

BREEAM & PassivHaus assessment

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1 SUSTAINABILITY, REASON AND THE GOAL

Sustainability is one of the main topics representing nowadays society. It does not only influence our view of the environment, but also reshapes thinking about our future. Construction is one of the biggest influencers having impact on the environment. Biggest concerns are energy and water consumption, pollution, consumption of raw materials, also negative impacts to the natural environment of the building surroundings. According European Union's research, buildings consume nearly 40 % of our energy, produce 30 % of non-recyclable waste, consume around 30 % of raw materials and 25 % of water (Juan A. Ferriz-Papi, 2017, slide 3).

Respond to these topics gave an origin to the sustainable construction assessments such as BREEAM, LEED and Passivhaus. In long history of construction, sustainable assessments are relatively new, but nevertheless their importance is raising. Through the years, when assessments came to existence, they spread from their birthplace around the globe. Not only they spread and are still spreading, but they also adapt to local conditions. Thanks to the different approach of each assessment and its adaptation to local conditions, every certificate varies in some way. BREEAM chooses holistic sustainability approach, focusing mostly on construction itself. On the other hand, Passivhaus focus mainly on energy consumption during construction and during usage of the building.

To choose the best assessment is questionable, because we must take the conditions, our vision, client's wishes and all the possibilities into consideration. Is it better to choose BREEAM or Passivhaus in EU countries? Next paragraphs will describe strong and weaknesses of these two assessments to help to answer this question.

2 BREEAM

BREEAM (Building Research Establishment Environmental Assessment Method) is UK based assessment founded in 1990. Nowadays BREEAM is applied in over 70 countries worldwide, therefore adaptability to local and climatic conditions is necessary (Building Research Establishment Ltd, 2018).

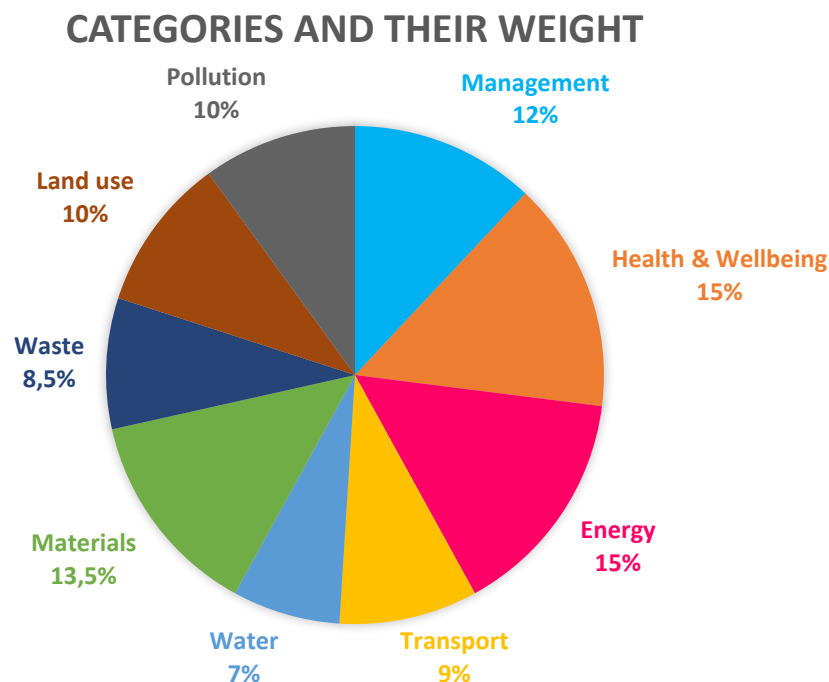
Through holistic approach is BREEAM targeting most of the nowadays market, which can be seen in diversity of branches focusing on specific topic like residential and commercial buildings, or with BREEAM in use on building's performance. No matter the focus, BRE is enhancing its certificates with sound research and tight connections to the industry.

To obtain BREEAM certification it is necessary to follow specific process. First, client must decide which standard will be applying for. Next step is get in touch with licensed and qualified BREEAM Assessor, who will oversee the project and ensure fulfilment of requirements. To obtain certification, the project must be registered. Ideally for new construction there will be kind of pre-assessment to the project even before start of the construction. This is the best-case scenario. Whole project is considered in a way of desirable BREEAM standard and the solution can be done in holistic approach fit the wanted result. Reality is on the other hand a bit different. Clients often seek the assessor in some part of already going construction, what makes the fitted solution, in most cases, hard to obtain. In both cases assessor is overseeing whole process of construction and helps to solve occurred problems or changes to fulfil the requirements. In the end, assessor will submit his/her assessment to check the project for rewarding BREEAM certification (as above).

BREEAM standards, which can be chosen:

- **NEW CONSTRUCTION** (Homes & Commercial buildings)
- **INFRASTRUCTURE** (Civil engineering & Public realm)
- **IN-USE** (Commercial buildings)
- **REFURBISHMENT & FIT-OUT** (Homes & Commercial buildings)
- **COMMUNITIES** (Master planning)

Assessment of each standard includes same categories, which are considered to reward the project with certificate. These categories are:



There is one more category (**Innovation**), which can bring another 10% to the total score. Each category is divided into subcategories, dealing with concrete problem, e.g. in category Energy we can find nine more subcategories like Ene 04 – Low carbon design. There are 51 subcategories according to the latest used BREEAM technical manual (BRE, 2016).

Whole process of obtaining the certification is based on gathering evidence, which is therefore evaluated and according consideration proper marking is given for each category. Final evaluation leads to six possible outcomes: **Outstanding** $\geq 85\%$, **Excellent** $\geq 70\%$, **Very good** $\geq 55\%$, **Good** $\geq 45\%$, **Pass** $\geq 30\%$ and **Unclassified** $< 30\%$.

Nevertheless, BREEAM Assessment is not without problems or some illogical issues and results. Due to the “tick-boxing system” some anomalies can occur, such as higher scoring of project on treated contaminated land, than on untreated uncontaminated land (Stuart Barlow, 2011).

3 PASSIVHAUS

PassivHaus is a Germany based assessment founded in early 1990s. PassivHaus principles can be used worldwide. The difference to the BREEAM is, PassivHaus is focusing on heat energy losses, how to prevent them, also to bring solution to a project to use passive sources or heating and cooling of fresh air as much as possible.

To achieve required indoor comfort, couple of techniques and principles are used. One of the most important is good insulation with minimum thermal bridges as much as possible. Building should be also excellently airtight, which means proper ventilation with effective heating and cooling abilities must be provided to ensure thermal comfort and inflow of fresh air. Main idea is to reduce necessity of space heating and primary energy consumption. To achieve that, it is very important to use passive solar heat gains same as use effectively heat created by using the building and its facilities. (BRE, 2011)

Obtaining PassivHaus certificate is process of checking and intense testing. Client must provide set of evidence, such as detailed scaled drawings, where exact orientation of the building will be seen. It is important to know all the detail like dimensions, heights and levels. Floor plans showing placement of the rooms and space are needed, same as proper section plans indicating height differences and nevertheless drawing of construction details. Specification of windows and doors used, their components and parameters are needed. Another important evidence that must be given are certificates of used ventilation and its components, airtightness test and report. Information about primary energy services must be provided, such as heating system, hot water system, usage of renewable technologies and appliances. Client should also deliver details of thermal modelling done by qualified person and confirmation photographs proving given evidence (as above).

With all the data gathered from evidence and testing, final results can be calculated and therefore decide ability of the project to obtain PassivHaus certificate based on set up requirements. Standards that must be met are listed in table below (as above)

Energy performance targets and air changes per hour	
Specific heating demand	$\leq 15 \text{ kWh/m}^2.\text{yr}$
Specific cooling demand	$\leq 15 \text{ kWh/m}^2.\text{yr}$
Specific heating load	$\leq 10 \text{ W/m}^2$
Specific primary energy demand	$\leq 120 \text{ kWh/m}^2.\text{yr}$
Air change per hour	$\leq 0,6 @ n50$

There can be a discussion, if PassivHaus is truly sustainable solution. With its focus on energy saving solution, there is a bit of lack in holistic approach in sustainability itself. There are no required specifications of material used, their origin or carbon footprint.

4 COMPARISON

Both assessments have their advantages and disadvantages. It is difficult to compare two very different assessments. We can say, principle of both is in common the same, to reduce impacts of construction (no matter if new constructed or already existing) on environment. The ways of achieving it differ at the early beginning. BREEAM is taking holistic approach, whilst PassivHaus is focusing on energy performance savings. In table below, I compare some of the differences.

	BREEAM	PassivHaus
Approach	Holistic	Energy performance focused
Local condition	Must be adapted	Can be used anywhere
Evidence	Mostly general, supporting each assessed group	Focused on thermal and energy performance, detailed, can be costly
Design	Created to achieve wished final score requirements in every of nine categories	Created to achieve airtight, well insulated and well-ventilated structure
Healthy living space	No specific requirements on indoor air quality of thermal comfort beyond standard regulation	High requirements on indoor air quality and thermal comfort in every condition

5 CONCLUSION

Truth is, we can spend hours and hours to compare every assessment with each other. They differ in principles, ideas or even in small details. To choose “the best” assessment is questionable task. When we’re deciding which assessment we want, we should have some main ideas what we want to achieve. Nowadays with a bit of afford and will is possible to achieve more than one certificate at the same time. By my opinion it is truly possible future of sustainable construction, to focus on every aspect of the construction not only during building process, but also during its use. I also think the first visions of achieving it are to obtain BREEAM and PassivHaus certificate at the same time, which is already happening.

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