Evaluating Energy Efficiency in Buildings

NEWMARK

Table of Contents

Introduction

In 2018, the European Union committed to achieve climate-neutrality by 2050 in alignment with the targets of the Paris Agreement. Some European countries as well as individual organizations have more ambitious goals. This commitment is being applied in new EU regulations and its member countries related to energy efficiency. Consequently, the energy efficiency of buildings and the use of renewable energies are decisive for the future value of real estate investments.

In the present evolution of society, climate protection is listed on top of the agenda and different standards and certificates are promoted to help. However, the intentions of certain standards and certificates differ and so does the specific perspective on energy efficiency and renewable energy. The ability to discern the meaning of various standards and certificates relative to energy efficiency allows us to decide what the certificate label on a building really means in this respect.

Energy efficiency, in regard to a building, determines the consumption of energy over the entire period of use. Energy efficiency as of today – with energy from fossil sources still predominant – implies reduced production of climate-damaging emissions. This introductory guide compares the energy performance certificate (**EPC**) with the common building certificates **LEED** and **BREEAM**, with the aim of identifying commonalities and differences among them and an interpretation of their meaning relative to energy efficiency.

Comparison of common building certificates

ORIGINS OF BUILDING CERTIFICATES

LEED, BREEAM and EPC verify aspects of building performance through third-party certification.

LEED was developed in the United States and requires evaluating data based on the imperial units of measure. In the European Union, with the metric system in place, this requires conversion for the benefit that LEED-certified buildings all over the world can be compared easily.

The Energy Performance Certificate (EPC) was introduced via the Energy Performance of Buildings Directive (EPBD) of the European Union in its first edition in 2002 and subsequently found its way into the legislation of the member countries. Its use reports on the energy consumption of a building.

BREEAM was developed in the UK and assesses aspects of sustainability. Like LEED, the evaluation for BREEAM is conducted across a range of categories that are weighted to determine a total score. In contrast to LEED, BREEAM considers metric or imperial units of measure depending on the customs of the country where the building is located.

COMPARING THE INTENT OF THE STANDARDS TO EVALUATE ENERGY EFFICIENCY

The comparison table below summarizes the criteria that the different certificates provide to evaluate energy-efficiency-related aspects of buildings. It reflects that LEED aims for cost savings, while BREEAM aims at CO_2 reduction, and EPC's target is the transparency of energy consumption.

Aspect Assessed	Area	LEED	BREEAM	EPC (EPBD)
Energy efficiency	**Energy performance based on demand respectively emissions**	Minimum Energy Performance (EAp2)	Reduction of CO2 emissions (ENE1)	Primary demand non-renewable
		Optimize Energy Performance (EAc1)		Energetic and thermal insulation quality, etc.
	Metering		Sub-metering of substantial energy uses (ENE2)	
			Sub-metering of tenancy areas (ENE3)	
	Equipment Performance		External Lighting (ENE4)	
			Lifts (ENE8)	
			Escalators (ENE9)	
Standards used for calculations		ASHRAE 90.1	National Energy Calculation Model (PL: DZIENNIK USTAW 2015 R. POZ. 376) (DE: GEG, ASHARE 90.1)	ISO14040, National Energy Calculation Model (PL: DZIENNIK USTAW 2015 R. POZ. 376) (DE: GEG & DIN V 18599)
Intent		Cost Savings	CO2 Reduction	Transparent statement on energy demand

Table 1: Comparison of criteria regarding energy efficiency

WEIGHT OF ENERGY EFFICIENCY IN CERTIFICATES TOTAL SCORES

Given the above comparison, it is not surprising that **BREEAM** places the most emphasis on energy efficiency among the three certificates, with up to 17% of its total score. Though more focused on cost savings, **LEED** allocates up to 14.5% of its total score to energy efficiency. EPC, as expected, focuses very little on energy efficiency and allocates only up to 3.5% of its total score to it.

A closer look at the certificates

LEED

The **LEED** Certificate was developed and has been maintained by the non-profit organization USGBC for the last 30 years. While version four is the current version of LEED, existing buildings may have been certified based on older versions of the certification. The certification process evaluates a building according to distinct categories and sums up the weighted category scores to a total of maximum 110 points.

Important foundational elements incorporated in LEED are the ASHRAE standards (American Society of Heating Refrigeration and Air-Conditioning Engineers). LEED requires, for example, simulations according to ASHRAE 90.1-2010 to achieve compliance in the category of minimum energy efficiency (EAp2), however without ever considering the energy consumption over the entire life cycle of a building. The scoring compares the building's calculated energy costs with those of a reference building.

Category	Max Points
Location & Transportation	16
Sustainable Sites	10
Water Efficiency	11
Energy & Atmosphere	33
Material & Resources	13
Indoor Environmental Quality	16
Innovation	6
Regional Priority	4
Integrative Process	1
Total:	**110**

Table 2: LEED scoring categories and points

BREEAM

BREEAM, developed in the UK, has been in use since 1990 and evaluates the energy efficiency of buildings aiming at the reduction of CO2 emissions.

Category	Max Points
Waste	7,5%
Energy	19%
Water	6%
Management	12%
Transport	8%
Health & Wellbeing	15%
Land Use & Ecology	10%
Pollution	10%
Materials	12,5%
Total without innovation:	100%
Innovation	10%
Total:	110%

Table 3: BREEAM scoring categories and points

Energy efficiency

Energy efficiency is part of the 2nd category ("Energy") with a share of about 12% of the category score. It can be evaluated either by applying an EPBD-compliant national energy calculation model or an energy simulation software according to ASHRAE 90.1 – which is also used in LEED. BREEAM also offers a simple checklist that can be used as an alternative to achieve at least two thirds of the possible score when using a calculation model or an energy simulation.

Conclusion & Outlook

It is clear that the varying approaches that the certificates follow is largely based on their original intention, however another important aspect of building performance closely related to energy efficiency is the use of renewable energy. This is achieved by means of purchasing energy from renewable sources or through the production of renewable energy making use of the building, for example via PV panels.

Given the goals of the Paris Agreement and their resultant influence on legislation, as well as increasingly volatile energy prices, energy efficiency and the use of renewable energy are the critical aspects to optimize the performance of a building.

Sources

1. BREEAM: BREEAM Knowledge Base.
   Web: https://kb.breeam.com/wp-content/plugins/breeamkb-pdf/pdf/?c=229, 2022.

2. BREEAM: BREEAM In-Use. Driving sustainability through existing buildings.
   Web: https://tools.breeam.com/filelibrary/BREEAM%20In%20Use/KN5686---BREEAM-In-Use-White-Paper_dft2.pdf, 2014.

3. BREEAM: BREEAM International New Construction, Technical Manual SD233 2.0.
   Web: https://files.bregroup.com/breeam/technicalmanuals/BREEAMInt2016SchemeDocument/, 2016.

4. USGBC: LEED v4 for Building Design & Construction.
   Web: https://www.usgbc.org/resources/leed-v4-building-design-and-construction-current-version, 2019.

5. USGBC, LEED v4 Interior Design & Construction.
   Web: https://www.usgbc.org/resources/leed-v4-interior-design-and-construction-current-version, 2019.

6. USGBC, Recertification Guidance for LEED Buildings.
   Web: https://www.usgbc.org/resources/recertification-guidance-leed-buildings, 2019.

7. USGBC, LEED v4 for Neighborhood Development.
   Web: https://www.usgbc.org/resources/leed-v4-neighborhood-development-current-version, 2018.

Glossary

ASHRAE	American Society of Heating, Refrigeration and Air-Colling Engineers
BREEAM	Building Research Establishment Environmental Assessment Method ENE1 Reduction of CO2 emissions ENE2 Sub-metering of substantial energy uses ENE3 Sub-metering of tendency areas ENE4 External Lighting ENE5 Low or Zero Carbon Technologies ENE8 Lifts ENE9 Escalators
EPBD	Energy Performance of Buildings Directive, EU directive on the Energy Performance of Buildings
EPC	Energy Performance Certificate
ESG	Environmental, Social, and Governance
GEG	German Energy Act for Buildings
ISO 14040	Life Cycle Assessment, address quantitative assessment methods for the assessment of the environmental aspects of a product or service in its entire life cycle stages. ISO 14040 is an overarching standard encompassing all four phases of LCA.
LCA	Life Cycle Assessment
LEED	Leadership in Energy and Environmental Design EAc1 Optimize Energy Performance EAc2 ON-Site Renewable Energy EAc5 Measurement & Verification EAc6 Green Power EAp2 Minimum Energy Performance
PV	Photovoltaic
USGBC	U.S. Green Building Council

EVALUATING ENERGY EFFICIENCY IN BUILDINGS

For more information:

esg.consulting@nmrk.com

https://www.nmrk.com/perspectives

nmrk.com

NEWMARK