

**Re-assessment of the Internal Noise
Climate within the New Apartments Contained Within the
Townhead Building, 150 Yorkshire Street, Rochdale.**

Report Prepared for:

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1.0 Summary

A previous assessment of the internal noise climate within apartment 2 of the residential apartments, contained within the former Rochdale Borough Council offices building at 150 Yorkshire Street in Rochdale, was undertaken in August 2023. This assessment highlighted that the internal noise climate within the apartment did not comply with the guide values contained within British Standard (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings". During the course of the assessment the qualitative assessment of the internal noise climate indicated that the primary transmission route was via the large windows serving the bedrooms and living spaces and as such these would require upgrading to limit the ingress of external noise via this route.

Since the completion of the original noise assessment, remedial works have been undertaken and the existing windows have been augmented by the addition of secondary glazing units to the windows on the John Street elevation of the building. In order to evaluate what effect the installation of the secondary glazing has had on the internal noise climate, a subsequent noise assessment has been undertaken, again within apartment 2 of the development.

The results of the re-assessment have demonstrated that the within the living room the mean (log) daytime level was 30dB L_{Aeq} and within the bedroom, the day and night time mean (log) levels were 26 and 22 dB L_{Aeq} respectively. As such the measured levels within the respective spaces did not exceed either the daytime or night time design guide values. Turning to the L_{Amax} levels within the bedrooms at night, it can be seen that the mean (log) value for this parameter during the night was 35dB and as such it was comfortably below the 45dB L_{Amax} guide during the night time period. In addition it was noted that during the night time period the measured levels did not exceed 45dB at any time.

Consequently, the results of the re-assessment of the internal noise climate have demonstrated that the addition of the secondary glazing system has had a significant and beneficial effect on the internal noise climate, such that the internal noise climate now complies with the design guide values detailed within BS 8233:2014. The results of the re-assessment have also demonstrated that the internal noise climate within apartment 2 now complies with Rochdale Council's requirement to demonstrate the at the apartments are "*suitable for habitation*". Additionally, discussions with the client have indicated that the existing glazing of all the apartments facing John Street had been augmented by the same secondary glazing specification. This being the case it is suggested that the same beneficial effects on the internal noise climate would be expected within these apartments as well.



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Robert Smith

2.0 Introduction

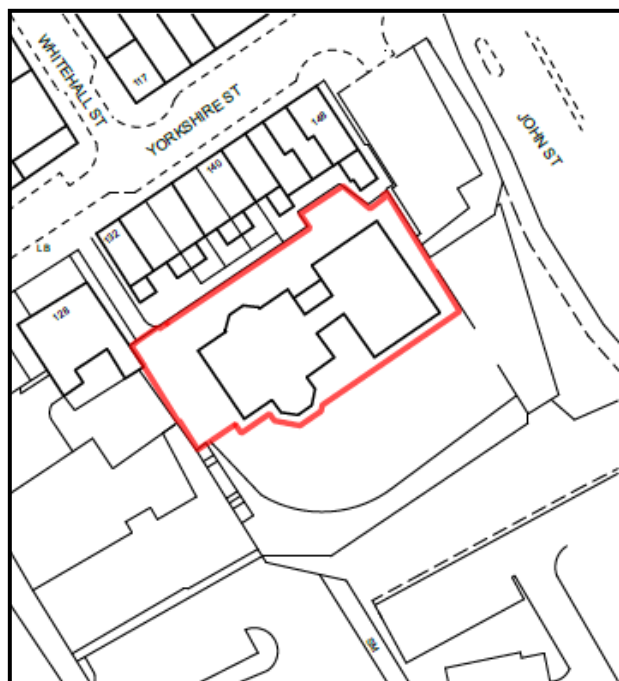
A previous assessment of the internal noise climate within apartment 2 of the residential apartments, contained within the former Rochdale Borough Council offices building at 150 Yorkshire Street in Rochdale, was undertaken in August 2023. The assessment highlighted that the internal noise climate within the apartment did not comply with the guide values contained within British Standard (BS) 8233:2014 “Guidance on sound insulation and noise reduction for buildings”. During the course of the assessment the qualitative assessment of the internal noise climate indicated that the primary transmission route was via the large windows serving the bedrooms and living spaces and as such these would require upgrading to limit the ingress of external noise via this route.

Since the completion of the original noise assessment remedial works have been undertaken and the existing windows have been augmented by the addition of secondary glazing units to the windows on the John Street elevation of the building. In order to evaluate what effect the installation of the secondary glazing has had on the internal noise climate, a further noise assessment has been undertaken, again within apartment 2 of the development.

3.0 Site Description

The existing building is located at 150 Yorkshire Street in Rochdale and is believed to date from the late nineteenth century (figure 1 below and photograph 1 overleaf). To the North of the existing building is Yorkshire Street itself which hosts a range of retail shops (photograph 2 overleaf), to the South of the existing building is a car park with the extensive Upperbanks residential development beyond (photograph 3 overleaf). To the East of the existing building is John Street (photograph 4 overleaf) and to the West of the existing building are further retail buildings on Yorkshire Street with the Wheatsheaf shopping centre beyond (photograph 5 overleaf).

Figure 1. Location of the residential apartments, (edged in red), 150 Yorkshire Street



Photograph 1. Former council offices, 150 Yorkshire Street



Photograph 2. Retail shops on Yorkshire Street



Photograph 3. Car park and Upperbanks development to the South of the former council offices



Photograph 4. John Street to the East of the former council offices



Photograph 5. Wheatsheaf shopping centre to the south of the former council offices



4.0 Assessment Criteria

Prior to the original internal noise assessment in August 2023, Rochdale Borough Council had raised concerns relating to the potential for break-in noise from the external environment to adversely affect the internal noise environment within the residential apartments. This concern was expressed in an email received from Rochdale Borough Council's Planning Department and the relevant text from this email is reproduced below.

The site is set against John Street which is a busy main road facilitating large volumes of traffic both through the day and night, with the associated traffic dominating the acoustic environment around this site. After discussing with the Environmental Health Officer they have requested that a Noise Impact Assessment is provided in order to demonstrate that the rooms are either currently suitable for habitation, or a scheme of works necessary to ensure suitable internal conditions.

It is noted that the adjacent Upperbanks development did carry out a NIA which concluded that uprated glazing was required for the windows in the elevations facing east.

With respect to the above comments and prior to undertaking the original noise assessment, discussions were held with Mr. Ryan Killeen within Rochdale Borough Council's Planning Department to agree an assessment procedure. These discussions indicated that the internal noise levels within the apartments would be assessed against the guide values contained within British Standard (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings".

4.1 BS 8233:2014 “Guidance on Sound Insulation and Noise Reduction for Buildings”

BS 8233:2014 draws together research and best practice relating to building design, providing guidance to facilitate the development of buildings that have internal noise environments that are consistent with and appropriate for their intended use. The Standard states that the guidance it contains is applicable to the design of new buildings, or refurbished buildings undergoing a change of use and as such it is deemed applicable to this proposal.

The British Standard highlights methods for the control of noise from a number of sources including external noise and building services etc., as well as evaluating the effect that noise from these sources may have on the acoustics of the internal spaces. With reference to the design guidance relating to the internal noise climate of dwelling houses flats and rooms in residential use, it is suggested that the guidance is applicable to 'anonymous' noise without a 'specific' character, and this is typically the situation where road traffic type noise or similar is the dominant or the principal contributor to the existing noise climate. This being the case BS 8233:2014 indicates that it would be desirable for the internal noise levels, resulting from the break-in of external noise, not to exceed the guide values detailed within table 4 of section 7.7.2. The main elements of the guidance contained within table 4 of section 7.7.2 of BS 8233:2014 are reproduced in table 1 below.

Table 1. Indoor ambient noise levels for dwellings (reproduced from table 4 of BS8233:2014)

Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35dB $L_{Aeq, 16 \text{ hour}}$	-
Dining	Dining room/area	40dB $L_{Aeq, 16 \text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq, 16 \text{ hour}}$	30dB $L_{Aeq, 8 \text{ hour}}$

In addition to the internal noise design guidance detailed above, supplementary note 4 is deemed appropriate to this assessment and state the following:

Note 4. *Regular individual noise events (for example scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.*

With reference to note 4 it should be noted that the current version of BS 8233:2014 does not, unlike the previous 1999 version of BS 8233, contain specific guidance relating to the L_{Amax} criterion for bedrooms. Despite this, the guidance contained within the World Health Organisation's (WHO) "Guidelines for Community Noise" and the previous version of BS 8233, will be adopted for this assessment. The specific guidance contained within the 1999 version of BS 8233 guidance stated that: "*for a reasonable standard for bedrooms at night, individual noise events (measured with the fast time-weighting) should not normally exceed 45 dB L_{Amax}* ".

Further guidance relating to the L_{Amax} criterion is contained within the Planning and Noise: Professional Guidance on Planning and Noise (ProPG) document, published jointly by representatives of the Chartered Institute of Environmental Health (CIEH), the Institute of Acoustics (IoA) and the Association of Noise Consultants (ANC). At paragraph A.20 of the Pro PG document the following is stated: "...therefore, it is

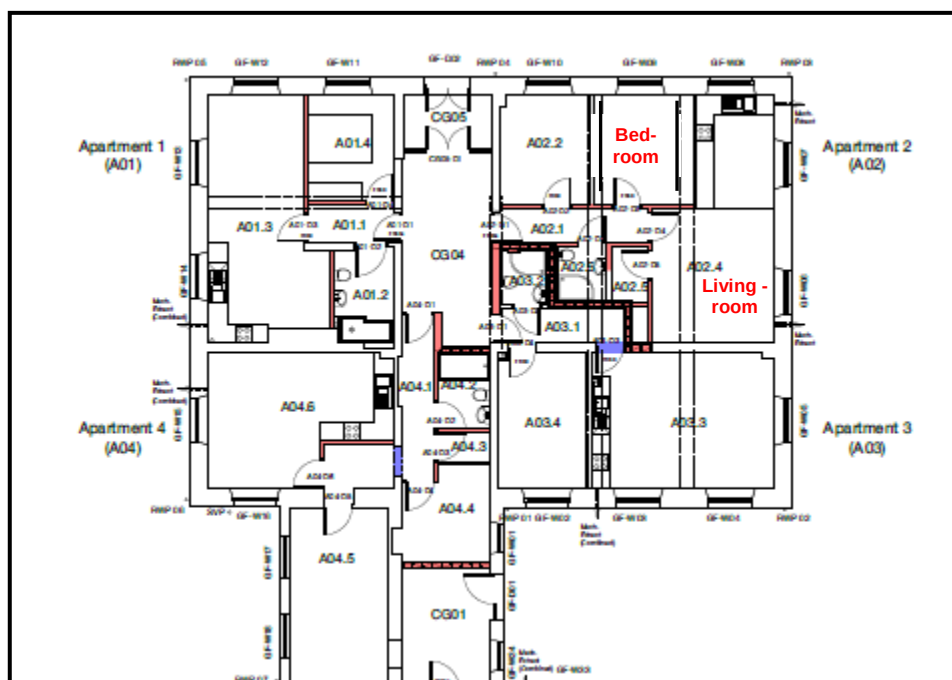
considered that if, in bedrooms at night, the $L_{Amax,F}$ from individual noise events (from all sources) would not normally exceed 45dB more than 10 times a night, then this represents a reasonable threshold below which the events on sleep can be regarded as negligible".

It must however be stated that many regard the 45dB L_{Amax} criterion as stringent. Additionally, it must be remembered that all of the above criteria are design guidance, they do not represent a set of rigid criteria, below which a development 'passes' and above which a development 'fails'.

5.0 Noise Climate Assessment Details

The internal noise re-assessment detailed within this report essentially replicated the procedure adopted during the original noise assessment undertaken in August 2023. In this respect the measurements were again made within apartment 2 on the ground floor of the development, within the bedroom and living room of apartment detailed on figure 2 below. Apartment 2 was again utilised as this would provide data from the same spaces as were previously assessed and because this apartment was again vacant at the time of the re-assessment.

Figure 2. Location of the noise measurement positions, apartment 2



5.1 Survey Times and Personnel

The re-assessment of the noise levels within the bedroom and living room apartment 2 were conducted over a full 24 hour period between 14:00 – 14:00 hours on the 19th - 20th November 2024.

5.2 Weather

At the commencement of the internal noise measurements, the external weather conditions were as follows:

All surfaces were dry, cloud cover was approximately 20%, the external temperature was approximately 2.5°C, the barometric pressure was approximately 1002mb and the wind speed was approximately 0.7m/s. At the commencement of the noise measurements the internal temperature within the apartment was 11°C

5.3 Equipment

The noise assessments were conducted using the equipment detailed in the table 2 below.

The sound level meters were field calibrated before, after and during the surveys as necessary, during which time no significant deviation in the calibrated level was observed.

All the equipment used is calibrated by a UKAS accredited calibration laboratory and the calibration certificates are available on request.

Table 2. Equipment used during the noise surveys

Equipment description	Manufacturer	Model number	Serial number
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636
Sound level meter	NTI Audio	XL2-TA	A2A-23832-E1
Microphone pre-amplifier	NTI Audio	MA220	141157
Microphone	NTI Audio	M2230	A26843
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Microphone weather protection enclosures	NTI Audio	WP30	-

5.4 Measurement Procedure

With respect to these internal measurements due regard, where appropriate, was paid to the guidance provided within the Association of Noise Consultants (ANC) – Measurement of Sound Levels in Buildings, Version 1.0, June 2020.

Throughout the internal noise assessments the measurement time interval was 5 minutes, the windows were closed but any ventilation openings were in their open positions and all measurements were made with the fast time weighting engaged. During the course of the assessments, the sound level meters were placed in positions that approximated the likely positions of the beds within the bedrooms and a sofa within

the living room area. The sound level meters were tripod mounted, such that they were approximately 1.2 metres above floor level and approximately 1.0 metre from the internal walls. The microphones were connected to the sound level meters via 5 metre extension cables, so permitting the operator to remain outside the assessment spaces. The measurements were unmanned or their duration.

6.0 Construction Specification

The existing building at 150 Yorkshire Street, within which the new apartments had been formed, is believed to date from the late nineteenth century and the principal construction details of the existing building are as summarised.

6.1 External Walls

The walls of the existing building are believed to be of solid masonry and are in the region of 550 - 600mm thick (photograph 6 below).

Photograph 6. External walls to the existing building



6.2 Glazing

The glazing within the apartments is contained within timber sash frames and the glazed elements themselves are of the sealed unit type with the following typical specification:

- 4mm pane - 16mm cavity - 4mm pane (all other glazing)

In addition the standard glazing units have been augmented by the addition of secondary glazing to the living rooms and bedrooms on the John Street elevation of the

building. Within the living room/kitchen the secondary glazing is arranged in a vertical sliding sash arrangement (photograph 7 below) with the cavity between the existing glazing and the secondary glazing being in the order of 150mm (photograph 8 overleaf). The secondary glazing itself comprises 4mm glass within the sliding sashes (photograph 9 overleaf).

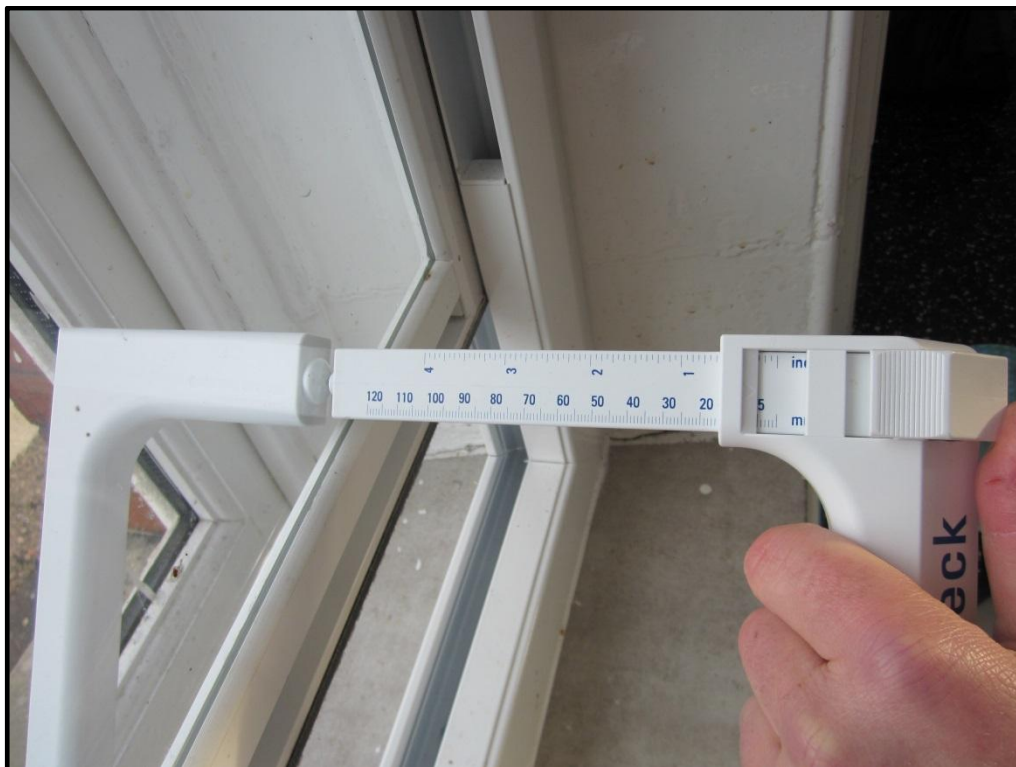
Photograph 7. Secondary glazing to the kitchen area of the living room/kitchen



Photograph 8. Secondary glazing cavity, living room/kitchen



Photograph 9. Secondary glazing glass thickness



Within the bedrooms the secondary glazing was again contained with sliding vertical sash frames with the cavity depth being slightly reduced to 100mm (photograph 10 overleaf).

Photograph 10. Secondary glazing cavity, bedroom

7.0 Noise Survey Results

At the time of the internal noise measurements, apartment 2 was complete, unfurnished and unoccupied. As a consequence it was likely that the amount of sound absorption within the living room/kitchen and the bedroom and so the reverberation times of the rooms used in this assessment, would be different to that which would prevail when the rooms were occupied and furnished. In order to permit the obtained sound levels to be standardised, sample reverberation time measurements were made within the two assessed rooms within apartment 2. The mean reverberation times are presented in table 3 below. For the purposes of the subsequent assessments the measured internal ambient noise levels will be 'standardised' to a reverberation time of 0.5 seconds, which would be typical of a furnished and occupied dwelling.

Table 3. Mean reverberation time measurements, plot 10

Room	Mean Reverberation Time, T_{20} , seconds
Living room	1.09
Bedroom	1.34

By virtue of the significant amounts of measured noise data collected during the noise surveys, tables 4 and 5 overleaf and graphs 1 and 2 overleaf contain summaries of the noise data from the measurement surveys. For the sake of comparison, tables 4 and 5 also contain the results of the previous assessments (in brackets) undertaken in August 2023. Full measured noise data are presented in tabular form in Appendix 1. With reference to the measurements made within the living room, it should be remembered

that this covered a 16 hour period with the measurements made within the bedroom covering a full 24 hour period.

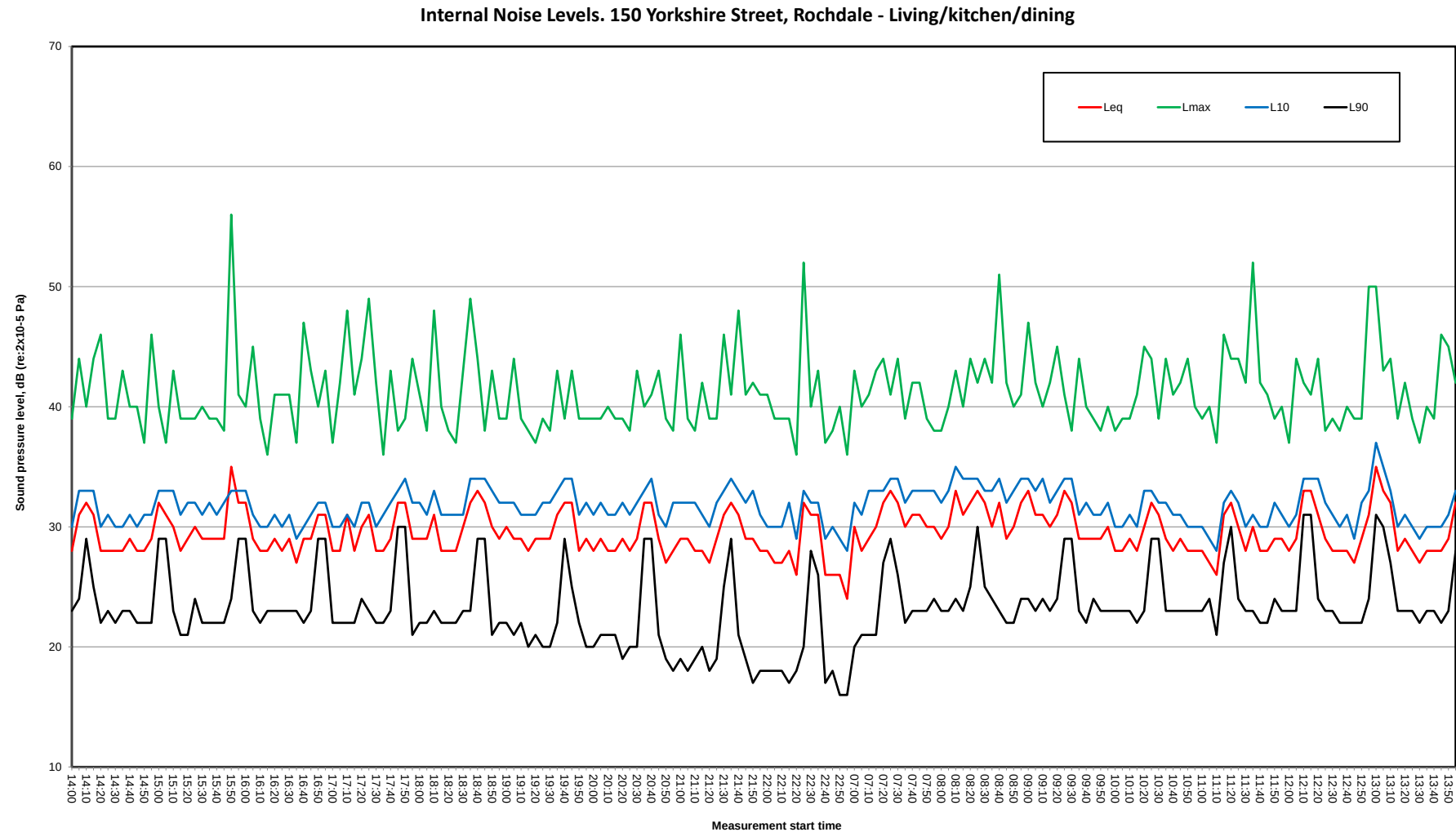
Table 4. Standardised internal sound level summary, living room (daytime)

	$L_{Aeq,T}$	$L_{Amax, T}$
Standard deviation, daytime	1.85 (2.29)	-
Daytime mean (log)	30 (36)	-
Daytime modal value	28 (36)	-

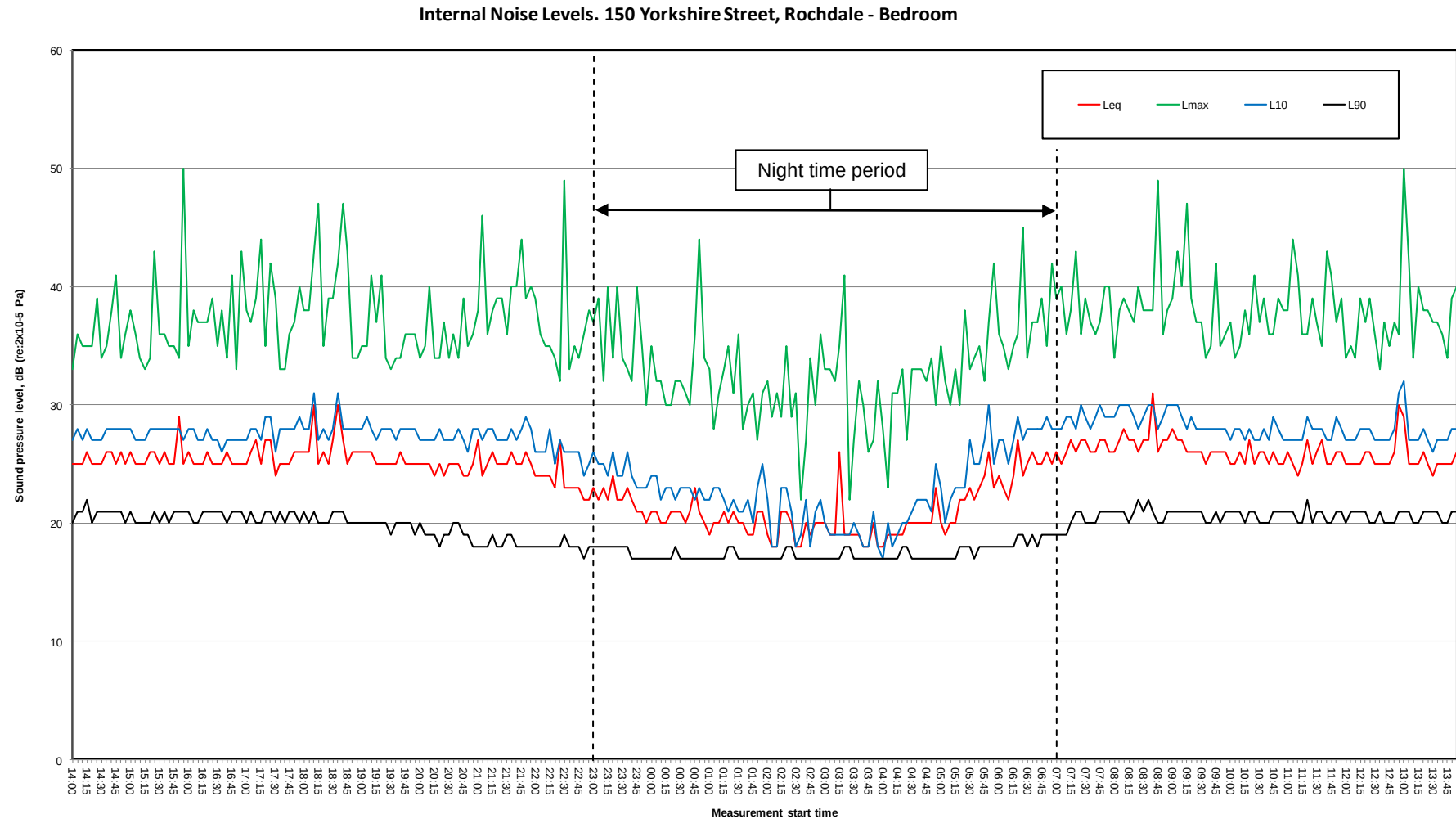
Table 5. Standardised internal sound level summary, bedroom (daytime and night time)

	$L_{Aeq,T}$	$L_{Amax, T}$
Standard deviation, daytime	1.25 (1.01)	-
Standard deviation, night time	2.18 (1.02)	4.26 (3.46)
Daytime mean (log)	26 (39)	-
Night time mean (log)	22 (38)	35 (46)
Daytime modal value	25 (39)	-
Night time modal value	20 (38)	32 (41)

Graph 1. Standardised sound level summary, living room area, apartment 2



Graph 2. Standardised sound level summary, bedroom, apartment 2



8.0 Discussion

With reference to the guidance contained within section 4 of this report the internal noise guide values suggest that the daytime noise climate should not exceed 35dB L_{Aeq} within habitable rooms, reducing to 30dB L_{Aeq} within the bedrooms at night. With respect to the measured levels resulting from this assessment of the internal noise climate, the standardised sound levels obtained from the living room have revealed that the mean (log) daytime level was 30dB L_{Aeq} . Turning to the situation within the bedroom, the day and night time mean (log) levels were 26 and 22 dB L_{Aeq} respectively and as such did not exceed either the daytime or night time design guide values. It can also be seen from tables 4 and 5 that the internal noise levels from this assessment were comfortably lower than those obtained in August 2023.

Turning to the L_{Amax} levels within the bedrooms at night, it can be seen that the mean (log) value for this parameter during the night was 35dB and as such it was comfortably below the 45dB L_{Amax} guide during the night time period. In addition it can be seen, from graph 2, that the measured L_{Amax} levels during the night time period did not exceed 45dB in any of the measurement periods.

Consequently, it is suggested that the addition of the secondary glazing system to apartment 2 has improved the sound insulation of the existing windows to the extent that, during the noise assessment undertake between the 19th and 20th November 2024, the measured internal noise levels did not exceed the guide values. This being the case, it can be seen that the addition of the secondary glazing system has had a significant and beneficial effect on the internal noise climate resulting from external noise break-in.

The results of the re-assessment have also demonstrated that the internal noise climate within apartment 2 now complies with Rochdale Council's requirement to demonstrate the at the apartments are "*suitable for habitation*". Additionally, discussions with the client have indicated that the existing glazing of all the apartments facing John Street had been augmented by the same secondary glazing specification. This being the case it is suggested that the same beneficial effects on the internal noise climate would be expected within these apartments as well.

9.0 Conclusion

Measurements of the internal noise climate within apartment 2 of the residential development contained within the existing building at 150 Yorkshire Street in Rochdale, resulting from external noise break-in, have been made. The results of the break-in noise survey have demonstrated that the addition of the secondary glazing system has had a significant and beneficial effect on the internal noise climate, such that the internal noise climate now complies with the design guide values detailed within BS 8233:2014.

Appendix 1. Standardised Internal Noise Levels

Living/kitchen/dining room, apartment 2

Start Time	$L_{Aeq, 5 \text{ mins}}$	$L_{Amax, 5 \text{ mins}}$	$L_{A10, 5 \text{ mins}}$	$L_{A90, 5 \text{ mins}}$
14:00	28	39	30	23
14:05	31	44	33	24
14:10	32	40	33	29
14:15	31	44	33	25
14:20	28	46	30	22
14:25	28	39	31	23
14:30	28	39	30	22
14:35	28	43	30	23
14:40	29	40	31	23
14:45	28	40	30	22
14:50	28	37	31	22
14:55	29	46	31	22
15:00	32	40	33	29
15:05	31	37	33	29
15:10	30	43	33	23
15:15	28	39	31	21
15:20	29	39	32	21
15:25	30	39	32	24
15:30	29	40	31	22
15:35	29	39	32	22
15:40	29	39	31	22
15:45	29	38	32	22
15:50	35	56	33	24
15:55	32	41	33	29

Start Time	$L_{Aeq, 5 \text{ mins}}$	$L_{Amax, 5 \text{ mins}}$	$L_{A10, 5 \text{ mins}}$	$L_{A90, 5 \text{ mins}}$
16:00	32	40	33	29
16:05	29	45	31	23
16:10	28	39	30	22
16:15	28	36	30	23
16:20	29	41	31	23
16:25	28	41	30	23
16:30	29	41	31	23
16:35	27	37	29	23
16:40	29	47	30	22
16:45	29	43	31	23
16:50	31	40	32	29
16:55	31	43	32	29
17:00	28	37	30	22
17:05	28	42	30	22
17:10	31	48	31	22
17:15	28	41	30	22
17:20	30	44	32	24
17:25	31	49	32	23
17:30	28	42	30	22
17:35	28	36	31	22
17:40	29	43	32	23
17:45	32	38	33	30
17:50	32	39	34	30
17:55	29	44	32	21

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
18:00	29	41	32	22
18:05	29	38	31	22
18:10	31	48	33	23
18:15	28	40	31	22
18:20	28	38	31	22
18:25	28	37	31	22
18:30	30	43	31	23
18:35	32	49	34	23
18:40	33	44	34	29
18:45	32	38	34	29
18:50	30	43	33	21
18:55	29	39	32	22
19:00	30	39	32	22
19:05	29	44	32	21
19:10	29	39	31	22
19:15	28	38	31	20
19:20	29	37	31	21
19:25	29	39	32	20
19:30	29	38	32	20
19:35	31	43	33	22
19:40	32	39	34	29
19:45	32	43	34	25
19:50	28	39	31	22
19:55	29	39	32	20

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
20:00	28	39	31	20
20:05	29	39	32	21
20:10	28	40	31	21
20:15	28	39	31	21
20:20	29	39	32	19
20:25	28	38	31	20
20:30	29	43	32	20
20:35	32	40	33	29
20:40	32	41	34	29
20:45	29	43	31	21
20:50	27	39	30	19
20:55	28	38	32	18
21:00	29	46	32	19
21:05	29	39	32	18
21:10	28	38	32	19
21:15	28	42	31	20
21:20	27	39	30	18
21:25	29	39	32	19
21:30	31	46	33	25
21:35	32	41	34	29
21:40	31	48	33	21
21:45	29	41	32	19
21:50	29	42	33	17
21:55	28	41	31	18

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
22:00	28	41	30	18
22:05	27	39	30	18
22:10	27	39	30	18
22:15	28	39	32	17
22:20	26	36	29	18
22:25	32	52	33	20
22:30	31	40	32	28
22:35	31	43	32	26
22:40	26	37	29	17
22:45	26	38	30	18
22:50	26	40	29	16
22:55	24	36	28	16
07:00	30	43	32	20
07:05	28	40	31	21
07:10	29	41	33	21
07:15	30	43	33	21
07:20	32	44	33	27
07:25	33	41	34	29
07:30	32	44	34	26
07:35	30	39	32	22
07:40	31	42	33	23
07:45	31	42	33	23
07:50	30	39	33	23
07:55	30	38	33	24

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
08:00	29	38	32	23
08:05	30	40	33	23
08:10	33	43	35	24
08:15	31	40	34	23
08:20	32	44	34	25
08:25	33	42	34	30
08:30	32	44	33	25
08:35	30	42	33	24
08:40	32	51	34	23
08:45	29	42	32	22
08:50	30	40	33	22
08:55	32	41	34	24
09:00	33	47	34	24
09:05	31	42	33	23
09:10	31	40	34	24
09:15	30	42	32	23
09:20	31	45	33	24
09:25	33	41	34	29
09:30	32	38	34	29
09:35	29	44	31	23
09:40	29	40	32	22
09:45	29	39	31	24
09:50	29	38	31	23
09:55	30	40	32	23

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
10:00	28	38	30	23
10:05	28	39	30	23
10:10	29	39	31	23
10:15	28	41	30	22
10:20	30	45	33	23
10:25	32	44	33	29
10:30	31	39	32	29
10:35	29	44	32	23
10:40	28	41	31	23
10:45	29	42	31	23
10:50	28	44	30	23
10:55	28	40	30	23
11:00	28	39	30	23
11:05	27	40	29	24
11:10	26	37	28	21
11:15	31	46	32	27
11:20	32	44	33	30
11:25	30	44	32	24
11:30	28	42	30	23
11:35	30	52	31	23
11:40	28	42	30	22
11:45	28	41	30	22
11:50	29	39	32	24
11:55	29	40	31	23

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
12:00	28	37	30	23
12:05	29	44	31	23
12:10	33	42	34	31
12:15	33	41	34	31
12:20	31	44	34	24
12:25	29	38	32	23
12:30	28	39	31	23
12:35	28	38	30	22
12:40	28	40	31	22
12:45	27	39	29	22
12:50	29	39	32	22
12:55	31	50	33	24
13:00	35	50	37	31
13:05	33	43	35	30
13:10	32	44	33	27
13:15	28	39	30	23
13:20	29	42	31	23
13:25	28	39	30	23
13:30	27	37	29	22
13:35	28	40	30	23
13:40	28	39	30	23
13:45	28	46	30	22
13:50	29	45	31	23
13:55	32	42	33	28

Bedroom, apartment 2

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
14:00	25	33	27	20
14:05	25	36	28	21
14:10	25	35	27	21
14:15	26	35	28	22
14:20	25	35	27	20
14:25	25	39	27	21
14:30	25	34	27	21
14:35	26	35	28	21
14:40	26	38	28	21
14:45	25	41	28	21
14:50	26	34	28	21
14:55	25	36	28	20
15:00	26	38	28	21
15:05	25	36	27	20
15:10	25	34	27	20
15:15	25	33	27	20
15:20	26	34	28	20
15:25	26	43	28	21
15:30	25	36	28	20
15:35	26	36	28	21
15:40	25	35	28	20
15:45	25	35	28	21
15:50	29	34	28	21
15:55	25	50	27	21

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
16:00	26	35	28	21
16:05	25	38	28	20
16:10	25	37	27	20
16:15	25	37	27	21
16:20	26	37	28	21
16:25	25	39	27	21
16:30	25	35	27	21
16:35	25	38	26	21
16:40	26	34	27	20
16:45	25	41	27	21
16:50	25	33	27	21
16:55	25	43	27	21
17:00	25	38	27	20
17:05	26	37	28	21
17:10	27	39	28	20
17:15	25	44	27	20
17:20	27	35	29	21
17:25	27	42	29	21
17:30	24	39	26	20
17:35	25	33	28	21
17:40	25	33	28	20
17:45	25	36	28	21
17:50	26	37	28	21
17:55	26	40	29	20

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
18:00	26	38	28	21
18:05	26	38	28	20
18:10	30	43	31	21
18:15	25	47	27	20
18:20	26	35	28	20
18:25	25	39	27	20
18:30	27	39	28	21
18:35	30	42	31	21
18:40	27	47	28	21
18:45	25	43	28	20
18:50	26	34	28	20
18:55	26	34	28	20
19:00	26	35	28	20
19:05	26	35	29	20
19:10	26	41	28	20
19:15	25	37	27	20
19:20	25	41	28	20
19:25	25	34	28	20
19:30	25	33	28	19
19:35	25	34	27	20
19:40	26	34	28	20
19:45	25	36	28	20
19:50	25	36	28	20
19:55	25	36	28	19

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
20:00	25	34	27	20
20:05	25	35	27	19
20:10	25	40	27	19
20:15	24	34	27	19
20:20	25	34	28	18
20:25	24	37	27	19
20:30	25	34	27	19
20:35	25	36	27	20
20:40	25	34	28	20
20:45	24	39	27	19
20:50	24	35	26	19
20:55	25	36	28	18
21:00	27	38	28	18
21:05	24	46	27	18
21:10	25	36	28	18
21:15	26	38	28	19
21:20	25	39	27	18
21:25	25	39	27	18
21:30	25	36	27	19
21:35	26	40	28	19
21:40	25	40	27	18
21:45	25	44	28	18
21:50	26	39	29	18
21:55	25	40	28	18

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
22:00	24	39	26	18
22:05	24	36	26	18
22:10	24	35	26	18
22:15	24	35	28	18
22:20	23	34	25	18
22:25	27	32	27	18
22:30	23	49	26	19
22:35	23	33	26	18
22:40	23	35	26	18
22:45	23	34	26	18
22:50	22	36	24	17
22:55	22	38	25	18
23:00	23	37	26	18
23:05	22	39	25	18
23:10	23	32	25	18
23:15	22	40	24	18
23:20	24	34	26	18
23:25	22	40	24	18
23:30	22	34	24	18
23:35	23	33	26	18
23:40	22	32	24	17
23:45	21	40	23	17
23:50	21	35	23	17
23:55	20	30	23	17

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
00:00	21	35	24	17
00:05	21	32	24	17
00:10	20	32	22	17
00:15	20	30	23	17
00:20	21	30	23	17
00:25	21	32	22	18
00:30	21	32	23	17
00:35	20	31	23	17
00:40	21	30	23	17
00:45	23	36	22	17
00:50	21	44	23	17
00:55	20	34	22	17
01:00	19	33	22	17
01:05	20	28	23	17
01:10	20	31	23	17
01:15	21	33	22	17
01:20	20	35	21	18
01:25	21	31	22	18
01:30	20	36	21	17
01:35	20	28	21	17
01:40	19	30	22	17
01:45	19	31	20	17
01:50	21	27	23	17
01:55	21	31	25	17

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
02:00	19	32	22	17
02:05	18	29	18	17
02:10	18	31	18	17
02:15	21	29	23	17
02:20	21	35	23	18
02:25	20	29	21	18
02:30	18	31	18	17
02:35	18	22	19	17
02:40	20	27	22	17
02:45	19	34	18	17
02:50	20	30	21	17
02:55	20	36	22	17
03:00	20	33	20	17
03:05	19	33	19	17
03:10	19	32	19	17
03:15	26	35	19	17
03:20	19	41	19	18
03:25	19	22	19	18
03:30	19	27	20	17
03:35	19	32	19	17
03:40	18	30	18	17
03:45	18	26	18	17
03:50	20	27	21	17
03:55	18	32	18	17

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
04:00	18	28	17	17
04:05	19	23	20	17
04:10	19	31	18	17
04:15	19	31	19	17
04:20	19	33	20	18
04:25	20	27	20	18
04:30	20	33	21	17
04:35	20	33	22	17
04:40	20	33	22	17
04:45	20	32	22	17
04:50	20	34	21	17
04:55	23	30	25	17
05:00	20	35	23	17
05:05	19	32	20	17
05:10	20	30	22	17
05:15	20	33	23	17
05:20	22	30	23	18
05:25	22	38	23	18
05:30	23	33	27	18
05:35	22	34	25	17
05:40	23	35	25	18
05:45	24	32	27	18
05:50	26	37	30	18
05:55	23	42	25	18

Living room, standardised internal noise levels

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
06:00	24	36	27	18
06:05	23	35	27	18
06:10	22	33	25	18
06:15	24	35	27	18
06:20	27	36	29	19
06:25	24	45	27	19
06:30	25	34	28	18
06:35	26	37	28	19
06:40	25	37	28	18
06:45	25	39	28	19
06:50	26	35	29	19
06:55	25	42	28	19
07:00	26	39	28	19
07:05	25	40	28	19
07:10	26	36	29	19
07:15	27	38	29	20
07:20	26	43	28	21
07:25	27	36	30	21
07:30	27	39	29	20
07:35	26	37	28	20
07:40	26	36	29	20
07:45	27	37	30	21
07:50	27	40	29	21
07:55	26	40	29	21

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
08:00	26	34	29	21
08:05	27	38	30	21
08:10	28	39	30	21
08:15	27	38	30	20
08:20	27	37	29	21
08:25	26	40	28	22
08:30	27	38	29	21
08:35	27	38	30	22
08:40	31	38	30	21
08:45	26	49	28	20
08:50	27	36	29	20
08:55	27	38	30	21
09:00	28	39	30	21
09:05	27	43	30	21
09:10	27	40	29	21
09:15	26	47	28	21
09:20	26	39	29	21
09:25	26	37	28	21
09:30	26	37	28	21
09:35	25	34	28	20
09:40	26	35	28	20
09:45	26	42	28	21
09:50	26	35	28	20
09:55	26	36	28	21

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
10:00	25	37	27	21
10:05	25	34	28	21
10:10	26	35	28	21
10:15	25	38	27	20
10:20	27	36	28	21
10:25	25	41	27	21
10:30	26	37	27	20
10:35	26	39	28	20
10:40	25	36	27	20
10:45	26	36	29	21
10:50	25	39	28	21
10:55	25	38	27	21
11:00	26	38	27	21
11:05	25	44	27	21
11:10	24	41	27	20
11:15	25	36	27	20
11:20	27	36	29	22
11:25	25	39	28	20
11:30	26	37	28	21
11:35	27	35	28	21
11:40	25	43	27	20
11:45	25	41	27	20
11:50	26	37	29	21
11:55	26	39	28	21

Start Time	L_{Aeq} 5 mins	L_{Amax} , 5 mins	L_{A10} , 5 mins	L_{A90} , 5 mins
12:00	25	34	27	20
12:05	25	35	27	21
12:10	25	34	27	21
12:15	25	39	28	21
12:20	26	37	28	21
12:25	26	39	28	20
12:30	25	36	27	20
12:35	25	33	27	21
12:40	25	37	27	20
12:45	25	35	27	20
12:50	26	37	28	20
12:55	30	36	31	21
13:00	29	50	32	21
13:05	25	42	27	21
13:10	25	34	27	20
13:15	25	40	27	20
13:20	26	38	28	21
13:25	25	38	27	21
13:30	24	37	26	21
13:35	25	37	27	21
13:40	25	36	27	20
13:45	25	34	27	20
13:50	25	39	28	21
13:55	26	40	28	21