

Wind Engineering

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Vipac was first to implement the Force Balance Method in Australia, a technique that removes the need for repeat testing if building properties change as the design evolves.

Vipac translates wind engineering tests into practical design solutions that enhance the safety, comfort, reliability and efficiency of building construction. Our services include:

Pedestrian Level Wind Studies

To identify the upper level winds caught on top floors and channeled to the street level, resulting in severe gusting along footpaths or discomfort in plaza areas. This test is often a Statutory Planning Regulation requirement for new developments.

Cladding Pressure Mapping

To provide either a single value of pressure for use in cladding design, or a contour map of the design pressures over the complete facade surface. This highlights critical areas of reduced loads, which enables the use of more efficient, cost-effective materials.

Structural Studies / Direct Force Balance Testing

To determine dynamic structural loads such as base bending moments and shear forces.

Physical modelling for “near field” dispersion studies (up to 1km)

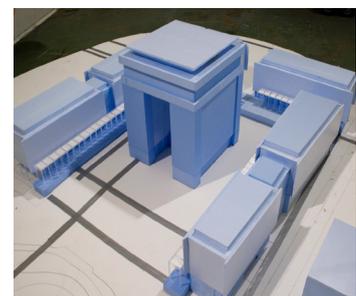
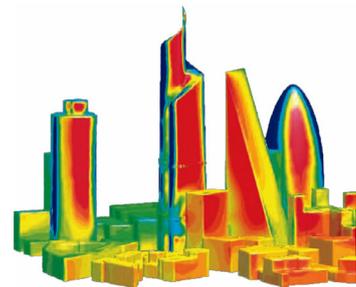
To measure complex aerodynamic interference effects, wind tunnel studies of model buildings with accurate modelling of plume discharge momentum and atmospheric velocity are conducted. By using a tracer gas and sensitive sampling equipment, concentrations of CO, NO_x, SO_x and dust particles are determined.

Computational modelling for “far field” dispersion studies (10's of km)

Different numerical analysis software such as AUSPLUME, CALINE 4, MAXCON, RTDM and AIRPLAN, are applied relative to the characteristics of the development. Modelling ascertains atmospheric pollutant concentrations for different pollutant sources and locations, with a range of micro-climate data.

Other services include:

- Local wind pressures (including wind load determination on cladding and building components)
- Ventilation/Air quality
- Wind-driven rain prevention
- Pollutant concentrations in public areas
- Air distribution analysis
- Natural ventilation
- Atrium fire and smoke behaviour
- Design and testing of motion dampers
- Wind-noise
- Advanced 3D printing to capture a high model resolution using resin powder, with overnight model building capability.



Wind tunnel testing provides information otherwise unobtainable from any other analytical, empirical, or computational technique.

More precise information on the extent of the wind flow and its interaction between the structure enables a more cost-effective design with greater reliability and safety.

Case Study - Sand Scour Test

Our sand scour testing provides a visual effect of outdoor wind conditions on the building and its surrounds, enabling interactive testing of proposed changes made on the spot.

Test Description

1. Construct scale model of building and surrounds for wind tunnel testing.
2. Use erosion technique to produce scoured velocity contours of high wind zones.
3. Assess scouring patterns of predicted annual pedestrian level wind comfort.
4. Compare results and assessment with previous testing of other nearby sites.

Vipac's Involvement

- Provide assessment of wind effects at town planning stage.
- Test and verify the use of canopies, planting and wind break features.
- Resolve wind related issues such as smoke spill, odour, dispersion, accumulation of litter and water spray from fountains.

Typical Outcomes

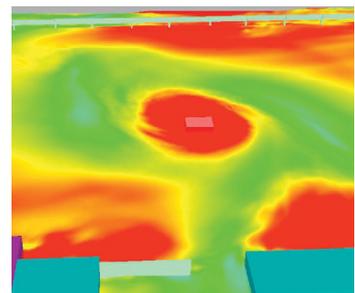
1. Accurate assessment of improved wind conditions.
2. Council familiarity with the test technique hastens resolution of wind impact issues.
3. Improved hardscape and softscape designs.
4. Recommended planting species from our photographic database and plant research.
5. Optimised size and location of entrance canopies and air lock features.
6. Safe and comfortable wind conditions which improve the ambiance of the site.

Award-Winning Services

Vipac was awarded the UDIA Environmental Award for Excellence in 2009 for its consultancy services on the Melbourne Convention and Exhibition Centre, addressing the following areas:

- Micro-climate issues.
- Engineering structural parameters including design wind loads and load optimisation.
- The integral footbridge.
- The adjacent South Wharf development.

The success of this project is testament to the benefit of wind tunnel testing on large-span roof structures and aeroelastic structures.



Vipac's testing adheres to the *Australian Wind Engineering Society Quality Assurance Manual* and the *American Society of Civil Engineers Wind Tunnel Guide*.