAMME is rolled to smooth and level the surface</div>	

A.6.3 Assessment of the fire performance of PROTEC® FLAMME on timber floor assembly

A.6.3.1 Assessment report

The assessment method used to assess the fire protection performances of product PROTEC® FLAMME when applied on timber floors is as follows :

Sprayed fire protective product
PROTEC® FLAMME

Annexes 1 to 6

Type of structure	Standard used for assessment	Assessment report reference
Timber floor	EN 1365-2	RS09-156

A.6.3.2 Classification according EN 13501-2

The REI classification determined according to EN 13501-2 chap 7.3.3 are given in table A.6.2

Table A.6.2	
Thickness of PROTEC® FLAMME	Classification
41 mm	REI 60
85 mm	REI 90

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4.2.1 – General

The fire protection rendering must be installed according to the manufacturer's instructions. It is the manufacturer's responsibility to provide correct information about the application to the users.

Minimum requirements for satisfactory installing of the product in respect of training, competence and experience are identified in the installation instructions of the manufacturer. On request of the applicator, the manufacturer may carry out a technical training on site for the use of the PROTEC® FLAMME product.

4.2.2 - Tool and equipment for application

Typical machines used to spray PROTEC® FLAMME are welded steel built and designed for the spraying of mineral fibers and low density pulverizable products. They usually comprise a supply hopper, a carding system, an air propulsion system, a water pump, and hoses to bring PROTEC® FLAMME and water to the spraying nozzle.

4.2.3 - Requirements for substrate

4.2.3.1 - Inspection of substrate

Before application the substrate should be inspected and prepared. The inspection consists of the verification of the surfaces to be sprayed. They shall be free from oil, grease, incompatible primer (see below), lock down agent or of any other substance that will impair adhesion.

4.2.3.2 - Anti corrosion primers

Corrosion protection primers acceptable for steel structures that have been a part of the test assemblies are :

- short / medium alkyd primers family
- two components epoxy family
- hot dip galvanised steel

4.2.3.3 - Bonding agent

Bonding primer for PROTEC® FLAMME is described in clause 1

4.2.4 – Additional bonding reinforcement

For timber floors, a metallic lath shall be used.

4.2.5 - Environmental conditions during mixing, application and construction

An air and substrate temperature of 5°C minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 72 hours after application. Envisage an adequate ventilation to allow the product to dry after being sprayed. In closed area where the ventilation is not adequate, it is necessary to install a ventilation and air circulation device sufficient to obtain a renewing of air at least 1 to 3 times per hour, depending on sprayed thickness and room temperature. During winter time special considerations must be taken according to recommendations from the manufacturer.

As given in § 2.1 the product is intended for semi-exposed conditions with no exposure to rain. The construction process may however result in the rendering being exposed to direct rain or leakages before the building envelope is closed. The resistance of the rendering to such short term exposure to rain has not been assessed within this ETA. It is therefore assumed that special provisions to temporarily protect the exposed rendering being subjected to rain are taken.

4.2.6 - Application of rendering

Depending on the nature of the substrate, PROTEC® FLAMME is to be applied on a proper primer or expanded metal rib lath. The primer must be tacky.

PROTEC® FLAMME should be sprayed in a coat of regular thickness, depending on the requested thickness as follows:

Total thickness between 15 and 88mm : a coat of regular thickness (the nearest to the requested thickness as possible) is sprayed. After checking the thickness, the coat is completed up to the requested thickness.

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After application, PROTEC® FLAMME is rolled (smoothed out with a roller).

4.2.7 - Site tests

The adhesion of the dry rendering to the substrate should be tested on site. A suitable method for site measurement is given in annex 2. It is based on EGOLF method SM/5.

The thickness should be measured at a frequency sufficient to determine the mean and minimum thickness. A suitable method for thickness measurement is given in EAD 350140-00-1106, G.4 (for non-fire tests).

The density of the rendering should be measured and be within the tolerances specified in Table 1.1. A suitable method for density measurement is given in EAD 350140-00-1106, G.4 except that the number of samples may be reduced to an appropriate level.

Hairline cracks in the dry rendering are not acceptable.

4.2.8 - Surface treatments and protection

The resistance to mechanical impact from hard and soft bodies have not been assessed. The use of the rendering is therefore limited to applications where the rendering is protected from such impacts. The accessible structure exposed to friction or impact related to the activity on site should be covered with adapted protection depending on the site configuration. The protection is to be independent from the PROTEC® FLAMME coating.

Rolling surface of the rendering to produce a more regular finish than that achievable by initial application is covered by this ETA.

The vapour permeability of the product has not been assessed.

Indications to the manufacturer and supplier

Packaging, transport and storage

PROTEC® FLAMME is packaged in plastic bags weighing 25kg on pallet of 24 bags.

The product shall be stored away from weather exposure or wet surface.

Stock of material is to be rotated and used before its expiration date indicated on the bags (12 months from date of fabrication).

Use, maintenance, repair

The product, installed according to this ETA and manufacturer specifications does not require any maintenance.

Limited damages of PROTEC® FLAMME can be repaired.

The damaged areas shall be carefully cleaned with a knife, cutter or trowel through the whole applied thickness, down to the support. An additional zone of 700mm all around the damaged areas shall be cut at an angle so as to create a conic shape centred on the damaged areas. Dust and particles generated by this operation shall be carefully eliminated.

Before repairing, the cleared substrate shall be treated with the primer BRL. The bonding primer is applied with a brush.

When the bonding primer starts to tack, PROTEC® FLAMME shall be sprayed with a spraying machine, in such a way that the opening is completely filled up and the surface of the repaired area is smooth and flush with the surrounding PROTEC® FLAMME after compacting manually with a roll to level outstanding fibers.

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