Fire risk management

IRC developing new model for evaluating fire-protection systems in light industrial building
As Canada and other countries move from prescriptive-based to objective-based building codes, design tools are needed to support these new codes. In the past, IRC’s Fire Risk Management Program, in conjunction with the Department of National Defence (DND) and Public Works and Government Services Canada, developed FiRECAM™, a computer model for evaluating fire-protection systems in residential and office buildings (see Construction Innovation, Volume 1, Number 1). Currently, IRC, in partnership with DND, is developing a new, but similar, computer model to evaluate fire-protection systems for light industrial buildings, with the primary focus on warehouses and aircraft hangars.

This model, called FIERA System, is based on a framework (see box) that allows designers to establish objectives, select possible fire scenarios, and evaluate the impact of each scenario on life safety, property protection and business interruption.

Various calculation options are available once this information has been entered. Selected fire scenarios can be simulated, providing information on:

- fire and smoke spread with time
- the time of fire detection and suppression activation
- occupant response and evacuation
- the behaviour of structural members and other building components.

The impact of each scenario is measured in terms of the expected number of deaths, property losses and number of days of business interruption.
THE NEW MODEL, FIERASYSTEM, WILL BE ABLE TO COMPARE DIFFERENT TYPES OF FIRE-PROTECTION MEASURES FOR THIS TYPE OF BUILDING.

The program can also be used to evaluate individual components of a design, such as the activation time of heat detectors or sprinklers, the time to flashover and the time of failure of construction elements. The results of the calculations are then compared with the established objectives and criteria to determine whether the chosen design options are adequate in terms of satisfying the objectives. When the objectives are not met, the user can make changes to the building design and then re-run the models to see if the objectives can be satisfied.

This model will assist engineers and building officials in evaluating building fire-protection systems in a clear and concise manner, and in determining whether a selected design satisfies the established objectives for the building. Such models will also facilitate the introduction and use of objective-based codes.

The first version of the software is expected to be ready for beta testing in 1998. Further planned development will allow it to be used in the design of other buildings, such as industrial plants, arenas and shopping malls. This development work will increase the number of fire scenarios the program can simulate and improve its ability to model the unique aspects of different buildings. Results of other research projects conducted by the Fire Risk Management Program - for example, in the areas of active fire protection, human factors and fire-resistant construction - will continue to be incorporated into the program.

The framework that has been developed leads the user through a series of steps in setting up the evaluation where the following variables are defined or identified.

Building characteristics:
- type of construction
- location of ventilation openings
- the way in which the building has been divided into compartments
- building contents
- type of fuel.

Occupant characteristics:
- number
- age
- location
- physical disabilities.

Fire-safety objectives and appropriate performance criteria for:
- fire and smoke spread
- occupant safety
- property protection
- continuity of operations
- environmental protection.
### Potential fire scenarios including:
- liquid pool fires
- jet fires
- flash fires
- solid-fuel fires.

### Active and passive fire-protection options:
- automatic sprinkler systems
- central alarm
- smoke-control systems