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REPORT ON VIBRATION MONITORING

AT

GRANGEGORMAN CAMPUS CENTRAL & EAST QUAD, DUBLIN 7

INTERIM VIBRATION REPORT 021-02: 26th April to 31st May 2019.

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1. SURVEY DETAILS

Glenside Environmental were commissioned by Sisk FCC GG PPP Joint Venture, to conduct vibration monitoring during site development works at Grangegorman Campus Central & East Quad, Dublin 7. This report presents the results of vibration monitoring at 3 locations, C, D and E from 26th April to 31st May 2019. The locations are illustrated in Figure 1.

1.1. Vibration measurement survey

Vibration monitoring was carried out using 3 no. Vibrock vibration analysers with the units positioned at Locations, East Quad West Boundary Wall Location C, Grangegorman Upper Location D and Central Quad Location E, as shown in Figure 1.

The location of the vibration measuring instruments were chosen according to the guidelines in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part 1 1990 Guide for measurement of vibrations and evaluation of their effects on buildings* and *Part 2 1993 Guide to damage levels arising from groundborne vibration.*

2. Vibration Guidelines

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes. However, higher magnitudes of vibration are typically tolerated for single events or events of short duration. For example, blasting and piling, two of the primary sources of vibration during construction, are typically tolerated over extended periods of time at vibration magnitudes up to 12mm/s. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night-time.

Guidance relevant to acceptable vibration at the foundation of buildings is contained within:

- Building Research Establishment (BRE) Digest 353 (July 1990): *Damage to structures from ground-borne vibration*, and;
- British Standard BS 7385 (1993): *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration*.

- British Standard BS 5228 (1992): *Noise control on construction and open sites* Part 4 *Code of practice for noise and vibration control during piling*.

The BRE digest refers to the German Standard DIN 4150, which provides limits below which there is very unlikely to be any cosmetic damage to buildings. For structures that are of great intrinsic value and are particularly sensitivity to vibration, transient vibration should not exceed 3mm/s at low frequencies. Allowable magnitudes increase to 8mm/s at 50Hz and 10mm/s at 100Hz and above.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a cosmetic threshold for minor or cosmetic (ie non-structural) damage should be taken as a peak particle velocity of 10mm/s for intermittent vibration and 5mm/s for continuous vibration. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. For light and flexible industrial and commercial structures threshold limits of 20mm/s for intermittent and 10mm/s for continuous are recommended, whilst for heavy and stiff buildings higher thresholds of 30mm/s for intermittent and 15mm/s for continuous are recommended.

3. Vibration Limits

Table 2.1 below details commonly applied vibration limits applicable at the closest sensitive property.

Table 2.1: Allowable Vibration at Sensitive Properties (NRA)

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 11Hz	11 to 50Hz	50 to 110Hz (and above)
3 mm/s	3 to 8 mm/s	8 to 11 mm/s

3.1. Vibration Survey results

A summary of the upper levels recorded during the vibration monitoring survey from 26th April to 31st May 2019 are presented below.

Table 2.2 Results from Locations C, D and E from 26th April to 31st May 2019.

Date	Peak Particle Velocity (ppv)mm/s		
	Location C East Quad West Boundary Wall	Location D Grangegorman Upper	Location E Central Quad
26/04/2019	0.545	0.834	0.760
27/04/2019	0.497	0.833	0.743
28/04/2019	0.471	0.838	0.745
29/04/2019	0.535	0.848	0.746
30/04/2019	0.503	0.841	0.742
01/05/2019	0.571	0.838	0.737
02/05/2019	0.487	0.836	0.735
03/05/2019	0.516	0.841	0.736
04/05/2019	0.464	0.830	0.732
05/05/2019	0.479	0.833	0.733
06/05/2019	0.545	0.840	0.747
07/05/2019	0.425	0.836	0.753
08/05/2019	0.413	0.833	0.751
09/05/2019	0.409	0.836	0.742
10/05/2019	0.408	0.830	0.735
11/05/2019	0.407	0.836	0.730
12/05/2019	0.409	0.841	0.736
13/05/2019	0.408	0.844	0.738
14/05/2019	0.410	0.842	0.763
15/05/2019	0.406	0.843	0.750
16/05/2019	0.406	0.842	0.749
17/05/2019	0.415	0.843	0.739
18/05/2019	0.415	0.844	0.735
19/05/2019	0.412	0.842	0.740
20/05/2019	0.409	0.845	0.739
21/05/2019	0.408	0.844	0.741
22/05/2019	0.406	0.845	0.898
23/05/2019	0.407	0.842	0.744
24/05/2019	0.409	0.848	0.743
25/05/2019	0.421	0.844	0.740
26/05/2019	0.413	0.845	0.745
27/05/2019	0.412	0.848	0.752
28/05/2019	0.411	0.845	0.802
29/05/2019	0.406	0.845	0.747
30/05/2019	0.406	0.848	0.744
31/05/2019	0.408	0.839	0.747

4. Conclusions

All vibration levels during the recording period were within the lower limit of 3mm/s.

Figure 1: Vibration monitoring locations