24 July 2023
ME162-01F04 Acoustic Report (r1) - Aqua Stone 5mm SPC

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UB Trading - Aqua Stone 5mm SPC flooring - Acoustic Report

Renzo Tonin & Associates was engaged by UB Trading Pty Ltd to provide an acoustic report on the predicted weighted normalised impact sound pressure level ($L_{n,w}$) performance of the Aqua Stone 5mm SPC flooring, with respect to '*AAAC Guideline for Apartment and Townhouse Acoustic Rating*', and predictions of performance on a concrete slab of varying thicknesses and typical floor and ceiling configurations.

Further, the predictions were compared to the '*National Construction Code*' (NCC), which has the following requirements for sound transmission through floors:

Airborne:	R_w + C_{tr} not less than 50 *when determined under AS/NZS ISO 717.1*
Impact:	$L_{n,w}$ not more than 62 *when determined under AS/NZS ISO 717.2*

Table 1 overleaf presents details of the respective AAAC star rating levels applicable to floors.

Table 1: AAAC Guideline star rating requirements for inter-tenancy sound insulation

Occupancy	Requirement	2 star	3 star	4 star	5 star	6 star
Airborne sound insulation for walls and floors[1]						
Between tenancies	R_W + Ctr ≥	40	45	50	55	60
Impact isolation of floors						
Between tenancies	$L_{nT,w}$ ≤	65	55	50	45	40

Notes: Association of Australian Acoustic Consultants (AAAC) *"Guideline for Apartment and Townhouse Acoustic Rating (Version 1.0)"*.
The above colour formatting is only for visual purposes and ease of communication.

1. Presented in terms of D_{nTw} + C_{tr} in the AAAC star rating document, however this has been converted to R_W +C_{tr} in this document for simplicity. It is commonly accepted that D_{nTw} + C_{tr} is 5dB less than R_W +C_{tr}.
2. Presented in terms of L_{nTw} in the AAAC star rating document, however this has been converted to $L_{n,w}$ in this document for simplicity. It is commonly accepted that $L_{nT,w}$ is approximately equal to $L_{n,w}$.

Renzo Tonin & Associates conducted impact testing of the sample, with the impact sound insulation test reports presented in APPENDIX B.

Table 2 presents typical floor-ceiling construction scenarios and expected airborne and impact sound insulation performance with respect to NCC requirements and AAAC star ratings.

Table 2: Typical floor-ceiling construction and expected performance

ID	Description	Sound insulation performance	Compliance with NCC criterion?	AAAC star rating
3	• 5mm Aqua Stone SPC flooring in floating configuration • 200mm thick concrete slab • 13mm standard plasterboard suspended on a light ceiling grid with minimum 200mm cavity and 50mm thick 11kg/m^3 glasswool insulation	**Airborne:** $R_W+C_{tr} \geq 60$ **Impact:** $L_{n,w} \leq 42$	**Airborne $R_W+C_{tr} \geq 50$:** ✓ **Impact $L_{n,w} \leq 62$:** ✓	**6-star** **5-star**
2	• 5mm Aqua Stone SPC flooring in floating configuration • 200mm thick concrete slab • 13mm standard plasterboard suspended on a light ceiling grid with minimum 200mm cavity (no insulation)	**Airborne:** $R_W+C_{tr} \geq 55$ **Impact:** $L_{n,w} \leq 50$	**Airborne $R_W+C_{tr} \geq 50$:** ✓ **Impact $L_{n,w} \leq 62$:** ✓	**5-star** **4-star**
1	• 5mm Aqua Stone SPC flooring in floating configuration • 150mm thick concrete slab • No ceiling and no insulation	**Airborne:** $R_W+C_{tr} \geq 47$ **Impact:** $L_{n,w} \leq 59$	**Airborne $R_W+C_{tr} \geq 50$:** ✗ **Impact $L_{n,w} \leq 62$:** ✓	**3-star** **2-star**

Notes:
- The expected performances have regard to the assumptions that the consultant can be reasonably expected to make in accordance with professional industry practice and on the assumption that the consultant is exercising the level of skill, care and attention required of a consultant practicing in his professional industry
- It is generally recommended that the additional recommendations in Appendix C be adhered to in the construction of the floor-ceiling system

To obtain a more accurate indication of weighted sound reduction index performance, we recommend that the systems be laboratory tested.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
20.07.2023	Draft	0	-	P. Mehta	N. Peters	-
24.07.2023	Issued	-	1	P. Mehta	-	N. Peters
File Path: ME162-01F04 Acoustic Report (r1) - Aqua Stone 5mm SPC						

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The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

External cladding disclaimer: No claims are made and no liability is accepted in respect of any external wall and/or roof systems (eg facade / cladding materials, insulation etc) that are: (a) not compliant with or do not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes.

APPENDIX A Glossary of terminology

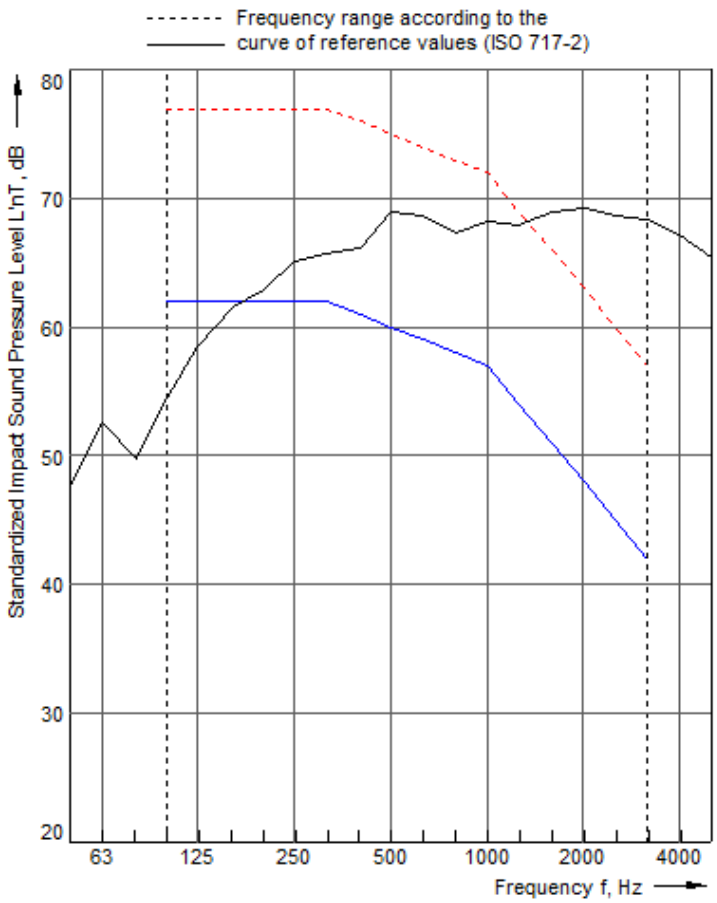
The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 120dB Deafening
Ln,w	Weighted Normalised Impact Sound Pressure Level A measure of the sound level transmitted from impacts on a floor to a tenancy below. It is measured in very controlled conditions in a laboratory and is characterised by how much sound reaches the receiving room from a standard tapping machine. A lower value indicates a better performing floor.
LnT,w	Weighted Standardised Field Impact Sound Pressure Level As for Ln,w but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the Ln,w. A lower value indicates a better performing floor.
Ctr	Spectrum Adaptation Term for the sound reduction index. A value used to modify the measured sound insulation performance of a wall or floor measured in terms of the Rw or the DnT,w so as to more accurately account for low frequency noise transmission from the sound of modern stereo systems. The value is defined in ISO 717-1 which also sets out the test methodology for measuring the sound insulation properties of building elements. The Ctr of a building element varies according to its physical properties. For example, a 90mm cavity brick masonry wall as a Ctr value of -6, as does a wall constructed of 150mm core-filled concrete blocks. By contrast, a brick veneer wall might have a Ctr of -12. The value is added to the Rw or DnT,w. with positive Ctr values being more favourable.
DnT,w	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the Rw laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.

APPENDIX B Impact Sound Insulation Test Report

IMPACT SOUND INSULATION - FIELD TEST REPORT		
Report reference:	ME162-01F04 Acoustic Report (r1) - Aqua Stone 5mm SPC	
Test reference:	ME162-01-01	
Date of test:	7 July 2023	
Understood construction:	Floor finish in source room:	• Nil (bare concrete slab)
	Existing substrate:	• Measured 180mm Concrete slab
	Ceiling in receiving room:	• Nil (bare concrete slab)

Frequency f Hz	L'nT 1/3 Octave dB
50	47.7
63	52.6
80	49.8
100	54.5
125	58.4
160	61.6
200	62.9
250	65.1
315	65.7
400	66.1
500	68.9
630	68.6
800	67.4
1000	68.2
1250	68.0
1600	69.0
2000	69.2
2500	68.7
3150	68.4
4000	67.2
5000	65.4



Rating according to ISO 717-2

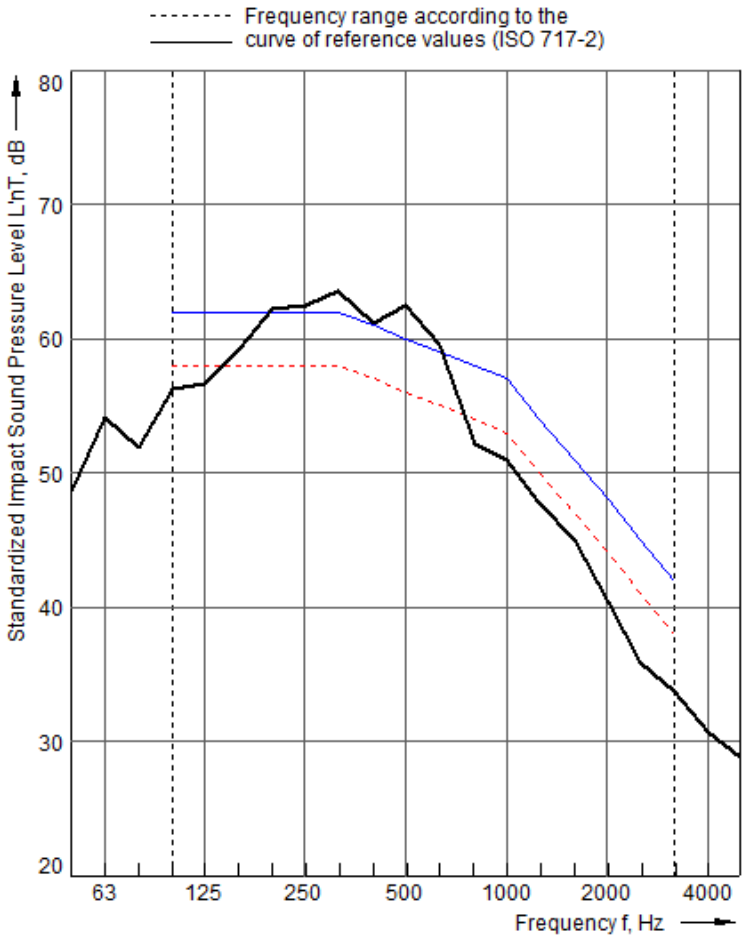
$L'_{nT,w}(C_i)$ = 75 (-11) dB $C_{i,50\text{-}2500}$ = -11 dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Measurements conducted in general accordance with International Standard ISO 16283-2:2018 'Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 2: Impact sound insulation' and International Standard ISO 717.1:2013 'Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Impact sound insulation.' Measurements and procedures documented in this report have been carried out in accordance with the Renzo Tonin & Associates Quality Assurance System. This quality system is based on AS/NZS ISO 9001.

IMPACT SOUND INSULATION - FIELD TEST REPORT		
Report reference:	ME162-01F04 Acoustic Report (r1) - Aqua Stone 5mm SPC	
Test reference:	ME162-01-04	
Date of test:	7 July 2023	
Understood construction:	Floor finish in source room:	• Sample of Aqua Stone 5mm SPC flooring floating atop:
	Existing substrate:	• Measured 180mm Concrete slab
	Ceiling in receiving room:	• Nil (bare concrete slab)

Frequency f Hz	L'nT 1/3 Octave dB
50	48.6
63	54.1
80	51.9
100	56.3
125	56.7
160	59.3
200	62.2
250	62.5
315	63.6
400	61.2
500	62.4
630	59.6
800	52.1
1000	51.0
1250	47.8
1600	45.0
2000	40.3
2500	35.9
3150	33.7
4000	30.7
5000	28.9



Rating according to ISO 717-2

$L'_{nT,w}(C_i)$ = 56 (0) dB $C_{i,50\text{-}2500}$ = 0 dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Measurements conducted in general accordance with International Standard ISO 16283-2:2018 'Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 2: Impact sound insulation' and International Standard ISO 717.1:2013 'Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Impact sound insulation.' Measurements and procedures documented in this report have been carried out in accordance with the Renzo Tonin & Associates Quality Assurance System. This quality system is based on AS/NZS ISO 9001.

APPENDIX C Additional recommendations

C.1 Acoustic sealing

C.1.1 General

It is most common that complaints of poor sound insulation are due to poor sealing details as opposed to insufficient sound insulation of partitions. It is therefore crucial that all junctions of differing materials and seals around doors and the like are treated with adequate attention to detail to ensure that sound insulation is not compromised. In general:

- In general, if less than 10mm discontinuities shall be sealed with acoustic sealant.
- In general, if greater than 10mm discontinuities shall be filled with polyester insulation, covered with 16-gauge galvanised sheet metal (or a rigid material have an equivalent mass per square meter) and sealed with an approved mastic. All alternative treatments shall be approved by a qualified acoustic consultant.
- Where an acoustically rated form of construction is to be penetrated by ductwork, pipe work, electrical services or the like, the contractor shall comply with the requirements set out in this section.
- In all cases penetrations in sound rated partitions shall be sealed so that the acoustic rating of the construction being penetrated shall comply with the ratings specified in this document.
- Penetrations shall be sized for mechanical ducts passing through walls to allow a uniform clearance of 10 – 20 mm around the item and this space shall be packed through its depth with polyester insulation. The joints on both sides shall be sealed with metal angles using an approved acoustic mastic.
- Penetrations shall be sized for pipes passing through walls to allow a uniform clearance of 10 – 15mm around the item and this space shall be packed through with polyester insulation. The joints on both sides shall be sealed using an approved acoustic mastic 12 mm minimum depth.
- Penetrations through the slab shall be sized to accommodate all required services penetrating the floor slabs with allowance for gaps around the services to be nominally 10mm, and no greater than 15mm
- The contractor shall inspect and ensure that all services penetrations through the floor slab to be packed through with polyester insulation. The joints on both sides of each floor slab shall be sealed using an approved acoustic mastic 12 mm minimum depth, to the satisfaction of Renzo Tonin & Associates.
- Any alternative sealing details utilised shall be designed to maintain the acoustic rating of the walls, ceilings and floors which they penetrate. Alternative details shall be submitted to the acoustic consultant for approval.

C.1.2 Approved acoustic sealants

Where an acoustic sealant is specified anywhere in this document, the material shall be a flexible non-hardening compound. Approved products are outlined in Table 3 below.

When using an acoustic sealant, the following installation methodology applies:

- Must be used in conjunction with an open-cell foam backing rod in the cavity;
- Depth of sealant equal to the gap dimension – usually 20mm;
- Must be used on both side of the material containing the gap.

Table 3: Approved acoustic sealants

Manufacturer	Brand name	Specific gravity
Acrylic fire & acoustic rated sealants		
HB Fuller	Firesound	1.5
Promat	Promaseal	1.6
Selleys	ProSeries Fireblock	1.5
Sika	Firerate	1.5
Hilti	CP606	1.5
Polyurethane fire & acoustic rated sealants		
Bostik	Fireban One	1.45
Sika	Firerate PU	1.6

C.2 Access panels

Non-acoustically rated access panels can detrimentally affect the acoustic performance of floor-ceiling systems, to this end:

- All access panels in apartments shall be rated a minimum of Rw + Ctr 25 and are to be similar to the 'Trafalgar APT/WW 30' or 'Rondo SRAP30' hinged panel system.
- Access panels fitted with 'push locks' are unacceptable.

C.3 Acoustic downlights

Non-acoustically rated downlights can detrimentally affect the acoustic performance of floor-ceiling systems, to this end:

- Non-tiltable LED or acoustic or fire-rated down-lights shall be installed within kitchens, living rooms, hallways and bedrooms where a down-light is installed less than 1200mm of a waste or downpipe.
- Standard down-lights are acceptable for all other applications.