



American Association
for Wind Engineering

THE WIND ENGINEER

NEWSLETTER OF AMERICAN ASSOCIATION FOR WIND ENGINEERING

July 2003



11th ICWE in Lubbock, TX (see p. 3)

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**WIND HAZARDS BRIEFING
IN CONGRESS**

(based on a note in This Week in Washington, ASCE, 06-13-03)

Under the auspices of the Congressional Wind Hazard Reduction Caucus, ASCE and members of the Wind Hazard Reduction Coalition conducted a briefing for Congressional staff on Thursday, June 12th. Marc Levitan, President-Elect of AAWE, of the Louisiana State University Hurricane Center briefed staffers on the May Midwest tornadoes – he investigated the damage with a team from AAWE. In addition, Danny Killcollins, Planning Manager, Florida Division of Emer-

gency Management, Bureau of Preparedness and Response, briefed staffers on hurricane sheltering in Florida and other hurricane zones.

Information on the Wind Hazards Reduction Coalition can be found at <http://www.windhazards.org>.

In related news, H.R. 2020, the Hurricane, Tornado and Related Hazards Research Act, which would create a federal wind hazards reduction program, has picked up momentum in the House. It has now nearly 60 co-sponsors.

AAWE members are asked to contact their Congressmen and encourage them to sign-up as co-sponsors of the bill (available at thomas.loc.gov).



Reps. Mario Diaz-Balart (R-FL) and Dennis Moore (D-KS) at a briefing (from This Week in Washington)



Marc Levitan (left) and Danny Killcollins brief Congressional staff (from This Week in Washington)

**INTERNATIONAL ASSOCIATION FOR WIND
ENGINEERING ADOPTS NEW BY-LAWS**

New by-laws of the International Association for Wind Engineering (IAWE) were adopted during the 11th International Conference on Wind Engineering, in Lubbock, TX. Representatives of member national and regional (cont. on p. 2)

Associations (the IAWE Assembly) approved by acclamation the by-laws of the IAWE. This document was developed by the Panel appointed at the 10th ICWE by the Steering Committee of the IAWE.

According to the adopted by-laws, the aim of the IAWE is to promote international co-operation among scientists, engineers and other professionals for the advancement of knowledge in the broad field of wind engineering.

To accomplish this goal, the by-laws postulate the following actions:

- organising international and regional meetings;
- accomplishing the liaison with national and international organisations working in wind engineering and in similar fields;
- promoting and facilitating the interchange of knowledge, ideas, results of research and technical co-operation; and
- encouraging the constitution of new Member Organisations.

Items addressed by the by-laws include: membership, finances, regions (3 regions - Europe and Africa, North and South America, Asia and Australia), conferences (international, regional and other meetings), president, regional co-ordinators, regional representatives, secretary general and secretariat, executive board, general assembly, regional assemblies, committees, official journal (the Journal of Wind Engineering and Industrial Aerodynamics), official website (www.iawe.org- to be established), procedures for introduction of amendments to the by-laws and dissolution of the IAWE.

Participants of the meeting of the IAWE Assembly unanimously elected Giovanni Solari to be the President of the IAWE. Giovanni was instrumental in the development of the current version of the by-laws and he is now tasked with leading the IAWE through the critical period of implementation of this document.

The Assembly also elected three Regional Representatives: Masaru Matsumoto for the Asia Pacific Region, Chris Baker for the European & African Region, and Ted Stathopoulos for the Americas Region. Under the new by-laws, current regional coordinators, Ahsan Kareem (Americas), John Holmes (Asia-Pacific), and the replacement for Giovanni

Solari (Europe-Africa) will hold their respective offices until the regional conferences in 2005.



Giovanni Solari - current President of IAWE



Kishor Mehta - Chair of 11th ICWE

WINDS OF CHANGE - 11th ICWE

Texas Tech University's Wind Science and Engineering Center boasts successful conference

Texas Tech University's Wind Science and Engineering Center (WISE) hosted the 11th ICWE, June 2-5, 2003. The International Conference on Wind Engineering (ICWE) is held every four years in rotating regions around the world. The next ICWE will be held in Cairns, Australia in 2007. John Cheung will be the chairman for the 12th ICWE.



Discussions during reception

This year's conference was host to over 362 participants representing 37 countries. 243 of the participants were researchers/professionals, 16 were guests, 8 were invited speakers, and 95 students.



Alan Davenport & John Holmes share ideas

The organizing committee wanted to attract students to the conference; as such, the registration fee for students was waived. Participation by 95 students from 17 countries attests to the success of this decision.

After the closing ceremony, one foreign student was overheard talking with Kishor Mehta (chairman of the conference). He asked Dr. Mehta how he could ever repay his kindness and generosity for waiving his conference registration fee. Dr. Mehta asked the student that he remembers this event and extends the same courtesy to students when he is in a position to do so.

The 11th ICWE featured two keynote speakers and eight invited speakers, in addition to the four tracks which ran the course of the conference.

Keynote speaker Dennis Mileti, the Director of the Natural Hazards Research Applications and Information Center at the University of Colorado in Boulder, spoke on the *Societal Impact of Wind Storms*.

Keynote speaker Leslie Robertson, Founding Partner, Leslie A. Robertson Associates, of New York, New York, spoke on *Engineering for Tall Buildings*.



Leslie Robertson interviewed by local TV reporter

Invited speakers included John Holmes of JDH Consulting, Melbourne, Australia, Roger Hoxey of Silsoe Research Institute, Bedfordshire, UK, Ahsan Kareem of Notre Dame University, John Snow of

University of Oklahoma, Ted Stathopoulos of Concordia University in Montreal, Canada, and Prof. Yukio Tamura of Tokyo Polytechnic University.



Ted Stathopoulos delivers invited lecture

Jack Cermak was recognized for his fifty-year contribution to wind engineering in the Americas and abroad; Ahsan Kareem paid this tribute during his talk. The plenary sessions of invited speakers were sponsored by AAWE (Monday), Matrix Structural Engineering (Tuesday), Ove Arup (Wednesday), and MMY (Thursday).

The ice breaker event on Sunday evening was sponsored by FM Global and SEI/ASCE. Exhibitors at the conference included ICC, Simpson Strong-Tie, CPP, NIBS, and MMY Engineers. The financial support from these companies and organizations is appreciated. Additional financial support was provided by the NIST/TTU cooperative program.



Tony Gibbs introduces one of invited speakers

310 papers were accepted for the conference. The papers covered topics ranging from bridges to low-rise building loads to aerodynamics to atmospheric science to ASCE7-02. The 11th ICWE was the first ICWE to feature a formal poster session which presented new posters each day of the conference.

The pre-conference proceedings are available in a bound, two-volume set. You may order a copy of the proceedings from TTU WISE. You can also view the pre-conference proceedings at www.icwe.ttu.edu. The post-conference proceedings will be available in CD format on December 15, 2003. You are encouraged to review the papers on the website and provide questions and comments by August 10, 2003. These questions and comments will be included in the post-conference proceedings.

As part of the conference, the International Association of Wind Engineers (IAWE) executive panel and steering committee met to approve the IAWE's revised by-laws, elect new officers of IAWE and select site for the next, 12th ICWE, see related stories on pp. 1 and 5.

The 11th ICWE wasn't all work. The registrants and their guests were given the opportunity to play during the evenings.



Ice breaker welcome with local twist

The conference kicked-off Sunday, June 1st with an ice breaker. Monday evening featured a Mexican Sunset Serenade with Mariachi music and Mexican dancers. This event was held at Reese Technology Center and it allowed participants to view the Debris

Impact Facility and the Field Site, including the 200 m Mesonet tower and WEMITE.



TTU Field Site at Reese Technology Center

Tuesday night, participants were invited to enjoy a 50's music review, a tour of the Buddy Holly Center, and an evening in the Depot District of Lubbock.

Wednesday evening, participants kicked back to an outdoor barbecue featuring a live band, cavalry officers, a horse trainer, and lessons on how to lasso. The backdrop for the event was the scenic County Line restaurant which boasts free-ranging peacocks, water ways, and first class barbecue.



Mexican dancers entertain conference participants



Ahsan Kareem learns how to lasso

If you desire more information regarding WISE, the 11th ICWE, or the conference proceedings, please contact Yvonne Rogers at (806) 742-3479, ext. 339, E-mail: yvonne.rogers@wind.ttu.edu.

NEXT INTERNATIONAL CONFERENCE ON WIND ENGINEERING

The next International Conference on Wind Engineering (12th ICWE) will be held in July 2007, in Cairns, Australia. According to organizers, Cairns is a unique location, where two natural treasures meet, Great Barrier Reef and World Heritage Rainforest. It offers superb tropical climate, with July average daily temperature of 24⁰ C.



John Cheung - Chair of 12th ICWE

A TRIBUTE TO JACK E. CERMAK

Ahsan Kareem

NatHaz Modeling Laboratory, University of Notre Dame, 156 Fitzpatrick Hall, Notre Dame, IN, USA

At the 11th International Conference on Wind Engineering at Lubbock Texas in June this year a tribute was paid to the “father of wind engineering,” Jack E. Cermak, for his many valuable and pioneering contributions to the subject, by Ahsan Kareem, Robert M. Professor of Engineering, University of Notre Dame. This article presents a summary of that presentation, which highlighted 50 years of wind engineering contributions by Dr. Jack E. Cermak, University Distinguished Professor, emeritus, Colorado State University, Colorado (Fig. 1).



Fig. 1 J. E. Cermak in the wind tunnel with building models

Throughout the world, Dr. Cermak is considered the “father of wind engineering.” In 1959, he founded the Fluid Dynamics Laboratory at Colorado State University (Fig. 2) where he pioneered the physical modeling of wind-structure interactions in boundary layer wind tunnels. The technique Cermak developed has now become a quintessential part of the overall design procedure for the design of structures to withstand wind gusts, which is today applied to projects from low-rise and high-rise buildings, long-span bridges, roofs, chimneys and towers to offshore structures, defense/aerospace installations and even sports apparel and arenas. In 1963,

he collected information to help enhance the wind-resistance of the World Trade Center Towers. Dr. Cermak has since served as a consultant and principal investigator for wind tunnel tests on over 500 new building projects. These projects include some of the signature structures around the globe. In 1999, the laboratory founded by Dr. Cermak was recognized by the *Engineering News-Record* as one of the 125 engineering innovations in the 125 years between 1874 and 1999.

Dr. Cermak has a distinguished career as an engineering educator as well. He has advised over forty doctoral students, who in turn are contributing to the fields of structural and environmental engineering. This has led to generations of students influenced by him, e.g., several of his great-grand students have completed their doctoral studies and are beginning their careers in academia and industry.

Dr. Cermak has chaired many of ASCE’s key technical committees earlier in his career and lately has done it again as a second round of his service to the profession. He also served as chair of the Committee on Natural Disasters for the National Research Council, which drew the agenda for post disaster investigations of natural disasters and their impact on built and social infrastructures. He has served as the Regional Editor (USA) of the *Journal of Wind Engineering and Industrial Aerodynamics*, Elsevier since its initial publication in 1973. This journal serves as a major source of research findings and design information for the effects of wind on structures. He has authored or co-authored more than 650 papers and reports.

In 1973, Dr. Cermak’s pioneering research led to his election to the National Academy of Engineering. He was also selected to be among one of the twelve University Distinguished Professors at Colorado State in 1986. In 1990 he was elected as an honorary member of the American Society of Civil Engineers. Chi Epsilon, the Civil Engineering Honor Society, also elected him as National Honor member, in 1994. Through the contributions of his friends, ASCE last year instituted Jack E. Cermak Medal, administered by the Engineering Mechanics Division and the Structural Engineering Institute, for outstanding contributions to the area of wind effects on structures. The author is humbled by the honor of being the initial recipient of this award.

Dr. Cermak founded the Wind Engineering Research Council, which is renamed now as the American Association for Wind Engineering, serving also as its first President. He also was one of the lead organizers of the first United States meeting on the effects of wind on structures at Cal Tech in the early seventies. This meeting has grown to a major quadrennial conference serving those interested in the recent developments in wind effects on structures.

Dr. Cermak's "tour of duty" netted numerous prestigious awards and honors. A sampling of these includes awards from Sigma Xi, ASCE Aerospace Division, Structural Engineering Institute, ASME Distinguished Lecturer, Senior Research Award from ASEE, ASCE's Ernest E. Howard Award, and a citation from the National Society of Professional Engineers.

Cermak "Father of Wind Engineering"

The author is sure that most of you would agree with William Shakespeare that "there is something in the wind'." However, while Shakespeare's fascination with wind was mostly poetic, Cermak's interest is primarily pragmatic. Initially Cermak's efforts in this field were confined to basic research concerning the development of scaling laws for physically simulating boundary layer flows in long test section wind tunnels. In the early sixties, it

became apparent to him that an atmosphere simulated in laboratory could be applied to a host of practical problems. The first such example involved the investigation of the cause and recommended treatment for the 20 mph gusts wreaking havoc on the playing field of San Francisco's then new Candlestick Park. Known as "the cave of wind" in 1961 All Star game, baseball's best players committed seven errors and the relief ace was nearly thrown off the mound. This was all blamed on the capricious winds. The wind tunnel study showed that the geographic features and the stadium itself created this perilous condition and presented remedial solutions to revamp the Candlestick Park. It was also noted that if the park had been built one playing field length to the north, much of the problems would have been avoided.

Wind Engineering came of age during the mid-1960s with a study of the then to-be-built World Trade Center Towers (WTC) in New York City (Fig. 2). This study by Cermak of the twin towers would be the first comprehensive study of the wind loading on a structure that could take a large variety of atmospheric variables into account. Colorado State received this project because, at that time, it was the only institution in the world with a boundary layer wind tunnel. Cermak gleaned personal and professional satisfaction from that project, as he believed that his group created something that was



Fig. 2. (left) Design and construction of wind tunnel – J. E. Cermak, H. Maynard and E. Plate (right) WTC model in the wind tunnel --- Front row: A. Davenport, M. Yamasaki, J. Skilling, L. Robertson; Back row: M. Levy and J. E. Cermak

useful to society in general. However, Cermak attributed the subsequent mushrooming of wind tunnel studies only in part to the greater confidence in their predictive capabilities and recognized another contributing factor: in spite of all the mathematical and engineering sophistication possible with analytical modeling and computational tools, wind analysis still managed to evade the quantification essential for design. The demand further escalated with the advent of taller, slimmer, thinner-skinned buildings, which are more sensitive to the dynamics of wind actions unlike the masonry edifices built earlier. This realization became evident as the Boston Hancock Tower's difficulties became known, the issues of wind effects on tall buildings came to the forefront of engineering practice. As a result, the problems of Boston's John Hancock have been viewed by some as the tall building community's Tacoma Narrows, while though others still blame it on struc-

tural issues.

In summary, Cermak's contributions in the scaling of atmospheric flows were pivotal in the emergence of a once obscure science that has now secured an important role in the design of structures, as wind tunnels are now a customary design tool in Civil Engineering akin to their aerospace counterparts used in the development of aircrafts and aerospace structures. In recognition of this monumental pioneering contribution, the design and research communities are indebted to Cermak for his vision, drive and certitude that led to these developments. The writer would like to express his gratitude for the support, guidance, advice and above all the freedom of exploration Cermak provided during author's graduate studies, which has since then served as a catalyst for promoting creativity in his professional career.

EMERGING ISSUES IN WIND ENGINEERING - PART 1

John Holmes

JDH Consulting, Mentone, Victoria, Australia, and Louisiana State University, USA

(from Editor: This is part one of an abbreviated version of a Invited Lecture presented during 11th ICWE, - printed with permission by the author)

Introduction

At the request of the organisers of 1st ICWE, I have been asked to gaze into a crystal ball and look at where wind engineering, as a discipline and a profession, is going in the 21st Century. This is, of course, not an easy task, but if one pitches predictions far enough in future, no one will be around to question the accuracy of the predictions. On the basis that wind engineering, as we know it, is about forty years old, I will attempt to look forward to the next forty years. In this presentation, I will first summarize what I see as the major milestones from the last forty years, before suggesting some directions for research activity for the next forty.

Major Milestones in the Last Forty Years

The 'kick-start' at 1st ICWE

Although the name 'wind engineering' was coined

in the nineteen-seventies, resulting in the International Conference on 'Wind Effects on Buildings and Structures' becoming the International Conference on 'Wind Engineering' in 1979, the foundations of modern wind engineering were firmly set in the early nineteen-sixties.

Several papers in the 1st International Conference on Wind Effects on Buildings and Structures at Teddington, U.K. in 1963 (effectively 1st ICWE) set the scene for the next forty years. Some examples of the directions set at this conference are:

- The adoption of Gumbel's extreme value analysis for design wind speeds, by Shellard.
- The description of the turbulent atmospheric boundary layers in synoptic winds, including the concepts of spectra, correlations and gradient wind speeds, by Davenport.
- A description of an early attempt at full-scale pressure measurement on a full-scale building, using 'home-made' electrical pressure transducers, by Newberry.
- The modelling of the atmospheric boundary layer in a wind tunnel (in Denmark) with a long fetch of surface roughness, by Franck & Jensen.
- A description of the principles of aeroelastic modelling of structures in wind tunnels, by Whitbread & Walshe.

- The basic theory of the buffeting of structures by atmospheric turbulence using random process and vibration theory, by Davenport & Harris.
- Empirical formula for the flutter speed of suspension bridges, by Selberg.
- The description of the principles of galloping instability, by Parkinson.
- An exposition of the mechanisms of cross-wind vibrations of slender structures by vortex-shedding, including lock-in, and the use of helical strakes, by Scruton.
- A random excitation model of vortex shedding, by Nakagawa & Fung.
- A description of the first 'modern' wind loading code, with design wind speeds based on a statistical analysis, height-dependent velocity profiles, 'shape factors' derived from boundary-layer wind tunnel tests and dynamic effects, by Jensen.

The above papers were ground-breaking and read well, even today. One wonders in fact whether some of them would even be published in 2003! It seems incredible that there were only 24 papers presented in total at the Teddington Conference – at least 13 of these (as listed above) were highly significant at the time - more than half the total! It is also interesting to note that, although there were only 24 papers presented, about 300 persons attended the Conference, of which more than half were practicing engineers from industry.

Although, not represented at the Teddington Conference, at about the same time, Jack Cermak in Colorado was developing the first large boundary-layer wind tunnels. Later in the nineteen-sixties, one of these wind tunnels was used for the first detailed wind engineering study of high-rise buildings – of course, these were the late World Trade Center Towers in New York City.

The nineteen-seventies and eighties

Such was the explosion of interest in the field created in the sixties, that in the next two decades, wind engineering research was largely a continuation and reinforcement of the work described above.

However, some new features of the work of the

nineteen-seventies and -eighties, worth noting are listed below:

- The development of several large boundary-layer wind tunnels in the 70's.
- The continuation of full-scale measurements – the interest in this was shown by the special conference on the subject held at London, Ontario in 1974. The most comprehensive of the studies of the seventies were the Aylesbury full-scale measurements by B.R.E, and the measurements on the Commerce Court by the N.R.C. of Canada. In the nineteen-eighties this was continued with the Silsoe Structures Building in the U.K., and the Texas Tech Field Experiment in the U.S.
- Work on wind flow over hills and topography, which was inspired by the interest in wind energy in the seventies. The theoretical work of Jackson and Hunt put these studies on a firm theoretical basis.
- A strong interest in preventing wind damage, particularly on small low-rise buildings, initiated by such events as the Lubbock tornado of 1970, and Cyclone 'Tracy' in Darwin in 1974.
- Development of Monte Carlo simulation methods for prediction of extreme wind speeds in rare events such as tropical cyclones.
- Major revisions of the wind loading codes and standards in several countries.
- Studies of internal pressures in buildings that had been ignored previously.
- Significant incremental developments in wind-tunnel instrumentation - examples of this are: development of high-response tubing systems for fluctuating pressure measurements, low-cost solid state pressure sensors; multi-channel electronic scanning systems; the high-frequency force balance for high-rise building studies. Increased post-test computer processing of data has accompanied these developments.
- The development of tornado design criteria in the United States for structures such as nuclear power stations, and transmission lines.
- The identification of thunderstorm 'downbursts', by Fujita.
- Following Cyclone 'Tracy' (1974), recognition of the different relationship between extreme wind speed and risk for regions in Australia affected by tropical cyclones (hurricanes), and the

effects on wind load factors resulting in the use of a design wind speeds with a return period of 1000 years in the Australian Standard of 1989. (This issue has apparently only recently received attention in the United States).

The nineteen-nineties

The nineteen-nineties introduced some important new development areas into wind engineering:

- Computational Wind Engineering. This is an area that showed great promise at the start of the nineteen-nineties, but had failed to achieve its potential by the end of that decade.
- Complex damage models from catastrophic events such as hurricanes, for insurance and re-insurance companies and government agencies. Much of this work however has been privately funded and is not available in the public domain.
- Thunderstorm research by wind engineers, following the recognition of the importance of these events for extreme winds in many countries. This work started slowly and is just now gaining momentum, as indicated by the number of papers on this topic at this Conference.
- The development of the LRC method by Kasperski. This has since opened up the whole area of equivalent static wind load distributions.
- The study of auxiliary dampers and active control systems for the mitigation of vibration in tall buildings, and other structures. This includes a variety of liquid dampers, in the development of which Japan was very much in the forefront.

The late eighties and nineteen-nineties were also notable for the rise of commercial wind tunnel operators. The disconnection of commercial wind tunnel operations from research groups has the danger that innovation will be stifled in the interest of meeting immediate deadlines and the need to turn a profit. However, the North American situation has shown that competition in the marketplace has induced the commercial operators to innovate.

We have also seen the commercialisation of the publication of wind engineering research and the incredible proliferation of papers on the topic in the last few years. As an example, the Journal of Wind Engineering and Industrial Aerodynamics published

134 papers in Volume 90 in 2002. There is one other journal dedicated to wind engineering, and several others that publish papers on the topic (not including specialist wind energy journals). Thus, there were probably 200 papers on structural-related aspects of wind engineering published in journals last year.

Despite the tremendous progress in the last forty years, there is still plenty of opportunity for real innovative research in wind engineering. Many of these emerging areas are indicated by the contributions to this Conference. I would like to discuss these and some others that are less well represented at 11 ICWE, in the remainder of this paper.

(to be continued in September 2003 issue of The Wind Engineer).

EMPLOYMENT OPPORTUNITY AT RMS

Job Title: Lead Wind Vulnerability Engineer (reference 03-028), **Location:** Newark, California

Department: Global Risk Modeling, **Job Responsibilities:** Development of wind (hurricane/tornado) vulnerability functions for catastrophe computer based risk models for US and international countries. Responsibilities include research into the physical nature of wind phenomena and development of wind vulnerability functions for property and business interruption coverage. Review and interpretation of past event data will play a critical role in that process as well as a need to understand and develop state of the art practices in the field. Technical support both internally and for clients will be required. The position will require independent work, as well as oversight of the work of others.

Job Requirements: M.S. or Ph.D. in civil/wind engineering or a related field. Minimum 2 to 6 years experience in the development of probabilistic risk models desirable. Knowledge of wind engineering/meteorology, and wind design codes. Excellent verbal and written communication and presentation skills required. **How to Apply:** Please send your resume to Risk Management Solutions, Human Resources, 7015 Gateway Blvd., Newark, California 94560, Fax: (510) 505-2501, recruiting@rms.com, **Web Link:** http://www.rms.com/AboutRMS/Career/JobDetail_03-028.asp

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**American Association
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Established in 1966

Objectives:

- The advancement of science and practice of wind engineering.
- The solution of national wind engineering problems through transfer of new knowledge into practice.

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