

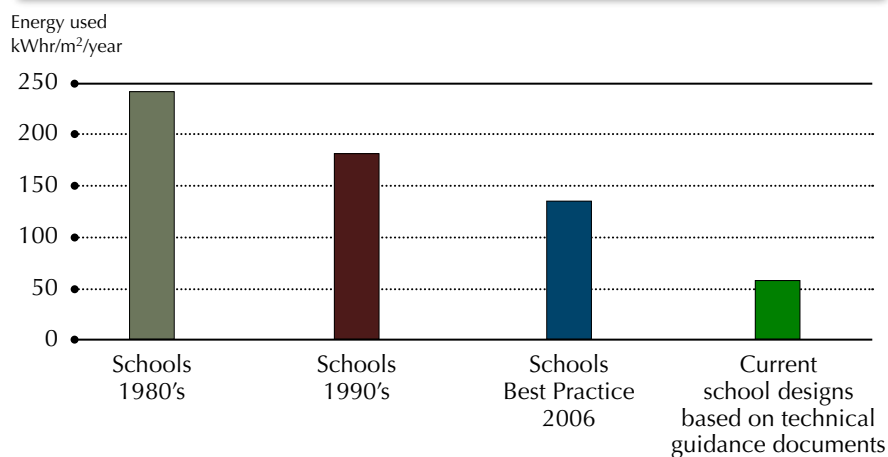
Using Minimum Energy in Ireland's Schools

By John Dolan, Department of Education and Science, Ireland

This article explains how Ireland has incorporated low energy design into primary and post-primary schools and gives an overview of projects that have helped inform this approach.

Since 1998, the Department of Education and Science has been using a process of design, awareness, research and technology known as DART to develop energy efficiency in educational buildings. Currently all primary schools built in accordance with the Department's primary schools technical guidance documents are capable of being up to 2.3 times more energy efficient than schools built to international best practice.

Figure 1 Energy usage in Ireland's primary schools



As part of its energy research programme, the Department of Education and Science has developed generic repeat designs, is promoting the school building itself as a learning tool and in addition is undertaking a biomass demonstration project, preparing the next generation of low energy schools and developing an energy certificate for school buildings.

Rather than focusing uniquely on energy design, the Department's Planning and Building Unit has taken a holistic approach, integrating energy efficiency in school designs into their suite of technical guidance documents. These documents are available on www.education.ie.

HOW IS LOW ENERGY DESIGN INCORPORATED INTO SCHOOLS?

Low energy design has been incorporated on a hybrid basis by maximising natural resources and utilising technologies. Maximising natural resources involves focusing on areas such as passive solar design, good natural daylight, natural ventilation and air infiltration.

Passive solar design in school building terms means positioning the teaching spaces to face east southeast. This can produce up to 25% savings on early morning heat up which represents a significant portion of the school's total heating.

Good natural daylight in a learning environment is highly desirable. The window design, configuration and locations maximise available daylight such that all classrooms can operate without artificial lighting for up to 80% of the occupied period. Computerised modeling is used to ensure that the design targets are achieved.

Natural ventilation in schools is provided, without draughts, through a mix of high- and low-level openable windows; again this is assured through the use of detailed computer simulations.

Air infiltration is a term used to describe unwanted and uncontrollable air leakage to and from a building. It can occur through minor gaps in construction and results in heat wastage. In effect a building that has a high infiltration rate will lose a significant amount of heat during the day and even more at night (due to lower nighttime temperatures) and thus requires more time and energy to heat up in the mornings. All new Irish schools greater than seven classrooms are now tested for air tightness and must achieve a minimum air leakage rate.

Use of technologies

Ireland has focused on utilising technologies in a number of areas including heating, lighting and water efficiency. A boiler selection to maximise efficiency is encouraged in the technical guidance documents and more energy efficient heating controls are promoted. Each teaching space has its own individual temperature sensor that allows the teacher to adjust room temperature within a limited band.

To maximise the potential of natural daylight, lighting specifications for schools are based on the most energy efficient lighting available with automatic dimming/off controls.

Research by the Department of Education and Science showed that young children used only the cold water taps in school for washing their hands as they were afraid of the hot tap, associating it with those in their homes which lack anti-scald provisions. Supplying a blended reduced temperature to the hot tap made no difference in their behaviour. In response, the Department has adopted a single tap solution to all wash hand basins where the hot and cold water are mixed at the tap intake with anti-scald protection; thus all water outlets for ablution are single taps giving a blended safe water supply.

Water usage is also minimised through automatic shut off taps and dual flush toilets.

GAELSCOIL AN EISCIR RIADA

The first project to feature the comprehensive DART approach was *Gaelscoil an Eiscir Riada* in Tullamore. The school successfully encompassed all of the above natural resources and also trialed new technologies. These included lighting and heating controls as well as the use of a heat pump.

Part of the project was to assess the suitability for future schools of the heat pump with its underfloor heating system. The high energy performance of the heat pump has not been matched for a school environment in areas such as reliability of the system, controllability and responsiveness of the heating.

The school is also contracted to a wind generator electrical supply company for green electricity and has a rainwater collection system.



The *Gaelscoil* project has received national and international awards including Environmental Initiative of the Year Award CIBSE London 2004; Excellence in Design or Specification, Sustainable Energy Ireland Awards 2004; and Inside Government Merit Award 2004 for Best Project within an Organisation for Innovation through Technology.

Generic repeat design

The Planning and Building Unit recently developed a two-storey primary school design for 8, 12 and 16 classroom schools which is generic in nature and can be repeated on various sites. The design also allows for the 8 and 12 classroom versions to be expanded in the future, if needed, with minimal disruption to the existing school thus allowing the day-to-day functions of the school to continue.

In addition to the excellent low energy consumption, the benefits of the generic repeat design projects include the following:

- The development of a considered educational model.
- Extendibility and future-proofing potential of the core model.
- Optimum standardisation of educational facilities at primary level.
- Reduced professional fees.
- Optimum land use and usability on restricted sites.
- Improved internal comfort environment.
- Durable use of materials resulting in lower maintenance and lifecycle costs.
- Quick delivery through the application of an off-the-shelf option.
- Greater certainty in budget projection and programming within the overall capital programme.

The school building as a learning tool

In its efforts to promote the environment and energy efficiency to school children, the Department is presently piloting two school buildings that acts as a learning tool.

A child-friendly touch screen display linked to the building energy management system provides the children and visitors with energy and environmental information relating to the building. A cartoon character, called Eddie the Grasshopper, encourages the children to learn about the school construction and its day-to-day energy use. The system can also be interfaced with the school's information technology network allowing the teachers to use it in the classrooms as a real-time learning tool.





Biomass demonstration project

This project comprises the design, installation and monitoring of biomass heating systems in primary and post-primary schools. Three systems are presently installed, and a further eight schools are scheduled for completion in September 2007.

The objectives of the project are to evaluate the suitable application, performance and compatibility of biomass systems with school heating requirements in terms of demand characteristics, controls, reliability, fuel storage, maintenance and operation.

A good practice guide for the design and installation of biomass heating systems in schools will be prepared for school design teams and managers and will lead to a suite of case studies on selected projects.

Next generation of low energy schools

Work on the design of the next generation of low energy schools is underway via the Rural Schools Project 2007 where the same design is developed for use on different sites. The objectives of this project are to further improve the Department's low energy design ethos and to make the schools carbon neutral.

The design process evaluates enhanced insulation and air tightness testing criteria, rainwater recovery, automated window controls linked to CO₂ monitors, biomass boilers and green electricity. It also extensively monitors heating, power and lighting, hot and cold water and sewerage flow rates, and energy consumption.

Future energy certificate

The Department is developing a project, in conjunction with Sustainable Energy Ireland, aimed at helping existing schools to meet the certification requirements of the Energy Performance Building Directive within a short time period and without the need for a costly and time-consuming assessor-based system. The proposal consists of creating a website that will allow schools to input building data and energy consumption elements and to obtain an energy performance certificate for display within their schools.

The Department's other energy research projects include wind generation, solar electrical generation, enhanced insulation, web-based operation and maintenance manuals, a post-primary school low energy research project, and energy workshops for school managers.

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