The Three Sisters, klimaaktiv object of the month 12/2018

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Abstract. In the lakeside city of Aspern in the 22nd district of Vienna, the homebuilding association for private employees has established the residential complex “The Three Sisters” on the construction site D22, a plot of land measuring 5,200m². When planning the building envelope of the three buildings which range from four to six floors, the responsible persons consciously decided to use the Wienerberger “Porotherm 50 W.i. Plan” brick. Thus, the first multi-storey residential building project has been constructed using the latest brick generation. The use of a mineral and monocoque construction method makes a significant contribution to eliminating the need for petroleum-based full heat insulation. Therefore, the building complex can throughout be categorized as a low-energy building. Further notable advantages of the applied construction method and building design include the use of an exterior wall system without additional insulation (upgraded insulation on the outside) to obtain a U-value of 0.12 W/m²K which corresponds the passive house standards. The high demands of the construction design in terms of ecological, economical and socio-cultural quality of the three building components are reflected in the ecological selection of construction materials, the persistence of the building complex and the stability of value, as well as apartment sizes, assisted living, smart-start-apartments, integrated green space concepts, roof terraces, urban gardening, etc. The TQB certification with 769 out of 1000 points has been obtained and the project has been awarded with klimaaktiv GOLD to prove the quality of the project and ensure quality assurance and management.

1. Goal to establish more sustainable buildings for the future of the urban development district lakeside city of Aspern
The substantial requirement for a sustainable building is to consider the holistic contemplation of a building (construction, operation and demolition) in the first planning-phases (ideally already included in the preliminary design/design). In the lakeside city of Aspern this is an aim resp. a prerequisite for every building to be constructed. The coordination of planning and implementation, execution of legal requirements, energy efficiency, sound insulation, ecological material-selection, user comfort, quality management of the building envelope by the means of BlowerDoor-tests, quality management of the room air by the means of internal space hygiene measurements can be observed throughout the project at hand. The achieved TQB-certification (with 769 out of 1000 points) and the klimaaktiv-certification with the highest possible rank “gold” and being the klimaaktiv object 2018-12 speaks for itself.

2. Implementation of sustainability-topics
In the course of the implementation of a sustainable building the responsible party purposely decided on the use of the Wienerberger “Porotherm 50 W. i. Plan” brick. It is the first multi-storey residential
building project to use the new generation of bricks during its construction. Due to the continuously in
mineral and single layer type constructed structure in nearly zero energy building quality, an essential
contribution was being made in order to relinquish from using crude oil-based heat insulation. Further
benefits of the construction material brick lie in the easy separability of the material (mineral wool as
cuttings in the tubular body) [1] at the end-of-life of a building and the recycling-ability of the brick
fragments [2].

2.1. Heat insulation
With this exterior wall-system, a u-value of 0.12W/m2K (passive house standard) can be reached
without the use of additional insulation (upgraded insulation on the exterior). The values of the energy
performance certification are respectively positive:

- Heating demand: 21.31 kWh/m² gross floor area and year
- Primary energy demand: 48.04 kWh/m² gross floor area and year
- CO₂: 5.7 kgCO₂/m² gross floor area and year

The monolithically wall with integrated heat insulation (cuttings made of water-repellent mineral
wool located in the tubular body) distinguishes itself due to optimal structural-physical and biological
performance and therefore presents itself as a timely and sustainable exterior wall solution.

Figure 1. Wienerberger "Porotherm 50 W. i. Plan" (W. i. Wärmédämmung inklusive) [3].

a. Heating system

Building A and building B
- Radiator: Individual room control with thermostatic valves, individual heat consumption
  calculation, radiator (60 ° C / 35 ° C)

Building C
- Floor heating: room thermostat zone control with time control, individual heat consumption
  calculation, surface heating (40 ° C / 30 ° C)
- Radiator: room thermostat zone control with time control, individual
  Heat consumption calculation, radiator (60 ° C / 35 ° C)

b. Sources

Central space heating is provided by District Heating Vienna – “Fernwärme Wien” and is
combined with a water tank in order to provide also hot water.

2.2. Requirements for the airborne noise insulation of the exterior components
According to the executed airborne noise measurements (for the W. i. series – 42,5, 38, etc.) at the
acoustic testing facility of the TGM Vienna, a sound reduction index RW of 48dB can be reached with
the Porotherm 50 W. i. Plan, bilaterally plastered. This corresponds approximately with a conventional
Porotherm brick with a VWS-system, hence it accomplishes the legal minimum requirement for
airborne noise insulation of exterior components until the category R’re s w = 43dB. Therefore, generally the requirements for the airborne noise insulation are being met by the W. i. brick.

2.3. Requirements for the airborne noise insulation in the interior of the building (divider walls)
Indoor units resp. apartment divider walls at residential constructions are to be measured in a way that provides that between both neighbouring utilization units/apartments (conditioned by the sound transmission through the separating component and the acoustic vertical transmission of the flanking constructions) a minimum requirement for the airborne noise insulation according to legal basis resp. OIB directive 5 and ÖN B 8115-2 is being adhered to (minimum requirement for the residential divider walls -> evaluated standard sound level difference DnT.w > 55dB).

Considering the acoustic vertical transmission topic, the flank of the exterior wall brick W. i. presents a certain sonically weak spot due to the hole pattern and the meagre mass. Regarding this, a detailed design by the means of a sonically separation at the divider wall connection has been acquired by the cooperation with the company Wienerberger, to improve resp. solve this topic.

3. Result of sustainable planning and-topics
The optimized planning resp. implementation concerning power demand, selected construction material, construction, comfort and room air quality can be observed through the achieved awards:

Point statement of the main categories for KlimaAktiv GOLD:

**Figure 2.** Point statement for the KlimaAktiv-certification [4].
4. “The Three Sisters”

Building A(NNA) / assembly house: This component with a total of 33 flats is designed as an assembly house for the group "Que[e]rbau". Que[e]rbau stands for self-chosen identity, self-chosen form of life and thinking outside the box, independent of propagated norms. In the assembly house, a five-storey central atrium assumes the function of opening up as a meeting place.

Building B(ELLA): There is something for everyone here: from the SMART start apartment with two rooms right up to five-room apartments. Two thirds of the apartments are oriented to the east and west. This component is comprised of 40 flats, and designed as a 6-storey building with recessed open-space zones and is accessible through two staircases. On the upper floors, the development is partly via an open access balcony.

Building C(LARA) / assisted living: This component is designed as a whole for assisted living with several operators and different care concepts.

On the ground floor, Diakoniewerk rented three apartments for the accommodation and care of migrants. On the 1st and 2nd floor, HABIT - Haus der Barmherzigkeit - runs a dormitory for children and adolescents with multiple disabilities. Furthermore, on the 3rd floor the association Integration Vienna operates a living community "Lebe bunt", for disabled and non-disabled young people.

An integrated green space concept connects the adjacent building plots into a coherent whole. Roof terraces, a communal sauna, a club café and an "urban gardening" field in the middle of the area complete the offer for the community.

4.1. Contributions to user satisfaction

Each of the 78 subsidized housing units has been supplemented by its own open space (terrace, balcony, loggia) and an additional storage room. In addition, all apartments have above-average room heights of about 2.63 m to 4.00 m and are therefore higher than required by the Vienna Building Code. Wherever possible, "French windows" have been installed that extend from floor to ceiling, visually increasing the space and allowing in more light and sun. The larger units are oriented and illuminated at least on two sides and therefore easy to ventilate, which provides great added value, especially in summer. Furthermore, each apartment is equipped with a controlled fresh air supply.

5. Conclusion

The requirements for the regionality of the materials (<200km linear distance to the construction site) for the primary structure resp. insulation could be met, as could be the application of low-pollution and low-emission construction products, which were implemented by the means of product management (separated approval before the installation of the materials).
Supplementary equipment like a playground, a roof terrace, a sauna, club- resp. common rooms and a community garden are available for the occupants of “the three sisters”.

The correct choice of ecological materials, validation-measurements of the airtightness (which prove the quality of the building envelope) during the construction progress resp. measurements of the room air quality (which ensure the innocuousness of the superficially installed materials) guarantee for the appropriate quality of this project.

Consequently, it can be guaranteed that “the three sisters”, due to the excellent cooperation of the architecture- and the sector planning team, the building owner; executing companies and urban development, was not only developed as an outstanding project but also put into action as such.

References

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