Level | **PGR**

Test and Performance of Adaptable Building Envelope

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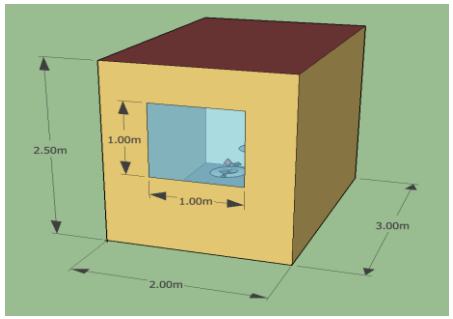
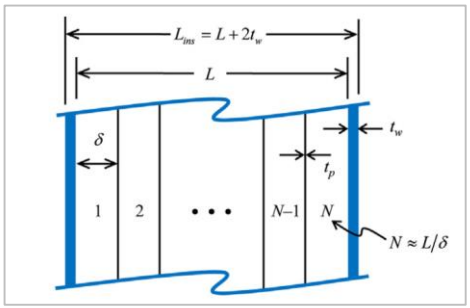


Cellular office simulation model for adaptable envelope (EnergyPlus)



Smart insulation with N-1 internal partitions [1]

Electrochromic glass

Overview | Approximately 20 to 40 percent of energy in the developed countries is consumed in the buildings. To reduce energy consumption, thermal resisted insulation panels are commonly used in the building envelope to reduce heat gain and heat loss by thermally isolating the indoor and outdoor environment. It would be advantageous for the envelope to be more responsive to the variation in outdoor temperature and solar radiation. However, the application potential of such adaptable envelope is still a matter of debate. This hinges on two aspects: 1) its heat transfer mechanism and 2) the optimal and robust control of the envelope. The former requires a systematical study of heat transfer between envelope and indoor and outdoor environmental. The latter needs analysis of adaptable envelope performance under a wide range of meteorological conditions, building design and its operation.

Outcomes and Impact | The purpose of the project is to develop building envelope with adaptable thermal property and evaluate the performance of such envelope technology. The outcome of such tests and analyses could provide a guideline for research on the adaptable building envelope in the future.

Work Involved | The project will focus on the following stages:

- review the adaptable control of heat flux through building envelope
- Analyse energy-saving potential of adaptable envelope in different meteorological conditions, building design and its operation by taking simulation-based approach
- Test and measure the performance of prototype adaptable building envelope in the real building

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Referenece:

[1] Mark Kimber, William W. Clark, and Laura Schaefer. Conceptual analysis and design of a partitioned multifunctional smart insulation. Applied Energy, 114:310–319, 2014.