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European Technical Assessment

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General Part

Technical Assessment Body issuing the ETA:

Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)

Trade name of the construction product

YESAL RESIG (Ignífugo)

Product family to which the construction product belongs

Rendering intended for Fire Resisting Application of building elements

Manufacturer

YESOS LAS LAGUNAS, S.A.
Autovía Málaga-Granada (A-92), km. 5
29300 Archidona (Málaga). Spain

Manufacturing plant(s)

Plant 1.

This European Technical Assessment contains

14 pages including 1 Annex, which form an integral part of this assessment. Annex 2. Contain confidential information and is not included in the ETA when that assessment is publicly available

This European Technical Assessment is issued in accordance with regulation (EU) Nº 305/2011, on the basis of

EAD 350140-00-1106. Renderings and rendering kits intended for fire resisting applications

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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SPECIFIC PARTS

1 Technical description of the product

The YESAL RESIG (Ignifugo) product is a mortar of fine granule based in calcium sulphate. This product is lightened with expansive minerals and formulated with several additives to improve the application and its performances. The application is performed by spray; the product powder is mixed with water in appropriated machines, or manually. Once the mortar is hardened, conforms a continuous rendering completely bonded to the support (steel with and without primers, galvanized steel and concrete).

The thickness of the applied product ranges from 6 mm to 44 mm, with a consumption of 6,5 - 7 kg/m²/cm thickness.

The final assembly contains a rendering and several primers (base epoxy and alkyd) when it is applied on steel supports (optional). According to EAD 350140-00-1106, this ETA is assessed under use conditions: Option 3.

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

2.1 Intended use(s)

The intended use of the YESAL RESIG (Ignifugo) mortar is the rendering of indoor building load-bearing constructive elements to increase the fire resistance in case of fire, keeping the resistance, integrity and insulation (REI) of the building elements until the fire extinction or the building evacuation.

This Product fulfils the Essential Requirements n^o 2 (Safety in case of fire), n^o 3 (Hygiene, health and the environment) and n^o 4 (Safety in use) of the Construction Products Regulation 305/2011.

This product has a category of use related to environmental conditions:

Type Z2 on steel support. Renderings intended for internal conditions without high humidity¹ content, and excluding temperatures below 0 °C, when they are applied on primed or un-primed steel, and galvanized steel.

Tipo Y (included Z1, Z2) for concrete support: Renderings intended for internal and semi-exposed conditions. Semi exposed includes temperatures below 0 °C, but no exposure to rain and limited exposure to UV (but the effects of UV exposure are not assessed).

Use category related to the element(s) intended to be protected:

- Type 3: Fire protective products to protect load-bearing concrete elements.
- Type 4: Fire Protective Products to protect load-bearing steel elements. Beams and columns with 3 and 4 exposed faces. With a section factor of < 300 m⁻¹. Temperature ranges from 350 °C to 650 °C. R15, R30, R60, R90, R120, R180 y R240.
- Type 5: Fire Protective Products to protect flat concrete profiled sheet composite elements.

2.2 Relevant general conditions for the use of the kit

The provisions made in this European Technical Assessment are based on an assumed working life of 25 years from installation in the works, according to EAD 350140-00-1106, provided that the conditions lay down for the installation, packaging, transport and storage as well as appropriate use, maintenance and repair are met.

The indications given on the working life cannot be interpreted as a guarantee given neither by the product manufacturer nor by EOTA nor by the Technical Assessment Body issuing this ETA, but are regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

The real working life may be, in normal use conditions, considerably longer without major degradation affecting the Basic works requirements

¹ These uses do not apply for internal humidity class 5 in accordance with EN ISO 13788.

Application on site. The suitability of use of this product can only be assumed if this is applied according to the manufacturer's instructions, which are part of the MTD to this ETA placed at IETcc.

A) Particularly, it is recommended to consider:

- The application has to be carried out by skilled labor,
- It can only be used the components of the Product indicated in this ETA,
- It is necessary to control the thickness of the applied product during application
- The support to protect must be clean, dry and without dust or grease in order not to affect the adherence of YESAL RESIG (Ignífugo) mortar.
- The recommended mixing water (water/cement) is 0,75 to 0,85, so for a YESAL RESIG (Ignífugo), sacks is necessary 15 ± 2 L of water.
- The application must be performed by spray, mixing the product with water in the projection machine, or manually. The powder is mixed with water in usual mixing machines. There are different types and brands of these types of machines; depending on the model, it varies the type of shirt-rotor, pumping pressure, distance and height, pressure of mixing water, air pressure, hose lengths and sections, etc. All these characteristics are included in the machines technical specifications and instructions of use. The water flow of the machine must be regulated until achieving a mass/paste/plasticity that covers uniformly and does not fall down. In order to achieve a uniform finishing of YESAL RESIG (Ignífugo), it must be used nozzles from 10 to 12 mm.
- It should be done in situ test to determine the product adherence on the support; it should be at least 80 % of the values enclosed in this ETA.
- The density of the applied rendering on site will not vary more than **850 kg/m³ ± 15 %**. If it was more than 15 %, it would be needed to carry out adherence tests.
- The hardened product will not present cracks, according to the test performed in this evaluation.
- Before, the installation of YESAL RESIG (Ignífugo), it is recommended to read its security card.

B) Requirements to use primers on different supports and its compatibility with its rendering:

- The alkyd and epoxy primers are compatible with YESAL RESIG (Ignífugo), however, the application of YESAL RESIG (Ignífugo) can be carried out directly on clean steel because it does not cause directly any corrosion on steel. Adherence can vary from one primer to another, depending on the primer quality and the finishing state of the surface. Oily primers and those which give off pigments are not recommended.
- For concrete and galvanized steel supports, the used of primers are not necessary.
- The ETA-Guideline is not designed to cover the application of rendering over any existing coating (e.g. 'old' existing paint) or rendering. It is therefore assumed that:
 - o any existing coating or rendering must be completely removed before the application.
 - o if it could not be removed, the compatibility and adherence between the new rendering and the existing coating or rendering must not be less than 80 % of that which would exist between the rendering and the support.
- Non compatibility with other fire protection materials. In these special cases, it is needed to check it with manufacturer.

C) Circumstances in which the rendering needs reinforcements.

Although it has not been evaluated in this ETA, in cases where the mechanical resistance needs to be improved, and in cases where the steel beams and columns are only applied on one face, it is recommended to place a mesh. In cases that the state of the surface of the primer does not assure an adequate adherence, please check it with the manufacturer.

D) Finishing of the final aspect of the rendering.

Any repairing required may be performed manually by using a trowel. Etc. Its finishing is rough but, if desired; it can be smoothed using a trowel or any other brickwork tool intended for this use.

E) Application limitations due to certain environments.

- The recommended environmental temperature of the product to be applied will be between 5°C and 40°C and it will be not admitted support temperatures upper to 45°C. In other conditions it will need to follow the manufacturer's instructions.
- During the application and drying time, the product has to be protected against the water rain.
- Curing and drying must not be exposed to strong winds during projection to avoid a rapid dry.

F) Incompatibility with other Fire protection materials. For these special cases, it is needed to check it with the manufacturer.

Recommendations of use, maintenance and repair. It is recommended to carry out yearly control inspections to check the state of the product (damages, cracks, cleanliness, etc). The repair procedure will be carried out by:

- complete disposal of the damaged product,
- preparation of the support (cleanliness),
- new application of YESAL RESIG (Ignífugo) sprayed or manually according to the reparation size. When the area to repair manually is significant, a mesh fixed to the support shall be used.

Further application details are laid down in the MTD place at IETcc.

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

The assessment of the YESAL RESIG (Ignífugo) for the intended use regard to the Basic works requirements nº 2, 3 and 4 was performed in compliance with the EAD 350140-00-1106: Renderings and rendering kits intended for fire resisting applications.

3.1 Safety in case of fire (BWR 2)

Basic requirement for construction works 2: Safety in case of fire						
Essential characteristic			Relevant clause in EAD	Performance		
Reaction to fire			2.2.1.1	A1		
Fire resistance			2.2.2	Performance		
Support		Thickness of the product		R15 at R240		
Steel		5 at 44 mm		See annex I		
Flat concrete profiled sheet composite		12,5 at 41,2 mm		REI 30 to REI 240		
Wall and slab of concrete	Nom load bearing	9.7 – 13.7 mm		REI 30 to REI 120		
	Load bearing			REI 240		
Unidirectional and bidirectional concrete wrought		23 mm	REI 240			
Durability			2.2.12	Adherence	Thermal efficiency	Visual aspect
Resistance to deterioration caused by high humidity ² (4 weeks at 32 °C, 95% HR)		Concrete	2.2.12.3	≤ 20 %	-----	Correct
		Steel		≤ 20 %	≤ 15 %	Correct
Resistance to deterioration caused by heat and cold ¹ (5 cycles)		Concrete		≤ 20 %	-----	Correct
		Steel		≤ 20 %	≤ 15 %	Correct
Resistance to deterioration caused by freezing and thawing ¹ (25 cycles)		Concrete		≤ 20 %	-----	Correct
		Steel		≤ 20 %	≤ 15 %	Correct
Thermal efficiency and aspect with the different primers			2.2.14.4	Thermal efficiency		Visual Aspect
Steel + primer 1C alkyd				< 15 % ³		Correct
Steel + primer 2C epoxi						
Galvanized steel						

3.2 Hygiene, health and environment (BWR 3)

Basic requirement for construction works 3: Hygiene, health, and the environment		
Essential characteristic	Relevant clause in EAD	Performance
Content, emission and/or release of dangerous substances. Leachable substances	2.2.3	The semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC) are not determined in accordance with EN 16516
Resistance to water vapour (EN 12086)	2.2.4	$\mu = 10$ (thickness 1 cm) // mg/(m ² /h): 14285

² Adherence and thermal efficiency values alter ageing, must not be inferior to 80 % (variation ≤ 20 % and 85 % (variation ≤ 15 %) respectively from initial value.

³ Variation of the test time respect to the same sample un-primed steel sheet.

3.3 Safety and accessibility in use (BWR 4)

Basic requirement for construction works 4: Safety and accessibility in use				
Essential characteristic		Relevant clause in EAD	Performance	
Resistance to functional failure from hard body impact load 0.5 kg steel ball (thickness 10-25 mm)	3 J (Nm)	2.2.6.1	non cracks, non delamination	
	10 J (Nm)			
Resistance to functional failure from soft body impact load 50 kg bag (thickness 6 - 25 mm)	500 J (Nm)	2.2.6.2	non cracks, non delamination	
Adhesion (bond strength)		2.2.7	Performance	
Support	Thickness of the product		0.3 MPa	
Concrete	44		0.3 MPa	
	25		0.3 MPa	
	6		0.3 MPa	
Steel	32		0.3 MPa	
	25		0.3 MPa	
	6		0.16 MPa	
Steel + primer 1C (alkyd)	25		2.2.14.4	0.1 MPa
Steel + primer 2C (epoxi)	25			0.2 MPa
Galvanized steel	25	0.3 MPa		
Air erosion		Annex C	NPA	
Resistance to corrosion of a steel substrate by the rendering (240 h, 23 °C at 60 % and at 95 % HR). Weight lost (%)		2.2.14.4 Annex B	23 °C 60% HR	23 °C 95% HR
Support	Steel		3.8 10 ⁻⁵ g/mm ²	5,1 10 ⁻⁵ g/mm ²
	Galvanised steel			

3.4 Identification of components

The characteristics of the components of this product show the following values, which are within the respective requirements and tolerances stated in the Manufacture Technical Dossier (MTD).

Properties		YESAL RESIG (Ignifugo) (Tolerances)
Binder content (volumen)		48 % (> 46 %)
Mixing ratio (%)		75 - 85 %
Colour		White
Particle size (EN 1015-1) (%)		> 1: 2,8 / > 0.5 : 9,8 / > 0.25: 18 / > 0.125: 29 / >0.063: 31
Denisty (kg/m ³)	Podwer	600 (550 ± 50)
	Paste (EN 1015-6)	1300 (1200 ± 100)
	Hardened EN 1015-10)	850 (± 15%)
Dry extract 105 °C, (% weight)		98 (≥ 98)
Ash content 450 °C, (% weiggt)		95 (≥ 95)
Flexuaral strenght (EN 1015-11) (MPa)		1,26 (≥ 1)
Compressive strenght (EN 1015-11) (MPa)		2,6 (≥ 2)

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to the mandate Construct 98/311, Annex 3 (taking into account decision 1999/454/EC of the Commission) system 1 for assessment and verification of constancy of performance (see EC delegated regulation (EU) N.º 568/2014 amending Annex V to Regulation (EU) Nº 305/2011) applies.

Product	Intended uses	Level or Classes	System
YESAL RESIG (Ignifugo)	Rendering intended for Fire Resisting Application of building elements	Any	1

The system 1 provides:

Tasks for the manufacturer: factory production control and further testing of samples taken at the factory by the manufacturer in accordance with the "Control Plan".

Tasks for the notified body: initial type-testing of the product, initial inspection of factory and of factory production control and two annual surveillances, assessment and approval of factory production control of the manufacturer.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan which is deposited at IETcc⁴.

5.1 Tasks for the manufacturer

Factory production control. The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this ETA.

The manufacturer may only use components stated in the technical documentation of this ETA including Control Plan. The incoming raw materials are subjected to verifications by the manufacturer before acceptance.

The factory production control shall be in accordance with the Control Plan. The results of factory production control shall be recorded and evaluated in accordance with the provisions of the Control Plan.

The documentation shall be kept for at least five years. In the next table are enclosed the controls and the minimum frequency performed by the manufacturer.

Property	Frequency
Raw Material	Batch
Bulk density of the components	Batch
Bulk density of dry product	Batch
Bulk density of paste product	Batch
Consistence	Batch
Bulk density of hardened	Monthly
Adherence	Monthly
Insulation efficiency	Monthly

Further information concerning tests, frequencies and tolerances are included in the test's plan, which is part of the MTD to this ETA placed at IETcc.

Other tasks of manufacturer. The manufacturer shall, on the basis of a contract, involve a body which is notified for the tasks referred to in section 4 in order to undertake the actions laid down in this clause. For this purpose, the control plan shall be handed over by the manufacturer to the notified bodies involved.

The manufacturer shall make a declaration of conformity, stating that this product is in conformity with the provisions of this ETA.

5.2 Tasks for the Notified body

Initial type-testing of the product. The initial type-testing have been carried out by the IETcc to issue this ETA which corresponds to EAD 350140-00-1106. Renderings and rendering kits intended for fire resisting applications

The initial type-testing of this ETA have been carried out by the IETcc on samples from the current production. The IETcc has assessed the results of these tests in accordance with this EAD.

Initial inspection of factory and of factory production control. The Notified Body shall ascertain that, in accordance with the Control Plan, the factory (in particular the employees and the equipment) and the factory production control are suitable to ensure continuous and orderly manufacturing of the components according to the specifications mentioned in clause 3 of this ETA.

Continuous surveillance, assessment and approval of Factory Production Control. The Notified body shall visit the factory at least twice a year. Surveillance of the manufacturing process shall include:

- Inspection of the documentation of factory production control, to ensure continuing compliance with the provisions of the ETA,

⁴ The Control Plan is a confidential part of the ETA and only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

- Identification of changes by comparing data obtained during the initial inspection or during the last visit.

In cases where the provisions of the European Technical Assessment and its “Control Plan” are no longer fulfilled the certification body (IETcc) shall withdraw the certificate of conformity.

Issued in Madrid on 25 of May 2022

By



Director

on behalf of Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc – CSIC)

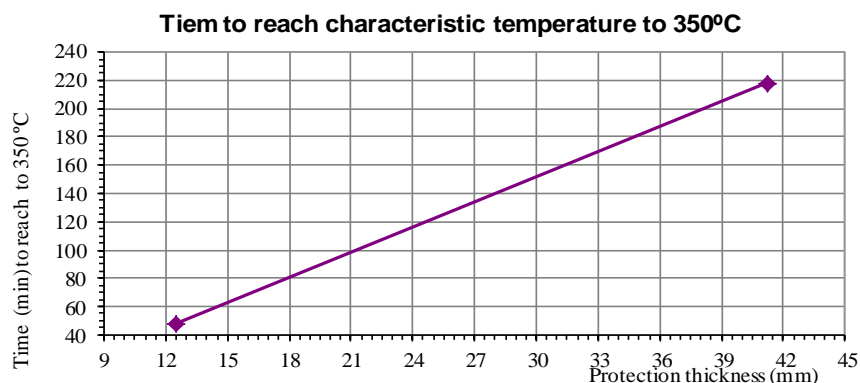
Annex I. Fire resistance tests

I.1 Flat concrete profiled sheet composite

The hardened density of the product for this test was 856 kg/m³.

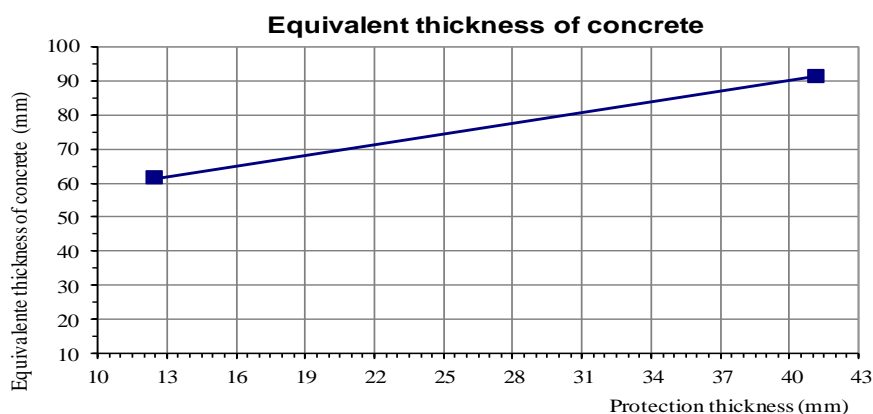
Temperature of the Steel profiled sheet. The characteristic temperature of the steel profiled sheet is the average of the medium and maximum temperature registered in all the points of the measurement. The next table show the characteristic temperature to the steel sheet reach 350 °C.

	Maximum thickness of protection $\equiv p_{max}$ (mm)	Minimum thickness of protection $\equiv dp_{min}$ (mm)
Time(min)/T°C characteristic=350°C	218	48



Equivalent thickness of concrete. The final Equivalent thickness of concrete obtained was obtained according to the curves of Eurocode 4 (ENV 1994-1-1:1995. Project of mixed structures of concrete and steel. Part. 1-1 General rules and rules for building) for concrete are:

Thickness of the protección System (mm) d_p	Equivalent thickness of concrete (mm) h_{eq}
41,2	91,4
12,5	61,4

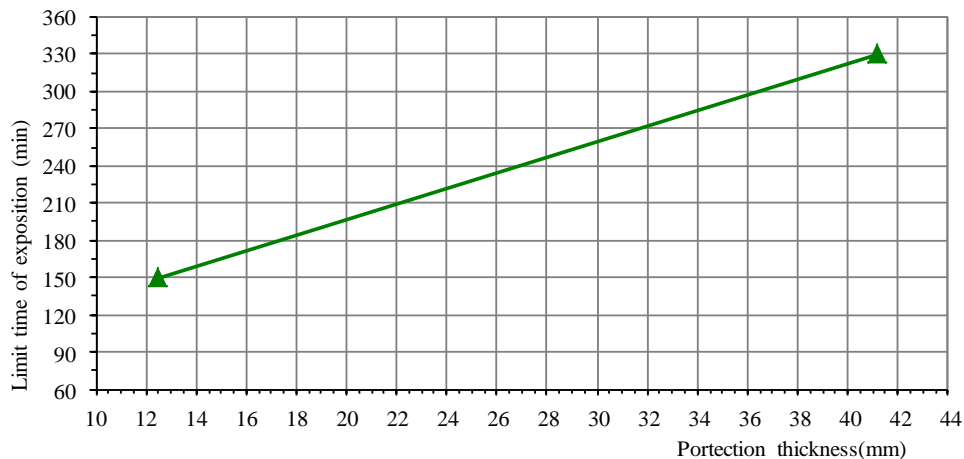


For the calculation of the equivalent thickness of concrete, the value “t_r” used to determine “h_e” has been taken as the time at which the test ended, being the characteristic temperature of the steel profiled sheet at this moment of 888°C for the minimum protection thickness, and 863 °C for the maximum protection thickness.

Limit time of exposition. This limit time of exposition is related with the adherence to the system and the protection to the mixed slab, according to part 13.4 of ENV 13381-5-2005:

Thickness of the protection system (mm) d_p	Limit time of exposition (min)
41,2	330
12,5	150

Limit time of exposition



Insulation. The thermal insulation of the mixed slab + the protection according to EN 1363-1 is:

	Maximum thickness of protection $\equiv dp_{max} \equiv 41,2$ mm	Minimum thickness Protection $dp_{min} \equiv 12,5$ mm
Time (min) EN 1363-1:2000	330	150

The application limitations of the results obtained are the following:

- The test results, according to the performance of the fire protection system in accordance with this method, can be applied to slabs composed of concrete/steel with profiled steel sheet which may or may not contain framework steel bars for the purpose of load resistance.
- The results of the assessment are applicable to the mixed slabs of concrete/steel with exposition to fire next to the steel and in accordance with the following:
 - The sheet's thickness is superior or equal to 1 mm of thickness.
 - The width of the rib ($lp1$), to which the fire protection material is directly fixed, should not be superior to 1.5 times as much the width of the specimen tested. Thus, $lp1 \leq 151,5$ mm.
 - The height of the rib ($h2$) should not be superior to 1,5 times as much the height of the specimen tested, that is, $h2 \leq 90$ mm.
- The equivalent thickness of concrete for a given thickness of the fire protection system is applicable within the corresponding Limiting Exposure Time (according to graphic).
- The results of the assessment are valid solely for slabs composed of concrete/sheet made with trapezoidal profiled steel sheet.
- The results of the assessment can only be applied to slabs made of concrete/sheet whose concrete's density is comprised between 0,85-1,15 times the concrete tested ($1.912 / 2.587$ kg/m³).
- The results of the assessment are applicable to concrete elements whose concrete's strength is equal or greater to the resistance of the concrete tested, that is: 28,4 MPa within 28 days.
- The results of the assessment are applicable to all of those concrete elements whose concrete has been made of siliceous aggregates.
- The results of the assessment can only be applied to slabs made of concrete/steel where the effective thickness of the slab is equal or superior to the slab tested (83,6 mm).
- The results of the assessment can only be applied to fire protection systems where the fixation system used is equal to the one used in the system tested.
- The results of the assessment can only be applied to protections of maximum two layers.

I.2 Beams and Columns of steel with 3 or 4 exposed faces

The hardened density of the product for this test was 855 kg/m³. The cursive figures correspond to extrapolated values.

Section factor (m ⁻¹)	Classification of Fire Resistance					350°C		
	R15	R30	R45	R60	R90	R120	R180	R240
≤ 65	5	8	11	14	20	26	37	---
70	6	9	11	14	20	26	38	---
75	6	9	12	15	21	27	39	---
80	6	9	12	15	21	27	40	---
85	6	9	12	15	22	28	40	---
90	6	9	12	16	22	28	41	---
95	6	9	13	16	22	29	41	---
100	6	10	13	16	22	29	42	---
110	7	10	13	16	23	30	43	---
120	7	10	13	17	23	30	43	---
130	7	10	14	17	24	31	44	---
140	7	10	14	17	24	31	---	---
150	7	11	14	17	24	31	---	---
160	7	11	14	18	25	32	---	---
170	7	11	14	18	25	32	---	---
180	7	11	14	18	25	32	---	---
190	7	11	15	18	25	32	---	---
200	8	11	15	18	25	33	---	---
210	8	11	15	18	26	33	---	---
220	8	11	15	19	26	33	---	---
230	8	11	15	19	26	33	---	---
240	8	11	15	19	26	33	---	---
250	8	11	15	19	26	33	---	---
260	8	12	15	19	26	34	---	---
270	8	12	15	19	26	34	---	---
280	8	12	15	19	26	34	---	---
290	8	12	15	19	27	34	---	---
300	8	12	15	19	27	34	---	---

Minimum thickness (mm) of product to keep the profile temperature below 350°C

Section factor (m ⁻¹)	Classification of Fire Resistance					400°C		
	R15	R30	R45	R60	R90	R120	R180	R240
≤ 65	5	7	10	12	18	24	35	---
70	5	7	10	13	19	24	36	---
75	5	7	10	13	19	25	37	---
80	5	8	11	14	20	26	38	---
85	5	8	11	14	20	26	38	---
90	5	8	11	14	20	27	39	---
95	5	8	11	15	21	27	40	---
100	5	8	12	15	21	27	40	---
110	6	9	12	15	22	28	41	---
120	6	9	12	16	22	29	42	---
130	6	9	13	16	23	29	43	---
140	6	9	13	16	23	30	43	---
150	6	10	13	17	23	30	44	---
160	6	10	13	17	24	31	---	---
170	7	10	14	17	24	31	---	---
180	7	10	14	17	24	31	---	---
190	7	10	14	17	25	32	---	---
200	7	10	14	18	25	32	---	---
210	7	10	14	18	25	32	---	---
220	7	11	14	18	25	32	---	---
230	7	11	14	18	25	33	---	---
240	7	11	14	18	25	33	---	---
250	7	11	15	18	26	33	---	---
260	7	11	15	18	26	33	---	---
270	7	11	15	18	26	33	---	---
280	7	11	15	18	26	33	---	---
290	7	11	15	19	26	34	---	---
300	7	11	15	19	26	34	---	---

Minimum thickness (mm) of product to keep the profile temperature below 400°C

Section factor (m ⁻¹)	Classification of Fire Resistance						450°C		
	R15	R30	R45	R60	R90	R120	R180	R240	
≤ 65	5	5	8	11	16	22	33	44	
70	5	6	9	11	17	23	34	---	
75	5	6	9	12	18	23	35	---	
80	5	6	9	12	18	24	36	---	
85	5	7	10	13	19	25	37	---	
90	5	7	10	13	19	25	37	---	
95	5	7	10	13	19	26	38	---	
100	5	7	10	14	20	26	39	---	
110	5	8	11	14	20	27	40	---	
120	5	8	11	15	21	28	41	---	
130	5	8	12	15	22	28	42	---	
140	5	9	12	15	22	29	42	---	
150	5	9	12	16	22	29	43	---	
160	6	9	12	16	23	30	44	---	
170	6	9	13	16	23	30	44	---	
180	6	9	13	16	23	31	---	---	
190	6	10	13	17	24	31	---	---	
200	6	10	13	17	24	31	---	---	
210	6	10	13	17	24	31	---	---	
220	6	10	14	17	24	32	---	---	
230	6	10	14	17	25	32	---	---	
240	6	10	14	17	25	32	---	---	
250	6	10	14	18	25	32	---	---	
260	7	10	14	18	25	33	---	---	
270	7	10	14	18	25	33	---	---	
280	7	10	14	18	25	33	---	---	
290	7	11	14	18	26	33	---	---	
300	7	11	14	18	26	33	---	---	

Minimum thickness (mm) of product to keep the profile temperature below 450°C

Section factor (m ⁻¹)	Classification of Fire Resistance						500°C		
	R15	R30	R45	R60	R90	R120	R180	R240	
≤ 65	5	5	7	9	15	20	31	41	
70	5	5	7	10	15	21	32	43	
75	5	5	8	10	16	22	33	44	
80	5	5	8	11	17	22	34	---	
85	5	5	8	11	17	23	35	---	
90	5	6	9	12	18	24	36	---	
95	5	6	9	12	18	24	36	---	
100	5	6	9	12	19	25	37	---	
110	5	7	10	13	19	26	38	---	
120	5	7	10	13	20	26	39	---	
130	5	7	11	14	21	27	40	---	
140	5	8	11	14	21	28	41	---	
150	5	8	11	15	22	28	42	---	
160	5	8	12	15	22	29	43	---	
170	5	8	12	15	22	29	43	---	
180	5	9	12	16	23	30	44	---	
190	5	9	12	16	23	30	44	---	
200	5	9	12	16	23	30	---	---	
210	5	9	13	16	24	31	---	---	
220	6	9	13	16	24	31	---	---	
230	6	9	13	17	24	31	---	---	
240	6	9	13	17	24	32	---	---	
250	6	10	13	17	24	32	---	---	
260	6	10	13	17	25	32	---	---	
270	6	10	14	17	25	32	---	---	
280	6	10	14	17	25	32	---	---	
290	6	10	14	18	25	33	---	---	
300	6	10	14	18	25	33	---	---	

Minimum thickness (mm) of product to keep the profile temperature below 500°C

Section factor (m ⁻¹)	Classification of Fire Resistance						550°C	
	R15	R30	R45	R60	R90	R120	R180	R240
≤ 65	5	5	5	8	13	18	29	39
70	5	5	6	9	14	19	30	41
75	5	5	6	9	15	20	31	42
80	5	5	7	10	15	21	32	43
85	5	5	7	10	16	22	33	---
90	5	5	8	10	16	22	34	---
95	5	5	8	11	17	23	35	---
100	5	5	8	11	17	23	36	---
110	5	6	9	12	18	24	37	---
120	5	6	9	12	19	25	38	---
130	5	6	10	13	20	26	39	---
140	5	7	10	13	20	27	40	---
150	5	7	10	14	21	27	41	---
160	5	7	11	14	21	28	42	---
170	5	8	11	15	21	28	42	---
180	5	8	11	15	22	29	43	---
190	5	8	12	15	22	29	44	---
200	5	8	12	15	23	30	44	---
210	5	8	12	16	23	30	---	---
220	5	8	12	16	23	30	---	---
230	5	9	12	16	23	31	---	---
240	5	9	12	16	24	31	---	---
250	5	9	13	16	24	31	---	---
260	5	9	13	17	24	32	---	---
270	5	9	13	17	24	32	---	---
280	5	9	13	17	24	32	---	---
290	6	9	13	17	25	32	---	---
300	6	9	13	17	25	32	---	---

Minimum thickness (mm) of product to keep the profile temperature below 550°C

Section factor (m ⁻¹)	Classification of Fire Resistance						600°C	
	R15	R30	R45	R60	R90	R120	R180	R240
≤ 65	5	5	5	7	12	17	27	37
70	5	5	5	7	13	18	28	39
75	5	5	5	8	13	19	29	40
80	5	5	6	8	14	19	31	42
85	5	5	6	9	15	20	32	43
90	5	5	6	9	15	21	32	44
95	5	5	7	10	16	22	33	---
100	5	5	7	10	16	22	34	---
110	5	5	8	11	17	23	36	---
120	5	5	8	11	18	24	37	---
130	5	5	9	12	18	25	38	---
140	5	6	9	12	19	26	39	---
150	5	6	10	13	20	26	40	---
160	5	6	10	13	20	27	41	---
170	5	7	10	14	21	28	42	---
180	5	7	10	14	21	28	42	---
190	5	7	11	14	21	29	43	---
200	5	7	11	15	22	29	43	---
210	5	8	11	15	22	29	44	---
220	5	8	11	15	22	30	44	---
230	5	8	12	15	23	30	---	---
240	5	8	12	16	23	30	---	---
250	5	8	12	16	23	31	---	---
260	5	8	12	16	23	31	---	---
270	5	8	12	16	24	31	---	---
280	5	9	12	16	24	32	---	---
290	5	9	13	16	24	32	---	---
300	5	9	13	17	24	32	---	---

Minimum thickness (mm) of product to keep the profile temperature below 600°C

Section factor (m ⁻¹)	Classification of Fire Resistance						650°C	
	R15	R30	R45	R60	R90	R120	R180	R240
≤ 65	5	5	5	5	10	15	25	35
70	5	5	5	6	11	16	27	37
75	5	5	5	7	12	17	28	38
80	5	5	5	7	13	18	29	40
85	5	5	5	8	13	19	30	41
90	5	5	5	8	14	20	31	42
95	5	5	6	9	14	20	32	43
100	5	5	6	9	15	21	33	---
110	5	5	7	10	16	22	34	---
120	5	5	7	10	17	23	36	---
130	5	5	8	11	17	24	37	---
140	5	5	8	12	18	25	38	---
150	5	5	9	12	19	25	39	---
160	5	6	9	12	19	26	40	---
170	5	6	9	13	20	27	41	---
180	5	6	10	13	20	27	41	---
190	5	6	10	14	21	28	42	---
200	5	7	10	14	21	28	43	---
210	5	7	11	14	21	29	43	---
220	5	7	11	14	22	29	44	---
230	5	7	11	15	22	30	44	---
240	5	7	11	15	22	30		---
250	5	8	11	15	23	30		---
260	5	8	12	15	23	30		---
270	5	8	12	15	23	31		---
280	5	8	12	16	23	31		---
290	5	8	12	16	24	31		---
300	5	8	12	16	24	32		---

Minimum thickness (mm) of product to keep the profile temperature below 650°C

The evaluation results within which the product can be used are: Section Factor between 60 m⁻¹ and 300 m⁻¹, Protection thicknesses assessed between 5 mm and 44 mm and Critical temperature of 650 °C

In the same way, the evaluation results are only applicable to:

- “I” and “H” section profiles,
- Those profiles of different type of section to the previous ones must be assessed expressly, according to the indications shown on ANNEX B of the ENV 13381-4:2005.
- Other grades of steel in accordance to EN 10025 and EN 10113
- Columns and beams with 3 or 4 faces exposed.

I.3 Unidirectional and bidirectional concrete wrought

The hardened density of the product for this test was 820 kg/m³. This report of the fire-resistance classification defines the classification assigned to a Unidirectional and bidirectional concrete wrought of 4600 mm x 2900 mm protected with 23 mm thickness of " YESAL RESIG (Ignífugo)" mortar.

The tested element is defined as a roof exposed to fire by his lower face. Its function is to resist the fire of bearing capacity, integrity and thermal insulation characteristics given in paragraph 5 of the standard EN 13501-2:2009 + A1:2010. Exposure conditions:

Curve temperature/time	T = 345 log ₁₀ (8t + 1) + 20
Exposure direction	Projected product in the face exposed to fire
Number of faces exposed	1
Load	400 kg/m ²
Support conditions	Samples resting on the short sides

The classification obtained was REI 240

Results from the test to the fire and obtained classification are applied directly to the same as in the tested model constructions when one or more of the variations listed below are carried out and provided that the construction will continue to be subject to the code for design, from the point of view of its rigidity and stability.

Characteristics	Tested samples	Allowed modification
Load	400 kg/m ²	It is not allow increase the applied load
Boards	No tested	No applicable
Accessories/fasteners	Three fasteners type airplane between blocks	It is not allowed increase the total Surface occupied by the tested fasteners
Cavity	Test without cavity	No applicable
Slope	Only for monopitch roof with 0° slope	It is allow its installation up to 25° slope

I.4 Concrete slabs and walls

The hardened density of the product for this test was 876 kg/m³.

Final equivalent thickness of concrete obtained according to Annex C of the standard EN 13381-3. "Test methods for determining the contribution to the fire resistance of structural members - Part 3: Applied protection to concrete members" has been:

	Time (min)					
	30	60	90	120	180	240
dp_{min} = 10,2 mm Total mean thickness of application.	37	47	32	17	---	---
dp_{max} = 13,0 mm Total mean thickness of application.	28	33	34	33	---	---
ε Values of equivalent thickness of concrete in mm for load bearing slabs and walls						
	Time (min)					
	30	60	90	120	180	240
dp_{min} = 10,2 mm Total mean thickness of application.	37	47	32	17	12	---
dp_{max} = 13,0 mm Total mean thickness of application.	28	33	34	33	31	27
ε Values of equivalent thickness of concrete in mm for non-load bearing slabs and walls						

The limits of applicability of the results of the assessment obtained are the next:

- Results valid only for slabs and walls (vertical and horizontal) of concrete with fire exposure from one side.
- Result applicable to densities of concrete within the range 2093 kg/m³ to 2831 kg/m³. (Densities of concrete tested 2462 kg/m³).
- Result applicable to concrete members with strength equal to or superior of the tested ones (HA-25/B/20/IIa) according to EN 206.
- The minimum thickness of the protection mortar is 9.7 mm and the maximum 13.7 mm.