University of Manchester

Chemistry Building

Noise Assessment

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Summary

RPS Planning & Development Ltd. has been commissioned to carry out a noise impact assessment relating to proposed services plant noise associated with the University of Manchester's Chemistry Building (the Site).

A noise survey has been carried out between 1330 and 1233 hours on Thursday/Friday 15th / 16th December 2011. The dominant noise source affecting the site was found to be road traffic on surrounding roads and existing plant noise from the Site and surrounding buildings.

Limiting plant noise levels have been set based upon the results of this survey in accordance with Local Authority requirements. Noise limits have been set based upon the prevailing background noise levels in the absence of extraneous noise and compliance with these limits should see that no detriment to amenity is experienced at the nearest sensitive noise receptors to the development.

1 Introduction

1.1 RPS Planning & Development Ltd. has been commissioned to carry out a noise impact assessment relating to proposed services plant noise associated with the University of Manchester's Chemistry Building (the Site). The assessment has been undertaken in accordance with relevant British Standards and also Manchester City Council's standard noise requirements for plant noise.

1.2 An unattended noise survey has been carried out between 1417 and 1233 hours on Thursday/Friday 15th / 16th December 2011. The dominant noise source affecting the site was found to be road traffic on surrounding roads and existing plant noise from the Site and surrounding buildings.

1.3 Limiting plant noise levels have been set based upon the results of this survey in accordance with Local Authority requirements. Noise limits have been set based upon the prevailing background noise levels in the absence of extraneous noise and compliance with these limits should see that no detriment to amenity is experienced at the nearest sensitive noise receptors to the development.

1.4 The following report presents the results of the assessment undertaken.

2 Noise Units, Standards and Guidance

a) Noise Units

2.1 Noise is defined as unwanted sound. The range of audible sound is from 0dB to 140dB. The frequency response of the ear is usually taken to be about 18Hz (number of oscillations per second) to 18,000Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise-measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

2.2 For variable noise sources such as traffic, a difference of 3dB is generally accepted as just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3dB. The "loudness" of a noise is a purely subjective parameter but it is generally accepted that an increase/decrease of 10dB corresponds to a doubling/halving in perceived loudness.

2.3 External noise levels are rarely steady but rise and fall according to activities within an area. In an attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Aeq} noise level

2.4 This is the "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

2.5 It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

ii) The L_{A90} noise level

2.6 This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

b) Standards and Guidance

i) Method of Assessing Noise From Fixed Installations

2.7 BS4142:1997 provides a method for rating industrial noise affecting mixed residential and industrial areas. It was first published in 1967 and has been extensively used by local authorities and consultants to rate noise from fixed installations, such as plant. The Standard was considerably revised in 1990, clarified in 1997, and advocates the use of $L_{Aeq,T}$; a level, which is directly measurable and termed the Specific Noise Level (SNL) when corrected for the duration of the noise.

2.8 The SNL is then corrected for character, if appropriate (see following paragraph) and termed the Rating Level (RL). When used to assess industrial noise, the RL is determined and the L_{A90} background level is subtracted from it. A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely.

2.9 BS4142 requires a +5dB correction to be applied to the SNL if the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum etc), or if there are distinct impulses in the noise (bangs, clicks, clatters, or thumps), or if the noise is irregular enough in character to attract attention. The SNL then becomes the RL.

2.10 BS4142 states that the assessment location should be free-field (away from any reflecting façades) and at a preferred height of between 1.2 and 1.5m above ground level, and hence is not applicable at first floor.

2.11 When assessing the noise from night-time operations, the period of 2300 hours to 0700 hours, as recommended in PPG24, has been adopted for this assessment.

ii) Local Authority Requirements

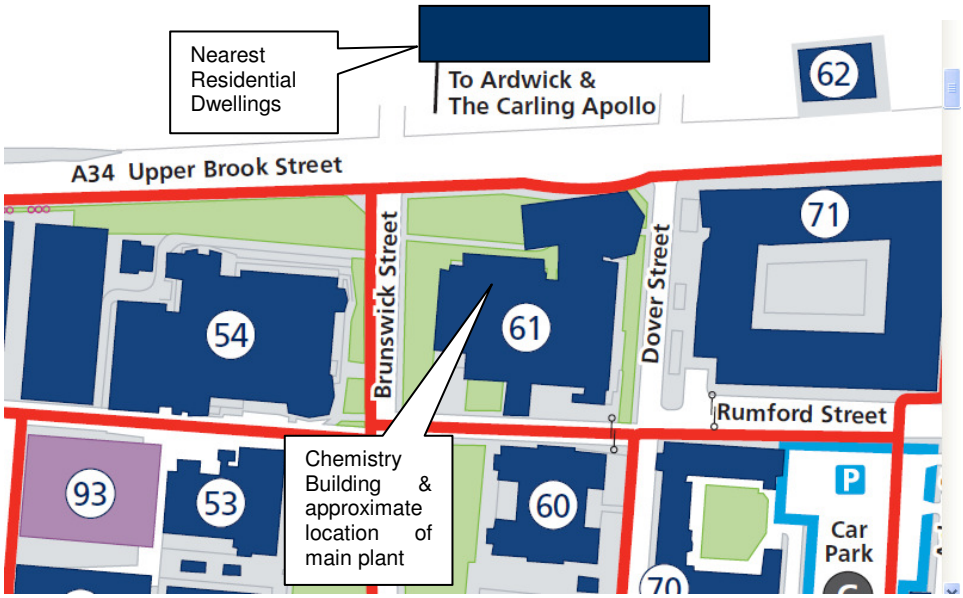
2.12 It is understood from correspondence with the Local Authority that plant noise should be 10dB below the existing background noise level when measured at 1m from the nearest noise-sensitive façade.

3 Site Description

3.1 The Chemistry Building is located on Brunswick Street, Manchester and is within the main campus of the University of Manchester and has the numerical identification of Building 61.

3.2 The building is surrounded by Brunswick Street, Dover Street, A34 Upper Brook Street and Building 60 which houses the University's Age and Cognitive Performance Research Centre.

3.3 The nearest noise sensitive receptors are on the opposite side of the A34 and are two and three storey residential accommodation. The nearest houses are on Glenbarry Close and the closest is approximately 80m from the ground floor of the Chemistry Building. A plan of the area is shown below.

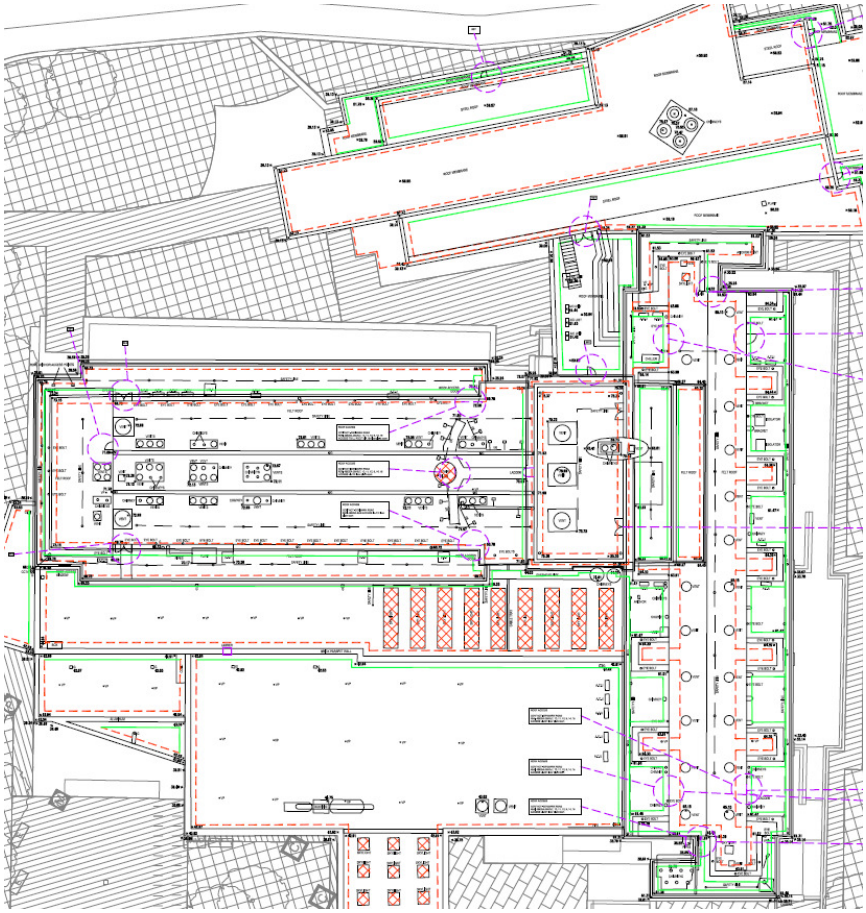


3.4 The roof of the Chemistry Building has numerous ventilation extract pointss (stacks) which are situated at high level, see photos at Appendix 1.

Proposal

3.5 Two new fans are to be installed on the roof of the building and a noise specification is required to ensure that plant noise complies with the City Council's noise requirement. Whilst the proposal is for two fans only, a third will also be installed by others and therefore this assessment considers the cumulative noise from all three fans.

3.6 The following plan shows the location of the existing plant. As can be seen there are numerous roof mounted plant/exhaust stacks.



3.7 The majority of this equipment will only operate during normal University hours however residual extract is required 24/7.

4 Analysis of Existing Noise Climate

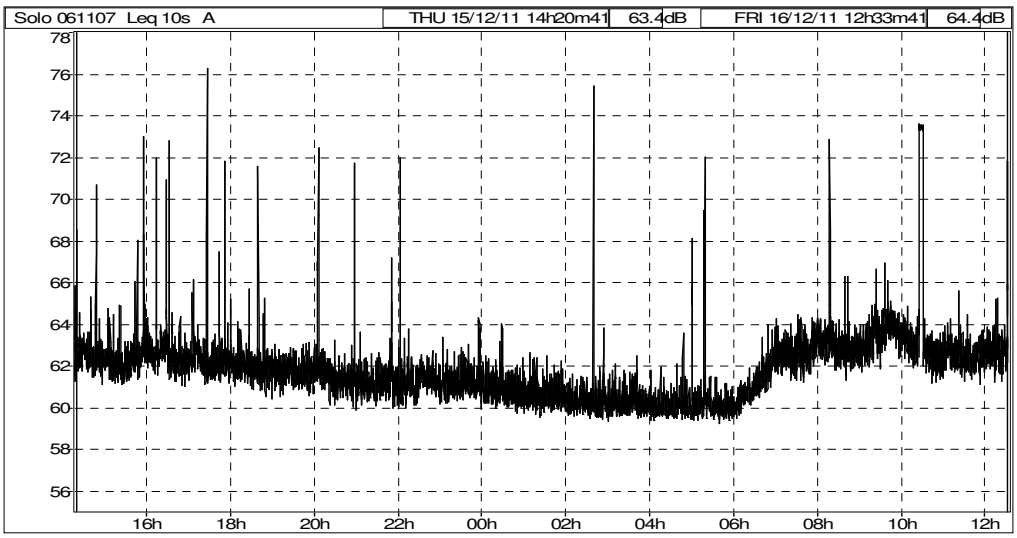
4.1 In order to determine the existing noise climate of the area, noise monitoring was undertaken between 1417 and 1233 hours on Thursday/Friday 15th / 16th December 2011. The monitoring exercise was undertaken on the roof area at the rear of the building (see Appendix 1). The monitoring location was chosen in order to establish the current level of noise from the roof mounted plant. Spot measurements were undertaken prior to the survey at the residential areas.

4.2 Weather conditions were dry and around 6-8 ℃ for the duration of the survey, with an average wind speed at roof level of 5-12ms^{-1}.

4.3 The instrumentation used during the survey was a 01dB Solo sound level meter serial no. 60844. The meter was fitted with the manufacturer's specification all-weather kit and was calibrated before and after the survey using a B&K 4231 calibrator serial no. 2393954. No significant deviations in level were noted. Instrumentation calibration documentation is available upon request.

4.4 Monitoring equipment was set up by competently trained RPS staff. Subjective impressions from Site were that the noise climate was generally dictated by road traffic on local roads, other machinery units on nearby buildings.

4.5 The noise profile of the long term survey is shown below. Existing plant noise levels are in the range 60-64 dB(A). The general pattern is a reduction in plant noise up until 0600 with an increase when more ventilation units are switched on around 0800. The new fans would follow a similar pattern.



4.6 A summary of the average ambient noise levels recorded are detailed within the table below. The values are the average L_{Aeq}, the lowest L_{A90} and the average L_{A90} values measured.

Table 4.1 : Summary of Noise Monitoring Results

Location	Monitoring Period	dB $L_{Aeq,5mins}$ (logarithmically averaged)	dB $L_{A90,5mins}$ (lowest)	dB $L_{A90,5mins}$ (average)
1	Daytime Hours 0700 – 2300	62.6	59.9	61.4
	Night-time Hours 0700 – 2300	60.7	59.2	59.7

4.7 A summary of the spot measurements are detailed within the table below.

Table 4.2 : Summary of Noise Monitoring Results – Spot Measurements

Location	Monitoring Period	dB $L_{Aeq,5mins}$ (logarithmically averaged)	dB $L_{A90,5mins}$ range
Glenbarry Close – rear of dwellings facing A34	Daytime Hours 1330-1400	65.4	47-58

5 Limiting Plant Noise Levels

5.1 It is understood that noise attributable to services plant associated with the development shall be designed to 10dB below the existing background noise level when measured at 1m from the nearest noise-sensitive façade, as per Local Authority requirements. Furthermore any plant should not lead to an increase in noise emissions from the roof mounted plant ie there should be no noise creep which would require any new plant to be 10dB quieter than existing plant.

5.2 The assessment excludes any tonal qualities to the noise from the fans. It is assumed that all plant operate in the central area of the roof therefore there would be no line of sight between the fans and the residential dwellings.

5.3 The following table provides a summary of the noise levels by undertaking a back extrapolation to establish a source sound pressure levels at 1m. With a shielding effect an allowance of up to 10dB can be provided and therefore the noise specification of the fan can increase from **71dB(A)** to a maximum of **81dB(A)**.

Lowest Background L_{A90} – spot measurements	48dB
L_{A90}-10dB – noise criteria	38dB
Distance to dwelling	80m
Distance Correction	+38dB
Sound Pressure level @ 1m – all 3 fan units	76dB(A)
Sound Pressure level @ 1m – single fan units	71dB(A)

5.4 Using the measured noise data on the roof of the Chemistry Building the noise contribution from the fans should not result in a noise increase. Assuming the same operating profile as per the existing fans then the following values would apply.

a	Lowest L_{Aeq} – spot measurements	60dB
b	Distance from measurement location to new fans	12m
c	Distance Correction	22dB
d	Noise contribution from 3 fans	+4.8dB
e	Corrections – c + d	~27dB
f	Noise spec = a -10dB	50 dB
g	Sound Pressure level @ 1m – single fan units = e+f	77dB(A)

5.5 On the basis of the above exercise the source noise level of a single fan should be no greater than **77dB(A)**.

5.6 As there would be shielding effects, then the more onerous of 81dB(A) and 77dB(A) should be used from the two approaches detailed above. This design limit would not lead to a perceptible increase in the future noise environment and would comply with local authority requirements.

6 Conclusions

6.1 Background noise measurements have been carried out at the site of a proposed mechanical services plant installation at the existing University of Manchester Chemistry Building.

6.2 Based on the results of the survey, limiting plant noise levels have been set, in order to comply with Local Authority requirements.

6.3 Compliance with these limits should see that no detriment to amenity is experienced at the nearest sensitive noise receptors to the development.

Appendices

Appendix A

Site Photos

