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An Experimental Study of Circular and Rectangular Heated Jets in Cross-Flow B.E. JOHNSON, G. ELLIOTT, K.T. CHRISTENSEN, Univ. of Illinois — Heated plumes of fluid emanating from both flush and raised stacks occur in a wide variety of technologically-relevant applications and the dispersion of this heated, and sometimes contaminated, fluid is therefore of practical concern. To this end, a detailed series of experiments are under way to document the downstream development of heated jets of both circular and rectangular cross-section emanating into a cross-flow with the intent of constructing an experimental database for validation of on-going large-eddy simulations. Multiple cross-stream velocities as well as various jet exit velocities and temperatures are under study to understand the plume development both in the near- and far-field. The jet flow is driven by a high-pressure regenerative blower and heated with an open-coil heater while the cross-flow is provided by an open circuit wind tunnel. Mean temperature fields and streamwise velocity fields are measured using a rake of Pitot-static probes and thermocouples at select locations downstream of the jet. Of particular interest, the impact of jet exit temperature, velocity and cross-section on the downstream development of the heated plume is explored. Similarities and differences between flush and raised stack configurations under identical experimental conditions will also be highlighted.

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