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VISION & REALITY – GLÜCKSTEIN QUARTIER – CONCEPTUAL DESIGN OF A HOUSING ESTATE IN THE TECHNOLOGY OF PASSIVE HOUSE – PROJECT ANALYSIS

VISION & REALITY – GLÜCKSTEIN QUARTIER – KONCEPCYJNY PROJEKT OSIEDLA WIELORODZINNEGO W TECHNOLOGII BUDOWNICTWA PASYWNEGO – ANALIZA PROJEKTU

Abstract

The article is about the concept of a housing estate in Germany. The project was created as a part of a competition. The contest was organized by the ISOVER Company. The name of the contest is ISOVER Multi-Comfort House Students Contest Edition 2013 Vision & Reality – Glückstein Quartier. With reference to a historical place which belongs to our place, the development has been called "diamond apartments" Houses have a shape like the crystal of a diamond. The way of creation, location, and building shape assure the maximum usage of solar energy, so that there will by optimal thermal comfort inside. The project also includes a large scale service and entertainment building complex, located in the immediate vicinity planned residential development.

Keyword: housing estate, multi house, passive house

Streszczenie

Niniejsza praca przedstawia opis, koncepcji projektu energooszczędnego osiedla mieszkaniowego w Niemczech. Projekt powstał w odpowiedzi na konkurs ogłoszony przez firmę ISOVER, ISOVER Multi-Comfort House Students Contest Edition 2013 Vision & Reality – Glückstein Quartier. W nawiązaniu do historycznego kontekstu miejsca, osiedle zostało nazwane „diamentowym". Forma budynków bezpośrednio nawiązuje do kształtu diamentowego kryształu. Sposób posadowienia budynków na działce, oraz ich kształt pozwalają na maksymalne wykorzystanie energii słonecznej, celem zapewnienia optymalnego komfortu cieplnego wewnątrz mieszkań. Projekt zakresem obejmuje również duży kompleks usługowo-rekreacyjny znajdujący się w bezpośrednim sąsiedztwie projektowanego osiedla.

Słowa kluczowe: osiedle mieszkaniowe, budownictwo pasywne

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1. Introduction. Aim of the competition

People thinking in a different way about the use of non-renewable sources of energy that follows technological progress, is something that is reflected in the modern process of design and construction of buildings.

Therefore, engineers created effective solutions for improving energy efficiency of residential buildings [1, 3–5]. With the aim of popularizing energy-saving construction, the organizer of the contest has announced a multi-family housing project in the historic district of the city of Mannheim in Germany. The project scope of the Isover Multi-Comfort House Students Contest Edition 2013 Vision & Reality – Gluckstein Quartier project consisted of residential buildings with high energy systems.

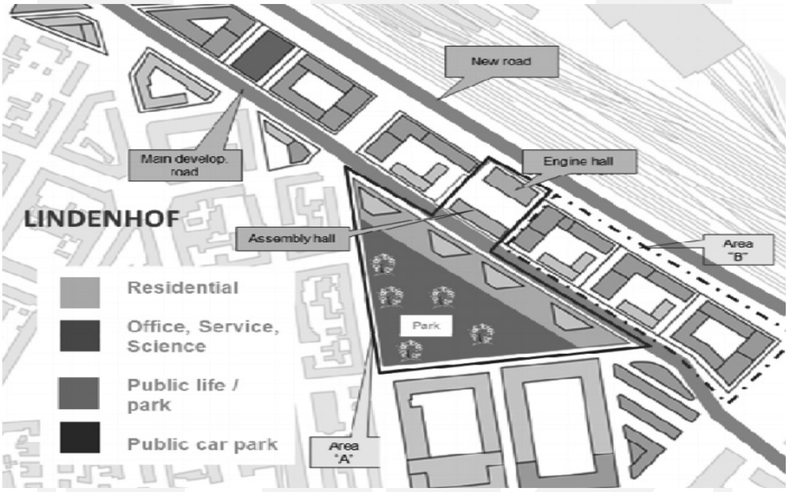

Fig. 1. Designed area, Mannheim

Glückstein Quartier is the north district of Mannheim. Situated directly opposite to the train station, between housing stock the Lindenhof and also Inner-City. The main aim of this project is create a new neighborhood planning system which connects different zone development parts. There are two areas: A and B where urban complex should be created. Area "A" is dedicated to residential functions. A maximum of 4 buildings with the maximum height level of ground floor + 4 floors shall be constructed in this area. The estimated number of flats is estimated at under 150 apartments. This area also contains historical buildings as well as the park. The task is to find a sustainable usage for both these spaces as well as a good link between the park area and the existing building stock of "Lindenhof" in the South-West and the two historic buildings and the new development to the North-Est.

"B" area is for both non-residential and residential usage. The task of the contest for this part is to create a master plan and a design for the building shapes, facades and the exterior green, taking into account office, service and scientific functions as well as residential functions. The height level for this area is: residential: ground floor + 5 upper floors, non-residential: ground-floor + 11 upper floors [1].

2. The concept of a passive building

The design for area "A" presented in our concept provides four multi-family buildings. The building is formed so as to take maximum advantage of solar energy. The name and the idea of new residential building comes from a diamond. The shape and the form of the buildings are similar to a diamond shape. The design is simple, transparent and excellently collaborates with the sun . Symmetrical shape, modular units of dwellings and the repeatability of used materials makes our investment quick and inexpensive. This factor provides a high class and energy-saving passive house that is economical both at the stage of formation and in operation.

Most of the windows are oriented south-east and south-west, which supplies maximum solar energy gains. In front of the elevation there are balconies, designed to eliminate the overheating of the housing during the summer. Their design is not connected to the the facade, so the thermal insulation is constant. The northern part of the building is a corridor. Designing the corridor as a separate structure saves us energy, which is needed to heat such a large area, and also is a buffer zone isolating from a busy, noisy street. All machinery and equipment, which use passive and active methods of saving and gaining energy, contributes to the low energy consumption on A++ level.

The most important part of the project is the optimally corresponding layer of thermal insulation. For vertical partitions, a double layer of Isover Sillatherm WVP 1–035 0.16 m (Fig. 3) is adopted, for the flat roof: Isover Metacam FLP 1 – DURATEC 2 × 0.18 m. (Fig. 4). There are solar collectors, located on the roofs of buildings at 45% of the surface, ceiling to roof. In addition, the operation of the building assumes the use of rain water, spin-off sites for waste segregation, and storage of rainwater to be used on private plots.

The existing parts of the city have been linked to park streets which lead to the other new urban neighborhood. This site is designed as a recreational services complex. It is composed of a modern office space, science facilities, high-quality living space and meeting places for social life. The district also offers a tremendous opportunity for investors who want to get involved in the development of an economically and ecologically valuable project of utmost importance. This zone consists of three similar building complexes. To help with the navigation around this district, each was named after a stone: Amber, Ruby, Gold.

Between the modern facilities, we can find two interesting historical buildings. The arrangement of Diamond buildings, trees and paths give us a perfect open view and connection from the Lindenhof. Renovated engine hall was adapted as an Independent Art Center, where residents will be able to learn a new craft that is film, music, theater, and present their work. In assembly hall, there are cafes and restaurants. Between the buildings, park with numerous small fountains for spending leisure time was designed.

All residential and recreational complex service is designed to raise the standard of living and working, as well as minimizing the need for non-renewable energy in the city center.

Buildings meet the requirements for passive certification: usable energy of less than 10 kWh /m^2 per year, primary energy below 60 kWh/m^2 per year. Linear heat transfer coefficient $\Psi = 0.01$ W/mK. Calculations were performed according to [2, 6–9] and the procedure laid down by the competition organizer.

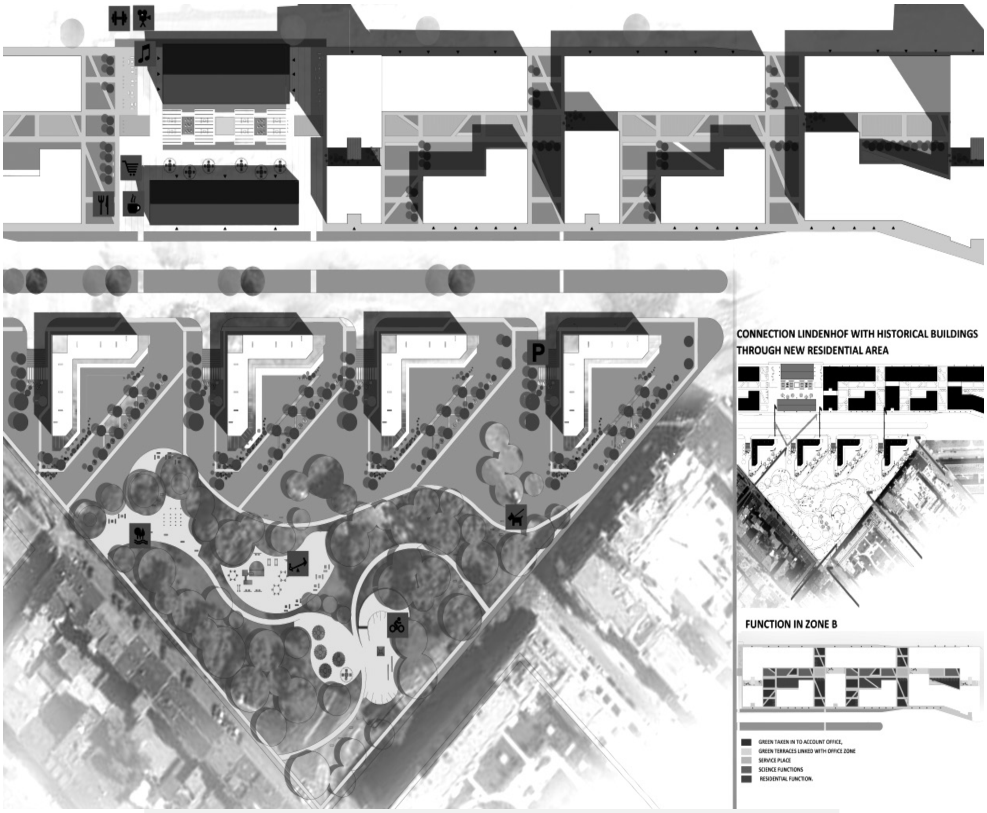

Fig. 2. Project diamond apartments's development

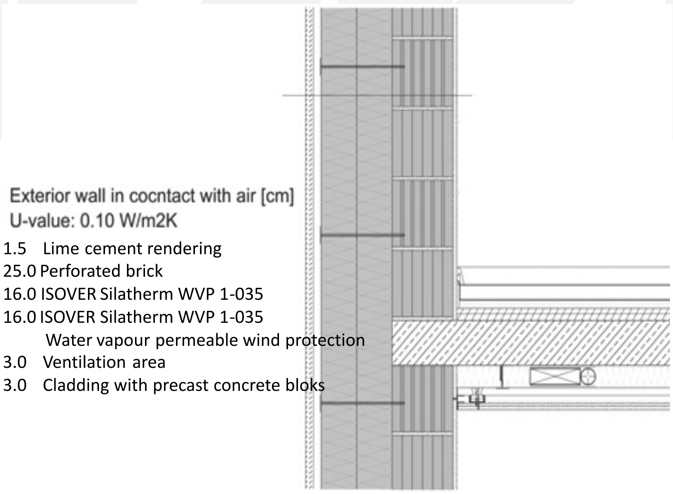

Fig. 3. Exterior wall in contact with air

5. Conclusions

This design of a multi-family residential complex may be an example of combining modernity and innovative solutions with historic buildings. It is one example that can be in harmony with the psychological habits of future users to design buildings with high energy efficiency while blending them in with the tissue of a historical urban area.

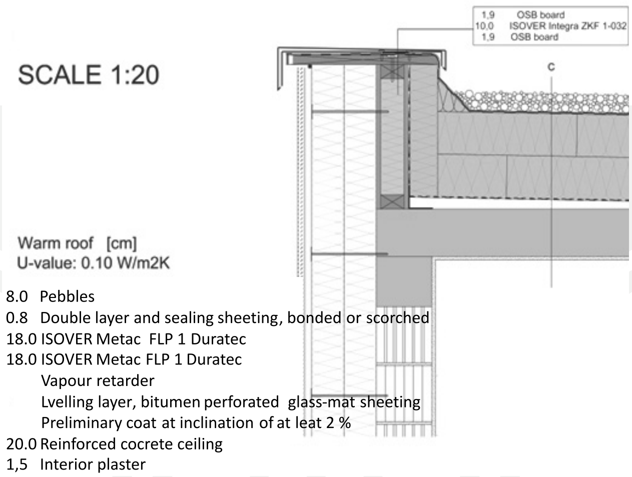

Fig. 4. Warm roof

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