

# Energy efficient solutions

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This month sees the deadline for Display Energy Certificates (DECs) arrive. From 1 October, all buildings with a total useful floor area over 1,000m<sup>2</sup> that are occupied by a public authority and institution providing a public service are required to clearly display a DEC.

October also marks the third and final deadline for the introduction of Energy Performance Certificates (EPCs). Non-dwellings over 10,000m<sup>2</sup> already required an EPC from April, while non-dwellings over 2,500m<sup>2</sup> required one from July.

The introduction of EPCs and DECs, coupled with the recent amendments to Part L of the Building Regulations i.e., the requirement for a 28% reduction in CO<sub>2</sub> emissions for mechanically-cooled, non-domestic structures, is forcing the whole design team to look at different ways in which to improve energy efficiency of the built environment.

## Meeting the challenge

The application of high temperature water-based cooling systems is helping meet the challenge of balancing the requirements of regulations such as these with performance for occupant comfort.

Chilled ceilings, chilled beams and Integrated Service Modules (ISMs), also known as multi-service chilled beams, provide a quiet, energy efficient and comfortable alternative to traditional cooling methods. The fact that they can be pre-fabricated off-site is another contributor to their growing popularity.

BSRIA reported last year that the market for chilled ceilings and beams has grown significantly in the last two years with further strong growth predicted for this year and next.

With operating temperatures of 14-17°C, chilled ceilings and chilled beams can use higher chilled water flow temperatures than other cooling systems. Thus, for large parts of the year this means that water at outdoor temperatures, evaporatively-cooled water or ground-sourced water can be used. This reduces the need for active refrigeration systems and the associated energy requirements. These reductions can also lead to a reduction in the size (and cost) of the central plant.

Energy consumption is not the only advantage of chilled ceilings, chilled beams and ISMs. They contain no moving parts, such as fans and filters, resulting in reduced maintenance requirements and associated costs. This means they are therefore more reliable and less noisy. Greater occupant comfort is also achieved as minimal air movement is generated.

Such water-based systems are also considered environmentally attractive, particularly in the light of controversies over the effects of modern synthetic refrigerants used in air conditioning.

## Design flexibility

Chilled ceilings, and passive chilled beams and ISMs, are most suitable for buildings with a sealed envelope that incorporate a fresh air distribution system. They are frequently used in conjunction



with displacement ventilation systems.

The design of active chilled beams and ISMs already incorporates fresh air distribution as part of the ducted air supply. Active chilled beams can also incorporate a heating element, removing the need for an additional heating system.

Chilled beams and ISMs also offer the added benefit of opening the concrete soffit up, allowing for thermal mass cooling. This is a natural process centred on the building's thermal mass, provided by exposed concrete slabs. It is increasingly being adopted as a sustainable low energy solution and works by utilising the natural properties of concrete which has a high specific heat capacity and conductivity.

This natural process has a cooling potential of up to 25W/m<sup>2</sup> according to the Concrete Centre. Utilisation of a building's thermal mass cooling potential can significantly reduce internal ambient temperatures.

As companies increase and decrease in size and as occupants change, they use of the occupied space will change. Consideration at the design stage will facilitate flexible partitioning and layout requirements. The sizing and spacing of terminal units can fit within the space planning grid, enabling partitioning to be added or removed at a future date.

## Which system type?

The decision on which option to choose should be centred around the specific requirements of each building. The cooling load, minimum fresh air volume and level of control required are key factors to consider, as is the water supply system utilised and the spacing of the terminal units. The most efficient system for the job will be the one which achieves the level of comfort required with the lowest associated energy usage.

## Prefabrication

ISMs can incorporate building services such as fire alarms and smoke detectors, sprinkler systems, voice, data and power cabling, speakers and public

address systems, passive infrared (PIR) sensors and importantly, lighting in an architecturally designed metal casing.

The off-site prefabrication of building services within ISMs, leads to on-site efficiencies in installation and a reduction in on-site wastage and storage requirements. In a recent BSRIA study, the installation of ISMs was considered to be 75% quicker than a traditional installation of fan coil units.

## Life cycle considerations

In a study by consultants Cyril Sweett the whole-life costs of chilled ceilings and beams, fan-coil units, VRF and VAV systems in a new three-storey office development operating over a 25-year period were considered. It concluded that the chilled ceilings and chilled beams option had the lowest life-cycle costs.

While not appropriate for every project there is no reason why this technology cannot be applied to most new and refurbished office developments, as well as within other environments such as schools, universities, airports, hospitals and libraries.

The recent refurbishment of Baskerville House in Birmingham, which incorporated a radiant chilled ceiling and passive chilled beams achieved a

'very good' BREEAM rating. It was also recognised by the BCO (British Council for Offices) when it won a prestigious 'refurbished / recycled workspace' region award.

A solution that provides a flexible means of delivering excellent comfort control and low energy consumption, in a discreet way without the unsightly, space-demanding duct work associated with air conditioning is a highly attractive option. One that also adds to a building's sustainable credentials is now increasingly demanded by end users, specifiers and architects. Due to their increased energy efficiency chilled ceilings, chilled beams and ISMs can help achieve good EPC and DEC ratings.

## Alternative methods of cooling

Until recently, many buildings were not regarded as fully serviced unless they were air-conditioned by traditional methods. However, in today's climate where reducing carbon emissions and energy usage, meeting amendments to the building regulations and achieving good room comfort are all key considerations, it is unsurprising that alternative methods of providing such cooling within non-domestic environments are attracting the interest of the whole industry.

