

Acoustics study

YA132.P1

Old Loom

120 Moston Lane

Manchester

M94HU



Manchester, UK
Version 2.0
December 10, 2019

Identification

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YA132.P1

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Prepared by: Luis Pereira

Prepared for: A1 Property Investments Manchester; [Manchester City Council \(MCC\)](#)

Revisions

Date	Changes / Comments	Reviser
10/12/2019	Annex B updated as per the information sent by Mahmoud Hreitani (Studio Tashkeel) on the 10/12/2019	LP

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Acronyms

IANLs internal ambient noise levels. [7](#), [11](#), [13](#)

MCC Manchester City Council. [2](#), [7](#), [8](#), [10](#), [11](#), [13](#), [15](#)

SPL sound pressure level. [11](#), [12](#)

Glossary

$L_{Aeq,16hr}$ equivalent A-weighted continuous sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within the period 07:00-23:00 hours has the same mean-squared sound pressure as the sound under consideration that varies with time. [10](#), [13](#)

$L_{Aeq,8hr}$ equivalent A-weighted continuous sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within the period 23:00-07:00 hours has the same mean-squared sound pressure as the sound under consideration that varies with time. [10](#), [13](#)

$L_{Aeq,T}$ equivalent A-weighted continuous sound pressure level - value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time. [10](#)

L_{AFmax} maximum A-weighted sound pressure level - value of the maximum A-weighted sound pressure level obtained using time-weighting “F”, during a specified time interval. [10](#), [13](#)

Summary

This report has been prepared in support of a planning application for a conversion and rear first floor extension of a public house (A4) into 2 No. shops (A1), 3 no. studios and 3 no. 1 bed apartments (C3) at 120 Moston Lane, Manchester, M9 4HU.

The MCC requires that [internal ambient noise levels \(IANLs\)](#) for residential development are below set limits and that noise transmission between the ground floor commercial uses and the residential units proposed above is kept below adequate levels.

A site survey has been carried out to identify if current proposals are compatible with the required criteria.

It has been determined that:

1. The existing glazing elements of the facade are suitable to achieve the required [IANLs](#): and
2. The existing first floor and external walls construction needs to be upgraded as indicated in Annex [F](#).

1 Introduction

A conversion and rear first floor extension of a public house (A4) into 2 No. shops (A1), 3 no. studios and 3 no. 1 bed apartments (C3) is proposed at 120 Moston Lane, Manchester, M9 4HU.

Yacoustics has been commissioned to assess if current proposals are compatible with the criteria set out by the [MCC](#).

This assessment has been carried out in accordance with the architects plans for the development and the existing site characteristics.

2 Proposed development

The proposed development consists of 2 no. shops (A1), 3 no. studios and 3 no. 1 bed apartments.

The shops are to be located at ground floor level and the residential units to be located at first and second floors.

A site location reference together with existing and proposed architectural plans for the development is presented as Annexes [A](#) and [B](#).

3 Relevant criteria

The criteria which is relevant for the proposed development is outlined as Tables 1 and 2 and has been established based on the MCC Planning & Noise Technical Guidance document (2015) [4].

Table 1 – Internal ambient noise levels for dwellings (sources: BS 8233:2014 [2] and WHO NNGE:2009 [1])

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dinning	Dinning room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (day-time resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$
			45 ¹ dB L_{AFmax}

Note: The presented noise limits relate to steady external noise sources.

1: Individual noise events should be limited to not exceed 45 L_{AFmax} more than 15 times.

Table 2 – Limits of noise transmission between other parts of the building and residential areas (adopted based on BS 8233:2014)

Source	Required criteria
Commercial use	$L_{Aeq,T}$ (within bedrooms) $\leq 20^1$ dB

¹ In accordance to BS 8233:2014 it is assumed that the typical internal ambient noise levels bedrooms is approx. 30 dB. As such a maximum noise transmission 10 dB below a space typical internal ambient noise levels is considered to translate to a negligible impact.

4 Methodology

The overall approach considered for the assessment of the MCC requirements was the following:

1. Survey to determine current IANLs at first floor level and assess the existing glazing elements suitability (See Annex C);
2. Sound insulation testing to determine noise transmission between the ground floor and first floor, in line with the principles of BS EN ISO 16283 [3] (See Annex C).

The survey methodology can be briefly described as follows:

1. Generation of a steady continuous diffuse sound field at least 10 dB higher than the background noise levels in any frequency band within the proposed development (a DS3 NTi Audio omnidirectional sound source and PA3 power amplifier were used - see Annex D for details);
2. 2x60 seconds measurement of average sound pressure level (SPL) (1/3 octave band) at NSR B using the manual moving microphone method (calibration certifications for all the used equipment are presented in Annex D). The following minimum separating distances were considered:
 - a) 0.5 m between microphone positions and room boundaries or diffusers; and
 - b) 1 m between microphone and the sound source.
3. Level differences (D) calculation for each relevant space;
4. Calculation of noise transmission considering the typical reverberant noise levels expected for an internet cafe¹ - taken from the *The Little Red Book of Acoustics* [5] (Table 3).

¹ The typical noise levels of an internet cafe have been considered since this is the "loudest" expected use associated with an A1 use class, i.e no specific tenants have been defined at this stage.

Table 3 – Typical reverberant noise levels (Internet cafe or similar [5])

Source	Octave band (Hz) SPL(dB)							Global dB(A)
	63	125	250	500	1k	2k	4k	
Internet cafe	60	60	60	65	65	55	50	67

5 Results

5.1 Internal ambient noise levels

The measured IANLs at first floor are presented as Table 4.

A time history graph of the survey is presented as Annex E.

It can be seen that the noise levels are in line with the requirements set out by the MCC and as such the existing glazing elements are compatible with the current architectural proposal¹.

Table 4 – Survey results - IANLs

Location	07:00 to 23:00	23:00 to 07:00
Bedroom	34 dB $L_{Aeq,16hr}$	28 dB $L_{Aeq,8hr}$ 37 dB L_{AFmax}

5.2 Noise transmission

The results for the calculated level differences and the expected maximum noise levels emitted by the ground floor A1 uses are presented as Table 5. Details of the sound insulation test data are presented as Annex E.

It can be seen that the expected maximum transmitted noise levels are in excess of the criteria set out in Section 3 and as such a method of compliance is presented in the following Section of this report.

Table 5 – Calculation of noise transmission

Space	Parameter	Octave band (Hz)							Global
		63	125	250	500	1k	2k	4k	
Bedroom	D dB	16	19	32	44	52	63	65	-
	Maximum SPL dB(A)	18	25	19	18	14	-7	-14	28

¹ Current architectural proposals consists of spaces with volumes similar to the existing rooms.

5.2.1 Mitigation solutions

A suitable mitigation solution to reduce noise transmission to adequate levels consists of:

1. Building an independent ceiling with absorbent material; and
2. Treat the existing external walls with an independent plasterboard lining.

Details of the solutions to be employed are presented as Annex F.

Table 6 presents the expected maximum noise levels emitted by the ground floor A1 uses with the above mentioned solutions in place.

It can be seen that the expected transmitted noise levels are in line with the requirements set out in Section 3.

Table 6 – Calculation of noise transmission

Space	Parameter	Octave band (Hz)							Global
		63	125	250	500	1k	2k	4k	
Bedroom	D dB	24	40	68	95	118	145	160	-
	Maximum SPL dB(A)	10	4	-17	-34	-53	-89	-110	14

Final considerations

Following the assumptions and findings presented in this report, it has been determined that the proposed development is in line with the acoustic requirements set out by the MCC provided the mitigation solutions presented in Section 5.2.1 are put in place.

Other solutions may be considered if required as long as its performance is compatible with the criteria described in Section 3.

Manchester, UK, December 10, 2019.



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- [1] WORLD HEALTH ORGANISATION (WHO). Night Noise Guidelines for Europe. Technical document, World Heath Organisation, 2009. Cited in page [10](#).
- [2] BS 8233:2014, Guidance on sound insulation and noise reduction for buildings. Standard, 2014. Cited in page [10](#).
- [3] BS EN ISO 16283-1:2014 Field measurement of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation. Standard, BSI, 2014. Cited in page [11](#).
- [4] MANCHESTER CITY COUNCIL. Planning & Noise Technical Guidance. Technical document, Manchester City Council, 2015. Cited in page [10](#).
- [5] R. Watson & Owen Downey. *The Little Red Book of Acoustics*. Blue Tree Acoustics, 2012. Cited 2 on pages [11](#) and [12](#).

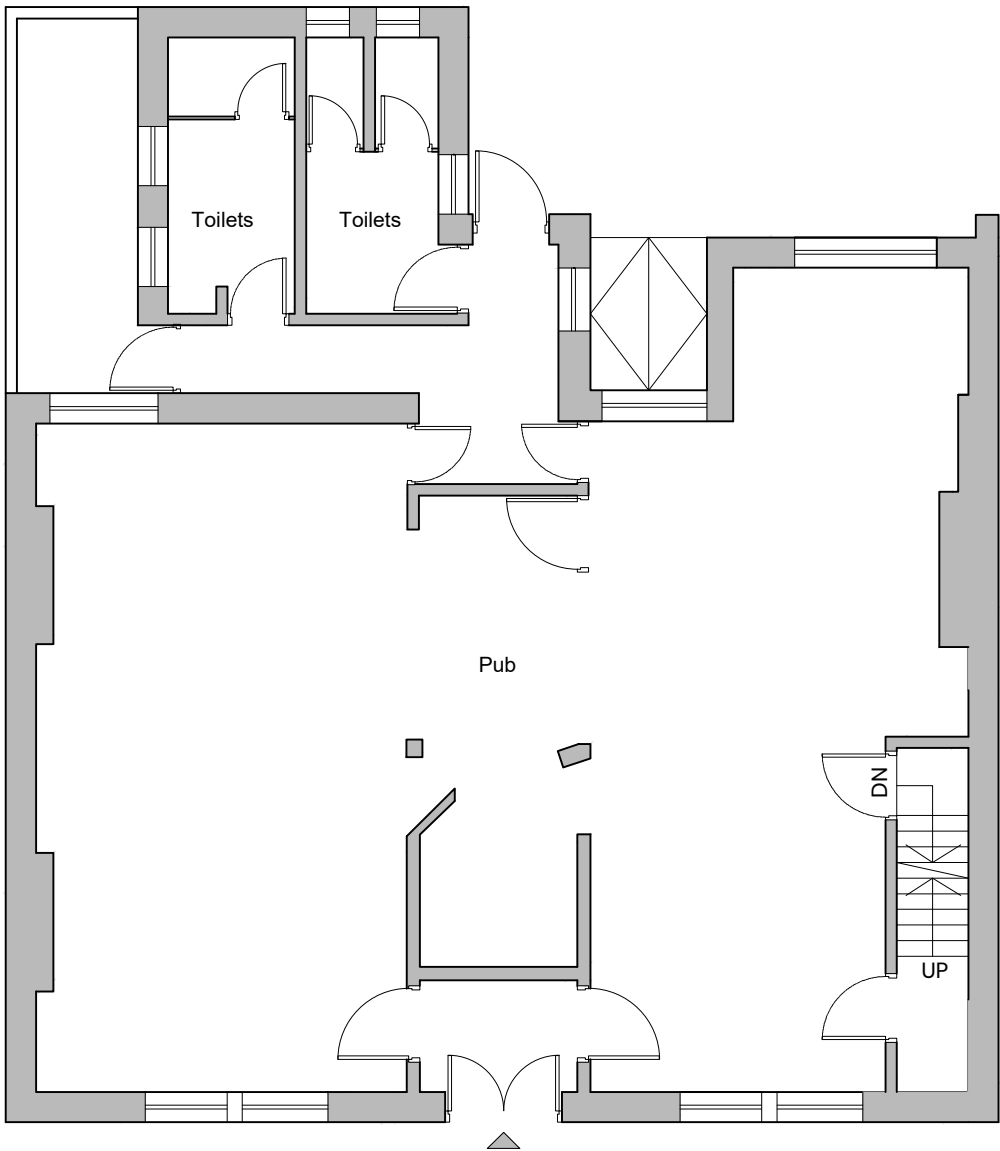
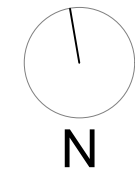
Annexes

ANNEX A – Development location



DEVELOPMENT LOCATION

ANNEX B – Existing and proposed architectural plans



Existing Ground Floor

General Notes:

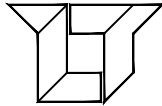
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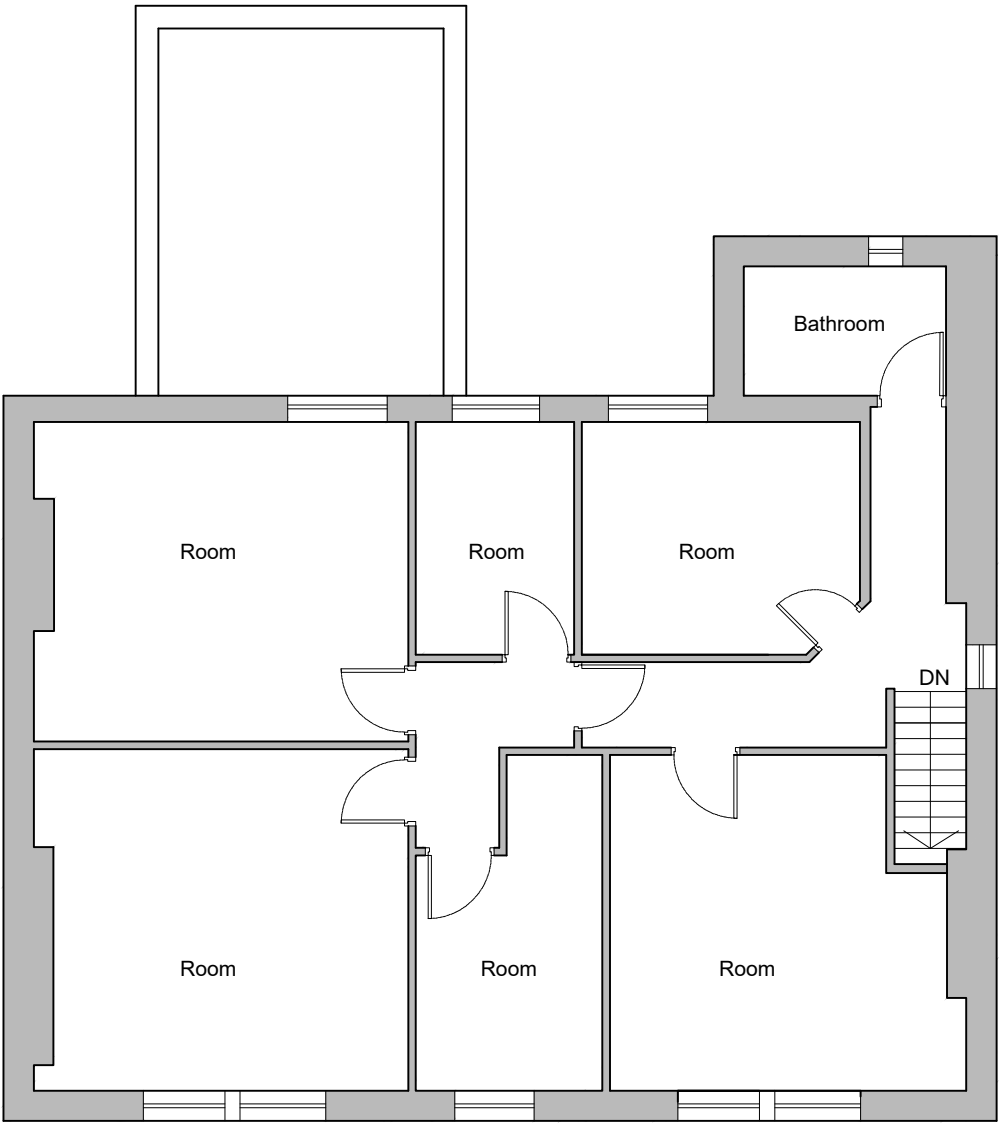
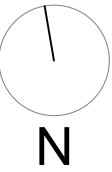
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client name		
A1 Property Investments Manchester Ltd		
project		
Old Loom		
drawing		
GA Existing GF Plan		
project number		scale
1906101		1/100 @ A3
drawing number	rev	issue status
1906101_PL_002	-	PLANNING
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Existing First Floor

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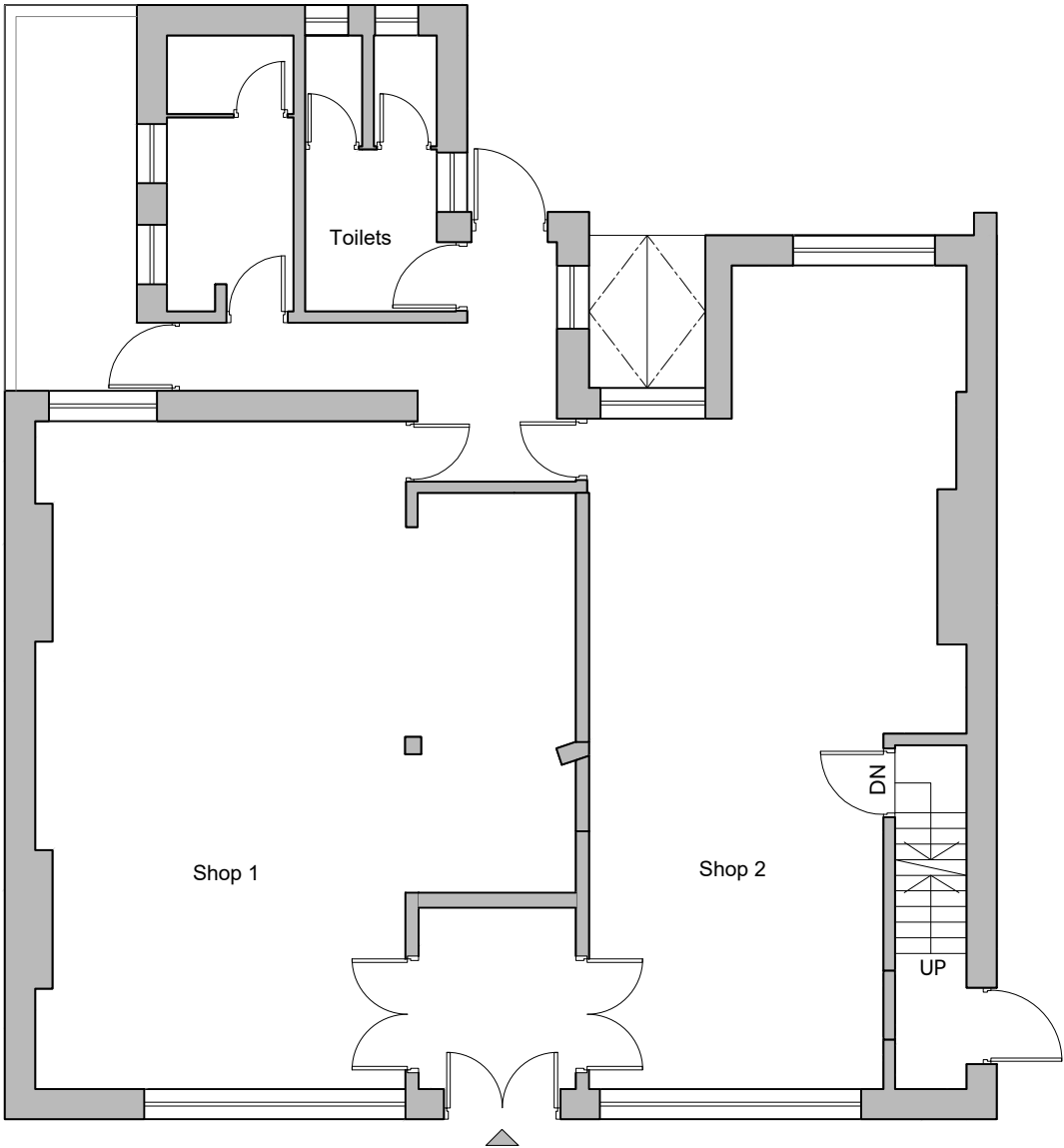
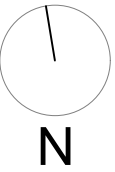
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drawing		
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1906101		1/100 @ A3
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Proposed Ground Floor

Accommodation Schedule	
Ground Floor	Area
Shop 1	32 m2
Shop 2	32 m2
First Floor	
Studio 1	24.5 m2
Studio 2	24.2 m2
Studio 3	26 m2
1 Bed Apartment 1	38 m2

General Notes:

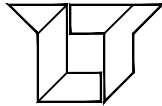
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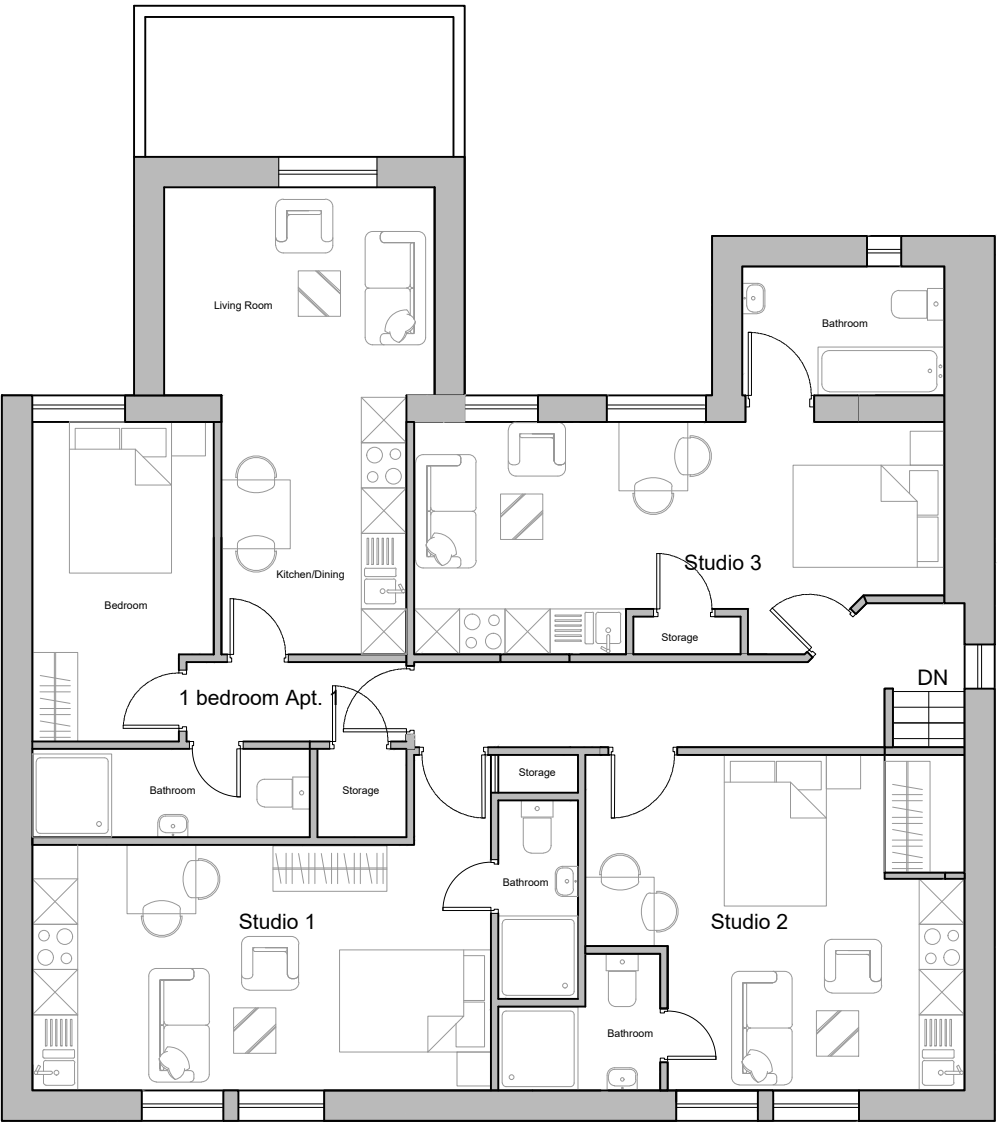
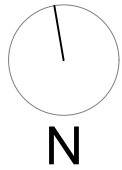
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drawing		
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project number		scale
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Studio 3	26 m2
1 Bed Apartment 1	38 m2

General Notes:

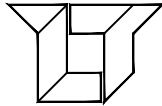
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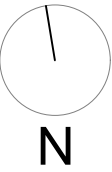
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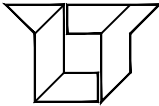
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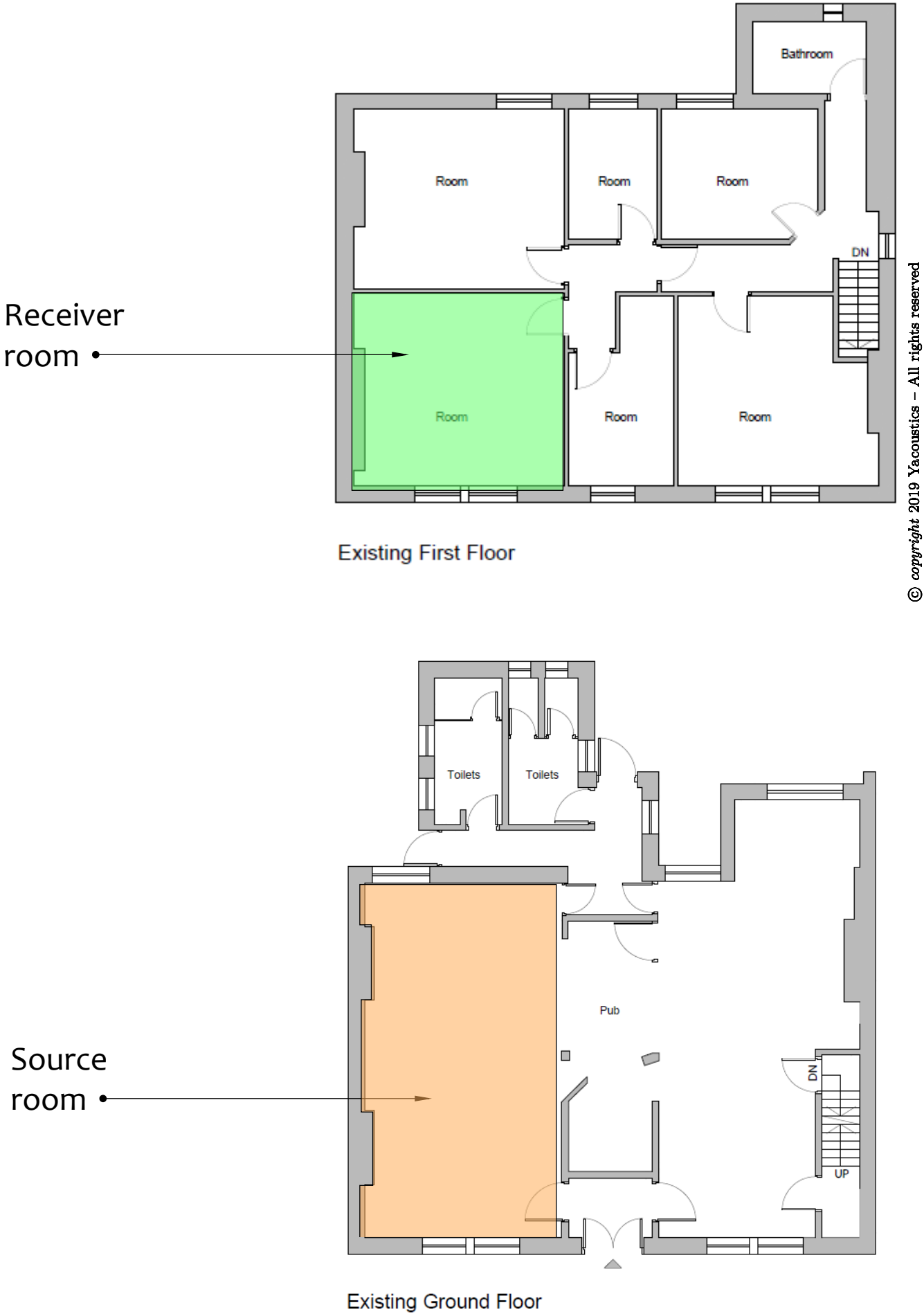
Proposed Roof Plan

ANNEX C – Survey details

INTERNAL AMBIENT NOISE LEVELS SURVEY



SOUND INSULATION SURVEY



ANNEX D – Equipment calibration certificates and details

FACTORY CALIBRATION DATA OF THE SV 307 No. 82048

with microphone SVANTEK type ST30 No. 82588

1. CALIBRATION* (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: **114.01** dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.01	113.99	-0.02
A	114.01	113.99	-0.02
C	114.01	113.99	-0.02

Calibration measured with the microphone SVANTEK type ST30 No. 82588. Calibration factor: - dB.

2. LINEARITY TEST* (electrical)

LEVEL METER function; Characteristic: A; $f_{sin} = 31.5$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	83.0
Error [dB]	-0.1	-0.1	-0.0	-0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Characteristic: A; $f_{sin} = 1000$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Characteristic: A; $f_{sin} = 8000$ Hz

Nominal result LEQ [dB]	29.0	30.0	31.0	35.0	40.0	60.0	80.0	100.0	120.0	122.0
Error [dB]	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0

3. TONE BURST RESPONSE*

LEVEL METER function; Characteristic: A; $f_{sin} = 4000$ Hz; Burst duration: 2s

Steady level nominal result = 120dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25
MAX	Fast	Indication [dB]	120.0	119.9	119.0	117.4	115.2	111.7	108.8	105.9	102.0	98.9	95.9	92.9
		Error [dB]	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1
	Slow	Indication [dB]	117.9	115.9	112.5	109.7	106.8	102.8	99.8	96.8	92.9	-	-	-
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-	-
SEL	-	Indication [dB]	120.0	117.0	113.0	110.0	107.0	103.0	100.0	97.0	93.0	89.9	86.9	83.8
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1

Steady level nominal result = 60dB

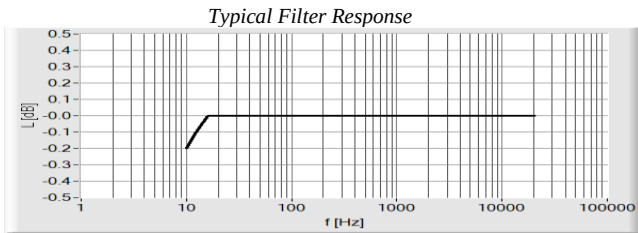
Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2
MAX	Fast	Indication [dB]	60.0	59.9	59.0	57.4	55.2	51.7	48.8	45.9	41.9
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.1
	Slow	Indication [dB]	57.9	55.9	52.5	49.7	46.8	42.8	39.9	36.8	32.9
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1
SEL	-	Indication [dB]	60.0	57.0	53.0	50.0	47.0	43.0	40.0	37.0	33.0
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0

Steady level nominal result = 40dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	Indication [dB]	40.0	39.9	39.0
		Error [dB]	0.0	0.0	0.0
	Slow	Indication [dB]	37.9	35.9	32.4
		Error [dB]	-0.0	0.0	-0.1
SEL	-	Indication [dB]	40.0	37.0	33.0
		Error [dB]	0.0	-0.0	0.0

4. FREQUENCY RESPONSE* (electrical)

LEVEL METER function; Characteristic: Z; Input signal =120 dB;



Measured Filter Response

(f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	-0.0	4000	-0.0
12.5	-0.0	125	-0.0	8000	-0.0
16	0.0	250	-0.0	16000	-0.0
20	0.0	500	-0.0	20000	-0.0
25	0.0	1000	-0.0		
31.5	0.0	2000	-0.0		

All frequencies are nominal center values for the 1/3 octave bands

5. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

Frequency [Hz]	20	31.5	63	125	250	500	800	1000	2000
Pressure Response [dB]	-1.0	0.1	0.2	0.1	0.1	0.2	0.2	0.1	-0.1
Free Field Response [dB]	-1.0	0.1	0.2	0.1	0.2	-0.0	-0.1	-0.0	0.4

Frequency [Hz]	3150	4000	5000	6300	8000	10000	12500	16000
Pressure Response [dB]	-0.5	-0.8	-1.1	-1.6	-2.2	-2.7	-2.0	-1.0
Free Field Response [dB]	0.5	0.8	0.7	1.0	0.8	0.6	0.6	1.3

6. INTERNAL NOISE LEVEL* (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤23	≤15	≤15

* measured with preamplifier 3 type x No. x.

7. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A;

Indication [dB]	≤20
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Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
23 °C	27%	998 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	65	Signal generator
2.	SVANTEK	SVAN 979	69475	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV30A	7449	Acoustic calibrator
5.	G.R.A.S.	51AB	200368	Sound Intensity Calibrator
6.	G.R.A.S.	40BP	93296	¼" Pressure Microphone
7.	G.R.A.S.	40AN	73421	½" Free Field Microphone
8.	SVANTEK	SL307	-	Microphone equivalent electrical impedance (18pF)

CONFORMITY & TEST DECLARATION

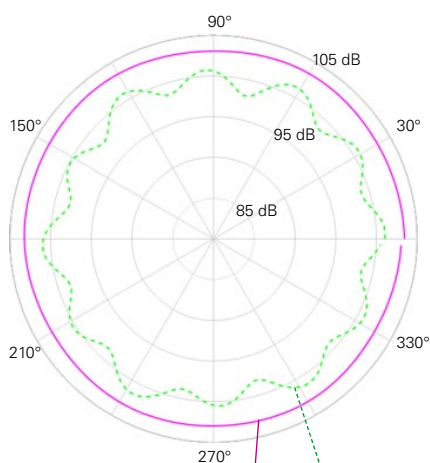
1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Ryszard Leoniak

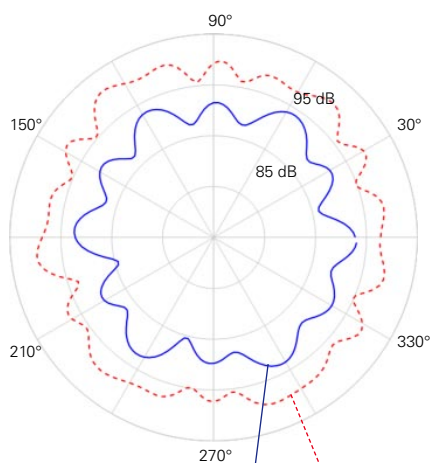
Test date: 2019-03-19



Control panel of PA3 Power Amplifier



Polar Plot of DS3 @ 1 kHz, 2 kHz



Polar Plot of DS3 @ 4 kHz, 5 kHz

All information subject to change without notice.

Specifications PA3 Power Amplifier

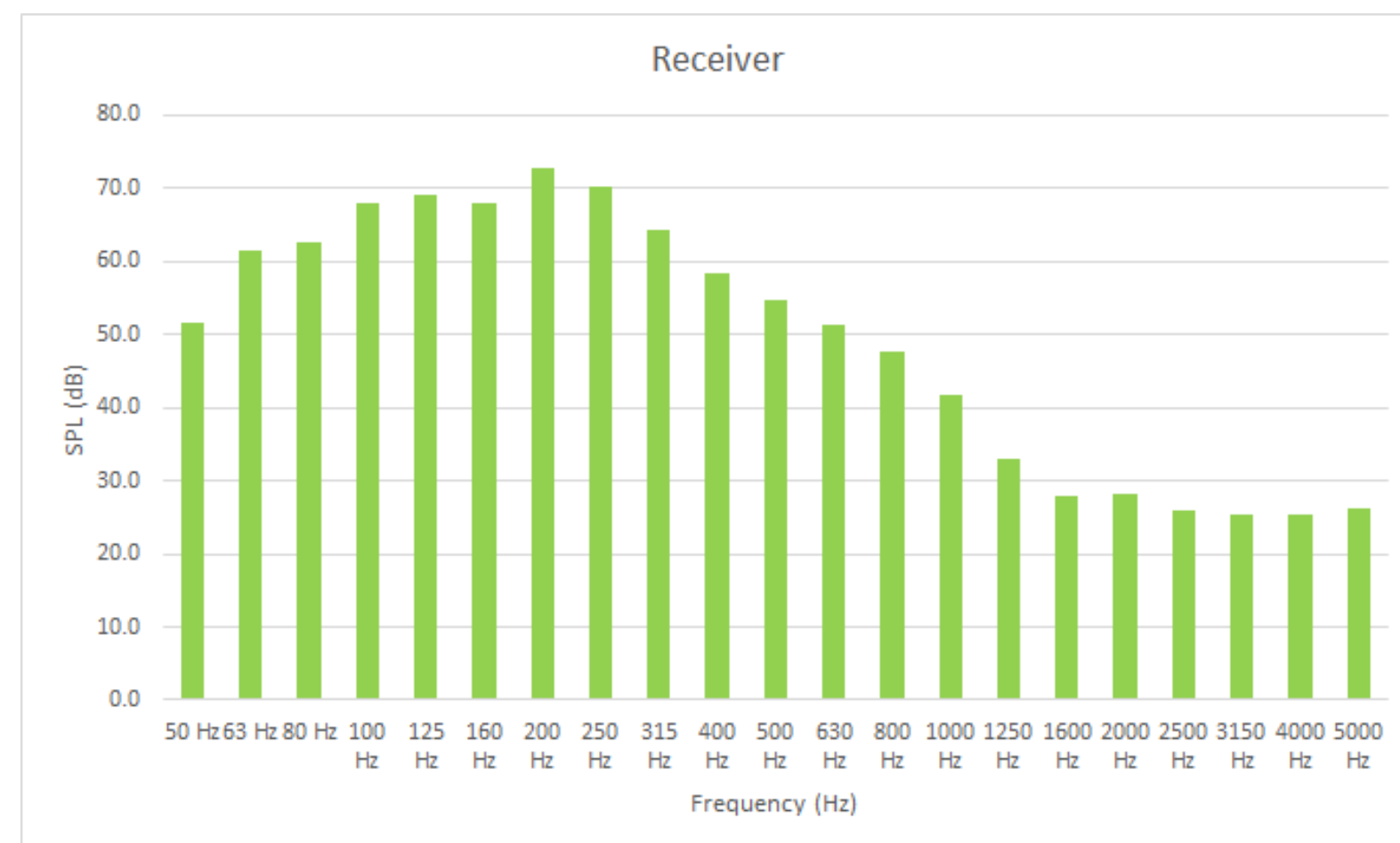
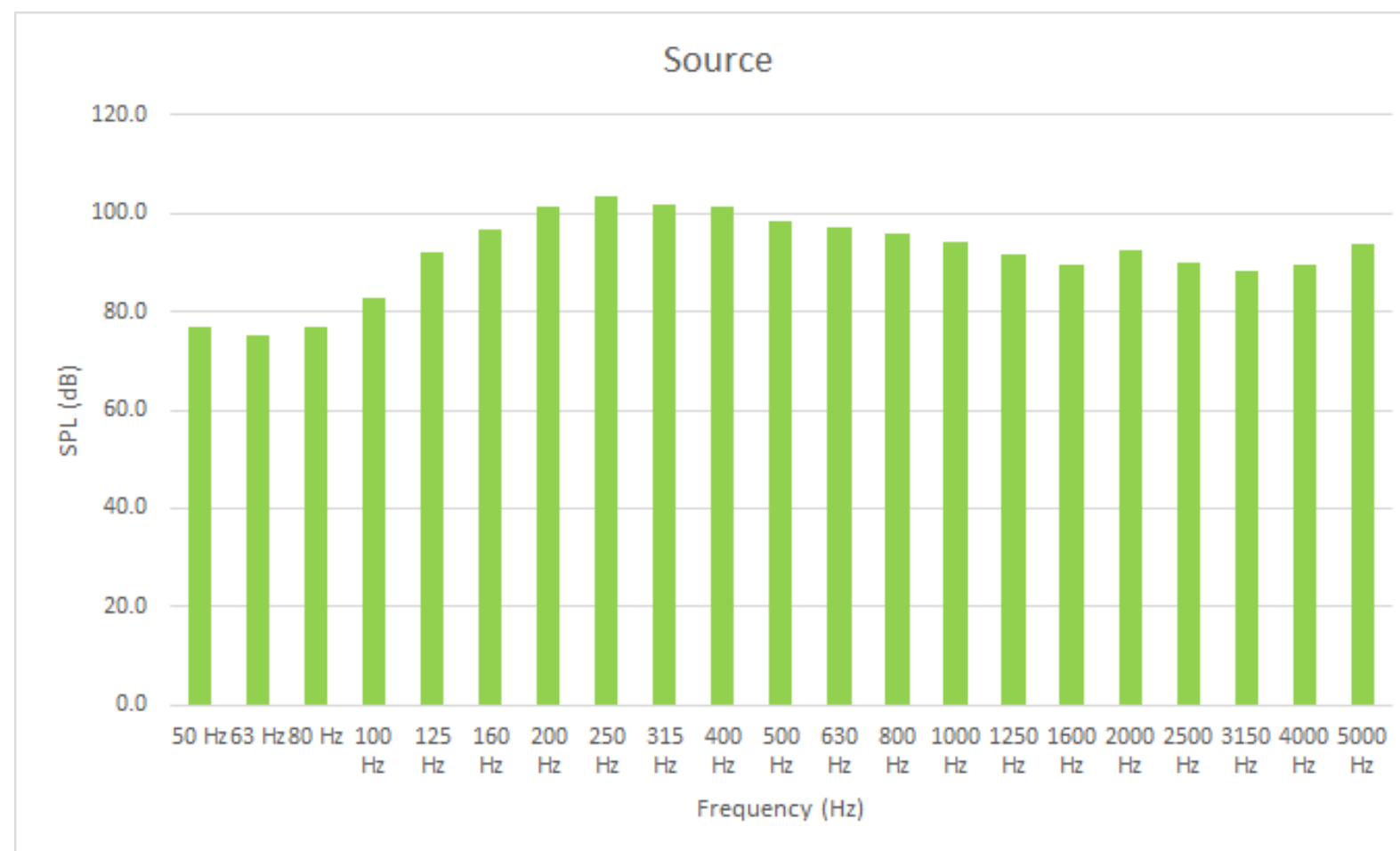
Maximum continuous output power	2*150 W into 2*4 Ω with external sine signal @ 0 dBu or Pink noise @ maximum level
Maximum short-term power	2*260 W into 2*4 Ω @ THD $\leq$ 1 %
Protection	Dynamic compressor, temperature, overcurrent, DC, excessive clipping; visual indication via LEDs
Selectable signal sources	- Internal equalized pink noise (Cf = 2.5) - External signal, equalized - Internal pink noise, not equalized (Cf = 3.6) - External signal without equalization
Gain	-18 dB to 29 dB (via Level control) mute
Power output Dodec configuration Bridge mode (load $\geq$ 8 Ω)	Speakon chn1: 1+ 1-; chn2: 2+ 2- 1+ 2-
Line-In Connector Level sensitivity Max. input level Impedance	XLR (balanced) 0 dBu for rated power into 2*4 Ω 20 dBu ($\pm$ 11 Vpp) $\geq$ 10 k Ω (balanced)
Subwoofer Line-Out Connector Gain Max. output level Impedance Cut-off filter	XLR (balanced) 3 dB (Line-IN to Subwoofer OUT) 18 dBu ($\pm$ 8.7 Vpp) $\leq$ 600 Ω 120 Hz low-pass filter Butterworth 24 dB/Octave (4 th order); complementary high-pass filter is automatically switched ON if subwoofer is active
Dimensions (L x W x H)	358 x 173 x 245 mm (14.1" x 6.8" x 9.7")
Weight	5 kg (11 lbs)
Power Supply	100 to 240 VAC, 50/60 Hz, 850 W, fuse T6.3A
Temperature Range	0° to +50°C (32° to 122°F)
Cooling	temperature controlled ultra-low-noise fan
Humidity Range	$\leq$ 90% RH (non-condensing)
Order information	NTi Audio # 600 000 506 (433 MHz) NTi Audio # 600 000 510 (USA, 315 MHz) NTi Audio # 600 000 511 (Japan, 426 MHz)

Specifications DS3 Dodecahedron Speaker

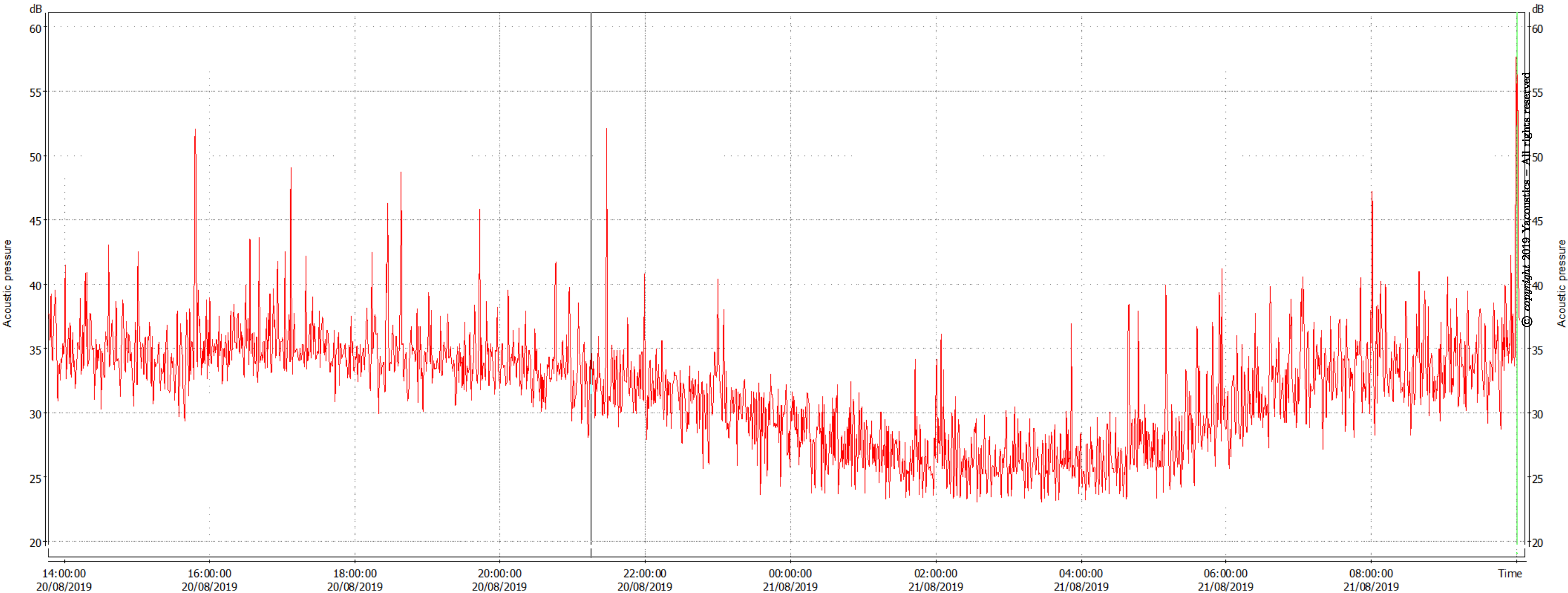
Standards	Compliant with ISO16283, ISO140, ISO3382, ISO354, DIN52210, ASTM-E2235/-E336/-E90
Sound power level	> 120.5 dB re 1 pW (typical 121 dB re 1 pW)
Frequency range	50 Hz to 10 kHz
Input connector	Speakon (chn1: 1+/1- chn2: 2+/2-)
Speakers	12 speakers, 5" each, in dodecahedral configuration
Nominal impedance	2 x 4.2 Ω
Max. short-term peak power	600 W
Maximum input power RMS ¹⁾	320 W
Power compression ¹⁾	< 1 dB
Diameter	350 mm (13.8")
Weight	7.5 kg (16.53 lbs)
Order information	NTi Audio # 600 000 500
Accessories (optional)	Speaker stand 35 mm, 130...230 cm retractable, with carrying bag, NTi Audio # 600 000 508

¹⁾: @ 1 hour continuous maximum power with Pink noise signal, 9 dB crest factor

ANNEX E – Survey data



Logger results, logger step = 42 s

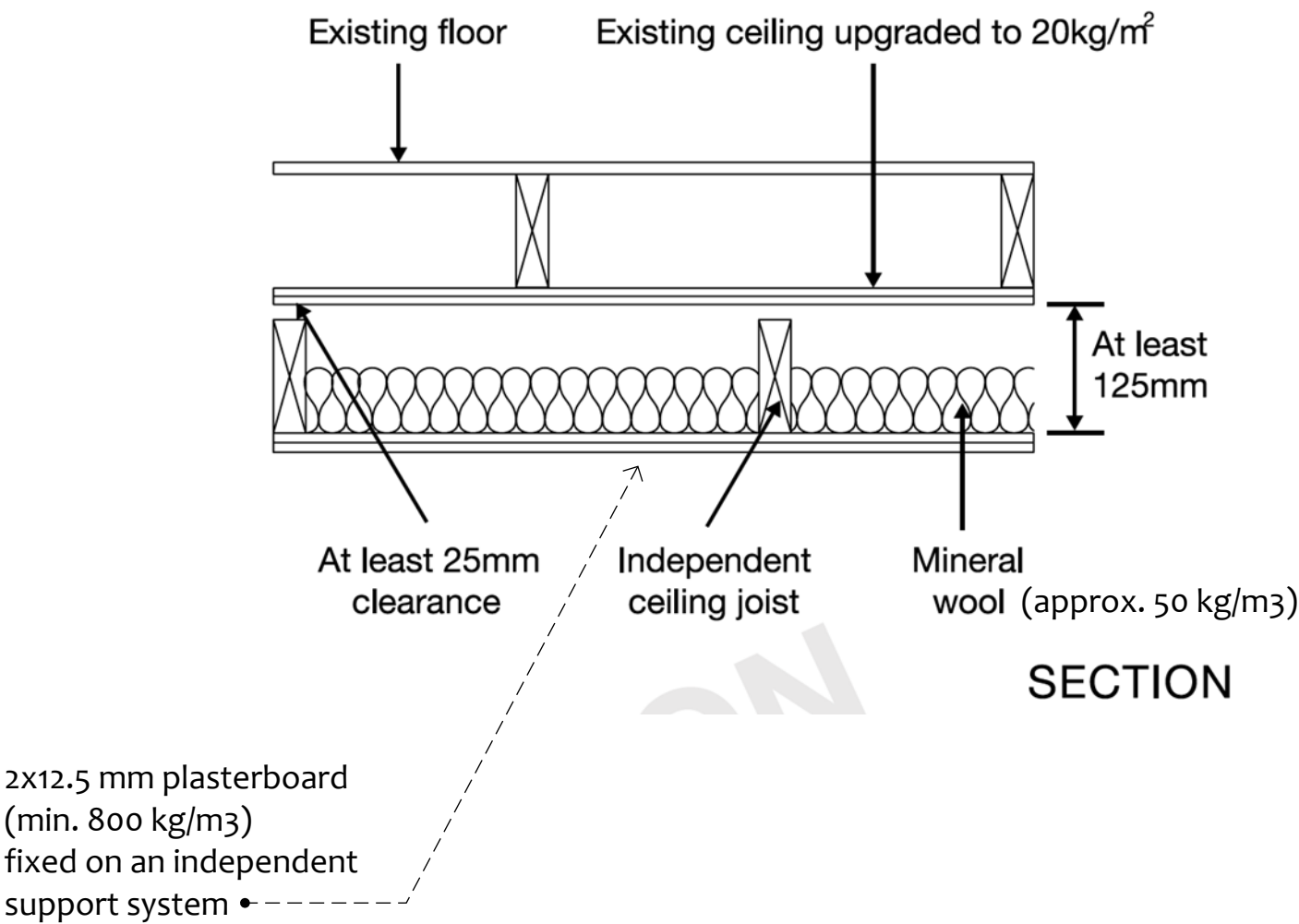


Info	-	Duration	-	■ LAeq (TH) [dB]
Main cursor	20/08/2019 21:14:56	-	-	P1 (A, Lin)
High vibration level	21/08/2019 09:59:54	00:00:02.000	-	31.5

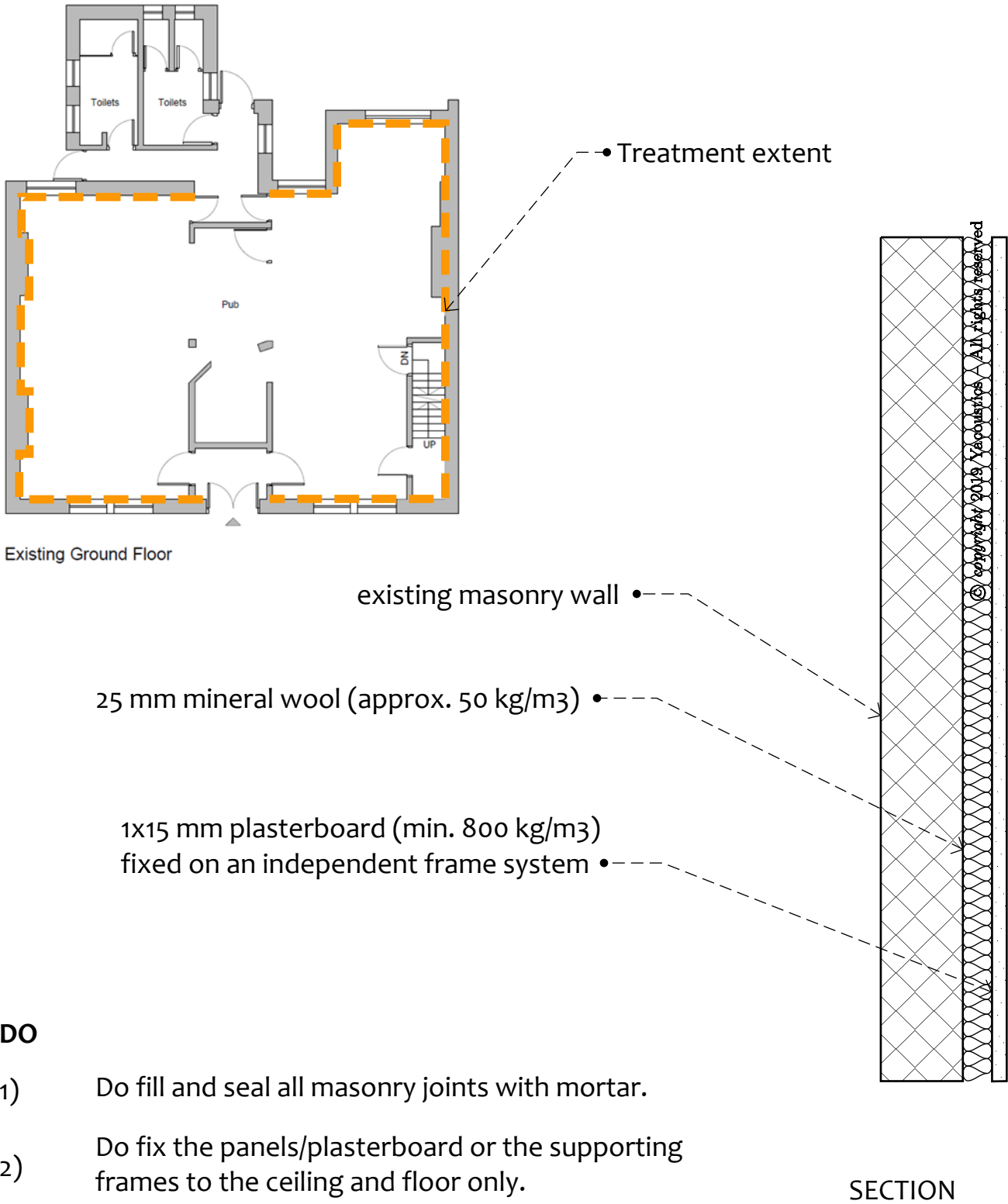
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ANNEX F – Mitigation solutions

FLOOR TREATMENT



LATERAL WALLS TREATMENT



DO

- 1) Do fill and seal all masonry joints with mortar.
- 2) Do fix the panels/plasterboard or the supporting frames to the ceiling and floor only.
- 3) Do tape and seal all joints.

DO NOT

- 1) Do not fix, tie or connect the free standing panels/plasterboard or the frame to the masonry core.

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