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TECHNICAL NOTE

DIR

COPY

NOT TO BE REMOVED FROM ROOM 201

PREPARED BY A. C. C. Warnock

CHECKED BY T. D. N.

APPROVED BY A. G. W.

DATE November, 1972.

PREPARED FOR Record Purposes

SUBJECT LOSS OF SPEECH PRIVACY DUE TO FLANKING TRANSMISSION
BY A COLUMN

It is common practice to cover columns and walls in open offices with wall carpet. This is an attempt to decrease the amount of flanking transmission around landscape screens by virtue of the carpet's absorption. It seemed that it might be useful to investigate the effectiveness of this technique in a controlled laboratory situation.

The apparatus used is shown in Figure 1. The loudspeaker was an Electro Voice 8-in. model mounted in a metal box. Two screens and two carpets were used the details of which are given in Appendix A. The loudspeaker was fed with pink noise and the output from the microphone was analyzed in third octave bands on a B and K spectrum analyzer and level recorder. The flanking surface was a piece of $\frac{1}{2}$ -in. -thick plywood, 2 ft wide and 7.5 ft long simulating a column.

The insertion losses obtained for the various configurations tested are listed in Table I and these were used to calculate the corresponding articulation indices (AI). To do this an ideal voice of 65 dB at 3 ft and a background noise level of 48 dB(A) with the third octave levels shown in Table II were assumed. The articulation indices calculated are listed in Table III.

From this table several points emerge.

1. Screen B was obviously superior to screen A when there was no flanking transmission.
2. Carpet B was better than carpet A in that it reduced the AI by a greater amount when applied to the column.
3. The flanking due to the column has a drastic effect on the privacy rating and neither carpet tested improved the situation.

4. The 2-in. thickness of glass fibre without a surface covering completely eliminated the flanking due to the column. A 3/4-in.-thick layer covered with carpet B had the same effect.

5. The flanking due to the column could also be eliminated by attention to geometry. Figure 2 is a scale drawing showing the area, estimated on a specular basis, that would be affected by the column. The results obtained, although not definitive, do not contradict the assumption that the area can be calculated by assuming specular reflection.

From this short study it would appear that the use of wall carpet alone is pointless since the privacy rating will become unacceptable when flanking transmission around a screen is present and the carpet samples tested do not do enough to improve the situation. An application of a layer of glass fibre or of glass fibre covered with carpet will eliminate flanking from columns or walls. The problems caused by columns, however can also be solved by considering the geometry of the office layout.

TABLE I
THIRD OCTAVE BAND INSERTION LOSSES FOR CONFIGURATIONS TESTED

Conditions	Third Octave Band Centre Frequency, Hz															Distance from Speaker to Screen	Distance from Screen to Microphone
	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000		
Screen A	8.5	14.5	9	7.5	7	9.5	10	12	10.5	11.5	15	20	18	23	23	3	3
Screen A and Bare Column	9	11	10	7.5	7	9	7.5	8	8	7	12	12	14	14.5	13.5	3	3
Screen A and Carpet A on Column	9.5	10.5	9	7	6	7.5	8	7	9.5	9.5	10.5	14	13	15.5	15	3	3
Screen A	4	8	11.5	8	7	7.5	6	8.5	9	9.5	12.5	20	18.5	21.5	19	3	6
Screen A and Bare Column	9.5	11.5	12.5	9.5	5.5	8	5.5	10	10	9.5	12.5	18	18	19.5	16	3	6
Screen A	2.5	1.5	8.5	9	6.5	6.5	6	7	7.5	6.5	9.5	15	14	19.5	18	6	6
Screen A and Bare Column	2	3.5	11.5	7.5	8.5	6	4.5	6	5.5	4.5	2.5	9	6	8	6	6	6
Screen A and Carpet A on Column	3.5	4	10.5	6.5	10.5	5.5	3	6	4.5	4.5	3.5	10	8.5	11	9	6	6
Screen A and 2 in. of Glass Fibre on Column	3.5	4	10	9	8.5	5.5	7	9	7	7	8.5	14.5	14	18.5	18.5	6	6
Screen B	2	2	1	8	13	14	19	14.5	8.5	11.5	13.5	19.5	17.5	19	22.5	6	6
Screen B and Bare Column	2	2	2	11	10.5	9	12	9.5	3.5	9.5	7	7	9	7	9.5	6	6
Screen B and Carpet B on Column	2	2	2	12	11	8.5	12	9.5	4	11	8	9	14	10	15.5	6	6
Screen B: Column with 1/2-in. Glass Fibre and Carpet B	0	0	3.5	10	12	11	17.5	16	8.5	13.5	12.5	20	19	16	21.5	6	6
Screen B	3	3	4	11	12.5	15	20	12	11	16	14.5	17.5	20	19	25	6	4.5
Screen B and Bare Column	1.5	1.5	5	12	9	7.5	9	8.5	4	8	8	6	12	11.5	14	6	4.5
Screen B and Carpet B on Column	1	3	6	11	8.5	8	9	11	4.5	9	11.5	10.5	19	17	20	6	4.5
Screen B	2	2	1	5	11.5	14	17	20.5	10	12	9.5	17.5	19	17.5	21	6	7.5
Screen B and Bare Column	0	1	1	6	15.5	10	10.5	10.5	0	6.5	7.5	6.5	11.5	10	5	6	7.5
Screen B and Carpet B on Column	0	1	1	6	14.5	9.5	11	10.5	8	7.5	8	7.5	13.5	10.5	15	6	7.5

TABLE II

LEVELS ASSUMED IN CALCULATION OF ARTICULATION INDEX

THIRD OCTAVE BAND CENTRE FREQUENCY, Hz

	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
Noise Spectrum	43.5	43.5	43	43	42	41	40	38	36	34	32	31	28	26	24
Ideal Speech Peaks at 12 ft	55	56	57	58	56.5	55	53.5	52	50.5	49	47.5	46	44	43	41

TABLE III

ARTICULATION INDEX IN THE SHADOW OF A SCREEN
FOR DIFFERENT FLANKING CONDITIONS

Speaker to Screen, Distance (ft)	Screen to Microphone, Distance (ft)	Screen Used	Flanking Surface	AI	Privacy Rating
3	3	None	None	0.7	No privacy
3	3	A	None	0.22	Marginal
3	3	A	Bare Column	0.36	Very poor
3	3	A	Column and Carpet A	0.35	Very poor
3	6	A	None	0.17	Marginal
3	6	A	Bare Column	0.17	Marginal
6	6	A	None	0.17	Marginal
6	6	A	Bare Column	0.30	Marginal
6	6	A	Column and Carpet A	0.28	Marginal
6	6	A	Column and 2 in. of glass fibre	0.16	Marginal
6	4.5	None	None	0.53	No privacy
6	4.5	B	None	0.05	Confidential
6	4.5	B	Bare Column	0.29	Marginal
6	4.5	B	Column and Carpet B	0.20	Marginal
6	6	None	None	0.5	No privacy
6	6	B	None	0.08	Acceptable
6	6	B	Bare Column	0.24	Marginal
6	6	B	Column and Carpet B	0.18	Marginal
6	6	B	Column, 3/4 in. Glass Fibre and Carpet B	0.08	Acceptable
6	7.5	None	None	0.47	Very poor
6	7.5	B	None	0.04	Confidential
6	7.5	B	Bare Column	0.19	Marginal
6	7.5	B	Column and Carpet B	0.13	Acceptable

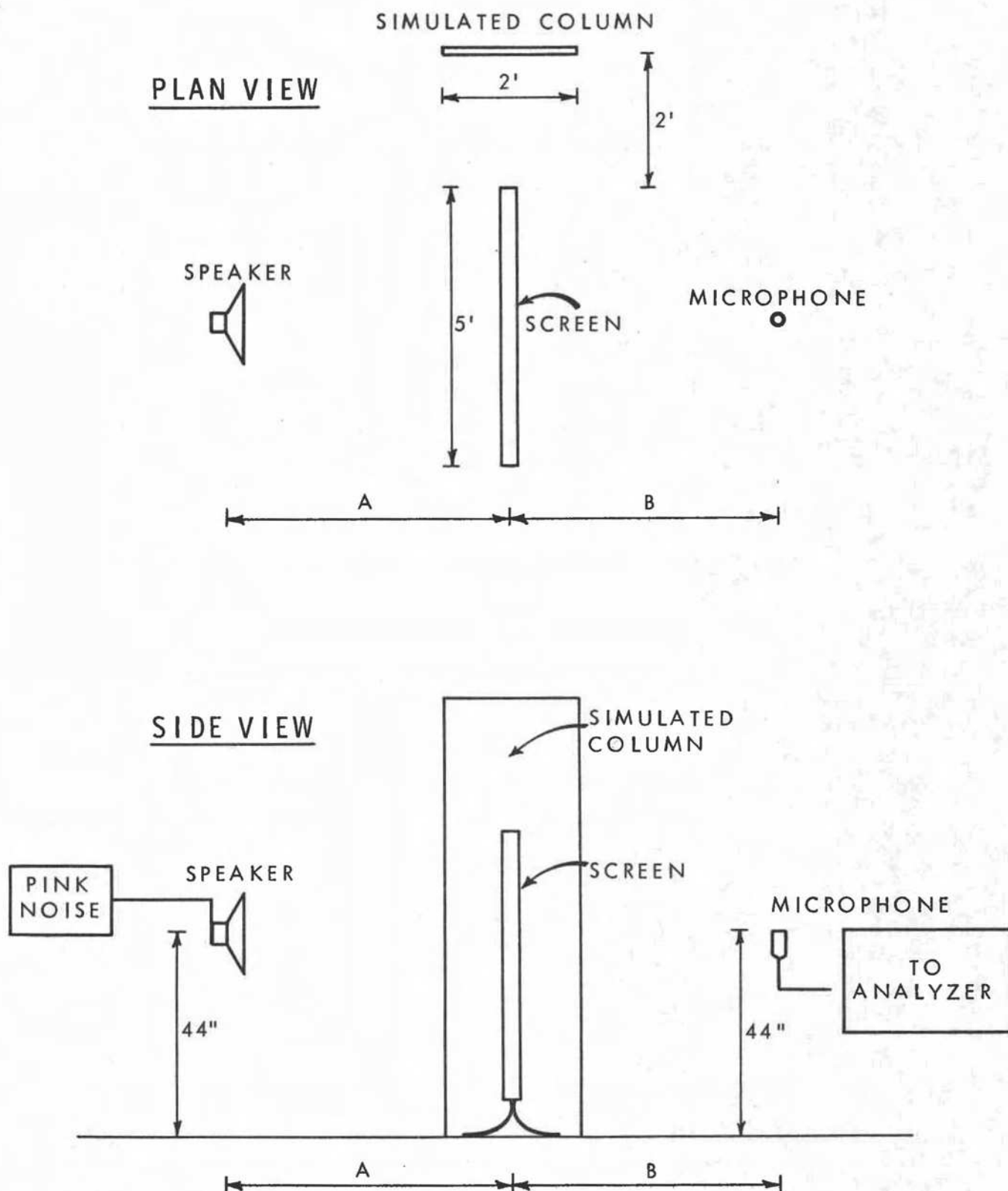


FIGURE 1 GEOMETRY OF APPARATUS

BR 5006-1

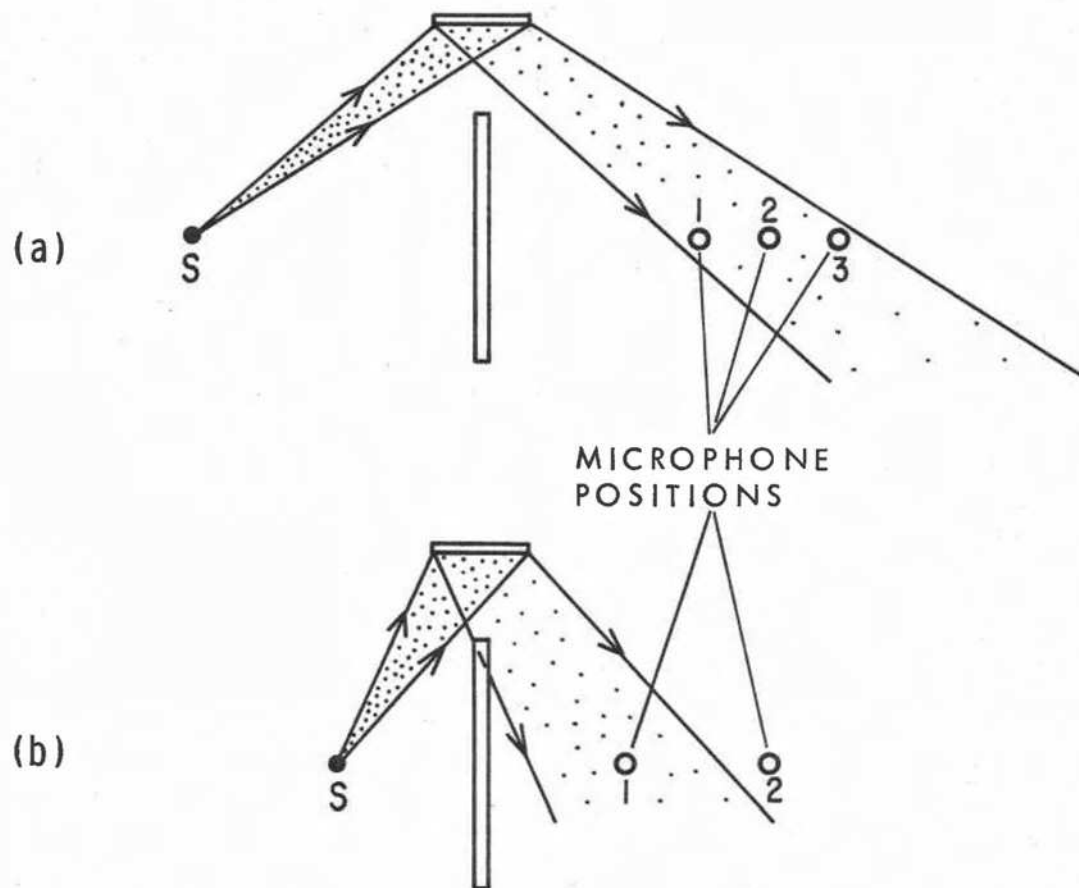


FIGURE 2

GEOMETRY OF TWO SITUATIONS INVESTIGATED
SHOWING AREA AFFECTED BY FLANKING SURFACE

BR 5006-2

APPENDIX A

Details of Screens and Carpets Used

- Screen A: 58½ in. x 48½ in. x 2½ in.
Standing height = 56½ in.
Three layers of ¾-in. glass fibre split into 3
sections by 2 layers of 1/8 -in. perforated hardboard
and 1 metallic membrane. NRC = 0.8.
- Screen B: 60 in. x 56½ in. x 3 in.
Standing height = 59 in.
Two layers of 1½-in. glass fibre separated by 1/8-in.
hardboard. NRC = 0.8.
- Carpet A: Sample of good quality nylon floor carpet used in impact tests.
- Carpet B: Sample of wall carpet. Harding Mural 100% Modacrylic
pile, quality 15460.