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WHITE PAPER

WOOD
SAFE®

Leaching of Fire Retardants

Why and How to Prevent Leaching of Fire Retardants



Publisher

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Foreword

In your exciting professional role, you likely value the regulations surrounding fire safety and fire protection systems that meet societal demands for fire-safe communities. In the past, the use of wood in construction was heavily restricted, but today, modern methods allow for the creation of sustainable structures entirely or partially made from this natural material.

When it comes to utilizing fire-treated wood outdoors, such as for cladding on high-rise buildings, it is crucial to ensure that the fire protection is approved for use in specific classifications. Failure to do so can pose a risk to life and property.


In your professional capacity, it is essential to make well-informed decisions. Understanding the topic of fire-treated wood, its usage classifications, and the potential implications is critical. This is not just about the economic and safety aspects of the business; it is also about maintaining your customers' trust in your work.

But don't worry! This brief guide is here to assist you in navigating the complexities of fire-treated wood and the importance of usage classification, so you can feel confident that you are acting in a way that preserves fire safety. Let's take the first steps together!



Thomas Bengtsson
CEO
Founder of Woodsafe Group



A photograph of a modern building with a wooden facade and a rooftop garden. The building has multiple stories with windows and a balcony. The rooftop garden has small trees and plants. The sky is overcast.

What you will learn

1. What is Fire Treatment?

Explore the process and purpose of treating wood materials to enhance their resistance to fire and understand that the same fire classification does not necessarily imply equivalent properties.

2. The Importance of Usage Classification

Understand how the usage classification affects the suitability of the product for use in different environments.

3. It All Starts with Responsible Specification

Grasp the significance of responsibly specifying the right characteristics for the product to maintain fire safety.

4. Consequences for Environment, Safety, and Economy

Examine how the use of fire-treated wood without classification affects the environment, safety, and economic value.

5. Insurers Tighten Conditions

Be aware that insurance companies are tightening requirements for insuring wooden buildings.

6. Pitfalls

Learn about various pitfalls that can be avoided through increased knowledge and awareness.

7. Testing Description EN16755

Explore the different classes and take note of any changes in upcoming revisions, as well as the differences between BS-EN16755 and EN16755.

If you need further elaboration or specifics on any of these topics, feel free to ask!

Fire-retardant treatment

Fire treatment through vacuum pressure is an industrial process that falls under third-party manufacturing control and is regulated by the EU's Construction Products Regulation (CPR) 305/2011, AVCP System 1. This globally recognized process enhances the properties of wood to ensure optimal reliability over time. The process begins with placing the material in an autoclave, after which the procedure is programmed based on the type of wood and the desired fire classification according to the installation conditions.

The initial pre-vacuum evacuates oxygen from the wood, followed by pressurization where fire retardants are injected into the wood's cells. The process concludes with a final vacuum followed by a drying process to restore the wood to the appropriate moisture content and to fixate the properties of the fire retardant.

More to read

If you want to learn more about fire treatment, download the Woodsafe Whitepaper fire retardant treatment of wood.

Need

Fire safety is regulated by statutory regulations, and it is important to understand that the requirements for certification and third-party control govern the eligibility to market fire-treated wood. It is crucial to note that the concept of fire treatment does not guarantee identical properties between different brands.



Challenge

The challenge of fire treatment lies in the fact that each type of wood that is treated becomes a unit with the fire retardant, meaning that the wood product itself acts as the fire protection. Variations in properties between different brands may include adaptations for interior or exterior use, as well as differing hygroscopic properties.

Solution

To manage this, it is necessary to thoroughly check and verify the classified properties of the product through certification.

Type Approval Certificates:

- Facade cladding (SP-Fire 105)
- Usage class EN16755 INT1, INT2
- Usage class EN16755 EXT, with surface treatment requirements
- Usage class EN16755 EXT, no surface treatment requirements

Fire Classification:

- Declaration of Performance (DoP)
- The DoP must be supported by a CE certificate

Certification Body:

- Documentation must always be issued by a certification body. Individual assessments and opinions are not legally acceptable.

Products with the same classification do not need to be equivalent. Details may vary!

Fire-treated wood with a classified usage class according to EN16755 EXT is not automatically equivalent to other products, even if the classification suggests so.

Challenge

- When faced with the choice of finding a fire-rated facade cladding and having two products to choose from, **it is important to understand** what lies behind their designations. The chemical composition of the fire treatment determines whether the wood panel needs to be covered with paint to maintain its fire protection. Some formulations are so complex that the usage class is classified without the need for additional coating.

Pitfalls to Avoid

Pitfall 1: Inadequate Documentation

There is a wide array of marketing claims stating that usage class characteristics are met for exterior use. Unfortunately, there is often a lack of connection between the documentation and an accredited third party that has verified the quality.

Pitfall 2: Overreliance on Surface Treatments

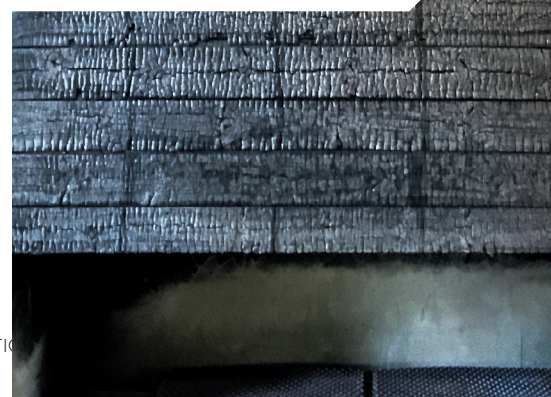
There is an overreliance on the belief that issues with leaching or lack of usage class can be resolved by simply painting the product. Applying a topcoat, stain, or other surface treatments, such as silicon treatments, must also undergo testing according to EN16755 EXT to ensure their effectiveness.

Solution

Quality-Assured Documentation

- Rely only on documentation from third-party accredited bodies.
- Disregard documentation that is not quality assured; ignoring this principle is risking lives and property.

By carefully verifying documentation from trusted and accredited sources, as well as understanding the chemical and practical aspects of the products you evaluate, you can ensure that your choice of fire-treated facade material is both effective and safe.



Exterior applications divide usage class into two parts

The classification report for exterior usage class does not necessarily imply equivalent properties. The differences may include requirements for protective coatings, the presence of such coatings, or variations in approved wood species.

A wood product treated with fire retardants is designed to delay ignition and reduce fire spread in the event of a fire. However, the fire classification does not provide information on how suitable the product is for use in humid environments, such as exterior facade claddings, structures, swimming pools, subways, mines, and similar applications.

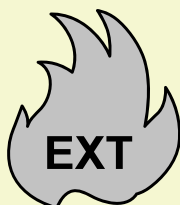
Systems without usage class

The wood is treated with a fire retardant that meets fire safety requirements. However, it is essential to note that the properties of the fire retardant may not be optimal for use in humid environments, such as facade claddings, due to the risk of leaching.

Products with usage class

These fire treatment systems involve a more permanent impregnation of the wood, which means that the properties of the fire retardant are suitable for exterior humid environments classified according to EN16755 EXT.

(logotype for EN16755)



Two product types of usage class EXT

- 1. Product with approved usage class, without requirement for protective coating:** This type of product consists of a complex formulation of substances that cure during the fixation process, such as film-forming paint.
- 2. Product with Approved Usage Class, With Requirement for Coating:** This type of product typically contains substances such as ammonium phosphate, borates, and similar compounds.

Key Factors to Know and Consider for Product Type Two (2):

- The coating system must be tested for the usage class.
- Correct application amount per coat of paint.
- Ongoing maintenance of the paint layer.

Understanding these distinctions and considerations is crucial for ensuring the effective use of fire-treated wood products in various applications, particularly in humid environments.

To specify means taking responsibility for lives, property, the environment, and, not least, credibility.

Pitfall 3

Lack of Consideration for Usage Class

Specifying only fire classification without including usage class can have serious consequences. By not incorporating the usage class, there is a risk of underestimating the fire safety of the building. The usage class is a crucial factor in ensuring that the fire classification is maintained in the environment where the product is used.

Pitfall 4

Cost Savings at the Expense of Fire Safety

The building's cost calculations are often a reason for cutting expenses. Spending money on investigating and specifying correctly, but then failing to follow those specifications, can pose a danger to lives, property, and the environment.

Solution

Competence and Proper Application

Competence in reading, interpreting, and applying regulations during procurement and use is essential for fire-treated wood. Specifying correctly, conducting proper procurement, and ensuring correct installation means that the builder saves money and that residents enjoy a safe living environment. Effective fire safety requires a holistic approach where all parts of the process—from specification and procurement to installation and maintenance—are carried out with the highest competence and precision.

Below is the recommended specifying text for two different applications with the addition of usage class:

FAÇADE CLADDING (SP-Fire 105)

“Fire-treated cladding from brand XXX or equivalent must demonstrate type approval certification according to facade cladding standards and EN16755 EXT. The type approval certificate must specify the range of wood species and whether there are requirements for surface treatment.”

FAÇADE CLADDING (B-s1, d0 (s2, s3))

“Fire-treated cladding from brand **XXX** or equivalent must provide a declaration of performance for fire classification as well as type approval certification according to EN16755 EXT. The type approval certificate must specify the range of wood species and whether there are requirements for surface treatment.”



Leaching can have negative effects on the environment and aquatic ecosystems.

Water Pollution

Through leaching, fire retardants can be transported to nearby watercourses, lakes, and seas. This can lead to the contamination of water resources and affect water quality, which in turn can harm aquatic organisms and threaten water-based ecosystems.

Environmental Impact

Fire retardants may contain chemicals that can have undesirable effects on surrounding plant and animal life. When these substances leach and spread to soil and water bodies, they can negatively impact the ecosystem.

Bioaccumulation in the food

Certain chemicals in fire retardants can accumulate in the food chain when organisms absorb them from water and food.

This can lead to higher concentrations of unwanted substances in larger predators, which may have long-term consequences for the balance of ecosystems. It is essential to handle and use fire retardants responsibly to reduce the risk of negative environmental and water impacts. Recycling materials and proper waste management can help minimize the spread of harmful chemicals into the natural environment.

"A deep understanding of the importance of choosing products with approved usage classes and considering how chemicals can affect the environment is crucial. Acquiring products that are classified according to EN16755 EXT is an important measure to reduce environmental impact during procurement."



Risk of Economic Consequences from Leaching!

Costs for Fire Protection Measures

If fire retardants are at risk of leaching, it may require actions such as the installation of new fire retardants or measures to prevent leaching. These actions can be costly and increase overall construction costs.

Decreased Property Value Due to Inadequate Fire Protection

If the fire protection in a building is not sufficiently effective due to leaching of the fire retardant, it can result in a decrease in property value. It may become difficult to sell or rent the property at the desired price if it does not meet necessary fire safety standards.

Legal Consequences

The builder may be held liable for any damages resulting from inadequate fire protection due to leaching of the fire retardant. This can lead to legal disputes and financial penalties, which in turn can nega

tively impact the builder's finances. It is crucial to ensure that fire protection measures are correctly installed and maintained to avoid these adverse economic consequences for the builder.

The Solution

Request documentation from certification bodies that verify the product is classified according to EN16755 EXT. It is also important to check whether the classification covers all wood species and if the approval includes requirements for surface treatment or not. This ensures that the appropriate measures are taken to maintain fire protection effectively.

Insurance companies are imposing expanded fire protection requirements and changing terms

Wood has distinct environmental advantages as a building material due to its renewable nature and several ecological and climate-smart benefits. However, the use of wood can increase vulnerability to potentially severe and costly damages, especially in the event of a fire..

Building Regulations Out of Sync with Insurance Requirements

The background for why insurance companies have begun to impose their own expanded fire protection requirements is due to dissatisfaction with current building regulations, which do not mandate that usage class must be required for exterior facade cladding. Insurance companies, responsible for managing the insured building throughout its lifecycle, are understandably eager to ensure that fire protection remains intact over time. By imposing their own fire protection requirements to insure a building, they reduce both customer and company risk levels.

This trend is positive as it promotes increased safety for residents and reduces the risk of property loss. At the same time, it is important for the real estate industry to be proactive in establishing sound specifications in the construction process to ensure the insurability of their projects.



Avoid Insurance Issues and Increased Life Risk by Following Standards for Fire-Treated Wood

Solution:

To avoid a situation where the building incurs significantly higher insurance premiums due to non-compliance with fire classification requirements according to EN16755, or in the worst case, becomes impossible to insure, it is important to use type-approved facade systems. Such systems are tested and certified to meet the necessary fire requirements, thereby ensuring both safety and economic benefits.

Examples of New Insurance Conditions starting from January 1, 2023:

- Facade Cladding SP-Fire 105
- Usage Class EN16755 EXT
- Type Approval Certificate**

*Source: Länsförsäkringar.

**Boverket's forked mark for type approval certificates.



Assessment Basis

Supplier/Brand:

Project:

Notified body:

Other Certifying Entity:

Checklist

IS THE FOLLOWING DOCUMENTATION AVAILABLE?	APPROVED/ CERTIFIED	NOT APPROVED/ MISSING
CE Marking		
Type Approval Certificate, EN16755 EXT		
EN16755 EXT Approved Without Coating		
EN16755 EXT Approved, Coating Required		
Third-Party Control by Notified Body		
Quality Management System ISO 9001		
Notes		

EN16755:2017/AC2018

Hygroscopic usage class

EN 16755 is a European standard that addresses various aspects of moisture-related issues within the building and construction industry. Hygroscopic testing according to this standard is crucial for preventing moisture absorption and thus minimizing the risk of wood degradation, mold growth, and leaching.

By conducting hygroscopic tests according to EN 16755, one can analyze and evaluate the ability of materials and products to absorb moisture from the environment. This information is vital for preventing moisture from penetrating building materials and creating an environment where mold and fungi can thrive.

Understanding how materials react to moisture enables appropriate measures to be taken to prevent moisture-related damage and preserve the structural integrity of the building. Hygroscopic testing according to EN 16755 can contribute to a long-term and sustainable solution for minimizing moisture damage, thereby reducing the risk of mold formation in various types of building materials and structures.



■ Indoor Climate - Normal Conditions

Acclimatization of pine wood should continue until equilibrium is achieved under normal climate conditions ($50\% \pm 5$ relative humidity and $23^{\circ}\text{C} \pm 2$). The testing assumes that the wood surfaces are without any surface treatment.

■ Indoor Climate - Temporary High Humidity

The product must be classified according to the relevant fire standard. Hygroscopic conditions apply ($90\% \pm 5$ relative humidity and $27^{\circ}\text{C} \pm 2$). The testing assumes that the wood surfaces are without any surface treatment. The moisture content in the material must not exceed 28%. There should be no outflow of liquid, and visible salts should be minimal without any increase at the surface.

EN16755:2017/AC2018 EXT

Exterior unsafe class

“Durability of Fire Performance,” or usage class as a more general term, is a European standard that evaluates the appropriate properties of fire retardants in different environments. The standard focuses on testing the effectiveness of fire retardants under varying climatic conditions and exposure environments to ensure that the fire protection is reliable and durable outdoors.

By following EN16755 EXT, one can assess how a fire retardant performs when exposed to different weather conditions. This is crucial for ensuring that the fire protection functions effectively and reliably in exterior applications.

The standard correlates with “ASTM D2898, Standard Practice for Accelerated Weathering of Fire-Retardant Treated Wood for Fire Testing,” and includes guidelines for conducting tests, measuring performance, and classifying fire retardants based on their reaction to exterior conditions. These guidelines ensure that materials exposed to various weather and environmental factors still meet the necessary safety requirements.

Pitfall:

It is important to note that the classification of a product according to EN16755 EXT can be issued under two entirely different conditions:

- Classification Without Requirement for Surface Treatment.
- Classification With Requirement for Surface Treatment.

Thus, the requirement for surface treatment is not approved without any surface treatment.

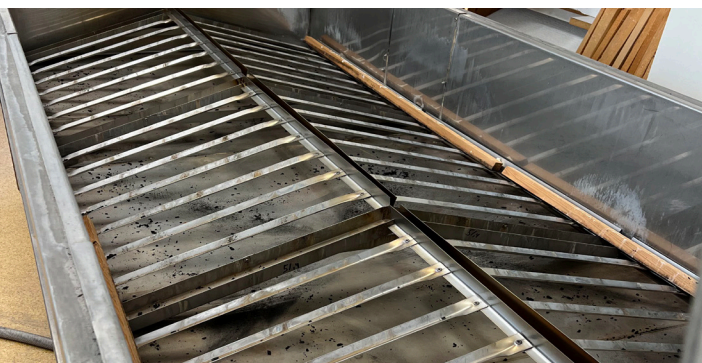
Solution:

Request proof from the supplier from a certification body that confirms what is approved.



Picture 1: Leaching on thermowood pine without usage class and without surface treatment.

Picture 2: Leaching through paint layers, without usage class.



EN16755:2017/AC2018 - EXT

Accelerated weathering and fire testing for usage class EXT

Accelerated Weathering EN16755 EXT

Exterior testing can be conducted through an accelerated aging process in a climate chamber according to specific cycles, or through natural aging outdoors.

Accelerated Aging:

- Method B
- Method A*
- EN927-6*

Fire Testing After Weathering:

- ISO 5660-1*
- EN13823

*These methods are under discussion for removal in the revised version of EN16755

The Solution:

The following documents and properties are recommended to ensure a fire-safe product:

- Type approval certificate from a notified body for the standard.
- Testing conducted by a certification body.
- Classification EN16755 EXT.
- Method B with UV light.
- Classified EN13501-1 (Fire Class).
- Fire testing EN13823 (SBI) with maintained fire class according to reference tested product classified under EN13501-1.

EN16755 EXT - REPEATING OF CYCLES FOR 6 WEEKS.							Conditioning	
	Time	Rain	Temperature	Airflow	Drying	UV-light	°C	RH %
Wetting, Hour	4	12 ± 0,8l/min	-	-	-	-	-	-
Drying, Hour	4	-	63 ± 3°C	7,6m / min	63 ±3°C	4hr	-	-
Wetting, Hour	4	12 ± 0,8l/min	-	-	-	-	-	-
Drying, Hour	4	-	63 ± 3°C	7,6m / min	63 ±3°C	4rh	-	-
Rest, Hour	8	-	-	-	-	-	-	-
Cycle, W, Total	6	-	-	-	-	-	-	-
Conditioning		-	-	-	-	-	23 +2°C	50 +3 % RH

Important to Note:

The usage class standard is undergoing comprehensive revision and clarification of its purpose. Below are proposals for certain testing methods that may be excluded.*

- **EN927-6***. Paints and varnishes - Paints and coating systems for exterior wood - Part 6: Exposure of coating systems on wood to artificial weathering testing using fluorescent UV and water. The reason for exclusion is that the testing method is not developed for fire protection and fire treatment.
- **ISO 5660-1***. Fire performance testing of building products - heat release, smoke production, and mass loss. The reason for exclusion is that the method is considered too small-scale.
- **Metod A***. Accelerated aging in a climate chamber without UV light according to EN16755 EXT. The need for UV light has been established as significant, thus, Method A will be excluded, and only Method B should be used.

* These methods are under discussion for removal in the upcoming version of the standard.

BS-EN16755 EXT. Giltig eller inte?

Until October 31, 2022, a differing standard was applied in the United Kingdom where the threshold for "total heat release" (THR) in the cone calorimeter was not evaluated, differing from the EN standard. This allowed products with inadequate properties to be approved, even though they would have failed if tested according to the correct standard. The UK has abolished the "addendum in the preface" and has since followed the same standard as other member countries.





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White Paper Usage Class V4F