*** ABSTRACT ONLY ***

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An Algorithm for Calculating the Plume Center Line Temperature and Ceiling Jet Temperature in the Presence of a Hot Upper Layer

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The analysis of recent experiments (NISTTN 1423) using JP-5 and JP-8 pool fires performed in 15 m and 22 m high hangars suggest that plume center line temperature correlations found in the computer fire model FPEtool (NISTIR 5486-1) under predict the ceiling temperature for large fires. The analysis was based on the results of thirty-three fire tests which had heat release rates ranging from 100 kW to 33 MW and ambient temperatures ranging from 8°C to 31 °C. The ceiling jet correlation also requires modification since a comparison of predicted sprinkler activation using FPEtool to measured sprinkler activation met with only limited success. The purpose of this paper is to present a new plume algorithm for the prediction of centerline temperature by modifying Heskestad's algorithm (Fire Safety Journal, 7, pp 25-32, 1984) to include the enthalpy excess entrained from the upper layer. A variable radiative fraction for the fire that depends on fire diameter is included in the algorithm. A modified version of Alpert's ceiling jet correlation (Fire Tech., 8, 181 1972) is presented to account for changes in r/H dependence as the upper layer develops. When an upper layer does not form, both Alpert's and Heskestad's correlations provide good agreement with the measured ceiling temperatures.