

THE EFFECTS OF INDOOR AIR QUALITY (IAQ) ON PERFORMANCE, BEHAVIOUR AND PRODUCTIVITY

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The main justification for ventilation has historically been to create a healthy indoor environment. Air pollutants originating inside the building, including gas-phase chemicals, chemical vapours, particles and water vapour emitted by building, furnishing and cleaning materials, by surface treatments such as paint and polish and by equipment such as office machinery, are removed together with bio-effluents originating from the occupants themselves, including CO₂. In most climates, the outdoor air supply that has been found by experience to provide subjectively acceptable air quality and to prevent the accumulation of moisture in the building is generally sufficient to maintain the concentration of pollutants at healthily low levels. Recirculating air is a convenient way of redistributing heating and cooling power and has the additional effect of equalising the humidity and the concentration of pollutants throughout the interior building volume, which are all functions that do not necessarily involve an increased supply of outdoor air. Until 5 years ago this would have been the justification for current ventilation practices. In 1999 the first of a series of experiments proving that IAQ also affects the performance of work by building occupants was published, revealing new mechanisms by which raised levels of indoor air pollution may reduce productivity, either in addition to or instead of having negative effects on comfort and health. It was shown in experimental exposures of human subjects lasting up to 5 hours that the performance of simulated office work could be significantly increased by removing common indoor sources of air pollution, such as floor-coverings, used supply air filters and personal computers, or by keeping them in place and increasing the rate at which clean outdoor air was supplied per person. These short-term effects were demonstrated repeatedly even at pollutant levels that had no measurable effects on the perception of air quality by the occupants themselves, although there were effects on sub-clinical SBS symptoms such as headache. Ventilation rates from 3-30 L/s/p have been studied. The prediction arising from these experiments, that the performance of real office work over time would be significantly and substantially affected by the changes in IAQ that take place in the course of normal building operation, have recently been validated in field intervention experiments lasting 8 weeks, which were carried out in call-centres in northern Europe and the Tropics. These findings have far-reaching implications for the efficient use of energy in buildings.