Science for Environment Policy
DG Environment News Alert Service
European Commission

26 November 2009

Less energy use in offices can mean more satisfaction

Increased energy use in office buildings does not necessarily increase the comfort and satisfaction of its occupants, according to new research into office ventilation systems. Low energy systems with high levels of individual control were found to be most satisfactory for office workers in 12 case study buildings in the UK and India.

The energy efficiency of buildings and sustainable construction are part of the EU policy on sustainable development[1]. Sustainable design tends to have three main considerations: the planet (environment), people (society) and prosperity (economy). Although we spend about 80 to 90 per cent of our time indoors, the views of occupants are not often considered a priority when designing sustainable buildings.

The study explored ventilation systems and the occupants' level of control over the system in 12 case study buildings (six in the UK and six in India). These buildings could be classified into six categories, according to whether they were air-conditioned or ventilated naturally with central or local control.

The naturally ventilated buildings typically cause half or less than half of the emissions of the air-conditioned buildings. The building with the lowest energy consumption and emissions was the TRC project in India that had an advanced naturally ventilated system. This used a passive downdraft evaporative system that traps ambient hot-dry air, cools it by the evaporation of water and then introduces it into the building. The highest energy consumer was the BPS building in the UK which is a centrally air-conditioned office with a high density of occupants.

Besides ventilation type, there were other building design characteristics that affected energy consumption and CO_2 emissions. For example, air-conditioned buildings tend to have other high-energy features like lightweight construction, open plan design and high occupant densities.

The researchers then questioned occupants about their comfort and health. Results indicated no positive relationship between energy use or CO_2 emissions and occupant satisfaction. This was particularly true in the UK but even in India the mixed mode system that combined air conditioning with local ventilation control produced greater satisfaction than the centrally controlled air conditioned system. In terms of health, seasonal ailments were lowest in naturally ventilated buildings in the UK and in mixed mode buildings in India.

The authors suggest that occupant comfort and satisfaction in temperate climates does not appear to be tied to energy consumption. Instead, the link between energy consumption and satisfaction/health found in these case studies was the degree of control that the occupants have over their office environment. The buildings with high-energy, centralised air-conditioning systems typically had no individual or direct control.

It is encouraging that low energy design was seen to achieve some of the highest levels of occupant satisfaction and the study provides support to owners and designers to consider energy efficient strategies and technologies in buildings. The researchers also suggest that buildings should be designed to be responsive to users in order to create a more comfortable and sustainable environment.

1. See http://ec.europa.eu/environment/urban/links.htm

Source: Steemers, K. & Manchanda, S. (2010). Energy efficient design and occupant well-being: Case studies in the UK and India. *Building and Environment.* 45: 270-278.

Contact: kas11@cam.ac.uk

Theme(s): Climate change and energy, Sustainable consumption and production