

Sick buildings can be just unfit

Not one of the buildings investigated for the second part of the Building Use Studies report on sick buildings met CIBSE comfort criteria or were well maintained.

Following a report which stated that air-conditioned buildings are more susceptible to sick building syndrome than naturally ventilated buildings, (see *Building Services*, July 1987) the Building Use Studies team went back to nine of the buildings to investigate the hvac system for suitability and efficiency. The purpose was to discover whether these aspects had any bearing on the likelihood of a building being prone to sick building syndrome.

For the first part of the study 46 buildings were surveyed. Of these, nine were chosen for extra study. The criteria for being chosen were:

- three with health ratings below average, one naturally ventilated, one air-conditioned and one mechanically ventilated;
- three with health ratings just above the average, two were air conditioned and one was naturally ventilated;
- three with higher than average rates of complaint, all air-conditioned.

The report states, "Objective environmental conditions in the nine buildings were measured in terms of air and globe temperature, relative humidity, lighting and sound levels, and air velocities. In addition, ventilation rates were estimated. These measurements showed that in all buildings, internal environmental conditions differed from those regarded as comfortable by the Chartered Institution of Building Services Engineers Environmental Guide."

Generally, findings were that temperatures were high, humidities low, lighting levels low, time-averaged sound levels high and ventilation rates low. In particular, when conditions between the naturally ventilated buildings and the air-conditioned buildings were compared, conditions in the former provided more stable air velocities and patterns of air movement, lower ventilation rates, lower background noise levels and lower spatial variations in temperature levels.

Given that the objective

assessments of the buildings did not paint them in a particularly favourable light, it is interesting to see what the subjective impressions of users were. Complaints that conditions were too warm are generally more common than complaints that conditions were too cool. Over half of the respondents in all buildings but one rated the environment as having too little air movement. Too little air movement was more the subject of complaint than uncomfortable draughts.

Nearly half of the respondents in all buildings but one rated the environment as too dry. Less than a quarter of re-

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spondents in all buildings but one said that they had ample fresh air. In three buildings daylight was seen to be adequate by more than half the respondents which usually correlated with a window view. Noise and distracting conversation were mentioned by a third or more of respondents. Over half of the respondents said that they are highly satisfied with their job.

Correlations between the objective and the subjective viewpoints were far greater than conventional wisdom would have it. In particular the building objectively assessed as the worst was also subjectively the worst.

But worse was to come. According to Building Use Studies view, in only one of the air conditioned buildings were the systems likely to be capable of producing comfort conditions.

Were these depressing results because of poor design or poor maintenance? Unfortunately this was not clear cut because all the air-conditioned buildings had been altered post completion. However in only two of the buildings did assess-

ments of the maintenance imply that standards were adequate (but, says Building Use Studies pointedly, they were still "not ideal"). Is it coincidental that the one air-conditioned building that showed a higher level of satisfaction was also the one building rated as being the most satisfactory in terms of maintenance? Or that the three buildings showing the highest levels of building sickness complaint were also the three rated as having the poorest maintenance? The report states "The standards of building services management in many buildings leave no room for complacency, either among

corporate building users or the air-conditioning industry.....it would appear that in many buildings environmental conditions can be improved and so remove some if not all of the reasons underlying staff disaffection."

The report concludes that the lack of achievement of comfort conditions is an important factor in reports of building related sickness, in particular conditions of high or uneven temperature, stuffiness and a perception of dryness and lack of air movement.

In simple buildings the cause of discomfort was usually easy to determine, but in air-conditioned buildings the reasons were more likely to be complex and thus harder to diagnose and remedy. Problems could have arisen in the design, or in the client's brief or in the way the building was operated and maintained. The report suggests that all three are probably involved.

Three of the relatively unusual environmental records taken for the study were lighting, humidity and noise.

Lighting was measured at around 17.00 h in winter. The lowest level found was 75 lux and the highest was 1400 lux. In three cases levels were substantially below the CIBSE recommendations, in five offices they were judged adequate and in one slightly high.

The average humidity levels for the nine buildings were: 38, 23, 16, 34, 33, 39, 37, 34, 46 %rh. However, the minimum levels recorded were: 14, 18, 11, 28, 18, 13, 29, 21, (and for the one humidified building 36% rh). With CIBSE recommending a minimum of 40% rh there is clearly a message here for designers.

Sound levels were a surprise. CIBSE recommends 46 dBA for general office areas. The average readings (for eight buildings) were: 52, 49, 50, 54, 53, 49, 49, 46. To give some baseline to these figures readings were taken before occupation and, still, levels were an average of some 40 dBA in the buildings with mechanical ventilation, largely caused by system noise.

Air movement is recognised as a problem area. Generally accepted figures for comfort conditions are between 0.1 and 0.3 m/s. In three offices air speeds were measured to be below 0.1 and in four offices air speed were measured at above 0.3 m/s. Thus in only two out of nine offices was air speed within recommended limits. The report did not look at air pollution levels but suggests that carbon dioxide levels may not be an adequate index of air freshness. It wonders about the levels of pollution harboured and produced over time by the hvac systems themselves through, for example, dirt build-up on filters and ducts.

Building Use Studies suggests that its main conclusion is that employers who are faced with high levels of complaint by staff about building related symptoms should begin by examining thoroughly the operation of the hvac systems. This, suggests the report, is a new skill not commonly available and requires closer working relationships between building services engineers and those responsible for operation maintenance and hygiene.

Sick Building Syndrome & Environmental Conditions: Case studies of nine buildings, is published by Building Use Studies Ltd, 14/16 Stephenson Way, London NW1 2HD.