

# Study on the indoor air quality

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## SUMMARY

Since the cost of energy is increasing sharply a trend to conserve energy in the indoor environment and in addition to improvements in thermal insulation, two possible solutions are adopted.

The first one is to provide reduced air gaps and opening for newly constructed buildings to minimise the infiltration of outdoor air.

The second one is to reduce the ventilation rate or the fresh air supplied in air conditioned buildings.

these two solutions are the reason for some serious problems of indoor air quality. Many indoor air contaminants have reached levels which are unacceptable to the occupants and the body odour generated by the occupants forms one of the earliest indoor air contaminants (1).

## OBJETIVES

As it has been stated in the summary, the body odour generated by the occupants is one of the major indoor air contaminants and one of the relevant indicator for the adequacy of ventilation.

Contradictory results have been recorded concerning which contaminant may be used as an indicator of the perceived body odour. is it the carbone dioxide generated by the occupants ? Does the crowding have a proportional effect on the body odour level ? (see ref. 2, 3, 4 and 5).

This study was an attempt to clarify some of the controversies rased the previous rescarchers in the body odour field.

The main objectives were to determine whether a correlation existed between CO<sub>2</sub> and the body odour. The reason behind this approach was the fact that CO<sub>2</sub> is convenient to measure and monitor in the case of a proven correlation.

Secondly, the correlation between the space volume per occupant the body odour level under a study state ventilation rate was studied.

Thirdly, the purpose was to determine whether there was any effect of relative humidity and temperature on body odour.

## PROCEDURE

A programme of experimental work was designed to investigate any correlation between odour, CO<sub>2</sub>, occupancy level and relative humidity.

A lecture room with a volume of 154 m<sup>3</sup> was selected because of its situation and construction. The density, time and duration of occupation were controlled. A series of investigations carried out on air quality in this room under varying conditions of occupancy. The levels of carbon dioxide and relative humidity were measured using appropriate instruments. The assessment of odour was carried out by the analysis of questionnaires completed both by the occupants of the room and by a panel of assessors (fig. 1).

## ODOUR MEASUREMENTS

Odour levels were assessed both inside and outside the room by piping the room air into a sniffer box.

Odours were assessed by means of panelists who were given a questionnaire to determine the perceived body odour, and the acceptability or unacceptability of the odour intensity and acceptability were assessed by the use of a sniffing station, each of the panelists being called every 15 minutes to make his assessment. The assessment of odour lasted till all the panelists had recorded that the odour had become unacceptable or until the end of the lecture. During the lecture, students in the lecture room were also asked to assess the odour by filling a questionnaire. As soon as the lecture was over the panelists entered the classroom and assessed the odour at the end of the session. The sniffing station had been designed according to the ASHRAE (American Society of Heating Refrigeration and Air conditioning Engineers) recommendation, with a potential volum air change of 3.71l/min. Monitoring on Mondays was avoided to prevent possible confusion with extended ventilation time over the preceding weekend in order to give each survey session a similar 18 h prehistory of occupancy and ventilation.

DEPARTMENT OF BUILDING ENGINEERING

Questionnaire to determine the intensity of perceived body odour

Date of visit

Tick one of the following

	1st. rdg	2nd	3rd	4th	5th
NO ODOUR DETEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SLIGHT ODOUR DETEC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MODERATE ODOUR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STRONG ODOUR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VERY STRONG ODOUR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OVERPOWRING ODOUR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do you consider the body odour level to be					
ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UNACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FIG. 1 Questionnaire to determine the intensity of perceived body odour.

#### CO<sub>2</sub>, RH AND TEMPERATURE MEASUREMENTS

The CO<sub>2</sub> concentration was measured an hour before the beginning of the lecture, the background level a quarter of an hour before and the concentration in the corridor a quarter of an hour after the end of the lecture.

The CO<sub>2</sub>, RH and temperature were recorded every quarter of an hour from the beginning of the lecture, the odour panelists were requested to assess the odour every quarter of an hour.

Table 1 : Range of voting CO<sub>2</sub> concentration (absorbance units)  
 The figures in forth column show the range (lowest and highest) of CO<sub>2</sub> concentration at which panelists judged the odour unacceptable.

TEST IDENTIFICATION	NUMBER OF OCUPANTS	RANGE OVER							OVER-ALL RANGE OF ALL TESTS
		A	B	C	D	E	F	G	
T1	14	38	43	43	36	36	39	43	36
T2	12	42	47	44	44	47	44	44	47
T1	21	45	45	45	45	46	45		45
T2	26	55	46	50	46	55	55		55
OVER ALL RANGE FOR EAH INDIVIDUAL PANELISTS		38	43	43	36	36	39		36
		55	47	50	46	55	55		55

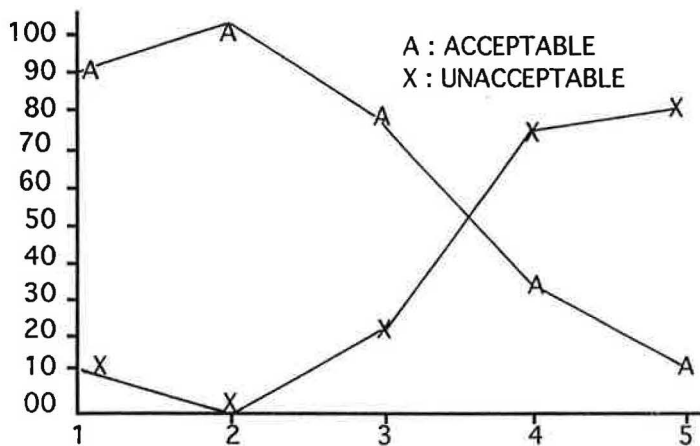


FIG. 2 : Perceived body odour scalling (presentation apparatus).