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ACOUSTIC PRIVACY BETWEEN OFFICES.

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INTRODUCTION.

British Standard 8233:1987 (1) states in the Foreword "The code is intended for use by designers and constructors of buildings ....". It is on the basis of this stated aim that it must be judged. This paper discusses acoustic privacy between offices and assesses BS 8233 as a design guide in the light of other publications and practical experience on two recent projects.

The expectation of acoustic privacy between cellular offices is often too high. Sometimes, in the author's opinion, this is because the visual privacy between adjacent offices leads to high expectations of acoustic privacy; complaints may arise if these expectations are not realised in practice. Given low visual privacy, for instance in an open plan office, or the audible presence of speakers in an adjacent cellular office, the expectation of absolute acoustic privacy declines and more care is taken by speakers to use quiet voice levels, to speak in a non-critical direction and, if necessary, to use a different venue for confidential meetings.

There are unquestionably occasions when confidentiality is necessary but often the lack of acoustic privacy is the cause of unreasonable complaint. The understanding of speech from the adjacent office is frequently of no practical or operational consequence but generates complaint even though one has to concentrate to hear the words. One is reminded of the Punch cartoon from long ago when an elderly lady complained that she was shocked to see mixed batheing from the window of her house - surely, said her companion, it is the other side of the lake from here - oh yes, said the lady, but with binoculars..!

GUIDANCE FROM BS 8233:1987.

In paragraph 9.4.1 (Educational buildings) the BS states that controlling internally generated noise for offices warrants a minimum sound level difference of 35 dB (or a weighted sound level difference of 38 dB.) It says that offices, in such buildings, require "Average" sound insulation.

In paragraph 11.2 (Offices) these numbers are repeated and additionally a comment is made about the need for a "not too low" noise level in any occupied area adjacent to a private area. For "privacy" this paragraph states that the minimum desirable sound level difference should be 45 dB (weighted 48 dB) and "even then it is possible that voices can be heard, but the conversation will not usually be understood."

Paragraph 11.3 comments about some practical difficulties with demountable partitions, window mullions, services ductwork, etc. but no guidance is given as to solutions for these inevitable problems.

Paragraph 14.2.5 gives more general comments on the problems and a few outline descriptions of solutions to some - e.g. for ceiling void barriers "Plasterboard or lead carefully fitted, and with all joints sealed, usually makes a suitable barrier." Figures 1 & 2 show ceiling void transmission, an unspecified barrier and some "high density mineral wool" laid on the top of a suspended ceiling. Figure 16, taken from the British Gypsum White Book, illustrates some, if not all, of the possible sound transmission paths between rooms.

GUIDANCE FROM ELSEWHERE.

Parkin, Humphreys and Cowell (2) set out a typical approach to assessing speech privacy. They state:

Privacy Required	Mean SRI of Partition + SIL in receiving room.
confidential	less than 75
good	less than 70
fair	less than 65

SIL (Speech Interference Level) of the background noise is defined in this reference as the average of the sound pressure levels in the 3 octave bands centred on 1000, 2000 and 4000 Hz. though more usually the octaves based on 500, 1000 and 2000 Hz. are used. (The American National Standard ANSI S3.14-1977 (R1986) uses the average of all four octave bands).

Fry, et al, (3) use a broadly similar approach by summing the mean SRI of the partition with the NR rating or dB(A) value of the ambient noise:

Sound as heard by occupant	Average Sound Insulation Plus Ambient Noise	
	dB(A)	NR
Intelligible	70	65
Ranging between intelligible & unintelligible	75-80	65-75
Audible but not intrusive (unintelligible)	80-90	75-85
Inaudible	90	85

More detailed guidance on criteria can be found in references 4 & 5 but none of these are much help to the lay designer needing to control transmission between rooms.

Useful suggestions are found in reference 6 though this too could be improved and expanded.

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PRACTICAL PROBLEMS

1. Cosmetic acoustics.
This term covers the application of the widely-held theory that if you cannot see the hole then noise will not go through it.

Recent examples of this include offices for acedemic staff in a University where each office has an acoustic ceiling of perforated metal trays with 12mm of glassfibre laid on its upper surface; the partitions between adjacent offices are 150 concrete blocks running from structural floor to a pitched roof which is about 0.3 to 2.0m above the ceiling. The block wall is plastered on both faces up to just above the ceilng. Acoustic privacy was found to be very poor and examination showed that the concrete block partition had been left down from the roof in a stepped pattern matching the block shape. The acoustic ceiling has virtually no sound insulation (though good sound absorption) so that the speech sound levels above the ceiling were high and transmission through the open holes in the wall was unrestricted. The holes could not be seen from the completed offices. Inadequate site supervision is the cause of many noise transmission problems. Coupled with the hole-in-the-wall these offices had a secondary transmission path via an exposed continuous cable duct running along the external wall just below window cill height. The cable duct had been packed with open-cell foam but the duct was within about 0.5m of the head height of the seated occupants of adjacent offices and the normal sound insulation calculations for room-to-room transmission, even using the composite Sound Reduction Indices (SRI), were meaningless in the circumstances.

Another example, frequently found, is the use of good quality demountable partitions but, where they abut a solid masonry wall, using a thin layer of foam to "close the gap" - the foam has little sound insulating capability and the composite SRI is seriously degraded. The problem is often aggrevated by the same factor mentioned above that occupants of adjoining offices may well be seated close to the external wall, and each close to the same partition, so that the actual transmission from speaker to listener is dominated by the weakest link of the foam "filling".

Intractable problems can arise from the finishing of very high quality offices with marble floors. A recent case showed this type of floor in a Chief Executive's office and continuing under the door to a waiting room where every word said in the office could be clearly heard. The bottom of the door was some 25mm above the floor so there was a large gap but even with a much smaller gap the transmission would have been significant - fitting of threshold seals to expensive doors is not a popular solution and it is better to aim at the use of a carpetted floor under doors so that, with minimum gap height, there is a respectable amount of sound absorption and transmission loss under the door. Footfall noise can also be a problem within offices fitted with hard floors and can, unless floor treatment has been installed, be transmitted both horizontally and to any rooms below the office.

PRACTICAL POINTERS

1. Transmission via ceiling voids.
When a partition rises to the underside of a continuous suspended ceiling of light weight or open-tray tiles noise will travel between the rooms via the ceiling void. Reference 6 suggests that a 13mm wallboard with 40mm mineral wool makes an effective noise barrier. Though this is true, the efficiency is obtained only if the barrier is well sealed; the practical difficulty of cutting and fitting the wallboard to the metal tees, etc, of the ceiling supports is not mentioned. These tees usually rise some 25mm above the top of the ceiling tile and practical experience shows that if a 25mm (or appropriate thickness) timber or other batten is placed on the top of the tiles between each pair of ceiling supports, along the line of the partition, a sensible fixing point for the bottom edge of the wallboard is obtained. Acrylic caulk can be used to seal any small residual holes. Figure 1 should make this clearer.

2. Holes for Services in ceiling void barriers.
Inevitably there will be a need for Services items such as ducts and pipes to pass through the ceiling void barriers. It is not practicable to suggest cutting plasterboard or other rigid heavy sheet barrier materials to seal exactly around such items. Normally the barrier will be fitted after the Sevices pipe or duct has been installed and the barrier will have to have a full height joint at one side, or on the centreline, of the pipe or duct. A practicable solution is to fit a pair of half-collars to the pipe or duct on each side of the barrier so that the inevitable gap around the item is covered. Fill the gap between the two collars with mineral wool and seal the edges of the collars with acrylic caulk. Figure 2 will make this clearer.

3. Junctions between partitions and the underside of ceilings.
Many ceilings are profiled to a greater or lesser extent and the junction with the partition is often filled with a foam strip. These strips can seriosly degrade to sound insulation. A fillet of clear mastic, to this junction and to other junctions with structural elements such as external walls, will make a dramatic improvement. The disadvantage is the reduced ease of relocation of partitions and the slight marks left on ceiling tiles.

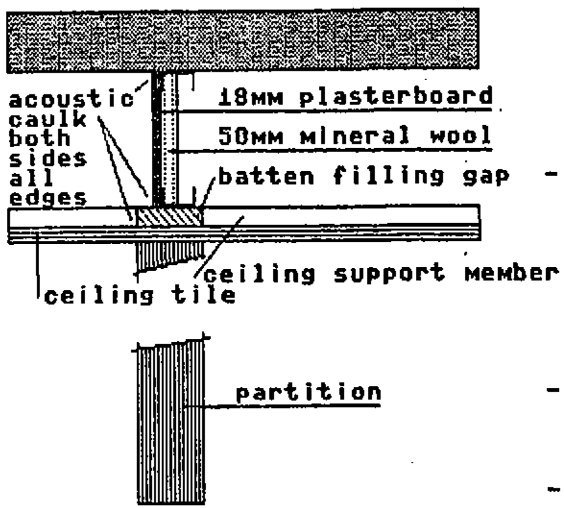
CONCLUSIONS

It would be unfair to criticise BS 8233:1987 on the grounds that it does not indicate design solutions for all possible paths of noise transmission from one room to another. But it is offered to designers and constructors of buildings as a code of pratice and is decidedly short on practicalities at least in respect of the aspect of noise control touched upon by this paper.

It is hoped that the few solutions offered in this paper may act as guidelines for acoustic privacy in offices for designers and constructors of buildings.

REFERENCES

(1) British Standard 8233:1987. British Standard Code of Practice for Sound insulation and noise reduction for buildings.
(2) PARKIN, HUMPHREYS & COWELL, "Acoustics, Noise and Buildings", Faber & Faber, 4th edition 1979
(3) FRY, et al, "Noise Control in Building Services", Pergammon Press, 1988
(4) CAVANAUGH, et al, "Speech Privacy in Buildings", J.A.S.A, vol 34, pp 475-492, 1962
(5) YOUNG, "Re-vision of the Speech-privacy Calculations", J.A.S.A, vol 38, pp 524-530, 1965



- batten must be heavy and solid material, e.g. Sasmox.

- apply clear mastic sealant to joints between top of partition and ceiling tiles on both sides.

- acoustic caulk applied liberally to seal all gaps and crevices.

Standard detail for ceiling void barrier with tile infill batten.

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FIGURE 1

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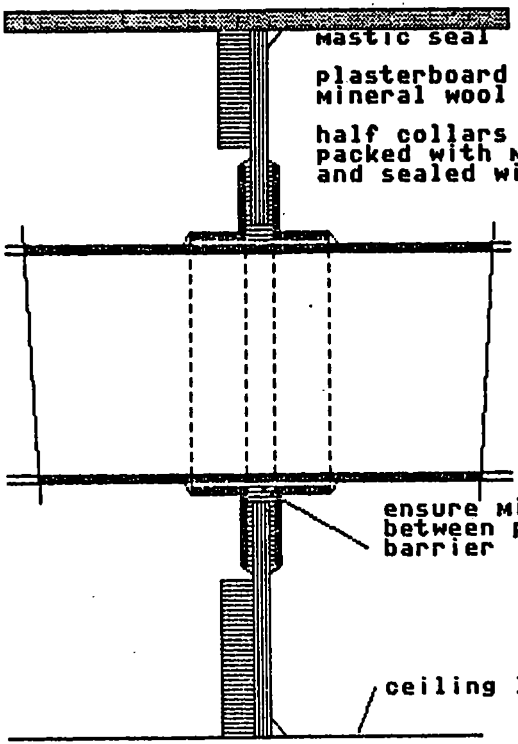
FIGURE 2



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detail for sealing pipe or duct passing through barrier.

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