Abstract Submitted
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Large-scale Natural Convection to Validate Models of Passive Cooling Systems of Large Structures[1] JEFF HARRIS, MATTHEW WELDON, MICHAEL PRENDERGAST, Pennsylvania State University, WILLIAM BROWN, ADANA STANISH, MICHAEL PATTERSON, Westinghouse Electric Company — Passive cooling of large, vertical structures is a design feature that can increase safety and decrease cost associated with heat removal. Preliminary studies of the heat transfer rate, velocity and temperature profiles from a large heated wall with Rayleigh number (based on height) of $7x10^{12}$ to $1.5x10^{13}$ are presented. The heat flux and temperature of the wall are measured continuously, along with the temperature profile of the air along positions normal to the heated wall, the inlet and outlet air temperature and humidity, and the velocity and turbulence profiles measured with laser Doppler velocimetry. The trends generally agree with a similar study in the literature, but the scale and aspect ratio of the flow channel are unprecedented in the open literature. The data show that there are unique aspects to the development of the flow field turbulence that are not well characterized for this scale of natural convection.

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