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1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to conduct an acoustic assessment to accompany a development application for Opal Bathurst Aged Care Facility located at 81 & 105 Stanley Street, Bathurst.

In this report we have:

- Identified environmental noise sources which may have impact on the site and recommend acoustic treatment to ensure a reasonable level of amenity is achieved for future occupants.
- Setup criteria for potential noise emission from mechanical plant and carpark use associated with the development. The noise emission from proposed carpark has also been assessed to the nearest residential receivers.

External noise impacts on the site have been assessed in accordance with Council requirements and Australian Standard 2107:2000.

Background noise levels have been set in accordance with AS1055.3, and noise emission goals have been set with reference to the EPA Industrial Noise Policy.

The assessment is based on the architectural drawings of project 15491, Sheets DA-1110, DA-2000 and DA2001 provided by Group GSA, dated November 2015.

2 SITE DESCRIPTION

The development Opal Bathurst Residential Aged Care Facility (RACF) is located at 81 & 105 Stanley Street, Bathurst. The two storey development will accommodate for 164 beds.

The site is bounded as follows;

- To the immediate south of the site by an existing child care centre.
- Adjacent to Stanley and Peel Streets by residential developments within a suburban area.

An aerial photo of the development site is presented below;



Figure 1: Site Map

3 NOISE DESCRIPTORS

In the case of environmental noise three principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

The roadways surrounding the development site carry low volumes of traffic flow, servicing the local traffic only. Furthermore, the development is set back approximately 100m from Stanley Road, and as such traffic noise impacts onto the development will be minimal.

As such, the primary potential noise impact on the development will be from the use of the on-site car park, as well as the child care centre bounding the property to the south.

4.1 PROJECT CRITERIA

Bathurst Regional DCP 2014 does not have any specific requirements for internal noise levels for an aged care facility. The assessment of external noise intrusion onto the project site is conducted in accordance with the following documents:

- State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004
- AS2107 – 2000 Acoustics – Recommended design sound level and reverberation times for building interiors.

4.1.1 SEPP (Housing for Seniors or People with a Disability) 2004

“34. Visual and acoustic privacy

The proposed development should consider the visual and acoustic privacy of neighbours in the vicinity and residents by:

- (a) appropriate site planning, the location and design of windows and balconies, the use of screening devices and landscaping, and*
- (b) ensuring acceptable noise levels in bedrooms of new dwellings by locating them away from driveways, parking areas and paths.*

Note: The Australian and New Zealand Standard entitled AS/NZS 2107-2000, Acoustic Recommended design sound levels and reverberation times for building interiors and the Australian Standard entitled AS3671-1989, Acoustics-Road traffic noise intrusions – Building siting and construction, published by Standards Australia, should be referred to in establishing acceptable noise levels.”

4.1.2 AS2107-2000

AS2107 recommended noise levels are as follows:

Table 1 –Recommended Internal Noise Levels

Type of occupancy/activity	Recommended design sound level, $L_{Aeq}(1\text{hour})$, dB(A)
Houses and apartment near minor road	
Living areas	40
Sleeping areas	35

4.2 NOISE INTRUSION ASSESSMENT

4.2.1 Carpark Noise Intrusion Assessment

The car-park on site can accommodate up to 46 cars vehicles, and will also be in use by delivery trucks.

The noise from the proposed car park use has been predicted based on the following assumptions during a worst 1 hour peak period:

- Half the vehicle capacity will drive in/out at 10km/hour, with a typical sound power level 84dB(A) L_{eq} per vehicle (noise data from other projects by this office).
- 1 truck will drive in/out at 10km/hour, with a typical sound power level 100dB(A) L_{eq} (noise data from other projects by this office).
- Trucks are not to conduct deliveries during the night time period of 10:00pm - 7:00am.
- Recommendations in Section 4.3 are implemented.

4.2.2 Child care Centre Noise Intrusion Assessment

A child care centre is located directly to the south of the project site. Potential noise emission from the child care centre is assessed to the project site. Our assumptions include the following;

- Up to 50 children will be playing simultaneously at the rear of the child care centre, directly facing the RACF.
- A group of 10 children have a sound power level of 85dB(A), data previously obtained by this office
- Any barrier effect separating the child care centre and the proposed RACF is not taken into account. This assumption provides for a conservative assessment.
- Recommendations in Section 4.3 are implemented.

4.3 EVALUATION OF NOISE INTRUSION AND RECOMMENDATIONS

Internal noise levels will primarily be as a result of noise transfer through the windows and doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

The predicted noise levels through the windows, walls, doors and roof are discussed below. The predicted noise levels have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Calculations were performed taking into account the orientation of windows, barrier effects (where applicable), the total area of glazing, facade transmission loss and the likely room sound absorption characteristics.

4.3.1 Glazing Constructions

The recommended glazing assemblies are indicated in [Table 2](#) below. The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 2 – Glazing Requirements

Space	Façade	Glazing Thickness	Acoustic Seals
All Habitable rooms	All	4mm float	Yes

In addition to complying with the minimum scheduled glazing thickness, the STC/ R_w rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in [Table 3](#) below.

Where nominated, this will require the use of acoustic seals equal to Schlegel Q-Ion series (*acoustic bulb seal*) around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Selley's Proseries Fireblock. Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are **not** acceptable where acoustic seals are required.

It is recommended that only window systems have test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

Table 3 – Minimum STC/R_w of Glazing Requirements

Glazing Assembly	Acoustic Seals	Minimum STC/R _w of Installed Window
4mm float	Yes	27

4.3.2 External Walls

Walls of a masonry or Ritek construction will not require further acoustic treatment.

Lightweight walls will require to have the following acoustic treatment;

6mm fibrous cement / minimum 92mm stud with 75mm thick 11kg/m³ insulation within the cavity / 10mm plasterboard

4.3.3 Roof/Ceiling

Penetrations in ceilings (such as for light fittings etc.) must be sealed gap free with a flexible sealant. Any ventilation openings in the ceilings would need to be acoustically treated to maintain the acoustic performance of the ceiling construction.

The minimum requirement for roof/ceiling construction should be as follows:

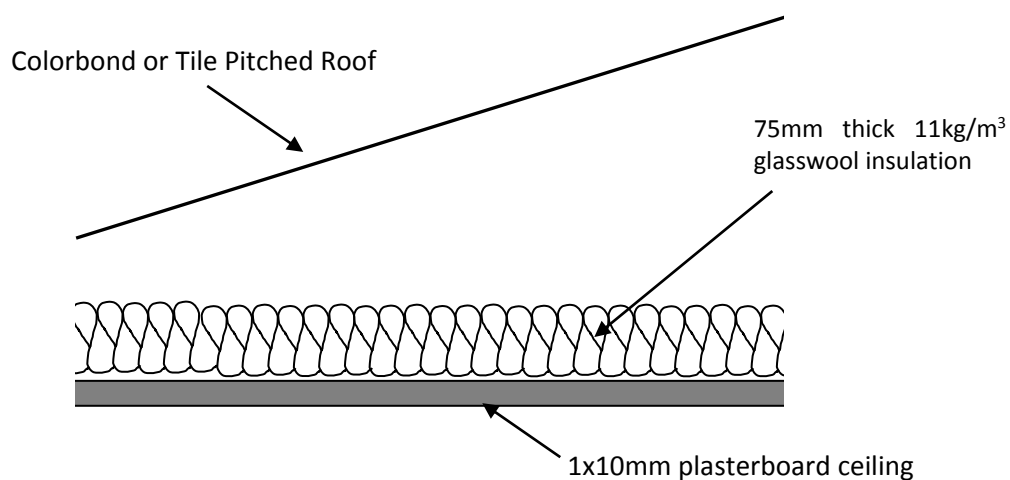


Figure 2: Roof/Ceiling Construction

4.4 VENTILATION REQUIREMENTS

With respect to natural ventilation of the dwelling, it is common acoustic practice that if the required internal noise within a room will be exceeded by less than 10B(A) if the windows are left open, there is no requirement for mechanical ventilation of the space. For example - the NSW Department of Planning guideline "Development near Busy Roads and Rail Corridors - Interim Guideline" states that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in other habitable rooms).

All units can have windows open sufficiently for both natural ventilation and keeping the acoustic amenity.

If mechanical ventilation is installed, it should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above is not reduced and does not exceed Council criteria for noise emission to nearby properties.

5 NOISE EMISSION ASSESSMENT

The main noise emitted from the project site will be those from mechanical plant and the carpark. Detailed mechanical equipment selection and layouts are not available at this stage and assessment for mechanical plant should be carried out during CC stage.

The nearest sensitive receivers are the residential houses to the east across from Peel Street, and to the south across from Stanley Street.

5.1 BACKGROUND NOISE LEVELS

Background noise levels were determined from Australian Standard AS1055.3. This site is categorised by being a R1 Residential Area, within an “Area with negligible transportation” being set back approximately 100m from Stanley Street, a local road. This is the quietest land type in the Standard, and therefore produces the most stringent noise emission control from the site.

Table 4 –Background Noise Levels

Location	Period/Time	Assessment Background Noise Level dB(A) L ₉₀
R1 Residential Area Opal Bathurst RACF	Day (7am-6pm)	40
	Evening(6pm-10pm)	35
	Night(10pm-7am)	30

5.2 ACOUSTIC OBJECTIVES

The following documents were used to determine the project criteria for noise emissions:

- NSW EPA Industrial Noise Policy
- Protection of the Environment Operations Act Regulation 2000

In the absence of any specific council criteria within the Bathurst Regional DCP 2014 with regard to noise emission, appropriate criteria will be adopted from the two guidelines listed above.

5.2.1 NSW EPA Industrial Noise Policy

The EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity.

The EPA Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residence would be assessed against the urban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

5.2.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by the residential receivers as suburban.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Table 5 – EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A) $L_{eq}(\text{period})$	
		Recommended	Maximum
Residential - Suburban	Day	55	60
	Evening	45	50
	Night	40	45
Commercial	When in Use	65	

5.2.2 Protection of the Environmental Operation (Noise Control) Regulation 2008

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or

(b) before 7 am or after 10 pm on any other day.

5.2.3 Summary of Noise Emission Objectives

Based on the requirements stated in the sections above, [Table 6](#) provides a summary of the assessment criteria applicable to the future residential development at the project site.

Table 6 – Environmental Noise Emission Criteria

Time Period	Assessment Background Noise Level dB(A) L_{90}	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria Background + 5 dB(A) $L_{eq}(15min)$	EPA Criteria for Residential Condensers
Day	40	55	45	N/A
Evening	35	45	40	N/A
Night	30	40	35	Inaudible within neighbouring premises

The operation noise on site, primarily mechanical plant and carpark/loading dock should comply with the above noise emission criteria.

5.3 NOISE EMISSION ASSESSMENT

5.3.1 Carpark and Loading Dock Noise

The noise emission from vehicles entering/exiting the proposed carpark has been predicted to the surrounding receivers. Noise emissions are based on a worst 1 hour period, with our assumptions presented below;

- The carpark has capacity for up to 46 vehicles.
- During the day and evening times, between 7:00am-10:00pm, in a worst 1 hour period, half the vehicle capacity will drive in/out of the site.
- During the night time, between 10:00pm-7:00am, in a worst 1 hour period, a quarter of the vehicle capacity will drive in/out of the site.
- A car travelling within the car park has a sound power level of 84dB(A) L_{eq} per vehicle (noise data from other projects by this office).
- 1 rigid truck will drive in/out at 10km/hour in a 1 hour period, with a typical sound power level 100dB(A) L_{eq} (noise data from other projects by this office).
- Trucks are not to conduct deliveries during the night time period of 10:00pm - 7:00am.
- No barrier effect of fences are taken into account between the child care centre and the car-park, this provides for a conservative assessment.

The predicted combined carpark and loading dock noise levels to the nearest receivers are presented in Table 7 below.

Table 7 – Predicted Noise Level from Carpark and Loading Dock Movements

Receiver	Predicted Noise Level dB(A) L_{eq}	Time Period	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria Background + 5 dB(A) $L_{eq}(15min)$	Complies
Residential across Peel Street	33	Evening Time	45	40	Yes
Residential across Stanley Street	37				Yes
Residential across Peel Street	30	Night Time	40	35	Yes
Residential across Stanley Street	34				Yes
Child Care Centre Stanley Street	50	When in Use	65	-	Yes

5.3.2 Mechanical Plant and Equipment

At the early stage of the project equipment items and their respective locations have not been determined, thus, detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the criteria levels set out in [Table 6](#) of this report.

5.4 RECOMMENDATIONS

Trucks are not to conduct deliveries during the night time period of 10:00pm - 7:00am.

Detailed acoustic review of all plant/equipment should be conducted at Construction Certificate stage (once equipment selections and locations are finalised).

6 CONCLUSION

This report presents an acoustic assessment of a proposed Residential Aged Care Facility at Stanley Street, Bathurst.

Noise impacts from surrounding roadways, on-site carpark and the bounding child care centre have been assessed in accordance with Australian Standard 2107:2000 and SEPP (Housing for Seniors or People with Disability). The acoustic treatments necessary to achieve these guidelines have been set out in Section 4.3.

Noise emission criteria for the site have been determined based on AS1055.3 and noise emission guidelines typically adopted by Council and the EPA. Noise emission controls have been presented in section 5.4 of this report.

Provided the recommended treatments stated in sections 4.3 and 5.4 are adopted, the proposed development will comply with all nominated acoustic criteria.

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

Yours faithfully,

A handwritten signature in black ink, appearing to read 'J. Davydov', with a stylized, flowing script.

Acoustic Logic Consultancy Pty Ltd
Johan Davydov