Computer Models For Fire and Smoke

Model Name: EgressPro

Version: 02

Classification: Consolidated egress model

Very Short Description: An egress model to predict egress times and relevant parameters for a deterministic time-line analysis for a user selected room, corridor, and stair arrangement.

Modeler(s), Organization(s):   SimCo Consulting

User's Guide: Integrated in Help File

Technical References: Help File

Validation References: The program uses established engineering relationships as given in references listed at the end of the program's Help file.

                                 The egress calculations are based on the theory presented in the SFPE Handbook on Fire Protection Engineering as well the Draft BS Code of Practice. The process of egress movement follows the general concepts of traffic flow.

                                 The model's Help file provides a case study to verify the programs results.

Availability: SimCo@alphalink.com.au

Price: $ 150

Necessary Hardware: Intel architecture running Windows 95 or higher

Computer Language: Delphi (pascal)

Size: -----

Contact Information: Peter Simenko, SimCo@alphalink.com.au

Detailed Description:

EgressPro provides a fire-engineering tool for assessing egress conditions during fire emergencies in buildings. The program calculates the response of sprinklers/heat or smoke detectors and evaluates the response behavior of people from the time of alarm to the end of the egress from rooms, floors or buildings on fire. The program predicts the flow of groups of persons in emergency based on the relationship between speed of movement and the population density. Program provides timing information required for the construction of time-line presentations, usually needed in fire engineering reports to demonstrate whether the evacuation of the endangered areas could be expected before the fire tenability limits are exceeded.

Fire Detection Time
The program calculates the time to alarm by calculating the detection time of heat detectors/sprinklers or smoke detectors in continuous growth t-squared fires, based on the Heskestad differential equations.

The procedure assumes the detector is located such that it is exposed to both the maximum ceiling jet velocity and temperature. Correlation for ceiling jet temperature and velocity were determined from limited experimental data: (no beam or truss ceilings, no cathedral ceilings, only smooth, horizontal unconfined ceilings).

Pre-movement Time
The program enables the selection of the pre-movement time, which depends on the use of the building and the type of alarm. Typical values that may be used for design purposes are provided for selected alarm types and occupancies [Ref. BS-Draft].

Room Geometry and Occupant Density
Room geometry must be entered with the egress door size. Value of the occupant density can be selected from the table provided as part of the program. The program multiplies the selected density value with the room area and displays it as the total number of occupants in the edit box. Alternatively, the user may enter his/her own number of occupants in the edit box.

Stair Geometry and Type
The travel distance along the line of travel on the stair slope must be entered and the stair-tread/riser geometry selected.

Egress Time Calculations
The program's calculations can be summarized as follows:

The number of occupants included in egress is either entered or calculated by multiplying the 'occupant density' with the corresponding floor area.

The specific flow is derived by multiplying the movement speed and the effective occupant density. The exit's effective width is determined by subtracting the boundary layer from its clear width.

The 'Stair/Corridor Egress Time' is calculated next. It is the time interval from the time when the first occupant enters the stair to the time when the last occupant exits the final exit door.

The continuity of the occupant's flow is stipulated throughout and the specific flow densities and movement speeds are adjusted where their limiting values exceed the tabulated critical values.

Printed Report
The program prints a A4 size report which documents all calculated parameters in a 'time-line' analysis format.