Example name: *Utopia Garden Project*

Template completed by:
Constantinos Vassiliades,
c.vassiliades@hotmail.com

Photographs

For installations

BISTS Location: *Dezhou, China, +37°26'2.73", +116°21'26.87"*
Climate Type: *Dwa*
Building Use:*Residential.*

Level of BISTS integration
3. Adding to the architectural image

√ New Build
O Refurbishment
O Other: ……………………
tick all that apply

Type of BISTS:

~~Active~~/Passive/~~Hybrid~~
delete as appropriate

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

Building element:

√ Facade
√ Roof
O Other: ……………………..
tick all that apply

Drawings/Sketches/Cross-sections

BISTS characteristics:

The project is 504 vacuum tube collectors placed horizontally into a massive metal casing in the form of a wave, which covers all the rooftops of the buildings, as well as horizontal vacuum collectors placed in orthogonal frames to the facades. The solar fields composed of vacuum tubes with a gross collector area of about 1,400 sq.m., utilize the sun on the roof and feed a central heating and cooling system running through the entire building complex. The domestic hot water tanks are positioned on the balconies behind an element with horizontal vacuum tubes. The tubes are placed in front of all the 20-storey building. Any excess solar heat is stored in a seasonal storage space underneath the complex.

Stage of Development: Responsible: *Company.*

O Idea/Patent ……………………………………..
O Prototype ……………………………………..
O Demonstration ……………………………………..
O Integral building element ……………………………………..
√ Commercially available *Hi-Min*
tick all that apply

BISTS description and context

It is a complex of apartment buildings called "Garden Utopia" Project in the Chinese city of Dezhou.

System viability

The flat owners save up to 75 % of annual energy costs in their new accommodations.

Modelling and simulation tools developed/used

For example….new modules/types created for established simulation programs, stand-alone modelling, use of generalised codes, model outcomes, validation and accuracy. Design tools developed

<table>
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BISTS Performance data

Based on:
O Estimation
O Detailed simulation
Specify software(s) used
O Measurement/testing
O Long-term monitoring
tick all that apply

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: W/m^{2}K
Noise, fire, etc ratings
Other:

For separate collectors:
performance rating coefficients -
(EN12975, a0,a1,a2), ASHRAE, etc

Other:

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Graphs for collector efficiency, seasonal energy gains, diurnal/seasonal solar fraction, etc.

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<tr><td colspan="2">

Additional information:

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Sources and references:

http://solarthermalworld.org/content/china-utopia-garden-sets-new-standard-architectural-integration
http://www.renewableenergyworld.com/rea/news/article/2012/06/solar-thermal-scales-new-heights-in-china
http://www.chinasolarcity.cn/Html/tours/180001568_2.html

</td></tr>
</table>

INSTRUCTIONS

Please fill in as much information as possible.

Tick where appropriate.

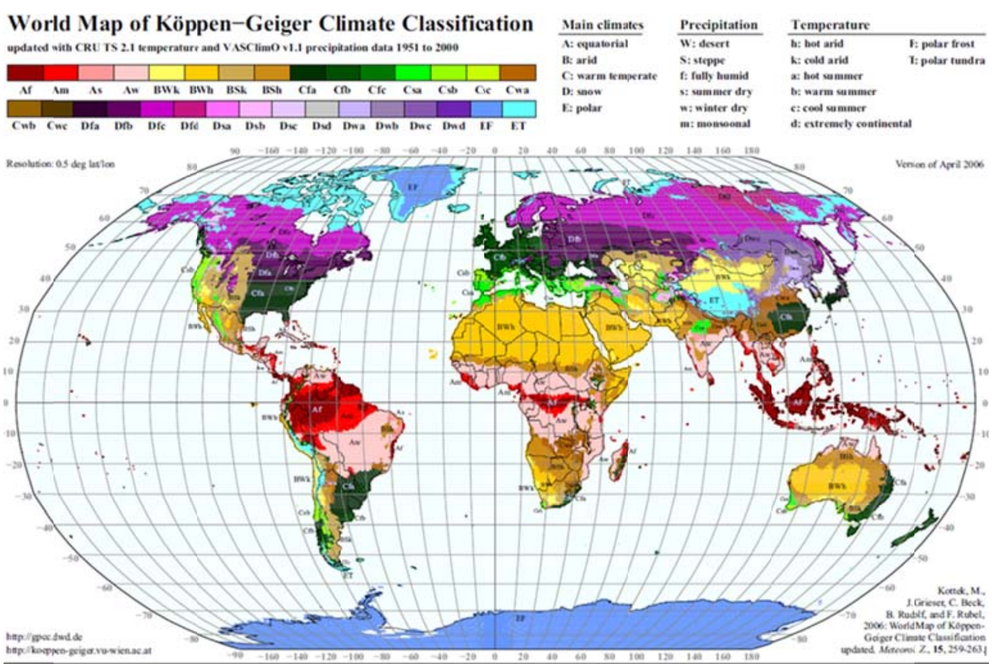
Text in red is suggested guidance. Insertinformation in provided space, removing red text as appropriate

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 Classificationupdated. 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'