Simulations of Innovative Solutions SinBerBEST For Energy Efficient Building Façades

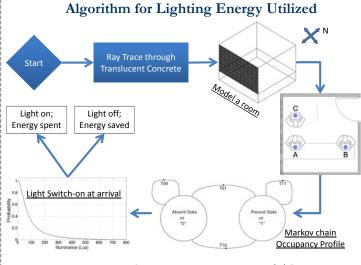
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Background and Motivation 19% 30% Residentia 22% 29% a) Sources of energy b) Energy consumption in use in US commercial buildings Sunlight (positive) Substitute indoor lights Heat (negative) Overheating of buildings

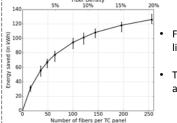
Scope and Methodology

- The scope of the research is developing proper tools for assessing saved energy by using Translucent Concrete (TC) panels as building materials.
- We employ computational platform to capture illumination, heat transfer, stochastic occupancy and light switching patterns to compare the net energy savings incurred during the entire year using TC panels.

Illumination Calculations Custom Ray Tracing Software Database Storage Use the external Load *.csv ir eather condition entering the roor Kadiance Model a room and Import material & designate a wall in room effectivity data for surface 0.8 Normalized ligh Distribution 7.0 0.0 0.0 0.2 20 30 40 50 60 70 80 90 ropic scattering of light Illumination of a room from wall with TC panels by each fiber 1) Optical Fibers (OFs) are modeled as point sources of light.

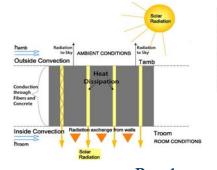


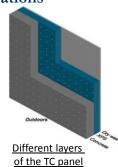
Lighting Savings from using TC



- For OFs volumetric ratio of 5.6%, use of lighting energy is reduced by about 50%.
- The energy saved increases to 65% for an OFs volumetric ratio of 10.6%.

Heat Transfer Calculations





Results

- Expenditure on Cooling (US\$) Expenditure on Lighting (US\$)
 - 1) Combining the loads on HVAC with lighting requirements.
 - 2) An OFs volumetric ratio of 5.6% performs best in saving about 18% of the cost.
 - 3) Small OFs volumetric ratio is more practical for fabricating the TC panels.
 - High OFs volumetric ratio leads to monetary loss as solar radiation loads are high.

Parameters:

Heater efficiency: 95%; Air-conditioner coefficient of performance CoP: 3.0 Utilities pricing for San Francisco Bay Area:

Electricity: 23.3 ¢/kWh; Natural gas: 5.4 ¢/kWh

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2) OFs are characterized to transmit light anisotropically.







