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BROWNFIELD DEVELOPMENT – NOISE PROBLEMS ASSOCIATED WITH CONVERTING COMMERCIAL PREMISES TO RESIDENTIAL USE.

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1. INTRODUCTION

1.1. In London, as elsewhere, there is increasing demand for housing. To meet this demand and encourage urban renaissance, sustainable development and protect "green belt" or land needed for other economic development. The Government is encouraging the re-cycling of previously commercial or industrial brownfield land for residential use[1].

1.2. Concurrently, in many central London locations the growing vogue for urban lifestyles coupled with prevailing land and property value trends make re-development of previously commercial premises to residential use an attractive business proposition.

1.3. The conversion of commercial premises to residential use often takes place in formerly exclusively commercial locations where existing active businesses continue to operate and flourish.

1.4. In some cases new residential premises are being created as part of the same building containing existing commercial premises or immediately adjacent and structurally attached to existing commercial premises. These businesses can generate significant amounts of noise and operate during noise sensitive times for 24 hours, seven days a week.

1.5. This paper will concentrate on three cases that have arisen over the last 18 months. Whilst the case studies stress the noise problems which have arisen, they represent a small minority of such developments and rather than expressing general resistance in principle to such otherwise environmentally positive development. The case studies are intended to highlight potential problems that can be mitigated to make residential re-development of commercial premises viable and more sustainable. Also the paper will show that whilst the noise problems that amount to statutory nuisance can be addressed using the Environmental Protection Act 1990. The noise conflicts would have been better addressed at less cost, to possibly a more stringent standard, during the planning, design and construction phases of the residential re-development rather than retrospectively.

2. AIRBORNE NOISE FROM AIR HANDLING PLANT

2.1 On the city borders a quadrangle of existing office blocks encloses a courtyard. The ground floor of one side of the quadrangle was converted to a large public house in the early 1990s. This public houses has a music and dancing licence allowing it to operate past midnight Thursday, Friday and Saturday.

2.2 To provide adequate ventilation to the public house with the music and dancing licence, a substantial plant room had been created at the rear of the premises in the courtyard area. The plant room is packed with A/C plant and on the flat roof of the plant room several very large items of A/C plant had been installed. Noise levels from this plant 1 metre from the façade of the offices facing onto the courtyard were considerable with a noticeable tonal component in the 160Hz 1/3 Octave band, Chart 1 below details plant noise levels at the nearest façade.

However despite these noise levels the local authority received no complaints, presumably because of the relatively less noise sensitive commercial use of the surrounding offices and the fact that the A/C plant ran at maximum load and noise output at night when the neighbouring offices were not occupied.

2.3 However in the late 1990s a developer took the lease on one of the office blocks making up the quadrangle and applied for planning permission for change of use to more than 20 residential flats.

2.4 Because residential use is itself unlikely to generate significant noise, the Council's noise team were not consulted on the planning application. In addition, during a morning site visit when the A/C plant was not operating, the planning officer did not notice the noise from the A/C plant. Therefore the potential noise impact of the existing A/C plant on the proposed residential use of one of the nearby office blocks was not anticipated. Consequently the Council's planning committee were advised to approve the application and permission for change to residential use was granted without noise mitigation conditions.

2.5 The residential re-development of the offices went ahead and residents began moving in December 1999. Almost immediately the Council's Night Noise Patrol received complaints from the residents. Visits confirmed that noise from the air handling plant was causing statutory nuisance by preventing sleep in the bedrooms overlooking the courtyard and interfering with the ordinary use of some of the living rooms in the flats. Chart 1 below shows recorded noise levels at the facade of one of the complainant's bedrooms.

2.6 Having established a statutory nuisance the Council's normal procedure would be to first contact the company that owned and ran the public house to discuss the matter, followed by service of an abatement notice. However the case EHO was concerned that the local authority's enforcement powers may have been limited by the granting of planning permission for the residential development, contrary to PPG 24-paragraph 12[2], in a location where high noise levels would occur at night. Without the planning permission for the residential development being conditioned to require noise mitigation in the design and construction of the proposed flats so that internal noise levels would be acceptable.

2.7 The case EHO therefore sought legal advice, the results of which were as follows:

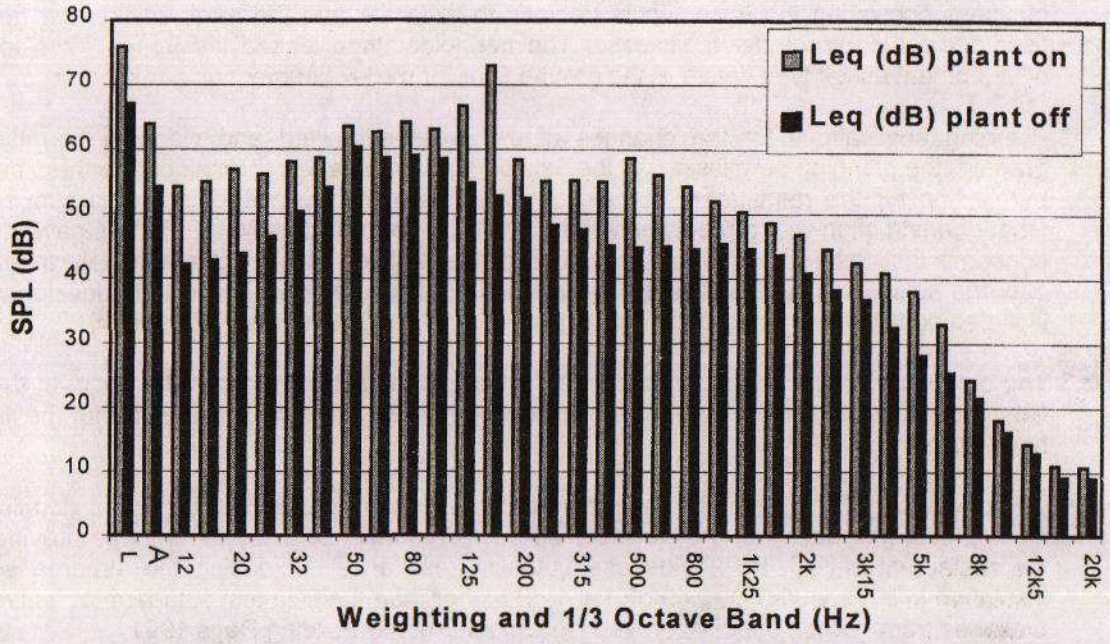
- Local Authorities have a statutory duty under section 80 (1) of the Environmental Protection Act 1990 to serve abatement notices when satisfied of the existence of statutory nuisance.

- The cases of Sturgess Vs Bridgeman, Miller Vs Jackson and Webster Vs Lord Advocate[3] all mean that the perpetrator of a nuisance has no defence to claim that the sufferer has moved to the nuisance.

- The hierarchy of law means that statutory law made by Parliament and case law made by judges in the higher courts out rank the Ministerial advice of PPG 24. Therefore even if the advice of PPG 24 appears not to have been followed, this does not militate against the local authority complying with its legal duties to seek abatement of statutory nuisances.

- Abatement notices should be served on the company that owned and ran the public house served by the air handling plant

Chart 1: Leq (5min) SPLs at the facade of flats overlooking the air handling plant, 23:00 to 24:00 hrs.



2.8 Subsequent to the legal advice the case EHO contacted the company that ran the public house and opened discussions, with a view to serving an abatement notice. As anticipated the company were not pleased to be held liable for a statutory nuisance they regarded as not of their making. However the company reluctantly but responsibly agreed to appoint acoustic consultants to deal with the matter. Joint site visits to complainant flats and the noise source were made by the case EHO and the acoustic consultants. Following these visits a provisional target plant noise rating level of 5 dB below the existing background 1/1 Octave band L_{90} SPL, 63 Hz to 8 kHz, 1 meter from the façade of the flats was agreed. Subsequently an abatement notice was served incorporating the target plant noise level.

2.9 Nursing an aggrieved sense of natural justice, the company that owned and ran the public house appealed the abatement notice. But continued to negotiate with the local authority, who agreed to the company's request to adjourn the appeal *sine die* and undertook not to enforce the abatement notice whilst *bona fide* attempts at complying with the abatement notice were explored.

2.10 In response to the abatement notice the consultants demonstrated that re-location of the plant or using it at reduced loading (and therefore lower noise output) were not viable options and produced a scheme of works to leave the plant *in situ* but reduce the noise affecting the nearby flats, as follows:

- Provision of an acoustic door set and seals to the plant room rear doorway.
- Acoustic enclosure of the open sided condenser plant on the roof.
- Provision of splitter attenuators to the kitchen ventilation inlet and outlet.
- Provision of plenum chambers to the condenser ventilation inlets and outlets.

2.11 This work has been agreed, has been given planning permission, partially completed and is due to be finished shortly.

3. AIRBORNE MUSIC AND CUSTOMER VOICES NOISE FROM A RESTAURANT BELOW FLATS

3.1 In the late 1990s the lease on an office building in the borough came up for renewal. The business occupying the upper floors decided to re-locate and the retail unit on the ground floor decided to surrender their lease. The freeholder then leased the upper floors for re-development as loft type flats and the ground floor for re-development as a restaurant.

3.2 Planning applications for the changes of use were submitted and planning permissions granted, the planning permission for the flats being granted a few months before the planning permission for the restaurant. The existing floor/ceilings in the building are of suspended timber construction with a predicted estimated D_{nTw} of approximately 46 dB. This gave rise to concerns that the existing sound insulation of the building would not adequately attenuate airborne noise from the restaurant. Therefore the planning permission for both developments included conditions to incorporate sound insulation to the Council's satisfaction.

3.3 The developer of the flats submitted details of sound insulation works to the floors in the loft flats, these sound insulation details have been approved, although it appears that the works have not been carried out.

3.4 The developer of the restaurant appears not to have submitted sound insulation details and no approval has been issued. However an additional layer of plasterboard was provided to the restaurant ceiling, to provide adequate fire resistance, increasing the airborne sound insulation to a measured D_{nTw} 49 dB i.e. 1 dB higher than the field test standard for converted premises from section 6.8 of Approved Document E of the Building Regs 1991.

3.5 Both developments went ahead, with the restaurant up and running before the flats above were completed and occupied. Within a short time of the flats being occupied in early 2000 the residents complained to the Council's Noise Patrol. Night time visits produced evidence that music noise and customers voices in the restaurant were clearly and persistently audible in the flats immediately above and statutory nuisance was established. The tune being played in the restaurant could be easily recognised and the gender of the customer voices differentiated.

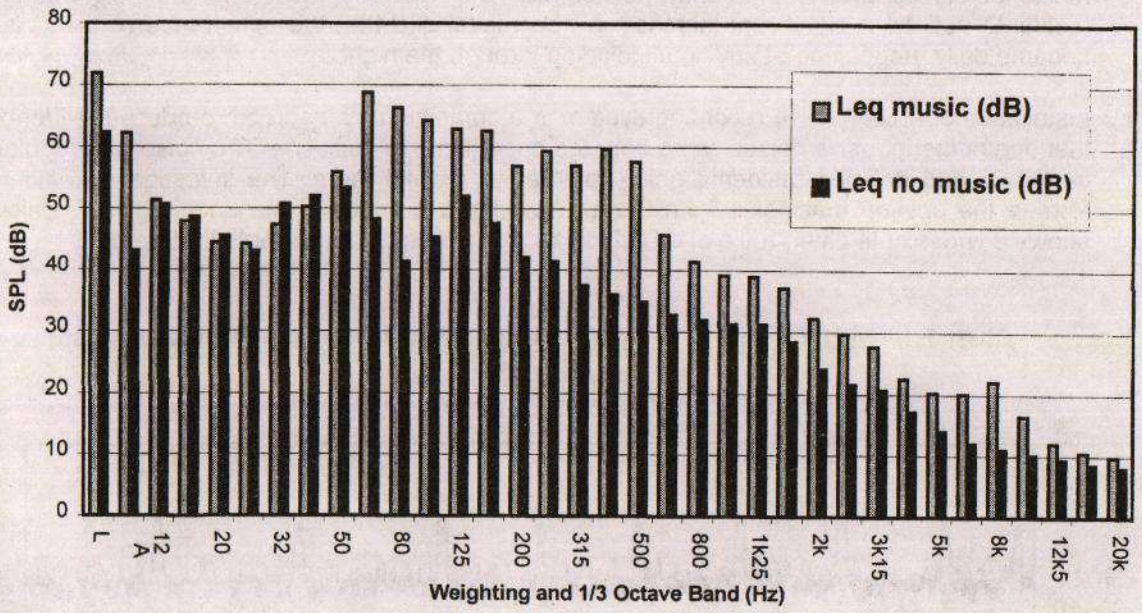
3.6 Noise readings recorded in the flats are shown in Chart 2 below.

3.7 Following the complaints and investigation of the noise problems. Planning enforcement breach of condition notices have been served on the leaseholders of the flats and the restaurant to secure compliance with the planning permission and an abatement notice has been served on the person responsible for the restaurant in regard to amplified music noise.

3.8 The leaseholder of the flats is being required to install the sound insulation approved under the planning condition for the flats, which is estimated will improve the D_{nTw} by approximately 4 dB. If the restaurant wishes to continue generating similar noise levels before the service of the abatement notice, the restaurateur will have to undertake extensive sound insulation works i.e.

- Under draw the existing ceiling with a layer of 15mm plasterboard.
- Install an independent ceiling on its own joists and wall plates, incorporating an air gap of at least 100mm from the existing ceiling.
- Install acoustic absorbent material of minimum density 40 kg m^3 in the new ceiling void.
- Create the new ceiling from two layers of 19mm Gyproc plank, joints staggered and taped.
- Seal the perimeter of the new ceiling with mastic and plaster, provide a 3mm skim coat to the whole ceiling

Chart 2: 1/3 Octave band Leq (5min) SPLs recorded in flat above restaurant/bar, 23:00 to 24:00 hrs.



3.7 We have found in the field that the above work produces an approximately 16dB improvement in D_{nTw} for a timber suspended floor/ceiling. Therefore the overall predicted estimated improvement in D_nT_w following works in the flats and restaurant is 20 dB, which should give a predicted estimated overall D_{nTw} of approximately 69 dB. This figure approaches the DnTw + $C_{tr,\ 50\text{-}5000}$ values which have been reported[4] as "totally acceptable" for controlling amplified music noise transmission between a pub and a flat above, analogous with the situation in this case. The target music noise level we are looking for in the flats is 10 dB below the existing background L_{A90} SPL. This is not inaudibilty, which would require the music noise level to be 14.8 dB(A) below the L_{A90} SPL[5], rather it is a realistically achievable noise level which can be sustained as reasonable in the circumstances of a building in mixed residential/commercial use in a central urban locality.

3.9 However, even with a predicted estimated overall D_{nTw} of approximately 69 dB for the floor/ceiling. Noise from the restaurant is still likely to be intermittently audible within the flats above and will remain persistently clearly audible if the music noise level in the restaurant is not kept below the appropriate threshold. Therefore the level and frequency spectrum of amplified music played in the restaurant will need to be carefully controlled, preferably by fitting an automatic volume control device or similar very high ratio compressor and equalisation control to the sound system, to restrict the music noise level in the restaurant to appropriate levels.

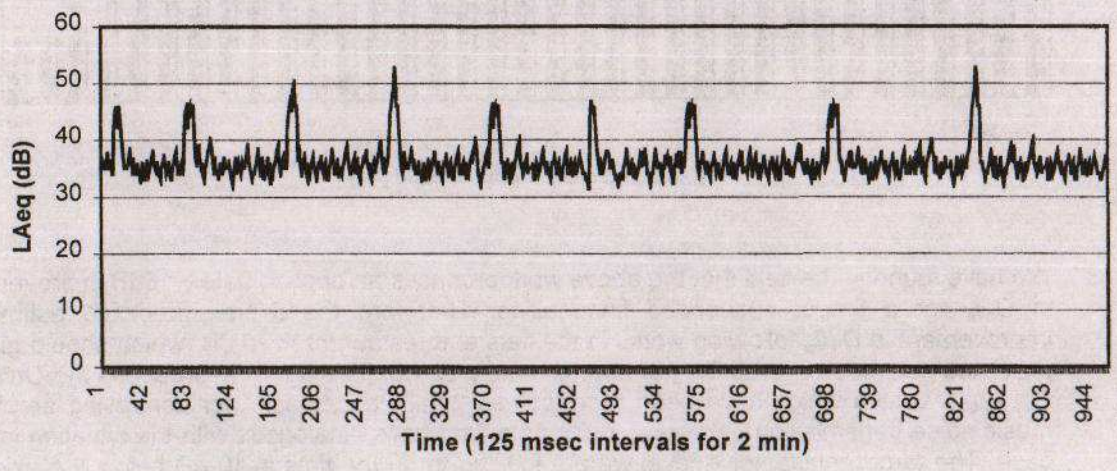
4. AIRBORNE AND STRUCTURE BORNE NOISE FROM AN EXISTING PRINT WORKS AFFECTING NEW RESIDENTIAL DEVELOPMENT

4.1 In 1996 a redundant warehouse adjacent to and sharing a party wall with an existing print works was granted planning permission for change of use to residential.

4.2 The flats in the new development were occupied in 1998 and even though the new residents could occasionally hear sporadic low level noise from the print works, they could tolerate this degree of inevitable intrusion from an industrial neighbour and no complaints were received by the Council. However in late 2000 new printing machinery was installed in the works. This machinery is apparently inherently noisier than the previous plant and the neighbouring residents noticed a significant increase in noise level and that the occurrence of the noise became daily, happening at any time including through the night.

4.2 Installation of a DAT noise recording system in a complainant's bedroom produced evidence that one of the intrusive noises came from the operation of a guillotine. The noise was regular, impulsive and delayed residents going to sleep or awoke them. The investigating officers formed the opinion that noise from the print works is a statutory nuisance. Chart 3 below shows a two minute time profile of a DAT noise levels taken in a residents bedroom.

Chart 3: LAeq (125 msec) in bedroom affected by noise from print works guillotine 0600 hrs.



4.4 The noise from the print works is being transmitted both structurally and via airborne routes into the neighbouring flats. It is anticipated that the abatement of the nuisance will entail the following works:

- Adjustment of the guillotine drop height and speed to reduce noise at source.
- Placing dampening elastometric pads under the plant to increase the isolation of the guillotine from the structure.
- Provision of an independent wall leaf incorporating acoustic absorbent material and two layers of plasterboard mounted on resilient bars on the print works side of the party wall.

5. CONCLUSSIONS

5.1 All the above problems could have been anticipated and adequately mitigated by the re-developer of the brownfield site during the planning, design and construction phases of the project.

5.2 A greater awareness of potential noise conflicts by planning officers and more effective communication with the noise team would have led to the re-developer of the brownfield site being directed to mitigate the noise impacts of existing noise sources on the new residential development via conditions to the planning permission. As a direct result of these cases we

have reviewed how these types of cases are handled and are drafting a new consultation guidance note for planning and noise team officers and an information note for developers.

5.3 Retrospective remedy of noise conflicts that arise from re-development of brownfield sites, when possible, is more resource intensive than preventing the problem happening in the first place.

5.4 In cases where statutory nuisance arises from the re-development of brownfield land to residential use close to or attached to existing noisy commercial uses. The noise reduction that can be achieved retrospectively using statutory nuisance powers may be compromised by the best practicable means defence. Consequently the degree of control of noise achieved may not be as stringent as if the noise conflicts had been addressed by the planning process requiring noise mitigation to be incorporated in the design and construction of the new residential development.

6. REFERENCES

1. White Paper – Our Towns and Cities: The Future – delivering an urban renaissance, DETR 2000 - www.regeneration.detr.gov.uk/policies/ourtowns/cm4911/index.htm.

2. Sturgess Vs Bridgeman (1879) 11 Ch D 852, Miller Vs Jackson 1979 3 All ER 338 and Webster Vs Lord Advocate 1984 SLT13: 1985 SLT 36.

3. PPG 24 – Planning and Noise, D.o.E, Sept 1994, HMSO.

4. Wright. P & Fothergill. L – The spectrum adaptation terms in BS EN ISO 717-1:1997, IoA Acoustics Bulletin, Nov/Dec 1998.

5. R.J.M Craik - Inaudibility as a criterion for assessing amplified music, IoA Acoustics Bulletin, July /August 2000.