IEAA-ASSESSMENT TOOL FOR ARCHITECTURAL COMPETITIONS

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Summary

Early planning stage determines major aspects of the future energy performance of buildings like orientation, compactness, openings etc. and optimization of these aspects causes extremely low additional costs. An optimized compactness even helps to reduce the construction costs of the building.

The objective of this research project was to identify measures and methods to "integrate energy efficiency aspects in architectural competitions" (IEAA) without changing the structure of the existing competition scheme and without additional effort for the participants.

An online-survey of architects in Austria delivered an opinion chart concerning this objective. Subsequently a software tool was created with three major features: easy handling, quantifiable indicators and eye-catching illustrations for an easy comparison of the submitted projects. Together with the Excel-Tool some supporting materials were developed: a functional software-manual for the planners and checklists for developers, pre-examiner, participants and jury members. With help of these materials actors and participants of the design competition should be able to integrate the developed tool in competitions without further guidance. Furthermore architects are able to use it as a lanning tool to support the design process.

The IEAA-assessment tool has been successfully tested and further developed within several competitions.

The paper shows the modular structure of the tool and the adaptability to different competition types and individual competition objectives.

Keywords: design competition, energy efficiency, assessment tool, passive house, low energy architecture

1 Introduction

Architectural competitions are the best way to find designs for exemplary, pioneering and economic buildings. Decisions made in this early planning stage determine energy efficiency of buildings, and won´t cause high additional costs [1]. Legal legislative and building codes demand high performance standards and developers demand assurance This has led to different approaches and strategies to implement energy-related aspects in architectural competitions and furthermore to considerable additional effort for participants and pre-examiner, as well as confusion among jury members.

The project team consists of three partners: Institute of Thermal Engineering (TU Graz), Inter-University Research Center for Technology, Work and Culture (IFZ Graz), and Division of Sustainable Constructions of the Institute of Structural Engineering (BOKU Vienna).

The result is the IEAA-assessment tool and guideline, taking into account the legal framework (Energy certificate under EPBD) and practicality (competitive procedures) of design competitions in Austria. First the current competition practice was analyzed and documented in a State-of-the-Art Report. An Online survey among Austrian architects showed the demand for an easy to use assessment tool, clear parameters defined in the competition specification and an expert with experience in energy efficient architecture as part of the jury. The developed tool was then tested by means of accompanying selected competitions. To ensure a realistic, broad implementation of the results, key organizations of the Austrian construction industry were involved in the project.

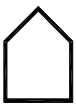
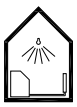
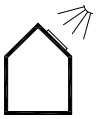
2 IEAA-assessment tool und IEAA-Guideline

The IEAA-assessment tool is based on the normative specified calculation algorithms of the Austrian energy performance certificates for buildings. The tools kernel is the official educational-tool of the energy performance certificates, provided by the Austrian Institute of Construction Engineering (OIB) [2]. The user interface was adapted to the requirements of project development and early design stage.

Usually architectural competitions have very diverse goals and complexity, depending on the conditions of the building site and the requests of the building owner. Therefore the IEAA-assessment tool was designed with a modular structure for more or less detailed input data. Furthermore different pre-conditions (e.g. energy carrier, energy standards, u-values) can be fixed by default-values to adjust the tool to the individual goals of the competition.

The modules 1-3 are interdependent and each module uses the input from the module before and requires further information. Table 1 gives an overview of the modular structure, showing the underlying requirements, necessary data input and resulting values.

Tab. 1 Overview of the modular structure of IEAA-assessment tool (HWB – space heating demand, KB – space cooling demand, EEB – final energy demand for space heating, space cooling and domestic hot water , PEB – primary energy demand, BelEB –lighting energy demand)

modules		Indication Organizer	Indication participant	Characteristic value
	module 1 building basis	Method of construction U-value building envelope Energy source Requirement level	Conditioned gross floor area Conditioned gross volume Facade	HWB/HWB*, KB* (EEB PEB, CO2)
	module 2 building enhance-ment	Energy source Requirement level	U-value building envelope Method of construction Shading Air conditioning	HWB, KB EEB PEB, CO2
	module 3 building service	Requirement level	Heating and hot water cooling lighting	EEB, BelEB PEB, CO2
	module 4 Active solar energy use	Use of Solarthermal and/or photovoltaic modules	Solarthermal: ▪ collector type ▪ collector area ▪ Orientation + slope	Reduction of EEB. Auxiliary energy demand: EEB
			Photovoltaic: ▪ collector type ▪ collector area ▪ Orientation + slope ▪ Building integration	Reduction of EEB, PEB and CO2

3 „Lessons learned“

In spring and summer of 2009 selected architectural competitions were accompanied by the project team to test the performance of the IEAA-assessment tool. The feedback from all stakeholders - developer, preliminary examiner, jury member and participants - was very positive. The module 1 "Building basis" was used and in some cases module 4 "Active solar energy use" was added. Module 1 evaluates energy efficiency with three parameters only - compactness, orientation and share of window area – while all other parameters are predetermined.

Module 2 "Building enhancement" and module 3 "Building service" show the impact of technological measures (e.g. u-values, heating system, energy carrier). Furthermore these modules provide additional support during the design process. The tool was successfully used by architects to optimize their concepts.

In order to achieve ambitious energy efficiency, specific parameters need to be considered from the start and need to be clearly documented in the competition specifications. Predetermined conditions (default-values) defined by developer and competition organizer play an important role in interpreting quantitative results in context with the design idea. If the developer lacks the necessary expertise, it is highly recommended to include an expert with experience in energy efficient architecture.

The IEAA-assessment tool identifies quantitative indicators and should not be used to give any score ranking of competing projects. The preliminary examination report gives

an objective view on the projects, including facts on energy efficiency as determined by comprehensive evaluation criteria.

The IEAA-assessment tool offers more transparency to the selection process. The quantitative results need to be considered in context with the overall design of the competing projects. The necessary expertise should be covered by a jury member, preferably an architect with experience in energy efficient building design. This jury member can point out relevant details during project development and before competition specifications are finalised as well as answer questions during the jury meeting.

The practical experience could confirm that the IEAA-assessment tool gives good guidance on whether the desired energy standard is achievable. Positive feedback had been received from planners, jury members and developers concerning the flexibility, and applicability and complexity. The limits of application are big projects with mixed use and specific building tasks with multiple buildings service systems. The IEAA-assessment tool is freely available online at: www.ifz.tugraz.at/index.php/article/articleview/1528/1/76/.

By using this tool, architects can apply the knowledge gained on energy efficiency in other design projects, which are not awarded through competitions. For the implementation and dissemination activities, meetings with representatives of building management, property developers and architects are necessary.

The project is funded by "Neue Energie 2020" from "Klima- und Energiefonds".

References

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