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THE ECONOMIC ASPECTS OF NOISE CONTROL

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In general it is possible to obtain any degree of noise attenuation if one is prepared to pay for it and unless one substitutes 'reasonable cost' for 'best available means' the Noise Abatement Act of 1960 is, in my view, meaningless.

In considering the use of any material to reduce noise, its cost is just as much a property of it as its ability to attenuate noise. These two properties, cost and attenuation are inseparable. As an example, the table indicates the costs of several types of partition or party wall. In addition to the costs of supply and erection of the wall some of the indirect costs have also been included. These are the costs (typical) of supporting the weight of the wall and also of providing the floor space to accommodate it.

Cost and Performance of Party Walls/Partitions

Wall	Mass Kg/m^2	Thickness mm	Cost ($£/m^2$)				Performance		
			Wall	Support	Space	Total	dB (av)	N	% satisfied
4½" Brick	250	140	3	1	2	6	45	62	50
9" Brick plastered	450	250	5	2	3	10	52	67	70
3" Block	150	100	3	1	1	5	44	51	20
Simple stud partition	30	115	2	0	2	4	31	52	25
Sophisticated stud partition	50	125	6	0	2	8	50	74	85

It can be seen from the table that a sophisticated stud partition (consisting of two double layers of Gypsum board fastened to a specially flexible steel channel stud system with fibreglass absorption in the cavity - Ref.1.) costs a total of £8/m^2 which is slightly less than the cost of the 9" brick wall. The basic cost is slightly more but it has been offset by the lower costs of carrying the weight and providing the floor space.

In addition to the costs of the various walls, it is of course, necessary to know their performances in order to choose between them. The table, therefore, also gives an indication of the acoustic performance of each type. Firstly, there is the average sound attenuation over the octaves between 100 - 3150 Hz, secondly there is the speech privacy number which represents the success of the walls in attenuating speeds (Ref.1.) and thirdly there is an estimate of the percentage of people who are likely to be satisfied by the performance of the wall in a typical situation.

Equally one could consider the cost and performance of various materials in absorbing sound as opposed to attenuating it (Ref.2.). Also where, in order to achieve the desired amount of reduction it is possible to use a combination of absorption and attenuating materials, there will be an optimum balance between the amounts of both. This optimum will depend not only on the acoustic performance of the two types of material but also on their costs. It will be a question of minimising the combined cost of the two types of material.

It might now appear that we have exhausted the discussion of how to select material. However, it has been assumed so far that we know what noise reduction is required. We are assuming that there is either a specification or that somebody has said that this is the level to which we must reduce the noise.

How is this sound level decided?

Fig.1. indicates various methods of doing this using the party wall between homes as an example. The abscissa is the percentage of people who are satisfied with the situation. The ordinate represents the cost of the noise reduction treatment, or alternatively represents the change in value of a house.

The chain dotted line represents the loss of value due to the fact that a number of people are not satisfied. For example in the situation where 90% of the people are satisfied, then the residual loss is small and is only £10/house compared to the perfect house. At the other end of the scale where only 10% of the people are satisfied then the loss of value is correspondingly much greater at £400 (see Ref.3.).

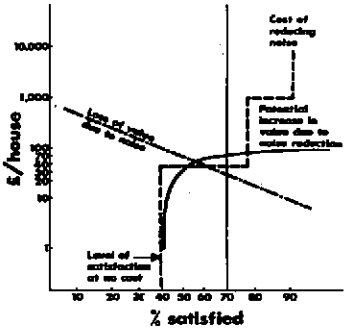

Fig.1. Methods of Choosing Materials

The datum is the cheapest party wall which satisfies all non-acoustic considerations and incidentally it may satisfy 40% of the people with regard to noise. This 40% satisfaction is achieved at no cost attributable to acoustic requirements and the full line then represents the benefit which will subsequently be derived from improving the noise reduction. The maximum benefit that can be obtained is about £100 which was the loss appropriate to 40% satisfaction. It can be seen that most of this loss of £100 can be eliminated if the satisfaction can be increased to 80% and that there is little further benefit from satisfying the remaining 10 or 20%.

The dashed line represents the cost of alternative party walls. The second cheapest party wall may achieve 75% satisfaction and cost £40/home more. Beyond this the next alternative may cost £1,000 more.

Thus the second cheapest wall obtains an improvement of £80 at the cost of about £40 and would therefore be generally considered worthwhile. This is analogous to the situation where

the 11" cavity wall is generally preferred to the $4\frac{1}{2}$" brick wall as a party wall (Ref.4.).

This approach may seem both rational and at the same time unfamiliar. It conflicts, of course, with the general way of doing things, which involves producing a Code of Practice. This divides the area of the Figure into two. The left-hand shaded area represents an unacceptable standard and the area to the right represents what is acceptable. Thus a wall is required to have a performance in the right-hand region regardless of cost. Further, a wall achieving 90% satisfaction is of no greater value than one achieving 70%. This is a common difficulty with Standards and Regulations namely that they miss the opportunity to provide an incentive for improvements on the minimum standard.

References

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