

Example name: A building integrated solar collector - All-ceramic solar collector

Template completed by:	Photographs
Simon Paul Borg	
(University of Malta)	
simon.p.borg@um.edu.mt	
For installations	
BISTS Location:	
Beijing, China	
Climate Type:	
Köppen Dwa	
Building Use:	
Residential	Provide a state of the second state of the sec
Lovel of RISTS integration:	Solar collectors act as balcony railings of the building
Reijence classification: 2	
Neljenga classification. 2	
Type of activity:	
*New-built with ceramic solar	Source: Yang, Y., Wang, Q., Xiu, D., Zhao, Z. and Q. Sun "A
collectors acting as balcony railings	building integrated solar collector: All-ceramic solar collector".
· · · ·	Energy and Buildings (2013).62(15-17)
Type of BISTS:	Drawings/Sketches/Cross-sections
Active System	
Function(s):	
*Water heating	
frate:	
Building element:	
*Facade	
3	



BISTS characteristics:

A building integrated solar collector - All-ceramic solar collector

"The parent materials of this type of all-ceramic solar collector are ordinary ceramic raw materials mainly meaning porcelain clay, quartz, feldspar, etc. In fact, most ceramic products have a certain requirement of whiteness. However, all-ceramic solar collectors have black or fuscous color, without whiteness requirement. Therefore, raw materials with higher Fe content can be used. The material of absorber coating is V–Ti black ceramic. The V–Ti black ceramic is produced using tailings of vanadium extraction as one of starting materials. In China, vanadium is mostly recovered from the converter and smelter slag produced by the treatment of titanomagnetites in the iron and steel industry and black shale. The residue after the V-recovery is called vanadium residue. Then, workers add supplementary materials to vanadium residue to extract vanadium salt. The final residue after extraction of vanadium salt is the tailings of vanadium extraction. It has been tested that the solar absorptance of black ceramic coatings is in the range of 0.93–0.97. The all-ceramic collector manufacturing process generally consists of the four basic stages: preparation of raw materials, shaping, drying and calcining. Firstly, ordinary ceramic raw materials were mixed with a suitable amount of water and ground in a ball-mill to powders of finer than 120 mesh. Secondly, biscuits were shaped by plaster molds. Thirdly, biscuits were dried and sprayed V-Ti black ceramic coating. Fourthly, the biscuits were calcined in a roller kiln to a high temperature of 1210 °C. All-ceramic solar collectors with other dimensions have been manufactured, such as 600 mm × 600 mm, 800 mm × 800 mm, and 1000 mm × 1000 mm. The lowest value of the testpressure of the all-ceramic solar collector is 2 bar. Moreover, the bursting pressure can be increased number of times by transforming the structure or the wall thickness."

"Solar thermal collectors act as not only the heat source of hot water system, but also the balcony railings. The thermal efficiency is about 47.1%."

Source: Yang, Y., Wang, Q., Xiu, D., Zhao, Z. and Q. Sun "A building integrated solar collector: All-ceramic solar collector". *Energy and Buildings (2013)*.62(15-17)

Stage of Development:

Responsible:

*Built

BISTS description and context

Project motivation: Desire for building integration of solar thermal. Detailed analysis is in process.



System viability

Economic analysis not available.

Modelling and simulation tools developed/used

Modelling tools used in the analysis not available.



BISTS Performance data	Graphs for collector efficiency, seasonal energy gains, diurnal/seasonal solar fraction, etc.
Based on: O Estimation O Detailed simulation Specify software(s) used O Measurement/testing O Long-term monitoring tick all that apply	Detailed analysis is in process.
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:	
Additional information:	
Sources and references:	
Source: Yang, Y., Wang, Q., Xiu, D., Zhao, Z. and Q. Sun "A building integrated solar collector: All-ceramic solar collector". Energy and Buildings (2013).62(15-17)	