

Report



Study visit Eco materials for construction

Berlin, Germany, 26.-29.04.2010

Monday, 26 April

Introduction to the study visit program

During the study visit the following sites were visited:

Visiting a low energy multi storey dwelling house, Kreuzzigerstraße 20, Berlin-Friedrichshain

The project was developed by an informal group of people. The initiative to erect the house came from a young family currently running a small hotel business at the ground floor of the house. Additional people were asked to join the project. No formal organization was established to develop the project – the future owners of flats took care about the managing the project. The construction of the house was finished in 2008.

During the project development various options for building of a low energy house were discussed. All flats of the house are having wooden frame windows and interior walls are having clay finishing. Other decisions were taken on individual bases for each flat separately, for example, installation of triple or double glass pane windows and using non toxic materials for inside works e.g., oils for finishing of wooden materials (e.g., floors). Shading elements (automatic systems or lags) are installed for sun protection of flats.

The house is also equipped with a wastewater treatment facility located in a cellar for treatment of “grey” water from shower and sinks. The treated water is afterwards reused for toilets and washing machines.

Residents have chosen to have a central ventilation system because this option was easier to install and also more cheap. However there are also individual ventilation controlling devices installed. For example, the main air inflow in the flat visited is ensured through small openings in the window frames.

Radiators (batteries) are used for heating. The average energy consumption of house is 40-50 kWh/m²/year (including energy consumption for ventilation, wastewater treatment, hot water and heating). The price for energy consumption of a flat of ~90m² is about 350 EUR/year.



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Useful links:

- <http://home.arcor.de/k20-berlin/projekt.html> (Homepage of the project in German)
- www.roedig-schop.de/neubau-k20.html (Homepage of the architect's office with some pictures of the object)

Tuesday, 27 April

Visiting a retailing company of ecological materials “Natur am Bau”, Tucholskystraße 22

The retailer shop “Natur am Bau” offers a large variety of ecological construction materials, e.g.:

- Insulation materials - made from sheep wool (bleached/not bleached), cellulose, hemp or flax fibres and reeds;
- Sound isolation materials – made of cork, hemp;
- Finishing materials – made of clay, calk;
- Floor covering – made of wood, sheep wool;
- Various ecological water-based lacquers and oils applicable for all surfaces except glass.

Most of the products available here are produced in Germany, but also in Poland and Switzerland.

What is the difference between ecological and conventional material? For example, ecological insulation material shall meet the following criteria:

- Energy saving (appropriate insulation level shall be reached)
- Raw material shall not have negative influence on humans or environment;
- Processing (production) shall be environmentally friendly
- Application in construction process shall not cause harm to environment or people
- Usage and disposal shall not shall not cause harm to environment or people

There are several certification systems for ecological construction materials: Blue angel, FSC, Öko-test; Nature plus, etc.

Although ecological materials are in average twice as more expensive as conventional ones, the interest of customers about ecological construction, insulation and finishing is increasing. Previously in Germany it has been even possible to obtain state subsidies (up to 50%) for using of ecological materials in construction. Besides the raising awareness of people also the choice and variety of products (scope of application, variety in colours, etc.) is increasing. Ecological materials have also sufficient fire resistance level.

There are 3 similar retailer shops of ecological materials in Berlin. The retailer shops serve as “training centres” for students, craftsmen and architects to obtain information on choice of materials available.



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Useful links: www.natur-am-bau.de (Homepage of the retailer - in German)
www.made-in-clay.de
www.oekobaustoffhandel.de
www.tretford.de
www.berg-berg.com

Visiting ZRS Architects & Engineers

ZRS Architects & Engineers is based in Berlin and was founded in 2003. The total number of employees is 25 (15 architects, 10 engineers). The company offers the large-scale services-architecture, structural engineering, energy consultancy, expert evaluation, materials development as well as academic research and teaching. The office competency covers application of ecological materials (clay and earth in particular) for construction of new and refurbishment of existing buildings. The project number is increasing and company is undertaking projects around the world (e.g., historical earth buildings in Abu Dhabi, school constructed of earth and bamboo in Bangladesh). ZRS Architects & Engineers is a member of the DGNB (German Green Building Council) and have licensed auditors.

Mr. Eike Roswag pointed out that using of ecological construction materials gives opportunity to decrease energy consumption, save energy costs - energy efficiency is a priority in all their projects implemented. Clients are aware about "green" buildings and are very open to such kind projects, so it is not necessary to provide additional information to them. The company doesn't do renovation of residential buildings because the finances of such clients are limited thus they require conventional building materials. Few examples of the company's projects:

- **Ihlow House** - it is a private dwelling in load-bearing rammed earth construction (total 180 m²) that is built on already existing platform. The project was put into operation in 2006. The first floor is built from rammed earth and for construction of the second floor timber frame with hemp fibre for internal and external insulation are used. The solar panels and wood pallets are used for heating. Primary energy consumption of the Ihlow House is 24 kWh/m²/year.
- **Westend Grun** - is renovated residential villa; the total floor area is 180 m². The upper floor was teared down and new timber frame storey was built. For insulation cellulose (120 mm) is used; for construction frame - earth bricks, for wall finishing - clay plaster and reed matting for external insulation. The house was built from already prepared panels and all engineer networks have not affected building construction- electrical power networks and heating pipes were installed under walls and ground.

Participants of the study visit were introduced to the German Sustainable Building Certification system that was developed to be a tool for the planning and quality evaluation of buildings. The certificate is based on the integral planning and defines the aims of sustainable building construction. Six aspects have an impact on evaluation: ecology, economy, social-cultural and functional topics, techniques, processes, and location. For each of these aspects criteria groups are developed. In comparison with LEED and ESTIDAMA the life cycle assessment of building and scope of criteria are stricter and wider. For the building life-cycle assessment it is assumed that the lifespan of building is 50 years and after this period the significant refurbishment is needed.

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Useful links:

- http://www.zrs-berlin.de/01_website_e/index.html (Homepage of ZRS Architects and Engineers (English))
- <http://www.nachhaltigesbauen.de/baustoff-und-gebaeuedaten.html> Website made by the German Ministry for Transport, Construction and Urban Development. Access to the different portals containing data on construction and materials (in German only)
- <http://www.dgnb.de/en/> Homepage of the DGNB (German Sustainable Building Council, Deutsche Gesellschaft für Nachhaltiges Bauen)
- <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988> Introduction to LEED on the sites of the U.S. Green Building Council
- <http://www.estidama.org/> Official site of ESTIDAMA (استدامة), currently no information placed

Wednesday, 28 April

Visiting Living EQUIA solar house, University of Applied Sciences for technology and economics, Rathenaustraße/HTW

- Solar technology
- Ecologic construction materials

Living EQUIA is a joint initiative of different universities from Berlin. Living EQUIA was formed in the frame of Solar Decathlon Europe 2010 (<http://www.sdeurope.org/index.htm?lang=en>) - a competition for students/architects integrating renewable energy sources to buildings. The program started in Washington DC about 5-6 years ago and competitions are carried out biannually worldwide. Now there is a separate competition first time for Europe. Living EQUIA is one of the 20 teams competing in the Europe competition (110 applicants in the first round) and the final competition will be in an exhibition in Madrid in June 2010. Developer's team is expecting ~5000 people to visit it per day during the fair.

The project Living EQUIA started in the summer 2008. The Berlin University of Applied Sciences for Technology and Economics is mainly working with the project and the demo building is also located in their campus. Half of the financing for the project they received from Ministry of Economy and the other half comes from different sponsors. The project is completely student run – 40 students are working with it - and only a couple of specialists are outsourced (i.e. architect for statics, expert for some parts of roofing).

The architectural design of the building has been made by students but compared to other competing projects this project is more concentrating on engineering rather than architecture. The building is prefabricated and the modules have been produced in a factory in Potsdam. Modules were built in 5 days and it takes 2 days for setting up everything on site. The building has in total 74 m² of floor space from which inside of the building is 55-56 m².

Heart of the house – technical room

The building is a prototype for the Madrid fair and not really an actual dwelling house. Technical room includes facilities for:

- pV and solar systems;
- heat pump from air;
- ventilation heat recovery;
- moisture recovery – an innovation.

The house has to have all the time 23°-25°C inside temperature (that is checked during the assessment of the project in the fair).

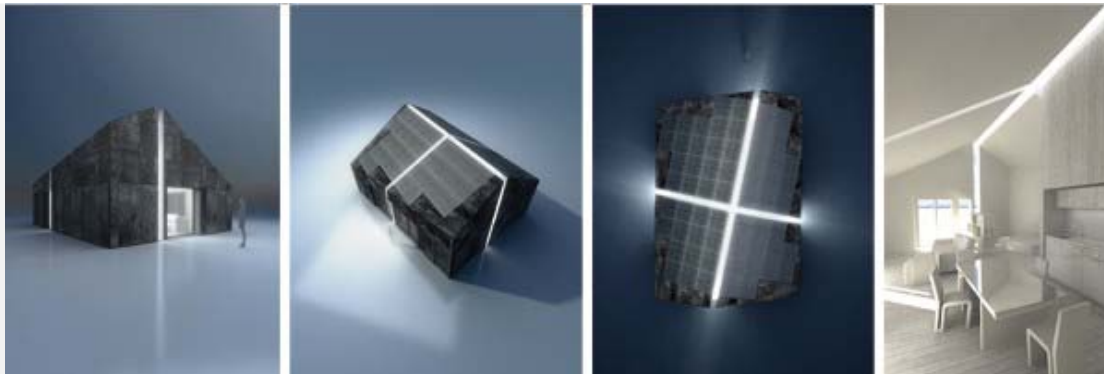
Roof

The northern side of the roof is traditional (pV and solar panels are added to the southern side). A special thing is the radiation system on the northern side of the roof to get rid of the heat and via that reduce cooling need (radiation exchange between sky and roof during the night). Phase Change Materials (PCM) are used on roof as heat storage. Southern side of the roof has photovoltaic panels and solar-thermal panels – in the façade (8m²).



Building structure and details

The house has wooden frame and is insulated with wooden wool (eco-materials are mainly used). The façade was not yet finished but will be done with flamed wood (black colour) – this has natural protection (no chemicals needed) and the colour blends in with the solar system. Also for inside plaster eco-material – clay – was used and for floors also a sustainable material – rubber – was applied. As usual for a low energy standard house triple glass windows are installed.



Picture from www.living-equia.com

The solar house has 2 big glass bands (axes) on roof for natural light and tilted ground orientation - 12° compared to roof – to provoke how we live. In the inside there is one big room, which includes a kitchen corner, dining, living and sleeping area and a bathroom. Heating of the living part of house is done via air and in bathroom it is water based system is mounted in the wall. The house does not have absorption cooling, as developers did not want an additional system but mainly use passive cooling – in case it is not enough then heat pump is used. Average energy consumption of the house is 4000 kWh/y, which makes 72 kWh/m²/ year.

As the technical systems are automatic then there will be a touch panel to control all relevant functions (lighting, Internet, music etc.). Additionally the team has a new idea – controlling by iPod.

The costs of the project are the following: 1 million Euros for the whole project from which 400 000 Euros were needed for the prototype. It can be estimated that in case of mass production the house (without home automation) would cost approximately 180 000 Euros.

Peculiarities for Living EQUIA solar house project are:

- dark façade (blocks of 1x1 metre – similar to pV panels);
- light axes;
- 12° difference under the roof.



Competition

The competition will be finalised in Madrid, June 2010 during a fair where each team has 10 days to set up their building. The competition lasts for 10 days and then each team has 10 days to dismantle the building. For Living EQUIA solar house 3 weeks are needed for dismantling on site in Berlin before going to Madrid. After competition the house will stay in Berlin where it is at the moment as a demo. Discussed has been even mass production and there are 2 different investors currently interested. Next competition will be in 2012.

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Useful links:

- www.living-equia.com Official homepage of the project
- www.sdeurope.org Homepage of the Solar Decathlon 2010

Supported by

Visting Rundling settlement project, Johannisthal district

Participants of the study visit met Mrs. Ina Tautorat who introduced the project in detail. Rundling settlement area is situated in the edge of Berlin. 100 years ago there was the first German airport, which was closed after World War I when it became an industrial area. In the mid of 1990's a nature protection NGO found that the mid of the area should be under protection and further building was forbidden. The mid area is also restricted for walking. On the circling area construction was allowed and the government of Berlin assigned it for housing with the aim of having high-rise buildings. Due to the fact that demand for such houses in that area was lacking the angle was changed and single family houses with ecological touch were built instead.

The group of houses was built after 2005. First 10 houses were built in 2004-2005. In total there are nowadays 20 houses placed on a circular way forming a semi-closed group. The architect (lives also in the community) of the buildings was searching people from Internet/fairs who would be interested in building together and living together – democratic structure and living among different generations. That kind of search takes 2-3 years.

Currently about 75-78 people live in this community starting from babies to students and to elderly people (youngest under 1 year and oldest over 70 years). They are having meetings where everything is discussed and decided together and find it important to discussing issues among themselves in the group and then make a decision.

A lot of work still needs to be done but everything takes time. They do not have an investor so everything is done step by step. If they can do some works themselves then they do together and do not order a company for that (for example ditches for water, cables for lighting).

There are no fences between gardens and houses – to have community feeling. There is only a small private area in front of each house for small gardens and the centre part of the area (house circle) is for common use. There is no car parking in the centre of the area - they are aiming for lower rate of cars because totally car free zone would be difficult due to their location. They are practicing neighbourhood support – lending cars etc.

The houses here have wood-frame structures; some have walls of straw and clay. All houses have an individual floor plan, which was a challenge for the architect. Only one house has a cellar and there all technical equipment for all houses (grey water facility, pellet boiler etc.) is stored. Some houses have additionally to heating system chimneys/ovens but that is more for creating a mood not for heating. Some houses have solar panels on roofs (not all) based on individual decision – these houses provide hot water for whole group. Some houses also have photovoltaic panels on roofs for electricity which goes to the grid and the group profits from that.

Community building

At the moment community building is in construction for which the structure is done by workers but the week after our visit an architect will come to show to the group how to apply straw blocks (30 cm) to the frame and later they will do that themselves for the whole building. Using straw will be ecological and that will be the first straw house in Berlin. Also there will be insulation layer of reed and clay plaster. Community building will also include a part where tools will be held (also bicycle repairing) and kitchen part. It will have pellet heating and chimney but no solar nor pV panels as it will have a flat green roof.



Cellar – technical room

Grey water system:

Part of the water they are cleaning themselves. It is a 3-stage process including UV radiation, which ends in the storage tank. Shower/sink water is collected to the tank and there cleaned as grey water, which then goes for toilet flushing and garden watering (their water management system). Such system also helps to save money and is not difficult to maintain. There is no central rainwater collection; some people are collecting individually for garden purposes.

Boiler house – heating with wood pellets (100kW boiler):

Electric incineration is used for burning. Relatively low effort – only ash needs to be removed once a week. Current heating boiler is more or less sufficient for 19 houses but it will get a bit difficult with the 20th house (community building) but as all houses are on low energy standard then it should not get critical. An engineer did the calculations so the heating should be sufficient at the end. As a special thing they have a flue gas washer that was specially made for them as usually only factories use them. It has 10-15% heat recovery. It was pointed out that wood pellets need double the space of oil.



Motivation and satisfaction

Motivation for living in such a community: for some inhabitants these are ecological reasons and for others community principles - having community feeling, living among several generations, knowing neighbours etc. As there are many people living together with different personalities there are sometimes conflicts and misunderstandings and for that reason they have created a conflict management team.

Satisfaction of people - some are very satisfied but this system does not work for everyone – some people want things to be ready quicker, some don't want to discuss too much, want things to be stricter but implementation of ideas in such group take time. They have democracy principle – getting a consensus.

Some subject fields (i.e. paths) have working groups and their ideas have to be approved by the whole group and such common decisions often do not come very easily and then sometimes some people feel left out and for some things move too slowly.

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Useful links:

- <http://www.rundlinge.de/> Private homepage about the project (in German only)
- <http://www.autofrei-wohnen.de/Berlin/LebJoh.html> More information about the project with collection of press releases (German, not fully up to date)

Thursday, 29 April – Departure

Feedback round and goodbye

Participants of the study visit gave a positive feedback about the content and organisation of this event. Three most interesting site visits for participants – visit at the **ZRS Architects & Engineers, Living EQUIA** and **the ecological retailer “Natur am Bau”**. Participants have admitted the good balance between visits – gaining theoretical background and seeing practical examples. It was suggested that for organisation of similar visits in future preparation of handouts of presentations would be advisable. Baltic experts would also be ready to share their information and give additional proposals for the site visits.

Attachments:

- List of participants of the study visit and contact details
- Presentation “Certification Systems for Sustainable Buildings: The German DGNB, the U.S. LEED, and the UAE Estidama Green Building Rating Systems
- Additional information “Comparing Estidama’s Pearls Rating System to LEED and BREEAM”

Photos made during the study visit are free to be downloaded at