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DESIGN GUIDE-LINES FOR NOISE IN LANDSCAPED OFFICES

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Introduction

There is a general deficiency of information on people's reactions to the acoustic environment of a landscaped office. Such field studies are necessary in order to provide a feedback of information to designers, from people actually working in their buildings. Accordingly, measurements were made in ten landscaped offices in England, from 1970-71, in order to determine the relative contributions, of office activity noise, air conditioning noise, and external noise. These physical measurements were then related to the subjective response of the occupants, in order to put forward design guide lines for noise in offices.

Noise measurements

The total noise environment in the office was made up of

(i) office activity noise, such as "people talking", telephones ringing and office machinery,
(ii) air conditioning noise, and
(iii) external noise transmitted to the building.

Tape recordings of the total noise in the office were taken for 60s at 1200s intervals throughout the working day. This was from 08.30 - 16.45 h, excluding the lunch period. Then, in the unoccupied office after 20.00 h, recordings were made of the noise from the air conditioning system, and the background noise with the system off. Hence, the noise due to the office activity alone was computed. These noise measurements compared well with continuous recordings made for twenty minutes in the same microphone position.

Subjective response to noise

A questionnaire was filled in by 729 occupants, who were asked to rate their satisfaction with noise from the individual office activities. These were "people talking", "telephone bells" and "office machines".

Correlation between subjective and objective measurements

It was thought that response to noise might be accounted for, not only by the actual level of the peak noise, but also by the amount by which the peaks of the noise exceeded the relatively quiet background. Thus the peak NR_{10} , and background, NR_{90}, Noise Rating values were used as the objective measures. They were computed from the noise levels exceeded for 10% and 90% of the time, respectively, in each octave frequency band from 31.5 Hz up to 8 k Hz. While the percentage of people dissatisfied with noise from the office activities was used as the subjective measure. These subjective and objective measurements were correlated for ten buildings, producing a multiple correlation coefficient, r, of 0.75, which was just significant at the 5% level.

The linear regression equation was:

Percentage dissatisfied

$$= 1.46\ (NR_{90}) + 2.45\ (NR_{10} - NR_{90}) - 57.5$$

This relationship only applies to the limited range of Noise Ratings encountered in the survey, i.e. for values of NR_{10} from 49 to 59, and NR_{90} from 37 to 49.

Design guide lines

This equation could be used as a rough guide in the interim period, before more landscaped offices become occupied, and available for social surveys. For example, if the peak value of the total noise in the office, NR_{10}, was designed to NR 55*, then the peaks should not exceed the background by more than NR 8 if the percentage dissatisfied with noise from the office activities was to be limited to 30 per cent.

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* NR55 was the recommended criteria for an office (with typewriters) by C.W. Kosten and G.J. Van Os (Netherlands, 1961)

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TABLE 1

Summary of objective and subjective noise measurements

Office Number	Room acoustics: RT (s) at 500 Hz	Vol. (m^3)	Area (m^2)	Aspect ratio	Noise Ratings: NR_{10}	NR_{90}	Dissatisfaction: % Dissatisfaction with People talking	'Phones	Office machines	Number of staff
1	0·4	2832	945	1·5	49	40	39	11	12	74
2	0.4	1101	361	1·3	56	43	23	37	34	35
3	0·7	6368	1592	2·4	54	45	38	22	38	104
4	0·4	6105	2212	1·1	42	44	19	16	33	128
5	0·7	2416	653	1·5	59	49	32	25	55	56
6	0·4	3567	1274	1·7	51	43	37	21	44	105
7	0·4	1440	473	1·8	53	42	34	25	4	68
8	0·4	848	309	2·6	56	43	58	63	3	40
9	0·8	4323	1533	2·1	56	46	36	38	34	47
10	0·3	2049	759	4·6	55	37	60	40	31	72