

Acoustic Associates Sussex Ltd

Noise Assessment for a Discharge of Condition

Site: The Square, Angmering, Littlehampton BN16 4EA

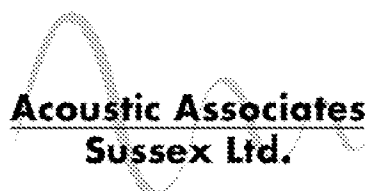
Client: The Lamb at Angmering

Report by: Martyn Chambers BA (Hons), MSc AMIOA

Date: 21/12/2021

Project: J3293

Issue 1



Sound Insulation Testing - Acoustic Design of Buildings - BS4142 - PPG24 - Schools Acoustics B883 -
Vibration - Expert Witness Testimony - Noise at Work - Air Tightness Testing - Auditorium Acoustics

Part of the Acoustella Acoustics Group (a non-affiliated)

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This report has been prepared for the private and confidential use of The Lamb at Angmering. This report has been prepared by Acoustic Associates Sussex Limited with all reasonable skill, care and diligence and presents information included within the scope agreed with the client. If any third party whatsoever comes into possession of this report, they rely on it at their own risk and Acoustic Associates Sussex Ltd accepts no duty or responsibility (Including in negligence) to any such third party

1 Introduction & Executive Summary

Acoustic Associates Sussex have been appointed to undertake an acoustic assessment in support of a discharge of condition for a consented change of use at The Square, Angmering, Littlehampton BN16 4EA.

The consented change of use of vacant retail shop previously known as 'Stitches and Frames' to a restaurant which will include the installation of new kitchen extraction system, air conditioning condensers. The restaurant is proposed to be called the 'Stone Room'. The application reference is A/197/21/PL. Conditions 5 and 6 of the decision notice for the application relate to noise. For ease of reference these have been reproduced below:

Condition 5: Before the restaurant is first brought into use, an acoustic assessment shall be undertaken to determine the impact of noise arising from the development site and the results of the assessment and details of any mitigation measures submitted and approved in writing by the Local Planning Authority. Noise from commercial premises should be controlled, such that the noise rating level ($L_{A,r,T,r}$) emitted from the development does not exceed the background noise level ($L_{A90,T}$), by more than 3dB. All measurements shall be defined and derived in accordance with BS4142:2014. The approved measures shall be implemented before the development is brought into use and thereafter be maintained in accordance with the approved details.

Condition 6: The sound insulation of the floor/ceiling between the ground and first floor shall achieve a minimum airborne sound insulation value of 50 dB ($D_{nT,w} + C_{tr}$). Before the restaurant is first brought into use, a test shall be undertaken by a competent acoustician and submitted to the Local Planning Authority to demonstrate compliance with this level.

The scope of the current assessment is as follows:

- Measure and assess ambient sound pressure levels (SPL), the residual background noise levels and the specific SPL from the extract system.
- Calculate the level attenuation needed for the proposed plant so that the client's ventilation engineer can design the extract system and choose the air conditioning condensers so that they do not exceed the requirements of condition 5.
- Measure the current level of sound insulation between the commercial unit ground floor and the 1st floor residential flats.
- Provide sound insulation advice so the party floor achieves an $D_{nT,w} + C_{tr}$ of 50dB in line with condition 6 of the decision notice
- Provide noise management plan suggestion to reduce the impact of the change of use on the soundscape of the location.

Standards and guidance referenced for this assessment include:

- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- BS4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound
- BS EN ISO 140-4:1998: Field measurements of airborne sound insulation between rooms
- BS EN ISO 717-1: 1997: Rating of sound insulation in buildings and of building elements. Part 1: Airborne Sound Insulation.
- Approved Document E: Resistance to the Passage of Sound (2003 edition incorporating 2015 amendments).
- Planning Noise Advice Document: Sussex, March 2021
- Noise and vibration control for building services systems CIBSE Guide B4: 2016
- Fläkt Woods Practical Guide to Noise Control (2005)

A class one sound level meter has been used to measure representative background sound levels (L_{A90}) at the nearest noise sensitive receptor (NSR). The representative L_{A90} for the proposed hours of use was established to be:

- Day-time period 42dB L_{A90}
- Night-time period (23:00-00:00) 33dB L_{A90}

As condition 5 stipulates the $L_{A_{r,Tr}}$ must not exceed the L_{A90} by more than 3dB(A), this means the $L_{A_{r,Tr}}$ must from the proposed fixed plant must not exceed:

- 45dB(A) for the day time period
- 36dB(A) for the one hour of use proposed during the night period (23:00-00:00)

Calculations have predicted the sound pressure level for the current design of the kitchen extract system. If the current plan for the extract system is to meet the requirements of condition 5 of the decision notice, then it would require a silencer with following level of attenuation:

- 7.4dB(A) to meet the requirements for the day time period
- 16.4dB(A) to meet the requirements one hour of use proposed during the night period (23:00-00:00)

The sound power level of the proposed condensers should not exceed 68dB(A) if they are proposed to be used during the hour of the night period (23:00-00:00) the restaurant is proposed to be open. If they are only proposed to operate during the day time period (07:00-23:00) the sound power level of the proposed condensers should not exceed 77dB(A).

If the plans for the extract system or the condenser locations are revised then the revised system would need to be designed so that the sound pressure level from the system, including all acoustic characteristic correction, did not exceed the measured L_{A90} levels +3dB(A).

Preliminary Sound Insulation tests have been conducted. Mitigation methods have been recommended within the report to improve the party floor between the ground floor commercial unit and the first floor residential flats to achieve 50 dB ($D_{nT,w} + C_{tr}$).

If the developer implements the suggested mitigation measures, then the local planning authority may consider discharging conditions 5 and 6 of A/197/21/PL as the noise issues will have been addressed.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

The consented change of use is to convert vacant retail shop previously known as 'Stitches and Frames' in to a restaurant. The restaurant will provide seating for 52 diners internally, with an additional 12 dinners on the external terrace. The proposed opening hours are:

- Monday-Friday 10am - 11pm
- Sat 8am - 12am
- Sun 8am - 11pm

Due to concerns of causing adverse impact nearby residential flats, the external terrace will close at 21:00 Monday to Saturday and 18:00 on Sunday and Public/Bank Holidays. This would be in line the with the opening hours of the external seating area outside the front 'The Resourceful Squirrel', which is a micro pub 2 doors up from the consented restaurant.

The change of use will require the installation of a kitchen extract system and 2 air conditioning condensers. These are to be located to the north east of site on a facade where there are no residential windows. This location shows good acoustic design as it creates barrier attenuation to all the closest residential windows.

Above the consented restaurant are 2 residential flats. Flat 1 face north west on to The Square. Flat 2 faces south east towards the courtyard at the rear of the application site. The two flats are separated by a flat roof which is over the middle section of the commercial ground floor.

The site location, the proposed floor plans for the restaurant and the proposed location of the fixed plant can be seen below in figures 1 - 4:



Figure 1: Site Location and Block Plan

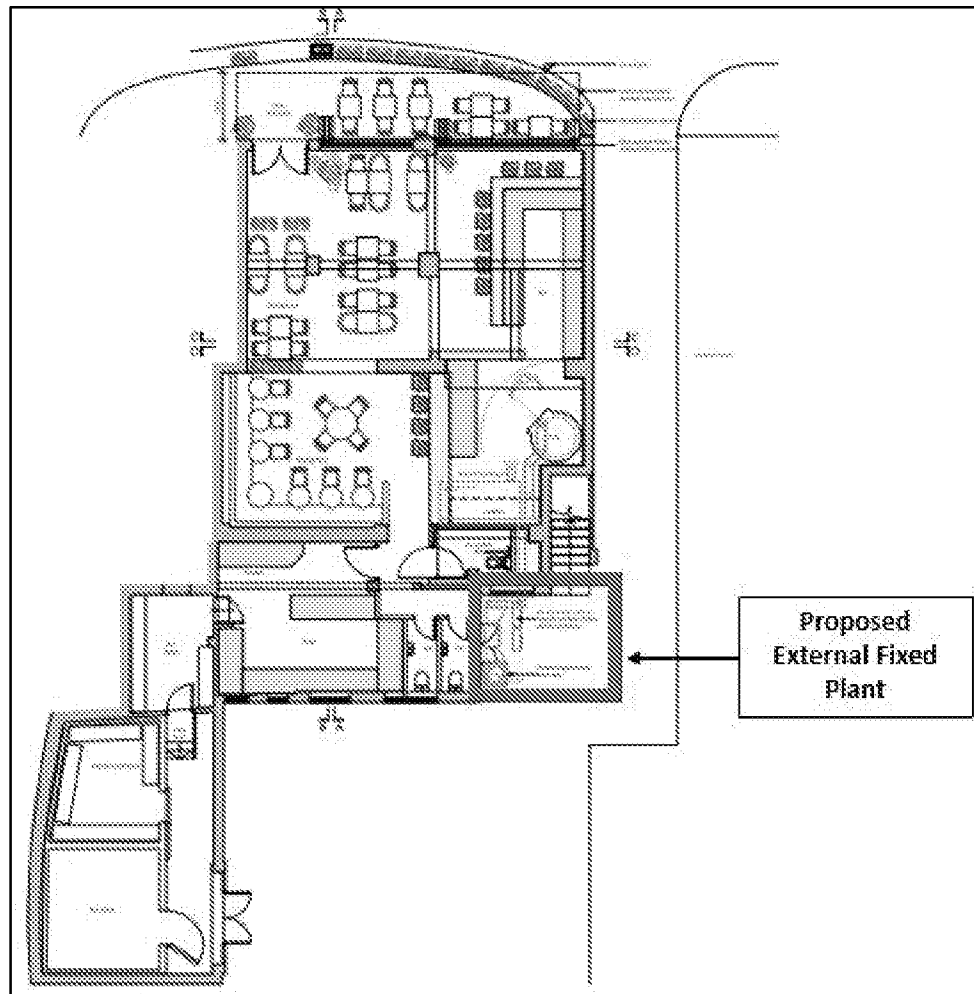


Figure 2: Proposed Floor Plan

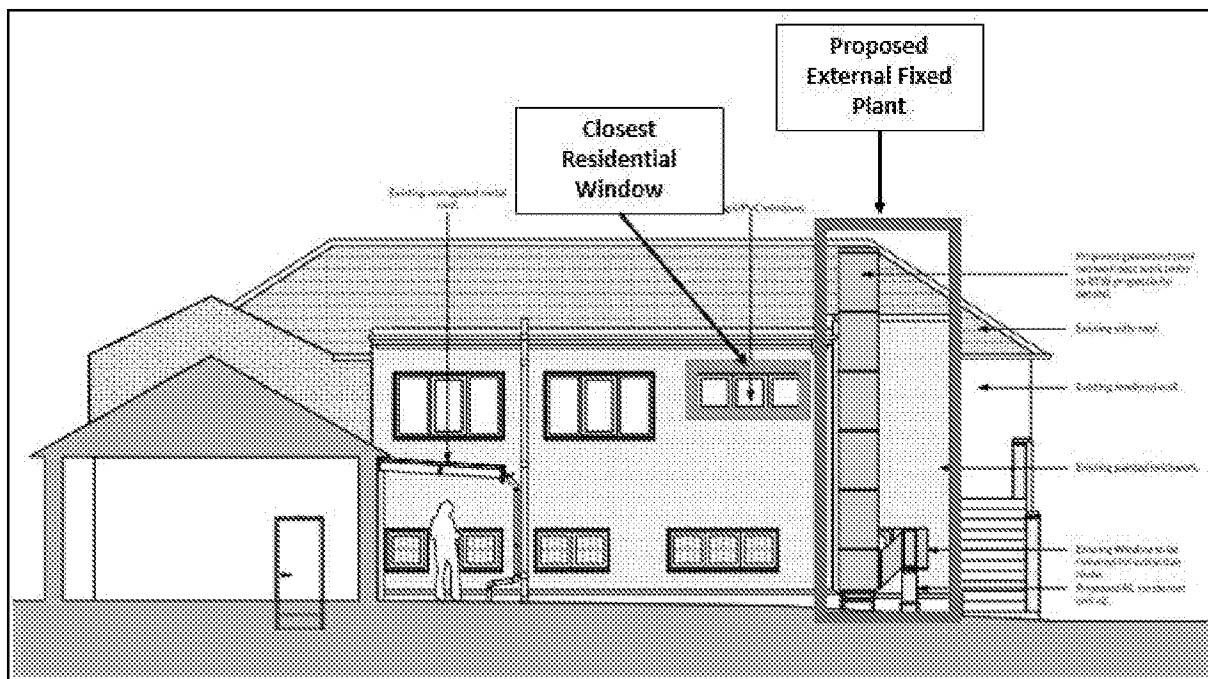


Figure 3: Proposed South Elevation

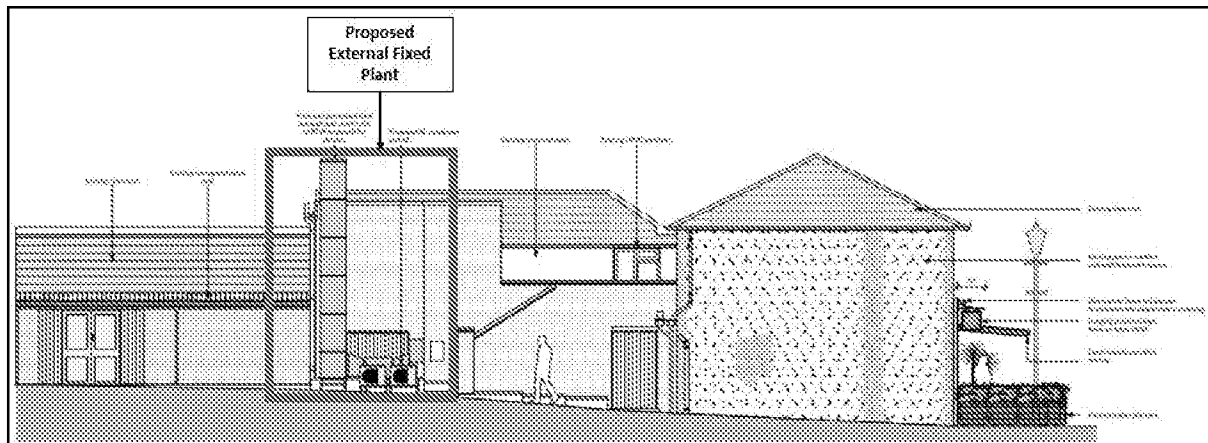


Figure 4: Proposed East Elevation

2.1.1 Fixed Plant details

The proposed fan for the extract system is a 'Systemair MUB 042 500E4 SILEO MULTIBOX'. The client's ventilation engineer provided the sound power levels for the unit which are shown in the appendices of the report. The duct work is proposed to be constructed off twin wall galvanised steel. A calculation for the sound reduction provided by such a construction using the Marshall Day Acoustics Ltd software INSUL can be found in the appendices of the report.

The make and model of the air conditioning units has not been confirmed at the time of report writing. The client has therefore briefed Acoustic Associates Sussex to provide a sound power level that the units must not exceed if they are to be inline with condition 6 of the decision notice.

The fixed plant is proposed to follow the same hours of use as the restaurant these are:

- Monday-Friday 10am - 11pm
- Sat 8am - 12am
- Sun 8am - 11pm

2.1.2 Local Soundscape

The soundscape at the front of the application site is dominated by road traffic noise. The soundscape is also impacted by local commercial businesses. 'The Lamb' pub with its external seating is situated opposite the site. Two doors up from the assessment site is the micro pub 'The Resourceful Squirrel'. This licenced premises recently (16/03/2021) received planning permission to extend the opening hours of its external seating to 21:00 Monday to Saturday and 18:00 on Sunday and Public/Bank Holidays. The planning reference number for this extension of opening hours is A/13/21/PL. The granting of the permission for the micro pub to extend the opening hours of its external seating shows a precedent at the location for the allowance of patrons to be seated outside in the evenings.

At the rear of the assessment site (east) of the application site is a commercial business Empire Environmental Services Ltd. The main impact from this business on the soundscape is from traffic movements using the access road to the side of the assessment site.

2.1.3 Closest Noise Sensitive Receptors

The closest residential properties are the first-floor flats above consented restaurant. Flat 1 face's north west on to the square. Flat 2 face's south east towards the courtyard at the rear of the application site. The two flats are separated by a flat roof which is over the middle section of the commercial ground floor. The closest residential window to the fixed plant is the lounge kitchen window of Flat 2. The location of this window in relation to the proposed fixed plant was previously shown in figure 3.

For clarity the location of the discussed flats is illustrated below in figure 5.



Figure 5: Residential Flat Locations

3 Methodology and Approach

The methodology used within the current report has been to conduct unattended noise surveys at the location.

The first survey location was located at the rear of the property near at the south east facade of Flat 2. These levels will be used to assess the representative background sound pressure level (L_{A90}) that the proposed plant must not exceed by more than 3dB(A) to be inline with condition 5. The calculations for this assessment were conducted in accordance with methodology stated in BS4142:2014+A1:2019.

For completeness the sound pressure level at the front of the assessment site was also monitored to have a full understanding of the soundscape of the location.

Sound insulation tests were conducted between the ground floor commercial unit and flats 1 and 2. The tests were conducted in line with BS EN ISO 140-4:1998 with the results calculated in accordance to BS EN ISO 717-1: 1997. The results were used to provide advice on upgrading the party floor to meet the required $D_{nT,w} + C_{tr}$ of 50dB.

4 Relevant Standards and Guidance

4.1 The Behaviour of Sound

In order to appreciate noise reports, it is important to know how sound behaves and propagates. Some details are provided in the following paragraphs.

Sound is measured in decibels (dB) and is often a relative sensation as one sound can mask another.

The dB scale is a logarithmic scale as opposed to a linear scale and it is important to note the following:

- A change in 1dB is not considered noticeable by a human
- A change is 3dB is only just considered noticeable by a human
- A change in 10dB is classed as a doubling or halving of loudness to a human, if a sound is at least 10dB below existing sound levels, it is generally considered that it does not contribute to the existing environment.

Sound emanating from a point source (a stationary object) reduces by 6dB each time the distance from it doubles (this is known as the inverse square law).

Sound emanating from a continuous line source (such as a road or a railway) reduces by 3dB each time the distance from it doubles.

Sound measured 1 metre from a hard surface increase by 3dB due to the reflection effect of the surface (commonly referred to as a “façade level”).

For sound to be classed as “free field”, it should be at least 3m from a reflective surface in the plane where it is measured (for example, when measuring road noise, a wall is considered to be the reflective surface but the ground is not, however when measuring aircraft noise, the opposite is true).

The image below, gives typical sound level values for everyday examples:

Painful Acoustic Trauma	140	Shotgun blast
	130	Jet engine 100 feet away
	120	Rock concert
Extremely Loud	110	Car horn, snowblower
	100	Blow dryer, subway, helicopter, chainsaw
	90	Motorcycle, lawn mower, convertible ride on highway
Very Loud	80	Factory, noisy restaurant, vacuum, screaming child
Loud	70	Car, alarm clock, city traffic
	60	Conversation, dishwasher
Moderate	50	Moderate rainfall
Faint	40	Refrigerator
	30	Whisper, library
	20	Watch ticking
	dB levels	

Figure 6: Typical Noise Level Examples

4.2 National Planning Policy Framework 2021

The National Planning Policy Framework (July 2021) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so.

The following paragraphs are relevant within NPPF Section 15 (Conserving and enhancing the natural environment) states the following:

Paragraph 174(e) - preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 185-Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

Paragraph 182 - Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

4.3 BS4142: 2014+A1:2019: Methods for rating and assessing industrial and commercial sound

This document provides a means of assessing the impact of industrial or commercial sound upon nearby noise-sensitive receptors, including residential properties.

It does this by comparing the Rating Level of the noise from the industrial or commercial source with the pre-existent L_{90} background noise level affecting the same noise-sensitive premises. The Standard provides guidance that:

- a) Typically, the greater the difference, the greater the magnitude of the impact.
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact, depending on the context.

4.4 Target Noise Level

As noted in condition 5 of the sites decision notice, in order for noise levels from the fixed plant to be deemed acceptable, then after all corrections have been made in line with BS4142: 2014+A1:2019, then the Rating Level or $L_{A,T,r}$ must not exceed 3dB(A) above the background sound level (L_{A90}) at the facade of the NSR.

4.5 Building Regulations Criteria

To give context to the sound insulation testing contained with the current report, the Building Regulations requirements for the sound insulation of conversions will be discussed.

Approved Document E of the Building Regulations (2003 Edition) specifies minimum performance values of Weighted Standardised Level Difference ($D_{nT,w} + C_{tr}$) for airborne noise transmission through party floors and walls and Weighted Standardised Sound Pressure Level ($L_{nT,w}$) for impact sound transmission through a floor.

It should be noted that with airborne sound insulation, it is the level difference that is being measured between rooms and the higher the result the better the insulation.

With impact sound insulation it is the actual sound pressure level in the receiving room that is measured, and therefore the lower results, the better the insulation

The acoustic requirements through separating floors and walls are as follows:

Requirements of A D E (2003 Edition)	Development Type	Element	Airborne Sound Insulation ($D_{nT,w} + C_{tr}$)	Impact Sound Insulation ($L_{nT,w}$)
Dwelling/Dwelling	Conversion	Floor	$\geq 43\text{dB}$	$\leq 64\text{dB}$
Dwelling/Dwelling	Conversion	Wall	$\geq 43\text{dB}$	N/A

Table 1: Building Regulations Noise Criteria

It should be noted that in the example of application site, with the ground floor being a commercial unit, under the current building regulations, no consideration would be given to impact sound testing from the first-floor flats to the ground floor consented restaurant.

It should be noted that it is normally required that the sound insulation performance between the commercial activities and residential dwellings exceeds the minimum building regulation requirements shown in table 1. As noted, condition 6 of the decision notice requires the party floor between the commercial ground floor and residential flats to achieve a $D_{nT,w} + C_{tr}$ of 50dB. This is 7dB above minimum building regulation requirements.

5 Background Sound Survey Baseline Conditions & Results

A background sound survey was carried out between the 24th November and 2nd December 2021 using two class 1 sound level meters.

- **SP1:** Was located at the rear of the property on the south east façade at representative location for the typical sound pressure levels impacting flat 2, the nearest noise sensitive receptor (NSR) to the proposed fixed plant location. The microphone position was approximately 3 meters from ground level. The measurement position would not be described as free-field. As such the levels discussed in this report will be facade levels with no correction made for free-field.
- **SP2:** Was located at the front of the property on the north west façade. The survey location was based at the proposed entrance to the restaurant. The microphone position was approximately 3 meters from ground level. The measurement position would not be described as free-field. As such the levels discussed in this report will be facade levels with no correction made for free-field.

It is noted that as the survey locations are not freefield, therefore no correction was needed in the final calculations for impact on the NSR's facade. The survey locations can be seen in figures 8 and 9 below

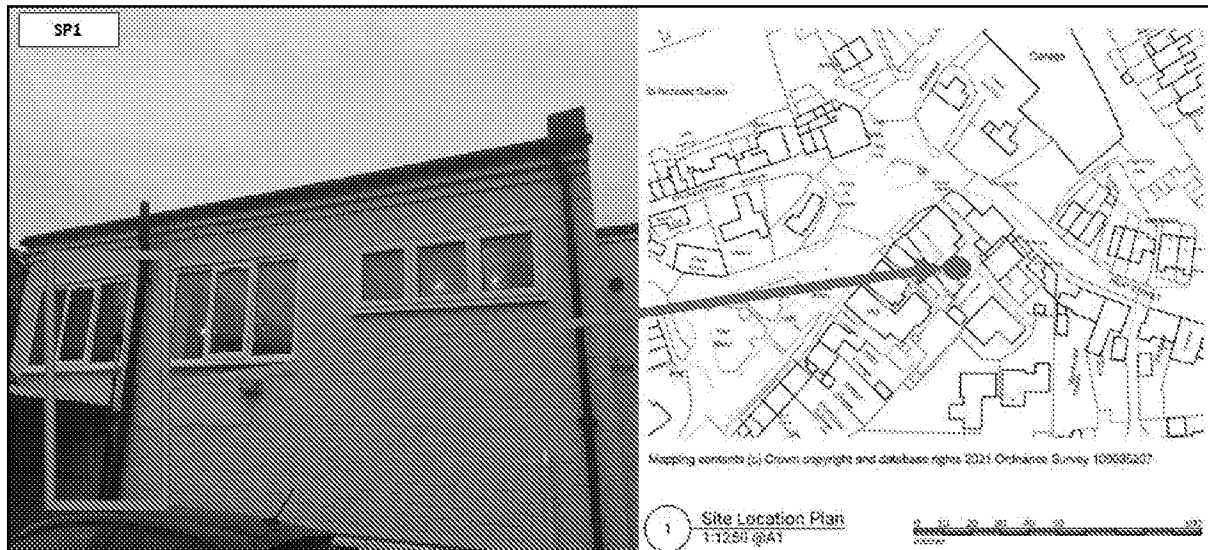


Figure 7: SP1 Sound Survey Location



Figure 8: SP2 Sound Survey Location

5.1.1 Baseline Conditions

- Survey carried out by:
 - Martyn Chambers: BA (Hons) MSc AMIOA
- Equipment used:
 - 2x Svantek 971
 - The Meters were calibrated before and after commencing the noise measurements (@94dB no drift).
- Weather conditions:

Variable: Wind: variable direction
 Mainly less than 5ms⁻², However on Saturday 27th into the morning of Sunday the 28th the wind was greater than 11ms and therefore has been removed from the data set in line with BS4142: 2014+A1:2019

5.1.2 Representative Background Sound Levels

The survey positions were chosen as the measurements taken at their locations will best represent the current sound levels at the locations of the proposed plant. BS4142 states the following on page 11 (Note 1):

To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum/modal value.

Further statistical analysis has been completed to establish the most commonly occurring value for the periods that the proposed fixed plant will run between. These have been conducted separately the day time period (07:00-23:00), and the 1 hour of the night time period the plant may run (23:00-00:00)

Figures 9 and 12 below show the most representative measured value for the L_{A90, 15minutes} for these assessment periods at SP1 and SP2.

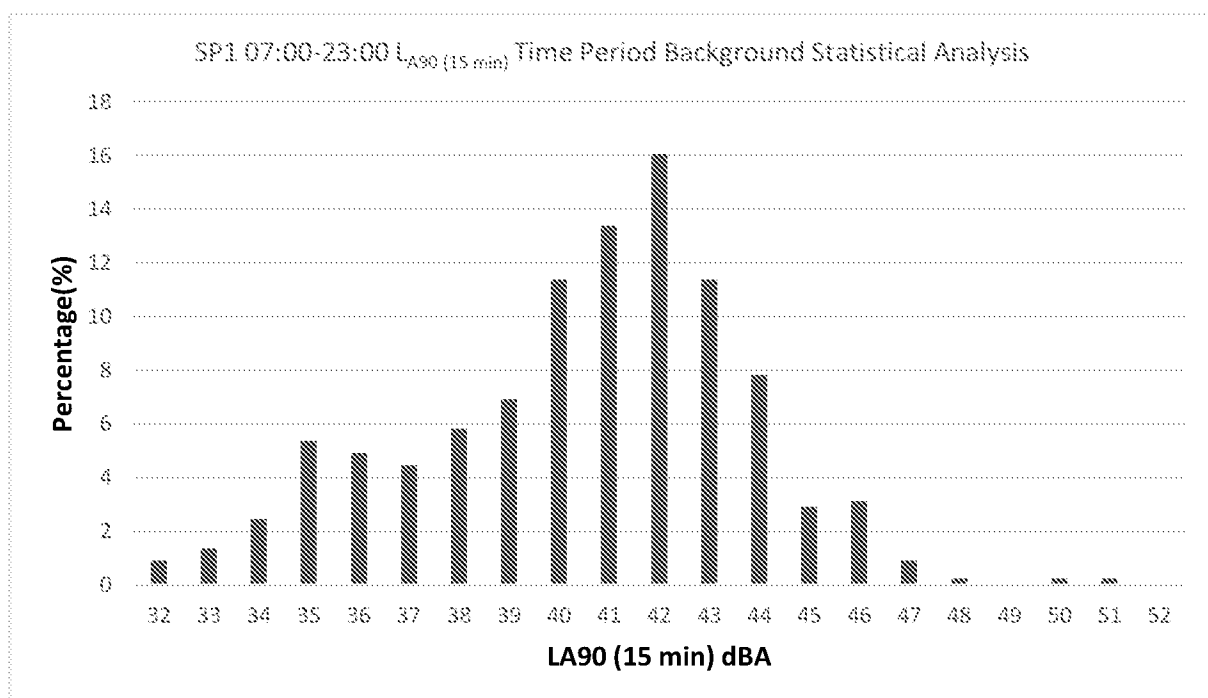


Figure 9: SP1 Day-Time Period Background Statistical Analysis 07:00-23:00 LA90 (15 min) dBA

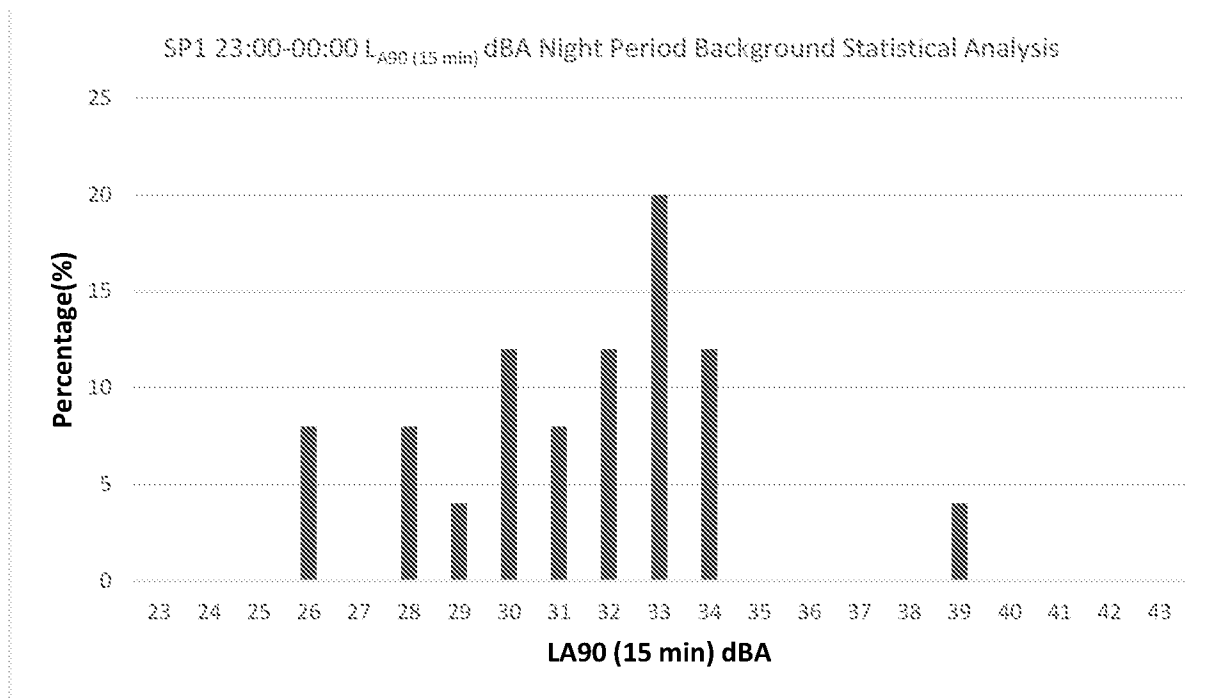


Figure 10: SP2 Night Period Background Statistical Analysis 23:00-00:00 L_{A90} (15 min) dBA

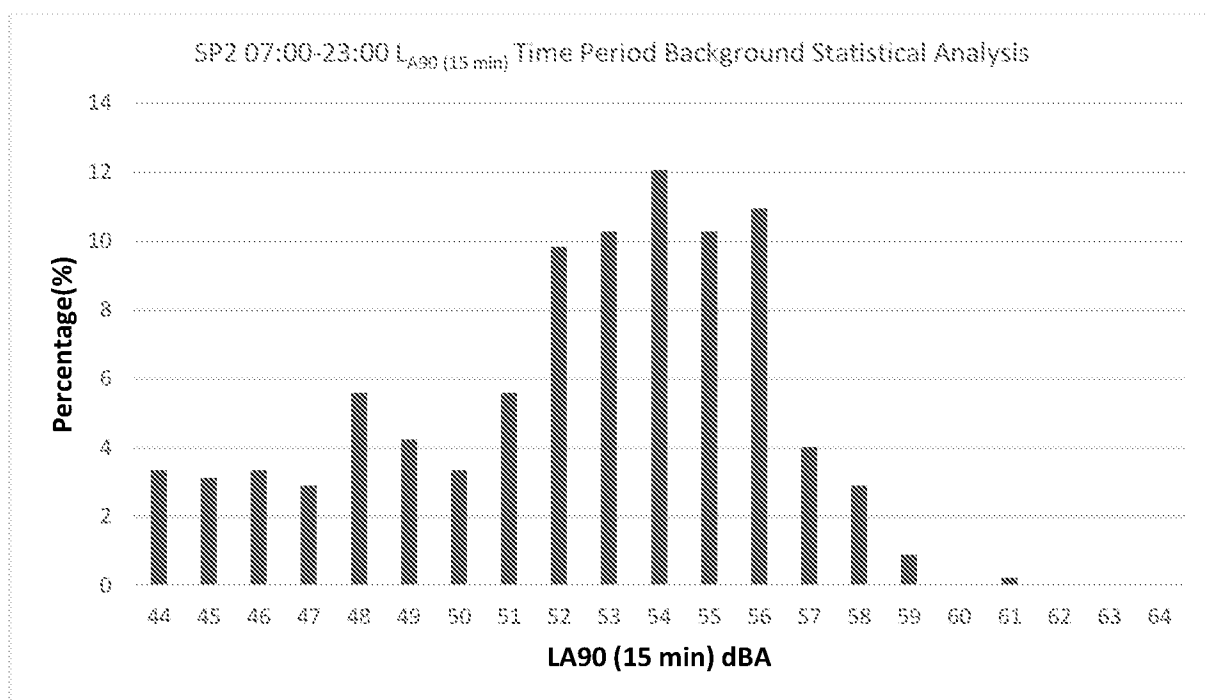


Figure 11: SP2 Day-Time Period Background Statistical Analysis 07:00-23:00 L_{A90} (15 min) dBA

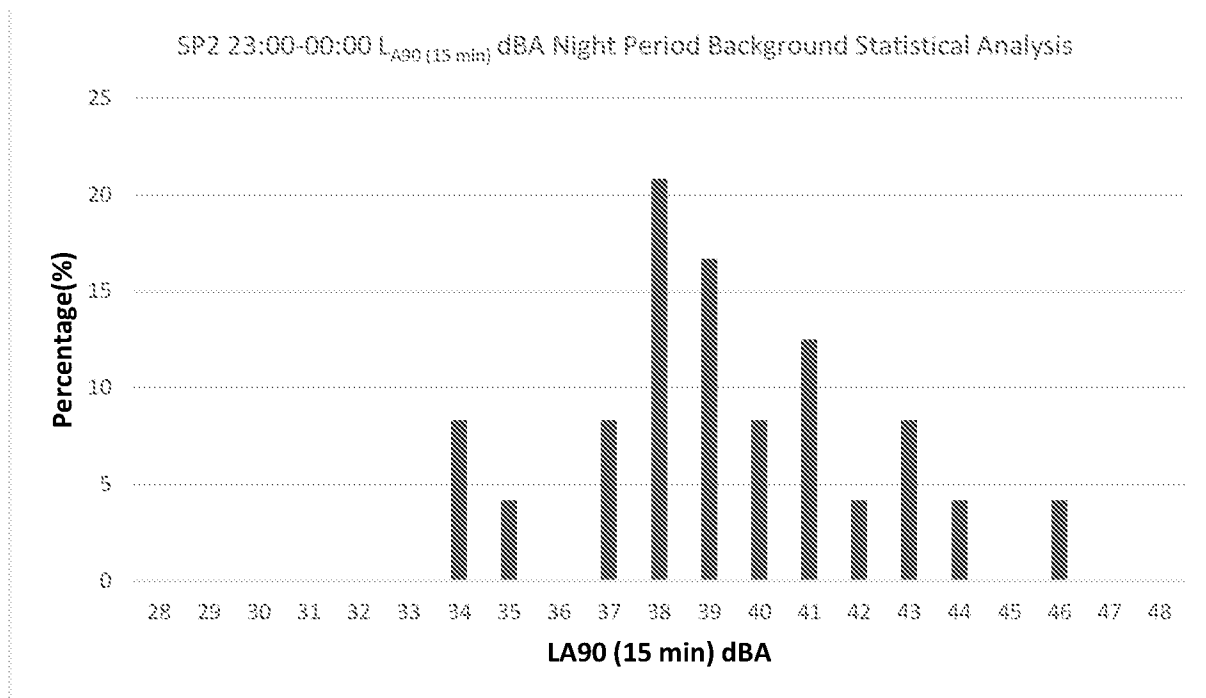


Figure 12: SP2 Night Period Background Statistical Analysis 23:00-00:00 L_{A90} (15 min) dBA

5.1.2.1 Summary of Background Sound Levels at the site

The most frequently occurring residual sound levels are therefore:

- Day-Time period 07:00-23:00
 - SP1: **42dB L_{A90}**
 - SP2: **54dB L_{A90}**
- Night-time period (23:00-00:00):
 - SP1: **33dB L_{A90}**
 - SP2: **38dB L_{A90}**

As SP1 would be the representative sound pressure level for the nearest noise sensitive receptor (NSR), the results from this survey will be used as the representative background sound levels. As condition 5 of the decision notice stipulates the $L_{A_{r,Tr}}$ must not exceed the L_{A90} by more than 3dB(A), this means the $L_{A_{r,Tr}}$ must not exceed:

- **45dB(A)** for the day time period 07:00-23:00
- **36dB(A)** for the one hour of use proposed during the night period (23:00-00:00)

6 Plant Noise Calculations

6.1 Kitchen Extract System

Calculation of the sound pressure level of the proposed kitchen extract system at the nearest NSR (the lounge/kitchen window of flat 2) has been conducted using the methodologies of the CIBSE Guide B4: 2016 and the Fläkt Woods Practical Guide to Noise Control.

The calculations were conducted using the duct layout plans shown in figures 2-4 and the sound power levels of the Systemair MUB 042 500E4 SILEO MULTIBOX' shown in the appendices of the report.

The full calculation can be seen in the appendices of the report, however, a summary of the of the predicted sound pressure level from the proposed extraction system at the nearest NSR can be seen in table 2 below. It should be noted that the predicted sound pressure levels shown in the table are if the system remained unattenuated (i.e. no silencers)

Sound Source	Calculated dB(A)
SPL from Termination Point	42.3
SPL from Outlet Duct	51.9
SPL from Fan Surround	25.7
SPL from Inlet Duct	29.7
Overall SPL from Extract System	52.4

Table 2: Predicted Sound Pressure Levels from Extract System

The overall SPL from extract system has been compared against the calculated $L_{A90} + 3dB$. The results are shown in table 3 below:

Sound Source	Overall SPL from Extract	L_{A90} Day +3dB	Difference Predicted Extract SPL	L_{A90} 23:00-00:00 +3dB	Difference Predicted Extract SPL
dBA	52.4	45	7.4	36	16.4

Table 3: Predicted Sound Pressure levels from Extract System in Comparison to $L_{A90} + 3dB$.

The above table shows that if the current plan for the extract system to meet the requirements of condition 5 of the decision notice, then it would require a silencer with following level of attenuation:

- **7.4dB(A)** to meet the requirements for the day time period (07:00-23:00)
- **16.4dB(A)** to meet the requirements one hour of use proposed during the night period (23:00-00:00)

It is also noted that any silencer would need to be inserted into the system directly after the outlet of the fan unit. This would reduce the noise breakout of the duct which is shown in the calculations to be the loudest sound source

6.2 Air Conditioning Condenser's

The make and model of the air conditioning units has not been confirmed at the time of report writing. The client has therefore briefed Acoustic Associates Sussex to provide a sound power level that the units must not exceed if they are to be in line with condition 6 of the decision notice.

A calculation was conducted using the proposed location of the condensers show in figure 2-4. The calculations took into account location, directivity, distance and barrier attenuation. The calculations were conducted by adjusting the sound power level at the proposed location of each condenser until the sound pressure level from units logarithmically combined equated to 6dB(A) below the calculated $L_{A90} + 3\text{dB}$ for the proposed night time hour of use (23:00-00:00).

The reason for the 6dB below the $L_{A90} + 3\text{dB}$ is to allow penalties for acoustic characteristics such as intermittency discussed in section 7 below.

The calculations showed the sound power level of the proposed condensers should not exceed 68dB(A) if they are proposed to be used during the hour of the night period (23:00-00:00) the restaurant is proposed to be open. If they are only proposed to operate during the day time period (07:00-23:00) the sound power level of the proposed condensers should not exceed 77dB(A). This is due to the difference between daytime representative background sound pressure level (42dB(A)) and the relevant night time period representative background sound pressure level (33dB(A)) being 9dB(A).

The full calculations for the maximum allowable sound power level of the condensers can be seen in the appendices of the report.

7 Corrections to be Considered

7.1 Tonality

Tonality is expressed within BS4142:2014+A1:2019 as follows:

The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

All the units proposed will be new and therefore unlikely to be tonal as manufactures design their new units to ensure against this.

7.2 Intermittency and on-time corrections

The extract system will run consistently during opening hours therefore no on-time or intermittency corrections should be made.

The condensers are likely to run intermittently. Therefore, penalty of 6dB is proposed to account for this acoustic characteristic.

8 Noise Levels and Character Corrections Summary

Table 4 and 5 below summarises the BS4142:2014:A1:2019 assessment made. It stands to reason if the noise level from the proposed plant is within the standards for the closest NSR, then the SPL levels at more distant locations will be further below the required level.

Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq} , 1 hour	52.4	7.3.4
Ontime correction	L _{Aeq} , 1 hour	+ 0	7.3.14
Acoustic feature correction	Intermittency	+ 0	9.2
Rating level		52.4	9.2
Background sound level Day +3dB	L _{A90}	45	8
Excess of rating level over background sound level	Day	7.4	11
Background sound level Night +3dB	L _{A90}	36	8
Excess of rating level over background sound level	Night	16.4	11
Assessment indicates	16.4 dB(A) of attenuation required		11
Uncertainty of the assessment	Discussed		10

Table 4: Noise Levels and Character Corrections Summary Table For Extract System

Results	Measurement Parameter		Relevant Clause
Specific sound level (corrected)	L _{Aeq} , 1 hour	30	7.3.4
Ontime correction	L _{Aeq} , 1 hour	+ 0	7.3.14
Acoustic feature correction	Intermittency	+ 6	9.2
Rating level		36	9.2
Background sound level Day +3dB	L _{A90}	45	8
Excess of rating level over background sound level	Day	9	11
Background sound level Night +3dB	L _{A90}	36	8
Excess of rating level over background sound level	Night	0	11
Assessment indicates	Condenser SWL must not exceed 68dB(A)		11
Uncertainty of the assessment	Discussed		10

Table 5: Noise Levels and Character Corrections Summary Table For AC Condensers

9 Sound Insulation

Condition 6 of the decision notices requires that the sound insulation of the floor/ceiling between the ground and first floor achieves a minimum airborne sound insulation value of 50 dB ($D_{nT,w} + C_{tr}$).

9.1 Preliminary Sound Insulation Tests.

On the 24th November 2021 Acoustic Associates Sussex attended site to assess the current level of sound insulation in the property.

Preliminary sound tests were conducted between the ground floor commercial unit, and flats 1 and 2 on the first floor. The sound insulation test graphs can be seen in the appendices of the report but a summary of the results can be seen in the table below:

Source Room	Receiving Room	$D_{nT,w}$ (dB)	$D_{nT,w} + C_{tr}$ (dB)	Condition 6 Criterion (dB)	Pass/Fail
Commercial Unit Front	Flat 1 Bedroom 1	38	30	50	Fail
Commercial Unit Front	Flat 1 Bedroom 2	40	33	50	Fail
Flat 2 Lounge Kitchen	Commercial Unit Rear Storage Room	53	46	50	Fail

Table 6: Preliminary Sound Insulation Test Results

As can be seen from table 2 above, the tests between the floors would fail to meet the minimum performance values of 50dB $D_{nT,w} + C_{tr}$ for airborne noise transmission required by condition 6 of the decision notice.

9.2 Existing Construction

From discussion with the client's architect and observations on site, it is indicated that the front section of the shop underneath Flat 1 has a timber joisted party floor. Underneath Flat 2 in the area proposed to be used and toilets, preparation areas and storage the party floor appears to be of beam and block construction.

Underneath the flat roof (which will form the rear of the restaurant) is also assumed to be block and beam construction. While there are no concerns in regards to the sound insulation between the restaurant and the flat roof. Flanking transmission at the junction between the beam and block construction of the flat roof and the external wall of flat 1 may be of concern.

It is also noted that there are a number of supporting steels encased in downstands throughout the proposed restaurant.

The current ceiling below the timber joist ceiling and the beam and block construction is a thin panel boarded ceiling with minimal sound reduction properties.

It is noted that ceiling height is of concern especially under the steels encased in downstands and in the rear section of the unit. However, due to the poor sound insulation tests results specifically at the front of the front of the property a significant upgrade to the party floor/ceiling is recommended.

9.3 Proposed Separating Floor Details

9.3.1 Between Front of the Commercial Unit and Flat 1

It would be recommended the current ceiling below the joists be removed. A Fireline board should then be fixed to the underside of the joists. It is the recommended that a metal furring (MF) grid ceiling system is installed. The British Gypsum's "Casoline" system would be suitable although others are available.

The ceiling system would have to be installed on anti-vibration hangers to improve the sound insulation performance of the ceiling. The void should be ideally 150mm, as shown in the figure below. However, it could possibly be reduced to 100mm, though it is noted this could reduce the sound insulation performance of the ceiling by a minimum of 2dB which increases the clients commercial risk of not achieving the 50dB $D_{nT,w} + C_{tr}$ requirement. Dense Mineral Fibre should be located within the MF ceiling. The full detail can be seen in the below figure

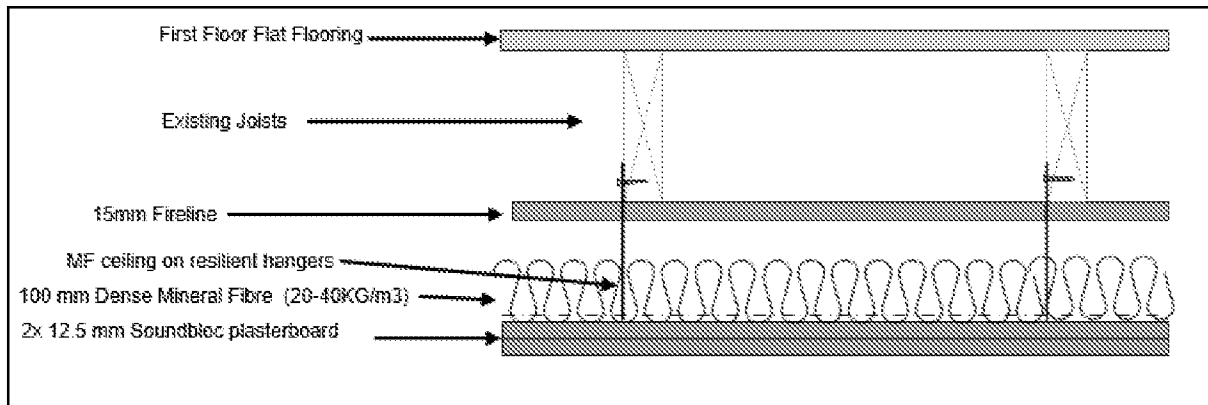


Figure 13: Proposed Detail Between Front of the Commercial Unit and Flat 1

The existing ceiling should be removed and a Fireline board fixed to the underside of the joists before the MF ceiling is installed. If a Fireline board is installed, 2x12.5mm Soundbloc could be used for the MF ceiling lining. If no Fireline board is installed, 2x15mm Soundbloc would be required instead of 2x12.5mm.

9.3.2 Between Rear of the Commercial Unit and Flat 2

The sound insulation performance of the beam flooring underneath at the rear of the unit underneath Flat 2 exceeded the sound insulation results of the front of the commercial unit.

The IsoMax Clip system and the GenieClip system, which have a lower drop height than the British Gypsum's "Casoline" system may therefore be preferential. The full detail can be seen in the figure below:

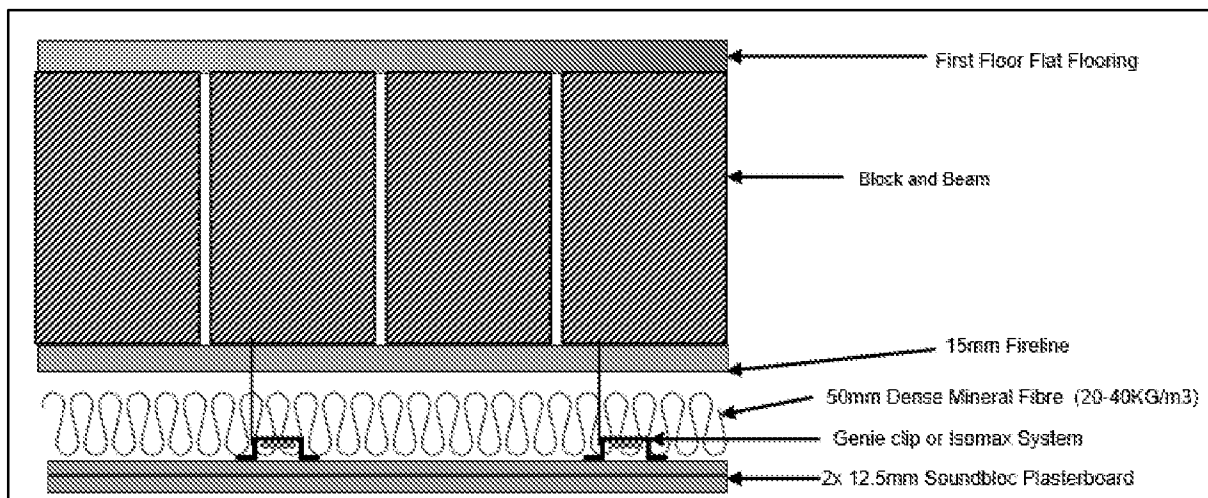


Figure 14: Proposed Detail Between Rear of the Commercial Unit and Flat 2

9.3.2.1 Specific Products

- IsoMax Clip system - <http://www.cmsdansk.co.uk/general-construction/acoustic-wall-solutions/isomax-acoustic-isolation-clips/#.X2yJSWhKqdU>
- Genie Clip - <https://www.soundstop.co.uk/ZGENIECLIP.php>

9.3.3 Underneath the Flat Roof

Underneath the flat roof (which will form the rear of the restaurant) is also assumed to be block and beam construction. There are no concerns in regards to the sound insulation between the restaurant and the flat roof. Flanking transmission at the junction between the beam and block construction of the flat roof and the external wall of flat 1 may be of concern. It is likely that in this area it is possible that the existing ceiling could simply be removed and 2x12.5mm Soundbloc plaster boards installed directly to the underneath of the beam and block floor.

However, it is strongly recommended that once the existing ceiling be removed Acoustic Associates Sussex are invited back to investigate the existing junction detail to inspect if further acoustic treatments would be necessary.

10 Downstands

There are several structural steel support beams running across the ground floor commercial unit. These are currently encased in existing downstands.

Due to the poor construction of these downstands it is recommend that they are removed and the steel encased in British Gypsum Casoline Downstand, shown in the below detail.

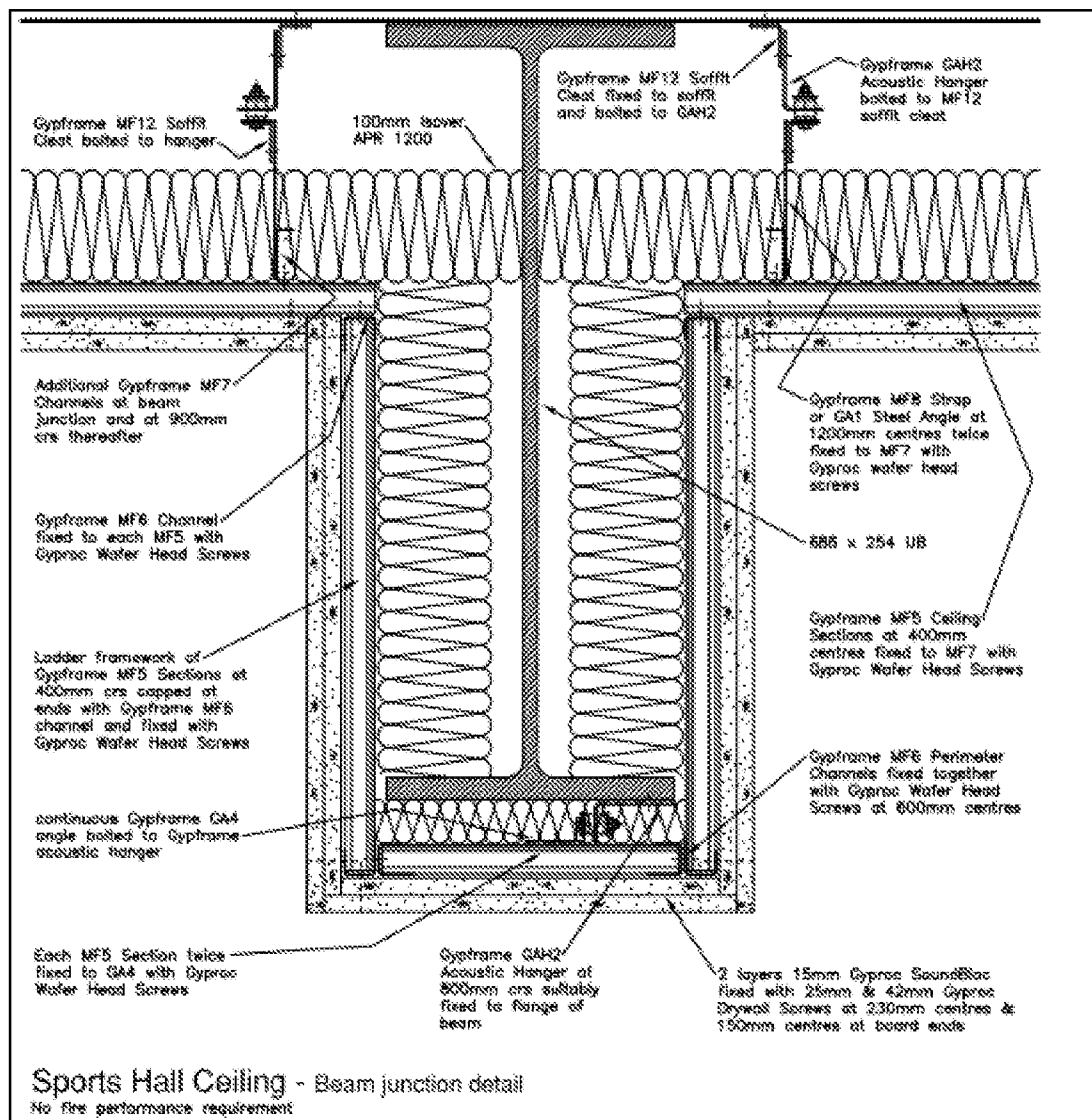


Figure 15: British Gypsum Casoline Downstand Detail

At some locations where head height is of concern and there is enough stiffness in the Gypframe, the Gypframe hanger underneath the steel could not be used, and so the frame is connected solely by the MF5's. This will reduce the drop height without compromising the sound insulation.

10.1 Flanking Transmission

The total sound insulation provided by the party floor relates to the construction of the flank walls as well as the separating floor itself. If not detailed correctly flanking sound transmission cause a sound test fail no matter what the floor construction is:

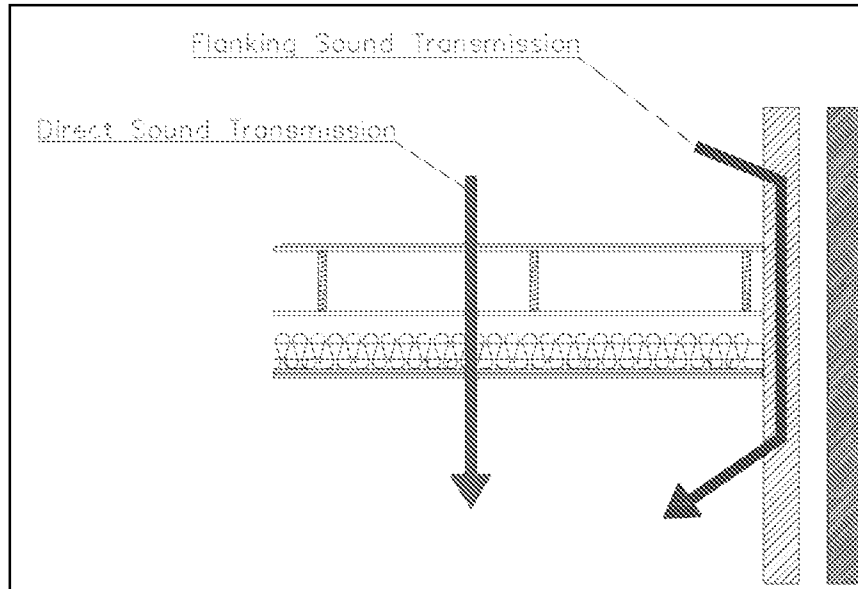


Figure 16: Flanking Sound and Direct Sound Transmission paths

Due to the poor performance of the sound insulation of the party floor between the front section of the commercial unit and the first floor Flat 1, it is likely that there is a significant element of flanking sound contributing to the sound transfer. It is therefore recommended that the existing masonry wall of the front section of the establishment be upgraded by applying the Gypliner Universal system, with a 30mm void. The detail is visualized in the below figure.

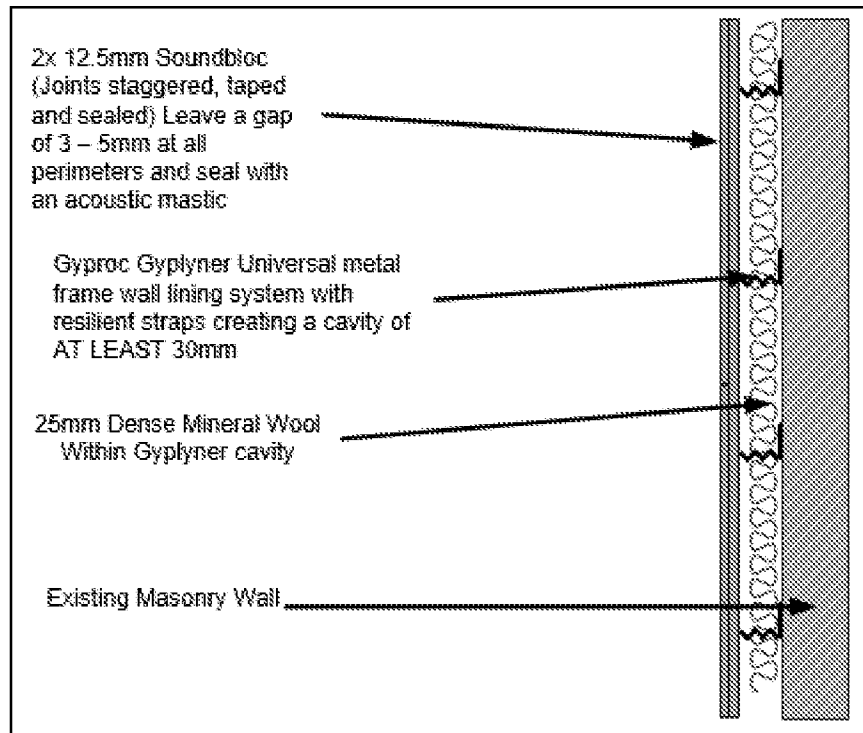


Figure 17: Proposed Wall Lining Detail

The full details would be:

Upgrade Area:

- Existing masonry
- Gyplyner Universal
- 30mm min Void
- 25mm Insulation
- 2x Fireline/Soundbloc

It would also be recommended masonry pillars in the front section be lined with 2x12.5mm Soundbloc mounted on Gyproframe liners or short cut lengths of Resilient Bar. These additional plasterboard layers should not pass through the suspended ceiling.

It is noted that the wall lining is only required under the front section of the commercial unit underneath Flat 1. It is not required underneath the flat roof or the rear section under Flat 2.

10.1.1 Suspended Ceiling Wall Lining Junction

It is essential that if a wall treatment is used it does not pass through the suspended ceiling. The suspended ceiling should continue to the outer existing masonry wall with the wall lining constructed to meet it. This is shown below in the figure below:

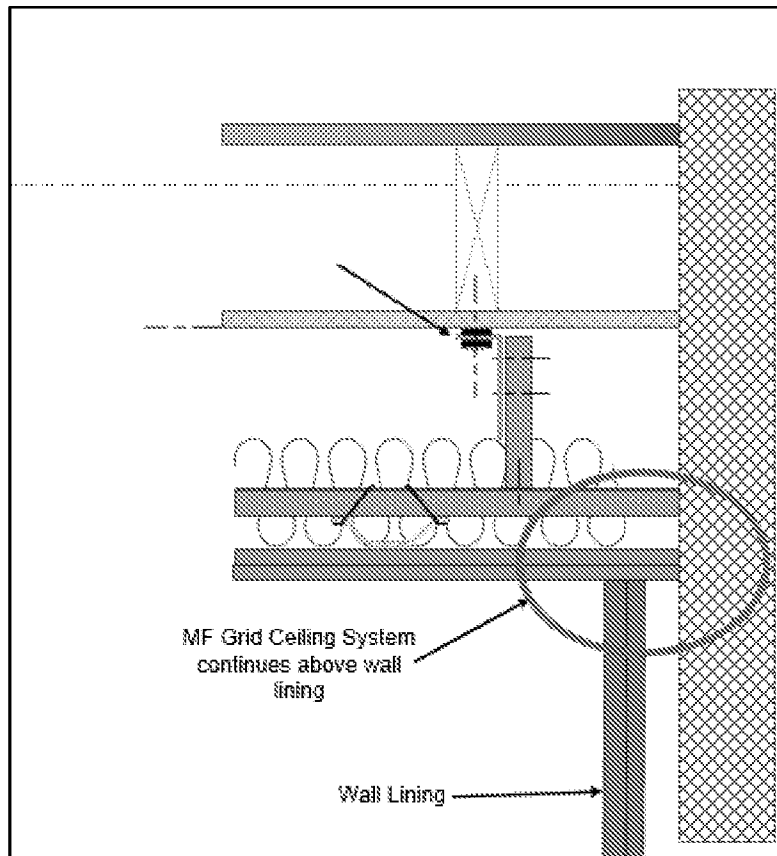


Figure 18: Wall lining suspended ceiling junction

10.2 Workmanship

Plasterboard joints should be staggered and sealed with Gyproc sealant or decorator's caulk. A 3-5mm gap should be left at all perimeter edges, this too sealed as above.

Proprietary products (Gyplyner etc.) should be specified/installed correctly/carefully and in accordance with the supplier's instructions

11 External seating Area

People noise will always be an uncertainty specifically when it comes to the proposed external seating area of consented restaurant. It is noted there is no specific planning condition of the decision notice relating to the use of this area, then plan for which was detailed during the planning application.

However, it is recognised by the client that the use of the external terrace by diners may have an impact on the local residential properties. In particular Flat 1 directly above the restaurant. It is therefore proposed that the external seating area of the terrace close at 21:00 Monday to Saturday and 18:00 Sundays and bank/public holidays.

This proposal would be in line with the micro pub 'The Resourceful Squirrel' which is located two properties north of the assessment site. The Resourceful Squirrel recently (16/03/2021) received planning permission to extend its opening hours to these times. The planning reference number for this extension of opening hours is A/13/21/PL. The granting of the permission for the micro pub to extend the opening hours of its external seating shows a precedent at the location for allowance of patrons to be seated outside in the evenings.

12 Uncertainty

The calculations contained in the current report are based on the current iteration of the design for the kitchen extract system. If the plans are revised then the revised system would need to be designed so that the sound pressure level from the system did not exceed the measured L_{A90} levels +3dB(A).

When Acoustic Associates Sussex visited the site the existing layout of the structure was mainly intact. It is likely that as construction works commence the plans provided to Acoustic Associates will evolve. It is recommended that in cases such as this, or if there are elements of concern that are not covered in the above report, that the client recontact Acoustic Associates Sussex for the report to be amended or clarified.

It is highly recommended that all details within the current report are checked with a structural engineer and fire safety officer.

If recommendations in this report are followed to a good standard of workmanship, then it is the conclusion of the report that the requirements of condition 6 of the decision notice would be adequately met. It should be noted that if the products are not installed to the manufacturer's specification it cannot be certain that the designs for the party floor/wall constructions will meet with the current building regulations regarding the passage of sound. The advice has been provided in good faith to help with the development's sound insulation but no responsibility can be taken for the structural integrity of the design or for any specific levels of sound insulation achieved.

13 Mitigation Methods.

Acoustic Associates Sussex would recommend that both the extract fan and condensers be placed on a time clock to avoid being accidentally left running outside of their designated periods of use.

On the schematics presented to Acoustic Associates Sussex, it is shown that all new ducting will be fixed using anti-vibration mounts. This will help prevent structure borne energy resonating from the adjusted fan system.

It is recommended that the system is subject to regular maintenance to ensure it remains in optimal performance.

It is also noted that any silencer would need to be inserted into the system directly after the outlet of the fan unit. This would reduce the noise breakout of the duct which is shown in the calculations to be the loudest sound source.

14 Conclusion

A class one sound level meter has been used to measure representative background sound levels (L_{A90}) at the nearest noise sensitive receptor (NSR). The representative L_{A90} for the proposed hours of use was established to be:

- Day-time period 42dB L_{A90}
- Night-time period (23:00-00:00) 33dB L_{A90}

As condition 5 stipulates the $L_{A_{r,Tr}}$ must not exceed the L_{A90} by more than 3dB(A), this means the $L_{A_{r,Tr}}$ must from the proposed fixed plant must not exceed:

- 45dB(A) for the day time period
- 36dB(A) for the one hour of use proposed during the night period (23:00-00:00)

Calculations have predicted the sound pressure level for the current design of the kitchen extract system. If the current plan for the extract system is to meet the requirements of condition 5 of the decision notice, then it would require a silencer with following level of attenuation:

- 7.4dB(A) to meet the requirements for the day time period
- 16.4dB(A) to meet the requirements one hour of use proposed during the night period (23:00-00:00)

The sound power level of the proposed condensers should not exceed 68dB(A) if they are proposed to be used during the hour of the night period (23:00-00:00) the restaurant is proposed to be open. If they are only proposed to operate during the day time period (07:00-23:00) the sound power level of the proposed condensers should not exceed 77dB(A).

If the plans for the extract system or the condenser locations are revised then the revised system would need to be designed so that the sound pressure level from the system, including all acoustic characteristic correction, did not exceed the measured L_{A90} levels +3dB(A).

Preliminary Sound Insulation tests have been conducted. Mitigation methods have been recommended within the report to improve the party floor between the ground floor commercial unit and the first floor residential flats to achieve 50 dB ($D_{nT,w} + C_{tr}$).

If the developer implements the suggested mitigation measures, then the local planning authority may consider discharging conditions 5 and 6 of A/197/21/PL as the noise issues will have been addressed.

15 Appendices

Sound power level	Acoustic filter	63	125	250	500	1k	2k	4k	8k	Total
	A filter									
Indoor	dB(A)	47	56	60	74	78	77	73	65	83
Outlet	dB(A)	49	67	73	75	80	79	75	66	84
Surrounding	dB(A)	27	47	44	44	40	51	42	30	55

Figure 19: Systemair MUB 042 500E4 SILEO MULTIBOX Sound Power Levels

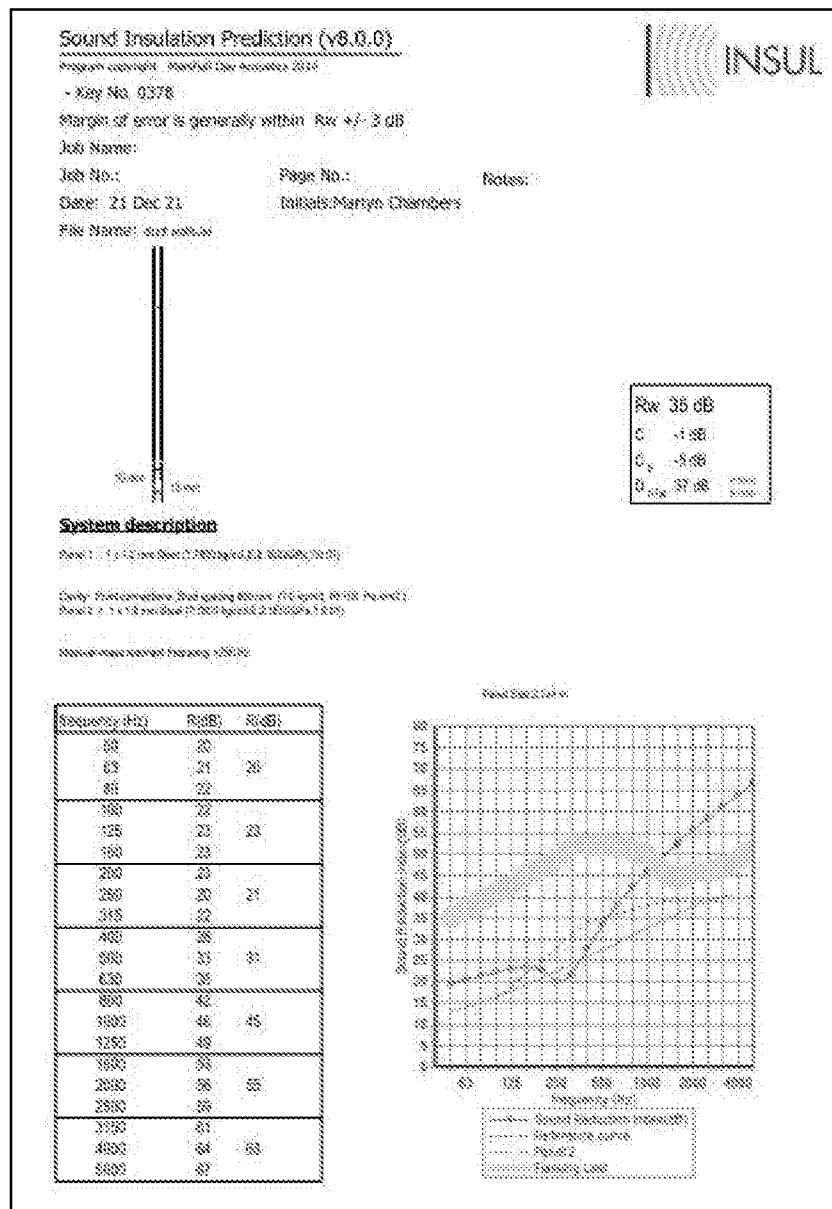


Figure 20: INUSL Galvanised Steel Twin Wall Duct Work Sound Reduction Calculation

Data	Frequency dB(A)							
	63	125	250	500	1000	2000	4000	8000
Outlet SWL (A)	49	67	70	75	80	79	75	66
Insertion loss per M of 600x200mm duct	1	0.7	0.3	0.2	0.2	0.2	0.2	0.2
Insertion loss for duct length (5m)	5	3.5	1.5	1	1	1	1	1
Termination reflections	16	11	7	5	1	0	0	0
SWL radiated from discharge	28	52.5	61.5	69	78	78	74	65
SPL with Distance Correction 'r = 2.3 ' (Direct i.e., no Barrier)	10	34	43	51	60	60	56	47
Barrier Attenuation	10	12	15	17	20	23	26	29
A-Weighted SPL at NSR	0	22	29	33	39	36	29	17
Broadband Predicted A weighted SPL at NSR					42.3			

Table 7: Predicted Duct Termination Point Sound Pressure Level Calculations at NSR

Data	Frequency dB(A)							
	63	125	250	500	1000	2000	4000	8000
Outlet SWL (A)	49	67	70	75	80	79	75	66
Insertion loss per m of 600mm-2000 duct	1	0.7	0.3	0.2	0.2	0.2	0.2	0.2
Insertion loss for duct length (5m)	5	3.5	1.5	1	1	1	1	1
L _w Duct (SWL _D)	44	63.5	68.5	74	79	78	74	65
Duct SRI (R _w)	20	23	21	31	45	55	63	63
L _w Breakout (SWL _B)	42.2	58.7	65.7	61.2	52.2	41.2	29.2	20.2
SWL _B - 3	42.2	58.7	65.7	61.2	52.2	41.2	29.2	20.2
SWL _B or SWL _D -3 (whichever is lower)	41	60.5	65.5	71	76	75	71	62
SPL with Distance Correction 'r = 0.7 ' (Direct i.e. no Barrier)	41	59	66	61	52	41	29	20
Barrier Attenuation	36	54	61	56	47	36	24	15
A-Weighted SPL at NSR	29	45	50	43	32	18	3	-9
Broadband Predicted A weighted SPL at NSR					51.9			

Table 8: Predicted Outlet Duct Breakout Sound Pressure Level Calculations at NSR

Data	Frequency dB(A)							
	63	125	250	500	1000	2000	4000	8000
Outlet SWL (A)	47	66	69	74	78	77	73	65
Insertion loss per m of 600mm-2000 duct	1.0	0.7	0.3	0.2	0.2	0.2	0.2	0.2
Insertion loss for duct length (5m)	2.0	1.4	0.6	0.4	0.4	0.4	0.4	0.4
L _w Duct (SWL _D)	45.0	64.6	66.8	66.8	71.6	73.6	69.6	61.6
Duct SRI (R _w)	20	23	21	31	45	55	63	63
L _w Breakout (SWL _B)	41.0	57.6	61.8	51.8	42.6	34.6	22.6	14.6
SWL _B - 3	42.0	61.6	63.8	63.8	68.6	70.6	66.6	58.6
SWL _B or SWL _D -3 (whichever is lower)	41.0	57.6	61.8	51.8	42.6	34.6	22.6	14.6
SPL with Distance Correction 'r = 3.6 ' (Direct i.e. no Barrier)	25	41	46	36	26	18	6	-2
Barrier Attenuation	13	16	19	21	24	27	30	33
A-Weighted SPL at NSR	12	26	27	14	2	-9	-24	-35
Broadband Predicted A weighted SPL at NSR					29.7			

Table 9: Predicted Inlet Duct Breakout Sound Pressure Level Calculations at NSR

Data	Frequency dB(A)							
	63	125	250	500	1000	2000	4000	8000
Fan Surrounding LWA	27	47	44	44	49	51	42	30
Directivity Correction	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
SPL with Distance Correction 'r = 2.4 ' (Direct i.e. no Barrier)	14	34	31	31	36	38	29	17
Barrier Attenuation	9	11	14	17	20	23	25	28
A-Weighted SPL at NSR	5	23	17	15	17	16	4	-11
Broadband Predicted A weighted SPL at NSR					25.9			

Table 10: Predicted Fan Surround Sound Pressure Level Calculations at NSR

Data	Frequency dB(A)							
	63	125	250	500	1000	2000	4000	8000
Condenser SWL (68dBA Broadband)	61	61	61	61	61	61	61	61
Directivity Correction	6	6	6	6	6	6	6	6
SPL from Condenser 1 with Distance Correction 'r = 3.4 ' (Direct i.e., no Barrier)	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.4
Barrier Attenuation Condenser 1	12.1	14.7	17.4	20.3	23.3	26.3	29.3	32.3
A Weighting	-26.2	-16.1	-8.6	-3.2	0	1.2	1	-1.1
A-Weighted SPL at NSR of Condenser 1	7	15	19	22	22	20	17	12
SPL at NSR from Condenser 1				27.8				
SPL from Condenser 2 with Distance Correction 'r = 3.8 ' (Direct i.e., no Barrier)	44.4	44.4	44.4	44.4	44.4	44.4	44.4	44.4
Barrier Attenuation Condenser 2	13.0	15.6	18.5	21.4	24.3	27.3	30.3	33.3
A Weighting	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1
A-Weighted SPL at NSR of Condenser 2	5.2	12.7	17.3	19.8	20.1	18.3	15.1	10.0
SPL at NSR from Condenser 2				25.8				
Logarithmically Combined SPL at NSR from Condensers				30.0				
Comparison to 36dB LA90 + 3dB of 23:00-00:00				-6				

Table 11: Maximum Sound Power Level on Condensers Calculations Sound Pressure Level Calculations

Standardized level difference according to BS EN ISO 140-4

Field measurements of airborne sound insulation between rooms

Client: The Lamb at Angmering
Description: The Square, Angmering, Littlehampton BN16 4EA

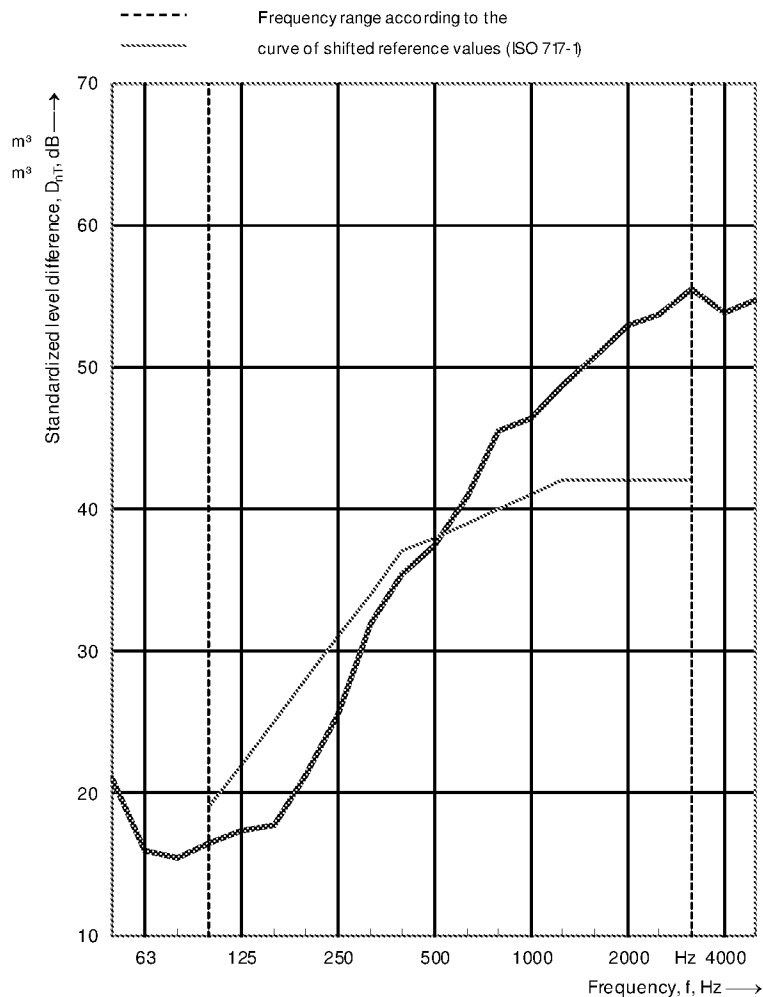
Date of test: 24/11/2021

Object: Comercial Unit Front To Flat 1 Bedroom 1

Source room volume:

Receiving room volume:

Frequency f [Hz]	D_{nT} 1/3 octave [dB]
50	21.1
63	16.0
80	15.4
100	16.5
125	17.3
160	17.7
200	21.2
250	25.6
315	31.9
400	35.4
500	37.5
630	40.9
800	45.5
1000	46.4
1250	48.7
1600	50.7
2000	52.9
2500	53.7
3150	55.5
4000	53.8
5000	54.7



Rating according to ISO 717-1

$D_{nT,w}(C,C_{tr}) = 38$ (-3 ; -8) dB

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

$C_{50-3150} = -3$ dB $C_{50-5000} = -2$ dB $C_{100-5000} = -2$ dB

$C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -8$ dB

Company: Acoustic Associates

No. of test report: J3293/1

Date: 01/12/2021

Signature: Martyn Chambers

Figure 21: Sound Insulation Test Graph - Comercial Unit Front To Flat 1 Bedroom 1

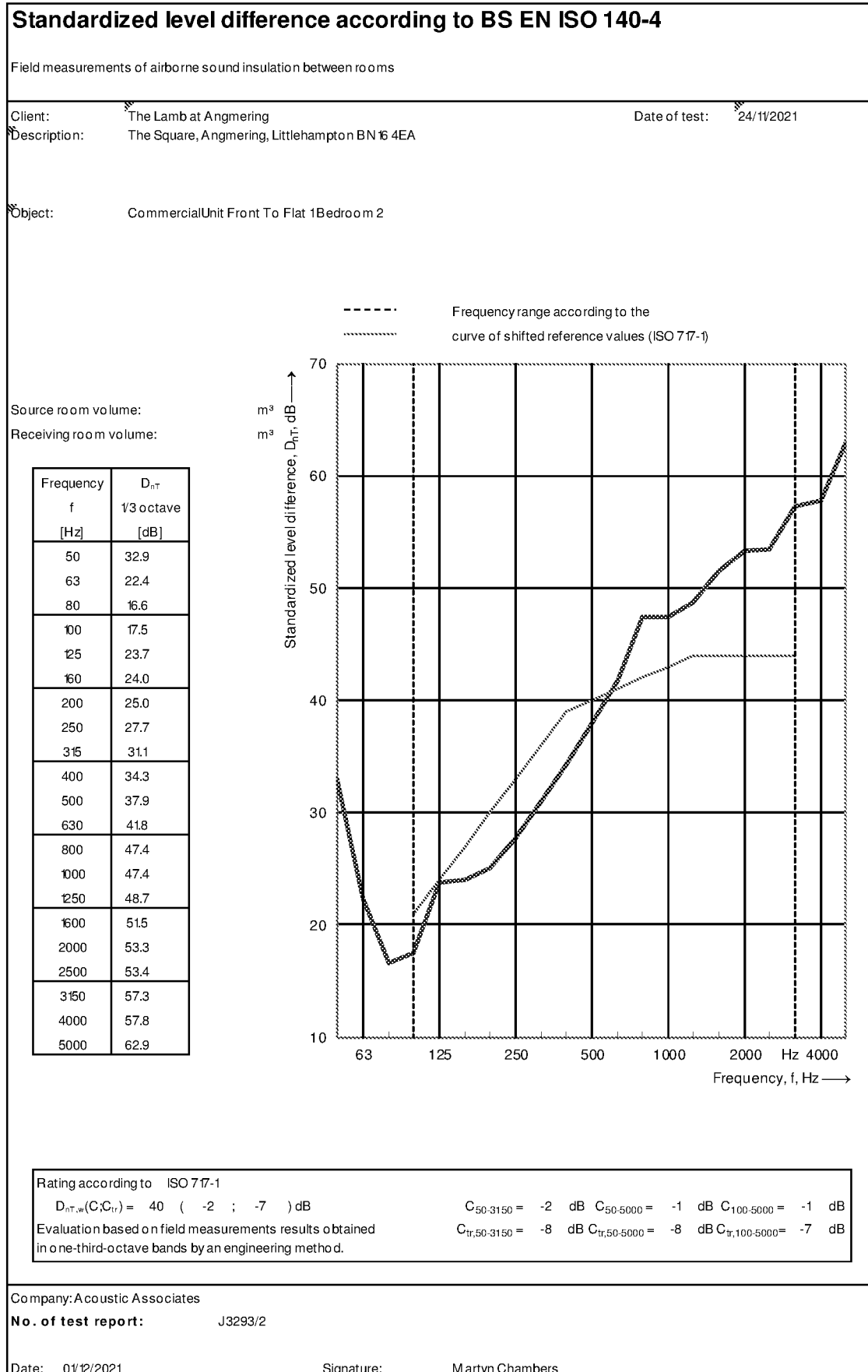


Figure 22: Sound Insulation Test Graph - Commercial Unit Front To Flat 1 Bedroom 2

Standardized level difference according to BS EN ISO 140-4

Field measurements of airborne sound insulation between rooms

Client: The Lamb at Angmering
Description: The Square, Angmering, Littlehampton BN16 4EA

Date of test: 24/11/2021

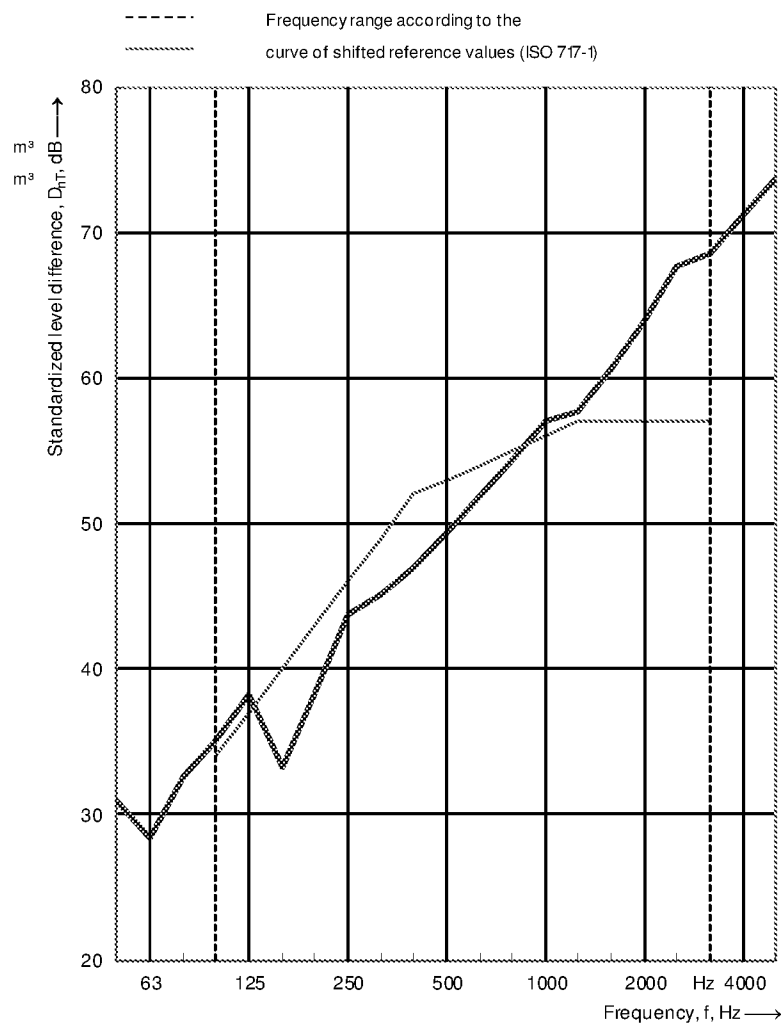
Object: Flat 2 Lounge Kitchen Commercial Unit Rear Storage Room

Source room volume:

Receiving room volume:

Frequency f [Hz]	D_{nT} 1/3 octave [dB]
50	31.0
63	28.4
80	32.6
100	35.0
125	38.2
160	33.2
200	38.2
250	43.7
315	45.1
400	46.9
500	49.3
630	51.9
800	54.4
1000	57.0
1250	57.7
1600	60.6
2000	64.0
2500	67.6
3150	68.5
4000	71.2
5000	73.7

¹ Values at limit of measurement



Rating according to ISO 717-1

$D_{nT,w}(C;C_{tr}) = 53$ (-2 ; -6) dB

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

$C_{50-3150} = -2$ dB $C_{50-5000} = -1$ dB $C_{100-5000} = -1$ dB

$C_{tr,50-3150} = -9$ dB $C_{tr,50-5000} = -9$ dB $C_{tr,100-5000} = -6$ dB

Company: Acoustic Associates

No. of test report: J3293/3

Date: 01/12/2021

Signature: Martyn Chambers

Figure 23: Sound Insulation Test Graph - Flat 2 Lounge Kitchen Commercial Unit Rear Storage Room