Labs21 Highlights

New European models in sustainable research space

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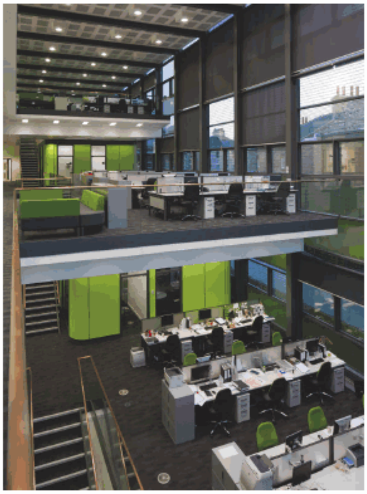

Like its predecessor, the Baddiley-Clark Medical Sciences Centre features write-up areas with natural ventilation.

up space was maintained.

Not only does the completed building provide innovations in the laboratory workplace design, it has gone on to exceed the BREEAM "Excellent" rating, achieving an overall score of 73% against a 70% threshold—still one of only three laboratories in the U.K. to have achieved this standard. Independent studies indicate that on the basis of energy consumption and carbon emissions, this equates to at least a LEED Platinum standard.

Separate assessments of the carbon emissions also demonstrate a "B" rating for the Energy Performance Certificate, indicating a 30% improvement against comparable facilities.

Lessons learned Some clear lessons emerge from these two projects:

- Right-sizing of major equipment such as fume hoods can make a significant contribution to the reduction of energy consumption over the lifetime of a facility.
- Embedding flexibility and adaptability is critical for long term sustainability of use.
- Setting clear sustainability targets from the outset, together with close management of the sustainability strategy throughout design and construction, can deliver world-class results without cost premiums.

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Labs21 Highlights

Design down under: Energy-efficient labs in Australia

By Lynette Williams

As an industry we are constantly challenged to improve and update our design concepts to meet the objectives of energy efficiency and flexibility. Historically, laboratory design produced high energy consumption, where occupational health and safety was the reason presented to ignore everything else.

For the southern states of Australia, the design conditions are summer 30 to 35°C (93 to 99°F) and winter 2 to 4°C (40°F) with relative humidity of 20 to 50%. Consequently, air conditioning systems need to provide cooling, with minimal heating. Humidity control is not generally a consideration for our office-style spaces.

Wet laboratory spaces are moving toward open-plan layouts with associated shared small rooms as support spaces which open off the main laboratory. We are currently designing these spaces with:

- Active mass cooling.
- Local fan coils to serve support spaces with high heat loads.
- Central tempered outside air unit to provide outside air/makeup air requirements.
- Fabric "sock" diffusers in the laboratories to give low-velocity, high-volume air supply.

For the dry laboratory or office space—either open-plan office layout with limited meeting rooms and enclosed offices or larger computer-based laboratory spaces—we use:

- Active mass cooling.
- Underfloor air distribution (UFAD) to provide the ventilation requirements and deal with fabric loadings.

The remainder of this article will more closely examine some of these technologies.

Active mass cooling Active mass cooling is a technology that uses the structure of the building, with cooled (15°C/59°F) water pipework run in the lower section of the slab. This creates a radiant panel at about 18°C (65°F). Zoning is limited by coil piping length and pressure drop with typical sizing of 15 to 20 m^2 (160 to 220 ft^2). With these criteria this system covers the environment loads—up to 50 W/m^2 (4.65 W/ft^2)—from people, equipment and lighting. An advantage is that it provides good thermal comfort via the radiant effect.

Several factors must be considered for active mass cooling. These include achieving architectural acceptance for an exposed slab, with preferably the underside being steel decking/permanent formwork, and co-ordinating the services reticulation so that it is atheistically pleasing. A pipework-free zone needs to be identified for penetrations for future services. In addition, a strategy for the suspension of services from the slab needs to be developed to suit the pipework.

This system is not suited to areas of high humidity since there is a risk of condensation occurring on the underside of the slab. As with any slab system the response time is slow; however, as it is designed for internal loads, this is not an issue.

Fabric diffusers and UFAD Fabric "sock" or textile diffusers provide an even air distribution pattern and have the advantage that they run within the laboratory space yet have a lack of surfaces on which dust can collect. If the sock is contaminated it can be removed and cleaned or disposed of. With fabric diffusers the filtration of the supply air is critical; contaminants will collect on the inside of the diffuser. However, as the air supply should be well-filtered this is not an additional requirement. With variable volume systems, consideration should be made of the support system for the duct so that there is no noticeable collapsing of the duct under low-flow conditions.

UFAD uses a low-pressure raised floor with twirl diffusers, encouraging mixing at low level with the return air captured at high level. UFAD provides good indoor air quality since there is limited mixing and so limited capture of dust and other contaminants. UFAD also provides good flexibility. The twirl diffusers are readily relocatable to suit layout changes.

UFAD needs detailed coordination with the other services running in the raised floor zone and with the structural engineer regarding any changes in slab heights. Coordination and control by the builder is also crucial during the construction phase when services are being run in the floor void before the installation of the floor.

Strategies in action We have used these systems on a number of projects including:

- STRIP 2 at Melbourne's Monash Univ. Two linked four-story laboratory/office buildings with an areas of 17,250 m^2 (185,680 ft^2) are used for post-graduate research by the Faculty of Medicine, Nursing and Health Sciences.
- Univ. of Adelaide, Innova21. An eight-story building of 14,000 m^2 (150,700 ft^2) used for engineering/computer laboratories. This building has achieved a six-star Green Star Education v1 design rating, which is approximately equivalent to LEED Platinum certification.
- Deakin Univ. Regional Community Health Hub, Geelong, Victoria. A four-story building with two wings linked by an atrium, with a total area of 9,000 m^2 (97,000 ft^2) will be used by exercise science and optometry for offices and teaching purposes.

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