

# solarCity Linz-Pichling – Sustainable City Development

Author:

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## Kindergarten

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**Client:** IMMORENT, Pan Grundverwertungsgesellschaft mbH, Vienna, A

**Design:** arch-schimek.at ZT GmbH, Linz, A, Architect Dipl.-Ing. Olivia Schimek

**Design of outdoor spaces:** arch-schimek.at ZT GmbH, Linz, A, Architect Dipl.-Ing. Olivia Schimek

**Completion:** 1<sup>st</sup> construction phase – building 1: 2003, 2<sup>nd</sup> construction phase – building 2: 2005

**Usable floor area:** 1<sup>st</sup> construction phase: c. 1,180 m<sup>2</sup>, 2<sup>nd</sup> construction phase: c. 1,060 m<sup>2</sup>, total c. 2,240 m<sup>2</sup>

**Energy demand:** including all active solar energy systems: 9 kWh/(m<sup>2</sup>a) or 21 kWh/( m<sup>2</sup>a)

### Location

The site of the day nursery is located at the south-western edge of the solarCity at the point of transition to the existing development in Pichling. As a result of its consistent west-east orientation and its positioning on the site, the building forms a protective shield to Neufelderstrasse, while the longitudinal side, with the aligned rooms for children's groups, opens onto the south, onto the generously dimensioned green space of the outdoor areas.

### Concept

In 1998, the City of Linz launched an architecture competition for the design of a twelve-group day nursery as a low energy building. Even at this early stage of the project, the main aspects of the architectural design followed sustainability as the key principle behind all measures.

In terms of energy technology, the solarCity day nursery is a pioneering and trendsetting project. From the very beginning, the architecture was designed according to ecology requirements and energy requirements, and consequently the facility was constructed so as to achieve passive building standards.

Correspondingly, in refining the architectural concept special attention was paid to the didactic function of this building. This is apparent particularly in the overall concept of colors and materials and in the design of the interior, including the specially designed furniture.

## **Building design and structure**

### **Entrance**

The main entrance and the adjoining waiting area for parents are positioned at the intersection of the main east-west circulation axis with the north-south pedestrian access route.

### **Building volumes**

The compact form of the building provides the basis for minimizing energy losses.

The consistent east-west orientation enables passive solar energy gains through the generously sized areas of glazing on the south side.

The building is a combination of various building elements with very different requirements:

- "Service block": the pair of two-story, north-facing blocks that run parallel to Neufelderstrasse accommodate all the service functions and facilities – timber
- "Glazed passageway": this circulation and communal space also functions as a passive and active energy collector – steel, glass and concrete
- "Children's houses": the rooms for the children's groups are housed in the two south-facing two-story cubes that are oriented towards the outdoor space – timber

### **Structure**

The timber structure makes a consistent contribution to an energy-conscious, environmentally sound building, and is low in expenditure of energy during construction.

### **Building envelope**

- North facade: optimum thermal insulation. Additional weather protection by means of a lattice of wooden slats. Glazing is kept to a minimum.
- South facade: large areas of glazing for passive solar energy gains with a frame in front to provide shade and protect against overheating in summer. This dual shading-system with fixed wooden louvers and planting that loses its foliage in winter creates a pleasant microclimate in the transitional area to the outdoor space. A photovoltaic system that forms an integral part of the permanent horizontal shading is elevated on the frame that carries the planting.

### **Passageway**

The "children's houses" with the group rooms and the "service block" are reached by a passageway flooded with daylight that connects the central entrance area and the parents' waiting area with the outdoor areas. This high, bright and airy space formed by a steel and glass structure, with its galleries, bridges, stairs and lobbies, forms a communicative, stimulating communal area and plays an important role in providing orientation inside the building.

## **Energy concept and building services**

### **Passive measures**

- Timber structure, reduction of the construction period thanks to the use of prefabrication
- Compact form of the building with a favorable surface – volume ratio
- Optimal positioning of the building in terms of orientation while taking into account the urban situation
- Minimization of transmission heat losses through excellent insulation and small windows on the north side
- Solar energy heat gains through the glazed passageway and the large south-facing glazing
- Clear organization of the temperature zones
- Daylighting concept minimizes the use of electricity

### **Active measures**

- Controlled ventilation with heat recovery system minimizes the need for additional energy and creates a pleasant room climate
- The glazed passageway collects and transfers additional solar energy gains with water collectors to provide warm water, air collectors (gravel heat storage) and water collectors (water tank heat storage) to gain heating energy and photovoltaic cells to complete the overall energy concept
- Connection to the district heating system in the context of the overall energy supply concept for the solarCity
- Daylight-dependant artificial light control
- Automatic building control system

With the proposed measures, a heating energy requirement can be achieved of 9 kWh/(m<sup>2</sup>a) in relation to the gross floor area (including active use of solar energy) or 21 kWh/(m<sup>2</sup>a).

### **Solar collectors**

130 m<sup>2</sup> of air collectors (building 1) and 130 m<sup>2</sup> of water collectors (building 2) form the core of the solar energy heating system. An additional 30 m<sup>2</sup> of water collectors cover the warm water consumption (entrance hall).

### **Photovoltaics**

150 m<sup>2</sup> of photovoltaic cells provide half the electricity requirements of the day nursery.

### **Gravel heat storage, building 1**

140 tons of gravel temporarily store the heat gained by means of the air collectors.

### **Water tank storage, building 2**

32,000 liters of water temporarily store the heat gained by means of the warm water collectors.

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