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**NOISE ASSESSMENT FOR MOBILE DRIVEN PILING RIG 5504
(CONCRETE PILE)**

FOR ROGER BULLIVANT
WALTON PARK
HEARTH COTE ROAD
SWADLINCOTE
DERBYSHIRE
DE11 9DU

AT JENNINGS
PENMAEN ROAD
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EXECUTIVE SUMMARY

Noise assessment for Piling Rig 5504 – 4 February 2020.



Summary Findings

The results and information obtained during the visit indicated the following:

- Noise exposure for the 5504 rig operator and assistant is likely to be in excess of the upper exposure action value of 85 dB(A).
- The rig is clearly marked to indicate that a noise hazard exists.
- The hearing protection provided is suitable to reduce the noise level at the ear to below 80 dB(A).

It should be noted that the noise levels generated by the rig are likely to vary dependant on the ground type and other local conditions.

Summary Actions and Recommendations

- The wearing of hearing protection should continue to be mandatory for both the rig operator and assistant and anyone else in the immediate vicinity of the rig.
- The employer is required to provide the employees with hearing protection and the employees are legally obliged to wear the protection.
- It should be ensured that employees have received suitable training regarding the noise risk and the wearing of hearing protection.
- Audiometry is required for the rig operators and assistants.

SURVEYED BY:



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1. INTRODUCTION

The survey described in this report was carried out on 4 February 2020 by Carol Bladon at the request of Andrew Clarke of Roger Bullivant at Jennings, Penmaen Road, Conwy and in accordance with our work specifications outlined in quotation reference ISS01479, in order to determine personal exposure to noise and general noise levels in the vicinity of piling rig 5504.

2. OBSERVATIONS / DESCRIPTION OF PROCESS

The 5504 rig drives 250mm square pre-cast concrete piles. At the Conwy site, 7 sections of pile were being used per location, 3 x 4 metre sections, 3 x 3 metre sections and one 6 metre length. The width of the rig is 3.09 m and operational length 7.5m. The operator stands beside the machine to control it remotely, normally at a distance of 1.5 to 2.5 metres. The piles are transferred to the rig in batches using a JCB forklift.

Wind direction on the day of the survey was from the front right-hand side of the rig.

3. METHODOLOGY AND INSTRUMENTATION

Noise measurements were taken with a Precision Pulse Integrating Sound Level Meter, which complies with the requirements of IEC 61672-1:2002-5 (Electro-Acoustics – Sound Level Meters) Group 'X' instruments. Performance of Class 1. Octave band filters comply with EN 61260: 1996, class 0. For the purpose of this survey measurements were taken in the A weighted scale and the C weighted scale for peak sound pressure readings. The sound level meter was calibrated before and after use with a matching noise calibrator.

A Casella CEL-633B Noise Meter, serial number 5044689, with microphone CEL-251, serial number 2103, and Preamplifier CEL-495, serial number 002540, was used along with a CEL-120 Acoustic Calibrator, serial number 3941376, calibrated by Casella September 2019.

Personal dosimetry was performed using CEL-350 Noise Dose Badges with CEL-252 microphones, calibrated 21 June 2019. The dosimeters were calibrated using the CEL-120 Acoustic Calibrator above. The dose meters comply with the requirements of IEC 61252: 2002, BS EN 61252: 1997.

4. LEGISLATION

The Control of Noise at Work Regulations 2005, which implement the 2003/10/EEC Physical Agents Directive (Noise), came into force on 6 April 2006. The emphasis of the legislation is to eliminate noise at source or reduce it to a minimum (Regulation 6). In addition, the legislation includes the following exposure limit values and action values (Regulation 4).

4.1 The lower exposure action values are –

- 4.1.1 a daily or weekly personal noise exposure of 80 dB(A); and
- 4.1.2 a peak sound pressure of 135 dB(C).

4.2 The upper exposure action values are –

- 4.2.1 a daily or weekly personal noise exposure of 85 dB(A); and
- 4.2.2 a peak sound pressure of 137 dB(C).

4.3 The exposure limit values are –

- 4.3.1 a daily or weekly personal noise exposure of 87 dB(A); and
- 4.3.2 a peak sound pressure of 140 dB(C).

4.4 Where the exposure of an employee to noise varies markedly from day to day, an employer may use weekly personal noise exposure in place of daily personal noise exposure for the purpose of compliance with these Regulations.

- 4.5 In applying the exposure limit values in paragraph 4.3, but not in applying the lower and upper exposure action values in paragraphs 4.1 & 4.2, account shall be taken of the protection given to the employee by any personal hearing protectors provided by the employer in accordance with regulation 7(2).

Hearing protection must be made available, on request, to any employee whose exposure to noise is likely to be at or above a lower exposure action value. If an employer is unable by other means to reduce the level of noise to which an employee is likely to be exposed to below an upper exposure action value, then he must provide personal hearing protectors and the area concerned must be designated a Hearing Protection Zone.

5. OCCUPATIONAL EXPOSURE

The daily personal noise exposure or $L_{EP,d}$ referred to in the Noise Regulations is the 'daily noise dosage' over an 8 hour period. The L_{eq} values measured are a fractional measurement during a working day, therefore an 8-hour L_{eq} measurement would be equivalent to the $L_{EP,d}$.

It is important to note that noise dosage is a combination of the level of noise and the duration of the person's exposure. The risk is based on the equal energy principal, with a 3 dB step being equivalent to a doubling or halving of sound energy.

It has been known for many years that workers in noisy industries can suffer permanent hearing damage and procedures for assessing the risk have been developed. Hearing deterioration depends on both the noise level experienced and the duration, this is cumulative. Individual susceptibility can vary, but the first effect is normally the ability to hear high pitched sounds. The ability to hear low pitched sounds is gradually affected. There is no real medical treatment and hearing aids will only provide limited benefit.

6. PRESENTATION OF RESULTS

A plan of the area around the rig (see Appendix I) has been marked with the A weighted noise levels recorded, to the nearest whole number. Colour coding has been used to highlight high noise areas. It should be noted that the drawings reference L_{eq} measurements only, with each recording taken during the installation of piles once resistance was met. They do not reflect overall daily personal exposures $L_{EP,d}$.

Results tables showing the individual noise measurements L_{eq} are also given in Appendix II. Peak sound pressure measurements are shown where applicable.

Personal noise dose summary results are reported in Appendix III, with calculations for 8, 10 and 12 hours of exposure. The individual noise dosimetry measurements are presented in graphical form in Appendix IV. It should be noted that personal dosimetry can provide useful noise exposure information, but the measurements can be prone to interferences.

Appendix V indicates the effectiveness of the hearing protection used. Frequency analysis was performed on the noise level monitored near the rig operator, this being the highest noise level recorded. The protection factor was calculated to mean minus one standard deviation minus 4 dB, this being the method chosen for use with the current noise regulations as being the most representative of the protection achieved.

7. DISCUSSION

7.1 Measurements

Noise measurements were taken once the rig met some resistance. They were taken next to the operator and at 5 metre intervals from the front, rear and sides of the rig. Access to the right-hand side of the rig was limited to 10 metres distance, as the rig was close to the boundary fence.

Noise levels measured near to the rig operator at approximately 2 metres from the driving pile were 90 dB(A).

Noise levels were highest at the front and right-hand side of the rig and lowest at the rear.

Noise dosimetry indicated that noise exposure for the operator and the person delivering the piles was likely to be in excess of the upper exposure action value, at 90 dB(A) $L_{EP,d}$, assuming an 8 hour shift is worked.

The measurements taken beside the rig operator and at the static locations around the rig indicate the reduction in noise levels and hence exposure that can be achieved by increasing the distance from the noise source. Rig operators should therefore, when possible, stand further away from the driven pile, as should the assistant once they have helped load each individual section.

7.2 Engineering controls

The focus on reducing the noise emitted by the rigs should continue to be made at the design stage and good maintenance of the rig will help to ensure that noise levels are kept to a minimum.

7.3 Hearing protection

As a convenient, easy to use guide for hearing protection attenuation, a SNR (single number rating) figure is normally provided. As a rule of thumb, the following can be applied:

A-Weighted noise Level (dB)	SNR required (dB)
85 - 90	20 or less
90 - 95	20 – 30
95 - 100	25 – 35
100 - 105	30 or more

The hearing protection currently available and in use is given below.

Type	SNR (dB)
Moldex Spark Plugs	35

Frequency analysis was performed for the noise measured at the rig operator's location as detailed in Appendix V. The acceptable in ear level is between 70 dB(A) and 80 dB(A), assuming that the plugs or muffs have been fitted correctly by the operator. Levels below 70 dB(A) may be classed as over attenuation where the operator may feel isolated and warning signals may not be heard. The hearing protection will provide a sufficient attenuation though it may slightly over attenuate.

7.4 Information, instruction and training

It is recommended that the company provides suitable information, instruction and training to employees exposed to high noise levels. This should include the correct wearing of hearing protection devices especially foam type ear plugs, that should be fully inserted into the ear canal and allowed to expand before work commences, and the correct storage of all hearing protection devices. Operatives should also regularly check any ear defenders provided for breaks or deterioration in the seal of the muff or damage to the casing or fixings.

7.5 Audiometry

Health surveillance in the form of audiometry is requisite in accordance with the legislation when employees are exposed to a $L_{EP,d}$ above 85 dB(A). It would be wise for the company to perform pre-employment hearing checks and then periodic hearing checks. As well as spotting any early signs of hearing damage it will also help protect the company against litigation for damage to hearing.

Where the exposure is between the lower and upper exposure values, or where employees are only occasionally exposed above the upper exposure action values, health surveillance should be provided if it is found that an individual is particularly sensitive to noise, for example due to past medical history, previous audiometric tests, a history of exposure to high noise levels and in a few cases family history.

8. CONCLUSIONS AND RECOMMENDATIONS

Noise exposure for the 5504 rig operator and assistant is likely to be in excess of the upper exposure action value of 85 dB(A) and the wearing of hearing protection should continue to be mandatory for this activity and for others in the immediate vicinity of the rigs. The employer is required to provide the employee with hearing protection and the employees are legally obliged to wear the protection. The rig is clearly marked to indicate that a noise hazard exists.

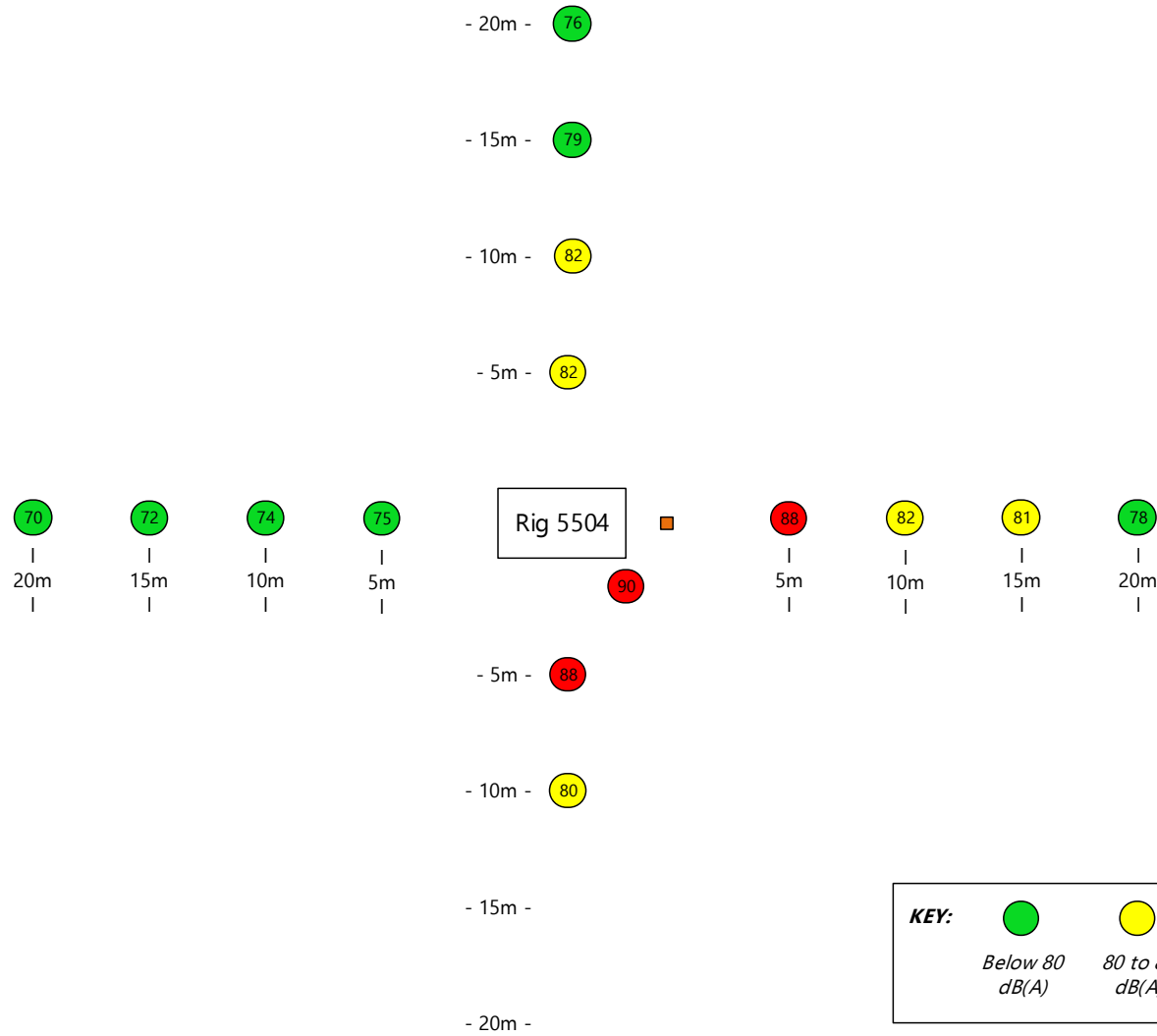
It should be noted that the noise levels generated by the rig are likely to vary and, in particular, may depend on the ground type and other local conditions.

The hearing protection provided is suitable to reduce the noise level at the ear to below 80 dB(A). It should be ensured that employees have received suitable training with regards to the noise risk and the wearing of hearing protection.

Audiometry is required for the rig operators and assistants.

APPENDIX I

Plan Of Area Around Rig 5504



APPENDIX II – RESULTS TABLE

Noise levels in the vicinity of Rig 5504

Location	Leq dB(A)	Duration min:sec	Peak if >120dB(C)
By operator, 2 m from pile driver at control panel (4 th – 7 th sections)	90.2	11:11	123.6
Front of Rig			
5 metres away (1 st – 4 th sections)	88.4	6:10	120.8
10 metres away (5 th – 7 th sections)	82.2	6:54	-
15 metres away (1 st – 3 rd sections)	81.0	3:24	-
20 metres away (4 th – 7 th sections)	77.9	8:26	-
Right Hand Side of Rig			
5 metres away (2 nd – 4 th sections)	87.9	5:07	-
10 metres away (5 th – 7 th sections)	80.0	7:53	-
15 metres away	Off site, no access		
20 metres away			
Rear of Rig			
5 metres away (4 th & 5 th sections)	75.0	2:21	-
10 metres away (6 th & 7 th sections)	74.2	5:34	-
15 metres away (3 rd & 4 th sections)	71.8	3:19	-
20 metres away (5 th & 6 th sections)	69.9	4:58	-
Left Hand Side of Rig			
5 metres away (7 th section)	82.1	4:07	-
10 metres away (2 nd – 4 th sections)	81.6	4:42	-
15 metres away (5 th & 6 th sections)	78.8	3:56	-
20 metres away (7 th section)	75.5	7:03	-

Table Key

RED	Above 85 dB(A)
YELLOW	Between 80 & 85 dB(A)
GREEN	Below 80 dB(A)

APPENDIX III – SUMMARY DOSIMETRY RESULTS

Person	Work Activity	Sampling Times	Leq	Peak	L _{EP,d} dB(A)		
			Including / Excluding breaks	dB(C)	8 hour's exposure	10 hour's exposure	12 hour's exposure
Dale Wilkinson	Rig operator	09:33 – 13:09	89.2 / 90.2	133.9	90.2	91.1	92.0
Andy Brookes	JCB delivering pile sections	09:34 – 13:10	89.1 / 90.1	134.9	90.1	91.1	91.9
The L_{EP,d} is calculated assuming 8, 10 and 12 hours of noise exposure Exceeds Lower Exposure Action Value of 80 dB(A) or 135 dB(C) peak Exceeds Upper Exposure Action Value of 85 dB(A) or 137 dB(C) peak							

APPENDIX IV – DOSIMETRY GRAPHS

Areas shaded pink on the following graphs are breaks.

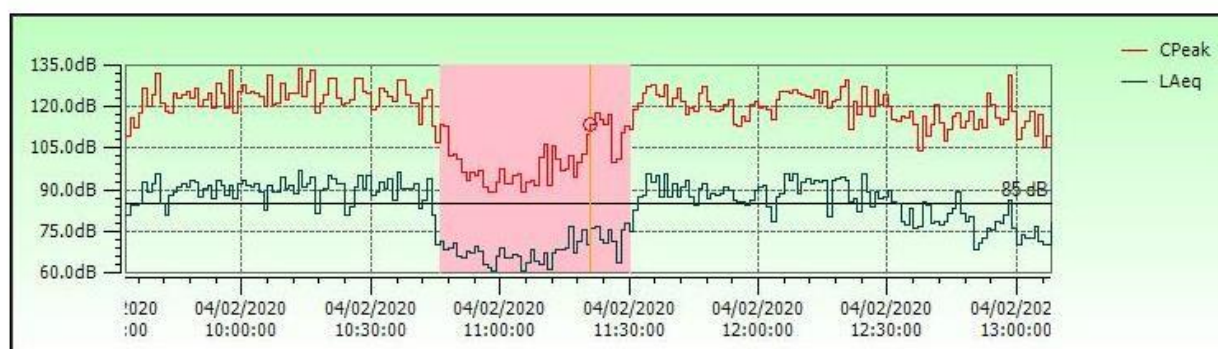
Roger Bullivant Rig 5504



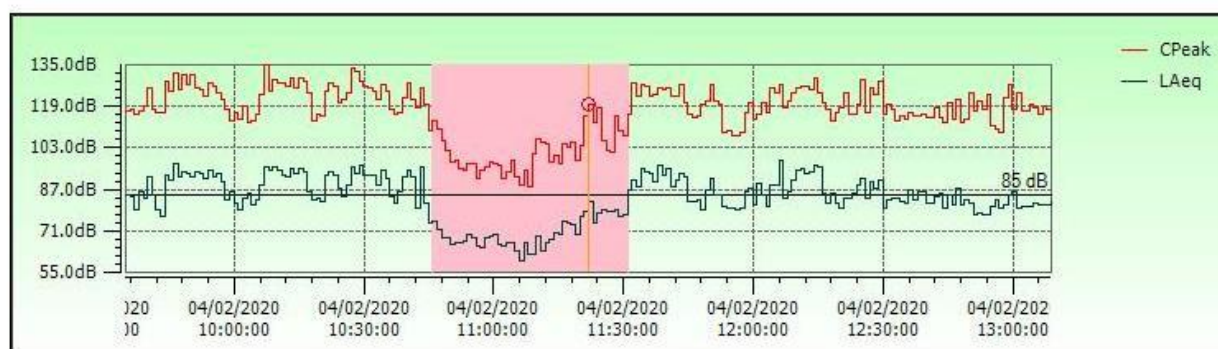
4 February 2020 Conwy

Instrument Model CEL-350

Serial Number	5044530	LCpeak	133.9 dB
Start Date & Time	04/02/2020 09:33:04	Cal (before) SPL	114.03 dB
Duration	03:36:15 HH:MM:SS	Overload	No
LAeq	89.2 dB		
Notes	Dale Wilkinson - Rig Operator		

**Instrument Model** CEL-350

Serial Number	5044630	LCpeak	134.9 dB
Start Date & Time	04/02/2020 09:34:55	Cal (before) SPL	113.99 dB
Duration	03:36:40 HH:MM:SS	Overload	No
LAeq	89.1 dB		
Notes	Andy Brookes - JCB		



APPENDIX V – EFFECTIVENESS OF HEARING PROTECTION

Noise Source

By Operator/control panel rig 5504

HPD

Moldex Spark Plugs (SNR 35)

Measured Level

90.2 dB(A)

In Ear Levels

62.5 dB(A) 1SD - 4dB

Hz	63	125	250	500	1K	2K	4K	8K
Measured level (A)	58	72.6	81.6	83.6	84	84.9	79.4	70.4
HPD Mean Attenuation	36	36	36.7	39	36	37	46.7	44.6
SD of Attenuation	6	6	6.1	6.5	5.9	4.9	3.2	3.8
Assumed Attenuation -1sd	30	30	30.6	32.5	30.1	32.1	43.5	40.8
SPL-APV(A) 1sd	28	42.6	51	51.1	53.9	52.8	35.9	29.6

Moldex Spark Plugs were worn by both individuals. They are suitable to reduce the highest noise level recorded (beside the rig operator) to below 80 dB(A) at the ear.