Integrated Health and Social Care Centre

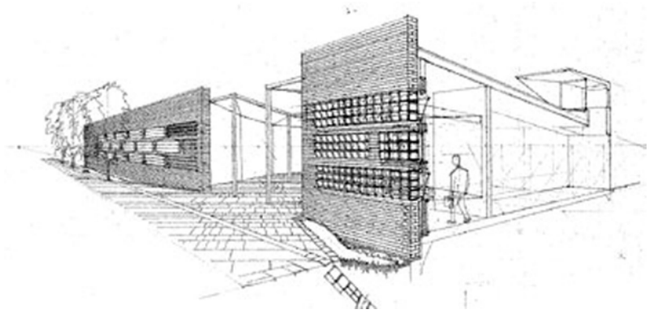
Malcolm Cook
Institute of Energy and Sustainable Development, De Montfort University Leicester, UK

The Braunstone Health and Social Care Centre near Leicester will deliver an integrated service to one of the top ten deprived wards in the UK. Until now, the provision of health and social care was provided by seven separate services distributed across the city. Architects Short and Associates have designed a sustainable building that exploits passive solar principles and natural ventilation. The project demonstrates a low energy solution to this challenging new building type.

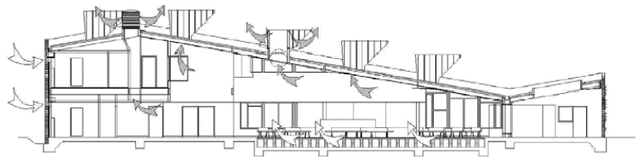
The reputation for theft, arson and vandalism in the Braunstone area of Leicester meant that the new Health and Social Care Centre had to be robust and secure. However, despite being physically impregnable, it was important that the building appear welcoming and non-institutional.

The plan form is rectangular and necessarily deep plan, punctured by four courtyards that provide daylight and ventilation. Daylit corridors lead from a large central concourse to GP rooms, social services and treatment rooms. These cellular spaces are either single-sided or cross ventilated. Stacks are used in the two-storey zone of the building to assist the flow of buoyancy-driven ventilation.

Most of the accommodation is single storey which facilitates the use of south-facing controllable roof lights for providing daylight into the core of the building.



South elevation showing terracotta flue liners used for physical protection and solar shading (Short & Associates)



Long section illustrating natural ventilation strategy and 'light scoops' (Short & Associates)

During the summer, the central reception area is supplied with air from a labyrinth below the floor that draws air from the four courtyards. The labyrinth is purged during the night to cool its thermal mass. Computer modelling using dynamic thermal and CFD simulations predicted that the labyrinth has the potential to cool incoming air by about two degrees.

The Institute of Energy and Sustainable Development were energy consultants as part of the client's professional team which comprised: Short and Associates, Environmental Design Partnership, Martin Stockley Assoc.; Monk Dunstone Assoc. and Summers Inman.

Debating Natural Ventilation in Schools

Wayne Aston
Passivent Ltd.

A standing room only debate took place recently at the Offices of Fulcrum in London on natural vs mechanical ventilation of schools. Included in the audience were architects, M&E consultants and contractors.

Arguments in support of natural ventilation included: lower whole life costs, lower emissions of damaging environmental pollutants, no self-generated noise, products readily available, proven methods, successful case studies and direct connection with the outside environment.

On the other hand arguments in support of mechanical ventilation included: modern quiet systems, compact designs, energy efficient heat recovery options and correctly tempered supply air to achieve the desired internal environment, irrespective of external conditions.

It was agreed that a combination of natural and mechanical ventilation would give the best holistic approach to modern design since both strategies have quite clear advantages and disadvantages. Hence each building must be weighed on the merits of incorporating each of the strategies. Thus it was thought that 'hybrid' options should be considered.

Natural Ventilation Group News is published by the CIBSE Natural Ventilation Group. This edition compiled by VEETECH Ltd. www.veetech.co.uk

Natural Ventilation Group

The Chartered Institution of Building Services Engineers
222 Balham High Road, London SW12 9BS
Tel: 020 8675 5211 Fax: 020 8675 5449 Web: www.cibse.org

Group News

Autumn 2004

This Newsletter is produced by the CIBSE Natural Ventilation Group Management Committee to inform members and potential members of the work being undertaken by the Group to benefit the discipline of natural ventilation within CIBSE. The management committee wish to encourage contact with all interested partners. Communication can be directed to the Group at CIBSE Headquarters or to individual Management Committee members (see back page).

Technical Visit - Portcullis House London

Nick Cullen
Partner
Hoare Lea Consulting Engineers
Research and Development

The Natural Ventilation Group arranged a visit to the Parliamentary offices in Whitehall. The project architect from Hopkins, Patrick Nee, gave a 45 minute introduction to the project explaining the original concept and highlighting the innovative elements of the construction.

The building is on a sensitive site, adjacent to the Houses of Parliament. It provides accommodation for Members of Parliament along with select committee and meeting rooms. The design of the building was inextricably linked to the design of the underground Jubilee line station. The decision to build Portcullis House was taken once the new station was given the go ahead. The architects worked on both schemes, a fortunate aspect of the project given the complexity of the structure.

Conceptually the building integrates both structural and building indoor climate systems within the façade and makes use of passive design techniques supplemented by mechanical systems. The building is cellular in nature and the construction is thermally heavyweight with the partitions and soffits being exposed concrete. Each office has a triple glazed window with an adjustable inter-pane blind providing good thermal performance in winter and summer. The blinds are dark enabling them to act as solar collectors in winter (and summer). Fresh air is provided via the floor void and extracted via the window and directly from the room. The fresh air is drawn in via openings at the base of the roof turrets and the vitiated air is exhausted via openings at the top of the turret. Prior to discharge the air passes through a thermal wheel providing preheating to the incoming fresh air. The system operates at night to provide a night cooling mode. Additional cooling is provided through the use of borehole ground water drawn at around 13°C from the chalk 150m below and discharged to the river having been used in the grey water system. Heating is provided by a conventional gas fired condensing boiler operating on a 70/50°C temperature regime.

Portcullis House, London

A major feature of the construction was the use of extensive pre-fabrication with everything from the waveform pre-cast floor slabs and bronze turrets to the building systems risers delivered from offsite facilities. The principle reason for this was the tight programme and the improvement in quality, particularly of the exposed structural elements.

Forthcoming Meetings

6th October: NVG Committee Meeting: Department of Civil and Environmental Engineering, Imperial College 1.30 pm.

7th December 1 - Day Seminar: Mixed Mode Ventilation. CIBSE HQ 10.00 am.

The NVG is very active and we are interested in continuing to broaden our membership. Anyone interested in taking part should contact Samantha McDonough at CIBSE, Tel: 020 8675 5211, email: smcdonough@cibse.org.

Natural Ventilation Control - Automated Window Opening

Will Perkins, Director of SE Controls,
Crossfield Road
Industrial Estate, Trent Valley,
Lichfield, Staffs
WS13 6RJ

In recent years, there has been a growth in the design and development of naturally ventilated buildings. A common approach to achieving the required performance of the system has been to provide automatically operated windows, which open under the dictates of the BEMS and/or local occupant control.

In many instances these systems have been brought together from different sources. Unfortunately, these elements are not always designed to work together, and the end system is modified to give a solution. Experience has shown that this approach is not necessarily the best way. Inefficient systems can lead to increased running costs, occupant dissatisfaction, generally poor performance and maintenance headaches for the client.

When considering designing and specifying a window control system, it may be helpful to consider some, or all of the following points:

- Clearly defined system-performance requirements;
- Window-actuator selection;
- Control wiring and power wiring;
- Window-actuator control system;
- Interface with other control systems;
- Commissioning.

The ultimate requirements of the window-control system will depend on several issues. These could include the building's day-time ventilation strategy, the building's night-time ventilation strategy (which may change seasonally), the intended building usage, the subdivision of the building, the level of occupant control versus centralised control, the building's fire strategy and architectural/client-specific considerations.

Once all points have been addressed, it is important that a clearly defined performance specification is drafted to make the client aware of what they are getting and give the potential supplier/ installers a point of reference against which accurate and comparable budgets can be obtained.

Key issues for a successful system include:

- ***Window-Actuator Selection:*** The window must be compatible with the actuator. Other window related issues cover weather, durability, life and duty requirements etc. Expert installation is essential.
- ***Control Wiring and Power Wiring*:** Often, this fundamental item is overlooked when tender packages are specified. It is important to consider cable installation between the actuator and the field wiring. The second is the field wiring itself.
- ***Window-Actuator Control Systems:*** The overall ventilation strategy needs to be clearly stated to enable the window-control system to match the performance requirements. It is crucial that the designer considers the system as a whole and does not look at each interface as stand-alone packages. They are intrinsically one system, and failure to ensure their integration can lead to the problems discussed earlier. The optimum solution is to treat the package of window control systems as a self-defined package.
- ***Commissioning:*** An agreed commissioning procedure should be submitted and agreed prior to the commencement of installation. As far as is possible off-site pre-installation testing should be undertaken to minimise on-site time and issues.

The Future

As actuator technology advances, so more features are becoming available. Already digital positional information of the window actuators is available, albeit at a premium. Plug-and-play actuators will be entering the market, which are designed to make installation much easier.

Seminar Report - The Ventilation, Indoor Air Quality and Acoustics in Schools

SOCIETY OF ELECTRICAL AND MECHANICAL ENGINEERS

March 31st The Guildhall, London

Professor Derek Clements □ Croome
Chairman The Natural Ventilation Group

This seminar was organised by The Building Research Establishment in association with the Society of Electrical and Mechanical Engineers and also the Natural Ventilation Group of the CIBSE. New standards have been issued by the Department for Education and Skills including Building Bulletin 93 *Acoustic Design of* Schools. BRE have been carrying out research on ventilation in schools which will help to support the revised approved document Part F in support of Building Regulations which were issued in June 2004. The new Part F quotes standards on ventilation and indoor air quality as the normal means of compliance. The new Building Bulletin on Ventilation in Schools is being edited by The Department for Education and Skills.

Research at BRE was carried out in 8 primary schools, all post 1995, in urban, suburban and rural settings. Measurements were carried out over the Winter periods in 2002/2003. The percentage of schools with ventilation rates under 3 l/s.p was 50% of the sample; 60% showed CO_2 levels above 1000 ppm. The need to open windows to ensure sufficient fresh air has to be offset by the various reasons given for windows being shut, such as noise, cold air and the desire to save energy. Cellular spaces often perform better than open ones because the teachers have more control over the environmental conditions.

Measurements carried out at Exeter University in four new primary schools in the South West, gave average CO_2 levels of 2000 ppm and peak levels of 4000 ppm. It was noted that the position of the windows is particularly important. Other environmental conditions, particularly acoustics were discussed.

The afternoon was devoted to case studies of schools designed by Wilkinson Eyre/Arup; Feilden Clegg/ Burro Happold; Fulcrum Engineering; Walters & Cohen/Max Fordham and FaberMaunsell. These case studies discussed design quality in general. Michal Cohen of Walters & Cohen was inspired by Danish school design that have showed very innovative approaches to interrelating the form of the school with ventilation needs.

Natural and Mixed Mode Ventilation in St. Vincent University Hospital, Dublin

Alice Andersen
WindowMaster A/S, Skelstedet 13,
2950 Vedbaek, Denmark

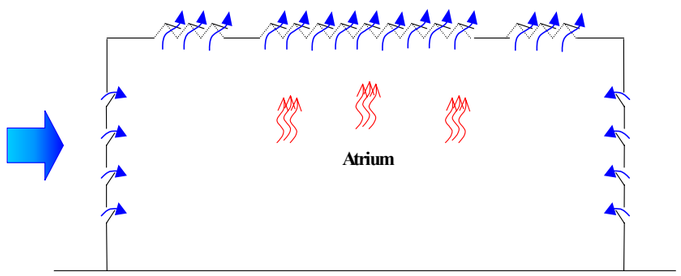
A major extension to this hospital is nearing completion. This consists of 5 levels and a central, naturally ventilated atrium. Adjacent areas include mechanically ventilated spaces and, where necessary, cooling. Thus an overall mixed mode ventilation solution has been applied. This building is one among several projects in which WindowMaster A/S has implemented natural ventilation solutions.

Natural ventilation takes place through façade windows at the two ends of the atrium and through roof openings. Flow is driven by both wind and stack effect with the control system set to maintain flow primarily from the façades to the roof openings as illustrated in the illustration.

The control system for ventilation has been implemented by WindowMaster A/S and is serviced by internal sensors and a weather station located at the top of the building. The weather station gives information about the current outside temperature, wind velocity, wind direction and rain. Along with CFD-calculations of the wind pressures on the building envelope for different wind directions, this information is used to determine the required window opening pattern.

The hospital extension

View of the atrium



Atrium ventilation flow concept

NVG 10th Anniversary International Workshop - Indoor Air Quality

Held at the Royal Academy of Science, London

The 10th Anniversary of the CIBSE Natural Ventilation Group was marked by a celebration seminar on indoor air quality. Invited international speakers included Professor Ole Fanger of the Technical University of Denmark, Professor Per Heiselberg - Head of the Hybrid Ventilation Centre at the University of Aalborg in Denmark, Professor Jan Sundell of the International Centre for Indoor Environment and Energy, Denmark and Professor Olli Seppänen of the Helsinki University of Technology, Finland. These guest speakers have substantial background in indoor air quality and presented results of some of the latest research.

Professor Ole Fanger highlighted field study results that show much dissatisfaction with current indoor air quality conditions in many offices. Problems not only include the ventilation rate but also indoor contaminant sources and contamination from clogged filters. Ole Fanger concluded that source control, air cleaning, personalised ventilation and the provision of air at the correct temperature and humidity can improve by orders of magnitude the quality of indoor air.

Professor Heiselberg discussed the challenges of controlling natural and hybrid ventilation systems. He emphasised the main challenges as being improving our physical understanding of air flow, combined with developing robust control systems.

Jan Sundell looked at the relationship between health and the air that we breathe. He reviewed the impact of ventilation rate on building related illnesses and demonstrated strong adverse correlations with low ventilation rates.

Olli Seppänen also addressed health and work place efficiency. He outlined research that linked short term sick leave and task efficiency with low rates of ventilation. He further looked at the impact of temperature on work-place productivity.

From the UK, Professor Derek Clements-Croome spoke about environment and productivity in the workplace. He undertook an international review of research and demonstrated the wide range of evidence highlighting the impact of the indoor environment on productivity. Robert Cohen from Energy for Sustainable Development (ESD) considered the development of sustainability and the role of advanced natural ventilation. He stressed the need for designing to avoid heat gains, good occupant control and fresh outdoor air.