Wind Power, Solar Technology and Rain Water Technology

San Francesca girls' residential home in Tokyo/Japan

Klaus W. König

For 75 years already the nuns of San Francesca in the outskirts of Tokyo take care of orphaned children in various Japanese locations. In the Far East the Italian order accomplishes the social mission of its foundress Francesca Saverio Cabrini. In 1880 she started to establish orphanages around the world. In December 2008 the new girls' residential home for young adults was finished as a complement of San Francesca Tokyo and accommodated the first five girls of age. In new buildings wind power, solar technology and rain water technology are integrated. "This is demanded by those Christian women as the preservation of creation is one of their fundamental ethical obligations" explains the Japanese architect Hiroshi Kamiya with regard to his planning. In a construction time of only one year, he brought the specifications of the order into a form, which according to the U.S. green building certification program LEED would gain the platinum medal or gold medal. For water saving and healthy indoor climate, the required number of points would be achieved with certainty.

Having attained the age of 18, the juveniles are sent out into the world and henceforward they have to fend for themselves. Depending on their professional education and personal development this is more or less risky considering the turbulence of Japan's capital Tokyo. With the new residential home the order is now able to offer girls of age, still being weak in their personal development, a smoother transition into adult live. In Japan the extended family traditionally offers protection and support. Such a bridge in the everyday life is invaluable, especially because Japan's male-dominated working world is hard for parentless female juveniles.

Fig. 1. *Girls' residential home San Francesca.* Photo: König

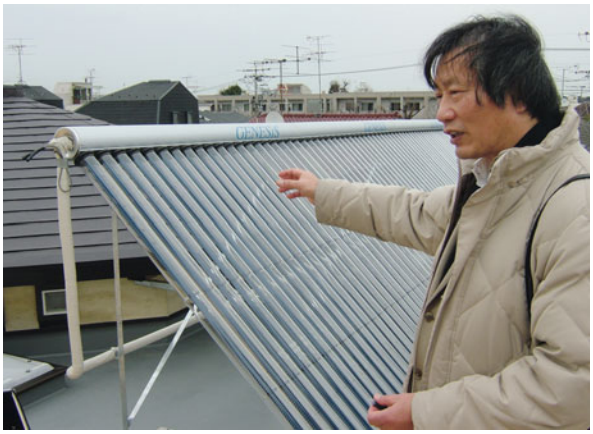

Fig. 2. *Solar vacuum collectors for hot water and floor heating, Architect Kamiya.* Photo: König

Construction and building equipment

The social mission of the nuns of San Francesca has also an ecological and a building biological component. Resources of nature are to be protected by the use of energy saving and CO_2-neutral building equipment. For heating in Tokyo's mild winter solar thermal tube collectors suffice, on cold days a stove with wood firing is additionally put in operation. Rain water is retained on the site up to 100 %. The water partially evaporates through the roof planting and a biotope, partially it seeps away for groundwater

Table 1. Project data new building girls' residential home.

Residents in the new building:	9 girls, 4 nuns, 1 administrative secretary
Address:	San Francesca, 3–9 Kugahara, Ohtaku Tokio/Japan (Children's home with 25 girls and 25 boys)
Planning:	Hiroshi Kamiya, Suikei Design, Tokyo
Realization/master builder:	Garan-Kousha, Yokohama
Land area	466 m²
Gross building area	266 m²
Gross floor area	465 m²
Commencement of planning	March 2006
Commencement of construction	December 2007
Completion	December 2008

History of the order San Francesca

Francesca Saverio Cabrini, born on 15th July 1850 in the vicinity of Milan, was the child of humble people, the last but one among 11 siblings. With 18 years of age she became an elementary teacher, took care of children in a neighbouring village and managed the orphanage in Codogno for 6 years. In Codogno and at the age of 30, Cabrini founded the order of the "Missionary Sisters of the Sacred Heart", an order that was confirmed by the Pope in 1881. Since early childhood Cabrini suffered from various diseases and general physical weakness. Nevertheless, she hurried from the establishment of one subsidiary to the next: Her road led from Codogno and other small villages of the Lombardy to Milan, from there to Rome and southern Italy, from Rome to New York, then to other countries of Europe as well as North, Central and South America. Francesca Cabrini died in Chicago on 22nd December 1917 at the age of 67. She was buried in New York. Source: www.kirchenlexikon.de

recharge. A rain water reservoir guarantees the water supply in case of emergencies. The biotope and the soakaway are fed from the overflow of the rain water reservoir. The feeding pump obtains its power from a photovoltaic and wind energy plant.

As to the choice of the building materials, the care for nature and the health welfare of the residents, the so called building biology, were crucial.

Fig. 3. *Rainwater filter made in Germany, Wisy down pipe filter SAGF type at the rainwater down pipe.* Photo: König

For such a special combination of tasks there are only few architects in Japan. Hiroshi Kamiya is one of them. The 60-year-old, since 1990 self-employed with his office Suikei Design, manages several interdisciplinary groups for green building and groundwater protection in the land of the rising sun. In addition, he teaches at the Hosei University in Tokyo. Kamiya, also planner for a part of the World's Fair 2005 in Aichi/Japan, has already been several times in Germany for exchange of information. He is a member of the Fachvereinigung Betriebs- und Regenwassernutzung fbr in Darmstadt. "In Japan, water recycling is becoming increasingly important," Kamiya said in a discussion with Dietmar Sperfeld, an expert at the fbr. "But Germany is the world leader in this technology, particularly in filter technology."

Filter made in Germany

Utilization of rainwater is one of the water-saving measures that have been promoted in Hesse from 1992 to 1997 by the provincial government. In this period the German company Wisy experienced an upturn with the new development of its rain water filters. The company is known in Japan since 1998 and has become the epitome of German rainwater technology. The patented filter collectors and vortex fine filters have been the attraction of the international fair in Tokyo's district Sumida City in August 1998. The Japanese engineers paid much attention to these products because they yield a water output of more than 90 % at simultaneously free cross section for discharge of dirty and residual water.

Architect Kamiya was one the first using these self-cleaning filters in Japanese projects. In 2001, at invitation of Wisy, he presented results and new ideas of his architect's office at the Internationale Regenwassertage in Mannheim. ▶▶

Fig. 4. *External washbowl with dual connection drinking water (left) and rainwater.* Photo: König

Fig. 5. *View of girls' residential home, new building 2008.* Drawing: Suikei Design

Ecology

- Recycling and natural construction materials
- Wind turbine
- Photovoltaics
- Solar heat and wood stove
- Green covering of the roof
- Rainwater utilization and soaking-in

Rainwater Management

Height of the total annual precipitation in Tokyo	1500 mm
Roof planting for evaporation	97 m² roof area, 18 m² planted surface
Accumulating area for rainwater utilization	68 m²
Filter in the intake at the down pipe	2 x Wisy down pipe filter collector FS
Rainwater reservoir	20 m³ in in-situ concrete underneath the building
Overflow of the reservoir	soaking-in on the site

Rainwater utilization:
- Emergency reserve for use in case of disaster (fire and drinking water)
- Biotope supply
- Groundwater replenishment

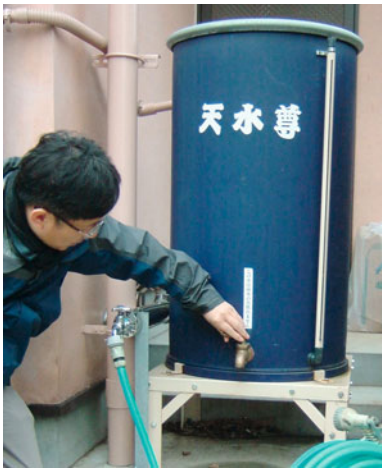

Fig. 6. *Rainwater reservoir above ground installed for easy access by children for irrigation purposes.* Photo: König

The founder of Wisy, Norbert Winkler, is interested in the exchange of views with such pioneers in Far East: "Our Japan business has now been stabilized. Even the rainwater museum in Sumida shows our products."

Fig. 7. *Wind turbine, power generation for supply of the rainwater circulation pump for the biotope and open water.* Photo: König

The world's first rainwater museum was established in 2001 by Dr. Makoto Murase. As a member of staff of the public health service and environmental officer an abandoned primary school has been placed at his disposal by his city council. From 2011 the rainwater museum will be relocated into a new building at the foot of the Tokyo Sky Tree television tower, which with 610 meters will then be the highest tower of the world. After its completion in two years time, this tower is to stand for the beginning of the digital broadcasting age in Japan and is to be a landmark for earthquake-proof civil engineering. The steel construction was started in July 2008; the tower shaft protrudes already beyond the surrounding commercial buildings in the district of Asakusa.

Renewable resources

Architect Kamiya and the building owners of the girls' residential home San Francesca went a step further than merely ordering the ecologically best material. They had the ambition to convey to the children the correlation between nature and city, the relevance of regional circular flow economy, and the value of the forest for the natural water balance. From his working group for ground water protection in the Tokyo area Kamiya knows the Tama region as drinking water catchment area of the metropolis, especially the village Kosuge. "A good forest management in the long term guarantees the drinking water supplies of Tokyo," knows Kamiya. "The forest owners' cooperative in this sense does an excellent job. Therefore, we give them our support by ordering the needed timber right there." He was on a field trip in Kosuge with a selection of the 50 children living here. Together with the children he identified the trees to be felled in the forest.

Another aspect of the natural water cycle is experienced by the children of San Francesca in the garden where a wind turbine drives the DC motor of the circulating pump which conveys accumulated rainwater from the underground cistern into the biotope and into a small rain reservoir located above the ground. This rain reservoir is used by the children for irrigation and hence arranged to be easily accessible. The children can make use of it in order to irrigate plants with little watering cans on their own responsibility. On a laterally mounted tube the water level in the reservoir can be optically checked in a simple way. The rainfall from the roof fills the rain reservoir again and again, excessive waters are seeped away on the site for groundwater replenishment.

Rainwater technology

For the water quality and the failure-free operation of a rainwater utilization plant the most critical component is the filter. Two down pipes with a German made filter run toward the reservoir which is cast in in-situ concrete underneath the ground plate. The filter sleeve, a perforated cylindrical element with a grade of filtration of 0.28 mm, fits within the wall of the intake pipe without constricting the pipe cross section. This allows an efficient dirt rejection (filter type C in accordance with DIN 1989-2: 2004-08). Filtered particles are flushed away into the sewer pipe without clogging the filter or without having to be disposed. This results in a high effi-

ciency and long service life, i.e. high water yield, good cleaning performance and long cleaning intervals. According to DIN 1989-1 such a filter has to be cleaned only once a year.

For many years already architect Hiroshi Kamiya has found the Wisy-filters to be completely satisfactory in this projects in Japan. He is fascinated by the fact that the physical mode of operation of the Wisy-filters allows the separation of the so called first flush. Until the filter fabric is entirely wet, the first litres of the roof discharge flow into the soaking-in. Thus, deposit from the roof and air pollution constituents dissolved in the rainfall do not reach the reservoir. Of course, over the years suspended particles contained in the water will be deposited as sediments on the bottom of the reservoir. To promote this self-acting process of sedimentation the reservoir is divided in 4 chambers by barriers. The rainwater runs into the first chamber while the removal with a buoyant suction filter of Wisy is installed in the fourth chamber. By this construction mode and by the consistent protection against day light the stored rainwater supply is storable with no time limit – a precondition for usability in the event of a disaster. Kamiya appreciates the clear guidelines of the DIN 1989 for rainwater technology in Germany. His ambition is to establish a standard for rainwater utilization in Japan according to the German standard. He directs the professional group for rainwater at the Architectural Institute of Japan AIJ in Tokyo.

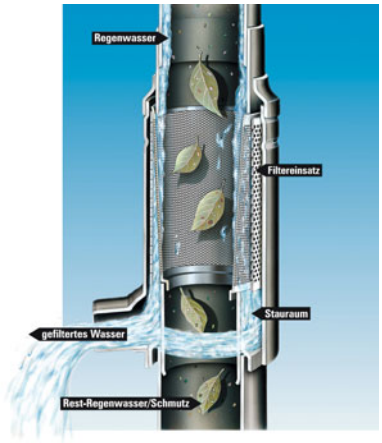

Fig. 8. *Mode of operation of self-cleaning rainwater filters.*
Graph: Wisy

The attendants consider the transfer of the German standards to Japanese circumstances. In October 2009 members of the initiative visited the DIN-headquarter in Berlin within the context of an excursion.

Just as Francesca Cabrini, the foundress of the order, formerly travelled around the world in social mission, deeply convinced by the necessity of her action, nowadays ecology experts like Hiroshi Kamiya travel from one continent to another in search of environmentally friendly building equipment for creating places of sustainable civil engineering. The girls' residential home San Francesca is such a place – both socially and ecologically.

Fig. 9. *Playground orphanage San Francesca.*
Photo: König

Contact:
WISY AG,
Haustechniksysteme, Filtertechnik,
Oberdorfstraße 26,
D-63699 Kefenrod,
Phone +49 6054 9121-0,
Ms. Cecile Hahn,
Mr. Jan Maurer,
E-Mail: jmaurer@wisy.de,
www.wisy.de