

Ms Jane Carrington
Foreman Homes
Station Industrial Park
Duncan Road, Park Gate
Hampshire
SO31 1BX

Date: 19th July 2023
Reference: R10184-2 Rev 0

Dear Jane

RE: Toynbee Road, Eastleigh- Vibration Planning Conditions

I am writing in connection with the planning consent for 105 new homes at the above site (Eastleigh Borough Council Reference F/21/91686) and, specifically the planning conditions relating to vibration (Conditions 7, 8 and 9).

It is noteworthy that your planning application was supported by a noise and vibration impact assessment undertaken by Sound Advice Ltd (Reference SA – 6595/Rev4). 24 Acoustics has not peer reviewed this report and cannot comment on its accuracy, however, it does provide an assessment of vibration impact from the railway which bounds the site upon the proposed housing development.

Conditions 7, 8 and 9 are reproduced below in full.

7. *No above ground works other for the purpose of remediation of any contamination on site shall commence prior to a detailed vibration assessment being submitted in writing to the Local Planning Authority for approval. When approved, site works excluding works related to building foundations may commence. The vibration impact assessment shall be carried out by a suitable qualified and experienced acoustician and shall comprise sufficient measurement and testing of railway induced vibration, propagation of vibration through the ground and testing or investigation of ground conditions and geology. Numerical calculation of vibration in and through the site and propagating within proposed buildings for dwelling use shall be undertaken using finite element analysis to solve complex simulations of foundation and structural design include for vibration isolation measures. Vibration levels should be no greater than 0.2 mm/s peak particle velocity in any habitable room of the development. The calculation shall include for uncertainty and refer to ISO/TS 14837 series on mechanical vibration from rail systems and professional practice including the Association of Noise Consultants 'Measurement & Assessment of Groundborne Noise & Vibration (3rd Edition) for measurement and calculation of vibration.*

Reason: To protect the amenity of future occupiers from the impact of the adjacent railway line.

8. *Prior to commencing enabling and foundation works onsite, using the same detailed method of calculation and analysis, a design for mitigating vibration in the ground and upper floors of the dwellings shall be proposed and submitted in writing for approval by the Local Planning Authority. As well as to prevent vibration levels no greater than 0.2 mm/s peak particle velocity in any habitable room, the design including isolating bearings, elastomers etc shall include for relevant longevity for the lifetime of the dwelling and shall be demonstrated as such to the satisfaction of the Local Planning Authority, including Building Control.*

Reason: To protect the amenity of future occupiers from the impact of the adjacent railway line.

9. *Prior to occupation of those dwellings shown to be effected a vibration measurement survey shall be carried out according to a method submitted to the Local Planning Authority for approval and shall include sufficient representative dwellings and locations within dwelling rooms to verify the effectiveness of the detailed vibration mitigation design. Where required, the applicant shall undertake further measurements to the satisfaction of the Local Planning Authority. The development hereby permitted shall not be brought into use until the scheme for vibration mitigation has been implemented in accordance with approved details and shown through verification measurement survey to be effective. Reason: To protect the amenity of future occupiers from the impact of the adjacent railway line.*

Fundamentally it is our opinion that Condition 7, in particular, is both erroneous and excessively onerous. Human response to vibration (which is frequency dependent) is most commonly assessed in the UK using British Standard 6472 (Guide to evaluation of human exposure to vibration in buildings) using the vibration dose value (VDV) parameter. The reference to vibration limits of 0.2 mm/s peak particle velocity are meaningless without frequency consideration of frequency content. It is appreciated that these limits have been taken from the content of the Sound Advice (which is based upon Australian guidance), however, the guidance has been taken out of context. Instead, the VDV parameter, which is frequency weighted, provides all necessary assurance with regards to the impact of any vibration on the future occupants of the new housing.

Referring to the Sound Advice report, the following daytime and night-time VDV levels are reported.

Time Period	Vibration Dose Value m/s ^{1.75}		
	L	T	V
25 th September 2020 – 7 Hr	0.027	0.027	0.052
26 th September 2020 – 16 Hr	0.026	0.026	0.058
27 th September 2020 – 16 Hr	0.026	0.026	0.055
28 th September 2020 – 16 Hr	0.024	0.026	0.05
25 th – 26 th September 2020 – 8 Hr	0.025	0.022	0.038
26 th – 27 th September 2020 – 8 Hr	0.022	0.022	0.039
27 th – 28 th September 2020 – 8 Hr	0.022	0.023	0.042
28 th – 29 th September 2020 – 8 Hr	0.022	0.022	0.034

Table 3 Summary of daily VDV and PPV

* Denotes Set Up

Figure 1: Sound Advice Vibration Dose Values (reproduced from pg 46 of their report)

British Standard 6472 assigns the following semantics to determined daytime and night time vibration dose values:

Table 1 Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place and time	Low probability of adverse comment $\text{m}\cdot\text{s}^{-1.75}$ 1)	Adverse comment possible $\text{m}\cdot\text{s}^{-1.75}$	Adverse comment probable $\text{m}\cdot\text{s}^{-1.75}$ 2)
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Figure 2: BS 6472 Vibration Dose Value Levels/ Semantics

Figure 1 indicates that the maximum VDV recorded by Sound Advice during the day was $0.058 \text{ m/s}^{1.75}$ which is substantially lower than the lowest value ($0.2 \text{ m/s}^{1.75}$) needed to cause low probability of adverse comment. At night the maximum VDV recorded was $0.042 \text{ m/s}^{1.75}$ which again is below the range of values associated with a low probability of adverse comment.

These levels were recorded in the ground. Generally a building will attenuate the vibration, however, on rare occasions the natural frequency of some elements of the building structure can coincide with the forcing frequency from the railway and amplify the vibration. Empirical evidence indicates that this can cause an increase in VDV by no more than a factor of 4. In the worst case this would result in VDV of $0.232 \text{ m/s}^{1.75}$ and $0.168 \text{ m/s}^{1.75}$ during the day and at night respectively. Both remain with the range of 'low probability of adverse comment' as defined in the standard.

These findings are commensurate with those in Section 11.7 of the report by Sound Advice which states:

'The results of this ambient vibration survey indicate that whilst some vibration events may be perceptible, in accordance with the advice given in the appropriate standards, there is likely to be no concern of adverse comments from future occupants of the proposed housing and no concern of cosmetic damage to new buildings arising from vibration at this measurement location'.

On the above basis it is considered:

- That the report by Sound Advice fulfils the spirit of the requirements of Condition 7 of the planning consent;
- The report by Sound Advice demonstrates that the analysis required in Condition 8 is unnecessary. If, however, EBC remains of the opinion that further work is required to more robustly demonstrate that the vibration impact in the developed properties will remain acceptable then the wording of the condition should be changed to relate to the VDV levels of BS 6472;
- Condition 9 is acceptable, however, it should be stressed that any compliance surveys undertaken should demonstrate compliance with BS 6472 via the measurement of vibration dose value (VDV).

I trust you will find the above satisfactory. Should you have any further queries, however, please do not hesitate to contact me.

Yours sincerely,
For 24 Acoustics Ltd

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