Technical manual

AMONN®
Amotherm

3rd EDITION

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Dear Readers,
Amonn has been manufacturing products to protect construction materials from fire for over thirty years. These products, namely our intumescent and fire-retardant paints and our fire-resistant plasters, are well-known throughout the industry. I am therefore proud to present the new Amotherm catalogue with all the latest products and solutions developed by our Research and Development team.

At Amonn we demand only the best - the highest technical expertise from our staff and the latest, cutting-edge equipment - when carrying out our research and development, so we can deliver top-quality products whose safety is certified.
I hope this catalogue is useful and you find the products you need.

Enjoy the catalogue.

Arno Amonn

Dear Paint Professionals,
the world in which we work, as well as the building industry, is constantly changing and evolving. We are all learning to live with new rules and approaches, so different from what we were used to.

The purpose of the Amonn catalogue is to support you in your work, a bit like a friend you can turn to for technical advice and products that meet the safety standards demanded by the industry.

Finally, I would like to thank all the team at Amonn who contributed to this catalogue; it wouldn't have been possible without their outstanding professionalism and passion for what they do.

I hope you enjoy the catalogue.

Claudio Traverso

Technical Director Amotherm

This revision (3rd Edition)
was updated in October 2025.

A story of safety

200 years of experience and innovation

For over two centuries Amonn has played a prominent role in the tradition, innovation and values of Italian enterprise, thanks to its long experience in manufacturing and distribution in a wide range of industrial and business sectors. The original company headquarters are located in Bolzano, housing the registered office and administrative departments. The Amotherm and Stufex ranges are manufactured at the production facility in Ponte nelle Alpi (BL), which is also home to the sales department, while the Lignex and Bessemer products are made at the Korneuburg factory near Vienna. Last, but not least, the Amonn&l'Aquatec facility in Bangkok, Thailand was set up to supply the Asian markets with passive fire protection products.

Family values for an international company

Ever since 1802, the company's growth and expansion have been based on the solid values of the Amonn family. These have led, in the 21st century, to its role as an international player, much appreciated for its high degree of specialisation and the skills that go into its products and services.

Everything comes down to expertise

Amonn was one of the first companies in Italy to introduce intumescent paints over 30 years ago and since then has expanded steadily, acquiring other companies which have contributed to the company's know-how. Amotherm combines Amonn's experience with the technical expertise of four leading Italian companies: Italvis, Protect and Stufex with their specialist industrial and construction know-how and Protherm with its range of intumescent products and plasters.

Thanks to its extensive range of products and the major technological advances it has made over the years, Amonn is now the leader in Italy and one of the top names in Europe for passive fire protection for buildings and construction materials, with a complete range of top-quality intumescent coatings and a highly qualified Engineering and Assistance department.

Innovation and specialist skills

The advantage of a scientific approach

Amonn gives each and every material the attention it needs, developing targeted products based on the mechanical properties of different surfaces and their behaviour when exposed to fire. The intumescent system developed and used by Amonn for over 30 years provides structures and materials with effective and tested passive fire protection. This has been possible thanks to Amonn's investment in the research and development of high-tech solutions which meet the ever-changing needs of the market and ever more rigorous standards and regulations.
Amonn's laboratory testing centre at its Belluno headquarters runs tests of all its intumescent and fire-retardant products on different construction materials and in all fire conditions. Over the years this research and experimentation has yielded invaluable information for our product development and allowed us to build up an important scientific knowledge base which is essential for the engineering consultancy service we provide on the use of our systems.

Intumescent paints were first introduced onto the market more than 60 years ago and since then great technical and application progress has been made. There are regulations which govern their use and, most important of all, laboratory testing to assess their efficacy.

To ensure effective, tested passive fire protection for structures and materials, Amonn invests significant resources into the research and development of innovative, high-tech solutions.

The company also has a furnace to test its products and carry out fire resistance tests, checking them throughout their development.

Dedicated solutions for every material

The Amonn research laboratory is specialised in the following sectors:
- fire-retardant paints for wood and other materials
- intumescent paints for structural elements such as steel, concrete and wood
- varnishes for wooden flooring

The laboratory is divided into three different areas:

Formulation
Here our technical staff study, produce and test prototypes that meet the demands of the market, our clients and industry standards, using dispersers of varying capacity and numerous latest-generation instruments to define the chemical and physical parameters of the paints.

Application
This area is equipped with cutting-edge application equipment (airless, airmix, etc..), a spray booth, demo flooring, etc. so our technical staff can verify the suitability of its prototypes in all possible application conditions.

Testing
Fire testing is the main focus of the laboratory; our technical staff evaluate the fire protection properties of the paints throughout development and then the consistency of their performance during use. A product's ability to reduce flame propagation and its thermal insulation performance during exposure to the fire curve are tested regularly.

Looking to the future: research and development

The team in our Laboratory is young, dynamic and highly qualified, offering specialist services such as:

- physical and chemical analyses of liquid and solid products using a thermobalance and an infrared spectrophotometer;
- verification of the thermal insulation and reaction to fire performance of coatings using gas furnaces which reproduce nominal fire curves in accordance with EN 13501-1/2 and 9174.

The products in the Amotherm range are designed specifically for fire protection and thermal insulation. They are manufactured using the best technologies available and our production engineers closely monitor them throughout to ensure the highest and most competitive price/performance ratio. All our production facilities respect the environment, in compliance with EN ISO 9001 and 14001.

Our laboratory is also equipped to conduct the following tests:

Adhesion tests:
- EN ISO 2409 (cross-cut test)
- EN ISO 4624 (pull-off test)

Reaction to fire tests:
- 9174 floors, walls or ceilings

Fire resistance tests:
- elements exposed on 1 to 4 sides without loads, positioned on the ceiling (beams), vertically (columns) up to one metre long or compartmentalising elements (e.g. walls) up to 0.5 m^2 surface, following standard fire curves define the chemical and physical parameters of the paints.

Density of liquid products:
- EN ISO 2811-1

Viscosity of liquid products:
- ASTM D2196-86 (Brookfield)
- Flow cups (DIN, ISO, Ford, etc.)

Determination of content of solids by mass:
- EN ISO 3251

Determination of dry film thickness:
- ISO 2808 (magnetic thickness gauge or P.I.G.)

Gloss measurement of a surface:
- ISO 2813

Colorimetric/spectrophotometric verification:
- ASTM E308-12

IR spectrophotometric analysis

Facts and figures of our research

What does investing in research and development really mean?

Every year Amonn allocates approximately 3.5% of its turnover to research.

Every year it carries out, on average, one hundred new fire resistance tests in its laboratories or outsources them to qualified centres to obtain the certifications required by national and European standards and to be compliant with the strictest safety standards.

Every year Amonn develops new formulas and improves its existing ones to meet the demands of the market and the needs of trade professionals, providing them with invaluable tools in the design stage of a project.

Every year our in-house research centre invests in new equipment, so our technical staff can test our products thoroughly during experimentation and after-sales control.

Our Laboratory is central to our work: it is where our technical staff share their experience and knowledge, where they come up with innovative solutions, provide invaluable customer service, ensure the highest quality standards and play an active part in the company's strategic decision-making processes.

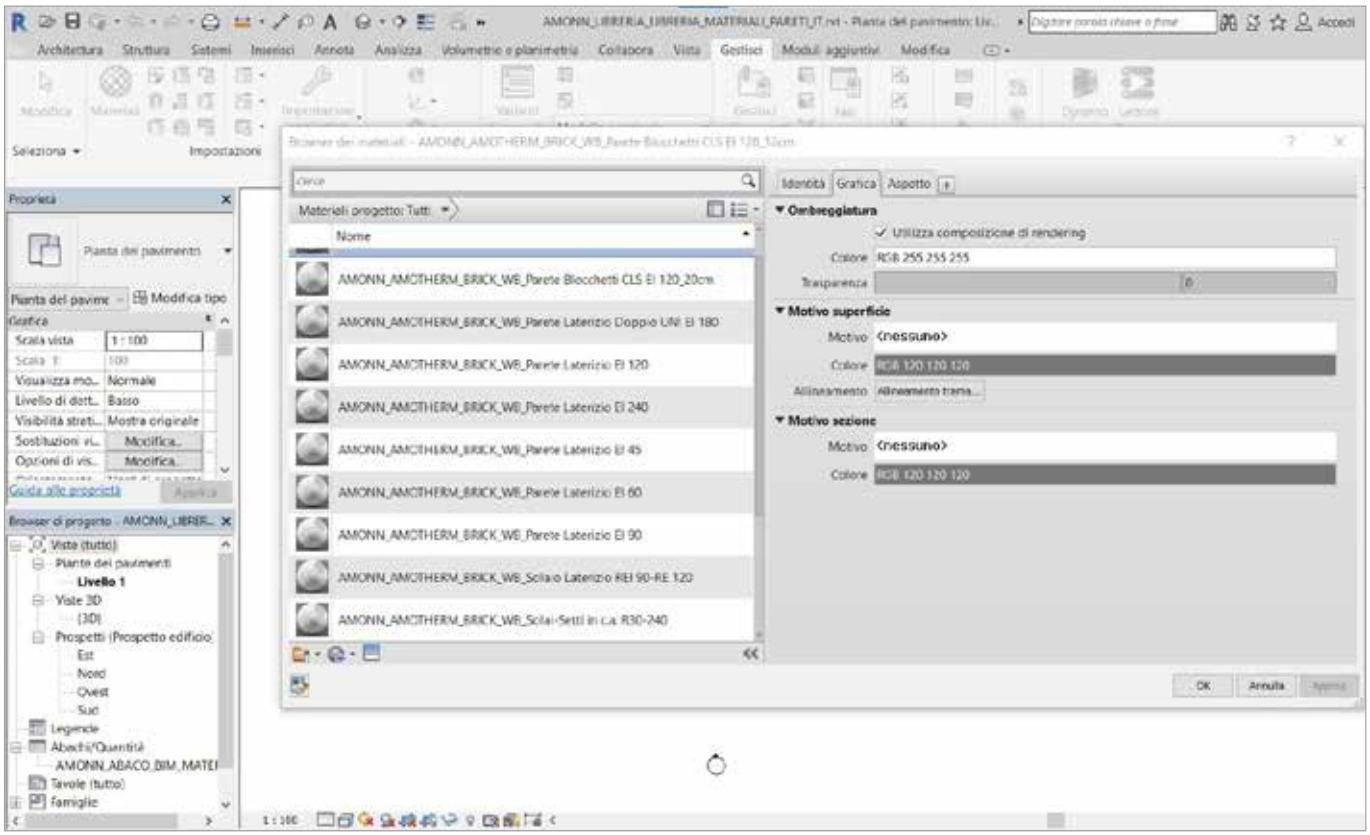
Amotherm and BIM

What are they?

We use CAD to create technical drawings, while BIM (building information modeling) is actually a digital representation of information. It is not just a drawing but objects that contain all the information people working on a project (engineers/architects/structural and thermo engineers…) need.
BIM can be useful in the design stage of a project to anticipate errors that could arise after construction or later on in the future and it is also invaluable for maintenance.

How does it work?

- Using dedicated BIM Authoring software (Revit, Archicad, Edificius...), a three-dimensional computerised representation of all the objects in the project is obtained.
- The models are uploaded to a platform all the stakeholders can access. Once downloaded by the operator, the model is inserted in a project.
- A BIM file is **interoperable**, which means everyone involved in the building project (architects, systems and structural engineers...) can access and work on the project in **real time**, also allowing close monitoring of progress.
- **IFC, Industry Foundation Classes**, is a particular data format that allows the exchange of an information model without loss or distortion of data or information. It is an open, neutral file format which is not controlled by individual software houses but developed to facilitate interoperability between different operators.
- **BuildingSMART International** has defined a certification process which ensures IFC data is correctly imported and exported, guaranteeing compliance with standards. All IFC-certified software is able to read, write and exchange information with other programmes.



To assist designers in their work and ensure ongoing compliance with industry standards, Amonn's complete BIM library, with all the Amotherm protective products, is available to its clients in Italian and English. To access it, just register in the MyAmonn reserved area, enter the project ID and download the BIM file. Scan the QR code to access MyAmonn!

Our environmental certifications

Ethic Green - The future in your hands

Although the **Ethic Green** project was only recently launched, it is the name Amonn has chosen to communicate its ongoing commitment to delivering environmentally-friendly products to all its consumers and users. Innovative products which meet the demands of today's world. Amonn uses all the technological solutions available today to ensure its products have the lowest possible impact on the environment and people's health. This is how…

- Hazardous substances such as formaldehyde, lead, toluene and many more have been removed from its entire product range.
- Products have VOC (volatile organic compounds) levels which are a lot lower than the limits set by EU directives and, in some cases, completely free of them.
- Constant sourcing of suppliers of raw materials and services as close to the factory as possible to reduce pollution due to transporting goods.
- Monitoring of every stage of the life cycle of its products.
- Proven quality and efficacy of its products.
- Use of energy from renewable sources.
- Use of highly technological, innovative plants and systems that are continuously controlled throughout all stages of production, keeping waste to an absolute minimum.

Meeting green standards

ISO 14001 is a technical standard developed by the International Organization for Standardization (ISO) for environmental management systems (EMS) which specifies the requirements of an environmental management system of any organisation. Amonn was awarded this certification in 2002.

An **EPD** is a voluntary declaration that provides environmental data about the life cycle of products in accordance with the international standard ISO 14025. It is an environmental label which clearly and transparently gives the results of an analysis conducted using the LCA – Life Cycle Assessment – method. EPD certification is one of the requirements of CAM (Minimum Environmental Criteria) set forth in Italian Ministerial Decree of 11 October 2017. In Amotherm's case, the analysis addressed the entire production cycle of intumescent paints, starting from the raw materials and the production of the basic chemical components used in the formula. Next, the impact caused by the Amonn production cycle was examined, namely the manufacturing of the containers for the end product, the management of production waste, the transportation of the raw materials and distribution through the sales network.

VOCs (volatile organic compounds) are various kinds of chemical compounds which are made up of molecules which can be different but are all volatile, meaning they evaporate easily in the air at room temperature. In the past, paint contained large quantities of VOCs because it was produced using technologies which are now obsolete. Today we try to keep them to an absolute minimum thanks, for example, to the wider use of water.

Indoor Air Comfort (IAC) is a certification process which demonstrates a product's compliance with low European VOC emissions criteria. Amotherm water-based intumescent products have passed the VOC emission tests and been awarded Indoor Air Comfort Gold® certification.

HACCP (Hazard Analysis and Critical Control Points) is a system with procedures aimed at ensuring food safety, based on prevention rather than an analysis of the finished product.

CE marking involves a series of mandatory procedures for all products for which EU specifications exist and includes affixing the «CE» symbol on the product (hence its name). It shows that manufacturers, distributors and importers have complied with all EU obligations relating to their products, so they can be sold freely throughout Europe.

German ABG/AgBB - German regulation which sets limits for emissions of volatile organic compounds (VOC) for wooden flooring and coverings.

French VOC Regulation A+ - French classification which looks for the presence of ten volatile organic compounds.

Amotherm products and their certifications

	EPD	In compliance with IAC Gold 6.0	In compliance with HACCP (complete primer and top coat treatment)
Amotherm Steel WB	●	●	●
Amotherm Steel Primer WB		●	●
Amotherm Steel WB HI	●	●	●
Amotherm Wood WB	●	●	●
Amotherm Brick WB	●	●	●
Amotherm Gyps WB	●	●	●
Amotherm Concrete WB	●	●	●

Existing slabs

Fire protection refurbishment of existing slabs

Reference standard: EN 1365- 2

Brief summary of information required for a needs assessment

1. **REQUIRED FIRE RESISTANCE CLASS**
   For example: REI 60 or REI 120 etc.

2. **TYPE OF COVERING**
   What are its materials (layered construction)? Is it a solid ceiling made of reinforced concrete slabs, prestressed concrete, prefabricated concrete slabs with polystyrene blocks (Predalles), a composite ceiling made of trapezoidal sheet metal and reinforced concrete castings, etc.?

3. How thick is the ceiling slab?

4. Is the ceiling plastered or not?

5. If it is concrete (Predalles, a flat slab or TT 40/10 type ceiling elements), ask for the value of the concrete cover.

▶ To submit all data correctly, please follow the steps below:

1. **Scan the QR code with your mobile phone.**

2. **Download the appropriate needs assessment form.**

3. **Complete the appropriate application form.**

4. **Send the form to this e-mail address:**

ingass@amonncolor.com

Passive Fire Protection Refurbishment

of horizontal load bearing separating elements

Introduction

The experimental standard EN 1365-2 specifies a method for the determination of the fire resistance of slabs and load bearing roof elements even in the presence of unventilated cavities. The specimens tested must best simulate the conditions of real use. The test results should give indications of resistance, integrity and insulation (REI). The applied loads have to be agreed with the test sponsor but will determine limits on direct application of the test results.

Usually the following parameters are checked:
(R) Resistance
(E) Flame-gas integrity
(I) Thermal insulation

The parameter "R" is verified by measuring the maximum deflection and/or the deformation speed under load during exposure to fire. The distance between the compressed part and the load-bearing zone of the slabs determines the limits set by the standards for each sample in accordance with EN 1363-1.
Parameter "E" is verified by measuring the trigger temperature of a cotton pad placed at a slab crack. Measurements are carried out according to the rules established at the regulatory level.
Parameter "I" may be assumed satisfied when the average temperature increase on the unexposed surface is limited to 140°C and the maximum temperature increase at any point on the unexposed surface is not greater than 180 °C.
The dimensions of the test specimens are generally determined by the size of the laboratory furnaces (usually 4 x 3 m). The slabs are positioned with the longest sides free to slide along the furnace walls during the test. The other two sides that determine the span for calculation are positioned in such a way as to have simple support conditions and free rotation of the ends. The loading conditions on the slabs are simulated by hydraulic jacks that usually push on a yoke of steel beams capable of creating shear bending moment actions in simple support with distributed/concentrated load.

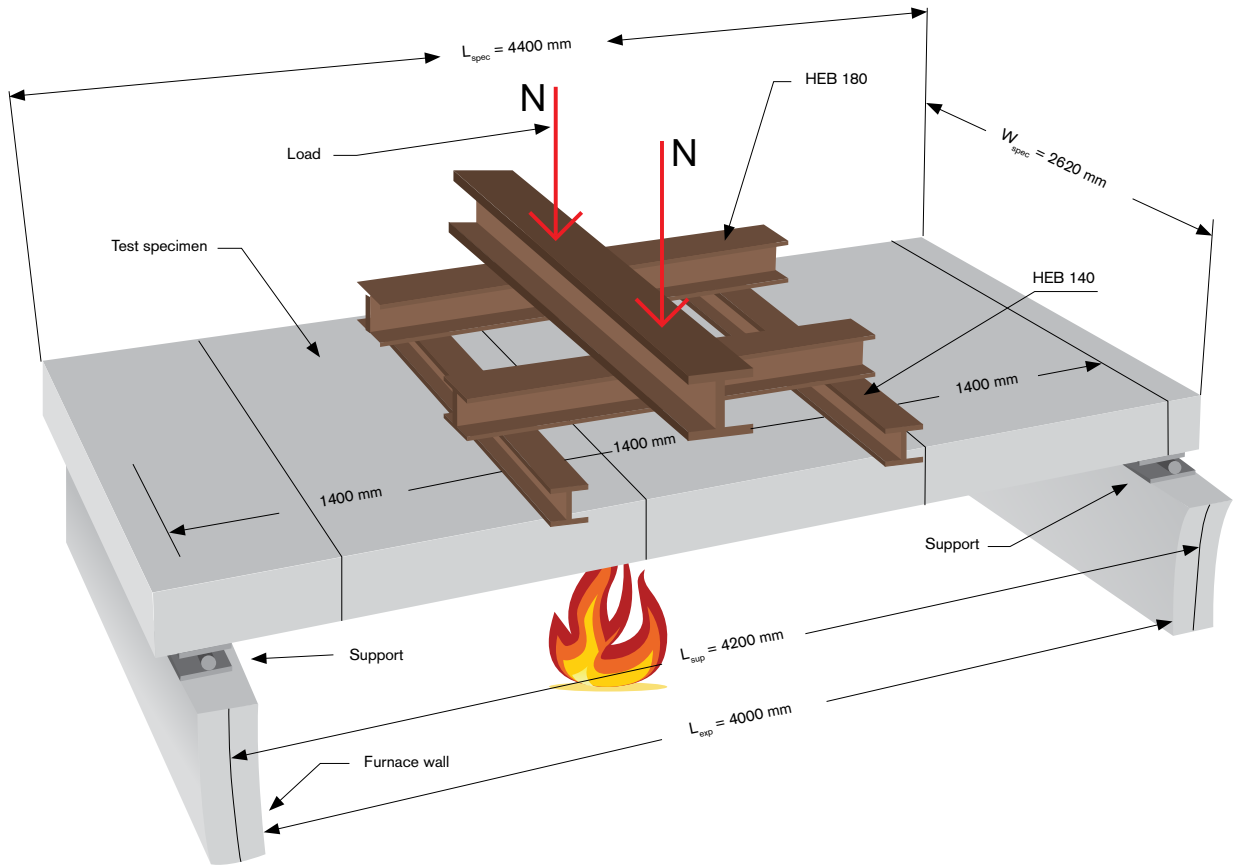
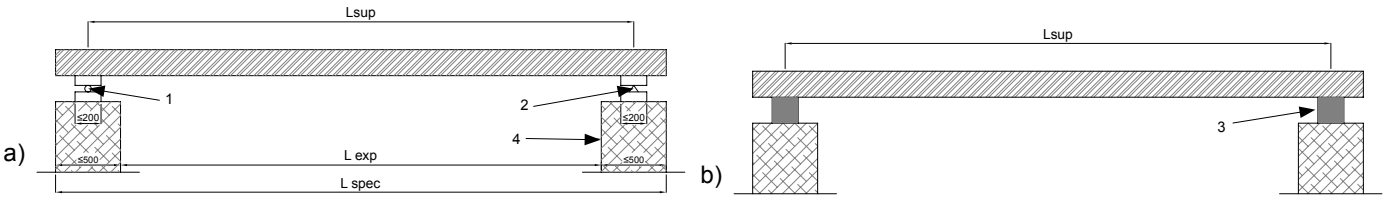


Illustration of the exposed length and span (cross section and longitude of specimen)

Key:
a) Standard supporting conditions
b) Restraint support conditions
1) Rolling support
2) Hinge support
3) Restraint support
$L_{sup} = L_{exp}$ + up to half the length of the bearing at each side
$L_{spec} = L_{exp}$ + up to 500 mm at each end

Measurements in millimetres



Limits of direct applicability of test results

The test results are directly applicable to similar constructions provided that the following conditions are met:

1) The maximum acting moments and shear forces shall not be greater than those tested;
2) The cavities or hollow spaces must not be less than those tested. Any combustible materials present must not exceed the surface units of those tested;
3) Any accessories or systems fixed to the intrados must not be greater per surface unit than those tested;
4) It is possible to vary the inclination of slabs up to 15% or 25% according to EN 1365-2 test standard respectively of 2014 and 2002.

General considerations

Subjective judgements can be included in the definition of similar construction that have little bearing on the safety and extent of the test results.
Similar constructions shall be considered with the limitations described below in accordance with the principles of standard EN 1363-1:

1) Slabs must be of the same composition of materials. Tests on slabs in brick/cement mix cannot be used for slabs such as prefabricated concrete slabs, hollow core slabs or composite slabs (steel deck with concrete topping)
2) The overall height of the slab cannot be less than the tested height as it would not be possible to prove the effectiveness of the seal and insulation compared to the tested one.
3) The same consideration should be made for the minimum thicknesses of the component materials as this would vary the overall thermal inertia.
   Better thermal inertia does not necessarily mean a safety advantage over the tested element.
   As an example, a composite slab made of 12 cm of brick/cement mix and 8 cm of reinforced concrete may not be safer than a slab of 16cm + 4 cm composed of the same materials. The reason here for lies in the higher fragility of the smaller bricks compared to the ones which could cause a loss of cohesion adhering to the supports of the protective material, thus changing the thermal flow from the intrados to the extrados.
4) The increase in the thickness of each individual component and of any cavity on the other hand is certainly to the advantage of fire safety as it can all be included in the concept of similar and improved constructions compared to the sample tested.
5) The standard does not provide for limits of applicability on spans and elements of different dimensions compared to those tested in the furnace (4 x3 m). Therefore, the shear and the maximum acting moment are not sufficient elements when certifying a structure regarding its fire resistance. A lower load than the tested one on double spans may not be to the safety advantage when using the test result. For this reason, Amonn possesses a series of technical documents capable of extending a solution by linking it to its safety coefficient (ratio of acting forces to resistant forces) of the tested slab.
6) To date there is no experimental standard for vaulted roofs so the use of test results according to EN 1365-2 should be carefully evaluated by fire professionals. Only by a complete view of the test reports it is possible to verify the thermal flows by analysing the test results given by the intermediate thermocouples of the tested section.

Amotherm Solutions

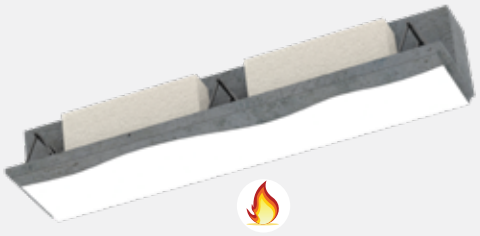
Type	FIRE PROTECTION REFURBISHMENT OF COMPOSITE BRICK/CONCRETE SLABS
Reference standard	EN 1365-2:2014
Fire resistance	REI 180
Exposure to fire	Intrados
Height and stratigraphy of slab	210 mm composed of 10 mm plasterwork - 160 mm of brick blocks - 40 mm of concrete
Protective system	**Amotherm Brick WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.20 kg/m²
Technical reference document	Classification Report I.G. 374679/4066 FR
Surface preparation	Amotherm Primer WB at 0.15 kg/m²
Permitted accessories	Lighting bodies, junction boxes and conduits for electrical systems
Technical Data Sheet	

Highlights

- Additional thermocouples on various slab elements for additional analytical evaluation

Type	FIRE PROTECTION REFURBISHMENT OF PLAIN UNPLASTERED COMPOSITE BRICK/CONCRETE BLOCKS
Reference standard	EN 1365-2:2002
Fire resistance	REI 90-RE120
Exposure to fire	Intrados
Height and stratigraphy of slab	200 mm composed of - 160 mm of brick blocks - 40 mm of concrete
Protective system	**Amotherm Brick WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	0.80 kg/m²
Technical reference document	Classification Report CSI 1952 FR
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF HORIZONTAL PRECAST CONCRETE SLABS WITH BLOCKS OF POLYSTYRENE (PREDALLES)
Reference standard	EN 1365-2:2014
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 200 mm composed of - 40 mm of concrete - 120 mm of polystyrene - 40 mm of concrete
Protective system	**Amotherm Brick WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.20 kg/m²
Technical reference document	Classification Report I.G. 374542/4059 FR
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Permitted accessories	Lighting bodies, junction boxes and conduits for electrical systems
Technical Data Sheet	



Highlights
- No need to drill pressure holes
- Semi-adherent implants do not need to be disassembled
- Additional thermocouples inserted at different levels for additional analytical assessments
- Application on damaged and restored slab parts

Type	FIRE PROTECTION REFURBISHMENT OF PRESTRESSED HONEYCOMB SLABS
Reference standard	EN 1365-2:2014
Fire resistance	REI 180
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 210mm composed of a 160mm precast reinforced concrete slab. +50mm concrete hood
Protective system	**Amotherm Brick WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.20 kg/m²
Technical reference document	Classification Report I.G.408505/4347 FR
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

Highlights
- Positioning of thermocouples at the base of the holes and in the centre of the holes in the honeycomb panels

Type	FIRE PROTECTION REFURBISHMENT OF PRECAST CEILING ELEMENTS TYPE TT-BEAMS 40/10
Reference standard	EN 1365-2:2014
Fire resistance	REI 60 - RE 120
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 400 mm composed of precast slabs of 50 mm and double TT-beams (100 mm thickness) to a total span of 1300 mm
Protective system	**Amotherm Concrete WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	Variable from 0.50 - 1.60 kg/m²
Technical reference document	Classification Report I.G. 388517/4172 FR and I.G. 388518/4173 FR
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

Highlights
- Additional thermocouples inserted at steel mesh and concrete topping for additional analytical assessments.
- Extension to double TT beams with steel reinforcements of less than 100mm with simple steel bar or prestressed reinforcement.
- EI requirement met at 82 minutes.

Type	FIRE PROTECTION REFURBISHMENT OF PLANE COMPOSITE SLABS WITH TRAPEZOIDAL STEEL DECK AND CONCRETE TOPPING
Reference standard	EN 1365-2:2002
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 110 mm composed of corrugated sheet metal type EGB 210D (0.8 mm thickness) and cast in situ, reinforced concrete (55 mm height)
Protective system	**Amotherm Steel WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.00 kg/m²
Technical reference document	Classification Report CSI 1950 FR
Surface preparation	Amotherm Steel Primer WB at 0.10 kg/m²
Technical Data Sheet	

Highlights
- Slab anchorage by shear connectors

Type	FIRE PROTECTION REFURBISHMENT OF PLANE COMPOSITE SLABS WITH TRAPEZOIDAL STEEL DECK AND CONCRETE TOPPING
Reference standard	EN 1365-2:2014
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 115 mm composed of sheet metal type OR 55/600 C (0.8 mm thickness) and cast in situ, reinforced concrete (60 mm height)
Protective system	**Amotherm Steel WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.00 kg/m²
Technical reference document	Classification Report I.G. 374679
Surface preparation	Amotherm Steel Primer SB at 0.10 kg/m²

Technical Data Sheet

Highlights

- Additional thermocouples on the corrugated metal sheet for additional analytical assessments.
- Temperature on the corrugated metal sheet < 350° at 60 minutes.
- Slab in standard supporting conditions.

Type	OMEGA LATTICE TRUSSES AND PURLINS SUPPORTING SANDWICH PANELS
Reference standard	EN 1365-2:2014
Fire resistance	REI 30
Exposure to fire	4 sides of the component rods of the truss beam and 3 sides of the purlin
Height and stratigraphy of the slab	550mm total height of the lattice beam + 120mm purlin + 38mm modular panel corrugations
Protective system	**Amotherm Steel WB** - Water-based, intumescent, mono-component paint
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.90 kg/m²
Technical reference document	Test Report I.G. 408443
Surface preparation	Amotherm Steel Primer WB at 0.10 kg/m²

Technical Data Sheet

Highlights

- Omega profile and space between two coupled L-profiles, completely filled with intumescent foam produced during the fire.

Type	FIRE PROTECTION REFURBISHMENT OF "HISTORICAL" SLAB CEILING WITH GIRDERS AND SOLID BRICKS
Reference standard	EN 1365- 2: 2014
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy pf the slab	H_{tot} 170mm – consisting of 120mm height IPE 120 beam + 50mm concrete slab
Protective system	Transparent intumescent system composed of **Amotherm Brick WSB** and **Amotherm Brick WSB Top**
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption on bricks	1.2 kg/m² of Amotherm Brick WSB and 0.10 kg/m² of Amotherm Top WSB
Consumption on beams	0,8 kg/m² Amotherm Steel WB
Technical reference document	Classification report I.G. 411097/4353 FR
Surface preparation Steel	Amotherm Steel Primer WB at 0.10 kg/m²
Surface preparation Brickl	Amotherm Primer WB at 0.15 kg/m²

Technical Data sheet

For more information contact the technical department at ingass@amonncolor.com

Highlights
- Maintenance of the aesthetic appearance of the historic attic.

Type	FIRE PROTECTION REFURBISHMENT OF BRICK VAULTS
Reference standard	EN 1363-1, EUROCODE EN 1996-1-2 APP. C
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy pf the slab	H_{tot} 130 mm, consisting of solid bricks measuring 245x55x115 mm, laid by knife, plaster 10 mm
Protective system	**Amotherm Brick WB** - water-based, intumescent one-component paint
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Consumption	1.2 kg/m²
Technical reference document	Test report 397649 / Analytical test guideline
Surface preparation	Amotherm Primer WB with a consumption of 0.15 kg/m²

Technical Data sheet

For more information contact the technical department at ingass@amonncolor.com

Highlights
- Measurement of the temperature in the brick thickness at different depths

Type	FIRE PROTECTION RENOVATION OF BRICK VAULTS
Reference standard	EN 1363-1, EUROCODE EN 1996-1-2 APP. C
Fire resistance	REI 120
Exposure to fire	Intrados
Height and stratigraphy of the slab	H_{tot} 120 mm, consisting of solid bricks measuring 245x55x115 mm, laid by knife
Protective system	Transparent intumescent cycle consisting of **Amotherm Brick WSB** and **Amotherm Top WSB** topcoat
Consumption	1.2 kg/m² of Amotherm Brick WSB and 0.10 kg/m² of Amotherm Top WSB
Technical Reference Document	Test report 397649 / Analytical test guideline
Surface preparation	Amotherm Primer WB with a consumption of 0.15 kg/m²

Technical data sheet

For more information, contact the technical department at ingass@amonncolor.com

Highlights

- Measurement of the temperature in the tile thickness at different depths

Existing walls

Fire protection refurbishment of existing walls

Reference standard: EN 1364-1

Brief summary of information required for a needs assessment

1. **REQUIRED FIRE RESISTANCE CLASS**
   For example: REI 60 or REI 120 etc.

2. **WALL TYPE**
   What materials is it made of? Is it made of masonry or concrete blocks? Is it a lightweight plasterboard wall? Is it double plasterboard or single plasterboard?

3. How thick is the wall? How wide is it? Example: 80 mm or 120 mm, etc.

4. Is the wall plastered or not?

5. How high is the wall?

▶ To submit all data correctly, please follow the steps below:

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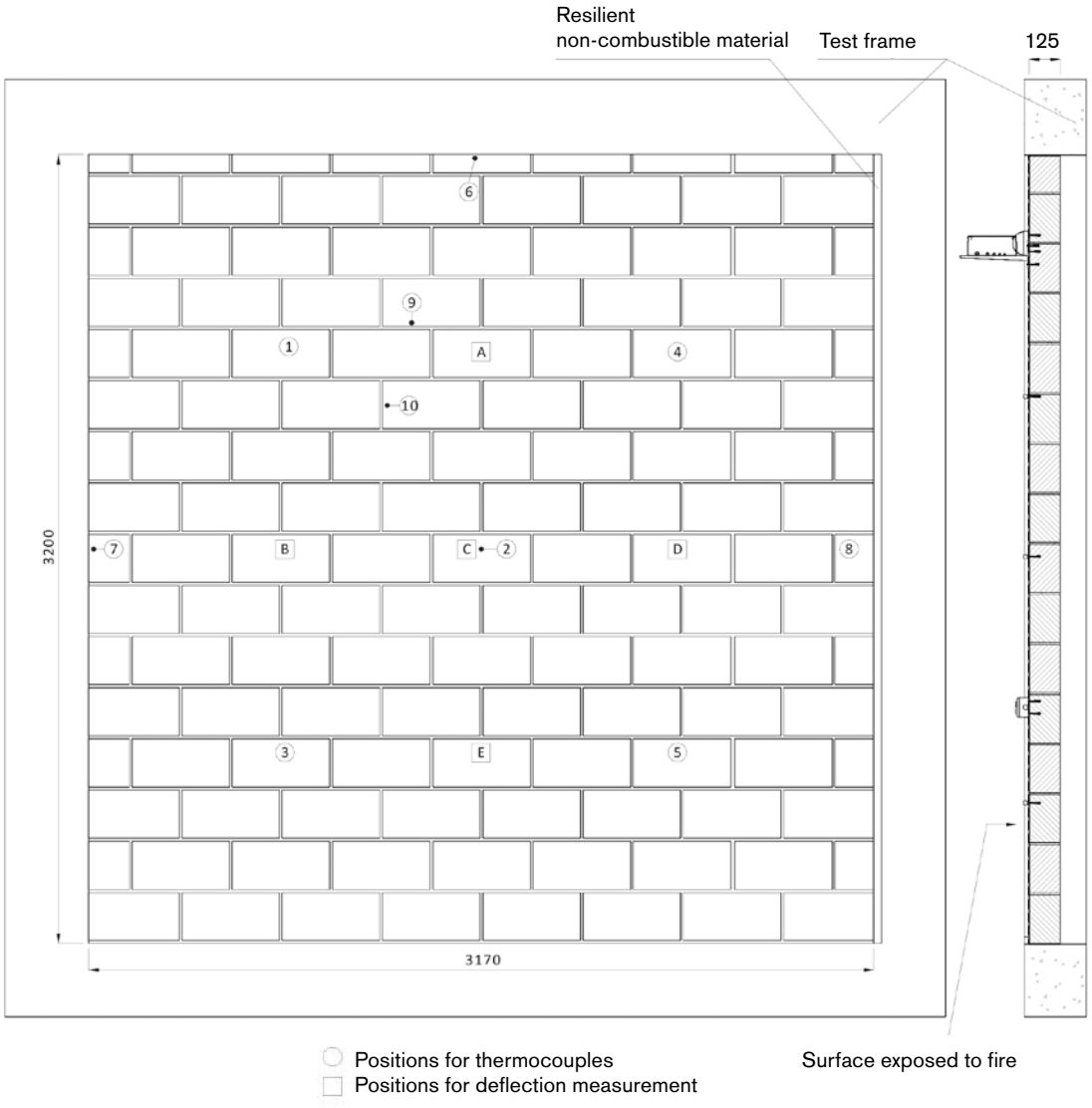
Fire protection refurbishment
of non-load bearing walls

Introduction

The fire resistance performance of non-load-bearing walls is tested according to standard **EN 1364-1:2015 "Fire resistance tests for non-loadbearing elements - Part 1: Walls"**.
The purpose of the test is to verify that the wall is able to resist the spread of fire from one side to another.

Usually the following parameters are checked:
- (E) Flame-gas resistance
- ((I) Thermal insulation

Another parameter that can be tested is the irradiance power (W). Less usual than the previous ones.
Parameter "E" is verified by measuring the trigger temperature at point of ignition of a cotton pad placed at a wall crack. The measurement is carried out according to the rules established at the regulatory level.
Parameter "I" may be assumed satisfied when the average temperature rise on the unexposed surface is limited to 140 °C and the maximum temperature rise at any point on the unexposed surface is not greater than 180 °C.
Tests are conducted on walls with a minimum standard size of 3x3 m. If the test is conducted leaving a vertical edge free, the result obtained can be extended to an infinite length.



The maximum deflection at mid-height can be measured by placing strain gauges on the wall.
If the measured value is below the regulatory limit, the result can be extended to 1 m above the test height.
The permitted variations such that it is possible to qualify a wall by comparison with the tested one, are contained in a separate section of the classification report (field of direct application).

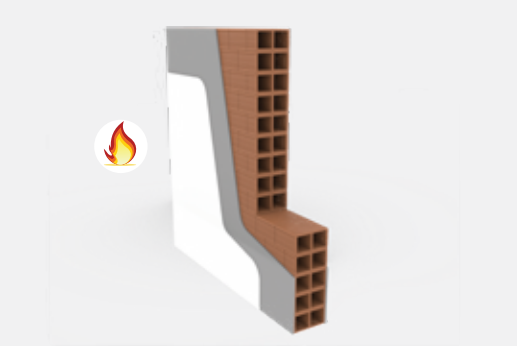
Limits of direct applicability of test results

Variation type	Reference paragraph of standard EN 1364-1:2015	Possible changes
Decrease in height	13.1 a)	allowed
Increase in the thickness of the wall	13.1 b)	allowed
Increase in the thickness of component materials	13.1 c)	allowed
Decrease in linear dimensions of boards or panels but not thickness	13.1 d)	allowed
Decrease in stud spacing	13.1 e)	not applicable
Decrease in the distance of fixing centres	13.1 f)	not applicable
Increase in the number of horizontal joints, of the type tested, when tested with one joint not more than (500 ± 150) mm from the top edge	13.1 g)	not applicable
Increase in the number of vertical joints, of the type tested	13.1 h)	allowed
The use of installations* such as electrical sockets, switches, etc., when tested as illustrated in figures 9, 10, 11 with the installations not more than 500 mm from the top edge	13.1 i)	not allowed
Horizontal and/or vertical joints, of the type tested	13.1 j)	allowed
Extension of width	13.2	allowed
Extension of height by 1.0 m	13.3	allowed
Standard supporting constructions	13.4.1	not applicable
Non-standard supporting constructions	13.4.2	not applicable

*Installations are foreseen by the standard only in wall cut-outs.

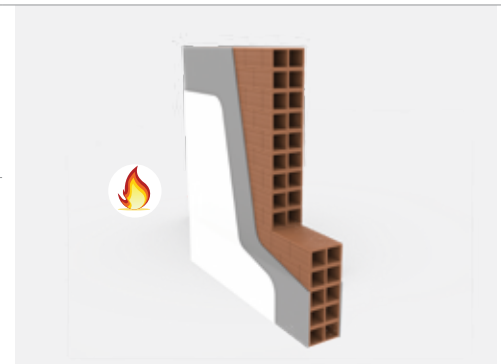
Amotherm Solutions

Type	FIRE PROTECTION REFURBISHMENT OF NON-LOADBEARING MASONRY WALLS
Reference standard	EN 1364-1:2002
Fire resistance	EI 45
Fire exposure	On the protected side
Wall stratigraphy	10 mm of plaster + 80 mm of masonry brick blocks + 10 mm of plaster
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	0.8 kg/m²
Technical reference document	Classification Report CSI 1791 FR
Height in the field of direct application	3 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	



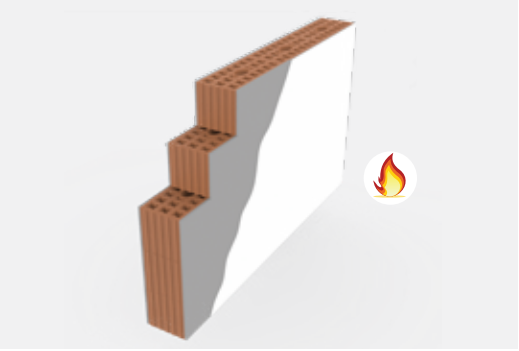
Type	FIRE PROTECTION REFURBISHMENT OF NON-LOADBEARING MASONRY WALLS
Reference standard	EN 1364-1:2002
Fire resistance	EI 90
Fire exposure	On the protected side
Wall stratigraphy	10 mm of plaster + 120 mm of masonry brick blocks + 10 mm of plaster
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	0.4 kg/m²
Technical reference document	Classification Report CSI 1788 FR
Height in the field of direct application	4 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

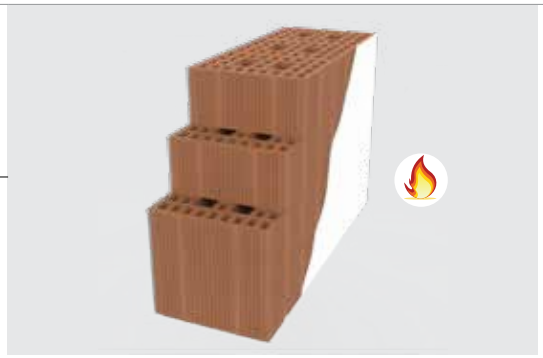
Type	FIRE PROTECTION REFURBISHMENT OF NON-LOADBEARING MASONRY WALLS
Reference standard	EN 1364-1:2015
Fire resistance	EI 120
Fire exposure	On the protected side
Wall stratigraphy	10 mm of plaster + 80 mm of masonry brick blocks + 10 mm of plaster
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	1.2 kg/m²
Technical reference document	Classification Report I.G. 401174/4287 FR
Height in the field of direct application	4,2 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.15 kg/m²
Technical Data Sheet	

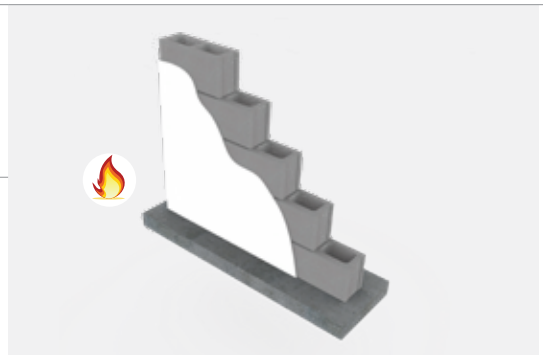


Highlights
- 20% Additional time (144 min)

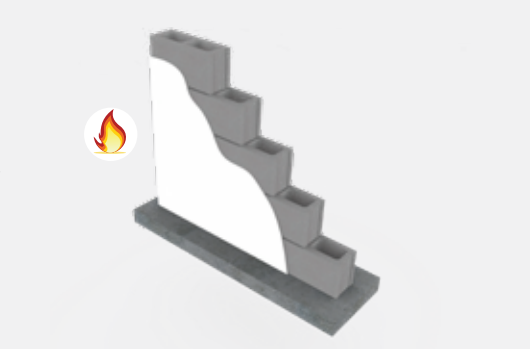
Type	FIRE PROTECTION REFURBISHMENT OF NON-LOADBEARING MASONARY WALLS
Reference standard	EN 1364-1:2002
Fire resistance	EI 180
Fire exposure	On the protected side
Wall stratigraphy	15 mm of plaster + 120 mm of masonry brick blocks + 15 mm of plaster
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	1.0 kg/m²
Technical reference document	Classification Report CSI 1816 FR
Height in the field of direct application	4 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	



Type	FIRE PROTECTION REFURBISHMENT OF NON-LOADBEARING MASONRY WALLS
Reference standard	EN 1364-1:2002
Fire resistance	EI 240
Fire exposure	On the protected side - the unplastered side
Wall stratigraphy	180 mm - masonry brick blocks + 10 mm of plaster on the unexposed side. Application on the unplastered side
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	1.4 kg/m²
Technical reference document	Classification Report CSI 1820 FR
Height in the field of direct application	4 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF REGULAR, FAIR-FACED CONCRETE CAVITY BLOCKS
Reference standard	EN 1364-1:2015
Fire resistance	EI 90
Fire exposure	On the protected side
Wall stratigraphy	80 mm of regular, fair-faced, concrete cavity blocks
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	1.0 kg/m²
Technical reference document	Classification Report I.G. 380728/4102 FR
Height in the field of direct application	4,2 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.15 kg/m²
Technical Data Sheet	

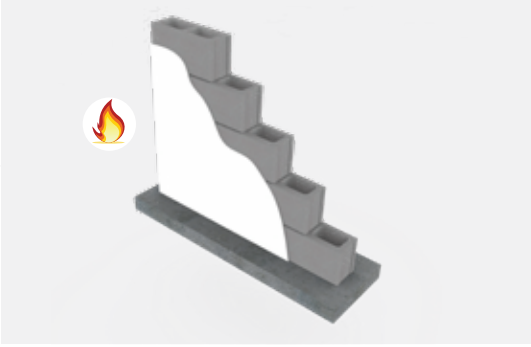
Type	FIRE PROTECTION REFURBISHMENT OF REGULAR, FAIR-FACED CONCRETE CAVITY BLOCKS
Reference standard	EN 1364-1:2015
Fire resistance	EI 120
Fire exposure	On the protected side
Wall stratigraphy	120 mm of regular, fair-faced, concrete blocks
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	1.2 kg/m²
Technical reference document	Classification Report I.G. 374541/ 4058 FR
Height in the field of direct application	4.2 m
Increase in Height	Not Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.15 kg/m²
Technical Data Sheet	



Highlights

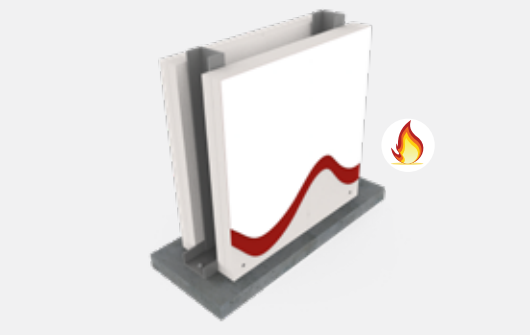
- Outdoor wall-mounted ceiling lamp in PVC applied on the fire-exposed surface, parts of electrical conduits, rigid pipe segments, electrical box with switch

Type	FIRE PROTECTION REFURBISHMENT OF REGULAR, FAIR-FACED CONCRETE CAVITY BLOCKS
Reference standard	EN 1364-1:2002
Fire resistance	EI 120
Fire exposure	On the protected side
Wall stratigraphy	200 mm of fair-faced, masonry concrete blocks
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	0.8 kg/m²
Technical reference document	Classification Report CSI 1937 FR
Height in the field of direct application	4 m
Increase in Height	Not allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	

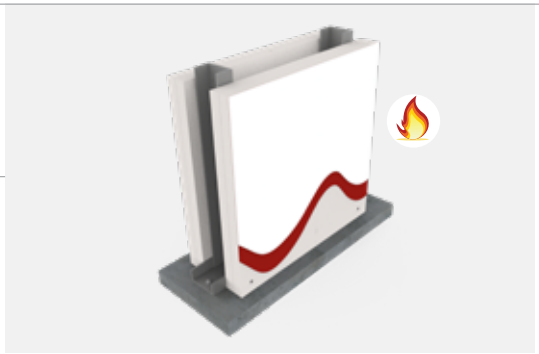


Type	FIRE PROTECTION REFURBISHMENT OF LIGHTWEIGHT PARTITION WALLS
Reference standard	EN 1364-1:2015
Fire resistance	EI 60
Fire exposure	On the protected side
Wall stratigraphy	Single gypsum board (1x12.5mm) per side with C-studs 50/600 mm
Environmental certification	Indoor Air Comfort GOLD®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Gyps WB** - water-based, mono-component paint
Consumption	1.0 kg/m²
Technical reference document	Classification Report I.G. 348691/3898 FR
Height in the field of direct application	4.0 m
Increase in Height	Up to 4 m for class EI 60 - up to 12 m for class EI 45. According to the indications of the extended application report I.G. 380214
Increase in Width	Allowed
Surface preparation	Amotherm Gyps Primer WB at 0.10 kg/m²
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF LIGHTWEIGHT PARTITION WALLS
Reference standard	EN 1364-1:2015
Fire resistance	EI 90
Fire exposure	On the protected side
Wall stratigraphy	Double gypsum board (2x12.5mm) per side with C-studs 50/600 mm
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Gyps WB** - water-based, mono-component paint
Consumption	0.8 kg/m²
Technical reference document	Classification Report I.G. 348690/3897 FR
Height in the field of direct application	4 m
Increase in Height	Up to 5 m for class EI 90 - up to 12 m for class EI 60. According to the indications of the extended application report I.G. 380213
Increase in Width	Allowed
Surface preparation	Amotherm Gyps Primer WB at 0.10 kg/m²
Technical Data Sheet	



Type	FIRE PROTECTION REFURBISHMENT OF LIGHTWEIGHT PARTITION WALLS
Reference standard	EN 1364-1:2015
Fire resistance	EI 120
Fire exposure	On the protected side
Wall stratigraphy	Double gypsum board (2x12.5mm) per side with C-studs 50/600 mm
Environmental certification	Indoor Air Comfort Gold® 6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Gyps WB** - water-based, mono-component paint
Consumption	1.2 kg/m²
Technical reference document	Classification Report I.G. 350213/3908 FR
Height in the field of direct application	4.0 m
Increase in Height	Up to 5 m according to the indications of the extended application report I.G. 380215
Increase in Width	Allowed
Surface preparation	Amotherm Gyps Primer WB at 0.10 kg/m²
Technical Data Sheet	



Type	FIRE PROTECTION REFURBISHMENT OF A HORIZONTAL LIGHTWEIGHT PANEL WALL
Reference standard	EN 1364-1:2015
Fire resistance	EI 120
Fire exposure	On the protected side
Wall stratigraphy	200 mm, consisting of 50mm CLS concrete + 100mm EPS reinforcement + 50 mm CLS concrete
Environmental certification	Indoor Air Comfort Gold® 6.0 from 02/2017 - EPD according to ISO 14025 and EN 15804
Protective System	**Amotherm Concrete WB** - Water-based one-component paint
Consumption	1.2 kg/m²
Technical reference document	Classification report I.G. 399452/4268 FR
Increase in Height	Allowed
Increase in Width	Allowed
Surface preparation	Amotherm Primer WB with a consumption of 0.10 kg/m²
Technical Data Sheet	

Highlights

- No need to drill pressure relief holes
- Fix the panels to the test frame with HALFEN Fixings on the non-exposed side

Structures

Fire protection refurbishment of structural elements

Reference standard: EN 13381

Structural elements made of reinforced/ prestressed concrete

Brief summary of information required for a needs assessment

1. **REQUIRED FIRE RESISTANCE CLASS**
   (For example: R 30, R 90, ...)

2. **TYPOLOGY OF THE STRUCTURAL ELEMENTS**
   Are the structural building elements made of normal reinforced concrete (i.e. cast in situ) or of prestressed (precast) concrete?

3. **TYPES OF ELEMENTS**
   Are they beams, columns, walls, slabs?

4. What are the dimensions?

5. How high is the concrete reinforcement?

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General information

Reinforced concrete is the most popular material for structural design of buildings in general. It has a centuries-old bibliography that has highlighted its merits and shortcomings and experts from different parts of the world continue to make good use of it. It has excellent anti-seismic characteristics as it uses the union of the two materials that compose it:

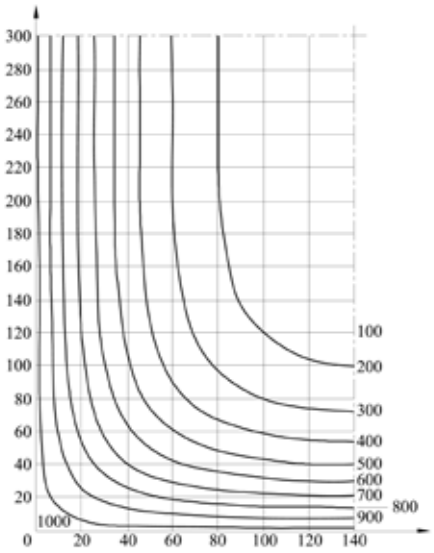
- concrete for compressive strength;
- steel for deformation strength.

Under ordinary temperature conditions, the main problem concrete can suffer, if not properly protected, is the phenomenon of carbonation, while steel, if not well protected by a layer of concrete (concrete cover), is subject to oxidation, which in turn compromises its resistance to bending/traction.

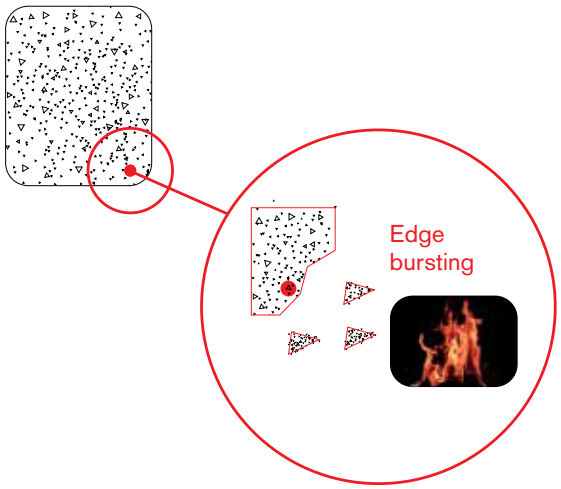
Fire properties of the materials

Ordinary or prestressed reinforced concrete exhibit fairly good **fire behaviour**, if its use has been properly designed.

Although the compressive strength of concrete decreases from as early as 100° with respect to its 'cold' capacity, it is difficult for this material - given that the cross-sectional dimensions are never too small - to fail under fire stress. The speed at which any given section heats up is quite slow, as lime is a material that retains a certain amount of water even after it has fully hardened. To give an idea of this aspect: it takes at least two hours of exposure to fire for 60 mm of concrete cover to reach a temperature of 500°, resulting in an important loss of strength for the outermost material only.



Analitical data evaluation using software for verification of temperature in concrete vs. temperature for a beam
h x b = 600 x 300 - R 120



Schematic illustration of the "spalling" phenomenon

On the other hand, the presence of water in the concrete's pores, while providing insulation capacity, leads to the most dangerous phenomenon which characterises this material at high temperatures. Namely "spalling", the sudden and violent expulsion of parts of the concrete mix which leave the reinforcing steel unprotected and which, as a conductor, very quickly loses its mechanical resistance properties. This is due to the increase in internal pressure in the element as a result of elevated temperatures which, as a consequence, lead to the evaporation of water and the degradation of certain components of the concrete mix. This phenomenon is all the more pronounced in pre-stressed structures and in vibrated, low-porous concrete.

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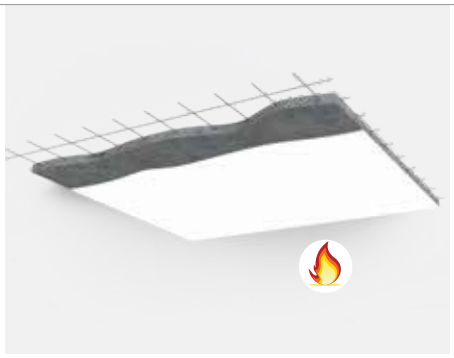
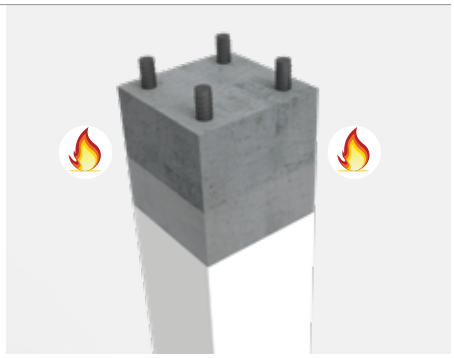
Type	FIRE PROTECTION REFURBISHMENT OF ORDINARY AND PRESTRESSED REINFORCED STRUCTURAL CONCRETE MEMBERS
Reference standard	EN 13381-3:2002
Fire resistance	R 30 to R 240 - slabs/walls; from R 30 to R 120 beams/columns
Type of protected element	Beams/columns and slabs/walls
Protective System	**Amotherm Brick WB** - water-based, mono-component paint
Consumption	Variable from 1.0 kg/m² to 2.5 kg/m²
Technical reference document	Assessment report CSI 2050 FR and CSI 2066 FR
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	



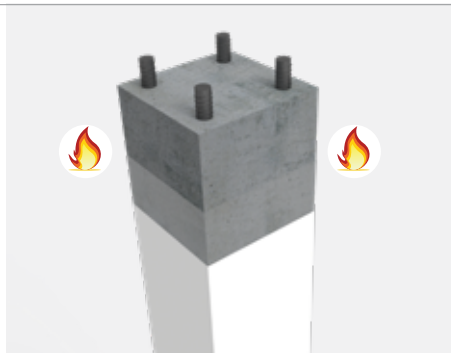


Beams / columns					
	DFT (µm)	**t = 30 min**	**t = 60 min**	**t = 90 min**	**t = 120 min**
Minimum thickness	535	20	24	23	***
Maximum thickness	1250	27	30	30	30

Slabs / walls							
	DFT(µm)	**t = 30 min**	**t = 60 min**	**t = 90 min**	**t = 120 min**	**t = 180 min**	**t = 240 min**
Minimum thickness	471	22	27	25	22	20	21
Maximum thickness	1250	30	47	54	55	52	42

DFT= dry film thickness
Actual consumption is 500 µm=1.0 kg/m²
The equivalent concrete thickness indicated in the table is in "mm".

Type	FIRE PROTECTION REFURBISHMENT OF ORDINARY AND PRESTRESSED REINFORCED STRUCTURAL CONCRETE MEMBERS
Reference standard	EN 13381-3:2015
Fire resistance	R 30 to R 180 - slabs/walls; from R 30 to R 120 beams/columns
Type of protected element	Beams/columns and slabs/walls
Protective System	**Amotherm Concrete WB** - water-based mono-component paint
Consumption	Variable from 0.5 kg/m² to 1.6 kg/m²
Technical reference document	APPLUS Assessment Report 18/13566-421-1 and 21/24707-1519-1
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Surface preparation	Amotherm Primer WB at 0.10 kg/m²
Technical Data Sheet	



Beams / columns					
	DFT (µm)	**t = 30 min**	**t = 60 min**	**t = 90 min**	**t = 120 min**
Minimum thickness	221	31	29	25	***
Maximum thickness	779	35	45	42	40

Slabs / walls						
	DFT(µm)	**t = 30 min**	**t = 60 min**	**t = 90 min**	**t = 120 min**	**t = 180 min**
Minimum thickness	213	19	19	15	13	11
Maximum thickness	768	30	44	45	42	15

DFT = dry film thickness
Practical consumption is 500 µm = 1.0 kg/m²
The equivalent concrete thickness indicated in the table is in "mm".

Structural elements made of wood

Brief summary of information required for a needs assessment

1. **REQUIRED FIRE RESISTANCE CLASS**

2. **TYPOLOGY OF THE STRUCTURAL ELEMENTS**
   Are they beams, columns or trusses?

3. Is there information on the sectional values of the elements?

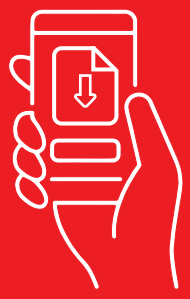
4. What type of wood is used (solid, laminated)?

5. Ask for the spans, distances, loads (a dimensioned drawing of the structure is helpful) or an expert's report.

▶ To submit all data correctly, please follow the steps below:

1. **Scan the QR code with your mobile phone.**

2. **Download the appropriate needs assessment form.**



3. **Complete the appropriate application form.**

4. **Send the form to this e-mail address:**

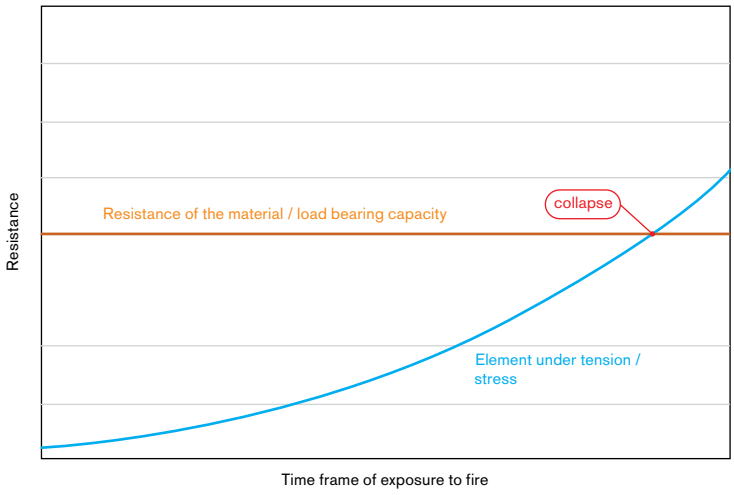
ingass@amonncolor.com

General information

Wood is a material that has always been used by man for various purposes, one of the most important being its use as a building material. It is used for structural elements such as: beams, slabs, roof trusses. It has good mechanical, insulation and low-density properties and above all it is a natural and biodegradable material. Yet from the point of view of behaviour to fire it is to be considered under two aspects: fire resistance and reaction to fire. The first identifies the load-bearing capacity of timber as a structural element to support certain actions in case of fire for a predefined period of time, the second is a property of the material itself. It identifies the degree of participation of timber as a **combustible material** to the propagation of fire to which it is subjected.

Resistance

Regarding fire resistance, wood performs better than other materials because initially the charred layer protects the underlying part of the element, until it reaches a 'limit' where the remaining section goes into crisis and collapses. **The loss of efficiency of timber structure occurs by reduction of the resistant section.**
In order to evaluate the load-bearing capacity of a wooden element subjected to fire, it is necessary to proceed by means of analytical verifications, as indicated in EN 1995-1-2.



Behaviour of timber subjected to fire

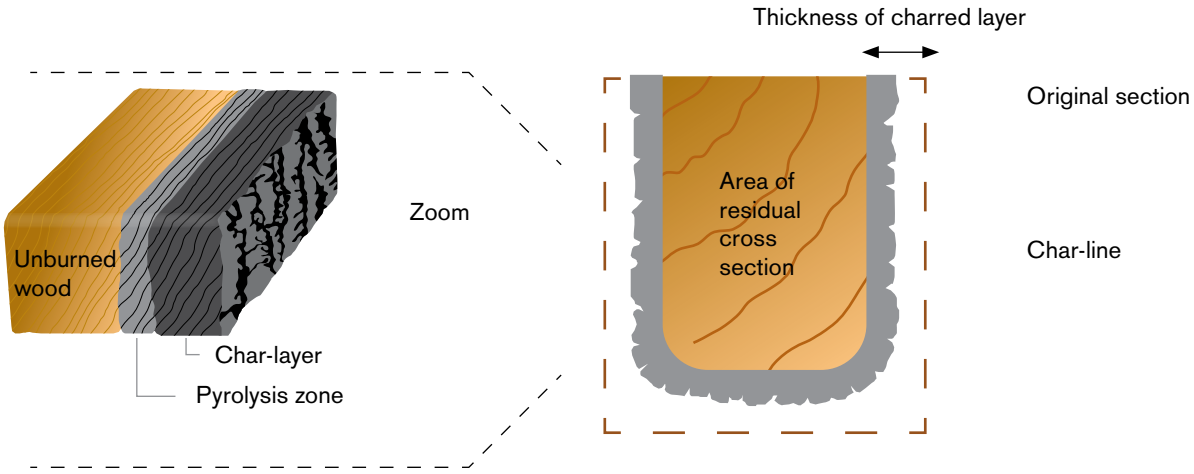
The proposed modes of verification are:

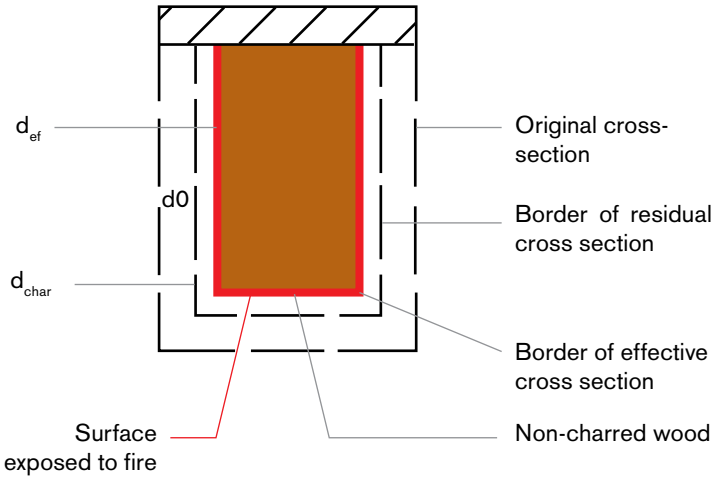
1. Reduced section method consisting in determining the load bearing strength of a specific section after a period “t” (min) of exposure to fire;

2. Reduced properties method: in addition to the determination of the reduced section, this analytical method includes further structural checks to be carried out, in order to verify the loss of structural properties;

The first one is the widely used one and our discussion will concern the analysis procedure provided by it. The verification is conducted similarly to that performed under ordinary temperature conditions but with the following differences:
• the resistant cross-section is reduced with time;
• the charring rate depends on the conditions of exposure to fire and the type of wood (laminated/massive);

The wood burns slowly and the charring proceeds from the outside in. The part that has not yet been charred remains mechanically efficient, even though the temperature has risen. **Mechanical failure (collapse) occurs when the inner part of the section that has not yet been carbonized (residual cross-section) has shrunk to such an extent that it no longer performs its load-bearing function.**





The residual cross-section at time "t" from the start of the fire, which is considered mechanically efficient is equal to the reduced initial cross-section of the notional charring depth (dchar,n) to which is added a zero strength layer k0 x d0 just below the char line which is considered by convention to have zero mechanical properties due to its high temperature. (The char line is conventionally considered to be at 300°C isotherm).
The effective cross-section at instant "t" is calculated by reducing the initial section, on each side exposed to fire, by the effective charring depth $d_{ef} = d_{char,n} + k_0 \times d_0$.

$d_{char,n} = \beta_n \times t$ thickness of charred wood at verification point in time "t"
β_n = design notional charring rate
d_0 = 7 mm (constant))

	k_0
t < 20 min	t/20
t ≥ 20 min	1,0

$d_{ef} = d_{char,n} + d_0$ = effective charring depth including the constant "d0"

Given the parameter "β_n" and the verification time "t" it is possible to define the section of charred wood (d_{ef}=7 mm+ β_n x t). The thickness of charred wood on each side exposed to fire will be deducted from the initial cross-section and it will then be possible to assess whether the residual section is able to withstand the loads to which it is subjected in case of fire.

The reference values given in Eurocode 5 - Structural fire design are:
β_n = 0,7 mm/min for plywood and β_n =0,8 mm/min for solid wood.

Amotherm Solutions

Type	FIRE PROTECTION REFURBISHMENT OF TIMBER STRUCTURES
Reference standard	EN 13381-7:2002
Resistance to fire	From class R 15 and depending on the protected element
Type of protected elements	Beams/columns and slabs/walls
Protective system	**Amotherm Wood WB** - water-based, coloured, intumescent cycle for passive fire protection of timber members
Consumption	Varies from 0.40 kg/m² to 0.80 kg/m² (optional top coat: 0.10 kg/m²)
Technical reference document	Evaluation Report Fires JR 199-25 NURE 2
Environmental certification	Indoor Air Comfort Gold®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Surface Preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood.
Technical Data Sheet	

Technical parameters regarding charring rate and protective coating thickness (columns / beams)

Amotherm Wood WB

Columns / Beams				
Technical Parameter	**Protective coating thickness (g/m²)**	**R 15**	**R 30**	**R 45**
β'(mm/min)	0	0,76	0,76	0,76
β''_{min} (mm/min)	400	0,354	0,597	0,678
β''_{max} (mm/min)	800	0,086	0,469	0,597
$k\beta_{min}$	400	0,465	0,785	0,891
$k\beta_{max}$	800	0,113	0,617	0,785
tpr_{min} (min)	400		8,16	
tpr_{max} (min)	800		12,15	

Technical parameters regarding charring rate and protective coating thickness (Slabs / walls)

Slabs / walls				
Technical Parameter	**Protective coating thickness (g/m²)**	**R 15**	**R 30**	**R 45**
β'(mm/min)	0	0,76	0,76	0,76
β''_{min} (mm/min)	400	0,406	0,609	0,677
β''_{max} (mm/min)	800	0,086	0,469	0,597
$k\beta_{min}$	400	0,533	0,801	0,89
$k\beta_{max}$	800	0,113	0,617	0,785
tpr_{min} (min)	400		6,33	
tpr_{max} (min)	800		12,15	

Type	FIRE PROTECTION REFURBISHMENT OF TIMBER STRUCTURES
Reference standard	EN 13381-7:2002
Resistance to fire	From class R 15 and depending on the protected element
Type of protected elements	Beams/columns and slabs/walls
Protective system	**Amotherm Wood WSB** - mixed (water based base coat and solvent based top coat) intumescent, transparent, 1-component cycle for fire protection of timber members
Consumption	Base coat consumption varies from 0.36 kg/m² to 0.67 kg/m² +0.10 kg/m² top coat
Technical Reference Document	Evaluation Report Fires JR 198-25 NURE 2
Surface Preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood.
Technical Data Sheet	

Technical parameters regarding charring rate and protective coating thickness (columns / beams)

Amotherm Wood WSB

Columns / Beams				
Technical Parameter	**Protective coating thickness (g/m²)**	**R 15**	**R 30**	**R 45**
β'(mm/min)	0	0,836	0,828	0,859
β''_{min} (mm/min)	360	0,622	0,8	0,859
β''_{max} (mm/min)	670	0,347	0,622	0,714
$k\beta_{min}$	360	0,744	0,966	1,000
$k\beta_{max}$	670	0,415	0,752	0,831
tpr_{min} (min)	360		6,47	
tpr_{max} (min)	670		8,49	

Technical parameters regarding charring rate and protective coating thickness (slabs / walls)

Slabs / walls				
Technical Parameter	**Protective coating thickness (g/m²)**	**R 15**	**R 30**	**R 45**
β'(mm/min)	0	0,836	0,828	0,851
β''_{min} (mm/min)	360	0,685	0,809	0,851
β''_{max} (mm/min)	670	0,353	0,624	0,714
$k\beta_{min}$	360	0,819	0,978	1
$k\beta_{max}$	670	0,422	0,754	0,84
tpr_{min} (min)	360		6,47	
tpr_{max} (min)	670		8,49	

Structural steel elements

Brief summary of information required for a needs assessment

1. **REQUIRED FIRE RESISTANCE CLASS**
   (R 30, R 60,...)

2. **TYPOLOGY OF THE STRUCTURAL ELEMENTS**
   What type of element is it? Are they beams, columns, struts or latticework?

3. What are the dimensions? (leaf width and thickness, core width and height)

4. Are they hollow sections? If so, what is the thickness of the steel?

▶ To submit all data correctly, please follow the steps below:

1. Scan the QR code with your mobile phone.

2. Download the appropriate needs assessment form.

3. Complete the appropriate application form.

4. Send the form to this email address:

ingass@amonncolor.com

General information

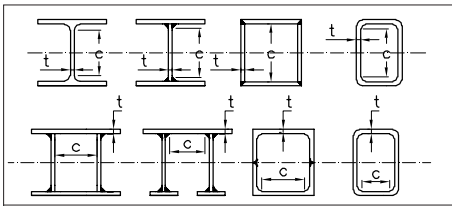
Steel structures are very vulnerable when exposed to fire because they are conductive elements that rapidly transfer heat from the outermost to the innermost sections while losing important mechanical properties. The yield strength is reduced starting from 400° until it is reduced in half at 600° while the elastic modulus (i.e. measure of its stiffness/ resistance elastic deformation to tensile load) already changes at around 100°. However, steel is still an indispensable construction material for anti-seismic and high-rise buildings thanks to its excellent strength-to-weight ratio. Structural fire protection remains necessary in the event of fire in order to allow for the necessary evacuation time before the building collapses.

Steel temperature Θ_a	Reduction factors at temperature Θ_a relative to the value of f_y or E_a at 20°C		
	Reduction factor (relative to f_y) for effective yield strength $k_{y,\Theta} = f_{y\Theta} / f_y$	Reduction factor (relative to f_y) for proportional limit $k_{p,\Theta} = f_{p\Theta} / f_y$	Reduction factor (relative to E_a) for the slope of the linear elastic range $k_{y,\Theta} = f_{y\Theta} / f_y$
20°C	1,000	1,000	1,000
100°C	1,000	1,000	1,000
200°C	1,000	0,807	0,900
300°C	1,000	0,613	0,800
400°C	1,000	0,420	0,700
500°C	0,780	0,360	0,600
600°C	0,470	0,180	0,310
700°C	0,230	0,075	0,130
800°C	0,110	0,050	0,090
900°C	0,060	0,0375	0,0675
1000°C	0,040	0,0250	0,0450
1100°C	0,020	0,0125	0,0225
1200°C	0,000	0,0000	0,0000

Critical temperature, utilization factor and ductility class

The temperature of steel structures exposed to fire is called "critical" when it coincides with the collapse of the structure subjected to the action of external loads. It is possible to verify the problem of critical temperature for steel when no feedback on the maximum allowable deformability is required and by simplifying the problem by applying the hypothesis of a uniform temperature of a given steel section. Then the critical temperature for steel is determined as a function of the utilization rate μ0, defined as the ratio between the stress load in case of fire and the cold strength of the element, while considering the ductility class of the section. The ductility class indicates the plastic deformation capacity of the section. Tables 1, 2 and 3 show the limiting dimensional ratios for the parts of the sections subjected to compression and bending, established by **EN 1993-1-2**. The section class of a composed member corresponds to the maximum class of its parts. A member that does not meet the limits for Class 3 is considered Class 4.

Table 1: Ductility class



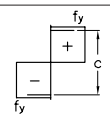
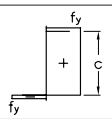
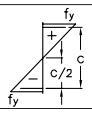
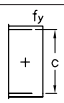
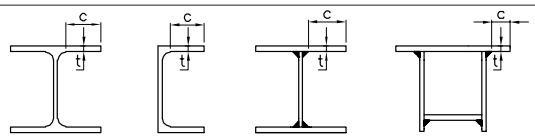
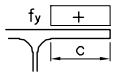
Class	Parts subject to bending	Parts subject to compression
Stress distribution (positive if compression)		
1	c/t ≤ 72 ε	c/t ≤ 33 ε
2	c/t ≤ 83 ε	c/t ≤ 38 ε
Stress distribution (positive if compression)		
3	c/t ≤ 124 ε	c/t ≤ 42 ε

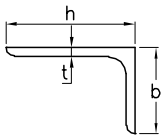
Table 2: Ductility class

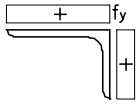


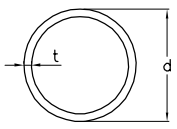
Class	Parts subject to compression
Stress distribution (positive if compression)	
1	c/t ≤ 9 ε
2	c/t ≤ 10 ε
3	c/t ≤ 14 ε

For the classification in case of fire it is necessary to adopt the value of $\varepsilon = 0{,}85 \times \sqrt{235/f_y}$ (f_y [N/mm²]).

Table 3: Ductility class



Class	Parts subject to compression
Stress distribution (positive if compression)	
3	h/t ≤ 15 ε; (b+h)/(2t) ≤ 11,5 ε



Class	Section in bending and compression
1	$d/t \leq 50\varepsilon^2$
2	$d/t \leq 70\varepsilon^2$
3	$d/t \leq 90\varepsilon^2$ Note: For $d/t > 90\varepsilon^2$ see EN 1993-1-6

Table 4: Value of ε and ε² in case of fire

f_y	S235	S275	S355	S460
ε	0,85	0,79	0,69	0,61
ε^2	0,72	0,62	0,48	0,37

Section factor or shape factor

For a given element, the ratio between the surface aera exposed to fire per unit length and its volume per unit length is defined as section factor or shape factor. The exposed surface determines the heat exchange. This depends on the position of the element (4 sides exposed or sides covered by other structures) and the type of protective coating (bonded or boxed). In the case of bolted connections, it is not necessary to verify the net sections in correspondence of the holes because the mass in those points is increased by the presence of the connection brackets and the bolts themselves. The mass factor of this section is in favour of safety. Unprotected steel has a fire resistance capacity that is inversely proportional to the A/V ratio (surface area exposed to fire/volume of the steel section) because the increase in mass has a positive effect on slowing the spread of heat. However, when unprotected, even very heavy steel members with small, exposed surface areas generally achieve a fire resistance rating higher than R15 only with difficulty. It is important from the beginning of the design phase never to exasperate the mass/resistance ratio in order to minimize structural costs. Costs that would then be spent on fire protection material necessary to guarantee the required fire resistance. The section factors of the most common cold formed profiles are shown below (m^{-1}).

Protected				
IPE				
IPE 80 A	437	509	317	389
IPE 80	369	429	270	330
IPE A 100	389	452	286	349
IPE 100	334	387	247	300
IPE A 120	370	428	271	329
IPE 120	311	360	230	279
IPE A 140	354	409	260	314
IPE 140	291	335	215	259
IPE A 160	332	382	245	295
IPE 160	269	310	200	241
IPE A 180	308	354	227	274
IPE 180	253	291	188	226
IPE O 180	226	260	168	202
IPE A 200	283	326	210	253
IPE 200	235	270	176	211
IPE O 200	212	244	158	190
IPE A 220	260	298	193	231
IPE 220	221	254	165	198
IPE O 220	200	230	149	179
IPE A 240	240	276	178	214
IPE 240	205	236	153	184
IPE O 240	185	213	139	167
IPE A 270	230	265	171	205
IPE 270	197	227	147	176
IPE O 270	170	195	127	152
IPE A 300	216	248	160	192
IPE 300	188	216	139	167
IPE O 300	163	187	121	145
IPE A 330	199	228	149	178
IPE 330	175	200	131	157
IPE O 330	152	175	114	137
IPE A 360	185	211	138	165
IPE 360	163	186	122	146
IPE O 360	142	162	107	127
IPE A 400	176	200	133	158
IPE 400	152	174	116	137
IPE O 400	135	154	103	122
IPE A 450	165	187	127	149
IPE 450	143	162	110	130
IPE O 450	122	138	94	110
IPE A 500	152	172	118	138
IPE 500	134	151	104	121
IPE O 500	114	129	89	104
IPE A 550	142	160	111	129
IPE 550	124	140	97	113
IPE O 550	108	121	85	98
IPE A 600	131	147	103	119
IPE 600	115	129	91	105
IPE O 600	93	104	73	85
750 x 137	128	144	101	116
750 x 147	120	134	94	109
750 x 173	102	114	81	93
750 x 196	91	102	72	83
HP				
HP 200x43	181	219	112	150
HP 200x53	145	176	90	121
HP 220x57	143	174	88	119
HP 260x75	129	156	80	108
HP 260x87	111	135	70	94
HP 305x79	147	178	91	121
HP 305x88	132	159	81	109
HP 305x95	122	148	76	101
HP 305x110	106	129	66	88
HP 305x126	94	113	58	78
HP 305x149	80	97	50	67
HP 305x180	67	81	42	56
HP 305x186	65	79	41	55
HP 305x223	55	67	35	47
HP 320x88	128	155	81	108
HP 320x103	111	135	70	94
HP 320x117	98	119	62	83
HP 320x147	80	96	51	68
HP 320x184	65	78	42	55
HP 360x84	162	196	98	132
HP 360x109	126	153	77	103
HP 360x133	104	126	64	86
HP 360x152	92	111	56	76
HP 360x174	81	98	50	67
HP 360x180	78	95	48	65
HP 400x122	116	141	70	95
HP 400x140	102	124	61	83
HP 400x158	91	111	55	74
HP 400x176	82	100	50	67
HP 400x194	75	91	46	62
HP 400x213	69	84	42	57
HP 400x231	64	77	39	53
Unprotected				

Protected				
HD				
HD 260x54,1	176	214	108	146
HD 260x68,2	141	171	88	117
HD 260x93,0	105	127	66	88
HD 260x114	86	104	55	73
HD 260x142	71	86	46	60
HD 260x172	59	72	39	51
HD 320x74,2	152	184	95	127
HD 320x97,6	117	141	74	98
HD 320x127	91	110	58	77
HD 320x158	74	89	48	63
HD 320x198	60	72	39	51
HD 320x245	50	60	33	43
HD 320x300	42	50	28	36
HD 360x134	104	125	63	85
HD 360x147	95	114	58	78
HD 360x162	87	105	53	71
HD 360x179	79	95	49	65
HD 360x196	72	87	45	60
HD 400x187	78	94	47	64
HD 400x216	68	82	42	56
HD 400x237	63	76	38	52
HD 400x262	57	69	35	47
HD 400x287	52	63	32	43
HD 400x314	48	58	30	40
HD 400x347	44	53	28	37
HD 400x382	40	49	25	34
HD 400x421	37	45	23	31
HD 400x463	34	41	22	29
HD 400x509	31	38	20	27
HD 400x551	29	35	19	25
HD 400x592	28	33	18	23
HD 400x634	26	31	17	22
HD 400x677	25	30	16	21
HD 400x744	23	27	15	20
HD 400x818	21	25	14	18
HD 400x900	19	23	13	17
HD 400x990	18	22	12	16
HD 400x1086	17	20	11	15
Unprotected				

Protected				
UPE				
UPE 80	291	341	209	258
UPE 100	278	322	204	248
UPE 120	259	298	195	233
UPE 140	247	282	187	223
UPE 160	235	267	180	212
UPE 180	225	254	173	203
UPE 200	213	240	165	193
UPE 220	198	223	155	180
UPE 240	188	211	148	171
UPE 270	178	199	142	163
UPE 300	153	171	124	141
UPE 330	138	153	113	128
UPE 360	130	144	107	121
UPE 400	120	133	100	112
UPN				
UPN 80	250	291	186	227
UPN 100	239	276	185	222
UPN 120	223	255	174	206
UPN 140	210	240	167	196
UPN 160	200	228	160	188
UPN 180	193	218	154	179
UPN 200	182	205	148	171
UPN 220	171	192	139	160
UPN 240	163	183	134	154
UPN 260	154	173	126	145
UPN 280	149	167	123	141
UPN 300	145	162	119	136
UPN 320	116	130	98	111
UPN 350	123	135	103	116
UPN 380	125	138	107	120
UPN 400	117	129	99	111
Unprotected				

Protected				
HE				
HE 100 AA	290	355	181	245
HE 100 A	217	264	138	185
HE 100 B	180	218	115	154
HE 100 M	96	116	65	85
HE 120 AA	296	361	182	247
HE 120 A	220	267	137	185
HE 120 B	167	202	106	141
HE 120 M	92	111	61	80
HE 140 AA	281	342	172	233
HE 140 A	208	253	129	174
HE 140 B	155	187	98	130
HE 140 M	88	106	58	76
HE 160 AA	244	297	150	203
HE 160 A	192	234	120	161
HE 160 B	140	169	88	118
HE 160 M	83	100	54	71
HE 180 AA	229	279	141	190
HE 180 A	187	226	115	155
HE 180 B	131	159	83	110
HE 180 M	80	96	52	68
HE 200 AA	211	256	130	175
HE 200 A	174	211	108	145
HE 200 B	122	147	77	102
HE 200 M	76	92	49	65
HE 220 AA	200	242	122	165
HE 220 A	161	195	99	134
HE 220 B	115	140	72	97
HE 220 M	73	88	47	62
HE 240 AA	185	225	114	154
HE 240 A	147	178	91	122
HE 240 B	108	131	68	91
HE 240 M	61	73	39	52
HE 260 AA	176	214	108	146
HE 260 A	141	171	88	117
HE 260 B	105	127	66	88
HE 260 M	59	72	39	51
HE 280 AA	168	204	104	139
HE 280 A	136	165	84	113
HE 280 B	102	123	64	85
HE 280 M	59	71	38	50
HE 300 AA	158	192	97	131
HE 300 A	126	153	78	105
HE 300 B	96	116	60	80
HE 300 M	50	60	33	43
HE 320 AA	152	184	95	127
HE 320 A	117	141	74	98
HE 320 B	91	110	58	77
HE 320 M	50	60	33	43
HE 340 AA	147	177	94	123
HE 340 A	112	134	72	94
HE 340 B	88	106	57	75
HE 340 M	50	60	34	43
HE 360 AA	142	170	92	120
HE 360 A	107	128	70	91
HE 360 B	86	102	56	73
HE 360 M	51	61	34	44
HE 400 AA	135	161	90	115
HE 400 A	101	120	68	87
HE 400 B	82	97	56	71
HE 400 M	52	62	36	45
HE 450 AA	133	156	91	114
HE 450 A	96	113	66	83
HE 450 B	79	93	55	69
HE 450 M	53	62	38	47
HE 500 AA	130	152	91	113
HE 500 A	92	107	65	80
HE 500 B	76	89	54	67
HE 500 M	55	63	39	48
HE 550 AA	123	142	88	108
HE 550 A	90	104	65	79
HE 550 B	76	88	55	67
HE 550 M	56	64	41	50
HE 600 AA	120	138	88	106
HE 600 A	89	102	65	79
HE 600 B	75	86	56	67
HE 600 M	57	65	42	51
HE 600x337	49	56	37	44
HE 600x399	42	48	32	38
HE 650 AA	118	135	88	105
HE 650 A	87	100	65	78
HE 650 B	74	85	56	66
HE 650 M	58	66	44	52
HE 650x343	50	57	38	45
HE 650x407	43	49	33	39
HE 700 AA	114	129	86	102
HE 700 A	85	96	64	76
HE 700 B	72	82	55	65
HE 700 M	59	67	45	53
Unprotected				

Protected				
HE 700x352	51	58	39	46
HE 700x418	44	50	34	40
HE 800 AA	108	122	84	98
HE 800 A	84	94	66	76
HE 800 B	72	81	57	66
HE 800 M	60	68	48	55
HE 800x373	52	59	41	48
HE 800x444	44	50	35	41
HE 900 AA	101	113	81	93
HE 900 A	81	90	65	74
HE 900 B	70	78	57	65
HE 900 M	62	69	50	57
HE 900x391	54	60	43	49
HE 900x466	45	51	37	42
HE 1000 AA	98	108	79	90
HE 1000x249	88	97	71	81
HE 1000 A	81	89	66	74
HE 1000 B	70	78	57	65
HE 1000 M	64	70	52	59
HE 1000x393	57	63	47	53
HE 1000x415	54	60	44	50
HE 1000x438	51	57	42	48
HE 1000x494	46	51	38	43
HE 1000x584	39	44	33	37
HL 920x345	69	79	52	62
HL 920x368	65	74	49	58
HL 920x390	62	70	46	55
HL 920x420	58	66	43	51
HL 920x449	54	61	41	48
HL 920x491	50	56	37	44
HL 920x537	46	52	35	41
HL 920x588	42	48	32	37
HL 920x656	38	43	29	34
HL 920x725	35	39	26	31
HL 920x787	32	37	25	29
HL 920x970	27	30	20	24
HL 1000 AA	82	92	63	73
HL 1000 A	76	85	58	68
HL 1000 B	66	74	51	59
HL 1000 M	60	67	46	54
HL 1000x443	55	63	43	50
HL 1000x483	51	58	40	46
HL 1000x539	46	52	36	42
HL 1000x554	45	51	35	41
HL 1000x591	42	48	33	39
HL 1000x642	39	44	31	36
HL 1000x748	34	38	27	31
HL 1000x883	29	33	23	27
HL 1100 A	76	85	59	68
HL 1100 B	67	75	52	60
HL 1100 M	61	68	47	55
HL 1100 R	53	59	42	48
UC				
UC 152x152x23	252	304	156	208
UC 152x152x30	195	235	122	162
UC 152x152x37	161	194	101	134
UC 203x203x46	168	202	104	139
UC 203x203x52	150	180	93	124
UC 203x203x60	131	158	82	109
UC 203x203x71	112	135	71	93
UC 203x203x86	94	113	60	79
UC 254x254x73	132	160	82	109
UC 254x254x89	110	133	69	91
UC 254x254x107	93	112	58	77
UC 254x254x132	76	92	48	64
UC 254x254x167	62	74	40	52
UC 305x305x97	120	145	75	99
UC 305x305x118	100	120	62	83
UC 305x305x137	87	105	54	72
UC 305x305x158	76	91	48	63
UC 305x305x198	62	74	39	52
UC 305x305x240	52	62	33	44
UC 305x305x283	45	54	29	38
UC 356x368x129	108	130	66	88
UC 356x368x153	92	111	56	75
UC 356x368x177	80	96	49	66
UC 356x368x202	71	85	44	58
UC 356x406x235	63	76	39	52
UC 356x406x287	52	63	32	43
UC 356x406x340	45	54	28	37
UC 356x406x393	39	48	25	33
UC 356x406x467	34	41	22	29
UC 356x406x551	29	35	19	25
UC 356 x406x634	26	31	17	22
Unprotected				

Steel protection material and experimental test standards

Steel protection materials are divided into two categories:

a) Protection material that do not change their physical form on heating which in turn are divided into:
- fireproof plasters
- fireproofed boards

b) Reactive fire protection materials - intumescent paints

Test standards EN 13381-4/8, concerning steel protection, attempt to determine a relationship between the thickness of the applied protection material, the section factor and the temperature of structural steel members when exposed to fire as described by EN 1363-1. The results of laboratory tests and subsequent evaluations can be used directly in the calculation of fire resistance of structural steel members according to the calculation methods determined in Eurocodes EN 1993/1-2. The test method also provides data on the adhesion and cohesion of the protection material when applied to load bearing structures. By calculating a corrective factor K the difference in performance of the same protective material, applied at the minimum and maximum thickness on unloaded columns and beams compared to loaded ones can be taken into account.

For reactive protection material it is necessary to test a series of hollow profiles with circular and/or square sections in order to be able to use a certain product also on these sections. For passive protection materials these tests are optional. It is possible to apply the same thickness on equal section factors - at equal massiveness - used for H/I members (open profiles) in the case of slabs or corrected with a particular formula when it comes to sprayed fireproof plasters.

Test reports issued by laboratories contain a series of experimental data: thermal diffusion, tested thickness of protection material, correction factor K, section factors of tested members and additional observations. This considerable mass of data, in order to be easily used by professionals, is translated in the Evaluation Reports by tables showing the resistance, the section factor of the member and the critical design temperature in relation to the thickness of the applied protection material. The tables can be achieved by using 4 different evaluation methods, alternatives to be chosen by the manufacturer with identical reliability, but with limitations regarding the direct application in the Eurocodes. These tables always include the correction factor K.

Example table of result

I / H Columns: 500 °C (EN 13381-8:2013)						
Massivity	Thickness of the applied protection material (µm)					
m^{-1}	15 min	30 min	45 min	60 min	75 min	90 min
60	182	182	189	295	413	530
65	182	182	201	317	444	571
70	182	182	212	338	475	612
75	182	182	224	360	506	653
80	182	182	235	381	538	709
85	182	182	246	403	569	805
90	182	182	258	424	600	901
95	182	182	269	445	631	997
100	182	182	281	467	663	1093
105	182	182	292	488	698	1161
110	182	182	303	510	743	1229
...	...	...	...	...	...	...
320	182	470	821	1361		
325	182	477	836	1408		
330	182	484	852	1454		
335	182	490	868	1500		
340	182	497	884	1546		

Thickness is given only of reactive protection material. The result is also valid for beams with 4 lateral exposures, with a maximum allowable thickness of 1.335 mm.

Limitations of direct applicability of experimental data and purpose of standards

European standards EN 13381-4 and EN 13381-8 specify test methods for determining the contribution to fire resistance made by passive and reactive fire protection systems respectively applied to structural steel members, such as beams or columns. Both standards consider only profile sections without web openings, which must instead be tested according to EN 13381-9. This standard is not directly applicable to rods without further evaluation. Analytical results on I- or H-section profiles are directly applicable to L-section, U-section and T-section profiles with the same section factor (open profiles). They do not apply to solid round beams which have to be checked and tested according to EN 13381-10.

The results of these test methods and assessment procedures are applicable to a fire protection system within the following limits:
- Regarding the thicknesses of the tested fire protection materials
- Regarding the tested section factors A/V values
- Regarding the maximum temperatures established during the test.

Analytical results for columns may be applied to beams exposed on all four sides up to the maximum protection material thickness provided by the loaded beam test.
As stated in EN 10025-1 the results of the evaluation are applicable to all other types of steel similar to the tested one.

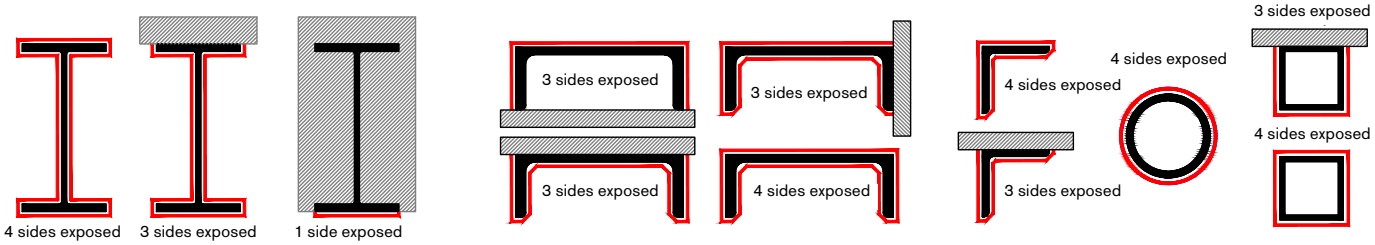
Use of experimental data and simplified analytical method according to Eurocodes

The analytical-experimental method allows to determine the thickness of the protection material necessary to obtain a certain class of fire resistance by applying data derived from laboratory tests. Testing of protection material for steel members (beams and columns) must have been carried out in accordance with EN 13381-4 or EN 13381-8. The results of these tests determine the necessary thicknesses of protection material in function of the critical temperature and the section factor of each element to be protected for the required protection class.

The procedure can thus be simplified:

1. Determine the section factor of the profile

$\frac{S}{V}$ Ratio of lateral surface area A **(receiving heat flux)** to material volume V **(storing heat)**

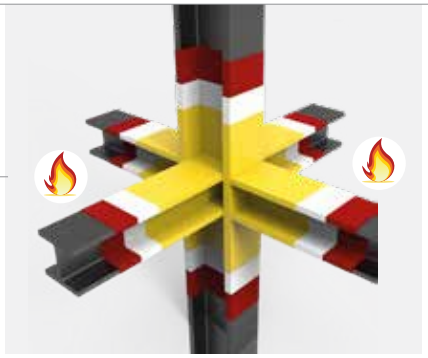


$\frac{S}{V} \quad \frac{P_{esp}}{A_{sez}}$ For elements with a constant section factor, it is equal to the ratio between the exposed perimeter and the section area of the profile.

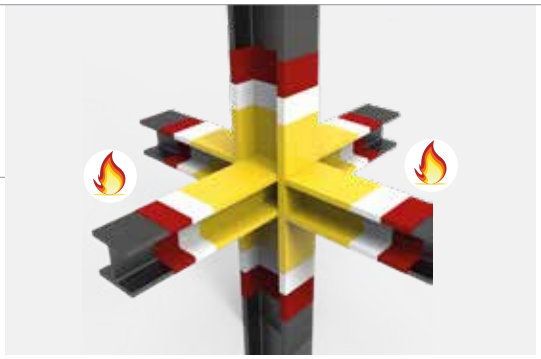
The assumption of a uniform temperature inside the profile is valid for A/V > 30
In Eurocode 3 the uniform temperature limitation is A/V > 10
For A/V > 300 the temperature of the profile is practically equal to that of the gas

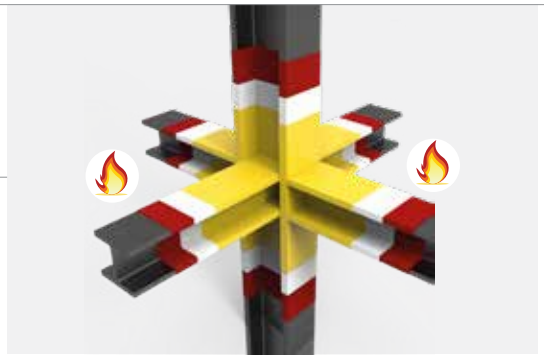
Amotherm Solutions

Type	FIRE PROTECTION REFURBISHMENT OF STRUCTURAL STEEL MEMBERS
Reference standard	EN 13381-4/8
Fire resistance	From R 30 to R 120 - Critical temperature from 350° to 600°
Type of protected profiles	I/H (Open sections)
C.E. marking	ETA 14-0417
Environmental certification	Indoor Air Comfort Gold ®6.0 of 02/2017 - EPD according to ISO 14025 and EN 15804
Protective system	**Amotherm Steel WB** - water-based, intumescent, mono-component paint
Consumption	Depending on the critical design temperature of the single element
Technical reference document	CSI Evaluation Reports 1770 FR - 1849 FR - 1752 FR - 1769 FR - AR00116AUPE
Surface preparation	Compatible primers: zinc phosphate epoxypolyamines/epoxyvinyls/ alkyds /alkyds modified with phenolic resins. In case of galvanized steel use Amotherm Steel Primer WB (0.10 kg/m²)
Technical Data Sheet	



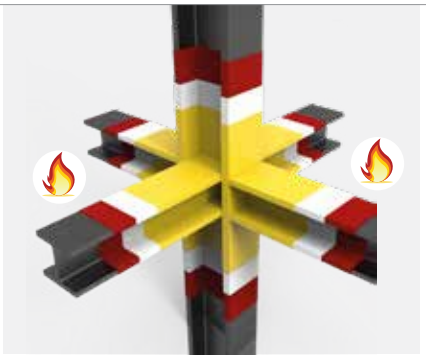
Type	FIRE PROTECTION REFURBISHMENT OF STRUCTURAL STEEL MEMBERS
Reference standard	EN 13381-8
Fire resistance	From R 15 to R 90 – Critical Temperature from 350°C to 750°C
Type of protected profiles	I/H (Open Profiles)
C.E. marking	ETA 25/0255
Protective system	**Amotherm Steel 600 WB** - water-based, intumescent paint
Consumption	Depending on the critical design temperature of the single element
Technical Reference Document	ETA 25/0255
Surface preparation	Compatible primers: zinc phosphate epoxypolyamines/epoxyvinyls/alkyds modified with phenolic resins. In case of galvanized steel: Amotherm Steel Primer WB (0.10 kg/m²)
Technical Data Sheet	



Type	FIRE PROTECTION REFURBISHMENT OF STRUCTURAL STEEL MEMBERS
Reference standard	EN 13381-4/8
Fire resistance	From R 30 to R 120 - Critical temperature from 350° to 600
Type of protected profiles	I/H (Open sections) and closed profiles with square cross-section
C.E. marking	ETA-23-0818
Protective system	**Amotherm Steel SB** - solvent based, intumescent, mono-component paint
Consumption	Depending on the critical design temperature of the single element
Technical Reference Document	CSI Evaluation Reports 1767 FR - 1801 FR - 1804 FR - 2285 FR
Surface preparation	Compatible primers: zinc phosphate epoxypolyamines/epoxyvinyls/alkyds/alkyds modified with phenolic resins. In case of galvanized steel use Amotherm Steel Primer WB (0.10 kg/m^2)
Technical Data Sheet	

Amotherm Solutions

Type	FIRE PROTECTION REFURBISHMENT OF STRUCTURAL STEEL MEMBERS
Reference standard	EN 13381-8
Fire resistance	From R 15 to R 120 - Critical temperature from 350° to 750°
Type of protected profiles	I/H (open profiles) and closed profiles with rectangular/circular sections
C.E. marking	ETA 24/0599
Protective system	**Amotherm Steel 400 SB/FD** – solvent-based, intumescent paint
Consumption	Depending on the critical design temperature of the single element
Technical reference document	ETA 24/0599
Surface preparation	Compatible primers: zinc phosphate epoxypolyamines/epoxyvinyls/alkyds modified with phenolic resins. In case of galvanized steel use Amotherm Steel Primer WB (0.10 kg/m^2)
Technical Data Sheet	



Wood reaction to fire

Fire Protection Refurbishment of wooden surfaces

Reference standard: EN 13501- 1

Brief summary of information required for a needs assessment

1. **TYPE OF ELEMENT TO BE TREATED IN TERMS OF FIRE BEHAVIOUR**
   Are they floors, wall coverings, floorboards, furniture, stands, scenery, etc.?

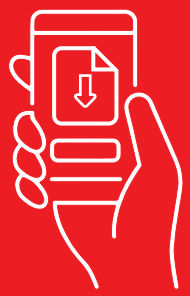
2. What is the condition of the surface? Raw, already treated, etc...

3. What reaction to fire class is required?
   What are the reference standards? European or Italian (e.g. Class 1 or B-s1, d0)

▶ To submit all data correctly, please follow the steps below:

1. Scan the QR code with your mobile phone.

2. Download the appropriate needs assessment form.



3. Complete the appropriate application form.

4. Send the form to this e-mail address:

ingass@amonncolor.com

Introduction

Wood is a material that, although used in construction for a variety of structural, decorative or furnishing purposes, has always posed the problem of its combustibility. In other words, the material's ability to burn until it is completely consumed.

Wood is an organic product of plant origin and consists mainly of cellulose and lignin, substances with a high carbon content. Carbon, together with hydrogen, is one of the essential components of the combustion process. By its nature, wood is therefore a highly combustible material.

Combustibility is certainly a negative characteristic of wood, as it could contribute to the development and spread of a fire and cause dangerous subsidence and collapse. However, it must be kept in mind that wood can exhibit these properties in different ways and to different extents, depending on a variety of factors specific to the material, the way it is used and the environmental conditions under which the combustion process takes place.

Initially, combustion takes place on the outer surface of the wood when the most exposed layer of wood comes into contact with a heat source. Combustion then progresses through the inner layers and continues in depth until the entire wooden mass is burnt.

The flammability of wood depends both on specific environmental conditions (e.g. heat source, air supply or ventilation) and on the chemical and physical characteristics of the product in question (e.g. type and species of wood, chemical composition, density, moisture content, ignition temperature, shape and size of the timber member).

Without going into detail on each individual factor, it has been shown that, in normal ventilation conditions, surface ignition of wood occurs at temperatures above 140°C.

Reaction to fire / Behaviour to fire

The reaction to fire is defined as the degree of response of a combustible material in contribution by its own decomposition to a fire to which it is exposed and mainly concerns the early stages of fire (ignition phase before flash-over). It is a characteristic of the material that is conventionally expressed in "classes" of reaction to fire.

The fire reaction class is a passive protection instrument in the field of fire protection. The purpose of using materials of a suitable fire reaction class is to reduce the speed of fire propagation so that the flame front does not hit other combustible materials, thereby spreading the fire. Slowing down the spread of fire during its first phase increases the time available for evacuation before flashover. The classification systems adopted at Community level through EC decisions complement the national systems.

The Euroclasses for the reaction to fire:

According with EN 13501-1 - Combustion classes	
A	Not combustible. No contribution to the fire
B	Combustible. Very limited contribution to fire
C	Combustible. Low contribution to fire
D	Combustible. Middle contribution to the fire
E	Combustible. High contribution to the fire
F	Behaviour of reaction to fire not determined

Smoke indicators	
s1	Very low production of smoke
s2	Combustible. Very limited contribution to fire
s3	Combustible. Low contribution to fire
Drop indicators	
d0	No production of drops / no flamed particles
d1	Drops falling / non-flammable particles
d2	Drops falling / flammable particles

Reaction to fire according to European standards

The European regulatory framework considers only construction products. The table shows the attributable classes in the classification of a material.

All products		Floors	
Class	Additional classifications	Class	Additional classifications
A1	-	$A1_{fl}$	-
A2	Smoke production (S1, S2,S3) Flaming droplets/particles (D0,D1,D2)	$A2_{fl}$	Smoke production (S1, S2,S3) Flaming droplets/particles (D0,D1,D2)
B		B_{fl}	
C		C_{fl}	
D		D_{fl}	
E	Flaming droplets/particles (D0, D1, D2)	E_{fl}	Flaming droplets/particles (D0, D1, D2)
F	NDP	F_{fl}	NDP

The parameters that contribute to determine the class of Reaction to Fire adopted in Europe allow to measure:

- **Flammability**
- **Smoke production**
- **Heat release**
- **Flaming droplets**

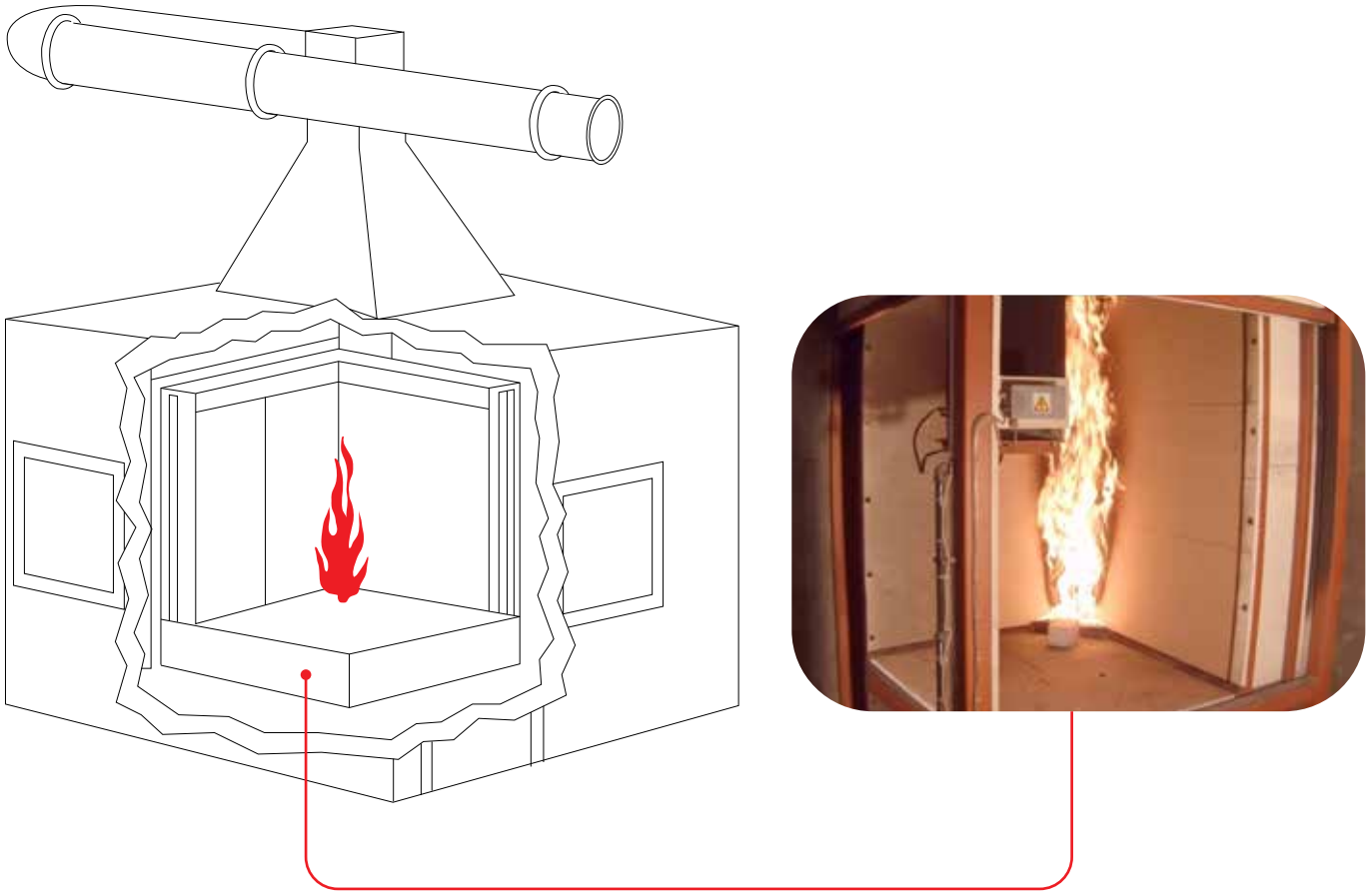
Laboratory tests carried out in accordance with the general principles of European standards must ensure repeatability and reproducibility.

The reference standards for the European classification procedure are as follows:

- **EN 13501-1:2019 Fire classification of construction products and building elements** Part 1: Classification using data from reaction to fire tests
- **EN 13238: 2010** Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
- **EN ISO 1182:** Reaction to fire tests for building products - Non-combustibility test
- **EN ISO 1716:2018** Reaction to fire tests for building products - Determination of the heat of combustion
- **EN ISO 11925-2:2020** Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test
- **EN 13823:2020** Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item (S.B.I)
- **EN ISO 9239-1:2025** Reaction to fire tests for floorings - Part 1: Determination of the burning behaviour using a radiant heat source

The following table shows the symbols and parameters used to determine the fire reaction class:

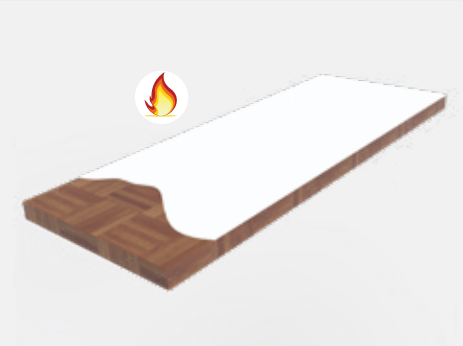
ΔT	Temperature rise [K]
Δm	Mass loss
t_f	Duration of flaming
PCS	Gross calorific potential
FIGRA	Fire growth rate
THR_{600s}	Total heat release
LFS	Lateral flame spread
SMOGRA	Smoke growth rate
TSP600s	Total smoke production within 600s
Fs	Flame spread



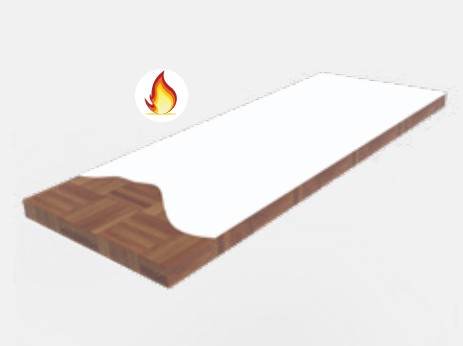
Single Burning Item (SBI) Test Equipment, EN 13823

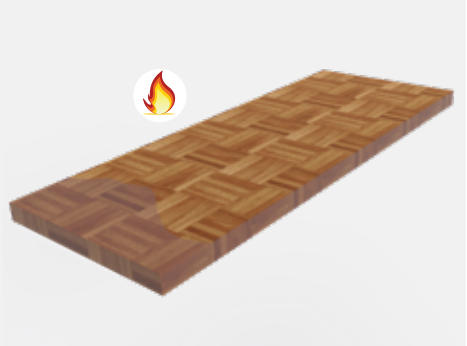
Amotherm Solutions

Type	FIRE PROTECTION REFURBISHMENT OF WOODEN FLOORING
Reference standard	EN 13501-1
Reaction to fire	Class B_{fl} s1
Fire exposure	Wooden elements placed on the floor
Type of wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	Transparent or coloured flame retardant cycle composed of **Amotherm Wood 540 SB** and **Amotherm Wood 540 Top SB topcoat**
Consumption	From 0.32 kg/m² (0.16 kg/m² of Amotherm Wood 540 SB and 0.16 kg/m² of Amotherm Wood 540 Top SB)
Technical reference document	Classification report CSI 0228/DC/REA/10_4 (EN 13501-1)
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	



Type	FIRE PROTECTION REFURBISHMENT OF WOODEN FLOORING
Reference standard	EN 13501-1
Reaction to fire	Class C-fl, s1
Fire exposure	Wooden elements placed on the floor
Type of wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	**Amotherm Wood 640 WB**, water-based, polyurethane fire-retardant
Consumption	150g/sqm to 300g/sqm
Technical reference document	Classification report I.G. 417507 (EN 13501-1)
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Planing or sanding down to bare wood to remove old paint or other foreign materials. The preliminary use of non-film-forming impregnating treatments is allowed for the decoration or protection of wood
Technical Data Sheet	





Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class C-s1, d0
Fire exposure	Wooden elements placed on the wall or ceiling or used for making furniture and furnishings
Type of Wood	Veneered wood, made of fireproof MDF support, ennobled with oak wood and assembled with phenolic glue. Total thickness of 17 mm.
Protective system	Solvent-based, transparent, two-component paint **Amotherm Wood 300 SB**
Consumption	From 0.24 kg/m²
Technical reference document	Classification Report I.G. 379062 (EN 13501-1)
Dimensions	Unlimited, thickness from 17 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	

Highlights
- Open pore aesthetic effect
- Suitable for industrial applications

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s1, d0
Fire exposure	Wooden elements placed on the wall or ceiling
Type of Wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	Transparent or pigmented flame retardant cycle composed of **Amotherm Wood 450 SB** and **Amotherm Wood 450 Top SB topcoat**
Consumption	From 0.36 kg/m² (0.20 kg/m² Amotherm Wood 450 SB and 0.16 kg/m² of Amotherm Wood 450 TOP SB)
Technical reference document	Classification report BM CR-09.2025-1
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	

Highlights
- Limits the reaction to fire of wooden furniture
- Ideal for industrial applications

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s2, d0
Fire exposure	Wooden elements placed on the wall or ceiling
Type of Wood	Solid wood and engineered wood products
Protective system	Solvent-based high-transparency primer-finish filler **Amotherm Wood 400 SB**
Consumption	400 g/m²
Technical reference document	Classification report I.G. 417419
Surface preparation	Sanding down to bare wood to remove old paint or for compatibility verification. The preliminary use of non-film-forming impregnating treatments is allowed for the decoration or protection of wood
Technical Data Sheet	

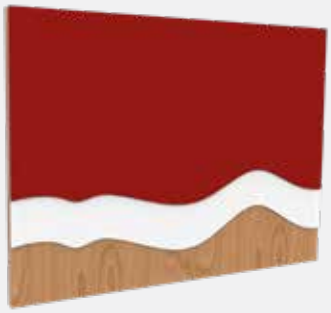
Highlights
- Open pore aesthetic effect
- Suitable for industrial applications

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s2, d0
Fire exposure	Wooden wall or ceiling elements
Type of Wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	Pigmented fire retardant cycle consisting of **Amotherm Wood 461 SB** and top coat **Amotherm Wood 461 Top SB**
Consumption	From 0.35 kg/m² (0.20 kg/m² of Amotherm Wood 461 SB and 0.15 kg/m² of Amotherm Wood 461 Top SB)
Technical reference document	Classification Report I.G. 375286
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s2, d0
Fire exposure	Wooden elements placed on the wall or ceiling or used for making furniture and furnishings
Type of Wood	Veneered wood, made of fireproof MDF support, ennobled and assembled with phenolic glue. Total thickness of 17 mm.
Protective system	Fireproof cycle composed of **Amotherm Wood 480 SB** and **Amotherm Wood 480 Top SB top coat**
Consumption	From 0.45 kg/m² (0.30 kg/m² of **Amotherm Wood 480 SB** and 0.15 kg/m² of **Amotherm Wood 480 Top SB**)
Technical reference document	Classification Report CSI 0460\DC\REA\20_3 (EN 13501-1)
Dimensions	Unlimited, thickness from 17 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s2, d0
Fire exposure	Wooden elements placed on the wall or ceiling
Type of Wood	Fireproof MDF wood (classified as B-s2, d0 according to the European standard); wood and engineered wood products that do not contain air cavities or are not assembled with thermoplastic glues (according to the Italian classification)
Protective system	Water-based, two-component primer-finish **Amotherm Wood 700 WB**
Consumption	240 g/m²
Technical reference document	Classification Report I.G. 417815 (EN 13501-1)
Dimensions	Minimum thickness 8 mm
Surface preparation	Sanding down to bare wood to remove old paint or for compatibility verification. The preliminary use of non-film-forming impregnating treatments is allowed for the decoration or protection of wood
Technical Data Sheet	

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	Class B-s1, d0
Fire exposure	Wooden elements placed on the wall or ceiling
Type of Wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	White one-component paint **Amotherm Wood WB** and optional topcoat **Amotherm Wood Top WB**
Consumption	From 0.40 kg/m² (Optional topcoat 0.10 kg/m²)
Technical reference document	Classification Report I.G. 402533 (EN 13501-1)
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood
Technical Data Sheet	



Highlights

- Product available in RAL/ NCS colours

Type	FIRE PROTECTION REFURBISHMENT OF NON-STRUCTURAL WOODEN ELEMENTS
Reference standard	EN 13501-1
Reaction to fire	B-s1, d0
Fire exposure	Wooden elements placed on the wall or ceiling not subject to stress, mechanical abrasion or exposure to atmospheric agents
Type of Wood	Wood and wood derivatives, neither containing air cavities nor assembled with thermoplastic glues
Protective system	Transparent flame retardant cycle composed of **Amotherm Wood WSB** and topcoat **Amotherm Wood WSB Top**
Consumption	From 0.46 kg/m² (0.36 kg/m² of **Amotherm Wood WSB** and 0.10 kg/m² of **Amotherm Wood Top WSB**)
Technical reference document	Classification Report CSI 0274/DC/REA/13_3 (EN 13501-1)
Dimensions	Unlimited, thickness from 4 mm
Surface preparation	Sanding down to wooden surface to remove old paint or compatibility check. The preliminary use of non-film-forming impregnating treatments is permitted for the decoration or protection of wood.
Technical Data Sheet	

For more information on products, the company and to download the data sheets consult the website www.amonncolor.com.

Concept and graphic design:
Davide Falzone

Note carefully.
The J.F. Amonn Srl reserves the right to modify the products and information contained in this catalogue at any time. Before making your purchase always check out the technical specifications which can be viewed and downloaded on the website www.amonncolor.com

Notes

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