MINERGIE-ECO 2011
→ The Evolution of an LCA Based Building Label in Switzerland

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Summary

The MINERGIE standard was introduced in 1998, with the more stringent MINERGIE-P and MINERGIE-P-ECO standards appearing later. Together they set performance criteria for energy efficiency, as well as for comfort. A MINERGIE-building consumes around 60 percent less energy than the conventional Swiss building, which in turn was built to one of the world's highest regulatory building standards.

MINERGIE-ECO is an extension of the MINERGIE label, covering the aspects of health (e.g. optimized daylight condition, low noise emissions) as well as healthy and environmentally friendly products (good available resources, low environmental impact, easy to dismantle and reuse or recycle). The application process demands to answer 240 questions (yes 1. or 2. priority and no) as well as a daylight calculation. A project running between 2006 and 2008 was working on the generation of a methodology as well as software modules (DLL's) to allow an uptake in energy performance calculation tools for buildings. Besides the existing calculation of energy consumption for heating, cooling, hot water and electricity these software would also offer a full Life Cycle Assessment (LCA) of the building and check its healthiness and comfort.

Since then, the DLLs have been implemented in two existing building energy performance software (Lesosai 7.0 and Thermo) and the methodology has been integrated in an existing online Building Component Catalogue (www.bauteilkatalog.ch) for the calculation of the embodied energy (non renewable primary energy) of building components. This allows professionals without an energy performance software to calculate the embodied energy. Additionally, a procedure to cover the most commonly build interior parts (e.g. interior walls, concrete slabs) and building equipment allows the calculation of these parts with a few mouse clicks.

Methodologies for the calculation of the threshold value for the embodied energy had to be developed. The methodology has been tested with 15 case studies (5 new and 10 retrofit buildings) and proofed its practicability.

For the first time it is possible to optimize a building with a holistic energy approach.

The Evolution of MINERGIE

MINERGIE – a Successful Label in the Building Sector

In Switzerland, there is just one building label that was able to establish itself on the market. Ever since its launch in 1998, the MINERGIE label, carried by the association under the same name, was able to achieve a market share of almost 25%, which is unique even by international comparison. This excellent market penetration is likely due to its simple procedure, tightly coupled integration with official regulations, the inclusion of all interest groups by means of events and courses, and its outstanding marketing. But its practicality and the tools provided by the MINERGIE association also greatly contributed to its success.

Fig. 1: MINERGIE-ECO-certified building (administration building company Zaugg, Rohrbach, Canton Bern)

MINERGIE-ECO – an Extension to MINERGIE

Since 2006, buildings with healthy and eco-friendly construction may be awarded the label MINERGIE-ECO. This is in addition to the labels MINERGIE, MINERGIE-P and MINERGIE-A, which evaluate energetic aspects and comfort criteria. Since then, more than 300 buildings with approximately 950,000 m^2 energy reference area were certified according to the MINERGIE-ECO standard. Thus, this label has received outstanding acceptance in the market. At the same time, MINERGIE-ECO influenced the building material market. The availability of recycled concrete improved significantly and the number of solvent-free products significantly increased.

Over the past few years, the American LEED-label established itself at the international level for large buildings. So far, there are still very few certified buildings in Europe. The reason for this is a failure to adapt to the European standards – with the exception of the LEED-Version for Italy – and the high expenditure involved in producing documentation. This is why the German Sustainable Building Council (DGNB) also expects to get a foothold in this market. Some 150 buildings were certified with the thematically broad DGNB-label thus far. It has already been adapted to the Austrian, the Bulgarian, and the Swiss market.

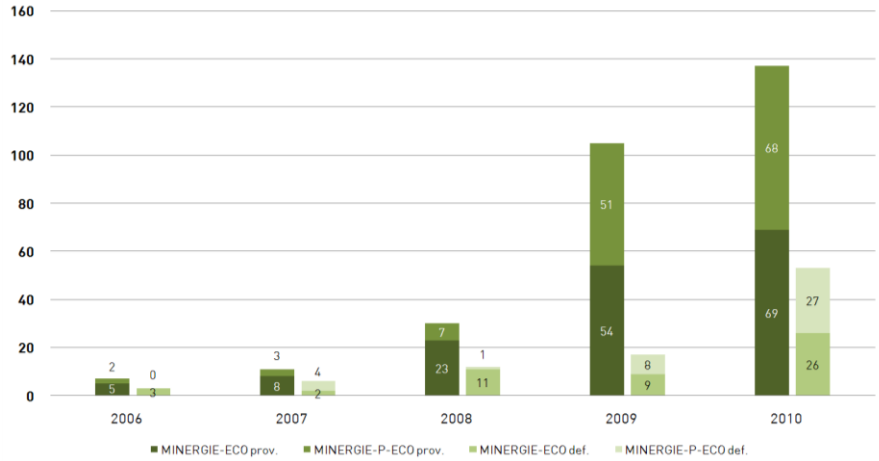

Fig. 2: Number of MINERGIE-ECO and MINERGIE-P-ECO certifications between 2006 and 2010 (provisional and definitive certificates)

Particularly when compared with these labels, MINERGIE-ECO is simpler in its design and highly practice-oriented – it demands significantly less effort for everybody involved. Of course this also has some disadvantages. MINERGIE-ECO is limited to only six criteria and when compared to the aforementioned other labels it appears at first glance to have some gaps as regards its content. On the one hand, this is intended to keep the process simple. The system limit, for example, was defined so as to only comprise the building. On the other hand, the criteria were nevertheless chosen so as to cover the most important aspects of sustainable construction. So, for example, the issue of legionella prevention in potable water is dealt with under the criterion indoor climate because the underlying mechanisms are associated with indoor air.

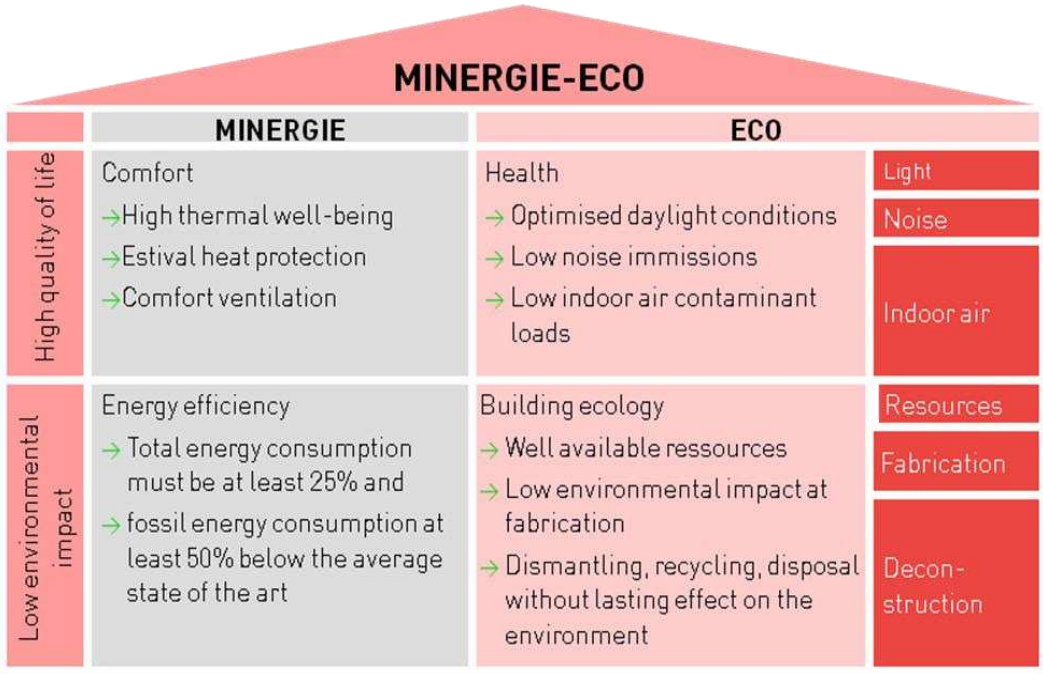

Fig. 3: The criteria of the current MINERGIE-ECO procedure

After more than five years of almost unchanged requirements it was time to review and optimize the process and to expand its application to modernizations. The revision did not focus on supplementing criteria but on improving the meaningfulness while simplifying the procedure and enhancing its practical orientation at the same time. This aims at broadening the unique selling points of MINERGIE-ECO in these areas in comparison to other labels.

MINERGIE-ECO has established itself but has a few weaknesses

In the procedure in its previous form, the issue of daylight is evaluated by a calculation and by means of catalogues with prerequisites regarding the additional criteria noise, indoor air, raw materials and construction/deconstruction. In this context, there are mandatory prerequisites that must be met (exclusion criteria such as using a minimum amount of recycled concrete in analogy to LEED prerequisites).

Health	Building Ecology
• Biocides and wood preservatives indoors • Solvent dilutable products indoors • Using products emitting formaldehyde in relevant quantities • Missing building check for harmful substances when refurbishing	• Heavy metal bearing materials (lead and large-area copper or titanium-zinc claddings outdoors without a filter for meteor water) • Insufficient use of recycled concrete • Non-European wood without sustainability certificate • Construction foams and filling foams

Fig. 4: MINERGIE-ECO exclusion criteria

Complying with the remaining other requirements generates points with a minimum requirement for each criterion. The total number of points must reach the applicable area specific threshold. Adequate proof must be submitted at two different times – after project completion and before completing the implementation. During the preliminary study period and the planning phase, the structure of the prerequisite catalogue follows the MINERGIE-ECO criteria; during the invitation to tender/implementation phase the structure follows the respective trades participating in the construction effort.

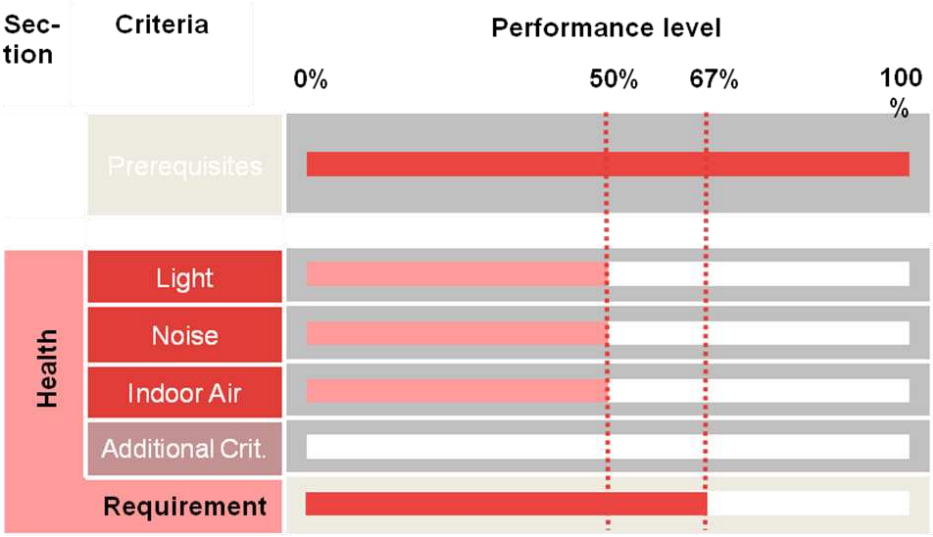

Fig. 5: Criteria and minimum requirements of previous MINERGIE-ECO procedure with the example of the area of health

The specifications were for the most part taken from existing instruments provided by the association eco-bau [eco-building], a platform existing for several decades and focused on sustainable building within the public sector construction in Switzerland. Especially notable are the "Leaflets for ecological building" [1] that provide specifications for most trades and are updated on a regular basis. The methodology of these leaflets is based on a best-of-class approach, i.e. the most ecological alternatives within a functional unit (such as a wall cladding) are marked on two different levels either as ecologically interesting or as limited ecologically interesting. This

classification is based on a method considering not only grey energy, but also emitted solvents, components relevant to the environment or health, work-hygienic risks and deconstruction/disposal friendliness.

The MINERGIE-ECO evaluation procedure has proven to be very flexible because it provides the applicant with several alternatives that are to be implemented only in some parts. In addition, there is no requirement to rely on the services of a sustainability expert because specifications are practice-oriented. The simple procedure not only diminishes certification costs but also expenditures for the overall certification process.

Nevertheless, the existing procedure does have a serious disadvantage: The evaluation is only performed within the same functional unit which does not allow for a cross-unit comparison, for example between a wall cladding made of fibrous cement and a compact façade, because the effect of suboptimal alternatives cannot be shown using this method. This, in turn, may lead to a distortion of partial results.

Further Development while Incorporating the LCA-approach.

This was one of the reasons for starting to adapt the MINERGIE-ECO methodology already in 2008. A project supported by the Swiss Federal Office for Energy created the basis for a procedure that was integrated into the new MINERGIE-ECO Version 2011. To this end, new software components had to be developed that are compatible with most programs calculating the energy consumption. The overall goal is to have a software at some point in the future that is not only capable of calculating the operating energy but also the overall non-renewable primary energy throughout the life cycle of a given building – even at a minimum additional data input.

The leaflet 2032 “Grey Energy of Buildings” [2] issued by the Swiss Society of Engineers and Architects (SIA) serves as the basis for calculating grey energy. This paper fixes the applicable useful life of a building and its parts, of building elements that have to be included, and the structure and reference value for results. The data basis is provided by the Swiss “Ecological profiles database for the building sector” [3] which in turn are based on the internationally known ecoinvent data base.

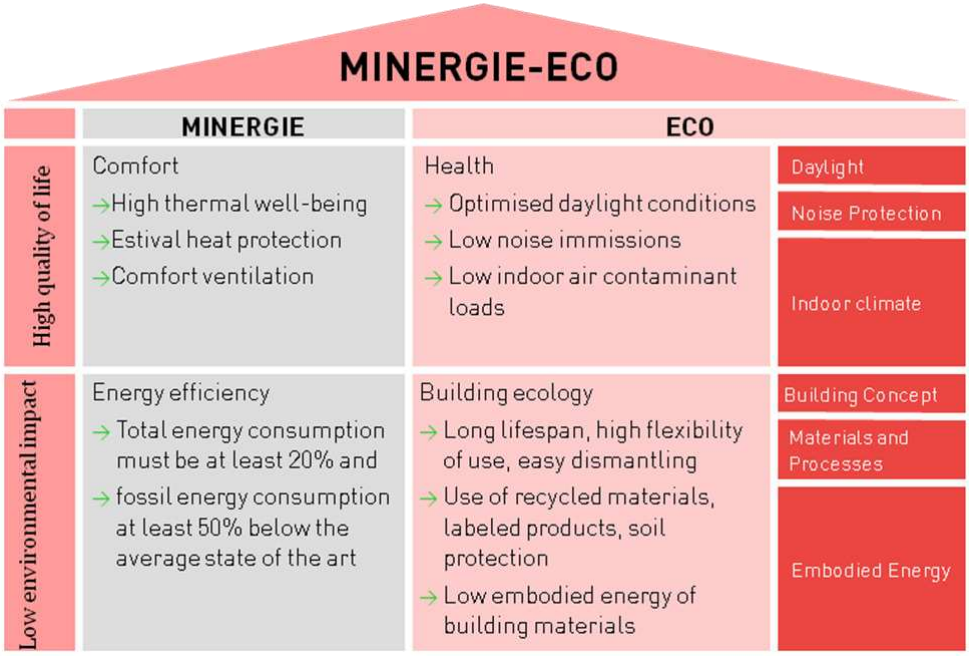

Fig. 6: Newly structured criteria of MINERGIE-ECO 2011

This way it is possible to introduce the calculation of grey energy within MINERGIE-ECO 2011 while simultaneously getting rid of more than half of all specifications of the procedure because these mainly focused on aspects like raw materials and environmental impact during production and processing. As an environment indicator, grey energy is able to sufficiently cover these aspects. First and foremost, this allows for an overall view of the used materials and their respective quantity which facilitates a significantly more precise statement on the environmental impact of a building. However, there are a few aspects that may not be depicted by means of a calculation such as the use of recycled concrete or wood with sustainability labels (resource conservation). This is why we continue to need a specification catalogue. However, this was newly structured.

Shifting the focus towards aspects of the project phase

In contrast to the previous procedure that, in terms of scope, focused on the invitation to tender and implementation phases, MINERGIE-ECO 2011 shifts the focus towards the project phase. During this phase, the potential to exert influence is significantly higher. The experience from the certification process has shown that this is where MINERGIE-ECO meets the most difficulties, because choosing material and products is much more easily managed than conceptual aspects. At the same time, the applicants should receive better support in implementing the specifications during the tendering and realization. This is achieved by means of a check list for those specifications that the applicant wants to implement. The list includes all steps that must be taken during the tendering and the implementation phase as well as the proofs that must be turned in for documentation purposes. This check list is an important step towards building practice, thus also increasing implementation security.

Evaluation method with traffic light system

Most sustainability labels within the building industry are based on different certification levels (LEED: Certified, Silver, Gold, Platinum). MINERGIE, however, has a different approach and markets different performance levels as independent products (MINERGIE, MINERGIE-P, MINERGIE-A). The part –ECO is an extension that is freely combinable with the other products. Because there are no certification levels, the result of a certification process is either pass or no pass. This result can actually be achieved via different steps. The new MINERGIE-ECO 2011 evaluation system realizes this via a traffic light system.

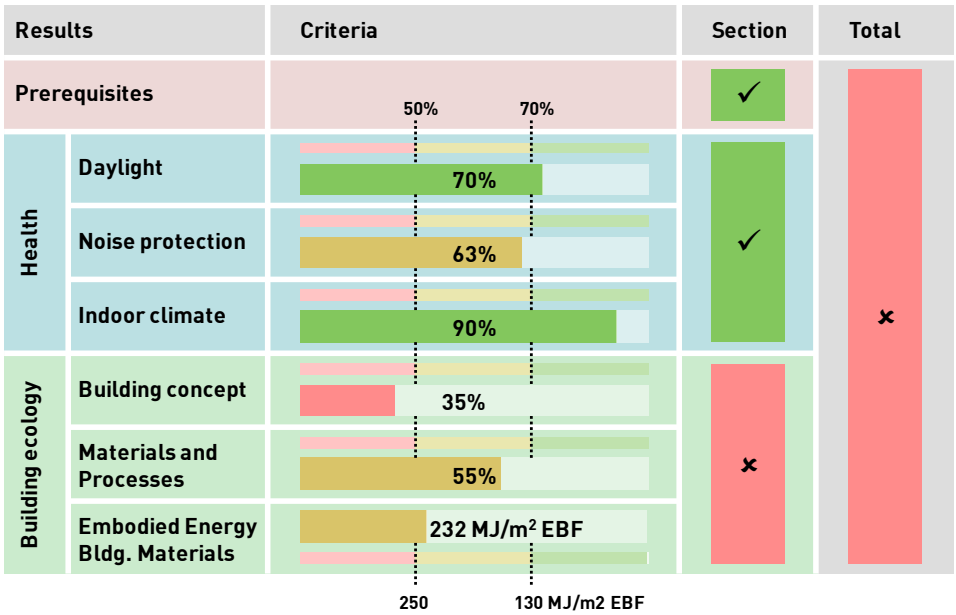

Fig. 7: The result representation of MINERGIE-ECO provides an at-a-glance summary of how a specific project is evaluated.

With the exception of the exclusion criteria that must be fully implemented, the partial results are divided into green, yellow and red based on threshold values determined by examining approximately 30 case studies. A red partial result means that a certification cannot be granted. This replaces former minimum performance degrees. The graphic display of results makes grasping and interpreting the results at a quick glance possible.

Newly developed instruments

Whoever was involved with the process of a LEED certification knows the difficulties caused by a lack of tools. Right from the beginning, MINERGIE-ECO took the approach of providing all the necessary instruments. The purpose of a building label is not exclusively about documenting the finalized status quo, but also about striving towards project optimization. This, however, is only possible with an instrument that is able to depict all important features and capable of immediately displaying the results. The existing MINERGIE-ECO instrument for proof assumes exactly this function and has in principle proved its value. It will be adapted to the new structure and to the new evaluation method of MINERGIE-ECO 2011.

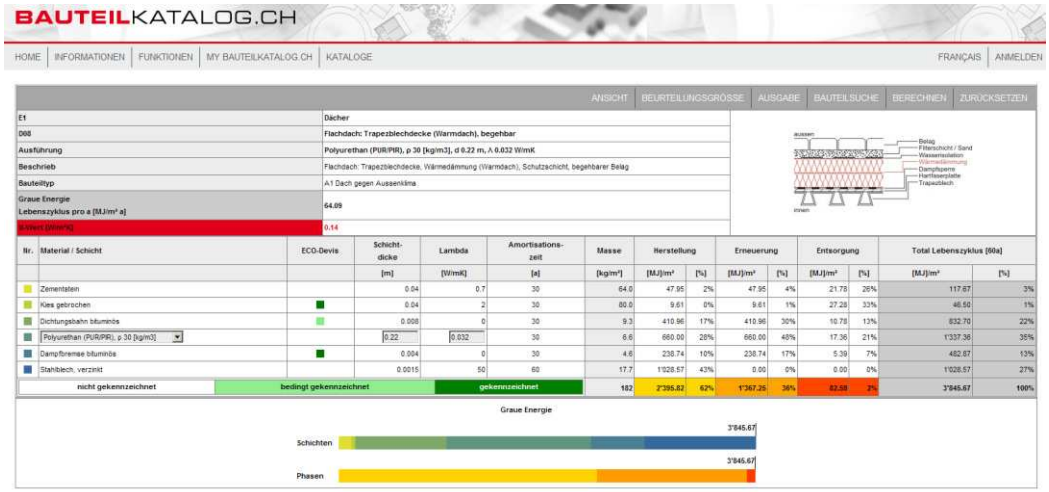

Fig. 8: Easy and fast calculation of grey energy for building components or complete buildings is possible with the electronic building components catalogue

The electronic building component catalogue [4] can be used for calculating grey energy. It allows the choosing and adjusting of predefined building components, capturing dimensions, and it shows results in relation to threshold values as defined by MINERGIE-ECO. The evaluation of the daylight situation is done as before using an excel-tool that was equipped with a new feature to also consider modernizations.

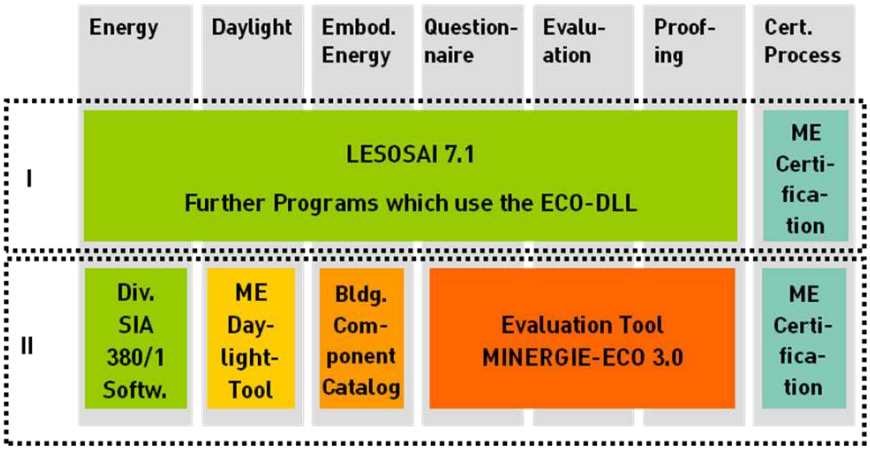

Fig. 9: Different instruments used within MINERGIE-ECO

At the same time, the basis for a fully integrated instrument that is capable of simultaneously calculating the operating energy consumption and grey energy was created while also allowing results outputs in accordance with SIA-Norm 380/1 (Thermal Energy in Buildings) [5], SIA-Norm 380/4 (Electrical Energy in Buildings) [6], SIA-Leaflet 2031 (Energy pass for Buildings) [7], SIA-Leaflet 2032 (Grey Energy of Buildings) [2], MINERGIE and accordingly MINERGIE-P and MINERGIE-ECO. That way is significant easier to optimize a project because there is no need to switch between different tools and because data only has to be entered once. To this end, we designed program modules (so called DLL's) with the necessary calculation routines and data bases. As of today, one software developer completely implemented these modules, and a second company partially implemented them. Negotiations are currently taking place with further software providers.

Conclusions

MINERGIE-ECO 2011 is making a large step forward with these adjustments – not in the direction of a thematically broad sustainability label of the "second generation", but rather towards an integrated approach allowing for the easiest, most practical application possible. In so doing, MINERGIE-ECO does not want to reach so much a scientifically oriented audience but rather a high market share, thus coming closer to the objective of a sustainable way of building in Switzerland.

List of References

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[4] Swiss Federal Office of Energy, Association eco-bau, Holliger Consult: Electronic building component catalog. Online-tool for calculation of embodied energy. www.bauteilkatalog.ch

[5] Swiss Association of Engineers and Architects (SIA), SIA-Norm 380/1 "Thermal Energy in Buildings", 2009.

[6] Swiss Association of Engineers and Architects (SIA), SIA-Norm 380/4 "Electrical Energy in Buildings", 2006.

[7] Swiss Association of Engineers and Architects (SIA), SIA-Leaflet 2031 "Energy pass for Buildings", 2009.