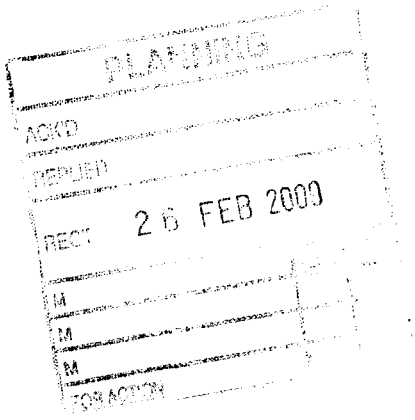


Noise Assessment Report

New Condenser Unit

Selfridges, Manchester

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Signed:

Acoustic Assessment Report

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1.0 Introduction

Azymuth Acoustics is appointed by Normech Services Ltd to provide an acoustic assessment of the proposed installation of an external condensing unit in the plant area on top of the Selfridges store in central Manchester.

The proposed development involves the installation of an additional Daikin RZQ type external condenser unit.

This report addresses the concerns of the local planning authority in relation to the proposed externally mounted condenser units.

This acoustic assessment includes sections covering the following aspects:

- The results of a noise survey at the premises, including measurements of background noise in the vicinity of the proposed condenser units.
- Criteria developed to set acceptable noise levels at sensitive receptors in nearby property; and
- An assessment of the impact resulting from the measured noise levels when compared against the relevant criteria.

2.0 Results of Noise Survey

Selfridges Manchester is located on Exchange Square (to the north) and is bounded to the west by New Cathedral Street (pedestrianised) and to the east by Cross Street / Corporation St. The building is situated in an area which comprises a mixture of shops, leisure uses and commercial property. The nearest residential properties are located in the No. 1 Deansgate Building.

2.1 Noise Measurement Procedures

The instrumentation used for the environmental noise survey consisted of a SvanTek 945 Type 1 precision sound level meter (ser. # 3507, cal. # AC/05/037/02) and a 01dB Cal 01 SL sound calibrator (ser. # 30112, cal. # AC/05/037/01.) The equipment was calibrated before and after the noise measurements.

The sound level meter measured A-weighted (fast response) noise levels as well as octave band noise levels for all measurements recorded.

Noise measurements were undertaken by Dominic McCann by placing the sound level meter / microphone at suitable location on the roof of the Selfridges store and setting the instrument to record noise levels continuously and set to store the resulting data at 30 minutes intervals. The survey was undertaken between 14:20 hrs on 2rd December –to 11:17 hrs on 3rd December 2008.

Weather at the time of measurements was cloudy but dry, with low wind speeds and temperatures between -3 °C to 5 °C.

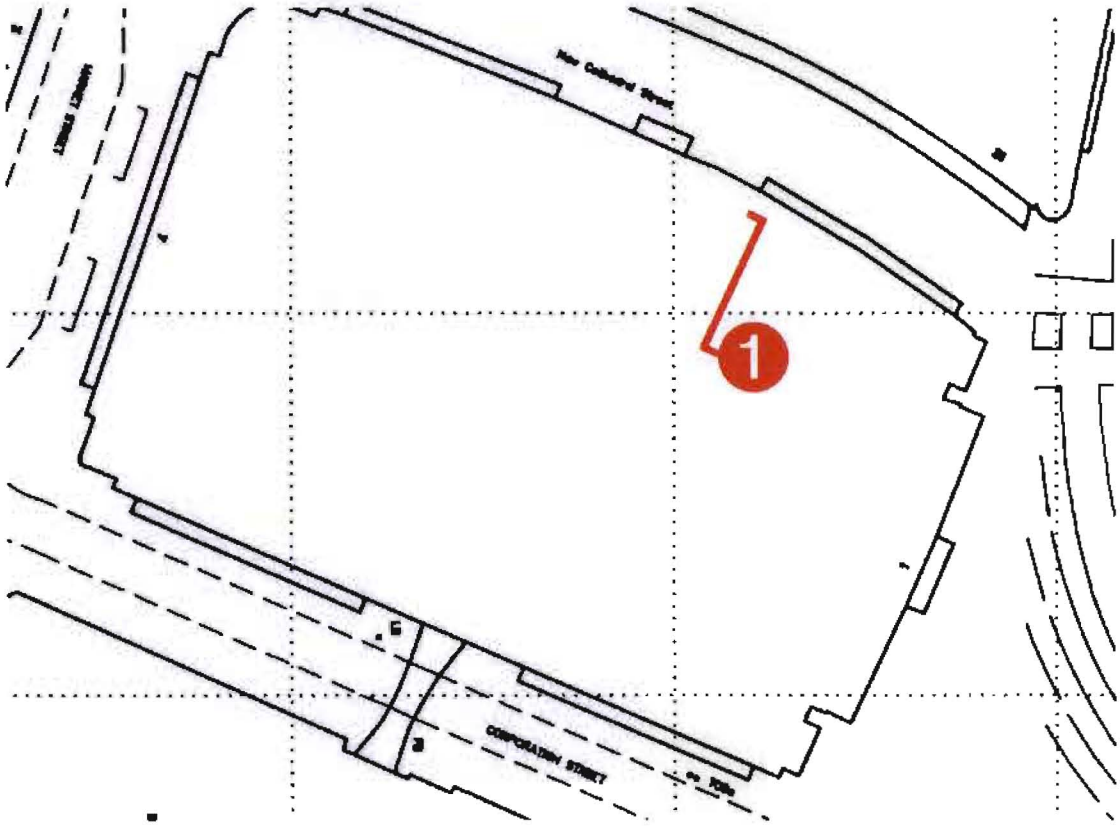


Figure 1: Sketch of Selfridges store, roof level showing measurement position (marked in red)

2.2 Summary of Statistical Noise Data

Full results of the noise levels measured by Azymuth Acoustics during the course of the recent noise survey are included in Appendix B of this report.

Table 1 below summarises the statistical noise levels measured in the vicinity of the proposed condenser unit.

Measurement Position	Period	L_{Amax}	L_{Aeq}	L_{A1}	L_{A10}	L_{A90}
Selfridges roof area	Daytime	66.7	63.8	63.6	62.8	60.6
Selfridges roof area	Night-time	59.8	56.8	58.3	57.6	56.0

Table 1: Summary of Free-field Noise Levels Measured at Selfridges (dBA)

2.3 Description of the Noise Climate of the Area

Noise levels in the vicinity of the site are dominated by existing plant noise from the Selfridges store, which is assumed to be operating on a B.M.S type system. This makes L_{Aeq} values in the vicinity almost constant during daytime period, approx 64 dB L_{Aeq} and reducing slightly at night to an almost constant 60 dB L_{Aeq}.

Road traffic, including city centre buses contributes to the noise levels around the periphery of the Selfridges store.

3.0 Noise Assessment Criteria

3.1 British Standard BS 4142

The test that is generally applied to assess the potential for noise from fixed installations to give rise to community response is contained in British Standard BS 4142: 1997. This standard can be used to predict the likelihood of complaint due to noise from a new or modified source.

BS 4142 describes a method for determining industrial and background noise levels outside residential buildings and for assessing whether the industrial noise is likely to give rise to complaints from the occupants.

BS 4142 assessment methodology involves comparing the existing background level with the predicted noise from the new development. This predicted level is adjusted to allow for any tonal or impulsive characteristics, and is called the Rating Level. The difference between the two levels can be used to indicate the likelihood of complaints arising, e.g. a predicted level of

10 dB greater than the background level indicates that complaints are likely; an increase of around 5 dB is of marginal significance and a predicted level of 10 dB less than the background level is a positive indication that complaints are unlikely.

British Standard BS 4142 requires that daytime assessments are based on the highest L_{Aeq} from the noise source over a period of 1 hour, while at night an assessment period of 5 minutes is specified.

3.2 World Health Organisation

In 1980 the World Health Organisation proposed environmental health criteria for community noise including consideration of noise levels at which sleep disturbance may take place. These guidelines were amended by the World Health Organisation in 1999. The guidance suggests that an internal L_{Aeq} below 30 dB is required to preserve

the restorative process of sleep. This is equivalent to a free-field level of around 42 to 45 dB L_{Aeq} or a façade level of 45 to 48 dB L_{Aeq}, assuming open windows.

3.3 Recommended Noise Assessment Criteria

Based on the guidance set out in the above documents (and BS 4142 in particular) it is recommended that the criteria detailed in Table 2 represents suitable targets for noise levels.

Period	External Noise Limit @ 5 Metres (dBA)
Daytime (07:00 to 23:00 hours)	65
Night-time (23:00 to 07:00 hours)	60

Table 2: Criteria (Max Rating Levels) for Environmental Noise

The noise levels set out above have been developed so as to ensure that noise from the condensing units does not have a significant effect on the ambient noise level inside any part of the adjoining properties, or on general environmental noise levels.

4.0 Acoustic Assessment

4.1 Condensing Unit

The proposed condensing unit is manufactured by Daikin (more information at www.daikin.co.uk). Table 3 below summarises Azymuth Acoustics' understanding of the noise output from the unit as provided by Daikin.

Unit	Free -Field Level @ 1m (dBA)	Free -Field Level @ 5m (dBA)
Daikin RZQ type condenser unit	52	40 (Azymuth Acoustics calculation)

Table 3: Noise Levels from the Daikin Condensing Unit at Various Distances

It is proposed that the units operate continuously throughout the daytime and night-time periods; this would make the source regular enough not to present an impulsive or intermittent character. The predicted noise level from the proposed plant is tabulated below:

Position	Octave Band Centre Frequency (Hz)								Total (dBA)
	63	125	250	500	1k	2k	4k	8k	
Measured day ambient L_{Aeq} close to building	62.0	57.0	56.3	52.7	54.5	46.0	41.0	31.8	**56.8**

Noise limit @ 5m from condensing units	67	62	59	55	54	49	45	37	**59**
Calculated noise level @ 5m from proposed condensing unit	39	40	39	40	33	30	24	19	**40**

Table 4: Calculated Noise Levels from the Proposed Condensing Units

It can be seen from the values tabulated above that the noise from the new plant will be substantially below the existing ambient and background noise levels in the vicinity of the Selfridges store.

As such, the noise contribution should have no measurable cumulative effect on the background noise levels and BS 4142 would indicate that 'there is a positive indication that complaints are unlikely.'

5.0 Conclusions

Azymuth Acoustics has undertaken an acoustic assessment of the proposed installation of an external condensing unit to the roof mounted plant area of the Selfridges Store in Manchester. The main focus of the assessment was the potential for noise from the externally mounted condensing unit to affect ambient noise levels at residences / commercial premises nearby.

Measured background noise levels in the vicinity of the site were in the range 55 to 65 dB L_{A90} at all times during the survey and were dominated by noise from existing plant associated with the Selfridges store and nearby Marks and Spencer store.

The predicted noise level from the new condensing units is 40 dBA for locations 5m from the plant; this is at least 15 dB below the measured background noise level close to the site boundary. As such the data indicates that 'there is a positive indication that complaints are unlikely'.

Appendix A

Glossary of

Acoustic Terms

Decibel (dB)

This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal.)

dB(A)

This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}

This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T_{30} or T_{60})

This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60 dB, after the source has been switched off, is known as the reverberation time. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)

Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150 Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

$$SRI = L1 - L2 + 10 \log (S/A)$$

Where: L1 = Noise level in the source room

L2 = Noise levels in the receiving room

S = Surface area of test specimen

A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)

This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.

Appendix B

Full Results of Noise Survey

Noise Levels at Selfridges Manchester (Roof Level)

