

Bureau Booth Testing

Acoustic Report

Speech Level Reduction Test

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Revision

Revision	Date	Comment	Prepared By	Approved By
001	01/06/2021	For Comments	JS	DSP

1. Introduction

The purpose of this document is to provide the information on the acoustic performance on the newly installed acoustic meeting booth that has been installed within the Limepay Office located at Level 3/283 Clarence St, Sydney NSW 2000.

In the absence of the specific measurement standards available for in-situ testing, ISO 23351-1:2020 “Acoustics – Measurements of speech level reduction of furniture ensembles and enclosures – Part 1: Laboratory method” will be used.

Figure 1 showed the layout of the tested meeting booth.

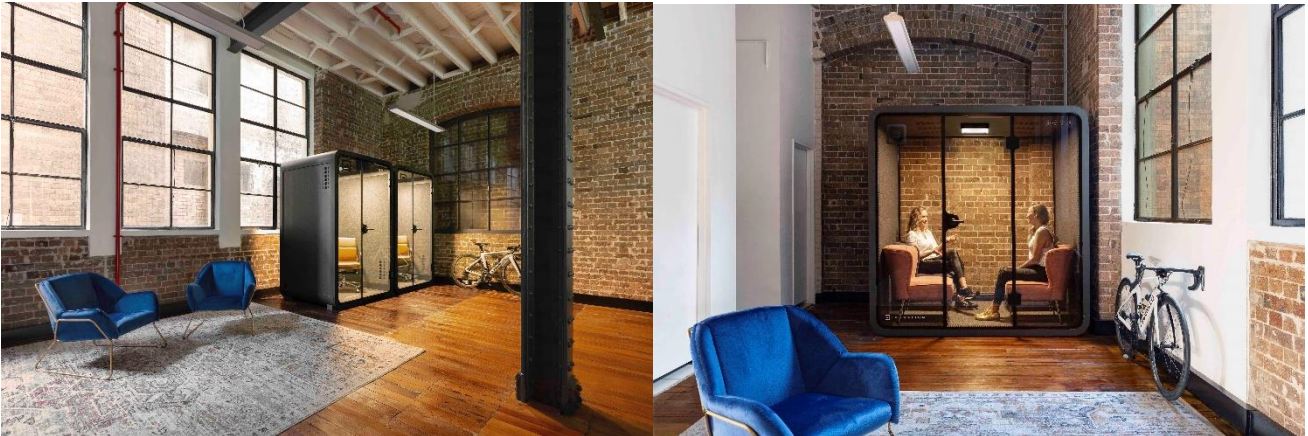


Figure 1: BUREAU Small and Large Meeting Booth

This report will also propose some acoustic alterations which can be incorporated into the construction of the meeting booth in order to achieve a higher acoustic performance.

1.1 Technical References

The following documentation has been used to prepare this report:

- AS 5335:2019 / ISO 3744:2010. *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – engineering methods for an essentially free field over a reflecting plane.*
- ISO 23351-1:2020. *Acoustics – Measurements of speech level reduction of furniture ensembles and enclosures – Part 1: Laboratory method.*



2. Speech Level Reduction Test

2.1 Testing Method

The acoustic testing included the use of a calibrated noise source (NTi Audio TalkBox – TNE737-D2), which generates a calibrated pink noise signal at 70dBA SPL at 1m and allows measuring the noise isolation performance of booth partitions. Furthermore, NTi Audio TalkBox also has a directivity pattern similar to that of human talker, which in our opinion is the most appropriate tools for speech level reduction.

The measurement of sound power levels at the receiver was calculated using Equation (1) in accordance with the Australian Standard AS 5335:2019. *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – engineering methods for an essentially free field over a reflecting plane.*

$$L_W = \overline{L_p} + 10 \ln \frac{S}{S_0} \text{ dB} \quad \text{Equation (1)}$$

where L_W = Sound power level, in dB

$\overline{L_p}$ = Surface time-averaged sound pressure level, in dB

S = area/measurement surface, in m²

$S_0 = 1\text{m}^2$

The measurement of level reduction (D_i) of the test specimen was calculated using Equation (2) in accordance with the International Standard ISO 23351-1:2020. *Acoustics – Measurements of speech level reduction of furniture ensembles and enclosures – Part 1: Laboratory method*

$$D_i = L_{W,P,1,i} - L_{W,P,2,i} \quad \text{Equation (2)}$$

where D_i = Sound power level, in dB

$L_{W,P,1,i}$ = Sound power radiated by the reference box without the test specimen, in dB

$L_{W,P,2,i}$ = Sound power radiated by the reference box with the test specimen, in dB

The 1/1-octave frequency band is denoted by i . P indicates wide-band steady state noise such as pseudorandom pink noise, produced by the sound source.

The speech level reduction ($D_{S,A}$) is based on a mathematical transformation presented on equation (3) where $L_{W,P,1,i}$ is replaced by the standardised sound power level of speech given on Table 1 below. Whilst the $L_{W,S,A,2}$ is the A-weighted sound power level radiated by the specimen.

$$D_{S,A} = L_{W,S,A,1} - L_{W,S,A,2} \quad \text{Equation (3)}$$

Table 1: Un-weighted sound power level of genderless speech

	1/1-octave frequency band, f (Hz)						
	125	250	500	1,000	2,000	4,000	8,000
$L_{W,S,1}$ (dB)	60.9	65.3	69.0	63.0	55.8	49.8	44.5



2.2 Instrumentation

The equipment used for the testing was the following:

- Hand-held Sound Spectrum Analyser Brüel & Kjær Type 2250, S/N 3027679
- Brüel & Kjær Sound Calibrator, S/N 1944752
- NTi Audio TalkBox, S/N TNE737-D2

2.3 Acoustic Testing

Table 2 presents the results summary from the in-situ speech level reduction testing conducted by Stantec on both meeting booths on Tuesday, 20th April 2021. There were no visible defects in the floor/ceiling system at the time of the testing.

Table 2: Acoustic testing results

Meeting Booth System	Measured $D_{s,A}$
• Small Meeting Booth	39.7
• Large Meeting Booth	39.4

The tests have been conducted in accordance with International Standard ISO 23351-1:2020. *Acoustics – Measurements of speech level reduction of furniture ensembles and enclosures – Part 1: Laboratory method* and Australian Standard AS 5335:2019. *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – engineering methods for an essentially free field over a reflecting plane.*



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