Report VA4880.231030.CMP

Radlett House, Radlett Place, London

Construction Noise Management Plan

31 October 2023

Sequoia
West Cottage
Priory Road
Sunningdale
SL5 9RH

VENTA ACOUSTICS

01962 461016
0203 8650332
mail@ventaacoustics.com

registered company no. 10139494

Contents

Attachments

Report Version	Author	Approved	Changes	Date
CMP	Jamie Duncan	Steven Liddell	-	31/10/23

The interpretations and conclusions summarised in this report represent Venta Acoustics' best technical interpretation of the data available to us at the time of assessment. Any information provided by third parties and referred to in this report has not been checked or verified by Venta Acoustics, unless otherwise expressly stated in the document. Venta Acoustics cannot accept any liability for the correctness or validity of the information provided. Due to a degree of uncertainty inherent in the prediction of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or wilful negligence on our part, be liable for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretations, predictions of conclusions made by the company or employees. The findings and conclusions are relevant to the period of the site survey works, and should not be relied upon to represent site conditions at later dates. Where additional information becomes available which may affect the findings of our assessment, the author reserves the right to review the information, reassess the findings and modify the conclusions accordingly.

1. Introduction

It is proposed to demolish the existing dwelling at Radlett House, Radlett Place, London, and construct a new building over three levels, from basement to first floor level.

Venta Acoustics has been commissioned by Sequoia to undertake predictions of the potential noise and vibration impact of the proposed works.

This is to accompany the Construction Management Plan, as required by Camden Council.

2. Site Description

As illustrated on attached site plan VA4880/SP1, the site building is located to the west of the end of Radlett Place, a small private road to the north of Avenue Road.

The most affected noise sensitive receivers are expected to be the house opposite at 1 Radlett Place, and the rear of the houses at 38 and 40 Avenue Road.

3. BS5228:2009 – Construction Noise

Camden's Minimum Requirements document states that *'the Best Practicable Means (BPM), as defined in Section 72 of the Control of Pollution Act 1974, shall be employed at all times to reduce noise (including vibration) to a minimum, with reference to the general principles contained in British Standard BS5228: 2009 'Noise and Vibration Control on Construction and Open Sites'*.

Annex E of BS5228-1:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* provide information and advice on reducing the impact of construction works on neighbouring properties.

Criteria for construction noise are recommended in the Department of the Environment Advisory Leaflet (AL) 72.

Department of the Environment Advisory Leaflet (AL) 72 states that construction noise levels at residential locations in rural, suburban and urban areas away from main road traffic and industrial noise should not exceed 70dB(A) during the daytime (defined as 7am – 7pm). The advice also recommends that noise levels during evening periods are at least 10dB lower. It is usually accepted that these limits apply to the average noise level over the working day. The numerical limits can therefore be exceeded for short periods, provided that these are balanced by periods of relative calm.

A further example, based on the likely change in ambient noise levels, is also provided. The ABC method places potential receptors in assessment categories based on the pre-existing ambient noise level. Where ambient noise levels are below L_{Aeq} 65dB during the day, this level should be considered a threshold value above which a potential significant effect is indicated.

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00–07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.
NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.
NOTE 3 Applied to residential receptors only.

[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
[B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
[C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
[D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Table 3.1 – ABC Method

Using the ABC method from Annex E of BS5228-1:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*, it is expected that the threshold at nearby receivers would be Category A.

Camden are understood to allow for a limit of ABC +5dB, equating to a working limit of 70dB(A) at the nearest receivers, the same as stated in Leaflet (AL)72.

4. Predicted Noise Impact

4.1 Proposed works

The proposed works include the demolition of the existing building on site, the excavation of a large basement that runs from the entrance of the site to underneath the new house to provide parking for five vehicles accessed via a car lift, as well as new living spaces.

The new building will be located to the east of the eastern façade of the existing building, and will space across the site from north to south, with the southern boundary being bordered by the new swimming pool and health and wellbeing elements of the house. At first floor level, the house will space across the site, but not extend over the swimming pool.

To the entrance of the site, in the north eastern corner, there will be a two-storey, ancillary domestic accommodation designed to function together with the main house as a single dwelling with a garage at ground floor level, providing access to the car lift to basement level, and living space at first floor level.

As per the requirements of Camden Council, it is proposed that all demolition, excavation and construction works will occur during Camden Council's standard hours of construction (08:00-18:00 hours, Monday – Friday and 08:00 – 13:00 hours Saturday). Furthermore, works identified as potentially having a high noise impact will be avoided on a Saturday.

Predictions of likely noise levels from the activities on site indicate that demolition works are those that are most likely to exceed the noise limits at the neighbouring properties. The process that

would be most likely to generate high noise levels would be the use of breakers, both hand and excavator mounted.

To minimise noise at the neighbouring properties, where possible, it is recommended that the existing concrete oversite and foundations are broken up using a hydraulic pulveriser or muncher. If this is not possible, the slabs could be cut up into sections using concrete saws, enclosed by localised acoustic screens, before being removed in sections, to be transported from site and broken up at another location.

4.2 Predicted noise levels

Calculations have been undertaken to determine the likely worst-case noise emissions at the most affected neighbours. As all works are to be undertaken during daytime hours, the assessment has been undertaken to ground floor rooms, which will benefit from screening from site hoarding. It is acknowledged that first and second floor windows will have a line of sight to the works and hence noise levels will be higher. These calculations are summarised in Appendix B of this report.

The 'on time' for activities has been assessed as between one hour and ten hours of continuous unbroken operation of plant at their noisiest condition depending on the typical plant usage

Source noise levels have been taken from manufacturers' data for indicative plant or listings in BS5228-Part 1: 2009 *Code of practice for noise and vibration control on construction and open sites: Noise*.

Table 4.1 summarises the predicted noise levels.

Works	Activity $L_{Aeq(10h)}$
Demolition - Excavator	78 dB
Demolition – Excavator (pulveriser not breaker)	68 dB
Demolition - Hand	73 dB
Piling Works	66 dB
Excavation of Basement/Groundworks	66 dB
Concrete pours	67 dB
Constructing formwork	59 dB
Skip/grab lorries	49 dB
Concrete/steel superstructure	67 dB
Envelope works	63 dB
Internal fitout	54 dB

Table 4.1 – Predicted sound pressure levels at most affected receptor

The greatest noise impact is expected during the use of either hand held hydraulic breakers, or excavator mounted breakers.

To mitigate noise, it is recommended that breaking out of the slab is undertaken as quickly as possible, at a time agreed with the immediate neighbours prior to the works. Consideration should be made of limiting these works to 'high noise hours' between 09:00-12:00 hours and 13:00-16:00

hours, although these can be amended through liaison with the neighbours to fit best with their lifestyles and schedules. When using hand breakers, localised screening should be utilised to mitigate noise as far as practicable to the nearby receivers. If possible, quieter demolition methods should be utilised such as hydraulic pulverisers or munchers.

For other activities, the greatest noise levels are expected to be generated by moving tools and materials around the site, hammering and use of saws.

Loading broken concrete into a completely empty skip will be avoided by providing a cushioning layer (sub-soil) before loading concrete. The use of radios outside the building will not be permitted.

Grinding or cutting of steel taking place outside of the building should be minimised and these works should be limited to the high impact noise hours and enclosed by barriers, where possible.

4.2.2 Traffic/delivery noise

Deliveries and waste removal will be by skip lorry, and delivery lorry on the public road into the site itself These will be arranged and controlled to limit waiting time to no more than a 30 minutes.

While the arrival and loading / off-loading of material on lorries is likely to be slightly higher than the typical traffic on Radlett Place, the infrequent and short duration nature of this is not expected to have a significant noise impact.

Drivers will be asked to turn off their engines where possible while loading / off-loading. Care will be taken during loading and off-loading to minimise dropping of material or other unnecessary noises.

Liaison with all nearby construction sites will be undertaken to avoid traffic congestion.

5. Vibration

Vibration levels are expected to be at their highest during the breaking-out of existing concrete. Based on past experience of vibration measurements from demolition works, heavy breakers typically generate vibration levels of 3mm/s to 5mm/s P.P.V. in structures situated within several metres of the working area. Handheld breakers are expected to generate lower levels. Although the vibration is likely to be perceptible in some areas of the neighbouring properties, the anticipated levels of ground-borne vibration are considered highly unlikely to cause cosmetic damage of structures. It is likely that the levels may give rise to re-radiated noise within the neighbouring residential premises during breaking out works. These works are expected to be relatively brief. Liaison with the neighbours prior to breaking out works is recommended to inform them of the possibility of tactile vibration.

6. Noise and Vibration Monitoring

Camden Council require the following regarding monitoring.

Noise monitoring shall be undertaken using a combination of semi-permanent (continuous) and attended monitoring methods. The locations of the semi-permanent (continuous) and attended monitoring and the frequency of the sampling have previously been agreed with London Borough of Camden in writing.

In the case of vibration, measured vibration levels shall be compared with the criteria in BS 5228: 2009 part 2 (i.e. 1mms^{-1} PPV for potential disturbance in residential and using a suggested trigger criteria of 2mms^{-1} for commercial).

6.1 Noise Monitoring

Class 1 integrating logging sound level meters will be installed with calibration verified (before and after) with a Class 1 acoustic calibrator. The instrumentation will have been fully calibrated by the manufacturer, or other approved body, as required by the relevant British Standard, with current calibration certificates available. The meters will be set to measure and store samples of various acoustic parameters such as L_{Aeq}, L_{A90}, L_{A10} and L_{Amax}. SMS alerts would be utilised and data would be downloaded remotely on a regular basis.

It is proposed that the meters are configured to log continuous 30-minute samples of noise throughout the working day, which will be used to calculate a 10-hour (daily) L_{Aeq}. Daily limits and short-term action levels will be agreed with the Council prior to the works.

6.2 Vibration Monitoring

Vibration monitoring will be undertaken with the use of a suitable seismograph, or similar, measuring the peak particle velocity [ppv] continuously over defined periods. The instrumentation will have been fully calibrated by the manufacturer, or other approved body, as required by the relevant British Standard, with current calibration certificates available. SMS alerts would be utilised and data would be downloaded remotely on a regular basis.

It is proposed that the meters are configured to log continuous 30-second samples of maximum ppv levels throughout the working day. Action levels will be confirmed with the Council prior to the works.

7. General Mitigation and Management

The following key factors have been identified as determining the degree and type of mitigation required.

7.1 Liaison with Residents

The importance of maintaining good relations and communication channels between the Client, contractor and neighbours is considered to be a critical issue. In conjunction with effective

communication of site activities and scheduling, liaison with local residents is essential in cultivating a positive attitude in the surrounding community.

Prior to, and throughout, the works, liaison with nearby residents will be one of the key elements for minimising potential impacts.

It is recommended that the Client/Contractor engages with representatives of occupants of the nearby properties at the planning stage to discuss the upcoming works and identify any mutually agreeable periods for 'noisy works', should the proposed working hours generally recommended by Camden be not suitable for their requirements.

The periods when high impact works are scheduled should have consideration for the neighbours' use of their properties, such as days when occupants work from home and scheduled special events such as parties, wakes, etc.

At the early stage, contact details should be provided, along with details of the works, likely durations of each stage of the works, and prior warning for any particularly noisy works anticipated.

During works, a dedicated telephone number and designated staff contact should be made available to respond to any complaints or queries, with a messaging service for 'out of hours' enquiries. Information on current and forthcoming activities should be made as freely available as possible.

7.2 Duration of Works

It is essential to cultivate an appropriate environment in which exposure to noise and/or vibration arising from the works can be best tolerated from the outset, minimising adverse community reaction.

Communication of information regarding the overall project duration is significant in controlling adverse community reaction.

7.3 Hours of Works

It is understood that the permitted hours for 'noisy works' are restricted to 8am to 6pm Monday to Friday and 8am to 1pm on Saturdays. In addition to the above permitted hours, it is proposed that further restrictions are placed on works deemed to be of 'high impact' in terms of the level of disturbance caused to neighbouring residents and businesses. This is to ensure that nearby occupiers have sufficient breaks from activities that have the potential to be particularly disruptive. The potential 'high impact' works have been identified in the attached calculations summary and are limited to the breakout of the ground floor slab. The permitted hours for 'high impact' works are 9am to 12pm and 2pm to 5:30pm Monday to Friday, although these could be amended with consent from the neighbours and the Council.

These hours should be rigorously observed for any operations which are likely to generate noise levels noticeable by neighbouring residents. In addition, it may be necessary to undertake noisy

works on an on/off basis, thereby providing neighbouring residents with some additional respite. Any exceptions deemed essential to the works which need to be authorised by Camden and must also be communicated with the residents.

It should be noted, however, that it is sometimes preferable to extend working hours for a limited period in order to quickly complete essential noisy operations rather than increase their duration, which might cause more annoyance. If this is to be the case, this would be agreed with the neighbours and the Council should be notified in advance.

7.4 Noise Characteristics

Some noisy activities are particularly intrusive due to tonal or impulsive characteristics which tend to draw more attention to their operation. A typical example of this is heavy duty percussive breakers. Awareness of these issues is important in liaison with local residents.

Keeping door and windows closed during the use of breakers would reduce the impact on the neighbours.

8. BS5228:2009

BS 5228: Part 1: 2009 *Code of practice for noise and vibration control on construction and open sites - Part 1: Noise* and BS 5228: Part 2: 2009 *Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration* provide information and advice on reducing impact of construction works on neighbouring properties.

Operatives on site should be trained to employ appropriate techniques to keep site noise to a minimum and should be effectively supervised to ensure that best working practice in respect of noise reduction is followed. This is not only to minimise the impact on neighbouring properties but also to safeguard the hearing of site operatives.

All site personnel should:

- Be mindful of neighbours and the impact of noise on their amenity. A good relationship with neighbours from the beginning of a project often reduces the likelihood of complaints;
- Strictly comply with agreed working hours. This includes minimising noise when arriving at site and preparing for the day;
- Ensure the proper use and maintenance of tools and equipment;
- Always select the lowest noise tools available for the job;
- Turn off machinery when not in use;

- Position machinery and activities on site to reduce the emission of noise to the neighbourhood and to site personnel. Generally, tools should be positioned far from neighbours and in areas where they are hidden from neighbouring windows by walls or site hoarding;

- Avoid unnecessary noise when carrying out manual operations and when operating plant and equipment;

- Understand that sound with characters such as whining, clanging or screeching as well as sudden sounds such as from hammering have a greater impact on neighbours than continuous, un-identifiable sounds;

- Where equipment is likely to cause disturbance to neighbours, this should only be used during agreed "noisy working hours" and / or a temporary structure should be erected around the machine;

- Use hearing protection when working in noisy environments.

8.1 Contractor's Obligations

In addition to the above, the following general conduct should be adopted by the contractor, where practical, in order to minimise and manage noise and vibration impacts at neighbouring properties;

- Erect good quality imperforate hoarding or temporary mass barrier sheeting, such as Echo Barrier (or similar), fixed to Heras fencing, or similar, around any openings made in the facades to the maximum practicable height, allowing for stability, wind loading, etc.;

- At all times and subject to availability, select and use the quietest plant, machinery and vehicles appropriate for the task being undertaken. All vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers, maintained in good and efficient working order and operated in such a manner as to minimise noise emissions;

- Employ at all times the Best Practicable Means (BPM), as defined in Section 72 of the Control of Pollution Act 1974, to reduce noise (including vibration) to a minimum, with reference to the general principles contained in British Standard BS5228 (see above);

- Facilitate an early community involvement exercise with neighbours to establish and agree protected areas of their properties and then to continually update progress and forewarn of forthcoming scheduled noisy works. A member of onsite staff should be designated as community relations manager to maintain good communications with neighbours;

- Adopt and adhere to agreed 'on' and 'off' times for noisy works and/or vibration sources, if required to do so by the Council;

- If deemed necessary, undertake or employ an independent third party to undertake noise, vibration and dust monitoring at locations to be agreed with the Local Authority, with pre-set 'amber' and 'red' trigger levels and text message alerts to notify when and where they are exceeded. The Contractor should commit to stop work immediately if a 'red' alert is received and to investigate. Working procedures may then need to be reviewed and modified to prevent re-occurrence. Records of monitor data should be compiled and reported weekly to all relevant parties. The extent of monitoring required can be continually assessed and amended as found necessary or desirable;

- It may be appropriate to undertake some test works prior to the commencement of the project to demonstrate the likely levels of vibration in the neighbouring properties. Depending on the outcome of the exercise, alternative plant or adjustments to the working programme may need to be considered;

- Operate a 'considerate builder' type scheme in which a commitment is made, amongst others, to undertake proper maintenance of equipment and control use of radios on site, with due consideration to proximity of neighbours, and ensure that equipment is turned off when not in use.

9. Conclusion

Demolition, excavation and construction works are proposed at Radlett House, Radlett Place, London.

The proposed works have been reviewed and predicted noise emissions calculated. These indicate that noise levels will generally be below $L_{Aeq,10hr}$ 70dB except for some durations of the demolition works using breakers.

Outline mitigation and Best Practical Means measures have been provided for the site as well as an overview of the recommendations of BS5228:2009 to assist in the training of site personnel.

Jamie Duncan MIOA


Approximate site extents
Most Affected Receivers
Image Landsat / Copernicus
Google Earth

APPENDIX A

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

APPENDIX A

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

APPENDIX B

VA4880 - Radlett House, Radlett Place, London

Assessment to neighbouring properties

Plant type	Sound Pressure Level $L_{Aeq,T}$ dB	Adjustments: Distance to Receptor m	Screening dB	Reflection dB	% on time (Ref 10h) %	Number of plant	Noise Level at Receptor $L_{Aeq,T}$ dB	Activity $L_{Aeq(10h)}$ dB	High Impact?
Demolition - Excavator									
Pulverizer Mounted on Excavator	80dB @10m	30	0	0	50	1	70	67	
Breaker Mounted on Excavator	90dB @10m	30	0	0	50	1	80	77	YES
Dumper Turck	63dB @10m	30	-5	0	25	1	48	42	
						Cumulative $L_{Aeq(10h)}$ Level		**78**	YES
Demolition - Hand									
Electric Saw	78dB @10m	30	-5	0	10	1	63	53	
Lump Hammer	81dB @10m	30	-5	0	10	2	69	59	
Dumper Turck	63dB @10m	30	-5	0	25	1	48	42	
Hand-held Hydraulic Breaker	93dB @10m	30	-5	0	25	1	78	72	YES
						Ground Floor Works Cumulative $L_{Aeq(10h)}$ Level		**73**	YES
Piling Works/Excavation of Basement/Groundworks									
Continuous flight auger injected piling	77dB @10m	20	-5	0	75	1	66	65	
Power Pack	70dB @10m	20	-5	0	75	1	59	58	
						Cumulative $L_{Aeq(10h)}$ Level		**66**	
Tracked Excavator	77dB @10m	30	0	0	75	1	67	66	
Dumper Turck	63dB @10m	30	-5	0	25	1	48	42	
						Cumulative $L_{Aeq(10h)}$ Level		**66**	
Poker vibrator	78dB @16m	20	-5	0	25	1	71	65	
Concrete Mixer Truck (Discharging) & Concrete Pump (Pumping)	75dB @10m	30	0	0	50	1	65	62	
						Cumulative $L_{Aeq(10h)}$ Level		**67**	
Foundation Concrete Works/Slab Pour									
Tracked Excavator	77dB @10m	30	0	0	75	1	67	66	
Dumper Turck	63dB @10m	30	-5	0	25	1	48	42	
						Cumulative $L_{Aeq(10h)}$ Level		**66**	
Cordless Drill/Screwdriver	67dB @10m	30	-5	0	10	2	55	45	
Electric wood saw (cutting formwork)	76dB @16m	30	-5	0	10	1	66	56	
Hammering	69dB @10m	30	-5	0	5	2	57	44	
Angle Grinder (Grinding Steel)	80dB @10m	30	-5	0	10	1	65	55	
						Cumulative $L_{Aeq(10h)}$ Level		**59**	
Poker vibrator	78dB @16m	20	-5	0	25	1	71	65	
Concrete Mixer Truck (Discharging) & Concrete Pump (Pumping)	75dB @10m	30	0	0	50	1	65	62	
						Cumulative $L_{Aeq(10h)}$ Level		**67**	
Skip/grab lorry	68dB @10m	30	0	0	10	1	58	48	
						Cumulative $L_{Aeq(10h)}$ Level		**49**	
Concrete/Steel Superstructure									
Angle Grinder (Grinding Steel)	80dB @10m	30	0	0	15	2	73	65	
Hammer Drill	70dB @10m	30	0	0	25	2	63	57	
Electric Welder	73dB @10m	30	0	0	25	1	63	57	
Hammering	69dB @10m	30	0	0	10	2	62	52	
Cordless Drill/Screwdriver	67dB @10m	30	0	0	25	2	60	54	
						Cumulative $L_{Aeq(10h)}$ Level		**67**	
Envelope Works									
Paslode Nail Gun	73dB @10m	30	0	0	2	2	66	49	
Hammering	69dB @10m	30	0	0	5	2	62	49	
Electric wood saw	81dB @10m	30	0	0	5	1	71	58	
Cordless Drill/Screwdriver	67dB @10m	30	0	0	10	2	60	50	
Angle Grinder (Grinding Steel)	80dB @10m	30	0	0	5	1	70	57	
Hammer Drill	70dB @10m	30	0	0	20	1	60	53	
						Cumulative $L_{Aeq(10h)}$ Level		**63**	
Internal Fitout									
Paslode Nail Gun	73dB @10m	30	-10	0	10	2	56	46	
Hammering	69dB @10m	30	-10	0	20	2	52	45	
Electric wood saw	81dB @10m	30	-10	0	10	1	61	51	
Hilti Cordless Drill/Screwdriver	67dB @10m	30	-10	0	20	3	52	45	
						Cumulative $L_{Aeq(10h)}$ Level		**54**	