How does the use of EMICODE®-certified surface treatment products affect the sustainability of wood floors and parquet?

GEV EMICODE®

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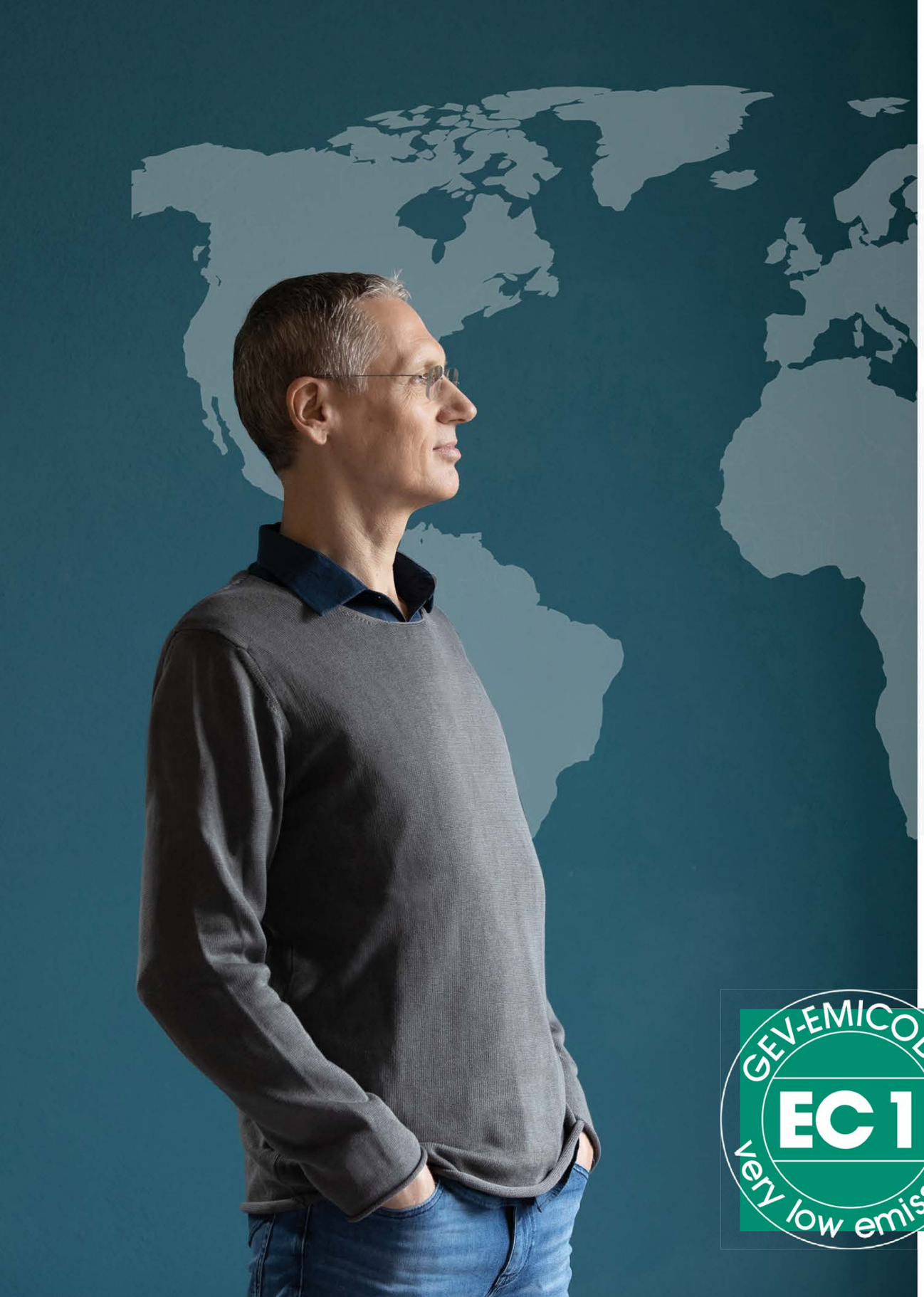

Introduction

Over the past 50 years, the construction of buildings has undergone massive changes. In earlier days, the main task of buildings was to provide residents with “a roof over their heads” and to protect them from all weathers. These days, buildings are expected to fulfill many more tasks that have been added over time. In the 1980s and 1990s in particular, demands on the airtightness of buildings increased more and more in order to reduce the consumption of energy. As a result, “outgassing” – which means emissions from building materials into indoor air – became a key issue. Due to the installation of passive ventilation systems, the permanent and latent exchange of air was reduced. As a result, harmful emissions escape to the outside at a much slower rate.

In the 1990s, however, there was no benchmark that would have given architects, planners, craftsmen and consumers guidance in their search for low-emission primers, fillers and flooring adhesives – let alone security in the jungle of available products. The year 1997 saw the foundation of the GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe e. V. (Association for the Control of Emissions in Products for Flooring Installation), which launched the EMICODE® quality seal for building products. The EMICODE® seal was meant to create transparency, to prevent the inflationary use of non-comparable environmental claims (“green claims”) at an early stage, and to serve as a product selection guide. Since then, the EMICODE® has developed into a vendor-neutral, internationally established quality and eco label.

26 years after the GEV‘s foundation, the topic of sustainability is now a key issue in almost all spheres of society and economy. More than 50 years after the Club of Rome published “The Limits to Growth”, also the general public is now becoming aware that the Earth‘s resources are limited and the sustainable management of these resources is absolutely essential.

This raises the question of how “sustainable” EMICODE®-certified products are and which impact they have on the building components that are produced with them. At present, only one aspect of sustainability can, in fact, be considered here and that is **environmental sustainability**. Economic and social aspects are definitely relevant, but the associated data and facts are only partially known.

For more than 28 years now, products for the surface treatment of wood floors and parquet such as coatings, lacquers, oils and waxes have been awarded the EMICODE® EC1 or EC1PLUS label and therefore been able to meet many sustainability parameters. Moreover, they help increase the specific sustainability of wood and parquet floors by extending their service life through renovation.

Basic terms

CONSTRUCTION PRODUCTS

EMICODE®-labelled building products are used on construction sites both inside and outside of buildings. As a rule, they are auxiliaries that help produce the building component desired by the architect or building owner.

Article 2 of the EU Construction Products Regulation (CPR) (German: EU-BauPVO)[1] defines construction products as follows:
“Under the terms of the CPR, the term ‘construction product’ means any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or part thereof and the performance of which has an effect on the basic requirements of the construction works.”

COMPONENT

A component is a part of a building, for example a floor. This is composed of various building products, e.g. insulation, screed, primer, adhesive and parquet. The component as a whole must form a functional unit.

SUSTAINABILITY

The GEV‘s use of the term “sustainability” is primarily based on the widely used and generally accepted Three-Pillar Model”, whose holistic approach takes economic, ecological and social aspects into account. A product, technical solution or process is sustainable if its effects fit into a reasonably sized intersection (or overlap) of the three aforementioned aspects.

Concerning the sustainability of modern products, it is primarily criteria of ecological sustainability that can be documented. Social aspects (e.g. occupational safety and health, exclusion of hazardous substances) and also economic aspects (e.g. capability for renovation, technical solutions with a favorable price-[sustainability-]performance ratio) are only considered in some subareas. Being part of the overall construction system, building products thus enable sustainability at a higher level. Their use is not an end in itself, but rather helps produce a structural component or a building and can thus have an even stronger impact in terms of sustainability.

[1] REGULATION (EU) No. 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. Journal reference: L 88 of 4 April 2011, pp. 5–43

Structure and types of wood and parquet floors

Wood and parquet floors are essentially made of wood or a combination of wood and wood-based materials. Wood is a natural, renewable resource and therefore meets the highest sustainability requirements. As a plant-based raw material, wood has absorbed significant amounts of CO_2 from the atmosphere during its growth phase, thus contributing to the mitigation of climate change.
Wood flooring and parquet can be installed on many different substrates to produce a floor. The structural component “wood or parquet floor” always consists of:

- **a subfloor** (usually a mineral screed, concrete floor, chipboard or plywood)
- **a primer** (if necessary), **an adhesive** (if necessary) **and/or underlays** (if necessary)
- **wood or parquet flooring** (incl. surface treatment with a coating or oil-based product).

If the wood or parquet is firmly connected to the subfloor by means of an adhesive, this is called a “bonded wood or parquet floor”. If an underlay is installed under the parquet and the parquet is not connected to the subfloor, this is called a “floating wood or parquet floor”.

Surface treatment products for wood and parquet floors

Products and methods for the surface treatment of wood floors have existed for several hundred years. Most European wood species have a porous structure and therefore quickly absorb different liquids, but also dirt and grime. It is difficult to keep an untreated wooden floor clean. The water used for cleaning slowly dissolves the lignin contained in the wood, and the remaining cellulose fibers lead to a grey color. For this reason, people started early on to use natural oils, fats and waxes in order to make wood floors water-repellent (hydrophobic). Until 150 years ago, the typical “finish” of a wooden floor consisted of stripping it manually with a scraper and then applying a linseed-based oil and sometimes also a wax. In the course of industrialization, sanding machines as well as suitable wood paints and lacquers became available. With the help of these products, it was possible to produce closed surfaces and “seal” the floor, thus making cleaning and maintenance much easier.
Today, the main function of coatings is to protect the wood or parquet floor from wear and tear and to make it easier to clean and maintain. In addition to the protective coating, also matting agents, paints, woodstains and other products are used to change the appearance of the floor (shine, color, texture) and make it an integral part of the room‘s interior design.

Types of surface treatment

In the past and now, a wide variety of surface treatment materials have been used for wood floors and parquet:

a) different natural oils, special “drying” (= cross-linking, hardening) oils based on linseed oil
b) waxes
c) pre-crosslinked oils, alkyds (and waxes) in solvents
d) acid-curing lacquers in solvents
e) solvent-based 2- or 1-component polyurethanes
f) hardwax oils – hybrid between a film-forming lacquer and an impregnating oil
g) water-based lacquers which form a film on the wood and require minimum maintenance
h) modern oils – a mixture of natural oils, alkyds and sometimes aliphatic diisocyanates

The EMICODE® quality seal for surface treatment products for wood and parquet floors

In order for manufacturers to be allowed to label and advertise their surface treatment products with the EMICODE® seal, they must commit to ensuring that these products meet several environmental criteria[2].

Substance restrictions

In principle, a certain number of substances are not permitted for use in EMICODE®-labelled products. The restrictions partly depend on concentration limits, the resulting labelling under Chemicals Law and emission values. The following restrictions apply:

- The product itself must **not be toxic.**

- **CMR substances** (carcinogenic, mutagenic and reprotoxic substances) as well as SVHCs (substances of very high concern) must only be present below the quantities that would lead to labelling. They must not be detectable in an emission test..

- The products are not allowed to contain the **oximes methyl ethyl ketoxime** (MEKO, butanone oxime), **methyl isobutyl ketoxime** (MIBKO) and **acetone oxime**.

Solvents: Products for wooden floor surface treatments, as well as water-based lacquers, water-based finishes and oils for mineral floors, and water-based lacquers for resilient floor coverings must have a maximum solvent content of:

3 % w/w VOCs	for EMICODE® class EC1PLUS
5 % w/w VOCs	for EMICODE® class EC1
8 % w/w VOCs	for EMICODE® class EC2

The GEV is aiming at a further reduction of the solvent content as far as technically feasible.

Due to the constantly changing assessment of substances – mostly from less to more hazardous, manufacturers are facing a problem. Therefore, the legislator and the GEV not only ask whether a substance is problematic, but also whether users, consumers and the environment are exposed to a possible hazard through the use of this substance. If there is no exposure and the legislator does not require labelling for products with a low substance content, it is assumed that there is no potential hazard for users, consumers and the environment.

All in all, the **EMICODE®** label thus achieves a very high level of ecological protection.

[2] GEV Classification Criteria: Requirements for emission-controlled products for wooden floor surface treatments, as well as lacquers, finishes and oils for mineral floors and lacquers for resilient floor coverings and the award of the EMICODE, edition: 07.11.2024.

Emission requirements

The GEV‘s core competence lies in the area of emissions. Compliance with the emission limits required by the EMICODE® seal is verified by independent external testing laboratories in so-called chamber tests[3]. In these tests, emission chambers are filled with standardized product samples. Emissions of VOCs into the chamber are determined after 28 days. Formaldehyde and acetaldehyde are checked after 3 days.

In particular, the TVOC (Total Volatile Organic Compounds) resp. TSVOC (Total Semi-Volatile Organic Compounds) values are determined for the following substances:
• volatile carcinogenic (cancer-causing) substances • volatile and semi-volatile substances.

In the most stringent class EMICODE® EC1PLUS, there are additional requirements:
Products evaluated according to EMICODE® EC1PLUS must comply with the LCI values (LCI = Lowest Concentration of Interest) and the R-value of the AgBB evaluation scheme after 28 days.

Limit values for emissions

	GEV-EMICODE® EC 1 PLUS very low emission	GEV-EMICODE® EC 1 very low emission	GEV-EMICODE® EC 2 low emission
after 28 days TVOC/TSVOC [µg/m³]	≤ 100 max. 40 SVOC	≤ 150 max. 50 SVOC	≤ 400 max. 100 SVOC

Today‘s market for coatings is dominated by water-based lacquers and oils with a high solids content. These products are available with the most demanding EMICODE® ratings EC1PLUS or EC1.

Please note: Solvent-based coatings have been largely withdrawn from the European market since 2010.

[3] DIN EN 16516:2020-10 Construction products: Assessment of the release of dangerous substances – Determination of emissions into indoor air; German version EN 16516:2017+A1:2020

Data on the environmental sustainability of wood and parquet floors, wood and parquet flooring and wood floor surface treatment products

The already existing EU Construction Products Regulation (EU-CPR), the draft of a revised CPR[4] and the drafted Ecodesign for Sustainable Products Regulation (ESPR, German: Ökodesign-VO)[5] contain criteria for environmental sustainability. The criteria mentioned there are summarized below and evaluated (as far as data is available) in relation to the entire wood/parquet floor, the wood/parquet flooring and the wood floor surface treatment products in terms of hazards and benefits. In the tables below, we only use the term "parquet" and not the combination "wood and parquet" for brevity reasons.

Criteria

Hazards resulting from product composition, hazardous substances / emission of hazardous gases / emission of radiation / substances hazardous to waters

Parquet floor: Hazards are low with the below-mentioned building materials. Wood dust, e.g. from sanding work needs to be vacuumed off. "Breathing these particles may cause allergic respiratory symptoms, mucosal and non-allergic respiratory symptoms, and cancer. The extent of these hazards and the associated wood types have not been clearly established."[6]

Parquet flooring: Parquet mainly consists of wood or wood-based materials. For emission-controlled products, risks due to hazardous substances and their emissions are not expected.

Parquet surface treatment products (coatings, oils, etc.): For EMICODE®-labelled products, emissions to an extent worth consideration are not to be expected. Thanks to a reduced need for ventilation and therefore lower heat losses, a pleasant room climate can be maintained. Thus, EMICODE®-labelled surface treatment products for parquet enable significant energy savings due to a reduced demand for heating energy. Furthermore, the risk of illnesses that can be summarized under the term "sick building syndrome" is reduced. The hazards arising from the ingredients have already been explained above.

Criteria

Benefits derived from the product composition, amount of recycled materials

Parquet floor: Determined by the wood or parquet flooring.

Parquet flooring: Wood is a renewable resource, a recycled material made from CO_2 and H_2O.

Parquet surface treatment products: Packaging: Use of high-density polyethylene (HDPE) containers. HDPE often contains more than 50 % recycled plastics. Water-based coatings: Some coatings consist of bio-based raw materials. The coatings themselves are not recycled. Important: The coating must not compromise the recyclability of the other building materials. Oils: Oils mainly consist of bio-based raw materials.

[4] Proposal for a Regulation laying down harmonised conditions for the marketing of construction products, amending Regulation (EU) 2019/1020 and repealing Regulation (EU) 305/2011. Journal reference: https://ec.europa.eu/docsroom/documents/49315 [5] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EG. Journal reference: https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX:52022PC0142 [6] https://www.osha.gov/wood-dust , 2024-04-30

Criteria

Production phase and use phase; energy efficiency / resource efficiency / PCF (Product Carbon Footprint) / PEF (Product Environmental Footprint)

Parquet floor: Determined by the wood flooring, installation material and wood floor surface treatment.

Parquet flooring: Parquet flooring has a real wood top layer of > 2.5 mm thickness. It is important to protect this top layer by appropriate coatings as well as suitable care and maintenance methods. Depending on the thickness of the top layer, wood and parquet floors can be sanded down to the bare wood several times and given a new surface treatment.

Parquet surface treatment products: Compared to its replacement, the renovation of a parquet floor saves up to 95 % energy due to the reduced need for raw materials, natural resources and transportation. In addition, CO_2 emissions are reduced by up to 80 % due to the reduced use of energy, raw materials, transportation and less waste.[7]

Criteria

Use phase, durability / reliability / retrofittability / maintenance / reprocessing / reparability

Parquet floor: Installation by professional craftsmen guarantees long use, maintenance and reparability.

Parquet flooring: Parquet has a very long service life, especially when bonded to the substrate. It can be repaired and redesigned (e.g. by replacing old elements, sanding and new surface treatment).

Parquet surface treatment products: Over its lifetime, a wood or parquet floor can usually be re-sanded several times. To further extend its service life, it is important to regularly apply a new coating. This not only makes the floor look attractive, but also makes it easier to clean. Recoating does not remove the top layer of the wood. Instead, it produces an additional protective layer, thus delaying the need for sanding the floor down to the bare wood. Different renovation methods can be used to change the appearance and / or color of the floor.

Criteria

End-of-life (or disposal) phase; waste generation / recycling / reuse / proper disposal

Parquet floor: The main components (subfloor, wood floor) can be recycled or reused.

Parquet flooring: The type of parquet determines the type of use. The adhesive does not prevent the removal of the parquet from the screed. Solid parquet can be reused after cleaning (if or where applicable).

Parquet surface treatment products: The surface treatment product must not compromise the recyclability of the other building materials.

[7] Study by The Swedish Environmental Research Institute (IVL) of 2020

Final assessment

Modern products for the surface treatment of wood and parquet floors offer the following benefits:

- Long-term, wear-resistant surface protection, making the floors easier to clean and maintain
- Extension of the parquet's service life due to the application of new coatings after sanding down the top layer
- The look and feel of the floor can be customized and changed over many years. A variety of colors and gloss levels are possible.
- Energy and CO_2 savings by renovating parquet floors instead of replacing them with new flooring
- Low or very low VOC emissions

Green building certification systems that take ecological aspects into account (DGNB, LEED or BREEAM) assess surface treatment products primarily by their emissions, i.e. not by their intrinsic properties, but by their impact on the building. This is based on the knowledge that the environmental impact caused by the production and provision of surface treatment products is insignificant compared to that of other building materials.

High-emission products, on the other hand, may lead to subsequent environmental problems and can make the utilization of the building problematic or even impossible.

In the use phase, potential emissions from surface treatment products play a major role: Even low emissions can trigger negative reactions by contributing to the “new building odor” or the “sick building syndrome”.

With EMICODE®-certified building products, it is also possible to meet the planned ventilation requirements for the residents. Additional active ventilation in summer or winter, with the resulting higher energy demand for cooling or heating, is then no longer necessary.

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