

**NRC-CNRC**

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Construction

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## *Investigation of Atrium Smoke-Management Design Related to Balcony Spill Plumes*

### *Objective*

To investigate existing design equations for smoke production in atriums and the applicability of these equations to situations where the smoke is produced by a fire located either under a balcony or in a room opening onto a balcony (producing a balcony spill plume).

### *Background*

With the introduction of performance-based design approaches, there is an increasing demand for consideration of the smoke produced by a fire located either under a balcony or in a room opening onto a balcony. Currently, there are several design methods for estimating the smoke-production rate; however, they are based on scale-model testing conducted in the U.K. and assume that the fire is in an adjacent room. As well, there are considerable differences in the capacity of the required smoke-exhaust system as calculated using these various approaches. These differences become particularly significant when one tries to apply them to the large atriums often found in North American buildings.

### *Statement of Work*

The project will include both full-scale testing and CFD modelling. The primary focus is on fires in a compartment opening onto a balcony. However, the project will also examine the situation where the fire is located under a balcony, since at present, there are no design methods that address this situation.

### *Expected Outcomes*

An updated set of design equations for atrium smoke-management design.

### *Partner*

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

### *Start/Expected Completion Dates*

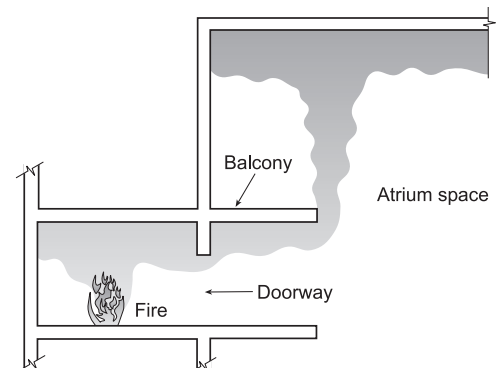
The project began October 2002 and will be completed June 2006.

### *Project Manager*

Dr. Gary Lougheed: 613-993-3762; Gary.Lougheed@nrc-cnrc.gc.ca

For more information, see [http://irc.nrc-cnrc.gc.ca/fr/smbe/balcony\\_e.html](http://irc.nrc-cnrc.gc.ca/fr/smbe/balcony_e.html)

*Factsheet 45, May 2005*



*Spill plume from beneath balcony*



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