Fifty Shades of Green

Technical insulation and the many variants of the Green Building Codes

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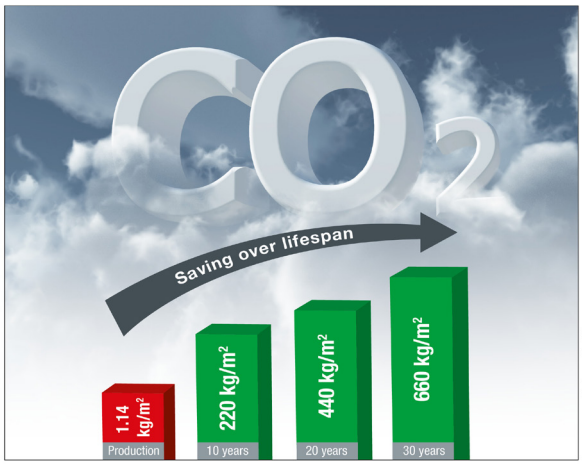


Image source: Kaimann GmbH

Kaiflex insulation saves up to 580 times more CO_2 than is required to produce it

Misconceptions about "energy-saving" and "sustainable"

Constructing a building means harming the environment. There's no getting around this fact, and even the highly praised Zero Energy and Passive Houses are constructed forms of environmental damage. Each construction material has to be produced and transported, which harms the environment with CO_2, effluents, production residues/waste and the consumption of resources.

The method selected to construct a house is insignificant in all of this. Brick-built houses will bear a huge burden of released CO_2 due to the cement and concrete production. And while timber constructions replace part of the cement volume with wood, steel also causes considerable environmental damage. In general, the energy consumed during the production of molten and fired construction materials (glass and glass wool, mineral wool, bricks and cement products, as well as metals) has an impact on the environment that even an "operating" Plus-Energy House is unable to compensate for, net, in 30 years. The most environmentally-friendly housing is therefore a natural cavity with a heat pump, solar collector and a wind turbine outside the (wooden) door: Stone Age 2.0.

But because we have fundamental comfort requirements (and there is a limited number of caves in prime locations), it is necessary to endure the environmental impacts, although they can be minimised. There are various approaches for achieving this that can be described as "sustainable construction", "energy-saving construction", "resource-efficient construction" or "Green Building". The very fact that different terms exist shows that the topic is being approached in a wide variety of ways. It is possible to construct an extremely energy-saving building entirely from PVC or PU foam, but it is not sustainable. An adobe house with a thatched roof is very sustainable, but neither very long-lasting nor very energy efficient.

A very current example of how good intentions can have negative impacts is the refusal of waste incineration pants to continue accepting polystyrene insulation products. The flame retardant HBDC that has been in use up until now is classified as a persistent organic pollutant (POP) and materials mixed with it must therefore be disposed of in a special manner. Energy-saving houses with fortress-like EPS/XPS-insulated walls will become an environmental problem in the future.

The various "Green Building Codes"

Is an energy-saving regulation (e.g. EnEV, klima: aktiv or Minergie) or a KfW requirement a Green Building Code? The straight answer is no. As shown above, saving energy is only a sub-aspect. Overall, the basic requirements of a "green" building can be subdivided as follows:

Energy-efficient construction

- Energy saving (optimise consumption = modulate; insulate, but properly ...)
- Energy generation (photovoltaics, solar, small wind turbines)

Low-emission construction

- Ecological construction materials (wood, renewable raw materials in general, natural stone)
- Low-emission construction materials (low-VOC materials)

Sustainable construction

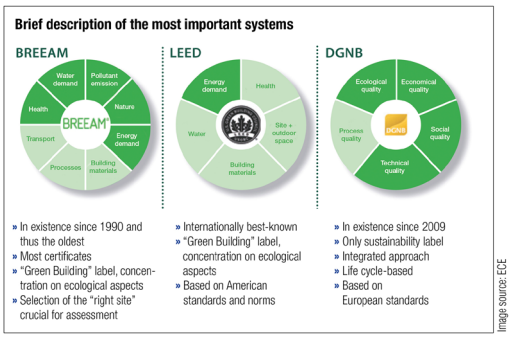
- CO_2 avoidance/saving (optimised design, especially with regard to cement-based materials, consideration of transport routes and production methods)
- Recyclable/disposable construction materials

The most widespread Green Building Codes are BREEAM (UK and Scandinavia), DGNB (Central Europe) and LEED (USA and Europe), with each of them setting different priorities and none of them being able to claim they provide a completely all-encompassing concept. This is why there have been also construction projects that demand a combination of codes.

LEED

LEED (Leadership in Energy and Environmental Design) is the most internationally recognised of the three guidelines and was adopted in 1998 by the U.S. Green Building Council, a construction industry association, with the currently valid version dating from 2015 Version ("v4"). Despite all of the modernisations and the founding of international "Green Building Councils", LEED is not as current as its European counterparts; it is still very USA-centric and therefore is not, or only to a limited extent, based on ISO, EN or DIN, but on ASTM standards, some of which are very antiquated. A prime example of this is the difficulty posed by trying to harmonise European thermal conductivity, i.e. lambda, R-, U- or k-values with BTU (British Thermal Units). LEED comprises 6 different evaluation criteria:

- Sustainable construction sites: based on the scale, location and other impacts of the building on its environment.
- Water efficiency: awards economic water consumption, internal and external.
- Energy and the atmosphere: the most detailed part covers the installation, inspection and monitoring of heating and ventilation systems, lighting and other fixtures and fittings, as well as the use of renewable energies.
- Materials and resources: outlines environmentally-friendly strategies for using local, renewable and reclaimed materials in order to reduce their consumption and promote recycling.
- Air quality within the building: concentrates on reducing harmful gases within the building and the integration of daylight and fresh air.
- Innovation and design process: a bit like a joker that can be awarded for exemplary performance in this category or a new and efficient technology.



Overview of the most important certification systems

The system is based on the allocation of points ("credits") for each of the required sustainability conditions placed on a building. Adding up the points achieved under each of the six categories gives a specific certification level that confirms the parameters of a building in terms of its ecological sustainability. LEED certification is awarded on a Certified, Silver, Gold and Platinum level. In principle, points 4 and 5 are the most relevant for the evaluation of technical insulation products and their associated products such as adhesives, tapes, pipe supports, etc. Before DGNB was introduced, LEED was the most prevalent Green Building evaluation system in Central Europe.

Image source: stockelements/shutterstock.com

ED-certified: The Hearst Tower in New York (USA)

BREEAM

The BREEM or BREEAM (Building Research Establishment Environmental Assessment Methodology) certification that was originally initiated in 1990 by the British organisation BRE (Building Research Establishment), was for a long time restricted to practically only Great Britain and Ireland because of its academic origins and the “typically insular” interpretation of the old versions. It is more comprehensive than LEED and is now divided into ten sections and numerous subsections:

- Management (Man 1-Man 5)
- Health & wellbeing (Hea 1-Hea 6)
- Energy (Ene 1-Ene 9)
- Transport (Tra 1-Tra 5)
- Water (Wat 1-Wat 4)
- Materials (Mat 1-Mat 5)
- Waste (Wst 1-Wst 4)
- Land use & ecology (LE 1-LE 6)
- Pollution (Pol 1-Pol 5)
- Innovation (Inn 1)

The criteria are weighted differently and credit points are awarded for each subsection that are multiplied by the weighting. Technical insulation products come under Energy and Materials, which both have a very high weighting (19 % and 12.5 % respectively). The following is written specifically about insulation under Mat 4: One credit point is awarded for high insulation performance and/or a low ecological footprint and for sustainability in sourcing, i.e. the procurement or stipulation of insulation products that are, for example, produced in demonstrably responsible companies, such as those certified according to ISO 14001 and ISO 50001.

Apart from the UK, BREEAM is widespread in Scandinavia in the respective local versions. In Central Europe, some existing buildings have BREEAM certification, while DGNB or its adaption by the Austrian Society for a Sustainable Real Estate Industry (ÖGNI) dominates among new builds.

LEED Categories	BREEAM Categories	DGNB Gruppen
Sustainable Sites (24%)	Management (12%)	Ökologie (22,5%)
Water Efficiency (13%)	Health & Wellbeing (15%)	Ökonomie (22,5%)
Energy & Atmosphere (32%)	Energy (19%)	Soziokulturelles & Funktionales (22,5%)
Materials & Resources (9%)	Transportation (8%)	Technik (22,5%)
Indoor Environmental Quality (14%)	Water (6%)	Prozess (10%)
Innovation in Design (5%)	Materials (12,5%)	
Regional Priority (3%)	Waste (7,5%)	Standort (ohne Gewichtung)
	Land Use & Ecology (5%)	
	Pollution (3%)	

Image source: ikl GmbH

Subject areas and their weightings

DGNB

The German Society for Sustainable Construction (DGNB) also developed a building assessment system in 2009 and was able to take into consideration experience with the older systems along with current developments. Along with BREEAM, DGNB is one of the most comprehensive certifications. It is divided into numerous criteria, within which levels of quality have to be achieved.

The criteria relevant to technical insulation products and their associated products are ENV 1.2 “Local environmental impact” and some of ENV 1.3 (“Responsible procurement”). In general, the majority of insulation products contribute to achieving the highest quality level or present no obstacles to a high rating.

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Leed und DGNB zertifiziert: Das Gebäude der Deutschen Bank in Frankfurt am Main nach Modernisierung.

The documentation for construction (insulation) materials must include the following:

- Technical data sheet
- Safety data sheet for hazardous substances (e.g. adhesives, detergents)
- Product declaration; for harmonised construction materials (which applies to the majority of technical insulation products) this is the DoP (Declaration of Performance according to the CPR), which has replaced the CE Declaration of Conformity)
- Manufacturer's declaration of the HBCD-free nature of the product (see above) and the non-use of halogenated and partially halogenated propellants

Building not construction material certification

The greatest misconception about the Green Building assessment system is that there are “certified” or “authorised” construction materials. This is fundamentally incorrect, because the approach of the Green Building Codes goes far beyond the collection of paperwork. It is a series of comprehensive concepts in which the individual product plays only a minor role in combination with all of the others. For example, a fully certified product such as Kaiflex HFplus s2, with its approvals for construction, fire protection, ship building, offshore, industry, etc. is initially only a “material” according to BREEAM, LEED, DGNB or even TQB/ÖGNB (Austria) and ASHRAE (Middle East) etc. It is only because Kaiflex HFplus s2 is an uncritical foam, halogen-free, low/no harmful substance, low/no VOC and is manufactured in a factory certified in accordance with ISO 9001, 14001 and 50001 that it is able to contribute towards the overall rating of a construction project. Sometimes even small things can be decisive. For example, Kaiflex HFplus s2 can also score points in an assessment because the Kairopak packaging makes it more economical and ecological to ship as a parcel or general cargo, i.e. it has environmental advantages in terms of transportation, logistics and warehousing.

Therefore, there are no LEED-, BREEAM-, or DGNB-certified construction materials. Lists on the organisations' web pages provide useful information and make them easier to locate, but they do not exempt manufacturers or auditors from their duty to document and inspect. Investors, designers and architects, as well as the companies that perform the work, in our case then, the insulation installers, should make contact at an early stage with Green Building auditors and construction material manufacturers in order to receive the best possible advice on selecting materials.

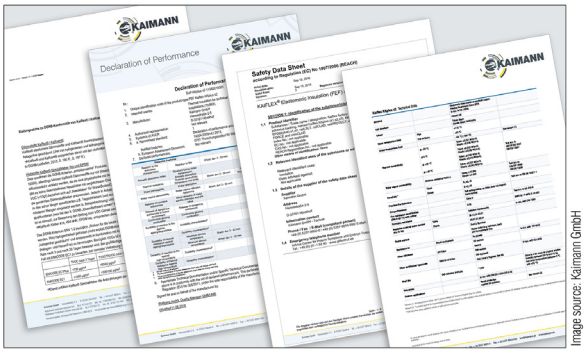

Image source: Kaimann GmbH

Fundamental components of the construction (insulation) materials documentation for the DGNB auditors.

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