Noise Impact Assessment for Planning Purposes

Job No:	*2402014*
Dated:	*09 July 2025*
Report Status:	*Final*
Prepared for:	*Life Property Group Ltd* *65 Station Road* *Port Talbot* *SA13 1NW*
Site address:	*48 Station Road* *Port Talbot* *Wales* *SA13 1LJ*

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Document Management

Issue/Revision	First issue	Revision 1	Revision 2	Revision 3	Final
Job Number	2402014				2402014
Report Number	R01				R01
Remarks	Draft				Final
Issue Date	09 July 2025				09 July 2025
Prepared by	Chris McDonagh				Paul Trew
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ANL File Reference	*\\ACNOISEDC1\Shared Folders\Job Files\K - O\Life Property Group\Station Road\report\2402014R01.docx*				

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BRIEF FOR CONSULTANCY:

This report has been prepared by Acoustics & Noise Limited, Newport, South Wales, for Life Property Group Ltd, 65 Station Road, Port Talbot, SA13 1NW under the instruction of Tim Smale.

Purchase Order No:

OBJECTIVES:

To investigate the noise levels being experienced at 48 Station Road, Port Talbot, Wales, SA13 1LJ and to carry out an assessment of the suitability of the site for a mixed residential and commercial offices development.

Where applicable recommend mitigation to meet typical noise impact criteria relevant to the proposal.

NON-TECHNICAL SUMMARY:

The development proposal seeks planning permission for the redevelopment of the site at 48 Station Road, Port Talbot, Wales, SA13 1LJ to a mixed office/residential use. The main building at the front is to remain as office space on all floors with the residential component being provided by a purpose built, four-storey building at the rear of the site which replaces the existing single storey extension.

The primary noise sources that could potentially impact on the proposed development are associated with the adjacent public house, known as the Pig Iron Tavern, which provides regulated live music entertainment primarily across the weekend period. This usually occurs during the evening times. At the rear of the public house are several pieces of roof mounted plant.

To determine the acoustic conditions at the proposed development site a 72-hour external noise survey was conducted over a weekend period during which live music entertainment was scheduled to occur. The survey was carried out at the rear of the development and is representative of the noise levels that the residential component of the development will be exposed to. During the live music performance, short-term internal noise measurements were carried out within the main development building, over all three floors, to describe the break-in noise transmitted via the wall separating the public house from the development building.

This report has assessed the site and made recommendations for the glazing solutions to the residential units based upon anticipated planning requirements which would be typical for residential development exposed to external environmental noise. For the office accommodation provided in the main building, the noise intrusion during regulated music entertainment provided by the adjacent public house is unlikely to impact on the future occupants during normal office hours (09:00-17:00) when no provision of entertainment is anticipated.

To minimise the risk of structure borne noise and vibration being transmitted to the residential units during live music entertainment within the adjacent public house, the detailed design of the building should consider acoustically separating the new building from the existing main building.

1.0 DESCRIPTION OF SITE

1.1 The site is located at 48 Station Road, Port Talbot, Wales, SA13 1LJ and is currently a vacant three-storey, town centre, end-terrace property with a single storey extension to the rear. The property was formerly utilised as a high street bank.

1.2 The site is bounded by a number of other retail/leisure properties and fronts onto a busy public highway. Adjacent to the building is a public house, known as the Pig Iron Tavern, that provides regulated live music entertainment primarily over the weekends. Opposite the front of the building is a Wetherspoons public house known as the Lord Caradoc.

1.3 The site is in a town centre location and the acoustic climate is characterised by activities associated with both the daytime and night time economy.

1.4 The acoustic climate at the rear of the development is characterised by operational noise from existing plant and activities associated with the adjacent Pig Iron Tavern.

1.5 A satellite view of the site is presented in Appendix 2.

2.0 DISCUSSION

2.1 DESCRIPTION OF PROPOSED DEVELOPMENT

2.1.1 The development proposal seeks planning permission for the redevelopment of the site at 48 Station Road, Port Talbot, Wales, SA13 1LJ to a mixed office/residential use.

2.1.2 The main building at the front is to remain as office space on all floors with the residential component being provided by a purpose built, four-storey building at the rear of the site which replaces the existing single storey extension.

2.1.3 A preliminary development layout is presented in Appendix 5.

2.2 DESCRIPTION OF EXISTING NOISE SOURCES

2.2.1 The primary noise sources that could potentially impact on the proposed development are associated with the adjacent public house, known as the Pig Iron Tavern.

2.2.2 The Pig Iron Tavern provides regulated live music entertainment primarily across the weekend period. This usually occurs during the evening times.

2.2.3 At the rear of the public house are several pieces of roof mounted plant.

3.0 DETERMINATION OF NOISE LEVELS

3.1 To determine the external acoustic conditions at the proposed development site a 72-hour noise survey was conducted over a weekend period during which live music entertainment was scheduled to occur. The survey was carried out at the rear of the development and is representative of the noise levels that the residential component of the development will be exposed to.

3.2 During the live music performance, internal noise measurements were carried out within the main development building, over all three floors, to describe the break-in noise transmitted via the wall separating the public house from the development building.

3.3 Details of the surveys are presented in Appendix 1 with the results of the external and internal surveys provided in Appendix 3 and Appendix 4 respectively.

3.4 Analysis of the external survey results demonstrates a reasonably stable acoustic environment at the rear of the development across the whole weekend with daily variation of less than 1 dB $L_{Aeq,16hrs}$ and night time variation of 2 – 3 dB $L_{Aeq,8hrs}$.

3.5 The greatest impact on the proposed residential units will likely occur during the night time period (23:00 – 07:00) when residents will be sleeping. When determining whether a development provides suitable internal ambient noise levels, consideration should be given to both the internal ambient noise level (e.g. $L_{Aeq,t}$) and the maximum noise level, L_{AFmax}, to represent the noise level from discrete noise events where present.

3.6 The World health Organisation recommends that to prevent sleep disturbance, indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night [7].

3.7 To avoid over specifying the sound mitigation and to align with the 45 dB internal L_{Amax} criteria of no more than 10 to 15 times a night, the L_{AFmax} data has been analysed and the outlying data has been excluded from the calculations.

3.8 In this case, we have assumed that the ten highest data points from the survey data represent ten events that would result in internal L_{AFmax} greater than 45 dB. The

eleventh value is used to represent the external noise level for single noise events when determining suitable mitigation (see Appendix 3).

3.9 Given that the external noise levels at the rear of the development remain similar during both the daytime and night time assessment periods and that the noise criteria for the night time period is usually more stringent than for the daytime, it follows that where the night time criteria are satisfied then the daytime criteria will also be satisfied by default.

3.10 During the internal noise survey, the band was clearly audible throughout the whole building with the clarity of the vocals enabling easy identification of each song being performed.

3.11 The internal noise frequency spectrum measurements were further analysed to determine a representative NR curve at each of the survey locations.

3.12 Noise rating (NR) is a graphical method for assigning a single-number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application.

3.13 To obtain a rating, the noise spectrum is superposed on a family of NR contours. The NR of the spectrum corresponds to the value of the first NR contour that is entirely above the spectrum.

3.14 To enable a robust assessment, the highest noise levels measured during the night time periods are used to represent the typical ambient noise levels affecting the proposed development. The relevant data is summarised in Table 1 below.

Table 1 – Summary of Representative Noise Levels to be Used in Assessment

Description	$L_{Aeq,t}$ (dB)	L_{AFmax} (dB)	NR
External Ambient Noise Level, Night Time, t=8hrs	54	73	--
Internal Ambient Noise Level during Live Music, t=15mins	45	--	42

4.0 IMPACT ASSESSMENT

4.1 RELEVANT GUIDANCE

4.1.1 As a matter of best practice, this assessment has been undertaken with reference to relevant guidance on noise. Summary descriptions of the guidance is presented in Appendix 6.

4.2 IMPACT ASSESSMENT FOR PROPOSED RESIDENTIAL UNITS

4.2.1 There is the potential for a noise impact at the proposed residential units from activities associated with the adjacent public house.

4.2.2 The purpose-built residential units located at the rear of the site will be exposed to noise from the adjacent roof mounted plant plus breakout noise from the rear of the public house.

4.2.3 There are no external amenity spaces associated with the proposed residential units and therefore, the relevant assessment criteria only concerns the internal acoustic conditions within those units.

4.2.4 ASSESSMENT CRITERIA

4.2.4.1 As this report is intended to accompany a full planning application, specific noise criteria are not yet available from the Local Authority.

4.2.4.2 However, suitable guidance on acceptable internal noise levels can be found in BS 8233:2014 [6]. This document suggests that *"…in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values*".

4.2.4.3 For the purposes of this report, internal and external noise levels at the site are assessed against the guideline criteria detailed in Table 2 below. The anticipated criteria correspond to desirable internal ambient noise levels recommended in BS 8233 [6] and is a typical planning requirement for residential developments exposed to external noise sources.

Table 2 – Assessment Criteria for Internal Noise Levels

Assessment Period	Maximum Internal Ambient Noise Level
Daytime (07:00 – 23:00)	35 dB $L_{Aeq,16hr}$
Night Time (23:00 – 07:00)	30 dB $L_{Aeq,8hr}$ 45 dB* L_{AFmax}

** not to be exceeded more than 10 times during the night time period*

4.2.5 **INTERNAL NOISE LEVELS**

4.2.5.1 The internal noise level in a room is calculated by subtracting the sound reduction performance of the external façade from the noise level outside the room.

4.2.5.2 In this case, the sound insulation performance of the external façade is assumed to be equivalent to the weakest acoustic element which will be the glazing units.

4.2.5.3 The external noise levels were measured at the location of the proposed residential units at the rear of the main building located on the roof of the single storey extension (see Appendix 2).

4.2.5.4 For the purposes of this assessment, it is assumed that the measured noise levels are representative of the noise levels outside all habitable rooms within the residential development. The representative external noise levels relevant to this assessment are presented in Table 1.

4.2.6 **OPEN WINDOW VENTILATION STRATEGY**

4.2.6.1 Whenever possible, it is desirable to open the windows to provide background ventilation and when partially open windows are relied upon for background ventilation, the sound reduction of the façade is reduced to 15 dB [7].

4.2.6.2 To achieve the anticipated internal noise criteria of 30 dB $L_{Aeq,8hrs}$ with an open window during the night time period, the external noise level would be required to be below 30 + 15 = 45 dB $L_{Aeq,8hrs}$.

4.2.6.3 Analysis of the results clearly demonstrates that the external noise levels are in excess of 45 dB $L_{Aeq,t}$ during the night time period and an open window ventilation strategy is not suitable for the proposed development.

4.2.7 MINIMUM FAÇADE SOUND INSULATION PERFORMANCE

4.2.7.1 Table 3 below details the calculations for the minimum required sound insulation for the building façade to achieve the anticipated internal ambient noise criteria.

Table 3 – Minimum Façade Sound Insulation Calculations

	External Free-Field Noise Level	Assessment Criteria	Minimum Façade Sound Insulation $R_w + C_{tr}$ (dB)
$L_{Aeq,8hr}$ (dB)	54	30	24
L_{AFmax} (dB)	73	45	28

4.2.7.2 From the calculations detailed in Table 3 the minimum required sound insulation performance is determined from the L_{AFmax} values. As discussed, the sound insulation performance of the external façade is equivalent to the weakest acoustic element which will be the glazing units.

4.2.7.3 From Table 3 it can be seen that the specified sound insulation performance for the glazing units will need to achieve a minimum of 28 dB $R_w + C_{tr}$.

4.2.7.4 It is important to note that the sound insulation performance is quoted in terms of $R_w + C_{tr}$ which includes a correction to account for the mainly low and mid frequencies attributable to the plant and music break-out noise as detailed in BS EN ISO 717 [1].

4.2.7.5 Manufacturers' data should be used to confirm the above minimum sound reduction performance requirements are achievable from any specified glazing units, including any provision for background ventilation if applicable.

4.2.7.6 The windows are required to be in the closed position to effectively control noise ingress. The decision on whether the windows should be permanently closed is outside the scope of this assessment and our technical expertise.

4.2.7.7 All rooms subject to sound mitigation measures should be provided with an alternative, effective means of ventilation. Any ventilation scheme should satisfy the requirements of Approved Document F and provide the required ventilation

rates. Specialist advice should be obtained to ensure that any ventilation scheme is suitable for purpose. It is important that any scheme is approved by Building Control and does not compromise the internal noise levels.

4.2.7.8 Recommendations for suitable ventilation are outside the scope of this assessment and technical expertise.

4.3 IMPACT ASSESSMENT FOR PROPOSED OFFICE SPACE

4.3.1 The main building at the front of the development site is to be refurbished and will continue to be used as office accommodation across all floors. There is the potential for a noise impact within the office space associated with the break-in noise transmitted via the separating wall between the development building and the adjacent public house..

4.3.2 The acoustic environment in offices affects wellbeing, concentration, communication and productivity. When considering the acoustic design, it is important to understand that different occupier types may have wildly differing needs. Appropriate design targets need to be set and aligned with these differing needs and should not be set too onerously.

4.3.3 Excessive noise can cause disturbance and discomfort and when background noise levels are too low, unwanted noise causes greater distraction. Conversely, higher levels of background noise can be beneficial for improved privacy between spaces.

4.3.4 At the time of this assessment, details for the proposed offices and their future occupants are not known and therefore, it is not possible to provide a specific acoustic design.

4.3.5 However, using the results of the internal noise survey to determine the level of break-in noise from the adjacent public house, this report provides preliminary recommendations to inform any detailed design required in the future, highlighting any potential areas of concern.

4.3.6 When considering the acoustic conditions within an office, guidelines for suitable design parameters are provided in the British Council for Offices '*Guide to Specification 2024*'.

4.3.7 Relating specifically to external noise intrusion, this document provides the following guideline noise criteria in terms of the Noise Rating (NR) level (as discussed in Section 3.0 of this report):

Table 4 – Guideline NR Levels

Description	NR Levels
Open Plan Offices	NR40 ($L_{eq,t}$)
Speculative Offices	NR38 ($L_{eq,t}$)
Cellular Offices	NR35 ($L_{eq,t}$)

4.3.8 The guideline values in Table 4 refer to the external noise intrusion levels which should not be exceeded during the hours of 09:00 – 17:00.

4.3.9 As discussed, details for the proposed offices are not known and therefore, an appropriate criterion would be the value for Speculative Offices. This criterion is described as a compromise between that for open plan and cellular offices.

4.3.10 The results of the internal noise survey indicate that the worst-case noise intrusion has a Noise Rating of NR42 which exceeds the guideline criterion for all office types.

4.3.11 However, this would only be of potential concern if the proposed offices were to be used whilst live music entertainment is being provided by the adjacent public house.

4.3.12 At the time of this assessment, a review of the entertainment schedules for the adjacent public house indicate that no music entertainment is scheduled to occur during the hours of 09:00 – 17:00.

4.3.13 During the internal noise survey, it was observed that the music entertainment was clearly audible and recognisable throughout the whole of the main building. This would indicate the presence of significant structure borne noise and vibration levels within the building.

4.3.14 Whilst this may not be of concern during office hours, there is a risk that the structure borne noise and vibration could be efficiently transmitted into the purpose-built residential component at the rear of the site if the residential building was physically attached to the main building structure.

4.3.15 To minimise the risk of structure borne noise and vibration being transmitted to the residential units, it is recommended that the detailed design of the building should consider acoustically separating the new building from the existing main building.

5.0 CONCLUSIONS

5.1 This report has assessed the site and made recommendations for the glazing solutions to the residential units based upon anticipated planning requirements which would be typical for residential development exposed to external environmental noise.

5.2 For the office accommodation provided in the main building, the noise intrusion during regulated music entertainment provided by the adjacent public house is unlikely to impact on the future occupant during normal office hours (09:00-17:00) when no provision of entertainment is anticipated.

6.0 RECOMMENDATIONS

6.1 Habitable rooms within the residential component of the proposed development should be provided with a glazing solution that achieves a minimum sound reduction performance of 28 dB R_w+C_{tr}.

6.2 Manufacturers' data should be used to confirm the above minimum sound reduction performance requirements are achievable from any specified glazing units, including any provision for background ventilation if applicable.

6.3 The windows are required to be in the closed position to effectively control noise ingress. The decision on whether the windows should be permanently closed is outside the scope of this assessment and our technical expertise. This decision should be taken by appropriate authorities.

6.4 All habitable rooms subject to sound mitigation measures should be provided with an alternative, effective means of ventilation. Any ventilation scheme should satisfy the requirements of Approved Document F and provide the required ventilation rates. Specialist advice should be obtained to ensure that any ventilation scheme is suitable for purpose. It is important that any scheme is approved by Building Control and does not compromise the internal noise levels.

6.5 Recommendations for suitable ventilation are outside the scope of this assessment and technical expertise.

6.6 To minimise the risk of structure borne noise and vibration being transmitted to the residential units during live music entertainment within the adjacent public house, the detailed design of the building should consider acoustically separating the new building from the existing main building.

P.A.T. 09/07/25
M.Sc., I.Eng., M.I.O.A., M.Inst.SCE., M.A.E.S.

Appendix 1
Noise Survey Details

A1.0 NOISE SURVEY DETAILS

EXTERNAL NOISE SURVEY

A1.1 The meter was calibrated at the start of the measurement procedure and checked after each set of measurements. No significant deviation i.e. > 0.5 dB was recorded.

A1.2 The survey commenced at 19:00 hours on 15th August 2024 for a continuous 72-hour period.

A1.3 Weather conditions: 10% cloud cover, 15°C, dry, occasional slight intermittent breezes <2.5ms^{-1}.

A1.4 The meter was located in a weather-proof container and powered with heavy duty rechargeable batteries. The microphone was located on a tripod at a height of 1.5m at the centre of the existing single storey extension roof. The microphone was inside an approved weather-proof microphone housing.

A1.5 The meter was adjusted to log and store L_{Aeq}, L_{A90} and L_{AFmax} in 15-minute periods for the duration of the survey (see Table 6).

A1.6 On completion of the survey, the data was downloaded to a computer for further analysis.

A1.7 The analysis consisted of using B&K 7820 Evaluator software to divide the results into the time periods 07:00-23:00 and 23:00-07:00.

A1.8 **Subjective Impressions**

A1.8.1 The external acoustic environment during the survey was characterised by road traffic, seagulls, patron noise from adjacent public house, roof mounted plant associated with the adjacent public house and entertainment noise during band performance.

A1.9 **Equipment Used:**

Table 5 – Equipment Used, External Noise Survey

ITEM	Serial No	UKAS Calibration Certificate Date (if applicable)
(ANL-M3) B&K 2250 Handheld Analyser	2559188	Certificate: 16158 Date: 08/03/23
(ANPC3) B&K 4231 Calibrator	2162602	Certificate: 16156 Date: 07/03/23

Table 6 – Meter Details, External Noise Survey

Instrument:		**2250**
Application:		BZ7224 Version 4.7.6
Start Time:		08/15/2024 18:28:46
End Time:		08/18/2024 12:35:13
Elapsed Time:		2.17:53:52
Bandwidth:		Broadband
Max Input Level:		141.26
	Time	Frequency
Broadband (excl. Peak):	FSI	AZ
Broadband Peak:		A
Instrument Serial Number:		2559188
Microphone Serial Number:		2556132
Input:		Top Socket
Windscreen Correction:		None
Sound Field Correction:		Free-field
Calibration Time:		08/15/2024 18:17:22
Calibration Type:		External reference
Sensitivity:		48.25 mV/Pa

INTERNAL NOISE SURVEY

A1.10 The meter was calibrated at the start of the measurement procedure and checked after each set of measurements. No significant deviation i.e. > 0.5 dB was recorded.

A1.11 The survey commenced at 20:13 hours on 16th August 2023. Short term surveys were carried out in a number of locations within the main building covering all floors.

A1.12 The meter was located on a tripod, 1.5m above the ground at each location. The microphone was inside an approved dust-proof microphone housing.

A1.13 The meter was adjusted to log and store L_{Aeq}, L_{A90} and L_{AFmax} for the duration of the survey (see Table 7). In addition, the one-third-octave band spectrum was measured during each survey.

A1.14 On completion of the survey, the data was downloaded to a computer for further analysis.

A1.14.1 **Subjective Impressions**

A1.14.2 The internal acoustic environment during the survey was characterised by entertainment noise associated with the adjacent public house. During the performance, the band was clearly audible throughout the whole of the existing building. Songs were clearly identifiable.

A1.15 **Equipment Used:**

Table 7 – Equipment Used, Internal Noise Survey

ITEM	Serial No	UKAS Calibration Certificate Date (if applicable)
(ANL-M4) B&K 2250 Handheld Analyser	2567736	Certificate: 16159 Date: 09/03/23
(ANL-C4) B&K 4231 Calibrator	2567363	Certificate: 16157 Date: 07/03/23

Table 8 – Meter Details, Internal Noise Survey

Instrument:		**2250**
Application:		BZ7224 Version 4.7.6
Start Time:		08/16/2024 20:13:25
End Time:		08/16/2024 20:15:57
Elapsed Time:		00:02:32
Bandwidth:		1/3-octave
Max Input Level:		142.78
	Time	Frequency
Broadband (excl. Peak):	FSI	AZ
Broadband Peak:		A
Spectrum:	FS	Z
Instrument Serial Number:		2567736
Microphone Serial Number:		2560565
Input:		Top Socket
Windscreen Correction:		None
Sound Field Correction:		Free-field
Calibration Time:		08/07/2024 22:28:54
Calibration Type:		External reference
Sensitivity:		40.47 mV/Pa

Appendix 2
View of Measurement Position

A2.0 VIEW OF MEASUREMENT POSITION

Figure 1 – Measurement Position

Figure 2 – View of Equipment Location

Appendix 3
External Noise Survey Results

A3.0 EXTERNAL NOISE SURVEY RESULTS

Table 9 – Summary of External Survey Results (Free-field Noise Levels)

Description	Period	Duration, t	$L_{Aeq,t}$ (dB)	$L_{AF90,t}$ (dB)	L_{AFmax} (dB)
Friday Evening	19:00 – 23:00	4:00:00	53.4	47.4	82.8
Friday Night	23:00 – 07:00	8:00:00	53.5	45.3	79.4
Saturday Day	07:00 – 23:00	16:00:00	53.6	46.1	87.3
Saturday Night	23:00 – 07:00	8:00:00	53.9	41.1	89.3
Sunday Day	07:00 – 23:00	16:00:00	52.6	44.1	82.1
Sunday Night	23:00 – 07:00	8:00:00	51.0	43.4	83.8
Monday Day	07:00 – 12:30	5:30:00	54.4	49.5	80.2

Table 10 – Daytime Free-field Noise Levels (Friday Evening, 19:00 – 23:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
15/08/2024	19:00:00	53.8	47.0	74.5
15/08/2024	19:15:00	57.1	46.8	82.8
15/08/2024	19:30:00	51.8	46.8	70.1
15/08/2024	19:45:00	51.4	46.4	71.1
15/08/2024	20:00:00	55.9	50.5	72.1
15/08/2024	20:15:00	54.4	49.3	75.8
15/08/2024	20:30:00	53.0	47.2	71.7
15/08/2024	20:45:00	49.6	46.7	62.3
15/08/2024	21:00:00	54.1	50.2	62.9
15/08/2024	21:15:00	54.3	50.3	70.9
15/08/2024	21:30:00	53.8	49.8	72.7
15/08/2024	21:45:00	53.0	48.4	64.6
15/08/2024	22:00:00	50.1	47.4	62.9
15/08/2024	22:15:00	51.2	48.2	64.5
15/08/2024	22:30:00	52.4	47.8	69.6
15/08/2024	22:45:00	51.2	47.9	67.2

Table 11 – Night Time Free-field Noise Levels (Friday Night, 23:00 – 07:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
15/08/2024	23:00:00	50.6	47.9	64.9
15/08/2024	23:15:00	50.9	47.2	63.0
15/08/2024	23:30:00	50.8	47.3	64.9
15/08/2024	23:45:00	52.2	47.2	76.0
16/08/2024	00:00:00	48.7	45.4	60.3
16/08/2024	00:15:00	50.1	46.8	60.9
16/08/2024	00:30:00	52.7	46.4	76.4
16/08/2024	00:45:00	49.7	45.9	65.7
16/08/2024	01:00:00	49.2	44.6	64.1
16/08/2024	01:15:00	47.2	42.8	59.2
16/08/2024	01:30:00	47.8	45.1	55.9
16/08/2024	01:45:00	51.0	46.5	63.8
16/08/2024	02:00:00	50.3	46.1	64.4
16/08/2024	02:15:00	47.8	44.5	56.7
16/08/2024	02:30:00	46.8	44.0	61.2
16/08/2024	02:45:00	47.7	44.7	60.3
16/08/2024	03:00:00	48.6	44.6	64.4
16/08/2024	03:15:00	47.8	45.1	56.5
16/08/2024	03:30:00	46.9	44.3	59.6
16/08/2024	03:45:00	47.8	44.7	60.7
16/08/2024	04:00:00	47.0	44.5	57.1
16/08/2024	04:15:00	51.1	44.9	73.4
16/08/2024	04:30:00	48.6	46.0	56.1
16/08/2024	04:45:00	48.1	45.5	58.5
16/08/2024	05:00:00	51.4	46.2	73.8
16/08/2024	05:15:00	55.3	47.5	73.8
16/08/2024	05:30:00	58.1	48.2	76.0

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
16/08/2024	05:45:00	54.5	48.2	78.0
16/08/2024	06:00:00	60.8	49.1	77.2
16/08/2024	06:15:00	61.5	50.6	75.4
16/08/2024	06:30:00	55.2	49.0	74.2
16/08/2024	06:45:00	58.3	49.4	79.4

Table 12 – Daytime Free-field Noise Levels (Saturday Day, 07:00 – 23:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
16/08/2024	07:00:00	58.2	50.0	77.2
16/08/2024	07:15:00	53.2	49.4	68.0
16/08/2024	07:30:00	51.9	48.4	70.0
16/08/2024	07:45:00	52.4	49.2	72.5
16/08/2024	08:00:00	56.5	49.5	77.6
16/08/2024	08:15:00	51.8	48.9	65.1
16/08/2024	08:30:00	54.7	48.4	81.5
16/08/2024	08:45:00	48.6	44.6	63.7
16/08/2024	09:00:00	51.0	43.4	73.9
16/08/2024	09:15:00	47.8	43.4	65.5
16/08/2024	09:30:00	48.2	44.0	63.5
16/08/2024	09:45:00	62.2	43.5	87.3
16/08/2024	10:00:00	50.0	44.0	71.8
16/08/2024	10:15:00	54.5	44.6	71.7
16/08/2024	10:30:00	51.1	45.3	70.6
16/08/2024	10:45:00	50.1	44.7	67.9
16/08/2024	11:00:00	51.2	45.2	67.4
16/08/2024	11:15:00	52.0	45.3	70.9
16/08/2024	11:30:00	52.4	47.4	69.0
16/08/2024	11:45:00	51.3	46.1	69.8

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
16/08/2024	12:00:00	50.7	45.9	66.5
16/08/2024	12:15:00	50.1	45.8	72.6
16/08/2024	12:30:00	49.5	45.0	68.5
16/08/2024	12:45:00	53.2	45.6	76.0
16/08/2024	13:00:00	53.6	46.4	69.6
16/08/2024	13:15:00	54.4	52.2	69.5
16/08/2024	13:30:00	52.0	46.4	73.7
16/08/2024	13:45:00	49.9	46.4	69.8
16/08/2024	14:00:00	49.6	45.8	61.8
16/08/2024	14:15:00	54.2	45.5	78.6
16/08/2024	14:30:00	50.3	46.0	71.3
16/08/2024	14:45:00	52.9	46.4	81.1
16/08/2024	15:00:00	49.9	46.3	61.0
16/08/2024	15:15:00	51.6	46.7	71.9
16/08/2024	15:30:00	48.7	45.5	58.9
16/08/2024	15:45:00	53.9	45.9	74.9
16/08/2024	16:00:00	53.7	46.6	74.8
16/08/2024	16:15:00	56.0	47.2	74.2
16/08/2024	16:30:00	53.2	47.0	71.8
16/08/2024	16:45:00	53.7	45.8	74.7
16/08/2024	17:00:00	54.3	47.2	75.5
16/08/2024	17:15:00	56.0	47.9	77.0
16/08/2024	17:30:00	53.7	47.1	74.0
16/08/2024	17:45:00	52.5	47.5	71.6
16/08/2024	18:00:00	54.0	49.1	70.3
16/08/2024	18:15:00	53.7	49.2	70.4
16/08/2024	18:30:00	59.7	49.2	78.8

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
16/08/2024	18:45:00	53.4	48.2	70.1
16/08/2024	19:00:00	55.5	47.4	78.4
16/08/2024	19:15:00	57.0	47.4	77.4
16/08/2024	19:30:00	55.7	47.3	78.2
16/08/2024	19:45:00	49.3	46.1	69.7
16/08/2024	20:00:00	50.2	46.5	68.6
16/08/2024	20:15:00	52.3	48.5	70.7
16/08/2024	20:30:00	53.4	47.8	69.6
16/08/2024	20:45:00	54.5	47.8	80.1
16/08/2024	21:00:00	52.9	48.2	77.0
16/08/2024	21:15:00	50.7	48.0	62.9
16/08/2024	21:30:00	51.6	48.6	69.3
16/08/2024	21:45:00	49.9	47.6	59.0
16/08/2024	22:00:00	52.0	48.3	68.3
16/08/2024	22:15:00	51.5	48.1	66.5
16/08/2024	22:30:00	50.1	46.9	62.0
16/08/2024	22:45:00	50.6	46.8	62.7

Table 13 – Night Time Free-field Noise Levels (Saturday Night, 23:00 – 07:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
16/08/2024	23:00:00	59.6	47.2	89.3
16/08/2024	23:15:00	49.1	46.6	61.2
16/08/2024	23:30:00	48.7	46.0	61.5
16/08/2024	23:45:00	49.2	46.2	64.7
17/08/2024	00:00:00	48.7	45.3	63.7
17/08/2024	00:15:00	50.2	46.0	72.1
17/08/2024	00:30:00	48.6	44.7	65.3
17/08/2024	00:45:00	54.2	45.9	84.1

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
17/08/2024	01:00:00	47.6	44.3	60.1
17/08/2024	01:15:00	47.2	44.5	59.6
17/08/2024	01:30:00	47.7	44.1	60.2
17/08/2024	01:45:00	49.8	41.9	77.8
17/08/2024	02:00:00	43.9	41.5	57.8
17/08/2024	02:15:00	46.9	41.3	68.5
17/08/2024	02:30:00	43.3	41.3	57.6
17/08/2024	02:45:00	44.9	41.1	66.9
17/08/2024	03:00:00	43.6	35.4	65.1
17/08/2024	03:15:00	41.4	35.7	61.6
17/08/2024	03:30:00	42.8	41.1	54.0
17/08/2024	03:45:00	45.3	41.0	71.5
17/08/2024	04:00:00	41.8	40.5	50.2
17/08/2024	04:15:00	42.2	40.6	54.2
17/08/2024	04:30:00	42.4	40.5	59.7
17/08/2024	04:45:00	46.1	40.8	70.3
17/08/2024	05:00:00	43.3	41.6	54.5
17/08/2024	05:15:00	60.1	42.5	79.8
17/08/2024	05:30:00	63.4	43.6	85.8
17/08/2024	05:45:00	54.2	42.8	73.5
17/08/2024	06:00:00	61.0	44.7	81.3
17/08/2024	06:15:00	54.5	44.9	69.4
17/08/2024	06:30:00	56.9	44.6	82.7
17/08/2024	06:45:00	52.2	44.7	69.4

Table 14 – Daytime Free-field Noise Levels (Sunday Day, 07:00 – 23:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
17/08/2024	07:00:00	48.8	44.4	63.6
17/08/2024	07:15:00	46.2	44.0	62.1
17/08/2024	07:30:00	46.0	43.2	56.7
17/08/2024	07:45:00	50.9	43.0	69.4
17/08/2024	08:00:00	52.5	42.5	72.7
17/08/2024	08:15:00	47.2	42.3	70.4
17/08/2024	08:30:00	47.7	42.4	68.2
17/08/2024	08:45:00	47.3	43.3	69.5
17/08/2024	09:00:00	47.6	43.4	66.7
17/08/2024	09:15:00	51.2	43.8	69.8
17/08/2024	09:30:00	47.9	42.7	68.0
17/08/2024	09:45:00	48.9	44.4	72.3
17/08/2024	10:00:00	55.4	45.5	77.2
17/08/2024	10:15:00	51.2	45.9	70.2
17/08/2024	10:30:00	49.2	45.3	75.5
17/08/2024	10:45:00	51.6	46.1	69.8
17/08/2024	11:00:00	49.9	45.3	68.0
17/08/2024	11:15:00	51.1	45.6	73.3
17/08/2024	11:30:00	52.1	45.2	72.9
17/08/2024	11:45:00	50.7	45.6	72.9
17/08/2024	12:00:00	53.7	45.6	72.9
17/08/2024	12:15:00	49.1	45.5	64.4
17/08/2024	12:30:00	50.3	45.4	70.7
17/08/2024	12:45:00	51.4	45.9	69.2
17/08/2024	13:00:00	52.5	45.6	72.5
17/08/2024	13:15:00	53.9	46.2	78.2
17/08/2024	13:30:00	51.6	45.8	72.1

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
17/08/2024	13:45:00	54.2	45.9	82.1
17/08/2024	14:00:00	53.7	45.8	75.1
17/08/2024	14:15:00	48.6	45.7	68.8
17/08/2024	14:30:00	51.0	45.7	70.1
17/08/2024	14:45:00	58.2	45.8	81.9
17/08/2024	15:00:00	52.2	46.1	73.1
17/08/2024	15:15:00	50.0	45.9	63.6
17/08/2024	15:30:00	56.9	46.6	73.1
17/08/2024	15:45:00	53.7	46.3	73.1
17/08/2024	16:00:00	51.9	44.8	74.9
17/08/2024	16:15:00	48.4	44.7	65.0
17/08/2024	16:30:00	49.8	46.2	68.0
17/08/2024	16:45:00	50.2	46.1	73.1
17/08/2024	17:00:00	54.8	45.9	74.9
17/08/2024	17:15:00	50.9	45.8	71.4
17/08/2024	17:30:00	52.7	46.2	75.2
17/08/2024	17:45:00	53.8	47.0	74.6
17/08/2024	18:00:00	49.8	46.3	72.0
17/08/2024	18:15:00	58.8	46.1	78.5
17/08/2024	18:30:00	61.2	46.8	81.1
17/08/2024	18:45:00	57.3	47.0	78.1
17/08/2024	19:00:00	50.5	45.6	68.0
17/08/2024	19:15:00	52.0	46.1	69.9
17/08/2024	19:30:00	55.5	47.3	77.0
17/08/2024	19:45:00	49.4	45.3	66.7
17/08/2024	20:00:00	54.3	45.5	72.9
17/08/2024	20:15:00	54.0	44.8	73.3

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
17/08/2024	20:30:00	52.1	44.8	70.5
17/08/2024	20:45:00	48.9	44.9	64.8
17/08/2024	21:00:00	48.8	44.3	64.3
17/08/2024	21:15:00	48.2	44.5	59.3
17/08/2024	21:30:00	47.5	44.2	70.2
17/08/2024	21:45:00	47.2	42.9	69.9
17/08/2024	22:00:00	51.7	43.4	80.3
17/08/2024	22:15:00	46.6	43.7	56.8
17/08/2024	22:30:00	45.4	41.4	59.0
17/08/2024	22:45:00	47.2	43.2	58.5

Table 15 – Night Time Free-field Noise Levels (Sunday Night, 23:00 – 07:00)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
17/08/2024	23:00:00	46.9	44.1	58.5
17/08/2024	23:15:00	46.4	43.9	59.9
17/08/2024	23:30:00	46.9	43.2	57.7
17/08/2024	23:45:00	46.8	43.2	63.4
18/08/2024	00:00:00	46.6	42.6	64.9
18/08/2024	00:15:00	44.9	42.3	58.7
18/08/2024	00:30:00	45.3	42.5	59.2
18/08/2024	00:45:00	45.7	42.8	55.2
18/08/2024	01:00:00	44.9	42.2	54.1
18/08/2024	01:15:00	45.6	42.9	60.0
18/08/2024	01:30:00	46.6	44.5	57.9
18/08/2024	01:45:00	45.6	43.0	56.5
18/08/2024	02:00:00	45.5	43.1	61.4
18/08/2024	02:15:00	47.1	44.4	59.0
18/08/2024	02:30:00	45.9	43.6	57.0

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
18/08/2024	02:45:00	46.2	44.0	52.2
18/08/2024	03:00:00	46.4	44.0	53.3
18/08/2024	03:15:00	47.3	45.0	57.5
18/08/2024	03:30:00	46.9	44.9	53.9
18/08/2024	03:45:00	46.9	45.0	55.8
18/08/2024	04:00:00	47.8	45.9	63.5
18/08/2024	04:15:00	47.8	46.0	54.2
18/08/2024	04:30:00	48.6	46.2	59.6
18/08/2024	04:45:00	49.4	43.5	73.7
18/08/2024	05:00:00	44.6	41.5	58.5
18/08/2024	05:15:00	49.8	44.2	72.9
18/08/2024	05:30:00	57.6	44.7	73.8
18/08/2024	05:45:00	56.1	45.9	75.3
18/08/2024	06:00:00	56.1	46.3	83.8
18/08/2024	06:15:00	55.5	47.0	76.4
18/08/2024	06:30:00	57.9	48.1	68.9
18/08/2024	06:45:00	56.1	48.7	68.8

Table 16 – Daytime Free-field Noise Levels (Monday Day, 07:00 – 12:30)

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
18/08/2024	07:00:00	56.5	47.9	75.2
18/08/2024	07:15:00	51.4	48.4	68.3
18/08/2024	07:30:00	54.4	48.5	72.4
18/08/2024	07:45:00	55.1	49.5	72.7
18/08/2024	08:00:00	59.8	49.4	80.2
18/08/2024	08:15:00	52.4	50.2	68.6
18/08/2024	08:30:00	54.6	50.5	69.8
18/08/2024	08:45:00	56.3	49.7	78.7

Start date	Start time	$L_{Aeq,15mins}$ (dB)	$L_{AF90,15mins}$ (dB)	L_{AFmax} (dB)
18/08/2024	09:00:00	52.3	49.3	62.2
18/08/2024	09:15:00	52.8	49.7	72.0
18/08/2024	09:30:00	54.8	50.2	73.5
18/08/2024	09:45:00	52.7	50.4	71.1
18/08/2024	10:00:00	53.3	50.7	73.7
18/08/2024	10:15:00	52.6	49.8	68.1
18/08/2024	10:30:00	53.3	49.8	67.1
18/08/2024	10:45:00	53.0	49.1	69.9
18/08/2024	11:00:00	52.3	49.7	68.4
18/08/2024	11:15:00	52.7	50.7	67.9
18/08/2024	11:30:00	53.0	50.5	70.8
18/08/2024	11:45:00	54.4	51.1	69.8
18/08/2024	12:00:00	53.5	51.1	67.3
18/08/2024	12:15:00	54.5	51.3	73.3

Table 17 – Analysis of L_{AFmax} Events (Ranked Highest to Lowest), Friday Night

id	Start date	Start time	L_{AFmax} (dB)
1	16/08/2024	06:45:00	79.4
2	16/08/2024	05:45:00	78.0
3	16/08/2024	06:00:00	77.2
4	16/08/2024	00:30:00	76.4
5	15/08/2024	23:45:00	76.0
6	16/08/2024	05:30:00	76.0
7	16/08/2024	06:15:00	75.4
8	16/08/2024	06:30:00	74.2
9	16/08/2024	05:15:00	73.8
10	16/08/2024	05:00:00	73.8
11	**16/08/2024**	**04:15:00**	**73.4**
12	16/08/2024	00:45:00	65.7
13	15/08/2024	23:00:00	64.9
14	15/08/2024	23:30:00	64.9
15	16/08/2024	02:00:00	64.4
16	16/08/2024	03:00:00	64.4
17	16/08/2024	01:00:00	64.1
18	16/08/2024	01:45:00	63.8
19	15/08/2024	23:15:00	63.0
20	16/08/2024	02:30:00	61.2
21	16/08/2024	00:15:00	60.9
22	16/08/2024	03:45:00	60.7
23	16/08/2024	02:45:00	60.3
24	16/08/2024	00:00:00	60.3
25	16/08/2024	03:30:00	59.6
26	16/08/2024	01:15:00	59.2
27	16/08/2024	04:45:00	58.5
28	16/08/2024	04:00:00	57.1
29	16/08/2024	02:15:00	56.7
30	16/08/2024	03:15:00	56.5
31	16/08/2024	04:30:00	56.1
32	16/08/2024	01:30:00	55.9

Table 18 – Analysis of L_{AFmax} Events (Ranked Highest to Lowest), Saturday Night

id	Start date	Start time	L_{AFmax} (dB)
1	16/08/2024	23:00:00	89.3
2	17/08/2024	05:30:00	85.8
3	17/08/2024	00:45:00	84.1
4	17/08/2024	06:30:00	82.7
5	17/08/2024	06:00:00	81.3
6	17/08/2024	05:15:00	79.8
7	17/08/2024	01:45:00	77.8
8	17/08/2024	05:45:00	73.5
9	17/08/2024	00:15:00	72.1
10	17/08/2024	03:45:00	71.5
11	**17/08/2024**	**04:45:00**	**70.3**
12	17/08/2024	06:15:00	69.4
13	17/08/2024	06:45:00	69.4
14	17/08/2024	02:15:00	68.5
15	17/08/2024	02:45:00	66.9
16	17/08/2024	00:30:00	65.3
17	17/08/2024	03:00:00	65.1
18	16/08/2024	23:45:00	64.7
19	17/08/2024	00:00:00	63.7
20	17/08/2024	03:15:00	61.6
21	16/08/2024	23:30:00	61.5
22	16/08/2024	23:15:00	61.2
23	17/08/2024	01:30:00	60.2
24	17/08/2024	01:00:00	60.1
25	17/08/2024	04:30:00	59.7
26	17/08/2024	01:15:00	59.6
27	17/08/2024	02:00:00	57.8
28	17/08/2024	02:30:00	57.6
29	17/08/2024	05:00:00	54.5
30	17/08/2024	04:15:00	54.2
31	17/08/2024	03:30:00	54.0
32	17/08/2024	04:00:00	50.2

Table 19 – Analysis of L_{AFmax} Events (Ranked Highest to Lowest), Sunday Night

id	Start date	Start time	L_{AFmax} (dB)
1	18/08/2024	06:00:00	83.8
2	18/08/2024	06:15:00	76.4
3	18/08/2024	05:45:00	75.3
4	18/08/2024	05:30:00	73.8
5	18/08/2024	04:45:00	73.7
6	18/08/2024	05:15:00	72.9
7	18/08/2024	06:30:00	68.9
8	18/08/2024	06:45:00	68.8
9	18/08/2024	00:00:00	64.9
10	18/08/2024	04:00:00	63.5
11	**17/08/2024**	**23:45:00**	**63.4**
12	18/08/2024	02:00:00	61.4
13	18/08/2024	01:15:00	60.0
14	17/08/2024	23:15:00	59.9
15	18/08/2024	04:30:00	59.6
16	18/08/2024	00:30:00	59.2
17	18/08/2024	02:15:00	59.0
18	18/08/2024	00:15:00	58.7
19	17/08/2024	23:00:00	58.5
20	18/08/2024	05:00:00	58.5
21	18/08/2024	01:30:00	57.9
22	17/08/2024	23:30:00	57.7
23	18/08/2024	03:15:00	57.5
24	18/08/2024	02:30:00	57.0
25	18/08/2024	01:45:00	56.5
26	18/08/2024	03:45:00	55.8
27	18/08/2024	00:45:00	55.2
28	18/08/2024	04:15:00	54.2
29	18/08/2024	01:00:00	54.1
30	18/08/2024	03:30:00	53.9
31	18/08/2024	03:00:00	53.3
32	18/08/2024	02:45:00	52.2

Appendix 4
Internal Noise Survey Results

A4.0 INTERNAL NOISE SURVEY RESULTS

Table 20 – Summary of Internal Noise Survey Results

Location	Start Time (hh:mm:ss)	Elapsed Time, t (hh:mm:ss)	$L_{Aeq,t}$ [dB]	$L_{AF90,t}$ [dB]	L_{AFmax} [dB]
Ground Floor Adjacent to Safe	20:13:25	0:02:32	31.3	24.8	42.8
Ground Floor Towards Front	20:18:16	0:02:17	35.5	31.4	46.5
First Floor Towards Front	20:23:53	0:15:06	45.1	33.6	74.5
Top Floor	20:41:34	0:03:17	33.8	31.1	49.4

Table 21 – Third-Octave Band Frequency Spectrum, Internal Noise Survey Results

Frequency [Hz]	Ground Floor Adjacent to Safe L_{Zeq} [dB]	Ground Floor Towards Front L_{Zeq} [dB]	First Floor Towards Front L_{Zeq} [dB]	Top Floor L_{Zeq} [dB]
50	31.0	32.4	37.3	39.2
63	29.7	34.7	35.0	41.0
80	43.3	37.6	50.1	37.3
100	39.8	42.5	46.6	39.3
125	44.5	47.4	43.3	39.8
160	35.7	39.9	40.2	35.6
200	28.4	30.4	35.6	31.3
250	22.8	25.8	34.3	26.2
315	18.8	23.9	33.3	25.1
400	18.0	24.7	33.4	23.9
500	15.7	23.5	34.2	23.8
630	12.7	22.6	35.3	24.9
800	11.9	22.7	36.7	24.5
1000	10.8	20.4	36.4	24.0
1250	11.3	20.4	34.6	22.8

Frequency [Hz]	Ground Floor Adjacent to Safe L_{Zeq} [dB]	Ground Floor Towards Front L_{Zeq} [dB]	First Floor Towards Front L_{Zeq} [dB]	Top Floor L_{Zeq} [dB]
1600	10.5	20.3	34.1	21.6
2000	9.6	20.0	33.4	19.6
2500	9.3	18.3	32.8	16.7
3150	8.4	16.6	31.0	15.4
4000	8.6	15.6	29.4	15.2
5000	9.2	14.8	28.9	14.0
6300	9.6	14.1	28.1	12.3
8000	9.1	12.8	27.4	11.5
10000	9.1	11.6	23.8	10.3
A	31.3	35.5	45.1	33.8
Z	51.1	52.7	66.3	53.2

Figure 3 – Indicative NR Curve for Ground Floor Adjacent to Safe Measurement

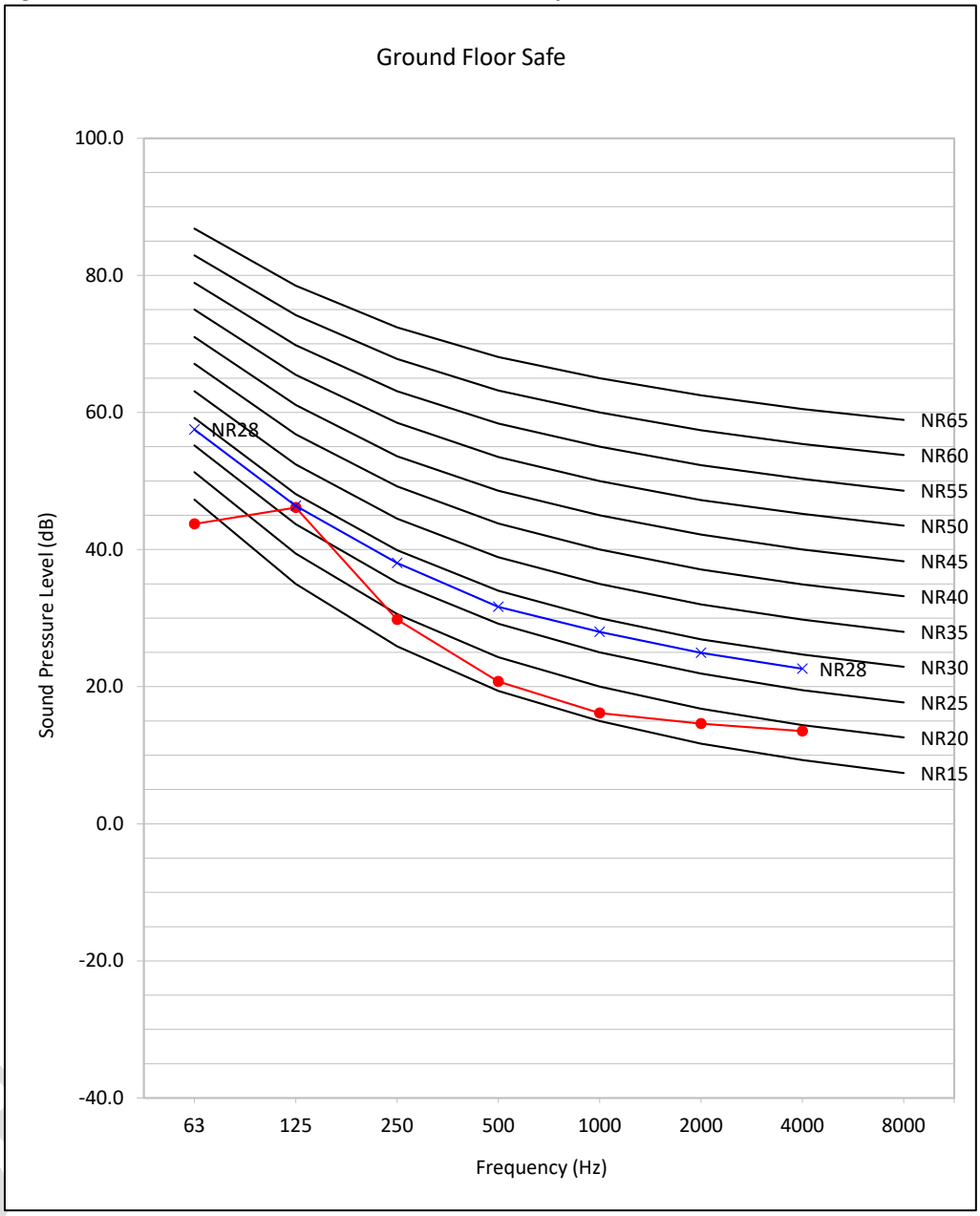


Figure 4 – Indicative NR Curve for Ground Floor Towards Front Measurement

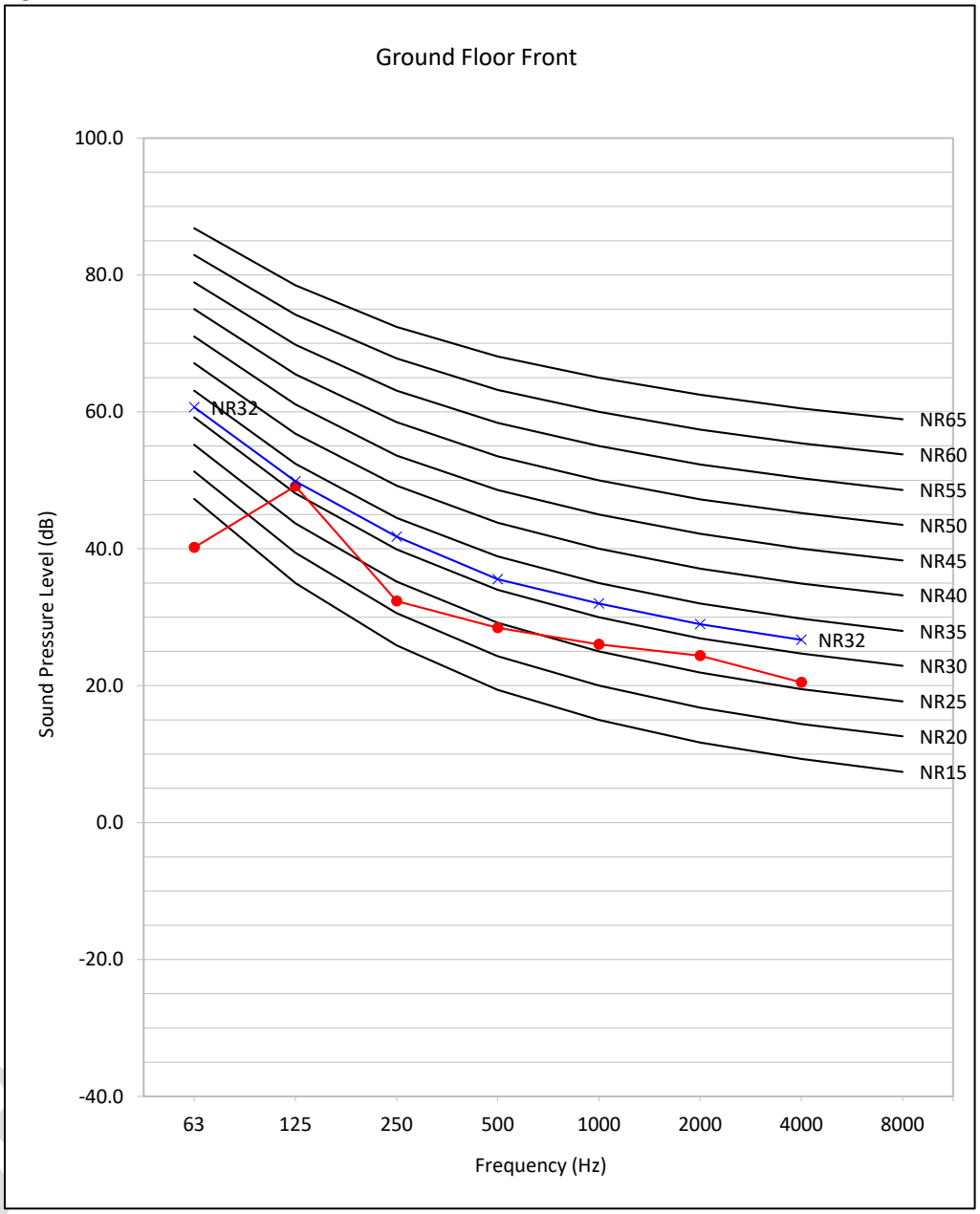


Figure 5 – Indicative NR Curve for First Floor Towards Front Measurement

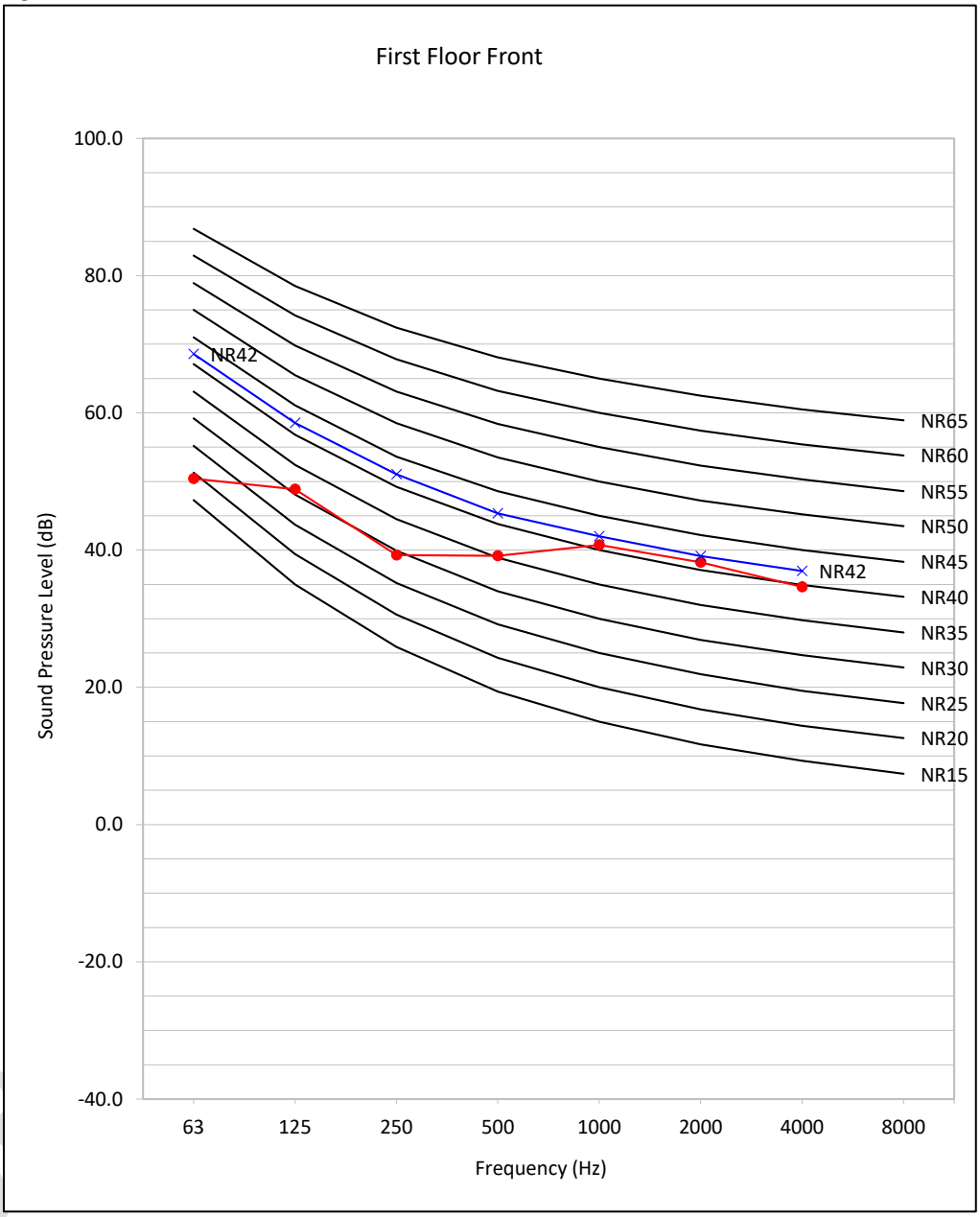
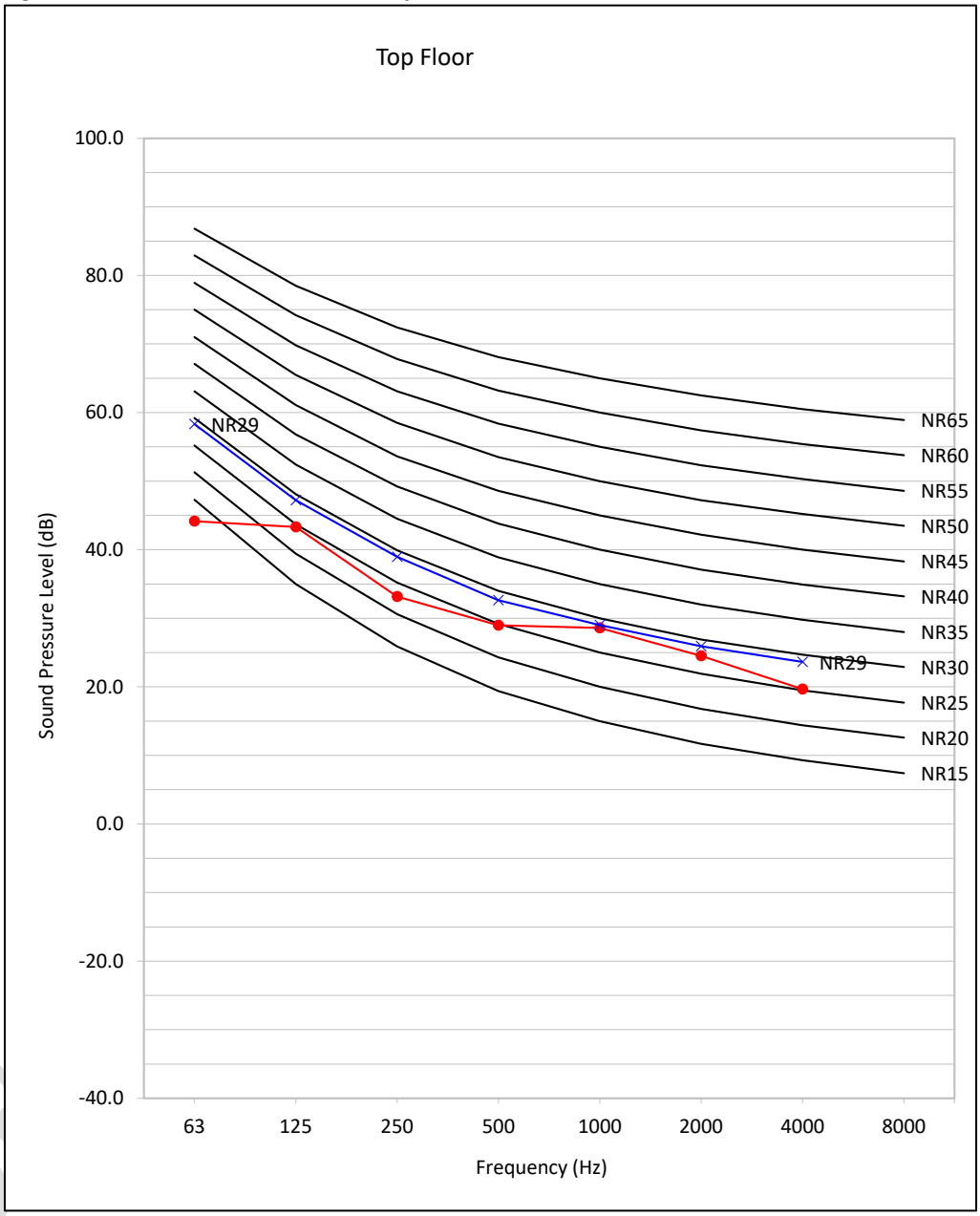


Figure 6 – Indicative NR Curve for Top Floor Measurement



Appendix 5
Proposed Development Drawings

A5.0 PROPOSED DEVELOPMENT DRAWINGS

Figure 7 – Proposed Ground Floor Layout

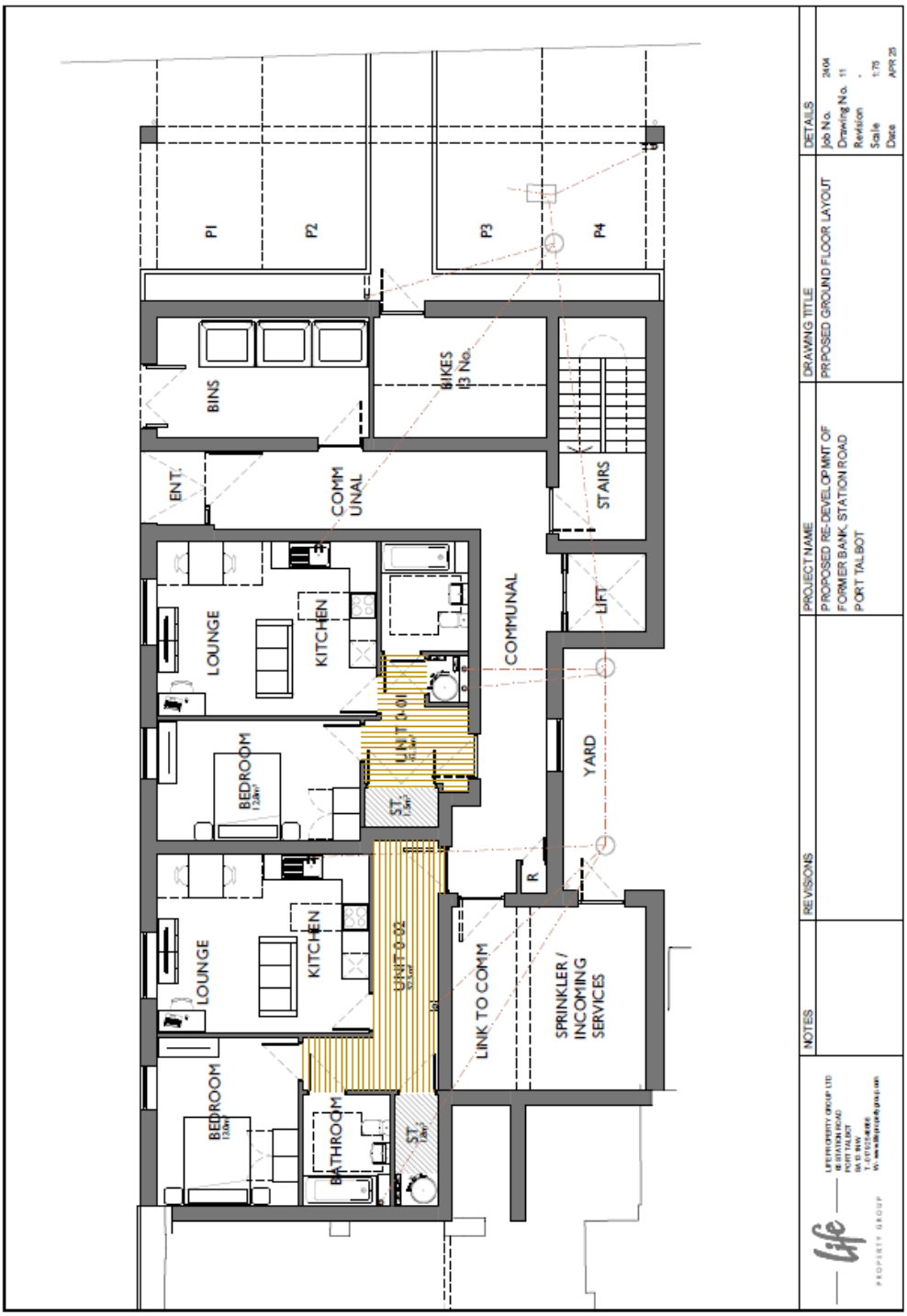


Figure 8 – Proposed First Floor Layout

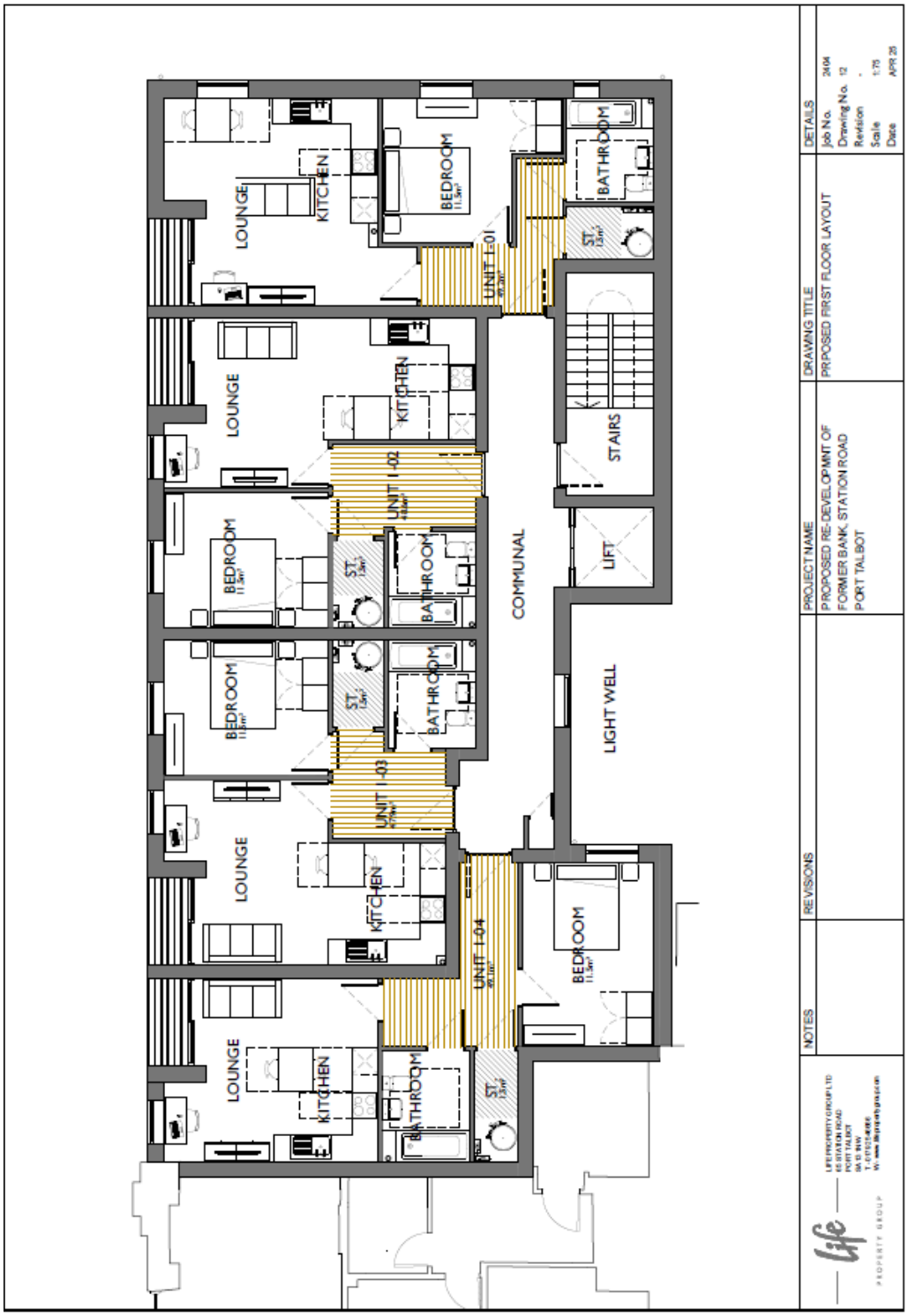


Figure 9 – Proposed Second Floor layout

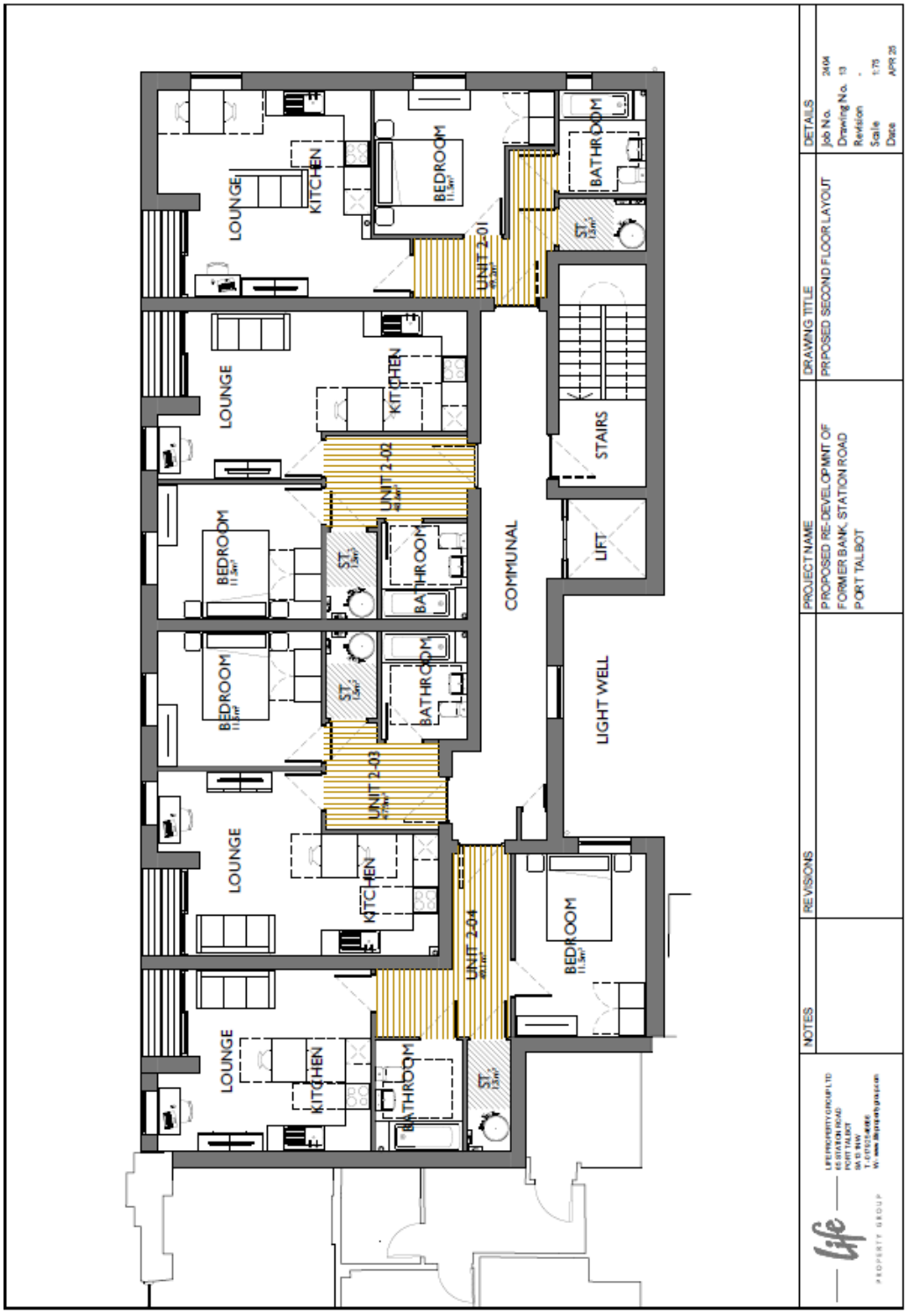


Figure 10 - Proposed Third Floor layout

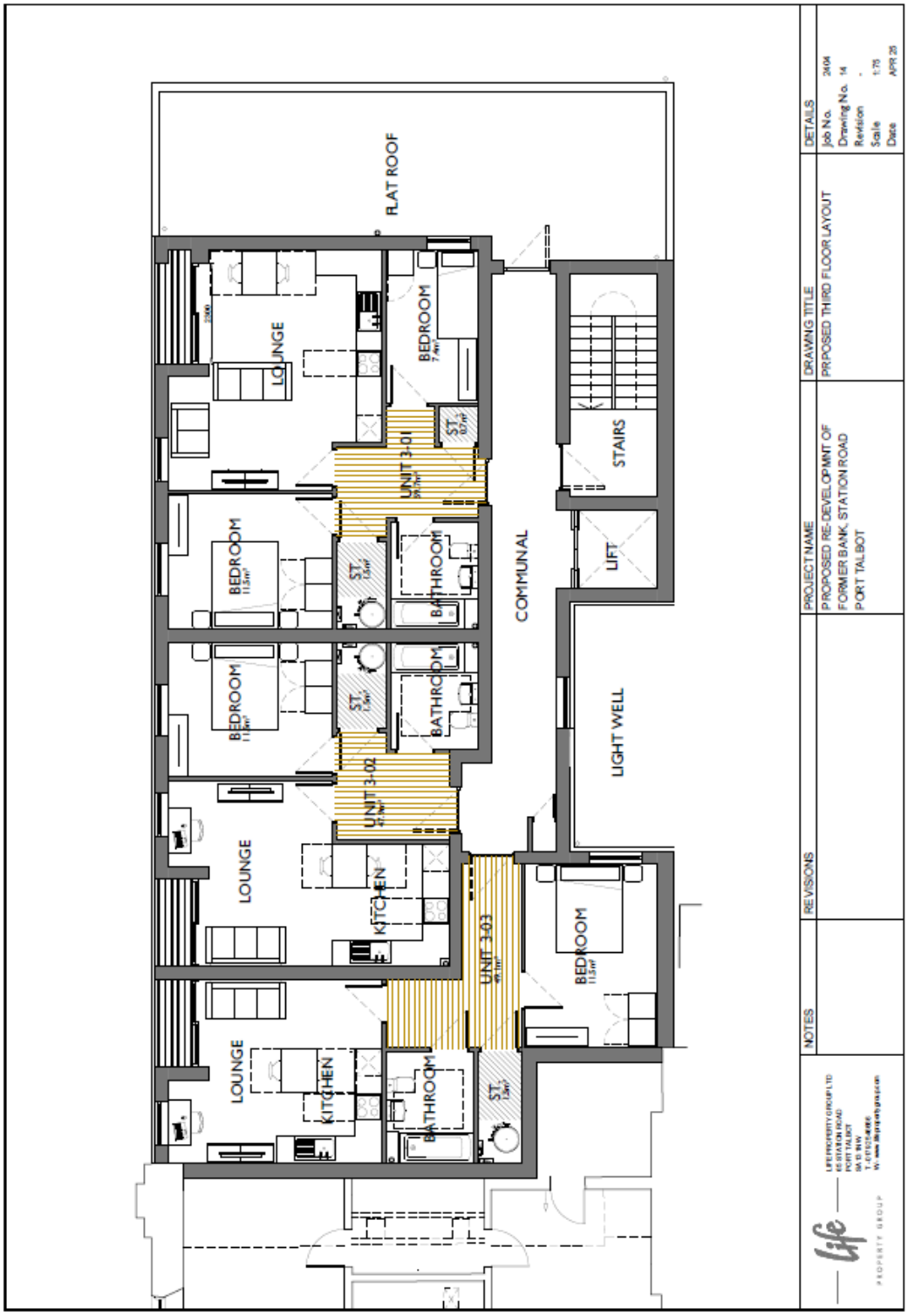


Figure 11 - Proposed elevations

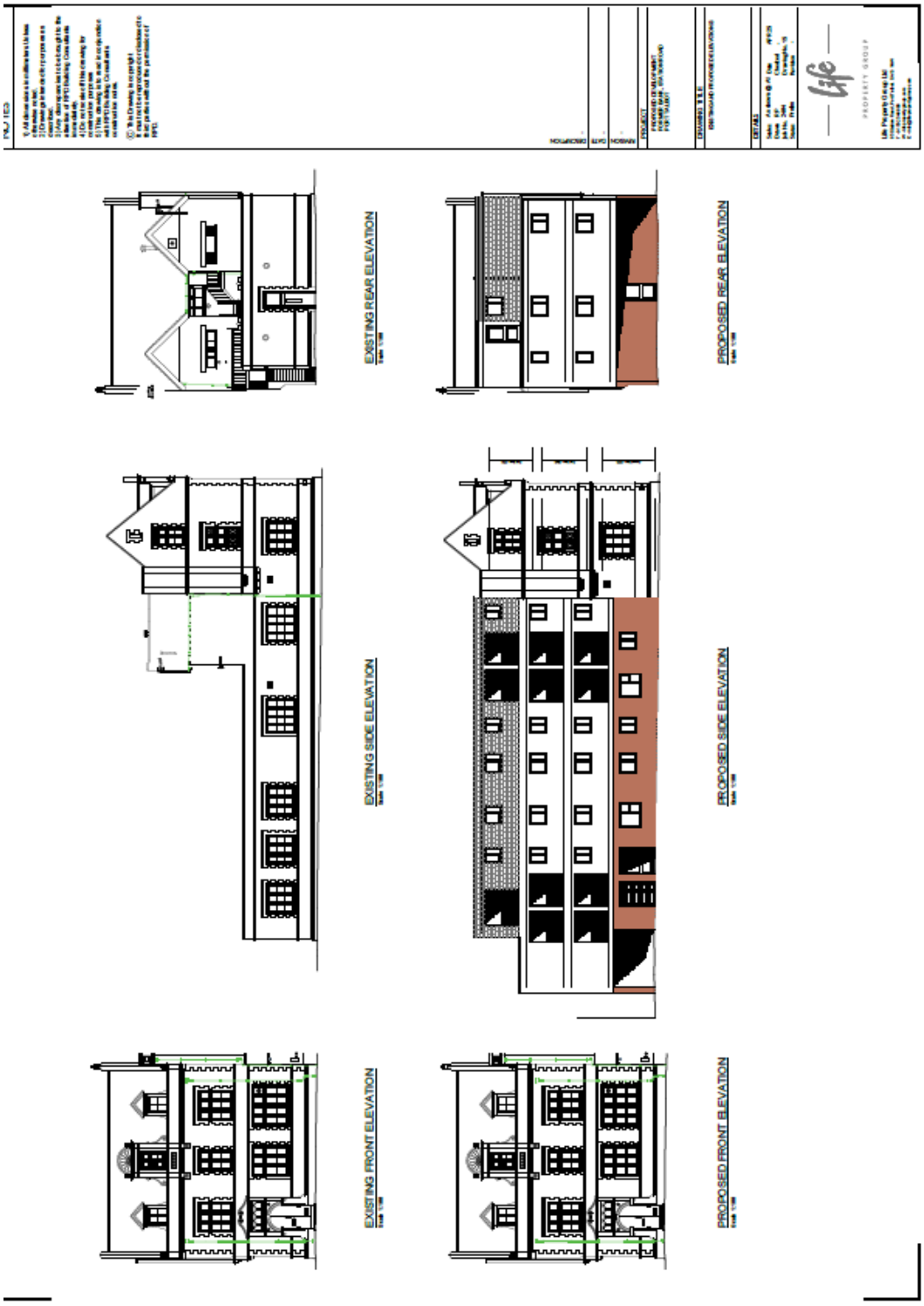
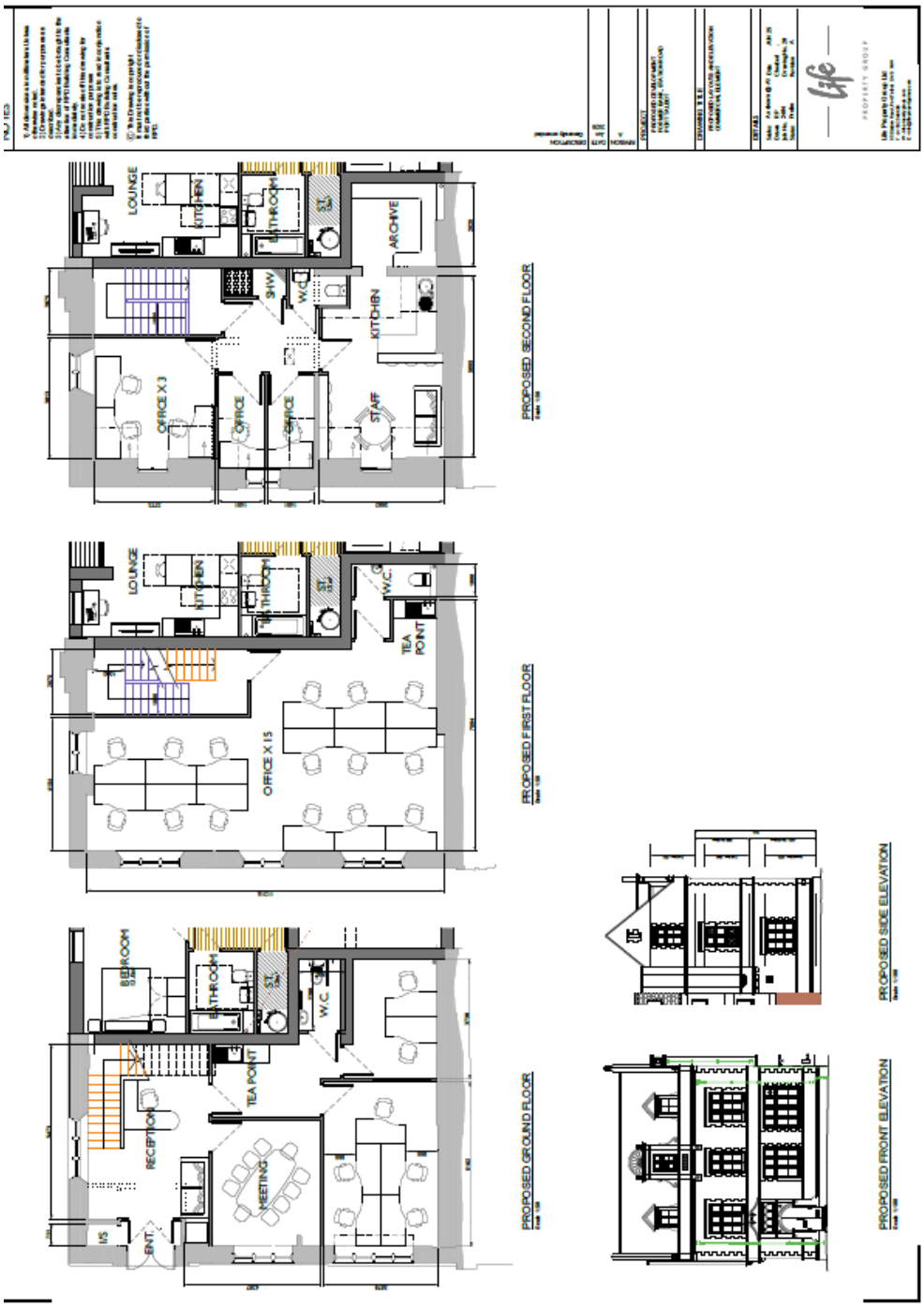


Figure 12 - Proposed Commercial layout



Appendix 6
Relevant Guidance

A6.0 RELEVANT GUIDANCE

A6.1 **Technical Advice Note 11 (TAN11) [2]**

A6.1.1 The requirements for the assessment of noise impact on a proposed development site are detailed in TAN11 (Noise). This document prescribes the measurement methods and standards to be used for the noise survey. The results of the survey are separated into day and night periods which are compared with four Noise Exposure Categories (NECs).

A6.2 **Noise Exposure Categories for Dwellings (NECs)**

When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four noise exposure categories the proposed site falls, taking account of both day and night-time noise levels. Local planning authorities should then have regard to the advice in the appropriate NEC, as shown in Table 22.

Table 22 – Planning Advice as per TAN11

NEC	Planning Advice
A	*Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.*
B	*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.*
C	*Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.*
D	*Planning permission should normally be refused.*

A6.2.1 The noise exposure category for the site is the measured noise level compared with the range of noise levels as shown in Table 23.

Table 23 – Free-Field Noise Levels Corresponding to the NECs, $L_{Aeq,T}$ dB

Noise source		Noise Exposure Category			
		A	B	C	D
Road traffic	0700-2300	<55	55-63	63-72	>72
	2300-0700	<45	45-57	57-66	>66
Rail traffic	0700-2300	<55	55-66	66-74	>74
	2300-0700	<45	45-59	59-66	>66
Air traffic	0700-2300	<57	57-66	66-72	>72
	2300-0700	<48	48-57	57-66	>66
Mixed Sources	0700-2300	<55	55-63	63-72	>72
	2300-0700	<45	45-57	57-66	>66

A6.2.2 Maximum noise event values L_{ASmax} of 82dB were analysed as per Note 2 [2].

"Note 2: Night-time noise levels 2300-0700): sites where individual noise events regularly exceed 82dBLAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8H (except where the LAeq,8H already puts the site in NEC D)".

A6.2.3 Mixed sources refer to any combination of road, rail, air and industrial noise sources. The '*mixed source*' values detailed in Table 23 are based on the lowest numerical values of the single source limits in the table. The '*mixed source*' NEC should only be used where no individual noise source is dominant.

A6.3 **Planning Policy Wales [3]**

A6.3.1 The foreword to the Planning Policy Wales (PPW) document states that '*PPW will help to ensure that the planning decisions taken in Wales, no matter how big, or how small, are going to improve the lives of both our current and future generations. It will support changing the way we live and work, and the buildings and environment of Wales, today, building a better environment to accommodate current and future needs*'.

A6.3.2 PPW sets out the land use planning policies of the Welsh Government. The primary objective is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, A well functioning planning system is fundamental for sustainable development and achieving sustainable places.

A6.3.3 The planning system should create sustainable places (Placemaking) which are attractive, sociable, accessible, active, secure, welcoming, healthy and friendly. Development proposals should create the conditions to bring people together, making them want to live, work and play in areas with a sense of place and well-being, creating prosperity for all.

A6.3.4 Placemaking in development decisions happens at all levels and involves considerations at a global scale, including climate change, down to the very local level, such as considering the amenity impact on neighbouring properties and people. Negative environmental impacts should be avoided in the wider public interest.

A6.3.5 The environmental impact relevant to this assessment, will be from noise. PPW refers to the term '*soundscape*' which it describes as '*the acoustic environment as perceived or experienced and/or understood by a person or people, in context (ISO definition)*'.

A6.3.6 An appropriate soundscape contributes to a positive experience of place as well as being necessary for public health, amenity and well-being. Conversely, noise pollution can have negative effects and should be reduced as far as possible.

A6.3.7 Certain sounds, such as those created by trees, birds or water features, can contribute to a sense of tranquillity whilst others can be reassuring as a consequence of their association with the normality of everyday activities. Problematic forms of sound are generally experienced as noise pollution and can affect amenity and be prejudicial to health or a nuisance. Noise action plans drawn up by public bodies aim to prevent and reduce noise levels where necessary and preserve soundscape quality where it is good. Both high and low levels of noise, depending on context, can be annoying or disruptive and impact on amenity, health

and well-being and as such should be protected through the planning process wherever necessary.

A6.3.8 A key planning policy principle is to consider the effects which proposed developments may have on soundscape quality and the effects which existing soundscape quality may have on proposed developments. Soundscape influences the choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor or inappropriate soundscapes.

A6.3.9 The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.

A6.3.10 Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur.

A6.4 **Noise and Soundscape Action Plan [4]**

A6.4.1 This document sets out action plans for each of the three agglomerations in Wales. These are identified as the Cardiff and Penarth agglomeration, the Newport agglomeration and the Swansea and Neath agglomeration.

A6.5 **ProPG: Planning & Noise [5]**

A6.5.1 Even though ProPG has been written principally to assist with the planning process in England, PPW recommends that the good acoustic design principles put forward in Supplementary Document 2 may also be adopted in Wales.

A6.5.2 A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally (inside noise-sensitive parts of the building(s)) and externally (in spaces to be used for amenity purposes).

A6.5.3 Good acoustic design should provide the optimum acoustic outcome, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements.

A6.5.4 In requiring good acoustic design, there is a hierarchy of noise management measures that LPAs should encourage, including the following, in descending order of preference:

- *Maximising the spatial separation of noise source(s) and receptor(s).*
- *Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.*
- *Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.*
- *Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.*
- *Using the layout of the scheme to reduce noise propagation across the site.*
- *Using the orientation of buildings to reduce the noise exposure of noise-sensitive rooms.*
- *Using the building envelope to mitigate noise to acceptable levels.*

A6.5.5 It is acknowledged that the inherent challenge of introducing noise-sensitive development in noisy locations can limit the extent to which good acoustic design can be achieved in harmony with the other factors that influence the overall quality of a scheme and that compromises may need to be made e.g. accepting that it may not always be possible to achieve acoustic standards with windows open or accepting that noise levels in parts of the outdoor amenity areas may not be optimal.

A6.5.6 Where the scheme relies on windows being closed to achieve good internal noise conditions, details should be provided why this approach has arisen and how the use of layout, orientation, spatial design and non-building envelope mitigation has been considered to minimise the need for reliance upon closed windows.

A6.5.7 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, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.

A6.5.8 A good acoustic design will be one that continues to minimise noise impacts and to avoid significant noise effects for the lifetime of the development or as long as is practicable taking into account other economic, environmental and social impacts. Ideally new development should also help to mitigate any existing adverse impacts elsewhere, for example by acting as a barrier between noisy infrastructure and any existing noise-sensitive uses that do not benefit from incorporated mitigation.

A6.6 **BS 8233 - Guidance on Sound Insulation and Noise Reduction for Buildings [6]**

A6.6.1 For many common situations, BS 8233 suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria for most people.

A6.6.2 The foreword advises that the information detailed in BS 8233 "*…takes the form of guidance and recommendations. It should not be quoted as it were a specification or a code of practice and claims of compliance cannot be made to it.*".

A6.6.3 Section 7.7.2 details the guideline values for desirable internal ambient noise levels within dwelling houses, flats and rooms in residential use (when unoccupied) when such properties are exposed to steady external noise sources.

A6.6.4 These guideline values range from 35 - 40 dB $L_{Aeq,16hrs}$ during the daytime period and 30 dB $L_{Aeq,8hrs}$ during the night time period as detailed in Table 24 below.

Table 24 – BS 8233 Internal Noise Level Guidelines

Activity	Location	07:00 – 23:00 hrs	23:00 – 07:00 hrs
Resting	Living Room	35 dB $L_{Aeq,16hrs}$	--
Dining	Dining room	40 dB $L_{Aeq,16hrs}$	--
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hrs}$	30 dB $L_{Aeq,8hrs}$

A6.6.5 The guidelines also provide scope for relaxing these values by up to 5 dB and still achieve reasonable internal conditions.

A6.6.6 The internal noise level in a room is calculated by subtracting the sound reduction performance of the external façade from the noise level outside the room.

A6.6.7 It should be noted that the acoustic performance of the building envelope will be reduced, in the event windows are opened for ventilation or cooling purposes, to no more than 10 to 15 dB(A).

A6.6.8 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 $L_{Aeq,16hrs}$ with an upper guideline value of 55 dB $L_{Aeq,16hrs}$ which would be acceptable in noisier environments.

A6.6.9 It is recognised that these guideline values may not be achievable in all circumstances where development might be desirable. In higher noise areas, 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.

A6.6.10 The guideline values presented in BS8233, applies to external noise as it affects the internal acoustic environment from sources without a specific character such as road traffic noise.

A6.6.11 BS 8233 provides both simple and detailed calculation methods for determining the internal ambient noise levels attributable to the external noise level. These methods are based on those given in BS EN 12354-3 [8].

A6.6.12 The indoor sound pressure level is estimated from the measured or calculated outdoor sound pressure level by using the sound level difference of the façade.

A6.6.13 The more rigorous calculation method described in BS 8233 uses octave band data to determine the internal noise level and is more appropriate where the external noise may exhibit specific characteristics.

A6.6.14 BS 8233 also states in section 7.7.2 that "*…regular individual noise evets can cause sleep disturbance. A guideline value may be set in terms of SEL of* $L_{Amax,F}$ *depending on the character and number of events per night…"*

A6.6.15 However, BS 8233 does not quantify what the L_{Amax} guideline value should be and therefore this assessment anticipates that any L_{Amax} criteria will make reference to the value presented in the W.H.O. guidelines [7].

A6.7 **Guidelines for Community Noise, W.H.O. [7]**

A6.7.1 Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood.

A6.7.2 The objective of the World Health Organization (WHO) is '*the attainment by all peoples of the highest possible level of health*'.

A6.7.3 WHO defines 'health' as '*A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'*. This broad definition of health makes reference to the concept of well-being and thereby includes noise impacts such as annoyance, speech interference, and impaired task performance as 'health' issues.

A6.7.4 The WHO guidelines deal with all aspects of environmental noise impact and provide guideline values for community noise in specific environments. Most of the

noise guidelines are given as period L_{Aeq} values. The relevant values for Dwellings are summarized in Table 25 below.

Table 25 – WHO Guideline Noise Levels for Dwellings

Residential Environment	Critical Health Effect(s)	$L_{Aeq,T}$ (dB)	Time Base, T
Outdoor Living Area	Serious Annoyance, daytime and evening	55	07:00 – 23:00 (16 hours)
	Moderate Annoyance, daytime and evening	50	07:00 – 23:00 (16 hours)
Dwelling, indoors	Speech intelligibility & moderate annoyance, daytime & evening	35	07:00 – 23:00 (16 hours)
Inside Bedrooms	Sleep disturbance, night-time	30	23:00 – 07:00 (8 hours)
Outside Bedrooms	Sleep disturbance, window open (outdoor values)	45	23:00 – 07:00 (8 hours)

A6.7.5 These guideline values consider specific environments and identified health effects. Each value is set at the lowest levels that affect health such as annoyance and were derived from annoyance studies.

A6.7.6 The guidelines, whilst not having any legal force in the UK, are commonly used by local authorities when setting environmental noise criteria for proposed developments.

A6.7.7 For a restful sleep, the W.H.O. guidelines further recommend that the indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10 to 15 times per night.

A6.7.8 In addition, the Guidelines also state that *"…at night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} so that people may sleep with the windows open…the noise reduction from outside to inside with the windows partly open is 15dB"*.

A6.8 **BS EN 12354 Part 3, Airborne Sound Insulation against Outdoor Sound [8]**

A6.8.1 This Standard specifies a calculation model to estimate the sound insulation or the sound pressure level difference of a façade or other external surface of a building. The calculation is based on the sound reduction index of the different elements from which the façade is constructed. Calculations can be carried out for frequency bands or single number ratings.

A6.8.2 The results of the calculation can be used to determine the indoor sound pressure level due to external sound sources such as road traffic.

A6.8.3 BS EN 12354 states that '*The sound level difference refers to a position 2m in front of the façade. If the calculated or measured outdoor sound pressure level refers to other positions or situations, the level at 2m in front of the façade should be deduced from it. It could, for instance, be deduced from the sound pressure level of the incident sound (without the building) by taking into account the façade reflection. For a plain façade this will result in a 3dB higher level, globally for all frequency bands*'.

A6.8.4 The indoor A-weighted sound pressure level can be determined from calculation in frequency bands for the appropriate frequency range, applying the A-weighting.

A6.8.5 Alternatively, the indoor A-weighted sound pressure level can be determined directly from the A-weighted outdoor sound pressure level, provided the level difference is expressed in a single number rating for the relevant outdoor sound spectrum in accordance with BS EN ISO 717-1 [9], i.e. applying the spectrum adaptation terms C_{tr} or C to describe the level difference as, for example, $R_w + C_{tr}$ when the outdoor sound is road traffic.

A6.9 **ISO 9613 [10]**

A6.9.1 Part 1 of this standard specifies an analytical method of calculating the attenuation of sound as a result of atmospheric absorption for a variety of meteorological conditions

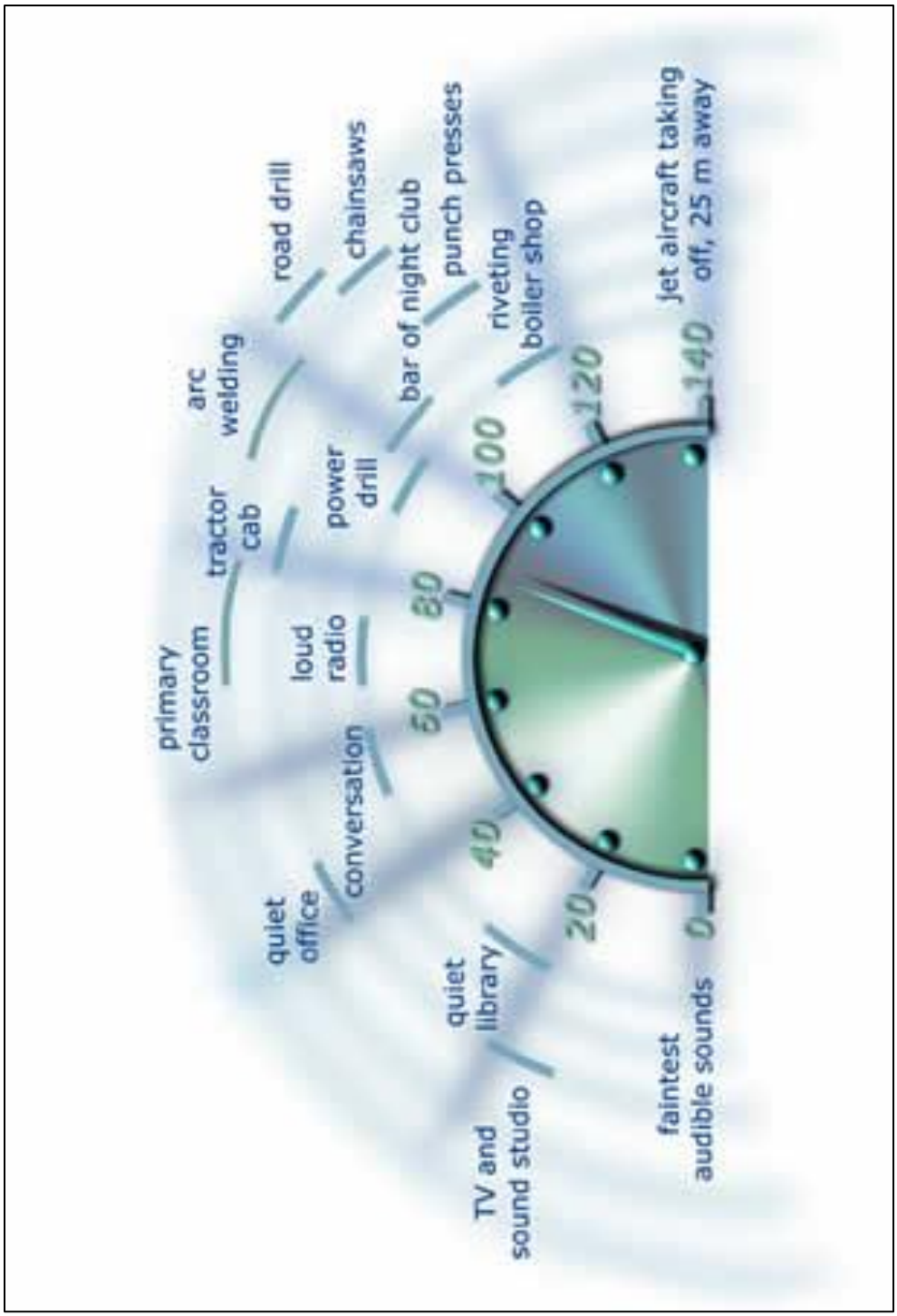
A6.9.2 Part 2 describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous

A-weighted sound pressure level (as described in ISO 1996) under meteorological conditions.

Appendix 7
Range of Typical Sound Levels

A7.0 RANGE OF TYPICAL SOUND LEVELS

Figure 13 – Range of Typical Sound Levels



Appendix 8
Glossary of Acoustic Terms

A8.0 GLOSSARY OF ACOUSTIC TERMS

A8.1 **Acoustic environment:**

Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013]

A8.2 **Ambient sound:**

Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far

NOTE The ambient sound comprises the residual sound and the specific sound when present.

A8.3 **Ambient sound level, $L_A = L_{Aeq,T}$:**

The equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T

NOTE the ambient sound level is a measure of the residual sound and the specific sound when present.

A8.4 **Background sound level, $L_{A90,T}$:**

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels

A8.5 **Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$:**

The value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10lg\left\{\left(\frac{1}{T}\right)\int_{t_1}^{t_2}\left[\frac{p_A(t)^2}{{p_0}^2}\right]dt\right\}$$

where:

p_0 *is the reference sound pressure (20 µPa); and*

$p_A(t)$ *is the instantaneous A-weighted sound pressure (P_A) at time t*

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

A8.6 **Measurement time interval, T_m:**

Total time over which measurements are taken

NOTE This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.

A8.7 **Rating level, $L_{Ar,Tr}$:**

Specific sound level plus any adjustment for the characteristic features of the sound

A8.8 **Reference time interval, T_r:**

Specified interval over which the specific sound level is determined

NOTE this is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.

A8.9 **Residual sound:**

Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

A8.10 **Residual sound level, $L_r = L_{Aeq,T}$:**

Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

A8.11 **Specific sound level, $L_s = L_{Aeq,Tr}$:**

Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r

A8.12 **Specific sound source:**

Sound source being assessed

A8.13 **A-weighting:**

Normal hearing covers the frequency (pitch) range from about 20 Hz to 20,000 Hz but sensitivity is greatest between about 500 Hz and 5,000 Hz. The 'A-weighting' is an electrical circuit built into noise meters to approximate this characteristic of human hearing.

A8.14 **Decibel (dB):**

The logarithmic measure of sound level. 0dB (A) is the threshold of normal hearing. 140 dB (A) is the level at which instantaneous damage to hearing is caused. A change of 1 dB is detectible only under laboratory conditions.

A8.15 **dB(A):**

Decibels measured on a sound level meter incorporating a frequency weighting (A-weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with an individual's assessment of loudness. A change of 3 dB (A) is the minimum perceptible under normal conditions and a change of 10 dB(A) corresponds roughly to doubling or halving the loudness of a sound.

A8.16 **Free Field:**

A sound field in which no significant sound reflections occur.

A8.17 **L_{Amax}:**

The maximum 'A-weighted' level of sound recorded during a sound event. The time weighting used (fast or Slow) should be stated.

A8.18 **Tonality:**

The degree to which a sound contains audible pure tones. Broadband sound (across a wider range of frequencies) is generally less annoying than sound with identifiable tones.

A8.19 **Frequency:**

The number of cycles per second of a vibration usually expressed in units of Hertz, Hz

A8.20 **Hertz:**

Unit of frequency, equal to one cycle per second. Frequency determines the pitch of a sound.

Appendix 9
References

A9.0 REFERENCES:

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6 BS 8233:2014. 'Guidance on sound insulation and noise reduction for buildings', British Standards Institution 2014

7 "Guidelines for Community Noise", Berglund, Lindvall, Schwela, World Health Organization, 1999

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