



MANAGING CONSTRUCTION NOISE AND VIBRATION

Melbourne is a noisy, bustling city with building construction and works on tramways, roads and other public infrastructure happening regularly. In delivering the Metro Tunnel project, we want to minimise the inconvenience and impacts of construction on local communities and the environment.

Ahead of major construction ramping up in 2018, Managing Contractor John Holland is delivering a package of works that includes the relocation of more than 100 underground utility services such as water, gas, electricity and telecommunications, construction of access shafts in the CBD, as well as site preparation works.

Managing impacts from construction noise and vibration

During construction, the use of heavy machinery may cause some noise and vibration above existing levels.

A number of mitigation measures were identified in the Metro Tunnel Environment Effects Statement (EES) to avoid, reduce or offset environmental impacts. These measures form the basis of the recommended Environmental Performance Requirements (EPRs) for the Metro Tunnel project and have been recommended by specialists through the EES process.

The EPRs define the outcomes that must be achieved during the design, construction and operational phases of the project. This approach is designed to ensure the project delivers a net benefit to the community, and in the process, encourages innovation and flexibility from the construction contractor in how they meet these requirements. EPRs relevant to this package of works will be implemented through contractual agreements with John Holland.

Measures for construction noise and vibration management include:

- Meeting the Environment Protection Authority Victoria's guideline noise levels and other relevant noise and vibration standards
- Limiting high vibration-causing activities to standard construction hours where possible. Any construction work proposed to take place outside of standard construction hours will be subject to a case by case approval process.
- Implementing measures to minimise noise and vibration transference where necessary, for example using squawkers for reversing vehicles, acoustic sheds, noise barriers, noise and vibration monitoring (if guideline targets may be exceeded)
- Guidance on safe and appropriate working distances for noise-causing and vibration-causing activities
- Completing property pre-condition surveys before construction begins where properties may be affected by vibration-causing activities
- Ongoing communication and consultation with nearby residents to create awareness and understanding of project impacts prior to works occurring

These measures are consistent with the recommended EPRs for managing noise and vibration.



Noise and vibration modelling is currently being undertaken to further guide these measures. Regular noise and vibration monitoring will be conducted to make sure activities (during normal hours and out of hours) comply with the targets in the relevant EPRs. Monitoring data will also be used to check that the noise and vibration levels are consistent with predictive modelling.

Noise levels

Noise impact depends on the source of the noise and proximity of the receiver to it. In addition, people have varying reactions and sensitivities to noise.

The amount of noise generated by construction activities for the Metro Tunnel will vary depending on the site and the type of work being carried out. For instance, noise levels from above ground activities such as demolition and removal of excavated material will be different to noise from underground activities such as tunnelling activities which occur later in the project.

Regardless of the noise source, activities would need to meet set guidelines, particularly for works undertaken outside Normal Working Hours (see Table 1 for guideline work hours).

From time to time, certain unavoidable activities undertaken outside Normal Working Hours may create noise levels that are considered undesirable. Early consultation with potentially affected residents, businesses and facilities will determine ways to avoid or mitigate impacts. Measures may include temporary relocation for residents, if required.

Noise from construction vehicles, such as trucks, could at times impact residents living near work sites. Using designated traffic routes, restricting the use of local roads to Normal Working Hours where possible, and minimising night time movements will help to reduce potential impacts.

Vibration guidelines

The project has adopted the conservative German DIN 4150 guideline targets for managing the potential impacts of vibration on structures. With more stringent targets than the equivalent British Standard (BS 7385), applying DIN 4150 demonstrates Metro Tunnel’s commitment to managing potential impacts.

The project will be constructed using a variety of heavy equipment which could generate ground-borne noise and vibration. At different stages, there is potential for this to have an impact on the comfort of people living or working near construction sites.

People can be sensitive to vibration and can detect vibration levels that are well below the threshold for causing any risk of damage to buildings. At certain stages of building Metro Tunnel, temporarily elevated vibration levels around construction, demolition and tunnelling sites may trigger additional mitigation measures.

The Metro Tunnel project is committed to managing the impacts for communities and will look at further mitigation measures, such as potentially offering temporary relocation or respite if vibration or ground-borne noise levels are considered unacceptably intrusive.

Protecting buildings

The predicted levels of vibration as assessed in the EES indicate no structural damage, even for older or heritage buildings, is expected as a result of construction activities. It is standard practice on major projects to offer building condition surveys on potentially affected properties prior to construction work commencing nearby. In line with this approach, the Managing Contractor will identify properties that could be affected by construction activities causing vibration and offer pre-condition surveys. Copies of the survey reports will be provided to property owners. Surveys will also be carried out on hospitals, universities and research facilities containing vibration-sensitive equipment.

Table 1 Guideline working hours for airborne construction noise

Normal working hours	Weekend /evening work	Night works
7am to 6pm <i>Monday to Friday</i>	6pm to 10pm <i>Monday to Friday</i>	10pm to 7am <i>Monday to Sunday</i>
7am to 1pm <i>Saturday</i>	1pm to 10pm <i>Saturday</i>	
	7am to 10pm <i>Sunday and Public Holidays</i>	

**The above working hours are subject to approval based on appropriate management plans and noise treatments being in place.*

Key construction activities

Construction activities which may result in intermittent noise and vibration include:

- Rock breaking – excavators with hammer attachments used to break up rock and concrete to enable excavation
- Piling – boring steel and concrete support structures below ground to support retaining walls and deep excavations, such as the tunnel shaft
- Vibratory rolling – used to compact fill material in order to reach required compaction levels, used during installation of piling pads and during road reinstatement as required
- The use of road saws, chainsaws and demolition saws during works
- The use of air compressors, mobile plant, generators and light towers

Terminology

Air-borne noise: May be continuous, impulsive or intermittent, and may contain high pitch or low dominating tones. The perception of noise by people can vary widely and depends upon many factors. Noise is measured by a sound meter using the decibel scale.

Vibration: The rapid movement of an object back and forth which occurs when it is displaced from its original position and returned to it. Vibration may be expressed in terms of displacement, velocity or acceleration. Construction vibration is often measured as vibration velocity (Peak Particle Velocity in mm/s) using an accelerometer or geophone. Vibration Dose Value is a metric used to accumulate vibration energy over a day or night time period to determine its impact on human comfort.

Ground-borne noise: Noise heard within a building that is generated by vibration transmitted through the ground into a structure. It is typically heard as a low frequency “rumbling” and is often referred to as “regenerated noise”. Ground-borne noise is measured by a sound meter.

About the Metro Tunnel

The \$10.9 billion Metro Tunnel will transform the way people move around Melbourne, with ‘turn up and go’ rail services, less crowded trams and improved access to key landmarks. It will free up space in the City Loop to run more trains, more often, in and out of the city.

The Metro Tunnel will create a new end-to-end rail line from Sunbury in the west to Cranbourne / Pakenham in the south-east, with high capacity trains and five new underground stations at Arden, Parkville, CBD North, CBD South and Domain.

As a result, capacity will be created on the network to enable 39,000 more passengers from day one to use the rail system during each peak period.

FOR MORE INFORMATION SEE THE **BUILDING THE PROJECT** BROCHURE AT **METROTUNNEL.VIC.GOV.AU**

Contact Us

To find out more about the Metro Tunnel and register for future updates:

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