West Keira, 71 Market Street

Acoustic Specification

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1 INTRODUCTION

The requirements or standards contained within this acoustic specification are in addition to any other non-acoustic requirements such as structural integrity, fire rating, material compatibility, etc.

Where the acoustic requirements or standards contained in this specification exceed those stated in another specification or drawing then the requirements of this specification shall override the other requirement. Where multiple performance requirements are stated the systems installed shall comply with all requirements.

This report presents:

- Acoustic criteria for the 71 Market Street tunnel during construction.
- Acoustic criteria for the 71 Market Street tunnel when completed.
- Recommended acoustic controls to the 71 Market Street works as required.

2 CONSTRUCTION STAGE

This section of the specification details the required noise and vibration criteria impacting on surrounding receivers to the 71 Market Street works.

This section only pertains to construction (demolition, excavation and construction etc) activities.

2.1 CONSTRUCTION VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

2.1.1 Structure Borne Vibrations

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 2.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 1 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15

2.1.2 Assessing Amenity

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site and follow.

Table 2 – DECCW Recommended Vibration Criteria

		RMS acceleration (m/s^2)		**RMS velocity (mm/s)**		**Peak velocity (mm/s)**	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

2.2 CONSTRUCTION NOISE

Construction noise generated from construction activities on the site should be managed such that compliance with the DECCW and AS2436 are achieved as follows.

2.2.1 NSW DECCW Interim Construction Noise Guidelines

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise effected level".

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

2.2.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with DECCW cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (ie – adopt DECC/Council guidelines).
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

3 NORMAL OPERATION

Noise and vibration impacting on surround receivers is required to comply with the following criteria.

3.1 INTERNAL NOISE LEVELS

Internal noise levels are required to comply with 65 dB(A) within all areas of the carpark and tunnel areas.

3.2 EXTERNAL NOISE LEVELS

Noise levels emitted by the mechanical plant at all property boundaries and nearby buildings on adjacent properties shall meet the requirements of:

1. Condition of consent
2. DECCW Industrial Noise Policy (Condition B14)
3. Any other relevant statutory authority.

3.3 VIBRATION

Vibration impacts to all surrounding receivers as a result of the operation of the 71 Market Street are detailed in the section below.

3.3.1 Tactile Vibration

Human comfort is normally assessed with reference to the British Standard BS 7385 Part 2 1993 or Australian Standard AS 2670.2 1990.

The Interim Guideline references the DECCW *Assessing Vibration- A technical guideline* which recommends that habitable rooms should comply with the criteria therein which is in line with the requirements of British Standard BS 6472:1992 “Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)”.

British Standard BS 6472:1992 “Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)” is recommended by the RIC’s and SRA’s Interim Guidelines for Councils “Consideration of vibration in the planning process” as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 “Evaluation of Human Exposure to Vibration and Shock in

Buildings (1 to 80Hz)” which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler

calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 7. For this project the aim will be for a low probability of adverse comment.

Table 3 - Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16hr day (Daytime)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night (Night time)	0.13	0.26	0.51

4 RECOMMENDED DESIGN PRINCIPALS

The recommended design principals to ensure noise and vibration comply with the criteria detailed in this specification include the following:

1. A detailed assessment of all mechanical equipment is required to be conducted once equipment is selected. Acoustic treatments and controls are required to be selected/developed to ensure noise levels comply with criteria detailed above.

2. The tunnel and associated ramps should not include any speed bums or grooved finishes.

3. All tunnel and associated areas should not have a smooth or painted finish.

4. All grates and associated drainage to be solidly fixed such that there is no movement or 'clanking' between metal and the building structure.

5 CONCLUSION

This speciation details the required noise and vibration criteria for both the construction stage and the operation stages of 71 Market Street development at West Keira, Wollongong.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

B.G.White.

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