The Catalonia Institute of Construction Technology

Wellington 19
ES-08018 Barcelona
Tel. +34 93 309 34 04
qualprod@itec.cat
www.itec.cat

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
www.eota.eu

European Technical Assessment

ETA 11/0185
of 13.10.2016

General Part

Trade name of the construction product	**TECWOOL F®**
Product family to which the construction product belongs	Rendering intended for fire resisting applications
Manufacturer	**TECRESA Protección Pasiva SL** Parque Leganés Tecnológico Margarita Salas 6 ES-28919 Leganés (Madrid) Spain
Manufacturing plant(s)	According to annex N kept by ITeC
This European Technical Assessment contains	12 pages including 2 Annexes which form an integral part of this assessment. Annex N contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available.
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	ETAG 018, Part 1 edition April 2013 and Part 3 edition May 2012, used as European Assessment Document (EAD)
This version replaces	ETA 11/0185, issued on 9.06.2011

General Comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es)).

Specific Parts of the European Technical Assessment

1 Technical description of the product

TECWOOL F® is a spray-applied fire protective rendering made of mineral wool mixed with white cement and additives. The rendering considered in this ETA does not require additional components such as mechanical fixings, primers, reinforcing mesh or top coats -option 1 as described in the foreword of ETAG 018-3.

TECWOOL F® is sprayed dry and mixed with water at the nozzle. The binder is included as part of the dry mix in the bag.

Properties of the applied rendering such as thickness range, density, adhesion values, etc., are described in Annex 2.

2 Specification of the intended use(s) in accordance with the applicable EAD

TECWOOL F® is intended for the fire protection uses as described in Table 1, which also shows the related environmental use conditions.

Table 1: Intended use categories related to the protected element and the environmental conditions.

Fire protection uses		**Environmental conditions**
ETAG 018-1 reference	**Element intended to be protected**	**ETAG 018-3 reference**
Type 5	Load-bearing composite elements of concrete/profiled steel sheet	Type Z_1

The environmental use categories are specified in ETAG 018-3, section 2.2.2:

- Type Z_1: internal conditions with humidity equal to or higher than 85% RH, excluding temperatures below 0°C. This category includes Type Z_2.
- Type Z_2: internal conditions excluding temperatures below 0°C, with humidity lower than 85% RH.

The provisions made in this ETA are based on a working life of TECWOOL F® of at least 25 years, provided that the conditions laid down in the manufacturer's instructions for the installation, use and maintenance are met. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given as to the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the appropriate product(s) in relation to the expected economically reasonable working life of the works.

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

The assessment of the TECWOOL F® for the relevant intended uses, considering the basic requirements for construction works 2, 3, 5 and 6, was performed following the ETAG 018 for *Fire Protective Products, Part 1: General (April 2013) and Part 3: Renderings and rendering kits intended for fire resisting applications (May 2012)*, used as EAD.

Table 2: Performance of TECWOOL F®.

Basic requirement	Essential characteristic		Performance
BWR 2 Safety in case of fire	Reaction to fire		A1
	Resistance to fire		See Annex 2
BWR 3 Hygiene, health and the environment	Release of dangerous substances		See 3.1.3
BWR 5 Protection against noise	Sound absorption	Min. thickness (17 mm)	α_w = 0,60; Class C
		Max. thickness (26 mm)	α_w = 0,80; Class B
BWR 6 Energy economy and heat retention	Thermal insulation	$\lambda_{U,90/90(23/50)}$	0,075 W/m·K
		$\lambda_{U,90/90(23/80)}$	0,080 W/m·K
	Water vapour permeability (μ)		2,1
General aspects relating to the performance of the product	Durability		Type Z_1
	Adhesion (bond strength)		See 3.1.7

3.1 Methods used for the assessment

3.1.1 Reaction to fire

The performance of the rendering has been determined according to EN 13501-1 [1].

3.1.2 Fire resistance

Fire resistance performance, classified in accordance with EN 13501-2 [2], has been determined following the test and evaluation methods given in Annex 2.

3.1.3 Release of dangerous substances

According to the manufacturer's declaration, the product specification has been compared with the dangerous substances listed on Annex VI to Regulation (EC) No 1272/2008, the "Indicative list of regulated dangerous substances possibly associated with construction products under the CPD, DS 041/051 Rev.12, 22 March 2012" of the EC Experts Group, and the EOTA TR 034 [3], to verify that TECWOOL F® does not contain such substances, with the exception of mineral wool

[1] EN 13501-1 *Fire classification of construction products and building elements. Part 1: Classification using data from reaction to fire tests implemented.*

[2] EN 13501-2 *Fire classification of construction products and building elements. Part 2: Classification using data from fire resistance tests, excluding ventilation services implemented.*

[3] EOTA Technical Report 034 *General BWR3 Checklist for EADs/ETAs - Dangerous substances,* of October 2015.

fibres, which meet the requirements given in Note Q of the Regulation (EC) No 1272/2008 and they are therefore not potentially carcinogenic.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope. In order to meet the provisions of the EU Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.1.4 Sound absorption

The sound absorption of assemblies installed according to Annex 2 has been tested according to EN ISO 354 [4]. The weighted sound absorption coefficient (α_w) and rating have been determined in accordance with EN ISO 11654 [5].

3.1.5 Thermal insulation

Thermal conductivity has been tested according to EN 12667 [6] and the declared values have been determined according to EN ISO 10456 [7].

Table 3: Thermal characteristics.

$\lambda_{10,dry,90/90}$	0,061	(W/m·K)	Conductivity fractile value at 10ºC at dry conditions, representing at least 90% of the production with a confidence level of 90%
$\lambda_{U,90/90(23/50)}$	0,075	(W/m·K)	Design value of conductivity at 23ºC and 50% R.H.
$\lambda_{U,90/90(23/80)}$	0,080	(W/m·K)	Design value of conductivity at 23ºC and 50% R.H.

3.1.6 Water vapour permeability

Tested according to EN ISO 12572, the declared value of the water vapour diffusion resistance coefficient (μ-value) is given in table 2.

3.1.7 General aspects relating to the performance of the product

Durability of the rendering has been assessed for Type Z_1 and Type Z_2 according to ETAG 018-3, section 5.7.1, verifying the resistance to deterioration caused by high humidity.

Adhesion (bond strength) has been determined in accordance with ETAG 018-3 and EGOLF SM5[8]. The adhesion/cohesion of the rendering depends on the installed thickness and the preparation of the substrate. Bond strength guidance values of the rendering and the conditions under which they were achieved are given in Annex 2.

The ETA is issued for TECWOOL F® on the basis of agreed data/information, deposited with the ITeC, in accordance with ETAG 018-3, section 5.7.3.

---

[4] EN ISO 354 *Acoustics. Measurement of sound absorption in a reverberation room.*

[5] EN ISO 11654 *Acoustics. Sound absorbers for use in buildings. Rating of sound absorption.*

[6] EN 12667 *Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance.*

[7] EN ISO 10456 *Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values.*

[8] EGOLF SM5 (EA 05:1999) *Fire testing. Method for the measurement of bonding properties of fire protection materials applied to steel, concrete and steel/concrete composite structures.*

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

According to the decision 1999/454/EC of the European Commission, the system of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 4: AVCP System.

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire protective products	For fire compartmentation and/or fire protection or fire performance	Any	1

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

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC [9] and the factory production control shall be in accordance with it. The following table specifies the cornerstones for the factory production control.

Table 5: FPC test plan for TECWOOL F®.

Product	Property	Minimum frequency
Dry mix	Incoming materials	1 per batch supplied
	Bulk density of aggregate	1 per batch (of aggregate)
	Bulk density of dry mix	5 times per day
Hardened rendering	Density	1 per month
	Adhesion	1 per month
	Insulation efficiency	1 per month

Issued in Barcelona on 13 October 2016

by the Catalonia Institute of Construction Technology.

Institut de Tecnologia de la Construcció de Catalunya

Ferran Bermejo Nualart
Technical Director, ITeC

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

ANNEX 1. Fire resistance performance and installation provisions for the assemblies related to the intended uses of TECWOOL F®

A.1.1 Overview of fire resistance performance for assemblies protected with TECWOOL F®

The fire protective assemblies in Table A.1.1 have been assessed within the framework of this ETA.

Table A.1.1: Fire protective assemblies.

Assembly assessed within the framework of this ETA	Classification	Test standards	Intended use type according to ETAG 018	Installation details
Load-bearing flat composite concrete/profiled steel sheet elements	EN 13501-2, see Annex 2	ENV 13381-5	Type 5	Annex 2

A.1.2 Installation and design provisions related to the assemblies protected with TECWOOL F®

The system installation should be carried out in accordance with the manufacturer's instructions and the provisions given in the following Annexes.

A.1.2.1 Tools and equipment

Typical machines used to spray TECWOOL F® are welded steel built and designed for the spraying of mineral fibres and low density pulverisable products. They usually comprise a supply hopper, a carding system, an air propulsion system, and hoses to bring TECWOOL F® and water to the spraying nozzle. For example, a typical spraying machine is the LR-18, supplied by Tecresa Protección Pasiva SL.

A.1.2.2 Substrate

Before application the substrate should be inspected and prepared. Surfaces to be sprayed shall be free from oil, grease, primers, lock down agents or of any other substance that will impair adhesion. If dirt is detected on the substrate, it is recommended to clean the substrate by spraying water with a hose.

Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of TECWOOL F®. Ducts, piping, conduit or other suspended equipment are to be installed after the application of TECWOOL F®, in which case later inspection of the applied rendering will be required as well as, when necessary, its reparation.

A.1.2.3 Environmental conditions during application and construction

The air and substrate temperature accepted for the application of the rendering shall be between 2 ºC and 40 ºC, during application and for a minimum of 24 hours after application. It is recommended to spray the rendering lightly with water once it has been applied and, when air temperature is higher than 30 ºC, it is necessary to do it every 12 hours. Depending on the temperature and the relative humidity on

the jobsite, TECWOOL F® will set in about 18 to 36 hours. During winter time special considerations must be taken according to recommendations of the manufacturer.

Adequate ventilation must be envisaged to allow the product to dry out after being sprayed. In closed areas where the ventilation is not adequate, it may be necessary to install a ventilation and air circulation device sufficient to obtain a renewing of air at least 4 times per hour. In opened areas, wind speed should not be higher than 8 m/s.

As given in section 2 the product is intended for internal condition Z_1. Special provisions for temporary protection of the exposed rendering being subjected to rain or temperature below 0ºC during construction shall be taken.

A.1.2.4 Verifications on site

The thickness should be measured at sufficient points to determine the mean and minimum thickness. A suitable method for thickness measurement is given in ETAG 018-3, section 5.0.2.

The density of the hardened rendering should be measured within the tolerances specified in the relevant Annex.

The bond strength of the rendering to the substrate should be tested on site. A suitable method is EGOLF Agreement EA 05, which can be used as a base for the site tests. The person responsible for the works will decide on the adequacy of the site tests results taking into account the reference values given in Annex 2. For their acceptability, the recommendations given in ETAG 018-3, section 7.3.1, or other existing criteria can be applied, under the responsibility of the person responsible for works.

A.1.2.5 Storage

The bags of TECWOOL F® must be stored in a dry and well ventilated place until use. Do not store the bags in direct contact with the floor. The product must be stored under shelter away from oozing wall or any other wet surface. TECWOOL F® can be stored up to 6 months from date of manufacture under dry conditions. Material damaged by moisture (open or damaged bags) should not be used.

A.1.2.6 Repair

Limited damages of TECWOOL F® can be repaired. The damaged area shall be carefully cleaned with a knife, cutter or trowel through the whole applied thickness, down to the support. An additional zone of 250 mm all around the damaged area shall be cut at a right angle. Dust and particles generated by this operation shall be carefully eliminated. TECWOOL F® shall be sprayed in such a way that the opening is completely filled up and the surface of the repaired area is levelled with the surrounding TECWOOL F®. Rendering shall be sprayed with water once TECWOOL F® has been applied.

ANNEX 2. Specification and assessment of fire protection of load-bearing composite concrete/profiled steel sheet elements protected with TECWOOL F® (intended use Type 5)

A.2.1 Classification

The assemblies described in this Annex have 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 defined in EN 1363-1, clause 5.1.1, is 152 minutes.

The assessment of the required thickness of TECWOOL F® in function of the type of profiled steel sheet and the exposure time, for the characteristic steel sheet temperature rise to 350 ºC, the equivalent thickness of concrete, as well as the insulation and stickability performance are given in section A.2.3.

A.2.2 Installation requirements

The system installation should be carried out in accordance with the provisions in A.1.2.

A.2.2.1 Supporting structure

TECWOOL F® is applied directly on trapezoidal profiled steel sheets of composite slabs cast with normal weight concrete.

No specific preliminary preparation of the profiled steel sheets to be protected by TECWOOL F® is required. However, they must be bare, free of dust, oil and grease (attention must be paid to the fact that the steel sheets are normally covered by a grease protective layer). Corrosion protective primers or bonding agents are not required for the application of the rendering and have not been assessed.

The concrete slab contains a mesh of reinforcement steel bars (B 500, diameter of 6 mm) of 150 mm x 150 mm, installed on top of the profiled sheet ribs. A second mesh of reinforcement steel bars (B 500, diameter of 4 mm) of 300 mm x 150 mm is installed at 45 mm distance above the lower one.

The substrate must be rigid, free of deformations or excessive vibrations before TECWOOL F® is applied. Mid span deflection of deck spans should not be greater than L/250.

Specifications for the components are given in Table A.2.1.

Table A.2.1: Specification of the components.

Component	Identification	Characteristics	Mounting and fixing
Trapezoidal profiled galvanized steel sheet	HAIRCOL 59	Thickness ≥ 1,0 mm Width of the ribs ≤ 181 mm Depth of the ribs ≤ 90 mm S320GD steel with galvanized Z275	Surface shall be bare, free of dust, oil and grease.
Concrete	Concrete strength class 25 N/mm^2 Siliceous aggregates	Concrete with the same strength class or better. Density: 2210 kg/m^3 ± 15%.	The concrete may or may not contain additional reinforcing bars for load bearing purposes. Without release agent.

A.2.2.2 Fire protective rendering

TECWOOL F® is applied on the apparent side of the profiled steel sheet to be protected, by following its corrugation, for exposure to fire from the steel side of the composite slab.

TECWOOL F® is sprayed in two coats of regular thickness to reach the requested thickness according to this Annex. During the application, the thickness of the protective material is regularly controlled with a pin caliper.

Hairline cracks in the dry rendering are not accepted.

Specifications for the components are given in Table A.2.2.

Table A.2.2. Rendering specifications for fire resistance test.

Component	Identification	Characteristics	Mounting and fixing
Rendering	TECWOOL F®	Thicknesses from 17,3 to 26,8 mm, according to the assessment rules Hardened density: 297 kg/m^3 ± 15%	Rendering is kept without finishing after application. Spray applied rendering with: - No topcoats or sealing coats - No mechanical fixings - No additives out of dry mix

A.2.2.3 Bonding properties of TECWOOL F® on composite concrete/profiled steel sheet elements

Assessment of the bonding properties of TECWOOL F® product when applied on trapezoidal profiled steel sheets of composite slabs cast with normal weight concrete, has been carried out according to EGOLF SM5 procedure.

The indicated values are representative of cohesive failure through the applied thickness of protective sprayed product TECWOOL F®. These values are guidance values, and they do not reflect a statistical evaluation, nor minimum guaranteed values.

Table A.2.3: Tensile bond strength on profiled steel sheets of composite slabs cast with normal weight concrete

Surface	Thickness of TECWOOL F®	Mean tensile bond strength (MPa)	Failure mode
Trapezoidal profiled galvanized steel sheet (HAIRCOL 59)	16 mm	0,011	Cohesive failure
	25 mm	0,011	Cohesive failure

Samples have been taken from the flat area of the ribs (see figure A.2.1).

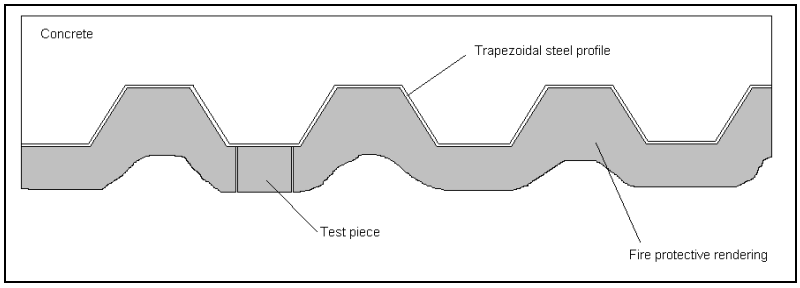

Figure A.2.1. Test specimen.

A.2.3 Assessment of the fire performance of TECWOOL F® on composite concrete/profiled steel sheet elements

A.2.3.1 General

The assessment method used to assess the fire protection performance of TECWOOL F® when applied on composite concrete/profiled steel sheet elements is according to ENV 13381-5.

A.2.3.2 Temperature of the profiled steel sheet

The time to reach 350 ºC in the profiled steel sheets has been determined according to provisions of standard ENV 13381-5, section 13.2 and they are given in table A.3.5 for minimum and maximum thickness.

Table A.2.4. Time to reach 350ºC.

Element	Thickness of TECWOOL F® (mm)	Time to reach 350ºC (minutes)
Trapezoidal profiled galvanized steel sheet (HAIRCOL 59)	17,3	96
	26,8	129

A.2.3.3 Equivalent thickness of concrete

The effective thickness H_{eff}, the equivalent effective thickness H_e and the equivalent thickness of concrete H_{eq} induced by the protective material TECWOOL F® applied on trapezoidal profiled steel sheets have been determined according to the provisions of the standard ENV 13381-5, section 13.3, and are given in table A.2.5.

Table A.2.5. Equivalent thickness of concrete.

Element	Thickness of TECWOOL F® (mm)	H_{eff} (mm)	H_e (mm)	H_{eq} (mm)	Limiting time for applicability (min)
Composite concrete/ trapezoidal profiled steel sheet element	17,3	81,2	121	40	139
	26,8	91,2	136	45	152

The equivalent thickness of concrete H_{eq} depending on TECWOOL F® thickness is given in figure A.2.2.

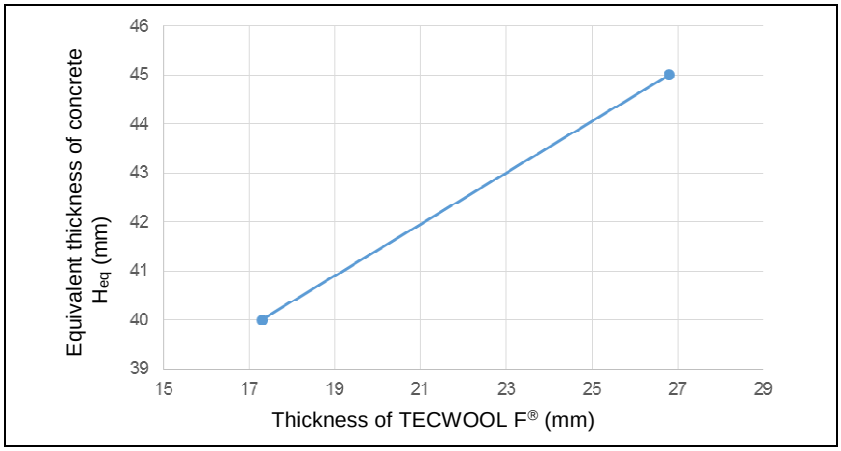

Figure A.2.2. Equivalent thickness of concrete H_{eq} in function of the thickness of the protective rendering TECWOOL F®.

A.2.3.4 Insulation performance

The separating function of the composite concrete/profiled steel sheet elements protected with TECWOOL F® was maintained during the test in accordance with the criteria established in EN 1363-1.

A.2.3.5 Stickability performance

The time for which the stickability of the protective material TECWOOL F® applied on trapezoidal profiled steel sheets is ensured has been determined according to the provisions of the standard ENV 13381-5, section 13.4, and is given in table A.2.6.

Table A.2.6. Stickability of TECWOOL F®.

Element	Thickness of TECWOOL F® (mm)	Stickability time (minutes)
Trapezoidal profiled galvanized steel sheet	17,3	139
	26,8	152