

Abbey Hall, Reading

Planning Noise Assessment

Report 18/0683/R1

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Revision	Description	Date	Prepared	Approved
0	1 st Issue	9 January 2019	James Whiddett	Richard Masey
1	1 st Revision	11 January 2019	James Whiddett	Richard Masey
2	2 nd Revision	28 January 2019	James Whiddett	Richard Masey

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Attachments

Glossary of Acoustic Terms

18/0683/SP1

Site plan showing noise survey measurement positions

18/0683/TH1 to 3

Noise level time histories at positions MP1 to MP3 respectively

18/0683/SPC1

External building fabric acoustic performance requirements specification

18/0683/F1

External building fabric acoustic requirement plan

 End of Section



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1 Introduction

- 1.1 It is proposed to convert the first floor of a former restaurant located at 11-13 King's Road, Reading to residential use. The ground floor is also being refurbished but remaining for commercial use (A3). The second floor is currently residential and remaining as it is. An additional residential third floor may also to be constructed.
- 1.2 Cole Jarman have been appointed to undertake an environmental noise survey on site in order to quantify the existing noise climate around the site. From the results of this survey, an external noise intrusion assessment has been carried out in order to determine the required sound reduction performance of the different façade elements to achieve suitable internal noise levels for the residential elements of the scheme.
- 1.3 Acoustic advice is also required with respect to internal sound insulation between the commercial unit and the residential element above.
- 1.4 This report contains details of a noise survey undertaken at the site and subsequent acoustic design advice in relation to the issues set out above.

2 Site Description

- 2.1 The building to be developed is located at 11-13 King's Road, Reading and comprises a former restaurant at ground floor level, associated kitchens and residential at first floor level and residential at second floor level.
- 2.2 The building is terraced and sits on the corner of King's Road, a busy main road with a frequent bus service and Abbey Square, a quiet side road.
- 2.3 Immediately outside the King's Road façade of the building lies a bus stop, and commercial properties with residential above beyond. Opposite the Abbey Square façade lies Reading Central Library with a church and office buildings beyond.
- 2.4 To the rear of site lies a small courtyard. We have been informed that construction works were occurring during the survey period (daytime only).

3 Guidance

3.1 **Local Authority Comments**

- 3.1 Following an initial submission made for the scheme, the Environmental Health Department at Reading Borough Council (RBC) provided the following response which sets out the requirement for a noise assessment to be undertaken. Key sections from the comment have been emboldened for clarity:



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“Noise impact on development

A noise assessment has not been submitted and ***the proposed development is by: a busy road, a major bus stop, is above an A3 use, and is in the town centre.*** Due to the number of different noise sources, and in particular, potential disturbance from engine noise of idling buses outside which could be difficult to mitigate, I recommend, REFUSAL until such an assessment has been submitted and ***can demonstrate an acceptable living environment for the new occupants.***

The noise assessment will need to ***identify the external noise levels impacting on the proposed site.*** It should also take into account noise from the ground floor A3 use (***noise from customers and staff inside the restaurant and noise from refrigeration equipment and also external mechanical plant such as kitchen extraction***).

The noise assessment will be assessed against the recommendations for internal noise within dwellings and external noise levels within gardens / balconies in accordance with ***BS8233:2014 and WHO guidelines for Community Noise.*** The report should identify any mitigation measures that are necessary to ensure that the recommended standard is met.

Where appropriate, the noise assessment data should also include noise events (L_{Amax}) and the design should aim to prevent noise levels from noise events exceeding 45dB within bedrooms at night.”

- 3.2 Regarding internal noise, the Environmental Health Officer has advised the following. It is noteworthy that this is informative only and the Building Regulations are not required to be met for planning reasons.

“Noise between residential properties

To minimise the disturbance by noise of future residential occupiers of the flats and its effect on neighbouring residents, residential accommodation must be designed and constructed or converted so as to ***achieve the insulation requirements set out in Building Regulations Approved Document E.***”

4 Design Criteria

4.1 Environmental Noise to Proposed Residential Areas

- 4.1.1 As noted in section 3.1, RBC require that both WHO guidance and British Standard 8233:2014 are used to define appropriate design standards for the proposed residents. These are discussed in the following sections.

The World Health Organisation (WHO) Guidelines

- 4.1.2 The Guidelines for Community Noise (World Health Organisation, 1999) included values for community noise in specific environments.



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- 4.1.3 It is important to note that the WHO Guidelines are aspirational, as illustrated by the National Noise Incidence Study (NNIS, 2000), which indicates that 55% of the population of England and Wales are exposed to external noise levels above 55 dB $L_{Aeq, day}$. A National Physical Laboratory (NPL) report (with reference CMAM 16, dated September 1998) reviewing the original 1980 WHO Guidelines and the 1995 draft version of the current Guidelines stated:

"Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached."

"As such, it would be unwise to use the WHO guidelines as targets for any form of strategic assessment, since, given the prevalence of existing noise exposure at higher noise levels, there might be little opportunity for and little real need for any across the board major improvements. On the other hand, the most constructive use for the WHO guidelines will be to set thresholds above which greater attention should be paid to the various possibilities for noise control action when planning new developments. It is important to make clear at this point that exceedances do not necessarily imply an over-riding need for noise control, merely that the relative advantages and disadvantages of noise control action should be weighed in the balance."

- 4.1.4 To prevent moderate annoyance in outdoor living areas, such as gardens and balconies of dwellings, the WHO guideline value is 50 dB $L_{Aeq, 16h}$. This can be described as an upper limit for the average noise level across the daytime and evening period (07:00h to 23:00h). The corresponding guideline value to prevent serious annoyance is stated as 55 dB $L_{Aeq, 16h}$. However, it is again noted that these levels are aspirational in nature, as described in A4.1 above.
- 4.1.5 In terms of the internal noise environment, in order to achieve maximum speech intelligibility and to avoid moderate annoyance, the guideline value for noise levels within dwellings is stated as 35 dB $L_{Aeq, 16h}$ (covering the day and evening 07:00h to 23:00h). The corresponding value for the night period (23:00h to 07:00h) to avoid sleep disturbance is 30 dB $L_{Aeq, 8h}$.
- 4.1.6 Additionally in terms of sleep disturbance, a guideline value of 45 dB L_{Amax} is given. In relation to this value, the Guidelines state:

"When the background noise is low, noise exceeding 45 dB L_{Amax} should be limited, if possible..."

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night..."

British Standard 8233:2014

- 4.1.7 Guideline values for dwellings with respect to internal and external noise levels are included in BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BSi). The recommendations are largely based upon the WHO Guidelines above.



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4.1.8 The standard states 50 dB $L_{Aeq,T}$ as being desirable as a steady state noise level not to be exceeded in gardens and balconies. It also states 55 dB $L_{Aeq,T}$ as an upper guideline value. The time period T is usually taken to be the 16 hour day (07:00h to 23:00h).

4.1.9 Paragraph 7.7.3.2 of the standard goes on to say the following:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

4.1.10 It can be seen that external noise levels, in particular on small balconies to apartment blocks, are not proposed to be a controlling index by which suitability of a residential site is defined.

4.1.11 Therefore, when designing noise sensitive developments that incorporate gardens or other external amenity areas, the intent shall be to provide an area for each property in which the noise levels are consistent with these standards. Where these standards cannot be achieved, then reasonable measures shall be employed to provide screening or other forms of mitigation so as to minimise the noise levels in the external amenity areas.

4.1.12 An important principle here is that sustainable development sites will often be exposed to relatively high levels of environmental noise, and while means are available to insulate internal spaces, they are not always available to protect external spaces. Strict adherence to the enforcement of such external noise criteria would preclude development in the majority of areas considered for development in semi-urban or urban environments or in areas in the vicinity of transportation noise sources. This is why the external standards shall be viewed as targets or triggers of mitigation measures rather than thresholds not to be exceeded in all circumstances.



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- 4.1.13 Buildings can be designed to achieve specific levels of insulation against external noise and it is reasonable, therefore, to set specific internal noise standards. In essence, these require a high quality design that achieves a good standard of amenity.
- 4.1.14 Guidance in respect of indoor ambient noise levels is contained in Table 4 of BS 8233:2014 and tabulated below.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq, 16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16h}$	30 dB $L_{Aeq, 8h}$

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

4.1.0.14.1.1. Table 4 of BS 8233:2014

- 4.1.15 The previous edition of BS 8233 included quantitative guidance with respect to night-time L_{Amax} noise levels in bedrooms. BS 8233:2014 does not provide such guidance, however in paragraph 7.7.5.1.1 it is noted that the recommendations for ambient noise in hotel bedrooms are similar to those for living accommodation and Table H.3 in Annex H.3 gives example night-time L_{Amax} limits in hotel bedrooms of 45-55 dB.
- 4.1.16 The WHO study derived the L_{Amax} night time noise standard on the basis of 10 to 15 occurrences per night.

4.2 Sound Insulation Between Residential and Commercial Spaces

Building Regulations 2010 and Approved Document E

- 4.2.1 This report does not consider internal sound insulation between proposed dwellings as this is not considered a matter for planning. The local authority however, require that the sound insulation between the ground floor commercial use and first floor residential spaces is appropriately considered.
- 4.2.2 In relation to the protection of a property from the transfer of sound to it from another demise that either adjoins, or part of the same building, the Building Regulations 2010 contains the following requirement:

“Protection against sound from other parts of the building and adjoining buildings



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E1. *Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings."*

- 4.2.3 'Approved Document E – Resistance to the Passage of Sound' gives advice as to how this requirement should be achieved. In it, the following is stated:

"0.1 In the Secretary of State's view the normal way of satisfying Requirement E1 will be to build separating walls, separating floors, and stairs that have a separating function, together with the associated flanking construction, in such a way that they achieve the sound insulation values for dwelling - houses and flats set out in Table 1a, and the values for rooms for residential purposes (see definition in Regulation 2) set out in Table 1b. For walls that separate rooms for residential purposes from adjoining dwelling—houses and flats, the performance standards given in Table 1a should be achieved"

Separate performance requirements exist for new build developments and those produced by a material change of use. The proposed dwellings at the Abbey Hall site are formed by a material change of use and therefore the following design criteria apply:

New Build or Conversion	Separating Element	Airborne Sound Insulation dB ($D_{nT,w} + C_{tr}$) Minimum Value	Impact Sound Insulation dB ($L'_{nT,w}$) Maximum Value
Conversion	Separating floor at 1 st Floor	≥ 43	N/A

T1 Performance requirements for commercial to residential separating floors

- 4.2.4 It is noteworthy that although Approved Document E sets out impact sound insulation requirements for separating floors between residential spaces, these criteria are not considered relevant to separating floors where a commercial unit is below a residential area.
- 4.2.5 Whilst the above is considered the baseline for what is acceptable, it is recommended that an enhanced level of sound insulation is implemented to better protect future residents from activity in the commercial unit.
- 4.2.6 It is assumed that the proposed commercial unit (expected to operate as a restaurant) could be open into the evening, on this basis it is suggested that the sound insulation performance of the floor should be such that noise from the unit, when assessed in the residences above, is limited to NR 20 L_{eq} (approximately 30 dB L_{Aeq}).
- 4.2.7 This is based on the BS8233 daytime (0700-2300) internal noise level criterion of 35 dB L_{Aeq} . A design criterion for Abbey Hall is set approximately 5 dB below the acceptable levels set out in BS8233 to take into account character of the noise from the restaurant below.



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- 4.2.8 The use of NR levels means that the frequency content of the noise is also considered, giving control over low frequency content which can sometimes be difficult to attenuate. This is therefore a more robust approach than simply using a more basic dB(A) value.
- 4.2.9 The levels noted above are based upon our experience of similar projects as well as some historic planning conditions proposed by other local authorities.
- 4.2.10 It is noteworthy that achieving the proposed design criteria above will also meet/exceed the requirements of the Building Regulations Approved Document E.

4.3 Mechanical Services Plant

- 4.3.1 The site falls within the jurisdiction of Reading Borough Council. Following review of the Reading Borough Local Development Framework we have considered policy 'CS34: *Pollution and Water Resources*' when setting plant noise emission limits.
- 4.3.2 The relevant sections of Policy CS34 state the following:

*Development will only be permitted where it would not be damaging to the environment through air, land, **noise** or light pollution.*

It continues...

*Proposals for development that are sensitive to the effects of air, **noise** or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution.*

- 4.1 The likelihood of an adverse noise impact from fixed items of plant at any neighbouring residential buildings can be assessed based on guidance contained in BS4142:2014.
- 4.2 According to this standard, the rating level of the noise from the item of plant is determined and compared to the existing measured L_{A90} background noise level for that period. It states:

"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact."

- 4.3 It also notes that:

"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context."

"A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context."

"Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."



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- 4.3.3 Based on the guidance above, it is recommended that plant noise limits be established at a rating level 10dB below the representative background noise level at nearby noise sensitive receptors.

4.4 Summary of Design Criteria

- 4.4.1 Based on the various commentary above, the following design criteria

- Daytime internal noise levels to all habitable rooms no greater than 35 dB $L_{Aeq,16h}$.
- Night time internal noise levels to all bedrooms no greater than 30 dB of $L_{Aeq,8h}$ and with noise events ideally not exceeding 45dB $L_{Amax,f}$ more that 10-15 times per night.
- **Aspirational** daytime noise levels $L_{Aeq,16h}$ in outdoor amenity areas (such a balconies and roof gardens) ideally no greater than 55 dB with noise levels above acceptable providing they are mitigated as far as is reasonably practicable.
- Noise from the proposed ground floor commercial unit limited to no more that NR20 L_{eq} when assessed in the first floor dwellings. Achieving this criterion will ensure the requirements of the Building Regulations are also met.
- Plant noise limits established at a rating level 10dB the representative background noise level at nearby noise sensitive receptors.

5 Environmental Noise Survey

5.1 Methodology

- 5.1.1 An external noise survey was undertaken at the site between 1530 hours on 19th December and 1545 hours on 20th December 2018.
- 5.1.2 Unattended noise measurements were made at three façade incident positions at first floor level as illustrated in attached site plan 18/0683/SP1 and described below:
- MP1 – 1m from the façade facing onto King’s Road. Representative of typical noise levels along King’s Road and the bus stop.
 - MP2 – 1m from the façade facing onto Abbey Square. Representative of typical noise levels along this side road.
 - MP3 – 1m from the façade facing the rear courtyard. Representative of typical noise levels to the rear of the building.
- 5.1.3 All measurement positions were mounted external to the building façade. The measurements were not therefore affected by the performance of the existing façade.



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- 5.1.4 Measurements of the L_{Aeq} , L_{Amax} and L_{A90} indices were recorded using the equipment listed within table T2 below:

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251
Weatherproof windshield	Norsonic	1212
Sound Level Analyser (x2)	Rion	NL-52
Acoustic Calibrator (x2)	Rion	NC-74
Weatherproof windshield (x2)	Rion	WS-15

T2 Equipment used during noise survey.

- 5.1.5 The microphones were fitted with windshields, and the sound level meters calibrated before and after the survey in order to confirm an acceptable level of accuracy. No significant drift was noted to have occurred.
- 5.1.6 The weather conditions when setting up and collecting the survey equipment were still, clear skies and mild. Historical weather data suggests that these conditions remained constant throughout the survey period with the exception of a brief period of very light rain on 20th December. These conditions are deemed acceptable and are considered not to have affected the measurement results.
- 5.1.7 The noise climate to the front of the site was dominated by traffic noise from King's Road. This noise source also controlled the noise climate at the side of the site along Abbey Square. Within the rear courtyard, the road traffic noise from King's Road was quieter but still audible alongside nearby mechanical services plant and a period of construction noise. At measurement position MP1, regular bus activity was noted to have a significant effect on the measured noise levels.

5.2 Results

- 5.2.1 The results of the measurements undertaken at each of the positions can be found in the attached time histories 18/0683/TH1 to 3, with representative typical noise levels tabulated in table T3 below:



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Measurement Position	Measured Noise Level, dB		
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	Night Time L_{Amax} , (typical)
MP1	69	64	83
MP2	63	57	76
MP3	59 ¹ (50 ²)	46	65

T3 Schedule of results from measurements at MP1

- 5.2.2 The L_{Amax} noise levels measured at position MP1 are specifically linked to bus activity at the bus stop, immediately outside the proposed development site on King's Road. This was confirmed by reviewing audio recordings made at this position. At the other positions, the L_{Amax} noise levels are controlled by more general road traffic.
- 5.2.3 Typical L_{Amax} noise levels have been determined by considering the 9-10th highest noise levels, based on 1-minute noise data for the whole night time period. This approach is made with respect to WHO guidance and the aim that L_{Amax} noise levels should ideally not exceed 45dB L_{Amax} more that 10-15 times during the night time.
- 5.2.4 Whilst the above noise levels are presented as single figures for brevity, the assessment of noise from the sources around the site was undertaken in octave bands (as reflected in mitigation specification 18/0683/SPC1 attached at the end of this report). Undertaking the assessment in terms of octave band noise data takes into account the character of the measured noise, i.e. it ensures that lower frequency contributions from idling buses, is appropriately taken into account.
- 5.2.5 The representative background noise levels for MP1, MP2 and MP3 across both day and night time periods can be found in table T4 below:

Measurement Position	Representative Background Noise Levels L_{A90} (dB)	
	Day Time (0700-2300)	Night Time (2300-0700)
MP1	55	45
MP2	52	42
MP3	46	41

T4 Schedule of representative background noise levels at MP1, MP2 and MP3

¹ Artificially increased by periods of construction noise

² Used for the purposes of calculation, omitting known construction activity.



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6 Plant Noise Limits

- 6.1 Plant noise limits derived for both the day time and night time periods, according to the principles outlined in section 4.3, are stated in table T5 below. These criteria apply at 1m from any nearby noise sensitive window, after applying any corrections deemed necessary to account for the character of noise from the proposed plant items relative to the existing noise climate, as described in BS4142:2014 (i.e. the limits are in terms of rating levels). It is noteworthy that if plant equipment is installed to serve the proposed commercial unit, the limits would apply at the windows of propose/existing dwellings within Abbey Hall.

Location	Noise Emission Limit, L_{A,T_r} dB	
	Day Time (0700-2300)	Night Time (2300-0700)
Noise sensitive windows along/near to King's Road façade	45	35
Noise sensitive windows along/near to Abbey Square façade	42	32
Noise sensitive windows along/near to rear courtyard façade	36	31

T5 Plant noise emission limits at the nearest noise sensitive properties

- 6.2 It is important to note that at time of writing, no proposal for mechanical services plant items have been made (either for the residential or commercial elements of the scheme). It is expected, however that the commercial unit will require some form of plant to be installed. The above plant noise limits should be utilised when at such a time when the assessment of noise from plant is necessary.

7 Noise Break-In

7.1 Noise Intrusion Assessment

Internal Noise Levels

- 7.1.1 In order to adequately control noise ingress to habitable rooms and bedrooms throughout the development it will be necessary for the various elements of the external building fabric to provide certain minimum levels of sound insulation performance.
- 7.1.2 An assessment of noise intrusion has been carried out based on calculations using the measured levels on site, and floor plans and elevations within the *Submission for pre-application advice* document provided to *Cole Jarman* by *Levitate*. As previously noted,



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calculations have been undertaken in octave bands to taken into account the spectral content of the prevailing noise.

- 7.1.3 It is understood that the existing façade is to be retained along the King's Road and a part of the Abbey Square, between ground to second floor levels. These façades are understood to comprise solid 215mm thick brickwork. This same construction is also understood to have been used to the rear of the building. These construction types have been taken into account with the assessment calculations.
- 7.1.4 There an option to construction a third floor extension to the building which would be built into a mansard style roof. When considering potential noise intrusion into these proposed spaces, noise break in through a lightweight clad roof structure has been considered.
- 7.1.5 If the proposed third floor extension is implemented, the existing lightweight metal cladding forming part of the façade of Abbey Square will be replaced with a mixture of brick slip clad Metsec frame and blockwork elements.
- 7.1.6 If the third floor development does not go ahead, it has been advised that the lightweight cladded façade elements will remain as existing externally.
- 7.1.7 It is noteworthy that the floor plans provide only potential indicative layouts of the development. Calculations have therefore been based upon the following room dimensions as presented in table T6 below. These dimensions should not be taken as constraints in terms of the design of the proposed dwellings. However, should the final floor and glazing areas differ significantly to these, then revisions to the calculations would be necessary.

Dimension			
Room	Floor area (m ²)	Height (mm)	Glazing area (m ²)
Bedroom	12	2500	2.6
Living Room	16	2500	5.2

T6 Assumed typical room dimensions

- 7.1.8 Acoustic performance requirements for the façade construction, glazing and ventilation openings have been derived to ensure the proposed internal criteria are achieved in all instances. The attached specification 18/0683/SPC1 sets out the requirements. The specification should be read in conjunction with attached figure 18/0683/F1 which shows the locations where each type is required.
- 7.1.9 Taking into account the specified acoustic performances for façade construction, glazing and ventilation, the proposed internal noise criteria are assessed to be achieved. It is of note that



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the overall façade mitigation specifications for the Kings Road and Abbey Square facades were controlled by the measured typical octave L_{Amax} noise levels. On the Kings Road, these noise levels were attributed to bus activity and therefore noise from this source has been appropriately controlled.

- 7.1.10 As a more generally recommendation; potentially moveable elements such a glazing and closable ventilation openings should be carefully fitted to ensure they do not rattle when exposed to higher levels on noise, particularly on the Kings Road façade.

External Noise Levels

- 7.1.11 External noise propagation has been measured as part of the noise survey.
- 7.1.12 In the proposed roof terraces along the corner of the King's Road and Abbey Square façades and the one located towards the rear of the building along the Abbey Square façade, due to proximity to King's Road and the nearby bus stop, noise levels are calculated to be above the recommended 55 dB $L_{Aeq,T}$ in BS8233.
- 7.1.13 Guidance in BS8233:2014 however, suggests that *"it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable"*. The standard goes on to suggest that in the case of roof terraces *"in residential buildings where normal external amenity space might be limited or not available, specification of noise limits is not necessarily appropriate."*
- 7.1.14 The Department for Communities and Local Government 'National Planning Practice Guidance' (PPG) also states the following with regard to mitigating the impact of noise on residential developments:
- "The noise impact may be partially off-set if the residents of those dwellings have access to:...*
- ...a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*
- 7.1.15 The Forbury Gardens lies approximately 175 metres to the north of the site (i.e. around a 3 to 5 minute walk) which would provide such an external publically accessible space. Therefore, the fact that noise levels in the communal amenity areas are in excess of the proposed aspirational design criteria is offset by the presence of an alternate external amenity space nearby.
- 7.1.16 With regards to the proposed roof terrace along the rear courtyard façade, noise levels are calculated to be well below the design target of 55 dB $L_{Aeq,T}$.
- 7.1.17 As a general recommendation, it is advised that the parapet walls surrounding the proposed roof terraces are of an imperforate construction with a mass no less that 10kg/m². A brick wall would meet such a requirement.



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7.2 Summary

- 7.2.1 With the proposed mitigation measures in place, as set out in attached specification 18/0683/SPC1, the proposed design criteria for the control of noise break in to internal area are expected to be met.
- 7.2.2 Noise to external areas has been discussed in relation to the guidance set out within BS8233. General recommendations have been made with regard to providing noise levels on the roof terraces which has been reduced where practicable. Whilst noise levels on the terraces facing on to Kings Road and Abbey Square may exceed the proposed aspirational design criteria, a nearby external amenity space has been identified. It is noteworthy that the proposed design criteria for external amenity spaces are aspirational only.

8 Internal Sound Insulation

8.1 Overview

- 8.1.1 The building is understood to have two floor construction types separating ground and first floor levels. The descriptions of these are as below, with the areas of each identified on the plan which follows:

Blue Area

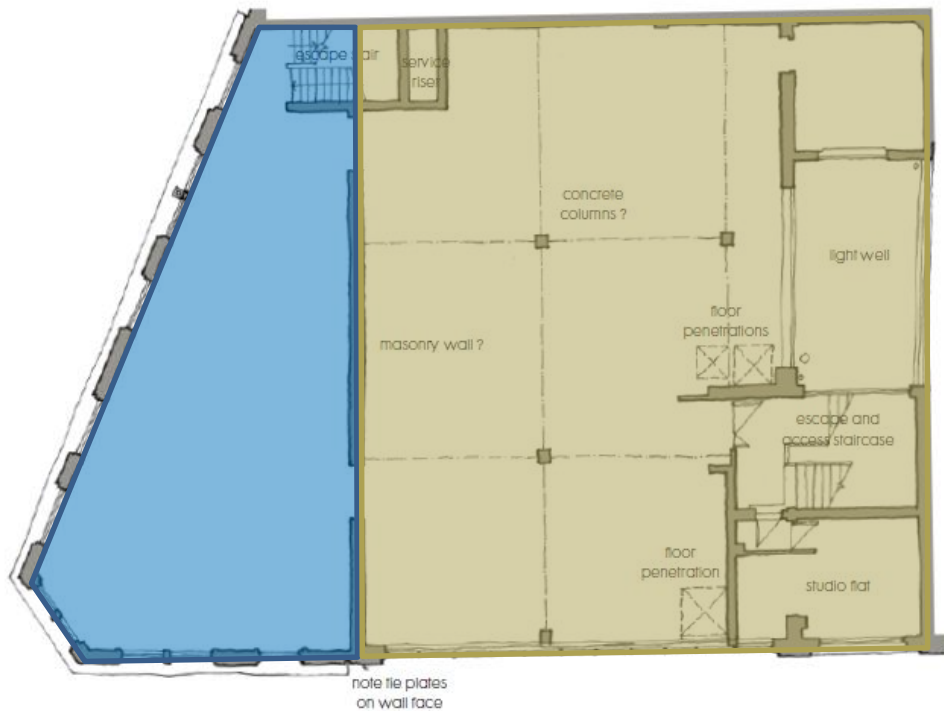
Timber floor on 460mm deep timber joists, plasterboard below (required to be made good)

Gold Area

Pre cast 200mm concrete slab



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First Floor Constructions

- 8.1.2 It was not possible to directly test the existing performance of either floor construction due to significant penetrations and holes throughout. Therefore, the guidance with respect to the required enhancement for this floor are provided based on the limited information available. Cole Jarman should be advised if any of the assumptions made with regard to the existing floor constructions (i.e. thicknesses, masses) are known to be incorrect so the design guidance can be updated accordingly.

8.2 Noise Data

- 8.2.1 As the expected noise units within the commercial unit (expected to be a restaurant) are currently unknown, pessimistic noise level data for a busy restaurant with speech and background music, drawn from Cole Jarman's library of previously measured noise data, has been used. This data is tabulated within table T7 below:



Planning Noise Assessment

Environment	Noise Index	Sound Pressure Level, dB at								dB(A)
		63	125	250	500	1k	2k	4k	8k	
Busy restaurant with speech and background music	L_{eq}	64	71	73	78	76	74	70	67	81
Kitchen	L_{eq}	68	71	72	73	70	69	68	64	76
Kitchen	L_{max}	67	74	84	89	87	89	86	79	94

T7 Cole Jarman restaurant noise level library data

- 8.2.2 The figures above are considered suitably representative of possible noise levels to be experienced within the proposed development. Design guidance has been provided on the basis of control the above noise levels. Cole Jarman should be advised if noisier activity is expected within the commercial unit.

8.3 Floors/Ceiling

- 8.3.1 In order to meet the proposed limits for noise breakout from the commercial unit to the residential dwellings above, it will be necessary to implement enhancements to the existing first floor ceiling/floor.
- 8.3.2 It is noteworthy that the guidance below is provided on the basis that all penetrations, gaps and holes in the existing floor construction would be appropriately stopped and sealed. Any penetrations required for services, light fittings etc. must be carefully detailed, with all details being reviewed by an acoustic consultant before implementation
- 8.3.3 It is also noteworthy that as well as providing a sound insulating function, the floors and ceilings should also be taken into account when considering flanking sound transmission around party walls proposed between flats. This design guidance falls beyond the scope of this assessment.

Concrete Floor Section

- 8.3.4 The following advice and proposed build-up is based on the assumption that the 200mm existing concrete slab is of a minimum mass of 2300kg/m². Cole Jarman should be advised if this assumption is incorrect so the design guidance be revised accordingly.
- 8.3.5 Where concrete floors exist within the development, these should be made good and all penetrations stopped, as previously noted. Any missing sections of slab must be filled with a build-up of equal mass to the rest of the slab.
- 8.3.6 A ceiling comprising the following should be installed beneath the existing first floor concrete slab:



Planning Noise Assessment

- 2 x layers of high density plasterboard (minimum individual board mass of 10.6 kg/m^2 (e.g. 12.5mm British Gypsum SoundBloc) installed below a British Gypsum Casoline MF grid ceiling or equivalent (no acoustic hangers) leaving a minimum 240mm void with 100mm Isover Acoustic Partition Roll (APR1200) in cavity.

8.3.7 Any secondary ceiling such as a lay-in grid which many retailers like as part of their fit outs should be installed below the sound insulating ceiling described above. No services should be installed above the sound insulating ceiling.

8.3.8 Careful co-ordination of the two ceilings should be considered so that the installation of the secondary ceiling does not compromise the integrity of the primary sound insulating ceiling. It is sometimes more convenient to have the tenant install the plasterboard ceiling while they are conducting their own fit out (assuming that the shell does not need to be handed over with it installed first).

Timber Floor Section

8.3.9 Where timber floors exist within the development, the following build up should be implemented:

- 18mm tongue and groove wood board flooring, spot-bonded with Gyproc Sealant at 300mm centres to a substrate of Gyproc Plank laid on 25mm Isover Sound Deadening Floor Slab, laid on a minimum of 12mm wood-based sheet sub-deck nailed to the joists (the existing floor boarding should be removed). 100mm Isover Acoustic Partition Roll (APR 1200) should be laid between the joists.
- Ceiling below should comprise 1x layer 19mm Gyproc Plank fixed to underside of joists, with a further layer of 12.5mm standard plasterboard (minimum individual board mass of 8 kg/m^2 e.g. 12.5mm British Wallboard). Boards should be staggered with all joints taped.
- If it is desired to use high density plasterboard to help with material consistency throughout the scheme, that would be acceptable.

8.3.10 Comparable alternatives to the above construction may be acceptable but any deviations should be checked by *Cole Jarman* prior to implementation.

8.3.11 The ceiling build-up proposed above may lead to a step in ceiling height due to the differing thicknesses of the above build-up and that proposed for the concrete floor sections. It is noteworthy that if this is not desirable, the suspended MF grid plasterboard ceiling, proposed in section 8.3.6 above, can be continued across the whole ground floor (in place of the proposed ceiling under the timber floor) in order to obtain an even ceiling height across the commercial unit. If this option is preferred, the required build up to the top of the timber sections of the floor would remain as proposed above.



Planning Noise Assessment

9 Ground Floor Commercial Unit

9.1 General Activity

- 9.1.1 We understand that the ground floor retail unit is likely to be occupied by a restaurant. These are not normally retail spaces which would generate high internal noise levels, but can potentially have background music playing. Because of this it may be necessary to include a tenant's clause stating maximum internal noise levels, so as to protect the amenity of the residential occupiers above.
- 9.1.2 Maximum limits are therefore provided for general activity noise, including ambient amplified music, so as not to create annoyance to neighbouring units and the residents above. The noise limits within the commercial premises which should be included as part of any tenant clauses are as follows:
- L_{Aeq} 75dBA (with not more than 70dB in the octave frequency bands 63Hz and 125Hz.
 - L_{Amax} 85dBA (with not more than 80dB in the octave frequency bands 63Hz and 125Hz.
- 9.1.3 Where tenants wish to create noise levels in excess of the above it will be the responsibility of the tenant to enhance the acoustic separation through their fit-out process and demonstrate the enhancement that has been achieved before a new limit can be allowed. Words to this effect should also be included in the tenant's leasing documentation.
- 9.1.4 Noise break out from the ground floor commercial unit through the façade should be appropriately controlled by the tenants, where deemed necessary i.e. a high noise generating activity is expected within. Noise intrusion into the commercial unit is not considered relevant for planning purposes.

9.2 Loudspeakers & Services

- 9.2.1 For all commercial spaces, any services installed from the slab will need to be installed with resilient hangers. Vibration transfer from any other plant installed internally should also be considered. As previously noted, no plant should be installed above the primary sound insulating ceiling in the retail unit.
- 9.2.2 In addition, we would also recommend that the following clauses be adopted within the tenant's agreements to prevent future disturbance from audio and plant equipment installed within the commercial parts of the building:

Loudspeakers shall not be rigidly connected to the building structure in any way, and shall incorporate suitable resilient mountings to prevent the transmission of any significant level of noise to the building structure, to the satisfaction of the landlord.

Any mechanical services plant to be installed internally shall be designed such that it does not exceed a noise level of NR25 when measured within any room of any of the flats on any of the upper floors of the development, with windows closed.



Planning Noise Assessment

Structure-borne vibration from the tenant's plant must not exceed the following vibration dose value (VDV), when measured in any habitable room of the residential flats forming part of the development itself in accordance with BS6472-1:2008:

Daytime 16 hour day 0700-2300: $0.2m.s^{-1.75}$

Night time 8 hour night 2300-0700: $0.1m.s^{-1.75}$

- 9.2.3 To achieve the latter clause, typically the careful selection of plant by the tenant so as to control noise generation by the plant within the ground floor demise is required. The use of suitable resilient isolation mountings would also typically be required to control the transfer of noise direct into the structure which could then travel throughout the building and affect the flats above.

9.3 Structure borne Noise

- 9.3.1 The restaurant has the potential to cause disturbance to residential flats above through structure borne noise transfer. In order to address this the tenant must be required to take reasonable measures to address this in their fit out, and we would suggest the following lease clause:

The tenant shall take measures to ensure that noise from impacts on any part of the building structure in the commercial unit floor and any other back of house area does not generate noise so as to be a reasonable source of complaint to occupants of the residential flats above. Which treatment will be desirable will depend upon particular operator's fitting out designs. Possible treatments could include:

- a. *Well used doors fitted with slow closing door closers and neoprene buffers (to reduce door closure noise).*
- b. *Tables and chairs fitted with neoprene glides.*
- c. *Rubber/plastic mats put on surfaces used to drop items onto regularly (including where dirty dishes may be left etc.)*
- d. *Preparation surfaces used for chopping etc., not fixed to walls, and possibly mounted on neoprene pads.*
- e. *Walls that may be impacted by trolleys fitted with resilient impact protection e.g. rubber mats.*
- f. *Floors that may be expected to regularly have items dropped on these be provided with rubber/plastic mats or else be constructed as floating floors.*



Planning Noise Assessment

10 Conclusions

- 10.1 It is proposed to convert the first floor of a former restaurant located at 11-13 King's Road, Reading to residential use. The ground floor is also being refurbished but remaining for commercial use. The second floor is currently residential and remaining as it is. An additional residential third floor is proposed to be constructed.
- 10.2 A noise survey has been undertaken to determine the prevailing noise climate at the site. This data has subsequently been used to determine the required façade mitigation measures to adequately control noise ingress.
- 10.3 Appropriate constructions have been identified for the separating floor between the ground floor commercial unit and first floor residential dwellings to ensure noise transfer is adequately controlled.
- 10.4 Plant noise limits have been established based upon the results of the noise survey undertaken at the site, the requirements of the local authority and taking guidance from BS4142:2014 as appropriate.

 End of Section



Planning Noise Assessment

Glossary of Acoustic Terms

L_{Aeq} :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq} .

L_{Amax} :

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the “fast” sound level meter response.

L_{A10} & L_{A90} :

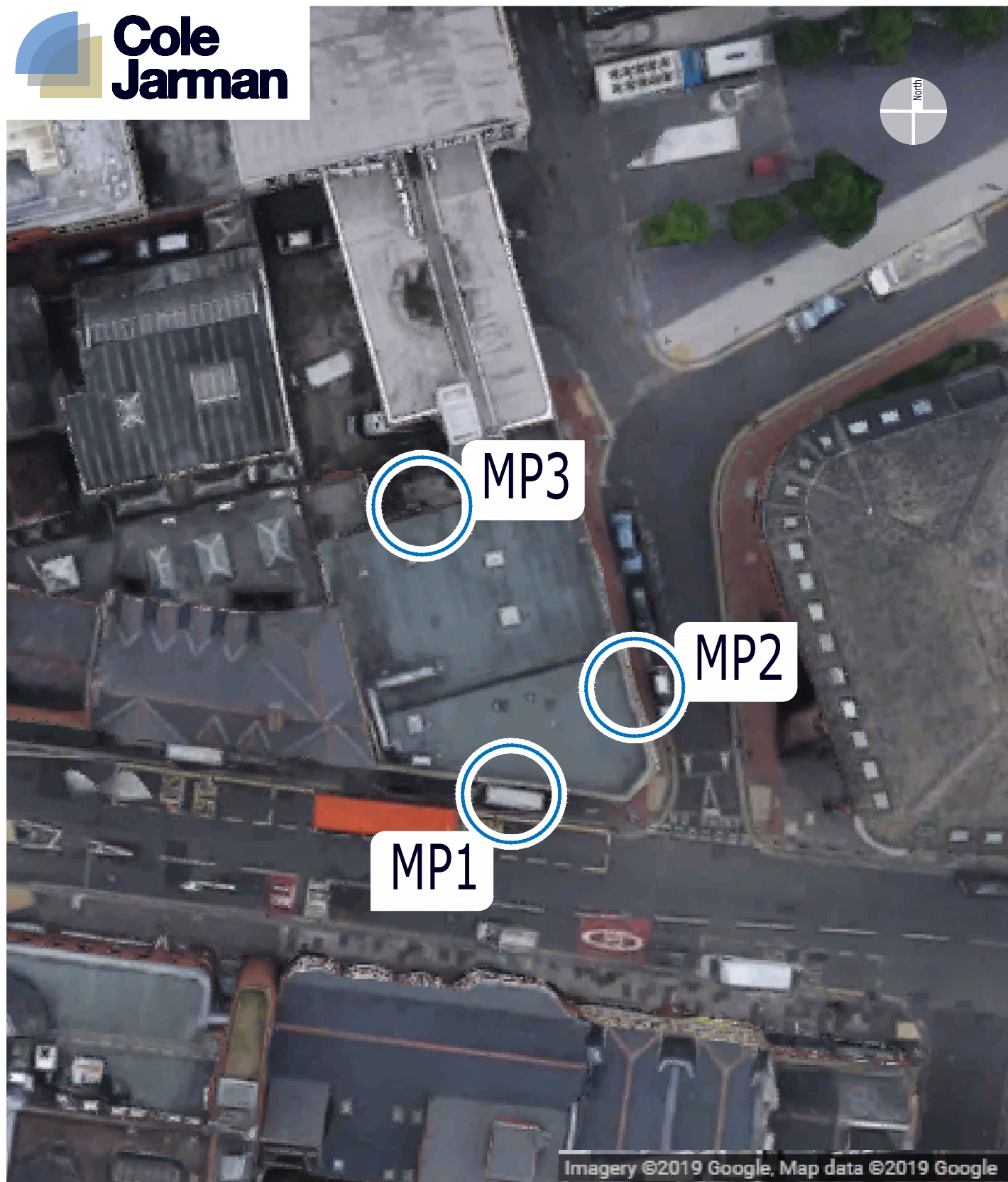
If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n .

L_{AX} , L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

■ End of Section



Title: Site plan showing noise survey measurement positions

Project: Abbey Hall, Reading

Date: January 2019

Revision: -

Scale: Not to scale

Figure 18/0683/SP1

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Figure 18/0683/TH01

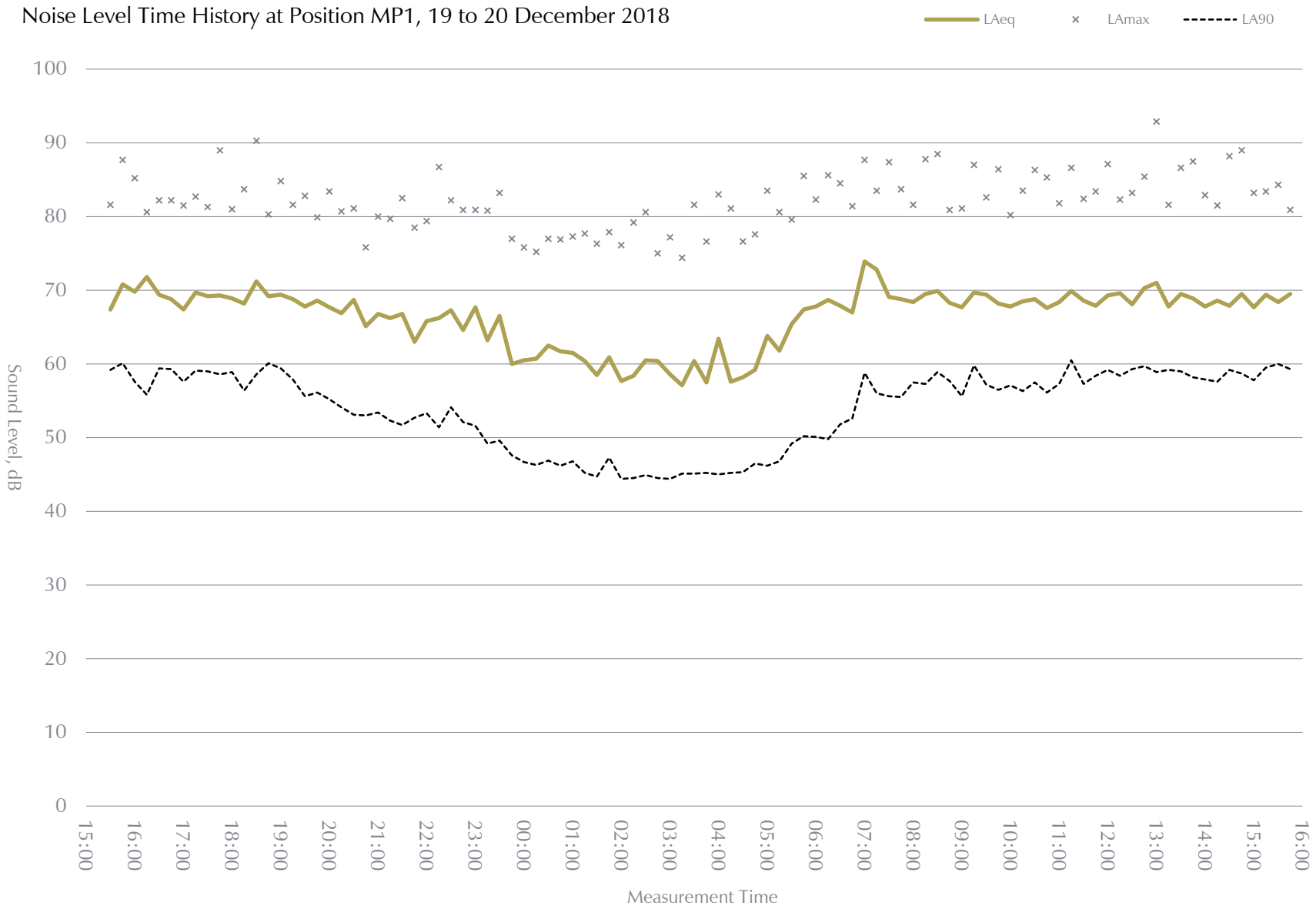




Figure 18/0683/TH02

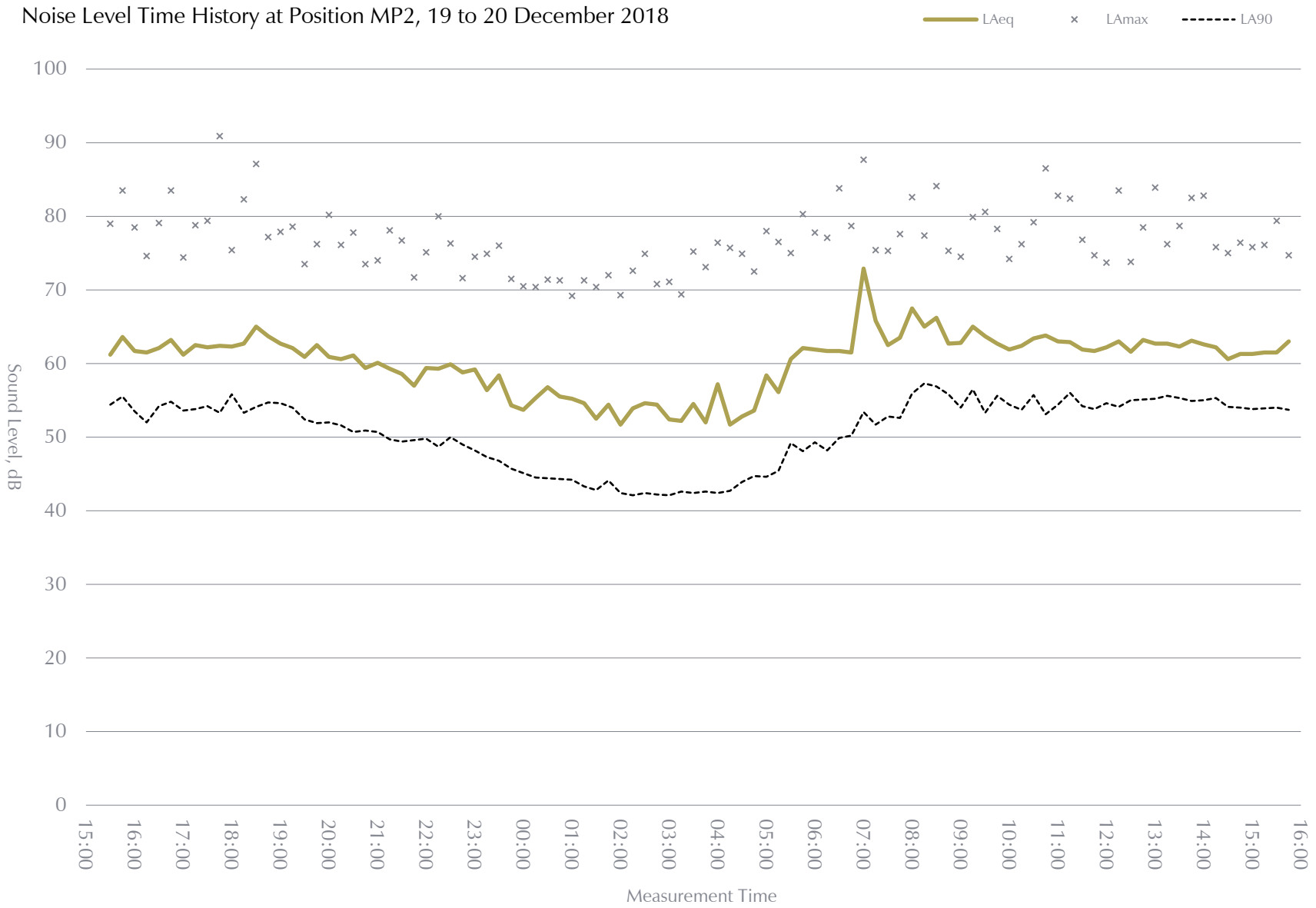
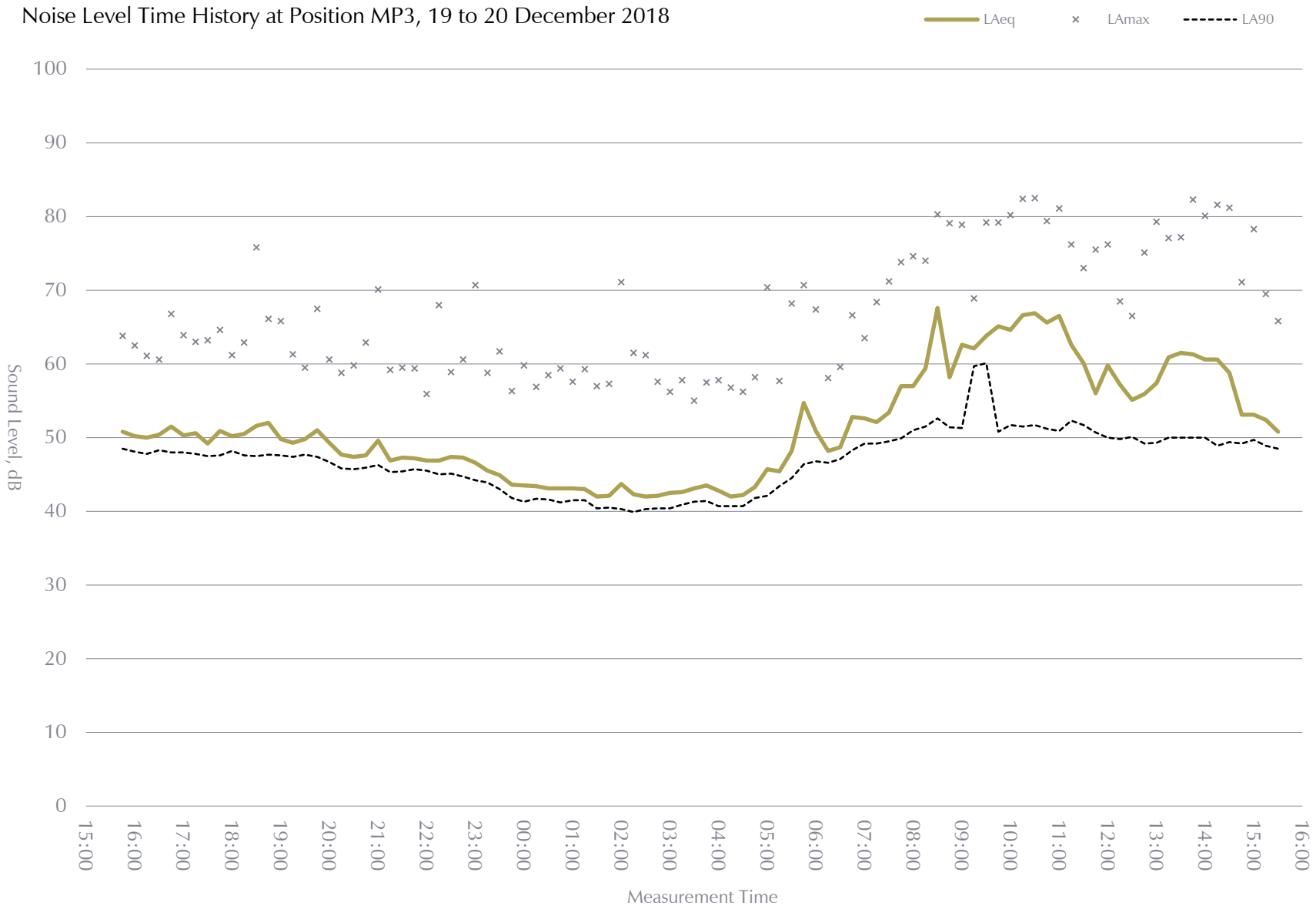




Figure 18/0683/TH03



Specification 18/0683/SPC1

Subject:	External Façade Building Fabric Performance Requirements Specification		
Project:	Abbey Hall, Reading		
Date:	11 January 2019	Prepared:	JW
Revision:	1	Approved:	RM

This specification covers the acoustic performance requirements for the different elements of the external building fabric, in order to control external noise intrusion to the residential properties and meet the specific internal noise criteria. The specific elements of the external building fabric covered by this specification are as follows:

1. Glazing
2. Ventilation
3. External wall construction

This specification is to be read in conjunction with figure 18/0683/F1, which identifies where each of the acoustic requirements apply.

Where glazing and ventilator types are proposed in a given area, it is acceptable to replace a lower specification element with one of a higher specification, if that helps to reduce the potential for installation errors on site, or helps to reduce cost by increasing order sizes of a particular product. For example, it would be acceptable to use glazing type G2 in place of G1 where G1 is required. It would not be acceptable to substitute products the other way around.

1 Glazings

The table T1 overleaf sets out the sound reduction performance requirements for the façades on the building.

The indicative R_w values and indicative glazing configurations quoted in table T1 are for guidance only; alternative configurations may be utilised, providing the octave band sound reduction performances are met.

The octave band sound reduction performances quoted in table T1 must be achieved by the glazing system as a whole in its installed condition. The specification therefore applies to the glazing, the frames and all seals on any openable parts of the systems and any required ventilation or condensation control mechanisms. This list is not exhaustive: no part of the glazing system shall cause the above figures not to be achieved.



External Façade Building Fabric Performance Requirements Specification

The supplier should be expected to prove by means of certified test results that the above sound reduction figures can be achieved by the system being proposed. The tests shall be conducted in accordance with BS EN ISO 10140 Parts 1 to 5 or BS EN ISO 140 Part 5 1998.

Glazing Type	Glazing Sound Reduction Index (SRI) @ Octave Band Centre Frequency (Hz)						<i>Indicative R_w</i>
	125	250	500	1k	2k	4k	
Glazing type G1							
<i>Indicative glazing type:</i> Standard thermal double glazing	20	18	26	33	33	30	30
Glazing type G2							
<i>Indicative glazing type:</i> 10mm acoustic laminate glass / 12-24mm airspace / 6mm acoustic laminate glass	26	27	34	40	39	46	37
Glazing type G3							
<i>Indicative glazing type:</i> 8.8mm acoustic laminate glass / 20-40mm airspace / 10.8mm acoustic laminate glass	27	36	43	52	55	60	46

T1 Glazing sound reduction performance requirements for all necessary façades

The required locations for each specified glazing type can be found in figure 18/0683/F1.

If preferred for aesthetic/practicality reasons, there are possible secondary glazing options for glazing types G2 and G3 which can replace the indicative double glazing systems set out above. Systems that are likely to achieve the above insertion losses for each glazing are as follows:

G2 Secondary Glazing Option

Indicative glazing type:

- 6mm float glass with mastic seal, 50mm cavity, 4mm toughened glass slider

G3 Secondary Glazing Option

Indicative glazing type:

- 6mm float glass with mastic seal, 200mm cavity, 4mm toughened glass slider



External Façade Building Fabric Performance Requirements Specification

It is again noted that the above are merely indicative configurations and it would be the responsibility of the glazing supplier to confirm that the chosen system can meet the required acoustic performance standards (inclusive of the effects of the chosen frame style e.g. sash windows).

2 Ventilation

BS8233 states that *'any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment'*. Therefore, it clearly is not expected that the criteria should be met under purge ventilation conditions, whether for smoke/pollution removal or thermal comfort. The advice provided is given with consideration of the minimum ventilation requirements set out in Approved Document F, and is subject to comment from the design team ventilation specialist.

On this basis, if internal noise levels are set with reference to BS8233, it is reasonable to conclude that the ventilation conditions should as set out within the guidance and that to apply the internal level criteria as defined in BS8233 under alternative conditions which, by their nature, can result in elevated noise levels is inappropriate. However, even if discounting this guidance, it is possible to provide purge ventilation either mechanically or through attenuated openings and it should not be deemed necessary to achieve the relevant noise criteria while windows are open within this development site.

The table T2 of this specification sets out the octave band and single figure sound reduction performance requirements for the passive ventilators to each façade on the necessary buildings. Specific details of the ventilation requirements for these are as follows:

Trickle Vents

For all façades, ventilation systems incorporating passive air intakes (trickle vents) in the façades are acceptable. The vents should have an installed element-normalized level difference ($D_{n,e}$) when tested in accordance with BS EN ISO 10140 Parts 1 to 5 of not less than that indicated in the following table:



External Façade Building Fabric Performance Requirements Specification

Location	Trickle Vent Installed Element Normalized Level Difference (dB $D_{n,e}$) @ Octave Band Centre Frequency (Hz)						Indicative $D_{n,e,w}$
	125	250	500	1k	2k	4k	
Ventilator Type V1 <i>Indicative vent type:</i> <i>Non-acoustics direct path trickle ventilators</i>	35	35	34	35	34	29	35
Ventilator Type V2 <i>Indicative vent type:</i> <i>Glidevade 'Fresh 80dB'</i>	48	39	44	52	66	61	49

T2 Ventilator sound reduction performance requirements for all necessary façades

Example typical vents which would achieve the performance requirements are also identified within table T2.

The locations for each specified ventilator type can be found in figure 18/0683/F1.

The indicative $D_{n,e,w}$ values and indicative vent types quoted above are for guidance only, alternatives may be utilised provided the **octave band** sound reduction performances quoted are achieved.

The noise levels internally have been assessed on the basis of a single unit in a bedroom and up to two units in any living room, mounted in the window frame or the outer wall, with each unit providing an open area of 2500mm².

It is noted that non-habitable rooms (such as bathrooms) have no acoustic requirements, so no specific acoustic ventilation is necessary to such rooms.

The client may wish to adopt a scheme of full mechanical or mechanically assisted ventilation, which would also be acceptable. If such a scheme is to be adopted, noise from the proposed system must be considered to ensure it does not produce unacceptable noise levels at both existing and proposed receptors. Proposals for any alternative means ventilation must be reviewed by an acoustic consultant.



External Façade Building Fabric Performance Requirements Specification

3 External Walls and Mansard Roof

The table T3 of this specification sets out the required octave band and single figure sound reduction performance requirements for the external walls on the building. Façade types F1 and F2 represent enhancements to the existing façade build-up. Where specific products are referenced, these are indicative only and other products/configurations may be acceptable providing the required acoustic performance figures are met.



External Façade Building Fabric Performance Requirements Specification

Façade Type	Façade Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)						Indicative R_w
	125	250	500	1k	2k	4k	
Façade Type F1 <i>Indicative construction type:</i> Existing façade should be enhanced internally through the installation of a lining comprising 2 x 12.5mm SoundBloc plasterboard on Gypframe Lining Channel framework to give 35mm cavity filled with 25mm Isover quilt (such as APR1200).	40	44	45	51	56	59	51
Façade Type F2¹ <i>Indicative construction type:</i> 15mm cement bonded particle board lining to rear of existing cladding, fitted internally, appropriate stud/framework to provide minimum 100mm void filled with 100mm Isover quilt (such as APR1200), finished with 2 x 12.5mm SoundBloc plasterboard. SoundBloc layers should be returned and appropriately detailed to meet the glazing where necessary (with any gaps sealed). ²	27	30	36	41	45	49	40
Façade Type F3 <i>Indicative construction type:</i> As existing	No changes required						

T3 External wall sound reduction performance requirements for all façades

The locations for each specified external wall construction type can be seen in figure 18/0683/F1 and described below:

¹ Proposed enhancement is based upon existing lightweight metal clad façade being retained. Alternative guidance can be provided if the façade is to change to the metsec system described in report 18/0683/R01.

² Cole Jarman can provide guidance on how this should be detailed on request.



External Façade Building Fabric Performance Requirements Specification

Façade Type

Façade Locations

F1	King's Road façade Abbey Square southernmost section of façade (not metal cladding section) and north most section
F2	Abbey Square façade (metal cladding section)
F3	Rear courtyard façade

T4 Specified façade type locations

The table T5 of this specification sets out the octave band and single figure sound reduction performance requirements for the proposed mansard roof:

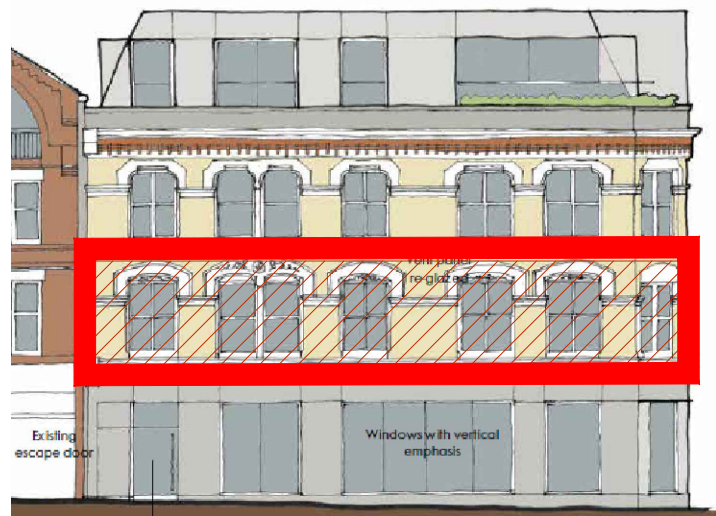
Location	Mansard Roof Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	Indicative R_w
<i>Indicative construction type:</i> Metal roof cladding system with 45mm thick PIR insulation board, 100mm mineral wool on steel liner tray. 2 x layers SoundBloc plasterboard forming internal lining with appropriate studwork. ³						
	28	34	40	45	49	44

T5 Mansard roof sound reduction performance requirements for all façades

End of Section

³ Indicative only. Proposed solution should be checked by Cole Jarman.

KINGS ROAD FACADE



Glazing/Ventilation

1st Floor

Living room windows: G2, V1

Bedroom windows: G3, V2

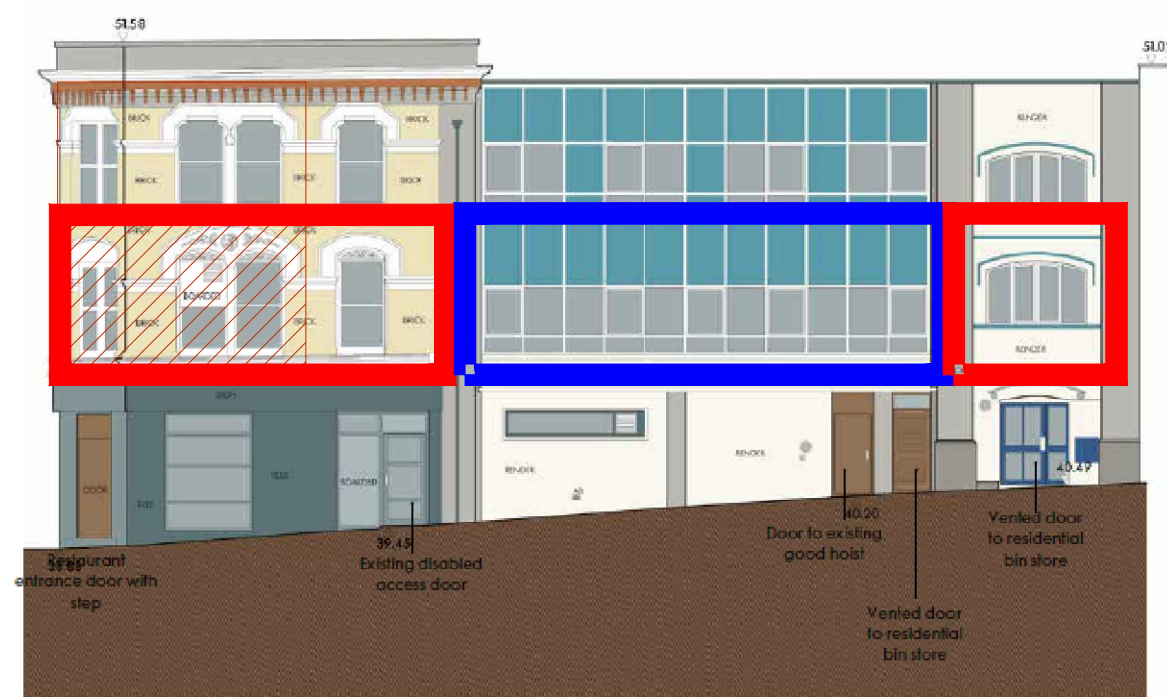
(hatched area)

Possible 3rd floor (mansard)

Living room windows: G1, V1

Bedroom windows: G2, V2

ABBEY SQUARE FACADE



Glazing/Ventilation

1st Floor - non hatched

Living room windows: G2, V1

Bedroom windows: G2, V2

1st Floor - hatched

Living room windows: G2, V1

Bedroom windows: G3, V2

Possible 3rd floor - above non-hatched

Living room windows: G1, V1

Bedroom windows: G1, V1

possible 3rd floor - above hatching

Living room windows: G1, V1

Bedroom windows: G2, V2

(Possible 3rd Floor extension not shown)

REAR COURTYARD FACADE

Facade as existing (F3)

Glazing/Ventilation

All Floors

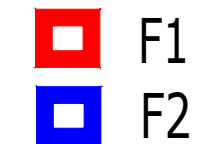
Living and Bedroom windows: G1, V1

Figure 18/0683/F1

Title:

External building fabric acoustic
requirement plan

Required External Wall Buildup



If 3rd Floor extension is progressed,
mansard roof construction should be as per
table T6 of Cole Jarman specification
18/0683/SPC1.

Facade, Glazing and Ventilation
requirements should also be read in
conjunction with Cole Jarman specification
document 18/0683/SPC1.

Project:

Abbey Hall, Reading

Date:

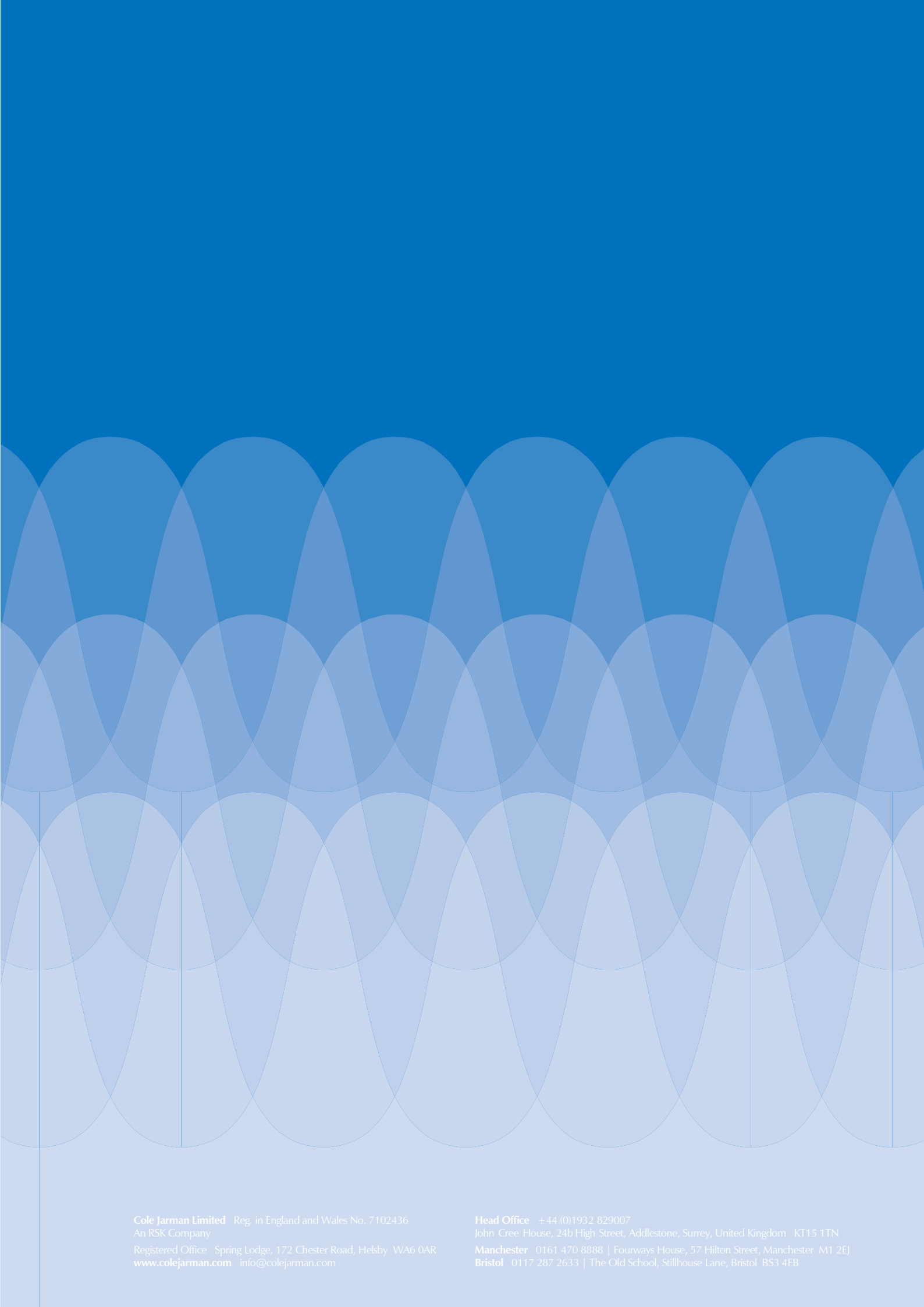
January 2019

Revision:

1

Scale:

Not to scale



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