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Correlations for Several Important Design Parameters of Turbulent Free Convective Flow within the Trombe Wall Channel

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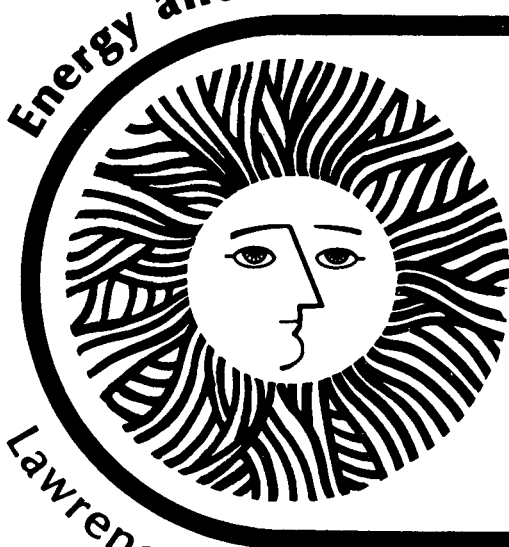
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**Energy and Environment Division**



Correlations for Several Important  
Design Parameters of Turbulent  
Free Convective Flow within the  
Trombe Wall Channel

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June 1979

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CORRELATIONS FOR SEVERAL IMPORTANT DESIGN PARAMETERS  
OF TURBULENT FREE CONVECTIVE FLOW  
WITHIN THE TROMBE WALL CHANNEL\*<sup>†</sup>

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Free convective turbulent flow heat transfer between the vertical channel surfaces of the Trombe wall has been investigated. Considered in this study were the velocity profiles normal and parallel to the direction of fluid flow, the pressure drop due to flow acceleration at the channel entrance, and the effect of the dissimilar but uniform channel surface temperatures.

The initial flow is assumed to remain laminar until a combination of geometry, temperature, and flow rate conditions reach a pre-defined level, where the flow assumes a transition and gradually develops into fully turbulent. Turbulent flow characteristics are predicted by a mixing length model.

A finite difference procedure was used to solve the governing Navier-Stokes equations using air as the fluid. Guided by the very limited available experimental data, computations were completed for a wide range of channel geometries, relative surface temperatures, and flow rates. Results have been reduced and several correlations were developed to enable important quantities to be estimated given the channel geometry, surface temperatures, and the inlet air temperature.

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\*Excerpts from a more detailed report to be published.

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