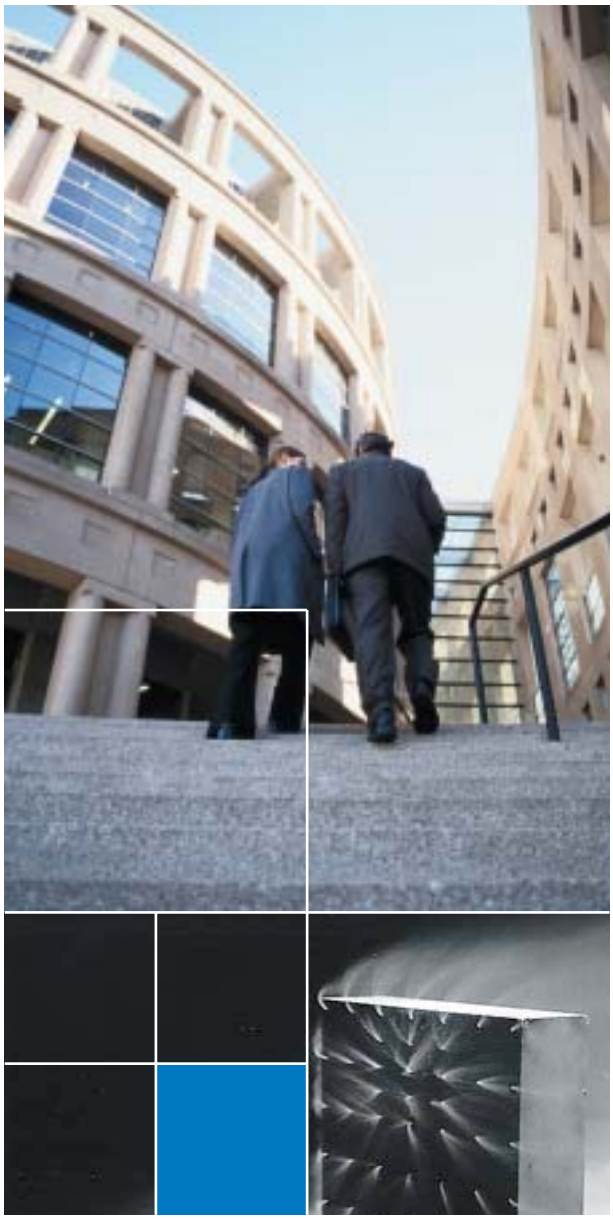
BRE

Wind environment: design solutions for architects and engineers



BRE's wind tunnel testing service enables designers to assess the impact that wind will have on a building and the area around it. Our wind environment specialists work closely with architects, engineers, developers and planning consultants to provide practical design solutions that are both technically sound and commercially viable.

We advise on a wide range of issues including:

- **Pedestrian wind environment**
  Assessing wind speeds around a development for pedestrian safety and comfort.
- **Site planning**
  Examining building form and site layout in the context of wind paths and velocities.
- **Low energy building design and natural ventilation**
  Assessing the local wind forces that will drive natural ventilation systems. Design evaluation and fine tuning of natural ventilation strategies. Determining strategies for urban areas.
- **Ventilation and air conditioning**
  Assessing the impact of wind on HVAC systems. Guidance on siting inlets and exhausts to maximise performance.
- **Fire and smoke control systems**
  Design guidance on the location of inlets and exhausts. Testing smoke ventilation strategies.
- **Open sites**
  Predicting wind behaviour after site clearance and assessing its impact on the neighbouring area during construction.
- **Spectator comfort**
  Predicting wind movement in stadia and its effect on spectator comfort and the pitch.

BRE also provides design advice on:

- structural wind loading
- pollution dispersion
- weathertightness

For more information please contact:

Dr. Earle Perera
T +44 (0)1923 664486
F +44 (0)1923 664796
E pererae@bre.co.uk

BRE, Garston, Watford
Hertfordshire WD25 9XX
T 01923 664000
F 01923 664010
E-mail: enquiries@bre.co.uk
www.bre.co.uk

BRE Scotland
Kelvin Road
East Kilbride
Glasgow G75 0RZ
T 01355 576200
F 01355 576210

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Case studies

Planning consent – pedestrian comfort

To obtain planning consent for a prestigious development of offices and retail units in Central London, the designers had to demonstrate that the wind environment would be safe and comfortable for pedestrians. The site was already extremely windy because of a 100m slab tower block that deflected high level, high speed winds down to ground level. BRE assessed the effect that the new buildings would have and worked closely with the designers to develop and test canopies and windbreaks that would reduce the adverse effects of the tower block.

Planning consent – fire safety

The project: a covered shopping mall in a city centre location. Building Control Officers required evidence that the local wind pattern would not adversely affect the ventilation of smoke from the canopy roof. There was particular concern that a twenty storey tower block at one end of the mall and some adjacent tall buildings, might produce positive wind pressures and undermine the ventilation strategy.

BRE wind tunnel tests showed that because of the complexity and extent of local wind effects, mechanical ventilation was more appropriate than a naturally ventilated solution. Wind pressure measurements were used to help design the appropriate mechanical ventilation system and pinpoint the appropriate fan strength.

Design development – natural ventilation

To design an effective ventilation system for a large, new public building, the engineers needed to understand the local wind environment. The strategy was to introduce fresh air through underfloor ducts and vent contaminated air through high level vents under the action of stack and wind pressures. To optimise the size and location of ventilation openings, the engineers required data on external facade wind pressure coefficients. The data was obtained from tests carried out in BRE's wind tunnel and used to evaluate ventilation rates for different configurations, internal surface temperatures and a range of local meteorological conditions.

Planning consent – underground car park

The project: a residential development with an underground car park. The Building Control Officer was concerned that the natural ventilation openings around the perimeter of the car park would not satisfy Building Regulations. It was necessary to demonstrate that exposure to carbon monoxide would be within the limits set out in Approved Document F. Wind pressure data obtained from wind tunnel tests and local meteorological wind speed data were used to identify frequency distributions of ventilation rates. Using rates of carbon monoxide emissions based on the expected use of the car park, BRE was able to demonstrate that the proposed natural ventilation system would provide a safe environment.