Proceedings of The Institute of Acoustics

SOUND INSULATION OF FLOORS IN CONVERSIONS

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INTRODUCTION

The problem of providing adequate sound insulation between dwellings within converted properties is discussed. In particular, methods of improving the sound insulation provided by the party floors are considered, together with the problems of encouraging developers to implement these methods.

BACKGROUND

As a means of upgrading inner city areas without the upheaval of demolition and re-building, the conversion of Victorian houses into multi-dwelling units has been encouraged by recent Government Housing Acts. Although the Acts lay down minimum standards for these conversions, there is no mention of sound insulation[1]. In addition, although the Building Regulations 1976 Part G[2] state that party floors should provide 'adequate' sound insulation, this part does not apply to conversions.
The existing floors between each storey of almost all converted houses are of the simple timber-joist construction shown in Fig.1. This construction forms a perfectly satisfactory partition between, say, a bedroom and a living-room of a house that is occupied by one family. However, after conversion, this floor often becomes a party floor separating two independent households and it is therefore desirable that it should provide 'adequate' sound insulation. Unfortunately, its sound insulation may fall well short of the standards in the Building Regulations and is often far from 'adequate'.

MAIN METHODS OF IMPROVING THE SOUND INSULATION

In general, there are two designs involving a timber joist floor that should meet the standards of the Regulations, and these are shown in Figs.2a and 2b. One consists of a floating floor with sand pugging (Fig.2a) and the other uses an independent false ceiling (Fig.2b). The floating floor design is the 'Deemed to Satisfy' construction quoted in Schedule 12 to the Regulations. The use of an independent false ceiling has been found to provide 'adequate' sound insulation in laboratory tests and in some field experiments and is a solution recommended by the Building Research Establishment[3].It is not however a straight-forward matter to incorporate either of these designs in a conversion. In almost all situations the condition of the existing floor is such that it is possible and consequently desirable to retain the joists and floor boards. However, the increase in floor mass resulting from using the sand pugging in the floating floor design would almost certainly be too great for the existing joists to support. While there is not a mass problem with the false ceiling design, installing a second set of joists also may not be possible due either to the limited room height available or due to the planning restrictions applying to the building.

ALTERNATIVE METHODS

The basic alternative design that has been investigated is shown in Fig.3. It consists of a floating floor with the top surface isolated from the existing floor by a resilient (elastic) layer. Initially, rebated hardboard on either cork granule paper or a rubber underlay were used, with subsequent tests being carried out on various combinations of materials including chipboard floating on fibre insulating board. The ideal combination consists of a top surface which is as heavy as possible, but such that the elastic layer retains its resilience when under load. Although this type of treatment would mean that the existing floor height is increased, most combinations of these materials can keep this increase to around 30mm and such a small increase would be allowable in most rooms. The floating element of the design shown in Fig.2a, however, would not be suitable as the increase in floor height is over 50mm.

HOW THESE METHODS CAN BE IMPLEMENTED

Having established that,despite the various difficulties that can arise, it is almost always possible to provide some treatment to improve the sound insulation , there is the question of ensuring that it is carried out. Local Authorities can exercise control over their own housing stock and insist that something is done and, for example, the Boroughs of Camden and Southwark together with the GLC do so. In the private sector there is virtually no control and consequently very rarely is any sound insulation treatment installed. The London Borough of Southwark, however, have found a way to exercise some control. It was realised that some of the complaints received by the Environmental Health Department about noise in conversions were not to do with anti-social behaviour but with poor sound insulation. Consequently, initial attempts were made at the planning stage to influence the stacking of rooms (i.e. avoiding living rooms over bedrooms etc) .

From a survey of the other London Boroughs it was found that not a great deal was being done elsewhere to impose conditions. Nevertheless, Southwark decided that for 'incorrectly' stacked conversions, sound insulation should be provided, aiming at the old Grade 2 standard. Work carried out in some of Southwark's own properties then showed that even with 'correctly' stacked rooms the insulation was poor, so that the planning condition was extended to all rooms. Subsequently, after successful tests on independent ceilings Southwark Council decided in February 1983 that the performance standard of the Building Regulations should be achieved between all units, and that is their current policy.

RESULTS

Table 1 gives the results(in terms of AAD) of various treatments measured. Most are single measurements, but some are the average result of more than one floor at the same development. Figs 4 & 5 show the improvement achieved (both airborne & impact) for one type of treatment.

POINTS OF DETAIL

In addition to the conclusions that can be drawn from the results regarding the treatments that give the best performance, it seems also that care should be taken over the following points of detail to ensure the best possible result:

1.Ensure that the top surface of the floating floor is not rigidly attached to the resilient layer.
2.Fix quadrant beading around the floor edge to seal any gaps.
3.Fix coving around the ceiling edges to seal any gaps.
4.Doors to common areas should be heavy and seal well when shut.
5.Treat all the floor area, removing fitted units if possible. Otherwise, treat the floor up to the units and fill any holes in the floor within the units.
6.Fill any gaps around pipework that passes through the floor with tightly packed mineral wool or a 'wet' filler.
7.Where services are in ducts, ensure treatment extends through duct, and clad duct with a layer of plasterboard.
8.On landing areas where the floor treatment cannot be used, fix a layer of hardboard to seal any gaps and use a rubber underlay in addition to carpet.
9.Leave the existing ceiling in place when fitting an independent ceiling.

COST

At 1983 prices, a chipboard on fibreboard floating floor costs approximately £20/m^2. An independent ceiling costs approximately £30/m^2.

CONCLUSIONS

1. It is possible to achieve a good standard of sound insulation in converted dwellings almost regardless of the various restrictions there may be such as: the state of the existing floor; the planning constraints; the available space and cost.
2. If there are no restrictions, the combination of a floating floor (eg. chipboard on fibreboard) and an independent ceiling is likely to meet the performance standard of the Building Regulations.
3. Care over details is needed to achieve the best possible result.

REFERENCES

1. HMSO 1974 - The Housing Act.
2 HMSO 1976 - The Building Regulations
3. W.A. UTLEY 1979 Applied Acoustics(12)(1979). Methods of improving the sound insulation of existing simple wood-joist floors.

ACKNOWLEDGEMENTS

The authors wish to thank both the Head of Scientific Services of the Greater London Council and the Head of Environmental Health Services of the London Borough of Southwark for their permission to publish this work. The views expressed here are those of the authors and not necessarily those of either the GLC or London Borough of Southwark.

TREATMENT	AIRBORNE AAD (dB)	IMPACT AAD (dB)
None - Simple TJ Floor (No Carpet)	259	180
None - Simple TJ Floor (Carpet)	189	69
Foam Backed Vinyl Only (Average of 3)	116	137
Hardboard on Cork Granule Paper(No Carpet)(Avg of 4)	45	66
Hardboard on Cork Granule Paper(No Carpet)(Best Result)	17	18
Hardboard on Rubber Underlay(No Carpet)(Average of 4)	90	72
Hardboard on Rubber Underlay(No Carpet)(Best Result)	61	41
Chipboard on Fibreboard(No Carpet)(Best Result)	40	34
Chipboard on Fibreboard(No Carpet)(Worst Result)	85	107
Chipboard glued to Fibreboard(No Carpet)	77	110
Blockboard slightly nailed to Fibreboard(No Carpet)	96	151
Chipboard screwed down on Felt(No Carpet)	129	126
Constrained damping layer(No carpet)	175	89
Chipboard on 50mm quilt on existing floor(No Carpet)	44	25
Chipboard on Battens on Quilt laid over joists(No Carpet)	16	25
As above plus ceiling on resilient hangers on joists	14	22
Independent Ceiling,existing ceiling removed(Carpet)	72	1
Independent Ceiling with 1 layer of Plasterboard(Carpet)	32	8
Ind.Ceiling with 2 layers of Plasterboard(Carpet)	19	4
Chipboard on Fibreboard plus Ind. Ceiling(No Carpet)	12	21

TABLE 1 - RESULTS FOR VARIOUS FLOOR TREATMENTS

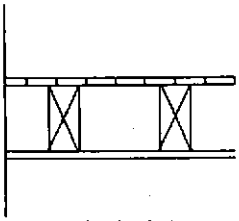


Fig 1 - Simple Timber Joist Floor

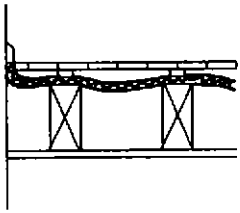


Fig 2a - "Deemed to Satisfy" construction from Building Regs.

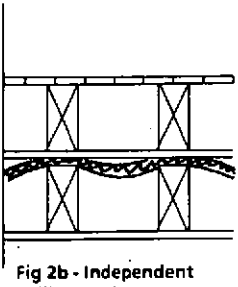


Fig 2b - Independent Ceiling Design

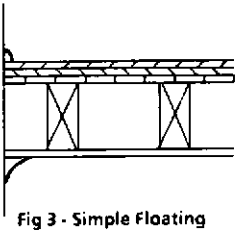
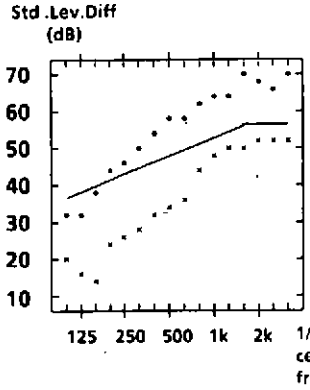
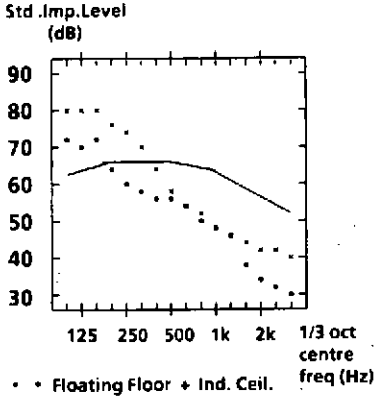


Fig 3 - Simple Floating Floor Design





Figs 4 & 5: Airborne & Impact Results