

technical

7526

Patrick Waterfield, Energy Consultant with the EDAS Northern Ireland Regional Centre, examines an issue central to the energy performance of school buildings and also looks at an innovative fabric - Transparent Insulation Material.



Patrick Waterfield

Casting light on passive solar design in schools

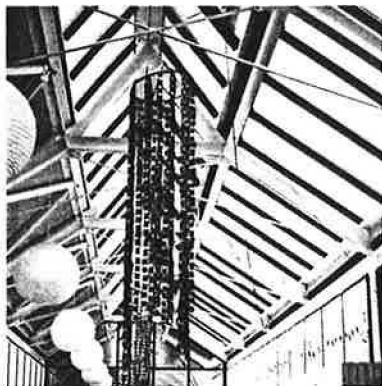
Strict UK local education authority guidelines mean that opportunities for innovative measures in school design are limited. However, occupancy patterns, health and financial considerations in schools should make the application of passive solar design more widespread.

To enhance learning stimuli, schools should be light, open places with plenty of contact with the outside world. Providing good levels of natural daylight should therefore be a design priority.

Since a higher level of ventilation is specified in school buildings than in many other building types, a greater proportion of the total building heat loss will be due to ventilation - at least one third and sometimes over half. However, if fresh air can be solar-heated, passively, the ventilation heat load may be effectively reduced.

Features such as atria and conservatories address both issues of ventilation preheating and daylighting and have been widely employed in school building design.

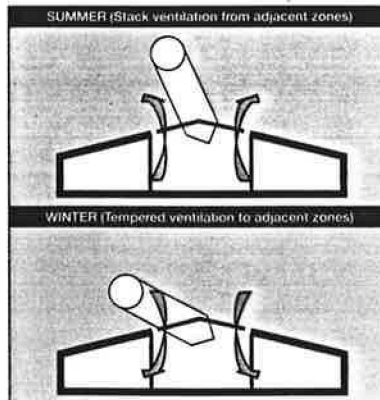
It is possible, without penalty of extra heat loss, to increase the area of windows facing into an atrium or



The Hook Infant School glazed atrium

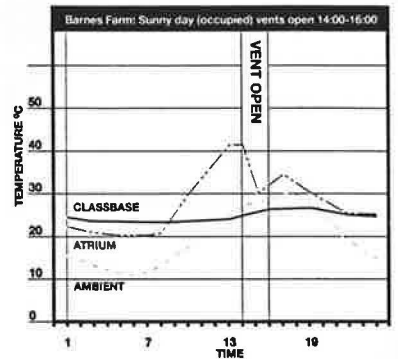
sunspace (which will almost always be at a higher temperature than the ambient environment) thus compensating for the reduction in daylighting levels to adjacent zones due to transmission losses through glazing and shading introduced by glazing bars.

An atrium or conservatory may also be used to provide tempered ventilation to adjacent spaces in cold weather and, via stack effects, from adjacent spaces during warmer periods. It may also provide a useful amenity space and a buffer effect between internal and external environments. However, care must be taken to avoid problems of glare, overheating and excess heat loss from heated sunspaces.

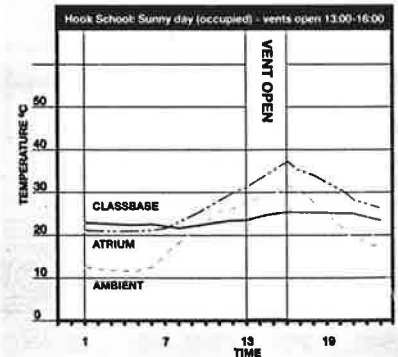


Barnes Farm Infants School, Essex, has a 6.2m wide, purpose-built, unheated atrium which is usable for all but a total of about one month during the winter. The 5.5m wide heated atrium at Hook Infants School, Hampshire, was retrofitted and is used all year round. Both single-storey atria provide well-lit, well-used, well-loved spaces, though overheating can pose problems. Both atria feature opening lights in the roof, to vent excess heat. At Barnes

Farm, one third of the glazed roof area was openable, while at Hook the proportion of openable area was much smaller. The respective thermal performances of each atrium on a hot and sunny day, monitored as part of studies undertaken for the Department for Education, may be seen in the panel below.



At Barnes Farm School, opening the vents in the atrium, which had been overheating, quickly dropped the temperature.

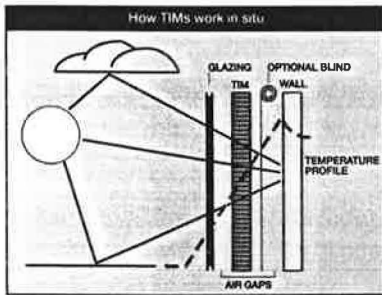


At Hook School, the opening of the vents, has a negligible effect on the temperature of the overheating atrium.

The width of the atrium was also found to be critical. Winter heating loads were predicted to increase only marginally with increased width of the unheated Barnes Farm atrium, though summer overheating would become critical at over 7m. Increased width of the heated Hook atrium would give rise to both increased winter heating loads and summer overheating.

Transparent Insulation Materials

Considerable advances have been made, in recent years, in innovative fabric elements. One example is transparent insulation materials (TIMs). TIMs combine optical transmittance, low thermal radiation transmittance, low thermal conductivity and effective convection suppression. Despite being translucent, TIMs are generally used not as a glazing substitute for daylighting, but as a cladding material (forming an "unvented mass wall").



A disadvantage of the above configuration is that, to avoid summer

Alison Crompton of ECD Architects and Energy Consultants gives a consultant's perspective of EDAS and why it supports the work of energy consultants and should not be considered a competitor.

The Energy Design Advice Scheme was established to encourage the use of energy consultancy in projects where otherwise it would not be included. This has positive benefits for everyone; energy consultants; architects and building services engineers. We at ECD have introduced clients, owners and occupiers to the Scheme and know that it works.

As a client for a project, the Scheme should encourage you to seek energy advice possibly for the first time. In



The Bourneville Solar Demonstration House

overheating, a moveable blind is often required. This introduces a source of potential unreliability, requiring maintenance and some form of control strategy. Current research involves the study of materials which are switchable from transparent to opaque, responding automatically to temperature or voltage.

The Bourneville Solar Demonstration House in Birmingham features many low energy and passive solar features, including a total of 30m² of TIM modules on parts of the south and east facing walls. The TIM modules comprise 10cm thick honeycomb-

this way, you will be given information about, for example, the cost-effectiveness of energy conservation measures which reduce running costs, or advice about how to improve internal conditions leading to more even temperatures or better daylighting. You can be assured of the quality of the professionals introduced by EDAS and rarely has a Government grant scheme been so simple to apply for.

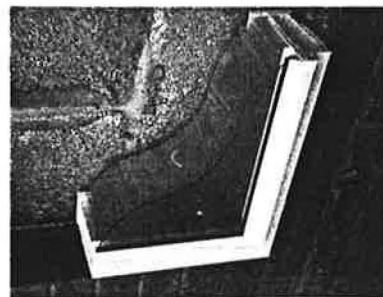
Energy consultants also benefit as more clients begin to see the advantage of energy advice. The consultants must prove competence and experience before being registered with EDAS, and the status of the profession as a whole is enhanced.

Through EDAS, consultants can be in the happy but rare position of putting

structure polycarbonate material between two sheets of glass with a 20cm thick high density concrete absorber wall. No blinds were considered necessary.

The TIM modules used in the Bourneville house cost a total of £6371. This provided, to a single monitored room, 1440kWh of space heating from September 1991 to April 1992.

More extensive technical information and further case studies may be obtained from your local Regional Centre.



Transparent Insulation Material Section

forward a proposal to a client whilst at the same time informing the client that up to 50% of the consultation costs may be met by the Government. Architects and building services consultants should also introduce their clients to the idea of energy consultancy which will enhance the performance of their own designs, and may identify potential problems at an early stage.

All EDAS registered consultants have access to technical seminars, a technical library and energy software and are constantly improving their knowledge base through the Scheme.

With all these benefits, and responses from EDAS typically within a week, what are you waiting for?

ECD are leading London based energy consultants and architects.



Alison Crompton