Building Integrated Solar Collection for Water Reuse and Thermal Control for Hot and Arid Climates

By

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Abstract

If building integrated solar absorption techniques are engaged on a facade, then consequences of water scarcity can be addressed through water reuse and thermal control for hot- arid climates. The social, economic, and environmental impacts of the inevitability of water scarcity are causing a shift to new methods in water resource management where prior accepted practices with water resource strategies, implied expectations that technological means will maintain pace with steadily increasing water demands. With non-tracking solar water pasteurization systems, geometrically optimized for concentration of solar energy to achieve optimal temperatures, integration into building facades can link dynamic cycling through the façade and floor plate systems, which respond to bioclimatic criteria for thermal comfort as well as addressing global water scarcity. In this thesis, in accordance with diurnal swings, the building matrix takes advantage of the solar resource, consolidated with a complex integrated solar absorptive façade system to pasteurize water and offset thermal heat gains. Through simulated testing and first principled methods, validated with solar modeling techniques and analysis, the operability of this experiment can be evaluated. Prototypically, a diagram for architecture engages existing methods analogous to solar collector systems for domestic hot water, radiant floor strategies for thermal regulation, and glass block for wall construction. This undertaking aspires to develop a next generation building typology model, with intentions to transfer across arid geographic locations with similar bioclimatic performance criteria, to challenge social constructs and reuse conceptions at scales of urban populations through multiple localities.