Ref. 7581/0049/RDC/1

6th September 2012

ACOUSTIC
CONSULTANTS

Residential Development off Higham Lane, Dodworth

Noise impact assessment

architectural

environmental

occupational

industrial

noise control at source

project management

planning

legal services

expert witness

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Appendices

Figure 1 – Site layout and measurement positions

Ambient Noise Survey measurements

Noise Break-in calculation spreadsheets

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1.0 SUMMARY

At the request of Redrow Homes Limited, Philip Dunbavin Acoustics have conducted an assessment of the ambient noise climate noise break-in for the proposed development off Higham Lane, Dodworth.

Measurements have been taken of the ambient noise climate between 0700 and 1000 during the daytime, and between 2300 – 0100 and 0600 – 0700 at night.

Glazing and ventilation have been specified in Section 6.3 to achieve the internal noise levels specified for habitable rooms in BS 8233 and World Health Organisation guidelines. Note that the specified glazing and ventilation treatments are only required for habitable rooms.

Report Prepared By:

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2.0 BRIEF FOR CONSULTANCY

PDA Ltd. were engaged to carry out the following:

a) We will travel to the site of the proposed development in Dodworth and perform an ambient noise survey in the vicinity of the proposed development. Measurements will be taken typically from 0600 to 1000 hours and 2300 to 0100 hours. The survey will be carried out in accordance with BS 7445 "Description and measurement of environmental noise".

b) In addition to the ambient noise measurements ground-borne vibration measurements will be taken. The results of the vibration survey will be assessed with reference to the recommended levels in BS6472 to determine whether induced vibration is likely to be disturbing to occupants.

c) We will calculate the noise propagation around the proposed site and assess noise levels at residences in accordance with the noise criteria of BS8233 and the World Health Organisation (WHO) Guidelines for Community Noise, and also with respect to the National Planning Policy Framework. We will propose suitable construction elements for the external envelope of the houses such that the internal noise climate meets the requirements of BS8233 'Sound insulation and noise reduction for buildings – code of practice', WHO Guidelines, or other suitable standard required by the Local Planning Authority.

d) Where the assessment of part b) indicates that vibration is likely to be disturbing to occupants we will propose suitable outline vibration isolation treatments to suitably isolate the building structure from the ground-borne vibration. Note that detailed vibration isolation design is beyond the scope of this proposal and further work would be required in the unlikely event that measured vibration levels exceeded the design criteria.

e) A full technical report will be prepared detailing all measurement procedures, calculations, results and mitigation measures suitable for submission to the Local Authority.

3.0 SITE DESCRIPTION

The site is a strip of land to the west of Higham Lane, Dodworth. The land is bounded on the north-west by the Huddersfield to Barnsley single track railway line beyond which is the A628 Whinby Road, and on the north-east is bounded by the rear gardens of houses on Hawthorne Crescent.

4.0 NOISE ASSESSMENT CRITERIA

4.1 National Planning Policy Framework

National Planning Policy is guided by the National Planning Policy Framework. With regard to Noise the Framework states the following;

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*

- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

> *There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*
>
> *NOEL – No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.2.21*
>
> *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur.*

The notes also offer an explanation of the term 'other adverse impacts' as follows;

> *... refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been specifically defined, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

Please note that the above guidance supersedes PPG 24 which has now been withdrawn.

4.2 BS8233:1999

BS8233 proposes acceptable internal noise levels in residences. Internal level criteria are expressed in terms of a 'good' or 'reasonable' standard and are detailed in the table below.

Table 1 - BS8233 recommended indoor ambient noise levels

Criterion	Typical Situation	Design range $L_{Aeq,T}$	
		Good	Reasonable
Reasonable Resting/Sleeping Conditions	Living rooms	30	40
	Bedrooms	30	35

In addition BS 8233 also mentions a separate 'reasonable' standard in bedrooms at night from individual noise events. This is expressed in terms of an L_{Amax} and to achieve this 'reasonable' standard the individual noise events should not 'normally' exceed 45 dB L_{Amax}. It should however be stressed that this 45 dB L_{Amax} is a stringent criterion, particularly with reference to what is essentially an urban development, and although BS 8233 states that it should not 'normally' be exceeded this does not preclude the level being exceeded for events which may not be considered to be 'normal'.

4.3 WHO Guidelines for community noise

The World Health Organisation also give guideline noise values for habitable rooms to prevent annoyance in living rooms and sleep disturbance in bedrooms. These criteria are the same as those given in BS 8233 with the exception that the 'reasonable' criterion for living rooms is reduced to 35 dB.

5.0 SURVEY DETAILS

An ambient noise survey was carried out at two locations close to the north-western boundary of the site to determine the noise levels incident on the site from the adjacent railway line and the A628 beyond. The measurement locations are shown in Figure 1 appended to this report.

5.1 Measurement Procedure

5.1.1 Survey times

The ambient noise survey was undertaken on the 29th and 30th September 2012 by Mr Wes Charlton of PDA Ltd. Measurements were taken from 2300 to 0100 and from 0600 to 1000 to capture the likely noisiest periods of the day and night.

5.1.2 Measurement Location

Measurements were taken from a two positions (See Figure 1).

5.1.3 Measurement Equipment

The ambient noise survey was conducted using a Rion NA-28 Class 1 sound level meter compliant with IEC 61672-1:2002.

The sound level meter was mounted with the microphone approximately 1.5 metres above ground level. Measurements were façade measurements taken 1m from the building façades.

The sound level meter was field calibrated both before and after the measurement period, during which time no significant deviation from the calibrated level was observed. The sound level meter was fitted with a microphone wind-shield at all times.

Vibration measurements were taken during a previous survey on the site reported in PDA report RG/YO/CJB/5778 dated 30th June 2008 the results of which are used in the impact assessment of this report.

5.2 Description of Noise Sources

Noise sources were dominated by distant traffic noise from the A628 and occasional trains on the adjacent railway line and occasional aircraft. Trains were observed to run one per hour in each direction with services timetabled to run from 0607 am until 2344 on weekdays, 0651 until 2314 on Saturdays and 0959 until 2012 on Sundays. During the survey two apparently empty passenger trains passed along the line between midnight and 1am, travelling relatively slowly. No freight trains were observed on the line and it is not believed that the line is likely to be used for freight.

5.3 Measured Results

The noise survey results are summarised in Table 2 below:

Table 2 – Summary of PDA noise measurements

Measurement location	Daytime Noise Level L_{Aeq}	Night-time Noise Level L_{Aeq}	L_{Amax}[1]
Position 1 East side of northern site boundary at 3m above ground to capture rail and road traffic noise	55	47	-
Position 2 – West side of northern site boundary 1.5 m above ground affected by rail noise only	56	50	79

Notes:
1. The LAmax level is the highest measurement recorded. WHO guidelines for community noise state that sleep disturbance may occur when the 45 dB LAmax criterion is exceeded for more than about 15 times during the 8 hour night-time period. Measurements at this development were taken for a minimum of one hour at each façade during the noisiest part of the night, hence taking the second loudest measurement will ensure that typically the L_{Amax} criterion will not be exceeded more than 15 times over the 8 hour night-time period.

Full measurement results are included in the appendix to this report.

6.0 NOISE BREAK-IN CALCULATIONS

Typical noise break-in to the habitable rooms has been calculated using sound insulation data for the façade elements and taking into account the typical room volume and an assumed reverberation time of 0.5 seconds for the rooms. The measurement positions were at the same distance from the railway line as the closest façades and have been used directly as the incident noise level on the nearest façades. For rooms not directly overlooking the railway line, either facing away from the railway, or for houses behind the first row of houses on the northern boundary of the site a conservative 5 dB reduction in the façade noise level has been assumed due to shielding and additional distance attenuation.

For the purposes of this report we have adopted the 30 dB L_{Aeq} criterion for bedrooms and 35 dB L_{Aeq} criterion for living rooms.

6.1 Building Envelope Elements

The following construction elements have been used to model the external building envelope;

6.1.1 Walls

We have assumed that the walls are traditional 100mm brick, 100mm blockwork cavity wall construction. As such noise break-in will be dominated by noise through the windows.

6.1.2 Glazing

As the glazing is the acoustically weak area, the noise level incident on the façade will determine the type of glazing specified.

6.2 Design Assumptions

Assessment and specification of the acoustic performance of the building envelope, has been undertaken based on achieving the internal ambient acoustic conditions, specified in Section 4.2 above.

Information on the sound insulation properties for specific element details have been sourced from PDA's in-house library of construction element sound insulation properties.

6.3 L_{Aeq} Noise Break-in

The results of the break-in noise calculations are presented in terms of the L_{Aeq} levels in Table 3 below. In all cases the results have been rounded to the nearest whole decibel.

Full calculation sheets are provided in the appendix to this report.

Table 3 – Calculated internal levels with required glazing and ventilation

Room	Design Target dB L_{Aeq}	Calculated level dB L_{Aeq} [1]	Glazing [2]	Ventilation [3]
Bedrooms overlooking the railway line	30	20	10/12/6	Minimum $D_{n,e,w}$ 40 dB ventsuch as Passivent TVALdB 450 or similar
Other bedrooms	30	20	4/12/4	Minimum $D_{n,e,w}$ 40 dB vent such as Passivent TVALdB 450 or similar
Living rooms overlooking the railway line	35	30	4/12/4	Minimum $D_{n,e,w}$ 31 dB vent such as Titon Trimvent 90 or similar
Other living rooms	35	25	4/12/4	Minimum $D_{n,e,w}$ 31 dB vent such as Titon Trimvent 90 or similar

Notes

1 Assuming closed windows and allowing for an inlet vent of specification detailed.

2 Air gaps specified between panes are the minimum required and may be substituted by units with a larger air-gap without any loss in performance.

3 Noise levels have been calculated assuming one of the specified vents per room. The specification is for acoustic performance only and compliance with the ventilation requirements of the Building Regulations should be checked by others.

6.4 L_{Amax} Noise Break-in

An assessment of the L_{Amax} break-in has also been undertaken for habitable rooms. These calculations have been conducted to achieve the 45 dB L_{Amax} criterion BS8233 based upon the guidance in World Health Organisation (WHO) Guidelines for Community Noise.

We would note that the 45 dB L_{Amax} criterion is taken from the World Health Organisation (WHO) Guidelines for Community Noise 1999. The 45 dB criterion is related to sleep disturbance. The WHO Guidelines state;

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAmax more than 10-15 times per night (Vallet & Vernet 1991)..."

As such it is acknowledged that the noise levels may exceed 45 dB L_{Amax} occasionally, but not more than approximately two times per hour before sleep is affected. We would note that it is not possible to build naturally ventilated residences in urban areas or close to roads or railways which could be guaranteed to never exceed 45dB L_{Amax} internally.

For the purposes of the assessment we have used the maximum measured L_{Amax} during the night-time period from a train pass at 0700 am.

The results of the break-in noise calculations are presented in terms of the L_{Amax} levels in Table 4 below. In all cases the results have been rounded to the nearest whole decibel and glazing and ventilation are as shown in Table 3.

Table 4 – Calculated typical L_{Amax} levels

Room	Design target dB L_{Amax}	Calculated level dB L_{Amax}
Bedrooms overlooking railway	45	43
Other bedrooms		44

6.5 Ventilation

The window ventilators specified in Table 3 will be required as an alternative to open windows. Any alternative vent should achieve the same acoustic performance (40 dB $D_{n,e,w}$ or 31 dB $D_{n,e,w}$ respectively) or greater.

Please note that the specification of vents is in terms of acoustic performance only. It should be checked by others that the ventilation requirements of the Building Regulations are also met.

6.6 Gardens

BS8233 and the World Health Organisation also specify noise criteria for 'outdoor living spaces', with the reasonable criterion being 55 dB $L_{aeq,16hour}$ for the daytime period. The measured noise levels at the Eastern end of the site do not exceed 55dB LAeq, whilst the measurements close to the railway line at the Westen end of the site exceed the criterion by 1 dB, which is not likely to be a perceptible increase. A barrier at 'grazing incidence' (i.e. where the source is still partly visible above the barrier) gives an acoustic attenuation of 5dB at all frequencies so we would recommend an imperforate 2.1m high fence of

minimum 10kg / m^2 surface mass is installed along the boundary of the railway which will reduce noise levels in the gardens to 50 – 51 dB L_{Aeq}.

7.0 VIBRATION

A vibration assessment has been carried out previously on this site and was reported in PDA report RG/YO/CJB/5778 dated 30th June 2008. The assessment was carried out in accordance with BS6472:1992 and reported a maximum daytime VDV value of 0.13 $ms^{-1.75}$. In accordance with the standard this is below the 'Low probability of adverse comment' level.

The assessment method of BS6472 has since changed in 2008 and now uses a different frequency weighting curve. In accordance with the latest version of BS6472, historical VDV values may be between 30% lower and 100% higher than the currently measured values depending on the vibration frequency spectrum, hence the worst case value of the VDV measured to the current standard would be 0.26 $ms^{-1.75}$. This falls within the 'Low probability of adverse comment' range for daytime residential use (see table below).

Table 5: BS 6472:2008 vibration criteria for residential use

VDV Period	VDV $ms^{-1.75}$	
	BS6472 Low Probability of Adverse Comments	BS6472 Adverse Comments Probable
Night-time 2300-0700	0.1-0.2	0.4-0.8
Daytime 0700-2300	0.2-0.4	0.8-1.6

8.0 CONCLUSION

At the request of Redrow Homes Limited, Philip Dunbavin Acoustics have conducted an assessment of the ambient noise climate noise break-in for the proposed development off Higham Lane, Dodworth.

Measurements have been taken of the ambient noise climate between 0700 and 1000 during the daytime, and between 2300 – 0100 and 0600 – 0700 at night.

Glazing and ventilation have been specified in Section 6.3 to achieve the internal noise levels specified for habitable rooms in BS 8233 and World Health Organisation guidelines. Note that the specified glazing and ventilation treatments are only required for habitable rooms.

APPENDIX

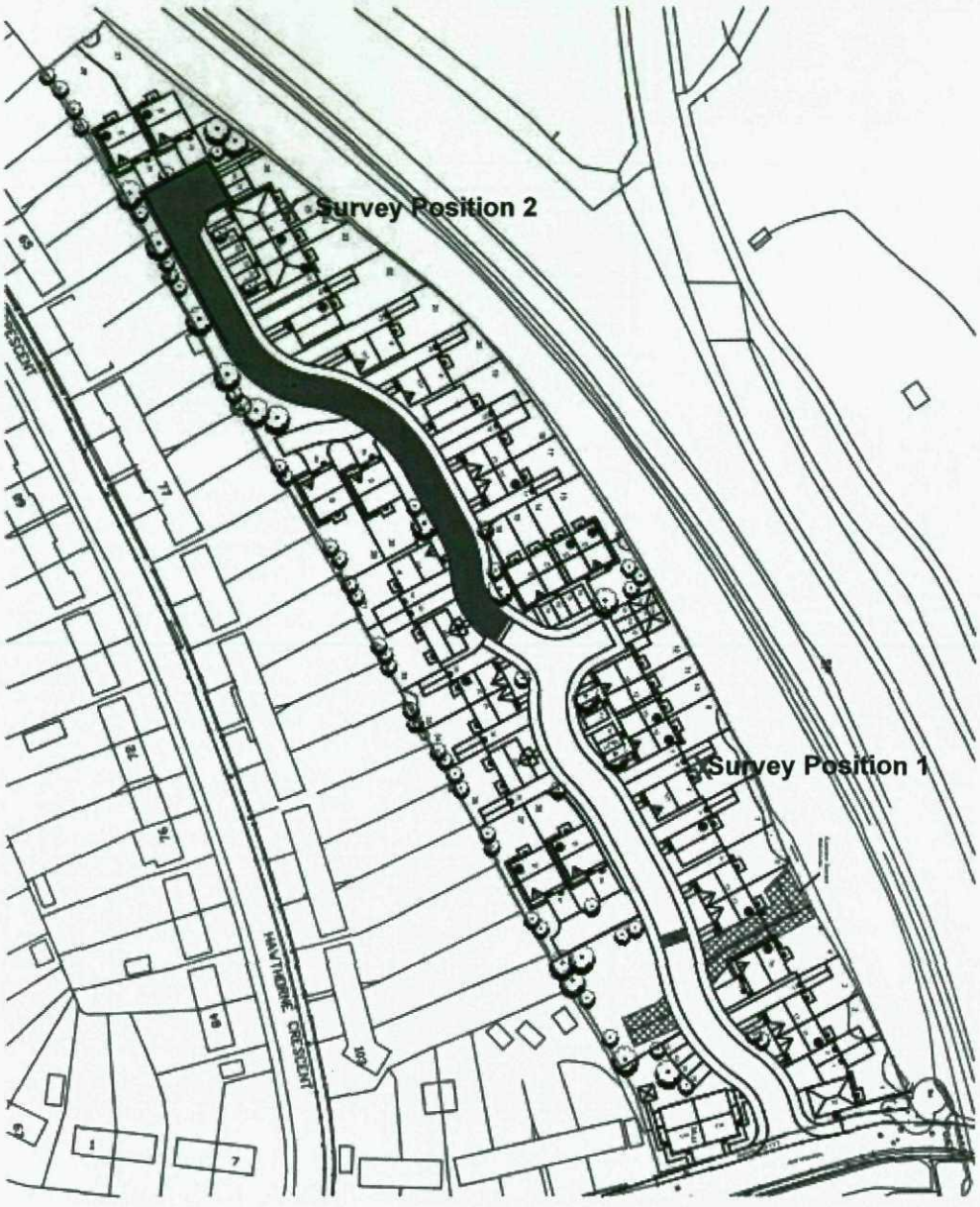

Figure 1 – Site layout and measurement positions

SURVEY MEASUREMENTS

Position 1

Date	Time	LAeq [dB]	Comment
29/08/12	23:28	43.0	
	23:33	43.1	
	23:38	42.2	
	23:43	42.2	
	23:48	42.5	
	23:53	40.5	
	23:58	41.6	
30/08/12	00:03	39.7	
	00:08	41.1	Train
	00:13	41.5	
	00:18	39.5	
	00:23	41.8	
	00:28	41.6	
	00:33	42.5	Train
	00:38	41.1	
	00:43	40.5	
	00:48	40.5	
	00:53	39.8	
	00:58	40.7	
	01:03	38.6	
	06:12	51.0	
	06:17	49.5	
	06:22	50.1	
	06:27	48.6	
	06:32	49.5	Train
	06:37	49.0	
	06:42	49.6	
	06:47	49.7	
	06:52	50.2	Train
	06:57	55.1	
	07:02	56.1	Train
	07:15	50.3	
	07:30	50.5	
	07:45	56.5	Train
	08:00	54.5	
	08:15	56.1	Train
	08:30	53.0	
	08:42	52.6	
	08:57	58.8	Police Siren
	09:12	53.2	
	09:27	53.4	
	09:44	55.0	

Daytime overall LAeq	**54.8**
Night-time overall LAeq	**47.3**

Position 2

Date	Time	LAeq [dB]	LAmax [dB]	Comment
29/08/12	23:29	43.5	65.9	
	23:34	41.2	46.5	
	23:39	43.1	52.3	
	23:44	41.1	46.3	
	23:49	40.5	49.2	
	23:54	40.7	45.5	
	23:59	39.7	45.1	
30/08/12	00:04	41.6	47.3	
	00:09	41.8	49.3	Train
	00:14	41.6	49.5	
	00:19	41.3	47.7	
	00:24	41.5	48.5	
	00:29	42.6	52.7	
	00:34	42.0	51	Train
	00:39	41.5	50.5	
	00:44	40.9	49.3	
	00:49	40.6	47	
	06:11	47.2	53.9	
	06:16	47.0	54.6	
	06:21	46.2	52	
	06:26	48.4	56.4	
	06:31	47.6	56.1	Train
	06:36	48.6	53.6	
	06:41	49.0	55.2	
	06:46	48.4	53.5	
	06:51	56.7	77.3	Train
	06:56	49.5	58.8	
	07:01	61.1	79.1	Train
	07:10	50.0	69.3	
	07:25	49.7	58.2	
	07:40	57.9	84.2	Train
	08:38	52.3	70.0	
	08:53	61.0	82.5	Police Siren
	09:08	53.1	72.8	
	09:23	53.2	57.8	
	09:38	53.6	59.1	

Daytime overall LAeq	**55.6**
Night-time overall LAeq	**49.6**

Overall spectra

Frequency [Hz]	63	125	250	500	1000	2000	4000	8000
Night-time Leq	62.3	53.1	45.4	50.2	49.0	45.6	40.2	42.7
Daytime Leq	64.1	56.4	47.8	54.4	51.9	46.3	39.2	34.0
Maximum night Lmax	75.5	76.5	69.9	76.0	74.3	72.8	67.0	63.3

CALCULATION SPREADSHEETS

Octave Band Composite SRI Break In Sheet

INPUT DATA

Project: Land off Higham Lane, Dodworth
Room: Small bedroom overlooking railway (worst case)

SA Wall	8.1
SA Glazing	1.1
No of vents	1.000
Room Volume	24.3
Room RT	0.5

	Ref	Description
Wall	1	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties
Glazing	30	10/12/06
Vent	3	Passivent TVAL dB 450
Source type	2	Free field line source

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Average Noise Level (dB)	62.3	53.1	45.4	50.2	49.0	45.6	40.2	42.7
Max Noise Level (dB)	76.5	69.9	76.0	74.3	72.8	67.0	63.3	60.3

SRI DATA

Total Facade Area		Effective Façade Area	19.2

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
SRI wall	31	37	42	52	60	63	68	68
SRI Glazing	20	26	27	34	40	38	46	46
D_{ne} Vent	34	45	44	36	40	42	55	55
T_{wall} X S_{wall}	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000
$T_{glazing}$ X $S_{glazing}$	0.011	0.003	0.002	0.000	0.000	0.000	0.000	0.000
T_{vent} X $S_{eff\text{-}vent}$	0.004	0.000	0.000	0.003	0.001	0.001	0.000	0.000
Composite T	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Composite SRI (dB)	30	36	38	38	42	44	55	55

BREAK IN CALCULATIONS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
External Noise Level (dB)	62	53	45	50	49	46	40	43
Max External Level (dB)	76	70	76	74	73	67	63	60
Composite SRI	30	36	38	38	42	44	55	55
Surface Area Correction	13	13	13	13	13	13	13	13
Absorption Correction	9	9	9	9	9	9	9	9
Source type correction	3	3	3	3	3	3	3	3
Max level source correction	3	3	3	3	3	3	3	3

RESULTS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Internal Noise Level (dB)	40	24	14	19	14	9	-8	-5
A weighted	13	8	6	16	14	10	-7	-7
Internal Noise Level dB(A)	**20**							
Max Internal Noise Level (dB)	54	41	45	43	37	30	15	12
A weighted	28	25	36	40	37	31	16	11
Max Internal Noise Level dB(A	**43**							

Octave Band Composite SRI Break In Sheet

INPUT DATA

Project: Land off Higham Lane, Dodworth
Room: Small bedroom not overlooking railwa

SA Wall	8.1
SA Glazing	1.1
No of vents	1.000
Room Volume	24.3
Room RT	0.5

	Ref	Description
Wall	1	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties
Glazing	30	4/12/4
Vent	3	Passivent TVAL dB 450
Source type	2	Free field line source

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Average Noise Level (dB)	57.3	48.1	40.4	45.2	44.0	40.6	35.2	37.7
Max Noise Level (dB)	71.5	64.9	71.0	69.3	67.8	62.0	58.3	55.3

SRI DATA

Total Facade Area		Effective Façade Area	19.2

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
SRI wall	31	37	42	52	60	63	68	68
SRI Glazing	18	24	20	25	23	29	35	35
D_{ne} Vent	34	45	44	36	40	42	55	55
T_{wall} X S_{wall}	0.006	0.002	0.001	0.000	0.000	0.000	0.000	0.000
$T_{glazing}$ X $S_{glazing}$	0.017	0.004	0.011	0.003	0.005	0.001	0.000	0.000
T_{vent} X $S_{eff\text{-}vent}$	0.004	0.000	0.000	0.003	0.001	0.001	0.000	0.000
Composite T	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Composite SRI (dB)	28	35	32	35	35	40	47	47

BREAK IN CALCULATIONS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
External Noise Level (dB)	57	48	40	45	44	41	35	38
Max External Level (dB)	71	65	71	69	68	62	58	55
Composite SRI	28	35	32	35	35	40	47	47
Surface Area Correction	13	13	13	13	13	13	13	13
Absorption Correction	9	9	9	9	9	9	9	9
Source type correction	3	3	3	3	3	3	3	3
Max level source correction	3	3	3	3	3	3	3	3

RESULTS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Internal Noise Level (dB)	36	20	15	17	16	8	-5	-3
A weighted	10	4	7	14	16	9	-4	-4
Internal Noise Level dB(A)	**20**							
Max Internal Noise Level (dB)	50	37	46	41	40	29	18	15
A weighted	24	21	37	38	40	30	19	14
Max Internal Noise Level dB(A	**44**							

Octave Band Composite SRI Break In Sheet

INPUT DATA

Project: Land off Higham Lane, Dodworth
Room: Living room overlooking railway
(worst case)

SA Wall	7.6
SA Glazing	3.2
No of vents	1.000
Room Volume	37.8
Room RT	0.5

	Ref	Description
Wall	1	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties
Glazing	30	'4/12/4'
Vent	3	Titon Trimvent 90
Source type	2	Free field line source

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Average Noise Level (dB)	64.1	56.4	47.8	54.4	51.9	46.3	39.2	34.0
Max Noise Level (dB)								

SRI DATA

Total Facade Area		Effective Façade Area	20.8

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
SRI wall	31	37	42	52	60	63	68	68
SRI Glazing	18	24	20	25	23	29	35	35
D_{ne} Vent	32	32	36	36	35	34	35	38
T_{wall} X S_{wall}	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000
$T_{glazing}$ X $S_{glazing}$	0.051	0.013	0.032	0.010	0.016	0.004	0.001	0.001
T_{vent} X $S_{eff\text{-}vent}$	0.007	0.007	0.003	0.003	0.003	0.004	0.004	0.002
Composite T	0.003	0.001	0.002	0.001	0.001	0.000	0.000	0.000
Composite SRI (dB)	25	30	28	32	30	34	37	39

BREAK IN CALCULATIONS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
External Noise Level (dB)	64	56	48	54	52	46	39	34
Max External Level (dB)	0	0	0	0	0	0	0	0
Composite SRI	25	30	28	32	30	34	37	39
Surface Area Correction	13	13	13	13	13	13	13	13
Absorption Correction	11	11	11	11	11	11	11	11
Source type correction	3	3	3	3	3	3	3	3
Max level source correction	3	3	3	3	3	3	3	3

RESULTS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Internal Noise Level (dB)	44	32	26	28	27	17	8	0
A weighted	18	16	17	24	27	19	9	-1
Internal Noise Level dB(A)	**30**							

Octave Band Composite SRI Break In Sheet

INPUT DATA

Project: Land off Higham Lane, Dodworth
Room: Living rooms not overlooking railway

SA Wall	7.6
SA Glazing	3.2
No of vents	1.000
Room Volume	37.8
Room RT	0.5

	Ref	Description
Wall	1	Two leaves of 102.5mm brickwork, 50mm cavity,rigid wall ties
Glazing	30	'4/12/4'
Vent	3	Titon Trimvent 90
Source type	2	Free field line source

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Average Noise Level (dB)	59.1	51.4	42.8	49.4	46.9	41.3	34.2	29.0
Max Noise Level (dB)								

SRI DATA

Total Facade Area		Effective Façade Area	20.8

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
SRI wall	31	37	42	52	60	63	68	68
SRI Glazing	18	24	20	25	23	29	35	35
D_{ne} Vent	32	32	36	36	35	34	35	38
T_{wall} X S_{wall}	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000
$T_{glazing}$ X $S_{glazing}$	0.051	0.013	0.032	0.010	0.016	0.004	0.001	0.001
T_{vent} X $S_{eff\text{-}vent}$	0.007	0.007	0.003	0.003	0.003	0.004	0.004	0.002
Composite T	0.003	0.001	0.002	0.001	0.001	0.000	0.000	0.000
Composite SRI (dB)	25	30	28	32	30	34	37	39

BREAK IN CALCULATIONS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
External Noise Level (dB)	59	51	43	49	47	41	34	29
Max External Level (dB)	0	0	0	0	0	0	0	0
Composite SRI	25	30	28	32	30	34	37	39
Surface Area Correction	13	13	13	13	13	13	13	13
Absorption Correction	11	11	11	11	11	11	11	11
Source type correction	3	3	3	3	3	3	3	3
Max level source correction	3	3	3	3	3	3	3	3

RESULTS

Frequency (Hz)	***63***	***125***	***250***	***500***	***1000***	***2000***	***4000***	***8000***
Internal Noise Level (dB)	39	27	21	23	22	12	3	-5
A weighted	13	11	12	19	22	14	4	-6
Internal Noise Level dB(A)	**25**							