Waterford Institute of Technology, Tourism and Leisure Building

The recently completed Tourism and Leisure Building, contains all of the passive design elements that would be expected in a landmark environmentally conscious educational development.

A&D Wejchert & Partners **Architects**
BDP Consulting Engineers

The building's passive design builds on the award wining concepts contained within in the Nurses Education Building on the same site, however this building has considerably more complex environmental demands and required an impressive list of new and innovative design concepts to minimise the buildings carbon impact.

Low Energy Kitchen Design

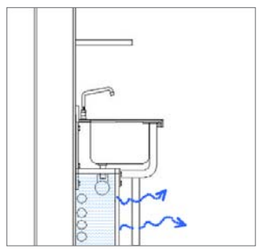
The building contains eight student kitchens which contain cooking equipment densities that are considerably higher than those found in commercial kitchens and therefore offer significant design challenges that have been met with a number of innovative techniques that have not previously been used in Ireland.

The project architect and environmental engineer worked closely with the catering consultant to interrogate the performance of every item of catering equipment to be used in the facility and, as part of this process, identified a number of significant inefficiencies with traditional equipment. The result of this process was the inclusion of a *"kitchen of the future"* which contains only low energy cooking equipment such as induction cookers and infra-red salamanders. This was a brave move for the college who have embraced the concept and will use the kitchen to train the next generation of chefs in the concepts of sustainable cooking.

Natural light is encouraged into the kitchens while a number of innovative concepts are used to reduce associated heat gains. The building is sculpted to offer natural shading to the glazing and the kitchen glazing is further protect through the use of innovative, solar selective light shelves built into the glazing units. This concept continues up the building to provide natural solar protection to the building's computer rooms which are also almost entirely naturally ventilated.

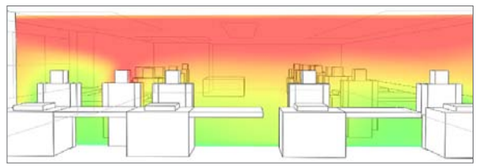
Kitchens of this equipment density are almost always air conditioned, but air conditioning has been eliminated from the design through an advanced kitchen ventilation system that has not previously been used within kitchens in Ireland.

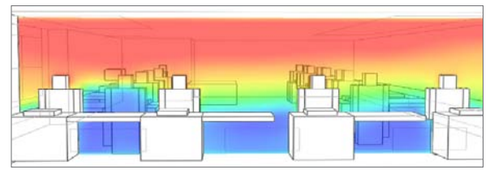
The air supply system uses a displacement system that delivers cool air at low level through specially formed grilles rather then the traditional high level supply system.



Displacement ventilation in kitchens does not follow normal design rules and advanced computer modelling was required to study and optimise the system as shown in the following images:

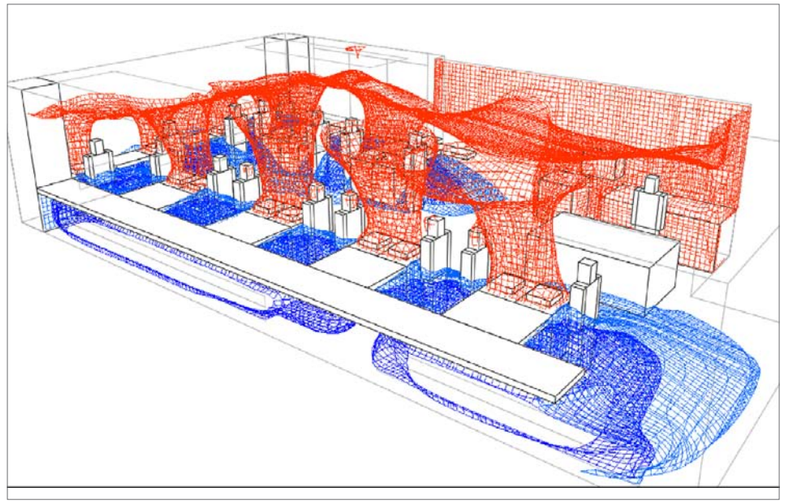
The first image shows the temperature distribution within a traditional kitchen design, and the second shows the improvement achieved with our design concept under identical air flow conditions.





The concept is further illustrated by the following 3D simulation image which shows cool air flowing in at low level and the kitchen hot spots contained over cooking areas.

The use of this strategy allowed a system to be designed without the need for any air conditioning.



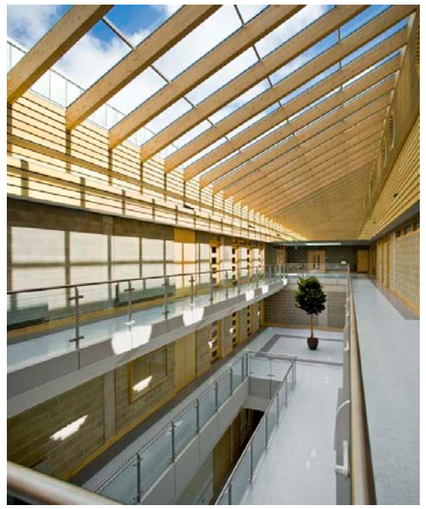
The kitchen system innovation was not however limited to system selection and contained the following innovative features:

- Natural ventilation is used at low loads, through insect screened window openings.
- Variable speed drives automatically adapt to the required load
- The kitchens automatically switch to high level supply during very cold conditions, operating as an interesting form of kitchen air heat recovery within the ceiling plenum and at high level in the room, without the need for heat exchangers.
- Carbon monoxide sensors allow the fans to operate at low speed without risk to the users.
- The natural ventilation can be used in conjunction with the mechanical systems in a hybrid mode to optimise internal conditions.

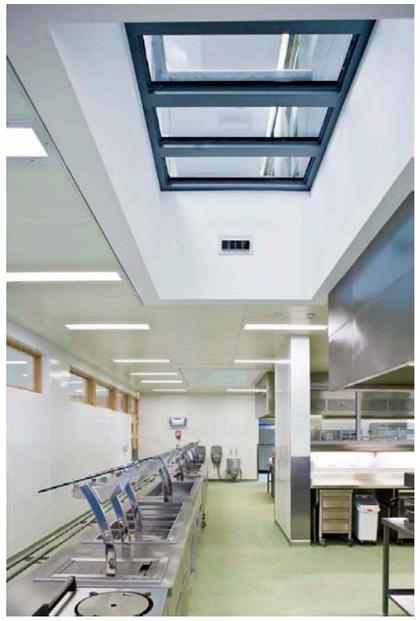
The kitchen's hot water consumption is considerable and is served by dedicated condensing hot water heaters that were not available on the market at the time of tender but were added as they became available during the construction process, allowing the building to benefit from the latest technology available for this key energy consumer.

The building's main atrium is flooded with light, drawing light all the way down to the kitchen corridors, and transferring light through internal glazing to the kitchens.

The atrium is also used as a central stack, drawing free cooling through the building during the day and during the night, to be stored in the building's mass which is exposed in almost all rooms. Light is also drawn through the building with a series of roof lights, so that the building's users are constantly in contact with the natural environment.



The building's controls also contain many innovative strategies, such as the board room system which automatically detects its requirements, taking advantage of natural ventilation and free cooling as a primary cooling measure.



In addition BDP have direct access to the building's controls through an internet connection, allowing all of the building's systems to be monitored and optimised.

The building's lighting system is a low energy system complete with automatic controls,

The building is also one of the first buildings to be fitted with waterless urinals, demonstrating the client's commitment to lowering the environmental footprint of their buildings and offering a demonstration of the best new conservation methods available.

Air tightness is also a key feature of producing a reduced energy performance and the building achieved a result of just over 5m3/m2/hr at a test pressure of 50Pa.

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The buildings overall energy performance is set to consume less than half the energy consumed by a similar building constructed to good practice standards. The building will offer an excellent case study of the use of displacement kitchen ventilation in Irish conditions.