Evaluation ENERBUILD-Tool – existing buildings

Lajon School

Picture outside

Picture outside

Picture outside

1 Basic information about the building

Name of the building	Elemnentary school Lajon
Address of the building	Ried 141. 39040 Lajen (Bz) Italy
Owner/investor	Municipality of Lajon
Year of construction	2008-2006
Planner	Arch TV Trojer Vonmetz Architekten
Building type	Massive construction
Building method	Concrete walls with external insulation
Number of buildings	1
Number of levels above earth	2
Number of levels underground	0
Kind of the public use	Educational use: school with multifunctional rooms
Effective area for public use in m ² (net)	624,9m²
Additional private uses	/
Effective area for private use in m ² (net)	/
Total effective area in m ²	624,9 m²
Source of energy for heating	Electric energy and geothermal energy
Heating system	Heat pump 8,3kW
Water heating system	Heat pump with puffer store
Date of the building evaluation	2006

2 Execution of the building evaluation with the ENERBBUILD tool

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3 Results

Nr.		Title	Must criteria (M)	max. points	evaluated points
A		Quality of location and facilities		max. 100	56
A	1	Access to public transport network		50	6
A	2	Ecological quality of site		50	50
B		Process and planning quality		max. 200	140
B	1	Decision making and determination of goals		25	15
B	2	Formulation of verifiable objectives for energetic and ecological measures	M	20	20
B	3	Standardized calculation of the economic efficiency	M	40	0
B	4	Product-management - Use of low-emission products		60	30
B	5	Planning support for energetic optimization		60	60
B	6	Information for users		25	15
C		Energy & Utilities (Passive house)		max. 350	350
C	1	Specific heating demand (PHPP)	M	100	100
C	2	Specific cooling demand (PHPP)	M	100	100
C	3	Primary energy demand (PHPP)	M	125	125
C	4	CO2-emissions (PHPP)		50	50
D		Health and Comfort		max. 250	120
D	1	Thermal comfort in summer		150	65
D	2	Ventilation - non energetic aspects		50	25
D	3	Daylight optimized (+ lightening optimized)		50	30
E		Building materials and construction		max. 200	50
E	1	$OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building)		200	50
Sum				max. 1000	716

Conference room

Central staircase

Classroom

4 Conclusions from the building evaluation with the ENERBUILD-Tool

a) Generally

The most problematic part was to gather all necessary documents and information. To be able to evaluate the part B of the planning process, an interview with the planner was necessary to figure out all information.

b) About the planning process

For the evaluation of the planning process written documentations are required, which do not always exist. Some topics were discussed and were integrated in the planning although.

c) About the building itself

The building was evaluated with 716 points and awards the ENERBUILD silver certification label. This grading is quite realistic and gives a good statement about an ecological overview of the building.

d) About the evaluation process

Problems during the evaluation problems were met in following:

Criterion B3: The criterion of economic efficiency is a must criterion, but in practice not always economic efficiency is followed for smaller public buildings, like in this example.

Criterion D2: The calculation from Uni EN 12354-5 seems very laborious. Are you doing sound-measurements usually in Vorarlberg?

Criterion D3: Is the average daylight factor meant for the whole surface of the building or only rooms were daylight is necessary (no corridors, technical rooms, WCs)?

5 Suggestions for improvement of the ENERBUILD-Tool

Some criteria of the catalog could be formulated more precise.
For example criteria B1: Division of the competitions into public competitions for architectural ideas and preliminary design, preliminary competition, executive competition, public tendering.

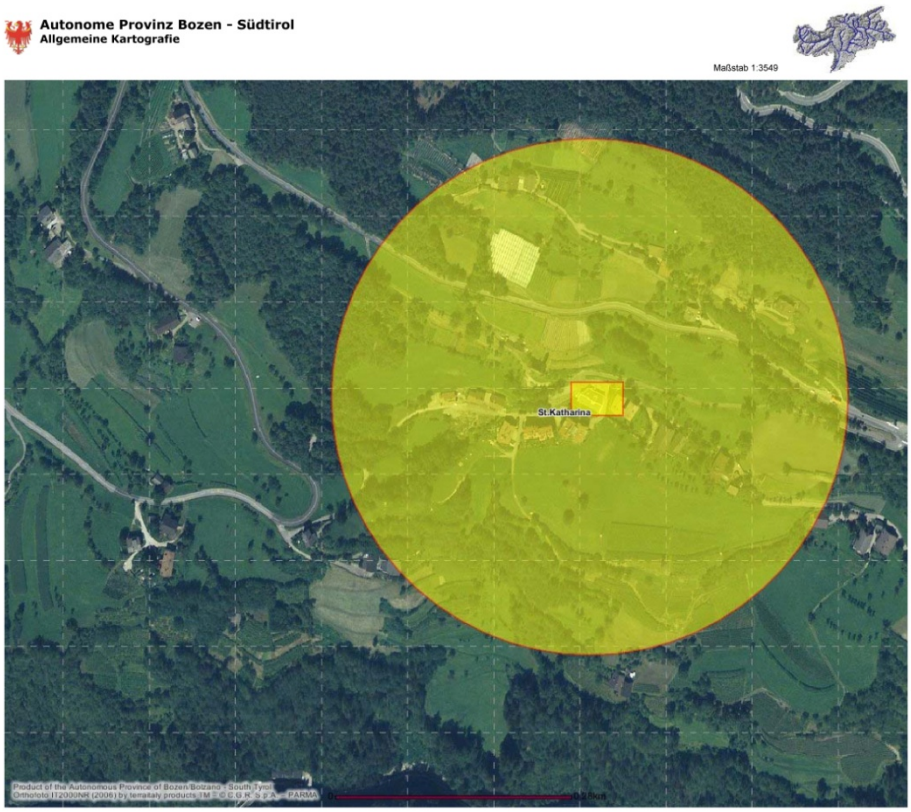
B3: The tool of Frankfurt for calculated the economic efficiency could be added in the appendix.

5. Annex A: Detailed evaluation of criteria

A Quality of location and facilities

A2 Access to public transport network

The public transport was evaluated within the surrounding bus stations in a diameter of 300 meters. There is one bus-station with an hourly frequency serving the school with the next village.



	Punkte
Access to public transport network	max. 50
Points for each bus-station in a radius of 300 m with hourly frequency or shorter frequency	je 6
Points for each bus-station in a radius of 300 m with half-hourly frequency or shorter frequency	je 10
Points for each train-station in a radius of 500 m with hourly frequency or shorter frequency	je 5
Points for each train-station in a radius of 500 m with half-hourly frequency or shorter frequency	je 8

EB-points:	Max. points:	Obtained points
	50	**6**

A2 Ecological quality of site

The function of the site was not changed. The ancient school was demolished and a new school reconstructed on the same surface.

- Therefore criteria a1 – area with zero ecological value:

Performance score	Calculated Ecological value of land
-1 – negative	>5
0 – standard	5
3 – good	2.6
5 - excellent	1

Performance score 5

EB-points:	Max. points:	Obtained points
	50	**50**

B Process and planning quality

B1 Decision making and determination of goals

A documentation of the decision making process exists partially. Different variants have been studied and evaluated in the planning phase. The 0-variant was evaluated and considered as not relevant.

Criteria	Max points	Obtained points
Exists a documentation of the decision making process	10	5
Did variants be considered and evaluated?	5	5
Evaluation of the 0-variant	5	5
Exists a documentation of the evaluation scheme of the variants	4	-
Does it contain: Urbanism Access to public transport Use of area and floor Energy efficiency Ecological use of materials	 2 2 2 2 2	

EB-points:	Max. points	Obtained points
	25	**15**

B2 Formulation of verifiable objectives for energetic and ecological measures

Definition of minimum criteria by fixing some limit values:

- The municipality fixed at the beginning of the planning process a limit for the energy consumption for heating. They defined the CasaClima A limit with 30kWh/m²a as minimum standard for the new school. Then during the later planning phases the objective was changed to the Passive House limit with 15kWh/m²a.
- Requirements for the primary energy consumption of heating where fixed within the passive-house label with 110 kWh/m²a. When the decision was taken to plan a passive house, the heating system was changed from a pellet plant to a heat pump with a ground heat exchanger. As a consequence the furnished energy for the heat pump should be delivered by a photovoltaic plant in order to become a net-zero energy building.
- The air tightness was fixed within the passive house label and the CasaClima certification: n50,lim < 0,6 h(-1)

- Efficiency of the ventilation system: the tenant and planner choose a product which was certified by the passive-house institute with a high efficiency.
- The use of regional products should be taken into account. The stones from the excavated material were used to build up the exposed brickwork of the groundfloor.

EB-points:	Max. points:	Obtained points
	25	**20**

B3 Standardized calculation of the economic efficiency

The live cycle costs and the economic efficiency were not calculated in the planning phase, but it where chosen materials with a long life time and low costs of maintaining (windows and flooring in oak tree, coatings).

EB-points:	Max. points:	Obtained points
	40	**0**

B4 Product-management-Use of low-emission products

The planner and the municipality decided from beginning on, that products with low emission should be used (insulation material, floorings, windows).

Criteria	Max points	Obtained points
Exists a documentation of the ecological optimization of the materials during the planning phases	10	0
The tender for all craftworks have been declared ecologically? Criteria like in baubook. 100% of works 90% of works 70% of works	20	0
Were all products of all craftworks declared? 100% 90% 70%	 30 20 10	20
Does un ecological building		10

supervision exist? Did the supervisor do regularly inspections on the building site? - Total construction process - Partially construction process	 20 10	

EB-points:	Max. points:	Obtained points
	60	**30**

B5 Planning support for energetic optimization

The energetically aspects during the planning and construction phase were considered and optimized.

The independent institution (Eurac research) analyzed and evaluated the effective energy consumption for heating.

Criteria	Max points	Obtained points
Compilation of a space allocation plan	5	5
Roomly distribution of air-flows as calculated in PHPP	5	5
Establishment of internal heat gains	5	5
Consideration of thermal bridges with 0,003 W(m²K)	5	5
Description of energetically requirements (Uw,Ug, g-value, effectiveness heat recovery) in tendering	5	5
Control of energetically aspects in offers	5	5
Support of site manager in energetically aspects with meetings on building site	5	5
Protocol of the initial measurement of the ventilation system	5	5
Protocol of the blower door test	5	5
Protocol of hydraulically adjustment of heating system	5	5

Compilation of energy requirements calculation after the construction phase, blower door test	5	5
Independent evaluation of the energy requirement calculation	5	5

EB-points:	Max. points:	Obtained points
	60	**60**

B6 Information for users

A user manual does not exist for the building. However when the building was delivered an informative meeting was held to inform the teachers and pupil about the use of shadings and window ventilation. An alarm signalization informs them about dysfunctions of the heating system. At the same time technicians of the maintaining enterprise are alarmed. The enterprise takes care of the maintenance of the entire building equipment and appliances.

EB-points:	Max. points:	Obtained points
	25	**15**

C Energy & Utilities (Passive house)

C1 Specific heating demand (PHPP)

Specific space heat demand: 13kWh/m²a

EB-points:	Max. points:	Obtained points
	100	**100**

C2 Specific cooling demand (PHPP)

Specific cooling demand: 0 kWh/m²a

EB-points:	Max. points:	Obtained points
	100	**100**

C3 Primary energy demand (PHPP)

Specific primary energy demand: 89 kWh/m²a

EB-points:	Max. points:	Obtained points
	125	**125**

C4 CO2-emissions (PHPP)

CO2-emissions: 11kg/m²a

EB-points:	Max. points:	Obtained points
	50	**50**

D Health and Comfort

D1 Thermal comfort in summer

Criterion	Points (max 150)
Building with less than 35 % Windows surfaces and without active cooling system	50
Analysis based on ON B8110-3	50
Or analysis OIB RL-6; KB* < 0,4 kWh/m³a	35
Or analysis OIB RL-6; KB* < 0,6 kWh/m³a	65
Or Analysis PHPP, Überschreitung 26 °C < 5 %	
Dynamical building simulation (at least for critical rooms) considerating the local climate, flexible shading systems and the respected usage of the buliding.	
exceeding 26 °C < 5 % without activ coling system (e.b.free night cooling)	150
exceeding 26 °C < 10 % without activ coling system (e.b.free night cooling)	50
exceeding 26 °C < 3 % with active cooling system	75
Analysis to prevent air currents (v < 0,1 m/s, ΔT < 2 K at the domicile)	75

Relation of opaque and transparent surfaces: 1223m² of opaque surfaces and 194,3m² of transparent surfaces. 15,9% of the surfaces are opaque, therefore the overheating analysis was made with the non dynamic calculation software PHPP.

The result of the overheating frequency is: 0%

EB-points:	Max. points:	Obtained points
	150	**65**

D2 Ventilation – non energetic aspects

Criterion	Points (max 50)
Sound transmission calculation (depending on the room use), prognostic of expected sound presser level $L_{A,nT}$ < 30 dB and $L_{C(50\text{-}4000),nT}$ < 50 dB	25
Sound emission calculation on most exposed working place $L_{A,nT}$ < 30 dB and $L_{C(50\text{-}4000),nT}$ < 50 dB	40
Sound emission calculation on most exposed working place $L_{A,nT}$ < 30 dB und $L_{C(50\text{-}4000),nT}$ < 50 dB	50

EB-points:	Max. points:	Obtained points
	50	**25**

Product sheet of mechanical Ventilation Heat Recovery Unit campus 500 DC

minimum ventilation (300 m³/h) 35,6 dB(A)

normal ventilation (500 m³/h) 37,7 dB(A)

maximum ventilation (600 m³/h) 39,7 dB(A)

The passive house certificate declares for this unit the usage of acoustical absorbers in room with air inlets and outlets. The installation of the ventilation machine has to be in a separated sound decoupled room. All this requirements were respected and therefore awarded 25 points.

D3 Daylight optimized (+ lightening optimized)

The daylight factor was calculated with following formula from UNI EN 15193, 2008 for each room:

Rooms	Daylight factor [%]
classrooms 1st floor	3,6
classrooms 2th floor	2,6
multi-functional room 2th floor	3,6
Atelier 1st floor	1,8
Office 2th floor	1,6
recreation and service rooms 2th floor	1,6
entrance and stairs	16,3
service rooms 1st floor	0,0

The average daylight factor was calculated with following formula

Result:

Mean daylight factor	3,8

EB-points:	Max. points:	Obtained points
	50	**50**

E Building materials and construction

E1 $OI3_{TGH-Ic}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building)

$OI3_{TGH,BGF}$ = 204 points

□□□□□□= 2∗(0,0007∗□□3□□□−□□□ ℎ2−0,623∗□□3□□□−□□□ ℎ+123)

EB-points:	Max. points:	Obtained points
	200	**50**