



# Air Pollution Modelling

## Services:

Building Acoustics

Wind and Snow Loading

Environmental Noise

Air Quality Studies

Structural Wind Loading

Wind Tunnel Testing

Cladding Pressures

Long Span Roofs

Control of Mechanical Vibrations

Computational Fluid Dynamics

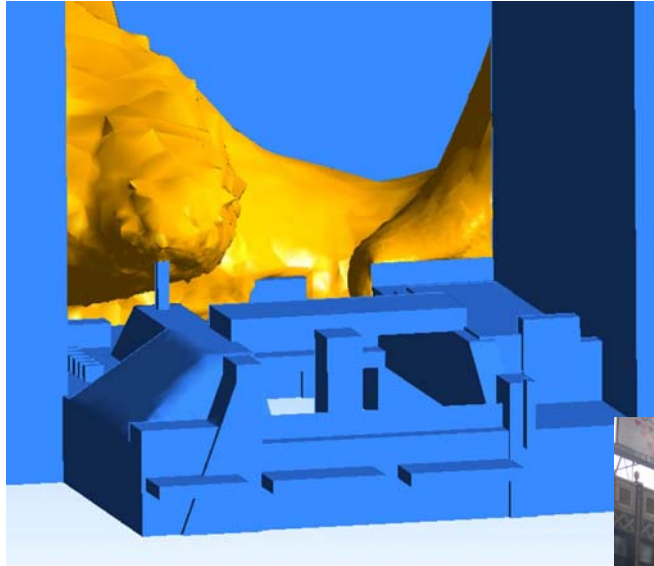
Microclimate Engineering

Design of Mass Dampers

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Air quality assessments are essential elements of design and due diligence studies for various developments including: transportation corridors, research laboratories, industrial facilities and municipal facilities such as wastewater treatment plants, among other sources. While issues related to air quality are often more acute in urban centers or in proximity to the source, long range transport and atmospheric interactions cannot be ignored when considering ambient levels and long term effects. Poor air quality affects human beings directly in terms of health effects and odour annoyance, as well as indirectly in terms of deterioration of the natural habitat.



Industrial emissions from points and area sources have short range impacts on nearby sensitive areas influenced by local topography and wind conditions, as well as long range impacts influenced by atmospheric chemistry.

GmE uses computer based mathematical models and wind tunnel testing on physical scale models to assess the impact of pollution sources on the environment.

Our experience comes from many years of working with clients in manufacturing sectors, biological and chemical research facilities, as well as work on institutional assignments.



*Physical and computer modelling is sometimes used by city planners to select the best location for new transportation corridors.*

We offer expertise in modelling & interpretation of results with respect to health and odour effects on human beings, as well as impacts on the natural environment. We have extensive contact with regulatory agencies in Canada and the United States, as well as some exposure to European regulations.





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## Exhausts From Chemical And Biological Research Facilities

Research and development facilities at universities or in the pharmaceutical and photonics industries, among others, handle a wide variety of gaseous emissions that vary in toxicity and odour impacts. *GmE* has been involved with modelling and resolving problems with emissions that have high toxic or odour potentials. Their impacts have been studied as they affect the occupants by way of re-entrainment of exhausts at fresh air intakes, and by how they affect the surrounding community through air emissions. Our work extends into wastewater treatment plants where the prediction and control of odours are among the critical issues.

## Accidental Spills

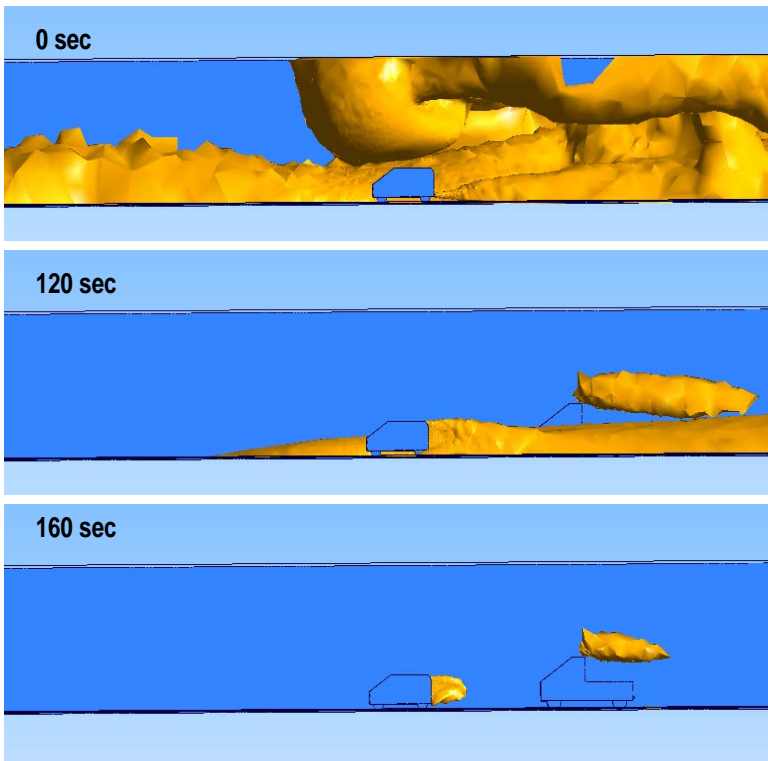
Gaseous pollutants from a facility can either be continuous (i.e. steady state) or random, as in the case of an accidental spill scenario. *GmE* has undertaken numerous analyses to consider the probabilities of accidental spills and how their impact should be compared to regulatory limits. *GmE* has dealt with most governing and regulatory bodies in North America including: EPA, ACGIH, MOE (Canada), and Health Canada.



*Depending on the site wind conditions, building geometry, and stack parameters, emissions from chemical fume hoods released through stacks may find their way back into the building at fresh air intakes.*

## Wind Tunnel Testing as a Powerful Design Tool

*GmE* uses physical modelling combined with wind tunnel testing as the most reliable approach to determine the impact of gaseous emissions on surrounding points of reception. The wind tunnel can also be used to validate computational fluid flow studies that are better suited for sensitivity or parametric analysis.



*Using CFD software, *GmE* has modelled vehicle emissions in enclosed spaces, such as vehicle tunnels, an approach which involves computer modelling of the tunnel, complete with vehicle exhausts in steady state, and transient conditions for uniform traffic flow and calm external winds.*



*Model of research facility tested in a wind tunnel. Emissions are modelled to represent actual momentum and buoyancy of the full-scale stacks.*