Treatment & lifespan

Effectiveness of fire reaction behavior in the long term

Hestus Partner in Fire retardancy

DGMR - SEAL OF APPROVAL

Summary

This whitepaper provides insight into the sustainability of fire-retardant treatments with BurnBlock® and the impact on the expected lifespan of wood products treated by Hestus. It addresses fire reaction behavior in the long term, supported by relevant standards and practical examples that provide insight into performance.

This whitepaper is a guide for professionals in the construction industry.

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1. Introduction

Fire-retardants reduce the reaction of wood products to fire, which leads to better fire safety performance. However, due to exposure to weather conditions, the fire performance may decrease over time. It is therefore essential to assess the durability of the fire-retardant treatment.
Biobased and circularity are high on the social agenda. Wood is increasingly used as a nature-friendly alternative to traditional building products. This requires fire-retardant measures. These are now also available on a nature-friendly basis. But do nature-friendly ingredients and treatments also guarantee a long lifespan when combined with fire-retardant treatments?

In our whitepaper *Testing methodology and Application* we discussed how Hestus tests and applies fire-retardant treated wood. This new edition focuses specifically on the durability of these treatments and the expected lifespan of the wood products.

2. What is the effect of fire retardancy based on Burnblock®?

Hestus uses BurnBlock® in its treatment process, a highly effective and non-toxic fire-retardant. It consists of a combination of natural ingredients in a patented formula. The ingredients are found in nature and in your own body. BurnBlock® prevents oxygen from reaching the treated object. Without oxygen, combustion cannot occur. In addition, BurnBlock® components also promote carbonization (charring) and release cooling and diluting gases to burning samples.

The wood undergoes a high-pressure treatment that adds the fire-retardant to the hollow cell structure of the wood. The wood is then dried, allowing the fir- retardant to penetrate the cell walls and partially fill the cells.

Wood treated with BurnBlock® can be used both indoors and outdoors, with or without further coating.

3. What is the effect of fire reaction behavior in the long term?

Both the retained efficacy of the fire-retardant treatment and of the wood products can be assessed according to the EN 16755 standard. In addition, the standard provides guidelines for ensuring the fire safety of fire-retardant treated wood during the intended lifespan (EN 350). Long-term durability can be simulated with an accelerated aging test.

Within the standard there is a classification (DRF) that indicates how durable a fire-retardant treatment is under different usage conditions. It is important to choose the right DRF class to ensure that the fire-retardant treated wood remains safe in end use.

Durability of reaction to fire – DRF classification
EN 16755

Class	Application	Guideline	EN standard
INT 1	Interior - dry	- Initial fire classification test	-EN 13501-1
INT2	Interior - moist	- Initial fire classification test - Hygroscopic test	-EN 13501-1 -EN 16755
EXT	Exterior	- Initial fire classification test - Accelerated aging test[1] - Fire test - Hygroscopic test	-EN 13501-1 -EN 927-6 -ISO 5660-1 -EN 16755

[1] Note: The EN 16755 provides different test methods. BurnBlock® treated wood has been tested at the Danish Test Institute (DTI) according to the EN 927-6 accelerated aging test.

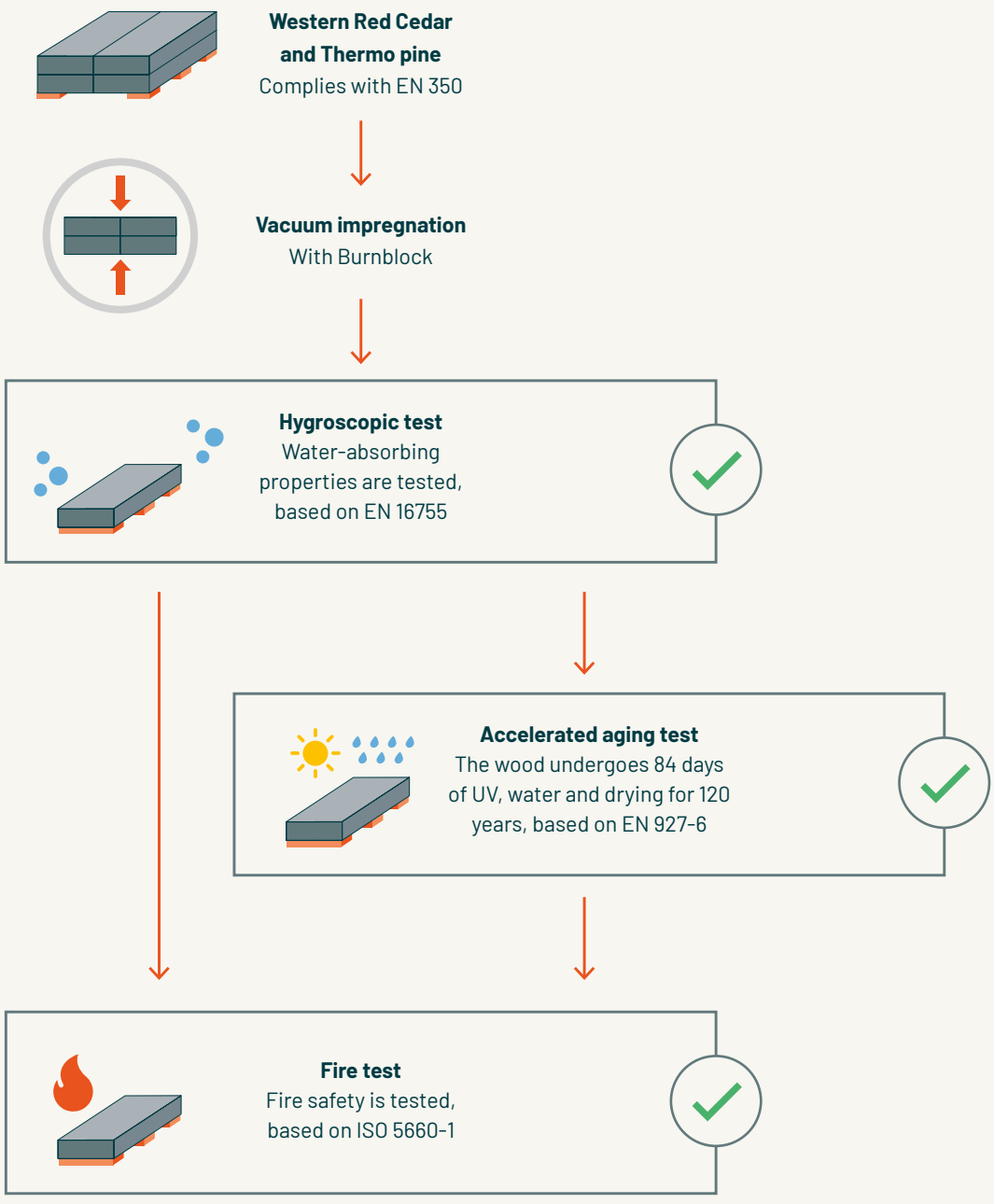
2.1 Lasting fire safety with Thermo-Pine and Western Red Cedar

After the accelerated aging test (EN 927-6), both Thermo-Pine and Western Red Cedar treated with BurnBlock® had the same fire class as before the accelerated aging test. This means that wood products, fire-retardant treated with BurnBlock®, can be applied without further finishing in classes INT1, INT2 and EXT.

The fire test methods applied to compare the results of the weathered and unweathered product and to determine the durability of the treatment are: the Single Burning Item test (EN 13823) * and the cone calorimeter test (ISO 5660) *. BurnBlock has demonstrated that Western Red Cedar and Thermo-Pine, impregnated with BurnBlock®, retain their fire performance after accelerated aging (EN 927-6) and also meet the hygroscopic requirements of EN 16755: 2017.

* these are the test standards used for the classification according to EN 13501-1

EN 16755 Durability of reaction to fire performance met Burnblock®



4. To what extent does the wood substrate have an effect?

The durability of fire-retardant treatments also depends on the durability of the wood substrate. The higher the durability of the wood substrate, the higher the durability of the treatment.

In Europe rules have been established regarding the expected lifespan of wood products (the wood substrate). The natural durability of solid wood and wood products is assessed according to the EN 350 standard. Among other things, fungal attack and water-absorbing (hygroscopic) properties and their effect on durability are tested. This standard classifies wood species into durability classes (1 to 5) based on resistance to decay including fungi, wood rot and wood-destroying insects.

Wood is made of cells with a hardened cell wall. These cells are the building blocks that form the structure of the wood (fibers, vessels). Wood is hygroscopic, meaning it can release moisture to the ambient environment, but also absorb moisture from it. The less hygroscopic, the better the durability.

Durability classes of wood (products) based on EN 350

Durability class		Intended lifespan
1	Very durable	25+ years
1-2	Very durable-durable	20-25 years
2	Durable	15-25 years
3	Moderately durable	10-15 years
4	Slightly durable	5-10 years
5	Not durable	<5 years

Note: the durability class is only valid for heartwood. Sapwood is less durable and is not recommended for outdoor applications such as cladding, as it is less weather-resistant and can rot or mould more quickly.

5. What does the sustainability of the wood substrate mean for the lifespan of BurnBlock®?

The lifespan of the fire-retardant treatment with BurnBlock® is directly related to the wood substrate. What does that mean for the different wood species that Hestus treats with BurnBlock®?

> *"From the comparison of the test results of the fire tests before (ISO 5660-1) and after (EN 927-6) the accelerated aging, it appears that the effect of the fire-retardant agent decreased at the same rate as the wood itself aged. As a result, the amount of fire-retardant per amount of wood remained the same. This means that BurnBlock® retains its fire class B for both Western Red Cedar and thermally modified pine." – Prof. Dr. Miha Humar, University of Ljubljana, Biotechnical Faculty, Department for Wood Science and Technology, 2019.*

5.1 Field of application

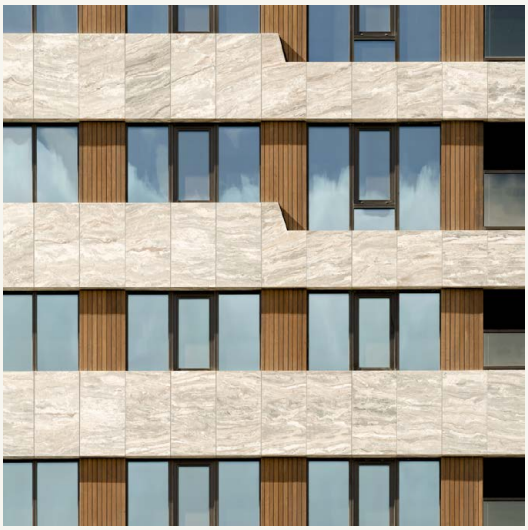
According to EN 16755, test results of specific wood species and thickness combinations may be applied to other wood species and thicknesses, provided that the same amount of fire-retardant is used, the fire class remains the same and the thickness of the wood substrate is equal to or greater than that of the tested product.

The test results with BurnBlock® are based on Thermo-Pine and Western Red Cedar. What does this mean for the intended lifespan of wood species that have been fire-retardant treated with BurnBlock® by Hestus, within fire class B?

Table intended lifespan of different wood species with BurnBlock® fire-retardant treated wood

Wood species classified for fire class B according to BurnBlock® classification table (the wood substrate)	Durability class of the wood substrate	Lifespan of the wood substrate (without finishing)	Without finishing and fully exposed [1]	Without finishing and semi-exposed [2]	With finishing, fully exposed and/or not exposed
- Platonised wood - Thermowood - Modified wood species - Accoya	1-2	15-25 years +	15-25 years +	30-50 years +	50 years +
Non-modified wood species	2	10-15 years	8-15 years	15 years	
	3	5-10 years	5 years	8 years	
	4	0-5 years	< 5 years	< 5 years	

Note: when finished, the maintenance instructions of the coating must always be carefully followed.



[1] *Fully exposed*

[2] *Semi-exposed*

6. To what extent does the user have an effect?

In addition to the performance and lifespan of the treated wood, correct installation and proper maintenance are essential to fully utilize the lifespan of the wood – especially when a finish has been applied.

The installation and maintenance instructions of the wood substrate must be carefully followed. On **www.centrumhout.nl** the correct installation guidelines can be found. For the preservation of a wooden façade, good ventilation behind the wooden façade cladding is essential. Optimal ventilation is achieved by maintaining an open space of 2 to 4 centimeters at both the top and bottom of the façade cladding, so that chimney draft is possible behind the façade.

In addition to the installation and maintenance instructions, proper storage of fire-retardant treated wood products is also crucial. Deliveries from Hestus are packaged with foil over the top side of the bundles. The bundles must be stored dry on a flat and dry surface. If the bundles are stored indoors, the foil can be removed.

6.1 Applying a coating

For the coating of wood products treated with BurnBlock®, specially developed and tested paint systems are available. For the correct coating Hestus works together with CE-certified partners. Follow the maintenance instructions carefully to enjoy the product for a long time.

In many cases, you can apply a colour coating to wood that has been fire-retardant treated by Hestus. Various wood species have been tested with coatings of specific brands, which have shown that fire class B is retained after application. Because new brands and products are regularly tested, we recommend checking the most recent overview of tested coatings at **hestus.nl**. The coatings can be applied within the conditions of a CE declaration.

7. Closing statement

European standards are regularly updated when they are no longer relevant. At present, EN 16755 is ready for revision. It is not yet clear when the revised standard will come into force.

Hestus believes in the power of working as partners, to serve a greater goal together: more wood in construction and a responsibly safe living environment for everyone.

Do you have specific questions or need tailored advice? Contact Nienke de Pijper via **06 83 24 66 22** or **n.depijper@hestus.nl**.

About Hestus

Hestus is your partner in fire retardancy. We contribute in a nature-friendly way to the safety of our physical living environment. We make wood fire-retardant in a responsible manner, so that fire safety and sustainability come together. As a subsidiary of sustainable developer and investor Schipper Bosch we have strong roots in making wood more sustainable.

Our knowledge and philosophy form the basis of everything we do and are tangible throughout our entire organization. We stand for clarity. Because we notice that there is still a lot of uncertainty surrounding fire safety. We can translate complex matters of fire classifications, laws and certifications and we can help you in the search for the most responsible solution. Everything that we and our partners in fire retardancy do is tested, checked and documented.

Hestus was founded in response to the growing demand in the market and a drive to do better. In the construction world the use of wood is continuously increasing. At the same time fire safety regulations are becoming increasingly strict. Hestus offers a 100% nature-friendly solution for the business market.

Join us in contributing to a physical living environment that is both fire safe and clean. Contact us for the possibilities.

Hestus Partner in Fire retardancy

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