Computer Models For Fire and Smoke

Model Name: G-JET

Version: 2.0

Classification: Smoke Detection Model

Very Short Description: Design tool for all categories of smoke detectors to predict their response to performance requirements in applications.

Modeler(s), Organization(s): Geir Jensen and Elin Tørlen Lønvik, InterConsult Group ASA.

User's Guide: Self-explanatory user interface. Explanations and definitions linked to terms.

Technical References: Application Specific Sensitivity: A Simple Engineering Model to Predict Response of Installed Smoke Detectors. Proceedings of AUBE '99. Duisburg. 1999.

Validation References: G-JET complies with basic formulas and assumptions, such as given by the 'Method 2 – Mass Optical Density' for engineering to performance requirements of the Appendix B (B-4.1.3.2) of NFPA Standard 72E edition 1999. Detectors of nominal sensitivity determined by tests as per European Norm 54 Part 7/9 or by Underwriters Laboratories Standard 268 will respond strictly to G-JET outputs at the worst case assumption of 100 % dilution in the smoke volumes. EN 54 Part 9 is used for the definition of effective sensitivity.

Availability: To be available from order at http://www.interconsult.com or through contact person.

Price: $ 85 for single-user application by CD, e-mail or download. Licenses for manufacturers adapting G-JET to products or customer guidelines: Ask for details.

Necessary Hardware: Windows 95/98/NT/2000.

Computer Language: Visual Basic.

Size: 10 MB of disk space. 16 MB of RAM.

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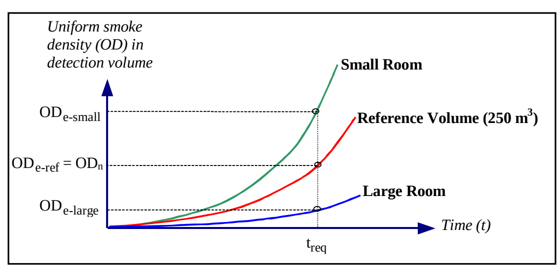
Detailed Description:

G-JET is a design tool that calculates which category of smoke detector is most suitable and recommends initial nominal sensitivity setting required to detect a given amount of smoke fully dispersed in a given room or smoke volume. G-JET accepts all categories of smoke detector applications and is independent of product brands. It is based on simple formulas and assumptions. It works within typical national or international prescriptive standards for automatic fire detection, but also fully comply with the referred 'Method 2: Mass Optical Density' for engineering to performance requirements. G-JET lists default values of effective sensitivity (minimum mass of smoke released to be detected), but accepts specific values input by users according to stakeholder objectives or other.

G-JET has been in proprietary use for 6 years. It was first published at the AUBE ’99 Conference on fire detection in Duisburg, March 1999. The paper in the book of proceedings describes the model, definitions, formulas, design tool features and assumptions involved. The paper of the proceedings, an introductory description and a printout sample is available from http://www.interconsult.com/pages/nasjon/smoker_1.asp.

The core of the model is the equation of optical density relating to mass of material transformed to smoke, fully diluted within a specified smoke volume and room volume and simple, conservative assumptions. The simplicity and usefulness are the prime features of G-JET compared to elaborative design options such as CFD. G-JET calculates the effective sensitivity of any common smoke detection application using aspirating, beam or point type of detectors. Effective sensitivity relates to a mass of given material evenly dispersed as smoke in a room, in a defined smoke volume or in a defined ‘cold plume cloud’.



It is a presumption both of the explanatory ”Method 2” by NFPA and of G-JET that no thermal effects be present; it is the early pre-smoke-layering phase, the pre-plume phase, that is being modeled. G-JET models the worst case challenge of smoke detection, that of fully dispersed smoke, as this is typically the most useful design criteria. Any other smoke from fires is assumed to layer itself by plumes, typically towards the ceiling where it creates significantly higher optical densities, and at a later phase of fires when damage is more significant. In the plume-phase all listed detectors of nominal (sensor head) sensitivity rated within typical standards will respond reliably within a narrow time frame, thus not necessitating any response modeling for practical purpose.