Advances in Wind Engineering

by Ir. Ng Beng Hooi

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The "Advances in Wind Engineering" was organised by the Civil & Structural Engineering Technical Division of The Institute Engineering of Malaysia in collaboration with Windtech Consultants Pte Ltd on 4th October 2018. The technical talk was chaired by Ir. Yasotta Chetty and attended by 125 participants.

The talk was presented by Mr Tony Rofail, Mr Aaron Lefcovitch and Mr Wei Cheng. Mr Tony, who is one of the director of Windtech Consultants, has 30 years combined experiences as both researcher and consultant in wind engineering including 26 years with Windtech Consultants since its establishment in 1991. His postgraduate studies were on the subject of Reliability of wind tunnel simulations, on which he has published number of papers. Mr Aaron, who is also one of the director, has over 10 years of experiences in wind engineering whereas Mr Wei Cheng has 7 years of extensive practical experience as consultant in Environmentally Sustainability Design(ESD) since he obtained his master degree in this field.

The talk started with the effect of wind tunnel testing on resilience and project cost. It is more cost-effective and can avoid overdesign if using wind tunnel modelling instead of wind loading standards. It is not suitable to use wind loading standards on the buildings subject to interference effects from neighbouring buildings, buildings that depart significantly from the rectangular prism shape, building when accelerations are expected to exceed occupant comfort criteria and building when the response is governed by cross-wind instead of along wind response.

On the accounting for directionality topic, the various types of methods are introduced, which is sector method, multi sector method, out-crossing method and load effects method. Besides, the comparisons between the mentioned methods are shown on the points of net façade pressures, base moments and accelerations. Following with the topic regarding of the building motion comfort, the acceleration criteria. Factors that exacerbate the perception of accelerations are type and combination of cues, frequency, environment in which the acceleration is experienced and also proximity to others.

Buildings that are susceptible to acceleration problems are building that are in flexible, slender, lightweight or lightly-damped type, buildings that are locate in region with a high basic wind speed, buildings that have interference of neighbouring building, buildings that are in irregular shape or sharp corners, and also buildings that are experiencing torsional accelerations due to the elongated in span or eccentric lift cores.

Mr Tony shares his presentation

Windtech consultants have provided wind engineering services for over 2500 major building projects in over 35 countries around the world. They provide a lot of services as shown below in table 1.

Services provide	**Remarks**
Wind load studies	facade
Wind load studies	Structure : i. Tall building structure ii. Long-span structures iii. Bridge structures iv. Statues/special strcutures
Axillary damping and vibration control	
Environmental wind studies	i. Pedestrian wind comfort ii. Natural ventilation (indoor/outdoor) iii. Thermal comfort iv. Air ventilation v. Stack effect vi. Wind driven rain vii. Wind driven dust
Air quality/pollution dispersion studies	i. Building site level ii. Region level
Full scale face performance testing	i. Aeroacoustics ii. Rain noise iii. Discharge/pressure lsos coefficient iv. Performance under serviceability wind loads v. Rain penetration

	vi. Performance testing of fume jets
Wind climate	i. Regional level ii. Building site level iii. Topographic correction
Aerodynamic optimisation	i. Building structures ii. Product development
Solar studies	i. Glare and thermal reflectivity ii. Daylight modelling iii. Solar access analysis iv. Shadow analysis
Energy modelling	i. Building energy modelling ii. Renewable energy profiting

Table 1 : service provide

Furthermore, Windtech developed their own pressure measurement system, which is much higher specifications than other system used by other wind engineering consultants. It enables increased clarity in the pressure signal for critical parts of the building surface. They are specialise in the design and commissioning of dampers for tall buildings and has recently developed an innovative, efficient form of liquid damper. Besides, they do provide the long term remote monitoring system for the natural frequencies, damping and mode shapes of tall buildings. This assist in maintaining correct tuning of dampers and for structural health monitoring. In addition, Windtech has an advanced test rig which enables a quick and efficient replication of the dynamic properties of a bridge deck section. It is essential to identify the inherent aerodynamic instabilities on the bridge deck profile. It also helps to provide a fast and cost effective service to their clients.

The talk ended with questions and answers session from the floor. To appreciate the contribution of Mr Tony, Mr Aaron and Mr Wei Cheng for sharing their essential knowledge regarding wind engineering of Windtech Consultants Sdn. Bhd., Ir. Chong Chee Meng, the Chairman of Civil & Structural Engineering Technical Division presented tokens of appreciation to the 3 speakers.

Ir. Chong Chee Meng presents a token of appreciation to Mr Tony

Ir. Chong Chee Meng presents a token of appreciation to Mr Aaron

Figure 4 Ir. Chong Chee Meng presents a token of appreciation to Mr. Wei Cheng