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TRAFFIC NOISE - ANOMALIES IN THE IMPLEMENTATION OF NOISE INSULATION REGULATIONS & PLANNING CONTROLS

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1. INTRODUCTION

The publication, in August 1990, of the Report of the Noise Review Working Party [1], which met under the Chairmanship of WJS Batho, has once again focused public attention on noise standards, albeit in the short term. As with previous Reports, such as those produced by the now extinct Noise Advisory Council [2], the attention of the reader is directed towards the unsatisfactory level at which some existing environmental noise standards have been set and, in the light of an increasing public awareness, recommendations are included which are aimed at effecting improvements. Areas included in the review included Planning and Noise, Neighbourhood Noise, Transportation Noise, Entertainment Noise and Noise within Buildings. In the area of Transportation Noise the Report dealt with road traffic noise, railway noise, aircraft noise and noise from helicopter activities. It was noted that a 1986-87 BRE questionnaire found that 11% of the adult population in England were bothered by road traffic noise and 7% by aircraft noise.

1.1 DEVELOPMENT OF MAJOR ROADS AND MOTORWAYS IN NORTHERN IRELAND

In Northern Ireland, with a relatively small land mass and low population (approximately 1.5 M inhabitants), development of roads have tended to take place at a slower rate than in the rest of the United Kingdom. The Planning Commission, in 1946, produced an interim report entitled "Road Communications in Northern Ireland" which included proposals for motorway construction and reconstruction of existing trunk roads, class 1 roads and class 2 roads.

Following introduction of the necessary legislation, work on the trunk roads commenced in 1949 and mileage was increased from 346 miles to 370 miles by 1959. Motorway development followed and, in July 1962, the first section of motorway was opened linking Belfast with Lisburn. Between 1962 and 1968 this Northern Ireland M1 Motorway was extended to Dungannon. Following a decision by Parliament to accelerate the motorway construction programme, a second motorway, the M2, linking Belfast to Antrim and Randalstown, was commenced and reached completion in 1973.

Since 1973 the two motorways have been linked by a dual carriageway, the Westlink, which passes close to the city centre. In addition, access to the M1 in particular have been improved by construction of an outer ring road around the Southern side of Belfast. At the same time existing roads have been improved by, for example, widening or by the introduction of slip roads at major road junctions. The development of the Belfast Ring Road and improvement of ancillary roads is still in progress.

It is clear that the latter aspect, ie. the improvement of existing roads, will result, except where preventative measures are taken, in an increase in noise exposure of residents in adjacent dwellings. The development of new residential accommodation close to new roads and motorways will naturally have the same effect. The extent of the resulting noise exposure will depend on a variety of aspects, such as proximity, traffic density, speed and measures taken to alleviate the effects of an excess of noise.

Following the construction of the Motorways there was initially a rapid development of adjacent land, particularly that close to access points. The developments were mainly of an industrial or commercial nature. Recently, in the last four or five years, this trend has changed and a number of residential developments have been established. Some dwellings in these developments have been constructed in close proximity to the carriageways.

1.2 Aims & Objectives.

This research project concentrates on road traffic noise and its effect on residential accommodation in Northern Ireland. The main objective of the project was to investigate whether or not planning criteria and general guidelines in respect of traffic noise were being followed by the responsible authority in respect of new developments near motorways. As a secondary objective it was decided to investigate the effects of various other road construction and road improvement schemes on existing dwellings. Overall, the aims were:-

1. To measure noise levels at sensitive dwellings on recently constructed housing estates close to motorways and

2. To measure noise levels at sensitive dwellings close to heavily trafficked main roads which have recently been improved.

3. To compare, in both instances, the assessed values of L_{10} (18 Hour) with recognised criteria.

2. TRAFFIC NOISE STANDARDS & CRITERIA

The protection of occupiers of dwellings against the effects of traffic noise in Britain is currently effected by the provision of suitable sound insulation in existing dwellings which are affected by new or altered highways and by the use of Planning Controls in the case of new developments.

2.1 New and Altered Highways

The Land Compensation Act 1973 [3] empowered the Secretary of State to make regulations for the provision of suitable sound insulation in the facades of dwellings affected by increased noise from motor vehicles using a new or altered highway. The Noise Insulation Regulations, 1975 [4], which apply to England & Wales, provide the mechanism for such action.

The regulations apply to dwellings and other buildings used for residential purposes, which are situated not more than 300 metres from affected highways. A discretionary power is available for highways built between 1969 and 1972, and altered highways, i.e. highways where the location, width or level has been altered. On the other hand a duty is placed on highway

authorities to carry out or make provision for grants in respect of carrying out insulation work, in respect of eligible buildings, in the case of highways built or altered by the provision of an additional carriageway after 1972. The test of eligibility in both cases is that the noise level outside a living room must be raised by at least 1 dB(A) as a result of the use of the new or altered road, and the noise level (L_{10} - 18 hour) should be not less than 68 dB(A).

In addition to providing sound insulation against traffic noise, highway authorities have discretionary power to provide sound insulation against works for the construction of roads, where it is expected that residents will be seriously affected by such noise for a substantial period of time.

The regulations specify the manner in which appropriate noise levels due to traffic noise will be ascertained and provide specifications for the provision of insulation work to 'qualifying' doors and windows. This will normally require the replacement by or conversion to a double window and the provision of a suitable sound attenuating ventilation system.

2.2 Use of Planning Development Control Powers

The control of noise in the environment by the adoption of proper planning procedures is vitally important, since very often remedial action following the event will have only limited effect. This fact is recognised by government, and a circular, 'Planning and Noise' [5] was issued by the Department of the Environment and Welsh Office in January 1973, which lays down principles and specific criteria in relation to noise, by which Secretaries of State will be guided in making planning decisions, and gives advice to local planning authorities on which to base their own policies.

The Circular, in dealing with noise from roads, gives guidance concerning both new roads affecting existing development and new noise sensitive developments affected by existing roads. When new major roads are being planned, local planning and highway authorities are urged to co-operate closely from the earliest stages to allow all the parameters concerned to be considered.

Clear guidance is given in the Circular concerning new noise-sensitive developments near roads. Paragraph 6 states that '*... new noise sensitive development should not be permitted if it would - now or in the foreseeable future - be exposed to unacceptable levels of traffic noise.*' It goes on in that paragraph to say that '*... the chief aim should be to keep such developments apart from primary road networks ... Where it is not possible to keep them apart planning authorities should ensure by appropriate conditions that buildings are sited and designed so as to minimise the effect of traffic noise on them.*'

The Secretaries of State considered that the strong presumption should apply where noise levels are in excess of 68 dB(A) on the L_{10}(18 hour) scale and went on to commend the guidance given in the Department's Design Bulletin, 'New Housing and Road Traffic Noise' [6], which recommends that is it desirable to confine major new residential development to locations subject to an L_{10} level substantially lower than 68 dB(A). The Circular also reproduces the advice that '... in any case it is essential that the building specification be such that in no dwelling is the internal L_{10} with windows closed greater than 50 dB(A).' This is taken to be a minimum rather than a desirable standard.

The standards used in both the Noise Insulation Regulations and Planning & Noise were set in the early 1970s. The Noise Review Working Party, 1990 recognised that social expectations (concerning noise levels), have risen considerably since that time and made a number of recommendations concerning both Planning and Noise and the Noise Insulation Regulations.

It is suggested that the Planning and Noise Circular should be revised as speedily as possible with a view to including sources of noise which are prevalent today. One important recommendation is that planning authorities should use three "Action Levels" in determining the suitability of various types of development in relation to ambient noise. These action levels are defined in the Report and are as follows:-

Action Level A: the level below which noise need not normally be a material consideration in determining an application for planning permission.

Action Level B: the level at which external sound insulation would be required at noise sensitive developments.

Action Level C: Noise at this level would be too great for insulation to be effective and there should be therefore a strong presumption against granting permission for noise sensitive development.

In relation to the Noise Insulation Regulations, it is suggested that the qualifying level for the provision of sound insulation might be reduced from 68 dB(A) to 65 dB(A).

2.3 Current Situation in N. Ireland

At the present time no regulation in relation to noise insulation from road traffic noise is in force in N. Ireland. Circular 10/73, "Planning and Noise", has never been officially adopted in N. Ireland, but it is generally recognised as a useful planning tool, both by planners and local authority environmental health officers.

3. INSTRUMENTATION, SITE SELECTION AND METHODS

3.1 Instrumentation

Bruel & Kjaer Noise Level Analyser type 4426
Bruel & Kjaer Alphanumeric Printer type 2312
Bruel & Kjaer Modular Precision Sound Level Meter type 2231
CEL 393-B Precision Computing Sound Level Meter
CEL 238 Secondary Processor
Bruel & Kjaer Calibrator type 4230

3.2 Site Selection

Measurement Sites were selected in recently constructed housing estates along the boundaries of the M1 and M2 Motorways. Generally, at each estate, dwellings within about 40 metres of the motorways were chosen and, for the purpose of this investigation, those dwelling expected to be most exposed to noise were included in the data reported.

In respect of noise from new or improved roads effecting existing dwellings, a number of dwellings were selected on a number of roads falling into these categories. Again, the dwellings selected were expected to be amongst the most seriously affected by noise.

3.3 Methods

Following the procedure laid down in the DoE Memorandum "Calculation of road traffic Noise" and, to simplify assessment of possible qualification for grant award under the Noise Insulation Regulations, measurements were made at a distance of 1 metre from the facade of the selected dwellings and with the microphone at a height of 1.2 metres above ground level.

It was ascertained that the volume of traffic using the Motorways was of the order of 1,500 vehicles/hour to 2,000 vehicles/hour. Thus, with a minimum sample rate of 5 samples/second, the minimum recommended sample period of 5 minutes was applicable. In the event a sample period of either 10 min/h or 15 min/h was chosen, sufficiently long to give the necessary accuracy for the Ring Road and improved road surveys. Measurements were made mainly in the short form method but, at a number of sites, the measurement period was extended to give a full 18 hour survey.

Location	d(m)	L_{10} (18 Hr)	Comments
M1 MOTORWAY			
5 Beechlawn Avenue			
- ground floor	20	68	Road in cutting
- first floor	20	74	
17 Plantation Drive	7	72	Heavily used Slip Road
5 Sprucefield Court	14	78	Thermal double glazing
9 Sprucefield Court	7	77	---ditto---
Greenvale, new house	16	71	Slight embankment
104 Appleton Park	12	71	Road on small embankment
M2 MOTORWAY			
50 Fairyknowe Park	10	69	Steep Motorway gradient
141 Whitewell Road	20	73	Gentle slope down to M2
45 Derry Road	10	72	Thermal double glazing, Gable end (no windows) facing M2

Table 1. Values of L_{10} (18 Hour) at measurement sites and facade distances from near side of M1 & M2 Motorways.

4. OBSERVATIONS AND RESULTS

The site investigations were carried out between 1990 and 1991 over periods when traffic flow can be considered to have been normal, ie. over non holiday periods with no roadworks. Weather conditions during the measurement periods chosen were favourable, dry with little or no wind. Checks were made on traffic flows at intervals.

Values of L_{10} (18 hour) calculated from the hourly measurements are given in Table 1, for dwellings close to the Motorways and in Table 2, for dwellings affected by the Ring Road development and by road improvement schemes. The Tables include distances of the facades of the dwellings from the nearside kerbs and general comments, such as the site location relative to the roadways, the orientation of the dwellings and whether or not the dwellings are double glazed.

Site/Area	d(m)	L_{10} (18 Hr)	Comments
7 Balmoral Ave.	6	71	Recently widened to form slip road at Lisburn Road junction
451 Upp Newtownards Rd	7	72	Road recently widened to form slip roads to Ring Road
14 Tillysburn Park	5	72	On new section of Belfast Outer Ring Road (Parkway)
19B Hawthornden Park	12	73	New section of Belfast Outer Ring Road
34 Shore Road, Greenisland	12	74	Prior to widening from single to dual c'way

Table 2. Values of L_{10} (18 Hour) at measurement sites and facade distances (d) from Arterial Roads.

5. ANALYSIS AND DISCUSSION

It is clear from the values of L_{10} (18 Hour) measured at the facades of the various residences surveyed, and given in Table 1 - Table 3, that the occupants of these and many other residences located in similar positions along motorways or major roads are subject to excessive noise. When occupants of dwellings near industrial establishments are exposed to similar levels of noise from operations in progress in the factories the result is usually considerable unrest with allegations of nuisance, investigations by local councils, threats of and resort to legal action. In this instance, where the noise stems from traffic, there appears to be little action

which the residents can take to alleviate the situation. For new dwellings any action which might have helped control the noise would appear to have been the responsibility of the planning authority whilst, in the case of existing older dwellings subject to noise from new or improved roads, the reduction of noise transmission into such dwellings is the responsibility of the highways authority.

5.1 Planning Aspects

When the selected sites near motorways are considered, reference to Table 1 will show that, at each of the sites listed, the value of L_{10} (18 Hour) was in excess of 68 dB(A). Each of these sites is located on a relatively recent housing development. In the case of Sprucefield Court, on the M1 Motorway, the values of L_{10} (18 Hour) are 77 dB(A) and 78 dB(A) for the two sites on this development. These levels are at or above the maximum level recommended in DoE Circular 10/73 *Planning and Noise* and in DoE Bulletin New Housing and Road Traffic, where the recommended maximum value of L_{10} (18 Hour) was reduced from 70 dB(A) to 68 dB(A). It is made clear in these DoE publications that 68 dB(A) should be regarded as a maximum level and that desirable levels should be substantially lower.

It is evident that little or no recognition has been given to the need to protect the occupants of such dwellings from the noise generated by motorway traffic. Since the planning authority have the responsibility of approving all planning applications it would appear that, in the case of these developments, they have not applied accepted guidelines designed to minimise the effects of traffic noise. This is especially of concern in one particular instance at the Greenvale development on the M1 motorway. Here the local Environmental Health Department advised, at the planning stage and before approval was given, that... "*We recommend that the builder give consideration to the close proximity of the motorway and take appropriate steps in the design and layout of the dwellings and use appropriate sound insulating materials so as to prevent noise nuisance within the dwellings. Bungalows would be less likely to give rise to complaints than houses and the construction of a solid wall along the rear of the site beside the motorway of appropriate length and height would also be beneficial.*" It is noted that whilst bungalows have been built, these are of chalet style construction, which are likely to suffer more from traffic noise than traditional two storey houses, because of inherently poorer sound insulation. The designs do not appear to incorporate any special sound attenuating features nor is any noise barrier provided.

Some of the sites considered in the study lie close to land which had previously been developed for housing. It would appear that originally the proximity of these sites to the motorways precluded their use for residences but some change in planning policy has resulted in approval. Whilst in the short term this may satisfy a demand for housing land, in the longer term it is likely that the occupants will find the noise climate increasingly unsatisfactory due both to increasing noise levels and rising expectations regarding environmental issues.

5.2 Noise Insulation Regulations

As with the motorway housing developments, sound levels at dwellings surveyed along new or improved roads all had L_{10} (18 Hour) values in excess of 68 dB(A). These dwellings are only a small sample of a much larger number of dwellings subject to high values of L_{10} (18 Hour) due to road improvements in the greater Belfast area. Since the Noise Insulation Regulations have not been implemented in Northern Ireland, residents of such severely affected dwellings have

no legal recourse to grant aid such as is enjoyed by residents in the rest of the United Kingdom.

In the early 1980's, prior to the construction of Westlink, the cross Belfast dual carriageway linking the M1 and M2 Motorways, the DoE (NI) considered implementing the Noise Insulation Regulations and indeed staff were trained for this purpose. The implementation of the Regulations would have required, as with all other legislation specific to Northern Ireland, an Order in Council. To the present, 18 years on from the introduction of the Noise Insulation Regulations on the mainland, no such Order has been signed in respect of Northern Ireland. Hence, in respect of traffic noise, the residents in affected dwellings in Northern Ireland are considerably disadvantaged.

5.3 The "Batho" Report

The findings of the "Batho" Report in respect of traffic noise are clearly that, due to improvements in living standards since "Planning and Noise" was published, the population at large has greater expectations in respect to the noise environment. Consequently, it is recommended in the Transportation Noise section of the Report that *"There should be further research to assess whether the current standard of 68 dB(A) for noise insulation work remains appropriate in regard to the changes in social attitudes which have occurred since 1973".*

In the discussion the suggestion is made that the possibility of a reduction to 65 dB(A) be made in the qualifying level for grant aid under the Noise Insulation Regulations. A further recommendation is that *"Action Levels A,B and C be used as a basis for planning guidance in respect of noise sensitive developments sited near roads."*

The dwellings at sites investigated fall into Action Level B and would therefore require one or more of the available measures of noise attenuation. There was little evidence of such measures having been taken. In some instances double glazing had been installed but this was invariably of the thermal type. At Greenvale, a boundary fence had provided at the motorway interface but this consisted of vertical boarding with gaps between adjacent boards. This form of construction provides relatively little sound attenuation but, by applying basic acoustic principles and without much additional cost, the overall performance as a noise barrier could have been appreciably improved.

It should perhaps be noted that, in Northern Ireland, there is a distinct difference in the delegation of authority. Whereas in England, Scotland and Wales planning is the responsibility of local government, in Northern Ireland the DoE is responsible for highways through its Roads Service branch and also for planning under the Planning (Northern Ireland) Order 1972. As a consequence, in situations when new roads or road improvements schemes are planned, there is likely to be more controlling influence from the two closely linked departments than would be the case on the mainland. Again, diverse views, as often are heard in local government situations, are less likely to be taken into account. The noise levels reported in this paper are evidence that the present system is not working to the best advantage of those members of the population living in areas such as those highlighted and exposed to excesses of traffic noise. Some immediate action is required to arrest this insidious trend in housing development and to correct the imbalance in policy regarding availability of grant aid to improve the noise climate of severely affected dwellings.

6. CONCLUSIONS

As a result of this study it can be concluded that:-

1. Values of L_{10}(18 Hour) in excess of 68 dB(A) have been measured at the facades of newly erected dwellings in close proximity to the M1 and M2 motorways in Northern Ireland.

2. Values of L_{10}(18 hour) of similar magnitude have been measured at the facades of mature dwellings adjacent to roadways which have been recently constructed or substantially altered to improve traffic flow.

3. In the case of newly erected dwellings, no specific measures appear to have been adopted to control traffic noise.

4. Occupants of mature dwellings near new or improved roads are subjected to excessive noise levels without recourse to a noise insulation grant.

5. The Department of the Environment for Northern Ireland as the responsible authority both for planning and roads have not introduced adequate measures to protect the residents in affected dwellings from excessive traffic noise.

REFERENCES

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