The Influence of Joint Sealants and Joint Sealing Tapes on the Sustainability of Buildings

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Contents

Introduction

Over the past 50 years, building construction has changed dramatically. Whereas in the past the main task of buildings was simply to provide a roof over people‘s heads and protect them from wind and weather, many other requirements have since been added. Especially in the 1980s and 1990s, increasingly higher demands were placed on the airtightness of buildings in order to minimize energy consumption. This made VOC emissions from building products (outgassing) an important issue, as the reduced exchange of indoor air led to higher concentrations and a longer residence time of existing emissions within the building.

In the 1990s, there still existed no benchmark that would have given architects, planners, craftsmen and consumers quick and easy guidance in their search for low-emission joint sealants and sealing tapes – let alone help in navigating the jungle of available products. In 1997, the GEV “Gemeinschaft Emissionskontrollierte Verlegewerkstoffe e. V.” (Association for the Control of Emissions in Products for Flooring Installation) was founded, which launched the EMICODE® seal for building products. The aim of the EMICODE® was to create transparency, reduce the inflationary use of non-comparable “green claims”, and provide an objective selection aid for building products. Since then, the EMICODE® has developed into a vendor-neutral, internationally established quality seal and eco-label.

29 years after the GEV’s foundation, the topic of sustainability is now a key issue that permeates almost all areas of society and the 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 that sustainable management of these resources is absolutely essential.

This raises the question of what contribution EMICODE®-licensed products can make to sustainability and how they affect the building components that are created with them. At present, only one aspect of sustainability can be considered here, and that is ecological sustainability. Economic and social aspects are certainly relevant, but the necessary data and facts are only partially known.

EMICODE® EC 1 and EC 1^{PLUS}-licensed joint sealants and joint sealing tapes release only very low amounts of VOCs. They thus help reduce the total amount of emissions into the indoor air of a building. By sealing the building envelope, joint sealants additionally make a significant contribution to the building’s energy efficiency and protect the facade from damage caused by moisture penetration.

Basic terms

(CONSTRUCTION-)PRODUCTS

EMICODE®-licensed products are used in the interior finishing of buildings. In general, they are auxiliaries that help produce the actual component intended by the architect or building owner.

Article 3 of the EU Construction Products Regulation (CPR)[1] defines construction products as follows:
"'Construction product' means any formed or formless physical item (...), that (...) is placed on the market, including by means of supply to the construction site, for incorporation in a permanent manner into construction works or parts thereof, with the exception of items that need first to be integrated into a kit or another construction product prior to being incorporated in a permanent manner into construction works."

Under this definition, joint sealants and joint sealing tapes are construction products.

BUILDING COMPONENTS

A "component" is a part of a building, such as a window or a door. Such components consist of various building products, e.g., a plastic frame, glass and a glazing sealant. To ensure the long-term functionality of the component inside the building, sealing with suitable joint sealants or joint sealing tapes is highly important.

SUSTAINABILITY

When using the term "sustainability", the GEV primarily refers to 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 of the three aspects mentioned above.

Concerning the sustainability of modern building products, it is primarily criteria of ecological sustainability that can be documented. Social and economic aspects are merely considered in some subareas (social: e.g., occupational safety, exclusion of hazardous substances; economic: e.g., capability for renovation, technical solutions with a favorable price-[sustainability-]performance ratio).

Modern building products make a positive contribution to sustainability essentially at the building level by enabling the low-pollution as well as resource- and energy-efficient manufacture of components. These, in turn, ensure the long-term and environmentally friendly use of the building.

[1] REGULATION (EU) 2024/3110 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 November 2024 laying down harmonized rules for the marketing of construction products and repealing Regulation (EU) No 305/2011. Reference: https://eur-lex.europa.eu/eli/reg/2024/3110/oj/eng

Joint sealants

Gun-applied (paste-like) joint sealing compounds cure into an elastic material after being applied into the joint. They adhere to the joint edges, thus providing a durable seal. Thanks to their elastic properties, they permanently compensate for move-ment between adjacent structural components caused, for example, by temperature fluctuations, and thus guarantee a long-lasting sealing effect. At facade level, joint sealants ensure that the building envelope is impervious to moisture as well as airtight. As a result, they make a significant contribution to preventing energy losses and complying with the requirements of the German Energy Act for Buildings (GEG[2]).

Joint sealants are available for a wide variety of different applications. Their use in facades, glazing, sanitary joints and floor joints is regulated by the harmonized EN 15651 series of standards. The products are subject to CE marking requirements. Both the CE mark and the Declaration of Perfor-mance must declare the so-called product type, which is a good indicator of the potential suitability of the joint sealant for a specific application. In addition to other properties, volume shrinkage as well as movement accommodation are important selection criteria. Movement accommodation is the ability of the cured joint sealant to permanently accommodate movements in the joint without leading to a failure of the sealant.

Depending on their raw material base, joint sealants cure through chemical cross-linking (e.g., products based on silicone, hybrid polymers or polyurethane) or by evaporation of water (e.g., products based on acrylate dispersions). In Germany, solvent-based products hardly play a role anymore for indoor applications.

Joint sealing tapes

For many applications that can be carried out with gunnable joint sealants, prefabricated joint sealing tapes (also known as precompressed foam tapes or elastomeric joint tapes) are now also available. In some situations where gun-applied joint sealants are less suitable, joint sealing tapes are an appropriate solution. Usually, these tapes come precompressed and coated on one side with an adhesive that allows them to be fixed inside the joint. After installation, they expand and thus seal the joint.

Other product groups

Gun-applied adhesives for construction sheeting ensure airtight connections between roofing membranes and building structure.

Polyurethane-based foams play an important role in the thermal insulation of joints, e.g., when installing windows and doors.

Prefabricated butyl-based tapes are used for sealing overlapping areas, e.g., for sealing window connection joints on the room-facing side.

[2] Gesetz zur Einsparung von Energie und zur Nutzung erneuerbarer Energien zur Wärme- und Kälteerzeugung in Gebäuden (Gebäudeenergiegesetz GEG; zuletzt geändert am 19.10.2023 (BGBl 2023 I Nr. 280) Link: https://www.recht.bund.de/bgbl/1/2023/280/VO.html Act on Energy Conservation and the Use of Renewable Energies for Heating and Cooling in Buildings (German Energy Act for Buildings – GEG; last amended on 19.10.2023; Federal Law Gazette 2023 I No. 280)

EMICODE® eco-label

Manufacturers are only allowed to label and advertise their joint sealants or sealing tapes with the EMICODE® quality seal, if they commit themselves to ensuring that their products meet several ecological criteria[3].

Substance restrictions

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

In particular, the following restrictions apply:

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

CMR substances of categories 1A and 1B (carcinogenic, mutagenic and reprotoxic substances) as well as SVHC substances (substances of very high concern) must only be present below quantities that would require labeling. Furthermore, they must not be detectable as emissions in quantities above 1 µg/m³.

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

Solvents (boiling point < 250 °C) must not be used as part of the formulation. Contaminations from raw materials used must not exceed 0.3 % by weight.

Additionally, the low TSVOC limits (TSVOC = total semi-volatile organic compounds) underlying the EMICODE® ensure that products with ingredients that are emitted slowly over a longer period of time are not licensed and are therefore not allowed to carry the label.

Naturally, classifications of substances undergo constant change. The GEV takes account of these changes by including in its assessment not only the substance classification, but also the potential hazards to product users, consumers and the environment.

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

[3] GEV Classification Criteria: Requirements for emission-controlled installation materials, adhesives and building materials and for awarding the EMICODE® seal. Edition: 25.11.2025, https://www.emicode.com/wp-content/uploads/2026/01/GEV-Classification-Criteria-2025-11-25.pdf

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 external testing laboratories in so-called chamber tests[4]. In these tests, emission chambers are filled with standardized product samples. Emissions of VOCs into the chamber are determined after 3 and 28 (or 10) days. Compliance with the predefined emission limits is checked by the GEV in regular unannounced spot checks.

In particular, the concentrations of the following substance groups are determined:
• volatile carcinogenic (cancer-causing) substances • volatile and semi-volatile substances.

Products of EMICODE® classes EC 1 and EC1[PLUS] must comply with the LCI values (LCI = lowest concentration of interest) and the R-value of the currently valid AgBB[5] assessment scheme after 28 days.

Emission limits

(maximum indoor air concentration at the respective measurement time)

	GEV-EMICODE EC 1 PLUS very low emission	GEV-EMICODE EC 1 very low emission	GEV-EMICODE EC 2 low emission
TVOC [µg/m³] after 3 days	≤ 750	≤ 1000	≤ 3000
TVOC/TSVOC [µg/m³] after 28 days	≤ 60 / ≤ 40	≤ 100 / ≤ 50	≤ 300 / ≤ 100

Modern joint sealants are available based on a wide variety of raw materials, including for example silicones, hybrid polymers, polyurethane and water-based acrylate dispersions. All of these sealants as well as joint sealing tapes can also be obtained with the most demanding EMICODE® classifications EC 1 and EC 1[PLUS]. Products licensed in this way meet the highest standards of consumer and environmental protection.

[4] 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
[5] Scheme for the health-related evaluation of emissions from building products, developed by the German "Committee for the Health-Related Evaluation of Building Products" https://www.umweltbundesamt.de/en/topics/health/commissions-working-groups/committee-for-health-related-evaluation-of-building

Data on the ecological sustainability of joint sealants and joint sealing tapes

Both the current version of the EU Construction Products Regulation and the new ESPR[6] (Ecodesign for Sustainable Products Regulation) contain criteria for assessing the environmental sustainability. The sustainability criteria specified therein are summarized below and evaluated in relation to joint sealants and joint sealing tapes.

Criteria

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

When using EMICODE®-licensed products according to the manufacturer‘s instructions, no emissions of any kind to any relevant extent are to be expected during the use phase (after the curing/drying process).

Hazards arising from ingredients are avoided due to the substance restrictions explained above.

Criteria

Benefits derived from product composition, amount of recycled materials

A large number of joint sealants are sold in plastic containers. Many manufacturers now also offer their products in containers with a high content of recycled materials. Logistical and technical solutions for recycling empty containers are currently being developed. The sealant itself is not recycled.

Criteria

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

Joint sealants and joint sealing tapes ensure the building envelope is airtight, prevent thermal bridges, and thus make modern, energy-efficient buildings possible. Thanks to very low emissions, EMICODE® EC 1 and EC 1^{PLUS}-licensed products contribute to maintain a constantly pleasant indoor climate. They help to further reduce the need for ventilation and thus also lower the building‘s energy consumption.

[6] Regulation (EU) 2024/1781 establishing a framework for the setting of ecodesign requirements for sustainable products (ESPR). Reference: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401781

Criteria

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

Joint sealants and joint sealing tapes prevent moisture from penetrating the masonry and thus help preserve the building fabric. Renovation work is made much easier by the use of joint sealants. Thanks to their paste-like consistency, they can be easily adapted to a wide range of installation environments. When applied expertly, they can help reduce the risk of mold growth and thus the danger of adverse health effects.

Criteria

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

The recyclability of other building materials must not be compromised by the sealants used.

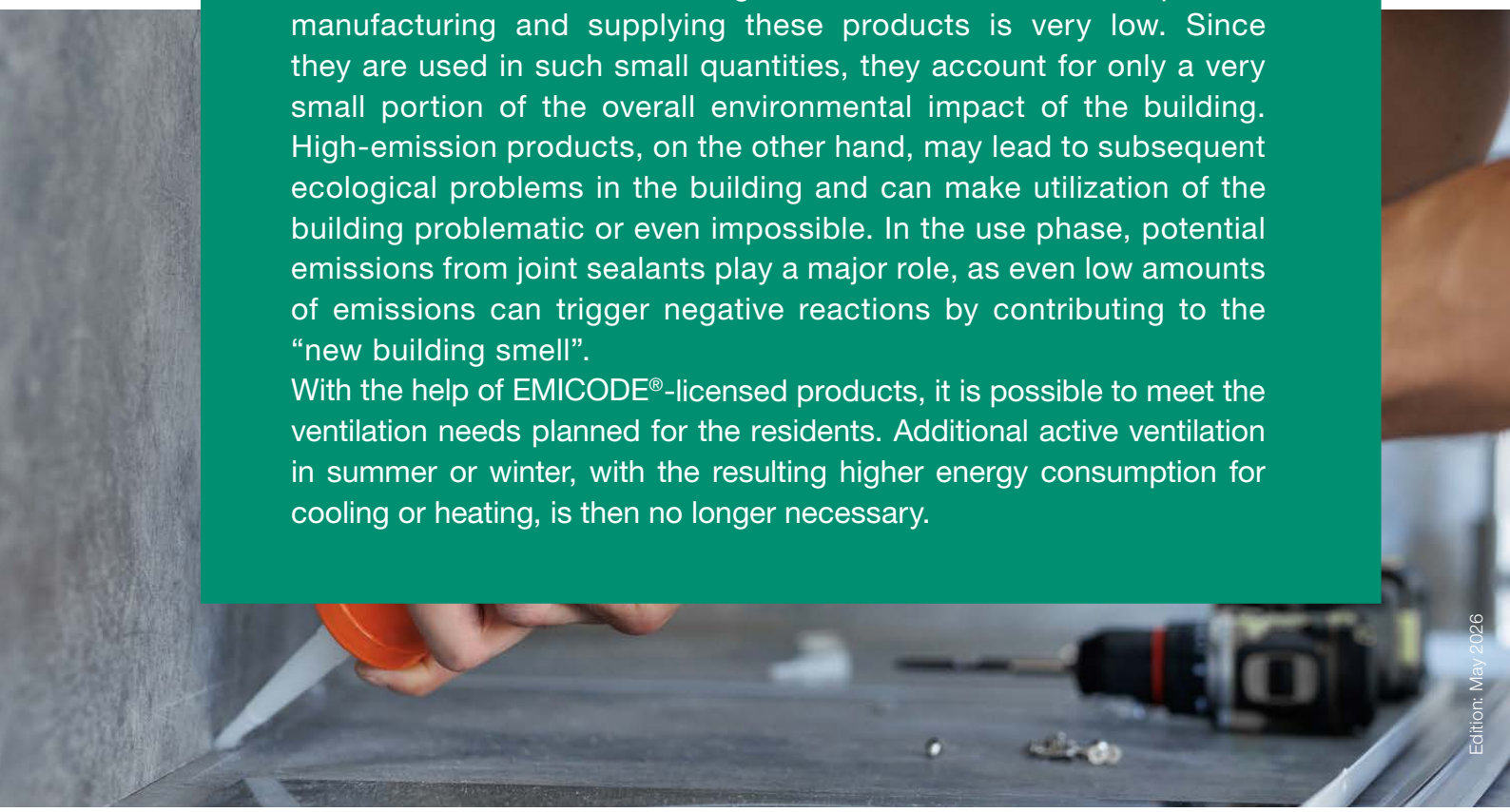
Many manufacturers now also offer their products in containers with a high content of recycled materials, thus helping to avoid waste and promoting circular economy.

Final assessment

Modern joint sealants and joint sealing tapes offer numerous benefits for the sustainability of buildings:

- Reliable sealing of the building envelope, thereby preventing heat loss and complying with the requirements of the German Energy Act for Buildings
- Protection against moisture damage by preventing moisture from penetrating the building envelope
- Prevention of thermal bridges, thereby reducing the risk of mold growth
- Protection against indoor moisture damage (e.g., by sealing in wet areas)
- Improved sound insulation through acoustic insulation (e.g., around window and door joints)
- Low or very low VOC emissions for better indoor air quality

Green building certification systems that take ecological aspects into account, such as DGNB, LEED, BREEAM or QNG, primarily assess joint sealants and joint sealing tapes based on their emissions – i.e., not by their intrinsic properties, but rather by their impact on the building. This is based on the knowledge that the environmental impact of manufacturing and supplying these products is very low. Since they are used in such small quantities, they account for only a very small portion of the overall environmental impact of the building. High-emission products, on the other hand, may lead to subsequent ecological problems in the building and can make utilization of the building problematic or even impossible. In the use phase, potential emissions from joint sealants play a major role, as even low amounts of emissions can trigger negative reactions by contributing to the “new building smell”.
With the help of EMICODE®-licensed products, it is possible to meet the ventilation needs planned for the residents. Additional active ventilation in summer or winter, with the resulting higher energy consumption for cooling or heating, is then no longer necessary.



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