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ACCURACY OF AIRBORNE SOUND INSULATION MEASUREMENTS RELATING TO THE BUILDING REGULATIONS

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INTRODUCTION

An investigation of the performance of party walls and floors was instigated in response to the rising concern felt by a number of Local Authority Environmental Health Departments. This is illustrated by their Institution Report (1) which noted the increase in noise complaint attributed to domestic sources. The Building Research Establishment (BRE) has monitored performance standards of party floors and walls constructed from the early fifties to date and clearly document the falling standards over this period. For example, "... levels of performance achieved by solid brick walls in the 1970s appear to be significantly lower than those achieved by similar walls in the years 1948-1956" (2). An expected improvement by introducing cavity walls also failed to materialise "...performance of recent cavity brick walls is inferior to that of recent solid walls" (3).

If local authorities were to undertake performance testing it would be expensive to test all properties so this study attempts to determine the smallest sample size required to predict the mean performance of a large group with reasonable certainty.

FIELD MEASUREMENTS

Nineteen houses were available for testing on a newly constructed council development in the south of England consisting of fifty four units. Measurements were carried out as specified by the British Standard (4) and the recommendations by Fothergill (5). The results were processed to comply with the current method of rating of airborne sound insulation (6) and the current Building Regulations (7) (8) which require the weighted standardised level difference, $D_{nT,w}$ to be determined if performance testing is used. The party walls consisted of two 100 mm concrete blocks separated by a 75 mm cavity, with a rendered and plastered finish. Photographic evidence of the level of workmanship during building was obtained. The results (9) show considerable scatter, figure 1, there being a wide difference between the best and worst result, figure 2. The standard deviation is such that the performance of the whole estate could not be predicted with sufficient certainty with the sample size obtained (35% of dwellings). Using any four pairs, as apparently allowed by the Building Regulations, either pass or failure for the whole estate could be predicted depending on the particular choice of properties. Work published by BRE, for example (10) is also characterised by a large standard deviation, direct comparison is difficult as the method of rating used determined the aggregate adverse deviation (AAD) from a set standard. The paper concluded that reducing standards between 1950 and the 1970s produced a lower mean value as well as an increase in the already large value of the standard deviation. It was not possible to repeat or extend the council development results to eliminate possible measurement error but results were available from Bristol University (11) which used our equipment for investigating student accommodation. Twenty floors were tested and the results were well grouped, figures 1 and 3, with a standard deviation less than half that of the council development. The reprocessing of these measurements to comply with the current method of rating had the effect of changing the results from a majority failing, using AAD, to a majority passing, using DnT,w, the private dwellings regulations. Further results from Bristol University (11) figure 1, for a private development where the performance of the precast concrete floors was measured using their own equipment, similarly exhibits a small scatter and again the change of the performance standard in the new regulations allowed the pass rate to increase from 15% using AAD to 100% using DnT,w. Measurement (12) obtained for wooden floors prior to flat conversion is shown in figure 1 for comparison with modern precast concrete floors. The high quality work of hospital construction is well known so as a further measurement consistency check, measurements were carried out on thirteen single 100 mm block partition walls in a newly completed hospital. These results, figures 1 and 4, are closely bunched thus confirming our experimental techniques. It is interesting to note that three of these single block walls out performed two examples of the cavity walls tested.

CONCLUSION

There is a strong case for improving the performance of party walls and floors, for example the work by BRE (13). However the means of achieving this objective is not clear. The Local Authorities (14) and the National Society for Clean Air (15) are endeavouring to apply performance standards for housing conversions using existing planning law with some success. At least for housing conversions the architects appear to be aware of the problem (16). For new dwellings there is sufficient publish data to clearly illustrate the falling values of mean performance which coupled with an increasing variance in large estates, heralds a further era of poor quality housing. The authors hope to quantify "poor workanship" using intensity measurements but to become involved with the building contractor instead of the customer, thus, perhaps reducing the variance of performance and add some measure of quality assurance to completed dwellings.

From our limited results it appears that the new method of performance testing is more generous to the building industry and does not sufficiently recognise the variance in the performance of structures currently being produced.

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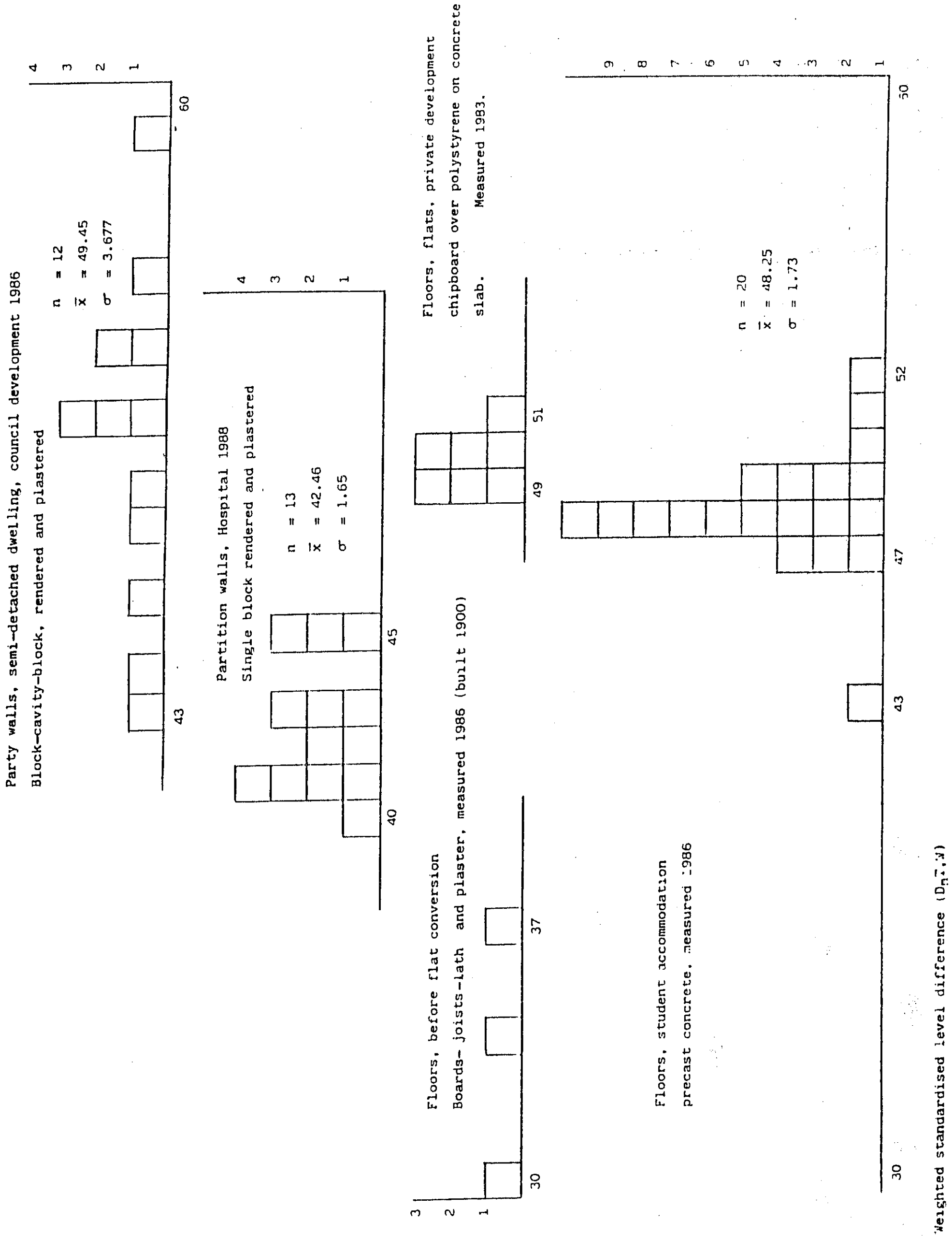

Figure 1 Airborne sound insulation, walls and floors

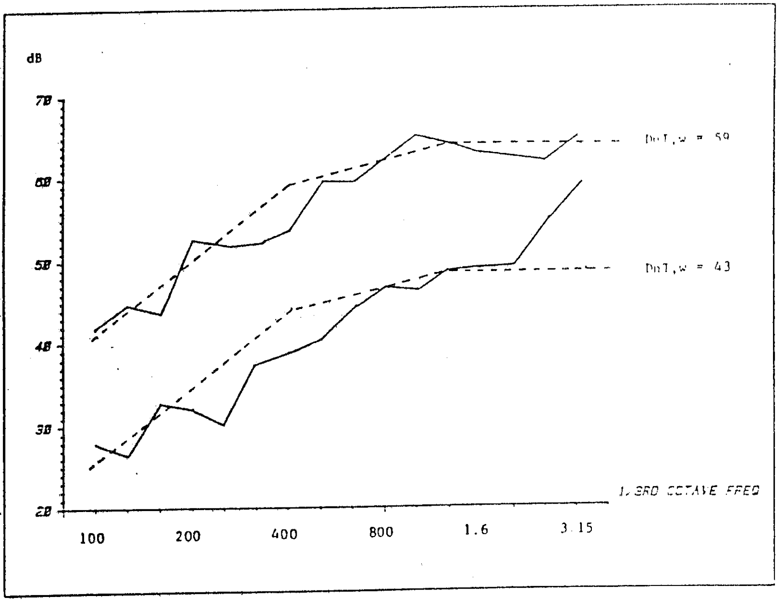

Figure 2 Measured best and worst - Council development (walls)

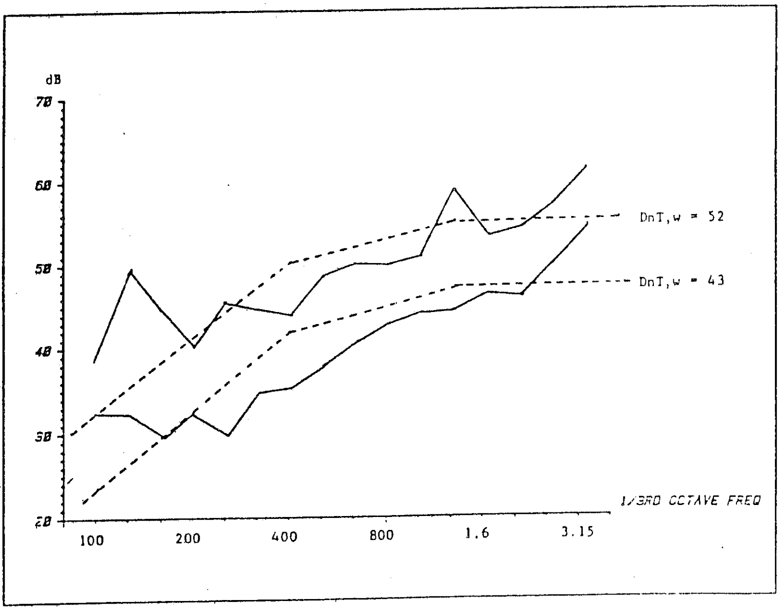

Figure 3 Measured best and worst - Student accommodation (floors)

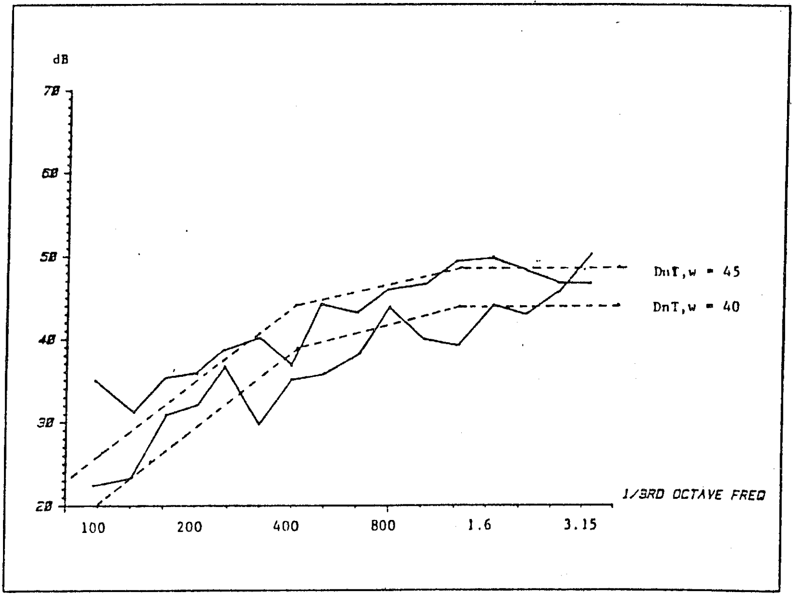

Figure 4. Measured best and worst - Hospital (walls)