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Impact Sound Insulation Test

Godfrey Hirst Hybrid 6.0/0.3 mm Flooring System

REPORT No
7718-1.1R

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Prepared For:
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Geelong VIC 3220

Attention: Ms Mandy Chandley

Revision History

Report	Date	Prepared	Checked	Comment
Final	09/03/2023	Ricky Thom	Stephen Gauld	

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1.0 CONSULTING BRIEF

Day Design was commissioned by Godfrey Hirst Australia Pty Ltd to measure the impact sound insulation of their Hybrid Flooring System with a thickness of 6.0 mm and a foam wear layer of 0.3mm. The measurements were conducted on site in accordance with Australian Standard AS/NZS ISO 140.7:2006 "*Acoustics – Measurements of sound insulation in buildings and of building elements – Part 7: Field measurements of impact sound insulation of floors*".

The test specimen was rated in accordance with AS ISO 717.2:2004 *"Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation".*

2.0 MATERIALS USED FOR SOUND REDUCTION

2.1 Concrete Slab

The tested flooring system includes a 270 mm thick concrete slab. The standard density of the concrete is 2,400 kg/m^3.

2.2 Flooring

The product is a Hybrid Flooring System comprising 6 mm hybrid plank with 0.3 mm foam wear layer.

3.0 TESTING SPECIFICATIONS

Location:	Concrete slab floor between Unit 18 and Unit 11 of 808 Forest Road, Peakhurst
Base Floor Construction:	270 mm thick concrete slab
Receiving Room Dimensions:	Unit 11, 808 Forest Road, Peakhurst Length: 6 m Width: 3.9 m Height: 2.75 m
Test Sample:	6 mm hybrid plank with 0.3 mm foam wear layer
Sample size:	1220 mm (L) x 180 mm (W) x 6.3 mm (T) each plank 5 planks wide – 900 mm
Test date:	Tuesday 21 February 2023

4.0 MEASUREMENT PROCEDURE

The impact sound insulation of a floor/ceiling system is determined by using a standard tapping machine[1] on the floor to generate impact noise and measuring the level of impact noise in the receiving room below.

The tapping machine is placed in 4 orientations as shown in Figure 1 below.

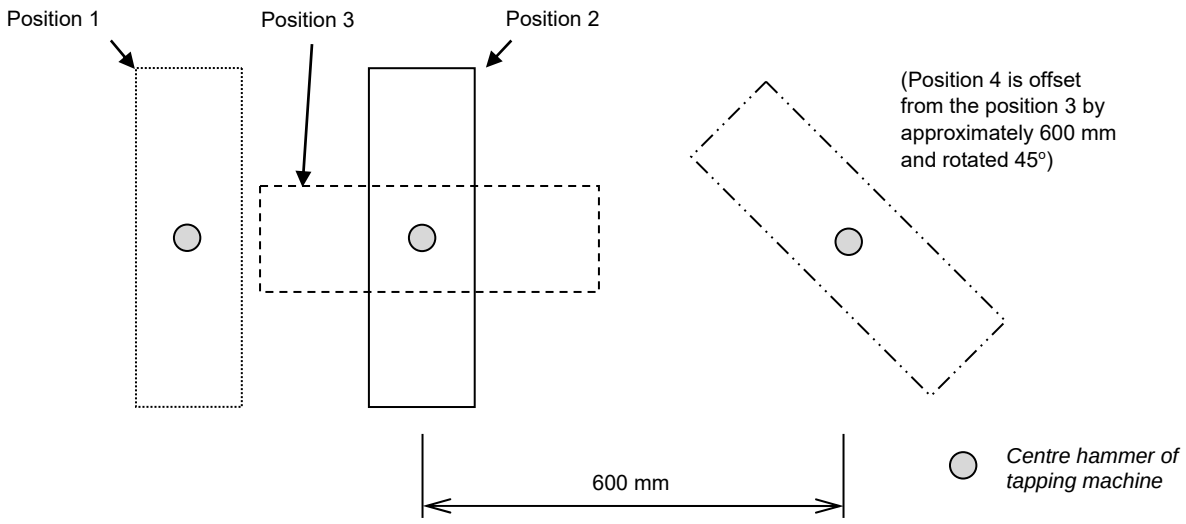


Figure 1 - Tapping machine test orientations

Impact noise levels in the receiving room are measured using the microphone sweep method for a period of 30 seconds per tapping machine orientation.

A background noise level measurement is carried out to account for any noise contributions from the environment and to apply appropriate corrections if required.

Reverberation time measurements are carried out in the receiving room. The reverberation time, T_{60}, is the time it takes for a noise source to decay by 60 dB after the stimuli is switched off. A "live" room, such as a reverberation room which consists of only hard surfaces, will typically have a long reverberation time. A "dead" room, such as an anechoic chamber, which consists of highly absorptive surfaces, will have a much shorter reverberation time.

Measurement of the reverberation time in the receiving room allows the measured sound insulation to be adjusted to account for the sound energy absorbed by the room.

Impact sound insulation measurements were carried out for the base floor and the base floor with the test sample to determine the improvement the test sample had on the existing floor/ceiling system.

[1] *Brüel and Kjær Tapping Machine Type 3207*

5.0 IMPACT SOUND INSULATION DESCRIPTORS

5.1 Australian/ISO Standard

The impact sound insulation performance of a system is denoted by a single value descriptor, the weighted impact sound insulation $L'_{n,w}$ (for laboratory tested rating) or $L'_{nT,w}$ (for field tested rating). The single value descriptor allows for easy comparisons between different systems. The lower the number, the better the impact sound insulation performance.

The rating of the system is determined by comparing the measured impact noise levels in the receiving room against a set of reference values between one-third-octave band centre frequency ranges of 100 Hz to 3150 Hz, as specified in AS/NSZ ISO 717.2:2004.

5.2 ASTM International Standard

The impact sound insulation performance can also be indicated by a single value descriptor known as the Impact Insulation Class (IIC) rating.

The IIC is derived from ASTM E1007-14: *Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures* and ASTM E989-06: *Standard Classification for Determination of Impact Insulation Class.*

The process in measuring and determining the IIC is very similar to the $L'_{nT,w}$, however the interpretation of the value is different. Where the $L'_{nT,w}$ improves as the number decreases, the IIC rating improves as the number increases. The prefix "A" in AIIC is representative of the Apparent Impact Insulation Class, and denotes the rating of a field measurement as opposed to a laboratory measurement.

5.3 Estimation of $\Delta L_{,w}$

The measurement procedure used to determine the reduction of transmitted impact noise is specified in AS/ISO 140.8 *Acoustics – Measurement of sound insulation in buildings and of building elements – part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor*. The impact noise reduction $\Delta L_{,w}$ therefore cannot be calculated according to the standard, using field measurements.

However, we have calculated the reduction in impact sound pressure level (ΔL) and the weighted reduction of impact sound pressure level ($\Delta L_{,w}$) for this field measurement using the same method recommended for laboratory measurements in AS/ISO 140.8 and AS/ISO 717.2 and therefore is indicative only.

6.0 TEST SAMPLE DESCRIPTION AND RESULTS

The base floor (see Section 3.0) was tested to establish a reference performance of the floor system from which the proposed test sample will be compared to.

The test sample of Godfrey Hirst Hybrid 6.0/0.3mm was installed on top of the base concrete floor, as shown in Figure 2.

Figure 2 - Godfrey Hirst ABA Hybrid 6.0/0.3mm laid on base floor

The measured impact sound pressure levels (rounded to the nearest one-tenth decibel) are tabulated for each one-third-octave band measured and are presented below in Table 1.

Table 1 Measured Impact Sound Pressure Levels

1/3 Octave Band Centre Frequency (Hz)	Standardised Impact Sound Pressure Level L'_{nT} (dB)		ΔL (dB)	Normalised Impact Sound Pressure Level (dB)
	Base Floor	Test Sample	Test Sample	Test Sample
100	51.4	48.4	3.0	52
125	54.2	52.4	1.8	56
160	58.0	55.6	2.4	59
200	57.0	54.1	2.9	58
250	56.4	51.4	5.0	55
315	57.0	50.4	6.6	54
400	58.0	48.7	9.3	53
500	58.6	47.2	11.4	51
630	59.6	47.9	11.7	52
800	60.6	44.7	15.9	48
1000	61.7	39.4	22.3	43
1250	62.6	35.8	26.8	40
1600	63.7	32.7	31.0	37
2000	64.7	29.2	35.5	33
2500	65.9	24.9	41.0	29
3150	71.9	24.8	47.1	29
4000	72.6	22.5	50.1	26
5000	66.6	16.5	50.1	20
	$L'_{nT,w}$ = 73	**$L'_{nT,w}$ = 46**	**$\Delta L'_{nT,w}$ = 27**	**AIIC = 60**

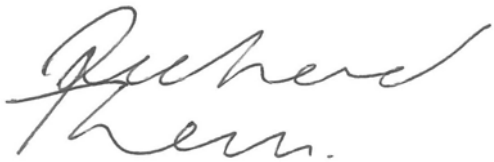
Based on the ΔL values shown in Table 1, the improvement of the tested sample when compared to the AS ISO 717.2:2004 reference floor (L_w 78) is **ΔL_w = 19 dB**, as per the methodology outlined in Section 5.3.

7.0 SUMMARY OF FINDINGS

Day Design was commissioned by Godfrey Hirst Australia Pty Ltd to measure the impact sound insulation of a flooring system incorporating their Hybrid 6.0/0.3mm flooring product.

The floor/ceiling system consisting of Godfrey Hirst Hybrid 6.0/0.3mm flooring product, installed on top of the base floor construction consisting of a 270 mm thick concrete slab, achieved a weighted standardized impact sound insulation rating of $L'_{nT,w}$ 46, a weighted impact sound reduction of ΔL_w 19 dB and an apparent impact insulation class of AIIC 60.

Test measurements and calculations were conducted by the undersigned.



Ricky Thom, BA, BE(Mech)Hons, GradIEAust
Acoustical Engineer
for and on behalf of Day Design Pty Ltd

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Appendices

- B001 – 270 mm concrete $L'_{nT,w}$
- B001 – 270 mm concrete AIIC
- B002 – 270 mm concrete + Godfrey Hirst Hybrid 6.0/0.3 - $L'_{nT,w}$
- B002 – 270 mm concrete + Godfrey Hirst Hybrid 6.0/0.3 - AIIC

BARE SLAB

IMPACT SOUND INSULATION TEST CERTIFICATE

7718-1 B001

Client:

Godfrey Hirst New Zealand Pty Ltd

Test Specimen:

Bare Slab

Building Construction
270 mm concrete slab
28 mm furring channel

Frequency - Hz	Standardised Impact Sound Pressure Level 1/3 Octave dB
100	51.4
125	54.2
160	58.0
200	57.0
250	56.4
315	57.0
400	58.0
500	58.6
630	59.6
800	60.6
1000	61.7
1250	62.6
1600	63.7
2000	64.7
2500	65.9
3150	71.9
4000	72.6
5000	66.6
$L'_{nT,w}$	73

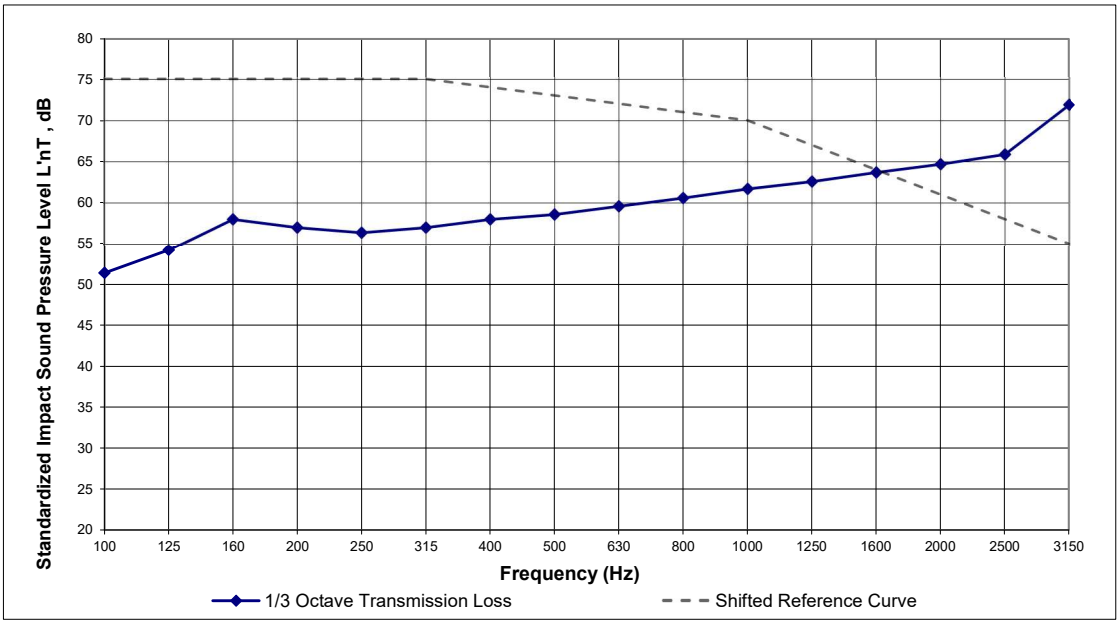
Australian Standards:
Measured according to AS/NZS ISO 140.7:2006
Rated to AS ISO 717.2:2004

Test Specimen Dimensions:

Test Location:
Unit 18 to Unit 11 below

808 Forest Road, Peakhurst, NSW

Instrumentation:
Brüel and Kjær Sound Level Meter type 2270
Brüel and Kjær Microphone type 4189
Brüel and Kjær Acoustical Calibrator type 4231
Brüel and Kjær Tapping Machine type 3207



Date of Test: Thursday, 9 June 2022

Project Number: 7718-1 B001

Test Engineer:

For and on behalf of Day Design Pty Ltd

BARE SLAB

IMPACT INSULATION CLASS TEST CERTIFICATE

7718-1 B001

Client:

Godfrey Hirst New Zealand Pty Ltd

Test Specimen:

Bare Slab

Building Construction
270 mm concrete slab
28 mm furring channel

Frequency - Hz	Normalised Impact Sound Pressure Level 1/3 Octave dB
100	55.4
125	61.0
160	65.0
200	64.8
250	64.2
315	65.1
400	65.4
500	65.9
630	66.2
800	66.8
1000	67.1
1250	67.5
1600	68.3
2000	69.0
2500	69.6
3150	75.2
4000	75.9
5000	69.4
AIIC	**25**

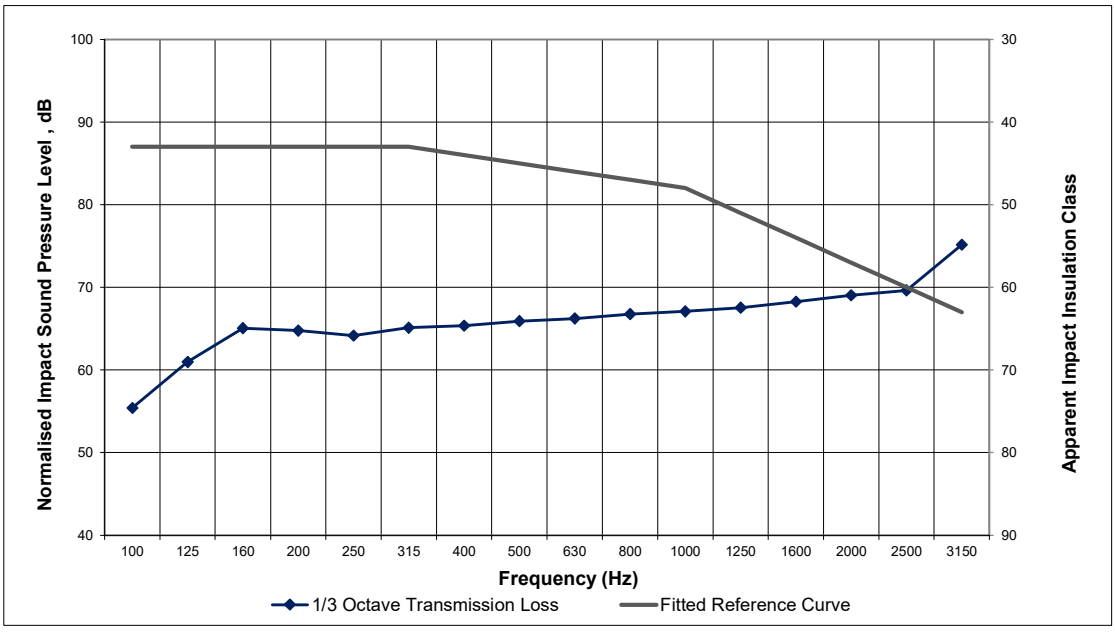
Australian Standards:
Measured according to AS/NZS ISO 140.7:2006
Rated to AS ISO 717.2:2004
Calculated according to ASTM E492 - 90
Calculated according to ASTM E989 - 06

Test Specimen Dimensions:

Test Location:
Unit 18 to Unit 11 below

808 Forest Road, Peakhurst, NSW

Instrumentation:
Brüel and Kjær Sound Level Meter type 2270
Brüel and Kjær Microphone type 4189
Brüel and Kjær Acoustical Calibrator type 4231
Brüel and Kjær Tapping Machine type 3207



Test Engineer:

Date of Test: Thursday, 9 June 2022

Project Number: 7718-1 B001

For and on behalf of Day Design Pty Ltd

HYBRID PLANK FLOORING SYSTEM

IMPACT SOUND INSULATION TEST CERTIFICATE

7718-1.1 B002

Client:

Godfrey Hirst Australia Pty Ltd

Test Specimen:

6 mm hybrid plank with 0.3 mm foam underlay

Building Construction

6 mm hybrid plank with 0.3 mm foam underlay
270 mm concrete slab
28 mm furring channel

Frequency - Hz	Standardised Impact Sound Pressure Level 1/3 Octave dB
100	48.4
125	52.4
160	55.6
200	54.1
250	51.4
315	50.4
400	48.7
500	47.2
630	47.9
800	44.7
1000	39.4
1250	35.8
1600	32.7
2000	29.2
2500	24.9
3150	24.8
4000	22.5
5000	16.5
$L'_{nT,w}$	**46**

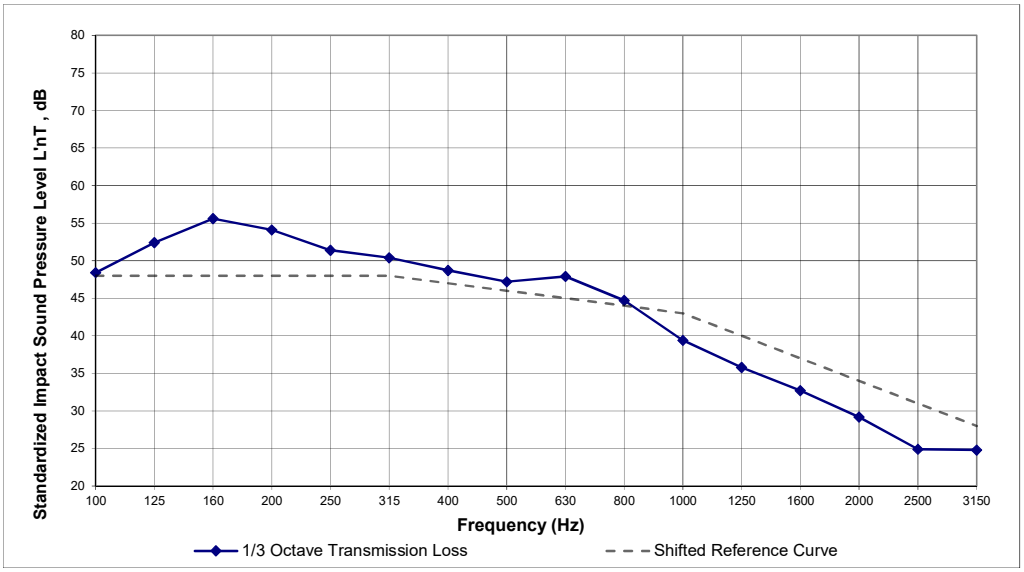
Australian Standards:
Measured according to AS/NZS ISO 140.7:2006
Rated to AS ISO 717.2:2004

Test Specimen Dimensions:
1220 mm (L) x 80 mm (W) x 6.3 mm (T)

Test Location:
Unit 18 to Unit 11 below

808 Forest Road, Peakhurst, NSW

Instrumentation:
Brüel and Kjær Sound Level Meter type 2270
Brüel and Kjær Microphone type 4189
Brüel and Kjær Acoustical Calibrator type 4231
Brüel and Kjær Tapping Machine type 3207



Test Engineer:

Date of Test: Tuesday, 21 February 2023

Project Number: 7718-1.1 B002

For and on behalf of Day Design Pty Ltd

CARPET FLOORING SYSTEM

IMPACT INSULATION CLASS TEST CERTIFICATE

7718-1.1 B002

Client:

Godfrey Hirst Australia Pty Ltd

Test Specimen:

6 mm hybrid plank with 0.3 mm foam underlay

Building Construction
6 mm hybrid plank with 0.3 mm foam underlay
270 mm concrete slab
28 mm furring channel

Frequency - Hz	Normalised Impact Sound Pressure Level 1/3 Octave dB
100	52.4
125	59.2
160	62.7
200	61.8
250	59.2
315	58.6
400	56.1
500	54.5
630	54.6
800	50.8
1000	44.8
1250	40.7
1600	37.2
2000	33.5
2500	28.7
3150	28.1
4000	25.7
5000	19.3
AIIC	**56**

Australian Standards:
Measured according to AS/NZS ISO 140.7:2006
Rated to AS ISO 717.2:2004
Calculated according to ASTM E492 - 90
Calculated according to ASTM E989 - 06

Test Specimen Dimensions:
1220 mm (L) x 80 mm (W) x 6.3 mm (T)

Test Location:
Unit 18 to Unit 11 below

808 Forest Road, Peakhurst, NSW

Instrumentation:
Brüel and Kjær Sound Level Meter type 2270
Brüel and Kjær Microphone type 4189
Brüel and Kjær Acoustical Calibrator type 4231
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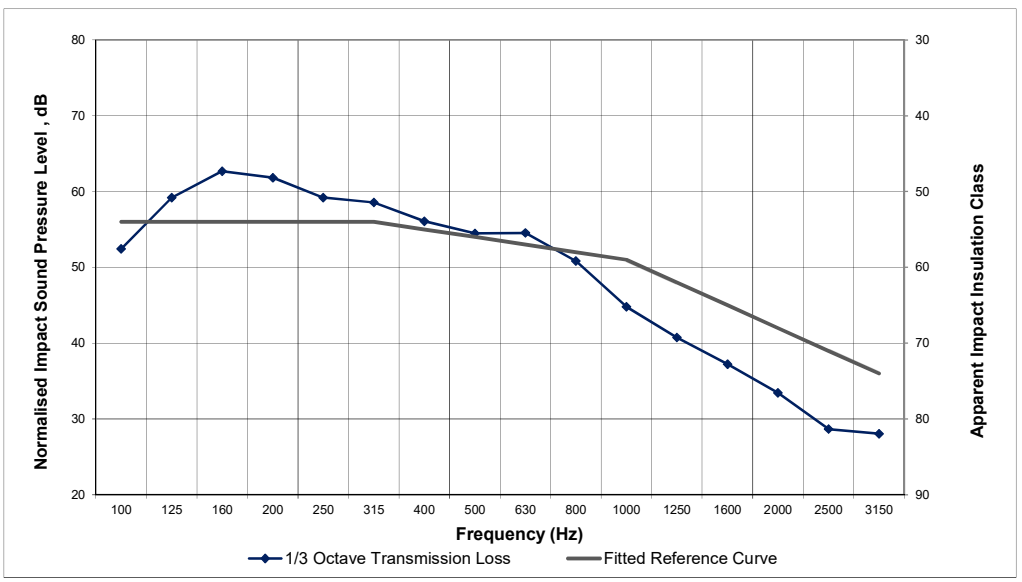

Test Engineer:

Date of Test: Tuesday, 21 February 2023

Project Number: 7718-1.1 B002

For and on behalf of Day Design Pty Ltd