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Mr R Walker
Cranbrook Basements Limited
26-28 Hammersmith Grove
Hammersmith
London
W6 7BA

By email

Date: 25th March 2014
Reference: R5129-1 Rev 2

Dear Mr Walker

RE: Basement Construction – Outline Noise Impact Assessment

Further to recent correspondence, I am pleased to provide the results of our outline generic assessment into the noise impact of the basement construction methods used by Cranbrook Basements Ltd.

1. Introduction

24 Acoustics has been requested by Cranbrook Basements Ltd to carry out a noise impact assessment for the methods used in basement construction. This is in response to a planning policy proposed by the Royal Borough of Kensington & Chelsea.

2. Planning Policy CL7

It is understood that the Royal Borough of Kensington & Chelsea proposes to introduce a planning policy, Basements Publication Planning Policy, CL7, which proposes to limit the size of basement extensions to no more than half the garden or open part of the site and the depth of excavation to a single storey in most cases. Although noise is cited as one of the reasons for introducing this policy, no quantification of noise impact is referenced.

The relevant sections of that document are as follows and are reproduced in Appendix A:

- Paragraph 34.3.48;
- Paragraph 34.3.49;
- Para 34.3.53;
- Paragraph 34.3.69
- Footnote 21;
- Policy CL7 Part M.

3. Construction Noise Methodology

Detailed advice on assessing noise from construction sites can be found in British Standard 5228 Code of Practice for noise and vibration control on construction and open sites, Part 1 - Noise. This standard provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.

It makes reference to a number of factors which are likely to affect the significance and acceptability of construction site noise. These are:

i) Site location;
ii) Existing ambient noise levels;
iii) Duration of site operations;
iv) Hours of work;
v) Attitude of the site operator;
vi) Noise characteristics.

It is generally recognised that for industrial noise the likelihood of complaints is related to the difference between the noise from the industrial source and the existing background noise level. British Standard 5228, however, recognises that this relationship between response and noise level differences may well be different for construction noise activities, and a greater difference may be tolerated when it is known that the operations are of a relatively short duration. It would be anticipated that the longer the construction activities are scheduled for, the closer the perception of a construction site to a permanent industrial facility, particularly if the construction activities take place at night. It is therefore important to consider the duration of the proposed works in addition to the hours of construction working within the context of the development area.

BS 5228 gives guidance on the assessment of construction noise relative to the existing ambient noise level and this is summarised below.

Period of Assessment	**Category A**	**Category B**	**Category C**
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75

Table 1: Daytime Construction Noise Threshold of Significant Effect

The Category A threshold is to be used when ambient noise levels (when rounded to the nearest 5 dB) are less than 65 dB L_{Aeq} over the relevant period. Category B threshold values are to be used when ambient noise levels (when rounded to the nearest 5 dB) are equal to 65 dB and Category C is used when ambient noise levels (when rounded to the nearest 5 dB) are higher than 65 dB.

If the total noise level (ambient plus construction noise) exceeds the appropriate category value, then a significant effect is deemed to occur.

For this assessment an ambient noise survey has not been undertaken however ambient noise levels in the area are assumed to be lower than 65 dB $L_{Aeq,\ 12hr}$ and a daytime limit for ambient plus construction noise of 65 dB $L_{Aeq,\ 12\ hr}$ is assumed to apply. The appropriate noise limit for each site would be dependent on the ambient noise levels at that particular location.

4. Construction Methodology

Cranbrook Basements Ltd uses construction methods which are intended to reduce the impact of noise on neighbouring properties. The methods used are described as follows.

A section of the existing concrete floor slab is removed using a pneumatic circular cutter. The underlying material is removed by hand digging. Material is moved to a skip located outside the front of the building by means of an electric motor driven conveyor. An air compressor is located outside the front of the building. All external plant is housed within the site hoarding which, it is assumed, includes a roof cover and encloses the conveyor. If an area of compacted earth is encountered an air spade is used to loosen the earth. If hard material such as rock or concrete is encountered then a pneumatic cut-off saw is used for a limited time to remove it. At all other times hand digging is used. After the excavation phase, a concrete mixer is located inside the building and concrete is poured to stabilise that section of the works.

Normal hours of operation for a basement development are as follows:

- Monday – Friday 08.00 – 17.00;
- Saturday 08.00 – 13.00.

It is understood that electric powered vehicles can be used for deliveries and collections from site and that approximately 3 vehicle movements per day is typical.

To minimise disruption to neighbouring residents, deliveries to and collections from site take place during the follow hours:

- Standard deliveries/collection 09.30 – 16.30;
- Large vehicle deliveries 10.00 – 16.00.

5. Calculations

Calculations of the potential noise levels generated by the construction works have been carried out using the guidance of BS 5228. The level of noise generated by the construction activities will depend upon a range of factors, which include plant to be used, distance between source and receptor and % on-time for each item of plant.

The following phases and plant are assumed for a typical Cranbrook Basements Development site.

Phase		Plant used
1	Cutting section of existing floor slab	Pneumatic circular cutter, air compressor, electric conveyor.
2	Hand digging	Electric conveyor
3	Breaking down of firm soil	Air spade, air compressor, electric conveyor.
4	Removal of hard material, small area	Pneumatic cut-off saw, air compressor, electric conveyor – up to half an hour.
5	Removal of hard material, large area	Pneumatic cut-off saw, air compressor, electric conveyor.
6	Concreting	Concrete mixer.

Table 2: Basement Construction Phases

Source noise data for the plant has been obtained from the plant manufacturers or taken from the database contained in BS 5228. The calculations assume an electric motor driven conveyor and an air compressor are located within the site hoarding. The calculations allow for break-out from inside the building through an open window of dimensions 1.5 m x 1.2 m.

As the sites are often in close proximity to neighbouring properties, a distance of 6 m between the site and the receiver has been assumed. The calculations (with all assumptions) are shown in Appendix B of this letter and summarised in Table 3 below.

Phase		Facade Construction Noise Level, dB $L_{Aeq,\ 12\ hour}$
1	Cutting section of existing floor slab	61
2	Hand digging	60
3	Breaking down firm soil	65
4	Removal of hard material, small area	62
5	Removal of hard material, large area	61
6	Concreting	58

Table 3: Summary of Calculated Facade Noise Levels, 6 m from development site

6. Assessment

The predicted noise levels shown in Table 3 assume a receiver 6 m away. Where properties are spaced further apart, noise levels would be lower. The predicted noise level for the normal excavation method of hand digging and conveyor operation is 60 dB $L_{Aeq,12hr}$ which is well below the assumed limit of 65 dB $L_{Aeq,\ 12hr}$ allowing ample headroom for a contribution from ambient noise. During the excavation phase, use of air tools is likely to result in higher noise levels but this generally occurs for short periods and will not result in the noise limit being exceeded.
During concreting operations, a noise level of 58 dB $L_{Aeq,\ 12hr}$ is predicted which is considerably lower than the assumed noise limit.

Vehicle Movements

Use of electric vehicles and limitations on delivery/collection times means that any impact from this aspect of basement construction is minimised.

Vibration

It is not possible to predict vibration levels due to basement construction operations however as the methods used by Cranbrook Basements Ltd do not involve piling or the use of percussive tools, it is considered that vibration levels are minimised.

7. Conclusions

It is considered that the construction methods used by Cranbrook Basements, are likely to ensure that for basement construction projects noise levels will generally not exceed those specified in BS 5228 and that vibration levels will be minimised. Use of electric vehicles and limitations on delivery/collection times means that any impact from vehicle movements is minimised.

I trust you will find the above of interest to you. Should you have any queries please do not hesitate to contact me.

Yours sincerely,
For 24 Acoustics Ltd

Aileen Reed BEng MIOA
Senior Consultant

Approved by
Reuben Peckham BEng MPhil CEng MIOA
Director & Principal Consultant

APPENDIX A: RBKC PLANNING POLICY CL7 – Sections relevant to noise

34.3.48 Basement development in recent years has been the subject of concern from residents. Basements have given rise to issues about noise and disturbance during construction, the management of traffic, plant and equipment, and concerns about the structural stability of nearby buildings. These concerns have been heightened by the growth in the number of planning applications for basements in the Royal Borough with 46 planning applications in 2001, increasing to 182 in 2010, 294 in 2012 and 450 in 2013. The vast majority of these are extensions under existing dwellings and gardens within established residential areas.

34.3.49 In the Royal Borough, the construction of new basements has an impact on the quality of life, traffic management and the living conditions of nearby residents and is a material planning consideration. This is because the Borough is very densely developed and populated. It has the second highest population density and the highest household density per square km in England and Wales1. Tight knit streets of terraced and semi-detached houses can have several basement developments under way at any one time. The excavation process can create noise and disturbance and the removal of spoil can involve a large number of vehicle movements.

34.3.53 Restricting the size of basements will help protect residential living conditions in the Borough by limiting the extent and duration of construction and by reducing the volume of soil to be excavated. Large basement construction in residential neighbourhoods can affect the health and well-being of residents with issues such as noise, vibration and heavy vehicles experienced for a prolonged period. A limit on the size of basements will reduce this impact.

34.3.69 Basement construction can cause nuisance and disturbance for neighbours and others in the vicinity, through construction traffic, parking suspensions and the noise, dust and vibration of construction itself. The applicant must demonstrate that these impacts are kept to acceptable levels under the relevant acts and guidance21, taking the cumulative impacts of other development proposals into account. Every effort must be made to locate the building compound and the skip on site or in exceptional circumstances in the highway immediately outside the application site.

Footnote 21: There are a number of relevant acts and regulations including Control of Pollution Act (COPA) 1974, Environmental Protection Act 1990 and Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001. The guidance includes British Standard BS 5228 – 1: 2009 Code of practice for noise and vibration control on construction and open sites.

Policy CL7
Part M ensure that construction impacts such as noise, vibration and dust are kept to acceptable levels for the duration of the works

APPENDIX B: CONSTRUCTION NOISE CALCULATIONS

Phase 1 - Cutting section of Slab

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Air compressor	90	6	0	24	15	3	54	25	-6.02	48
Electric conveyor	97.2	6	0	24	15	3	62	75	-1.25	60
Open window - circular cutter	93.6	6	0	24	15	3	58	25	-6.02	52
							Total SPL due to fixed plant =			61

Phase 2 - Normal operation, conveyor and hand digging

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Electric conveyor	97.2	6	0	24	15	3	62	75	-1.25	60
							Total SPL due to fixed plant =			60

Phase 3 - Breaking down of firm soil

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Air compressor	90	6	0	24	15	3	54	4	-13.98	40
Electric conveyor	97.2	6	0	24	15	3	62	75	-1.25	60
Open window - air spade	112.8	6	0	24	15	3	77	4	-13.98	63
							Total SPL due to fixed plant =			65

Phase 4 - Removal of hard material, small area

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Air compressor	90	6	0	24	15	3	54	25	-6.02	48
Electric conveyor	97.2	6	0	24	15	3	62	75	-1.25	60
Open window - cut-off saw	96.1	6	0	24	15	3	60	25	-6.02	54
							Total SPL due to fixed plant =			62

Phase 5 - Removal of hard material, large area

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Air compressor	90	6	0	24	15	3	54	17	-7.70	47
Electric conveyor	97.2	6	0	24	15	3	62	75	-1.25	60
Open window - cut-off saw	96.1	6	0	24	15	3	60	17	-7.70	53
							Total SPL due to fixed plant =			61

Phase 6 - Concreting

Plant Details		distance	% soft	Adjustments, dB(A)			Resultant	Activity duration		Activity
Type	PWL	, m	ground	distance	screening	reflection	LAeq, 1hr	%	Correct. dB	LAeq,12hr
Open window - concrete mixer	94.8	6	0	24	15	3	59	75	-1.25	58
							Total SPL due to fixed plant =			58

APPENDIX C: PROJECT TEAM CV'S

Curriculum Vitae, Aileen Reed

Full Name:	Aileen Reed
Position:	Senior Consultant, 24 Acoustics Ltd
Contact Details:	24 Acoustics Ltd, Pepper Mill Barn, Old Salisbury Lane, Romsey, SO51 0GD
	Tel: +44 1794 515999
	Email: aileen@24acoustics.co.uk
Date of Birth:	17th September 1970
Citizenship:	N. Irish
Academic Qualifications:	BEng 'Electroacoustics', Salford University, 1993;
Professional Qualifications:	Member of the Institute of Acoustics.

Employment History:

2011- Current	Senior Consultant, 24 Acoustics Ltd.
2004-2011	Full time mother.
1996 - 2004	Acoustic Technology Ltd/Bureau Veritas Consulting Engineer.
1993- 1996	ACIA Engineering Acoustics Assistant & Consulting Engineer.

Key Experience

Environmental Noise/ Vibration:	Experienced in the calculation and assessment of environmental noise from industry, renewable energy sources inc wind turbines in accordance with ETSU-R-97, minerals & waste and infrastructure (road, railways, airports) in accordance with all relevant methodology for stand-alone/ EIA purposes; Measurement of noise and vibration, baseline/ ambient, construction sites, industrial sites etc; Prediction and assessment of construction noise in accordance with relevant guidance; Modelling and calculation of noise and vibration from industrial and infrastructure using both proprietary noise-mapping software and other techniques developed in-house; Specialist experience in acoustic modelling of petrochemical plant/oil & gas terminals and developing environmental noise management schemes for those sites; Assessment of ground borne vibration from railway/ construction activities.
Industrial Acoustics:	Use of vibration measurement techniques to predict noise source levels from industrial plant and machinery; Engineering noise/ vibration control of a range of plant, including oil and gas processing terminals; Occupational noise and vibration risk assessment for an extensive range of industries, including offshore. Provision of engineering control measures to reduce personnel noise/ vibration exposure. Assessment of industrial injury claims relating to occupational noise and vibration exposure.

Curriculum Vitae, Reuben Peckham

Full Name:	Michael Reuben Peckham
Position:	Director & Principal Consultant, 24 Acoustics Ltd
Contact Details:	24 Acoustics Ltd, Pepper Mill Barn, Old Salisbury Lane, Romsey, SO51 0GD Tel: +44 1794 515999 Email: reuben@24acoustics.co.uk
Date of Birth:	4th May 1974
Citizenship:	British
Academic Qualifications:	BEng 'Engineering Acoustics and Vibration', Institute of Sound and Vibration Research, University of Southampton, 1995; MPhil 'Whole Body Vibration', Institute of Sound and Vibration Research, University of Southampton, 2000.
Professional Qualifications:	Chartered Engineer; Corporate member of the Institute of Acoustics.
Offices Currently Held:	Member of the Institute of Acoustics' Specialist Noise and Vibration Engineering Technical Committee; Examiner, Institute of Acoustics' Postgraduate Diploma in Acoustics. Noise and Vibration Control Engineering module.

Employment History:

2005- Current	Director & Principal Consultant, 24 Acoustics Ltd.
2002-2005	Bureau Veritas Principal Consultant & Business Development Manager.
2002	RPS Planning Transport & Environment Senior Consultant.
2000- 2002	Acoustic Technology Ltd, Consulting Engineer.
1997- 1999	Institute of Sound and Vibration Research, University of Southampton , Research Assistant & Consultant.
1995- 1996	Jaguar Cars Ltd, Noise, Vibration & Harshness Engineer.

Key Experience

Environmental Noise/ Vibration:	Calculation and assessment of environmental noise from industry, renewable energy sources inc wind farms/ turbines in accordance with ETSU-R-97, minerals & waste and infrastructure (road, railways, airports) in accordance with all relevant methodology for stand-alone/ EIA purposes; Measurement of noise and vibration, baseline/ ambient, construction sites, industrial sites etc; Experienced in the modelling and calculation of noise and vibration from industrial and infrastructure using both proprietary noise-mapping software and other techniques developed in-house; Modelling and measurement of underwater noise sources. Prediction of groundborne sources (e.g. dock activity) on the marine environment. Prediction of ground borne noise and vibration from railway/ road/ construction activities; Specialist technical experience in the measurement and assessment/ control of noise from wind turbines and wind farms (working for developers and local planning authorities). Investigation and engineering control of environmental noise/ vibration and liaison/ negotiation with statutory authorities agree satisfactory levels in accordance with relevant planning legislation and the Environmental Protection Act, 1990.
Architectural Acoustics:	Specialist technical inspector for Robust Details Ltd; Have acted as design team member and advised upon the acoustic design of large residential/ mixed used developments, schools, hospitals, recording studios etc. Scope has included protection of external noise (upon internal spaces), prevention of external noise break-out, sound insulation and acoustical engineering of sensitive internal spaces.
Industrial Acoustics:	Use of vibration measurement techniques to predict noise source levels from industrial plant and machinery; Engineering noise/ vibration control of a range of plant, including oil and gas processing terminals, power stations (nuclear, biomass, combined gas heat recovery stations etc.); Occupational noise and vibration risk assessment for all heavy industries, including provision of engineering control measures to reduce personnel noise/ vibration exposure.
Expert Witness Services:	Have acted as an expert witness in courts of law (at Magistrates, Crown, County and High Court level) and at planning appeals and public inquiries.