Assessment of the Existing Noise Climate in the Vicinity of the Permitted Residential Development at 69 – 71 New Street, Huddersfield

Report Prepared for:

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1.0 Summary

Planning consent has been granted permitting the conversion of the former commercial offices, within the existing Prudential House building at 69 – 71 New Street in Huddersfield, to form five new residential apartments arranged over the first to third floors of the existing building.

The planning consent was granted subject to the imposition of a number of conditions, one of which, condition 3, related principally to the requirement to conduct an assessment of the existing noise climate combined with the prediction of the likely internal noise levels within the development resulting from external noise break-in. Where necessary, suitable attenuation measures will be specified to limit the ingress of external noise.

In compliance with the requirements imposed by planning condition 3, Druk Limited was commissioned to undertake an assessment of the existing noise climate in the vicinity of 69 – 71 New Street in Huddersfield. Using data from the existing noise climate assessment, calculations will be undertaken to assess the likely internal acoustic climate within the permitted residential apartments, resulting from external noise break-in, together with the specification of suitable noise attenuation measures as necessary.

Applying the obtained sound levels from the existing noise climate survey and combining these with the stated assumptions relating to the sound insulation of the façade elements, calculations have been undertaken to evaluate the level of external break-in noise to the permitted apartments. The calculations have demonstrated that the sound insulation of the façade elements detailed within the report would be sufficient to secure that the break-in noise levels would not exceed the adopted design guide values. Despite this it is it is suggested that alternative ventilation would be required in order to permit these spaces to be adequately ventilated without having to rely on opening windows.

The proposed mitigation measures would also comply with the requirement contained within the ProPG document which requires that the acoustic design statement "*confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development*".

As a result, it is suggested that that the requirements contained within planning condition 3 would be met by the assessment of the existing noise climate combined with the proposed façade sound insulation measures contained within this report.

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2.0 Introduction

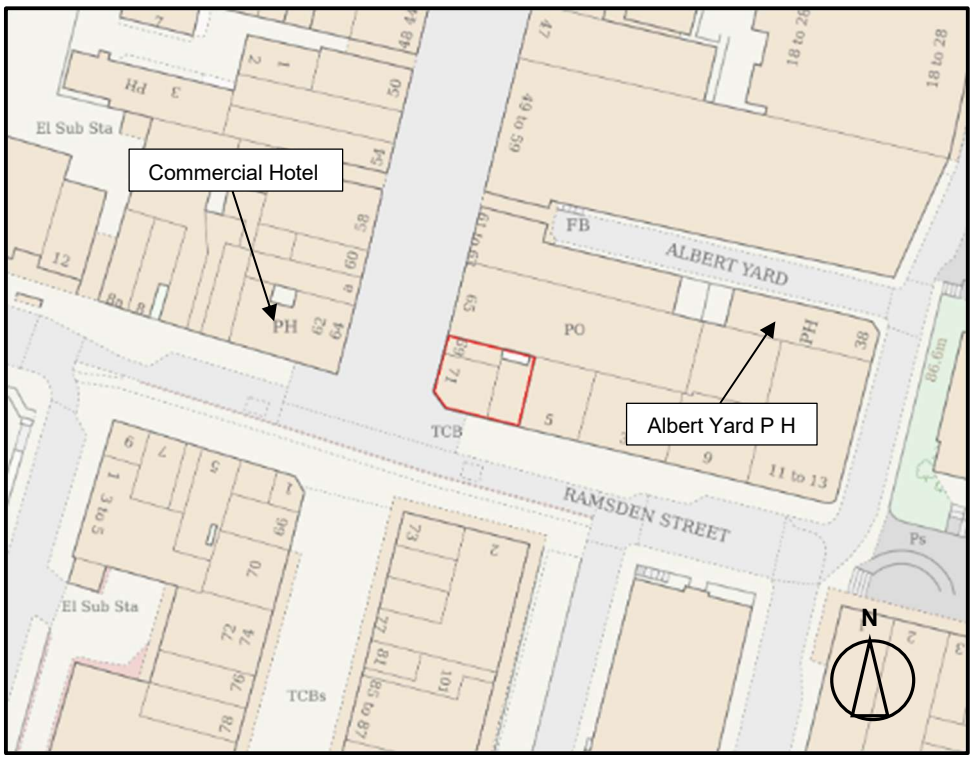
Planning consent has been granted permitting the conversion of the former commercial offices, within the existing Prudential House building at 69 – 71 New Street in Huddersfield, to form five new residential apartments arranged over the first to third floors of the existing building.

The planning consent was granted subject to the imposition of a number of conditions, one of which, condition 3, related principally to the requirement to conduct an assessment of the existing noise climate combined with the prediction of the likely internal noise levels within the development resulting from external noise break-in. Where necessary, suitable attenuation measures will be specified to limit the ingress of external noise.

3.0 Site Description

The permitted residential apartments will be formed within the existing Prudential House building located at 69 – 71 New Street in Huddersfield (figure 1 and photograph 1 overleaf). To the North of the Prudential House building is New Street itself which hosts a variety of mainly retail premises (photograph 2 overleaf). To the South of the Prudential House building is a continuation of New Street (photograph 3 overleaf) which again hosts mainly retail premises. Immediately to the East and West of the Prudential Building are Ramsden Street and High Street (photographs 4 and 5 overleaf), both of which host mainly commercial premises, although at the Junction of New Street and High Street is the Commercial Hotel. With reference to the presence of premises associated with the night time economy, other than the Commercial Hotel directly opposite Prudential House, the next nearest location would be The Albert public house at the junction of Albert Yard and Victoria Lane (photograph 6 overleaf).

Figure 1. Site of the proposed residential development, 69 – 71 New Street (edged in red), Huddersfield



Photograph 1. Prudential House building at 69 – 71 New Street (looking North East)

Photograph 2. New Street to the North of the Prudential House building

Photograph 3. Continuation of New Street (looking South)

Photograph 4. Ramsden Street to the East of the Prudential House building

Photograph 5. High Street to the West of the Prudential House building

Photograph 6. The Albert public house at the junction of Albert Yard and Victoria Lane

4.0 Assessment Criteria

As planning consent has been granted, subject to the imposition of a number of conditions, the principal aim of this report will be to evaluate the existing noise climate in the immediate vicinity of the development site and to assess what noise attenuation measures may be necessary to comply with the requirements of planning condition 3.

4.1 Planning Condition 3

The planning permission for the development within the Prudential House building at 69 – 71 New Street in Huddersfield was granted in May 2025 and this permission contained several conditions of which one, condition 3, related to the issue of the internal noise climate within the permitted apartments. The text of planning condition 3 is reproduced below:

3. *Prior to the undertaking of any conversion and construction of the development works hereby approved, a report specifying the measures to be taken to protect the development from noise from all significant noise sources that are likely to affect the proposed development including road traffic, commercial/licensed premises shall be submitted to and approved in writing by the Local Planning Authority. The report shall:*

a) Determine the existing noise climate
b) Predict the noise climate in living rooms (daytime), bedrooms (night-time) and other habitable rooms of the development
c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).

The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained. Reason: To protect the amenity of occupiers of the proposed development from noise or disturbance from nearby noise generating premises to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.

With reference to the above planning condition, it is noted that it does not stipulate any design targets, with respect to external noise break-in, which are to be met within the permitted residential apartments. With this in mind, the existing noise climate and potential noise attenuation measures will be assessed with reference to the guidance contained within BS 8233 “Guidance on sound insulation and noise reduction for buildings”. In addition, the guidance contained within Planning and Noise: Professional Guidance on Planning and Noise (ProPG), May 2017, document and the guidance contained within the Acoustics, Ventilation and Overheating - Residential Design Guide will also be considered. Other guidance will be considered as necessary.

4.2 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 is the dominant or 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 $L_{Aeq,\ 16\ hour}$	-
Dining	Dining room/area	40dB $L_{Aeq,\ 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,\ 16\ hour}$	30dB $L_{Aeq,\ 8\ hour}$

It should also be noted that BS8233:2014 applies the frequently quoted 'rule of thumb' that where a window is partially open for ventilation purposes etc., the sound levels just outside the window will be around 15dB higher than the levels just inside the window. Despite this, a number other documents indicate that the sound insulation provided by a partially open window would be in the region of 9 - 13dB.

In addition to the internal noise design guidance detailed above, supplementary notes 4, 5 and 7 to table 4 of section 7.7.2 are 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 LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values.*

***Note 5**. If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting sound level.*

***Note 7**. Where development is considered as necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.*

With reference to note 4, the design guidance detailed within the previous 1999 version of BS 8233 relating to individual noise events, expressed as L_{Amax} levels will, as per the requirements of planning condition 8, be adopted for this assessment. This guidance stated: "*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}*". It must however be stated that many acousticians 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'.

4.3 Planning and Noise: Professional Guidance on Planning and Noise (ProPG)

This document was published in May 2017 and was produced jointly by representatives of the Chartered Institute of Environmental Health (CIEH), the Institute of Acoustics (IoA) and the Association of Noise Consultants (ANC). The ProPG document seeks to provide guidance on and complement the wider aims contained within the Noise Policy Statement for England (NPSE) and the additional guidance contained within the National Planning Policy Framework (NPPF). In addition, the ProPG document acknowledges the contribution made by existing guidance contained within both the World Heath Organisations (WHO) "Guidelines for Community Noise" and (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings".

The ProPG document guidance is restricted to the consideration of new residential developments and the potential implications for these developments arising from predominantly airborne noise that typically emanates from transportation noise sources. Despite this and although the proposal considered within this report relates to the proposed conversion of an existing building, the initial assessment principles contained within the ProPG document are considered pertinent to this scheme and as such the guidance will be adopted here.

The guiding principle of the ProPG document with reference to the existing noise climate is that once the potential impact on a development has been quantified, good acoustic design should be implemented to mitigate the potential effects that the existing noise climate may have on the proposed resident of any new residential development. In this case the good design principle relates to both the internal acoustic environment within dwellings and any external amenity areas serving those dwellings. With reference to good acoustic design ProPG does recognise that this does not mean "*overdesign or gold plating*", but it does mean delivering "*the optimum acoustic outcome for a particular site*".

With respect to the internal noise level guidelines, ProPG makes reference to the guidance contained within table 4 of section 7.7.2BS 8233:2014, reproduced in section 4.2 above. Whilst recognising that it is preferable to achieve the internal noise guidelines ProPG does, at paragraph 2.30, recognise that national planning and noise policy does not always require that these levels are achieved. This is particularly the case where to do so would: "*disproportionately increase the cost of the development*".

Remaining with the issue of internal noise level guidance and the proposed levels for individual noise events, expressed as an L_{max}, the guidance contained within Appendix A of the ProPG is instructive. The Appendix contains a short summary of research into the effects of individual noise events and the effect that these can have on sleep. In the light of this summary the document, at paragraph A.20, states the following, "...*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*".

The potential impact of ventilation on the acoustic integrity of the façade of a dwelling is also addressed by the ProPG document. The document suggests that good acoustic design should be used to achieve the internal design targets in noise sensitive rooms with windows open. Here it is assumed that this relates to windows partially open for ventilation purposes. Despite this it also recognises the limitations of acoustic design and highlights that internal noise levels may only be achievable with windows closed in certain environments, such as urban areas or sites adjacent to transportation noise sources. In these situations, it is suggested that internal noise levels are assessed with windows closed but with any façade openings used for ventilation purposes in their open position. Finally, and with reference to ventilation ProPG at paragraph 2.35 states that "*internal noise level guidance are generally not applicable under purge ventilation conditions*".

4.4 Acoustics, Ventilation and Overheating - Residential Design Guide

There is an increasing recognition that in addition to securing an acceptable internal noise climate, there needs to be a degree of integration between acoustic design and the requirement to address both the ventilation and thermal comfort of a dwelling. Typically, achieving a good internal acoustic environment has been achieved by requiring dwelling windows to remain closed, but most ventilation and overheating assessments look to the ability to open windows to permit both adequate ventilation and the management of the internal thermal environment. In many locations, particularly urban environments, it is recognised that opening windows will typically have negative impacts on the internal acoustic environment within a dwelling.

In an attempt to provide additional guidance on the interplay between suitable ventilation to address potential overheating within a noisy environment, the "Acoustics Ventilation and Overheating Residential Design Guidance", hereafter referred to as the AVO Guide, has been formulated by the Association of Noise Consultants (ANC). This comprehensive document seeks to strike a balance between the often competing requirements relating to both good acoustic conditions within a residential dwelling and the provision of ventilation to mitigate potential overheating.

The guidance also recognises that there may be instances where occupants may 'trade' the internal acoustic environment by accepting higher noise levels for a period of time in order to maintain control over the thermal environment.

The document relates primarily to residential developments that are subject to airborne noise from transportation noise sources. Despite its focus on new residential dwellings, predominantly flats and houses, the AVO Guide does suggest that it may also be applicable to other forms of residential dwellings such as care homes and residential institutions. Although the document’s focus is primarily on new residential dwellings rather than the conversion of an existing building as is the case here, some of the basic principles contained within the AVO Guide will be adopted for consideration with respect to this development.

In essence the higher the external noise level, the more likely it is that the internal noise levels would exceed the guide values detailed within BS 8233:2014 with windows open for ventilation purposes. As a consequence, it is more than likely that additional or alternative ventilation requirements will be required in order to effectively ventilate the internal spaces, in all but purge ventilation conditions, without prejudicing the façade

sound insulation. It must however be remembered that where alternative mechanical ventilation is specified, the emission of noise from such systems must not lead to an unnecessary increase in the internal noise climate. The likelihood for potential adverse outcomes increases with the duration of exposure to noise, with shorter potential exposures resulting in a lower risk of adverse outcomes.

4.5 Approved Document F (ADF) - Ventilation

With reference to the relevant guidance relating to the ventilation of dwellings, this is contained within Approved Document F (ADF) guidance to the Building Regulations 2010, currently in the 2021 edition as it relates to dwellings.

In summary the ventilation strategies outlined in ADF relies on a combination of approaches, including: Extract ventilation to remove water vapour or pollutants; whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation and purge ventilation to securing rapid exchange of air and or water vapour. With reference to extract ventilation in individual rooms this is typically achieved via intermittent extraction fans, whole house ventilation is often achieved through a combination of background (trickle) ventilators and/or continuous supply fans and. It is acknowledged that purge ventilation is typically achieved through the opening of windows. ADF also states that "*Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance*".

Approved Document F details four main types of ventilation systems that can be used to provide ventilation to dwellings, typically described as systems 1 to 4. A summary of these systems is provided within table 2 below overleaf and this table also provides additional annotation that expands upon the details provided within ADF.

Table 2. Summary of the ADF ventilation systems 1 - 4

Ventilation system	**Purge ventilation**
System 1: background ventilation (trickle ventilators) and intermittent extraction fans	Typically provided by opening windows
System 2: passive stack (natural)	Typically provided by opening windows
System 3: Continuous mechanical extraction (MEV) (Trickle ventilators provide inlet air)	Typically provided by opening windows
System 4: Continuous mechanical supply and extract with heat recovery (MVHR)	Typically provided by opening windows

Ventilation provisions conforming to the descriptions of systems 1, 3 and 4 are most commonly found within dwellings. With reference to purge ventilation, in addition to securing rapid exchange of air to remove pollutants, this can and is typically used to address the thermal comfort of occupants. It must however be remembered that the issue of thermal comfort is not covered by Approved Document F, guidance to the Building Regulations.

It should however be borne in mind that when specifying the ventilation provision for a dwelling, the interaction of the ventilation provision with the internal noise levels should be considered. This interaction is a result of the fact that the provision of suitable ventilation openings in a building façade can affect that the sound insulation of the façade elements, which in turn can affect the level of external noise break-in and so the internal noise levels that will prevail within a dwelling. Whilst this report will specify an appropriate type of ventilation provision in accordance with the general descriptions contained within table above, it is not intended to be a detailed ventilation design statement and a full evaluation of any ventilation provision is beyond the remit of this report.

4.6 Approved Document O - Overheating

The guidance relating to the limitation of unwanted solar gains in summer in additional to providing an 'adequate means' of removing heat from the indoor environment, are contained within Approved Document O (ADO) of the Building Regulations 2010 which came into effect in June 2022.

The requirements within ADO relate to new residential buildings only and do not apply to residential dwellings that are formed from a material change of use etc. Despite this, some of the guidance contained within ADO will be employed here, although in this respect it will be employed for informative purposes only.

It must be remembered that ADO relates primarily to the limitation of excess heat gain and the ventilation of internal spaces to remove such heat, it is not acoustic specification document. Despite this it does contain a few sections dealing with the potential noise implications relating to the use of open windows to remove excess heat from a space. In this respect, section 3 of ADO considers the situation where the external noise climate is '*noisy*' enough to discourage the opening of windows for this purpose, as this would lead to potentially unacceptable high internal noise levels. In this respect, paragraphs 3.2 and 3.3 of ADO refer to noise within "*bedrooms at night"* and in this respect Section 3.3 of ADO states that:

"*Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*

a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)

With reference to the above noise levels, ADO indicates that where the opening of windows to remove excess heat would result in the above noise levels being exceeded, an overheating mitigation strategy must be implemented. However, in the case of mechanical cooling, requirement 02(b) of ADO states that this should only be applied where "*sufficient heat cannot be removed from the indoor environment without it*". Immediately it can be seen that the suggested indoor noise levels within bedrooms during the night time period detailed within Section 3.3 of ADO, are higher than the guide values for the same environment detailed within BS 8233:2014. This being the case, where an alternative ventilation strategy is considered appropriate, this will be based on securing internal noise levels in compliance with the guide values contained within BS 8233:2014.

4.7 Sound Reduction of a Partially Open Window

The ventilation of the internal spaces of a dwelling can include options ranging from the opening of windows to the provision of dedicated mechanical ventilation. With reference to the opening of windows, as suggested above this will not only permit the exchange of air but will also facilitate the ingress of external noise.

In this respect the estimates of the sound reduction provided by a window, partially open for ventilation purposes, can and do vary. With respect to the sound reduction provided by an open window, BS 8233:2014 suggests a 15dB sound reduction, suggesting that where a window is partially open for ventilation purposes etc., the sound levels just outside the window will be around 15dB higher than the levels just inside the window. The "Acoustics Ventilation and Overheating Residential Design Guidance", the AVO Guide, formulated by the Association of Noise Consultants (ANC) suggests that a partially open window can provide a sound reduction of around 13dB. Data presented by Søndergaard & Egedal (2016) suggested that for a top hung window with an opening equivalent to 0.35m^2, a sound reduction of around 9dB R_w would be expected. As can be seen the estimates of the sound reduction provided by a partially open window, can and do vary. Despite this, the suggested 13dB sound reduction suggested within the AVO Guide will be adopted in the subsequent initial assessments contained within this report.

Consequently, it is suggested that in all but the quietest of areas that the opening of windows would result in the internal noise levels exceeding the adopted internal design guide levels. As such, in the majority of locations it will be necessary to provide alternative methods of ventilation to ensure that the internal spaces can be adequately ventilated without having to resort to opening windows and so detrimentally affecting the internal noise climate.

5.0 Survey Details

5.1 Survey Times and Personnel

The survey to evaluate the existing noise climate in the vicinity of the permitted residential development within the Prudential House building was undertaken between 13:20 hours on Friday 20th February to 13:20 hours on Saturday 21st February 2026. This period was selected as it encompassed both the potentially busy evening peak period on the Friday afternoon/evening combined with a Friday night into the Saturday morning, which are typically amongst the busiest and so potentially noisiest, periods with respect to night time activity within a town centre.

The existing noise climate survey was conducted by Mr. R. Smith of Druk Limited and was attended between 17:30 – 18:30 and 22:30 - 00:00 hours on the 20th February, but unattended for the remainder of the survey. Despite the fact that the majority of the noise survey was unattended, simultaneous audio recordings were made throughout the 24 hour survey period. These audio recordings were subsequently interrogated to obtain a 'picture' of the existing noise climate and to identify any events that were regarded as being significant.

5.2 Weather

At the commencement and conclusion of the existing noise climate survey the weather conditions were as follows:

Friday 20th February 2026

All surfaces were damp/wet, cloud cover was 100%, the temperature was approximately 9°C, the wind speed was approximately 1.8m/s from a South Westerly direction and the barometric pressure was approximately 988mb.

Saturday 21st February 2026

All surfaces were damp, cloud cover was approximately 40%, the temperature was approximately 10°C, the wind speed was approximately 1.3m/s from a South Westerly direction and the barometric pressure was approximately 996mb.

5.3 Equipment

The existing noise climate survey was conducted using the equipment detailed in the table 3 below. The sound level meters were field calibrated before, after and during the survey as necessary, during which time no significant deviation in the calibrated levels were observed.

Table 3. Equipment used during the existing noise climate survey

Equipment description	Manufacturer	Model number	Serial number
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E0
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
Microphone weather protection enclosures	NTI Audio	WP30	-

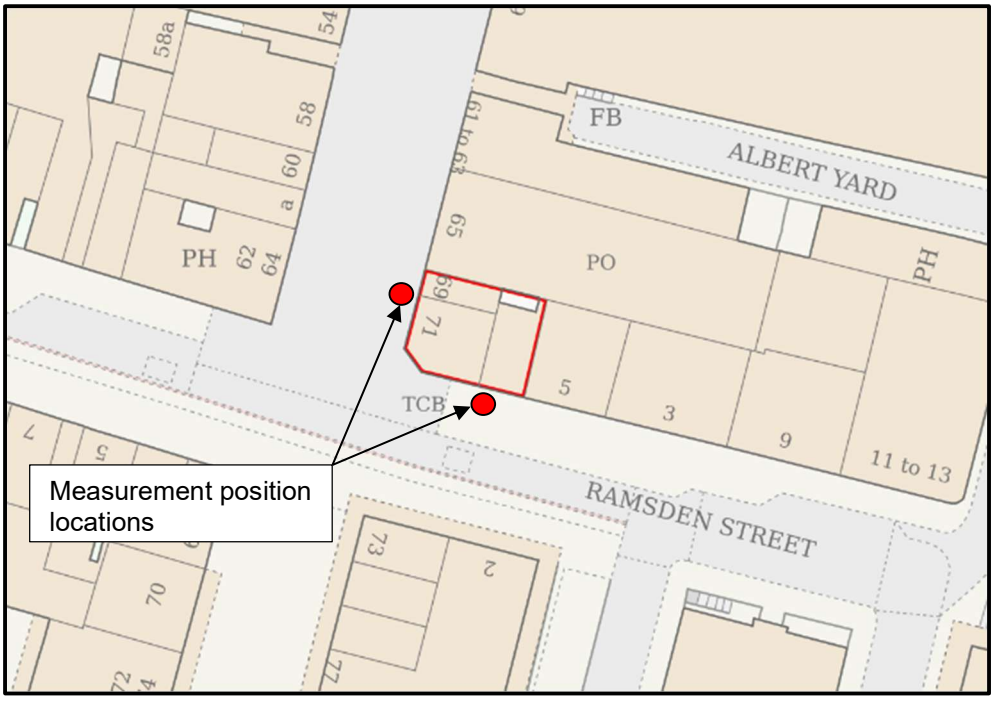
5.4 Measurement Procedure

The location of the proposed residential development suggested that the principal contributors to the existing noise climate would be general activity within the town centre and, potentially, road traffic. Both the site visits and interrogation of the simultaneous audio recordings suggested that this was indeed the case. With reference to the presence of hospitality venues or venues associated with the night time economy, the

only two venues of this type in the vicinity of Prudential House were the previously identified Commercial Hotel and the Albert Yard public house.

As the habitable spaces within the permitted apartments will have windows on the New Street and Ramsden Street elevations only, the measurements of the existing noise climate were obtained from positions on these elevations of the Prudential House building. The approximate location of the measurement positions are detailed on figure 2 below.

Figure 2. Approximate location of the measurement positions



In the measurement positions the sound level meter microphones were placed within weather protection enclosures and extended on booms from second floor windows on both the New Street and Ramsden Street elevations of the Prudential House building. In these positions the microphones were approximately 0.75 metres from the façades of the Prudential House building and approximately 7.5 metres above ground level.

Throughout the survey all measurements were made with the ‘fast’ time weighting engaged, the measurement time interval was 5 minutes and simultaneous audio recordings were made.

6.0 Noise Survey Results

The existing noise climate in the vicinity of Prudential House was regarded as being essentially urban in nature and character and was subject to noise contributions primarily from activity within the town centre.

6.1 Qualitative Assessment

During the afternoon period the principal contributors to the noise climate included: the comings and goings of shoppers and pedestrians, the operation of a small roundabout ride for children at the junction of New Street and Ramsden Street, road traffic and some intermittent construction noise from the town centre redevelopment works.

From the late afternoon into the early evening and night time period, the overall noise climate began to slowly reduce. During this time the streets in the immediate vicinity of Prudential House appeared to be relatively quiet and this was confirmed during the attended element of the survey between 22:30 – 00:00 hours. The attended element of the survey also revealed that whilst there were some pedestrians on the street, they were relatively quiet and appeared to be passing through.

With reference to the nearest hospitality venues to Prudential House, the Commercial Hotel and The Albert, the attended section of the survey highlighted that The Albert had closed for the evening and the Commercial Hotel also appeared to be closed. Reference to published opening times for The Albert suggests that this pub is open between 10:00 – 22:00 hours daily. Turning to the Commercial Hotel, enquiries indicated that these premises had been closed for some time. Consequently, it is suggested that in their current form, neither establishment should represent a particular source of noise disturbance for the permitted apartments.

Overall, the existing noise climate began to further reduce from around 23:00 hours until around 02:20 hours, at which point the existing noise climate increased a little until around 02:50 hours. Interrogation of the simultaneous audio recordings suggested that the slight increase in the noise climate was a result of a relatively sharp bust of rain combined with a period of strengthening wind.

As the night progressed the existing noise climate began to display a relatively typical and slow increase in the overall noise levels from around 05:30 hours on. This relatively slow increase in the existing noise climate continued until around 08:45 – 09:00 when a more pronounced increase in the surrounding noise climate occurred. This initial increase appeared to coincide with what sounded like a period of power tool use, which appeared to be relatively close to Prudential House. Another increase occurred at around 09:45 – 10:00 hours and this appeared to be associated with the operation of a generator and some music noise in the street. A further increase in the local noise climate occurred at around 12:10 -12:20 hours and this coincided with what sounded like a busker singing. The presence of a busker in the doorway to the vacant ground floor commercial unit, immediately to the North of Prudential House, was confirmed during the visit to Prudential House to collect the noise monitoring equipment.

6.2 Basic Results and Discussion

By virtue of the significant amount of measured data collected from the measurement position during the noise survey, tables 4 and 5 and graphs 1 and 2 below and overleaf contain summaries of the data obtained during the 24 hour noise survey. A summary of the measured data are presented in Appendix 1. Table 6 overleaf contains a brief summary of any noise events that were discernible above the general more 'anonymous' noise climate during the noise survey.

With reference to the measured sound levels from the from both measurement positions, as the microphones were approximately 0.75 metres from the existing building façade, a 3dB façade correction has been applied in order to establish representative free field sound levels.

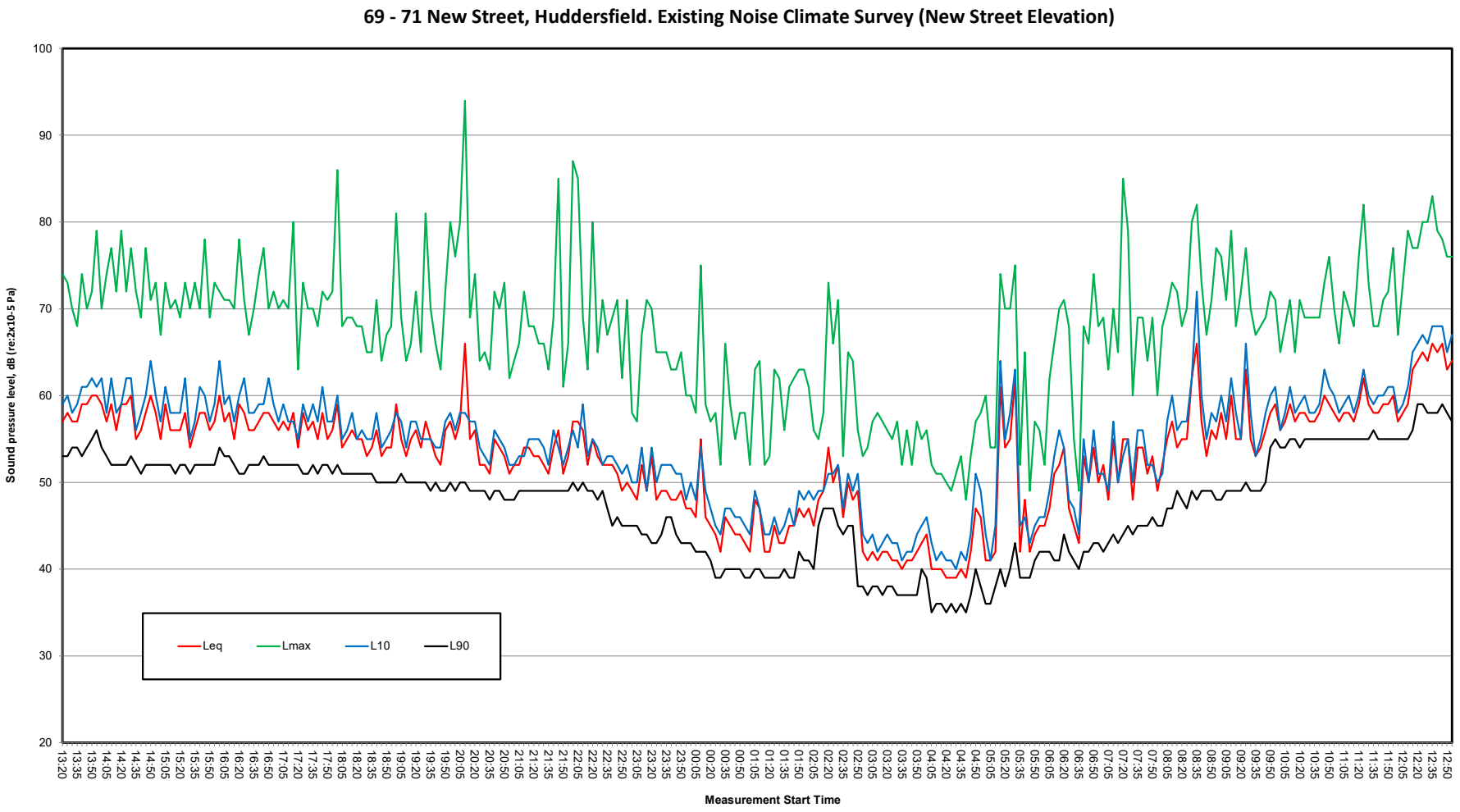
Table 4. Measured sound level summary, existing noise climate survey, New Street elevation, Prudential House

	$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
Standard deviation, daytime period	3.64	5.65	4.10	3.43
Standard deviation, night time period	4.76	6.85	4.71	3.06
Mean (log), daytime period	58	77	60	52
Mean (log), night time period	49	65	51	41
Modal value, daytime period	55	70	58	49
Modal value, night time period	42	58	44	39
Maximum value daytime period	67	94	72	59
Minimum value daytime period	48	60	49	42
Maximum value night time period	62	75	64	47
Minimum value night time period	39	48	40	35

Table 5. Measured sound level summary, existing noise climate survey, High Street elevation, Prudential House

	$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
Standard deviation, daytime period	3.47	5.07	4.06	2.83
Standard deviation, night time period	4.84	7.80	4.99	1.47
Mean (log), daytime period	58	77	60	51
Mean (log), night time period	50	65	52	41
Modal value, daytime period	58	73	60	50
Modal value, night time period	42	50	45	40
Maximum value daytime period	66	91	67	56
Minimum value daytime period	48	59	49	42
Maximum value night time period	61	76	65	45
Minimum value night time period	40	46	41	38

Graph1. Measured sound levels, existing noise climate (façade corrected levels), New Street elevation, Prudential House



Graph 2. Measured sound levels, existing noise climate (façade corrected levels), High Street elevation, Prudential House

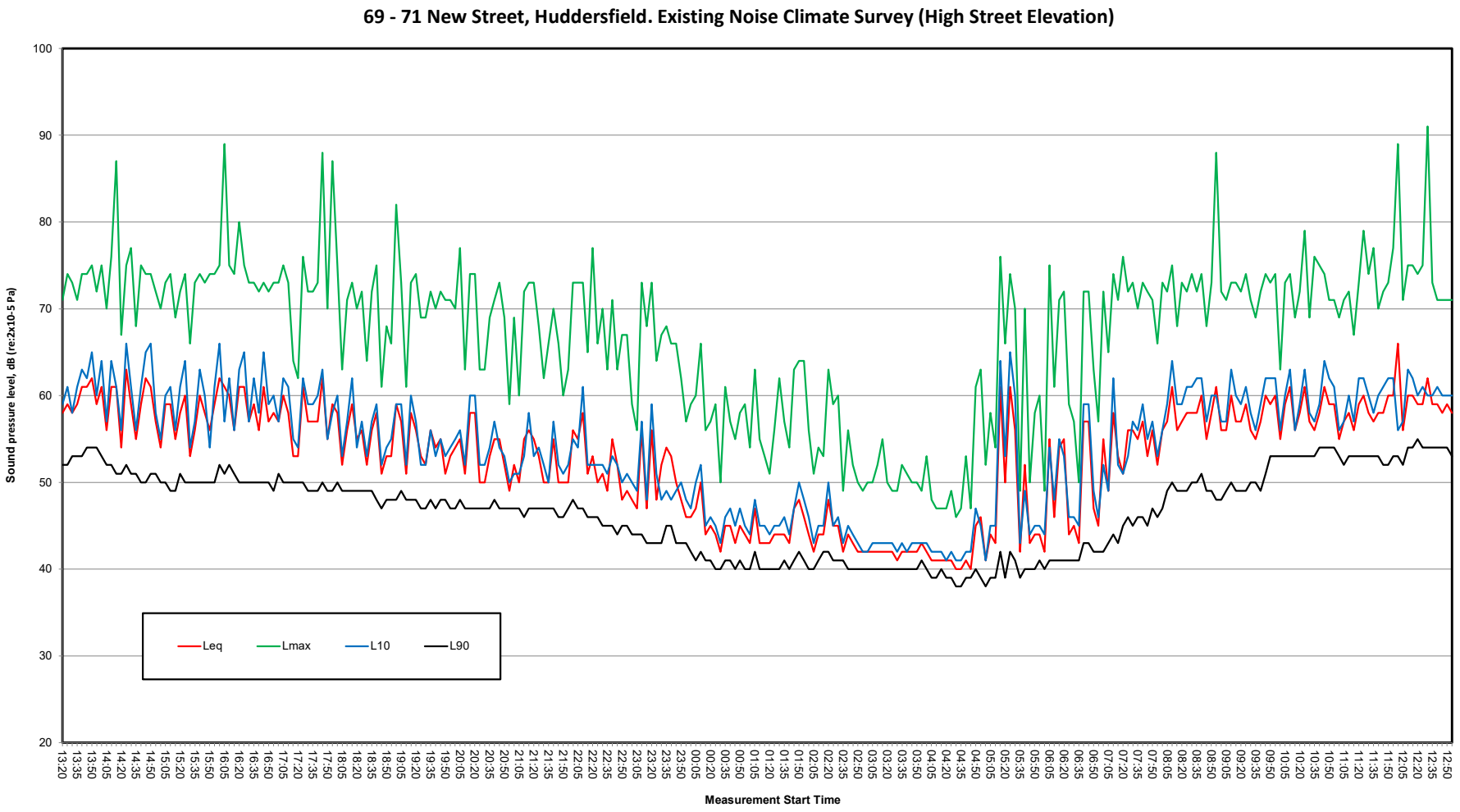


Table 6. Discrete noise events

Measurement period	Comment
18:00 – 18:05	Increasing wind, sharp rain shower and what sounded like a heavy vehicle
20:10 – 20:15	Shouting and whistling in the street
21:45 – 21:50	Loud vehicle in the street
22:00 – 22:05	Loud vehicle in the street
23:35 – 23:55	Distant building alarm
07:20 – 07:25	What sounds like the waste bins in the street being emptied
08:45 – 09:00	Sound like power tools being used in the immediate vicinity
09:45 – 10:00	What sounds like the operation of a generator and music playing
12:10 on	Music and singing from a busker in the street

As can be seen from table 4 and graph 1, the noise climate on the New Street elevation was, with the exception of the L_{A90} levels, steadier during the daytime than the night time period. Overall, the noise climate in this position was regarded as being representative of an urban location, subject to the usual urban noise contributors described above. In this position the mean daytime and night time sound levels, expressed as an L_{Aeq}, were 58 and both 49dB respectively. Turning to the situation on the High Street elevation, table 5 and graph 2 again indicate that again the daytime noise climate was again a little steadier again, with the exception of the L_{A90} levels, than was the case during the night time with the overall levels being very similar to those on the New Street elevation. In this position the mean daytime and night time sound levels, expressed as an L_{Aeq}, were 58 and 58dB respectively.

An initial assessment of the obtained sound levels and their potential interaction with the ventilation of the internal spaces, will be undertaken. Comparing the calculated mean (log) L_{Aeq} values for the daytime period on the New Street and High Street elevations, 58dB respectively, it can be seen that assuming the 13dB ‘rule of thumb’ for the sound reduction provided by a partially open window, suggested in the AVO guide, the guide value for internal noise detailed within BS 8233:2014 would be exceeded. Repeating the exercise and adopting the mean (log) L_{Aeq} values for the night time period on the two elevations, 49 and 50dB for the New Street and High Street elevations respectively, the guide value for internal noise detailed within BS 8233:2014 would again be exceeded within the bedrooms.

Turning to the L_{Amax} night time noise climate and again applying the 13dB 'rule of thumb' for the sound reduction offered by a partially open window, it can be seen that, taking the calculated mean L_{Amax} values from the New Street and High Street elevations, 77dB respectively, a partially open window for ventilation purposes would result in the internal noise levels exceeding the guide values detailed BS 8233:2014.

Remaining with the L_{Amax} noise climate, the guidance contained within the ProPG document, namely that providing the internal level within a bedroom does not exceed 45dB more than 10 times per night within a bedroom "*then this represents a reasonable threshold below which the events on sleep can be regarded as negligible*" will be applied. Applying the measured sound levels from the survey, it is likely that the L_{Amax} noise climate in both measurement positions would exceed this guidance with partially open windows.

Finally, the suggested 'limits' contained within ADO suggest that windows would be likely to be kept closed where the noise levels within bedrooms exceed: 40dB $L_{Aeq,8\ hours}$ and 55dB L_{Amax} more than 10 times in a night. Applying these 'limits' to the measured sound levels from the survey, it can be seen that the existing noise climate during the survey would be such that it would be very likely that windows would need to be kept closed in order to comply with the internal noise criteria. Despite this, it must be remembered that the 'limit' values from ADO are applied, to this situation, for informative purposes only.

Consequently, the foregoing 'initial' assessments indicate that in both measurement positions, employing a ventilation strategy that relies on opening windows would not be appropriate for the proposed apartments. The issue of ventilation will be revisited in a subsequent section of this report.

7.0 Noise Transmission Calculations

Using the measured sound levels from the existing noise climate surveys, calculations will be performed to assess the likely internal noise levels within the permitted apartments. As the existing noise climate comprised essentially 'anonymous' noise without 'specific' character the assessments will be conducted according to the guide values contained within table 1 of section 4.2 above.

The subsequent assessment of the potential internal noise levels within the permitted apartments will be undertaken using the highest measured sound levels from the noise surveys and these are detailed in tables 7 and 8 below and overleaf. By applying the highest measured sound levels from the surveys, it is suggested that the following calculations may be regarded as worst case assessments using sound levels that are unlikely to persist for all but very short periods of time.

Table 7. Highest measured sound levels, New Street elevation, used in the assessments

OBCF, Hz*	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Overall, dB(A)**
Daytime, L_{Aeq}, (13:00 – 13:05 hours)	70	68	62	68	62	54	49	38	**67**
Night time, $L_{Aeq.}$ (05:30 – 05:35 hours)	66	59	61	58	55	54	51	51	**62**
Night time, $L_{Amax,}$ (05:30 – 05:35 hours)	81	72	74	73	69	67	65	65	**75**

Table 8. Highest measured sound levels, High Street elevation, used in the assessments

OBCF, Hz*	63	125	250	500	1k	2k	4k	8k	Overall, dB(A)
Daytime, L_{Aeq}, (12:00 – 12:05 hours)	66	60	56	54	62	63	43	39	**66**
Night time, $L_{Aeq.}$ (05:15 – 05:20 hours)	67	55	58	58	55	55	52	52	**61**
Night time, $L_{Amax,}$ (05:15 – 05:20 hours)	82	73	73	73	68	68	66	66	**76**

The sound insulation provided by a building envelope is calculated from the sound insulation provided by the various façade elements, such as the glazing, external walls etc., and the areas they cover. In the majority of cases, it is the glazing and ventilation provision that can be considered as the 'weak' links acoustically, therefore increasing the sound insulation of these elements will improve the overall sound insulation of the façade. The result of the calculation is a composite sound insulation value for the whole façade.

The following assessment of the likely internal noise levels within the permitted apartments has been undertaken according to the room and façade dimensions detailed on drawings 01 and 03 (revision A) issued by the Northern Design Partnership of Oldham. To facilitate the calculations, the following assumptions have been employed:

- The reverberation times within the rooms would be 0.5 seconds.
- The floor to ceiling height will be approximately 2.9 metres at first floor level, 2.8 metres at second floor level and 2.7 metres at third floor level.
- The calculations have been produced assuming the windows would be closed but with the ventilation openings would be open.
- The measured sound levels detailed in tables 11 and 12 above would be equally incident upon the accommodation on the New Street and High Street elevations of the permitted development.
- Passive background ventilation equivalent to 10 000mm^2 for living rooms and 4 000mm^2 for bedrooms, has been assumed for both elevations.

7.1 Construction Specification

The following construction types have been evaluated from site visits and architectural specifications

External Walls

The external walls of the existing Prudential House building are very substantial and comprise solid masonry approximately 400mm thick. Test results for a construction of this type suggest that external walls of this type should provide an overall sound insulation of around 66dB R_w, with the octave band sound insulation values being as detailed in table 9 overleaf.

Table 9. Masonry Cavity Wall Construction, Octave Band Sound Insulation Values

OBCF, Hz*	125	250	500	1k	2k	4k	Overall, R_w dB(A)
Solid masonry wall sound Insulation, dB	49	55	62	67	71	70	**66**

* Octave Band Centre Frequency

Glazing

The suggested glazing would be of the sealed unit type and would be of the following nominal specifications: 4mm pane - 12 to 20mm cavity - 4mm pane, 6mm pane - 16mm cavity – 6.8mm pane and 6mm pane - 16mm cavity – 8.8mm pane. Laboratory test data obtained from Pilkington Glass indicate that these configurations should provide a sound insulation values of around 29dB, 40 and 41dB R_w respectively. The octave band sound insulation values are as detailed in table 10 below. Alternative glazing configurations would be acceptable providing the sound insulation performances are at least equivalent to the specifications detailed in table 10 below.

Table 10. Glazing, octave band sound insulation values

OBCF, Hz*	125	250	500	1k	2k	4k	Overall, R_w (C_{tr}) dB
4mm, 20mm cavity, 4mm	21	17	25	35	37	31	**29 (-4)**
6mm, 16mm cavity, 6.8mm**	21	28	37	48	48	54	**40 (-6)**
6mm, 16mm cavity, 8.8mm**	21	30	39	47	50	55	**41 (-6)**

* Octave Band Centre Frequency
** Pilkington Optiphon

An indication of the location of the various glazing types is contained within Appendix 3

Ventilation

The initial assessments will be undertaken assuming the provision of input air via window frame mounted 'background' (trickle) ventilators. In this case the selected window frame mounted background ventilators of the Titan SFXSA V75/C50 and V75/C75 types. Laboratory test data indicates that the Titan window frame mounted ventilators should provide sound insulation values of 42 and 38dB $D_{n,e,w}$ in their open positions. The octave band sound insulation values for the selected ventilators are detailed in table 11 below. Alternative ventilator configurations would be acceptable providing the sound insulation performance of the units is at least equivalent to the specification detailed in table 11 below. An indication of the location of the ventilator types is contained within Appendix 3.

Table 11. Background ventilation, octave band sound insulation values

OBCF, Hz*	125	250	500	1k	2k	4k	Overall, $D_{n,e,w}$ dB
Titan SFXSA V75/C50	40	37	34	43	50	53	**42**
Titan SFXSA V75/C75	37	37	36	47	49	55	**44**

* Octave Band Centre Frequency.

7.2 Calculation Results and Discussion

Calculations have been performed for the bedrooms and the dining/living areas within the permitted apartments. The calculations have been undertaken assuming that the windows would remain closed but the background ventilation provision would be in the open position. It should however be remembered that this does not suggest that the windows may not be opened or should be unopenable, but that where windows are open it is possible that the adopted noise guide criteria will be exceeded.

The results of the break-in noise calculations, including the assumptions relating to the proposed façade elements detailed above, are presented with reference to the design guidance contained within section 4.0 above, in tables 12 – 16 below and overleaf. Full calculation data are available in Appendix 2.

Table 12. Calculated internal sound levels, Apartment 1

Location	Design target, daytime, dB L_{Aeq}	Calculated level, daytime, dB L_{Aeq}	Design target, night time, dB L_{Aeq}	Calculated levels, night time, dB L_{Aeq} and (L_{Amax})
Living/dining/kitchen	35	**33**	-	
Bedroom	35	**29**	30	**29 (44)**

Table 13. Calculated internal sound levels, Apartment 2

Location	Design target, daytime, dB L_{Aeq}	Calculated level, daytime, dB L_{Aeq}	Design target, night time, dB L_{Aeq}	Calculated levels, night time, dB L_{Aeq} and (L_{Amax})
Living/dining/kitchen	35	**35**	-	
Bedroom	35	**35**	30	**29 (43)**

Table 14. Calculated internal sound levels, Apartment 3

Location	Design target, daytime, dB L_{Aeq}	Calculated level, daytime, dB L_{Aeq}	Design target, night time, dB L_{Aeq}	Calculated levels, night time, dB L_{Aeq} and (L_{Amax})
Living/dining/kitchen	35	**31**	-	
Bedroom	35	**28**	30	**28 (43)**

Table 15. Calculated internal sound levels, Apartment 4

Location	Design target, daytime, dB L_{Aeq}	Calculated level, daytime, dB L_{Aeq}	Design target, night time, dB L_{Aeq}	Calculated levels, night time, dB L_{Aeq} and (L_{Amax})
Living/dining/kitchen	35	**34**	-	
Bedroom	35	**35**	30	**29 (42)**

Table 16. Calculated internal sound levels, Apartment 5

Location	Design target, daytime, dB L_{Aeq}	Calculated level, daytime, dB L_{Aeq}	Design target, night time, dB L_{Aeq}	Calculated levels, night time, dB L_{Aeq} and (L_{Amax})
Living/dining/kitchen	35	**32**	-	
Bedroom 1	35	**33**	30	**27 (41)**
Bedroom 2	35	**35**	30	**28 (42)**

As can be seen from tables 12 - 16 above, based on the stated assumptions relating to the sound insulation of the proposed façade elements, under the windows closed but ventilation openings open scenario and employing the adopted sound levels detailed in tables 7 and 8 above, the calculated internal noise levels within the permitted apartments would not exceed the adopted design guide levels.

As the Prudential House building on New Street in Huddersfield is both listed (Grade II) and within a conservation area, it is possible that the restrictions may be placed on the replacement of the existing glazing and frames, for modern sealed unit glazing, either within the same (modified) frames or replacement frames of a similar type to those that are currently present. In this case, the sealed unit glazing options detailed in table 10 above may be substituted for a secondary glazed option. In this case a secondary glazing option comprising the existing or replacement single glazed external panes, either 4 or 6mm thick, would require augmentation with a secondary 4mm internal pane with a 100 – 150mm cavity between the existing glazing and the secondary pane. Labortatory test data for this type of glazing, obtained from Selectaglaze, indicate that this configuration should provide a sound insulation value of around 43dB R_w with the octave band sound insulation values being as detailed in table 17 below. Again, an alternative glazing configuration would be acceptable providing the sound insulation performances are at least equivalent to the specifications detailed in table 17 below.

Table 17. Secondary glazing, octave band sound insulation values

OBCF, Hz*	125	250	500	1k	2k	4k	Overall, R_w (C_{tr}) dB
4 - 6mm external pane, 100 – 150mm cavity, 4mm pane	25	35	41	45	44	46	**43 (-5)**

* Octave Band Centre Frequency

With respect to the permitted apartments, the foregoing sections recognise that a partially open window for general ventilation, other than purge ventilation purposes, would result in an increase in the internal noise levels such that they would exceed the adopted design guide values. With this in mind it is recommended that alternative ventilation provision to permit the ventilation of the internal spaces without having to open the windows is provided.

The use of an alternative ventilation strategy would also comply with the guidance 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) in May 2017. The ProPG document at paragraph 2.34, states: "*Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole building ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilation) in the open position*". In this situation it is suggested that alternative ventilation would permit the internal spaces to be adequately ventilated without having to rely on opening windows.

With reference to the alternative ventilation options, the strategy could take the form of either a system 3 or system 4 provision as summarised in Approved Document F (ADF). In this case System 3 typically relates to a continuous mechanical extraction (MEV) system which operates to remove air from the building with the 'make-up' air being drawn in via background ventilators etc. Often, this type of alternative ventilation is provided by a range of different strategies although decentralised mechanical extract ventilation units (dMEVs) in habitable rooms are a popular choice as they combine low energy consumption with low sound emission levels. System 4 refers to a fully mechanical system incorporating heat recovery and is typically used in noisy environments etc. Bearing in mind the obtained noise levels from the 24 hour survey and the calculated results summarised in tables 12 – 16 above, it is suggested that alternative ventilation of the type 3 format would be more appropriate in this situation than would a type 4 system.

With reference to an alternative ventilation strategy, the requirement to ventilate the internal spaces would need to be carefully considered as the benefit to the occupants should be balanced with the possible disincentives to use, such as the perceived complexity of the installation and running costs. In addition, it should be borne in mind that many local authorities require that any ventilation system can achieve an exchange rate of four air changes per hour. Consequently, it is suggested that it would be prudent to discuss the ventilation requirements with the Local Planning Authority at the earliest opportunity.

In addition, it is strongly recommended that the emission of sound from the alternative ventilation system is adequately controlled to ensure that this element does not detrimentally affect the internal noise climate. The sound emission from the operation of the ventilation system, combined with the external noise break-in, should not cause the internal levels within the apartments to exceed the adopted design guide levels. It is also essential that the occupants must also be provided with the option to open windows as they choose. Whichever system is installed, it is recommended that the

advice of a suitably qualified/experienced ventilation engineer, to design an appropriate system, is obtained. Again, it would be prudent to discuss any ventilation proposals with the Local Planning Authority at the earliest opportunity.

Remaining with the issue of ventilation and its interaction with the glazing, it is the case that where secondary glazing option is adopted, the use of frame mounted background ventilators of the types detailed in table 11 above, would probably not be not be possible. In this case, the ventilation system will require air to be drawn into the apartments via alternative means. In many situations this can be achieved via through the wall ventilators, although in this case an acoustic wall ventilator would be required. This type of provision could be achieved by the use of a ventilator such as the Greenwood MA3051 acoustic wall ventilator, the sound insulation values of which are as detailed in table 18 below, although ventilators offering similar levels of sound insulation performance would be acceptable.

Table 18. Acoustic through the wall ventilator, Greenwood MA3051 type**,** octave band sound insulation values

OBCF, Hz*	**125**	**250**	**500**	**1k**	**2k**	**Overall, $D_{n,e,w}$ dB**
Greenwood MA3051	47	46	49	56	66	**55**

* Octave Band Centre Frequency.

However, bearing in mind the fact that Prudential House is both listed and within a conservation area, the use of through the wall ventilators may not be possible. Again, it would be prudent to discuss any ventilation proposals using through the wall units, with the Local Planning Authority at the earliest opportunity.

As a consequence of the foregoing, it is suggested the sound insulation of the façade elements detailed within this report, combined with the proposed alternative ventilation provision, would be sufficient to limit the ingress of external noise to the permitted residential apartments within the Prudential House building, in compliance with the adopted design guidance. The proposed mitigation measures would also comply with the requirement contained within the ProPG document which requires that the acoustic design statement "*confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development*".

It is suggested that that the requirements contained within planning condition 3 would be met by the assessment of the existing noise climate combined with the proposed façade sound insulation measures detailed above.

8.0 Conclusion

The existing noise climate in the vicinity of Prudential House was regarded as being essentially urban in nature and character and was subject to noise contributions primarily from activity within the town centre.

Applying the obtained sound levels from the existing noise climate survey and combining these with the stated assumptions relating to the sound insulation of the façade elements, the calculations have demonstrated that the sound insulation of the

façade elements of the permitted development would be sufficient to secure that the break-in noise levels would not exceed the adopted design guide values. Despite this it is it is suggested that alternative ventilation would be required in order to permit these spaces to be adequately ventilated without having to rely on opening windows.

The proposed mitigation measures would also comply with the requirement contained within the ProPG document which requires that the acoustic design statement "*confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development*".

As a result, it is suggested that that the requirements contained within planning condition 3 would be met by the assessment of the existing noise climate combined with the proposed façade sound insulation measures detailed above.

Appendix 1: Existing Noise Climate Survey, Measured Sound Levels (façade corrected)

Measured sound levels, New Street elevation, 20th – 21st February 2026

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
13:20	57	74	59	53
13:25	58	73	60	53
13:30	57	70	58	54
13:35	57	68	59	54
13:40	59	74	61	53
13:45	59	70	61	54
13:50	60	72	62	55
13:55	60	79	61	56
14:00	59	70	62	54
14:05	57	74	58	53
14:10	59	77	62	52
14:15	56	72	58	52
14:20	59	79	59	52
14:25	59	72	62	52
14:30	60	77	62	53
14:35	55	72	56	52
14:40	56	69	58	51
14:45	58	77	60	52
14:50	60	71	64	52
14:55	58	73	60	52
15:00	55	67	57	52
15:05	59	73	61	52
15:10	56	70	58	52
15:15	56	71	58	51

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
15:20	56	69	58	52
15:25	58	73	62	52
15:30	54	70	55	51
15:35	56	73	57	52
15:40	58	70	61	52
15:45	58	78	60	52
15:50	56	69	57	52
15:55	57	73	59	52
16:00	60	72	64	54
16:05	57	71	59	53
16:10	58	71	60	53
16:15	55	70	57	52
16:20	59	78	60	51
16:25	58	71	62	51
16:30	56	67	58	52
16:35	56	70	58	52
16:40	57	74	59	52
16:45	58	77	59	53
16:50	58	70	62	52
16:55	57	72	59	52
17:00	56	70	57	52
17:05	57	71	59	52
17:10	56	70	57	52
17:15	58	80	57	52

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
17:20	54	63	55	52
17:25	58	73	59	51
17:30	56	70	57	51
17:35	57	70	59	52
17:40	55	68	57	51
17:45	58	72	61	52
17:50	55	71	57	52
17:55	56	72	57	51
18:00	59	86	60	52
18:05	54	68	55	51
18:10	55	69	56	51
18:15	56	69	58	51
18:20	55	68	55	51
18:25	55	68	56	51
18:30	53	65	55	51
18:35	54	65	55	51
18:40	56	71	58	50
18:45	53	64	54	50
18:50	54	67	55	50
18:55	54	68	56	50
19:00	59	81	58	50
19:05	55	69	57	51
19:10	53	64	54	50
19:15	55	66	57	50

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
19:20	56	72	57	50
19:25	54	65	55	50
19:30	57	81	55	50
19:35	55	70	55	49
19:40	53	66	54	50
19:45	52	63	54	49
19:50	56	72	57	49
19:55	57	80	58	50
20:00	55	76	56	49
20:05	57	80	58	50
20:10	66	94	58	50
20:15	55	69	57	49
20:20	56	74	57	49
20:25	52	64	54	49
20:30	52	65	53	49
20:35	51	63	52	48
20:40	55	72	56	49
20:45	54	70	55	49
20:50	53	73	54	48
20:55	51	62	52	48
21:00	52	64	52	48
21:05	52	66	53	49
21:10	54	72	53	49
21:15	54	68	55	49

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
21:20	53	68	55	49
21:25	53	66	55	49
21:30	52	66	54	49
21:35	51	63	52	49
21:40	54	69	56	49
21:45	56	85	54	49
21:50	51	61	52	49
21:55	53	66	54	49
22:00	57	87	56	50
22:05	57	85	54	49
22:10	56	69	59	50
22:15	52	63	53	49
22:20	55	80	55	49
22:25	53	65	54	48
22:30	52	71	52	49
22:35	52	67	53	47
22:40	52	69	53	45
22:45	51	71	52	46
22:50	49	62	51	45
22:55	50	71	52	45
23:00	49	58	50	45
23:05	48	57	50	45
23:10	52	67	54	44
23:15	49	71	49	44

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
23:20	53	70	54	43
23:25	48	65	50	43
23:30	49	65	52	44
23:35	49	65	52	46
23:40	48	63	52	46
23:45	48	63	51	44
23:50	49	65	51	43
23:55	47	60	48	43
00:00	47	60	50	43
00:05	46	58	48	42
00:10	55	75	54	42
00:15	46	59	49	42
00:20	45	57	47	41
00:25	44	58	45	39
00:30	42	52	44	39
00:35	46	66	47	40
00:40	45	59	47	40
00:45	44	55	46	40
00:50	44	58	46	40
00:55	43	58	45	39
01:00	42	52	44	39
01:05	48	63	49	40
01:10	47	64	47	40
01:15	42	52	44	39

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
01:20	42	53	44	39
01:25	45	63	46	39
01:30	43	62	44	39
01:35	43	56	45	40
01:40	45	61	47	39
01:45	45	62	45	39
01:50	47	63	49	42
01:55	46	63	48	41
02:00	47	61	49	41
02:05	45	56	48	40
02:10	48	55	49	45
02:15	49	58	49	47
02:20	54	73	51	47
02:25	50	66	51	47
02:30	52	71	52	45
02:35	46	53	47	44
02:40	50	65	51	45
02:45	48	64	49	45
02:50	49	56	51	38
02:55	42	53	44	38
03:00	41	54	43	37
03:05	42	57	44	38
03:10	41	58	42	38
03:15	42	57	43	37

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
03:20	42	56	44	38
03:25	41	55	43	38
03:30	41	57	43	37
03:35	40	52	41	37
03:40	41	56	42	37
03:45	41	52	42	37
03:50	42	57	44	37
03:55	43	55	45	40
04:00	44	56	46	39
04:05	40	52	43	35
04:10	40	51	41	36
04:15	40	51	42	36
04:20	39	50	41	35
04:25	39	49	41	36
04:30	39	51	40	35
04:35	40	53	42	36
04:40	39	48	41	35
04:45	42	53	44	37
04:50	47	57	51	40
04:55	46	58	49	38
05:00	41	60	44	36
05:05	41	54	41	36
05:10	42	54	45	38
05:15	61	74	64	40

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
05:20	54	70	55	38
05:25	55	70	58	40
05:30	62	75	63	43
05:35	42	52	45	39
05:40	48	65	46	39
05:45	42	49	43	39
05:50	44	57	45	41
05:55	45	56	46	42
06:00	45	52	46	42
06:05	47	62	49	42
06:10	51	66	53	41
06:15	52	70	56	41
06:20	54	71	54	44
06:25	47	68	48	42
06:30	45	55	47	41
06:35	43	49	44	40
06:40	53	68	55	42
06:45	50	66	50	42
06:50	54	74	56	43
06:55	50	68	51	43
07:00	52	69	51	42
07:05	48	63	49	43
07:10	55	70	57	44
07:15	50	65	50	43

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
07:20	55	85	53	44
07:25	55	79	55	45
07:30	48	60	50	44
07:35	54	69	56	45
07:40	54	69	56	45
07:45	51	64	52	45
07:50	53	69	52	46
07:55	49	60	50	45
08:00	52	68	51	45
08:05	55	70	57	47
08:10	57	73	60	47
08:15	54	72	56	49
08:20	55	68	57	48
08:25	55	70	57	47
08:30	62	80	62	49
08:35	66	82	72	48
08:40	57	73	60	49
08:45	53	67	55	49
08:50	56	71	58	49
08:55	55	77	57	48
09:00	58	76	60	48
09:05	55	71	57	49
09:10	60	79	62	49
09:15	55	68	58	49

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
09:20	55	72	55	49
09:25	63	77	66	50
09:30	55	70	58	49
09:35	53	67	53	49
09:40	54	68	55	49
09:45	56	69	58	50
09:50	58	72	60	54
09:55	59	71	61	55
10:00	56	65	56	54
10:05	57	68	58	54
10:10	59	71	61	55
10:15	57	65	58	55
10:20	58	71	59	54
10:25	58	69	60	55
10:30	57	69	58	55
10:35	57	69	58	55
10:40	58	69	59	55
10:45	60	73	63	55
10:50	59	76	61	55
10:55	58	70	60	55
11:00	57	66	58	55
11:05	58	72	59	55
11:10	58	70	60	55
11:15	57	68	58	55

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
11:20	59	76	60	55
11:25	62	82	63	55
11:30	59	73	60	55
11:35	58	68	59	56
11:40	58	68	60	55
11:45	59	71	60	55
11:50	59	72	61	55
11:55	60	77	61	55
12:00	57	67	58	55
12:05	58	73	59	55
12:10	59	79	61	55
12:15	63	77	65	56
12:20	64	77	66	59
12:25	65	80	67	59
12:30	64	80	66	58
12:35	66	83	68	58
12:40	65	79	68	58
12:45	66	78	68	59
12:50	63	76	65	58
12:55	64	76	67	57
13:00	67	84	68	58
13:05	64	80	67	57
13:10	66	79	69	58
13:15	65	77	67	57

Measured sound levels, High Street elevation, 20th – 21st February 2026

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
13:20	58	71	59	52
13:25	59	74	61	52
13:30	58	73	58	53
13:35	59	71	61	53
13:40	61	74	63	53
13:45	61	74	62	54
13:50	62	75	65	54
13:55	59	72	60	54
14:00	61	75	64	53
14:05	56	70	57	52
14:10	61	76	64	52
14:15	61	87	61	51
14:20	54	67	56	51
14:25	63	75	66	52
14:30	59	77	61	51
14:35	55	68	56	51
14:40	59	75	61	50
14:45	62	74	65	50
14:50	61	74	66	51
14:55	57	72	58	51
15:00	54	70	55	50
15:05	59	73	60	50
15:10	59	74	61	49
15:15	55	69	56	49

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
15:20	58	72	61	51
15:25	60	74	64	50
15:30	53	66	54	50
15:35	56	73	57	50
15:40	60	74	63	50
15:45	58	73	60	50
15:50	56	74	54	50
15:55	59	74	61	50
16:00	62	75	66	52
16:05	61	89	57	51
16:10	60	75	62	52
16:15	56	74	56	51
16:20	61	80	63	50
16:25	61	75	65	50
16:30	57	73	57	50
16:35	59	73	62	50
16:40	56	72	58	50
16:45	61	73	65	50
16:50	57	72	59	50
16:55	58	73	60	49
17:00	57	73	57	51
17:05	60	75	62	50
17:10	58	73	61	50
17:15	53	64	55	50

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
17:20	53	62	54	50
17:25	61	76	62	50
17:30	57	72	59	49
17:35	57	72	59	49
17:40	57	73	60	49
17:45	62	88	63	50
17:50	55	70	55	49
17:55	59	87	58	49
18:00	58	75	60	50
18:05	52	63	53	49
18:10	56	71	57	49
18:15	59	73	62	49
18:20	55	70	54	49
18:25	56	72	57	49
18:30	52	64	53	49
18:35	56	72	57	49
18:40	58	75	59	48
18:45	51	61	52	47
18:50	53	68	54	48
18:55	53	66	55	48
19:00	59	82	59	48
19:05	57	73	59	49
19:10	51	61	52	48
19:15	58	73	60	48

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
19:20	56	74	57	48
19:25	53	69	52	47
19:30	52	69	52	47
19:35	56	72	56	48
19:40	54	70	53	47
19:45	55	72	55	48
19:50	51	71	53	48
19:55	53	71	54	47
20:00	54	70	55	47
20:05	55	77	56	48
20:10	51	63	52	47
20:15	58	74	60	47
20:20	58	74	60	47
20:25	50	63	52	47
20:30	50	63	52	47
20:35	53	69	54	47
20:40	55	71	57	48
20:45	55	73	54	47
20:50	52	69	53	47
20:55	49	59	50	47
21:00	52	69	51	47
21:05	50	60	51	47
21:10	55	72	53	46
21:15	56	73	58	47

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
21:20	55	73	53	47
21:25	53	68	54	47
21:30	50	62	52	47
21:35	50	66	50	47
21:40	55	70	57	47
21:45	50	66	52	46
21:50	50	60	51	46
21:55	50	63	52	47
22:00	56	73	55	48
22:05	55	73	54	47
22:10	58	73	61	47
22:15	51	65	52	46
22:20	53	77	52	46
22:25	50	66	52	46
22:30	51	70	52	45
22:35	49	63	51	45
22:40	55	71	53	45
22:45	52	63	52	44
22:50	48	67	50	45
22:55	49	67	51	45
23:00	48	59	50	44
23:05	47	56	49	44
23:10	56	73	57	44
23:15	47	68	48	43

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
23:20	56	73	59	43
23:25	48	64	51	43
23:30	52	67	48	43
23:35	54	68	49	45
23:40	53	66	48	45
23:45	50	66	49	43
23:50	48	62	50	43
23:55	46	57	48	43
00:00	46	59	47	42
00:05	47	60	50	41
00:10	50	66	52	42
00:15	44	56	45	41
00:20	45	57	46	41
00:25	44	59	45	40
00:30	42	50	43	40
00:35	45	61	46	41
00:40	45	57	47	41
00:45	43	55	45	40
00:50	45	58	47	41
00:55	44	59	45	40
01:00	43	54	44	40
01:05	47	63	48	42
01:10	43	55	45	40
01:15	43	53	45	40

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
01:20	43	51	44	40
01:25	44	56	45	40
01:30	44	62	45	40
01:35	44	57	46	41
01:40	43	54	44	40
01:45	47	63	47	41
01:50	48	64	50	42
01:55	46	64	48	41
02:00	44	56	46	40
02:05	42	51	43	40
02:10	44	54	45	41
02:15	44	53	45	42
02:20	48	63	50	42
02:25	45	59	45	41
02:30	45	60	46	41
02:35	42	49	43	41
02:40	44	56	45	40
02:45	43	52	44	40
02:50	42	50	43	40
02:55	42	49	42	40
03:00	42	50	42	40
03:05	42	50	43	40
03:10	42	52	43	40
03:15	42	55	43	40

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
03:20	42	50	43	40
03:25	42	49	43	40
03:30	41	49	42	40
03:35	42	52	43	40
03:40	42	51	42	40
03:45	42	50	43	40
03:50	42	50	43	40
03:55	43	49	43	41
04:00	42	53	43	40
04:05	41	48	42	39
04:10	41	47	42	39
04:15	41	47	42	40
04:20	41	47	41	39
04:25	41	49	42	39
04:30	40	46	41	38
04:35	40	47	41	38
04:40	41	53	42	39
04:45	40	47	42	39
04:50	45	61	47	40
04:55	46	63	45	39
05:00	41	52	41	38
05:05	44	58	45	39
05:10	43	54	45	39
05:15	61	76	64	42

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
05:20	50	66	53	39
05:25	61	74	65	42
05:30	56	70	60	41
05:35	42	49	43	39
05:40	52	70	49	40
05:45	43	50	44	40
05:50	44	58	45	40
05:55	44	60	45	41
06:00	42	49	44	40
06:05	55	75	54	41
06:10	46	61	48	41
06:15	54	71	55	41
06:20	55	72	53	41
06:25	44	59	46	41
06:30	45	57	46	41
06:35	43	50	45	41
06:40	57	72	59	43
06:45	57	72	59	43
06:50	47	63	49	42
06:55	45	57	46	42
07:00	55	72	52	42
07:05	49	65	49	43
07:10	58	74	62	44
07:15	53	71	52	43

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
07:20	51	76	51	45
07:25	56	72	53	46
07:30	56	73	57	45
07:35	55	70	56	46
07:40	57	73	59	46
07:45	53	72	55	45
07:50	56	71	57	47
07:55	52	66	53	46
08:00	56	73	56	47
08:05	57	72	59	49
08:10	61	75	64	50
08:15	56	68	59	49
08:20	57	73	59	49
08:25	58	72	61	49
08:30	58	74	61	50
08:35	58	72	62	50
08:40	60	74	62	51
08:45	55	68	57	49
08:50	58	73	60	49
08:55	61	88	60	48
09:00	56	72	57	48
09:05	56	71	57	49
09:10	60	73	63	50
09:15	57	73	60	49

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
09:20	57	72	59	49
09:25	59	74	61	49
09:30	56	71	58	50
09:35	55	69	56	50
09:40	57	72	59	49
09:45	60	74	62	51
09:50	59	73	62	53
09:55	60	74	62	53
10:00	55	63	56	53
10:05	59	73	60	53
10:10	61	74	63	53
10:15	56	69	56	53
10:20	58	72	59	53
10:25	61	79	63	53
10:30	57	69	58	53
10:35	56	76	57	53
10:40	58	75	59	54
10:45	61	74	64	54
10:50	59	71	62	54
10:55	59	71	61	54
11:00	55	69	56	53
11:05	57	71	57	52
11:10	58	72	60	53
11:15	56	67	57	53

Start Time	$L_{Aeq\ 5mins}$	$L_{Amax,\ 5mins}$	$L_{A10,\ 5mins}$	$L_{A90,\ 5mins}$
11:20	59	73	62	53
11:25	60	79	62	53
11:30	58	74	60	53
11:35	57	77	58	53
11:40	58	70	60	53
11:45	58	72	61	52
11:50	60	73	62	52
11:55	60	77	62	53
12:00	66	89	56	53
12:05	56	71	57	52
12:10	60	75	63	54
12:15	60	75	62	54
12:20	59	74	60	55
12:25	59	75	61	54
12:30	62	91	60	54
12:35	59	73	60	54
12:40	59	71	61	54
12:45	58	71	60	54
12:50	59	71	60	54
12:55	58	71	60	53
13:00	60	73	62	53
13:05	56	68	58	54
13:10	59	71	60	54
13:15	64	77	67	56

Appendix 2: Break-in Noise Calculations

69 - 71 New Street, Huddersfield
Break-in Noise Calculations

First floor apartment 1
L_{Aeq} Assessment, daytime

Living/kitchen/dining room (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		66	61	66	60	56	54	62	63	43	39	26
B	Exposed façade, m^2	10.7		10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
C	Volume of receiving room, m^3	53.9											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-12.4	-12.4	-12.4	-12.4	-12.4	-12.4	-12.4	-12.4	-12.4	-12.4
F	Composite SRI			17.8	22.8	27.8	23.9	28.9	38.9	41.9	38.9	43.9	48.9
G	A + B + E - F		27	41.4	41.3	30.0	29.7	23.4	21.2	18.6	1.9	-7.5	-24.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		30	44.4	44.3	33.0	32.7	26.4	24.2	21.6	4.9	-4.5	-21.7
K	Number of ventilators	5											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				38.0	26.7	25.4	27.1	25.9	19.3	-3.4	-17.8	
N	Internal room noise level, vent open		33		45.2	33.9	33.4	29.8	28.1	23.6	5.5	-4.3	
Glazing:	*4mm, 16/20mm, 4mm*												
Ventilator type:	*Titan V75/C50*												

Bedroom 1 (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		66	61	66	60	56	54	62	63	43	39	26
B	Exposed façade, m^2	12.2		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	46.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8
F	Composite SRI			14.2	19.2	24.2	31.2	40.2	51.2	51.2	57.1	63.1	63.1
G	A + B + E - F		24	46.3	46.2	34.8	23.5	13.3	10.1	10.5	-15.1	-25.5	-37.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		27	49.3	49.2	37.8	26.5	16.3	13.1	13.5	-12.1	-22.5	-34.7
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				33.4	22.1	20.8	22.5	21.3	14.7	-8.0	-22.4	
N	Internal room noise level, vent open		29		49.3	38.0	27.6	23.5	22.0	17.2	-6.6	-19.4	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

L_{Aeq} Assessment, night time

Bedroom 1 (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		61	63	67	55	58	58	55	55	52	52	47
B	Exposed façade, m^2	12.2		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	46.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8
F	Composite SRI			14.2	19.2	24.2	31.2	40.2	51.2	51.2	57.1	63.1	63.1
G	A + B + E - F		24	48.0	46.7	29.9	25.9	17.1	2.4	2.4	-6.0	-12.4	-17.1
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		27	51.0	49.7	32.9	28.9	20.1	5.4	5.4	-3.0	-9.4	-14.1
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				33.9	17.2	23.2	26.3	13.6	6.6	1.1	-9.3	
N	Internal room noise level, vent open		29		49.8	33.1	30.0	27.3	14.3	9.1	2.5	-6.3	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

L_{Amax} Assessment, night time

Bedroom 1 (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		76	78	82	73	73	73	68	68	66	66	63
B	Exposed façade, m^2	12.2		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	46.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8
F	Composite SRI			14.2	19.2	24.2	31.2	40.2	51.2	51.2	57.1	63.1	63.1
G	A + B + E - F		39	62.7	62.1	47.3	40.5	31.9	15.8	15.9	8.2	2.3	-1.4
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		42	65.7	65.1	50.3	43.5	34.9	18.8	18.9	11.2	5.3	1.6
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				49.3	34.6	37.8	41.1	27.0	20.1	15.3	5.4	
N	Internal room noise level, vent open		44		65.2	50.5	44.6	42.1	27.7	22.6	16.7	8.4	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

69 - 71 New Street, Huddersfield
Break-in Noise Calculations

First floor apartment 2
L_{Aeq} Assessment, daytime

Living/kitchen/dining room (Western elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	21.5		13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3
C	Volume of receiving room, m^3	73.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8	-13.8
F	Composite SRI			18.5	23.5	28.6	30.6	41.6	51.5	50.6	58.4	63.4	68.1
G	A + B + E - F		28	43.9	46.0	39.0	30.8	25.6	9.9	2.5	-10.3	-25.7	-44.4
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		31	46.9	49.0	42.0	33.8	28.6	12.9	5.5	-7.3	-22.7	-41.4
K	Number of ventilators	5											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				41.7	34.7	28.5	35.3	18.6	8.2	-2.7	-19.1	
N	Internal room noise level, vent open		35		49.7	42.7	34.9	36.1	19.6	10.0	-1.4	-17.5	

Glazing: *Pilkington Optiphon 6mm, 16mm, 8.8mm*
Ventilator type: *Titan V75/C75*

Bedroom 1 (Western elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	14.2		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	33.9											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4
F	Composite SRI			16.9	21.9	26.9	33.9	42.9	53.8	53.9	59.7	65.6	65.6
G	A + B + E - F		30	47.1	49.2	42.1	29.0	25.8	9.2	0.7	-10.0	-26.3	-40.4
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		33	50.1	52.2	45.1	32.0	28.8	12.2	3.7	-7.0	-23.3	-37.4
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				39.5	32.5	26.3	33.1	16.4	6.0	-4.9	-21.3	
N	Internal room noise level, vent open		35		52.4	45.4	33.0	34.5	17.8	8.0	-2.8	-19.2	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C75*

L_{Aeq} Assessment, night time

Bedroom 1 (Western elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		62	62	66	59	61	58	55	54	51	51	47
B	Exposed façade, m^2	14.2		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	33.9											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4
F	Composite SRI			16.2	21.2	26.3	33.3	42.3	53.2	53.2	59.0	65.0	65.0
G	A + B + E - F		25	46.7	46.1	33.4	28.9	17.2	2.8	2.1	-6.9	-13.0	-16.5
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		28	49.7	49.1	36.4	31.9	20.2	5.8	5.1	-3.9	-10.0	-13.5
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				35.8	23.1	25.6	23.9	9.4	6.7	-2.4	-8.6	
N	Internal room noise level, vent open		29		49.3	36.6	32.8	25.4	11.0	9.0	-0.1	-6.2	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C75*

L_{Amax} Assessment, night time

Bedroom 1 (Western elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		75	77	81	72	74	73	69	67	65	65	63
B	Exposed façade, m^2	14.2		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	33.9											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4
F	Composite SRI			16.2	21.2	26.3	33.3	42.3	53.2	53.2	59.0	65.0	65.0
G	A + B + E - F		39	62.0	61.0	46.8	41.5	31.5	16.6	15.3	7.2	1.4	-0.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		42	65.0	64.0	49.8	44.5	34.5	19.6	18.3	10.2	4.4	2.3
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				50.7	36.5	38.2	38.2	23.2	19.9	11.7	5.8	
N	Internal room noise level, vent open		43		64.2	50.0	45.4	39.7	24.8	22.2	14.0	8.2	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C75*

69 - 71 New Street, Huddersfield
Break-in Noise Calculations

Second floor apartment 3
L_{Aeq} Assessment, daytime

Living/kitchen/dining room (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		66	61	66	60	56	54	62	63	43	39	26
B	Exposed façade, m^2	10.3		10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
C	Volume of receiving room, m^3	51.7											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-12.3	-12.3	-12.3	-12.3	-12.3	-12.3	-12.3	-12.3	-12.3	-12.3
F	Composite SRI			15.3	20.3	25.3	32.3	41.3	52.2	52.3	58.2	64.1	64.1
G	A + B + E - F		22	44.0	43.9	32.5	21.2	11.0	7.8	8.2	-17.4	-27.7	-39.9
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		25	47.0	46.9	35.5	24.2	14.0	10.8	11.2	-14.4	-24.7	-36.9
K	Number of ventilators	5											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				38.2	26.9	25.6	27.3	26.1	19.5	-3.2	-17.6	
N	Internal room noise level, vent open		31		47.4	36.1	28.0	27.5	26.2	20.1	-2.9	-16.9	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

Bedroom 1 (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		66	61	66	60	56	54	62	63	43	39	26
B	Exposed façade, m^2	11.8		10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
C	Volume of receiving room, m^3	44.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6
F	Composite SRI			15.9	20.9	25.9	32.9	41.9	52.8	52.9	58.7	64.6	64.6
G	A + B + E - F		22	44.6	44.5	33.2	21.9	11.6	8.5	8.8	-16.7	-27.0	-39.2
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		25	47.6	47.5	36.2	24.9	14.6	11.5	11.8	-13.7	-24.0	-36.2
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				33.6	22.3	21.0	22.7	21.5	14.9	-7.8	-22.2	
N	Internal room noise level, vent open		28		47.7	36.4	26.4	23.3	21.9	16.6	-6.8	-20.0	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

L_{Aeq} Assessment, night time

Bedroom 1 (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		61	63	67	55	58	58	55	55	52	52	47
B	Exposed façade, m^2	11.8		10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
C	Volume of receiving room, m^3	44.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6
F	Composite SRI			15.9	20.9	25.9	32.9	41.9	52.8	52.9	58.7	64.6	64.6
G	A + B + E - F		22	46.3	45.0	28.3	24.3	15.4	0.8	0.7	-7.6	-13.9	-18.6
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		25	49.3	48.0	31.3	27.3	18.4	3.8	3.7	-4.6	-10.9	-15.6
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				34.1	17.4	23.4	26.5	13.8	6.8	1.3	-9.1	
N	Internal room noise level, vent open		28		48.2	31.5	28.8	27.1	14.2	8.5	2.3	-6.9	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

L_{Amax} Assessment, night time

Bedroom 1 (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		76	78	82	73	73	73	68	68	66	66	63
B	Exposed façade, m^2	11.8		10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
C	Volume of receiving room, m^3	44.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V))			-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6	-11.6
F	Composite SRI			15.9	20.9	25.9	32.9	41.9	52.8	52.9	58.7	64.6	64.6
G	A + B + E - F		37	61.0	60.4	45.7	38.9	30.2	14.2	14.2	6.6	0.8	-2.9
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		40	64.0	63.4	48.7	41.9	33.2	17.2	17.2	9.6	3.8	0.1
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				49.5	34.8	38.0	41.3	27.2	20.3	15.5	5.6	
N	Internal room noise level, vent open		43		63.6	48.9	43.4	41.9	27.6	22.0	16.5	7.8	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

69 - 71 New Street, Huddersfield
Break-in Noise Calculations

Second floor apartment 4
L_{Aeq} Assessment, daytime

Living/kitchen/dining room (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	20.8		13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
C	Volume of receiving room, m^3	70.9											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6
F	Composite SRI			21.6	26.6	31.7	34.7	45.7	48.7	53.7	61.4	66.4	66.4
G	A + B + E - F		25	40.8	42.9	35.9	26.6	21.5	12.7	-0.6	-13.3	-28.6	-42.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		28	43.8	45.9	38.9	29.6	24.5	15.7	2.4	-10.3	-25.6	-39.7
K	Number of ventilators	5											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				41.8	34.8	28.6	35.4	18.7	8.3	-2.6	-19.0	
N	Internal room noise level, vent open		34		47.4	40.3	32.2	35.7	20.5	9.3	-1.9	-18.1	
Glazing:	*Pilkington Optiphon 10mm, 16mm, 8.8mm*												
Ventilator type:	*Titan V75/C75*												

Bedroom 1 (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	13.7		11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
C	Volume of receiving room, m^3	32.7											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3
F	Composite SRI			16.8	21.8	26.8	33.8	42.8	53.6	53.7	59.5	65.4	65.4
G	A + B + E - F		30	47.2	49.3	42.3	29.1	25.9	9.3	0.9	-9.8	-26.1	-40.2
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		33	50.2	52.3	45.3	32.1	28.9	12.3	3.9	-6.8	-23.1	-37.2
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				39.6	32.6	26.4	33.2	16.5	6.1	-4.8	-21.2	
N	Internal room noise level, vent open		35		52.6	45.5	33.2	34.6	17.9	8.2	-2.7	-19.0	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C75*												

L_{Aeq} Assessment, night time

Bedroom 1 (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		62	62	66	59	61	58	55	54	51	51	47
B	Exposed façade, m^2	13.7		11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
C	Volume of receiving room, m^3	32.7											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3
F	Composite SRI			16.8	21.8	26.8	33.8	42.8	53.6	53.7	59.5	65.4	65.4
G	A + B + E - F		24	46.2	45.6	32.9	28.4	16.7	2.3	1.6	-7.3	-13.4	-16.9
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		27	49.2	48.6	35.9	31.4	19.7	5.3	4.6	-4.3	-10.4	-13.9
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				35.9	23.2	25.7	24.0	9.5	6.8	-2.3	-8.5	
N	Internal room noise level, vent open		29		48.9	36.1	32.5	25.4	10.9	8.9	-0.2	-6.3	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C75*												

L_{Amax} Assessment, night time

Bedroom 1 (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		75	77	81	72	74	73	69	67	65	65	63
B	Exposed façade, m^2	13.7		11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
C	Volume of receiving room, m^3	32.7											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3
F	Composite SRI			16.8	21.8	26.8	33.8	42.8	53.6	53.7	59.5	65.4	65.4
G	A + B + E - F		38	61.5	60.5	46.3	41.0	31.0	16.1	14.8	6.8	1.0	-1.1
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		41	64.5	63.5	49.3	44.0	34.0	19.1	17.8	9.8	4.0	1.9
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				32	37	37	36	47	49	55	61	
M	L_{Aeq} - $D_{n,e}$ + 10*log(10) - B				50.8	36.6	38.3	38.3	23.3	20.0	11.8	5.9	
N	Internal room noise level, vent open		42		63.8	49.5	45.1	39.7	24.7	22.1	13.9	8.1	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C75*												

69 - 71 New Street, Huddersfield
Break-in Noise Calculations

Third floor apartment 5
L_{Aeq} Assessment, daytime

Living/kitchen/dining room (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		66	61	66	60	56	54	62	63	43	39	26
B	Exposed façade, m^2	8		9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
C	Volume of receiving room, m^3	63.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2
F	Composite SRI			17.9	22.9	28.0	35.0	43.5	54.8	54.9	60.6	66.5	66.5
G	A + B + E - F		17	39.4	39.3	27.9	16.6	6.8	3.3	3.6	-21.8	-32.1	-44.3
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		20	42.4	42.3	30.9	19.6	9.8	6.3	6.6	-18.8	-29.1	-41.3
K	Number of ventilators	5											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*\log(10) - B$				39.3	28.0	26.7	28.4	27.2	20.6	-2.1	-16.5	
N	Internal room noise level, vent open		31		44.0	32.7	27.4	28.4	27.2	20.7	-2.0	-16.3	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C50*

Bedroom 1 (Southern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	25.1		14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
C	Volume of receiving room, m^3	42.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4
F	Composite SRI			20.2	25.2	30.3	37.3	45.4	57.0	57.2	62.6	68.4	68.4
G	A + B + E - F		28	45.3	47.4	40.3	27.1	24.7	7.5	-1.1	-11.4	-27.7	-41.8
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		31	48.3	50.4	43.3	30.1	27.7	10.5	1.9	-8.4	-24.7	-38.8
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*\log(10) - B$				34.0	27.0	23.8	32.6	17.9	2.5	-5.4	-25.8	
N	Internal room noise level, vent open		33		50.5	43.4	31.0	33.8	18.6	5.2	-3.6	-22.2	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C50*

Bedroom 2 (Western elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	14		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			34.0	39.0	49.0	55.0	52.0	67.0	70.0	70.0	75.0	75.0
G	A + B + E - F		13	28.2	30.3	18.3	6.1	14.9	-5.8	-17.2	-22.1	-37.5	-51.6
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		16	31.2	33.3	21.3	9.1	17.9	-2.8	-14.2	-19.1	-34.5	-48.6

Glazing: -
Ventilator type: -

Bedroom 2 (Northern elevation)

	* Octave Band Centre Frequency, Hz		dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		67	63	70	68	62	68	62	54	49	38	24
B	Exposed façade, m^2	12.3		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			16.1	21.1	26.1	33.1	41.8	53.0	53.0	58.9	64.8	64.8
G	A + B + E - F		28	45.6	47.7	40.7	27.5	24.5	7.7	-0.8	-11.5	-27.9	-42.0
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		31	48.6	50.7	43.7	30.5	27.5	10.7	2.2	-8.5	-24.9	-39.0
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*\log(10) - B$				37.1	30.1	26.9	35.7	21.0	5.6	-2.3	-22.7	
N	Internal room noise level, vent open		35		50.9	43.8	32.0	36.3	21.4	7.2	-1.4	-20.6	

Glazing: *Pilkington Optiphon 6mm, 16mm, 6.4mm*
Ventilator type: *Titan V75/C50*

	Combined sound level, dB(A)	35

L_{Aeq} Assessment, night time

Bedroom 1 (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{eq}		62	62	66	59	61	58	55	54	51	51	47
B	Exposed façade, m^2	25.1		14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
C	Volume of receiving room, m^3	42.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4
F	Composite SRI			20.2	25.2	30.3	37.3	46.3	57.0	57.2	62.6	68.4	68.4
G	A + B + E - F		22	44.2	43.6	30.9	26.4	14.7	0.5	-0.4	-9.0	-15.0	-18.5
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		25	47.2	46.6	33.9	29.4	17.7	3.5	2.6	-6.0	-12.0	-15.5
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*log(10) - B$				30.3	17.6	23.1	23.4	10.9	3.2	-2.9	-13.1	
N	Internal room noise level, vent open		27		46.7	34.0	30.3	24.4	11.6	5.9	-1.1	-9.5	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

Bedroom 2 (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		62	62	66	59	61	58	55	54	51	51	47
B	Exposed façade, m^2	14		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			35.0	39.8	48.9	55.2	61.9	66.9	70.6	70.2	75.0	75.0
G	A + B + E - F		3	26.2	25.9	9.0	5.3	-4.2	-12.6	-17.1	-19.8	-24.8	-28.3
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		6	29.2	28.9	12.0	8.3	-1.2	-9.6	-14.1	-16.8	-21.8	-25.3
Glazing:	-												
Ventilator type:	-												

Bedroom 2 (Northern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		62	62	66	59	61	58	55	54	51	51	47
B	Exposed façade, m^2	12.3		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			16.1	21.1	26.1	33.1	42.1	53.0	53.0	58.9	64.8	64.8
G	A + B + E - F		23	44.6	44.0	31.3	26.8	15.1	0.7	-0.1	-9.0	-15.2	-18.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		26	47.6	47.0	34.3	29.8	18.1	3.7	2.9	-6.0	-12.2	-15.7
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*log(10) - B$				33.4	20.7	26.2	26.5	14.0	6.3	0.2	-10.0	
N	Internal room noise level, vent open		28		47.2	34.4	31.3	27.1	14.4	7.9	1.1	-7.9	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												
	Combined sound level, dB(A)		28										

L_{Amax} Assessment, night time

Bedroom 1 (Southern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		75	77	81	72	74	73	69	67	65	65	63
B	Exposed façade, m^2	25.1		14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
C	Volume of receiving room, m^3	42.5											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4	-11.4
F	Composite SRI			20.2	25.2	30.3	37.3	46.3	57.0	57.2	62.6	68.4	68.4
G	A + B + E - F		36	59.5	58.5	44.3	39.0	29.0	14.3	12.8	5.1	-0.6	-2.7
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		39	62.5	61.5	47.3	42.0	32.0	17.3	15.8	8.1	2.4	0.3
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*log(10) - B$				45.2	31.0	35.7	37.7	24.7	16.4	11.2	1.3	
N	Internal room noise level, vent open		41		61.6	47.4	42.9	38.7	25.4	19.1	13.0	4.9	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												

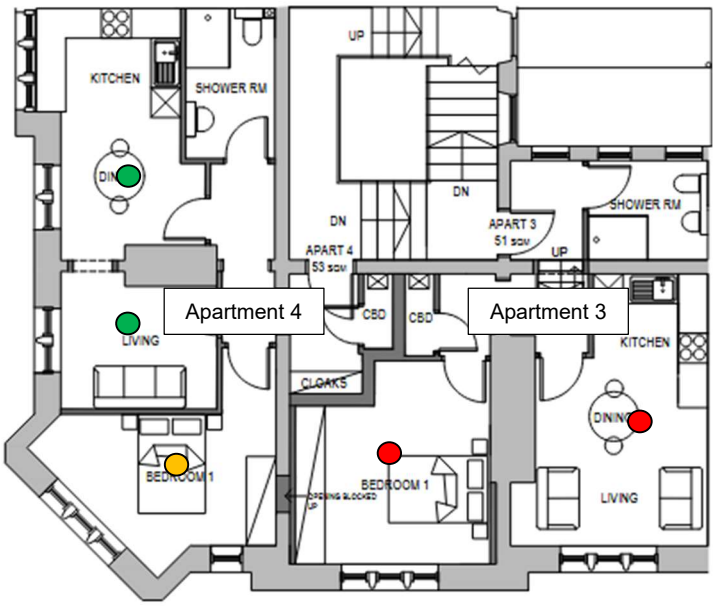
Bedroom 2 (Western elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		75	77	81	72	74	73	69	67	65	65	63
B	Exposed façade, m^2	14		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			35.0	39.8	48.9	55.2	61.9	66.9	70.6	70.2	75.0	75.0
G	A + B + E - F		17	41.5	40.8	22.4	17.9	10.1	1.2	-3.9	-5.7	-10.4	-12.5
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		20	44.5	43.8	25.4	20.9	13.1	4.2	-0.9	-2.7	-7.4	-9.5
Glazing:	-												
Ventilator type:	-												

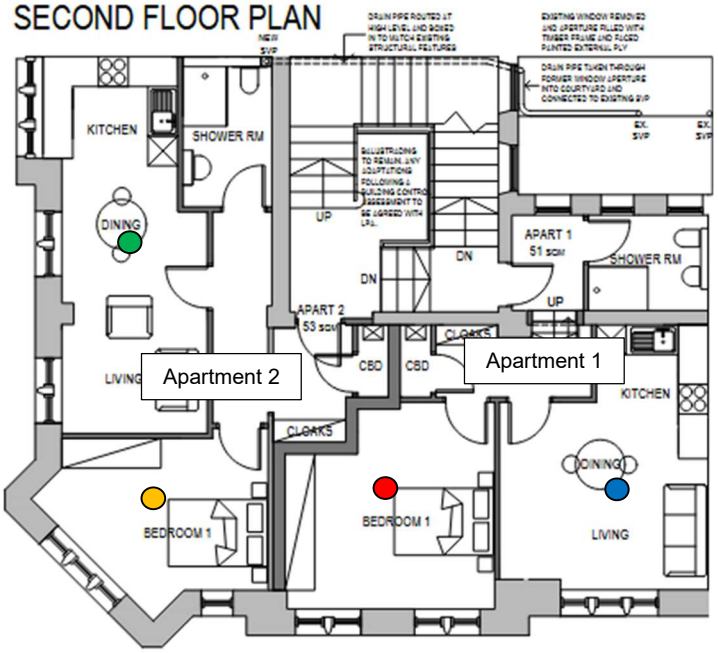
Bedroom 2 (Northern elevation)

* Octave Band Centre Frequency, Hz			dB(A)	31.5*	63*	125*	250*	500*	1k*	2k*	4k*	8k*	16k*
A	Measured L_{max}		75	77	81	72	74	73	69	67	65	65	63
B	Exposed façade, m^2	12.3		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
C	Volume of receiving room, m^3	50.4											
D	Reverb Time, seconds			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
E	10 x Log(RT60/(0.163 x V)			-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2
F	Composite SRI			16.1	21.1	26.1	33.1	42.1	53.0	53.0	58.9	64.8	64.8
G	A + B + E - F		36	59.9	58.9	44.7	39.4	29.4	14.5	13.1	5.1	-0.8	-2.9
H	K = 3			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I													
J	Calculated internal noise level		39	62.9	61.9	47.7	42.4	32.4	17.5	16.1	8.1	2.2	0.1
K	Number of ventilators	2											
L	Ventilator $D_{n,e}$				35	40	37	34	43	50	53	63	
M	$L_{Aeq} - D_{n,e} + 10*\log(10) - B$				48.3	34.1	38.8	40.8	27.8	19.5	14.3	4.4	
N	Internal room noise level, vent open		42		62.1	47.8	43.9	41.4	28.2	21.1	15.2	6.5	
Glazing:	*Pilkington Optiphon 6mm, 16mm, 6.4mm*												
Ventilator type:	*Titan V75/C50*												
	Combined sound level, dB(A)		42										

Appendix 3: Internal layout and location of the proposed glazing and ventilation options

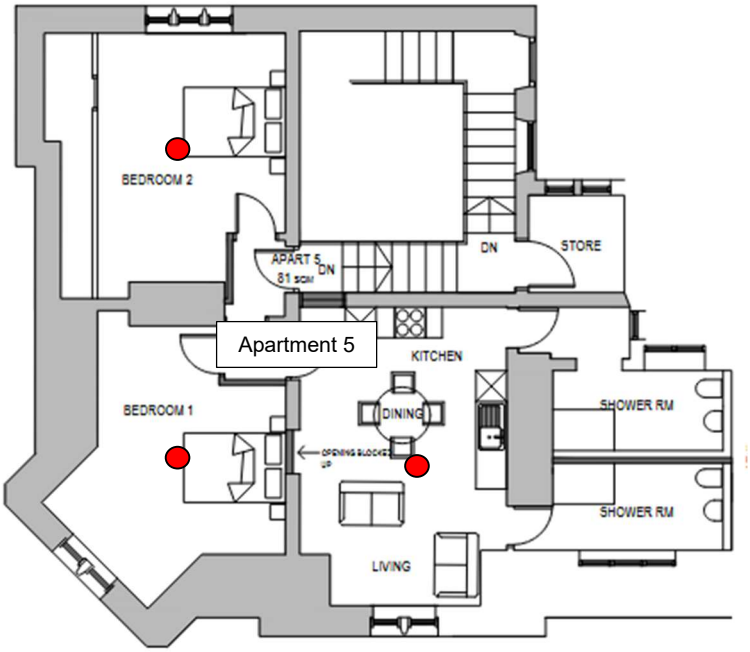


SECOND FLOOR PLAN



FIRST FLOOR PLAN

- 4mm – 12 - 20mm – 4mm sealed unit + Titan V75/C50 ventilator
- 6mm - 16mm – 6.8mm sealed unit + Titan V75/C50 ventilator
- 6mm - 16mm – 8.8mm sealed unit + Titan V75/C75 ventilator
- 6mm - 16mm – 6.8mm sealed unit + Titan V75/C75 ventilator



THIRD FLOOR PLAN

- 4mm – 12 - 20mm – 4mm sealed unit + Titan V75/C50 ventilator
- 6mm - 16mm – 6.8mm sealed unit + Titan V75/C50 ventilator
- 6mm - 16mm – 8.8mm sealed unit + Titan V75/C75 ventilator
- 6mm - 16mm – 6.8mm sealed unit + Titan V75/C75 ventilator

Appendix 4: Reference

L.S. Søndergaard, R. Egeda. “Open windows with better sound insulation”, DELTA Acoustics, Denmark, 2016.