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REMEDIAL MEASURES FOR TIMBER JOIST FLOORS

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INTRODUCTION

The BRE Advisory Service receives many complaints about sound insulation from people who live in flats. The majority of these complaints are made by the occupants of 'conversions' ie those dwellings that have either been formed into flats by refurbising 'older' housing stock or utilising large warehouses and factory buildings of steel and masonry construction by forming them into flats or maisonettes. However, complaints are also received from the occupants of flats that have been purpose built and have constructions that would be acceptable for Building Regulations approval.

In refurbishments the reason for complaints is mostly due to the poor sound insulation performance of the floor construction but is sometimes attributable to the character of the measured insulation even when a 'reasonable' rating is recorded.

It is not the intention for this presentation to produce any new revelations, but it will I hope serve to remind us all how very easy it is for complaints to arise if we only concern ourselves with the economics of the situation, witout paying attention to detail, and also even when a single figure index appears acceptable, how some activities especially with regard to impact noise give rise to complaints.

IMPRESSIONS

Although the complaints about noise vary in intensity, there is a common misunderstanding about remedial measures, because people still expect that there is a simple solution, which uses one-material or infill that will produce an improvement in sound insulation performance to 'eliminate' their neighbours noise. They are then very surprised when the various ways of obtaining a significant increase in sound insulation are described to them. There are always those who are particularly bothered by even the most muted sounds from neighbouring flats, but I think that a considerable number of flat dwellers have to tolerate very unsatisfactory levels of intrusive noise.

MONITORING

Unfortunately the number of examples in occupied flats that are monitored and measured are limited and the four examples I can show you today are for a small number of constructions. However, it is fair to say that in many flats the sound insulation is poor, because the construction will not meet a good performance standard, and it is often cost that architects/builders and developers use as a reason for not choosing a floor with the correct detailing. It is also true, that some floors that should give a good performance don't do so because they are not built properly or are adverse affected by the flanking construction.

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The examples chosen show how difficult it is even with good detailing, to achieve worthwhile improvements or change the shape of the measured performance curve. A survey carried out by the LSG in 19 (2) showed in fact that most flat dwellers would certainly be willing to pay for a construction that would really provide sound insulation against all but the minor intrusive sounds.

IMPROVING FLOATING FLOOR TO TIMBER FRAMED HOUSES

The following slides illustrate my first example. A modern terraced timber frame house. The house construction was brick clad and the separating floors were a timber and plasterboard raft and battens on a floating layer of paper faced mineral fibre 25 mm thick. The measurements were made between two similar flats, on the lounge floor,with the upper flat unfurnished.The first slide (fig.1) shows an unmodified floor of an unfurnished lounge giving an impact index of L_{nTw} = 59. The next slide(fig.2) shows a measurement on the same lounge floor which was modified using a single hardboard layer, felt and a laminate isolating material gibing L_{nTw} =62. Comparing them, we see that the improvement above 250 Hz was quite dramatic, but at low frequency the performance was worse. The next slide(fig.3) shows the airborne measurement D_{nTw} = 55 for the the original floor and then the next (fig.4)shows D_{nTw} =52 for the modified one.If we compare them, we see that there is some improvement between 315 and 630 but at both lower and higher frequencies the modified floor performed less well.

The original complaint was about a child running and jumping on the separating floor, and this complaint continued after modifications. The lower floor occupants were an older couple who were reasonably active but found the constant activity above too annoying. There were several houses of this type where complaints were received about noise, particularly about impact noise and noise from vacuum cleaners and washing machines for dishes and clothes. The next two slides show again that the measured index value should have proved satisfactory, this being a measurement on a similar floor, to the previous slides, but when comparing its performance it is worse than the original floor conditions for the previous example.

In both these cases the house type was timber framed, and any other means of improvement other than to the floating floor were not practicable,because of ceiling heights,and disturbance factors.

The partitions were also set on the floating floor, perhaps overloading the isolating quilt, which in any case was a low density fibre material. The final decision by the LA in this case was not to make further improvements or even try a suggested pilot scheme as this was too costly.

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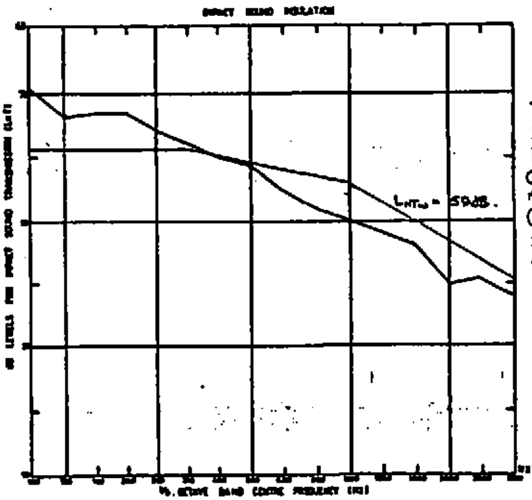
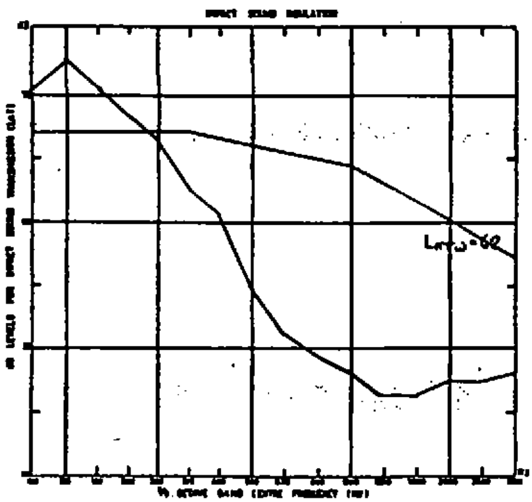


Timber Frame Construction
Floor:- Floating Chipboard layer, 19mm Plasterboard (Plank) on a 25mm resilient quilt, paper faced

fig. 1.



Timber Frame Construction
[illegible] slide but with hardboard, felt and isolating laminate [illegible] added.

fig. 2.

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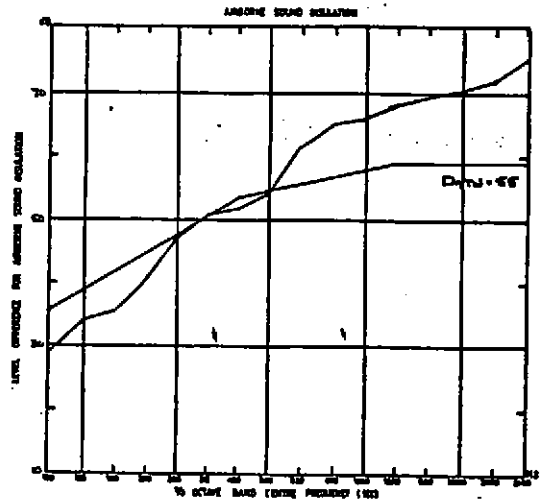
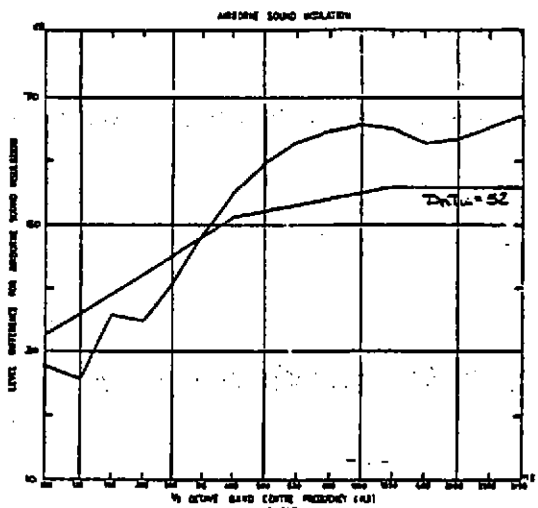


Timber Frame Construction. Floor: Floating Chipboard Layer 18mm Plstbd. (Plank) on 25 mm fibre quilt. paper faced.

fig. 3.



As previous slide but with bond felt and rubbing laminate layer added.

fig. 4

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INDEPENDENT CEILINGS

The next slides show the before and after for a 'Duplex' type flat, which is a 'house' type construction, either terraced or semi detached, which,post World War II was adapted to form two flats, sometimes with side entrances and outside stairs and sometimes with a front door to upstairs and side entrance downstairs. Thefirst measurements were made on the original floor, which was similar to any internal wood joist floor construction of the time. This showed(fig.5), as expected, that the performance index was very low. An independent ceiling construction was added, with minimum joist depth 125 mm and only just clear of the existing ceiling, the absorbent quilt was placed between the new ceiling joists. It can be seen(fig.6)that the improvement in airborne sound insulation was good, but lower than hoped for because of various flanking paths. The impact performance was however much enhanced(fig.7&8)and with a L_{nTw} =58 gave a very worthwhile improvement. Both performance curves showed the best improvements at frequencies below 250 Hz.

FLOATING FLOOR IMPROVEMENTS IN CONVERSIONS

In this example, the builder nailed through battens of a floating floor construction fixing it to the floor joists. The lounge floors in these rooms were of very large dimensions and the effect was horrendous, but because of furniture problems,measurements(figs.9&11),were only possible in the small kitchen areas. The results were therefore favourable to the 'nailed' condition, but when the nails were removed the improvements(figs.10&12) were disappointing partly because 'spiking' was used to locate the battens and also because the mass of the floor was not high enough.

COMMENTS

The main point of these examples was to indicate how a deficiency in low frequency insulation can cause severe complaints, particularly with regard to the noise generated by music reproduction, rotating machines and the impact sound of childrens feet. It is also true that more people are living in flats, particularly conversions, and therefore we should do more to improve sound insulation at this end of the frequency range. My first two examples showed how difficult it was to improve performance if the isolation of the floating floor was not good, even if the mass of the floor was adequate. The independent ceiling provides good isolation, but its performance is often limited by flanking transmission down walls. If we want to improve flanking transmission either in conversion or new build,it must be done at the design stage and those resposible for approving and designing have to be made more aware of the problems.It is toolate to think of the means when the rooms are already built. No occupier wants to have his already minimal size room dimensions reduced by an independent leaf on either ceiling or floor.

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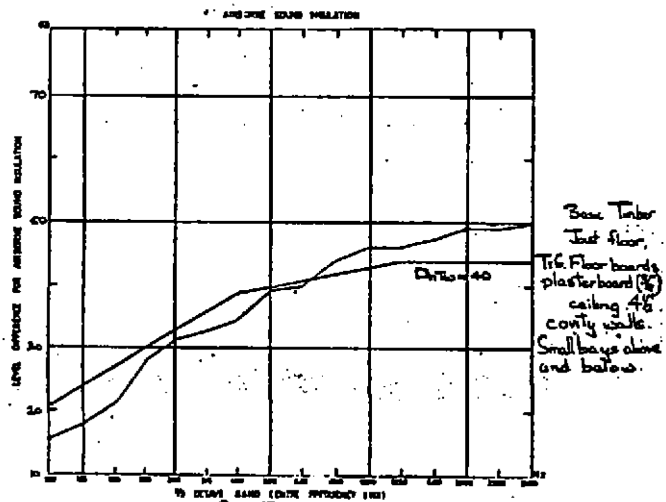

fig 5.

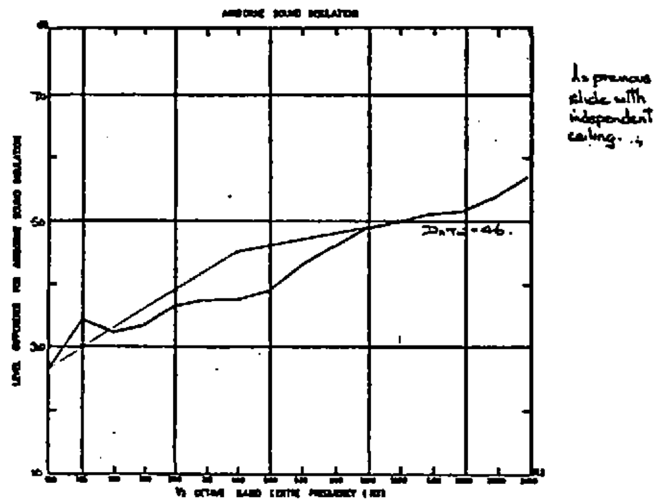

fig. 6

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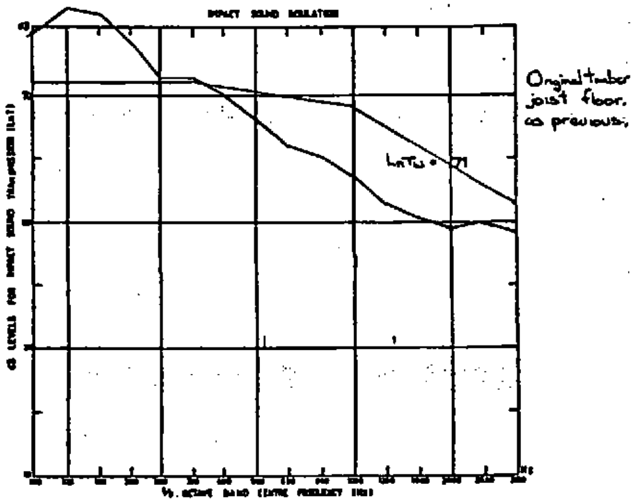

Fig. 7.

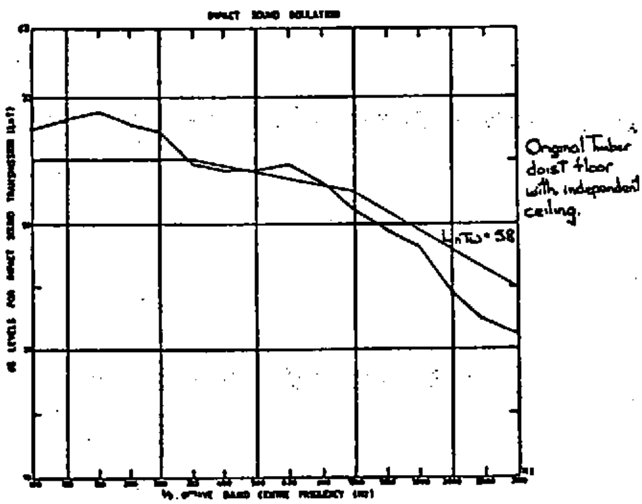

fig. 8.

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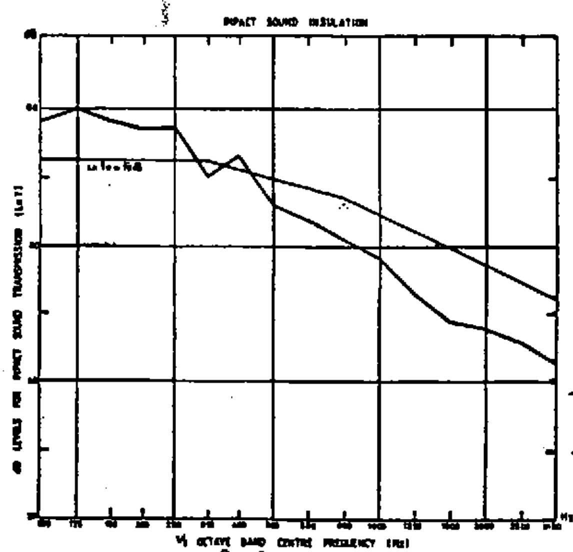
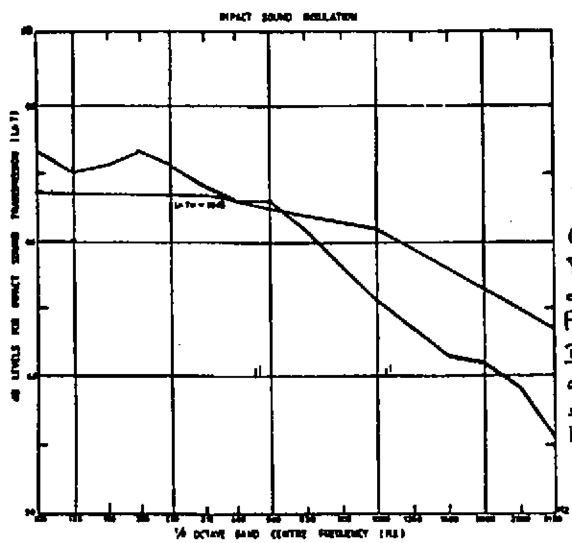


Heavy Masonry. Conversion to Floating Floor on Rubber or Polypropylene. Battens 'NAILED' through to joists by 4" nails.

fig 9.



Heavy masonry: Conversion to Floating Floor on Rubber or Polypropylene Battens located along joist by spikes in oversize holes.

fg 10

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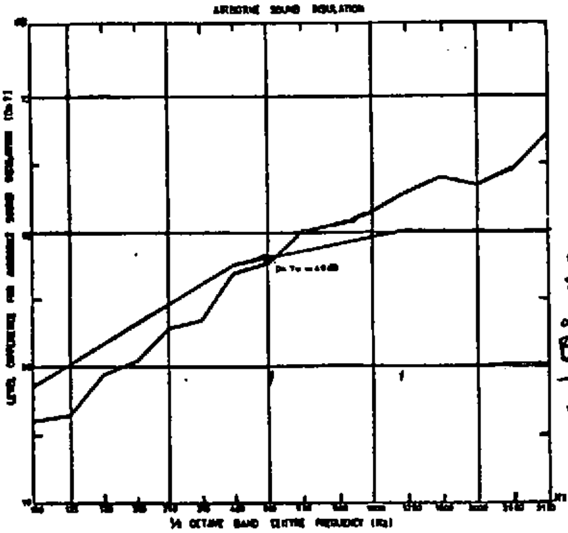
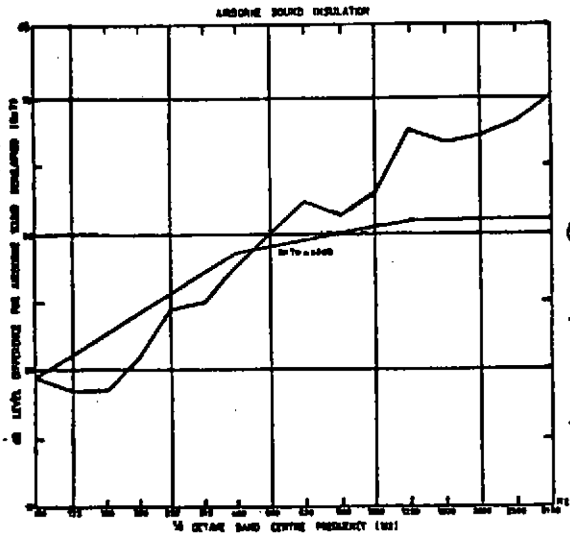


Heavy masonry: Conversion to Floor Floating on Rubber or Polypropylene. Battens NAILED through to joists by 4" nails.

fig 11



Heavy masonry: Conversion to Floating Floor on Rubber or Polypropylene Battens located along joists by spikes in oversize holes.

fig 12.

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In new build this could become a worse problem if lightweight inner leaf blockwork is used to meet new Building Regulation requirements especially the gable end wall of flats. Finally, in heavy masonry buildings we can show that excellent standards of sound insulation can be obtained but all of this is to no avail if the builder puts 100 mm nails through the floor boards!

It would appear that more thought in design is required and better information about isolating materials. Also the old adage 'attention to detail' which is important both to design and installation on site is often found wanted both in the design and on site.