Example name: Renovation of residential area Dieselweg 3-19/Graz

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For installations

BISTS Location: Graz - Áustria,
15º27'48.49'' E
47º02'13.93'' N

Climate Type: Dfb

Building Use: Residential building

Level of BISTS integration
Rush: Level 3
Reijenga: 4

O New Build
X Refurbishment
O Other: ……

Type of BISTS:

Hybrid

Function(s):
X Air heating
X Water heating
O Combi-system
X Cooling/ventilation/shading
X PV/T
O linked to another system (e.g., heat pump)
O Other: ……

Building element:

X Facade
X Roof
O Other: ……..

BISTS characteristics:

Solar thermal energy: The innovative energy concept is the integration of solar thermal collectors in all south and southwest façade, the roof of carport was also covered with collectors and additional collectors were installed on the roofs of the five single buildings. The total area of collectors provides 3 m^2 of collectors per apartment.

Heat storage: Heat storage tanks (5 m^3) are installed in the basement and supplied by the solar thermal plant and a ground water heat pump.

Heat distribution: The heat distribution is done by small heating pipes, inserted in XPS insulation boards and mounted on the existing walls; these are warmed from the outside.

DHW: Is done decentralized in the apartments, but supported by the heat storage tanks. The pipes are located between the old and the new façade.

Façade solutions – *"To insulate with sunlight"*:
Special solar-comb construction (cellulose) converts light into heat (warm during winter/ shading during summer). Rear-ventilated glass panels protect the solar-comb construction from weather and mechanical damage. Increase of the surface temperature; improvement of the indoor environment quality. High acoustical absorption. Solar-comb construction can be painted in every colour. The components are pre-fabrication off-site.

Stage of Development: Complete **Responsible:** ESA-Energie Systeme Aschauer GmbH

O	Idea/Patent	……..
O	Prototype	……..
X	Demonstration	Dieselweg 3-19
O	Integral building element	……..
O	Commercially available	……..

BISTS description and context

Project motivation: Obtain a reduction of the heat demand in about 90% and also diminish the greenhouse gas emissions. Furthermore, is intend to get a reduction in operating costs for space heating and DHW-preparation, avoiding an increase in rents, also allowing lower monthly charges for the tenants.

Building name / Year of construction: Dieselweg 3-19 / 1952

Function and form: Residential buildings, parallelepiped shapes in plant

Size: 204 apartments, 14520 m^2 of net floor area

Renovation concept: The essential improvement of the thermal envelope with prefabricated façade modules. The integration of a series of components into the prefabricated façade module system like windows, ventilation devices and solar thermal collectors. The implementation of a new and innovative solar-active energy concept.

System viability

		Before	**After**
Running costs	**Heating**	Before renovation about € 2.00 m^2 net floor area/month (calculated for an apartment heated by electric heating device).	After renovation about € 0.11 m^2 net floor area/month.
	DHW	Before renovation about € 0.40 m^2 net floor area/month.	After renovation about € 0.10 m^2 net floor area/month.

Modelling and simulation tools developed/used

BISTS Performance data

Based on:
O Estimation
O Detailed simulation

X Measurement/testing
X Long-term monitoring

Performance parameters

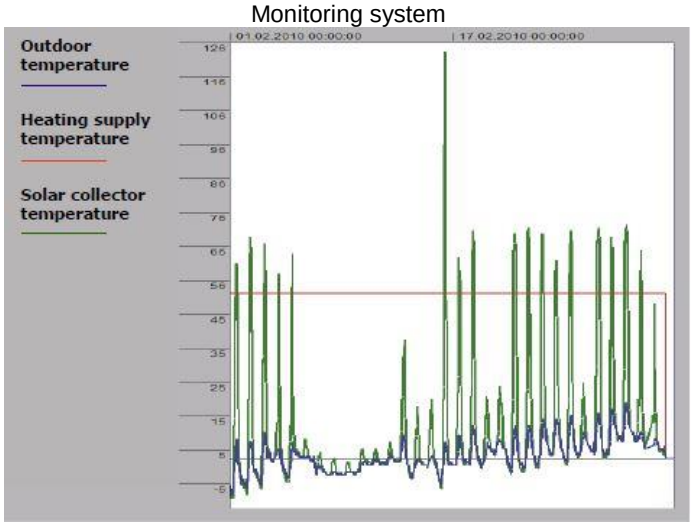
For integrated systems:
key performance indicators -

Solar savings fraction: %
Light transmittance: %
Solar transmittance: %
Total solar energy transmittance: %
Solar heat gain factor: %
Building fabric U-values: 0,02 -0,12 W/m^2K
Noise, fire, etc ratings
Other:

For separate collectors:
performance rating coefficients -

Other:

Monitoring system



Additional information:
Sources and references:

INSTRUCTIONS

Please fill in as much information as possible.

Tick where appropriate.

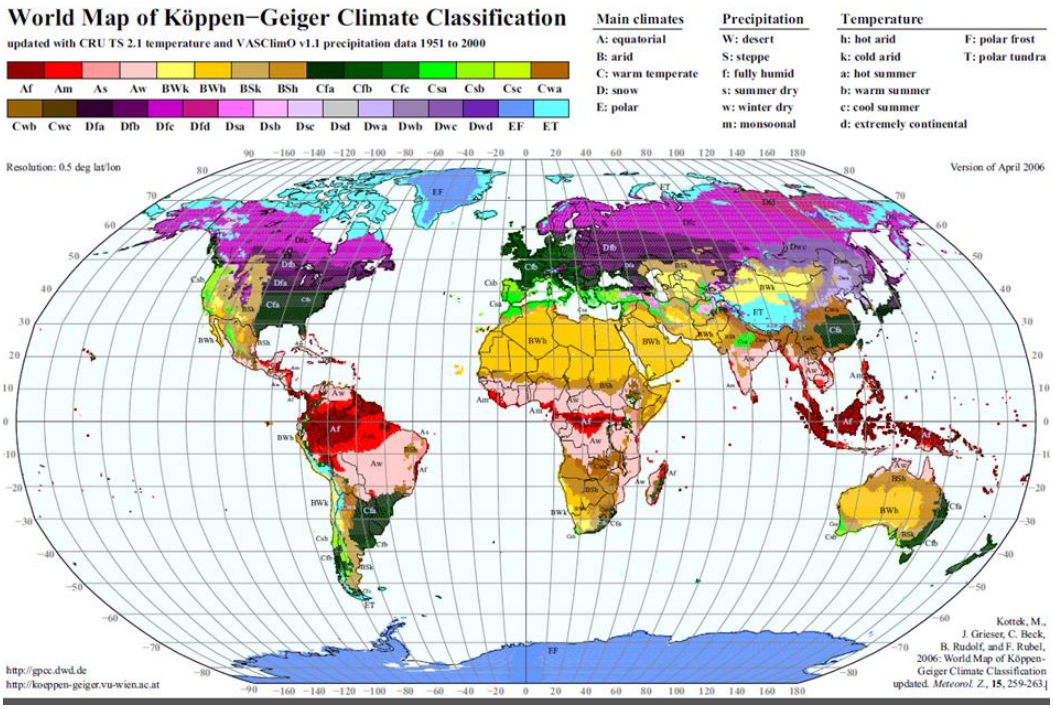
Text in red is suggested guidance. Insert information in provided space, removing red text as appropriate

If possible, use metric values.

If necessary, supply additional information on separate sheets

Reference listing

Köppen climate classification



(Kottek, M., J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of Köppen-Geiger Climate Classification updated. Meteorol. Z., 15, 259-263.)

Reijenga classification

The integration of PV systems in architecture can be divided into five categories:

1. Applied invisibly
2. Added to the design
3. Adding to the architectural image
4. Determining architectural image
5. Leading to new architectural concepts.

(Reijenga, TH and Kaan, HF. (2011) PV in Architecture, in Handbook of Photovoltaic Science and Engineering, Second Edition (eds A. Luque and S. Hegedus), John Wiley & Sons Ltd, Chichester, UK)

Rush classification
The architectural/visual expression of building services systems are identified as:

Level 1. Not visible, no change
Level 2. Visible, no change
Level 3. Visible, surface change
Level 4. Visible, with size or shape change
Level 5. Visible, with location or orientation change

(Rush, RD. (1986) The Building systems integration handbook Wiley, New York, USA)

Collector test standards

BS EN 12975-2 2006 ‘Thermal solar systems and components solar collectors - Part 2 test methods’
ASHRAE Standard 93-2010 ‘Methods of Testing to Determine the Thermal Performance of Solar Collectors’
ASHRAE Standard 95-1987 ‘Methods of Testing to Determine the Thermal Performance of Solar Domestic Water Heating Systems’