



Limerick County Hall



Limerick County Hall is more than just an elegant public building.

This building was conceived as a gateway between a semi-natural ecosystem - the Ballynaclough River, and an important regional landmark, the Crescent Shopping Centre. The County Hall is, therefore, a meeting place in more than one way. Here the urban merges into the rural and this important civic structure fittingly utilises both modern energy design solutions and the never-ending energy of the environment itself.

The Nature of an Environmentally Aware Building

At the heart of Limerick County Hall is an impressive principal structure made from exposed concrete slabs that provide heat through passive solar warming of the thermal mass. Within this, careful shaping of the internal arches and fitted light trays distribute natural light evenly and generously. The tall linear structure on one side of the building, resembling a futuristic conservatory, is an air chimney that is shaded by the

complex pleated screen on its exterior. This is known as a brise soleil. It also links an adjacent library with the Crescent's car park and overlooks the tilted forecourt. In front of this architectural composition sits the independent pavilion of the County Council Chamber. The six-metre-long fibreglass moulds forming the elegant floor of Limerick County Hall were designed to maximize areas of exposed slab to take full advantage of the building's thermal capacity.

Limerick County Hall is a busy complex with office accommodation and connected support areas from the lower ground floor to the third floor levels. Each level shares a common atrium on the building's western elevation that allows staff and public to interact. Council chambers and public viewing gallery are located at ground floor level, in the double height area that creates the sense of an imposing public space. Above the council chambers on the second floor, the main kitchen and restaurant facility is within easy reach of everyone.

The Environmental Strategy

The environmental aims for Limerick County Council Headquarters were shaped by BRECSU Report 30's 'Energy Efficient Office of the Future' (or EOF) best practice guidance. The EOF standards define criteria for the internal building environment and represent a fundamental challenge in naturally ventilated energy-efficient design. Limerick County Hall realizes the following goals in all regards.

Summer Conditions

The building is designed not to exceed a daily temperature of 28°C for more than 1% of the year and not to exceed 25°C for more than 5% of the year. Air movement - used to offset higher dry bulb temperatures - does not exceed 0.8 m/s for cooling.

Winter Conditions

The building is designed to limit heat loss, based on the 'Maximum Permitted Heat Energy Rate' (MPHER) set out in the EOF building guidelines.



 *The Impressive Atrium provides the "stack effect" whereby air drawn through the offices is vented out through the upper zone of the atrium to*

Ventilation Zones

To minimise the use of energy-consuming mechanical systems, such as fans and air-conditioning units, the building has been strategically split into zones, which fall very simply into three areas: naturally ventilated, mechanically ventilated and comfort cooled/air-conditioned.

Natural Ventilation

The majority of spaces are naturally ventilated, dispensing with the need for humidity control throughout the building. However, given local climate and building usage, it was concluded early in the design to limit humidity fluctuations outside the standard recommendation for air-conditioned spaces (40-70%). Air circulates in open plan office areas by cross-ventilation, where air drawn in on one side of the office is vented out on the opposite side through the atrium.

Low partitions minimise obstruction of cross-ventilation airflows and daylight. Some areas require full-height partitions, and designers identified the most suitable locations for these to achieve effective single-sided natural ventilation.

In summer days, the offices gain heat from direct sunlight through glazing and internally from people and equipment. Since most of the building utilises natural ventilation, it is vital to ensure good air movement by opening windows. Correct use of windows – both manual and automatic – assures maximum benefit from natural ventilation, particularly for summer night-time cooling.

During summer nights, automatic windows controlled through the Building Energy Management System (BEMS), open to pre-cool the exposed building thermal mass using lower night temperatures. This free cooling reduces peak internal temperatures, with the exposed mass encouraging air to move across its surface and maximise energy transfer.

When adverse weather conditions make it difficult to open windows, ventilation is maintained with protected louvre ventilators on external facades that work in conjunction with mechanical extraction fans, high in the atrium. The fans only operate when wind or rain is too severe to open windows. At these times there is additional ventilation from trickle vents, manually operated louvres and windows.



 *Manual External Louvre Vent*



 *Manual Internal Vent*



 *Manual Internal Vents opened*

Mechanical Ventilation

In the County Hall, mechanical ventilation and cooling is minimal. The council chamber is the only space with a mechanical supply and extract system and the atrium has only a mechanical extract. A CO₂ sensor reduces the volumes of air moved when the council chamber is unoccupied or only partially

occupied, reducing energy consumption. In winter, a heat exchanger recovers heat from extracted air to further improve energy efficiency.

Energy Consumption

An energy benchmark is a representative value for a common building against which a buildings' actual performance can be compared. In this case, the energy consumption benchmark or target for Limerick County Hall building is that specified by DETR, Energy Consumption Guide 19, 'Energy Use in Offices'. A naturally ventilated, open plan building, would typically have a performance of 236kWh/m²/yr.

With energy efficiency improvements in the atrium, solar control measures, fabric improvements and upgraded heating controls, energy efficient lighting and associated controls, the energy and hence energy cost estimates will be considerably reduced. The target energy performance for this building is predicted to be 76.4kWh/m²/yr, or a 70% improvement.

When compared to a partially air-conditioned building of similar scale or size, the reduction is predicted to be about 87%. The CO₂ emissions will also be reduced to 26.7 kgCO₂/m², a 50% improvement or a saving over 400 tonnes per annum.

Thermal Modelling

A report was commissioned to demonstrate the efficacy of the proposed Buro Happold environmental strategy. Thermal Analysis



 Limerick County Hall Atrium

 The County Hall's eye-catching atrium forms an essential part of its natural ventilation, standing full height along the entire length of the south-west façade. In summer, automatic openings in the atrium combine with manual and automatic openings in the offices to ventilate the main building and offset heat gain. During winter, trickle ventilation provides fresh air to the atrium. Its external solar shading reduces the unwanted solar gain and minimises glare, while offering adequate day lighting and views to the outside.

Software (TAS) gave a dynamic computer simulation of the building environment, establishing that the energy aims for summer and winter conditions were achievable if specific measures were taken.

One such measure was the introduction of a louvre at the atrium base. Air admitted through this louvre reduces the atrium temperature, which in turn reduces the air temperatures in the upper storeys. The minimum required free areas were identified as 15m² at low level and 33m² at high level. A detailed study of the atrium shading system found that early morning sun streaming in through the office elevation was sufficient to cancel out the effects of the night cooling strategy.

To keep constant and comfortable air temperature during the day, modelling showed that solar control glass with a 60% shading coefficient plus some additional external shading would be necessary. The effect of different brise-soleil configurations on shading performance assisted an informed decision on choosing the shading system and allowed designers to set parameters. The ventilation zones plan was also entered into the computer model to see if partitioned areas adjacent to the atrium would be successfully naturally ventilated. It also looked at the effects of possible future partitioned areas to create guidelines for any future partitioning. This was valuable in ensuring that any future office reconfigurations would not lessen the effectiveness of the natural ventilation strategy.



For winter periods, the study found that by upgrading the original atrium glazing specification the building would achieve an Energy Rating of 71.2 kWh/m²/yr, thus meeting energy targets. The TAS analysis proved an invaluable tool, enabling effective development of County Hall's natural ventilation strategy and thermal design.

Internal Lighting

Limerick County Hall has low-energy lighting in nearly all areas, with the exception of the reception, atrium and council chambers, which use decorative lighting. In the chamber itself, there are reduced/dim lighting controls for different levels of use. The lighting control system is adaptable, with day lighting controls, occupancy controls and manual controls for particular areas. The system operates only when natural day lighting is inadequate, to achieve the lowest possible energy usage and giving flexibility of office partitioning.

Modern Methods Giving Enduring Benefits

Use of thermal analysis simulation software played an invaluable role in optimising the environmental strategies for Limerick County Hall. The effectiveness of the building's natural ventilation was improved and the production of additional guidelines for future partitioning was a welcome additional benefit.

The building is now completed and is currently being enjoyed by its occupants. The design simulation has given the team added confidence that the building will provide an agreeable and efficient working space, with reduced energy demands that impact minimally on the local environment.

Limerick County Hall is a successful fusion of modern design and sustainable energy techniques, providing a building that is low-energy, user-friendly and easily maintainable. A striking public building that is both functional and comfortable to be used by the people of Limerick.



 Limerick County Hall is a Landmark Building exhibiting several innovative features



 Daylight linked controls on the energy efficient up-lighters, combined with fritted glass panels, help minimise glare and maximise use of natural daylight

The Limerick County Hall building received funding through the Model Solution Investment Support Scheme being administered by Sustainable Energy Ireland on behalf of the Department of Communications Marine and Natural Resources. This scheme provided funding towards energy efficient technology solutions incorporated into this building. It will be an exemplar of modern design incorporating many energy saving features thus enabling it to operate with very low energy consumption, cost, and CO₂ emissions.

Source Text

ChewPieng Ryan, Buro Happold Consultants Ltd.

Design Team

- Architects:
Bucholz McEvoy Architects
- Buiding Services Engineers:
Buro Happold
- Structural Engineers:
Michael Punch & Partners
- Quantity Surveyors:
Boyd & Creed
- Fire Engineering:
FEDRA Buro Happold UK
- Main Contractor:
John Sisk and Son Ltd.
- Luminaire Design & Copyright:
BDP Lighting in Conjunction with Buccholz McEvoy



Glasnevin
Dublin 9
Ireland
t +353 1 8369080
f +353 1 8372848
e info@sei.ie
w www.sei.ie

Sustainable Energy Ireland is funded by the Irish Government under the National Development Plan 2000-2006 with programmes part financed by the European Union

