COOLFACADE
ARCHITECTURAL INTEGRATION OF SOLAR COOLING STRATEGIES INTO THE CURTAIN-WALL

Keywords: Solar Cooling, Curtain-Wall, Architectural Integration, Façade design, Integrated facades

Architectural Engineering + Technology Department / Design of Construction

Area of Research: Green Building Innovation

Research Summary: Energy efficiency issues have growing worldwide relevance in the current context. The necessity of lowering energy consumption from fossil fuels aims to develop new technologies driven by renewable sources of energy. As result of the application of energy savings' measures and the development of new technologies, thermal performance of buildings during winter period has been greatly improved. However, the energy needs for cooling are increasing drastically worldwide. The widespread use of AC units in buildings has an important impact on its overall energy consumption. Also, the use of these systems can be a source of indoor air quality problems. For this reason it makes sense to develop not only new ways to produce energy via renewable sources, but to also promote passive strategies that help minimize the use of conventional HVAC systems in office buildings.

Solar cooling systems have been focus of attention these last years, for its potential to lower indoor temperatures using solar (and thus renewable) energy. However, there is no much development regarding its architectural integration within buildings. The research project deals with the integration of solar driven cooling strategies into the building façade, as a way to support the use of low-energy alternatives to the use of centralized AC in buildings with high internal heat gains. Furthermore, the possibility of using the façade itself as a heat dissipation system is seen as an opportunity for the development of self-sustaining cooling façade modules to be applied either on new buildings or refurbishment projects, avoiding mechanical cooling equipment whatsoever in the line of new “nearly zero” energy standards.

Research Methodology: The proposed structure for the research project considers three sections: Two sections developed in parallel which explore the possibilities and constraints about mixed-mode facades (A) and solar cooling performance (B) respectively, and a third section dealing with the integration of these inputs for the future development of solar cooling façade products for office buildings (C).

Specific data collection and analysis methods are consider for each section: Section A relies on case study evaluation, section B considers energy performance assessment and finally section C follows the logic of architectural design as an iterative process for the design and evaluation of the integrated aspects.