BATTLE McCARTHY©

PROJECT:
Ionica Headquarters

CLIENT:
St Johns College, Cambridge

ARCHITECTS:
RH Partnership

BM SERVICES:
Mechanical, Electrical and Structural Engineering,
& Sustainability Consultants

VALUE:
£6million

DESIGN BRIEF

The Ionica Telecommunications headquarters is a good example of a building with high internal gains that can provide comfortable conditions by means of natural ventilation. An enlightened brief called for an energy efficient building that allowed the option of opening windows, rather than the traditional,hermetically sealed, air-conditioned box. Battle McCarthy's approach, working with the RH Partnership, was to devise a building strategy that would allow the building to operate with the minimum of mechanical equipment and therefore energy consumption.

DESIGN INITIATIVES/ACTIONS UNDERTAKEN

Design objectives were to produce a daylit, naturally ventilated building with a high-quality working environment. A central atrium is the standard device to allow daylight penetration into a deep-plan office as well as providing good natural cross-ventilation.
The innovative design principle behind the Ionica Headquarters was to place wind towers along the top of the atrium, allowing cross-ventilation to be driven through the building in a controllable manner, even during high winds.

The Ionica Headquarters is designed to utilise the pressure differential surrounding the building. Fresh air will enter through the façades under positive pressure. The wind towers positioned on the roof are under negative pressure for all wind directions. This pressure difference ensures an air flow from the offices to the atrium and out of the building. If the wind velocity drops below a certain level (1-2.5m/s) then buoyancy-driven flow can be relied upon. Warm air will naturally rise through the building and out through the wind towers. To further encourage the stack effect, a glazed atrium is positioned below the wind towers, which encourages heat to build up along the roof. Fixed louvres below the sunspace prevent solar radiation from penetrating the interior.

The wind towers are designed to draw air through the building regardless of the external wind direction. Wind-tunnel testing has been used extensively to determine air movement through particular building forms at an early stage of the process, significantly changing the design of the tower.

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AWARDS

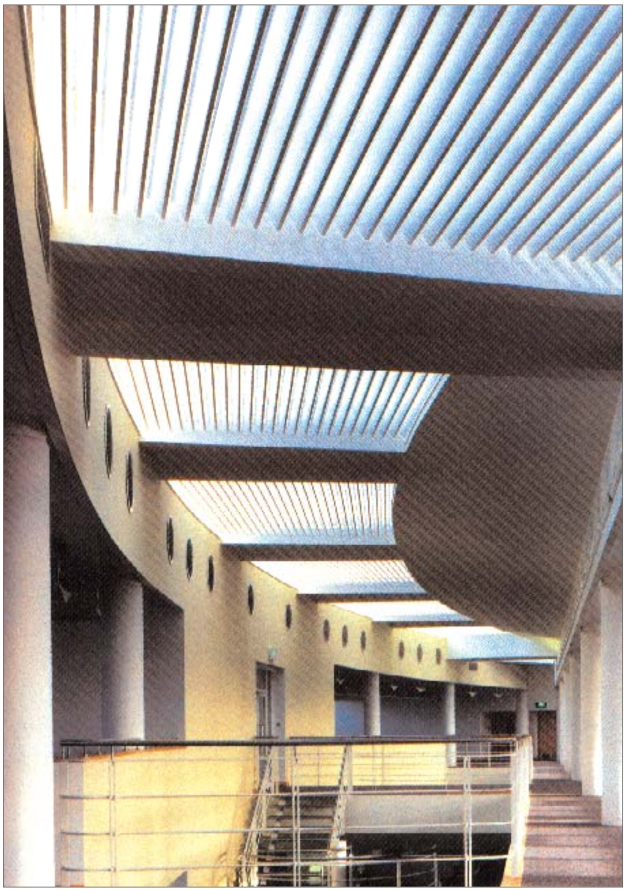
H&V News Building Service Engineers of the Year	1995
RICS Energy Efficient Building of The Year	1995

Initially, the wind tower had louvred openings on four sides, but this did not produce an efficient system. Testing showed that in certain conditions the louvred wind tower actually produced a positive downflow into the building. The solution was to create an 'open-top chimney' with a cap and floor to prevent rain ingress. Air is drawn in via controllable doors on each side of the tower, which then acts like a 'plenum'. These doors also control the flow of air through the building. As the wind speed increases, so the suction increases. The air flow can be reduced from 100% to 15% by gradually closing the doors.

Another design factor that was critical to the success of the ventilation system was the position of the wind towers. The building is oriented on an east-west axis and therefore, if the wind were blowing from the east or west along the length of the building, curvature would ensure that one wind tower would not 'shadow' the next.

Four distinct seasonal conditions were studied, with both day and night-time modes. To guarantee comfort in extreme climatic conditions the building was designed with a mixed-mode approach to ventilation, It is ventilated naturally for the majority of the year, but mechanically if heat gain or loss is too great. A comprehensive building management system is therefore crucial for a structure of this nature. An intelligent control system is able to monitor weather changes and control the operation of both the passive and active environmental systems to ensure the most efficient use of energy. This provides the ability to learn how the building responds to various weather changes and to adjust the systems accordingly.

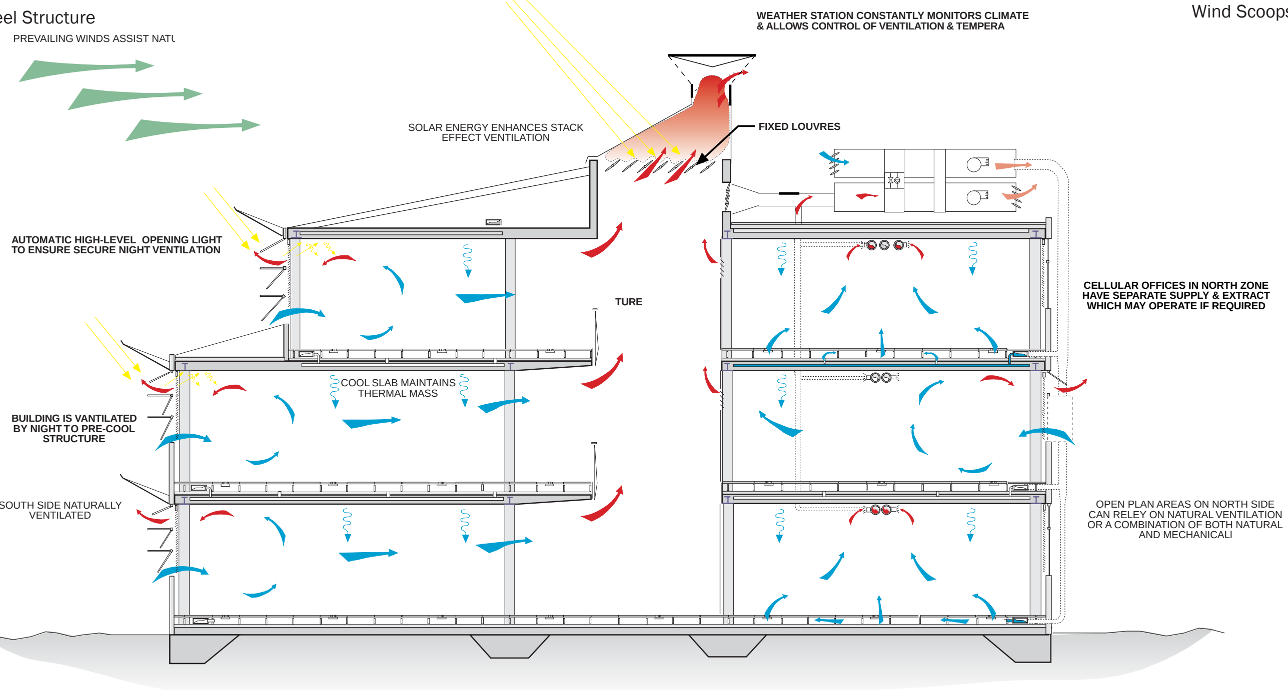
Energy use for the natural ventilation strategy - using good external shading, exposed thermal mass and wind towers - was predicted at 130 kWh/m^2/year, This shows a 46 per cent saving on a good-quality, air-conditioned building.



Internal Atrium

Steel Structure

Wind Scoops



Mid-season Daytime Environmental Operation