Building Integration of Solar Thermal Systems (BISTS): Case Studies

Mervyn Smyth and Laura Aelenei

A solar thermal system is considered to be building integrated, if for a building component this is a prerequisite for the integrity of the building’s functionality.
64 case studies submitted to date
47 have been allocated reference numbers and reviewed
39 are of direct relevance
The remainder are model or support material

Not a quantitative analysis .... but rather indicative
### Installed on ….

<table>
<thead>
<tr>
<th>Output</th>
<th>Air Heating</th>
<th>Active</th>
<th>Passive</th>
<th>Wall</th>
<th>Roof</th>
<th>Other</th>
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<td></td>
<td>New</td>
<td>4 off</td>
<td>3 off</td>
<td>3 off</td>
<td>4 off</td>
<td>1 off</td>
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<tr>
<td></td>
<td>Refurbishment</td>
<td>3 off</td>
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<td>2 off</td>
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<table>
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<tr>
<th>Water Heating</th>
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<tr>
<td>Air</td>
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<td>New</td>
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<td>Refurbishment</td>
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<td>4 off</td>
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<table>
<thead>
<tr>
<th>Cooling</th>
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<tbody>
<tr>
<td>New</td>
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<tr>
<td>3 off</td>
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<tr>
<td>Refurbishment</td>
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<tr>
<td>Active</td>
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<table>
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Note: based on 39 cases studies up to BIST ref 47

### BIST Description

#### Application
Air heating, 17

BIPV/T, 6

water heating, 25

linked (auxiliary system), 13

cooling/ventilation, 13

combi-system, 4

Air heating

Transpired façade collector, Canada

Façade crown collector, UK

Window shutter, France

PVT roof collector, Canada
Water heating

Integrated roof tiles, China

Shading device, France

Ridge tiles, Holland

Solar balustrade, USA

Unglazed façade collector, Switzerland

Flat plate collector, Ireland

Combi-system

Roof combined air/water collector

Wall combined air/water collector
Cooling/ventilation/shading

Solar thermal glass, France

Solar awning, USA

Desiccant Ventilated Façade

Radiant cooling, Japan

Solar facade blinds, USA

Building Integrated PV/Thermal

PV roof air heating, Canada

PV air heating, Portugal

PV water heating, Sweden
Linked systems

District heating, Sweden

Kingspan façade linked to auxiliary air heater, UK

Air heat pump on the roof, Greece

Façade integrated solar thermal concentrated system linked to absorption chiller, Italy

Other

Desiccant Ventilated Façade

NCT asphalt collector, UK

Integrated photo-bioreactor, Germany

PCM envelopes, Spain
BIST Description

Stage of development

- Idea/patent, 10
- Prototype, 10
- Demonstration, 16
- Commercially available, 22
BIST Description

Collector building element

- Facade, 26
- Roof, 17
- Other, 10
Architectural wave, China

Intelliglass, Spain

Other

All-ceramic solar collector, China

Garden fence, USA

Architectural integration

Building type
Architectural integration

Building physics
Shading: PVT window blinds, Sweden

Structure: Combined air/water balcony

Integral storage: ICS ridge collector, Holland

Insulation

Transpired air collector with and without back insulation

Significant back panel insulation, Portugal

PVT back panel insulation, Brazil

Solar-comb insulation, Austria
Architectural integration

Building Architectural Integration

Architectural empathy?

Blended, mounted in the apex ridge of pitched roof

Obvious, but the north side is covered with the same stainless steel elements but not thermally active

Invisible transpired wall collector

Out of sight
Wider considerations

Areas of obvious technological development and deployment

Minimal work published in

• Economics…some on capital costs and running costs, nothing on payback and maintenance

• Some on embodied energy, nothing on sustainable materials, environmental impact, fire safety

• Some on project motivation, nothing on social impact or legislation
Performance

System contribution

Collector efficiency

Heat loss coefficient

Temperature vs time

Comparison

IAM
Case Studies – observations...so far

- Wide range of interesting concepts/systems (although some repetition of the same system on different buildings)
- Limited information
- BIST description (generally good, less regarding the building detailing)
- Sizing procedure (minimal)
- Building physics (secondary consideration)
- Physical connection (some detailing, but minimal)
- Costs - economic, environmental, social (limited)
- Performance (wide variation)
- Aesthetics (missing)
- Distribution (exclusively developed world)

Thank you