



LIFETIME ENGINEERING

of Buildings and Civil Infrastructures



Objectives of NATIONAL DISSEMINATION GROUPS in Thematic Network Lifetime: National information, demonstration, education and training of lifetime engineering

WATERFORD INSTITUTE OF TECHNOLOGY LIBRARY BUILDING

The Waterford Institute of Technology is a growing educational facility. As part of the overall campus expansion, a new library was required. Completed in 2000, this striking structure is a 1200 seat library and information centre.

The library building is intensely used throughout the day and contains a high density of computers. Particular care was taken to design a building that has a pleasant airy environment, using where possible natural ventilation methods. A notable feature was the multi-storey atria to give plentiful natural light. From the design brief the architects had established that the necessary components were:

- Energy-efficient 'green building'
- Lifetime design + performance
- Computer technology compatibility
- Comfortable user environment
- Progressive image
- Clearly defined circulation and control

LIFETIME PERFORMANCE

Economy

Consideration of lifetime design required the project team to balance the costs of construction against the running costs and stated aims of the development. Additional construction expenditure was incurred in order to reduce running costs in the following examples:

- The building includes a passive night cooling system. By adopting this approach, no mechanical air-conditioning system was needed saving both initial installation costs and avoiding running costs for the lifetime of the building.
- Construction materials were 'green'. Local materials manufactured with low-energy processes were used where viable.
- All equipment purchases for the building demonstrate minimal energy consumption and heat generation during the lifetime of the building. Flat screen computer monitors mean that the heat contributed by the computers is halved

Human conditions

One of the prime objectives of the client and design team was to provide comfortable working conditions for the building users throughout the operational life of the building. The design team employed the following design strategies in order to enhance the health and well-being of the user environment.

- Natural light is plentiful throughout the building without being harsh. Daylight on the south elevation is controlled with external brise soleil, minimising solar heat gain and glare from direct light. Natural light is diffused through the glazed sloped roof in the north elevation.
- Temperature fluctuations are minimised throughout the building. The concrete structure of the building is exposed throughout, providing a large heat sump that creates thermal inertia by absorbing heat during the day and releasing it back into the space at night. Cool air is then circulated through the ventilation system at night to cool the structure, so that the building's heat absorption capability during the day is increased.
- Natural ventilation is employed using a flow of air beginning through ventilation inlets at low level along the atrium perimeter. As the air temperature increases, it rises towards ventilation outlets at the highest point in the atrium.
- Non toxic materials were employed. All insulation uses non-CFC and non-HFC materials.
- Building performance measurements of temperature in both the fabric- the floors, walls and roof – and the user spaces have been made possible by embedding thermocouples in the cast concrete and block-work during construction. Accurate information of the performance of the systems and acts as a teaching aid for students.
- On completion of the building instruction seminars were arranged to explain how to use the systems and operation manuals were presented to the college. Staff could then ensure that the building and services were optimally utilised and the energy costs considerably reduced.

Culture

The new library has introduced a new language of built form which embodies and influences a cultural identity.

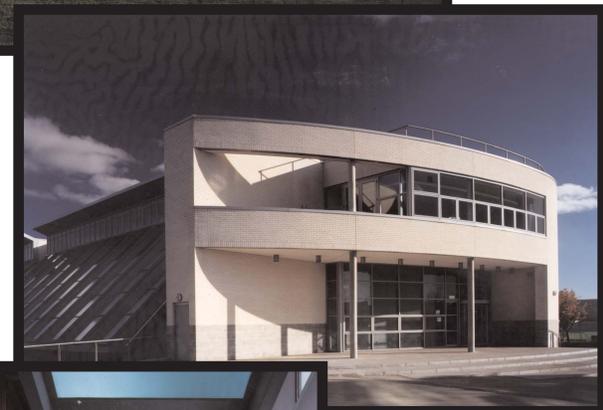
- The modern linear appearance of the building helps to enhance the character of the campus and present a new progressive image to the public.
- The new library sets standards not just for public buildings, but also for many commercial buildings where a high density of occupants and computers necessitate the use of air-conditioning.
- The response to the library has been tremendously positive among staff, students and visitors.
- The library received the Sustainable Building Award in the Education and Healthcare Category of the Construction Excellence Awards 2000.

Ecology

Integrating energy-efficient design and an intelligent building management system has reduced the energy demand of the building. To complete the environmentally sensitive treatment of the project the following strategies were employed:

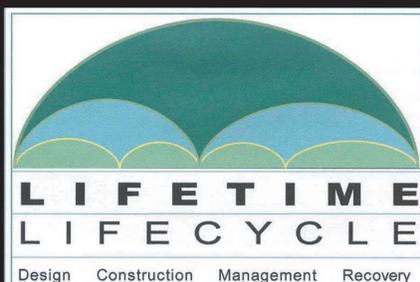
- The design of the building uses a low energy passive environmental control which is a system of harnessing the environment around the building to assist in the lighting, heating and cooling inside the building.
- The new library building did not require any new services and sits into the existing campus infrastructure.
- A dense level of foliage between the building and the road serves to shelter the campus and its users from traffic noise.
- Construction materials were utilised which were manufactured using low energy processes and locally sources where viable.
- Paving around the new structure was kept to the ends of the building and green areas are maintained where possible.

Architect: A + D Wejchert Architects
 Energy Consultants: Energy Research Group, UCD
 Mechanical & Electrical Consulting Engineers: JV Tierney & Company
 Structural Engineer: Michael Punch & Partners
 Quantity Surveyors: Healy Kelly & Partners
 Computer Simulation Models: VEsol
 Poster by: Energy Research Group, UCD



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- Taylor Woodrow Construction Ltd, UK
- CSTB Centre Scientifique et Technique du Bâtiment, FR
- Imperial College of Science, Technology and Medicine, UK
- Universität Karlsruhe (TH), TMB/Facility Management, DE



Thematic Network LIFETIME in figures:

- Working period: 1/6/2002 - 31/5/2005
- Participation: 96 partners from 28 countries
- Plenary workshops: 2002 Norway, 2003 Finland and 2005 France
- 25 National Dissemination Groups
- Funding from 5th Framework Programme: Competitive And Sustainable Growth (GROWTH) Programme