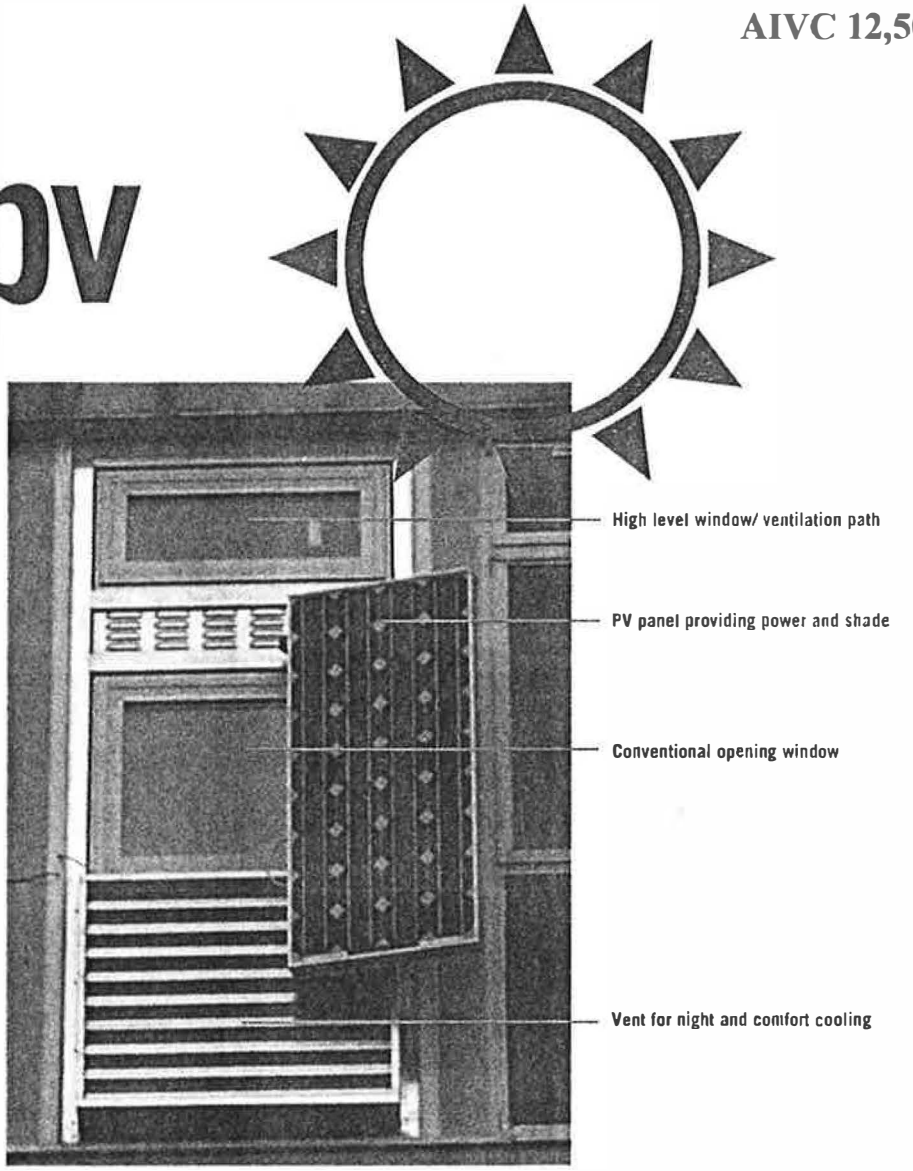
Airlit pv

The BRE is bringing together the latest thinking in solar control, natural ventilation, daylighting and pv. Its goal is to cut solar and internal gains so cooling is not required.

BY JOHN PALMER



Airlit-pv is part of an integrated approach to provide an energy efficient strategy for buildings. The BRE is developing a modular facade unit that will reduce, or possibly eliminate, the need for air conditioning by optimising daylighting, controlling solar gain, providing controllable natural ventilation, and allowing effective night cooling.

Having explored other options, the design team adopted a combination of conventional approaches, rather than more complicated technology like electrochromic glazing. The unit is divided into three sections.

At the bottom – to approximately sill height – a fresh air vent allows for comfort cooling in peak daytime conditions and night cooling. The central section consists of a conventional view window that may be opened in extreme conditions. Finally, the upper section offers a high level window which also acts as a ventilation pathway. In addition, the unit features:

- ☐ a pv panel above the main view window – acting as an external solar shade and providing power;
- ☐ a trickle ventilator incorporating a pv-driven fan that provides supplementary air for comfort cooling and local air movement;
- ☐ internal blinds on glazing to control glare;
- ☐ a fixed internal light shelf.

The design focused on providing adequate glazing for daylighting at the same time as protecting from excessive solar gain. The internal blind is under occupant control and complements the external (pv) shading which may be moved to track the sun.

In addition to powering the fan, the pv panel also generates electricity to run the control system and associated actuators.

The first prototype has been constructed largely from conventional components, adapted where necessary. The photo above shows how the components fit together.

Control for the prototype is based on an intelligent local controller and allows for substantial occupant interaction. The trickle vents are under system control, which may be overridden by occupants. Likewise, upper windows may be opened manually or automatically for night-cooling – in response to internal and external temperatures. The mid-pane window, though, is occupant-openable only.

The first prototype units are currently under test in four locations around Europe. The tests will characterise the performance of the unit in terms of solar control, natural ventilation and pv power output.

To date, the unit is functioning as designed. Figure 1 shows operation over a three day period where night cooling was initiated. Observations when installed on a real building are unlike the results expected from a more clinical test cell installation. For example, the external sensor was unshielded and suffered from solar heating. This raised the external temperature reading and prevented the lower vent from opening – it seemed too warm outside to introduce cooler air.

As to the important question of whether it really cuts cooling loads, first indications are good, and intensive monitoring continues.

The BRE wishes to acknowledge the support of the DETR through PII and DG XII of the EC (Contract JOR3-CT98-0280), along with all project partners.

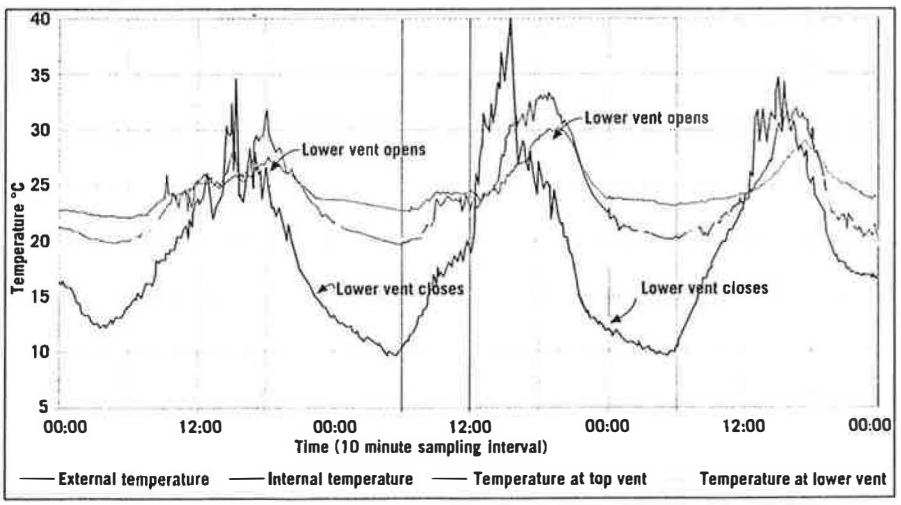


FIGURE 1: Night cooling through the window's vents makes room temperature comfortable without refrigeration.