

**A Protocol to Determine the Performance of South Facing Double Glass  
Façade System**

A Preliminary Study of Active/Passive Double Glass Façade Systems

by

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**Abstract**

This project proposes a protocol for experimentally determining the performance of a double glass envelope system. As a proof of concept, the protocol was applied to an experimental study of a south-facing, single story double glazed ventilated wall system. Two modular full-scale double glazed window models with naturally or mechanically assisted ventilation were constructed and monitored for a range of weather conditions. The goals of this investigation were to develop and apply the test protocol and to monitor and analyze the thermal performance of these two systems and to improve our understanding of the double façade system. Using this test protocol preliminary results show the average cavity heat removal rate is approximately 25% higher for the active system when compared to the naturally ventilated system. Also, the passive system has a higher temperature difference between the indoor glass surface and the indoor air than the active system. This experimental protocol can be further applied to determine other performance issues of the double envelope system.

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## List of Variables

$q_A$	Total heat admission through glass
$E_{D\tau D}$	Direct solar radiation transmitted through glass
$E_{d\tau d}$	Diffuse solar radiation transmitted through glass
$q_{RCi}$	The rate of heat flux inward by radiation and convection
$E_t$	Total solar radiation
$\tau$	Transmittance
$N_i$	Heat transfer factor, inward flow fraction
$\alpha$	Absorptance
$U$	U-value
$t_o$	Outdoor (cavity air outlet) temperature
$t_i$	Indoor (cavity air inlet) temperature
$F$	The dimensionless ratio of the solar heat gains to the incident solar radiation
$Q$	Air flow rate required to remove heat, cfm
$H$	Heat to be removed, Btu/min
$c_p$	Specific heat of air, Btu/lb <sub>m</sub> °F (about 0.24)
$\rho$	Air density, lb <sub>m</sub> /ft <sup>3</sup> (about 0.075)
$A$	Active double façade system
$P$	Passive double façade system
$F_{hr}$	Fraction of cavity solar heat removed
$Q_c$	Cavity air flow rate
$OAT$	Outdoor air temperature
$E_v$	Vertical solar radiation
$WS$	Wind speed
$WD$	Wind direction
$\Delta T$	Temperature difference between air inlet and outlet