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CONTROL OF SOUND INSULATION IN "CHANGE OF USE" SITUATIONS AFFECTING HOUSES OR FLATS

S. Maslivec, Environmental Health Officer

Bolton Metropolitan Borough Council

1. INTRODUCTION

In recent years the demand for small housing units has increased, and this is being met in part by the conversion and subdivision of older properties into a number of self-contained flats. On conversion, it is common for walls and floors, which once separated rooms in houses initially built for single occupancy, to become separating structures between the newly formed dwellings. Often, these structures fall short of the sound insulation provisions of the current Building Regulations resulting in an increase in the likelihood of annoyance due to noise between households. The problem is further compounded by the fact that the sound insulation provisions of the Regulations do not apply to conversions, and frequently there is incompatibility of room layout e.g. noise sensitive rooms, such as the bedroom of one dwelling sharing a wall or floor with a noise producing room of an adjacent dwelling, e.g. livingroom or kitchen.

In Bolton, planning applications have been submitted to convert "two-up-two-down" mid terraced property into two self contained flats, usually with normal dwelling houses either side. Ensuring room compatibility both vertically within the flat and horizontally with the house next door is virtually impossible.

The Environmental Health profession is concerned with the protection of the environment of residents where conversions take place, and a degree of control may be exercised by the District Planning Authority when determining planning applications for conversions. Satisfactory room arrangement can be taken into account, and in some cases a sound insulation improvement scheme may be necessary. As for the mid-terrace conversion, a recommendation for the refusal of planning permission is the only solution.

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Two methods of sound insulation often suggested in Bolton, and also by the policy document of the Manchester Area Council for Clean Air and Noise Control (1), are based on the advice of the Building Research Establishment in respect of the wall-lining method (2) and the independent ceiling for floors (3). Field tests of both methods are described in this paper.

This paper, then, attempts to identify, quantify and suggest controls for the problems of unwanted airborne sound transmission between flats in houses which have undergone conversion, and similarly between flats and adjacent dwelling houses.

2. PLANNING AIMS

The Planning process is a suitable approach to preventative action in respect of noise annoyance arising from flat conversions. This approach has been upheld in a recent High Court appeal decision (4). In this context the aims of planning are:

(a) to protect existing neighbours

- noise transmission will usually be via a party wall or floor and a good arrangement of rooms is essential to achieve compatibility of room uses. There will be cases when acceptable room arrangement cannot be achieved by design alone, but upgrading the party wall or floor by an independent leaf may offer an improvement in sound insulation.

(b) to protect new flat residents against noise from other flats

- again satisfactory room arrangement is essential. Floors should provide an effective division between flats, and if necessary, improved so as to minimise sound transmission through and along the floor. In the case of new party walls between flats, the aim should be to provide a wall that would meet the Building Regulations if they were to apply.

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3. PRACTICABLE METHODS FOR IMPROVING SOUND INSULATION

Two methods often suggested in Bolton for improving the sound insulation qualities of walls and floors, respectively, are:-

(i) wall-lining - consists of an independent wall on its own frame (27kg/m^2 approx) isolated from the present wall by as wide a cavity as possible. A glass fibre quilt is hung in the cavity using a fixing batten along the top.

(ii) Secondary-ceiling - consists of a ceiling (27kg/m^2 approx) carried on its own set of joists and spaced as far below the existing ceiling as possible, with an acoustically absorbent quilt placed in between. The quilt must not be compressed between the existing floor and the new joists to avoid a sound transmission path.

4. CASE STUDIES

Sound insulation measurements of a suspended timber floor and a brick party wall 'before' and 'after' modification were taken using a Bruel and Kjaer Building Acoustics Analyzer (Type 4418) in accordance with B.S. 2750 : Part 4 : 1980 (5). The Standardized Level Difference (D_{nT}) was found for each of the third octave bands in the range 100Hz to 3150Hz, together with the Weighted Standardized Level Difference (D_{nTW}) (6).

Case 1 - independent ceiling

The existing floor between two newly created flats consisted of standard 225mm joists, 13mm plaster lath ceiling below with ornate plaster covings around the edges and butt jointed floor boards above.

The new ceiling rested on 50mm x 75mm joists with a single 12mm leaf of plaster board nailed to the joists with 100mm mineral wool blanket between. At the time of the 'after' measurements the new ceiling was incomplete requiring a further plasterboard leaf, plaster skim and sealing at the edges.

Results (see fig.1) - for the ceiling an improvement is seen at all frequencies from 315Hz with the exception of the ⅓ octave at 3150Hz, this probably being due to the coincidence dip. The second layer of plasterboard may have a beneficial effect in this respect. If the poor performance between 160Hz and 250Hz is due to mass-spring-mass resonance it should move to a lower frequency when the second layer of plasterboard is added.

Case 2 - wall lining

Upgrading of a party wall between the livingroom of a flat and the bedroom of an adjacent dwelling house consisted of an independent 100mm x 50mm timber frame supporting two layers of 19mm plasterboard with a 25mm acoustic mat hung in the cavity. The gap from the back of the plasterboard to the wall was 75mm, and a plaster skim and edge sealing completed the work. The existing wall was of brick construction 220mm thick, plastered both sides and continuous to roof level. Floor joists ran parallel to the wall in both rooms.

Results (see fig.2) - a general improvement is seen at all frequencies except at 100Hz (lower) and at 160Hz (the same).

5. CONCLUSIONS

(i) The simple timber joist floor (untreated) provides an unsatisfactory separating element between two dwellings.

(ii) Upgrading the sound insulation qualities of existing party walls between rooms of incompatible use is necessary.

(iii) Two recommended party wall and party floor treatments have been tested and each method, acoustically at least, offers improvements which could meet or even exceed the Building Regulations standards.

(iv) The Planning Acts have an important role in preventing or reducing amenity loss due to noise, and their application to the "change of use" situations described is relevant and necessary.

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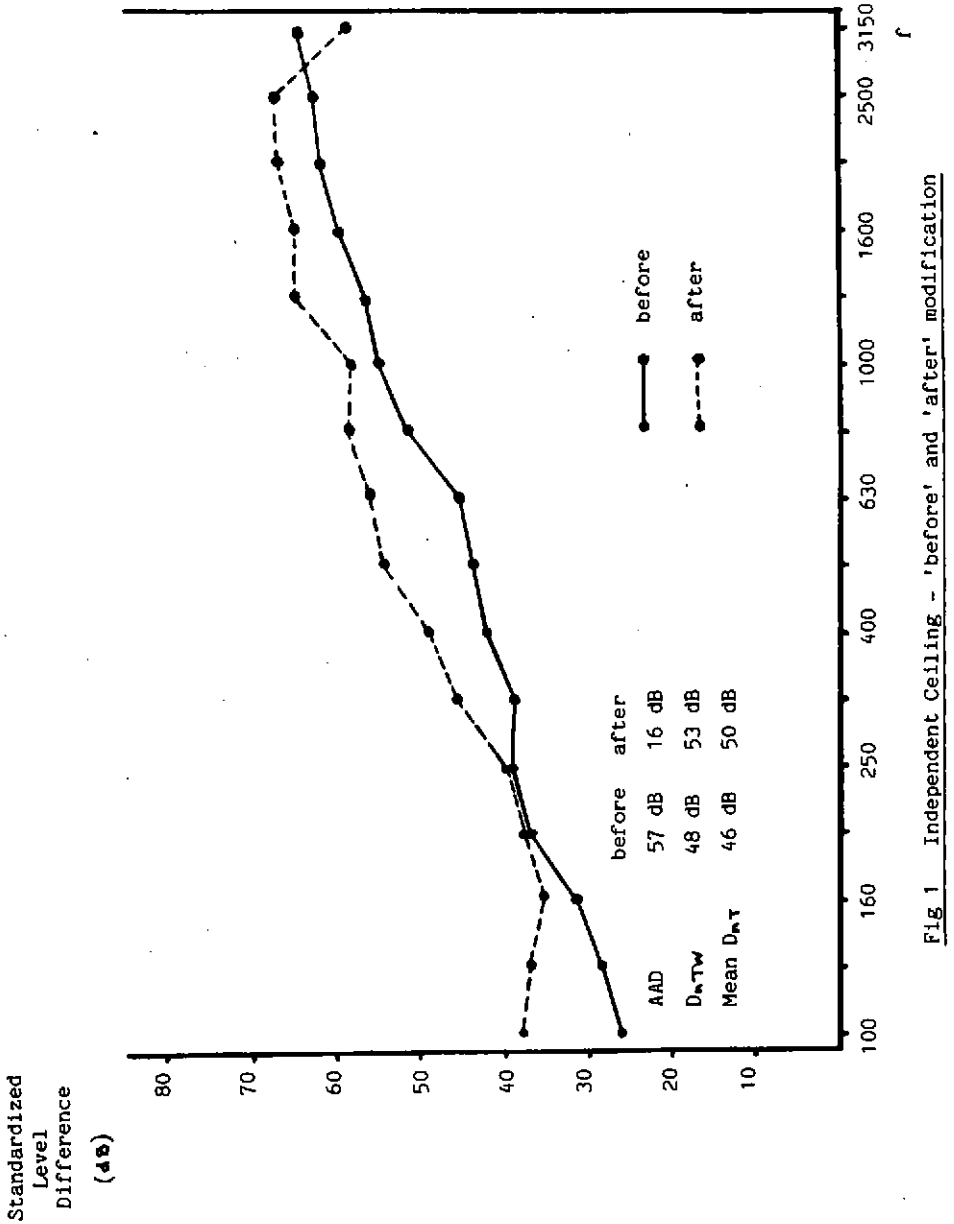

Fig 1 Independent Ceiling - 'before' and 'after' modification

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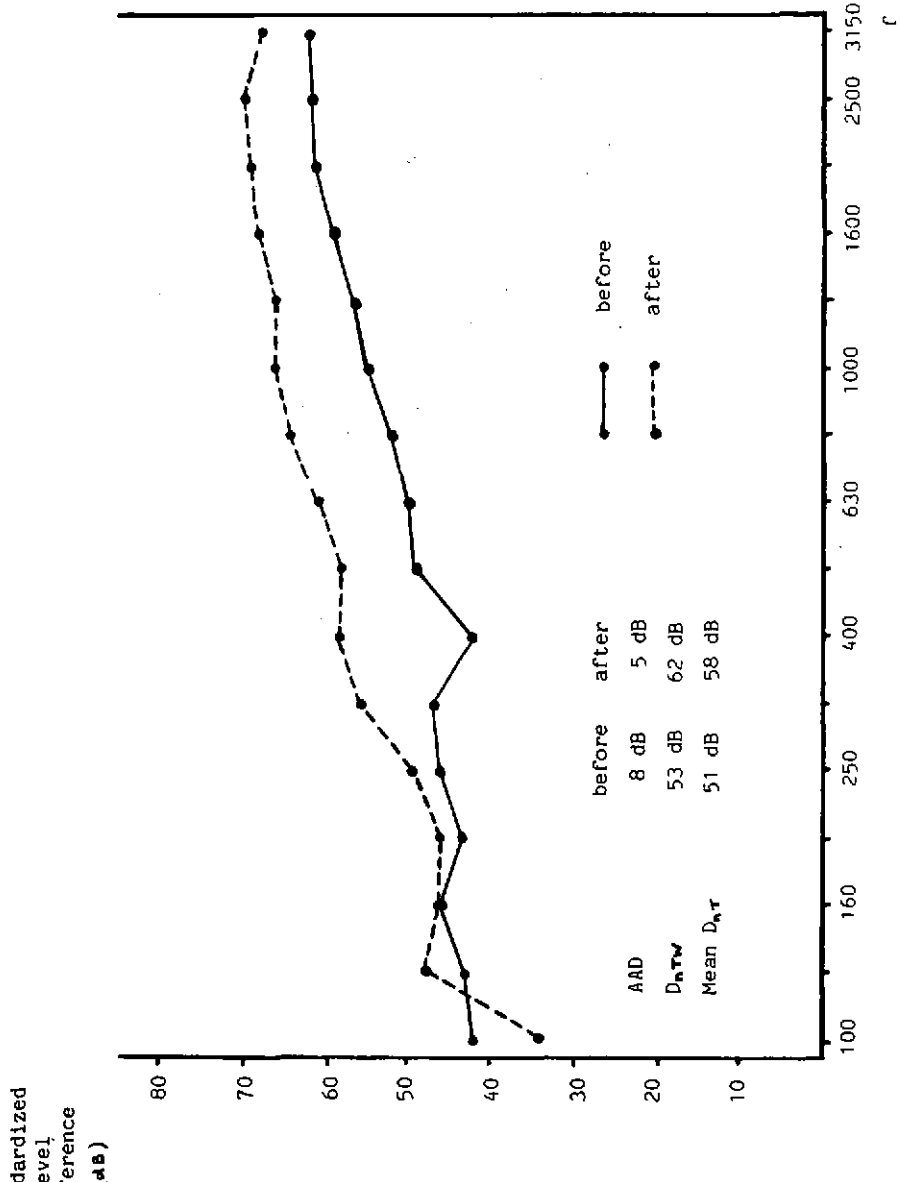

Fig 2 Wall Lining - 'before' and 'after' modification

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