

INTERNATIONAL UNION OF ARCHITECTS



SUSTAINABLE BY DESIGN 2050

AN INITIATIVE OF THE UIA

HOME

Minimum Impact House

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Architect

Drexler Guinand Jauslin Architects

Engineers/Specialists

Wameling Ingenieure Offenbach

Location

Western Europe - Germany - Frankfurt am Main

Climate Zone

temperate

Design status

build

Date of completion

2007

Type

Mixed use

Site area (m²)

119

Footprint (m²)

29

GFA (m²)

222

NFA (m²)

145

NFA/GFA

0.653

Density

1.866

Gross Volume (GV) (m³)

665

Building Costs

280000 EUR

Building Costs / m² GFA

1261.261

Building Costs / m² NFA

1931.034

Building Costs / m³ GV

421.053

Primary Energy (kWh/m²a)

10.2

Heating Energy (kWh/m²a)

13.9

Cooling / Heating-System

Air-Water-Heat Pump with Solar Thermal

Use of renewable resources - low tech

natural cross ventilation, evaporative cooling, others

Use of renewable resources - high tech

solar heating, heating pump

Renewable, recycled, recyclable and innovative materials

Solar power (hot water), heat pump outside air

Key Sustainability aspects

renewable building materials, recycling and reuse, ecological building materials, integrated planning process, participation of users in planning process, low cost design, use of innovative design tools

Sustainability rated

Passive House

Social and ethical responsibility

Building their own home is the dream of many people, especially families. Here a strategy is provided to create a new type of homes in the city and reinforcing the social, economic, and cultural fabric of the urban centres. In the fast-grown suburbs an unnatural homogenous population is created because on the very small group of people usually moves there within a short period of time. This segregation of a large proportion of the society weakens the social structure. In the city centre a social groups a mixed and interact. The individual experiences being part of a society every day. This understanding is the foundation for any social and democratic understanding.

Resource efficiency and environmental impact

Residential houses are the main course for land-use. Building new suburbs leads to the destruction of natural environments, more streets, traffic, and pollution. One



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important aim was to demonstrate that in the smallest urban niche it is possible to build a fully-functioning house which meets the highest design standards and ecological criteria.

As part of the research a portion of the city was systematically searched for left-over-spaces in which minihouses could be built. An large number has been found which implies, that up to a third ($\approx 29\%$) of the demand of residential housing for the next ten years, based on an estimate of the planning department, could be integrate in existing urban fabric if appropriate building-types and construction technique will be applied.

With highly efficient buildings the annual running of the building is only a part of the ecological impact. The life-cycle analysis investigated four modules for minimising the impact of the project: - Operation of the building- Building construction- Mobility land use and building new infrastructure. The aim was to reduce the energy consumption and ecological impact in all modules by readjusting design, construction, and technology of the building. With highly efficient buildings the energy contained and emissions caused by the building construction can by a substantial part of the overall balance. Using life cycle analyses the contents of the construction materials were added to the energy consumption over an estimated life span of 50 years. The results show that even in conventional building the construction has a greater impact on the GWP and about equals the amount of energy used for heating during 50 years.

From the life-cycle-analysis it became clear that a timber construction would result in a substantial reduction of energy contents and emissions. Since five-story timber buildings can only be building with exceptional permission a alarm-system, escape-routes and highly fire-protective cladding for the construction was needed. By this an new prototypes for urban timbre houses was design, which should also be readable in the choice of material in the facade

Economic lifecycle performance

Because of the small land, the overall cost of the project were roughly equal to a suburban house with the same floor area. The increased cost for the development and construction of the prototype was compensated by the reduction of the annual running-cost which reduced the annual debits. The design of the facade and the integration of highly-efficient technology reduces the energy-consumption reduces

In a research project the prototype was compared to a typical suburban house. A life-cycle-analysis quantified the amounts of energy, material, and investment for the construction, and consumed during an estimated life-span of the buildings of 50 years. The analysis for which a software was developed was also used as a design-tool for optimising the prototype-building in terms of energy-consumption, construction, and materials. For the building construction renewable resources, mainly timbre, had been used which reduces the energy content and emissions.

Contextual performance and impact

Minimum-Impact-House is a holistic approach for the reduction of the overall-impact of residential housing by creating a new type of residential house by densifying the city centre. In the design project a prototype mini-house has been developed to explore the potential of so far uninhabitable urban niches. A triangular site of only 29sqm was chosen to built a Mini-house in size comparable to a family house of 150sqm. This strategy avoids the further use of land and the need of building of new infrastructure like streets and public buildings. The city centre is denser an environment so that the inhabitants won't to travel so often to work, shopping, education, or cultural events. Densifying the city centre is a chance for new architecture and redefining the urban structure. During the last century planning and building was focused on suburbs and big commercial and public buildings often missing the one-to-one experience of the people. Urban life needs small spaces and niches to flourish. People need chances to build their own homes that they can relate to an identify rather than picking one in thousand generic suburban terraced houses.



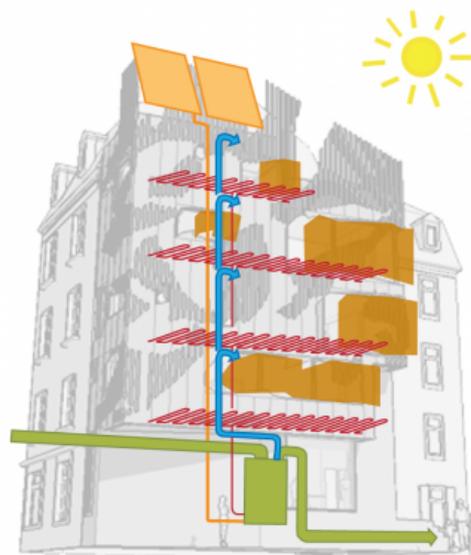
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Grundriss EG



Grundriss 1. OG



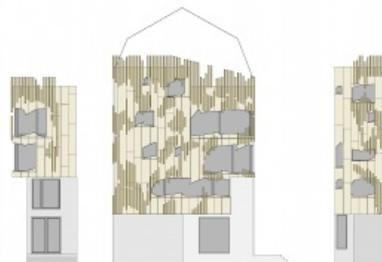
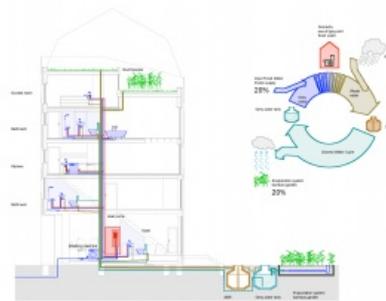
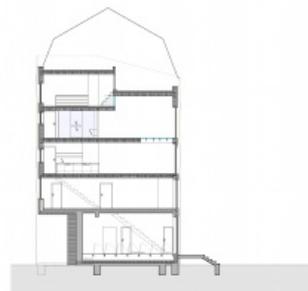
Grundriss 2. OG



Grundriss 3. OG



Grundriss 4. OG





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