PASSIVE HOUSE TECHNOLOGY FOR MULTIPLE-UNIT HOUSES IN VIENNA AND LOWER AUSTRIA


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Summary

The article should illustrate scientifically and comprehensively the experiences of the architectural office "Treberspurg & Partner Architekten ZT GmbH" with the realization of passive houses, focused on multifamily residential buildings, during the last 10 years.

Keywords: Multifamily residential buildings

1 Introduction

With the Kyoto Protocol Austria has agreed to reduce its greenhouse gas emissions by 13 % until 2012, compared to the base year 1990. In order to fulfill this commitment and to avoid possible payments of international CO2-Certificates, amounting from 1.5 to 5 Billion Euros (depending on current market value), financial subsidies for passive houses should be harmonized and optimized throughout Austria. This is especially relevant in regard to residential buildings, for refurbishments as well as new buildings.

In case of a general application of the passive house technology, particularly in the field of refurbishments, a clear win-win-situation would arise. Advantages would be a decrease of fossil fuel imports, on the one hand and an improvement of the employment situation in the building sector, on the other hand.

Due to recent building developer competitions for passive houses in Vienna a considerable impulse could be generated in favour of the passive house technology. In comparison to other Austrian federal states, Vienna could thereby reach first place in regard to the number of residential units built in passive house standard. This is remarkable considering that no additional financial subsidies were provided. Now this trend should be encouraged in all other federal states in Austria.

The consistent pursuit of energy-efficient and solar architecture in theory [1] and practice has been the aim of the work of the Treberspurg architect's office since 1982. A great deal of personal commitment and the awareness of the ethic responsibility of the architect to plan buildings fulfilling about the next 100 years of requirements in this field, power these efforts. It was honoured with the UIA-award in 1999 in Peking "For the

Improvement of the Quality of Human Settlements". Unfortunately, in many cases the utilized capacity and the financial expenses of the office have not been covered by such projects.

The development of the passive house technology in the past 10 years should be illustrated on the basis of realized passive houses and experiences of the architectural office "Treberspurg & Partner Architekten ZT GmbH".

2 First efforts in passive house technology

2.1 Residential building "Am Hirschenfeld", Brünner Strasse, Vienna

- 215 residential units
- 1 main building and 10 smaller buildings + kindergarten + restaurant + underground car park
- Building owner: „GESIBA gemeinnützige Siedlungs- und Bau AG", Vienna
- Architect: „ARGE Architekten Reinberg – Treberspurg – Raith", Vienna
- Completion: 1996 (competition 1991)
- Energy demand: main buidling 22 kWh/(m²a), smaller buildings: 35 kWh/(m²a) according to OIB
- Building costs net: ca. 1.000 EURO/m² useable living area

It was the first residential building project using an incoming and outgoing ventilation system with heat recovery and pre-heating of the fresh air with district heating on that scale in Central Europe. Therefore this low-energy residential building can be regarded as the forerunner of today's passive house technology. (**Fig. 1**)

Fig. 1 Residential building "Am Hirschenfeld"

3 Realized passive houses

3.1 Residential buildings EBS with one passive house, solarCity Linz

- 93 residential units including 5 residential units in passive house standard
- 7 residential buildings including 5 low-energy houses (each ca. 30 kWh/(m²a)), 1 "almost passive house"[1] (17 kWh/(m²a), 1 passive house + common rooms + underground car park
- Building owner: „EBS Wohnungsgesellschaft mbH", Linz
- Architect: „Treberspurg & Partner ZT GmbH", Vienna
- Completion: 2005

Passive house data:
- Energy demand: 12,2 kWh/(m²a) according to PHPP
- Heating load: 11,1 W/m² according to PHPP, air tightness n_{50}: 0,6/h, ventilation system with decentralised compact ventilation devices
- Building costs net: 1.325,23 EURO/m² useable living area

Aim of the research, sponsored by the program "Haus der Zukunft" from the Austrian Federal Ministry of Transport, Innovation and Technology, was to analyze three different building standards – passive house, „almost passive house" and low-energy house. The outcome of this were results about innovative technologies and the interaction between tenants-technology-costs in residential buildings. [2] (**Fig. 2**)

Fig. 2 Residential houses EBS

3.2 Residential building "Pantucekgasse", Vienna

- 114 residential units + common rooms + underground car park
- Building owner: „a:h Gemeinnützige Siedlungsgenossenschaft Altmannsdorf-Hetzendorf", Vienna
- Architect: „Treberspurg & Partner ZT GmbH", Vienna
- Completion: 2006
- Energy demand: 7,3 kWh/(m²a)) according to PHPP

[1] „Almost passive houses" are buildings which do not fulfill all passive house criteria but are more energy efficient than „low energy houses".

1 Heating load: 7,2 W/m² according to PHPP, air tightness n_{50}: 0,2-0,5/h, ventilation system with decentralised compact ventilation devices with smallest heat pump hot water supply
- Building costs net: ca. 1.212 EURO/m² useable living area

At present the residential building "Pantucekgasse" is the biggest realized passive house project in the field of multifamily residential buildings. It consists of a compact structure and a multitude of different access types and apartment types (**Fig. 3**).

Fig. 3 Residential building "Pantucekgasse"

4 Realized "almost passive houses"

Due to the current situation of financial subsidies in Vienna and Lower Austria where no additional financial subsidies for passive houses are available to cover extra costs, it is very difficult to win housing developers for passive house projects. On this account many projects are realized as "almost passive houses" with lowest energy demand to tap the full potential of financial subsidies.

4.1 Residential building "Pfarrhofgasse", Purkersdorf

- 48 residential units + medical practice + underground car park
- Building owner: „GPA Wohnbauvereinigung für Privatangestellte", Vienna
- Architect: „Treberspurg & Partner ZT GmbH", Vienna
- Completion: 2006
- Energy demand: 16 kWh/(m²a) according to OIB
- Heating load: 18 W/m² according to OIB, air tightness n_{50}: 0,45-0,95/h, ventilation system with decentralised compact ventilation devices
- Building costs net: ca. 1.324 EURO/m² useable living area

The residential building is located in the centre of the village Purkersdorf and built in lowest-energy standard with a controlled ventilation system featuring heat recovery. The two upper floors are a timber construction. The building's heating is supplied by local heat from the biomass district heating plant in Purkersdorf (**Fig. 4**).

Fig. 4 Residential building “Pfarrhofgasse”

4.2 Residential building “Withalmstrasse”, Wolkersdorf

- 16 terrace houses + 65 residential units + common rooms + underground car park
- Building owner: „KAMPTAL gemeinnützige Wohnbaugesellschaft GmbH“, Horn
- Architect: „Treberspurg & Partner ZT GmbH“, Vienna
- Completion: 2006/2007
- Energy demand: terrace houses: 21 kWh/(m²a), residential units: 11-21 kWh/(m²a) both according to OIB
- Heating load: terrace houses:19 W/m², residential units: 15-21 W/m² both according to OIB
- Building costs net: ca. 1.500 EURO/m² useable living area

The initial idea was to build the total residential buildings in passive house standard. This had to be given up due to insufficient financial subsidies. Nevertheless, 5 terrace houses were planned as passive houses, but due to the lack of potential tenants these passive houses had to be re-planned as low-energy houses (**Fig. 5**).

Fig. 5 Residential building “Withalmstrasse”

5 Conclusions – Promotion of passive houses

5.1 General requirements

- Further education in passive house technology should be available for planners as well as executors. The topic should be also be further integrated into the university education and training of architects.
- Research programs and funds, especially in the field of refurbishments, should be guaranteed in the long term and in adequate amount to support scientific research as well as the realisation of pioneer projects. Without the financial subsidies for the possibly ending program "Haus der Zukunft" of the Austrian Federal Ministry of Transport, Innovation and Technology, approx. 60 % of the passive housing units realised in Vienna and Lower Austria would not have been able to be completed.

5.2 Incentives for architects and planners

- Passive houses should receive the highest possible financial subsidies. In Lower Austria only severely reduced subsidies and in Vienna no subsidies for passive house projects are available at present.
- Subsidies for the initial phase of passive house projects should be guaranteed through a subsidy fund in order to cover the extra planning costs. The tender must include a two-stage procedure, which evaluates the projects according to formal criteria and content.
- A passive house consultant who can be chosen from a pool should be involved from the first phases of passive house projects. The costs should be mainly covered by federal subsidies. The resulting integral planning is crucial for a successful realisation of passive house projects. [3]

References

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