

# WINDTECH



Wind Studies

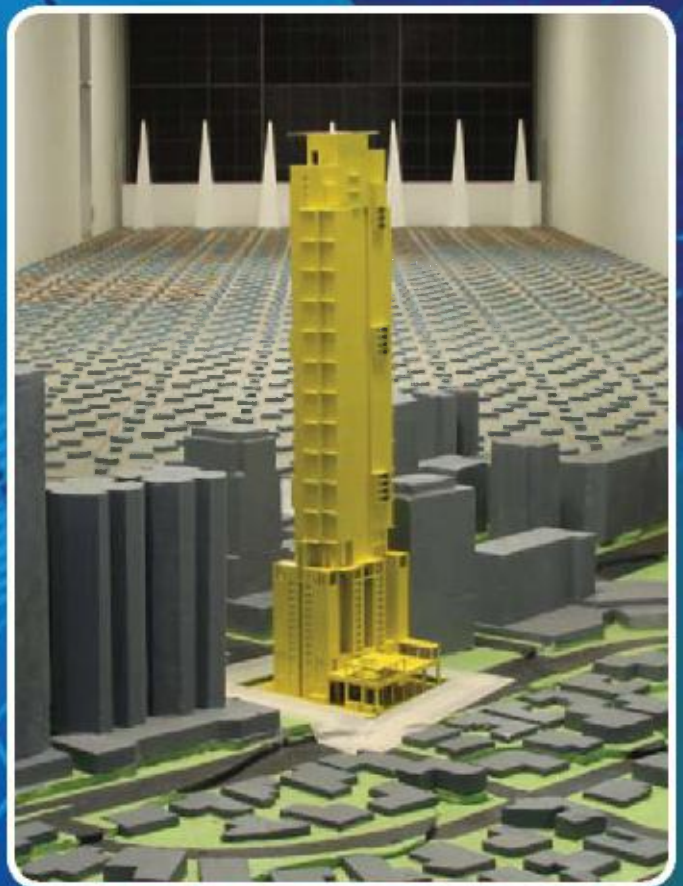


Solar Studies



Sustainability

**Windtech Consultants:  
Experts in the  
Study of Wind  
Effects on Buildings  
& Structures**



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# Introduction

WINDTECH Consultants is a company of consulting engineers specialising in the analysis of wind effects on buildings, structures and the environment. Since 1991, the company has been providing wind engineering and related high technology services for over 1000 major building projects, assisting planners and building design professionals. Since 1996, WINDTECH Consultants has also undertaken studies into solar effects and Environmentally Sustainable Development.

The trend to building taller, larger and lighter structures has highlighted the need for specialist services in providing accurate analyses of the effect of winds. This generally results in significant savings in the cost of the facade and the structure in comparison with the use of estimates from wind loading standards.

WINDTECH Consultants is one of the world's leading Wind Engineering laboratories. Analysis techniques developed by WINDTECH Consultants over the past few years place the company at the forefront of its field in the analysis of the effect of wind on the most complex structures. This has been possible through WINDTECH Consultants' policy of continual research and development and improvement.

The company has two boundary layer wind tunnel facilities with state-of-the-art data acquisition and data processing systems. This allows a fast turnaround as well as providing greater reliability in the results.

At WINDTECH Consultants we pride ourselves in offering our clients an impeccable service, backed by a reliable quality assurance system at a competitive fee structure.

We look forward to demonstrating to you our commitment to service and quality on your next project.



# Facade & Cladding Pressure Studies: for cost-effective robust designs

WINDTECH Consultants has a state-of-the-art data acquisition, signal conditioning and data processing system to ensure the highest possible accuracy in the prediction of wind pressures for the design of façade cladding and associated fixtures.

The trend to have high-rise buildings with operable façades can result in large internal pressures, which can affect not only the net façade pressures but also the internal partitions and for some super-tall buildings can also affect the design of the floor slabs. The most accurate approach to the determination of these loads is to measure these differential pressures directly from the wind tunnel model.

WINDTECH Consultants has developed a state of the art technique involving a rigorous analysis of load paths for the determination of these loads. This technique incorporates a risk analysis approach to ensure that the resulting loads are at a comparable level of risk to the surface pressures, which are designed based on working stress loads. This effectively provides a reliable prediction as well as providing substantial savings by eliminating over-design.

WINDTECH also have substantial experience with the study of the design pressures for double skin facades and buildings facades with unusual appurtenances attached.



## CASE STUDY

### Q1 Tower, Gold Coast, Australia

Q1 Tower, Surfers Paradise, at 321m, it is currently Australia's tallest building. A study was carried out to accurately predict the cladding pressures on the building's façade using a risk analysis approach to the treatment of the effect of the internal pressures on the net façade pressures. As Surfers Paradise falls within a cyclonic region, both Cyclonic and Non-Cyclonic wind-storm scenarios were investigated. For most areas the wind tunnel estimates were significantly less than the code's estimate, particularly along the vertical edges. This is largely attributable to the aerodynamic form of this tower building and the rigorous methodology adopted. The study included estimation of the design pressures on the significant canopy structure around the base of the tower as well as the effect of the extreme non-cyclonic winds on the differential pressures across the inter-tenancy walls and floor slabs.

Other studies were carried out including a structural loads/ building motion study and a pedestrian wind environment study.

## Sample Past Projects

- Q1 Tower (321m), Surfers Paradise, Australia
- Lodha Bellissimo, Mumbai
- ICICI Building, Mumbai
- 1 Richard Johnson Square, Sydney
- Bank of New Zealand Building, Auckland
- Fort Cambridge Development, Malta
- Northpoint Development, Pattaya, Thailand
- Al- Baker Executive Towers, Doha
- Sukoon Tower, Juffair, Bahrain
- Raffles City, Bahrain
- Era Tower Bahrain
- Ocean Heights (310m), Dubai Marina
- Signature Towers (360m), Business Bay, Dubai
- Tamouh City of Lights, Abu Dhabi
- One Shenton Way, Singapore
- The Sail @ Marina Bay, Singapore
- Marina Business and Financial Centre, Singapore
- Troika, Kuala Lumpur
- Shanghai Finance Commission building, Shanghai
- Yanlord Plaza, Chengdu, China
- Tamar Development, Hong Kong
- Discovery Primea, Manila
- Dream Mall, Kaohsiung, Taiwan

# Structural Loads/Motion Studies for tall Buildings: for cost-effective robust designs

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This study accurately determines the base overturning moments as well as the equivalent static point load distributions and shear force distributions over the height of the tower building. A typical report also includes maximum building displacements along the various axes of the tower and the assessment of occupant comfort based on the measured levels of tip accelerations. Rotational velocities are also checked as they tend to affect occupant comfort from the point of view of visual cues.

The building accelerations and rotational velocities are compared against a range

of comfort criteria. Where the criteria are exceeded, WINDTECH Consultants can design suitable tuned mass dampers or tuned liquid dampers to control the building motion to an acceptable level.

WINDTECH Consultants' modal analysis technique, used in the analysis of wind loads on tall buildings represents current world best practice. This technique provides the most accurate approach to the analysis of wind tunnel data, particularly for complex structures or buildings having highly coupled modes of vibration between the two translational modes and the torsional mode.

Our standard scope also includes the prediction of the correlation between different modes of vibration, which is particularly important when the natural frequencies of these modes are very close.

WINDTECH Consultants has also devised an advanced methodology for accurately determining the load distribution on linked tall buildings from wind tunnel data. This effectively overcomes any limitation due to complexity of the dynamic behaviour of the structure being investigated.

## Sample Past Projects

- Lodha Bellissimo, Mumbai
- Lumiere Towers, Sydney
- Q1 Tower, Surfers Paradise
- 420 Queen Street, Brisbane
- Soul Apartments, Surfers Paradise
- Al- Baker Executive Towers, Doha
- Sukoon Tower, Juffair, Bahrain
- Raffles City, Bahrain
- Icon Tower, Bahrain
- M & C Tower, Ho Chi Minh City
- Tamouh City of Lights, Al Reem Island, Abu Dhabi
- Capital Plaza, Corniche, Abu Dhabi
- Signature Towers (360m), Business Bay, Dubai
- Bab Al-Qasr, Abu Dhabi
- The Address at Burj Dubai
- Ocean Heights tower (310m) at Dubai Marina
- Capital Towers, Kuwait City
- Kuwait Investment Authority Headquarters, Kuwait
- Saraya Headquarters, Amman, Jordan
- Burj Rafal, Riyadh
- King Abdullah Financial District, Riyadh
- Motlak Tower (81-storey), Jeddah
- J G Summit Centre, Manila
- Discovery Primea, Manila
- Serendra Towers, Fort Bonifacio, Manila
- The Waltz, Fort Bonifacio, Manila
- Raffles Suites and Residences and Fairmont Hotel, Manila
- Ciputra World (3 towers), Jakarta
- Maybank Headquarters Building, Singapore
- Ocean Building, Raffles Place, Singapore
- The Sail @ Marina Bay, Singapore
- Parisian, Angullia Park, Singapore
- Marina Business and Financial Centre (5 towers), Singapore
- Wangsa Tegap Serviced Suites, Kuala Lumpur



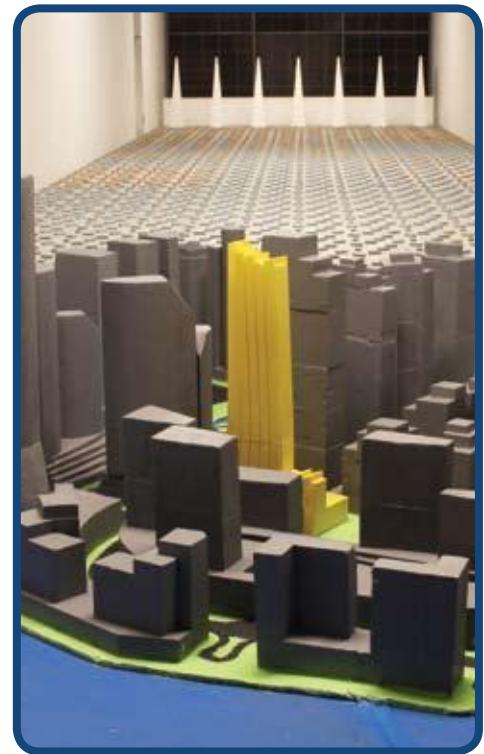
## CASE STUDY

### Empire Tower, Reem Island, Abu Dhabi

A wind tunnel study of structural loads and building motion was undertaken for this twisting and leaning 60-storey tower structure. WINDTECH Consultants used its published technique to accurately account for the effect of the structure's complex/coupled dynamic response, which is different to conventional wind tunnel analysis techniques.

This structure is certainly not amenable to code-based predictions of the structural loads and occupant comfort under building motion due to its height, not to mention its unusual, twisted form. The wind tunnel study identified an unusual amount of torsional loads acting on the structure, which was found to be due to the form of the building structure.

Other studies were carried out including a façade pressure study and a wind environment study. It should be noted that the façade pressure study resulted in a 12% saving in the cost of the façade package for this building.



## CASE STUDY

### One Shenton Way, Singapore

A structural loads and building motion study was undertaken for this two tower development. These towers are structurally linked (refer to picture). WINDTECH Consultants utilised its rigorous approach in the analysis of the wind tunnel results to cater for towers that have very complex structural behaviour, including the effect of load transfer between rigid connections between the two linked tower buildings. This technique required tests to be carried out simultaneously for both towers.

The methodology published by WINDTECH Consultants for linked tower buildings represents current world best practice and has been successfully used on this project. The study also provided an assessment of occupant comfort due to building motion against five different criteria. The outcome of this study is that significant reductions were achieved in the design loads due to properly accounting for the effect of the rigid linkage.

Other studies were carried out including a façade pressure study and a wind environment study.



# Structural Loads Studies: for cost effective robust designs

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## Stadium and Long-Span Roof Structures

WINDTECH Consultants has developed worlds best practice in the study of wind loads and responses of stadium roofs and long-span canopy structures, utilising advanced solid state multi-channel simultaneous pressure scanning techniques. The Load Response Correlation technique as well as the direct pressure integration technique are used. These provide significantly more information than was previously possible using traditional techniques.

Until recently, the information provided to designers by wind tunnels is in the form of wind loads or wind pressures, rather than load effects, such as bending moments, axial forces, reactions, etc. Now with the aid of advanced solid state multi-channel simultaneous pressure scanning techniques it is possible for wind tunnel testing to achieve even greater economy and reliability in the design by accurately accounting for spatial variations in loading and by monitoring the actual key load effects to determine the most critical load combination for each load effect from the wind tunnel results.

### Sample Past Projects

- Palaran Stadium - Kalimantan, Indonesia
- Sumatra Stadium, Indonesia
- Qantas Aircraft Maintenance Hanger, Brisbane Airport
- Nanjing Stadium, China
- Khalifa Stadium, Doha (temporary structures)
- Queensland Art Gallery Roof Structure
- Skilled Park Stadium, Gold Coast
- Flying Museum, Cessnock, New South Wales
- Birkenhead Shopping Centre Canopy, Sydney
- Metcash Distribution Centre, Brisbane (500m x 300m warehouse).
- Queensland State Tennis Centre, Tennyson, Brisbane
- Wellington Sports Centre, New Zealand
- Otago Stadium, Dunedin, New Zealand

### CASE STUDY

#### Nanjing Stadium, China

WINDTECH Consultants has carried out study of wind loads on the roof structure of the Nanjing Stadium (the main component of the China Games, 2005) using this technique. A total of 15 load effects were investigated, ranging from axial loads along main members to mid-span deflections. Advanced solid state multi-channel simultaneous pressure scanning techniques were utilised to determine both the background and resonant responses of this large lightweight roof structure, for each of the load effects. A total of eight load cases were obtained to cover the maximum and minimum responses for the 15 load effects that were studied.

The net design wind loads on the various cladding elements was also measured directly in the wind tunnel using real-time differential pressure measurements.





## Special Structures

WINDTECH Consultants has a particular interest in the study of wind effects on special structures. Unusual wind-sensitive structures, large and small, require special modelling. This calls for knowledge of the limitations and an understanding of the principles behind wind tunnel testing. Often a special methodology and testing regime needs to be formulated to arrive at the most accurate results possible.



**Temporary Structures for the Asian Games 2006, Doha**



## CASE STUDY

### Temporary Structures for the Asian Games 2006, Doha

One of the temporary structures was the 25m diameter cauldron. This consisted of a complex moving structure comprising two slim rotating rings revolving around a main ring located on a 25m high shaft. A 1:50 scale model of the structure was prepared using the rapid-prototyping technique. The model was configured with pressure taps within each ring and over the supporting shaft and was placed within a 1:50 scale model of the Khalifa Stadium. The model was designed such that the rings can be rotated to simulate the effect of different stages of the rings' revolution relative to each other and for the erection mode configuration.

Before commencement of testing, a study was carried out using a 1:300 scale model of the sports precinct to determine the effect of the surrounding structures on the upstream velocity and turbulence intensity profile for wind incident from different wind directions. These wind profiles were replicated at 1:50 scale to be used for this study. An extensive analysis was carried out of the wind climate for Doha. This included a seasonal extreme wind speed analysis to correspond with the time of year when this structure was in place.

The high-frequency force balance technique was important as a check on the results of the Load Response Correlation technique. The need for the Load Response Correlation technique stems from a requirement to determine the relative displacements of the ring elements, as they must operate within very strict limits to avoid the rings colliding with each other (there was an allowance for only a few centimeters gap between the concentric rings). The Load Response Correlation technique is also useful in providing a more accurate set of equivalent static loads for such an unusual structure.

WINDTECH Consultants was also engaged to investigate the wind drag forces on a 150m long and 58m high video screen featured in the opening and closing ceremonies of the 2006 Asian Games in Doha. This screen consists of a matrix of LED screens connected via 25mm diameter vertical cables. The aim is to determine the wind drag for the design of the supporting structural frame, which consists of a series of 8 vertical space trusses. A special technique was used to simulate the flow around the cables in the scale model. This required a distortion of the scale of some of the elements as well as the porosity of the screen. Wind tunnel testing was carried out using both a force balance and a pressure tapped model to enable an accurate prediction of both the overall drag and the distribution of the wind forces on the large LED screen.

WINDTECH Consultants was also responsible for the wind management plan for the opening and closing ceremony. An algorithm was developed based on wind tunnel testing to relate the wind speed at a number of wind speed monitoring stations to the wind effect on various mobiles used during those events.

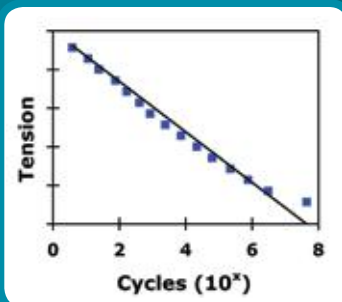
# Fatigue Life Analysis for Steel Structures

Large steel-framed structures are particularly prone to fatigue failure due to the ability of small cracks to quickly propagate into the structural element. Such structures can eventually fail under repetitive loads that are significantly below the ultimate strength capacity of the structure at the time of construction. WINDTECH Consultants can undertake an analysis of structures of this kind to estimate the fatigue life of the key joints within the structure. The accuracy of this estimate can be substantially enhanced if a wind tunnel study is also carried out and reliable wind climate data is available. WINDTECH Consultants can also provide load-cycle data to assist the structural consultant to undertake a study of the fatigue life.

## CASE STUDY

### 30m high fin on the roof of a 300m tall tower building

This tower building in the Middle East has a 30m high roof fin (refer to the image). The roof fin is of steel-framed construction with welded members and a bolted footing. A fatigue life analysis was carried out for various joint types in the structure. This required an analysis of the local wind climate data and inputs from the structural consultant in terms of the relationship between the applied pressure and the stress experienced at various joints. A design was presented to ensure the fatigue life of the various joints was satisfactory.



## CASE STUDY

### Steel frame for Otago Stadium

A wind tunnel study was carried out of the design pressures on the structure and cladding for this building. The structural load study was based on the Load Response Correlation technique which has resulted in a light and efficient structure made of ETFE facade and roof cushions supported by a predominantly steel structure. The structural consultant engaged WINDTECH Consultants to undertake a form of load-cycle analysis in the form of load-effect vs number of cycles for a number of key load effects. This in turn was used to undertake detailed stress-cycle modelling for the connection details associated with those members.





# Full-scale measurements: for certainty of performance

## Performance of Facade Elements

WINDTECH Consultants can provide testing of the following aspects of façade elements such as louvre panels, external blinds and fins;

- Wind-Noise Generation
- Rain-Noise Generation
- Discharge Coefficient and Effective Area
- Performance under Serviceability Wind Loads, and,
- Rain Penetration

### Sample Past Projects

- Louvre panel system for Diethelm Louvres, Singapore
- External Louvres for the new Lend Lease Headquarters, Sydney
- Louvre panel system for H. H. Robertson, Sydney
- Privacy screens for Harbour Lights, Cairns, Australia

## Design and Testing of Motion Dampers

WINDTECH Consultants provides cost effective designs of motion dampers to control building motion. This is normally carried out in the cases where wind tunnel testing indicates exceedance of occupant comfort criteria for building motion. Our experience is that tuned liquid dampers are far more cost effective. WINDTECH Consultants has designed both sloshing liquid dampers and tuned liquid column dampers. Our services include testing of prototypes, on-site measurement of the dynamic properties of the tower at an advanced stage of construction and commissioning.

WINDTECH Consultants also offers design and commissioning services for other types of dampers such as tuned mass dampers, viscoelastic dampers and damped outrigger systems.

### Sample Past Projects

- Georgia Apartments, Sydney (100m tall, very slender tower)
- Sukoon Towers Bahrain (177m tall)
- Signature Towers Dubai Business Bay (360m tall)
- Motlak Tower, Jeddah (285m tall)
- Crystal Towers Kuwait (240m tall)

## CASE STUDY

### Wind Noise and Vibration study of the drum screen for the Sebel Harbour Lights, Cairns

WINDTECH Consultants tested a prototype of the screen having sharp edges for wind from different angles of attack. It was found that the initial prototype sample emitted significant noise. The level of noise and vibration was also measured. Subsequent tests of a revised prototype, having radiused edges confirmed the effectiveness of the modification in mitigating the wind-noise.



Wind-noise test of a Privacy Screen panel for Harbour Lights, Cairns. WINDTECH also carried out a study of the facade and internal pressures

# Environmental Wind Studies: improving the habitable environment

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## On-Site Inspections and Remedial Studies:

WINDTECH Consultants can undertake desk-top assessments as well as on-site inspections of building or façade vibrations, adverse wind environments and wind-noise problems in existing buildings. Windtech Consultants have provided remedial treatments for the following problems in existing buildings:

- unacceptable wind conditions
- whistling in lifts
- lift breakdown due to wind pressure
- whistling and/or vibration in facades
- wind-noise from façade elements
- lobby doors refusing to open or shut due to strong wind entry
- wind and dust entry
- vibration of facade systems
- measurement of the natural frequency of vibration
- long-term or short-term monitoring of wind speed and/or vibration
- testing and certification of motion damper performance.

## Wind Environment Studies

Wind tunnel modelling provides an accurate and definitive assessment of wind conditions prevailing in the surrounding streetscapes and any critical out-door areas within or adjacent to the site.

Wind velocities are measured in the wind tunnel and are related directly to comfort criteria. If any treatments are required, this study will also enable the testing of these treatments to ensure their effectiveness. When required, innovative and cost-effective solutions to potential problems are provided to ensure that the architects' design intent is achieved. Initial testing is normally carried out without the effect of planting or other measures. Treatments are gradually added to ensure that the optimum treatment solution is achieved. WINDTECH Consultants utilises hot-wire anemometry, which is the most accurate technique available.

If required, a frequency analysis can be undertaken for wind environment studies to determine the approximate number of days in the year where the wind speeds are expected to exceed given criteria.

## CASE STUDY

### 830-840 Bourke Street Waterloo, Sydney

This residential development, consisting of two buildings, is located in one of Sydney's city fringe suburbs. Initial testing was performed without the effect of the proposed planting regime.

The model was modified to incorporate strategic elements from the proposed planting with some modifications and was tested in the wind tunnel. The retesting showed that a refinement of the initial planting regime was sufficient to bring the wind conditions in most areas to within the relevant criteria for the respective areas.

However, the strategic tree planting approach needed to be supplemented with other measures for the proposed outdoor dining area, located at the corner of an undercroft area. The criterion for this area becomes more stringent as it involves stationary activities. The introduction of a freestanding canopy (refer to the image) to deflect the sidestreamed winds was effective in bringing the wind conditions to satisfy the relevant criterion.



## Air Quality Studies

Wind studies of plumes emitted from chimney stacks were begun initially to study the provision of artificial draught for combustion processes. Today, as a consequence of increased environmental awareness, industries producing atmospheric waste are required to comply with strict environmental criteria. Designers are now potentially liable for harm brought about by excessive pollutant concentrations due to unsatisfactory building or site layout.

Common applications of this type of study include :

- The study of the propagation of odour from sources such as sewerage effluent, treatment ponds and chemical wastes.
- The dispersion of smoke from power generators using coal fuel.
- The dispersion of air pollution emitted from vehicle exhausts (eg. a new bus stand or a proposed freeway).
- The re-entry of air-conditioning exhaust into the system, potentially leading to the fatal Legionnaires disease.

Depending on the nature and scale of the study, the dispersion patterns of the atmospheric pollutant can be modelled either mathematically or physically. Physical modelling, involving the use of a wind tunnel can be conducted using either visual techniques or through a quantitative analysis by measuring concentrations of a trace gas at a number of critical locations. WINDTECH Consultants has undertaken numerous wind tunnel model studies to investigate the flow of atmospheric pollutants around buildings such as kitchen exhausts, air-conditioning exhausts, and dispersion of fumes by standby power generators. Flow visualisation is generally recommended (with or without the use of a trace gas) as it allows the identification of the critical flow mechanisms that have the most significant impacts. This enables the formulation of effective ameliorative measures.

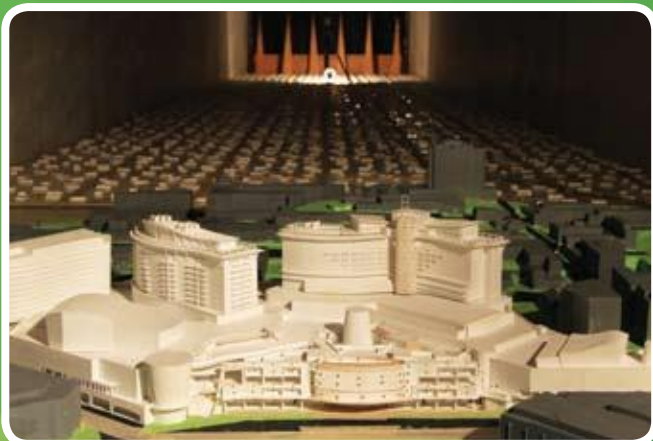


## Modelling of Wind-Driven Rain

WINDTECH Consultants has substantial experience in the prediction of the effect of wind on the footprint of rain. Firstly, this involves the determination of the distribution of particle sizes for the site and then the relationship between wind and rain events. This information is combined with wind tunnel measurements to arrive at the estimated trajectory path of the rain droplets.

Examples of projects where Windtech undertook this type of study are:

- Star City Casino, Sydney, Australia
- Soul Apartments, Surfers Paradise, Australia



## Erosion Modelling

WINDTECH Consultants can assist with the modeling of soil or particle erosion due to wind and can advise regarding the extent of wind required to cause significant erosion and methods of mitigation. An example of such a study is the investigation of the erosion of iron ore stockpiles in Bahrain.



# Environmentally Sustainable Development: building for the future

Optimising natural ventilation and passive thermal performance are essential to sustainable design as they have the greatest lasting impact in reducing the demand by the development for power and its consequent environmental impacts. It is normal to see a 75% reduction in power consumption by implementing simple modifications to the construction system.

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## Natural Ventilation

WINDTECH Consultants is a leader in the study of natural ventilation in buildings. WINDTECH Consultants has undertaken modeling of natural ventilation for numerous buildings since 1999 using wind tunnel modelling. This has also enabled WINDTECH Consultants to recommend new cost-effective techniques in achieving natural ventilation in buildings where natural ventilation would not have been possible otherwise.

## CASE STUDY

### Cowper St Parramatta, Sydney

A wind tunnel study was carried out for this building located within the Sydney metropolitan area to optimise the natural ventilation characteristics. The study used the performance of the double ended and corner units as benchmarks. The study concluded with a recommendation to provide an auxiliary ventilation system which was subsequently tested and detailed. Full-scale measurements were carried on completion of the project to confirm the effectiveness of the system.



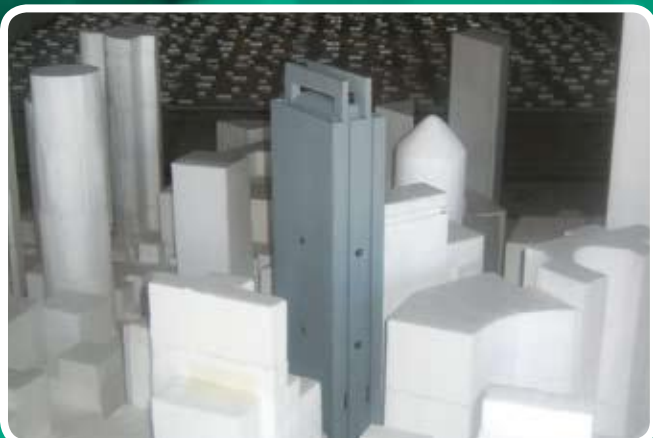
## Wind Power

WINDTECH Consultants can assist in providing accurate and reliable predictions of the wind speeds and corresponding power output from proposed wind turbines using wind tunnel testing. Wind tunnel testing provides far greater accuracy than CFD techniques. A comparison between our wind tunnel modeling and CFD predictions for the same project has shown that CFD modeling techniques are often inaccurate by as much as 50%.

## CASE STUDY

### 1 Richard Johnson Square, Sydney

A row of vertical axis wind turbines was proposed for the top of this tower building. WINDTECH Consultants used wind tunnel modeling to reliably predict the wind speeds at each turbine for the 16 compass directions. A relationship between the wind speeds at wind turbine hub height and airport meteorological recordings (for different wind directions) was also established to enable the client to undertake their own feasibility study.



## Thermal Comfort Studies

Since 1997 WINDTECH Consultants has been providing consulting services to assist in the design of Environmentally Sustainable Developments.

WINDTECH Consultants conducts modeling of the energy required in residential dwellings for heating and cooling over the year. WINDTECH Consultants uses a second generation software package to analyse the thermal comfort for single and multi-unit dwellings. The accuracy of this software has been verified against field measurements. The software is capable of predicting the heating and cooling energy required by the occupants to maintain thermal comfort throughout the year. This is performed by entering seasonal data relating to wind speed, temperature, humidity as well as information on the sun path. The software is capable of accounting for the effect of shading by other buildings or objects, the type of sub-floor, wall, floor, ceiling and roof construction, orientation and size and type of windows and doors, venting, level and type of insulation.

Where the design results in excessive heating and cooling loads the software enables the identification of the room(s) where the bulk of the heating gain/loss occurs and recommendations are made with regards to the most efficient and cost-effective method of reducing the thermal loads. This can involve one or more of the following methods:

- strategic use of insulation
- alteration of construction materials
- adjustment in the configuration of building openings.

WINDTECH Consultants' expertise is recognised in the inaugural Urban Development Institute of Australia Awards which commenced in 2004. WINDTECH Consultants was associated with four out of the five winning entries.



## Sample Past Projects

- Sturt Place, St Ives, Sydney, Australia
- 55 Lavender St, Milsons Point
- 185 Macquarie St, Sydney
- 49-53 Regent St, Railway Square, Sydney
- 61-65 Regent St, Chippendale
- Millennium Towers, Kings Cross (Stages 1 and 2)
- Oxford Square redevelopment, 55-73 Oxford St, Surry Hills
- 18-22 and 42 Walker St, Rhodes
- The Entrance Apartments, The Entrance
- 222-228 Coward St, Mascot
- 2 Delecta Ave, Mosman
- 8 Windward Ave, Mosman
- 2 Stanton Rd, Mosman
- Transfield House Site, Alfred St, Milsons Point
- Cnr Miller & Ernest Sts, Cammeray
- 34 Illife St, Bexley
- 2-storey dwelling in Bundeena
- Bay St, Tweed Heads
- Enid St, Tweed Heads
- 118-122 Corrimal St, Wollongong
- 100 Hudson Parade, Clareville
- Mill Hill Rd, Bondi Junction
- 5-11 Atchison St, St Leonards
- 15-19 Warby St, Campbelltown
- 9-15 Alberta St, Surry Hills
- Lot 5, Rocky Point Road, Rocky Point, Qld
- 70 Ferny Ave, Surfers Paradise

## CASE STUDY

### 157 Redfern St, Redfern, Sydney

An analysis of the thermal loads was performed for the 84 dwellings within this development at 157 Redfern Street, Redfern for the thermal component of BASIX (similar to LEEDS). The analysis indicates that a majority of the units required too much energy for cooling to maintain comfort for the occupants. An analysis of the design of these units indicated it had a significant amount of glazing orientated on the eastern, northern and western façade (southern hemisphere), thereby capturing a high amount of heat. Remedial treatment involved improving the properties of the glazing systems and the inclusion of bulk insulation in the ceiling of the top floor to minimize the amount of heat transfer into the units. The natural cross ventilation of the units was also improved by making several of the glazed systems operable, hence allowing the build up of heat to escape to the exterior environment. These measures have resulted in a significant reduction in the cooling loads for a large number of units by as much as 79%.

# Solar Studies: Environmental Impacts and Comfort

WINDTECH Consultants provides consulting services in the area of solar effects, including the study of solar reflectivity, solar access, overshadowing and daylight. WINDTECH Consultants has undertaken over 200 such studies including a Solar Reflectivity Analysis of the Burj Dubai Tower, currently the World's tallest building.

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## Solar Reflectivity Studies

Solar glare from buildings is known to be a potential hazard to motorists. For this reason, Councils now generally require a study of solar reflectivity from large building projects and recommendations for solving potential glare problems.

The method adopted by WINDTECH Consultants to examine solar reflectivity from buildings was developed by David N. H. Hassall. The Hassall technique involves the use of a glare protractor and reflection protractor which determine the amount of glare to be expected from any building surface and the degree of annoyance.

The Hassall technique provides detailed information on the more critical aspects of the study. This in turn makes the study very efficient and also able to provide useful results with recommendations regarding the maximum reflectivity of facade materials being used as well as the time of occurrence of the critical levels of glare and from which section of the facade.

## Solar Access Studies

Many local government authorities now require an assessment of the quality of the living spaces in new residential unit developments largely in terms of their energy efficiency and access to direct sunlight. WINDTECH Consultants has undertaken solar access studies for a large number of projects.

### Sample Solar Study Projects

- Burj Dubai Tower (to become the world's tallest building)
- Domestic Terminal T2, Mascot, Sydney
- GPO Redevelopment, Sydney
- The Forum, St Leonards, Sydney
- University of Auckland New Business School, New Zealand
- QV Residential Tower, Melbourne
- 88 Walker St and 100 Mount St, North Sydney
- Neuroscience Research Precinct, Randwick, Sydney
- Victoria Square Masterplan, Zetland, Sydney

## Daylight Analysis

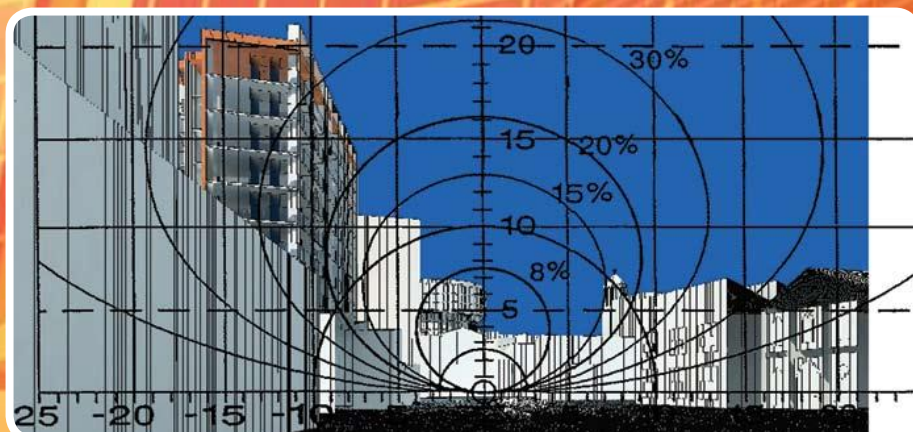
Daylight analysis is carried out when concern is expressed with regards to the potential for excessive overshadowing by the surrounding buildings. This study is normally required where it is difficult to assess the deemed to comply provisions in various building standards due to the complexity of the openings to the sky, the presence of nearby buildings obstructing sky illumination or where the building has an irregular form.

Assessment of the adequacy of natural lighting from the sky is compared against criteria on which the building codes are based.

## Shadow Analysis

WINDTECH Consultants offers services in the provision of Shadow Diagrams.

WINDTECH Consultants can also use scale models supplied by the architect to produce high quality photographic prints of the shadows cast at various times of the day for the Equinox and Summer and/or Winter Solstice. The exact times and seasons are determined based on the requirements of the relevant local authority. Often the existing scenario is also presented for comparison. WINDTECH Consultants' Helioscope is used for this work. The Helioscope involves the use of an adjustable light-source in conjunction with a turntable and special lighting effects. The use of physical modeling technique has been preferred by regulators in some local government areas due to its reliability and clarity.





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reliability and impeccable service



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