A Further Review of Smoke Flows and Smoke Detector Response for Beam Pockets and Waffle Ceilings

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A previous study using computational fluid dynamics illustrated the effect of deep beams on the performance of smoke detectors in corridors, waffle and deep beam ceilings. The previous study used a limited size computational domain which provided data on smoke flows and field conditions for detector response.

Beam pockets on a room ceiling have traditionally been viewed as an impediment to smoke transport, which seems to intuitively suggest a significant delay in the operation of ceiling spot smoke detectors. This is in contrast to the case of a ceiling jet spreading out radially below an unconfined smooth ceiling (the baseline) surface. In this study the computational domain has been expanded to reflect the conditions of a larger space and multiple smoke detector locations on a waffle–type ceiling and a ceiling with beam bays of 12 feet by 12 feet. Review of the data and the visualized smoke flows show that the reservoir effect of the beam pocket geometry does occur. This paper will review the results of an expanded study on deep beamed ceilings and explore how the spacing of smoke detectors is impacted by deep beamed ceilings.