



Architectural & Environmental Acousticians

Noise & Vibration Engineers

Discharge of Planning Condition 7

Land Adjacent to Tars Farm House



Discharge of Planning Condition 7

Project: LAND ADJACENT TO TARS FARM HOUSE

Report reference: RP01-201163-R0

Client: MR PAUL VOLLER
TARS FARM
CHURCH LANE
BARNHAM
WEST SUSSEX
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1. INTRODUCTION

- 1.1 Cass Allen has been instructed by Mr Paul Voller to assess the acoustic design of a new development at Land Adjacent to Tars Farm House in Barnham.
- 1.2 The assessment has been carried out in accordance with the requirements of a noise related planning condition that has been imposed on the development. The condition is:

7 *No development shall commence until an acoustic assessment has been undertaken to determine the impact of noise from the nearby railway line. The results of the assessment and details of a scheme of mitigation measures necessary to ensure an appropriate level of aural amenity within habitable rooms and in garden areas shall be submitted and approved in writing by the Local Planning Authority. The assessment shall demonstrate that the internal noise levels within the residential units will conform to the "Indoor ambient noise levels for dwellings" guideline values specified within Table 4 under section 7.7.2 of BS 8233:2014. All works, which form part of the approved scheme, shall be completed before any part of the development is occupied and shall thereafter be maintained in accordance with the approved details. The assessment and mitigation scheme shall be compiled by a competent acoustician on sound insulation and noise reduction for buildings. The scheme should take into account the correct number of air changes required for noise affected rooms.*

Reason: To protect the amenity of local residents in accordance with Policy QE DM1 of the Arun Local Plan. This is required to be a pre commencement condition because it is necessary to ensure that noise mitigation measures are built into the construction of the houses.

- 1.3 This report contains technical terminology; a glossary of terms can be found at www.cassallen.co.uk/glossary.

2. DEVELOPMENT DESCRIPTION

- 2.1 The development comprises four residential properties. A current drawing of the proposed development layout is shown in Appendix 1.
- 2.2 The site is located in a predominantly residential area, bounded to the south by Tars Farm House and Church Lane. To the north of the site are paddocks, a railway line (the West Coastway Line) and Barnham Railway Station. To the east and west of the site is residential area.
- 2.3 An annotated aerial photo of the site is shown in Figure 1 below.

Figure 1 Annotated Aerial Photo



- 2.1 To address the requirements of Planning Condition 7, noise affecting the habitable areas of the proposed development and facade design has been assessed.

3. NOISE AFFECTING THE DEVELOPMENT

- 3.1 The noise levels that will exist within the habitable areas of the finished development have been predicted based on the existing noise environment at the site and details for the design of the development. The predicted noise levels have then been compared with appropriate design criteria. Suitable mitigation measures have been identified where necessary to achieve acceptable noise levels.

Design criteria – Internal noise levels

- 3.2 Planning Condition 7 refers to BS8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' in relation to the design criteria for acceptable noise levels in acoustically sensitive areas of the new development. The design criteria given in Table 4 under section 7.7.2 of BS8233:2014 are summarised in Table 1 below.

Table 1 BS8233:2014 Internal Noise Criteria

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB LAeq,16hour	-
Dining	Dining room/area	40 dB LAeq,16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour

- 3.3 It is also considered appropriate in this case to assess the potential impact of noise emissions from individual train passes on the nearby railway line on the bedrooms of the development during the night-time. This is in line with guidance given in BS8233:2014, which points out that regular individual noise events during the night have the potential to cause sleep disturbance.
- 3.4 Appropriate design criteria for acceptable maximum noise levels in habitable rooms of new residential developments are given in the World Health Organisation (WHO) document '*Guidelines for community noise*', which recommends that "noise exceeding 45dB LAFmax should be limited, if possible" and that "for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB LAmx more than 10-15 times per night".
- 3.5 BS8233 also states that it is desirable that noise levels in external amenity areas of residential developments do not exceed 50 dB LAeq and that 55 dB LAeq,T should be regarded as a upper guideline value. BS8233 recognises however that these guideline values will not always be achievable in city centres or urban areas adjoining main roads or other transport sources. In these cases, BS8233 states that the development should be designed to achieve the lowest practical noise levels in the amenity spaces.
- 3.6 The following acoustic design criteria have therefore been adopted for the development:
- Average noise levels in living rooms and dining rooms during the day should not exceed 35 dB LAeq,0700-2300hrs and 40 dB LAeq,0700-2300hrs respectively;
 - Average noise levels in bedrooms should not exceed 35 dB LAeq,0700-2300hrs during the day and 30 dB LAeq,2300-0700hrs during the night;

- Maximum noise levels should not regularly exceed 45 dB LA_{max} in bedrooms during the night;
- Where possible, average noise levels in external amenity areas during the day should be lower than 50-55 dB LA_{eq},0700-2300hrs.

Existing site noise levels

- 3.7 A noise survey was carried out at the site from 11th August to 12th August 2020 to assess existing noise levels in the area. The full methodology and results of the noise survey are provided in Appendix 2. No significant noise was identified from Barnham Railway Station itself (e.g. announcements over PA systems).
- 3.8 Background noise levels (LA₉₀) across the site were dictated by distant road traffic and natural sources.
- 3.9 Areas of the development subject to the highest levels of train noise are at the northern edge of the site. The noise survey results show that noise levels at this position are as follows:
- Average noise levels during the daytime - 45 dB LA_{eq},0700-2300hrs;
 - Average noise levels during the night-time - 41 dB LA_{eq},2300-0700hrs;
 - Typical maximum noise levels during the night-time - 50 dB LA_{max}.

The above noise levels are at a distance of 170m from the nearest railway tracks (this is the distance of the nearest dwelling in the development).

Internal noise levels in noise-sensitive rooms

- 3.10 The facades of the development will be constructed using the wall constructions given in Table 2 below. The sound insulation performance of the external wall constructions is also shown. These were predicted using INSUL v9.0 facade modelling software, including appropriate design margins where necessary.

Table 2 External Wall Constructions

Type	Construction	Predicted Sound Reduction (dB)	
		Rw	Rw + Ctr
Facing Brick	103mm facing brickwork, 135mm cavity with 85mm Celotex CW500 insulation board, 100mm Thermalite Shield blockwork, 1x12.5mm plasterboard	56	53

- 3.11 Units will be ventilated via trickle ventilators in the external facades with openable windows for the provision of purge ventilation (as per System 1 or System 3 from Building Regulations Part F).
- 3.12 Calculations were carried out using facade modelling software in accordance with the methodology given in BS8233:2014 to calculate the sound insulation performance required of the glazing and ventilation to achieve the nominated internal noise criteria.

- 3.13 The calculations were carried out based on the dimensions/details for facade elements taken from project drawings.
- 3.14 The results of the calculations are shown in Appendix 3 and are summarised in Table 3 below.

Table 3 Acoustic Requirements for Habitable Rooms

Rooms	Glazing Performance Requirements (inc. Frames)	Ventilator Performance Requirements
All habitable rooms	26 dB Rw+Ctr	31 dB D _{new} ,w + Ctr

- 3.15 Based on the results of the calculations summarised in Table 3 and the measured noise levels at the site (considering both the day and night-time average and maximum noise levels), a specification has been developed for all facades of the development. The facade specification is shown in Appendix 4.
- 3.16 Our calculations show the glazing and ventilation requirements are very low and standard facade elements would easily be sufficient to achieve acceptable internal noise levels.
- 3.17 The sound insulation performance values in Table 3 could typically be achieved by the glazing and ventilator types shown in Table 4.

Table 4 Typical Glazing & Ventilator Acoustic Performances

Glazing (in Good Quality Sealed Frames)	Typical Weighted Sound Reduction (Rw + Ctr)
4/16/4mm standard thermal double glazing	26
Ventilators	Typical Acoustic Performance (D _{new} + Ctr)
Standard 'hit & miss' in-frame trickle ventilator	31

- 3.18 It can be seen from the above that acceptable internal noise levels will be achievable in the development with the use of standard thermal double glazing and standard 'hit and miss' trickle ventilators.

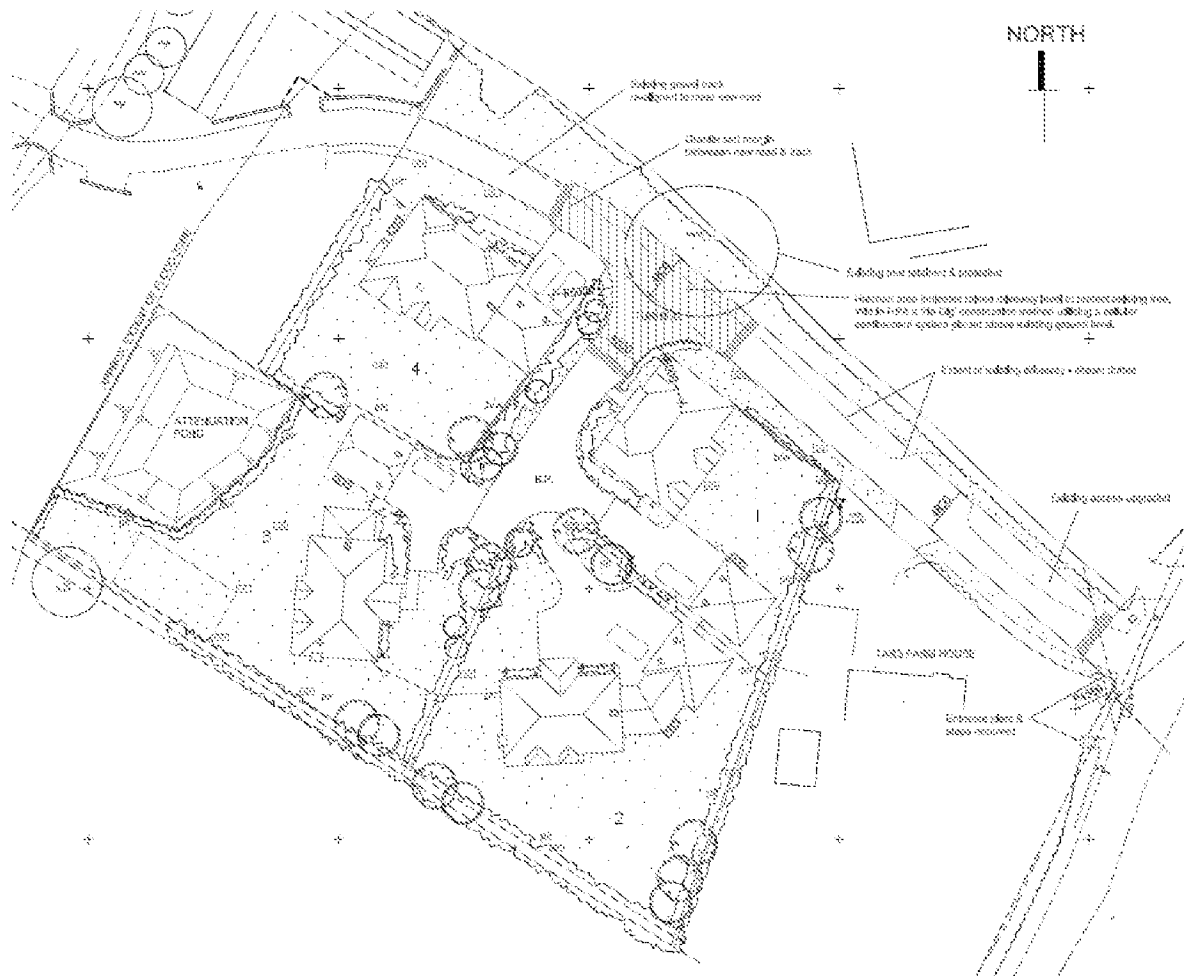
Noise levels in external amenity areas

- 3.19 The layout of the development has also been reviewed in relation to the BS8233 recommendation that noise levels in external amenity areas should ideally not exceed 50 – 55 dB LAeq,T.
- 3.20 The noise survey results indicate that noise levels in external amenity areas are predicted to achieve the BS8233 recommended levels.
- 3.21 It is our view therefore that the proposed development complies with the requirements of Planning Condition 7.

4. CONCLUSIONS

- 4.1 Cass Allen was instructed by Mr Paul Voller assess the acoustic design of the proposed development as required by Planning Condition 7.
- 4.2 A noise survey was carried out at the site. Train noise affecting the development has been assessed in accordance with the requirements of Planning Condition 7 imposed on the development.
- 4.3 The design of the development is considered to be acceptable subject to the glazing and ventilation specification indicated in this report.
- 4.4 It is our view that this report contains the information required to discharge Planning Condition 7 on the development.

Appendix 1 Development Layout



Appendix 2 Survey Results

Survey Summary:

The survey comprised short-term operator attended noise measurements and longer-term unattended noise monitoring at the site. Noise levels at the site were generally dictated by train movements on the adjacent railway lines, occasional aircraft overflights, sporadic building activity nearby (hand tools, banging etc) and natural sources (birdsong etc). Occasional train horns dictate the highest maximum noise levels.

Survey Period:

11/08/2020 to 12/08/2020

Survey Objectives:

- To identify noise sources that contribute to ambient noise levels at the site;
- To measure noise levels around the site over a typical day and night-time period.

Equipment Used (Appendix 2, Table 1):

Type	Manufacturer	Model	Serial Number
Sound level meter ¹	Brüel & Kjær	2250 (G1)	2630237
Calibrator	Brüel & Kjær	4231	2115551
Sound level meter ¹ (noise logger)	Rion	NL-32	00530374
Tri-Axial Vibration Meter	Rion	VM-54	00360145

Note 1: All sound level meters were calibrated before and after measurement periods and no significant drift in calibration was found to have occurred. The results of the measurements are therefore considered to be representative.

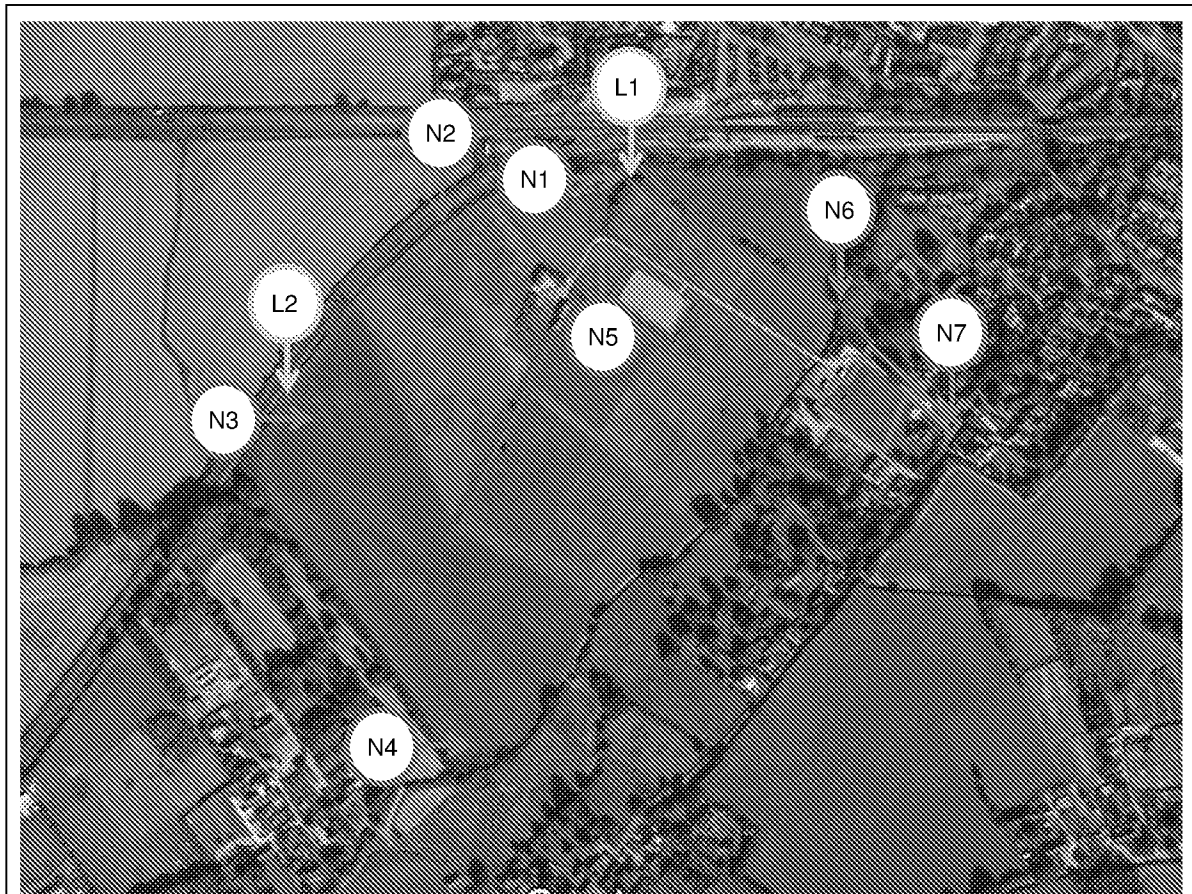
Weather Conditions:

The observed weather conditions were acceptable for acoustic measurement throughout the attended survey periods (low wind speeds and no rain). Weather records for the area confirmed that weather conditions were also generally acceptable for acoustic measurement during the unattended monitoring.

Measurement Positions (Appendix 2, Table 2):

Position (refer plan below)	Description
L1 & L2	Longer-term unattended noise monitoring positions. 1.5m above ground level with line of sight to the railway. L2 approx. 3.5 from track
N1 – N7	Attended noise monitoring position. 1.5m above ground level.

Site Plan showing Measurement Positions (Appendix 2, Figure 1):



Attended Noise Monitoring Results (Appendix 2, Table 3):

Date	Position	Time	Meas. Length	LAeq, dB	LAmx, dB	LA90, dB	Observations
11/08/2020	N1	10:37	34 mins	54	75	31	Noise dictated by train passes on the adjacent railway. Noise levels were low between train passes and dictated by distant aircraft, road traffic and natural sources (birdsong). Sporadic construction activities (hand tools etc) associated with nearby building works also contributed to the measured levels. No noise from Barnham Station
11/08/2020	N1	11:14	9 mins	54	72	32	As above.
11/08/2020	N2	11:33	23 mins	62	87	31	Train passes and natural sources. No construction works.
11/08/2020	N4	12:03	8 mins	41	55	35	Natural sources, distant traffic, occasional train passes and construction activities.
11/08/2020	N3	12:20	9 mins	55	76	32	Train passes and natural sources. No construction works. Position N3 is 10m away from the boundary of the site.
11/08/2020	N5	12:42	6 mins	47	60	33	Aircraft overflight, one quiet train pass, natural sources.
11/08/2020	N6	12:59	4 mins	44	56	39	Aircraft overflight, distant train passes, natural sources. No noise from Barnham Station.

Attended Noise Monitoring Results (Appendix 2, Table 3):

Date	Position	Time	Meas. Length	LAeq, dB	LAmix, dB	LA90, dB	Observations
11/08/2020	N5	13:08	5 mins	44	68	34	Aircraft overflight, one quiet train pass, natural sources. Some construction noise.
11/08/2020	N7	13:30	4 mins	51	69	38	Natural sources, distant road traffic, occasional vehicle pass (two during measurement)

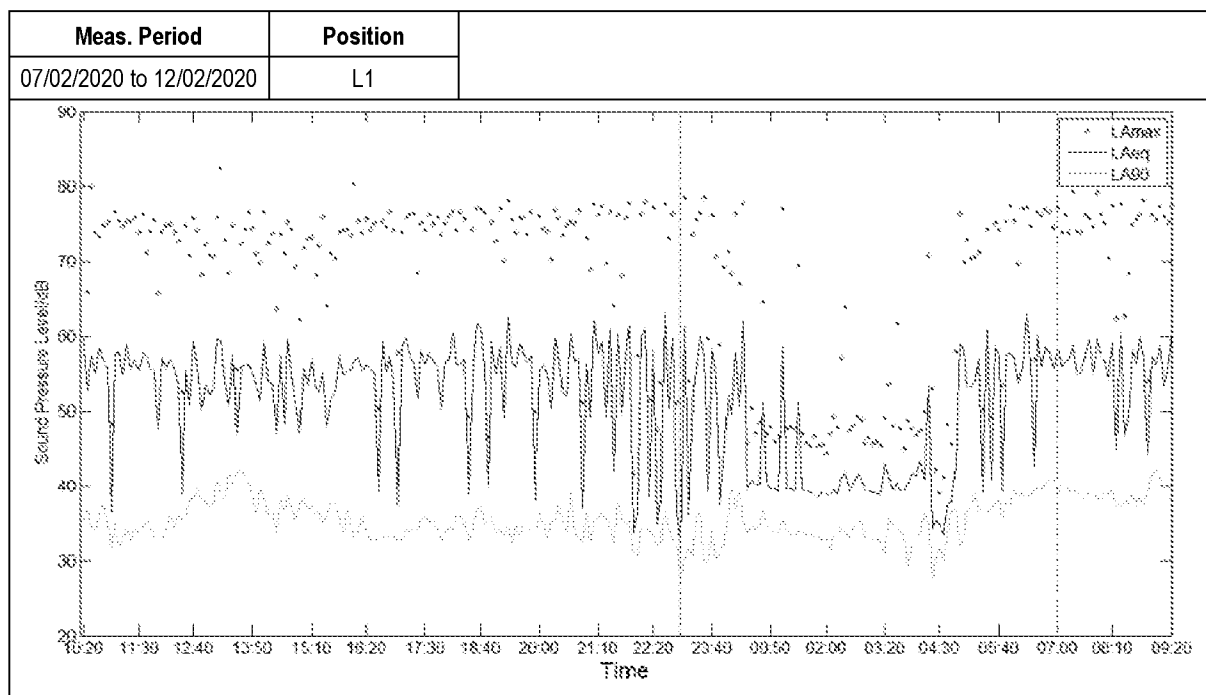
Unattended Noise Monitoring Results (Appendix 2, Table 4):

Meas. Period	Position	Daytime (0700-2300hrs)		Night-time (2300-0700hrs)		
		LAeq,16hr, dB	LA90,1hr dB ¹	LAeq,8hr, dB	LA90,5mins, dB ¹	LAmix, dB ²
11/08/2020 to 12/08/2020	L1	57	34	54	33	77
11/08/2020 to 12/08/2020	L2	62	37	58	27	84

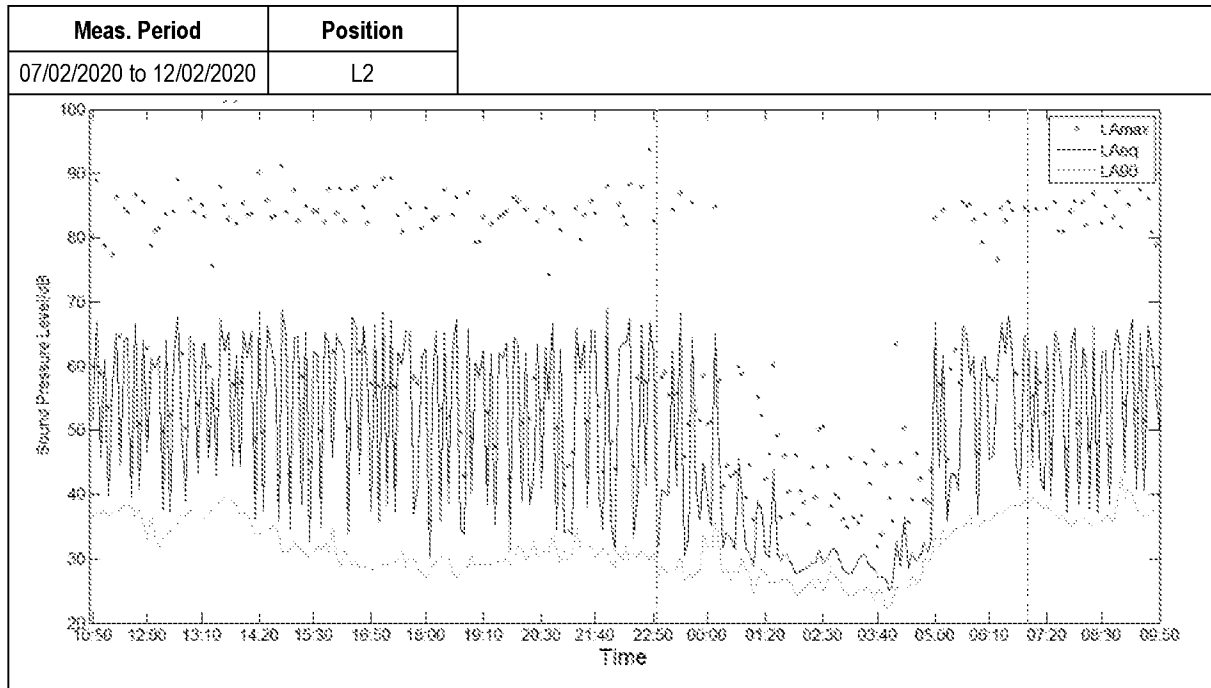
Note 1: Typical lowest measured during the period shown.

Note 2: Highest typical maximum noise level during the night-time (not exceeded more than 10-15 times per night).

Unattended Noise Monitoring Results (Appendix 2, Figure 2):



Unattended Noise Monitoring Results (Appendix 2, Figure 3):



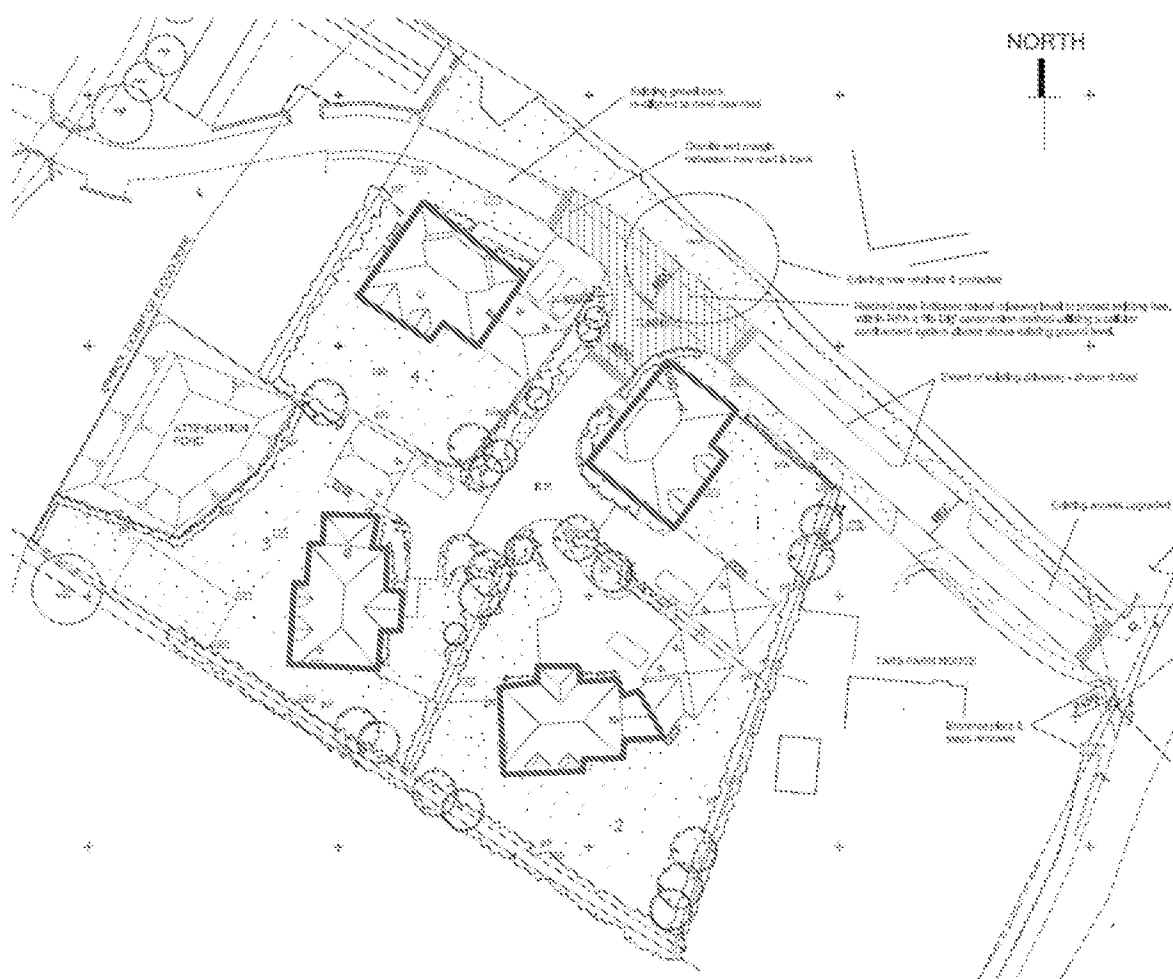
Appendix 3 Facade Calculations

Appendix 4 Acoustic Facade Specification

Reference	Colour	Glazing Specification	Ventilator Specification
FC01		26 dB Rw+Ctr	31 dB Dnew+Ctr

NOTES: Values must include the Ctr correction. Manufacturers or suppliers should provide laboratory test data demonstrating that the proposed systems are capable of achieving the values given. Windows should be tested as complete systems (rather than just the glazing in isolation).

All floors:



CLIENT: Mr Paul Voller
 PROJECT: Land adjacent to Tars Farm House
 ROOM: Bedroom 4 (single), Plot 2
 RUN REF: 21163
 VARIANT: Daytime Average Noise Levels (LAeq,16hr)

Room Dimensions [m] $\begin{matrix} W \\ 2.4 \end{matrix} \times \begin{matrix} L \\ 4.0 \end{matrix} \times \begin{matrix} H \\ 2.4 \end{matrix}$
 Room Volume = 23.0 m³
 Partition Area = 15.4 m²
 Ventilation ref area = 10.0 m²
 Free Field SPL K = 3 dB

SELECT Free Field or Façade SPL for model input >>>

EXTERNAL SPECTRUM (A weighted)

Direct input - Free Field SPL (A weighted octave bands) dB →
 Road traffic spectrum (according to BS 8233:1999 section 6)

14.3 27.1 32.9 42.4 38.1 32.8 35.1 Direct input

REVERBERATION TIME

DIRECT INPUT → No data

EQUAL RT for all bands → Default - RT set to 0.5s

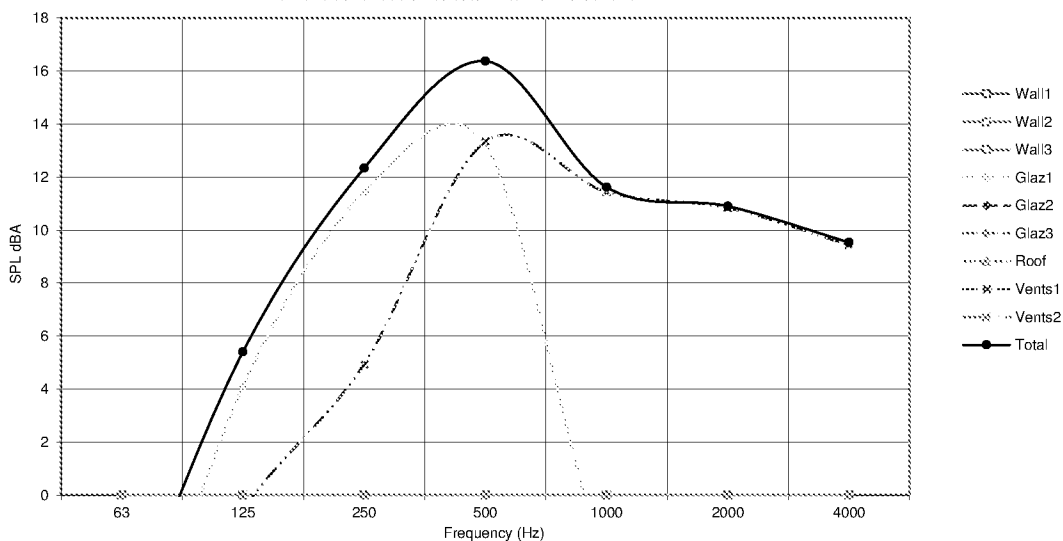
NOTES:

Façade Element	Area [m ²]	SRI dB to BS EN ISO 140-3:1995							Rw	C	Ctr
Wall 1 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm bloc	8.1	43	48	47	49	59	69	79	1%	56	-3
ATTENUATION											
Wall 2 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm bloc	5.8	43	48	47	49	59	69	79	1%	56	-3
ATTENUATION											
Wall 3 WALLS	0	0	0	0	0	0	0	0	0%		
ATTENUATION											
Glazing 1 26 dB Rw + Ctr - Standard Thermal Double Glazing	1.5	19	19	18	25	37	36	38	37%	26 (inc Ctr)	-
ATTENUATION											
Glazing 2 GLAZING	0	0	0	0	0	0	0	0	0%		
ATTENUATION											
Glazing 3 GLAZING	0	0	0	0	0	0	0	0	0%		
ATTENUATION											
Roof ROOF / FLOOR	0	0	0	0	0	0	0	0	0%		
ATTENUATION											
Resultant composite Façade SRI		29	29	28	35	46	46	48			
Resultant SPL inside room excluding ventilators dB		16.0	-9	4	11	13	-2	-7	-7	40%	

Ventilator Type	Num	D _{avg} dB to BS EN 20140-10:1992							Dnew	C	Ctr
Ventilation H6 and miss trickle (4000mm ²) e.g. Trion Trivent XS13	2	30	35	35	36	34	29	33	50%	32	-1
ATTENUATION											
Ventilation VENTS	0	0	0	0	0	0	0	0	0%		
ATTENUATION											
Resultant SPL inside room through ventilators dB		17.8	-8	-1	5	13	11	11	9	50%	

Total SPL inside room

Element contribution to total internal noise level



CLIENT:	Mr Paul Voller	Room Dimensions [m]	W	L	H
PROJECT:	Land adjacent to Tars Farm House		2.4	4.0	2.4
ROOM:	Bedroom 4 (single), Plot 2				
RUN REF:	21163	Room Volume =	23.0 m3		
VARIANT:	Night-time Average Noise Levels (LAeq,8hr)	Partition Area =	15.4 m2		
		Ventilation ref area =	10.0 m2		
		Free Field SPL K =	3 dB		

SELECT Free Field or Façade SPL for model input >>> 

EXTERNAL SPECTRUM (A weighted)

dBA	63	125	250	500	1000	2000	4000
Direct input - Free Field SPL (A weighted octave bands) dB	41.0	10.3	23.1	28.9	38.4	34.1	28.8
Road traffic spectrum (according to BS 8233:1999 section 6)							
	10.3	23.1	28.9	38.4	34.1	28.8	31.1

Direct input

REVERBERATION TIME

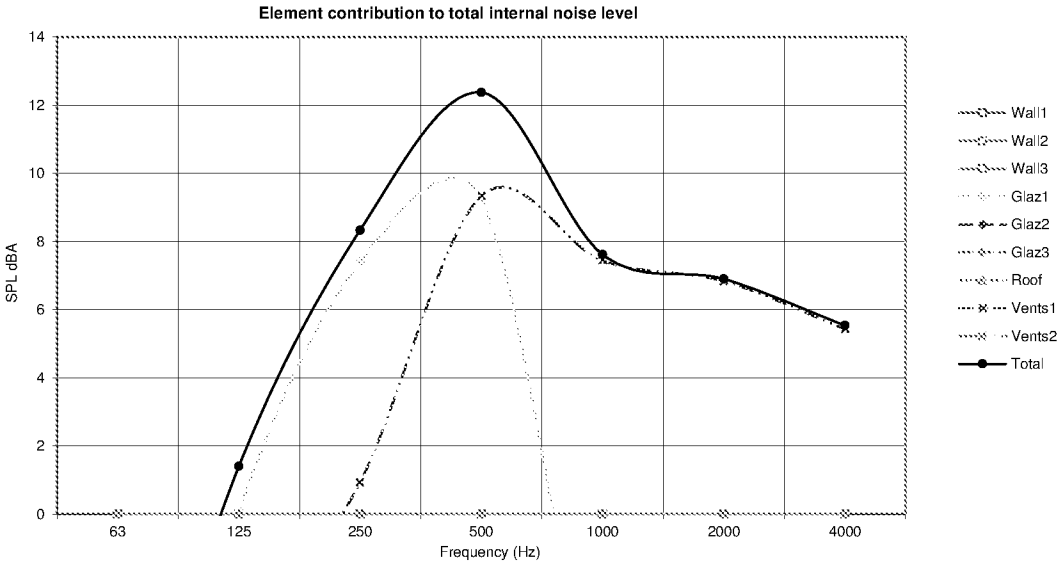
DIRECT INPUT								No data
EQUAL RT for all bands								
	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Default - RT set to 0.5s

NOTES:

Façade Element	Area [m2]	SRI dB to BS EN ISO 140-3:1995							Rw	C	Ctr
Wall 1 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm ATTENUATION	8.1	43	48	47	49	59	69	79	2%	56	-3
Wall 2 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm ATTENUATION	5.8	43	48	47	49	59	69	79	2%	56	-3
Wall 3 WALLS ATTENUATION		0	0	0	0	0	0	0	0%		
Glazing 1 26 dB Rw + Ctr - Standard Thermal Double Glazing ATTENUATION	1.5	19	19	18	25	37	36	38	34%	26 (inc Ctr)	-
Glazing 2 GLAZING ATTENUATION		0	0	0	0	0	0	0	0%		
Glazing 3 GLAZING ATTENUATION		0	0	0	0	0	0	0	0%		
Roof ROOF / FLOOR ATTENUATION		0	0	0	0	0	0	0	0%		
Resultant composite Façade SRI		29	29	28	35	46	46	48			
Resultant SPL inside room excluding ventilators dB		12.0	-13	0	7	9	-6	-11	-11	40%	

Ventilator Type	Num	D _{avg} dB to BS EN 20140-10:1992							Dnew	C	Ctr
Ventilation Hit and miss trickle (4000mm ²) e.g. Tron Trivent XS13 ATTENUATION	2	30	35	35	36	34	29	33	0%	32	-1
Ventilation VENTS ATTENUATION		0	0	0	0	0	0	0	0%		
Resultant SPL inside room through ventilators dB		13.8	-12	-5	1	9	7	7	5	50%	

Total SPL inside room



CLIENT: Mr Paul Voller
 PROJECT: Land adjacent to Tars Farm House
 ROOM: Bedroom 4 (single), Plot 2
 RUN REF: 21163
 VARIANT: Night Time Maximum Noise Levels (LAmax)

Room Dimensions [m] $\begin{matrix} W \\ 2.4 \end{matrix} \times \begin{matrix} L \\ 4.0 \end{matrix} \times \begin{matrix} H \\ 2.4 \end{matrix}$
 Room Volume = 23.0 m³
 Partition Area = 15.4 m²
 Ventilation ref area = 10.0 m²
 Free Field SPL K = 3 dB

SELECT Free Field or Façade SPL for model input >>>

EXTERNAL SPECTRUM (A weighted)

Direct input - Free Field SPL (A weighted octave bands) dB ---->
 Road traffic spectrum (according to BS 8233:1999 section 6)

dBA	63	125	250	500	1000	2000	4000
50.0	19.3	32.1	37.9	47.4	43.1	37.8	40.1
	19.3	32.1	37.9	47.4	43.1	37.8	40.1

Direct input

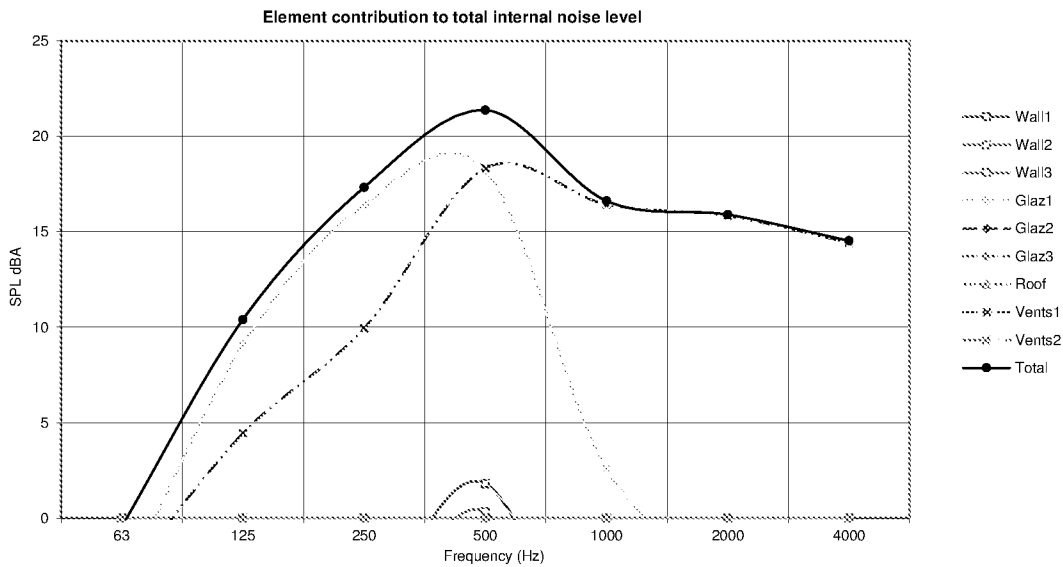
REVERBERATION TIME

DIRECT INPUT ----> No data
 EQUAL RT for all bands ----> Default - RT set to 0.5s

Façade Element	Area [m ²]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm t ATTENUATION	8.1	43	48	47	49	59	69	79	0%	56		-3
Wall 2 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm t ATTENUATION	5.8	43	48	47	49	59	69	79	0%	56		-3
Wall 3 WALLS ATTENUATION		0	0	0	0	0	0	0	0%			
Glazing 1 26 dB Rw + Ctr - Standard Thermal Double Glazing ATTENUATION	1.5	19	19	18	25	37	36	38	35%	26 (inc Ctr)	-	-
Glazing 2 GLAZING ATTENUATION		0	0	0	0	0	0	0	0%			
Glazing 3 GLAZING ATTENUATION		0	0	0	0	0	0	0	0%			
Roof ROOF / FLOOR ATTENUATION		0	0	0	0	0	0	0	0%			
Resultant composite Façade SRI		29	29	28	35	46	46	48				
Resultant SPL inside room excluding ventilators dB		21.0	-4	9	16	18	3	-2	-2	40%		

Ventilator Type	Num	D _{avg} dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation HR and miss trickle (4000mm ²) e.g. Tiron Trivent XS13 ATTENUATION	2	30	35	35	36	34	29	33	55%	32		-1
Ventilation VENTS ATTENUATION		0	0	0	0	0	0	0	0%			
Resultant SPL inside room through ventilators dB		22.8	-3	4	10	18	16	16	14	50%		

Total SPL inside room



CLIENT: Mr Paul Voller
 PROJECT: Land adjacent to Tars Farm House
 ROOM: Living Room, Plot 3
 RUN REF: 21163
 VARIANT: Daytime Average Noise Levels (LAeq,16hr)

Room Dimensions [m] **4.3** X **7.3** X **2.4**
 Room Volume = **75.3** m³
 Partition Area = **29.2** m²
 Ventilation ref area = **10.0** m²
 Free Field SPL K = **3** dB

SELECT Free Field or Façade SPL for model input >>>

EXTERNAL SPECTRUM (A weighted)

Direct input - Free Field SPL (A weighted octave bands) dB ---->
 Road traffic spectrum (according to BS 8233:1999 section 6)

dBA	63	125	250	500	1000	2000	4000
45.0	14.3	27.1	32.9	42.4	38.1	32.8	35.1
	14.3	27.1	32.9	42.4	38.1	32.8	35.1

Direct input

REVERBERATION TIME

DIRECT INPUT ---->

EQUAL RT for all bands ---->

								No data
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	Default - RT set to 0.5s

NOTES:

Façade Element	Area [m ²]	SRI dB to BS EN ISO 140-3:1995							Rw	C	Ctr
Wall 1 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm t ATTENUATION	7.5	43	48	47	49	59	69	79	1%	56	-3
Wall 2 103mm brick, 135mm cavity, 85mm Celotex insulation board, 100mm t ATTENUATION	9.6	43	48	47	49	59	69	79	1%	56	-3
Wall 3 WALLS ATTENUATION		0	0	0	0	0	0	0	0%		
Glazing 1 26 dB Rw + Ctr - Standard Thermal Double Glazing ATTENUATION	11.4	19	19	18	25	37	36	38	73%	26 (inc Ctr)	-
Glazing 2 26 dB Rw + Ctr - Standard Thermal Double Glazing ATTENUATION	0.7	19	19	18	25	37	36	38	1%	26 (inc Ctr)	-
Glazing 3 GLAZING ATTENUATION		0	0	0	0	0	0	0	0%		
Roof ROOF / FLOOR ATTENUATION		0	0	0	0	0	0	0	0%		

Resultant composite Façade SRI

Resultant SPL inside room excluding ventilators dB

23	23	21	29	40	40	42	
19.8	-5	8	15	17	2	-3	-3

Ventilator Type	Num	D _{avg} dB to BS EN 20140-10:1992							Dnew	C	Ctr
Ventilation HR and miss trickle (4000mm ²) e.g. Tiron Trivent XS13 ATTENUATION	3	30	35	35	36	34	29	33	21%	32	-1
Ventilation VENTS ATTENUATION		0	0	0	0	0	0	0	0%		

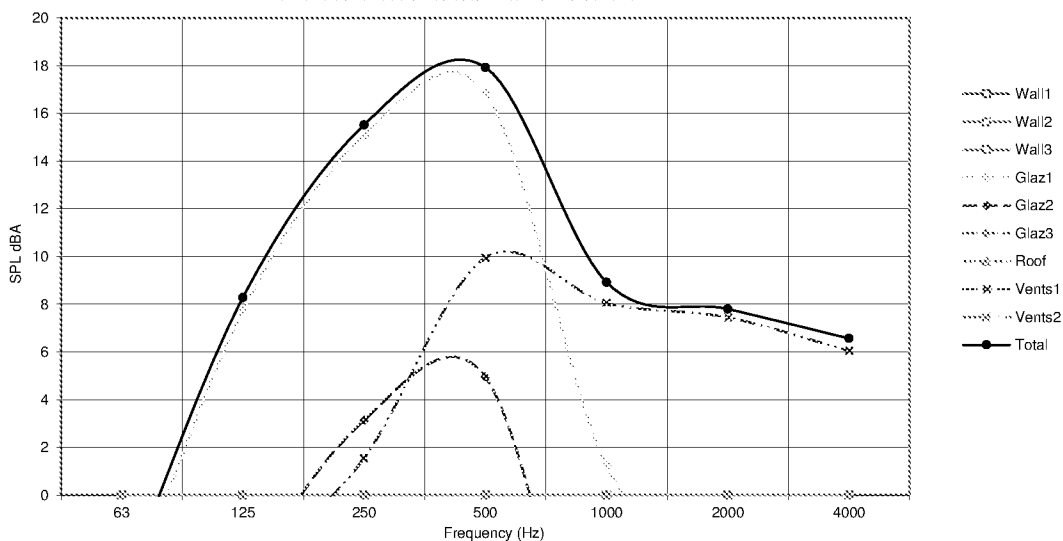
Resultant SPL inside room through ventilators dB

14.4	-12	-4	2	10	8	7	6
23%							

Total SPL inside room

20.9	-4	8	16	18	9	8	7
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Element contribution to total internal noise level





Architectural & Environmental Acousticians

Noise & Vibration Engineers

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