Example name: *The Villa, Prefab Construction*

Template completed by:
Constantinos Vassiliades,
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Photographs

For installations

BISTS Location: *Can be placed everywhere*
Climate Type: -
Building Use: *Residential.*

Level of BISTS integration
3. Adding to the architectural image

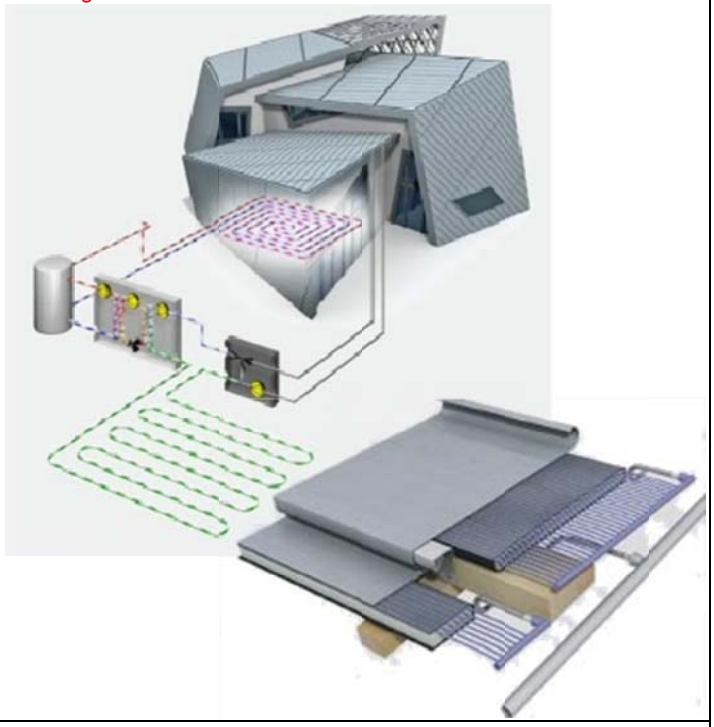
√ New Build
O Refurbishment
O Other: ……
tick all that apply

Type of BISTS:

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

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

Drawings/Sketches/Cross-sections



Building element:

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

BISTS characteristics:

The system uses a combination of solar and geothermal energy. Unlike conventional solar panels which operate only by direct solar radiation, in this case the heat and the humidity of the ambient air is used as a heat source. It is a hybrid system which during the winter, draws energy from the ground through geothermal probes and heat the water, and in the summer the energy is collected by the solar thermal installation in the zinc sheets. The weakness of the system is that light-colored surfaces yield less heat than dark collectors.

Stage of Development: Responsible: *Company.*

O	Idea/Patent	……..
O	Prototype	……..
O	Demonstration	……..
O	Integral building element	……..
√	Commercially available	*Rheinzink*

tick all that apply

BISTS description and context

It is a two-storey villa, which is prefabricated and can be sent and built anywhere in the world. The frame is made of wood, while the shell is consisted of zinc sheets. Beneath the zinc sheets, the piping of the thermal system is placed.

System viability

For example….Economic viability (capital and running costs), maintenance, embodied energy, environmental impact and sustainability, wider social contexts

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

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:	*Graphs for collector efficiency, seasonal energy gains, diurnal/seasonal solar fraction, etc.*
Additional information:	
Sources and references: *http://daniel-libeskind.com/projects/villa-libeskind-signature-series* *http://www.follow-your-inspiration.com/Libeskind-Villa/sustainable-concept* *ftp://lesoftp.epfl.ch/Download/Roecker/Del_BC_V1.pdf* *http://www.archdaily.com/25078/daniel-libeskind-designs-prefab/1489441932_c2af6fff6a/* *http://www.follow-your-inspiration.com/Libeskind-Villa/Solar-Geothermal-Heat* *http://www.jetsongreen.com/2009/10/libeskind-villa-modern-prefab-germany.html*	

INSTRUCTIONS

Please fill in as much information as possible.

Tick where appropriate.

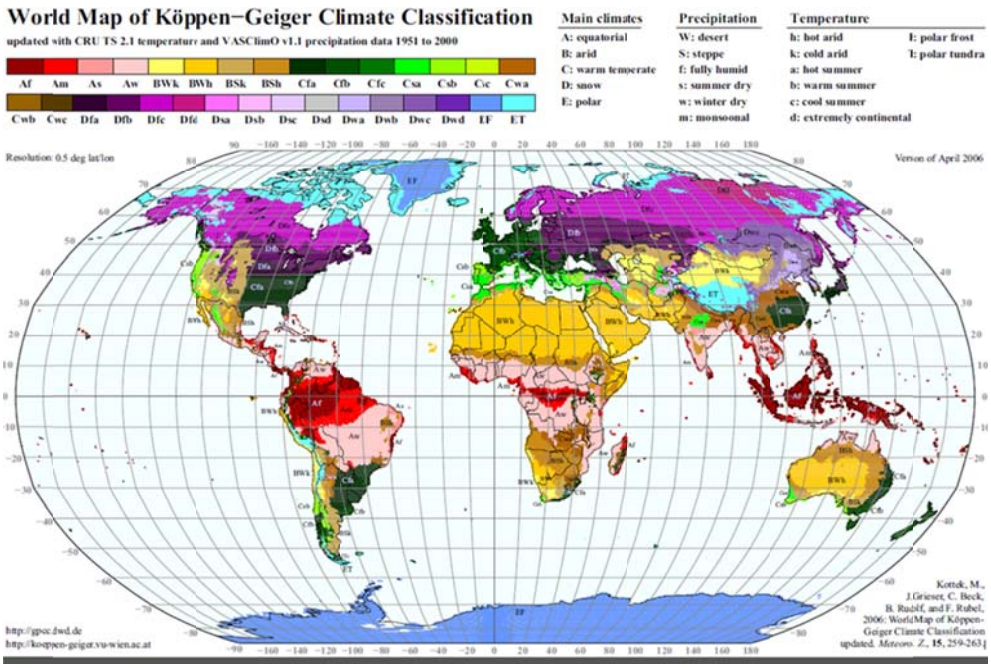
Text in red is suggested guidance. Insertinformation in provided space, removing red text as appropriate

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'