Computer Models
For
Fire and Smoke

Model Name: SPLASH (Sprinkler Layer and Substracted Heat)

Very Short Description: A quasi-field model describing the interaction of sprinkler sprays with fire gases

Modelers, Organization: A.J. Gardiner, L.A. Jackman and successor of South Bank polytechnic, under contract to Brandforsk and under FRS supervision. Further development FRS.

References: Gardiner, A.J. The mathematical modeling of the interaction between sprinkler sprays and the thermally buoyant layers of gases from fires, PhD thesis 1988.

Availability: Available within Brandforsk, FRS & South Bank Polytechnic

Hardware: VAX

Language: FORTRAN 77

Size: Approx. 0.2 MB (Program plus data files for one sprinkler type)

Detailed Description:
Inputs:
> *Sprinkler*: Type, spray emission parameters, water flow rate. Depth of deflector plate below ceiling number and spatial arrangement in corridor.

> *Corridor geometry*: Height of ceiling, width of corridor. Exit condition (downstand, doorway, vent).

> *Smoke layer*: Maximum temperature, depth, size of control volumes temperature profile.

Outputs:
1. Total heat transfer from smoke to spray
2. Overall sprinkler envelopes

3. Effect of spray on physical properties of gas layer as it passes through the sprinkler envelope.
4. Variation in heat transfer, and drag to buoyancy ratio in crontrol volumes throughout the spray.
5. Droplet, physical and thermal histories throughout spray (including number of evaporated drops and those hitting the ceiling).
6. The water delivery pattern on the floor.

Assumptions:

The smoke flow and sprinklers are remote from the fire (in corridor).
Steady state conditions
Heat loss to the structure is ignored
Smoke emerging from sprinkler spray is homogenized before entering the next spray.

Limitations:

The model is note fully validated. 'Data base' of spray emission parameters for sprinkler types is limited.

Thermal response of sprinklers, for example, is not calculated due to steady state conditions.

Highlights:

Realistic droplet data are used to model the sprinkler spray.