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Report No2257 - vib

Vibration Monitoring: Britannia St, London WC1.

For: Durkan

12/11/2006
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1.0 Object

The object of this report is to present the findings of a vibration survey carried out at the proposed development site at Britannia St, London WC1 over a 24 hour period between Wednesday 29th November & Thursday 30th 2006.[1]

It should be noted that the car park was in full operation during the survey and as such the data will not be purely train vibration although it was noted that the car park closed at 7pm opening again at 7am.

2.0 Scope

The scope of this report is as follows:

1) Presentation of survey vibration findings during a "typical" weekday period.

NOTE: It is understood that the vibration survey data is required to provide information for the design of vibration bearings for the proposed development.

A detailed triaxial assessment was undertaken of the Peak Particle Velocity levels and frequency content caused by train movements using the tunnel under the proposed development site

3.0 Survey

Vibration equipment was installed at the following positions on the dates detailed below:

Position	Description	Date of Installation / Survey
1	Approximately 2m off the centre line of the tunnel on the car park base slab	Wednesday 29th November & Thursday 30th 2006.

The fixed monitoring position enabled vibration data to be collected during the full 24 hour period.

See Photo Appendix for approximate location of monitoring equipment.

[1] NOTE: Due to adverse weather the Vibration Dosage Recordings were carried out on 8th Dec 2006..

4.0 Measurements

During the fixed monitoring histogram recordings were made which were subsequently analysed for the purpose of this report.

The following measurements were carried out:

Peak Particle Velocity (P.P.V) mm/s (1 min period).

Vibration Dosage Values (VDV) $m/s^{1.75}$ (Day time period only)

5.0 Measurement Equipment

The measurements were made using the following equipment:

1) 1 off Instantel MiniMate + Series III Tri-axial vibration analyser.

2) 1 off Vibrock V901

The Instantel monitor was set to record in stripchart mode taking the ppv & waveform measurements over the full 24hrs period. The Vibration Dosage Analyser was used during an attended survey to give an approximation to the likely foundation eVDV levels[2].

6.0 Site Operations

The site local vibration sources over the monitoring period consisted of the following:

1) Rail cutting along Western boundary of site

2) Thameslink Railway tunnel going under site (See exact position on the site plan in the Appendix.)

3) Localised vehicle movements around the car park (0700 – 1900hrs only).

The Vibration data collected from the monitor is detailed in the vibration data sheets in the Appendix for both PPV and VDV monitoring.

[2] eVDV – estimated Vibration Dosage Value

7.0 Survey Findings

The results are detailed in the Appendix and are summarised below;

MiniMate + Peak Particle Velocity (PPV) Monitoring

Position	Description	Comment
1	Approximately 2m from the Apex line of the tunnel	For the period 29th – 30th November 2006. There are regular levels of PPV Peak particle velocity in the Transverse axis above 4mm/s with the peak level recorded achieving 9.08mm/s @ 43Hz. In the vertical axis there are regular levels of PPV Peak particle velocity in the Longitudinal axis above 3mm/s with the peak level recorded achieving 5.7mm/s @ 57Hz. For the Longitudinal axis there are regular levels of PPV Peak particle velocity in the Longitudinal axis above 3mm/s with the peak level recorded achieving 7.57mm/s @ 18Hz.

Frequency Content:

The frequency content of the vibration is summarised in the PPV scatter plots in the Appendix to this report. In summary they are:

Vertical Axis: 50 – 80Hz frequency range for the higher levels of PPV.

Transverse Axis: 40 – 60Hz frequency range for the higher levels of PPV.

Longitudinal Axis: 35 – 70Hz frequency range for the higher levels of PPV.

Human Response Criteria

Vibration Dosage (VDV) Monitoring

Position	Description	Comment
1	Approximately 2m from the Apex line of the tunnel	Monitoring undertaken on the 8th December 2006 after adverse weather affected the instrumentation on 29th – 30th November 2006: 2 hourly periods were recorded between 10am – 12 noon. The predicted daytime e VDV was 0.588 $m/s^{1.75}$

The threshold levels for human response are detailed in Table 7 in BS6472: see below.

Human Response Criteria Table 7 BS6472

Place	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16hrs day	0.2 to 0.4	**0.4 to 0.8**	0.8 to 1.6
Residential buildings 8hrs night	0.13	0.26	0.51

Conclusion: the peak vibration dosage levels recorded are within the "adverse comment possible" criteria : NOTE: this only takes into account the ground level vibration at the surface and will be likely to be adversely affected by foundation piles being driven to within 1m of the tunnel wall.

8.0 Conclusion

The background vibration results in the car park show that vibration levels recorded during the are relatively consistent throughout the day and night time periods and range between 4 – 6mm/s on a regular basis. This is confirmed by the attended VDV measurements just off the apex of the tunnel which provided an estimated Vibration Dosage Value of 0.588 which is in the "Adverse comment possible" banding according to BS6472.

Due to the close proximity of the rail cutting and the tunnel it is recommended that consideration is given to mitigating the vibration impact on this building based on the levels recorded.

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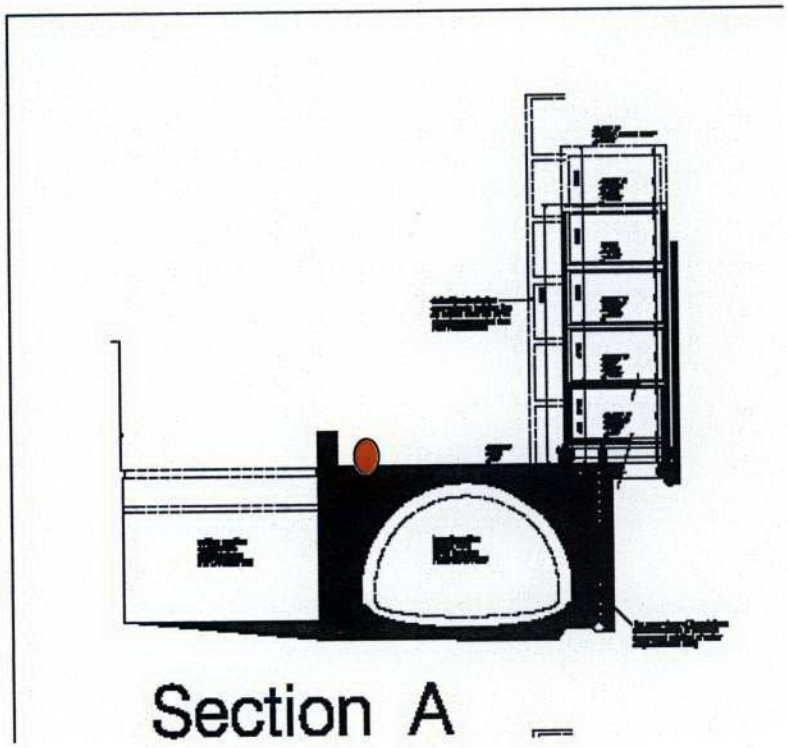
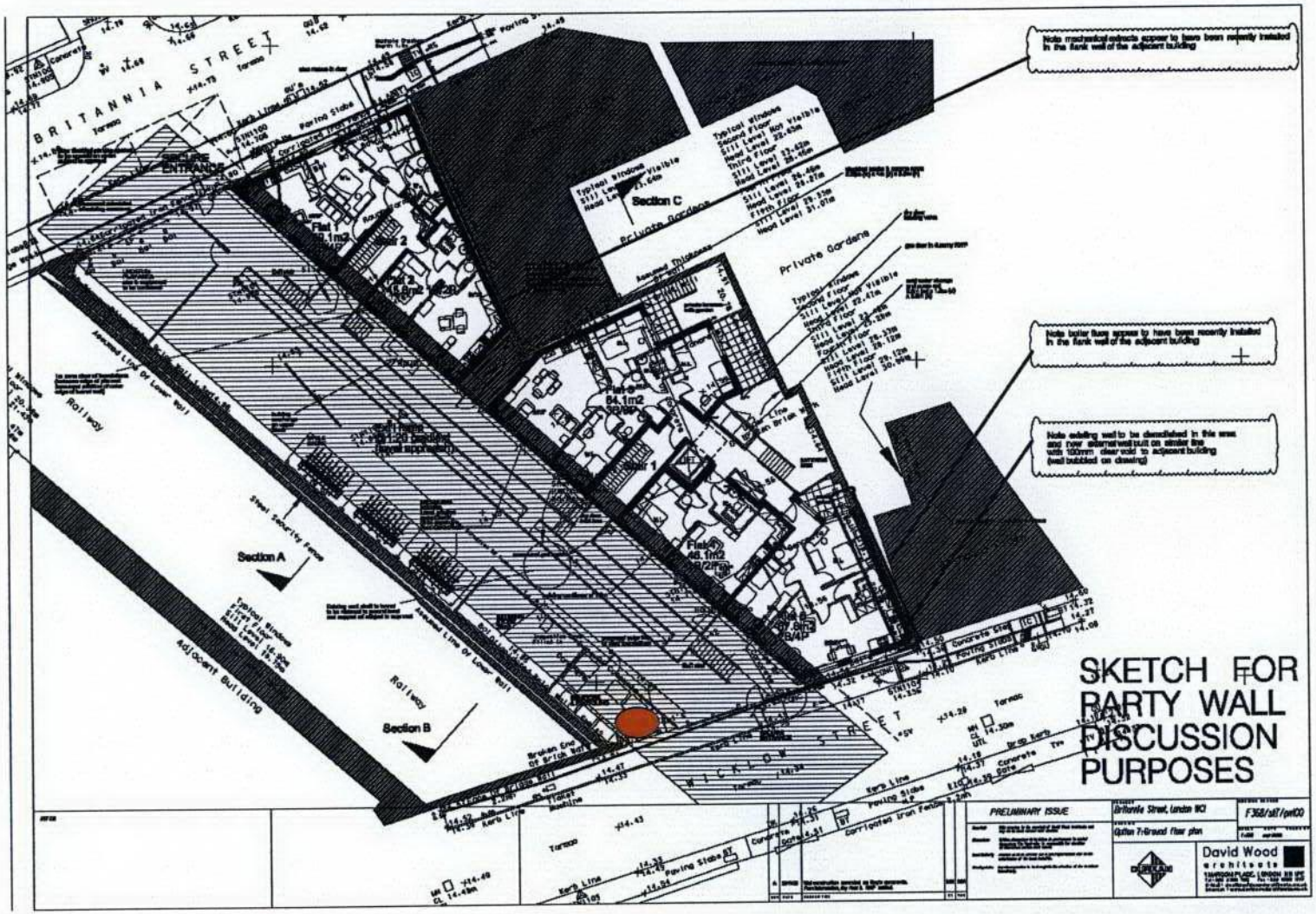
W.A.Whitfield BA, MSc, MIOA

Noise & Vibration Consultant.



Vibration Monitoring Position

Section Drawing of Proposed Building Position and position of Vibration Monitor



Vibration Monitoring Position

Britannia St: Site Layout Plan – showing approximate position of vibration monitor