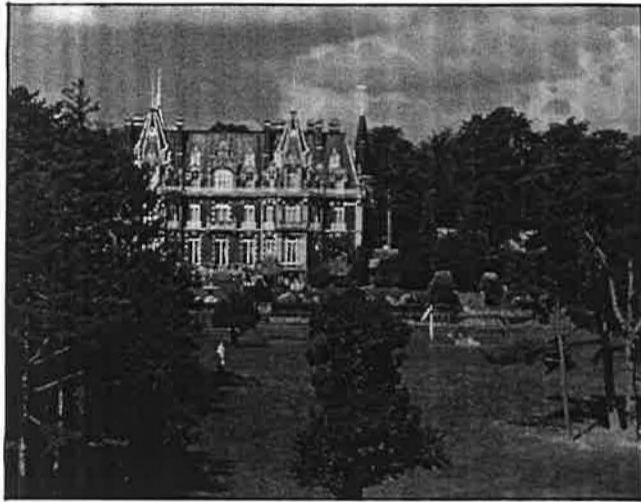


Displacing air conditioning



Green engineering - the use of displacement ventilation in the new Regent Centre at Chateau Impney provides good environmental conditions without the use of mechanical cooling.

High heat loads are traditionally dealt with by air conditioning with mechanical cooling. However, there is growing pressure to use ventilation wherever possible. Just such has been achieved in a new conference and exhibition centre in the Midlands.

Strategic use of displacement ventilation has overcome the need for a full air-conditioning system in a new exhibition and conference centre in the grounds of Chateau Impney near Droitwich.

The main room in the Impney Regent Centre measures 80 x 40 m and has a maximum height of 6 m. When used as a conference venue, it can accommodate up to 1300

people. There are also 10 smaller conference rooms and four bars.

Displacement

The entire centre is served by a displacement ventilation system designed, supplied and installed by Displacement Air Systems of Stourbridge.

Glen Hyson of DAS explains that this installation is the largest the company has executed in the two years since it was set up. The total project was worth about £160 000, over three times the value of previous projects.

The air requirements of the building are met by a single AAF Easdale air-handling unit that can provide up to 22 m³/s. It has two-speed supply and return fans and a

hygroscopic thermal wheel that can transfer up to 340 kW of heat from exhaust air to incoming fresh air.

Air is supplied at 19°C, or at outdoor ambient if this is higher, there being no mechanical cooling in the system.

The principle of operation is to prevent the temperature of the air 1.1 m above floor level exceeding 3 K above the outdoor temperature — or 22°C if air is being supplied at 19°C.

Air is introduced into the space through displacement ventilation units at floor level. At Chateau Impney, these units are supplied by ductwork passing through the ceiling void from the air-handling unit in a first-floor plantroom and then dropping vertically to

the displacement units.

At the face of these ventilation units, the air speed is 0.3 m/s falling to just 0.2 m/s after a metre.

"A notable feature of the displacement ventilation system at Chateau Impney is its extremely low noise level"

The cooled air rolls across the floor of the space and only rises when it is warmed by a heat source, such as a person, taking heat and airborne

pollutants up towards the ceiling, where it is extracted through egg-crate louvres into the ceiling plenum.

Along one side of the main room is a wide balcony that one might expect to become overheated by warm air rising from the floor below. This is prevented, however, by displacement units on the balcony itself.

Convective heat from lighting fittings in the ceiling stays at high level, and only radiant heat from them has to be taken into energy calculations.

In the main exhibition/conference room, four large half-octagonal units along one wall can provide up to 2 m³/s each.

Carbon-dioxide sensor

Coarse control of the quantity of supply air is provided by two-speed fans in the AHU. Finer control is achieved by dampers in the ductwork. If the temperature of the outdoor air is less than 19°C, some of the exhaust air can be recirculated to reduce the use of the boiler plant that serves the heating coil in the AHU. A carbon-dioxide sensor in the air provides the means of ensuring that adequate air quality is maintained.

During the summer, the objective is to restrict the temperature 1.1 m above floor level to 3 K above the outdoor temperature, and this is achieved without mechanical

cooling, even with high levels of lighting for display and effects.

Tempered

A different approach applies when the outdoor temperature is below 19°C. The supply air to the displacement units is tempered by one of three methods — boiler plant serving the heating coil in the AHU, heat transfer by the thermal wheel or recirculating some of the return air.

To offset the fabric heat loss, radiant heating panels served by hot water are installed in the ceiling and part way up the walls. Air can also be supplied at 20°C to offset some of the fabric heat loss.

Before occupation, the main room can be brought up to temperature quickly by supplying air at 28°C with full recirculation. Pre-heating can thus be achieved in about 30 minutes.

A notable feature of the displacement ventilation system at Chateau Impney is its extremely low noise level — NR25. A major contribution to achieving this noise level is restricting the speed of the air in the ductwork to a maximum of 3 m/s — about half the normal speed.

Despite the best efforts of the system designers, it is still possible for some parts of the room to be aware of noise and air movement. It happened while we were visiting the new Impney Regent Centre, and turned out to be due to the cooling fan in a public address amplifier at the back of the hall!

Reader Reply No. 135

Low-voltage fans

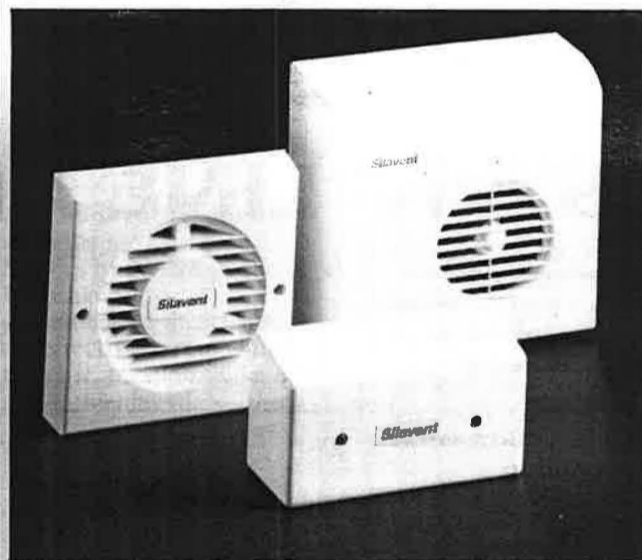
Silavent has introduced a range low-voltage fans for installing within the splash area of a bath or shower. Complying with the 16th Edition of the IEE Wiring Regulations for 12 V supply, SELV fans can incorporate axial or centrifugal impellers.

The low-voltage range is based on the Extract 2000 and Curzon 2000 ranges of toilet and

bathroom fans.

The extensive SELV range includes pull-cord, timer and condensation-control options. They can be installed in the wall or in the ceiling or connected to 100 mm-diameter flexible or rigid pipes. Some versions can be fitted in windows. All have non-return shutters as standard.

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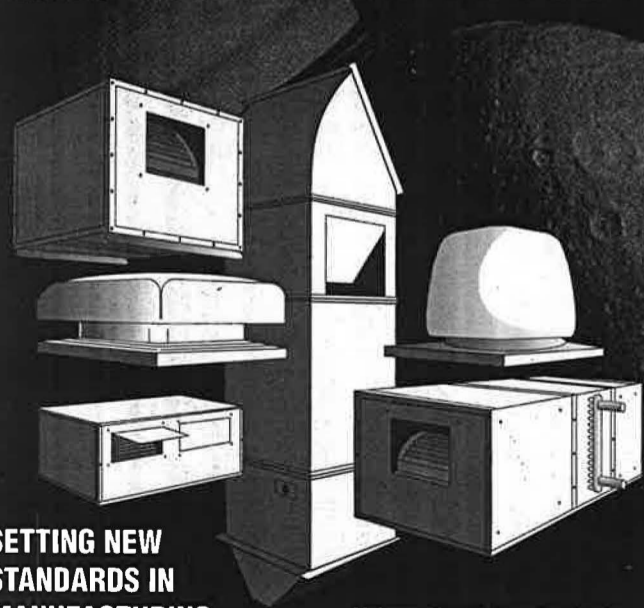
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