Manly Pacific Square

Cibaria Restaurant
Mechanical Noise Assessment

Mostyn Cooper

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1 INTRODUCTION

Pulse White Noise Acoustics has been engaged to undertake the acoustic design of the mechanical services which are proposed to be installed as part of the Manly Pacific Hotel, Cibaria Restaurant.

As part of the acoustic design acoustic treatments have been recommended to ensure noise levels comply with the relevant project noise level criteria as well as project external noise level requirements. Noise levels have been recommended to ensure compliance with the relevant internal noise levels as recommended within the Australian Standard AS2107:2016 and the relevant external noise emission noise levels based on council and EPA criteria.

2 PROJECT DESCRIPTION

The project includes the new Manly Pacific Hotel, Cibaria Restaurant project.

The assessment of the building has been undertaken in accordance with the following:

1. Recommended internal noise levels of the Australian Standard AS2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors.*
2. External noise emissions in compliance with council requirements and the NEW EPA Noise Policy for Industry.

3 PROECJT INTERNAL NOISE LEVELS

The recommended internal noise levels for various areas of the project are detailed in the following table. The recommended noise levels detailed within AS2107: 2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* and the projects *Acoustic Specifications* (including those detailed in Section 2 above) have been used as the basis of this assessment.

The recommendations of the standard are detailed in the table below.

Table 1 Project Recommended Internal Noise Level Requirements

Type of Occupancy/Activity	Design sound level maximum ($L_{Aeq,t}$)
Restaurant areas	50
Gelato Area	50
Kitchen Areas	55
Cool Rooms	60
Bar Areas	50
Toilets and wet areas	55
Wine Room	55
Corridor and common areas	50
Notes: 1. All noise levels are to be free of tonal or annoying characteristics *2. Internal noise levels to include the combined noise from environmental noise intrusion as well as building services operations.*	

Additionally internal noise levels have been assessed for compliance with the requirements of AS1668 for periods in an emergency mode including 65 dB(A) within an occupied area and 80 dB(A) within a fire star way.

4 PROJECT EXTERNAL NOISE LEVELS

Noise emissions from the operation of mechanical services on the site should be assessed in accordance with the following requirements.

4.1 Protection of the Environment Operation Act

Offensive noise is defined by the Protection of the Environment Operations Act, 1997, which includes the following;

> *Noise*
> *(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances;*
> > *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
> > *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is inside the premises from which it is emitted, or*
> > *(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.*

4.2 EPA Noise Policy for Industry

As part of this assessment the use of the recommended noise emissions criteria included within the EPA's Noise Policy for Industry has been used as the basis of ensuring the noise emissions are not offensive.

4.2.1 NSW Environmental Protection Authority, Noise Policy for Industry

The NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPI), previously Industrial Noise Policy, details noise criteria for the control of noise generated from the operation of developments and the potential for impact on surrounding receivers.

The NPI includes both intrusive and amenity criteria which are summarised below.

1. Intrusive noise level criteria, The NPI states the following:

   'The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the LAeq descriptor), measured over a 15minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.'

2. Amenity noise level criteria, The NPfI states the following:

   'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.'

   Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

   Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

   The LAeq is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the LAeq,15min will be taken to be equal to the LAeq, period + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

   Project amenity noise level (ANL) is urban ANL (Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).

Noise level used in the assessment of noise emission from the site have been based on the noise level survey conducted at the site and detailed in this section of the report.

Consequently, the resulting noise level criteria are summarised in the table below. The criteria are nominated for the purpose of determining the operational noise limits for the operation of the site including mechanical plant associated with the development which can potentially affect noise sensitive receivers and operational noise levels from the future tenancies. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive criteria are adopted. The calculated *Project Amenity Noise Level* includes either the Recommended

Amenity Noise Level minus 5 dB(A) plus 3 dB(A) (for a 15minum period) or the measured existing Leq noise level – 10 dB if this is greater as determined by the NPfI.

Table 2 External Noise Level Criteria in Accordance with the NSW NPI

Location	Time of Day	Project Amenity Noise Level, $L_{Aeq, period}$ [1] (dBA)	Measured $L_{A90, 15\ min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA)
Suburban residences	Day	53	51	>54	56
	Evening	43	49	>54	54
	Night	38	47	54	52

Note 1: Project Amenity Noise Levels corresponding to "Sub Urban" areas, recommended noise levels.
Note 2: L_{A90} Background Noise or Rating Background Level
Note 3: Periods defined by the EPA include Day – 7am to 6pm, Evening – 6pm to 10pm, Night – 10pm to 7am.

5 RECOMMENDED TREATMENTS

Recommended acoustic treatments to the selected plant and equipment has been based on the information included in the project's mechanical services drawings and the plant and equipment selections provided by Evolved Engineering.

All recommended treatments detailed below are based on acoustic calculations of the selected mechanical equipment, including calculations undertaken using STRUT.

Recommended acoustic treatments for items of plant are detailed in the following sections and assume the following:

1. Flexible ductwork includes insulated flexible ductwork.
2. All plant and equipment is to be vibration isolated from the building structure.

5.1 Condenser Units

No additional acoustic mitigations required.

5.2 FCU's

1. All supply and return air ductwork to include 50mm internal insulation.
2. All flexible ductwork to include insulated flexible ductwork.

5.3 OAF-L00-01

1. Internally line a minimum of 3m of the intake air ductwork with 50mm insulation.
2. Internally line a minimum of 3.5m of the supply air ductwork with 50mm insulation.

5.4 KMAF-L00-01

1. Internally line a minimum of 3m of the intake air ductwork with 50mm insulation.
2. Internally line a minimum of 3m of the supply air ductwork with 50mm insulation.

5.5 KMAF-L00-02

1. Internally line a minimum of 3m of the intake air ductwork with 50mm insulation.
2. Internally line a minimum of 3m of the supply air ductwork with 50mm insulation.
3. Externally wrap the fan and all flexible connections with a 4kg/m^2 loaded vinyl.

5.6 KEF-L00-01

1. Internally line a minimum of 5m of the discharge air ductwork with 50mm insulation including Melinex lining if required, alternatively install an acoustic silencer with a minimum insertion loss as detailed in the table below;

Insertion Loss - C2-063QS

63	125	250	500	1000	2000	4000	8000
4	6	9	18	19	13	11	7

2. Internally line a minimum of 4m of the intake air ductwork with 50mm insulation including Melinex lining if required, alternatively install an acoustic silencer with a minimum insertion loss as detailed in the table below;

Insertion Loss - C2-063QS

63	125	250	500	1000	2000	4000	8000
4	6	9	18	19	13	11	7

3. Externally wrap the fan and all flexible connections with a 4kg/m^2 loaded vinyl.

5.7 KEF-L00-02

1. Internally line a minimum of 5m of the discharge air ductwork with 50mm insulation including Melinex lining if required, alternatively install an acoustic silencer with a minimum insertion loss as detailed in the table below;

Insertion Loss - C2-063QS

63	125	250	500	1000	2000	4000	8000
4	6	9	18	19	13	11	7

2. Internally line a minimum of 5m of the intake air ductwork with 50mm insulation including Melinex lining if required, alternatively install an acoustic silencer with a minimum insertion loss as detailed in the table below;

Insertion Loss - C2-063QS

63	125	250	500	1000	2000	4000	8000
4	6	9	18	19	13	11	7

3. Externally wrap the fan and all flexible connections with a 4kg/m^2 loaded vinyl.

5.8 TEF-L00-01

1. Internally line a minimum of 1m of the discharge air ductwork with 50mm insulation.
2. Internally line a minimum of 1m of the intake air ductwork with 50mm insulation.

5.9 TEF-LXX-01

No additional acoustic mitigations required.

6 CONCLUSION

This report details the recommended acoustic treatments for the mechanical services which are proposed to be installed as part of the Manly Pacific Hotel, Cibaria Restaurant.

Recommended acoustic treatments include those which are required to comply with the Australian Standard AS2107:2016, projects acoustic specifications and the relevant project external noise emission requirements.

For any additional information please do not hesitate to contact the person below.

Regards

Ben White
Director

Pulse White Noise Acoustics

7 APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] (Sound Transmission Loss)	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.

Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*