

50 CROWN STREET, READING

Planning Compliance Review
Report 15263.PCR.01

Platinumsa Limited
Red Cow
50 Crown Street
Reading
RG1 2SE

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1.0 INTRODUCTION

KP Acoustics has been commissioned by Platinumsa Limited, Red Cow, 50 Crown Street, Reading, RG1 2SE to undertake an environmental noise survey at the same locations.

The background noise levels measured will be used to determine the noise emission criterion for a proposed kitchen extraction in accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound*' as part of the planning requirements of Reading Council.

This report presents the methodology and results from the environmental survey, followed by calculations in accordance with BS4142 to provide an indication as to the likelihood of the noise emissions from the proposed plant unit installation having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by a commercial/residential building to the north, a car park to the East, Crown Street to the South, and Southampton Street to the East.

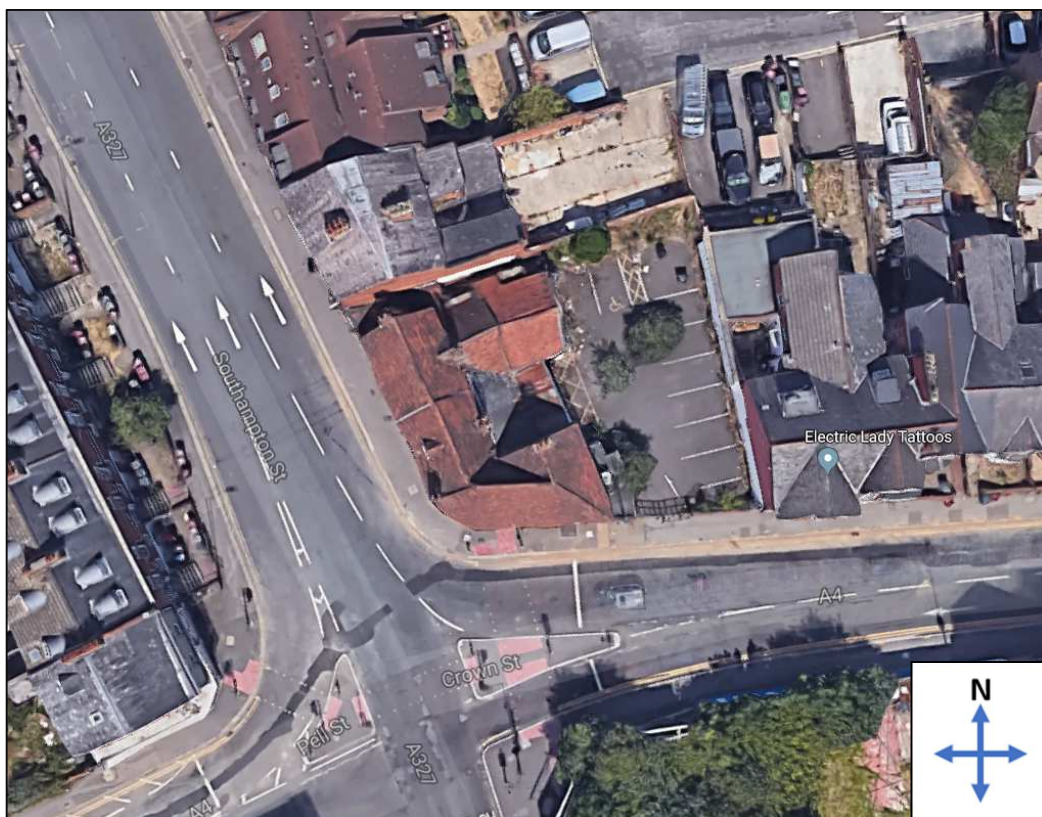


Figure 2.1 Site Location Plan (Image Source: Google Maps)

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment, with the dominant source being road traffic noise from the Southampton and Crown Street

2.2 Environmental Noise Survey Procedure

A noise survey was undertaken at the proposed site as shown in site plan 15263.SP1. The locations were chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

It was not possible to gain suitable access for an unattended, automated noise survey at the site due to there being no secure location to install the monitoring equipment. A manual measurement procedure was undertaken in lieu, in compliance with ISO 1996-2:2007 Acoustics "Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels".

The noise levels were measured at a location where they would be representative of the noise profile at the identified sensitive receiver between 9:00 and 10:30 on 28/11/2016. A Measurement close to Crown street was also undertaken for comparison with that carried out closer to the receiver.

The environmental noise measurement position, proposed plant installation locations, and the closest noise sensitive receiver relative to the plant installations are described within Table 2.1 and shown within Figure 2.2 and 2.3.

Icon	Descriptor	Location Description
	Noise Measurement Position closer to the receiver	The meter was installed 1.5m above ground and separated from any reflective wall surface.
	Noise Measurement Position closer to the main roads	The meter was installed 1.5m above ground and separated from any reflective wall surface.
	Closest Noise Sensitive Receiver	Window of the rear extension of 48 Crown street. It is assumed that it is a residential window.
	Location of the duct termination of the kitchen extraction system	Proposed plant installations are outlined in Section 5.1

Table 2.1 Measurement position and description

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise.

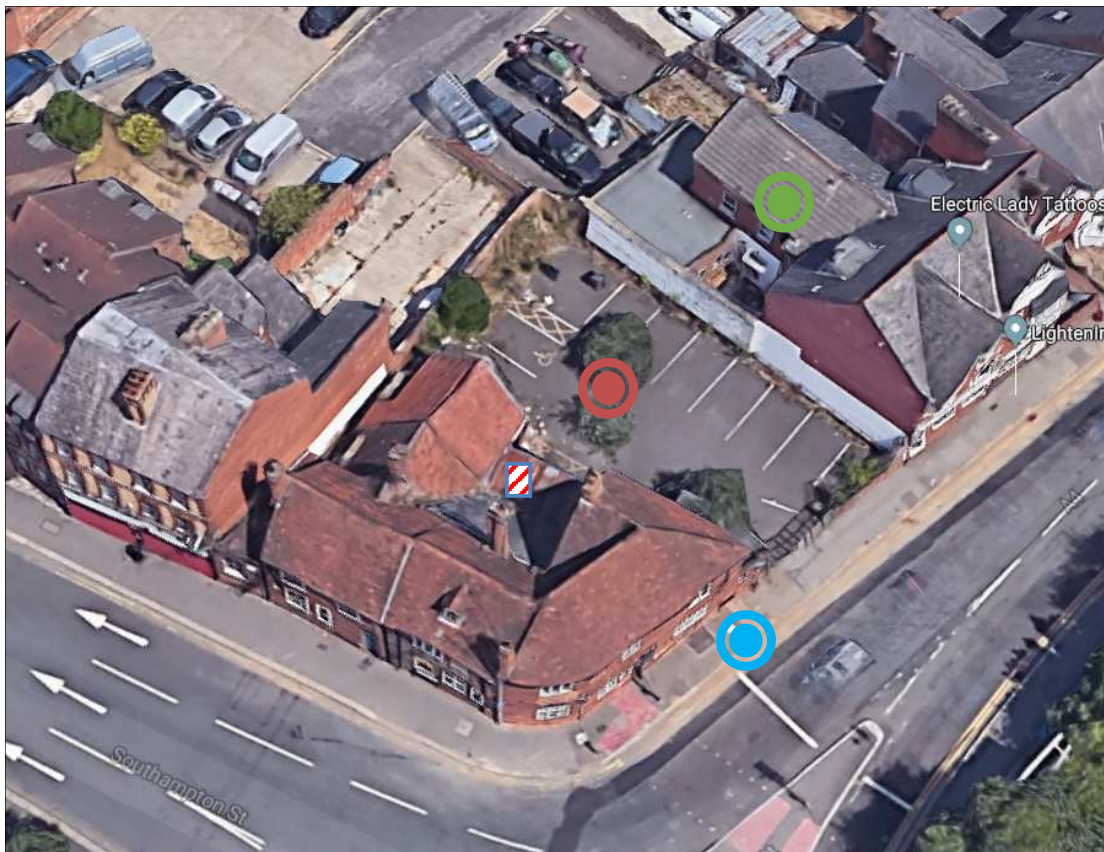


Figure 2.2 Site measurement position, identified receiver and proposed plant unit installation (Image Source: Google Maps)

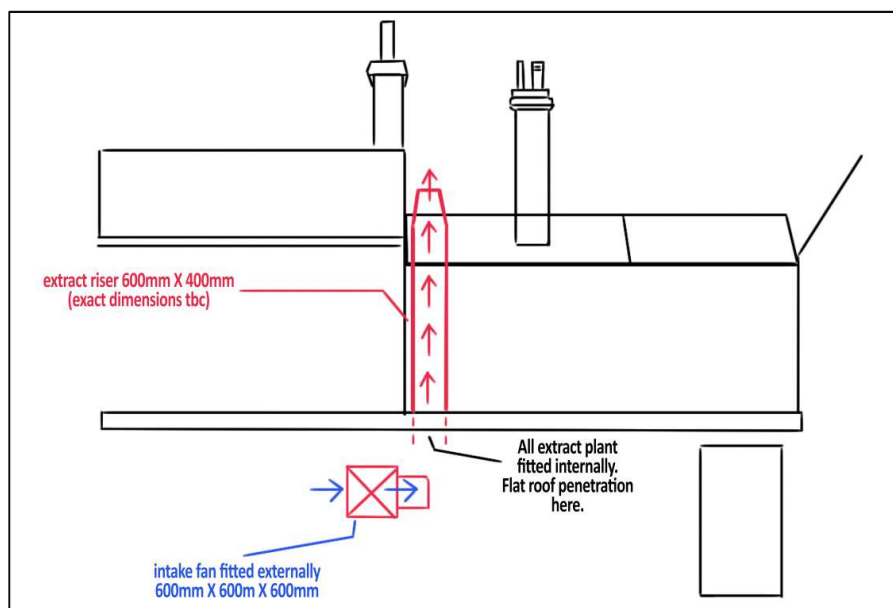


Figure 2.3 Installation layout of extractor and intake fans. Rear elevation

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 no. NTi XL2A Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The measured representative background noise levels of the area are shown in Table 3.1.

Descriptor	Location close to main roads (Crown Street)	Location closer to the receiver's window (Rear of 50 Crown Street)
Background Noise L ₉₀ , 15min (dBA)	61	54

Table 3.1: Representative measured background noise level

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

The area closer to the receiver's window would be protected from the traffic noise due to the envelope of the buildings. As shown in Table 3.1, the noise level measured closer to the identified receiver's window is 7 dB lower than the level measured closer to the road.

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'

British Standard BS4142:2014 'Methods for rating and assessing industrial and commercial sound' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question (L_{Aeq, T_r}), including any relevant acoustic feature corrections, as follows:

- **Tonality** – *‘For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible’*
- **Impulsivity** – *‘A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible’*
- **Intermittency** – *‘If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied’*
- **Other sound characteristics** – *‘Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied’*

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the impact
- 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 could be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

4.2 Local Authority Guidance

The criterion of Reading Council for noise emissions of new plant in this instance is as follows:

Noise assessments should be prepared by suitably qualified acousticians. They should usually outline the existing noise environment, the potential noise sources from the development, or the noise sources likely to affect the development, together with any mitigation measures. Advice should be sought from the council's Public Protection Service for individual requirements. (BS4142). The assessment should include information about: the sound power level and the likely resultant noise level of equipment at the site boundary for all noise-producing machinery such as extract ventilation systems, refrigeration equipment etc. that is likely to be installed [...]"

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

It is understood that the proposed plant installation is comprised of the following units:

- 1 No. Flakt Woods JC240619DW kitchen extractor fan. Combination of 700 x 400 mm and 500 x 200mm rectangular ductwork.
- 1 No. Flakt Woods JC240619DW intake air fan to supply air to the kitchen. Combination of 400 x 400 mm and other square ductwork to be confirmed by the supplier.

The kitchen extractor fan will be located internally, and the ductwork will penetrate the rear flat roof and discharge above the building pitched roof. The proposed intake fan will be installed on the rear façade of Public House at 50 Crown Street as shown in Figure 2.3.

The noise emission levels as provided by the manufacturer for the units are shown in Table 5.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Over all (dBA)
		63	125	250	500	1k	2k	4k	8k	
Extractor fan	Sound Power Level. SWL (dB)	89	89	83	79	76	73	68	62	82
Intake Fan	Sound Power Level. SWL (dB)	80	80	79	75	71	71	66	58	78

Table 5.1 Plant Units Noise Emission Levels as provided by the manufacturer

5.2 Closest Noise Sensitive Receiver

The closest noise sensitive receiver to the proposed installation location has been identified as being a residential window on the rear extension of 48 Crown Street, located approximately 16 metres from the proposed extraction system duct termination.

5.3 Calculations

The ‘Specific Sound Level’ of each plant unit installation has been calculated at 1m from the closest receiver using the noise levels shown in Table 5.1, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc. Detailed calculations for each plant unit installation are shown in Appendix B.

The ‘Rating Level’ of each plant installation have been assessed following the guidelines of BS4142 when the plant would be operational, with a subsequent conclusion taking into consideration the above context. The full BS4142 assessment is presented in Table 5.2.

BS4142 Assessment		
Source:	Kitchen extraction system and intake fans	
Operating Period:	Daytime	
Reference time interval (T_r):	1 h	
Receiver:	First Floor window on the rear extension at 48 Crown Strett, Reading.	
Element	Level (dB)	Comment
Specific Sound Level $L_s = L_{Aeq, T_r}$	37	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 . In this case, the specific sound levels take into consideration published noise data from the manufacturers, with appropriate corrections for

		attenuation due to distance, reflections, and any screening or proposed mitigation
Representative Background Noise Level $L_{A90, T}$	54	Sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T . Derived using the most common occurring levels $L_{A90, 5min}$ during the environmental noise survey undertaken on site
Acoustic Feature Correction	+3	A +2dB correction has been applied for tonality, in case the extractor fan could generate mild tonal noise.
Rating Level	40	Rating Level = Specific Sound Level + Acoustic Feature Corrections
Excess of rating over background sound level	-14	
Assessment Indication		
Assessment indicates a negative exceedance of 14 dB, therefore it is unlikely that an adverse impact on the receiver would occur provided that the mitigation measures outlined in Section 6.1 are implemented.		

Table 5.2 BS4142 assessment

6.0 NOISE CONTROL MEASURES

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following noise control strategy should be adopted.

6.1 Kitchen Extraction System

In order to control the noise emissions from the kitchen extraction system duct termination point, an acoustic silencer should be installed right after the fan outlet. The silencer should provide the minimum insertion loss values outlined in Table 6.1 below.

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Silencer for both extract and intake fan. Figures based on a circular silencer 600mm diameter.	2	4	6	14	16	16	13	11

Table 6.1 Insertion loss figures to be provided by acoustic silencer

The same type of silencer should be installed in the inlet of the intake fan.

6.2 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

7.0 CONCLUSION

An environmental noise survey has been undertaken at 50 Crown Street, Reading, by KP Acoustics Ltd between 9:00 and 10:30 on 28/11/2016. The results of the survey have enabled a representative background noise level to be set.

Manufacturer's noise data of proposed plant units has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014 for compliance with Reading Council requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014.

It has been concluded that noise emissions from the proposed plant units would not have an adverse impact on the nearest residential receivers provided that the noise control strategy presented in Section 6 is followed.

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

50 Crown street, Reading

PLANT NOISE EMISSIONS CALCULATIONS

Source: Kitchen Extraction System fan Receiver: window to the rear extension at 48 Crown Street	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Duct Termination									
Fan Outlet. Sound Power level.	89	89	83	79	76	73	68	62	82
Correction due to Silencer Insertion Losses	-2	-4	-6	-14	-16	-16	-13	-11	
Correction for duct length	-5	-5	-3	-2	-1	-1	-1	-1	
Correction for end reflections	-9	-5	-2	-1	0	0	0	0	
Correction for Sound Pressure level at 1m from termination	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for directivity	-2	-3	-4	-8	-12	-17	-23	-28	
Correction for distance	-24	-24	-24	-24	-24	-24	-24	-24	
Total SPL at receiver due to duct termination noise emissions	37	38	34	19	12	4	-4	-13	27
Duct Break Out									
Fan Outlet. Sound Power level.	90	88	85	80	75	70	70	65	82
Correction for duct wall	-51	-53	-51	-44	-36	-26	-29	-29	
Correction due to radiating surface	8	8	8	8	8	8	8	8	
Correction for conversion from SWL to SPL	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for close surfaces	3	3	3	3	3	3	3	3	
Correction for distance	-24	-24	-24	-24	-24	-24	-24	-24	
Correction due to Silencer Insertion Losses	-2	-4	-6	-14	-16	-16	-13	-11	
Total SPL at receiver due to duct break out noise emissions	13	7	4	0	0	4	4	1	10
Intake Fan									
Fan inlet. Sound Power Level	80	80	79	75	71	71	66	58	78
Correction due to Silencer Insertion Losses	-2	-4	-6	-14	-16	-16	-13	-11	
Correction for conversion from SWL to SPL	-11	-11	-11	-11	-11	-11	-11	-11	
Correction for close surfaces	3	3	3	3	3	3	3	3	
Correction for distance	-23	-23	-23	-23	-23	-23	-23	-23	
Total SPL at receiver due to duct break out noise emissions	47	45	42	30	24	24	22	16	37
Sound Pressure Level at Receiver due to All Units, dB	48	46	43	30	24	24	22	16	37

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

- 1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.
- 1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.
- 1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

- 2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.
- 2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.
- 2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.
- 2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

- 2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.
- 2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.
- 2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 Type A Bases (A.V. Rails)

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

3.2 Type B Bases (Steel Plant Bases)

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 Type C Bases (Concrete Inertia Base: for use with steel springs)

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m³) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.