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REPORT

of

SOUND MEASUREMENTS AND RECOMMENDATIONS

at

DENE BOTTOM WORKS,
STORTHES HALL LANE,
KIRKBURTON,
WEST YORKSHIRE
HD8 0PW

Dates of measurements:	7th & 14th January 2014
Date of report:	15th January 2013
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CONTENTS

1.0 **Summary and Conclusions**

Residential development is proposed on the site of former industrial units at Dene Bottom Works, Kirkburton. The site is adjacent to a street lighting and road sign depot. For this reason the applicant has commissioned this survey and report on the existing noise sources affecting the development. The report describes sound measurements at the site and compares the results with guidance on the subject of noise affecting dwellings provided by Kirklees Council.

1.1 The outdoor sound levels at the site were measured at 55-57 dB LA_{eq} during the daytime and 44-47 dB LA_{eq} at night.

1.2 In order to comply with the published acceptance criteria of the LPA on interior sound levels inside dwellings it will be necessary to use reinforced double glazing to bedrooms which have curtain wall glazing. It is recommended that double glazing using one pane of 4mm float glass and one pane of 10mm float glass (eg. 4-12-10, 4-16-10, etc.) or the acoustic equivalent will be needed for these bedrooms. All other glazing may consist of conventional double glazing using two panes of 4mm plate glass (eg. 4-12-4, 4-16-4, etc).

1.3 Background ventilation may be achieved within the interior sound requirements by using conventional trickle vents.

1.4 Bedroom ceilings may be constructed from a single layer of 12.5mm plasterboard.

1.5 The existing outdoor sound levels comply with the LPA's requirements for private gardens. No special noise mitigation measures are needed to protect private gardens.

1.6 The dominant source of outdoor sound affecting the development at all times was road traffic. There was no measurable sound from a nearby depot which handles street lighting and signs although the depot was in use and visited by lorries during our daytime survey period. Lorries visit the depot infrequently during the daytime only but did not affect the time-averaged LA_{eq} or the maximum LA_{max} levels which were from road traffic.

2.0 Planning Requirements on Noise

The requirements of the Local Planning Authority with respect to noise are to ensure the minimum standards quantified in the Kirklees Council guidance document 'Noise Design Advice'. These requirements are summarised below.

2.1 Road Traffic Noise

Section 2.1 of the Kirklees MBC document deals with the sound level requirements of new residential properties affected by transportation noise sources and quantifies the minimum standards as:

35 dB LA_{eq} (1-hour) in habitable rooms between 0700 and 2300 hours,
30 dB LA_{eq} (15-min)) in bedrooms between 2300 and 0700 hours,
45 dB LA_{max} in bedrooms between 2300 and 0700 hours,
50 dB LA_{eq} (1-hour) in private gardens between 1000 and 1500 hours.

2.2 Existing Industrial or Commercial Noise Affecting New Dwellings

Section 3.1 of the Kirklees MBC document gives requirements which are different to those described above for locations where new residential properties are affected by noise from existing commercial or industrial sources. An assessment is required in accordance with BS 4142 from which the design target is a rating level of the outdoor sound to be at least 5 dB below the background levels during daytime and at night. An alternative design target is to achieve the following interior levels:

NR 30 in habitable rooms between 0700 and 2300 hours,
NR 25 in bedrooms between 2300 and 0700 hours,

The NR values are reduced by 5 dB if there is a distinguishable tone. They are measured as 15-minute L_{eq} values.

In all cases the above indoor sound levels are to be achieved "with windows open or with acoustic ventilation provided which is over and above 'background' ventilation."

3.0 Sound Sources

Transportation Noise
The dominant sound source affecting the proposed development during the periods of our survey was that of road traffic on Storthes Hall Lane which runs along the north west side of the site, with secondary sound from Penistone Road which runs at an elevated level 55m from the north east border of the site

Street Light Depot
A storage depot (Anderson & Heeley) holding street lights and highway signs is located adjacent to the site. The depot is open during week day daytimes only. During the daytime survey period there was occasional activity on the depot site consisting of the movement of non-articulated flat-back lorries, including reversing bleepers, and loading of the flat-beds using hydraulic grab arms. Sound from the depot was only audible at intermittent periods.

There was no sound from other sources affecting the site during any of our survey periods.

4.0 Sound Measurements

Sound levels were measured at the site during the daytime of Tuesday 7th January and at night on Tuesday 14th January 2014. Measurements were taken at the following positions as shown on the map attached to the appendix of this report:

Position 1 Southern end of the site
Position 2 Northern end of site 4m from Storthes Hall Lane

Weather conditions were dry with no wind during both survey periods. Measurements were taken using a Bruel & Kjaer type 2260 precision sound level meter for which current calibration certificates are held.

Sound Descriptor		**Daytime 1400-1530**	**Night 2200-2300**
Pos. 1. Southern end of site			
Ambient	LA_{eq}	54.8	44.4
Background	LA_{90}	52.8	42.0
Maximum	LA_{max}	63.2	63.7

Pos. 2. Northern end of site

Ambient	LA_{eq}	56.8	46.6
Background	LA_{90}	51.0	43.8
Maximum	LA_{max}	72.6	70.7

Sound frequency spectra are shown below of the highest day and night L_{eq} results and the highest L_{max} result, all of which occurred at position 2 nearest to Storthes Hall Lane.

Sound pressure levels dB linear:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Daytime Leq	62.0	53.3	46.7	52.1	55.7	44.6	30.8	26.1
Night Leq	51.2	45.8	37.2	44.2	44.6	33.1	26.3	21.3
Highest Lmax	68.8	70.2	68.0	72.1	66.1	63.5	61.5	55.9

5.0 External Sound Insulation of Dwellings

5.1 Interior Sound Levels

The basis of sound insulation is that the outdoor sound sources must not cause indoor sound levels in excess of:

- 35 dB LA_{eq} in living rooms from 0700-2300 hours,
- 30 dB LA_{eq} or 45 dB LA_{max} in bedrooms from 2300-0700 hours.

5.2 Bedroom Curtain Wall Windows

The sound levels inside an interior room are given by the formula:

$SPL_{inside} = SPL_{outside} - R + 3 + 10 \log S - 10 \log A$

For a furnished domestic room the terms ‘A’ for sound absorption and ‘S’ for surface area are generally self-cancelling, which is assumed to be the case. It is found from the results that reinforced double glazing will be necessary for bedrooms with curtain wall windows consisting of one pane of 4mm float glass and one pane of 10mm float glass (eg. 4-12-10, 4-16-10, etc.) in order to achieve the LPA’s requirements. The sound reduction indices are:

Sound reduction indices dB:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Glazed curtain wall	24	28	23	32	38	42	44	48

The calculation of L_{max} sound levels reaching interiors at night is:

Sound pressure levels dB linear, Lmax:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Outdoor SPL	68.8	70.2	68.0	72.1	66.1	63.5	61.5	55.9
3dB Reflection	3	3	3	3	3	3	3	3
Wall and Glazing	24	28	23	32	38	42	44	48
Indoor SPL	48	45	48	43	31	25	20	11

The overall level represented by the above spectrum is **43 dB LA_{max}**. The same calculation on the night L_{eq} results predicts an interior sound level of **16 dB LA_{eq}**. Both of these values achieve the design targets.

It is recommended that curtain walls to all bedrooms are fitted with double glazing using one pane of 4mm glass and one pane of 10mm glass (eg. 4-12-10, 4-16-10) or the acoustic equivalent.

5.3 Living Room Curtain Wall Windows

The same calculation for the daytime L_{eq} results shows that the interior sound requirements in living rooms with curtain wall windows will be achieved by double glazing consisting of two panes of 4mm float glass (eg. 4-12-4, 4-16-4, etc.). The sound reduction indices are:

Sound reduction indices dB:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Glazed curtain wall	18	22	20	26	36	39	31	35

The calculation is shown overleaf of the sound levels reaching living rooms at the noisiest position facing Storthes Hall Lane for the sound levels measured during the daytime.

Sound pressure levels dB linear, Leq:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Outdoor SPL	62.0	53.3	46.7	52.1	55.7	44.6	30.8	26.1
3dB Reflection	3	3	3	3	3	3	3	3
Wall and Glazing	18	22	20	26	36	39	31	35
Indoor SPL	47	34	30	29	23	9	3	-6

The overall level represented by the above spectrum is **30 dB LA_{eq}** which is the prediction inside living rooms during the daytime.

It is recommended that curtain walls to all living rooms may be fitted with double glazing consisting of two panes of 4mm float glass (eg. 4-12-4, 4-16-4, etc.) or the acoustic equivalent.

5.4 All Other Windows

The same calculation as 5.2 applied to the results measured during the daytime and at night predicts interior sound levels at all positions with conventional windows rather than curtain walls to be within the design targets if conventional double glazing is used with two panes of 4mm float glass (eg. 4-12-4, 4-16-4, etc.

It is recommended that all windows other than curtain walls may be fitted with conventional double glazing using two panes of 4mm glass (eg. 4-12-4, 4-16-4).

5.5 Alternative Glazing Specifications

Alternative glazing specifications offering the same or higher sound reduction indices may be used in all cases. If alternative specifications are being sourced then the sound reduction indices at each sound frequency must be examined as in the calculations of sections 5.2 and 5.3. The use of single-figure indices such as R_w, R_a, R_{tra}, etc. may not provide sufficient information on which to base an alternative specification.

5.6 Ventilation

Guidance published by the World Health Organisation advises that the outdoor-to-indoor sound level difference across a window with a casement open for ventilation is around 15 dBA. This suggests that the interior sound requirements will be achieved with windows open for ventilation in living rooms but not in bedrooms. Background ventilation within the requirements will be achieved in bedrooms by using conventional trickle vents.

5.7 Roof Materials

The sound insulation of a conventional tiled roof is governed mainly by the plasterboard ceiling since the sound insulation of the outer roof is

limited by ventilation apertures. Single plasterboard of thickness 12.5mm offers a sound reduction of 24 dB and 29 dB at 500 Hz and 1000 Hz, being the sound frequencies which dominate the outdoor noise. After adding the value of sound insulation of the quilt and outer roof it is estimated that the outdoor-to-indoor requirement will be achieved by the use of single 12.5m plasterboard to bedroom ceilings.

It is recommended that bedroom ceilings may be constructed from a single layer of 12.5mm plasterboard.

5.8 Gardens

The LPA usually calls for the sound levels in private gardens not to exceed 50-55 dB LA_{eq}. The daytime sound levels were below these values indicating that the outdoor requirements in gardens will be achieved without any specific noise mitigation measures.

6.0 Assessment of Sound from Depot

The adjacent depot handling street lighting and signs was inaudible at the site except during occasional periods when a lorry visited the depot to load or unload. The sound generated by this activity is included in the daytime results and in the corresponding recommendations for sound insulation to the dwellings, also in the outdoor results affecting the gardens.

The sound generated by lorries visiting the depot, loading or unloading was too low against the background from road traffic to measure at the nearest position on the development site. The maximum sound levels from the depot were lower than those from road traffic. Since it was not possible to quantify sound from these premises either individually or collectively by measurement at the site, this suggests that the commercial sound, if it were measurable, would be at least 10 dB lower than the background. This is within the requirements of the LPA. The depot does not operate at night.
