



Fresh air intake

Before the advent of airconditioning, people working inside most buildings including hospitals, would tend to keep windows open to allow outdoor air to keep the rooms cool in the summer months. The liberal intake of outdoor air helped to dilute the stale air inside the rooms preventing concentration of tobacco smoke, body and food odours and creating a fresh atmosphere indoors.

In airconditioned spaces, in order to have effective cooling and cut down the energy costs, buildings are tightly constructed, ceiling heights are reduced and windows are kept closed to keep the “indoor air in and the outdoor air out”. The need to provide a comfortable, cool environment inside, causes the inner space to be completely isolated from outside. Thus an airtight space is created which needs “less” electric energy to condition as it does not allow even a ‘breath of fresh air’ in. As a result the same air is circulated in a confined space again and again.

Carbon dioxide

Humans inhale oxygen and exhale CO_2 . The concentration of CO_2 in exhaled breath is typically around 3.8% (38,000 ppm).

Once this CO_2 leaves the mouth or nose, the concentrations dissipate and mix in the surrounding air very quickly. Indoor concentrations of CO_2 in occupied spaces typically range from 500 ppm to 2000 ppm. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) which has carried out considerable research over many years on this subject recommends that **CO_2 concentrations in**



occupied buildings should not exceed 1000 ppm. More importantly, knowing the difference between inside and outside concentrations can help us determine how much outside air is being introduced to an occupied space.

As people exhale CO_2 , they also exhale and give off a wide range of other “bioeffluents” which can include gases, odours, pherons, particulate, bacteria and virus. When these bioeffluents are allowed to build up in a space, for instance as a result of poor ventilation, occupants tend to complain of fatigue, headaches and general discomfort.

Ventilation

Obviously, **well-designed ventilation is the key to the problem.** Unfortunately, many times, ventilation is given only cursory attention. It is a very crucial aspect of a building as it allows for exchange of air between the indoors and the outdoors. It is this circulation of fresh air which prevents indoor air pollution. ASHRAE has, after many deliberations with connected authorities in the medical field, specified the ventilation rates in various hospital areas and this is reproduced in the Annexure.

ASHRAE gives designers the choice of:

- introducing hundred per cent outdoor air with a minimum of fifteen air changes per hour and full exhaust, only when Building Codes in some countries or some states in America require it, or
- a minimum of twenty per cent outdoor air out of a minimum total of twenty five air changes per hour.

Some consultants may call for sixty per cent outdoor air, some forty and some hundred per cent. There is no uniformity of thought and no Building Codes to go by.