# Deluxe Hamburg, Beerenweg 3

| Client | Location | Document | Revision | Date |
|---|---|---|---|---|
| Deluxe Hamburg | Beerenweg 3, Hamburg | Acoustic Specification | v1 | 1 December 2022 |

**Contents**

# 1 Acoustic survey

## 1.1 Site observations

1.1.1 The Deluxe premises at Berrenweg 3 is on the upper floor of a two-storey industrial building. The building is of concrete frame construction with a separating floor of 125mm pre-cast concrete planks. The joints between planks appear to have been filled from above to a fairly shallow depth. The roof is also concrete planks (beam & block or pre-cast planks of around 100mm thickness). The walls appear to be double-leaf block with approximately 350mm overall thickness.

1.1.2 The north and west elevations contain a large area of UPVC windows with double-glazed units. There are also some smaller windows on the south elevation. There are a number of roof lights within the premises, some of which are currently covered up.

1.1.3 The adjoining area on the upper level is occupied by GE. We did not see the whole space, but were able to see an open-plan office adjoining the M&E area of the Deluxe premises.

1.1.4 The units below the Deluxe premises are occupied by a classic car repair workshop on the north side and a leather workshop for upholstering cars on the south side. The Deluxe premises partially overlaps a storage warehouse towards the east. None of these businesses appear to generate much noise, the loudest noise sources being car engines, compressor, impact driver (for removing wheels), spanners and other tools dropping on the floor.

1.1.5 The most noticeable noise ingress from below was at mid-frequencies, including intelligible speech and sneezing! We wouldn't usually expect to hear intelligible speech through a concrete slab, however the gaps between pre-cast planks are severely reducing sound insulation at mid-frequencies.

1.1.6 We observed a total of three aircraft passing overhead during our two visits, which we believe were on final approach to land at the Airbus factory approximately 6km southwest of the premises. We were not able to measure the aircraft noise in isolation as there were other noise sources running as the planes came over, however we do have one measurement which we can use for a "worst-case" assessment. It is likely to over-estimate the low-frequency noise ingress due to the testing we were carrying out at the time.

## 1.2 Sound insulation

1.2.1 Airborne sound insulation was measured between the upper-floor Deluxe premises and the adjoining business units. A further test was carried out of an existing internal partition. Test results are shown in Figure 1. Detailed test results are included in Section 8.

| Test no. | Source room | Receive Room | Element | $D_w$ - dB | $D_{63Hz}$ - dB |
|---|---|---|---|---|---|
| 1581-01 | Level 1 (south) | Leather workshop (garage) | Floor | 47 | 37 |
| 1581-02 | Level 1 (north) | Car workshop | Floor | 47 | 38 |
| 1581-03 | Level 1 (north) | GE office | Wall | 55 | 32 |
| 1581-04 | Level 1 (north) | Proposed theatre space | Wall | 50 | 25 |

Figure 1 sound insulation test results

1.2.2 Both measurements of the existing floor slab exhibit a pronounced dip in performance in the 500 Hz – 1.25 kHz region, and the sound insulation achieved in each $^1/_3$ – octave band above 500 Hz is 5-7dB below what we would ordinarily expect. We believe this is due to the gaps between and around the pre-cast planks.

1.2.3 The wall measurements are broadly in line with what we expect for a gypsum board partition with two layers either side of a metal stud.

1.2.4 Test 1581-03 is limited by flanking along the façade where there is boxed-in cavity containing heating pipework. There is significant noise transfer via this path.

## 1.3 Ambient noise levels

1.3.1 The ambient noise level in the Deluxe premises is generally very quiet. The industrial units below are relatively quiet and the main sources of noise intrusion from below are speech and power tools, predominantly in the mid-frequency range as noted in section 1.1.5 and for the reasons noted in 1.2.2.

1.3.2 The measured ambient noise was generally in the range $L_{Aeq}$ 20-25 dB with transient noises not exceeding $L_{Af,max}$ 55 dB.

1.3.3 There is very little low frequency noise intrusion to the premises, only the occasional aircraft and heavy goods vehicle passing outside. The level of this noise intrusion can be adequately attenuated by the proposed isolation shell construction.

# 2 Existing Winterhude studio facilities

2.1.1 Some basic reverberation time and ambient noise level measurements were carried out in the three newest ADR studios at the Winterhude premises.

## 2.2 Room acoustics

2.2.1 Measurements of the ADR studio reverberation times found the mid-frequency reverberation time to be around $T_{mf}$ 0.10s with a slight rise in low frequency RT.

2.2.2 The client expressed a preference for very dry recording spaces as it is easier to manipulate a dry recording to suit a more reverberant environment than it is to remove "room sound" from a recording. The reverberation time specification in Section 6 are broadly based on the measured performance of these existing studios.

## 2.3 HVAC noise level

2.3.1 We understand these studios are cooled via wall-mounted AC units and fresh air ventilation is provided via opening windows. Cooling and purging stale air therefore only happens between takes. The measured noise HVAC noise level in Studio 6 booth is NR35, which is far too high for recording. The air velocity from the wall-mount unit and its proximity to the microphone would also be problematic for recording.

2.3.2 The new ADR studio facilities should have mechanical ventilation which runs constantly at suitable noise levels and very low velocity. The AC system should be designed to achieve $L_{eq}$ ≤ NR15 and termination air velocity of around 1.2m/s. In our experience, this would enable the AC to remain running for most recording tasks.

# 3 Assumed operating levels

3.1.1 We have assumed the following operating levels for the studio spaces in order to assess the sound insulation requirement and specify the isolation shell construction. The levels are based on measured programme material from particularly loud features in calibrated Dolby Atmos Features mix theatres. The Music Mix studio is based on a calibration level of 79 dBC. The Multi-purpose Studio is based on tracking a live band. Operating levels are specified as $L_{f,max}$[1] sound pressure levels.

| | Octave band centre frequency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Room** | **31.5 Hz** | **63 Hz** | **125 Hz** | **250 Hz** | **500 Hz** | **1 kHz** | **2 kHz** | **4 kHz** | **8 kHz** |
| ADR Studio | | 58 | 69 | 78 | 86 | 86 | 79 | 72 | 61 |
| ADR Control Room | 82 | 92 | 84 | 80 | 85 | 85 | 74 | 73 | 74 |
| Dolby Features Theatre | 114 | 116 | 109 | 104 | 107 | 106 | 101 | 95 | 94 |
| Music Mix Studio | 108 | 110 | 103 | 98 | 101 | 100 | 95 | 89 | 88 |
| Multi Purpose Studio | 96 | 107 | 113 | 118 | 113 | 108 | 107 | 99 | 96 |
| Office | | 58 | 69 | 78 | 86 | 86 | 79 | 72 | 61 |
| Corridor | | 58 | 69 | 78 | 86 | 86 | 79 | 72 | 61 |

Figure 2 assumed worst-case $L_{s,max}$ operating levels

# 4 Proposed background noise levels

4.1.1 Figure 3 shows the design criteria for HVAC noise levels for each space. Background noise levels are specified as $L_{eq}$[2] levels assessed against noise rating (NR[3]) curves.

| Room | Area ($m^2$) | Volume ($m^3$) | HVAC noise level | HVAC system type | Max term vel (m/s) |
|---|---|---|---|---|---|
| Reception / Tea Point | 54.9 | 219 | Leq ≤ NR35 | Ceiling mount | <2.2 |
| ADR Studio 1 | 8.4 | 25 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Control Room 1 | 9.5 | 29 | Leq ≤ NR20 | Ducted | <1.6 |
| ADR Studio 2 | 8.4 | 25 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Control Room 2 | 9.5 | 29 | Leq ≤ NR20 | Ducted | <1.6 |
| Editing | 24 | 84 | Leq ≤ NR35 | Ceiling mount | <2.2 |
| Theatre 1 | 50.6 | 203 | Leq ≤ NR20 | Ducted | <1.6 |
| Machine / Projection room | 9.4 | 38 | Leq ≤ NR50 | Wall mount | NA |
| Music Mix | 30 | 105 | Leq ≤ NR20 | Ducted | <1.6 |
| Live Room / Multi-Purpose | 20.8 | 79 | Leq ≤ NR15 | Ducted | <1.4 |
| Konferenz / Green Room | 17 | 59 | Leq ≤ NR25 | Ceiling mount | <1.8 |
| Buro | 26.1 | 104 | Leq ≤ NR35 | Ceiling mount | <2.2 |
| ADR Control Room 3 | 9.5 | 29 | Leq ≤ NR20 | Ducted | <1.6 |
| ADR Studio 3 | 8.4 | 25 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Studio 4 | 8.9 | 27 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Control Room 4 | 11.7 | 35 | Leq ≤ NR20 | Ducted | <1.6 |
| ADR Studio 5 | 8.9 | 27 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Control Room 5 | 11.7 | 35 | Leq ≤ NR20 | Ducted | <1.6 |
| ADR Studio 6 | 8.9 | 27 | Leq ≤ NR15 | Ducted | <1.4 |
| ADR Control Room 6 | 11.7 | 35 | Leq ≤ NR20 | Ducted | <1.6 |
| Data IO | 57.2 | 218 | Leq ≤ NR50 | Wall mount | NA |

Figure 3 HVAC design criteria

[1] $L_{f,max}$ sound pressure levels are short duration impulsive sounds such as doors slamming or explosions and gunshots on film sound tracks. The 'f' denotes fast time-weighting which correlates well to the ear's integrating time at mid and high frequencies, while the slow time weighting better represents the ear's integrating time at low frequencies.

[2] $L_{eq}$ is the average sound pressure level during a measurement period.

[3] NR curves are sound pressure level spectra commonly used to characterise steady-state noise sources such as HVAC systems. The spectra are defined in BS 8233:2014. NR values are broadly comparable to NC values.

# 5 Sound insulation

5.1.1 Figure 4 shows the proposed sound insulation performance for each space. Performance is specified as $D_w$[4] and $D_{63Hz}$[5].

| Source Room | Receive Room | Element | Specified | | Predicted | |
|---|---|---|---|---|---|---|
| | | | $D_w$ - dB | $D_{63Hz}$ - dB | $D_w$ - dB | $D_{63Hz}$ - dB |
| Reception / Tea Point | ADR Studio 1 | Wall | 75 | 17 | 77 | 39 |
| ADR Studio 1 | ADR Control Room 1 | Wall with door | 59 | 2 | 69 | 34 |
| Corridor | ADR Control Room 1 | Wall with door | 64 | 7 | 43 | 24 |
| ADR Control Room 1 | ADR Control Room 2 | Wall | 58 | 36 | 79 | 43 |
| ADR Studio 2 | ADR Control Room 2 | Wall with door | 59 | 2 | 69 | 34 |
| Corridor | ADR Control Room 2 | Wall with door | 64 | 7 | 43 | 24 |
| Corridor | ADR Studio 2 | Wall | 69 | 11 | 77 | 39 |
| Editing | ADR Studio 2 | Wall | 65 | 7 | 77 | 39 |
| Theatre 1 | Editing | Wall | 68 | 48 | 91 | 59 |
| Machine / Projection room | Theatre 1 | Wall with window | 50 | 19 | | |
| Theatre 1 | Music Mix | Wall | 81 | 60 | 107 | 59 |
| Theatre 1 | Live Room / Multi-Purpose | Wall | 85 | 64 | 107 | 59 |
| Corridor | Music Mix | Wall with door | 64 | 7 | 69 | 34 |
| Corridor | Live Room / Multi-Purpose | Wall with door | 69 | 11 | 69 | 34 |
| Data IO | ADR Studio 6 | Wall | 55 | 23 | 77 | 39 |
| ADR Control Room 6 | ADR Studio 6 | Wall with door | 63 | 40 | 69 | 34 |
| Corridor | ADR Control Room 6 | Wall with door | 64 | 7 | 43 | 24 |
| ADR Studio 6 | ADR Studio 5 | Wall | 64 | 6 | 79 | 43 |
| ADR Control Room 6 | ADR Control Room 5 | Wall | 58 | 36 | 79 | 43 |
| ADR Control Room 5 | ADR Studio 6 | Wall | 63 | 40 | 79 | 43 |
| ADR Control Room 5 | ADR Studio 5 | Wall with door | 63 | 40 | 69 | 34 |
| Corridor | ADR Control Room 5 | Wall with door | 64 | 7 | 43 | 24 |
| ADR Studio 5 | ADR Studio 4 | Wall | 64 | 6 | 79 | 43 |
| ADR Control Room 4 | ADR Studio 4 | Wall with door | 63 | 40 | 69 | 34 |
| Corridor | ADR Control Room 4 | Wall with door | 64 | 7 | 43 | 24 |
| ADR Control Room 5 | ADR Control Room 4 | Wall | 58 | 36 | 79 | 43 |
| ADR Control Room 3 | ADR Studio 3 | Wall with door | 63 | 40 | 69 | 34 |
| Corridor | ADR Studio 3 | Wall | 69 | 11 | 77 | 39 |
| Corridor | ADR Control Room 3 | Wall with door | 64 | 7 | 43 | 24 |
| Buro | ADR Control Room 3 | Wall | 59 | 2 | 77 | 39 |
| Corridor | Buro | Wall with door | 49 | 0 | 30 | |
| Buro | Konferenz / Green Room | Wall | 54 | 0 | 54 | |
| Corridor | Konferenz / Green Room | Wall with door | 59 | 3 | 30 | |
| Car workshop | ADR Studio 6 | Floor | 62 | 39 | 79 | 42 |
| Theatre 1 | Car workshop | Floor | 68 | 57 | 79 | 42 |
| External | ADR Studio 6 | Roof | 52 | 32 | 80 | 48 |

Figure 4 Proposed sound insulation performance

5.1.2 The specified sound insulation levels are based on limiting $L_{s,max}$ sound breakthrough to acoustically critical spaces such that it does not exceed the specified room NR level by more than 5dB in any octave band. I.e. $L_{s,max} \leq$ NR + 5 dB. This does not mean sound transfer between spaces will be inaudible, but in our experience ensures audible transfer is occasional and does not interfere with operation in adjoining rooms. Non-critical spaces are generalyl based on $L_{eq} \leq$ NR + 10 dB

5.1.3 The predicted performance is based on computer modelling (Insul), calculation and reference to measured data on previous projects. Prediction uncertainty is typically ±3 dB for double-leaf partitions and ±6 dB for triple-leaf partitions. Figure 4 sets out the specified and predicted sound insulation performance for key adjacencies. Prediction uncertainty is typically ±3 dB for double-leaf constructions and ±6 dB for triple-leaf constructions.

5.1.4 There are some anticipated shortfalls in sound insulation based on the predicted sound insulation performance:

(1) Theatre 1 – Music Mix & Live Room / Multi-Purpose: The low frequency sound insulation is 1 dB and 5 dB short of the target performance. Increasing the performance would involve significantly increasing the mass and overall size of the separating construction to a point where the layout no longer works. This shortfall in performance would mean sub-frequencies (generally <100Hz) would peak at 6-10dB above the specified noise level in the adjoining spaces.

(2) Theatre 1 – car workshop below: the low frequency sound insulation is limited by the mass and physical separation we can achieve between the existing structure and the floating floor. The shortfall in low frequency sound insulation will mean passages of programme material with very high SPLs in the LFE frequency range will result in noticeable breakthrough to the workshop below. We wouldn't expect breakthrough to be noticeable the most of the time, only for particularly loud passages. Given the nature of the work carried out in the workshops, we consider it unlikely this breakthrough would be disturbing.

(3) Corridors to ADR Control Rooms: the sound insulation performance is limited by a single door.

(4) ADR Control Room – related ADR Studio: the sound insulation requirement in the table is based on independent usage of the two related rooms when actually the recording

[4] $D_w$ is a single-figure measure of airborne sound insulation based on level difference data in the 100Hz – 3,150Hz range. A single-figure value is calculated by referencing the measured data to a reference curve, defined in ISO 717-1. $D_w$ figures are corrected for background noise but not reverberation time. $D_w$ is broadly comparable to STC.

[5] $D_{63Hz}$ is the level difference in the 63 Hz octave band, corrected for background noise but not reverberation time.

space would only ever be used concurrently with the control room. The predicted sound insulation performance is more than adequate for this application.

(5) Corridor – Buro / Conference Room etc: the sound insulation performance is limited by a single door.

# 6 Room acoustics

6.1.1 Figure 5 shows the specified reverberation time[6] criteria for each space. Audio-critical spaces include spectral limit criteria. Where a $T_{125Hz}$ value is specified this is based on 1.4x the target mid-frequency specification. The limit will be adjusted based on the measured mid-frequency reverberation time values at commissioning. Mid-frequency reverberation times are specified as $T_{mf}$[7] or $T_{500Hz}$[8], dependent on the function of the room.

| Room | Area ($m^2$) | Volume ($m^3$) | RT spec | Tolerance | Spectral limits |
|---|---|---|---|---|---|
| Reception / Tea Point | 54.9 | 219 | Tmf = 0.55s | NA | NA |
| ADR Studio 1 | 8.4 | 25 | Tmf = 0.08s | ± 0.05s | T125Hz <0.11s |
| ADR Control Room 1 | 9.5 | 29 | Tmf = 0.22s | ± 0.07s | T125Hz <0.31s |
| ADR Studio 2 | 8.4 | 25 | Tmf = 0.08s | ± 0.05s | T125Hz <0.11s |
| ADR Control Room 2 | 9.5 | 29 | Tmf = 0.22s | ± 0.07s | T125Hz <0.31s |
| Editing | 24 | 84 | Tmf = 0.42s | NA | NA |
| Theatre 1 | 50.6 | 203 | T500Hz = 0.27s | 0.2s - 0.39s | Dolby Atmos Features spectral limits |
| Machine / Projection room | 9.4 | 38 | NA = 0s | NA | |
| Music Mix | 30 | 105 | T500Hz = 0.26s | 0.16s - 0.34s | Dolby Atmos HE spectral limits |
| Live Room / Multi-Purpose | 20.8 | 79 | Tmf = 0.23s | ± 15% | T125Hz <0.28s & T63Hz <0.35s |
| Konferenz / Green Room | 17 | 59 | Tmf = 0.38s | NA | NA |
| Buro | 26.1 | 104 | Tmf = 0.45s | NA | NA |
| ADR Control Room 3 | 9.5 | 29 | Tmf = 0.22s | ± 0.07s | T125Hz <0.31s |
| ADR Studio 3 | 8.4 | 25 | Tmf = 0.08s | ± 0.05s | T125Hz <0.11s |
| ADR Studio 4 | 8.9 | 27 | Tmf = 0.09s | ± 0.05s | T125Hz <0.13s |
| ADR Control Room 4 | 11.7 | 35 | Tmf = 0.23s | ± 0.07s | T125Hz <0.32s |
| ADR Studio 5 | 8.9 | 27 | Tmf = 0.09s | ± 0.05s | T125Hz <0.13s |
| ADR Control Room 5 | 11.7 | 35 | Tmf = 0.23s | ± 0.07s | T125Hz <0.32s |
| ADR Studio 6 | 8.9 | 27 | Tmf = 0.09s | ± 0.05s | T125Hz <0.13s |
| ADR Control Room 6 | 11.7 | 35 | Tmf = 0.23s | ± 0.07s | T125Hz <0.32s |

Figure 5 reverberation time criteria

# 7 Commissioning testing

## 7.1 Background noise levels

7.1.1 HVAC noise levels will be measured in accordance with BS ISO 9568. The design criteria will apply to the design operating fan speed (typically "low").

## 7.2 Sound insulation

7.2.1 Sound insulation measurements will be carried out following procedures in ISO 16283-1. Results will be calculated following procedures in ISO 717-1, corrected for background noise but not reverberation time.

7.2.2 The pink noise source noise will be generated using two full-range loudspeakers running decorrelated noise. Due to the sound pressure levels required to measure the specified level of sound insulation, the test loudspeaker system will be a high-power PA system and not a calibrated dodecahedral test speaker. As such the loudspeaker directivity may not conform to The Standard. The installed loudspeaker systems will not be used for testing.

## 7.3 Reverberation time

7.3.1 Reverberation times will be measured in accordance with BS EN ISO 3382 using the integrated impulse response method. The measured T30[9] values will typically be reported.

[6] Reverberation time (also referred to as RT or $T_{60}$) is defined as the time it takes for sound to decay by 60 dB. The term "reverberation" doesn't strictly apply to highly damped spaces such as studios, as the sound field is not sufficiently diffuse to have a true reverberant field. For highly damped spaces "decay time" is a more accurate description, however we use reverberation time as it is more easily recognised terminology.

[7] $T_{mf}$ is a measure of mid-frequency reverberation time, calculated as the arithmetic average of the 200 Hz – 4 kHz one-third octave band reverberation time.

[8] $T_{500Hz}$ is the reverberation time in the 500 Hz octave band. This parameter is used by Dolby for Atmos Features and HE studios. Similarly, $T_{125Hz}$ is the reverberation time in the 125Hz octave-band.

[9] $T_{30}$ is the measured reverberation time calculated from 30 dB of sound decay (from -5dB to -35dB) and extrapolated to 60dB. This is the most commonly used reverberation time measure due to the practical difficulties of measuring 60dB of decay without running in to the noise floor. $T_{20}$ is sometimes used where there are high background noise levels; this is measured over a 20dB decay range and extrapolated to 60dB.

# 8 Appendix A – sound insulation test results

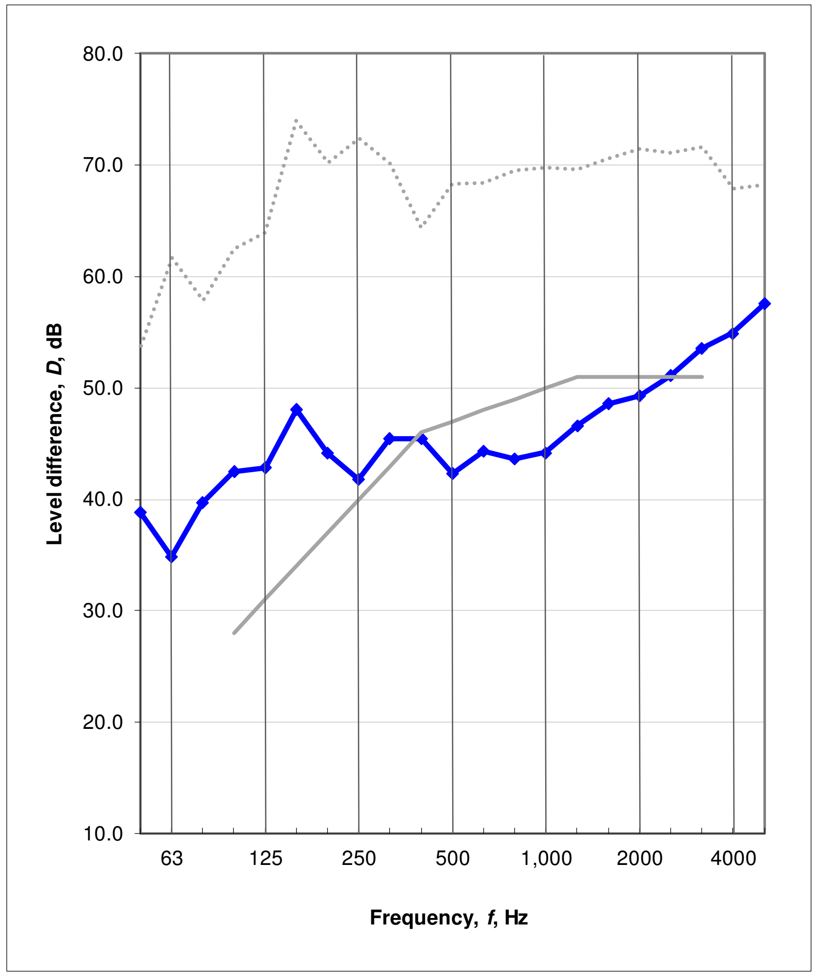
**Standardized level difference measured in accordance with ISO 16283-1**
**Field Measurements of airborne sound insulation between rooms**

Client: Deluxe Hamburg  Date of test: 04-Oct-22

Description and identification of the building construction and test arrangement, direction of measurement:
1581-01: Level 1 (ADR 3 space) - Leather Workshop garage space

Area of common partition: $m^2$
Source room volume: $m^3$
Receiving room volume: $m^3$

| Frequency *f* Hz | *D* (one-third octave) dB | |
|---|---|---|
| **50** | 38.8 | |
| **63** | 34.8 | |
| **80** | 39.7 | |
| **100** | 42.5 | |
| **125** | 42.9 | |
| **160** | 48.1 | |
| **200** | 44.1 | |
| **250** | 41.8 | |
| **315** | 45.4 | |
| **400** | 45.4 | |
| **500** | 42.3 | |
| **630** | 44.3 | |
| **800** | 43.7 | |
| **1000** | 44.2 | |
| **1250** | 46.6 | |
| **1600** | 48.6 | |
| **2000** | 49.3 | |
| **2500** | 51.1 | |
| **3150** | 53.5 | |
| **4000** | 54.9 | |
| **5000** | 57.6 | * |




* receive level adjusted for background noise
\+ receive level within 6dB of background

Rating in accordance with ISO 717-1:
*D* w = **47 dB  D31.5Hz = 31dB ; D63Hz = 37dB**

Results based on field measurement
results obtained by an engineering method

No. of test report: 1581-01  Name of test institute: Level Acoustic Design Ltd
Date: 04-Oct-22

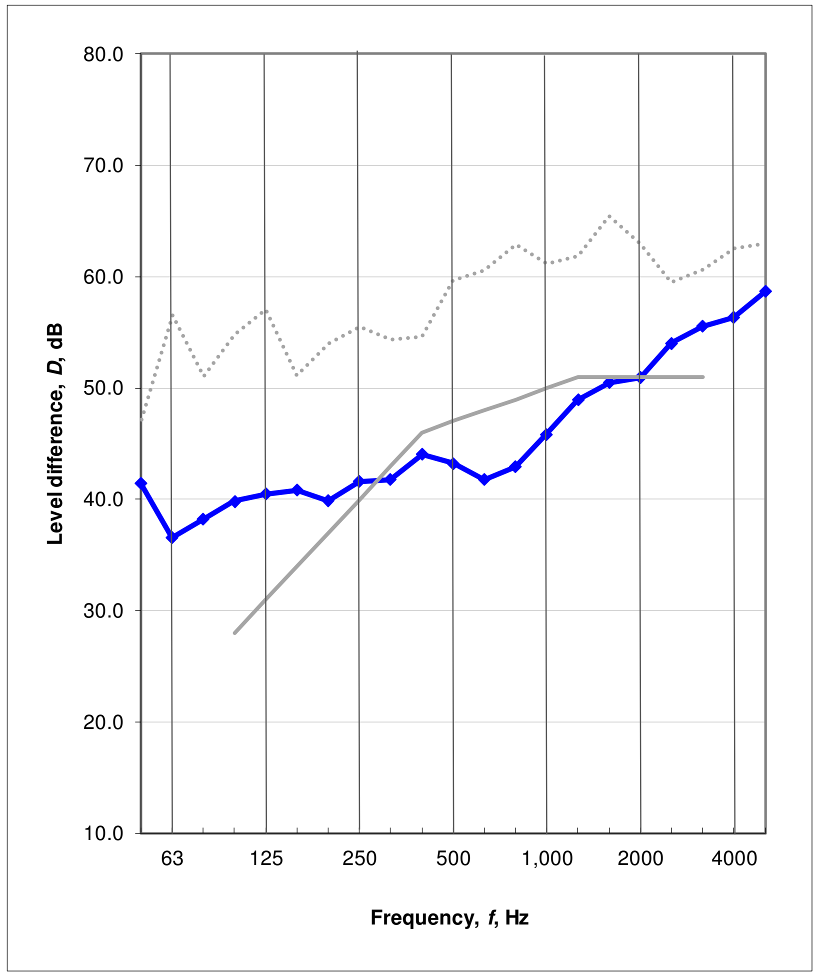
**Standardized level difference measured in accordance with ISO 16283-1**
**Field Measurements of airborne sound insulation between rooms**

Client: Deluxe Hamburg  Date of test: 04-Oct-22

Description and identification of the building construction and test arrangement, direction of measurement:
1581-02: Level 1 (M&E Studio space) - British Car Garage

Area of common partition: $m^2$
Source room volume: $m^3$
Receiving room volume: $m^3$

| Frequency *f* Hz | *D* (one-third octave) dB | |
|---|---|---|
| **50** | 41.4 | + |
| **63** | 36.6 | |
| **80** | 38.2 | |
| **100** | 39.8 | |
| **125** | 40.5 | |
| **160** | 40.8 | * |
| **200** | 39.9 | |
| **250** | 41.6 | |
| **315** | 41.8 | |
| **400** | 44.0 | * |
| **500** | 43.2 | |
| **630** | 41.8 | |
| **800** | 42.9 | |
| **1000** | 45.8 | |
| **1250** | 48.9 | |
| **1600** | 50.5 | |
| **2000** | 50.9 | |
| **2500** | 54.0 | + |
| **3150** | 55.6 | + |
| **4000** | 56.3 | * |
| **5000** | 58.7 | + |




* receive level adjusted for background noise
\+ receive level within 6dB of background

Rating in accordance with ISO 717-1:
*D* w = **47 dB  D31.5Hz = 24dB ; D63Hz = 38dB**

Results based on field measurement
results obtained by an engineering method

No. of test report: 1581-02  Name of test institute: Level Acoustic Design Ltd
Date: 04-Oct-22

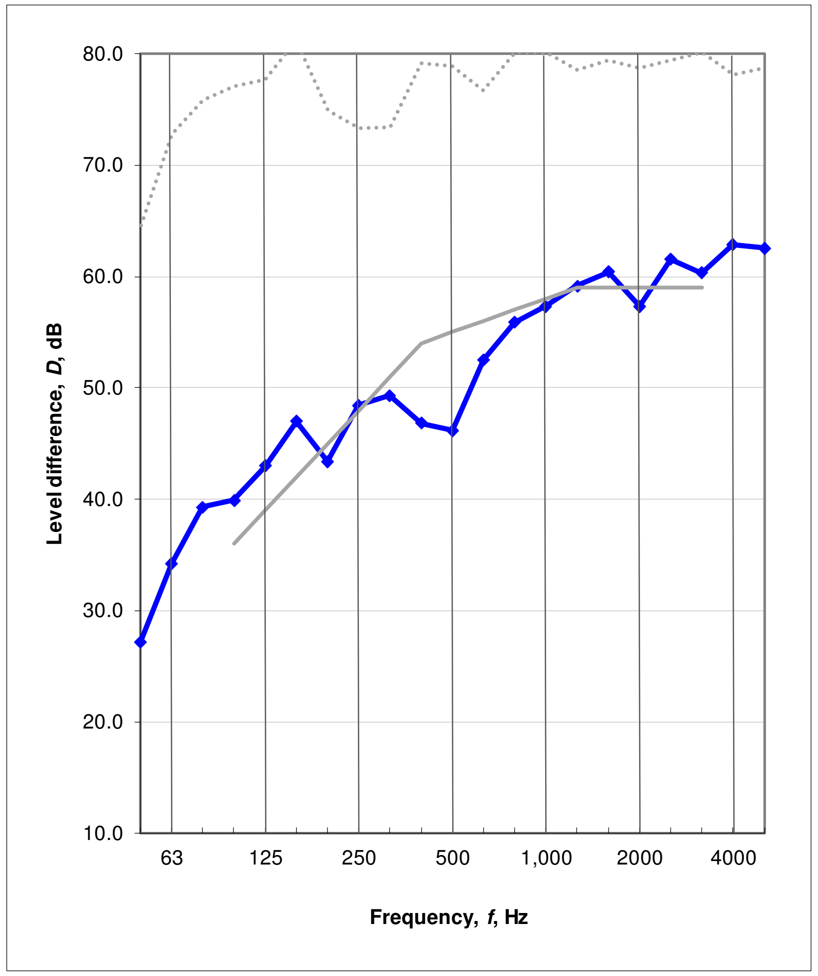
**Standardized level difference measured in accordance with ISO 16283-1**
**Field Measurements of airborne sound insulation between rooms**

Client: Deluxe Hamburg Date of test: 04-Oct-22

Description and identification of the building construction and test arrangement, direction of measurement:
1581-03: Level 1 (M&E Studio space) - GE Office

Area of common partition: $m^2$
Source room volume: $m^3$
Receiving room volume: $m^3$

| **Frequency *f* Hz** | ***D* (one-third octave) dB** |
|---|---|
| **50** | 27.2 |
| **63** | 34.2 |
| **80** | 39.3 |
| **100** | 39.9 |
| **125** | 43.0 |
| **160** | 47.0 |
| **200** | 43.4 |
| **250** | 48.4 |
| **315** | 49.3 |
| **400** | 46.8 |
| **500** | 46.2 |
| **630** | 52.5 |
| **800** | 55.9 |
| **1000** | 57.3 |
| **1250** | 59.1 |
| **1600** | 60.4 |
| **2000** | 57.3 |
| **2500** | 61.5 |
| **3150** | 60.3 |
| **4000** | 62.9 |
| **5000** | 62.6 |




* receive level adjusted for background noise
\+ receive level within 6dB of background

Rating in accordance with ISO 717-1:
***D* w =** **55** **dB** **D31.5Hz = 20dB ; D63Hz = 32dB**

Results based on field measurement
results obtained by an engineering method

No. of test report: 1581-03 Name of test institute: Level Acoustic Design Ltd
Date: 04-Oct-22

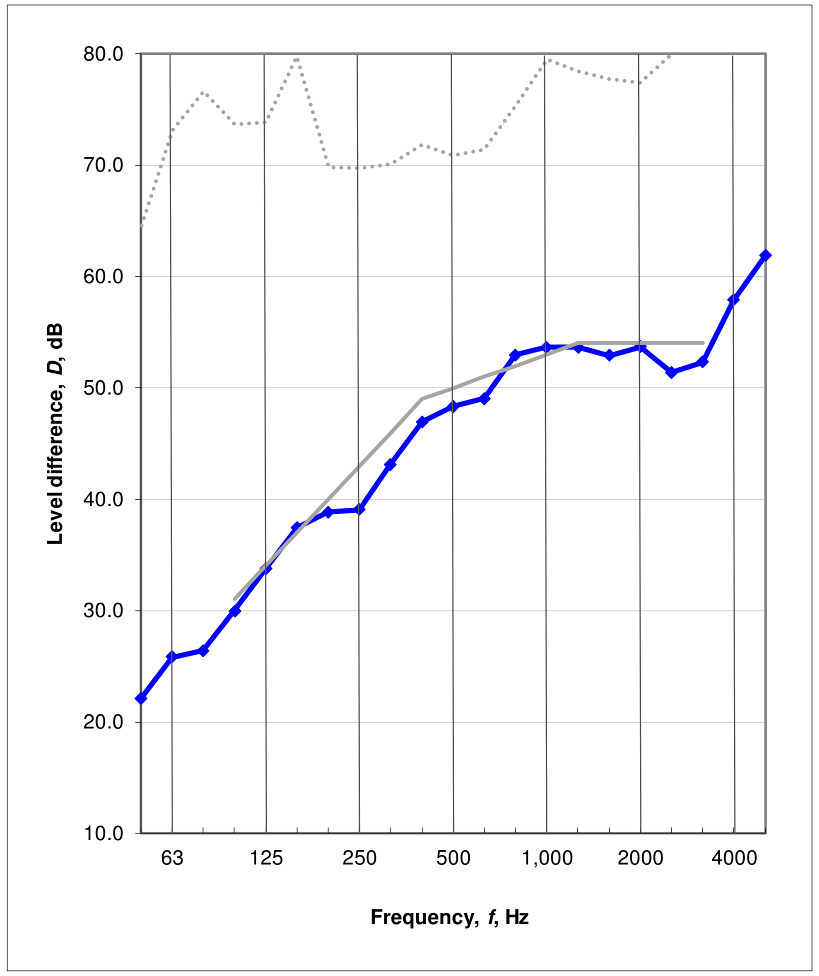
**Standardized level difference measured in accordance with ISO 16283-1**
**Field Measurements of airborne sound insulation between rooms**

Client: Deluxe Hamburg Date of test: 04-Oct-22

Description and identification of the building construction and test arrangement, direction of measurement:
1581-04: Level 1 (M&E Studio space) - Deluxe Mix Theatre space

Area of common partition: $m^2$
Source room volume: $m^3$
Receiving room volume: $m^3$

| **Frequency *f* Hz** | ***D* (one-third octave) dB** |
|---|---|
| **50** | 22.1 |
| **63** | 25.8 |
| **80** | 26.4 |
| **100** | 30.0 |
| **125** | 33.8 |
| **160** | 37.5 |
| **200** | 38.8 |
| **250** | 39.1 |
| **315** | 43.1 |
| **400** | 46.9 |
| **500** | 48.4 |
| **630** | 49.0 |
| **800** | 52.9 |
| **1000** | 53.7 |
| **1250** | 53.7 |
| **1600** | 52.9 |
| **2000** | 53.7 |
| **2500** | 51.4 |
| **3150** | 52.3 |
| **4000** | 57.9 |
| **5000** | 61.9 |



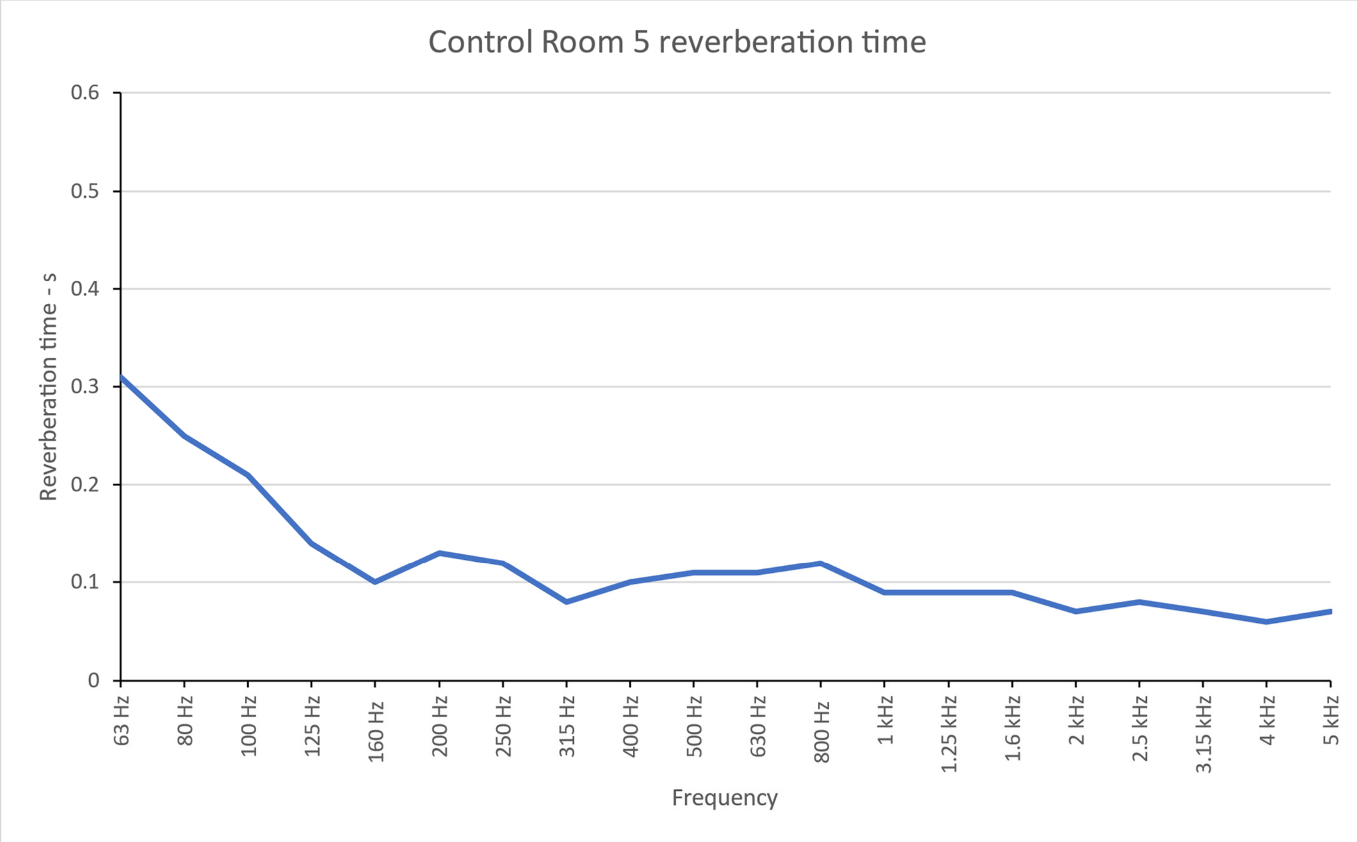

* receive level adjusted for background noise
\+ receive level within 6dB of background

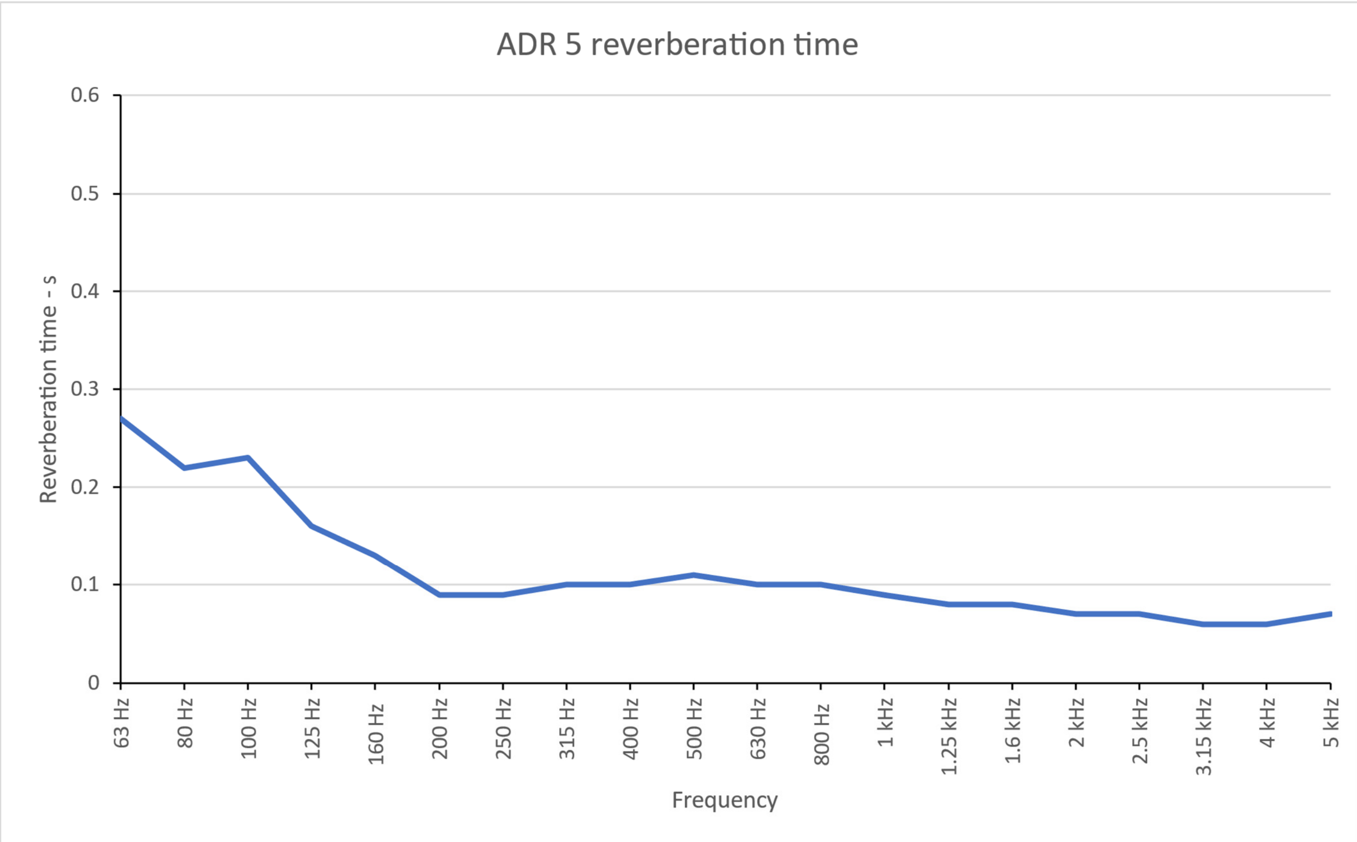
Rating in accordance with ISO 717-1:
***D* w =** **50** **dB** **D31.5Hz = 22dB ; D63Hz = 25dB**

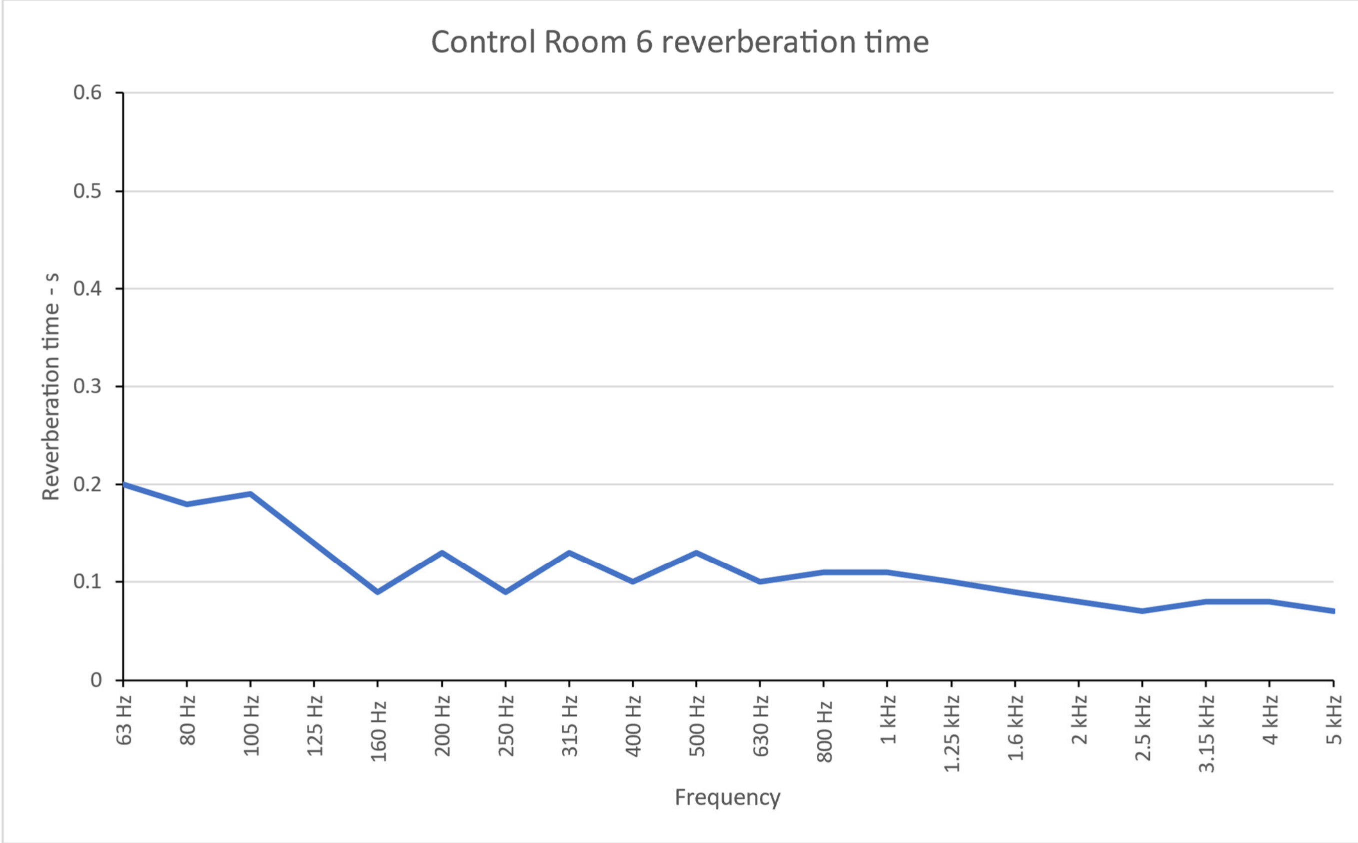
Results based on field measurement
results obtained by an engineering method

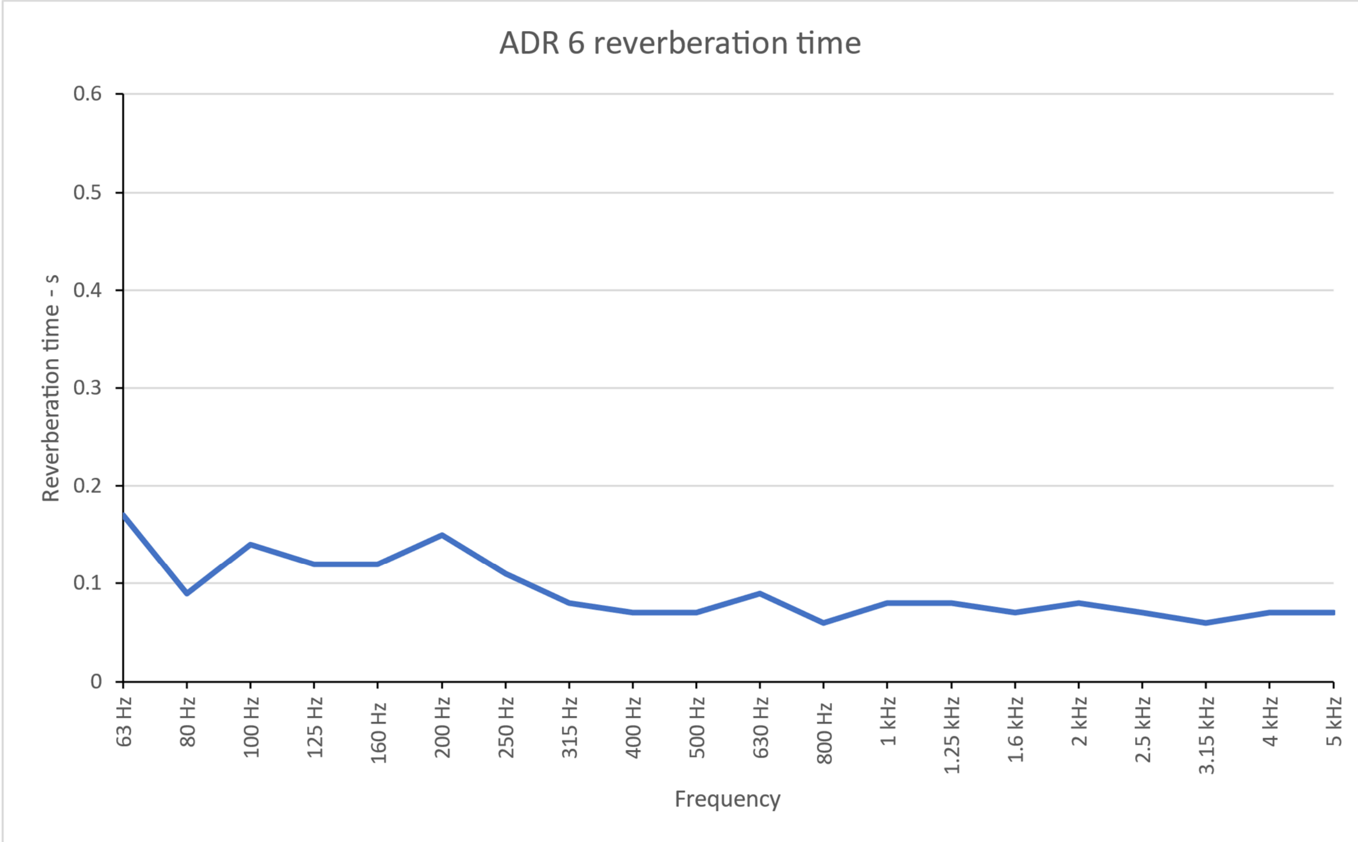
No. of test report: 1581-04 Name of test institute: Level Acoustic Design Ltd
Date: 04-Oct-22

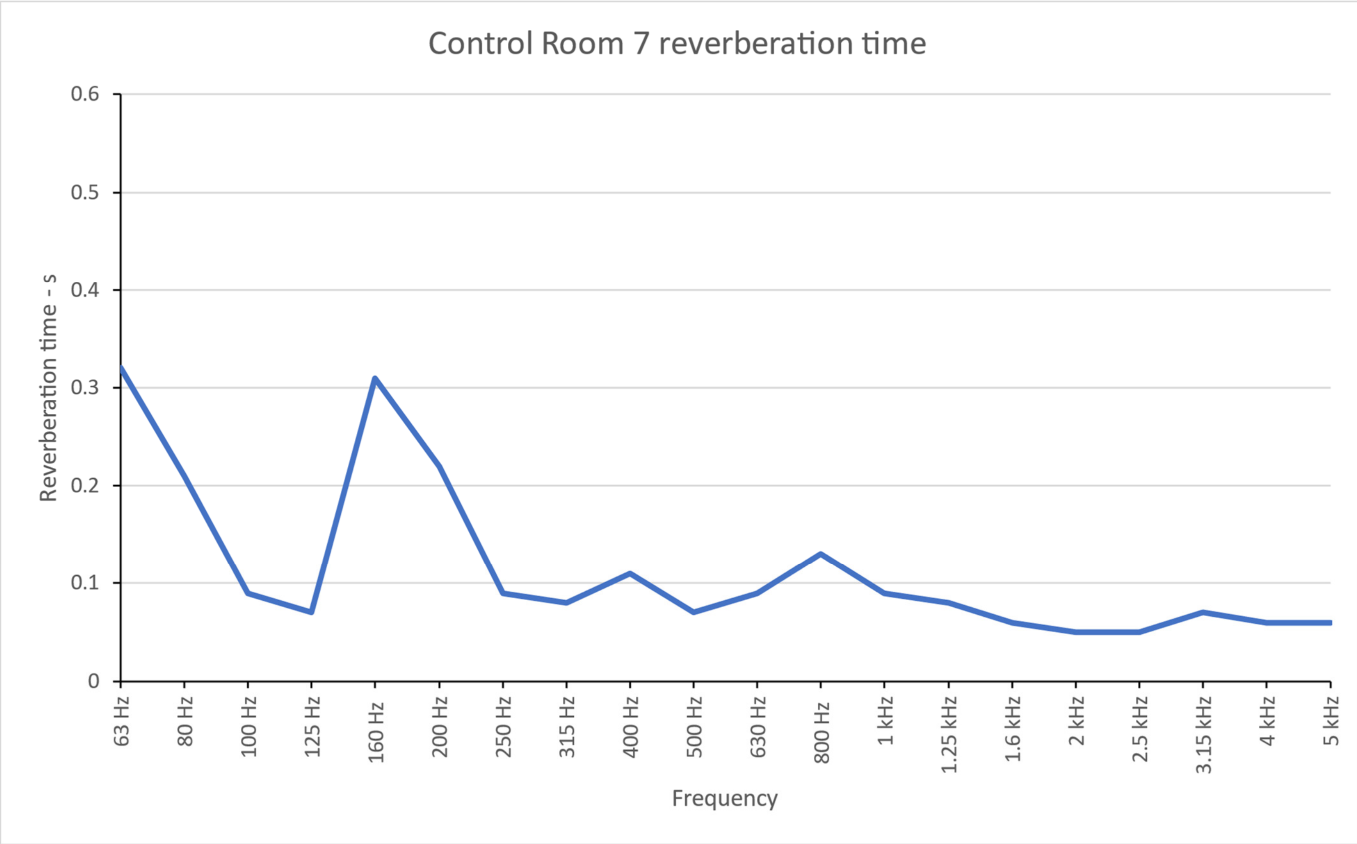
# 9 Appendix 2 – Winterhude test results

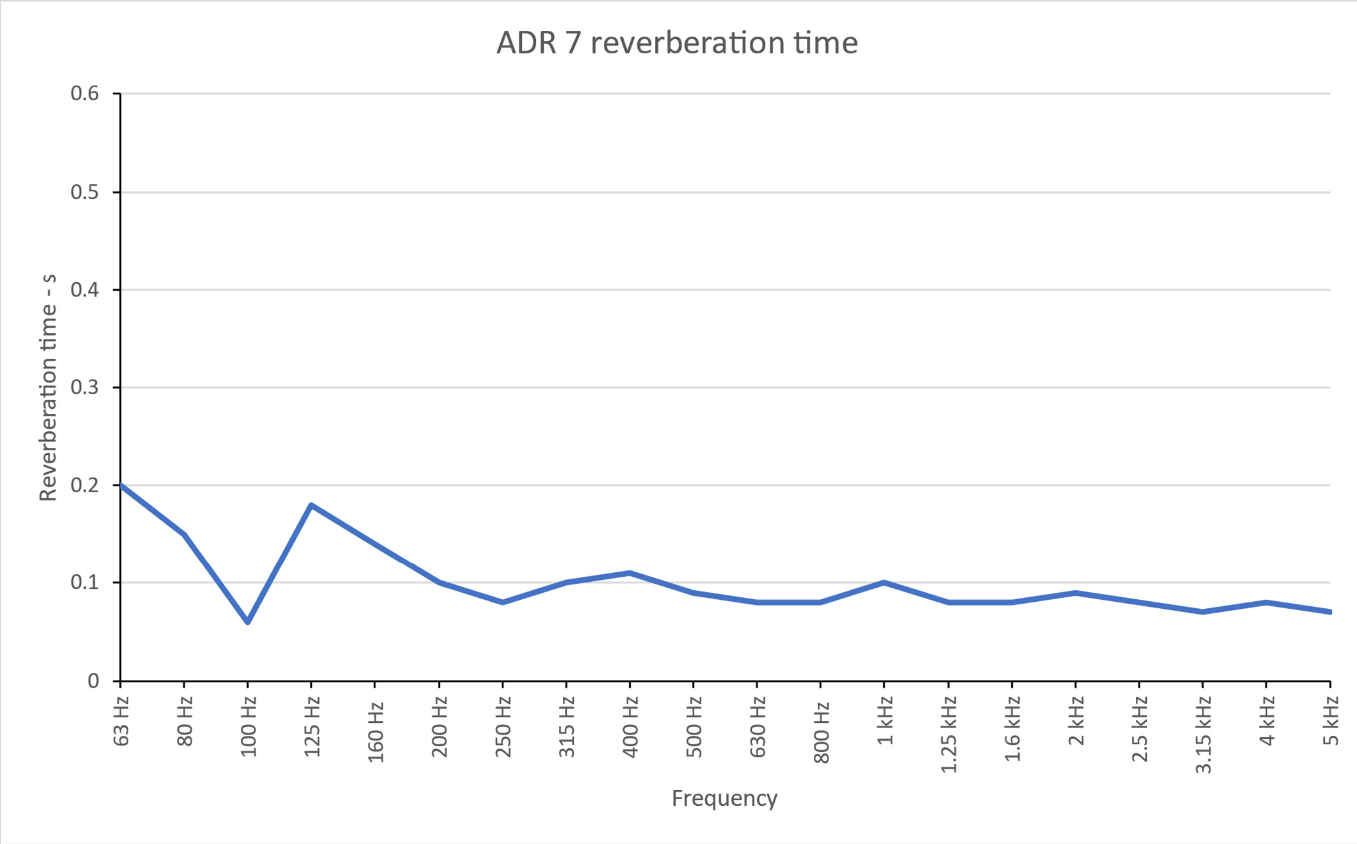



Control Room 7 reverberation time
Reverberation time - s
0.6
0.5
0.4
0.3
0.2
0.1
0
63 Hz
80 Hz
100 Hz
125 Hz
160 Hz
200 Hz
250 Hz
315 Hz
400 Hz
500 Hz
630 Hz
800 Hz
1 kHz
1.25 kHz
1.6 kHz
2 kHz
2.5 kHz
3.15 kHz
4 kHz
5 kHz
Frequency


ADR 7 reverberation time
Reverberation time - s
0.6
0.5
0.4
0.3
0.2
0.1
0
63 Hz
80 Hz
100 Hz
125 Hz
160 Hz
200 Hz
250 Hz
315 Hz
400 Hz
500 Hz
630 Hz
800 Hz
1 kHz
1.25 kHz
1.6 kHz
2 kHz
2.5 kHz
3.15 kHz
4 kHz
5 kHz
Frequency