

DUBLIN
2000

S
E
P
T
E
M
B
E
R

21-23

"20 20 Vision"

Dublin 2000

"20 20 Vision"

20 - 23 September

Royal College of Surgeons
Dublin

PROGRAMME, ABSTRACTS
& EXHIBITION



Programme at a Glance

Wednesday 20 September

18.00 – 20.00 Registration

18.30 – 21.00 Welcome Reception

Thursday 21 September

08.15 Registration

09.00 Opening Plenary Session
O'Flanagan Theatre

All A sessions in O'Flanagan Theatre

All B sessions in Houston Theatre

1a State of the Art Case Studies 1

09.45

1b Computer Methods for HVAC Analysis

11.00 Morning refreshments

2a Innovative Building Systems Design

11.30

2b Testing & Integrating Computer Methods

12.30 Lunch Break

3a State of the Art Case Studies 2

14.00

3b Refrigerant Technology: Future Systems

15.15 Poster session and refreshments

4a Innovative Building Assessment & Design

16.00

4b Design for Sustainability

19.30 Gala Dinner at the Conrad Hilton Hotel

Friday 22 September

08.15 Registration

08.45 Plenary Session

5a Future Gazing

09.00

5b Better IAQ Through Understanding

6a Fundamentals of Future Systems

09.45

6b Inter-technology?

10.45 Morning Refreshments

7a Commissioning and Operation of HVCA

11.15

7b Servicing for Older Buildings

12.45 Lunch Break

8a Designing to Minimise Global Climate Change

14.15

8b Services Design & HVAC Management

15.15 Afternoon Refreshments

9a State of the Art Heat Pump Applications

15.45

9b What Happens when the Owner Sues?

19.00 for 19.30 Literary Pub Crawl

Saturday 23 September

08.15 Registration

10a 2020 Energy

08.45

10b HVAC Special Applications

11a Innovation in System Design

09.45

11b Light & Energy

10.45 Morning Refreshments

12a CIBSE/ASHRAE Student Award Judging

11.15

12b Design Tools Software

12.15 Refreshments & Close

Dublin 2000

Programme & Exhibition Catalogue

Wednesday 20 September

18.00-20.00 Registration in Royal College of Surgeons' entrance foyer

18.30-21.30 Welcome Reception
wine and canapes in College Hall, with entertainment by the traditional trio Cairde on uilleann pipes, flute and fiddle.

Thursday 21 September

09.00 Plenary Session

Chaired by David Wood, President CIBSE.

✶ **Keynote address: The Kyoto Protocol Impact on HVAC & R Technology**

by James Wolf, President ASHRAE

The future of HCFC and HFC Technologies will be discussed considering the effects of the Kyoto Protocol to control global warming and potential climate change and the Montreal Protocol on Ozone depletion.

The current international and domestic laws affecting CFCs, HCFCs, and HFCs will be presented to demonstrate the significant impact on the present and future availability and use of chemicals as refrigerants for air conditioning and refrigeration.

Current research on development of substitute refrigerants for HCFC-22 equipment and projections on the availability of alternative technology for air-cooled and water-cooled equipment for building air conditioning systems will be covered.

Finally, criteria for selection of air conditioning equipment for current and future building projects will be outlined, considering the future of HCFC and HFC Technologies.

Keynote address: CIBSE & Innovation
by Donald Leeper, CIBSE Champion for Innovation

The concept of Innovation is central to many of the activities of the Institution. In this brief presentation three aspects of innovation are considered:

1. The technological advances in building services engineering that affect the work of members.
2. The changes proposed in recent years in the Processes of Construction in the UK, with reference to some of the key publications, including the Latham and Egan reports. A brief guide of some of the many acronyms that have arisen, including CRISP, the RAs, m4I and CBPP are reviewed.
3. People issued that will allow the process changes needed in Construction and the benefits of technological advance be realised.

Finally, areas where the Institution is actively supporting the aims of Rethinking Construction are covered together with what else might be done since the interdependence of technology, process and values offers real opportunities for the Institution in meeting its mission.

09.45 Session 1a

State of the Art Case Studies Part I

Chairman: Seamus Homan,
Homan O'Brien, Dublin

10 **Comfort conditioning for large spaces**
by Peter Simmonds, Ove Arup & Ptnrs, UK; Stephanie Reuss & Stefan Holst, Transsolar Energietechnik GmbH, Stuttgart; Wayne Gaw, Flack+Kurtz Consulting Engineers, San Francisco

This paper describes the development of a hybrid conditioning system that creates a comfortable indoor environment in a building. The operation of a variable-volume displacement conditioning system and a radiant cooled floor have been optimized to reduce the building load. Control strategies were developed that optimize energy consumption and contain moisture levels within specified limits. The development of conditioning-only occupied zones is shown and how the over-all energy consumption is reduced. Its application in a large airport is described.

4-10

11-20
✓
Sellic – An engineering library
by Malcolm G Tait, KJ Tait Engineers,
Edinburgh

The intent of this paper is to present the design process which has created by new SELLIC Library for the University of Edinburgh. The University's brief required a library which would serve them through the next generation of library processes, whilst being as energy efficient as possible.

The paper will review the collaboration process between Client and Design Team and highlight three examples of interdisciplinary design the structure, envelope and wind towers.

Customising factory built unit for efficiency, reliability and cost effectiveness

by Sukhdev S Mathaudhu,
Mathaudhu Engineering, Inc. USA

In this, First Place – Commercial Category 1999 ASHRAE Technology award-winning project demonstrates the concept of a factory pre-fabricated "Mechanical Room" that houses all the air handlers, compressors, evaporative condensers and a walk-in control room vs. a field-built Central Plant/Mechanical Room. Low supply air temperature application and factory pre-fabricated "Mechanical Room" helped reduce cost by \$206,000 over field-built.

Added benefits included, "testing & balancing" of unit prior to shipment; minimum job site connections and a single source responsibility for warranty.

BRE's environmental building: energy performance in use by James Fisher,
Research in Building Group, Department of Architecture, University of Westminster
Kaitriona Ni Riain, Fiona MacKenzie & John Littler, all of BRECSU

BRE's Environmental Building was the result of a project initiated under the Government's Energy Efficiency Best Practice Programme. This paper provides results of the performance of the building during the 2½ years of occupancy. Monitored data has shown that the building provides a comfortable place for occupants, although the gas consumption for heating has exceeded its target. This paper focuses on the energy and environmental performance only, other elements have been considered in other work.

09.45 Session 1b
Computer Methods for Successful HVAC Analysis

Chairman: Tim Dwyer, South Bank University, London

✓
Natural ventilation analysed using dynamic simulation software

by Vincent Murray & Ken Beattie, Dublin Institute of Technology

The possibility of using natural ventilation for commercial buildings is increasingly being considered. To assist natural ventilation in these buildings atriums are often suggested for the building's design as well as mechanical systems providing low air change rates. To ensure that natural ventilation will meet today's comfort expectations the proposed design needs to be evaluated using dynamic simulation software.

54-66

✓
A practical application of computer modelling and physical validation to a building atrium by Kevin Mitchell,
AMEC Design & Management; David Stribling, Flomerics

This paper describes the use of computer modelling in the design of an entrance atrium in the UK. Airflow Modelling was used with Dynamic Thermal Analysis to develop the mechanical and architectural design. The interdisciplinary approach enabled the team to develop the design of the solar shading and the HVAC system, optimising the location of system elements. The processes employed resulted in increased internal comfort levels and a reduced life cycle cost of the facility.

67-83

✓
Integrated simulation for HVAC performance prediction: State-of-the-art by Dr Ir Jan Hensen, Center for Building Systems, Technische Universiteit Eindhoven, The Netherlands

This paper aims to outline the current state-of-the-art in integrated building simulation for performance prediction of heating, ventilating and air-conditioning (HVAC) systems. The ESP-r system is used as an example where integrated simulation is a core philosophy behind the development. The current state and future developments are illustrated with case studies. It is argued that for building simulation to penetrate the profession in the

84-92

near future, there is a need for appropriate training and professional technology transfer initiatives.

The methods of 2020 for building envelope and HVAC systems simulation – will the present tools survive?

by *Dr Per Sahlin, EQUA Simulation Technology Group AB, Stockholm, Sweden*
Building simulation methods in use today were developed during the seventies and early eighties. They were optimized to enable full-year whole-building simulations on available hardware. Consequently, they are highly specialized and difficult to modify in order to meet new needs. In this paper, we compare the traditional methods to new equation based methods. These have the capacity to model virtually any system and are thus able to grow in new directions as needs evolve.

11.30 Session 2a

Innovative Building Systems Design

Chairman: *Dr James E Hill, Building and Fire Research Laboratory, Gaithersburg.*

Making the old/new or turning castles into condos, how can us Yanks do it better and cheaper by *Robert M Suggs III, RM Suggs Company*

Buildings today must be integrated to include all services and co-ordinated to provide an acceptable comfort and usability level to justify their continued existence. The engineer is responsible for function where looks and form are the prime requisites of the architect. The idea for providing such accommodations for an existing historical facility, built for an entirely alien purpose, extends beyond a challenge. While "historical", as defined for facilities in the States, is significantly different from Europe, none the less, the challenges are similar. This synopsis intends to expand on and present some new innovative solutions.

Designing for flexible building services – new CIBSE guidance by *Denice Jaunzens, BRE; James Brittain, ABS Consulting, London; Dr Hywel Davies, CIBSE Research, UK*

As the pace of business change accelerates, so change within business premises increases, and

businesses want to minimise the costs of these changes. To assist in this CIBSE is publishing new guidance on the requirements for flexible building services in office based environments. This paper considers the issues that designers should discuss with clients to ensure that building services are designed with appropriate flexibility. It concludes with a set of principles that designers should follow.

Constructing the team – a multi-cultural experience by *Dr Mike AP, AMEC Design & Management;*

Dr John L Steele, Loughborough University This paper describes an orchestrated cross-cultural training event which aimed to generate a common understanding of cultural values within an Anglo-American design team. The organisation, facilitation, and outcomes of the workshop are discussed in relation to issues of cultural diversity and interdisciplinary working.

This paper will be of interest to clients and project teams planning a cross-cultural collaborative design project and organisations looking to become part of a Joint Venture with overseas partners.

11.30 Session 2b

Testing and Integrating HVAC Computer Methods

Chairman: *John Cuthbert, Cuthbert Condron Associates, Dublin*

✓ **A CFD study of the airflow field in a mixing box** by *Prof Richard M Kelso & Paul Marshall, College of Architecture and Design, University of Tennessee; Prof Allen J Baker, College of Engineering, University of Tennessee*

Air handling units are important components of HVAC systems, and one of their principal functions is to mix outside and return air streams. This mixing performance is poorly understood but believed to be of low effectiveness.

This paper presents the results of a CFD study into the flow of air inside a mixing box. Temperature and speed vector plots and mixing effectiveness found are included."

144-154

156-171
✓ **A case study and validation of interactive CFD in VR**

by Paul Kingston, Hoare Lea & Ptnrs, Bristol

Computational Fluid Dynamic (CFD) has rapidly developed as an industrial design and evaluation tool for Building Services Engineering. The aim of the work is to illustrate the integration of CFD data into a truly interactive Virtual Reality (VR) environment to provide engineers with demonstrable design evaluation and visualisation facilities. The VR model allows the user complete interactive control of the environment and will provide an elegant means of enabling engineering solutions to be appreciated by non-engineers

Keywords (Computational Fluid Dynamics, Virtual Reality, Visualisation, Infrared, Hotwire anemometry, Displacement Ventilation, Buildings)

173-184
✓ **CFD simulation of transient cooling in a typical Hong Kong office** by John Z Lin, Division of Building Science and Technology, City University of Hong Kong

For the analysis and design of an air conditioning system, the unsteady histories of displacement ventilation of a typical office in Hong Kong is simulated numerically with a validated CFD model. The numerical simulation illustrated the evolution of stratified temperature profiles in the office. The simulation also revealed the development of the thermal plum produced by hot walls and objects. Hence the study helps to understand the formation of the initial velocity and temperature fields."

14.00 Session 3a

State of the Art Case Studies Part II

Chairman: Professor Max Fordham, President-elect, CIBSE

186-196
✓ **Practical case study of a chilled slab/cooling pond/mixed mode building**

by Dr David Arnold & Peter Othen, Troup Bywaters & Anders

A client was pleased with the performance of a recent building designed and built with low energy objectives on the "mixed mode" principle. When the time came to build another building he appointed the same design and construction team and challenged them to suggest cost effective improvements to the environmental features of the original building. This paper is a case study of the design, installation and commissioning of the building operating alternately on passive and mechanical cooling.

197-211
✓ **Ventilation of 19 City of Tampa fire stations** by Warren G Hahn, Hahn Engineering Inc, Tampa

Combustion gases from diesel engines accumulate in the apparatus rooms of fire stations when fire trucks and emergency vehicles leave for or return from an emergency run. All doors are closed for security reasons and combustion gases become trapped in closed apparatus rooms. This paper discusses a study and investigation of the methods available to minimize these combustion gases and the subsequent installation of apparatus room ventilation systems in nineteen City of Tampa Fire Stations.

Cooling and heating of buildings by activating the thermal mass with embedded hydronic pipe systems

by Bjarne W Olesen, DF Liedelt "VELTA" GmbH, Norderstedt, Germany

Heating and cooling of buildings may be done by water based radiant systems, where pipes are embedded in the concrete slabs between each storey. Activating the building mass will reduce the peak load and transfer some of load to out side the period of occupancy. Because these systems operate at water temperature close to room the potential for use of renewable energy sources are increased. Several examples of buildings with these types of systems are presented together with measured performance.

14.00 Session 3b

Refrigerant Technology for Future Systems

Chairman: *Michael Buckley, Buckley Consultancy, Dublin*

Observation and analysis of two phase flow of boiling refrigerant R600a inside horizontal tubes by *Angel Lagos, Prof RW James, JF Missenden of School of Engineering Systems and Design, South Bank University, London*

This paper presents a study of one component two-phase flow inside horizontal tubes, with bends using R600a. The phase change flow patterns that occur in the tubular evaporator were observed recorded and discussed. The evaporator was a 16-row transparent glass coil with return bends of 180 degrees and was connected to a refrigeration unit. The effect of mineral oil on the flow patterns and behaviour at the transition zone together with photographic and recording techniques were also discussed and reported here.

Results of a probabilistic fault detection and diagnosis method for vapour compression cycle equipment

by *Dr Margaret B Bailey, Department of Civil and Mechanical Engineering, United States Military Academy, New York*

Automated fault detection and diagnosis (FDD) of vapor compression cycle equipment is a valuable feature due to energy and environmental concerns. This paper describes designing and testing the viability of a FDD system for chillers. The FDD tool utilizes a neural network program to analyze archived chiller operating data and detect faults through pattern recognition. Faults include improper refrigerant and oil charge, air-cooled condenser fouling and fan loss. The trained FDD tool is capable of correctly predicting the current state with a misclassification rate of three percent.

Performance of R-407C as a drop-in replacement for R-22 in unitary air conditioners and heat pumps

by *Siva Gopalnarayanan, Flurochemicals R&D; Jerome Blanc, Centre d'Application de Levallois*

R-407C is evaluated as a drop-in substitute for R-22 in a reversible heat pump at standard and high ambient conditions. Results indicate that

R-407C has comparable seasonal cooling efficiency and a 3% lower seasonal heating efficiency than R-22. At a high ambient temperature of 57.2°C, R-407C has a comparable COP and a 5% lower capacity. Results from long term >drop-in= field testing of R-407C in a large retail store air conditioning system is also presented.

Influence of geometrical parameters on capillary tube behaviour with new alternative refrigerants by *Samuel Sami, H Maltais and DE Desjardins, University of Moncton, NB USA*

In this paper, the experimental data obtained on capillary tube behavior, using various new alternatives under different geometrical parameters will be presented and analyzed. Capillary geometrical parameters will include length, diameter, as well as entrance conditions.

The results clearly showed that the pressure drop across the capillary tube is significantly influenced by the diameter of the capillary tube, inlet conditions to the capillary and refrigerant type. The data demonstrated that the capillary pressure drop decreases with the increase of the capillary diameter and that alternatives in general experience higher pressure drop than that of R-22.

16.00 Session 4a

Innovative Building Assessment & Design

Chairman: *Terry Wyatt, Hoare Lea, Bristol*

The potential for solar desiccant cooling in the UK by *Dr Clive B Beggs & Dr PA Sleigh, School of Civil Engineering, University of Leeds; Sandy Halliday, GAIA Research, Edinburgh*

The paper presents a study to evaluate the potential for using solar energy to drive a desiccant cooling system in England. The model utilises real meteorological data to predict the performance of a solar driven system. The paper conclusively demonstrates that solar powered desiccant cooling is a feasible solution for cooling & heating buildings in the UK.

Improving cooling tower performance for sustainable refrigeration

by *H Goshayshi, JF Missenden & Dr Graeme Maidment, School of Engineering Systems & Design, South Bank University, London; Prof Roger Tozer, Waterman Gore Partnership*

This paper describes the system advantages of rejecting low grade condenser heat through latent means both in capital and energy terms. It describes how tower packings may be evaluated for optimum behaviour in terms of heat transfer achieved and energy wasted. Experimental investigations are described which have led to new correlation techniques allowing packings to be modelled mathematically. The techniques described allow building services engineers to analyse and design more sustainable systems for heat rejection.

351-381

○ **Designing for air-to-air heat and moisture exchange in HVAC applications**

by *Robert Besant, University of Saskatchewan; C Simonson, Wei Shang*

Air-to-air heat and moisture exchange for ventilation air is important for HVAC design and operation because it can: 1) Reduce peak auxiliary energy rates and annual loads as well as capital and operating costs 2) Permit higher ventilation rates to create better IAQ at minimum auxiliary energy costs.

This paper briefly discusses the types of air-to-air heat and moisture exchangers available and their performance in HVAC applications. The capital and operating cost savings are outlined. A new method of HVAC design for air-to-air exchangers is presented which maximizes the life-cycle cost savings.

Latent heat storage in buildings materials by *Ruth Kelly, AMEC Design & Management, Stratford-Upon-Avon*

Thermal storage by latent heat was recognised early as an attractive alternative to sensible heat storage in the building fabric. Recent research has looked at the incorporation of organic phase change materials (PCMs) into porous building materials, creating functional and effective building elements which can effect significant energy savings. Research indicates that the use of energy-storing building materials is a novel concept which warrants continuing consideration.

✿ **16.00 Session 4b**

Design for Sustainability

Chairman: *Dr David Arnold, Troup Bywaters & Anders*

*2540 page.

✿ **Green building research at NIST BFRL**

by *Dr James Hill, National Institute of Standards & Technology, Gaithersburg, USA*

For over seven decades, the National Institute of Technology and Standards (NIST) and its predecessor organization, the National Bureau of Standards has done research on energy conservation in buildings. In 1993, NIST formally created a "Green Building Research Program" to assist the building industry in addressing concerns with indoor air quality, ozone depletion, global warming, and sustainability.

The purpose of this talk will be to briefly describe the results of two specific research efforts that have been carried out since the creation of the Green Building Research Program. The first has been done by NIST staff; the second by a new industry association that NIST help create.

✿ **Designing to encourage waste minimisation in the construction industry**

by *Andy Keys, AMEC, Stratford-Upon-Avon; Andrew Baldwin & Simon Austin, Loughborough University, Leicestershire, UK*

The process of waste minimisation through 'Designing out Waste' is in its infancy. By redirecting the focus of waste minimisation to the earliest stages of projects the greatest opportunities for waste avoidance and recycling exist.

The paper summarises a doctoral research project titled 'Designing out Waste'. It is intended to stimulate thought into the concept of designing out physical wastes that continue to create hazards and expense during the construction process

✿ **Designing for sustainability**

by *Sheila J Hayter, B Snead, Richard B Hayter, Kansas State University; PA Torcellini, R Judkoff*

This paper addresses each step in the building design process - from inception to occupancy. Recommendations and examples of how we can meet our obligations of sustainability are given using two examples of actual buildings

that have low energy use and minimal impact on the environment. In addition, these buildings have life cycle costs comparable to conventional buildings and provide comfortable, healthy, and productive indoor environments.

✿ **Gala Dinner at the Conrad Hotel, Earlsforth Terrace. Reception 19.30, Dinner 20.00. Entertainment by the Festive trio and Deirdre Seaver**

E Roger Hitchin & Dr Christine H Pout, Building Research Establishment

This paper explores electricity consumption and carbon emissions associated with air-conditioning in the UK over the last 20 years and potential changes over the next 20 years. If current trends continue, energy use and the consequent carbon emissions associated with air-conditioning could quadruple by 2020. Realistic but assertive regulatory measures reduce consumption and emissions by 35% relative to the business as usual case. Technically feasible limits could reduce energy consumption below current levels but would be difficult to implement.

Friday 22 September

08.45 Plenary Session: Nanoscale Science and Technology

Introduced by David Wood, President, CIBSE

Dr Gareth Redmond, National Microelectronics Research Centre, Cork.

09.15 Session 5a Future Gazing

Chairman: *Bjarne W Olesen, DF Liedelt "VELTA" GmbH, Norderstedt, Germany*

✿ **Engineering and ingenuity – towards environmental design** *by Dr Randall Thomas, Max Fordham & Ptnrs, London*

The starting point for designs which respond to our worsening environmental situation is a study of building form with particular emphasis on the façade and section on materials. Only after these have been resolved optimising the solar potential, making the best use of daylight, providing controllable assisted natural ventilation attenuating noise and producing an attractive building should the design team as a whole turn to HVAC systems. The plant is only part of the strategy and the smaller the part the better. The application of this approach is illustrated by three varying case studies.

Local cooling: global warming? UK carbon emissions from air-conditioning now and in the next two decades *by*

09.15 Session 5b

Better IAQ Through Understanding

Chairman: *Richard Rooley, Rooley Consultants, Stoke Poges, UK*

✓ **A predictive method to determine the leakage area needed in residences for IAQ control by infiltration**

by Dr Donald G Colliver, University of Kentucky

A technique has been developed to estimate the leakage needed to provide at least a desired amount of infiltration based upon frequency-of-occurrence. Cumulative frequency distributions (CFD) of the hourly air infiltration calculated from long-term hourly weather data were used to describe the amount of weather-driven infiltration when 1-, 3-, 6-, 8-, 12-, 24-, and 48-hour time periods are grouped together. Comparisons are also presented between the leakage area required to provide 0.35 ACH on the average, as opposed to at least 95% of the 1-, 8-, 12-, and 24-hour time periods

✿ **ASHRAE's residential ventilation standard: exegesis of proposed standard 62.2** *by Max Sherman, Lawrence Berkeley National Laboratory, California*

In June 2000 ASHRAE approved for public review standard 62.2P, "Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings, which is an attempt by the Society to address concerns over indoor air quality in dwellings and to set minimum requirements that would allow for indoor air quality and energy efficiency measures to be evaluated. This report

510-522

summarises the public review draft and attempts to address questions and concerns that those potentially affected by the standard might have. This report may also be of use to those considering public review comments on the proposed standard.

✓ **A positive ventilation air chiller**
by *Enoch Munyebvu, Robin J Saunders, Dr Stephen Beck, University of Sheffield*
A recently developed compact ventilation unit has been used as the basis for a new low cost air cooler capable of providing ventilation, recirculation and filtration with a wall aperture 300 mm square. A refrigeration system was successfully retrofitted into the ventilation unit and prototype performance has been assessed. A cooling load of 817 W was achieved at a useful coefficient of performance of 1.39 with a maximum air temperature drop of 10°C.

10.45 Session 6a
Fundamentals of Future Systems
Chairman: *Peter Warburton, Arup Associates, London*

Neural networks for control and fault detection in state-of-the-art buildings
by *Darrell D Massie*
Implementation of neural networks (NN) for building load and energy prediction can optimize equipment design, utilization and operation, resulting in significant monetary savings for building owners and operators. NNs provide superior building load and energy usage predictions, have been successfully implemented to perform supervisory control over systems such as thermal energy storage and building setpoint control, to adjust the setpoints of complex non-linear HVAC processes and for automated HVAC diagnosis of abnormal behavior within vapor compression cycle equipment.

user typed mdp
press HMI to review
www.arct.cam.ac.uk/mdp

10.45 Session 6b
Inter-technology?
Chairman: *Dr Jeffrey Spitzer, Oklahoma State University*

An internet-based system to support inter-disciplinary and inter-organisational collaborative conceptual design by *Dr John Steele, Simon Austin, Loughborough University; Sebastian Macmillan, Paul Kirby & Robin Spence, The Martin Centre, University of Cambridge*
This paper describes an Internet-based design tool to support interdisciplinary teams during the conceptual phase of the design process. The tool, which accords well with the richly iterative and often non-linear process which design typically follows, is intended to encourage inspirational concept design without imposing a rigid procedure. As well as offering alternative routes through concept design, the tool offers 'team thinking tools', presents advice on effective teamwork practices, and enables the capture, storage and retrieval of design decisions

A software tool for modelling combined heat and power systems, by *Robert G O'Brien & R Gordon Bloomquist, Washington State University*

The software model that we developed can provide a comprehensive simulation of proposed and existing combined heat and power (CHP) plant and system applications under varying rate structures and alternative environmental and other input scenarios. It provides a fully integrated analysis of central electric power production plants that are linked to district energy applications using hot water or steam for heating and/or chilled water-cooling connected to a network of residential, commercial, institutional, or industrial facilities.

IT's for you...internet applied for real building services engineers by *Tim Dwyer, South Bank University, London*
This paper is aimed both at potential users of Internet technology and those who currently dabble but are unsure of the wider benefits or practicalities of Internet use. The development of the Internet as an essential tool for practising engineers has broadly been accepted by the larger

companies, educational institutions and government. However the greatest benefits may yet to be realised by the smaller practice and the individual - those referred to as the 'SOHO' user in the popular press. This paper will consider the use of Internet technology and will cover areas relating to equipment requirements through to the practical applications of Internet for the building services engineer.

11.15 Session 7a Commissioning and Operation of HVCA

Chairman: *Doug Oughton, Oscar Faber*

Design phase requirements of total building commissioning

*by Chad B Dorgan, Dorgan Associates,
Wisconsin*

Due to significant problems with the quality of construction and the associated costs, delays and problems, the total building commissioning process has been developed and successfully applied in North America. To obtain the maximum results, a key focus of the total building commissioning process is during the development and completion of the design. In this paper, the tasks required during the design of a building to ensure the owner's requirements are met are presented.

An overview of TBCx by Charles Dorgan, University of Wisconsin

What do owners desire from a construction project or new building? Energy efficient buildings? Productive buildings? Low maintenance buildings? A building that meets project intent and needs? A sustainable facility or green building? The Total Building Commissioning Process (TBCxP) has evolved as one means to fully involve owners, operating staff, occupants, users and clients of facilities, process or manufacturing managers, design teams and contractors to achieve a quality building.

**Lessons learned in commissioning of a
high technology data centre** *by Richard
A Greco, Facility Assocs, San Francisco*
Stephen P. Teale Data Center is a State of California department providing public sector

organizations with information technology services. In mid 1999 we commenced commissioning of Teale Data Center's electrical and mechanical systems. Lessons learned were: 1) Documentation of the design intent proved difficult due with a design/build process. This was successfully completed by the project's end. 2) Installation of equipment had a problem rate of approximately 15%. 3) System performance and integration was the most problematic.

Construction of TBCx requirements by Carl N Lawson, Duke University Medical Center, North Carolina

A key phase of the total building commissioning process (TBCxP) is construction. It is critical that during construction that the individual workers are aware of the owner's requirements and that their work will be verified. During construction the commissioning authority acts as the owner's representative in verifying the work being completed, assuring proper documentation is being maintained, and that the building is 100% functional the day the owner occupies it. The benefits achieved during the construction phase of TBCxP include reduced change orders, on budget/schedule, properly trained staff, and reduced callbacks for the contractor.

11.15 Session 7b Servicing for Older Buildings

Chairman: *Paul Yunnie, Andrews Boilers
& Water Heaters, UK*

Wilson Weatherly Phipson, Building Services Engineer: 1838-1891

*by J Michael Barber, University of
Liverpool; Frank J Ferris, Richard
Forster & Brian Roberts of CIBSE
Heritage Group*

WW Phipson was probably the foremost Building Services Engineer of his era, designing systems for such buildings as The Royal Albert Hall, Alexandra Palace, Glasgow University etc. An archive of his papers is being examined by the CIBSE Heritage Group, and work on this and other sources has indicated his modus operandi to be part contractor part consultant. He worked with Architects such as Waterhouse and Gilbert

624-631
Scott. G N Haden was his major competitor for work.

0
V
Retrospective review of the world's first low energy fully air-conditioned curtain walled building (1948) by Dr David Arnold, Troup Bywaters & Anders

The Equitable Building, in Portland, Oregon, was the first of a new architectural form. The genesis for the building was a wartime project in an architectural magazine. The editor invited architects to produce designs for different projects that might be built once wartime building restrictions were lifted. Belluschi, the architect, produced a design that subsequently formed the basis for the Equitable Building. Kroecker, the mechanical engineer, designed an innovative system that was energy efficient.

Laboratory renovation in older buildings by Charles Henck, Henry Adams Inc, Baltimore

The renovation of a 22,000 square foot two-story 1975 lab that had 27 fume hoods including eight 12-foot hoods in one room was a challenge because there was less than two feet of ceiling space for ductwork and piping. The use of the attic space and the addition of a new mechanical room solved the space constraints. A new variable volume reheat supply air system with a variable volume exhaust air system was designed. The control system was designed to track the exhaust air quantity and adjust the supply air quantity to maintain the space pressure relationships.

Innovative HVAC solutions for a historic building renovation by Boggarm S Setty, Setty & Associates, Fairfax, USA

A study was conducted for a 380,000 sq. ft. national museum in Washington, DC, circa 1857. The museum houses portrait paintings and was renovated several times since 1900. The building has slate floors, marble columns, and cast iron balconies.

The existing structure does not allow for any horizontal distribution of HVAC systems, yet the museum requires precise temperature filtration and humidity control in every 20 foot module. The existing HVAC system encompasses 1,500 tons cooling. The system employs desiccants for dehumidification and carbon filters for air quality control, and is conceived so as not to disturb the historic fabric of the ceilings or floors.

Innovative HVAC systems are conceived within "think tank" meetings with architects, engineers, and other disciplines involved. The meetings discussed what could be accommodated in a structural system that allows only 16 inch x 18 inch ducts in walls in particular spaces. Solutions included control of condensate across single pane historic windows with heavy leakage of air in both winter and summer. Systems were conceived to accommodate the fluctuation of moving public population from one place to another. The paper to be presented will address the innovative design solutions for upgrading the HVAC system distribution of the ducts and pipes, and wiring for DDC controls to maintain exacting temperature and humidity conditions throughout the museum modules.

**14.15 Session 8a
Designing HVAC to Minimise Global Climate Change**

Chairman: *Dr Donald G Colliver, University of Kentucky*

Cooling degree-days and their applicability to building estimation and normalisation by Dr Tony Day, Dr Graeme Maidment & Martin Ratcliffe, South Bank University, London

This paper presents a cooling degree-day model for evaluating and monitoring the refrigeration energy consumption of air-conditioned buildings. The problem is approached by analysing the energy balance on the central plant. This defines the base temperature in terms of system operating conditions, and includes a fictitious temperature rise for latent load. The expected range of base temperatures are shown together with suggestions for further work needed to validate the model.

Computer aided design for variable speed pumping circuits by Christopher Parsloe, BSRIA, UK

This paper explains the use of a computer program to analyse the performance of pipe systems with two port control valves and variable speed pumps. Examples are given showing how the program was used to investigate the positioning of differential pressure sensors, the sizing of two port valves

and the role of balancing valves in systems. The paper concluded that this type of analysis can help to optimise the performance of systems with variable speed pumps.

Mobile thermostat for climate control in residential buildings by *Dr Alex Burd & Galina Burd, Advanced Research Technology, LLC Connecticut and Wisconsin*

The objective of the investigation was to evaluate the performance of a new control device - the wireless mobile thermostat. The mobile thermostat's prototype system was manufactured, installed and tested during one year in a two-story residential townhouse with a central furnace and forced-air system. The modes of operation with the stationary and mobile thermostats were compared and analyzed. The mobile thermostat allows to improve comfort and to reduce annual energy consumption for heating and cooling.

**14.15 Session 8b
Methods for Services Design & HVAC Management**

Chairman: *Ray Bentley, Terence Lee Partnership, London*

Planning and execution of business centred maintenance for perfect buildings in year 2000 by *Kam-Chuen Lam, Hong Kong Polytechnic University*

The traditional approach to maintenance of building services can no longer match the users' needs. Maintenance is a professional service, and must satisfy the customer's needs. There is a need for change and a willingness within the building team to adopt a re-engineered management of building services maintenance based on customer's business functions and needs in pursuing high quality building with better profitability for both clients, building users and last but not least, the maintenance provider.

Life cycle asset management by *Jim Sawers, Reid Crowther & Ptnrs, Calgary*
A life cycle asset management methodology is proposed as a practical tool to identify, quantify and prioritize deferred maintenance and component renewal in a facility; to

develop and report on the results of alternative levels of short and long term funding; and to develop a detailed deferred maintenance reduction plan based on the adopted funding level. The tool can be used for a single building or multiple buildings. Of particular value, is the ability to prioritize needs by building, building area, trade, building system or building element

**15.45 Session 9a
Start of the Art Heat Pump Application**

Chairman: *James Wolf, President, ASHRAE*

Recent developments in ground source heat pump system design, modelling and applications by *Jeffrey D Spitler & Simon J Rees, Oklahoma State University; Cenk Yavuzturk, University of Wyoming*

This paper gives an overview of recent research and developments in ground source heat pump system design, modeling, and applications for commercial and institutional buildings. Design methodology suitable for determining ground loop heat exchanger size and modeling suitable for predicting hourly or minutely response of the ground loop heat exchanger are presented. In addition, in situ measurement techniques for ground thermal properties, hybrid ground source heat pump system control, and a UK example are discussed.

**15.45 Session 9b
What Happens When The Owner Sues – A Simulated Arbitration**

Moderator: *Richard Rooley, Rooley Consultants*

The construction of a ten-storey addition to Big City Medical Centre descended into a nightmare. The technology of the air conditioning system failed, there was ingress of bacteria, relationships among the designers and contractors had virtually collapsed. The costs escalated out of control. The expert, who was called in to solve the problem, misrepresented his qualifications and experience. It is alleged that both the designer

and the contractor made serious errors. Was the motivation of the client, personal or in the interest of his employer?

The cross-examination stages of the arbitration which followed the disaster will be played out and the audience will vote on the allocation of blame.

The simulation is based on real examples from the experience of the participants.

Saturday 23 September

08.45 Session 10a

2020 Energy

Chairman: *Richard B Hayter, Kansas State University*

Comparing building performance assessment in the UK, the USA and Sweden, lessons and opportunities for harmonisation by *John Field, Target Energy Services; Jonathan Soper, ESS Engineering, London*

This paper compares various established methods for assessing or regulating buildings energy efficiency. System benchmarks, such as electrical power density and efficacy are becoming more widely used and could transcend national boundaries more easily than building energy consumption benchmarks. Conclusions are drawn about the potential to simplify and improve energy standards for the assessment of buildings by designers and managers, and to reduce the duplication of published guidance work.

Energy benchmarks for public sector buildings in Northern Ireland

by *Phil Jones, Building Energy Solutions, Epsom, UK; RN Turner, Dept of Finance & Personnel; DWJ Browne & PJ Illingworth, Energy Conservation, Works Service, N Ireland.*

This paper presents the preliminary results of a study throughout the Northern Ireland public sector estate aimed at improving energy monitoring & targeting by developing local energy benchmarks for a range of public buildings. Benchmarks play a key role in promoting energy efficiency in buildings and are fundamental to the work of building designers, operators and energy

managers. Energy benchmarks are shown for 16 types of building based on an analysis of roughly 2,000 properties including offices, schools and libraries.

A Benchmarking Case Study at Children's Hospital Medical Center, Cincinnati, Ohio by *Thomas E Kinman, Children's Hospital, Ohio*

This document will cover the Benchmarking efforts at Children's Hospital Medical Center (CHMC) in Cincinnati, Ohio relating to building maintenance and utility plant operation. The evolution of the Benchmarking parameters, how these parameters were agreed upon, and how they are now used as internal reporting mechanism to Senior Management and to the Board of Trustees will also be discussed.

08.45 Session 10b

HVAC special Applications

Chairman: *James Curley, HA O'Neil, Dublin*

The design and performance of an evaporative cooling test rig for a maritime climate by *Ben A Costelloe & Donal P Finn, Dublin Institute of Technology*

The success of chilled ceiling systems has prompted a review of cooling tower based evaporative cooling technology as an effective means of cooling modern buildings. At present, however, there is little published analysis of the performance, availability or efficiency of this form of cooling. To address this issue an automated laboratory test rig has been developed with the aim of optimising the performance and demonstrating the potential of this form of cooling in maritime conditions.

Free convective heat transfer in a partially open cavity by *Giovanni Tanda, Francesco Deiva & Mario Misale, Dipartimento di Termoeconomica e Condizionamento Ambientale, Università degli Studi di Genova, Genova, Italy*

Natural air ventilation in partially open cavities is encountered in many practical applications such as energy conservation in buildings and

the heating/cooling of environmental systems. In this work, natural convection heat transfer in a partially open cavity is analysed. A vertical isothermal plate, placed inside the cavity, acts as the thermal source promoting the buoyant air flow drawn into the cavity through vent openings. Experiments encompassed the determination of the local and average convective heat transfer coefficients for the heated plate by means of the schlieren optical technique.

09.45 Session 11a

Innovation in Systems Design

Chairman: *Sean Mulcahy, VMRA, Dublin*

M/A
O

High performance displacement ventilation using fabric diffusers – a case study by *Nicholas Cullen, Hoare Lea R&D, Bristol*

Designing a displacement ventilation system based upon the ASHRAE prescriptive standard for a smoking lounge provided a challenge to the design team.

This paper discusses the issues explored during the design, the use of fabric diffusers, and presents the results of a comparative air quality and energy analysis between the displacement and conventional dilution ventilation systems. The paper discusses some of the problems encountered during and after commissioning and describes the use of Computational Fluid Dynamics (C.F.D.) in diagnosing the problems

X
O
W
I
A

Airflow measurement methods to optimise minimum fresh air by *John Fletcher, BSRIA, UK*

The provision of minimum fresh air is important because it can affect occupant comfort and energy consumption but setting it correctly is often difficult because airflow rates are low and space is restricted. This paper presents interim results of a research project part funded by the DETR under the Partners In Innovation scheme to investigate measurement methods appropriate for setting minimum fresh air rates in mechanical ventilation systems. A range of potential methods are outlined together with preliminary advice on which may be most appropriate.

Building zone modelling adapted to the study of temperature control systems

by *Peter Riederer, JC Visier, R Lahrech & A Husaunndee, Centre Scientifique et Technique du Bâtiment, France; D Marchio, Ecole Nationale Supérieure des Mines de Paris; Peter Gruber, Siemens Building Technologies Ltd, Switzerland*

This paper analyses simplified zone models used for control studies.

The temperature measured by a controller sensor depends on its position in the zone. This phenomena is analysed experimentally in this study. Two "well mixed" models are tested in open loop and closed loop validations as well as in emulations (with a real controller). The result is a list of difficulties and criteria that have to be taken into account for the development of zone models.

09.45 Session 11b

Light and Energy

Chairman: *Kevin Mitchell, AMEC*

Conflict and control: the use of locally addressable lighting in open plan office space by *Thomas Moore & David Carter, University of Liverpool; Anthony Slater, BRE, UK*

The use of locally dimmable user controlled lighting in open plan office space can lead to conflict between users. This in turn leads to withdrawal by some from the control group. Those who withdraw from the control loop are more likely to respond negatively to their environment than those who do not. This paper contains advice for system designers and managers on ways to reduce the incidence of conflict.

O
T
W
I
A

TripleSave – the investigation and monitoring of a combined natural daylighting, heating and stack ventilation system by *Dr Li Shao, Prof SB Riffat, G Oakley, Dr SJ Smith, Institute of Building Technology, University of Nottingham*

This investigation aims to develop a unit combining lightpipes and passive stack ventilation. The performance of lightpipes has been continuously monitored and the

measurement of natural stack ventilation has been carried out using a tracer-gas method. It has been shown that by fitting a LCP panel to a light pipe, much higher levels of daylight can be transmitted. Typical air change rate through the passive stack is about 8 air changes per hour in Winter

Development and experimental characterisation of low cost façade integrated concentrator photovoltaics

by *Dr Philip Eames, A Zacharopoulos, D McLarnon, Trevor Hyde, Brian Norton, University of Ulster, N Ireland*

A cost effective new design for a building integrated photovoltaic facade system that uses a dielectric, non-imaging optical design, to reduce PV material requirements by up to 60% is presented. Theoretical and experimental results for prototype laboratory manufactured systems are included. Annual performance predictions for Northern and Southern European locations are made, illustrating that approximately 90% of the solar energy collected by a conventional PV panel is collected by the new concentrator system.

**11.15 Session 12a
HAC Student Award Judging**

Introduced by: *Ewen Rose*

The Graduate Award, now in its fifth year, lends itself well to the forward-looking theme of CIBSE's Dublin conference because it celebrates the achievements and potential of a future generation of building services engineers. With this in mind, the judging has been scheduled as the final conference session and will once again take place in front of a distinguished panel and is open to all conference delegates. The finalists are all high academic achievers and have been nominated by their colleges or employers. To decide which one will scoop the outstanding first prize of a trip to next winter's ASHRAE Conference in Atlanta, they will all be making presentations designed to demonstrate their understanding of the building services engineering profession, but also to show they have the personality and strength of purpose to develop as ambassadors for the industry.

The judging panel consists of: Jim Wolf, President of ASHRAE; David Wood, President of CIBSE; Kevin Mitchell, Chairman of the CIBSE/ASHRAE group; Dick

Hayter, past President of ASHRAE; and Ewen Rose, Editor of HAC Journal.

**11.15 Session 12b
Design Tools Software**

Chairman: *Greg Traynor, Chairman Republic of Ireland Branch, CIBSE*

A knowledge based tool to aid in the preliminary evaluation of CHP for a building

by *Dr Jonathan Williams, BRE; Dr Ian P Knight, Welsh School of Architecture, Cardiff University; Graham Roberts, BRE, UK*

This paper discusses the UK Government's Energy Efficiency Best Practice programme (EEBPP) project to develop, in collaboration with Transco, a simple computer based methodology for sizing CHP in new buildings. Using the software, a preliminary evaluation of the sizing can be made with only knowledge of the building's type, size, location and a few key elements specific to each sector. This enables the model to be used when designing new buildings.

925 - 937

○
✓ **The acoustics and ventilation method – a simple design tool** by *Richard Griffiths, University of Plymouth, UK*

The acoustics and ventilation method allows the designer to explore natural ventilation and acoustics issues at an early design stage. Few input parameters are necessary, like the number of people the space must accommodate and the volume of air per person appropriate to the acoustic function. While allowing the comfort temperature to rise during occupation by some 10 to 15%, the natural ventilation and acoustics can be discussed via the volume of the space.

~~~~~

## POSTERS

### 15.15 Poster Viewing Session

#### Thursday 21st September

1  
0  
**Validation of a computational fluid dynamics simulation of a supply air ventilated window** - *Ryan Southall & Dr M McEvoy, The Martin Centre, Cambridge,*

A possible solution to the problem of maintaining good ventilation levels whilst improving thermal insulation is the supply air 'ventilated' window.

A Computational Fluid Dynamics model has been constructed to model the performance of the window. This model is described and is validated against ASHRAE standard U-Values for conventional windows, and against experimental measurements taken from a test rig that we have constructed. The simulation achieves a good degree of accuracy for steady state conditions.

**Do simple design tools improve design decisions in a hot climate?** - *Mary Hancock, Oxford Brookes University, UK*

A simple modelling tool was used to influence refurbishment strategies at a group of schools in Peshawar, Pakistan. The schools were monitored both before and after introduction of low cost measures to improve thermal comfort. Unexpectedly the monitored results did not follow the simulations. The paper considers why the two sets of data did not coincide and seeks to generate some general conclusions on the use of modelling in the design process.

1  
0  
**Sustainable cooling via a ground coupled chilled ceiling system** -

*Dr Graeme Maidment, R Monksmith,, JF Missenden, South Bank University*

This paper describes a study into the practicalities and economics of applying a ground water / chilled ceiling system in commercial buildings. To evaluate and optimise the system design, a theoretical heat transfer model has been developed and this is described.

The model was used to evaluate the performance of the system and this showed large inefficiencies. The model was then used to optimise the system design characteristics. The performance of the optimised system

compared against conventional systems is discussed.

**Development of a window with an overall heat loss co-efficient of less than 0.4mq\_K and 0.7 visual transmittance** -

*Dr Philip C Eames, Trevor Hyde, Yueping Fang, Philip W Griffiths & Brian Norton, Centre for Sustainable Technologies, University of Ulster, N Ireland*

A new form of, and manufacturing process for, a contiguously sealed double-glazing with an evacuated gap and internal low long-wave radiative emittance coating is described. This glazing is no heavier than conventional double-glazing, gives good visual transmittance and may be retrofitted to existing buildings. The experimentally measured heat transfer coefficients and visual transmittances of 0.5x0.5 metre laboratory fabricated evacuated glazing samples are reported.

**1-D Model extension to ejector performance at secondary flow choking**

- *Yang Pei Rong, Dr Christopher Yap & Dr Chou Siaw Kiang, National University of Singapore*

Modelling of ejector performance at the secondary choking flow conditions in an ejector refrigeration system (ERS) is presented. Chou et al's equation is incorporated into the 1-D model by Keenan et al to predict the attainable mass flow ratio, the critical discharge pressure of ejector and to computer the ejector performance characteristics map. There is good agreement with experimental data obtained using R113 and steam ejectors.

**Matrix-free numerical methods for buildings energy simulation** - *Michael Crowley, Dublin Institute of Technology;*

*Mohammed Hashmi, Dublin City University*

Simulation of energy flows in buildings is computationally intensive, so improvements in solver efficiency can always be utilized. Commonly used implicit solvers require extensive matrix processing while standard explicit methods have limited stability. A stable explicit algorithm is proposed which does not require the use of matrices. Its computational efficiency approaches that of implicit methods. In addition, it makes more efficient use of current computer resources and is particularly well suited to future (parallel) architectures.

**Mobile thermostat for climate control in residential buildings - Dr Alex Burd & Galina Burd, Advanced Research Technology, LLC Connecticut and Wisconsin,**

The objective of the investigation was to evaluate the performance of a new control device -- the wireless mobile thermostat. The mobile thermostat's prototype system was manufactured, installed and tested during one year in a two-story residential townhouse with a central furnace and forced-air system. The modes of operation with the stationary and mobile thermostats were compared and analyzed. The mobile thermostat allows to improve comfort and to reduce annual energy consumption for heating and cooling.

**Mobile thermostat for climate control in residential buildings - Dr Alex Burd & Galina Burd, Advanced Research Technology, LLC Connecticut and Wisconsin**

The objective of the investigation was to evaluate the performance of a new control device - the wireless mobile thermostat. The mobile thermostat's prototype system was manufactured, installed and tested during one year in a two-story residential townhouse with a central furnace and forced-air system. The modes of operation with the stationary and mobile thermostats were compared and analyzed. The mobile thermostat allows to improve comfort and to reduce annual energy consumption for heating and cooling.

---

## Exhibitors

### **Calorex**

#### **Heat Pumps & Dehumidifiers**

*Tony St Quinton, The Causeway, Maldon, Essex CM9 7PU, UK*

Tel: (01621) 856611 Fax: 850871

e-mail: [stq@calorex.com](mailto:stq@calorex.com)

CALOREX HEAT PUMPS Ltd is a world leader in the field of dehumidification and latent heat recovery. We have the largest range of both thermodynamic and absorption units in Europe enabling the Company to react to the whole RH spectrum.

Members of the CIBSE Patrons organisation, a proactive supporter of the Institute's educational initiatives and the foremost exponent of moisture control within Patrons. Dehumidification and heat recovery units for swimming pools have been supplied to Ireland for over 15 years. Industrial units have not been overlooked however and a number of industrial process dehumidifiers have been produced for Irish industrial complexes.

### **EDSL**

#### **(Environmental Design Solutions Ltd)**

*Alan Jones, 13-14 Cofferidge Close, Stoney Stratford, Milton Keynes, MK11 1BY, UK*

Tel: (01908) 261461 Fax: 566553

e-mail: [edsl@csi.com](mailto:edsl@csi.com)

Tas Building Designer

A major new release from EDSL – developers of Tas building simulation software.

Key features:

- Cad link input
- Dynamic building simulation
- Natural ventilation
- Solar shading
- Comparison of different air conditioning systems
- Export to 'Lightscape' for lighting analysis and visualisation
- Access to 2500 weather sites
- Available for Windows 95, 98, BT & 2000

### **Euro Gas Ltd**

*Des Prendergast, Unit 38B, Southern Cross Business Park, Boghall Road, Bray, Co. Wicklow, Ireland*

Tel: (01) 2868244 Fax: 2861729

e-mail: [eurogas@indigo.ie](mailto:eurogas@indigo.ie)

Euro Gas Ltd is one of Ireland's leading distributors of Heating, Ventilating and Hot Water Equipment to the Mechanical Services Industry.

Our Company provides full After Sales Engineering to our clients and employs three fully qualified Service Engineers. We list hereunder the Companies we represent and the range of products provided:

**Beel Industrial Boilers Plc** – Steam & Hot Water Boilers; **Rendamax BV** – Hot Water and Central Heating Boilers; **Remeha UK**

**Limited** – Cast Iron Boilers, Oil & Gas up to 1900 kW; **Lochinvar UK Limited** - Water Heaters and Central Heating Boilers; **Schwank UK Limited** – Radiant Plaque & Tube Heaters; **Reznor UK Limited** – Indirect Gas Fired Air Handling Equipment; **Niche Limited** – Direct Gas Fired Air Handling Equipment; **A1 Bridge Flue Systems Limited** – Flue and Flue Dilution Systems; **Quartz Limited** – Fan Coil Units; **Monicon** – Gas Detection Equipment; **AEL** – Plate Heat Exchangers.

## **Gilberts (Blackpool) Ltd**

*Jonathan Haslam, Gilair Works, Clifton Road, Blackpool, Lancashire, FY4 4QT, UK*

Tel: (01 253) 766911 Fax: 767941

e-mail: sales@gilbertsblackpool.com

Designer and manufacturer of all types of air distribution – grilles, diffusers, louvres, smoke/fire dampers and V.A.V. Gilberts will provide a compact display that features its most recent product developments such as floor and ceiling swirl diffusers. On stand, previews will also be available for the new GSR series slotted face swirl, GRC series circular diffuser and absolute filter terminals.

## **McCool Controls Ltd**

*Finn McCool, Unit 12, Docklands Innovation Park, East Wall Road, Dublin 3*

Tel: (01) 8550542 Fax: 8550540

e-mail: MAIL@McCoolControls.ie

We are the leading supplier of:

- HVAC control systems
- Energy management systems
- Max demand controllers

**ENERGY UNDER CONTROL**

Products:

- Cylon – BEMS systems
- Honeywell – HVAC control equipment
- ABB switchgear
- Landis & Staefa controls
- Phoenix laboratory airflow controls
- Paragon air flow control systems

Full maintenance and service backup facility  
24 hour call out service.

## **Merriott Radiators**

*Frank J Donohoe, Unit 8, Broomhill Business Park, Broomhill Road, Tallaght, Dublin 24*

Tel: (01) 459 6213 Fax: 451 5143

e-mail: sales@merriottradiators.com

Merriott Radiators are the Design division of Barlo Group Plc. Barlo Group manufactures radiators under the Merriott, Barlo and Veba brand names in Ireland, England and Belgium. The Merriott tubular design radiators are manufactured in Clonmel, Co. Tipperary in a modern production facility utilizing the latest technological machinery and processes. The Company is BSI registered under certificate no. FM21441 and operates a quality management system which complies with the requirements of BS EN ISO 9002: 1994 The product conforms fully to all the requirements of the European standard for radiators BS EN 442.

Merriott Radiators offer total flexibility in system configuration and the versatility to suit almost any architectural or interior concept.

## **Mitsubishi Electric Ireland**

*Paul Sexton, Westgate Business Park, Ballymount, Dublin 24*

Tel: (01) 419 8827 Fax: 419 8890

e-mail: sales.info@meuk.mee.com

With products evolved from over forty years of research and development, Mitsubishi Electric Air Conditioning systems are among the most advanced in the world.

### **WR2 System**

The City Multi R2 system is the world's first 2-pipe system to offer simultaneous, independent control of heating and cooling of each indoor unit compared with conventional three-pipe systems. Following the success of the City Multi R2 air-cooled system, the City Multi WR2 water heat source system has now been launched in the Irish marketplace. In the City Multi WR2 system, the circuit connecting to the outdoor heat source unit is supplemented by a water heat source, which recovers heat effectively, and then refrigerant piping is used to connect the indoor units.

### **Power Cassette**

Whether you're looking for extra flexibility in layout planning or smooth installation, Mitsubishi Electric's new 4-way airflow power

cassette unit is the perfect choice for today's diversified residential and commercial applications. The three most important characteristics of an air conditioner – flexible layout planning, efficient yet powerful performance, and installation/maintenance ease – have been refined to make this series ideal for use in retail outlets, restaurants, and business offices.

If you would like further information on these products or any of the other products in our range, come visit us at our stand on the concourse.

## **Philips Electronics (IRL)**

*Ronan Marsh, Newstead, Clonskeagh, Dublin 14*

Tel: (01) 7640000 Fax: 7640121

Philips new range of suspended luminaries carries with it an innovative style with the expected quality from Philips Lighting. The TPS 498, TPS 672 and the TPX 700 all use the highly efficient and slim 'TL' 5 fluorescent tube.

### **1. TP 498 – Sophisticated and Supreme**

The TPS 498 offers a flexible range of solutions for shop and office applications smartly designed, it is the perfect solution for a number of needs.

### **2. TPS 672 – Stylish and Miniature**

The TPS 672 brings class and stature to sophisticated environments with its sleek design and compact shape. Its appearance creates the opportunity to incorporate it into any design, whether it be shops or offices.

### **3. TPX 700 – Freedom of Design**

The TPX 700 goes one step beyond the rest by providing complete freedom of design. It is the central component of an unlimited number of lighting solutions, each with its own aesthetic characteristics.

## **Redbro Ltd**

*Paul Brophy, Unit 4, 70 Heather Road, Sandymount Industrial Estate, Dublin 18*

Tel: (01) 2940321 Fax: 2940325

e-mail: [pbrophy@indigo.ie](mailto:pbrophy@indigo.ie)

Redbro has been in existence for over 30 years, and is one of the leading companies in the industry. We represent numerous companies in Ireland, such as Trox, NuAire, Sanyo, Eltron, Stieble Eltron, Apreco. The company is based in South County Dublin, with 6 employees and is actively involved in the HVAC industry. Redbro enjoys good relationships with other members of the

industry, due to our belief in customer service, efficiency and knowing our customers' requirements

## **RSL (Ireland) Ltd**

*Gerry McDonagh, 48F, Robinhood Industrial Estate, Clondalkin, Dublin 22*

Tel: (01) 4508011 Fax: 4567512

e-mail: [Gerry@RSLIreland.com](mailto:Gerry@RSLIreland.com)

RSL (Ireland) Ltd is the Republic's leading distributor of air conditioning and refrigeration equipment and is exhibiting new product developments from Baltimore Aircoil Company, the worldwide manufacturer of evaporative cooling and ice thermal storage equipment.

BAC has introduced the HXI Dry/Wet Fluid Cooler which combines the best of dry and wet operation in a single unit that saves 70% of the water used in a conventional cooling tower. In addition to these important water savings the fluid to be cooled is in a closed and clean cooling circuit and the three operating modes of the HXI ensure year round cold fluid temperatures.

BALTICARE<sup>sm</sup> is a specialist care service offered by BAC to provide single source responsibility for both the supply and water quality control of evaporative cooling equipment. Balticare is a comprehensive service that includes a site specific water treatment programme, monthly service visits and monitoring of the cooling system for efficient and safe operation.

## **Johnson Control Systems/Thermo Systems**

Agents for McQuay International Johnson Controls Systems

*Aiden Lynch, Unit 2, Church Buildings Industrial Estate, Church Lane, Dublin 14*

Tel: (01) 4931701 Fax: 4931746

e-mail: [aiden.lynch@thermosystems.ie](mailto:aiden.lynch@thermosystems.ie)

Johnson Control Systems are a world leader in building management systems controlling HVAC, lighting, security and fire management for all types of buildings.

Our customers worldwide include healthcare, education, pharmaceutical, commercial, local government bodies, semi-conductor and IT industries.

The global operation is serviced by 300 Johnson Controls and Partnership offices, including 25 manufacturing plants, employing over 80,000 personnel.

This stand is presented with our Irish partners, Thermo Systems, who are located in Rathfarnham offering coverage throughout the Southern Ireland region.

## **Valve Control Systems Ltd**

*Robert Daly, Unit D5, Dunshaughlin Industrial Estate, Dunshaughlin, Co. Meath, Dublin 15*

Tel: (01) 8258081 Fax: 8258077

e-mail: [V.C.S.@indigo.ie](mailto:V.C.S.@indigo.ie)

1. WIRSBO underfloor heating incorporating the new "WIRSBO Genius Control System".
2. Ecoflex pre-insulated pipe exhibiting the new large bar piping system.

## **Wilo Engineering Ltd**

*Tony Cusack, Enterprise Centre, Childers Road, Limerick, Ireland*

Tel: (61) 410963 Fax: 414728

e-mail: [sales@wilo.ie](mailto:sales@wilo.ie)

Wilo Engineering Ltd is the Irish Sales Subsidiary of the German-owned Wilo-Salmson AG Group of Pump Companies. The group has five manufacturing plants, with two in Germany, two in France and one in Ireland. There are also over 30 Sales Subsidiaries dotted around the world. The Wilo Company was founded in 1878 and since then it has become one of the foremost Building Services Pump Manufacturers in the world.

Included in the vast range of products are pumps for Heating and Chilled Water Systems, Booster and Fire Hose Reel Sets, Sealed System Pressurisation Sets, Stainless Steel Vertical and Horizontal Multistage Pumps, Submersible Drainage and Sewage Pumps, Borehole Pumps and Oiltransfer Sets.

The company also manufactures a comprehensive range of electronic controls for use with its pumps.

**Barbour Index**, the UK's leading specialist information service provider, has a range of services tailored to the needs of building services engineers. These include NES, an electronic specification writing tool that can save you time whilst keeping you right up-to-date with changes to British and European standards. The service also links to Construction Expert – a single, integrated database of product data and technical information from more than 200 publishers including CIBSE, BSRIA and BSI. For more information, run the demonstration on the CIBSE conference CD.

