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(DRAFT) EXTERNAL CONDENSER UNIT NOISE ASSESSMENT REPORT

Project: Flat O at 71 Park Street, London, W1

Client: TF Associates Ltd

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1. INTRODUCTION

1.1 A noise assessment has been carried out at 71 Park Street, London, W1. Flat O on the fifth floor at 71 Park Street is to be refurbished and remodelled. The refurbishment works will include the installation of an air conditioning system. Two external condenser units are required which are to be located on the roof of 71 Park Street itself and as such, a noise survey and assessment report is required to accompany an application for planning and listed building consent for the new units. The nearest neighbouring windows/areas[1] (for assessment purposes) relate to (a) the fourth floor flat below (in 71 Park Street) and (b) the rear windows in the top floors of 16 Upper Brook Street. These windows are approximately 6m and 15m from the units' location respectively. The location of the proposed external units is shielded from both these neighbouring properties by either the roof-line or the external walls of 71 Park Street.

1.2 The measurements have shown that the proposed installation meets with the requirements of Westminster City Council (WCC) Noise Policy. As the proposed location of the external unit is shielded from neighbouring windows etc by the roof-line and external walls of the building itself, no additional noise attenuation measures are required to satisfy the criteria. The site location is given in Figure 1 below:

[1] There are windows in a common-access corridor on the 6th floor of 71 Park Street that overlook the flat roof where the AC units are to be located. These windows do not open and are therefore not included in the assessment.

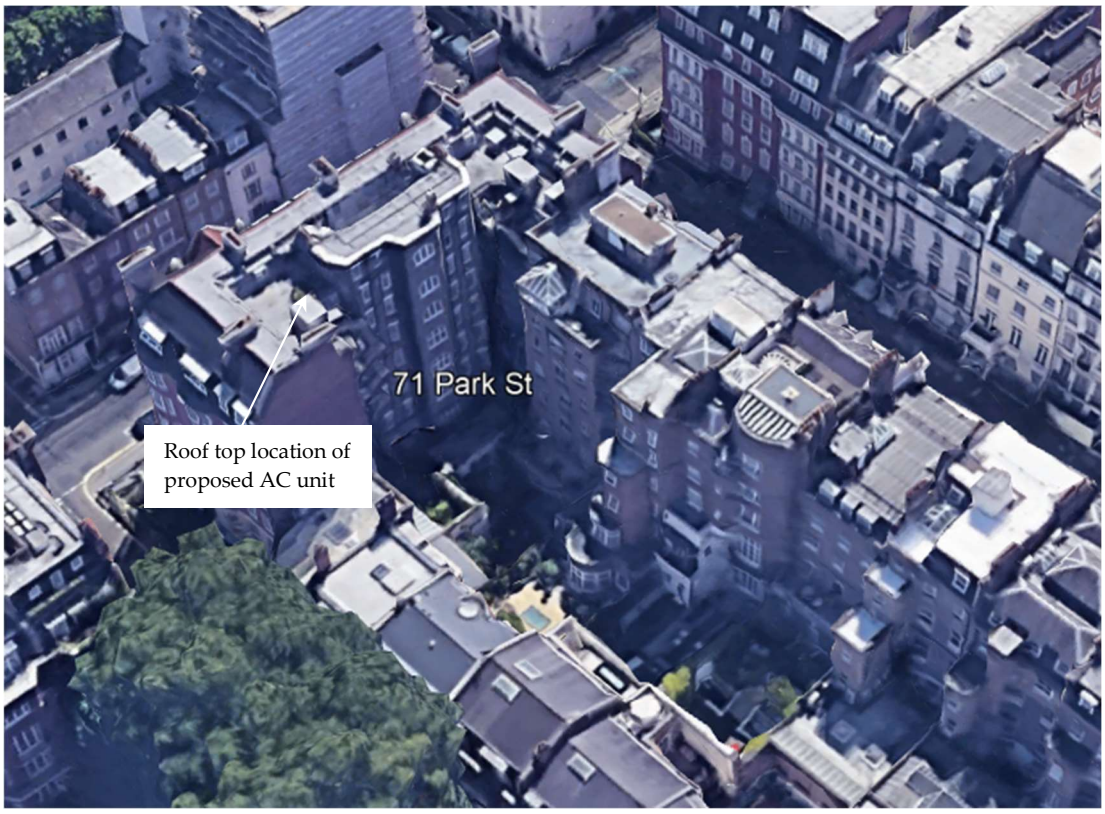


Figure 1: Site Location 71 Park Street from Rear (© Google Earth™)

2.0 NOISE MEASUREMENTS

2.1 Environmental noise measurements were carried out from Tuesday 21st to Thursday 23rd September 2021. Sound level measurement equipment was installed on the roof at 71 South Street towards the rear (adjacent to the proposed AC unit location). The equipment was used to log noise levels over the two-day period. The measurement equipment is listed below in Table 1.

Table 1: Environmental Noise Measurement Instrumentation

No	Description

1	Larson Davis Model 812 Class 1 Sound Level Meter with Model 377B02 ½" Diameter Condenser Microphone
2	Larson Davis Model CAL200 Sound Level Meter Calibrator.

2.2 All acoustic equipment conforms to the relevant parts of BS EN 60651:1994 (equivalent to BS 5969:1981) for the requirements of Type 1 acoustic accuracy. Additionally, the relevant equipment conforms to the specifications contained within BS EN 60804:1994 (equivalent to BS 6698:1976) for integrating sound level meters.

2.3 In order to verify the correct operation of the equipment on site, an acoustic calibrator was applied during the course of the measurements. A maximum change of 0.1 dB(A) was noted, this can be considered as an insignificant change. The calibrator complies with the specifications of IEC 942:2003. The instrumentation was previously factory calibrated in March 2021.

2.4 Fast meter response was used for all measurements carried out during the course of the survey.

2.5 Noise levels are expressed in terms of continuous equivalent noise levels (L_{Aeq}) over an appropriate time period. The use of L_{Aeq} allows non-steady and non-continuous noise to be assessed and compared to the existing noise climate. L_{Aeq} is referred to as the ambient noise level. In addition to

this background noise levels have also been measured and are expressed as L_{A90}. A full explanation of terminology commonly used in the measurement and assessment of noise levels is given in Appendix B at the end of this report.

3.0 RESULTS

3.1 Noise level measurements were carried out at 15-minute intervals during the survey period. Ambient (L_{Aeq}) and background (L_{A90}) noise levels were measured. Average noise levels for the day-time (07:00 to 19:00 hrs), evening time period (19:00 to 23:00 hrs) and night time period (23:00 to 07:00 hrs) have been determined. The results are summarised in Table 2 below.

Table 2: Summary Results

	Day	Evening	Night
L_{A90}	48.2	46.6	44.3(43.0)*
L_{Aeq}	54.3	48.7	46.6

*Note: the lowest night-time background noise level ($L_{A90, 15\ mins}$) was measured at 4.15am on the morning of Thursday 23rd September 2021.

3.2 Although the survey was not attended on a full-time basis, it was noted that during site visits that the rear of 71 Park Street is quite well shielded from traffic noise on nearby roads. Traffic noise was still audible though. Weather during the survey period was generally dry with light winds. A full listing of 15-minute interval data for each measurement location is given in the graph at the end of this report (Figure A1). A photograph showing the noise monitor in position on the roof is shown in Figure A2.

3.3 Noise level data for the proposed external condenser units, 2x Daikin RXYSQ6TV9 to be installed have a noise level of 51 dB(A) for each unit (at a distance of 1m) in heating mode respectively - See attached data sheet shown in Figure A3 which also shows the octave band sound pressure level spectrum).. The proposed layout with respect to the neighbouring windows is given in Figure A4 at the end of this report.

3.4 Calculated noise levels are as follows (See Figure A4 for full details):

4th Floor Flat – 71 Park Street

			63	125	250	500	1k	2k	4k	8k	A
1. Daikin RXYSQ6TV1											
1.1	SPL at 1m		56	53	50	47	46	44	38	33	
	2 units		3	3	3	3	3	3	3	3	
A-weighting			-26	-16	-9	-3	0	1	1	-1	
			33	40	44	47	49	48	42	35	54
Rev Effect of Walls			2	2	3	3	3	4	4	3	
Barrier from roof-line		0.5	-9	-10	-12	-15	-18	-20	-23	-20	
Distance Correction		5m	-14	-14	-14	-14	-14	-14	-14	-14	
Resultant SPL dB(A)			**12**	**18**	**21**	**21**	**20**	**18**	**9**	**4**	**27**

Rear Windows of 16 Upper Brook Street

			63	125	250	500	1k	2k	4k	8k	A
1. Daikin RXYSQ6TV1											
1.1	SPL at 1m		56	53	50	47	46	44	38	33	
	2 units		3	3	3	3	3	3	3	3	
A-weighting			-26	-16	-9	-3	0	1	1	-1	
			33	40	44	47	49	48	42	35	54
Rev Effect of Walls			2	2	3	3	3	4	4	3	
Barrier from external walls		0.1	-7	-8	-9	-10	-11	-12	-14	-14	
Distance Correction		15m	-24	-24	-24	-24	-24	-24	-24	-24	
Resultant SPL dB(A)			**4**	**10**	**14**	**16**	**17**	**16**	**8**	**0**	**23**

3.5 As the existing background noise levels are above the WHO guidelines (as described in detail in Westminster Policy ENV 7: Controlling Noise from

Plant …) paragraph 1 option (a) applies and noise emissions from the proposed plant *"should not exceed 10 dB below the minimum external background noise level at the nearest noise sensitive properties."* The proposed air conditioning equipment does not attract the + 5 dB(A) correction referred to in the noise policy. It therefore follows that the criterion to meet is 33 dB(A) for the night time period (which has the lowest measured noise levels). The calculation shows that the required criterion is therefore met and no additional noise mitigation measures are required.

4.0 CONCLUSION

4.1 A noise measurement survey and assessment has been carried out for the external air conditioning units which is to be installed on the roof-top at 71 Park Street, London W1. The units will serve Flat O which is to be refurbished and remodelled.

4.2 The proposed installation has been shown to meet with Westminster City Council's acoustic criteria without additional noise mitigation measures as the units are shielded from neighbouring windows by the roof-line and external walls of 71 Park Street itself.

APPENDIX A: GRAPHS AND FIGURES.

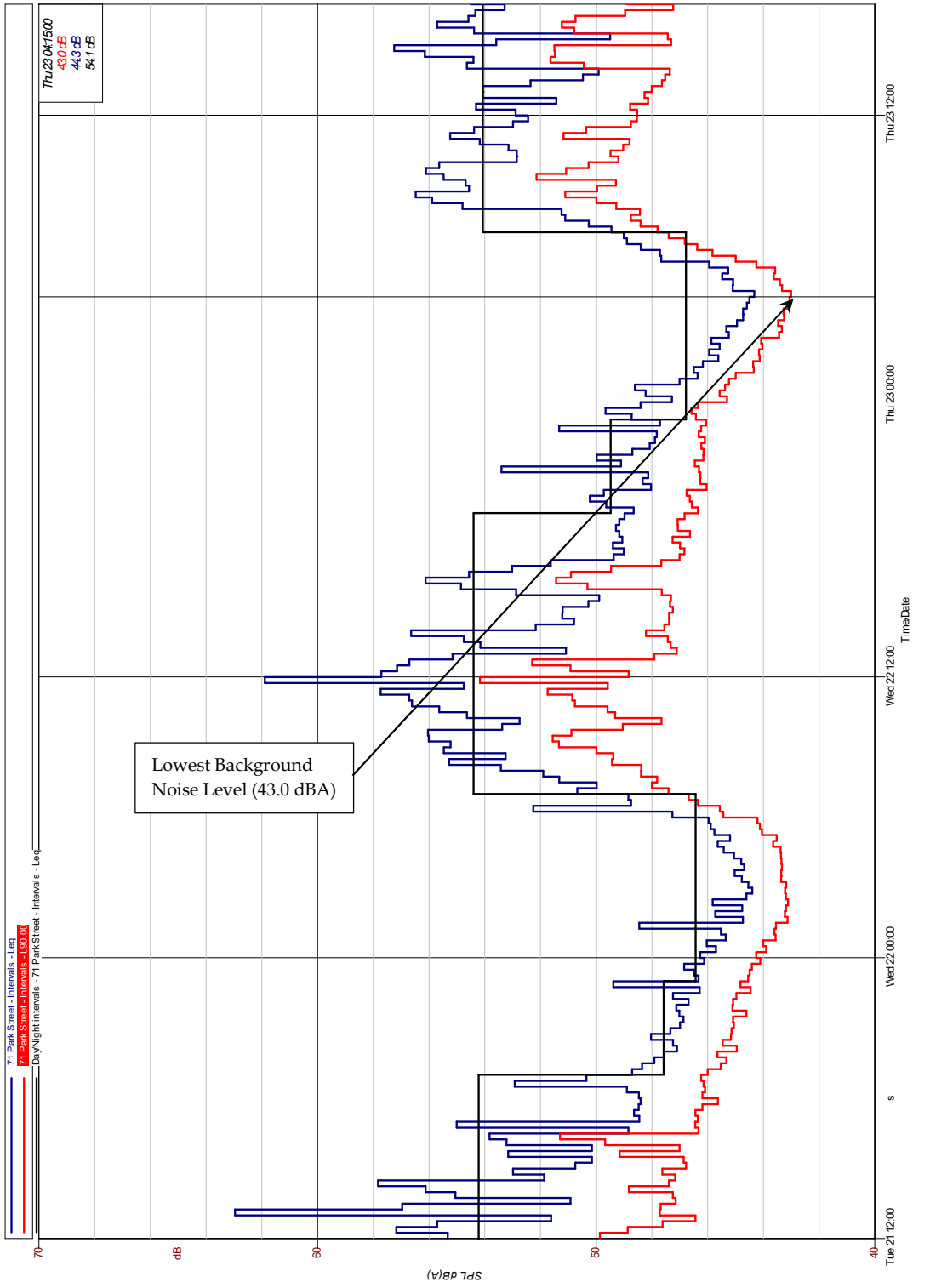


Figure A1: Environmental Noise Measurement Data – Roof-top at 71 Park Street, London W1 (Tuesday 21st to Thursday 23rd September 2021)

Figure A2: Photograph showing noise measurement equipment on the roof-top at 71 South Street, London W1

Figure A3: Equipment Noise Data

Daikin RXYSQ6TV

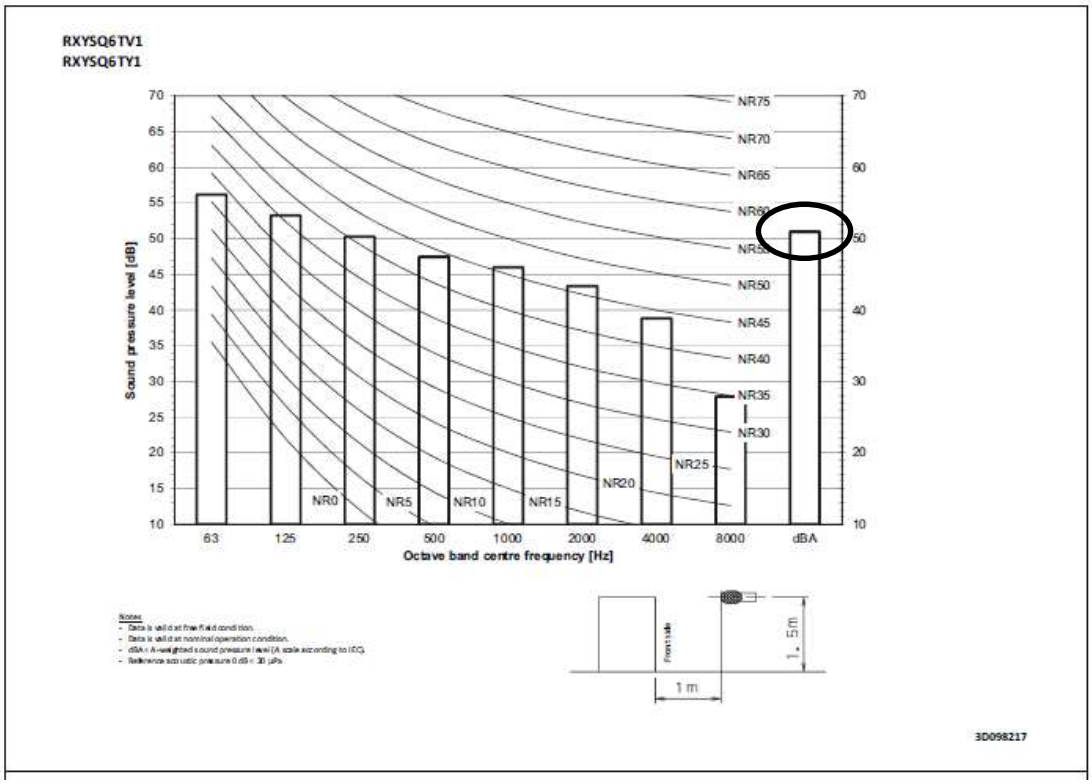
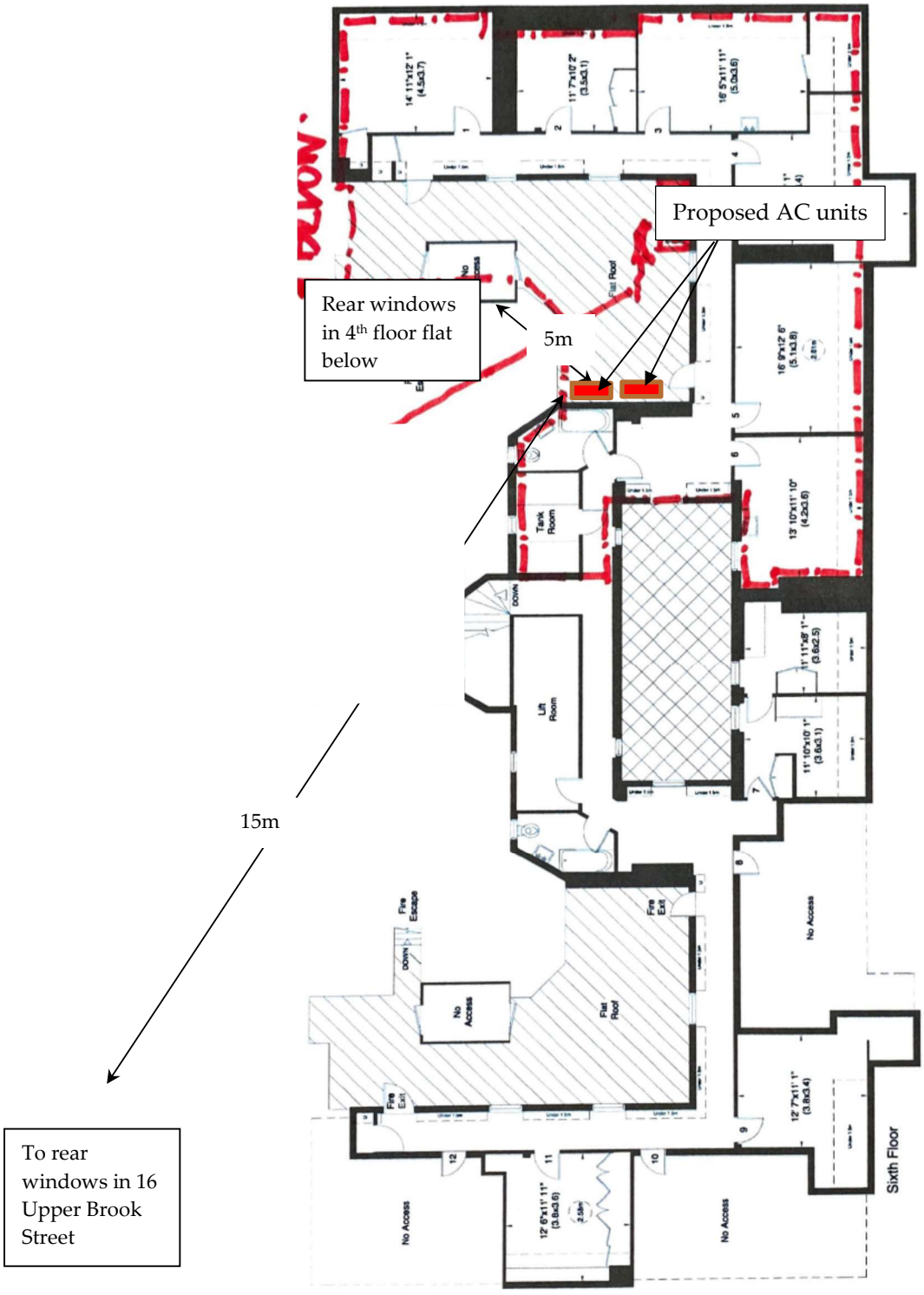


Figure A4: Proposed layout showing Air Conditioning plant



APPENDIX B: GLOSSARY OF NOISE TERMS AND UNITS.

1.0 Noise

1.1 The sounds that we hear are as a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as train engines or wheels, and they travel to a receiver, i.e. the human ear, as air pressure waves.

1.2. The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m^2) to the highest that can be withstood without physical pain (about 10 watts/m^2). If we were to use a linear scale to represent this range of human sensitivity it would encompass more than a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.

1.3. The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A more practical operating range of 0 to 120 is obtained by multiplying by 10, ie. 10 x Bel, which produces the scale units known as decibels or dB.

1.4. Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Commercial four-engine jet aircraft at 100m	120dB
Riveting of steel plate at 10m	105dB
Pneumatic drill at 10m	90dB
Circular wood saw at 10m	80dB

Heavy road traffic at 10m	75dB
Male speech, average, at 10m	50dB
Whisper at 10m	25dB
Threshold of hearing, 100Hz	0dB

1.5. Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, ie. A rise of 3dB for each doubling of sound intensity. Subjectively, a 3dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10dB.

1.6. The subjective loudness of noise can be measured by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A).

1.7. dB(A) noise levels can be measured using a variety of noise indices. The index which correlates best with human response due to machinery noise is the L_{Aeq} this is the A-weighted L_{eq} which is referred to as the 'equivalent continuous noise level' and is a measure of the total sound energy generated by a fluctuating sound signal within a given time period.