RENEW SCHOOL

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Top grades for the energy change – The New Middle School Rainbach / Mühlkreis

There must be something more than complete heat insulation! **A small community and its dedicated mayor set a wonderful example as environmentally conscious developer and invested in a high-quality refurbishment. They achieved the highest possible grades in energy efficiency and ecology and created a healthy and comfortable indoor climate for the students. They did not even have to close the school as the main works took place during the summer vacation. At the beginning of the new school term, the community started with a „new" middle school.**



Main entrance of the New Middle School Rainbach in Mühlkreis. © Rehberger

The buildings of the secondary modern school and the elementary school are one school complex in the community in Mühlkreis in Upper Austria. The elementary school was built in 1952 and the secondary modern school in 1973. Both were originally individual buildings with one common school yard. In 2000, the bad energetic condition of the secondary modern school made a general refurbishment necessary. The high heating costs, icicles, condensate and mould formation along the thermal bridges became unbearable. However, it took quite a long time until the present version could be set on track.

High-quality refurbishment is cost-, time, and work-intensive. Furthermore, the persons involved must be moved in order to enable comprehensive refurbishment. The necessary containers need space, which causes additional costs. Learning and teaching in „tin sheds" requires plenty to tolerance and patience both from students and teachers." These are some of the prejudices when it comes to the

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traditional refurbishment of schools. Motivated by the results of the "EGEM" EnergySaving Municipalities Programme Procedure the refurbishment concept was turned upside down. In the course of the EGEM Procedure, the entire region was analysed from the energetic point of view and it clearly showed that Rainbach has a tremendous need in thermal building refurbishment. Being aware of their function as a role model mayor Stockinger and the community council took this result serious and totally rethought the whole project of school refurbishment, breaking new ground both from the constructional and the educational point of view, as the secondary modern school was supposed to become a „New Middle School" in Rainbach.

The new refurbishment concept– energy efficient, ecological and fast

The architects Ingrid Domenig-Meisinger and Albert Böhm - an experienced project team that have already implemented innovative solution in previous school refurbishment projects - won the tender. The plans for the installation of a basement were set aside. As a start, the unattractive schoolyard was closed and transformed into a „communication center" in the heart of the school complex. The new entrance hall connects the two buildings and offers enough space for community events. *„Three walls already existed."* explains the architect. *"Only the roof, the floor and one wall had to be added."* The compactness of the building complex was automatically improved. There are fewer outside walls that might release the heat. The walls of the existing buildings were insulated with wooden façade elements and the second floor was added with the same wooden elements (instead of the expensive installation of a basement) thus creating new space for computer rooms and a physics lab. The new energy supply concept based on renewable, locally available energy sources, ecologically high-quality construction material and a sophisticated ventilation system with heat recovery for passive night ventilation and a daylight-controlled automatic LED lighting system completed the refurbishment concept.

„The use of pre-fabricated elements kept the construction times on the spot short and fulfilled all necessary requirements for a school refurbishment." says the architect Ingrid Domenig-Meisinger. *„The technology has already been developed, details worked out and there are a number of experienced timber manufacturing companies in this field."* In order to prepare the refurbishment the facade was measured and the individual elements and their logistic were planned in detail. The planning was quite a complex procedure, as all corners, joints, links and connections had to be worked out and solved precisely in order to avoid any remedial work during the assembly. The advantages were definitely worth the increased planning efforts. The refurbishment could be done during the summer vacation, thus saving the costs for alternative accommodation and moving twice. At the beginning of the new school term, the students and teachers could start right in the new school.

Obstacles in implementation

There are many arguments in favor of this kind of high-quality refurbishment. There were two challenges in Rainbach: On the one hand, the obvious additional costs had to be explained and on the other hand – which was by far the biggest challenge – the authorities, the users and the locals had to be convinced. The standard refurbishment had already been approved and the new concept needed to be justified. Especially the installation of a ventilation system was the source of constant discussion, even though various studies showed the bad air quality in classrooms: Unfortunately CO_2-values far beyond the permissible limits are common in schools without a ventilation system, which has a considerable influence on concentration and the students' health on the long run. These additional costs and prejudices - such as discussions on bacteria or noise caused by the ventilation system - are the common obstacles in school refurbishment projects.

The road to success

The implementation of the high-value refurbishment in Rainbach was a long and difficult road. The stubborn team consisting of the mayor and the architects never lost track of their goals. The architect organized a visit to a comparable school refurbishment site, which finally convinced those

responsible. An information day for parents, teachers and the community population set the next important milestone. An external impartial moderator guided through the event. The architects presented their project and the mayor informed about the frame conditions. The core part was a dialog where the audience was given the chance to ask questions and to discuss the project. The result was a wide approval; the advantages had finally convinced the population and the measures were not questioned any more. The approval of the modified concept by the school authority however turned out pretty complex due to the distributed areas of responsibility. It took many meetings and face-to-face talks until finally (shortly before the start of the construction work) the approval was granted.

It was also very important to involve the school caretaker into the concept and the actual implementation right from the beginning, especially concerning the building installation technology. *„This is far more complicated than 25 years ago"* says the school caretaker Erich Pröll *„the job description has changed –today you act as a technician who monitors and assesses measuring data and constantly adjusts the operation of the technical devices."* The first year after having taken the heating and ventilation systems into operation was a learning process in Rainbach. In the meantime, everything runs smoothly and the teachers and students feel great in their new school.

Additional costs vs. added value

„What are the additional costs of a high-quality refurbishment?" Mayor Stockinger could hardly wait for this question during the discussions in fall 2014, one year after having finished the refurbishment. *„With the reduced heating costs the additional costs for this heating system will pay for itself in a few years. Moreover, the supply of wood chips by local farmers increases the region's added value ".*

It takes a good financing concept, *„of course this is not so easy"*, says the mayor. *„We had to consider thoroughly which measures we should invest in. We decided that a plus-energy-building with a good indoor climate had top priority. We decided to keep the old school furniture instead that was still in a very good condition and will only be changed when needed."*

Everybody agreed that a refurbishment without a ventilation system would be at the expense of the children's health. *„This is why the ventilation system is CO2-controlled"* says the architect. *„Today our CO2-concentration is far below any limit. Not only the CO2-values have been measured in Rainbach but also many other pollutants, such as VOC and formaldehyde. „We can say with clear conscience that the students have a healthy indoor climate"*, says Mayor Stockinger.

Fact box Refurbishment Plus-energy school Rainbach:

Refurbishment: 2013
Developer: Community Rainbach in Mühlkreis, Upper Austria
Planning: Arch+More ZT GmbH, Arch. Ingrid Domenig-Meisinger
ARCHEVOLUTION, Arch. Albert Böhm
Building technology: New Energy Consulting, Ing. Jürgen Obermayer
Contractor: BM Ing. Herbert Petersdorfer
Wood construction:
Brüder Resch Hoch- u. Tiefbau Ges.m.b.H. & CO.KG.
Obermayr Holzkonstruktionen GmbH
Simader Baumeister und Zimmermeister GmbH

Key data of the refurbishment concept:

Energy indicators before/after refurbishment: 104 kWh/m2.a/ 11.6 kWh/m2.a.
Heating: Wood chip (150kW); Gas fired with peak load or failure reserve (50kW).
Solar thermal system 20 m2.
Buffer storage 2.300 l.
Ventilation/climate Passive house ventilation with moisture recovery and CO2- individual room

control.
Night cooling via atrium.
Automatically controlled shading with exterior blinds.
Lighting Daylight dependent lighting, mainly with LED.
Electricity PV system with 42 kWp; final version 50kWp.

Further information:

Haus der Zukunft Plus Plusenergieschule Rainbach:
http://www.hausderzukunft.at/results.html/id7216
ARCH+MORE: http://www.archmore.cc/cms/
ARCHEVOLUTION: http://www.archevolution.at/

Picture Serie



Mayor Fritz Stockinger, Arch. Ingrid Domenig-Meisinger and Arch. Albert Böhm in the gym-hall of the newly refurbished plus energy school Rainbach.



The new glass roof provides ample light for the corridors inside the building.
© Rehberger



The school facade after refurbishment
© Domenig-Meisinger



The school complex consisting of secondary modern school and elementary school prior the refurbishment.
© Municipality Rainbach

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