

Computer Models For Fire and Smoke

<i>Model Name:</i>	RiskPro
<i>Version:</i>	02
<i>Classification:</i>	Risk Ranking model
<i>Very Short Description:</i>	The program provides a means by which an integrated and flexible evaluation of fire hazards and protection measures in buildings is possible, based on the Risk Ranking approach.
<i>Modeler(s), Organization(s):</i>	SimCo Consulting
<i>User's Guide:</i>	Integrated in Help File
<i>Technical References:</i>	Help File
<i>Validation References:</i>	<p>The RiskPro program is based on the work of M. Gretener, a Swiss engineer, who in 1960 studied the possibilities for calculating the fire risk of industrial and other buildings. M. Gretener published his method for methodical evaluation of fire hazards in 1965. His original method was later revised and modified on the basis of new information from Switzerland and abroad. The study group consisted of representatives from the Swiss Federation of Engineers and Architects, the Swiss Institute of Safety and Security, and the Swiss Association of Cantonal Fire Insurances.</p> <p>The revised method – now known as SIA 81 method - is currently used as a decision aid for the evaluation, control and comparison of fire protection concepts for buildings throughout Europe. In Switzerland it is used to demonstrate 'equivalency' with the prescriptive building regulations for complex buildings or if cost-savings with alternative design solutions are expected. The method is also used to ensure that the insurance premiums are in line with the fire hazards involved.</p>

Availability: SimCo@alphalink.com.au

Price: \$ 300

Necessary Hardware: Intel architecture running Windows 95 or higher

Computer Language: Delphi (pascal)

Size: -----

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Detailed Description:

The RiskPro program evaluates the most important variables (fire safety parameters) influencing the fire risk in buildings. A range of numerical values is assigned to each variable to reflect its importance in the assessment. A distinction is made between fire hazards, fire protection measures and exposures. The quotient formed by the product of fire hazards and protection measures represents the severity of the expected fire impact. When this measure is multiplied with the potential consequences, i.e. life and property exposure, the measure of fire risk is obtained, expressed as fire risk index. This approach is documented by the following formula:

$$\text{Fire risk} = ((\text{FirH} \times \text{ComH} \times \text{IgnH}) / (\text{NorM} \times \text{ActM} \times \text{PasM} \times \text{ManM})) \times \text{Exp}$$

Where:

Fire risk = Measure of fire risk, expressed as index value;

FirH = Occupancy related fire hazards;

ComH = Compartment related fire hazards;

IgnH = Ignition hazard;

Exp = Loss exposure;

NorM = Normal fire protection measures such as: manual extinguishers, water supply grade, location of hydrants, etc;

PasM = Structural, i.e. 'passive' fire protection and fire compartmentation;

ActM = Active protection-measures, i.e. the availability of detection, alarm transmission, fire fighting capacity and response, as well as of the automatic extinguishing and smoke venting systems.

ManM = Management related measures.

Tolerable or Acceptable Fire Risk

It is recognised that there is a basic level of risk inherent in every activity. To account for this fact the calculated measure of risk is compared with a tolerable risk value of 1.3 (Tolerable Risk Index = 1.3). Consequently, all the calculated risks up to 1.3 may be considered tolerable. On the other side, all the risks higher than 1.3 may be regarded as excessive.

Fire-protection Concepts

The following basic fire protection concepts can be evaluated by the RiskPro program:

Structural Concept

The 'Structural Concept' is based on fire compartmentation and structural stability to fire; it may be the best choice as long as the normal use of the building allows compartmentation by fire resistant floors and walls. The necessary fire resistance should be determined by the condition that the fire should not spread outside the fire compartment.

Monitoring Concept

The 'Monitoring Concept' is based on automatic fire detection with alarm transmission to fire brigade. It may present the best choice when the normal use of a building calls for a minimum compartmentation. It is most applicable for occupancies with reduced fire load densities, for low to medium rise buildings in which fires may be expected to develop slowly, and where an effective and quick-responding fire brigade is available.

Extinguishing Concept

The 'Extinguishing Concept' is based on the application of automatic extinguishing devices such as sprinklers, CO₂ or others, with automatic alarm transmission to fire brigade.

The Extinguishing Concept with limited or no structural fire resistance may represent the best choice when the normal use of a building calls for a minimum of compartmentation but involves a potential for fast fire growth and/or spread. It is most applicable for occupancies with medium to high fire load densities and fast developing fires. For maximum effectiveness, the alarm should be transmitted day and night to a nearby fire brigade.

Management Concept

While most of the today's fire safety measures are hardware based it is becoming increasingly clear that the fire safety management measures such as prevention and emergency can often effectively compensate for known deficiencies in hardware. Indeed,

where the capital is in shortage, the appropriate use of Management Measures may be the best option available. However, Management Measures themselves will decay unless they are periodically tested, such as by management review.

Typical Occupancy Values

The RiskPro program incorporates tables with relevant fire-hazard data for over 400 typical occupancies, as surveyed in Switzerland. The tables provide the fire hazard data for the following parameters for each typical occupancy: fire load, burning rate, smoke and toxicity, and ignition hazards.

Evaluation Results Data Base

All calculated results are saved in a relational data base where they can be stored, surveyed or sorted for later retrieval or editing.

Printed Report

The program prints a A4 size report which documents all calculated parameters and the Risk Rating Index.

References

1. SIA Documentation 81, Method for Fire safety Evaluation, Swiss Federation of Engineers and Architects;
2. The SFPA Handbook - Fire Protection Engineering, 2nd Edition, Boston, Massachusetts, 1955;