Volume 5, No. 3, August, 2003

WIND ENGINEERING SOCIETY Newsletter

❖ Chairman's Column

Ed. Welcome to our new Chairman Paul Freathy, and thanks Paul, a Chairman's contribution without being asked! Best wishes for a successful 2 years.

The first three tasks for any incoming Chairman is to look back on what has been done before, set grand plans and then wake up and set slightly less grand plans. Having taken over from Roger Hoxey in May, I am probably at stage 2 in this process but realising the need for stage 3!

I must first thank Roger on your behalf for his two years of stewardship during which we discussed and presented the Strategy Report. Indeed, I think I would go back one more to Brian Smith because it was he who formed the Strategy Committee under my chairmanship. This continuity is very important because part of the realisation that grand plans are going to be difficult is due to the short 2-year tenure that each Chairman has. The constitution of WES is wise in this respect - appointing the outgoing Chairman as Vice-Chairman for one year to then be replaced by the incoming Chairman-elect. The Strategy Report provides a realistic view of where we are and where we need to be. It will be my guide over the next two years and I would very much like to ensure that at least some of its recommendations get implemented during my 'watch'. I won't fall into the trap of committing myself to which ones (!) but I will promise to report on progress through the Newsletter and at the AGM. Anybody who has a view on what we should be doing is welcome to e-mail me at the address below.

Looking back, we can be pleased with the way the Society has developed but retained its informal character. Wind engineering comprises a fairly small family of practitioners who largely know each other. The friendly exchange of information and constructive criticism stimulates development and learning, without frightening the learner. However, I do believe that we should be on the lookout for ways to increase our membership. Users of wind engineering – architects, structural engineers, etc – are an obvious area to approach but we must guard the strengths of WES jealously. Therein lies the challenge.

Looking forward, I see getting the basics right as top priority. These are chiefly good quality technical meetings and good communications with members. Our relationship with the ICE is also very important, as will be our new relationships with other appropriate bodies.

Watch this space for these and other ideas!

Paul Freathy
Chairman
pfreathy@anemos.co.uk.

Contents

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❖ Snippets

➢ ***Request received from Yukio Tamura.***

Dear Friends and Colleagues:

I am Yukio Tamura of Tokyo Polytechnic University (TPU).
Our TPU Wind Engineering Research Group chaired by myself proposing the research program named "Wind Effects on Buildings and Urban Areas" has been authorized as the Center of Excellence (COE) of the 21st Century by the Ministry of Education and Science in Japan for 4.5 years from August 2003 to March 2008.
We are now looking for several young researchers who can join our team as a COE Researcher or a Post Doctor (PD) to carry out the COE program.

The followings will be paid by TPU:

- air ticket from your place to Japan
- salary (at least 27,000 USD/year)
- necessary research fund

It is possible to start any time after September 2003, and the employment will be renewed every year, and be able to postponed until March 2008.

We would be very happy if you could recommend somebody to us as a candidate
and distribute this announcement to your friends.

Thank you in advance for your collaboration.

With best regards,

Yukio Tamura

➢ ***Sting Jet***.

A potentially devastating weather phenomenon has been documented for the first time by meteorologists. Dubbed the Sting Jet, it is the source of the most damaging winds that scour Britain in winter, uprooting trees, damaging property and taking lives.

The name was inspired by an expression first used by Norwegian meteorologists four decades ago. When describing the source of the strongest winds to batter their country, they talked of the "poisonous tail of the bent-back weather front".

Prof Keith Browning at the University of Reading and Peter Clark and Tim Hewson of the Met Office have found the sting in the tip of this tail and coined the evocative phrase Sting Jet to describe the extraordinary gales that it spawns. At the start of next month, the public will have a unique opportunity to find out more about the jet at an exhibition of the very best of British science, held in the Royal Society, London.

Recent studies by Dr Robert Muir-Wood of Risk Management Solutions, a company that weighs up weather risks, have concluded that the Sting Jet already causes more than £600 million of damage in Europe in an average year. Because global warming is pumping more heat energy into the Earth's atmosphere, the havoc wreaked by the Sting Jet – and the bill for the damage – may rise still further.

What is perhaps most surprising about this find is that, even to the untrained observer, the business end of the Sting Jet is obvious. From the God's eye perspective of a satellite, the devastating winds of the jet are focused at the hook-like tip of the swirl of clouds in a storm system – such as those in the Great Storm of 1987, and a notorious storm that struck on October 30, 2000.

By studying the Great Storm in detail, Prof Browning and his colleagues have concluded that the jet is responsible for the strongest surface winds. This is the "bent-back front" about which the Norwegians fretted decades ago. It took painstaking analysis, however, to uncover the processes that create the extraordinary winds in the bent front "and fit all the bits together", says Prof Browning, who has studied storms for decades.

Extract from an article by Roger Highfield that appeared in the Daily Telegraph, June 18th 2003.

- ***And from the USA…..***

We Need Your Help

Dear Wind Engineer,

On May 7, 2003, Representative Dennis Moore of Kansas, with co-sponsorship from Representative Mario Diaz-Balart introduced legislation to provide increased support to work toward mitigating losses from extreme winds. This Bill, HR 2020 the "Hurricane,Tornado and Related Hazard Reduction Act", a bipartisan bill that would focus on minimizing the loss of life and property due to severe windstorms and would greatly increase the support for wind engineering activities. You can read the bill and supporting details by going to the AAWE web site www.aawe.org, main page or Federal Activities, House of Representatives.

The passage of the bill would be greatly enhanced if the public (like you) communicated to their Representatives their support of this Bill. Due to a "write your Representative" capability offered by the Congressional web site, this is rather easy to do. Simply go to http://www.house.gov/writerep as shown on the screen capture shown below and fill in the requested information. When you fill in your zip code the name of your representative will automatically be filled in. Please help to urge support of this Bill.
Michael P. Gaus
Past President AAWE

Ed. I tried MK45 and it came up with Tony Blair!

❖ ICE Conference, Belfast

ICE President, Adrian Long brought back the ICE Conference and took it to his home city of Belfast in June this year. The theme of the conference was "Sustainability in the urban environment" and this led to a fascinating collection of papers that show the diversity of subject matter that today's engineers must grapple with.

As Chairman of WES, I was asked to present a paper on urban winds, keeping to the sustainability theme. It was a pleasure to be returning to Belfast and to meet some old acquaintances. The Northern Irish welcome is well known. Unfortunately, it was a flying visit so I cannot report fully on the other sessions. Perhaps I will just mention a keynote address by Professor John Burland on the subject of the leaning Tower of Pisa. Many will have heard him speak on the subject, and it was certainly a smooth and informative delivery born of practice. I had not heard it before and was fascinated. I recommend to anybody this tale of history, politics, false starts, engineering and finally triumph.

In my own session, I found it interesting to think of wind as a sustainability issue. I am more used to thinking about it in terms of material choice and design. Perhaps that was the strength of the conference as it made us think outside our own preconceptions. Of course, wind *is* important in this context. Sustainability implies creating urban developments that stand the test of time. To do so they must not fall down (wind loading), they must work (wind/rain, cladding performance) and they must create a pleasant environment (street level winds, pollution).

Sustainability also implies a forward view, which leads us into climate change and global warming. Will wind speeds increase as a result of increased heating of the atmosphere? WES recently had a meeting on this topic and it seems the jury is out. Analysis of wind records for the UK certainly suggests not, but perhaps the detail is best left for another article in the future.

Congratulations to the ICE team that staged the event. It was the first for many years and I am sure it will be the fore-runner of more to come.

❖ 11th ICWE

The conference attracted 362 participants from 37 countries, including 243 researchers and professionals, 8 invited speakers, 16 guests, and 95 students. The students came from 17 different countries. The number and diversity of students indicates that wind engineering will be in good hands in the future.

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Three UK delegates with Buddy, outside the conference venue. Lubbock is known to the wind engineering community but better known as the place where Buddy Holly grew up.

❖ ICE Oral History

A request from Michael Chrimes, Head Librarian at the Institution of Civil Engineers

The Institution of Civil Engineers Archives Panel are determined to establish an 'oral history archive'. We are currently drawing up guidelines for interviewing and transcribing the records, but would like to draw on the expertise of others in identifying potential subjects to interview, and volunteers who might be prepared to carry out the interviews or assist in transcribing them.

With regard to potential subjects, the most obvious resource would be elderly distinguished members, but it may be that younger engineers who have worked on interesting or famous projects could also provide a valuable resource for posterity. Perhaps you could raise the idea among your committee members, or through your newsletters. I would, of course, be happy to provide further details.

Please respond to Michael Chrimes at ICE
mike.chrimes@ice.org.uk

❖ Colin Wood bows out

A recent dinner held at St Clare's College, Oxford marked the retirement of Colin Wood from teaching and researching wind engineering at Oxford University. The dinner was organised for WERGs, members of the select group of students that had passed through Colin's hands, and for a few WES representatives. Around 30 people attended the reception and meal and had a thoroughly good time in excellent company. It is, perhaps, one measure of Colin's influence that the event was organised in the UK by an Australian who had passed through Oxford on his way to Texas Tech. Chris Letchford masterminded the evening and gave us all a 'student's view' of being a member of WERG (Wind Engineering Research Group). Colin has been in the wind business at Oxford for more years than should be mentioned in print, having been inspired on his travels to return and build an impressive new wind tunnel at the Osney Laboratory. He was involved in many real design projects but was probably happiest carrying out research. In his reply to Chris Letchford's address, he cheerfully confessed to a few suspect commercial judgments!

A recurring theme of the evening was how much those present and others enjoyed Colin's company, his guidance and support. In turn, he gladly paid tribute to the support of Rex Belcher who has managed and run the wind tunnel alongside Colin, being an essential part of this successful partnership. Chris Letchford recalled how, as a fresh arrival, Rex needed to be completely satisfied of your competence before you would be let loose in the tunnel on your own. This rigorous attention to quality and competence, balanced by friendly guidance and encouragement is what made the Oxford team work so well.

As the speeches drew to a close, WES Chairman Paul Freathy rose to pay tribute to Colin's achievements and influence on behalf of UK wind engineers. At our Committee meeting in May we had unanimously decided to award Colin the Fellowship of WES. Although announced at the AGM, the presentation was held back until this occasion. Paul echoed the earlier tributes, remarking on the pleasure with which he recalled working with Colin on a commercial project many years ago. Wishing him well in his

retirement, the presentation of a Fellowship certificate was made and warmly applauded by all present.

❖ ICE Reorganization

ICE has commenced a change programme in order to deliver the five strands of development that were identified in the Business Plan, as agreed by Council. This required us to re-organize the ICE management structure into five new divisions. Following interviews with a selection panel, consisting of the President, Senior Vice-President, Vice-President Engineering, Vice-President Professional Development and the Director General, I am delighted to confirm to you the following appointments:-

Amar Bhogal - Director of Engineering Knowledge and Deputy Director General
Hugh Ferguson - Director of Commercial Services and Managing Director of TTL
Anne Moir - Director of Communications & Marketing
Brian Murkin - Director of Finance & Resources (including Finance, HR, IT/MIS & Business Planning)
Jon Prichard - Director of Membership

This management team will assume its new titles and responsibilities with immediate effect. One of its most important and urgent tasks will be to align ICE's current staff responsibilities and resource into the revised configuration required for matrix management by integrated, multi-disciplinary teams. As part of this process, International matters will become fully integrated as core business into every one of the five new divisions. During transition however, the current International team will report to Amar Bhogal, Director Engineering Knowledge and Deputy DG.

ICE staff will continue to be involved, through the current programme of activity workshops, in the design of the new matrix management structure, the rationalization of responsibilities and the elimination of duplication between divisions. This exercise, which is currently well under way and making good progress, is expected to take until the end of September. Implementation and transition will then proceed and should be complete by Christmas 2003.

Tom Foulkes
Director General

Institution of Civil Engineers

❖ UK WEB SITE

Reminder: To make it easier to contact the Wind Engineering Society we now have a domain name of ukwes.org so you can get to our web site through www.ukwes.org or you can email the society by putting a name in front of @ ukwes.org. At the present time all emails will come to Roger Hoxey to be forwarded or dealt with.

❖ COST C14

News from the COST C14 action "Impact of Wind and storms on City Life and the built environment"

Following on from the dissemination event held at the ICWE, Lubbock the COST C14 coordination recently met in Reykjavik to discuss future events. It has been decided that a workshop will be help at the University of Ioannia, Greece. The workshop will have an open session on 21 November 2003 and non COST members are encouraged to attend. The final dissemination will take place at the von Karman Institute for Fluid Dynamics (www.vki.ac.be), Belgium between 5 – 7 May 2004. The final event is open to all and a formal request for papers will be issued soon. Further

details of both events will soon be available on the COST website – costc14.bham.ac.uk

❖ Some recent papers by WES members

Listed here are just some of the papers with an author who is a member of the Wind Engineering Society published in the last 3 years. If you have written a paper that is not included, please send me a copy or tittle details. I intend to include a few more abstracts in the future when the list is shorter.

Macdonald J.H.G. & Cammelli S., 'The significance of cable wind loads on the aerodynamic damping of long-span bridge vibrations', *11th Int. Conf. Wind Engineering*, Lubbock, Texas, 2-5 June 2003, Pre-prints Vol. 2, pp. 1679-1686

Macdonald J.H.G., 'Evaluation of buffeting predictions of a cable-stayed bridge from full-scale measurements', *Alan G. Davenport Engineering Symposium*, London, Ontario, Canada, 20-22 June 2002, Paper B5 (in special issue of *JWEIA* in press)

Macdonald J.H.G., Irwin P.A. & Fletcher M.S., 'Vortex-induced vibrations of the Second Severn Crossing cable-stayed bridge – full-scale and wind tunnel measurements', *Proc. ICE: Structures and Buildings*, Vol. 152, No. 2, pp. 123-134, May 2002 (also written discussion in press)

Macdonald J.H.G. 'Separation of the contributions of aerodynamic and structural damping in vibrations of inclined cables', *JWEIA*, Vol. 90, No. 1, pp.19-39, January 2002

Georgakis C.T., Macdonald J.H.G. & Taylor C.A. 'Non-linear analysis of wind-induced cable-deck interaction', *IABSE Conf. Cable-supported Bridges*, Seoul, South Korea, 12-14 June 2001, IABSE Reports Vol. 84, Paper 330

Macdonald J.H.G. 'Susceptibility of inclined bridge cables to large amplitude vibrations considering aerodynamic and structural cable damping', *4th Int. Symp. Cable Dynamics*, Montreal, Canada, 28-30 May 2001, pp. 243-250

John H.G. Macdonald[a], Stefano Cammelli[b,1]
The significance of cable wind loads on the aerodynamic damping of long-span bridge vibrations. 11ICWE.

John H.G. Macdonald. Evaluation of buffeting predictions of a cable-stayed bridge from full-scale measurements. ADG Symposium.

John H.G. Macdonald. Vortex-induced vibrations of the Second Severn Crossing cable-stayed bridge – full-scale and wind tunnel measurements. ICE Struct & Buildings.

John H.G. Macdonald Separation of the contributions of aerodynamic and structural damping in vibrations of inclined cables. JWEIA.

John H.G. Macdonald, Christos T. Georgakis, Colin A. Taylor., Non-Linear Analysis of Wind-Induced Cable-Deck Interaction. IABSE.

J.H.G. Macdonald. Susceptibility of inclined bridge cables to large amplitude vibrations considering aerodynamic and structural cable damping. Dynamics symp.

Brownjohn J M W, Bogunovic Jakobsen J, 'Strategies for aeroelastic parameter identification from bridge deck free vibration data', Journal of Wind Engineering and Industrial Aerodynamics Vol. 89, 2001, 1113-1136.

Brownjohn J M W and Choi E C C, 'Wind tunnel section model study of aeroelastic performance for Ting Kau Bridge deck', Journal of Wind and Structures Vol. 4 No. 5, 2001, 367-382.

Zhang X, Brownjohn J M W, Omenzetter P, 'Time domain formulation of self-excited forces on bridge deck for wind tunnel experiment' Journal of wind engineering and Industrial Aerodynamics 91(6) 2003 723-736.

…And a few papers from the 11th ICWE.

Costas Georgopoulos, Windstorm Vulnerability Assessment of Tiled Roofs in the UK with a Damage Function based on Structural Reliability Analysis

Y-H Chiu and D. W. Etheridge. Unsteady Flow Effects on Natural Ventilation Stacks - Theory and Experiment.

A.D. Shea, A.P. Robertson, W.I. Aston, N.M. Rideout. The performance of a roof-mounted natural ventilator.

Graham Knapp. Comparison of Full-Scale and CFD Results for the Silsoe 6m Cube.

Jennifer Burton & Peter D. Gosling. Wind Tunnel Pressure Measurements On Conic Shaped Membrane Roof Arrangements.

Kai Fan Liaw. Large Eddy Simulation of flow around a circular cylinder.

Ryan Reynolds. The structure of urban-type rough-wall boundary layers.

Paul Stangroom. CFD modelling of the Askervein hill.

Richard Pattenden.The flow over a finite-height circular cylinder mounted on a ground plane.

……more papers to come.

University Day

HALF DAY MEETING *at the* INSTITUTION OF CIVIL ENGINEERS, One Great George Street, LONDON SW1P 3AA *on* Wednesday 10th September 2003 at 2.00pm.

CURRENT WIND ENGINEERING RESEARCH IN UNIVERSITIES - STUDENT PRESENTATIONS

Chairman:

Professor Ian Castro

University of Southampton

Presentations Listed below

Non-Members of the Society are welcome to attend

(for which there is no charge)

Seats are allocated on a first come, first served basis

Tea and biscuits will be served during the meeting

For further information please contact Eunice Waddell

Tel: **020 7665 2238.** *Fax:* **020 7799 1325 or *email:*** **Eunice.waddell@ice.org.uk**

PROGRAMME

TIME	**PRESENTATION**
14.00	**Chairman's introductory remarks**
14.03	Unsteady flow effects on natural ventilation stacks - theory and experiment. Y-H Chiu, University of Nottingham
14.21	The effect of roof geometry and stack height on the performance of a roof-mounted natural ventilator. Andy Shea, UMIST
14.39	Comparison of full-scale and CFD results for the Silsoe 6m cube. Graham Knapp, University of Nottingham
14.57	Wind tunnel pressure measurements on conic shaped membrane roof arrangements. Jennifer Burton, University of Newcastle-upon-Tyne.
15.15	**Tea and Biscuits**
15.35	The flow over a finite cylinder mounted on a ground plane. Richard Pattenden, University of Southampton
15.53	Large eddy simulation of flow around a circular cylinder. Kai Fan Liaw, University of Nottingham
16.11	The structure of urban-type rough-wall boundary layers. Ryan Reynolds, University of Southampton
16.29	CFD Modelling of the Askervein hill Paul Stangroom, University of Nottingham
16.47	**Prize for Best Presentation; Closure**

The abstracts are reproduced below.

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Unsteady Flow Effects on Natural Ventilation Stacks - Theory and Experiment

Y-H Chiu and D. W. Etheridge
School of the Built Environment
University of Nottingham

Abstract

A common strategy for naturally ventilated buildings is to use ventilation stacks to obtain the required magnitude and direction of the flows. A major uncertainty in the design of natural ventilation stacks is the effect of unsteady airflow induced by the wind. Under the influence of unsteady wind conditions, flow reversal may become established even in the presence of buoyancy.

The ultimate aim of the present research is to improve design procedures and two different approaches, theory and experiment, are being employed to investigate unsteady flows in stacks. The experimental approach uses scale models in a wind tunnel. For this purpose a technique for measuring instantaneous flow rate and direction in a stack has been successfully developed. The theoretical approach makes use of a quasi-steady temporal inertia model of envelope flows, which predicts the temporal variation of flow rate and internal pressure, given the external wind pressure fluctuations.

The presentation will describe the measurement technique and some examples of results that have been obtained. Comparisons that have been made between the theoretical model and experimental measurement will also be presented.

Email: laxyc3@nottingham.ac.uk

The effect of roof geometry and stack height on the performance of a roof-mounted natural ventilator

A.D. Shea[a], A.P. Robertson[a], W.I. Aston[b], N.M. Rideout[b]
[a] Silsoe Research Institute, Wrest Park, Silsoe, Bedford, MK45 4HS, UK
[b] Passivent Ltd, 2 Brooklands Road, Sale, Cheshire M33 3SS, UK

Introduction

Buildings account for approximately 45 % of the total energy consumed in the UK and there is an increasing level of legislation addressing energy and environmental issues in the non-domestic building sector. The Airscoop (Passivent Ltd.) is one device designed to deliver natural ventilation from both wind and thermal forces and thereby reduce the need for mechanical ventilation systems. The Airscoop is now the subject of performance monitoring as part of an Engineering Doctorate project being conducted at Silsoe Research Institute, Bedford (UK).

The Airscoop Ventilator

The Airscoop comprises a vertical chamber that is usually square in section. The chamber is divided internally into four ducts by partition plates. The upper part of each chamber wall is louvred to allow airflow but to inhibit rain penetration. The device acts as a passive stack under calm conditions. With wind, windward-facing louvres tend to act as inlets whilst leeward-facing louvres act as outlets, according to the net pressure differences across the louvred faces which vary according to wind direction and local roof geometry.

Performance Measurements

Ventilation rates have been measured using ultrasonic anemometers inserted in or adjacent to the inlet and outlet ducts of the ventilating device and referenced to an ultrasonic anemometer mounted in the field at ventilator height. Measurements made on the Silsoe Structures Building (10^o duo-pitched roof) clearly show a difference between attached, accelerated span-wise wind flow and length-wise flow that separates off the gable verge. Additional experimental work has been conducted in the Silsoe Atmospheric Flow Laboratory using a scale model with 10^o duo-pitch roof and extended duct heights to determine the variability in ventilation due to stack height and its interaction with wind driven ventilation.

Email: andy.shea@bbsrc.ac.uk

Comparison of Full-Scale and CFD Results for the Silsoe 6m Cube

Graham Knapp
School of Civil Engineering, The University of Nottingham, UK

Abstract

This paper presents the initial results of a 3-year research project investigating the use of

Computational Fluid Dynamics (CFD) in the prediction of structural loads for buildings and summarises the project. The project builds on previous work concentrating on wind speeds and flow patterns around buildings using recent advances in turbulence modelling and computational power.
CFD studies on the flow around the 6m cube at Silsoe Research Institute have been performed and predictions of pressure on the cube surface and air velocity around the cube are reported. These are discussed with reference to the CFD solver used and compared with full-scale data, values from the British code of practice on wind loads and previous CFD simulations. The study has found unsteady asymmetrical flow not previously reported for this type of simulation and possible reasons for this are discussed.
The real test for CFD is whether it can provide useful design information and a critical examination is made of whether this technology could be used by practicing engineers at this stage.
Email: evxgak@nottingham.ac.uk

Wind Tunnel Pressure Measurements On Conic Shaped Membrane Roof Arrangements

Jennifer Burton* & Peter D. Gosling
School of Civil Engineering and Geosciences
University of Newcastle upon Tyne, UK
and Centre for Structural Engineering, Building Research Establishment, Garston, Hertfordshire.

Abstract.
A study was designed to look in detail at the wind loading on a conic shaped fabric roof structure to increase the limited amount of wind loading data available to designers of membrane structures. The pressure coefficients acting on the surfaces of the given conic model have been determined for a number of test cases, including a single conic canopy, a conic roof on a fully enclosed building, and multispan conic roof spans.
The results, when compared to a single duopitch canopy roof situation in British Standard, Eurocode and Australian and New Zealand codes for wind loading, showed that the wind tunnel results compared favourably to the values for the net pressure coefficients given in each case. The fully enclosed building case correlated closely with the blocked canopy situation given in the Australian code when considering the net pressures, but the external pressure coefficients alone do not compare to the British Standard and Eurocode results for a non-canopy duopitched roof.
The various bay arrangements correlated closely with the reduction factor values given in the British Standard and Eurocode for multibay canopy arrangements. Differences in the results can be accounted for by the differences between the geometries of the structures given in the design codes and, for example, the nature of a conic with a continuously varying surface is identified as potential sources of variation in pressure coefficient values.
Email: jennifer.burton@ncl.ac.uk

Large Eddy Simulation of flow around a circular cylinder

Kai Fan Liaw
University of Nottingham

Abstract
Large Eddy Simulation (LES) and a Reynolds Averaged Navier-Stokes (RANS) model are used to simulate the 3D flow around a circular cylinder at Reynolds number between 250 and 10,000. Results are compared with published experimental data. The purpose of the study is to demonstrate the applicability of LES in simulation of bridge response to wind excitation at a later stage of this project. LES is able to simulate the vortex shedding in the wake region of the cylinder. The simulation uses the finite volume method (FVM) with an unstructured tetrahedral mesh. In the LES a second order central difference and a second order backward Euler differencing scheme are employed for the spatial discretisation and time discretisation respectively. Calculations performed on a wake-refined mesh using LES give good predictions of drag and pressure coefficients near the wake but not the flow separation regions. Comparatively, RANS model predicted better flow separation but wake formation is badly simulated. Comparisons have shown that LES with a second order central difference discretisation produced the best results. Future work will concentrate on finer meshes for the LES.
Email: evxkfl@nottingham.ac.uk

The structure of urban-type rough-wall boundary layers

Ryan Reynolds

School of Engineering Sciences, University of Southampton

Abstract

A significant research effort towards understanding and predicting turbulent boundary layers has existed for many decades with special emphasis on smooth wall cases. Rough wall studies have complimented these efforts and shed new light on the mechanisms driving this type of flow. Work by Krogstad & Antonia (1999) has shown that rough surfaces substantially affect the turbulence quantities well into the boundary layer and that the flow structure varies considerably with roughness geometry. As a subset of rough wall turbulent research, urban studies attempt to model the boundary layer arising over roughness environments with large three-dimensional elements typical of urban landscapes. The local flow conditions near urban environments are significantly affected by the geometry and density of the roughness elements themselves. An understanding of the turbulent motions involved in urban roughness can lead to improved modelling and parameterisation schemes of, for example, pollutant dispersion, as discussed recently by Britter & Hanna (2003).

Results from recent wind tunnel tests over arrays of cuboid roughness elements are presented. This work follows earlier studies and contains additional analysis from previous results presented (Cheng & Castro, 2002). Discussion will include a quadrant analysis of the instantaneous shear stress transfer over and among the roughness elements. This conditional sampling technique shows differences in local shear composition in the boundary layer. Details of the influence of events of large magnitude, which occupy a small percentage of the time, are included.

Funding is available from NERC, through UWERN for experimental work, though the studentship is funded by the School of Engineering Science at Southampton.

Britter R.E. & Hanna S.R. (2003), Flow and dispersion in urban areas, *Ann. Rev. Fluid Mech.* **35**, 469-496.

Cheng H. & Castro I.P. (2002), Near wall flow over urban-like roughness, *Boundary Lay. Met.* **104**, 229-259.

Krogstad P.A. & Antonia R.A. (1999), Surface roughness effects in turbulent boundary layers, *Exp. Fluids*. **27**, 450-460.

Email: r.reynolds@soton.ac.uk

CFD modelling of the Askervein hill

Paul Stangroom
University of Nottingham

Abstract

The Askervein hill off northern Scotland was the focus of a major study on boundary layer wind flow over low hills performed in the early 1980's. It remains the most extensive field survey performed to date, and over 50 towers were deployed and instrumented over the hill measuring the mean wind flow characteristics as well as the turbulent properties of the flow. The focus of this work has been to validate results from a numerical simulation of flow over the hill against the field data.

Comparisons are made between the main field survey, wind tunnel simulations, and the numerical model. The numerical model results are for both structured and unstructured grids, using the k-ε RNG turbulence model. Results for the numerical model are promising and compare favourably with the main field survey, showing similar levels of accuracy to those from the wind tunnel.

Email: evxps@nottingham.ac.uk

The flow over a finite-height circular cylinder mounted on a ground plane

Richard Pattenden
School of Engineering Sciences, University of Southampton

Abstract

The flow around circular cylinders is an area which has been extensively studied over the years. Most of this work has focussed on infinitely long cylinders or those enclosed between end plates which render the flow almost two-dimensional. In this situation the classic von-Karman vortex shedding pattern is observed. In practical situations however many cylindrical structures have at least one free-end and may be of low length/diameter ratio. The flow over the free-end and its influence on the lateral vortex shedding has received much less attention.

The subject of the present work is to investigate the flow over a cylinder of length/diameter ratio of 1 mounted on a ground plane and with the other end free. Other authors have found that the antisymmetric vortex shedding is suppressed at this aspect ratio where the free-end flow dominates, while there is some doubt over the exact structure of the free-end flow.

Experiments have been carried out on a wind tunnel model at a Reynolds number of 200000. Measurements of the velocity field have been made with particle image velocimetry (PIV) and hot-wire anemometry, in addition to surface flow visualisation and force and pressure measurements. Large-eddy simulations (LES) have also been performed on the same geometry and the results compared.
The combination of experiments and LES has proved to be useful for gaining a better understanding of the instantaneous flow structures and how they relate to the mean flow. In particular further insight into the nature of the flow over the free end and the unsteadiness in the wake region has been obtained.
Email: richard.pattenden@soton.ac.uk

❖ About WES

Executive Committee

The current committee is as follows. Contact details can be obtained either from the WES website or from Eunice Waddell at the ICE.

Chairman	Paul Freathy
Vice Chairman	Roger Hoxey
Hon. Sec/Treasurer	John Wills
Chairman, Research Ctte	Brian Lee
Chairman, Strategy Ctte	Paul Freathy
Members	Chris Baker
	Dick Barnard
	Gordon Breeze
	Brian Smith
	Mark Sterling
	Vacancy
Co-opted members	Andrew Allsop
	Ian Castro
Structures & Building Board representative	Tom Wyatt

ICE Support

Our contact at the Institution for all administrative support is Eunice Waddell. She can be contacted at

Tel: 020-7665-2238
Fax: 020-7799-1325
e-mail: Eunice.Waddell@ice.org.uk

WES website www.ukwes.org

❖ Forthcoming WES Meetings

❖ Scruton Lecture November 5th 2003 at ICE

Synopsis
Structures, Dynamics and Wind - a 10 Year Review
T.A. Wyatt and B.W. Smith

The past ten years has seen increasing recognition of the importance of wind engineering in the design of structures together with the availability of new tools for the engineer to use. The theoretical and modelling advances, however, have made the determination of a robust route to design increasingly complex. Bridges of record breaking spans or unusual configuration, lighter and more esoteric structures of many kinds, the use of novel materials, and structures shaped more by architectural considerations than by optimal resistance to the wind on the one hand, with the introduction of more detailed Code requirements on the other, have characterised the past decade for the wind engineer. The outcome has been not only advance, but also some surprises and even some disappointments and retrofits.

The speakers will review both advances and surprises, covering a wide range of wind-sensitive structures. Drawing especially on their extensive personal experience, they will offer their own views on current techniques and a few unresolved questions.

❖ Other Forthcoming WES Meetings

10th September 2003, University Day, an afternoon meeting at ICE with student presentations which are reviewed and a prize awarded. (details above)

5th November 2003, 6 p.m., 8th Scruton Lecture at ICE. Tom Wyatt and Brian Smith will be presenting the Scruton Lecture jointly.(details above)

3rd February 2004, High Intensity Winds. We are planning a meeting to discuss 'high intensity winds'. These range from tornadoes to hurricanes as well as the more complicated downburst or microburst.

12th May 2004, AGM and evening meeting discussing case studies, at ICE.

15th – 17th September 2004, Proposed WES UK Conference at Cranfield University. Details to follow.

❖ Other Forthcoming Conferences

2004

5th Bluff Body Aerodynamics Symposium
Ottawa, Canada

❖ Contact Point

Contributions and responses to:


Roger Hoxey@ukwes.org


Roger Hoxey

Silsoe Research Institute,
Wrest Park, Silsoe, Bedford,
MK45 4HS


01525 864024


01525 861735