The true road - a cautionary tale

***Richard Austen suggests that the design of mechanical services needs to take account of the building's most valuable assets– and not just look at the cost of the kit**

On a recent large project, the designer was faced with choosing between two types of floor diffuser for the ventilation system. It was agreed that, because of its ability to displace heat gains upwards and its greater ventilation effectiveness, a low turbulence inlet that gave a horizontal distribution pattern would provide a significantly superior indoor climate than the alternative vertical discharge and mixing type. However, there was, as always, the question of price. It was estimated that using the horizontal swirl unit would involve an extra installed cost of £6 per item and, based on one outlet per 4 m^2, this equated to £1.50/m^2.

On the project overall, by selecting the vertical swirl diffuser, the designer was able to show a saving of some £60,000 and he felt his astuteness on behalf of his client would earn him a 'pat on the back'. Sadly, in reality something harder, lower and applied with the other extremity of the human frame might have been more appropriate.

The only truly significant cost of a building is the people in it. On a recent exercise for a large financial services company the sums were generally as follows. The cost of each occupant in their proposed new HQ building was set at £35,000 per annum. This is not just salary but includes all the statutory payments, such as NI contributions, together with the provision of staff benefits like restaurants, sports facilities, etc.

Doubled costs

Of course, the staff are not paid to occupy space and eat subsidised canteen meals, and in this case, each employee was required to produce twice their cost as output, i.e. an average of £70,000 per person. As each person was designated an area of 10 m^2, each square metre of office space would be burdened with a productivity of £7,000 per annum.

Much is currently being researched and written on 'indoor air quality' and its effect on the indoor climate. It is soon expected that it will be possible to quantify exactly how much effect each component of the indoor climate is having on the performance of the occupants within a space. However, one does not have to be a Danish professor to know that poor atmospheric conditions will impact on occupant efficiency. Anyone who has experienced the combination of a pub lunch, a stuffy office and a hot afternoon, knows that this can quickly drop into single figures and, given sufficient privacy, may even nod off to zero. This is, of course, an extreme case but it does reflect the general pattern that human performance tends to fall away as the working day proceeds. The purpose of creating a good environment is to arrest this decline and to sustain occupant activity and interest. After all, on the basis of a seven and a half hour working day, the difference between 'switching off' five minutes early and staying on an extra ten minutes

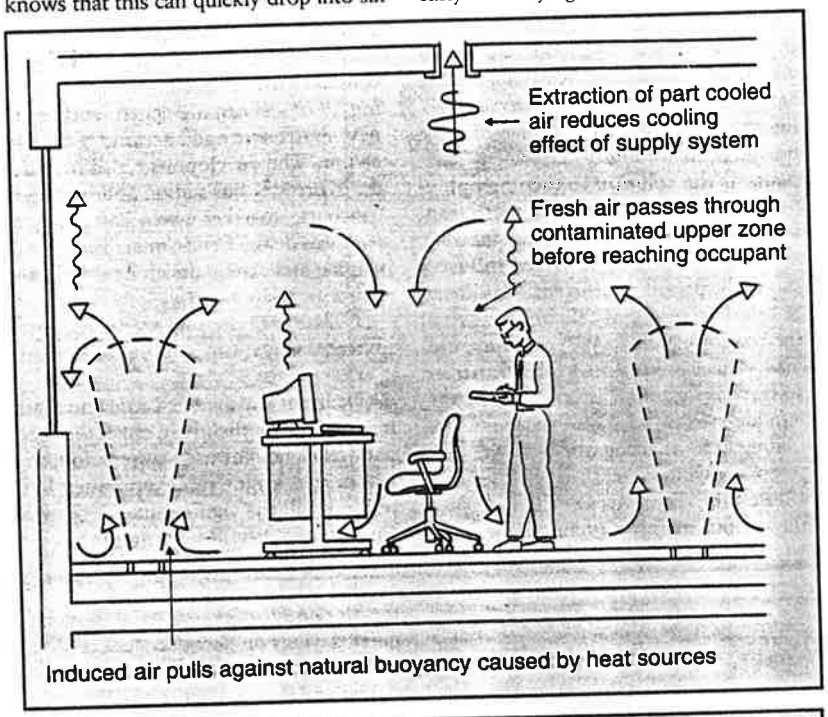

Fig 1: air distribution with vertical swirl diffuser

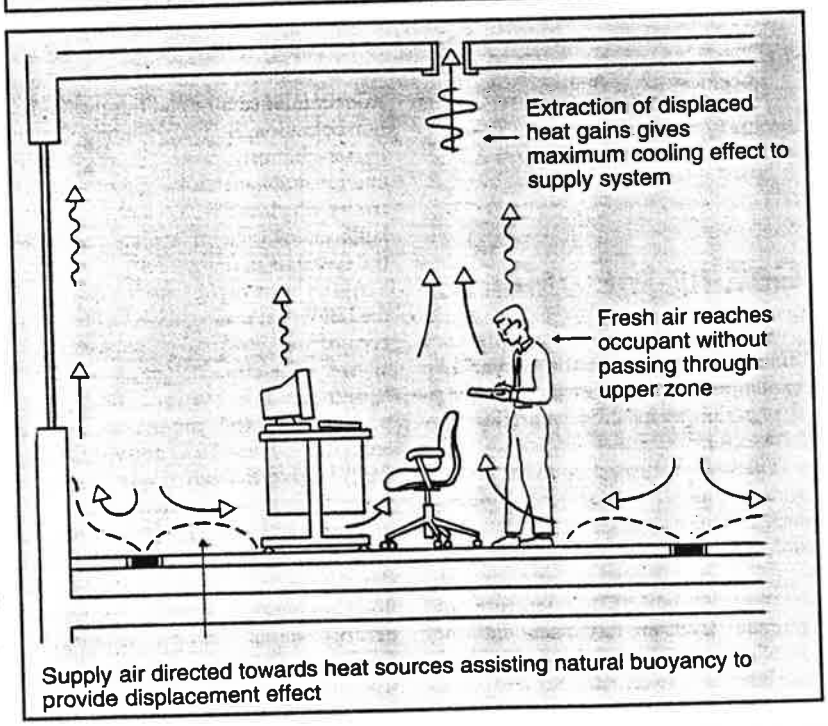

Fig 2. air distribution with horizontal swirl diffuser

to finish the job is, in itself, an increase in productivity of over 3%.

For argument's sake let us combine the points above and assume that the choice of the cheaper and less effective diffuser results in an average loss of efficiency of a mere 1%. Applying this to our financial services building, the loss in productivity would amount to £70 per m^2 and this, of course, is an annual figure. Thus, the capital cost saving of £1.50 per m^2 will last less than a fortnight and, from then on, there is a 'negative' pay-back. Put another way, over a twenty year lifespan, the accumulated difference would buy the best part of two new buildings. As Thomas Carlyle insisted "In expenditure, even great expenditure, lies the road to true economy".

Wider issues than selling

Of course, this raises wider issues than the selling (or not) of floor diffusers. Why, one might ask, is there a headlong rush, sometimes seemingly led by CIBSE, towards buildings with a minimum in the way of mechanical services? Is it part of a government conspiracy which sees ecologically OK, but otherwise inefficient buildings, full of under-performing occupants as the solution to the unemployment crisis – the 90's equivalent to leaning on a broom in a 60's car factory. Surely the building services industry should be pressing for its installations to be as effective as possible irrespective of the cost, and if the odd environmental 'nasty' has to be expensively controlled so be it. If nothing else, the income this would generate would be more life-sustaining than advising architects on how to open a window.

Recently, there was an attempt to rate the various methods of air conditioning now currently available. Little effort was made to assess the likely effect on occupant efficiency for each system and, as a result, the 'league table' compiled had, perhaps, all the significance of the GM Conference. It will be argued that this assessment was aimed at property developers and their letting agents, who have priorities other than the working efficiency of their tenants. But developers need tenants – at the moment oh! how they need tenants– and surely there will be no better time for the building services industry to educate prospective renters of buildings where their best interests lie in respect of the indoor climate. Impossible? – not so. Quite recently on French television, there were peak-hour advertisements extolling the virtues of air conditioning in commercial buildings– seemingly anonymous but, in fact, financed by France's five leading equipment manufacturers. Sadly for them, the author was not asked to mastermind this campaign and their message that "modern buildings need air conditioning" failed to focus on the most compelling of *raisons d'être*– increased profitability for the occupant.

A final word of warning, once you have created the perfect environment, do not expect to be treated as a hero by the happy and efficient work force. A little while back, a well-known wandering R & D partner visited a refurbished bank headquarters building in Holland where, at no little expense, the owners had installed air-cooled radiant ceilings and displacement ventilation. The staff were asked how they liked their new working conditions. "Marvellous" they replied, "now they've done away with the air conditioning."

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Louvres feature in shopping development

Kingfisher louvres form an integral part of the design of the 330,00 sq ft Crowngate Centre, the Crown Estate's major shopping centre in central Worcester.

Opened in April 1992, Crowngate combines the refurbishment of an existing 1970's shopping centre with eight new malls arranged around a central atrium. The development also includes the Worcester bus station and passenger concourse, together with a 750 space car park. Inside the Centre imaginative landscaping and careful design have attracted major retailing names.

A feature of the four storey red brick external elevations are the seven metre high sections of architectural louvres, manufactured and installed by Kingfisher Louvre Systems Ltd, which provide ventilation and screening to the car park.

At the more exposed areas, such as the roof-top plantroom, Kingfisher has installed a bank of weather louvres with variable pitch blades that not only optimise weather protection, but also enhance the architectural lines of the building. Smaller louvre panels have been incorporated within the main structure to serve additional satellite plantrooms.

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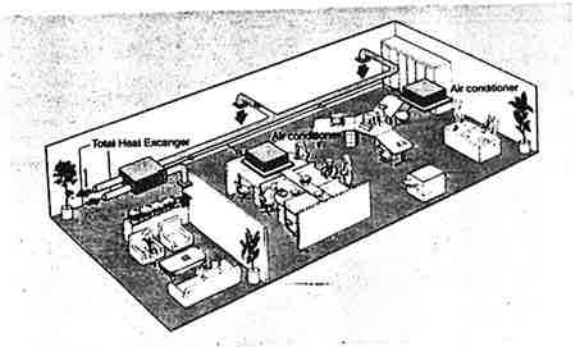

Above: integrated air conditioning and ventilation

Getting the balance

Interest is said to be growing in the combined heat reclaim ventilation and air conditioning system, newly developed by Daikin Europe for the commercial property sector.

The system is based upon the integration of a high efficiency duct mounted heat exchanger into either a Daikin VRV or SkyAir multi split air conditioning system. As fresh outdoor air passes into the heat exchanger its temperature and humidity levels are modulated until they match those of the indoor air. The resulting balance between outdoor and indoor environments reduces the cooling load on the air conditioning system with consequent savings on energy costs.

Application of the new system enables reductions in energy consumption of up to 23% to be achieved, based on 17% lower energy losses than those of a normal ventilation system plus a 6% gain from combined air conditioning/ventilation operation. Both air conditioning and heat exchanger unit can be switched on and off simultaneously via a remote controller which can also operate the ventilation circuit on an individual basis when the system is in fan mode.

At the heart of the combined system is the HRV heat exchanger which is a high performance, low pressure loss unit with an operating efficiency of around 70%. Designed on the stationary cross flow principle, the HRV can operate in ambients of between -10°C and 40°C (80% RH). High efficiency levels also result from the built in automatic changeover function which switches the unit between 'heat exchange' and 'bypass' according to signals from either the indoor and outdoor temperature sensors; the set temperature signal from the combined air conditioner or the operation mode signal from the air conditioner.

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