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Architectural & Environmental Consultants

Noise | Vibration | Air Quality

Noise Assessment – Condition 12 & 13

Salisbury Square, Hatfield

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Noise Assessment – Condition 12 & 13

Project: SALISBURY SQUARE, HATFIELD

Report reference: RP01-23396-R1

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REVISION	ISSUE DATE	REPORT BY	CHECKED BY	NOTES
0	25 October 2023	Henry Cox, BEng AMIOA, Acoustics Consultant	Chris McNeillie, MSc CEng MIOA, Director	Initial issue
1	03 May 2024	Henry Cox, BEng AMIOA, Acoustics Consultant	Sam Bryant, MPhys CEng MIOA, Director	Updated commercial noise assessment

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

1.1 Cass Allen has been instructed by GCPD Limited to assess the acoustic design of a new development at Salisbury Square, Hatfield in relation to the requirements of Planning Conditions 12 and 13.

1.2 Condition 12 and 13 set noise criteria for transport sources and commercial sources, respectively, in habitable areas of the finished development.

1.3 A 3D noise model of the development was constructed based on the results of noise surveys carried out at the site. The noise model was used to calculate noise levels at all facades of the development. Noise levels at the site are dictated by traffic on Great North Road. Mechanical plant noise and occasionally amplified music (during events) is audible at the site from The Great Northern, a nearby pub.

1.4 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 the Condition 12 and 13 criteria. Mitigation measures (i.e. glazing acoustic requirements) have been identified where necessary to achieve acceptable noise levels.

1.5 The noise survey results, and subsequent 3D noise modelling indicate that noise levels in external amenity areas will comply with the Condition 12 criteria.

1.6 It is our view that this report contains all the noise-related information required to discharge Condition 12 and 13.

2. INTRODUCTION

2.1 Cass Allen has been instructed by GCPD Limited to assess the acoustic design of a new development at Salisbury Square, Hatfield.

2.2 The assessment has been carried out in accordance with the requirements of Condition 12 and 13 which have been imposed on the development and are reproduced below:

> *12. No development above ground level shall take place until details relating to a scheme to protect the proposed development from noise due to transport sources is submitted to and approved in writing by the Local Planning Authority. Thereafter, the development shall not be carried out other than in accordance with the approved details, and not occupied until the approved measures are in place.*
>
> *The scheme shall ensure the indoor ambient noise levels in living rooms and bedrooms meet the standards within BS 8233:2014. Internal LAmax levels should not exceed 45dB more than ten times a night in bedrooms. Relaxed noise levels will be considered if it can be shown that good acoustic design has been implemented and all steps have been taken to achieve the non-relaxed noise levels in BS8233:2014.*
>
> *Where opening windows raises the internal noise levels above those within BS8233, other methods of ventilation/attenuation will have to be implemented.*
>
> *Passive systems and rates will be considered, however, evidence that overheating will not occur will need to be provided in the form of a SAP assessment (other overheating assessments can be provided but will need to be agreed in writing by the local planning authority such as a TM59 assessment) conducted with windows closed, curtains/blinds not being used, showing the required ventilation rates to ensure that overheating will not occur. Details must be provided of the ventilation system to be installed and to demonstrate that it will provide the ventilation rates shown in the assessment.*
>
> *Mechanical ventilation can be installed, with ventilation rates required to provide 4 air changes per hour to habitable rooms. However, mechanical ventilation should only be used as a last resort, once all other noise mitigation measures have been implemented (good acoustic design, orientation of sensitive rooms, bunds, noise barriers, passive systems or acoustic louvres).*
>
> *Outdoor amenity areas should meet the 55dB WHO Community Noise Guideline Level. A slight relaxation of this level (up to 3dB) will be considered, if it can be demonstrated that all reasonable steps have been taken to reduce the level as much as possible, (such as noise barriers, shielding, good acoustic design etc). If outdoor amenity areas cannot comply, then it should be shown through measurements that a suitable place is available within 5 minutes' walk from the development that complies with the amenity noise level.*
>
> *13. No development above ground level shall take place until details relating to a scheme to mitigate the noise from nearby commercial activities, deliveries, plant and equipment are submitted to and approved in writing by the Local Planning Authority.*

Thereafter, the development shall not be carried out other than in accordance with the approved details, and not occupied until the approved measures are in place.

Assessment for noise from commercial operations must be in accordance with BS4142: 2014+A1:2019.

Indoor ambient noise levels in living rooms and bedrooms from commercial noise sources must be 10dB below the standards within BS 8233:2014 (Living rooms daytime – 25dB and bedrooms at night – 20dB) and LAmax levels must not to exceed 40dB internally with windows closed. Internal noise levels with habitable windows open must also be considered.

Consideration must be given to the Nation Planning Policy Framework and the agent of change.

2.3 To address the requirements of the noise and vibration related planning conditions, the following matters have been assessed:

- Transport noise affecting the habitable areas of the development and the design of the external facades (as per Planning Condition 12).
- Commercial noise affecting the habitable areas of the development and the design of the external facades (as per Planning Condition 13).

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

3. CONDITION 12 – TRANSPORT NOISE

3.1 The transport 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 the Condition 12 criteria. Mitigation measures have been identified where necessary to achieve acceptable noise levels.

Condition 12 criteria – Internal noise levels

3.2 Condition 12 states that "*The scheme shall ensure the indoor ambient noise levels in living rooms and bedrooms meet the standards within BS 8233:2014. Internal LAmax levels should not exceed 45dB more than ten times a night in bedrooms*."

3.3 The relevant BS8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS8233) criteria and the maximum noise level criterion are summarised in Table 1 below.

Table 1 Condition 12 Internal Noise Criteria

Location	07:00 to 23:00	23:00 to 07:00
Living room	35 dB LAeq,16hour	-
Bedroom	35 dB LAeq,16hour	30 dB LAeq,8hour 45 dB LAmax (no more than 10 times a night)

Existing site noise levels

3.4 Noise surveys were carried out at the site on 01 August 2015, 05 August 2015, and 16 August 2021 to investigate the existing noise environment at the site. The full results and methodology of these surveys was provided in the noise assessment that was submitted as part of the planning application (Cass Allen reference: RP01-15191-R1).

3.5 A further noise survey was carried out at the site on 20 July 2023 to verify and supplement the existing data. The full methodology and results of the 2023 noise survey are provided in Appendix 1.

3.6 Based on the results of the site noise surveys, a 3D computer noise model was developed using CadnaA v2023 to predict the transport noise levels that will exist across the development. The methodology and results of the noise modelling are provided in Appendix 2.

3.7 The modelling results indicate that habitable areas of the development with direct line of sight to Great North Road (A1000) will be subject to the highest transport noise levels, as follows:

- Average transport noise levels during the daytime - 59 dB LAeq,0700-2300hrs
- Average transport noise levels during the night-time - 51 dB LAeq,2300-0700hrs
- Typical transport maximum noise levels during the night-time - 67 dB LAmax

Internal noise levels in noise-sensitive rooms

3.8 The facades of the development will be constructed using the external wall types in Table 2 below. The sound insulation performance of each construction was predicted using INSUL v9.0.24 facade modelling software, including a 3dB margin.

Table 2 External Constructions

Type	Construction	Predicted Sound Reduction (dB)	
		Rw	Rw + Ctr
EW 01 - Houses	102.5mm brick, 175mm cavity with standard wall ties and filled with 150mm Rockwool Ny-Rock cavity slab, 100m standard aircrete blockwork (assumed 580 kg/m3), 12.5mm wallboard on dabs.	61	55
EW 02 - Mixed Block	102.5mm brick, 150mm cavity with standard wall ties and filled with 100mm Rockwool Nyrock Rainscreen, 12mm gypsum sheathing board, SFS system with 100mm cavity fully filled with Rockwool.	60	54
EW 04 - Roof	Clay roof tiles, counter-battened ventilation layer, 100mm Rockwool Hardrock Multifix, 18mm plywood, 200mm timber rafters fully filled with Rockwool Flexi, 2No. 15mm Knauf Firepanel.	52	48
EW 05 - Dormer	Code 5 lead, 18mm plywood, 100mm timber stud filled with 75mm Ecotherm Eco-versal rigid insulation and 25mm residual cavity, 62.5mm Ecotherm Ecoliner (inclusive of 12.5mm plasterboard finish).	50	40

3.9 Background ventilation for the development will be provided by mechanical ventilation with heat recovery (MVHR) systems with no direct penetrations in the facade for ventilation into habitable rooms. Therefore, noise ingress to habitable rooms will be dictated by the glazing and the wall constructions in Table 2.

3.10 Calculations were carried out using facade modelling software in accordance with the “more rigorous” methodology given in BS8233 to establish the sound insulation performance required of the glazing to achieve the Condition 12 criteria in all habitable rooms of the development.

3.11 The calculations were carried out based on the dimensions for facade elements read from the project drawings.

3.12 The results of the calculations are shown in Appendix 3 and are summarised in Table 3 below.

Table 3 Condition 12 Acoustic Requirements

Habitable Rooms	Glazing Performance Requirements (inc. Frames)
Bedrooms and Living Rooms	27 dB Rw+Ctr (as per reference FC02 in Appendix 4)

Note 1 Some areas have higher sound insulation performance requirements to comply with the Condition 13 criteria. Please refer to Appendix 4 for the combined glazing specification.

3.13 It can be seen from the above that compliance with Condition 12 is predicted to be achieved via the selection of 27 dB Rw+Ctr glazing in bedrooms and living rooms. This could typically be achieved by standard thermal double glazing in a standard casement window.

3.14 Please note that some areas have higher sound insulation performance requirements to comply with the Condition 13 criteria (discussed in Section 84). A glazing acoustic performance specification is provided in Appendix 4 to comply with the Condition 12 and Condition 13 criteria.

3.15 MVHR will be used in all habitable areas of the development, and it is our understanding that openable windows will not be relied on as part of the overheating mitigation strategy. On this basis, residents will not need to compromise the acoustic performance provided in a 'closed-windows scenario' to achieve acceptable ventilation rates.

Noise levels in external amenity areas

3.16 The design of the development has also been reviewed in relation to the Condition 12, which states that "*Outdoor amenity areas should meet the 55dB WHO Community Noise Guideline Level*".

3.17 The noise survey results and subsequent 3D noise modelling indicate that noise levels in external amenity areas will comply with the Condition 12 criteria (see Appendix 2).

4. CONDITION 13 – COMMERCIAL NOISE

4.1 The potential noise impact of existing commercial sources has been assessed in accordance with BS4142:2014+A1:2019 – *Methods for rating and assessing industrial and commercial sound.*

4.2 Internal levels that will exist within the habitable areas of the finished development have also been predicted based on the existing noise environment at the site and details for the design of the development. The predicted noise levels have been compared with the Condition 13 criteria. Mitigation measures have been identified where necessary to achieve acceptable noise levels.

Condition 13 criteria

4.3 The commercial noise criteria from Condition 13 are summarised in Table 4 below.

Table 4 Condition 13 Internal Commercial Noise Criteria

Location	07:00 to 23:00	23:00 to 07:00
Living rooms	25 dB LAeq,T	-
Bedrooms	-	20 dB LAeq,T 40 dB LAmax (no more than 10 times a night)

Existing noise levels

4.4 Noise surveys were carried out at the site on 01 August 2015, 05 August 2015, and 16 August 2021 to investigate the existing noise environment at the site. The full results and methodology of these surveys was provided in the noise assessment that was submitted as part of the planning application (Cass Allen reference: RP01-15191-R1).

4.5 A further noise survey was carried out at the site on 20 July 2023 to verify and supplement the existing data. The full methodology and results of the 2023 noise survey are provided in Appendix 1. The lowest typical background noise levels during the day are 37 dB LA90. Using a combination of project data and Cass Allen archive data, the lowest typical background noise level during the night is predicted to be 32 dB LA90.

4.6 The following commercial noise sources were identified at the site:

- Amplified music noise from The Great Northern (open until 1am on Saturdays).
- An extract fan from The Great Northern.
- Bottles being disposed at The Great Northern.
- Deliveries to The Great Northern.

4.7 Based on the results of the site noise surveys, a 3D computer noise model was developed using CadnaA v2023 to predict the noise levels that will exist across the development. The methodology and results of the noise modelling are provided in Appendix 2.

4.8 Calculations indicate that areas of the development closest to The Great Northern will be subject to the highest commercial levels, as follows:

- Average amplified music noise levels (day or night) - 50 dB LAeq,T
- Average extract fan noise levels (day or night) - 33 dB LAeq,T
- Maximum noise levels from bottles - 65 dB LAFmax
- Delivery noise was not measured on site. See 4.29 for discussion.

Music and Entertainment Noise

4.9 It should be noted that BS4142 is not intended to be applied to the rating and assessment of sound from music and other entertainment sources. However, it is clear from the above levels that amplified music has the potential to be clearly audible at the site, and is the dominant commercial noise source affecting the development during events at The Great Northern.

4.10 As the "agent of change", the applicant should seek to avoid any restrictions being placed on the existing businesses due to noise impact. In this case, the applicant has control over the mitigation at the development, which should be designed such that future residents can enjoy suitable resultant internal noise levels.

4.11 Condition 13 sets criteria for suitable internal noise levels from commercial sources (see Table 4).

4.12 Calculations were carried out using the methodology described in Paragraphs 3.8-3.11 to establish the sound insulation performance required of the glazing to achieve the Condition 13 criteria in all habitable rooms of the development.

4.13 The results of the calculations are shown in Appendix 4 and are summarised in Table 5 below.

Table 5 Condition 13 Acoustic Requirements

Habitable Rooms	Highest Glazing Performance Requirements (inc. Frames)
Bedrooms	33 dB Rw+Ctr (as per reference FC01 in Appendix 4)
Living Rooms	27 dB Rw+Ctr (as per reference FC01 and FC02 in Appendix 4)

4.14 It can be seen from the above that compliance with Condition 13 is predicted to be achieved via the selection of 33 dB Rw+Ctr glazing in bedrooms and 27 dB Rw+Ctr glazing in living rooms.

4.15 A glazing sound insulation performance specification is provided in Appendix 4 to comply with the criteria in Condition 12 and Condition 13.

4.16 MVHR will be used in all habitable areas of the development, and it is our understanding that openable windows will not be relied on as part of the overheating mitigation strategy. On this basis, residents will not need to compromise the acoustic performance provided in a 'closed-windows scenario' to achieve acceptable ventilation rates.

4.17 In summary of the above it is our view that the design of the development will comply with the requirements of Planning Condition 13 subject to the selection of the windows to comply with the glazing acoustic specification in Appendix 4.

Extract Fan Noise

4.18 Noise from the fan was just perceptibly tonal, and therefore it is appropriate to apply a +2 dB character correction in accordance with BS4142, resulting in a free-field noise rating level of 35 dB LAr,Tr at the nearest sensitive facade.

4.19 This value is 2 dB below background during the daytime, and 3 dB above background during the night-time. Both figures indicate “low impact, depending on the context” or below onset of “adverse impact, depending on the context” in accordance with BS4142.

4.20 It is therefore our view that the existing mechanical plant noise identified on site is unlikely to result in adverse impact on residents, even in the situation that windows are open.

Bottle Disposal Noise

4.21 The average noise contribution (LAeq,T) of bottles being disposed over a 1-minute period was calculated based on measurements carried out at the site.

4.22 An assumption was made that bottles being disposed would continue for up to 5 minutes in a given 1 hour / 15 minute reference period during the daytime / night-time.

4.23 Noise from bottles being disposed is clearly perceptibly impulsive, and therefore it is appropriate to apply a +6 dB character correction in accordance with BS4142, resulting in the following free-field noise rating levels at the position of the nearest sensitive facade:

- 39 dB LAr,1hour during the daytime
- 45 dB LAr,15 minutes during the night-time

4.24 These values are 2 dB above background during the daytime, and 13 dB above background during the night-time. This is below onset of “adverse impact, depending on the context” during the daytime, but an indication of “significant adverse impact” during the night-time.

4.25 It is therefore our view that the noise from bottles being disposed at the Great Northern is unlikely to result in adverse impact on residents during the daytime, even in the situation that windows are open.

4.26 Although the figures above indicate potential for noise impact during the night-time, it is not unreasonable to expect that the pub will avoid disposing bottles during those hours when the development becomes occupied.

4.27 It should be noted that the outcome of the BS4142 assessment is, to an extent, pre-determined by the layout and its relative distance to the commercial sources. In this case, there is no opportunity within the consented scheme for boundary treatment which would significantly attenuate the commercial noise sources at habitable areas of the development. However, it should be noted that

the internal noise in habitable rooms of the proposed development will comply with the daytime and night-time criteria in Condition 13 when windows are closed, given the facade acoustic specification provided in Appendix 4.

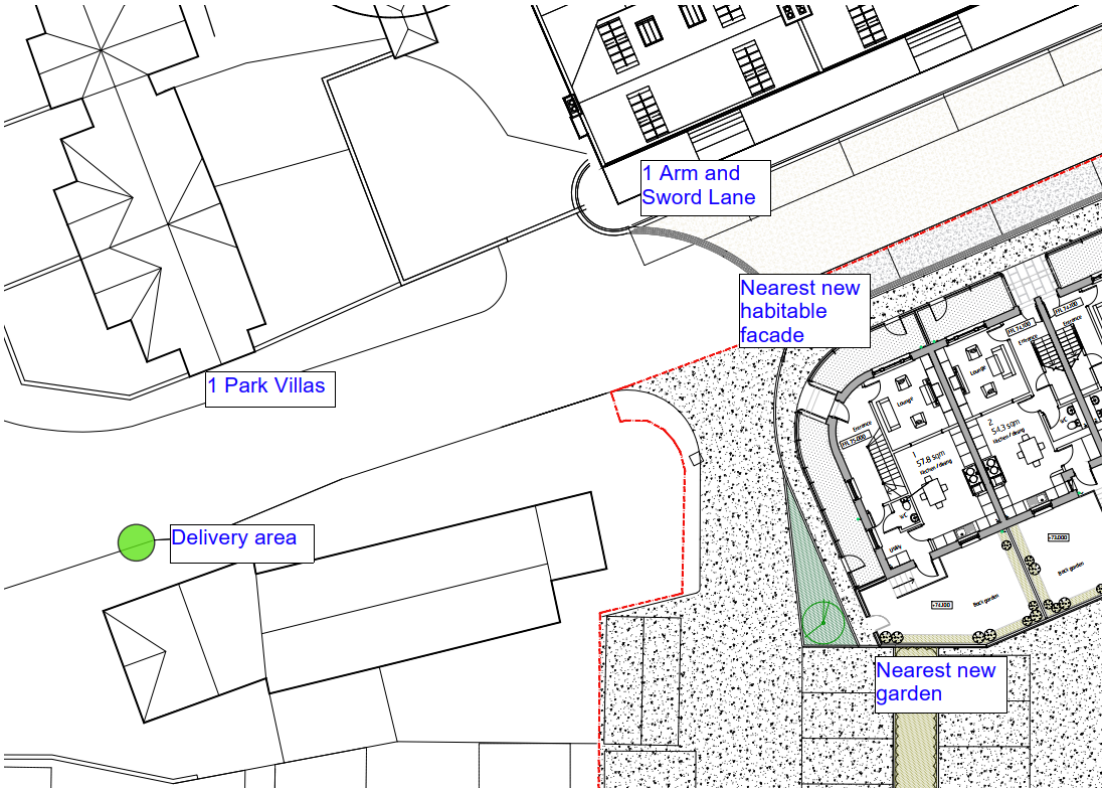
4.28 MVHR will be used in all habitable areas of the development, and therefore residents will not need to compromise the acoustic performance provided in a 'closed-windows scenario' to achieve acceptable ventilation rates.

Delivery Noise

4.29 No deliveries to the Great Northern were observed on site during the site surveys (2015, 2021, 2023). However, staff at the pub confirmed that they receive one beer delivery per week and one gas delivery "every few weeks". Deliveries occur during the daytime only and not during "early hours". This is a relatively infrequent occurrence during the period that is least likely to result in adverse impact, due to higher background noise levels and the very low risk of sleep disturbance.

4.30 Deliveries occur at the top of Arm and Sword Lane, next to the pub entrance. This is shown diagrammatically in Figure 1 below.

Figure 1 Delivery location and nearby sensitive receptors



4.31 The gardens of the new development do not have direct line of sight to the delivery area, due to screening from The Great Northern and the built form of the new development itself.

4.32 It is our understanding that there are no unresolved complaints relating to deliveries from nearby existing sensitive receptors, which are significantly closer to the delivery position than the habitable facades of the new development. While not conclusive in isolation, the lack of complaints supports the view that deliveries are unlikely to result in significant noise impact, especially when factoring in the increased distance to the new development.

4.33 In summary of the above, given the details of existing operation, infrequency, and time period, it is our view that deliveries to The Great Northern are unlikely to result in adverse impact at the new development.

External Amenity Areas

4.34 The above commercial noise assessment indicated that none of the commercial noise sources will result in “adverse impact, depending on the context” during the daytime, which is the relevant time period for assessing the potential impact of commercial noise in gardens. On this basis, it is our view that existing commercial noise sources at the site will not result in adverse impact at the gardens of the development.

Summary

4.35 In summary of the above, it is our view that this report contains all the necessary information to recommend that Condition 13 is discharged.

5. CONCLUSIONS

5.1 Cass Allen was instructed by GCPD Limited to assess the acoustic design of the development as required by Condition 12 and 13.

5.2 Transport noise affecting the development was assessed as required by Planning Condition 12 and compliant internal noise levels will be achievable in all habitable rooms with standard thermal double glazing and the proposed MVHR ventilation systems.

5.3 The noise survey results, and subsequent 3D noise modelling indicated that noise levels in external amenity areas will comply with the Condition 12 criteria.

5.4 Glazing to some habitable rooms will need to be upgraded to comply with the requirements of Condition 13 due to noise from The Great Northern. A detailed acoustic specification for the glazing is given in Appendix 4.

5.5 Existing commercial noise sources at the site were assessed and mitigation has been proposed to comply with the requirements of Condition 13.

5.6 It is our view that this report contains all the noise-related information required to recommend that Condition 12 and 13 be discharged.

Appendix 1 2023 Survey Results

Survey Summary:

The survey comprised short-term operator attended noise measurements to validate previous survey results. Noise levels at the site were generally dictated by road traffic on Great North Road.

Noise from the railway was insignificant in comparison to road traffic noise.

No significant noise was observed from aircraft.

Plant noise from The Great Northern pub was identified and measured.

Due to a lack of a suitable available noise monitoring position to assess road traffic noise emissions from Great North Road, noise from this source was measured and assessed in accordance with the "shortened" measurement procedure given in the Department of Transport Welsh Office document "*Calculation of Road Traffic Noise*" (1998) and converted to LAeq,0700-2300 and LAeq,2300-0700 in accordance with the DEFRA/TRL document "*Method for converting the UK road traffic noise index LA10,18h to the EU noise indices for road noise mapping*" (2006).

Survey Period:

20/07/2023

Survey Objectives:

To measure noise levels around the site to verify existing noise survey results.

Equipment Used:

Type	Manufacturer	Model	Serial Number
Sound level meter[1]	NTi Audio	XL2	A2A-17487-E0
Calibrator	Larson Davis	Type CAL200	15011
Sound level meter[1] (noise logger)	Rion	NL-32	01213688
Calibrator	Rion	NC-74	34551703
Sound level meter[1]	Rion	NL-52	00965090

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-medium wind speeds and no rain).

Measurement Positions:

Position (refer plan below)	Description
N1	Attended noise monitoring position. 1.5m above ground. Free-field.
N2	Attended noise monitoring position. 1.5m above ground. Free-field.
N3	Attended noise monitoring position. 1.5m above ground. 3m from facade.
N4	Attended noise monitoring position. 1.5m above ground. Free-field. Direct line of sight to plant.
N5	Attended noise monitoring position. 1.5m above ground. Free-field. Direct line of sight to Great North Road.
N6	Attended noise monitoring position. 1.5m above ground. Free-field.
L1	Unattended noise logging position (shortened CRTN). 3m above ground level. Free-field. Direct line of sight to Great North Road.

Site Plan showing Measurement Positions:

Attended Noise Monitoring Results:

Date	Position	Time	Meas. Length	LAeq, dB	LAmax, dB	LA90, dB	Observations
20/07/2023	N1	13:00	5 mins	50	55	45	LAeq dictated by traffic on Great North Road Trains audible (~57 LAmax) but insignificant to LAeq and LAmax. LAmax dictated by occasional vehicle passing on Arm and Sword Lane. No significant commercial noise.
		13:05		59	61	40	
		13:10		57	78	43	
		13:15		53	69	43	
		13:20		52	69	43	
		13:25		54	71	42	
	N2	13:35	5 mins	41	58	37	LAeq dictated by distant traffic on Great North Road (no line of sight) and aircraft. LAmax dictated by aircraft. No significant commercial noise. Maximum noise levels from buses and trains are very low (peak ~43 dB LAF,instantaneous).
		13:40		46	62	38	
		13:45		44	58	38	
		13:50		44	57	37	
		13:55		45	58	37	
	N3	14:05	5 mins	46	60	39	LAeq dictated by distant traffic on Great North Road (no line of sight) and aircraft. LAmax dictated by aircraft. Measurements contaminated by nearby AA recovery.
		14:10		45	56	39	
		14:15		48	66	38	
		15:15		43	57	37	As above but the AA recovery vehicle was no longer present.
		15:20		43	52	36	
	N4	14:25	2m30s	57	62	54	L90 dictated by external fan serving The Great Northern pub, 5m from measurement position.
	N5	14:30	5 mins	67	77	57	Noise dictated by Great North Road. The 91 dB LAFmax measurement was due to a car horn. The maximum recorded level was 74 dB LAFmax before this.
		14:35		65	76	54	
		14:40		66	91	50	
	N6	14:55	5 mins	50	58	44	Noise dictated by Great North Road.
		15:00		50	60	45	
		15:05		52	64	47	
	L1	12:40	1 hour	69	84	56	Noise dictated by Great North Road.
		13:40		70	87	57	
		14:40		70	82	58	

Shortened CRTN Calculation Summary:

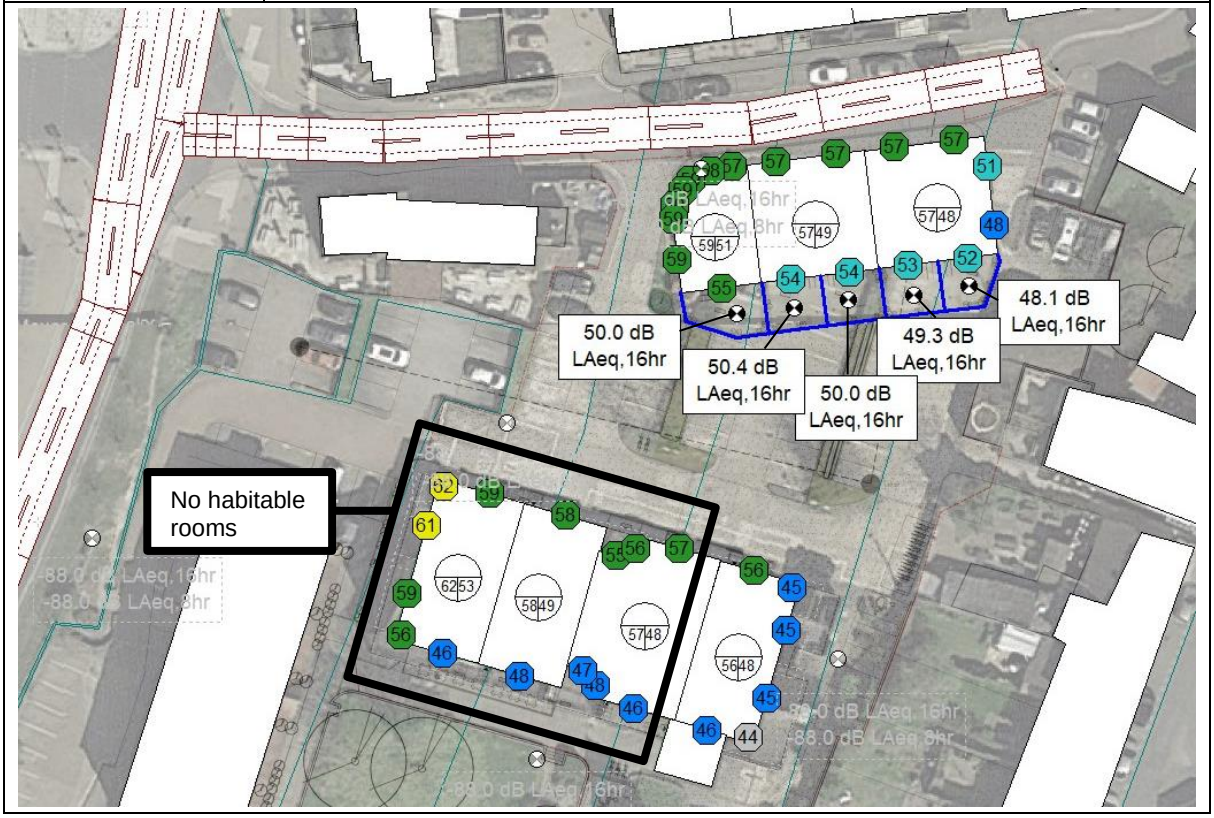
Date	Position	LA10,1hr dB			LA10,18hr dB	Daytime LAeq,16hr dB	Night-time LAeq,8hr dB
		1240 – 1340 hrs	1340 – 1440 hrs	1440 – 1540 hrs			
20/07/2023	L1	73.7	73.8	73.8	72.8	70	62

Appendix 2 Modelling Results

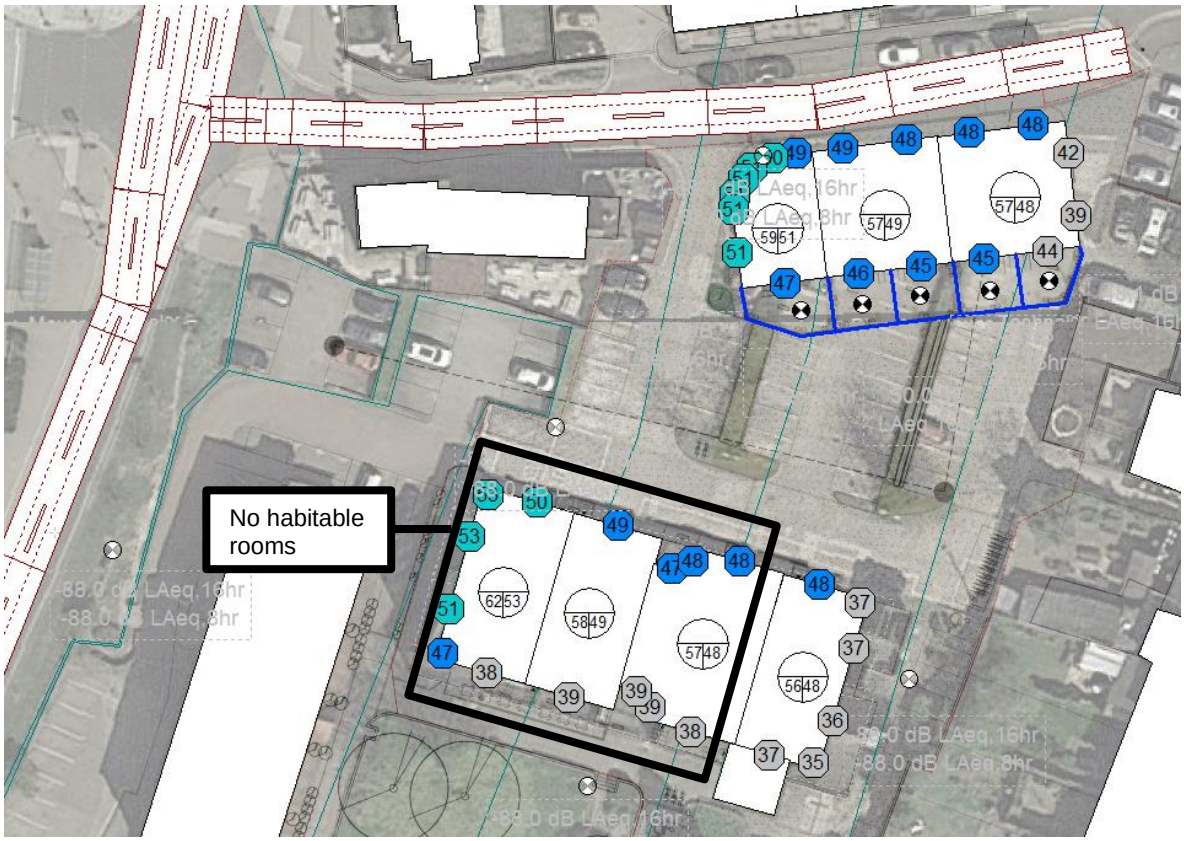
Modelling Software:	CADNA/A Version 2023
Modelled Scenarios:	Transport noise levels across the site Commercial noise levels across the site
Data inputs:	• Noise survey results • Topographical data for the site • Development layout
Calculation Algorithms Used:	• Calculation of Road Traffic Noise 1988 – Department of Transport • ISO 9613-1:1993 Acoustics-Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere • ISO 9613-2:1996 Acoustics-Attenuation of sound during propagation outdoors – Part 2: General method of calculation

Modelling Printout:

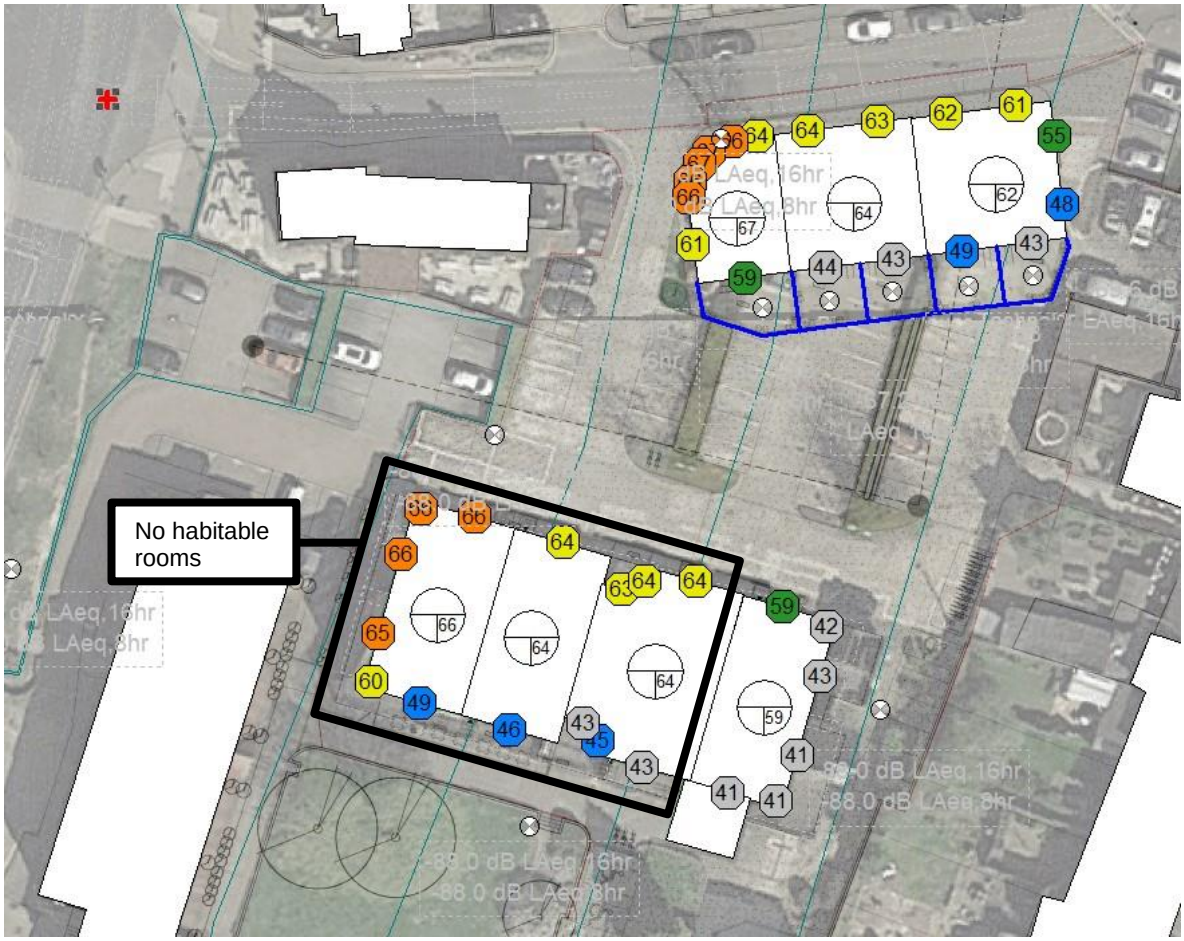
Scenario	Daytime average free-field transport noise levels (LAeq,16hr) Garden levels are shown at 1.2m above ground



Scenario	Night-time average free-field transport noise levels (LAeq,8hr)

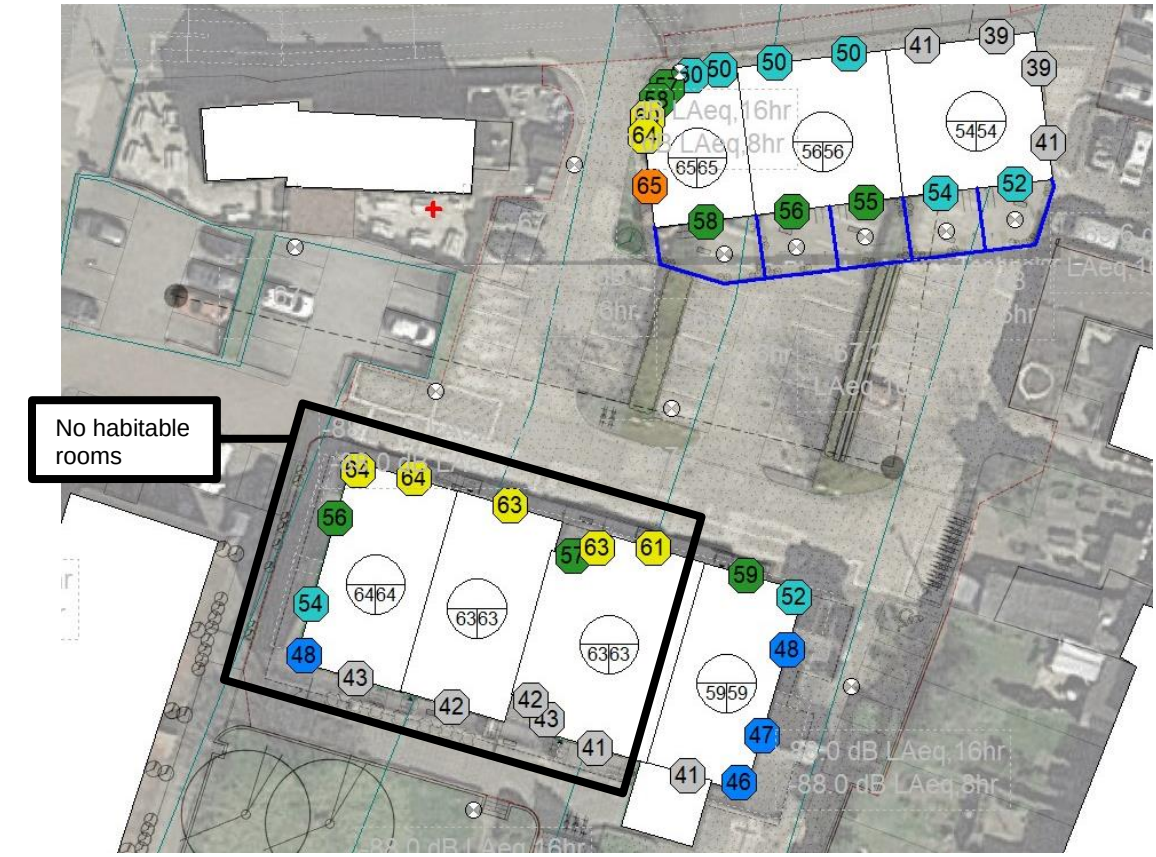


Scenario	Night-time maximum free-field transport noise levels (LAFmax)



Scenario	Average free-field commercial noise levels (LAeq,T)

Scenario	Night-time maximum free-field commercial noise levels (LAFmax)



Appendix 3 Noise Ingress Calculations

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FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Transport Noise: Daytime Average - LAeq,16hr
NOTES:	Criterion: 35 dB LAeq,16hr

Room Dimensions [m]: W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	59.0								
		40.8	44.9	48.4	51.8	55.0	52.2	47.0	**Reference spectrum**

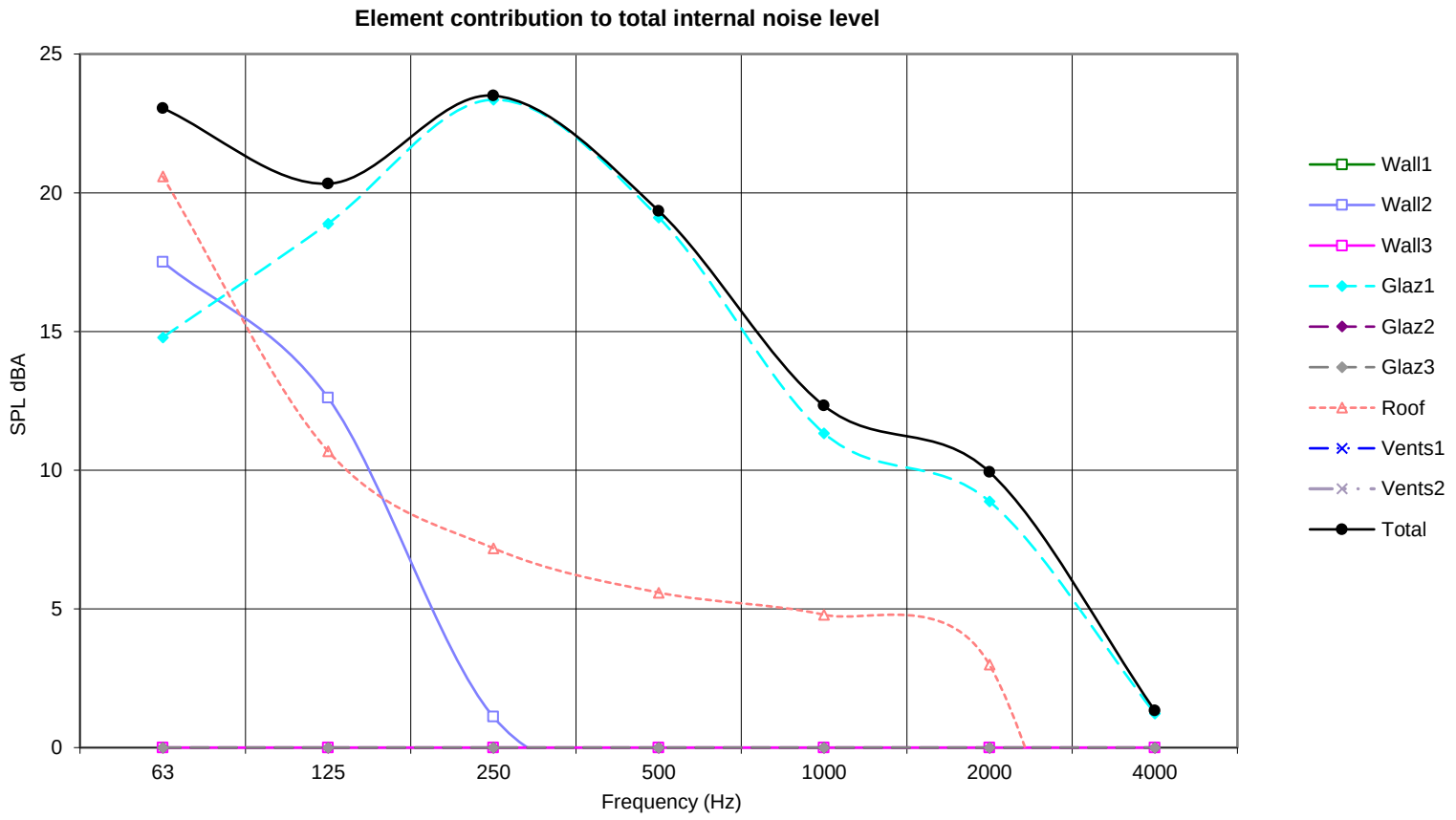
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	0%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	12%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	66%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	11.0	23	37	44	49	53	52	66	22%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	29	30	37	47	47	50				
	Resultant SPL inside room excluding ventilators dB	28.1	23	20	23	19	12	10	1	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**28.1**	23	20	23	19	12	10	1



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Transport Noise: Night-time Average - LAeq,8hr
NOTES:	Criterion: 30 dB LAeq,8hr

Room Dimensions [m]: W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	51.0								
		32.8	36.9	40.4	43.8	47.0	44.2	39.0	**Reference spectrum**

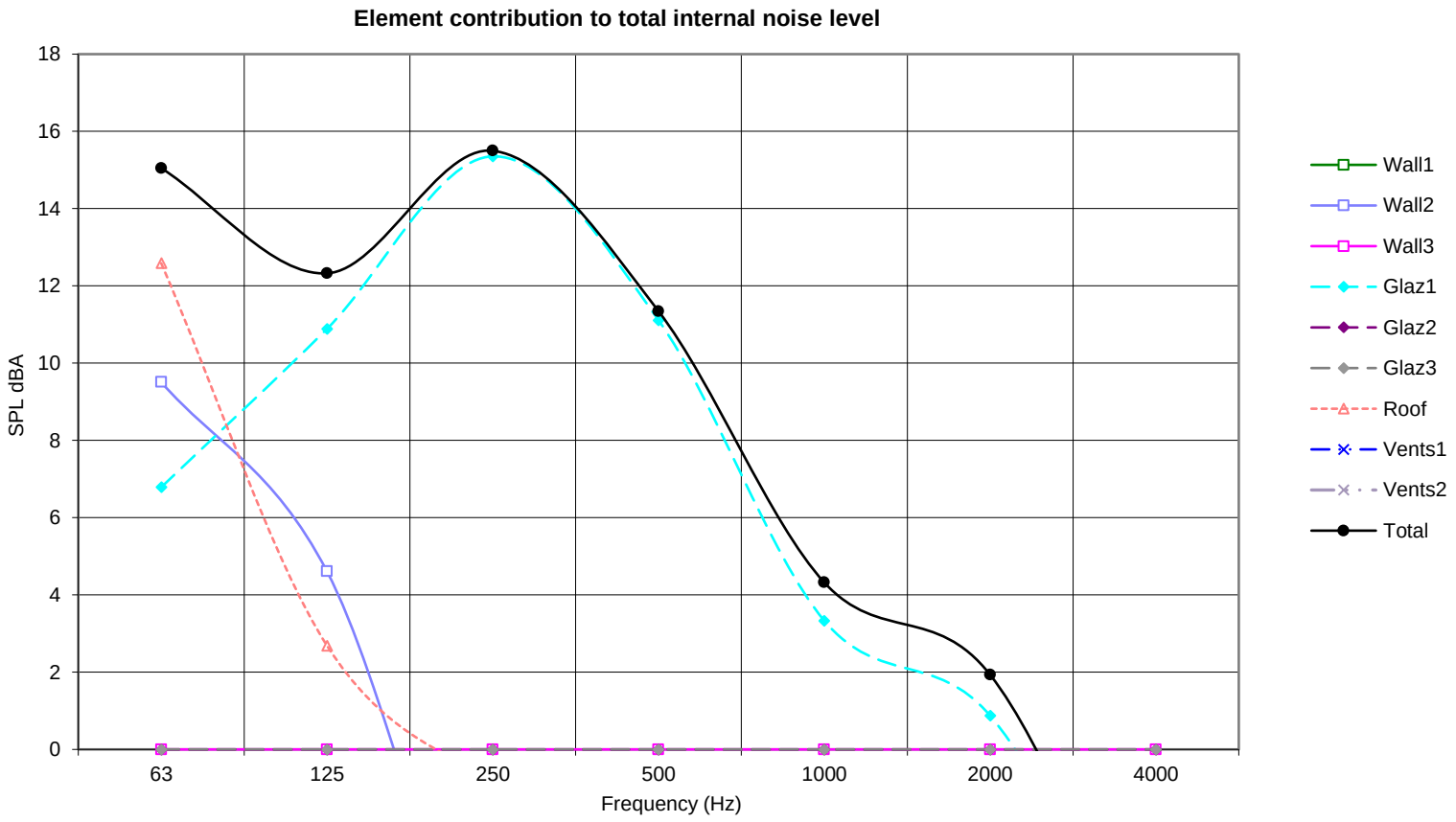
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	1%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	11%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	63%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	11.0	23	37	44	49	53	52	66	21%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	29	30	37	47	47	50				
	Resultant SPL inside room excluding ventilators dB	20.1	15	12	15	11	4	2	-7	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**20.1**	15	12	15	11	4	2	-7



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Transport Noise: Night-time Maximum - LAFmax
NOTES:	Criterion: 45dB LAFmax

Room Dimensions [m]: W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	67.0								
		48.8	52.9	56.4	59.8	63.0	60.2	55.0	**Reference spectrum**

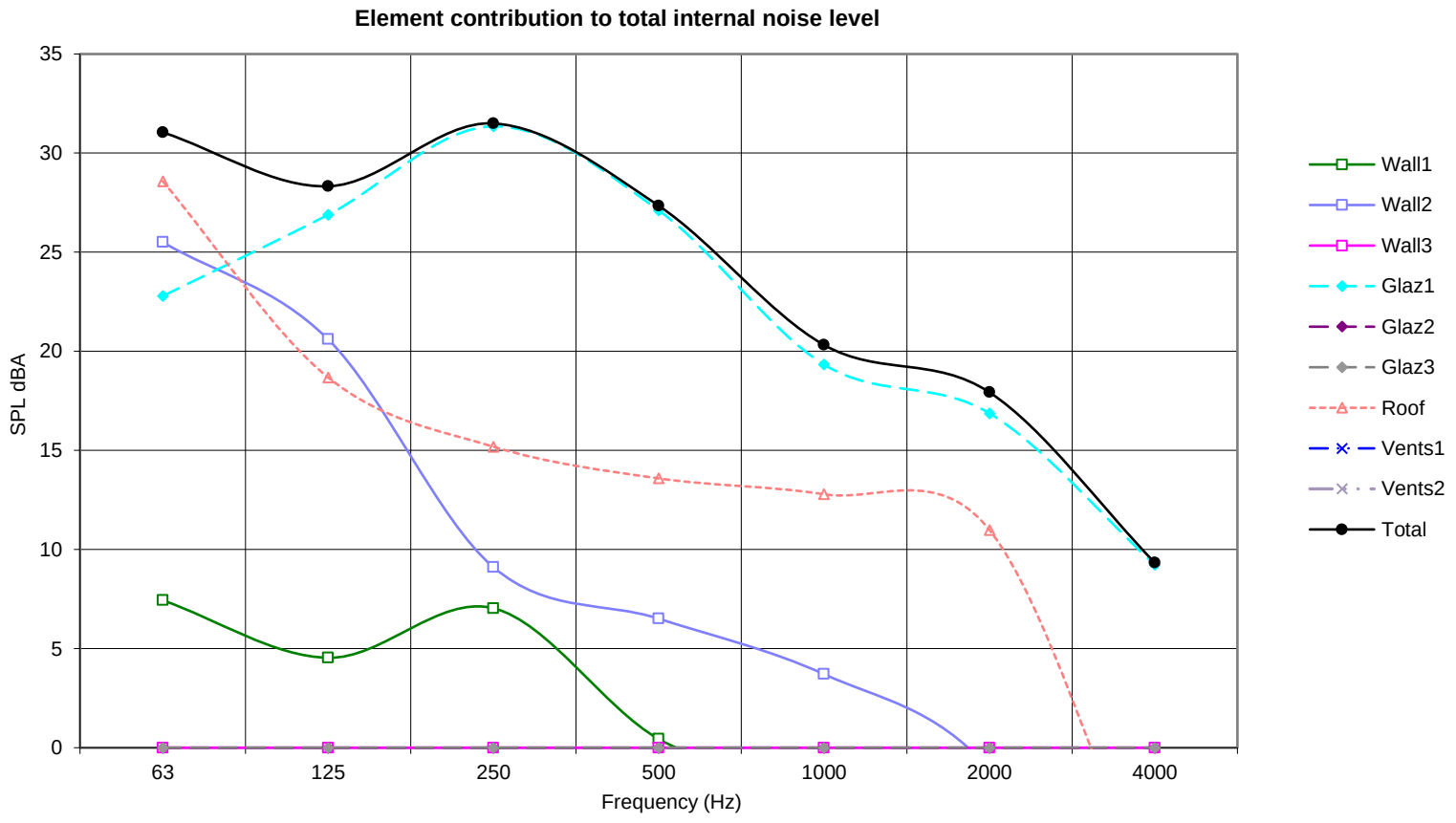
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	0%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	12%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	66%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	11.0	23	37	44	49	53	52	66	22%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	29	30	37	47	47	50				
	Resultant SPL inside room excluding ventilators dB	36.1	31	28	31	27	20	18	9	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**36.1**	31	28	31	27	20	18	9



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - LKD. Houses (GF) - Worst Case Living Room
VARIANT:	Transport Noise: Daytime Average - LAeq,16hr
NOTES:	Criterion: 35 dB LAeq,16hr

Room Dimensions [m]: W 10.0 X L 3.8 X H 2.6

Room Volume = 98.8 m3
Partition Area = 19.8 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	59.0								
		40.8	44.9	48.4	51.8	55.0	52.2	47.0	**Reference spectrum**

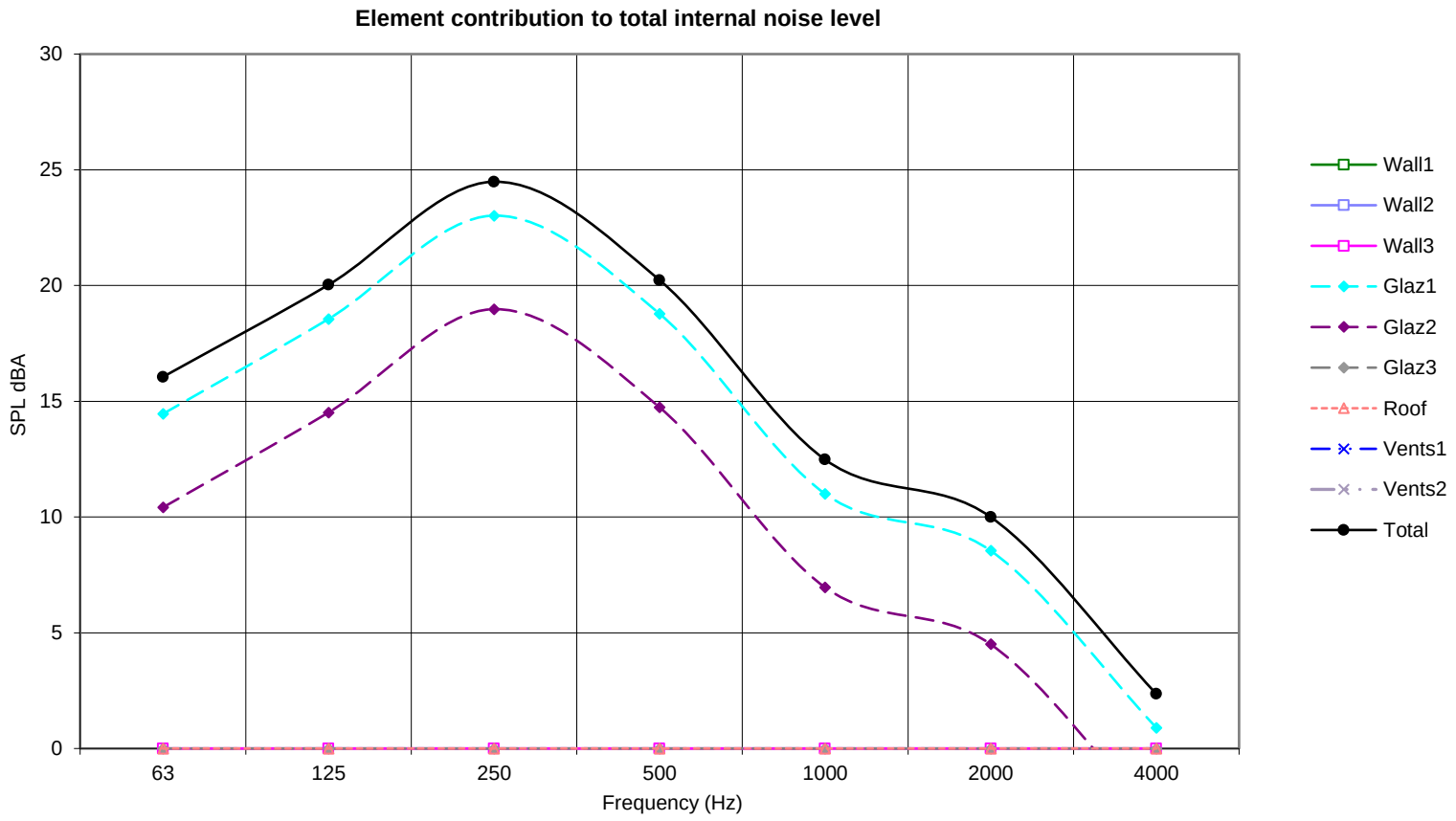
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	6.3	39	46	47	57	63	67	69	0%	61	-3	-6
	ATTENUATION												
Wall 2	EW01 - Houses Wall	8.5	39	46	47	57	63	67	69	0%	61	-3	-6
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.6	20	20	19	27	38	37	40	71%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	28%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	ROOF / FLOOR		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant composite Façade SRI		26	26	25	33	43	43	46				
	Resultant SPL inside room excluding ventilators dB	27.5	16	20	24	20	12	10	2	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**27.5**	16	20	24	20	12	10	2



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 1, Flat 3 (2F) - Worse Case Block Bedroom
VARIANT:	Transport Noise: Daytime Average - LAeq,16hr
NOTES:	Criterion: 35 dB LAeq,16hr

Room Dimensions [m] W 5.6 X L 3.8 X H 2.4

Room Volume = 51.1 m3
Partition Area = 20.2 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	56.0								
		37.8	41.9	45.4	48.8	52.0	49.2	44.0	**Reference spectrum**

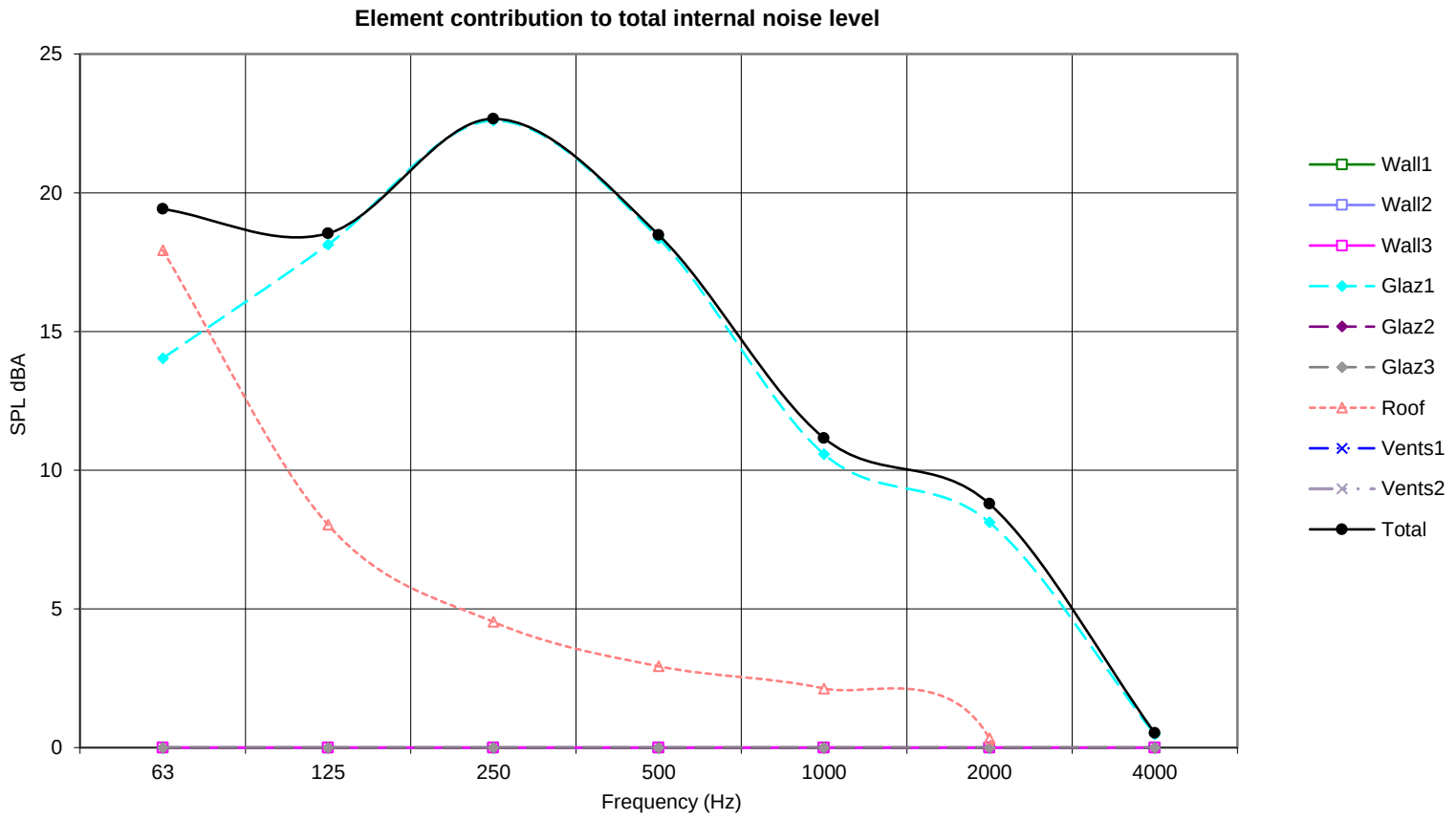
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.3	20	20	19	27	38	37	40	81%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	16.8	23	37	44	49	53	52	66	17%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	27	27	34	45	44	47				
	Resultant SPL inside room excluding ventilators dB	26.4	19	19	23	18	11	9	1	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**26.4**	19	19	23	18	11	9	1



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	5.6	X	3.8	X	2.4
ROOM:	FC02 - Bed 1, Flat 3 (2F) - Worst Case Block Bedroom						
VARIANT:	Transport Noise: Night-time Average - LAeq,8hr						
NOTES:	Criterion: 30 dB LAeq,8hr						

Room Volume =	51.1	m3
Partition Area =	20.2	m2
Ventilation ref area =	10.0	m2
Free Field SPL K =	3	dB

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

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	48.0								
		29.8	33.9	37.4	40.8	44.0	41.2	36.0	**Reference spectrum**

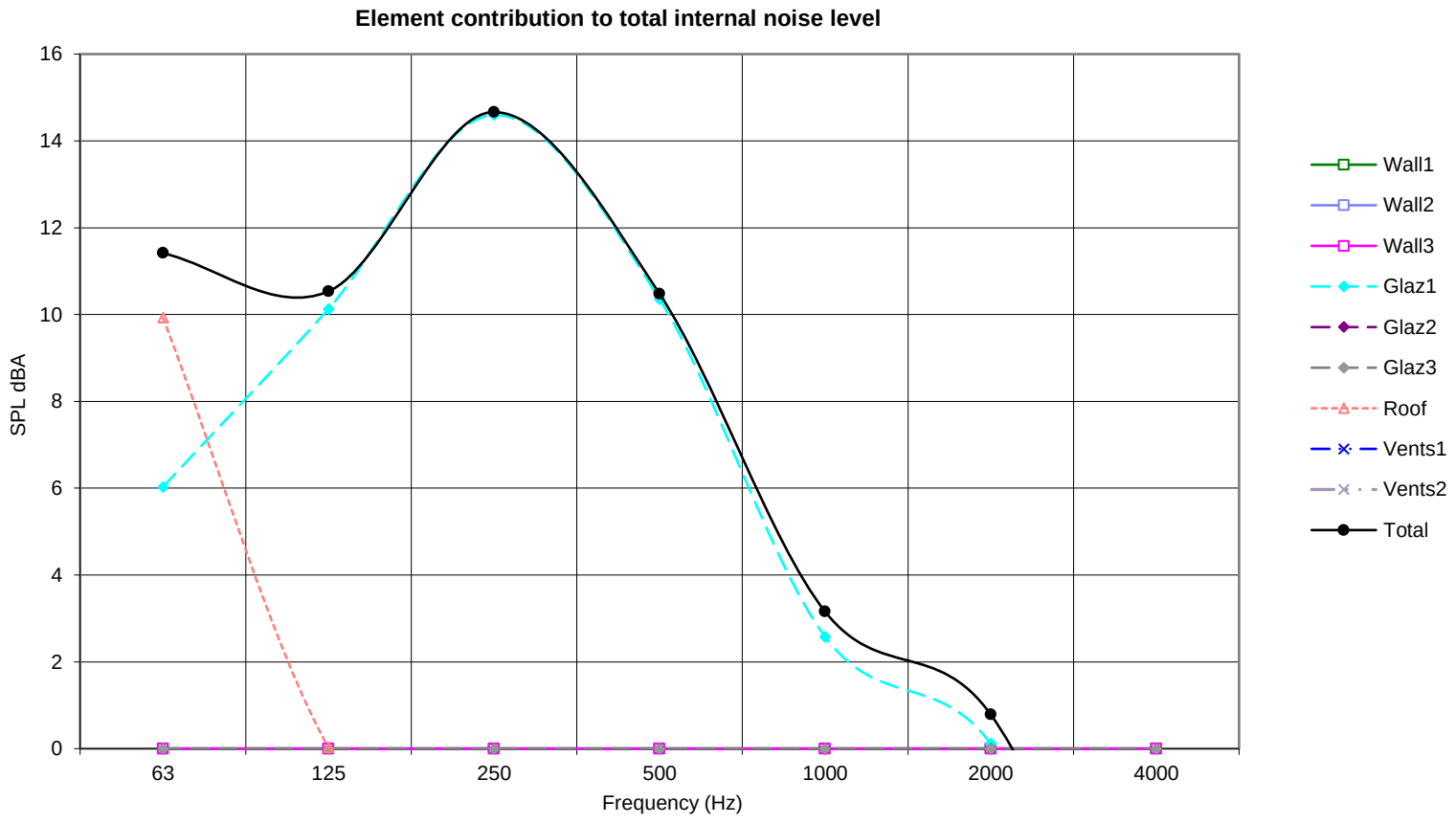
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.3	20	20	19	27	38	37	40	76%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	16.8	23	37	44	49	53	52	66	16%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	27	27	34	45	44	47				
	Resultant SPL inside room excluding ventilators dB	18.4	11	11	15	10	3	1	-7	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**18.4**	11	11	15	10	3	1	-7



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	5.6	X	3.8	X	2.4
ROOM:	FC02 - Bed 1, Flat 3 (2F) - Worst Case Block Bedroom						
VARIANT:	Transport Noise: Night-time Maximum - LAFmax						
NOTES:	Criterion: 45dB LAFmax						

Room Volume =	51.1	m3
Partition Area =	20.2	m2
Ventilation ref area =	10.0	m2
Free Field SPL K =	3	dB

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

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	-								**No data**
Road traffic spectrum (according to BS 8233:1999 section 6)	62.0								
		43.8	47.9	51.4	54.8	58.0	55.2	50.0	**Reference spectrum**

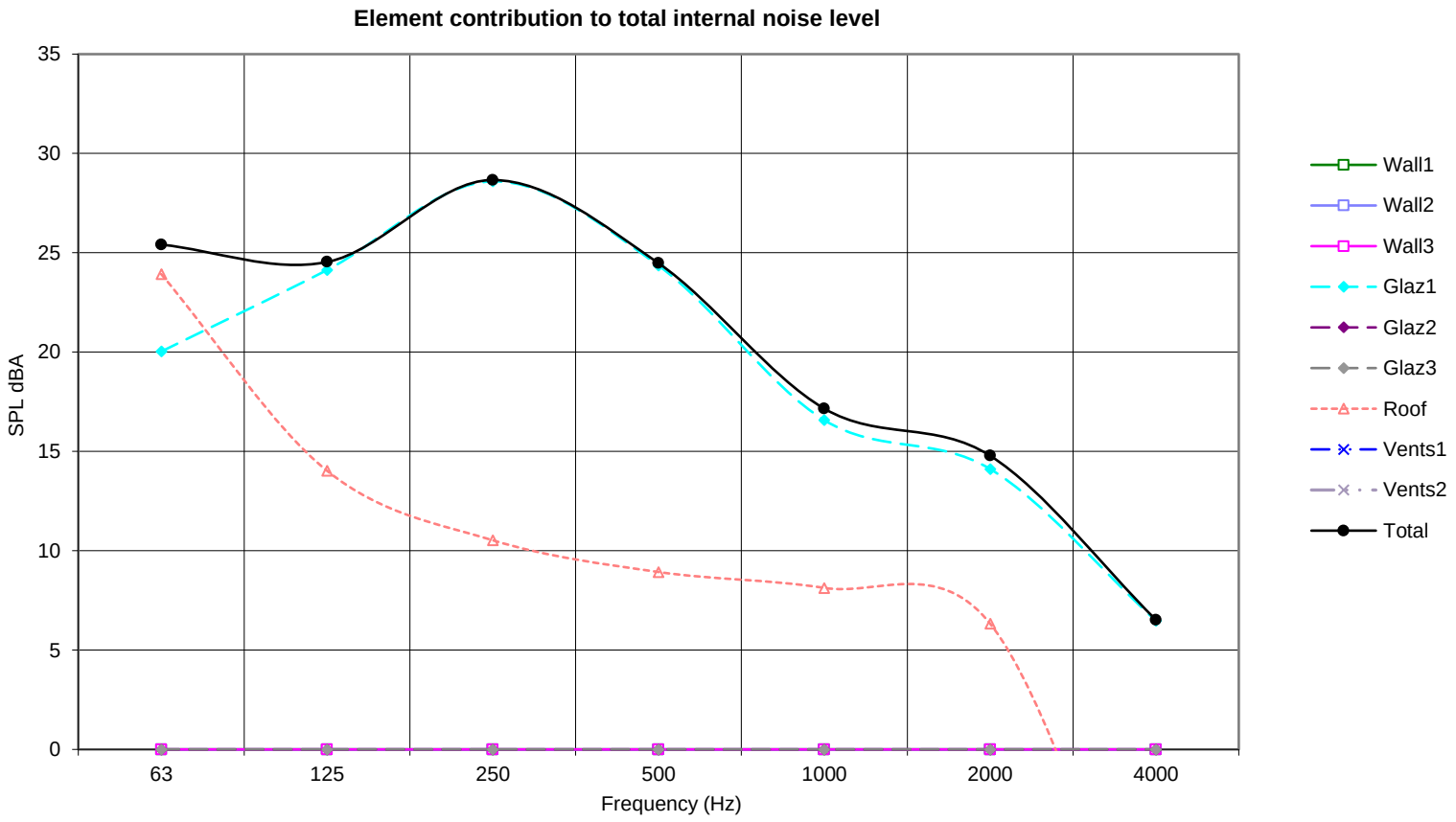
REVERBERATION TIME

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**	

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.3	20	20	19	27	38	37	40	82%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	16.8	23	37	44	49	53	52	66	17%	52	-1	-4
	ATTENUATION												
Resultant composite Façade SRI			22	27	27	34	45	44	47				
Resultant SPL inside room excluding ventilators dB		32.4	25	25	29	24	17	15	7	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Resultant SPL inside room through ventilators dB		-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**32.4**	25	25	29	24	17	15	7



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	7.8	X	6.7	X	2.4
ROOM:	FC02 - Flat 3 (2F) - Worst Case Living Room						
VARIANT:	Transport Noise: Daytime Average - LAeq,16hr						
NOTES:	Criterion: 35 dB LAeq,16hr						

Room Volume =	125.4	m3
Partition Area =	52.2	m2
Ventilation ref area =	10.0	m2
Free Field SPL K =	3	dB

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

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	50.2	36.9	37.7	42.8	43.4	45.4	42.3	33.5	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		36.9	37.7	42.8	43.4	45.4	42.3	33.5	**Direct input**

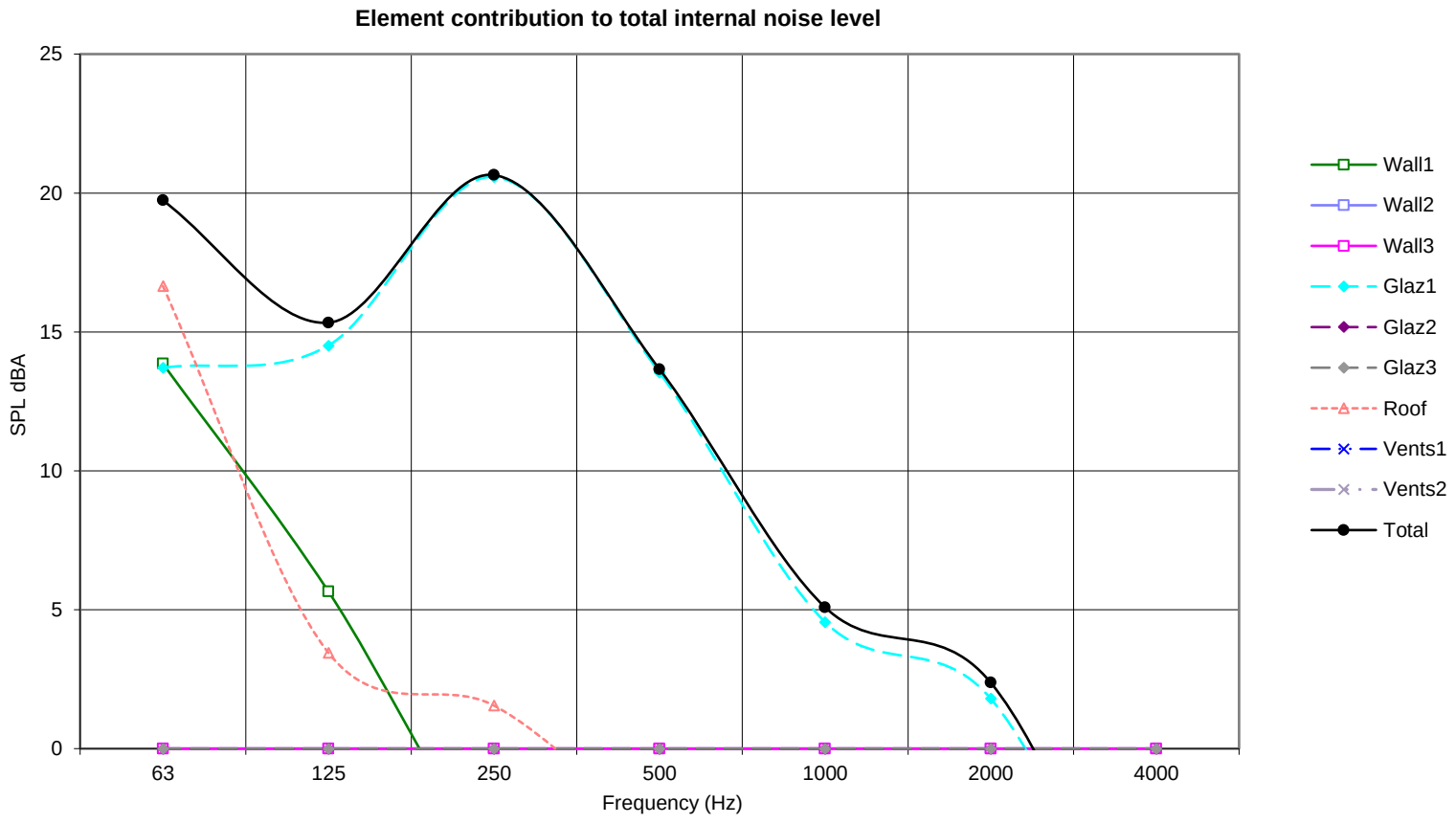
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW05 - Dormer	5.0	17	26	41	47	53	55	64	10%	50	-3	-10
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	9.3	20	20	19	27	38	37	40	70%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	37.9	23	37	44	49	53	52	66	18%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		21	27	26	34	44	44	47				
	Resultant SPL inside room excluding ventilators dB	24.4	20	15	21	14	5	2	-9	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**24.4**	20	15	21	14	5	2	-9



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC01 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Pub noise - music and plant: night-time average - LAeq,T (night)
NOTES:	Criterion: 20 dB LAeq,T (night)

Room Dimensions [m]: W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	50.0	37.3	37.7	38.7	44.2	45.1	42.7	36.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		37.3	37.7	38.7	44.2	45.1	42.7	36.0	**Direct input**

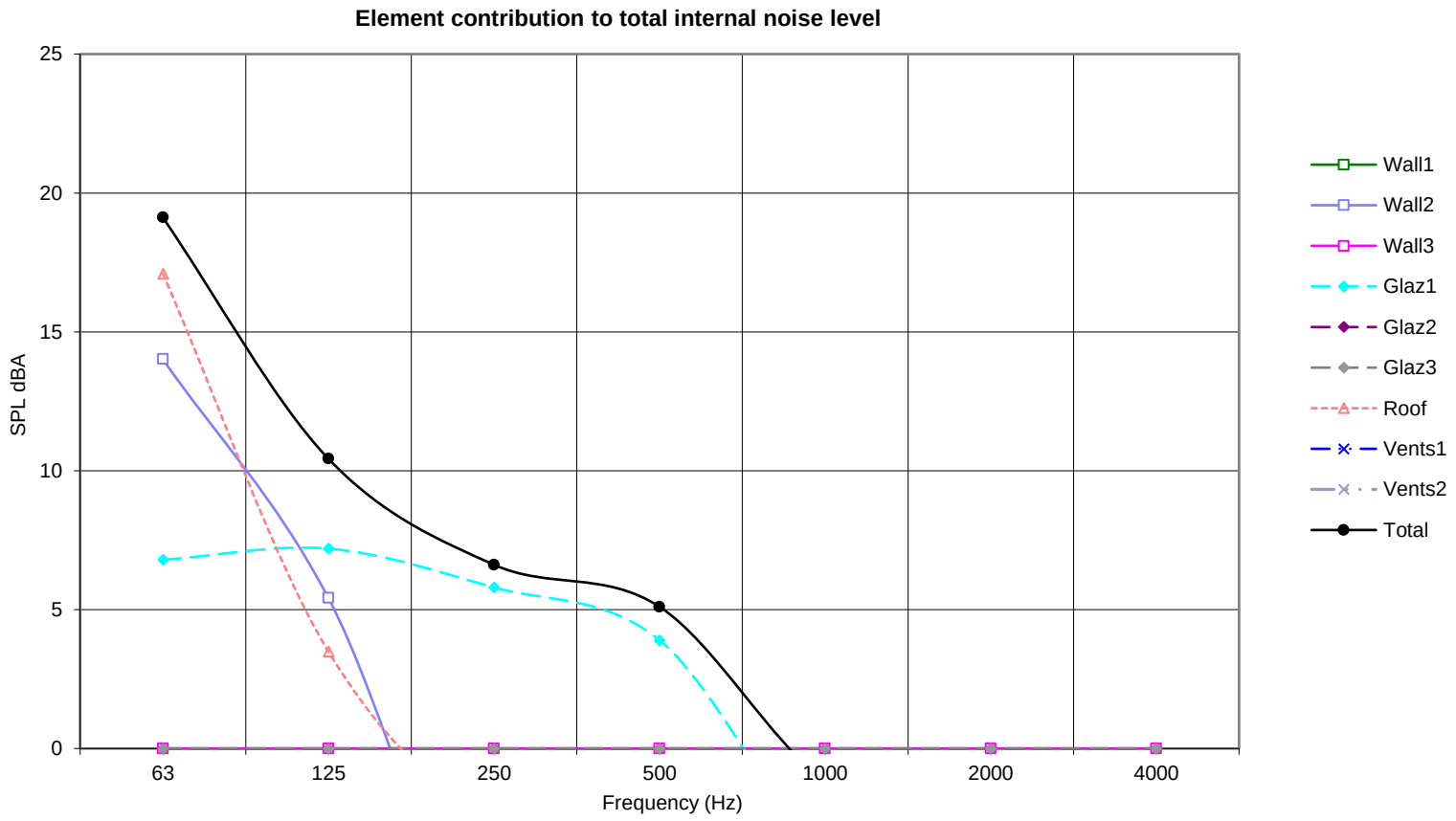
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	1%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	27%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	33 dB Rw + Ctr - High Acoustic Performance Double Glazing	1.4	24	24	27	34	43	44	49	16%	33 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof, double boarded internally	11.0	23	37	44	49	53	52	66	52%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		23	32	37	44	51	51	59				
	Resultant SPL inside room excluding ventilators dB	20.1	19	10	7	5	-1	-4	-18	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**20.1**	19	10	7	5	-1	-4	-18



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Pub noise - music and plant: night-time average - LAeq,T (night)
NOTES:	Criterion: 20 dB LAeq,T (night)

Room Dimensions [m] W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>> Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	47.0	34.3	34.7	35.7	41.2	42.1	39.7	33.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		34.3	34.7	35.7	41.2	42.1	39.7	33.0	**Direct input**

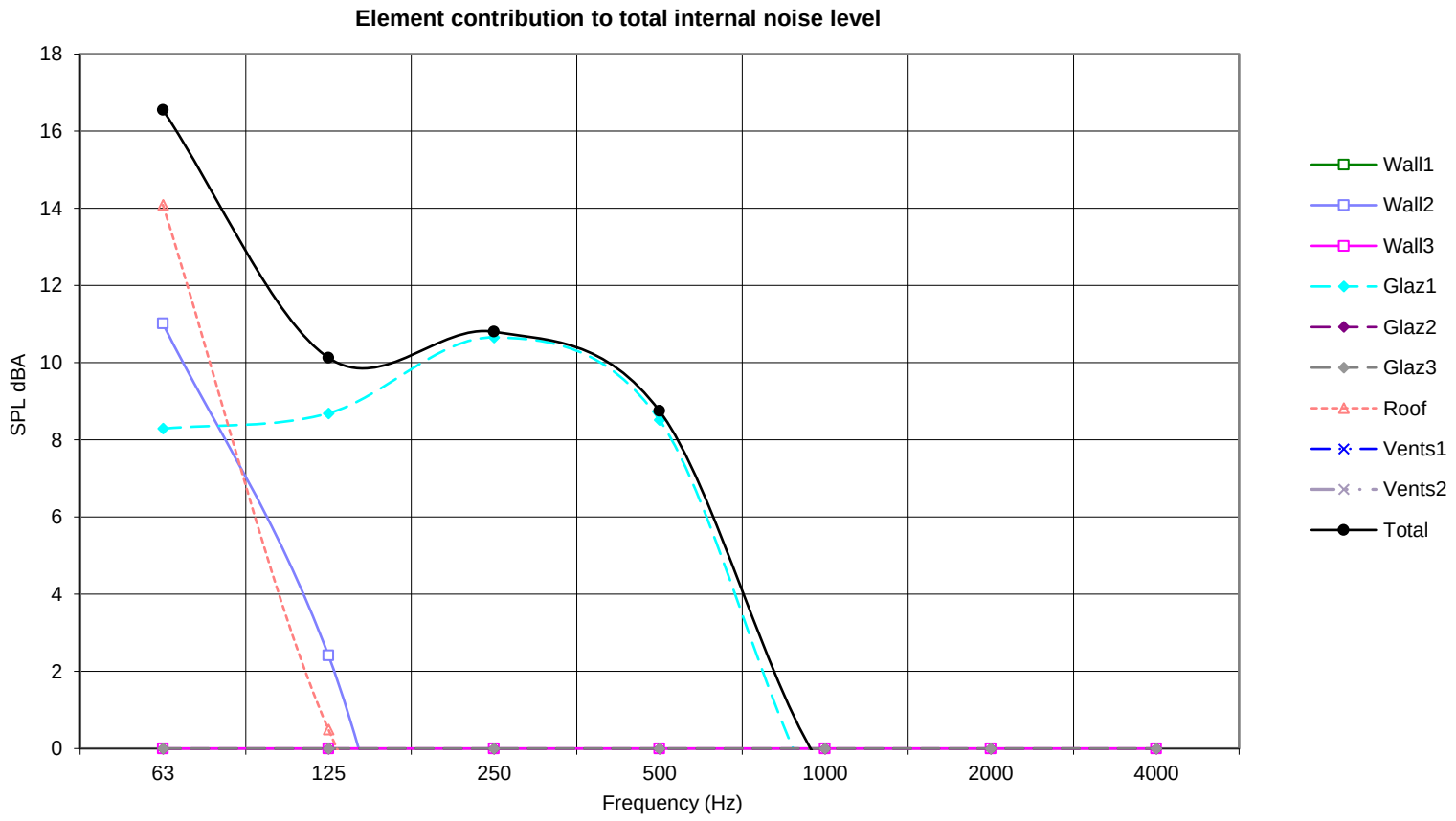
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	1%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	18%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	42%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	11.0	23	37	44	49	53	52	66	34%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	29	30	37	47	47	50				
	Resultant SPL inside room excluding ventilators dB	18.8	17	10	11	9	-1	-3	-13	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**18.8**	17	10	11	9	-1	-3	-13



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 4, Houses (2F) - Worst Case House Bedroom
VARIANT:	Pub noise - disposal of glass bottles - LAmax
NOTES:	Criterion: 40 dB LAmax

Room Dimensions [m]: W 5.2 X L 3.2 X H 2.4

Room Volume = 36.1 m3
Partition Area = 17.1 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	65.0	47.9	45.3	49.1	51.0	58.1	60.8	59.9	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		47.9	45.3	49.1	51.0	58.1	60.8	59.9	**Direct input**

REVERBERATION TIME

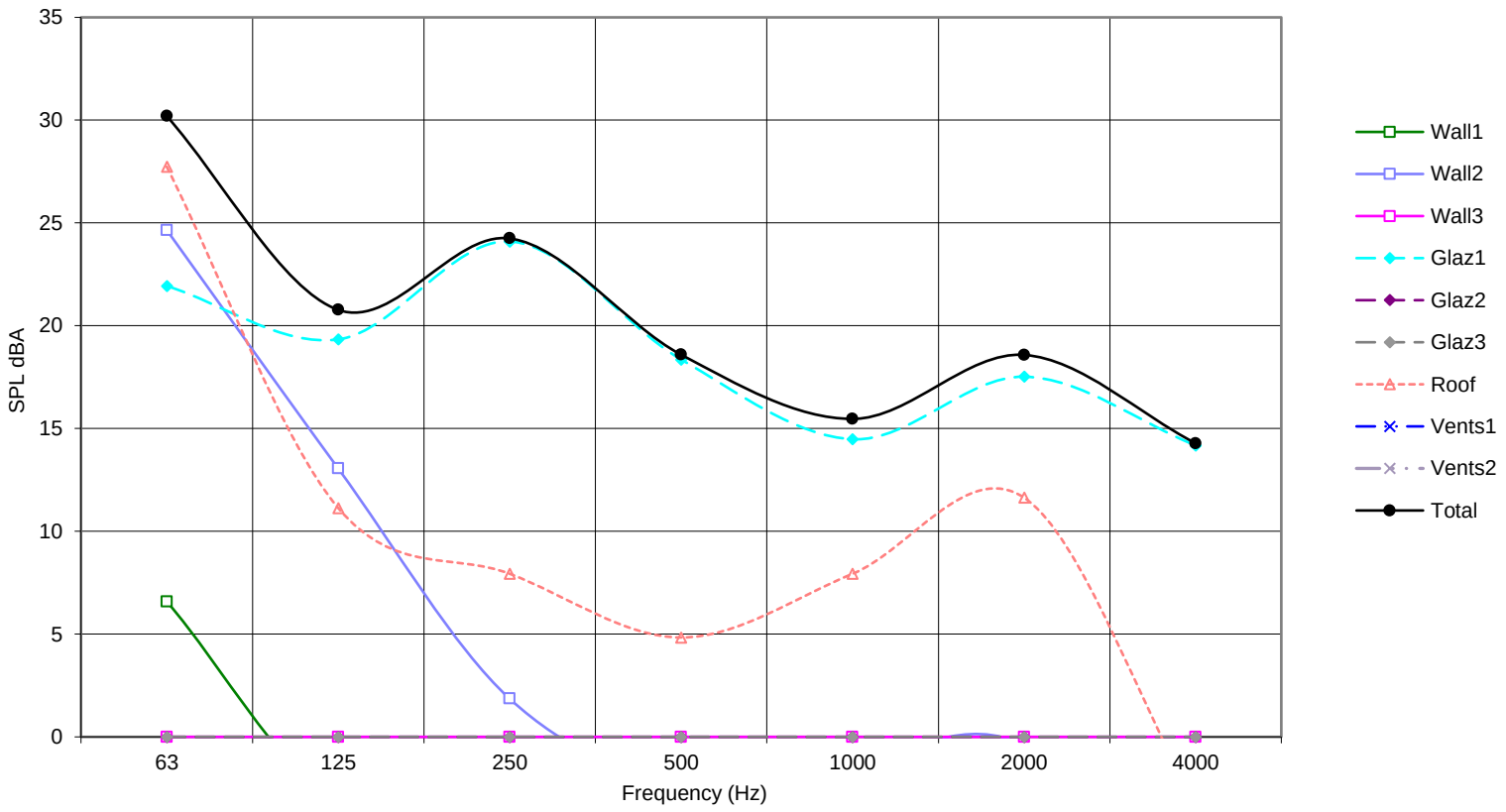
DIRECT INPUT ----->									**No data**
EQUAL RT for all bands ----->									
	0.5	0.5	0.5	0.5	0.5	0.5	0.5		**Default - RT set to 0.5s**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	3.4	39	46	47	57	63	67	69	0%	61	-3	-6
	ATTENUATION												
Wall 2	EW05 - Dormer	1.4	17	26	41	47	53	55	64	19%	50	-3	-10
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	41%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	11.0	23	37	44	49	53	52	66	39%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	29	30	37	47	47	50				
	Resultant SPL inside room excluding ventilators dB	32.1	30	21	24	19	15	19	14	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**32.1**	30	21	24	19	15	19	14

Element contribution to total internal noise level



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - LKD. Houses (GF) - Worst Case Living Room
VARIANT:	Pub noise - music and plant: night-time average - LAeq,T (day)
NOTES:	Criterion: 25 dB LAeq,T (day)

Room Dimensions [m]: W 10.0 X L 3.8 X H 2.6

Room Volume = 98.8 m3
Partition Area = 19.8 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	50.0	37.3	37.7	38.7	44.2	45.1	42.7	36.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		37.3	37.7	38.7	44.2	45.1	42.7	36.0	**Direct input**

REVERBERATION TIME

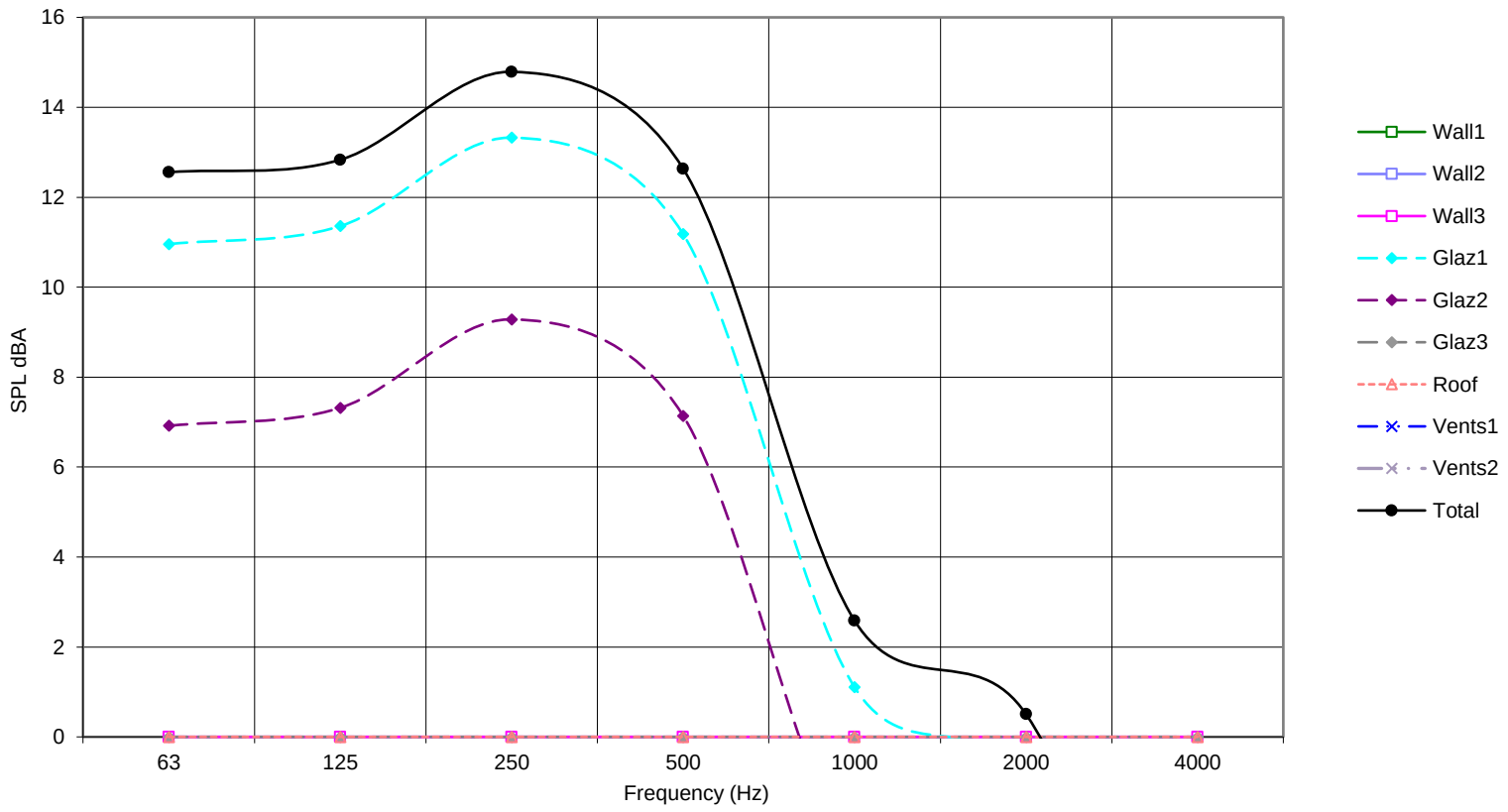
DIRECT INPUT ----->									**No data**
EQUAL RT for all bands ----->									
	0.5	0.5	0.5	0.5	0.5	0.5	0.5		**Default - RT set to 0.5s**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW01 - Houses Wall	6.3	39	46	47	57	63	67	69	1%	61	-3	-6
	ATTENUATION												
Wall 2	EW01 - Houses Wall	8.5	39	46	47	57	63	67	69	1%	61	-3	-6
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.6	20	20	19	27	38	37	40	67%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	27 dB Rw + Ctr - Standard Thermal Double Glazing	1.4	20	20	19	27	38	37	40	26%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	ROOF / FLOOR		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant composite Façade SRI		26	26	25	33	43	43	46				
	Resultant SPL inside room excluding ventilators dB	19.5	13	13	15	13	3	1	-9	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**19.5**	13	13	15	13	3	1	-9

Element contribution to total internal noise level



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	5.6	X	3.8	X	2.4
ROOM:	FC01 - Bed 1, Flat 3 (2F) - Worst Case Block Bedroom						
VARIANT:	Pub noise - music and plant: night-time average - LAeq,T (night)						
NOTES:	Criterion: 20 dB LAeq,T (night)						

Room Volume =	51.1	m3	
Partition Area =	20.2	m2	
Ventilation ref area =	10.0	m2	
SELECT Free Field or Façade SPL for model input >>>	Free Field SPL K =	3	dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	50.0	37.3	37.7	38.7	44.2	45.1	42.7	36.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		37.3	37.7	38.7	44.2	45.1	42.7	36.0	**Direct input**

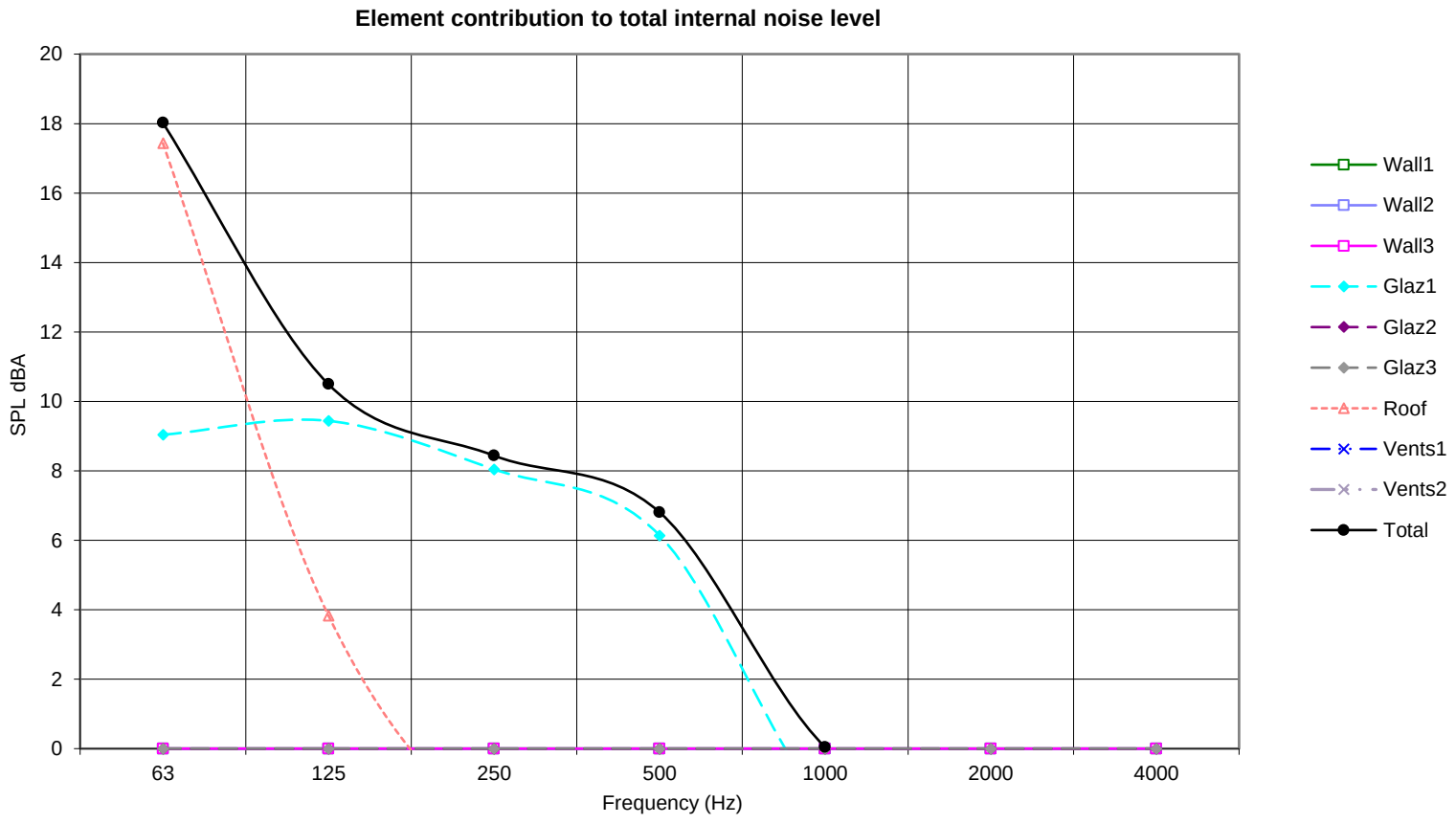
REVERBERATION TIME

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**	

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	33 dB Rw + Ctr - High Acoustic Performance Double Glazing	3.3	24	24	27	34	43	44	49	30%	33 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof, double boarded internally	16.8	23	37	44	49	53	52	66	63%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		23	31	34	41	49	49	56				
	Resultant SPL inside room excluding ventilators dB	19.4	18	10	8	7	0	-2	-17	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**19.4**	18	10	8	7	0	-2	-17



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FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H	
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	5.6	X	3.8	X	2.4	
ROOM:	FC02 - Bed 1, Flat 3 (2F) - Worst Case Block Bedroom							
VARIANT:	Pub noise - music and plant: night-time average - LAeq,T (night)						Room Volume =	51.1 m3
NOTES:	Criterion: 20 dB LAeq,T (night)						Partition Area =	20.2 m2
							Ventilation ref area =	10.0 m2
		SELECT Free Field or Façade SPL for model input >>>					Free Field SPL K =	3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	46.0	33.3	33.7	34.7	40.2	41.1	38.7	32.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		33.3	33.7	34.7	40.2	41.1	38.7	32.0	**Direct input**

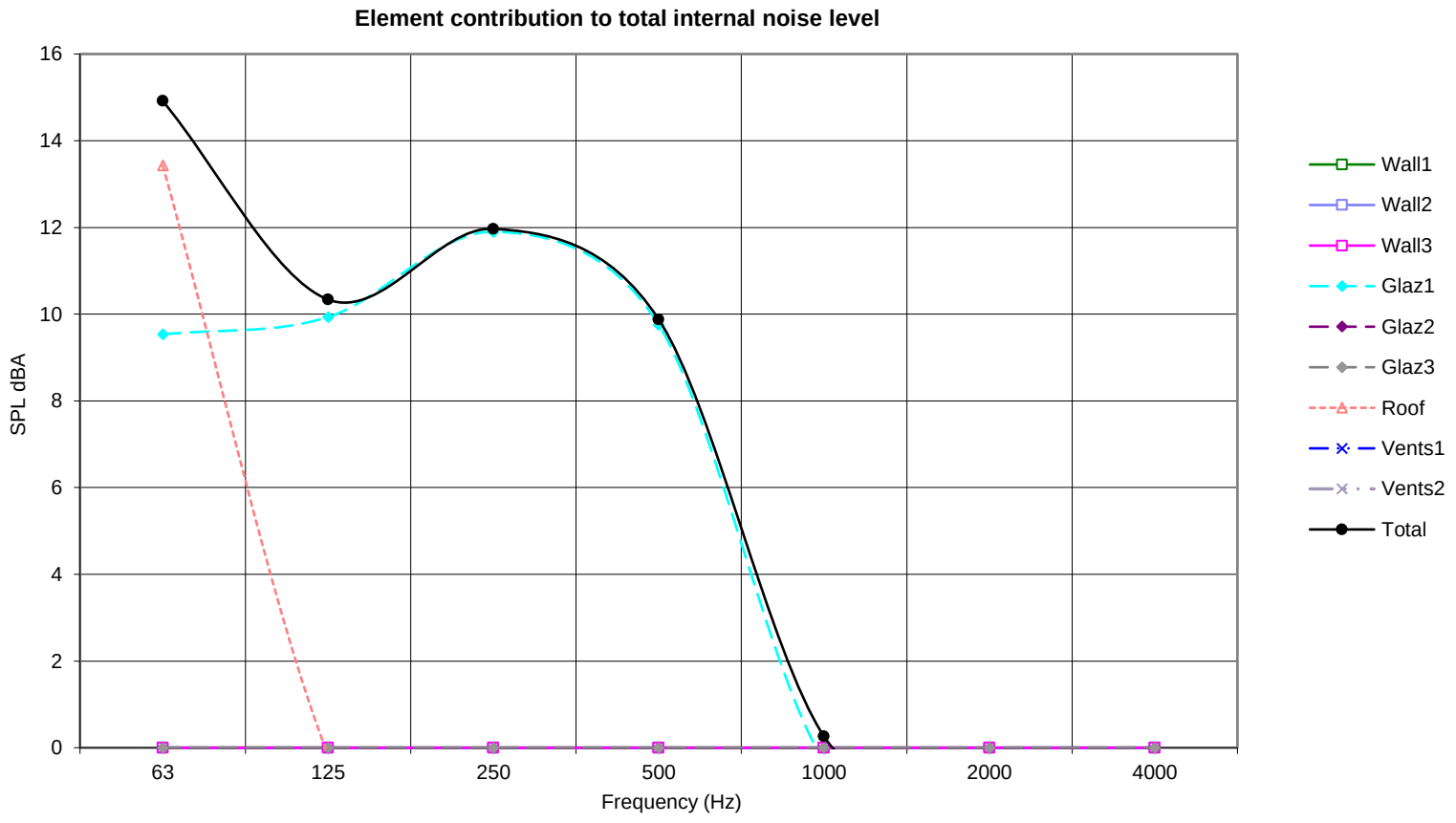
REVERBERATION TIME

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**	

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.3	20	20	19	27	38	37	40	60%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	16.8	23	37	44	49	53	52	66	32%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	27	27	34	45	44	47				
	Resultant SPL inside room excluding ventilators dB	18.4	15	10	12	10	0	-2	-11	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**18.4**	15	10	12	10	0	-2	-11



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

PROJECT:	Salisbury Square, Hatfield
ROOM:	FC02 - Bed 1, Flat 3 (2F) - Worst Case Block Bedroom
VARIANT:	Pub noise - disposal of glass bottles - LAmax
NOTES:	Criterion: 40 dB LAmax

Room Dimensions [m]: W 5.6 X L 3.8 X H 2.4

Room Volume = 51.1 m3
Partition Area = 20.2 m2
Ventilation ref area = 10.0 m2
SELECT Free Field or Façade SPL for model input >>>
Free Field SPL K = 3 dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	65.0	47.9	45.3	49.1	51.0	58.1	60.8	59.9	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		47.9	45.3	49.1	51.0	58.1	60.8	59.9	**Direct input**

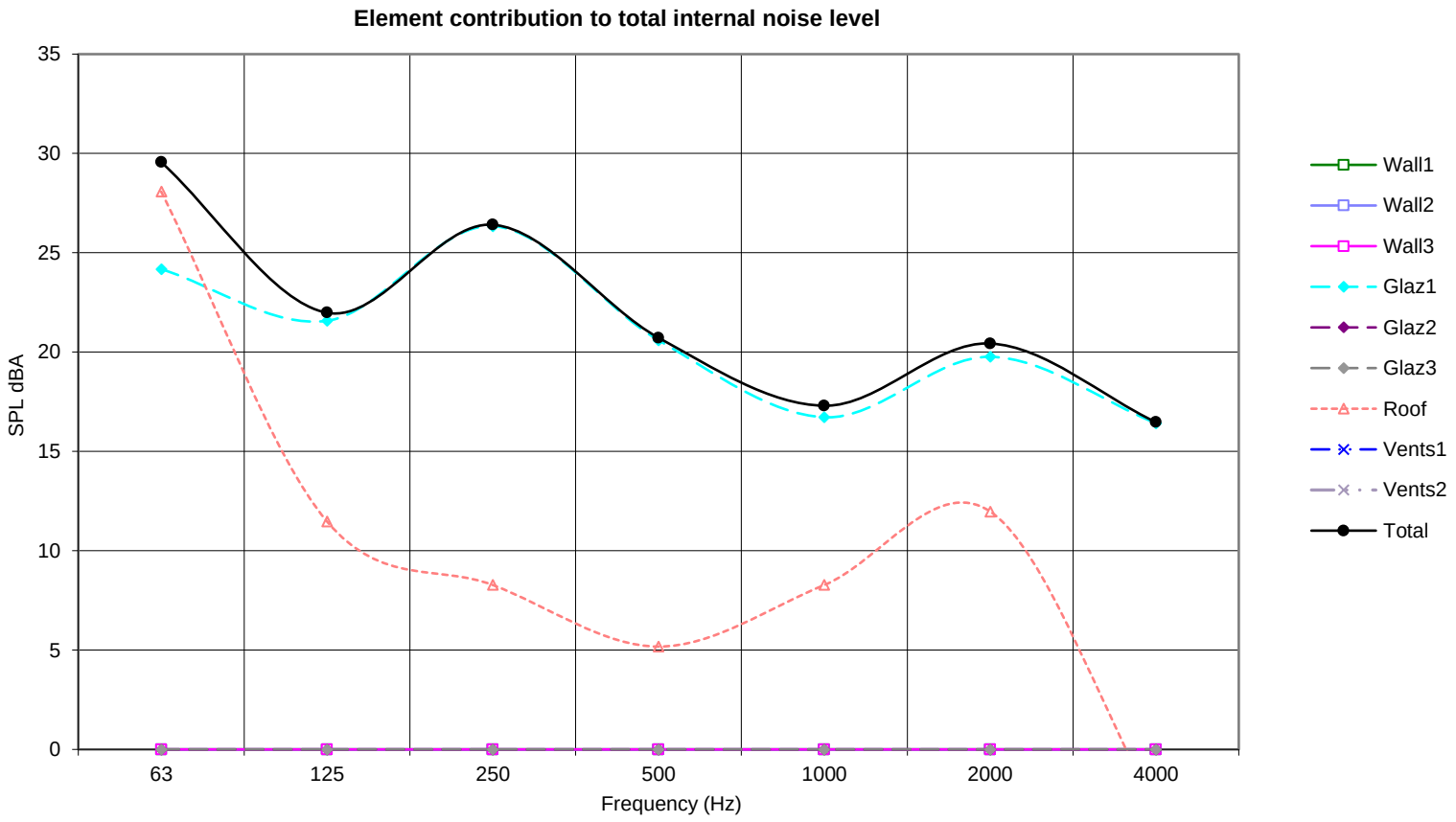
REVERBERATION TIME

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**

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	3.3	20	20	19	27	38	37	40	62%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	16.8	23	37	44	49	53	52	66	38%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		22	27	27	34	45	44	47				
	Resultant SPL inside room excluding ventilators dB	32.6	30	22	26	21	17	20	16	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**32.6**	30	22	26	21	17	20	16



FACSIM V2.7.9 - MODELLING OF FACADE ACOUSTIC INSULATION TO BS12354-3 and BS8233

			W		L		H	
PROJECT:	Salisbury Square, Hatfield	Room Dimensions [m]	7.8	X	6.7	X	2.4	
ROOM:	FC02 - Flat 3 (2F) - Worst Case Living Room							
VARIANT:	Pub noise - music and plant: daytime average - LAeq,T (day)					Room Volume =	125.4	m3
NOTES:	Criterion: 25 dB LAeq,T (day)					Partition Area =	52.2	m2
						Ventilation ref area =	10.0	m2
		SELECT Free Field or Façade SPL for model input >>>				Free Field SPL K =	3	dB

NOTES:

EXTERNAL SPECTRUM (A weighted)

	dBA	63	125	250	500	1000	2000	4000	
Direct input - Free Field SPL (A weighted octave bands) dB ----->	50.0	37.3	37.7	38.7	44.2	45.1	42.7	36.0	
Road traffic spectrum (according to BS 8233:1999 section 6)									
		37.3	37.7	38.7	44.2	45.1	42.7	36.0	**Direct input**

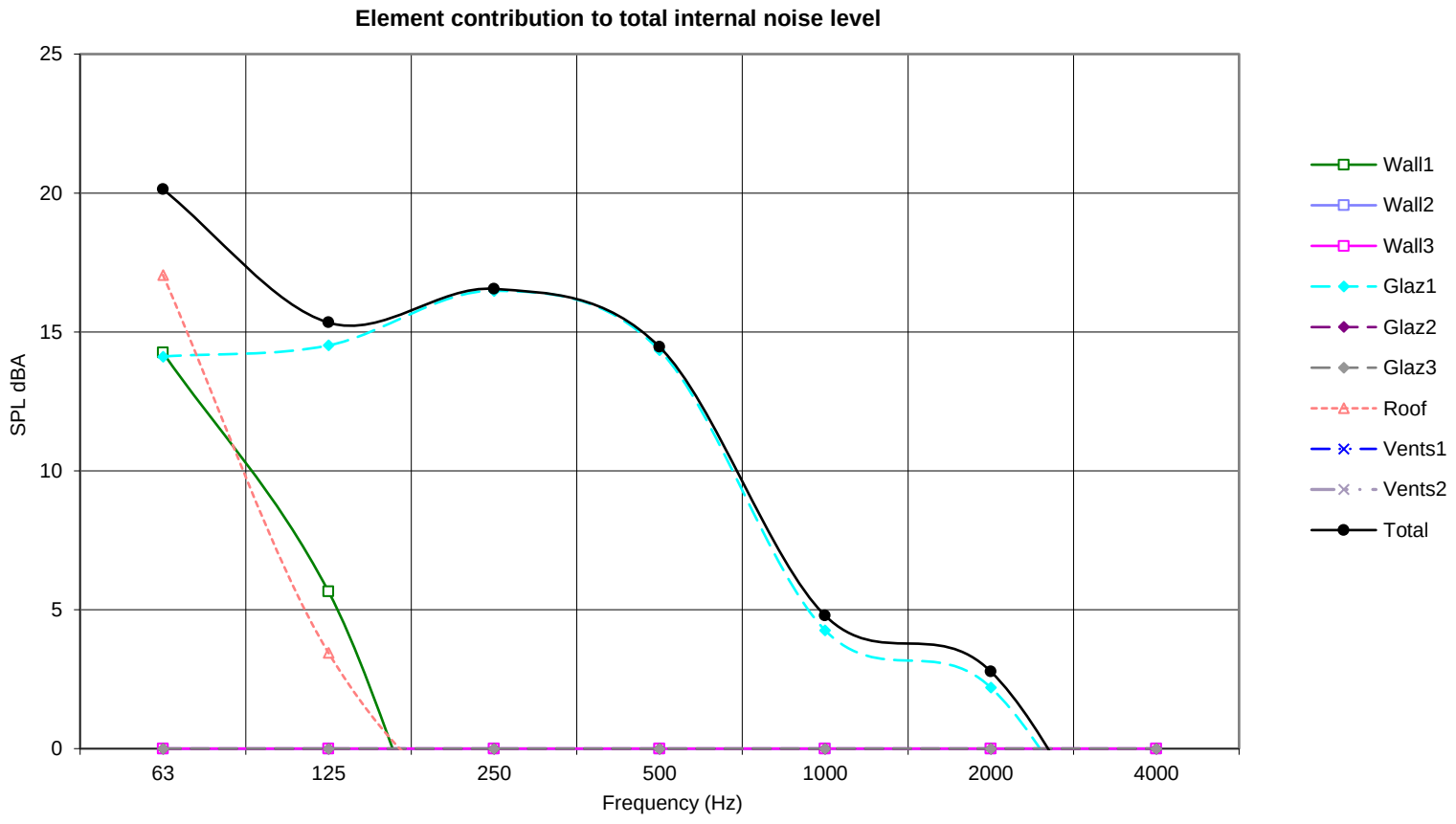
REVERBERATION TIME

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**	

Façade Element		Area [m2]	SRI dB to BS EN ISO 140-3:1995								Rw	C	Ctr
Wall 1	EW05 - Dormer	5.0	17	26	41	47	53	55	64	14%	50	-3	-10
	ATTENUATION												
Wall 2	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Wall 3	WALLS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 1	27 dB Rw + Ctr - Standard Thermal Double Glazing	9.3	20	20	19	27	38	37	40	59%	27 (inc Ctr)	-	-
	ATTENUATION												
Glazing 2	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Glazing 3	GLAZING		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Roof	EW04 - Roof , double boarded internally	37.9	23	37	44	49	53	52	66	25%	52	-1	-4
	ATTENUATION												
	Resultant composite Façade SRI		21	27	26	34	44	44	47				
	Resultant SPL inside room excluding ventilators dB	23.3	20	15	17	14	5	3	-7	100%			

Ventilator Type		Num	$D_{n,e}$ dB to BS EN 20140-10:1992								Dnew	C	Ctr
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
Ventilation	VENTS		0	0	0	0	0	0	0	0%			
	ATTENUATION												
	Resultant SPL inside room through ventilators dB	-99.0	-96	-96	-96	-96	-96	-96	-96	0%			

Total SPL inside room	**23.3**	20	15	17	14	5	3	-7

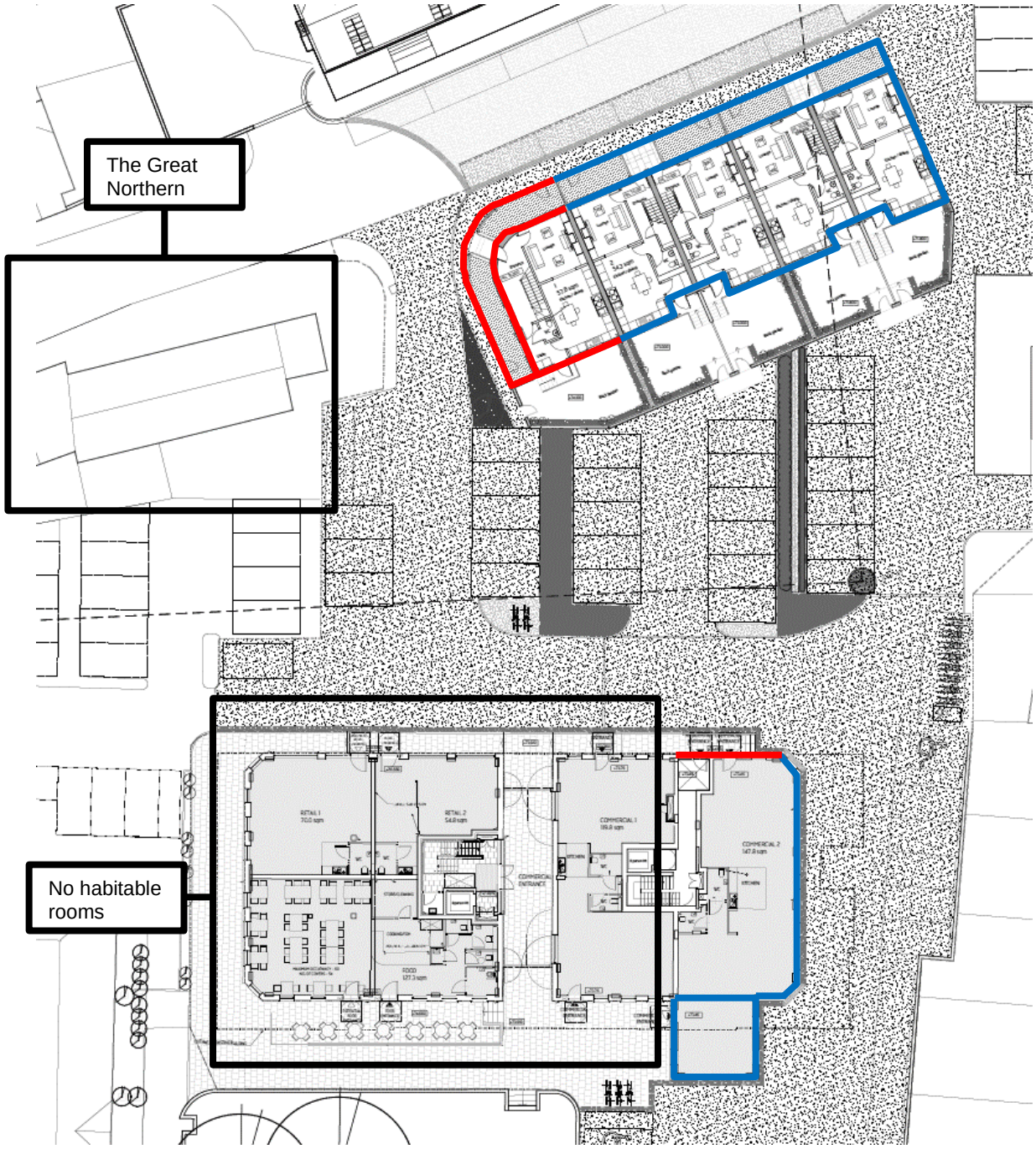


Appendix 4 Acoustic Facade Specification

Reference	Colour	Minimum Glazing Sound Insulation Performance Requirements	
		Bedrooms	**Living Rooms**
FC01		33 dB Rw+Ctr	27 dB Rw+Ctr
FC02		27 dB Rw+Ctr	27 dB Rw+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 in residential use:



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