ABSTRACT

The physical basis and associated mathematical model for estimating the fire-generated environment and the response of sprinkler links in well-ventilated compartment fires with draft curtains and fusible linkactuated ceiling vents is developed.

Complete equations and assumptions are presented.

Phenomena taken into account include:

- The flow dynamics of the upward-driven, buoyant fire plume.

- Growth of the elevated-temperature smoke layer in the curtained compartment.

- The flow of smoke from the layer to the outside through open ceiling vents.

- The flow of smoke below curtain partirions to building spaces adjacent to the curtained space of fire origin.

- Continuation of the fire plume in the upper layer.

- Heat transfer to the ceiling surface and the thermal response of the ceiling as a function of radial distance from the point of plume-ceiling impingement.

- The velocity and temperature distribution of plume- driven near-ceiling flows and the response of near- ceiling-deployed fusible links as functions of distance below the ceiling and distance from plume-ceiling impingement.

The theory presented here is the basis of a user-friendly computer program, LAVENT, which is supported by a user guide and which can be used to study parametrically a wide range of relevant fire scenarios.