



Wind Studies



Solar Studies



Sustainability

www.windtech.com.au

**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 2000 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 ensure that the company remains 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.

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

At WINDTECH Consultants, we pride ourselves in offering our clients a high level of 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 323m, 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 facade 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 analysis techniques adopted in the study. The study included estimation of the design pressures on the significant canopy structure around the base of the tower as well as the 33m high roof feature. In addition, the effect of the extreme non-cyclonic winds on the differential pressures across the inter-tenancy walls and floor slabs was carried out.

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

Sample Past Projects

- Q1 Tower (323m), Surfers Paradise, Australia
- 1 Richard Johnson Square, Sydney
- Lodha Bellissimo, Mumbai
- Century Mill Tower, Worli Mumbai
- 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
- 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
- KL Sentral, Kuala Lumpur
- Troika, Kuala Lumpur
- Shanghai Finance Commission building, Shanghai
- Jiu Shi Headquarters, Shanghai
- Yanlord Plaza, Chengdu, China
- Tamar Development, Hong Kong
- Discovery Primea, Manila
- Trump Tower, 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 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.

For super-tall or slender dynamic buildings, WINDTECH Consultants also undertakes wind tunnel studies on an aeroelastic model to accurately quantify the effect of aerodynamic damping.

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
- Century Mill Tower, Worli, Mumbai
- Atmosphere, Kolkata
- Lumiere Towers, Sydney
- Q1 Tower, Surfers Paradise
- Soul Apartments, Surfers Paradise
- 420 Queen Street, Brisbane
- Queen Victoria Village (2 towers), Melbourne
- Treasury Building, Perth
- Al-Baker Executive Towers, Doha
- Raffles City, Bahrain
- Icon Tower, Bahrain
- Tamouh City of Lights, Al Reem Island, Abu Dhabi
- Capital Plaza linked towers, Corniche, Abu Dhabi
- Signature Towers (360m), Business Bay, Dubai
- The Address at Burj Dubai
- Ocean Heights tower (310m) at Dubai Marina
- Kuwait Investment Authority Headquarters, Kuwait
- King Abdullah Financial District, Riyadh
- Raffles Place, Shanghai
- Yanlord Plaza, Chengdu
- Kempinski Hotel and Residences, Jeddah
- M & C Tower, Ho Chi Minh City
- Discovery Primea, Manila
- Knightsbridge Tower, Manila
- Trump Tower, Manila
- Raffles Suites and Residences and Fairmont Hotel, Manila
- KL Sentral, Kuala Lumpur
- Ciputra World (3 towers), Jakarta
- Rasuna Tower (280m), Jakarta
- GCNM Tower, Jakarta
- Maybank Headquarters Building, Singapore
- The Sail @ Marina Bay, Singapore
- Parisian, Angullia Park, Singapore
- Marina Business and Financial Centre (5 towers), Singapore



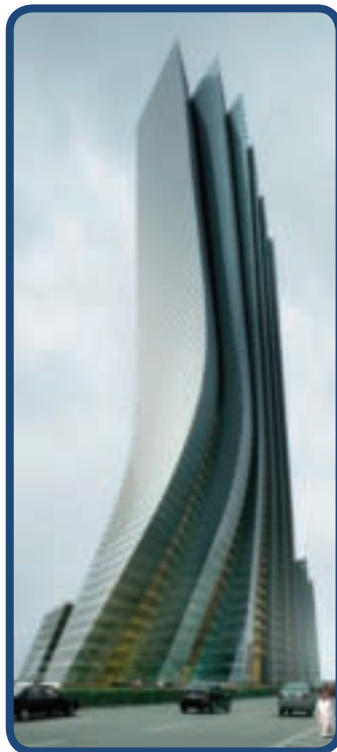
CASE STUDY

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 via the rigid connections between the two linked tower buildings. This technique required testing to be carried out simultaneously for both towers.

The methodology published by WINDTECH Consultants for linked tower buildings represents current world best practice and was 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 demonstrated significant reductions in the design loads due to properly accounting for the effect of the rigid linkage.

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



Structural Loads Studies: for cost effective robust designs

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 tunnel laboratories was limited to a single load effect such as peak deflection with limited or no information on how the critical pressure distribution can vary for different 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 both time and spatial variations in loading. This is achieved by monitoring key load effects to determine the most critical load combinations.

After the completion of the design using the initial wind tunnel results, WINDTECH Consultants can reanalyse the structure, allowing the designer to further optimise their structure.

Sample Past Projects

- Palaran Stadium - Kalimantan, Indonesia
- Sumatra Stadium, Indonesia
- Qantas Aircraft Maintenance Hanger, Brisbane Airport
- Nanjing Stadium, China
- Queensland Art Gallery Roof Structure
- Skilled Park Stadium, Gold Coast
- Flying Museum, Cessnock, New South Wales
- Manila Arena (world's largest indoor arena)
- Metcash Distribution Centre, Brisbane (500m x 300m warehouse).
- Queensland State Tennis Centre, Tennyson, Brisbane
- Wellington Sports Centre, New Zealand
- Forsyth Barr Stadium, Dunedin, New Zealand
- Waikato Velodrome, New Zealand

CASE STUDY

Nanjing Stadium, China

WINDTECH Consultants has carried out a study of the 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.

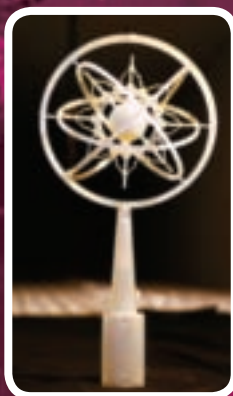
The net design wind loads on the various cladding elements was also measured directly in the wind tunnel using real-time differential pressure measurements.





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 at the 2006 Asian Games was the 25m diameter cauldron. This consisted of a complex moving structure comprising three slim rings revolving within a main fixed 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 also 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.

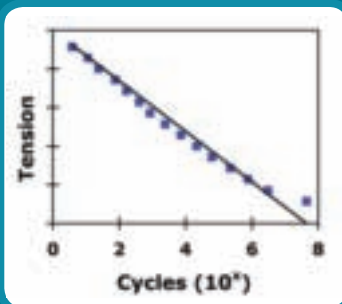
Fatigue Life Analysis for Steel Structures

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 enhanced if a wind tunnel study is also carried out and reliable wind climate data is available. WINDTECH Consultants can also undertake desktop assessments of fatigue life to assist the structural consultant in the design of key connections.

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 undertaken to determine the design pressures on the structure and cladding for this building. The structural loads 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 load-cycle analysis in the form of load-effect versus 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 cases where wind tunnel testing indicates exceedance of occupant comfort criteria for building motion. Our experience is that tuned liquid dampers tend to be far more cost effective than tuned mass dampers. 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.

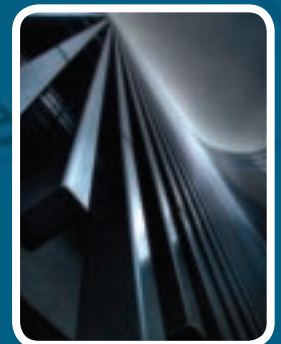
Sample Past Projects

- Rasuna Tower, Jakarta (280m tall)
- Georgia Apartments, Sydney (100m tall, very slender tower)
- 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.

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

CASE STUDY

The Age Site, 612 Lonsdale Street, Melbourne

This residential development, consisting of two buildings, is located in the Melbourne CBD. Initial testing was performed without the effect of the proposed planting regime.

Windtech were engaged following a failed attempt by another wind consultant to address the effect of the site's significant exposure to the prevailing northerly winds without significantly modifying the tower setbacks. Initial tests confirmed the significant effect of the northerly winds. The model was modified to incorporate strategic planting and incorporate porosity in the facade of the podium car park. Testing showed that after some refinement, these treatments were sufficient to bring the wind conditions to within the relevant criteria for the respective areas.

Additional measures were required for the proposed outdoor cafe areas, located at the corner of an undercroft area. The criterion for this area becomes more stringent as it involves stationary activities. This included the introduction of a freestanding canopy.



Air Quality Studies

Wind studies of plumes emitted from chimney stacks were initially used 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 dispersion of exhaust from standby power generators, cogenerators, power stations or car parks.
- Entry of exhaust gases or the re-entry of air-conditioning exhaust into air-conditioning system, potentially leading to the fatal Legionnaires disease.
- The dispersion of air pollution emitted from vehicle exhausts (for example a new bus stand or a proposed freeway).
- The study of the propagation of odour from sources such as sewerage effluent, treatment ponds and chemical wastes.

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 by means of spectrometry. 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, dispersion of fumes by standby power generators and vehicle exhausts. Flow visualisation is generally recommended (with or without the use of spectrometry) 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. This involves the determination of the distribution of particle sizes for the site as well as 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. This involves designing the development for its given location and harnessing the local environment to improve the energy efficiency of the development and thermal comfort of the occupants. It is normal to see a 75% reduction in power consumption by implementing simple modifications to the construction system. Research has also found that buildings with higher energy efficiency have an increased end market value.

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Natural Ventilation

WINDTECH Consultants is a leader in the study of natural ventilation in buildings. WINDTECH Consultants have provided accurate modeling of natural ventilation for numerous buildings since 1999 using wind tunnel techniques. Our technique has been verified against field measurements. This has also enabled WINDTECH Consultants to provide detailed design recommendations to achieve effective natural ventilation in situations where it would not be possible otherwise.

CASE STUDY

The Quay, Haymarket, Sydney

A wind tunnel study was carried out for this two tower development located within the Sydney CBD to optimise the natural ventilation performance of the development. The study used the performance of the double ended and corner units as well as various ventilation standards as benchmarks. The study recommended additional window opening locations for specified apartments. This enabled suitable thermal comfort and air quality to be achieved for the occupants of those residential apartments.



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 requirements in residential dwellings for heating and cooling to maintain thermal comfort for the occupants throughout the year. WINDTECH Consultants are accredited in the use an advanced 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 to maintain thermal comfort throughout the year. This is performed by entering seasonal data relating to the location of the development, 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, size and type of glazed systems, ventilation, 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 for 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 was recognised in the inaugural Urban Development Institute of Australia Awards in 2004. WINDTECH Consultants was associated with four out of the five winning entries.



Sample Past Projects

- Australia Towers, Sydney Olympic Park
- Divercity Blocks C and D, Waterloo,
- Sky by Crown, North Sydney
- Pemulwuy Precincts 1, 2 and 3, Redfern
- 157 Redfern St, Redfern
- Metro Residences, Chatswood
- Hillsdale Apartments, Hillsdale
- St. Tropez Waterfront, Homebush Bay
- 18-22 and 42 Walker St, Rhodes
- The Entrance Apartments, The Entrance
- 222-228 Coward St, Mascot
- 20 Levey Street, Wolli Creek
- Metro Residences, Chatswood
- 8 Windward Ave, Mosman
- 3-17 Queen Street, Campbelltown
- 12-40 Bonar Street, Arncliffe
- 114-124 Church Street, Parramatta
- 34 Illife St, Bexley
- 2-20 Botany Road, Alexandria
- 18 Fisher Avenue, Ryde
- 30-32 Guess Avenue, Wolli Creek
- 118-122 Corrimal St, Wollongong
- 100 Hudson Parade, Clareville
- 5-11 Atchison St, St Leonards
- 15-19 Warby St, Campbelltown
- 9-15 Alberta St, Surry Hills
- 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 400 such studies including a Solar Reflectivity Analysis of the Burj Khalifa, Dubai, 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, local government authorities now generally require a study of solar reflectivity impact from large building projects with 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 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.

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.

Sample Solar Reflectivity and Daylight Analysis Studies

- Burj Khalifa, Dubai (the world's tallest building)
- Domestic Terminal T2, Mascot, Sydney
- GPO Redevelopment, Sydney
- The Forum, St Leonards, Sydney
- Wenona School Performing Arts Complex, North Sydney
- 635 Gardeners Road, Mascot, Sydney
- QV Tower, Little Lonsdale & Russell Sts, Melbourne
- Williams Landing Railway Station, Victoria

Solar Access and Shadow Analysis

WINDTECH Consultants offers services in the analysis of Solar Access to the various living and outdoor areas and the effect of shadows cast by the development.

Many local government authorities now require an assessment of the potential for overshadowing of a new development onto existing neighbouring buildings and sites. This is usually undertaken for the Winter Solstice at 9am, 12noon and 3pm, although some local government authorities will also require the assessment to be undertaken at other times of the year, such as the Equinox.

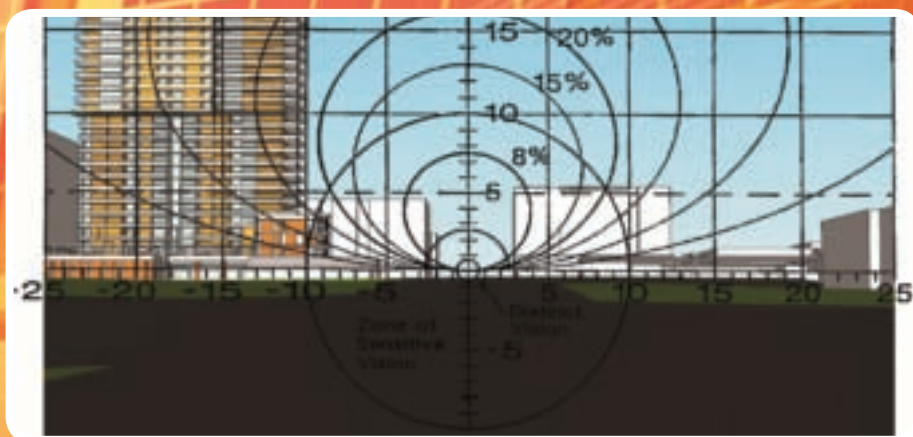
WINDTECH Consultants prepare a detailed 3D computer model of the subject development and local surrounding area, including neighbouring buildings and significant topographical effects.

The 3D analysis software allows the shadows cast by the sun to be superimposed over the 3D model at various times of the day and year, and images are obtained from the model for the required times from the relevant viewpoints. Consideration is also made as to the effect of other nearby proposed developments, and a comparison is presented between the existing future conditions.

Furthermore, in addition to Shadow Diagrams, many local government authorities have requirements for how many hours direct solar access each residential apartment should receive to the main living space and adjoining private open space. The 3D computer model is also able to be utilised for this type of assessment.

Sample Solar Access and Shadow Analysis Studies

- Pacific Place, Chatswood, Sydney
- 30 The Bond, Hickson Rd, Sydney
- 207 Pacific Highway St Leonards, Sydney
- Campbell Crescent Terrigal, NSW
- Toowoon Bay Rd, Long Jetty, NSW
- Forresters Beach Retirement Village, NSW
- 335 Wharf Rd, Newcastle, NSW
- Hamilton Harbour Development, Brisbane
- 52 Regent St, Chippendale, Sydney
- Redfern Housing Block, Sydney
- Meriton Tower, 531-551 George St, Sydney
- Centrepont Tower Development, Sydney
- 185 Macquarie St, Sydney
- 55 Lavender St, Milsons Point, Sydney
- 42 Walker St, Rhodes, Sydney
- Top Ryde City Apartments, Sydney
- 164 Liverpool Rd, Ashfield, Sydney
- Sturt Place, St Ives, Sydney
- 778-782 Military Rd, Mosman, Sydney
- Victoria Square Masterplan, Zetland, Sydney
- Macquarie Place, Parramatta, Sydney
- Australia Towers, Sydney Olympic Park





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