

## 2020 HIGHLIGHTS

# Task 56 – Building Integrated Solar Envelope Systems for HVAC and Lighting

### THE ISSUE

In the residential sector, solar thermal and PV systems are typically placed on building roofs with limited attempts to incorporate them into the building envelope thus creating aesthetic drawbacks and space availability problems. On the contrary, the use of facades is highly unexplored, and daylight control is delegated to individual management of blinds and curtains leading to high thermal loads during mid-seasons and summer.

In the tertiary segment (offices, schools, hospitals), the roof is again, most of the time, the only surface devoted to the installation of solar thermal and PV technologies. While daylight control here is state of the art in terms of shading effect, the utilization of shading devices to redirect natural light into the room thus improving visual comfort still needs further work.

When energy efficient technologies are installed together with traditional ones, frequently they are just “added on top” of the main systems, resulting in high investment costs and low-performance optimization. An interesting option to overcome this competition is to combine multiple functions in envelope components thus enabling hybrid systems to simultaneously cover different energy, comfort and aesthetic needs.

### OUR WORK

The Task’s scope is to prepare an overview of multifunctional solar envelope products and systems that are available or near to market, analyzing the conditions for their effective market penetration and discussing these factors with relevant stakeholders, such as technology providers, consulting offices and architects.

SHC Task 56 focuses on simulation, laboratory tests and monitoring of multifunctional envelope systems that use and/or control solar energy, influencing thermal energy demand, thermal energy consumption and comfort of the building.

The strategic objective of Task 56 is to coordinate the research and innovation effort taking place within the scientific community and the private sector towards a wider utilization of envelope integrated technologies.

#### Participating Countries

*Austria*

*Canada*

*Denmark*

*Germany*

*Italy*

*Netherlands*

*Norway*

*Spain*

Task Period

2016 - 2020

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## KEY RESULTS IN 2020

### Strategies for Market Penetration and Standards for Solar Envelopes

To foster the market penetration for industrialized solar envelope systems, the experts of SHC Task 56 outlined strategies to deal with some of the known market barriers for this kind of solution, such as architectural integration or legal barriers. The work focused on strategies for solar building envelope manufacturers but also includes valid recommendations for other stakeholders, such as policymakers, architects, building owners and industry associations. In the report, *Development of Strategies for Market Penetration*, a number of strategies to enhance the commercial success of solar envelope technologies are discussed, considering both the current market status and possible future changes in the legal framework and boundary conditions.

In addition, Task participants analyzed test methods and relevant standards for construction products and energy components, such as solar thermal collectors, photovoltaics, daylighting and shading systems, ventilation devices, and heat pumps, to assess their applicability to solar building envelope solutions. Moreover, they discussed how current standards and regulations could be improved to prepare the groundwork for broader adoption of solar building envelope systems. The results of this activity are presented in the report, *Test Methods and Recommendations*.

### Design Guidelines

The integration of solar envelope systems into buildings and their HVAC systems is a crucial issue for solar envelope systems. The Task tackled this issue by analyzing virtual reference buildings where the incorporation of different solar envelope elements was studied via numerical simulation. To this scope, numerical models were elaborated on using a cross-platform approach, and multiple simulations were run to test different boundary conditions.

The numerical results were analyzed to *extrapolate* *Design Guidelines* and reliable information regarding energy and cost performance. Cost-optimal solutions based on suitable combinations of passive and active technologies were identified based on the climate and building type.

### Technology Position Paper

Starting from the work and experience gathered in SHC Task 56 activities, the Task's *Technology Position Paper* summarizes the relevance, potential, and current status of the development and market of building solar envelope systems contributing to the HVAC and lighting of buildings.

This document summarizes and highlights the actions needed to best exploit the integration of solar envelopes into building design practices, addressing policy and decision-makers as well as manufacturers and presenting present high-level information as a basis for the market uptake and further developments.



Visual impression of solar thermal venetian blinds, Arkol project. © IBK2