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Camden Bus Estate Agents,
27a Parkway,
London,
NW1 7PN

PLANT NOISE ASSESSMENT

Acoustics Report M1444/R01
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1. Introduction

This acoustic report documents a noise assessment for the proposed plant at the Camden Bus Estate Agents, 27a Parkway, London; Figure 1. The plant is to be installed as part of the upgrade of the site.

The report is divided into the following sections:

- Section 2: Overview of the Development
- Section 3: BS4142:2014
- Section 4: Background Noise Survey
- Section 5: Plant Noise Assessment
- Section 6: Conclusion
- Appendix A: Survey data
- Appendix B: Calculations

2. Overview of the Development

The Camden Bus Estate Agents (CBEA) currently operate from an ex London Transport Routemaster double decker bus, which is parked on a tarmacked area at 27a Parkway.

The proposed scheme is to upgrade the Camden Bus Estate Agents facilities whilst retaining the bus by providing a:

- Ground floor glazed enclosure around the bus
- Excavated basement with the bus suspended above

As part of the scheme there will be a plant room located within the basement; Figure 1. The plant has yet to be selected, but will provisionally consist of a boiler and a single condenser unit. Ventilation for the room will be via a louvered door that opens into the light well.

The nearest residential windows to the plant room, labelled A and B in Figure 1, are 10m and 20m from the louvered plant room door respectively.

The existing noise environment is dominated by road traffic noise on both Parkway and Arlington Road.

3. BS4142:2014

The plant noise assessment detailed in this report has been conducted in accordance of BS4142: Methods for Rating and Assessing Industrial and Commercial Sound.

3.1 BS4142:2014

BS4142:2014 provides a methodology to assess the impact of industrial and commercial noise affecting dwellings, whereby the 'typical' background noise level is deducted from the industrial noise Rating Level (industrial noise corrected to account for the 'on-time' and noise character of the noise source; see sections 3.2 and 3.3 below). The following guidance is given based on the established difference:

- A difference of around +10dB or more is likely to be an indication of significant adverse impact
- A difference of +5dB is likely to be an indication of an adverse impact
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact

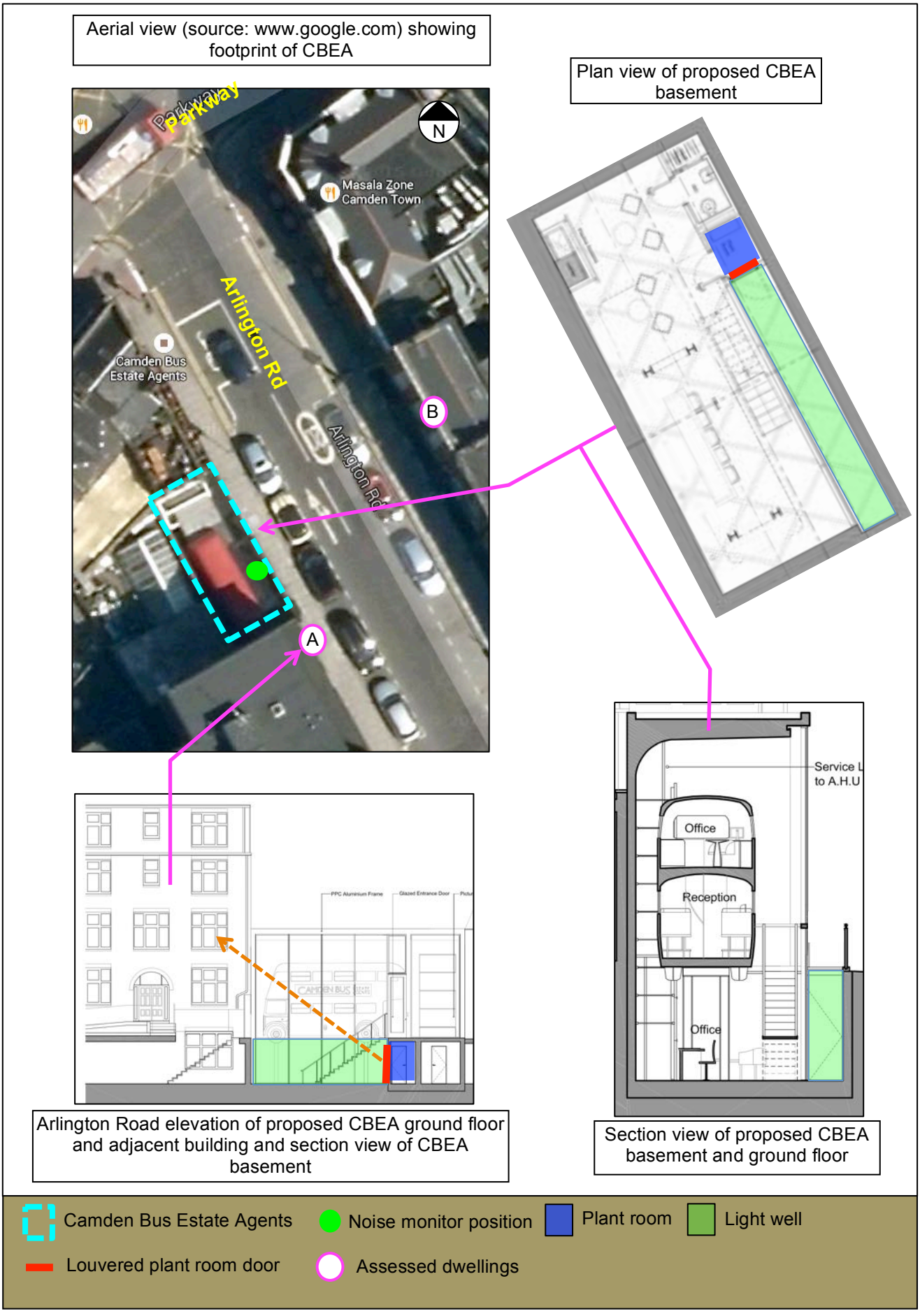


Figure 1. Aerial, plan, section and elevation views of CBEA

Where background noise and Rating Levels are low, BS4142:2014 states that *'absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night'*. Low background noise and rating levels are not defined. However, in BS4142:1997 it states that '*background noise levels below 30dB and rating levels below about 35dB are considered to be very low'*.

The absolute industrial noise can be assessed internally within a dwelling rather than externally if this corresponds to the location that will be occupied during the operation of the industrial noise. Typically this will result in the industrial noise being assessed within the nearest bedroom (with windows open) during the night period (23:00 – 07:00hrs).

3.2 On-time correction

To take account of industrial/commercial noise sources that do not operate continually an 'on-time' correction is applied using:

$$- 10 \log (r/r_{ref})$$

Where:

$r_{ref.}$ = reference time (1hr between 07:00 – 23:00hrs and 15 minutes between 23:00 – 07:00hrs)

r = total 'on-time' during the reference period

Note that the shorter reference time interval between 23:00 – 07:00hrs is designed to penalise industrial/commercial noise events that occur during the night.

3.3 Noise character correction

BS4142 provides four noise character correction categories with associated penalties that must be applied when determining the Rating Level, namely:

- **Tonality:**
  - Not perceptible = 0dB
  - Just perceptible = +2dB
  - Clearly perceptible = +4dB
  - Highly perceptible = +6dB
- **Impulsivity:**
  - Not perceptible = 0dB
  - Just perceptible = +3dB
  - Clearly perceptible = +6dB
  - Highly perceptible = +9dB
- **Intermittency:** +3dB if the intermittency of operation is readily distinctive against the residual noise environment
- **Other:** +3dB applied if the specific sound is neither tonal or impulsive but features noise characteristics that are readily distinctive against the residual noise environment

4. Background Noise Survey

- **Survey dates**: 30th – 31st October 2014
- **Weather:** Dry with wind speeds below 5m/sec
- **Monitor locations; Figure 1:** Microphone, mounted on a tripod, located 1m from the Arlington Road side of the bus.
- **Equipment:** Bruel & Kjaer Type 2238
- **Monitor configuration:** Configured to measure consecutive 15-minute samples of noise

- **Calibration:** calibrated before and after the survey using a Brüel & Kjær Type 4231 calibrator with no deviations found

All noise measurements include façade reflections. Full tabulated results are given in Table A1, Appendix A.

The weather conditions will not have adversely affected the noise measurements.

4.1 Survey observations

The underlying noise environment is dominated by the constant road traffic flow on Parkway.

4.2 Typical background noise level, L_{A90}, at nearest dwellings

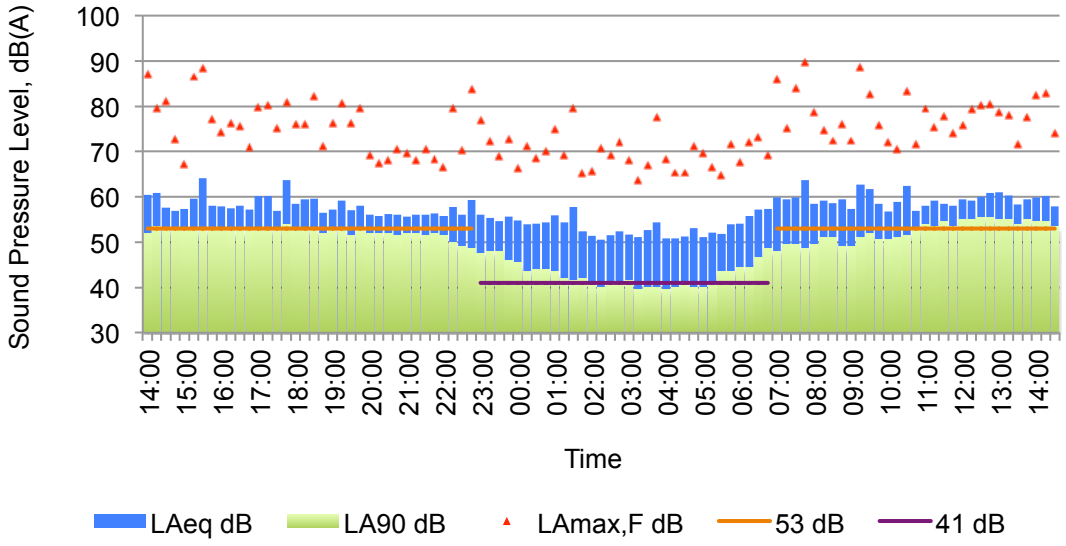
The measured noise levels include reflections off the bus. To obtain free-field values 3dB has been deducted from the data. Figure 3 shows the resultant free-field corrected background (L_{A90}) noise levels.

The typical free-field day and night background noise levels have been established as; Figure 3:

- 07:00 – 23:00hrs: L_{A90} 53dB
- 23:00 – 07:00hrs: L_{A90} 41dB

The above measured background noise levels are expected to represent the typical values that will occur at the nearest residential windows to the proposed plant. They have therefore been used for the BS4142 assessment of plant noise emissions at receptors A and B, Figure 1.

Figure 3. Noise monitor data (free-field levels)



5. Plant Noise Assessment

The plant has yet to be selected, but provisionally will consist of a boiler and single condenser unit, both located within the new plant room. The plant noise emissions to the exterior will therefore be via the louvered plant room door.

In order that the plant does not result in an adverse noise impact at the nearest dwellings this section covers the determination of suitable:

- Rating Level limit at the nearest residential window
- Noise limit within the plant room

The plant can be selected with reference to the determined limits.

5.1 Rating Level limit at nearest residential windows

BS4142:2014 states that when the Rating Level is at parity with the typical background it indicates that the Specific Level will have a low impact; we have found that since the publication of BS4142:2014 Local Authorities normally stipulate that the plant Rating Level must not exceed the typical background.

In the absence of a reply from Camden Council to our request to confirm their plant noise criterion, we have taken that a Rating Level of up to and equal to existing typical background will be acceptable in this case. Based on the established existing typical background noise levels, the Rating Level limits at the nearest residential windows are therefore:

- Day (07:00 – 23:00): 53dB
- Night (23:00 – 07:00hrs): 41dB

The above limits can be used in the selection of any future plant at CBEA. Note that the determination of the plant Rating Level must include BS4142 noise character corrections as appropriate (see section 3.3 of this report).

5.2 Plant noise limit within the plant room

The following corrections have been applied to the day Rating Level limit in order to establish the corresponding noise limit within the plant room:

- **Calculation tolerance:** -3dB
- **BS4142 noise character correction:** Modern boilers and condenser units are normally not tonal, will not have impulsive characteristics and their intermittency of operation will not be readily distinctive against the residual noise environment. However, as a conservative measure -3dB has been applied to account for any potential 'other' noise characteristics
- **On-time correction:** 0dB; 100% operation has been assumed
- **Distance correction:** 20 x Log(d) + 11, where d = direct distance between the louvered door and residential window
- **Directivity correction:** determined by the louvered door dimensions and bearing angle, using the corrections given in Figure 11.2, p322, Noise Control in Building Services, SRL Ltd.
- **Reverberation correction:** -3dB to account for the reverberation within the light well
- **Louvered plant room door:** insertion loss for a typical weather louvre
- **Correction of sound power to pressure:** 10 x Log (a), where a is the area of the louvered door

The full calculation is provided in Table B1, Appendix B. Note that no shielding correction has been applied in the calculation; receptor A will have an unobstructed view of the plant room door

(see orange dashed line in Figure 1). The line of view however for receptor B will be partially/ fully shielded; this has not altered the outcome of the assessment as the noise limit in the plant room to comply with the Rating Level limit at receptor A is lower.

The lowest calculated day and night plant room noise limits are:

- Day (07:00 – 23:00): 68dB
- Night (23:00 – 07:00hrs): 56dB

The above values can be used in the selection of suitable plant.

If higher noise levels are expected within the plant room, an acoustic louvered door can be used. This will allow for the noise limits to be increased by up to 25dB.

Typical condenser and boiler units generated around 55dB at 1m; these values can be taken to be their reverberant noise levels within the room. On this basis one boiler and one condenser unit operating would result in a reverberant noise level of 58dB. This is 10dB below the day noise limit.

The plant is not expected to be operating during the night. However, if both units are needed to be running simultaneously either quieter plant can be selected, a reduced capacity operating load for the condenser unit employed or an acoustic louvered door installed.

6. Conclusion

A noise survey has been conducted to determine the typical background noise levels at the nearest dwellings to the Camden Bus Estate Agents; Figure 1.

The proposed plant, which will be located within the new basement plant room, has yet to be selected. Provisionally it will consist of a boiler and single condenser unit.

Plant Rating Level limits at the nearest residential windows and a corresponding noise limit within the plant room have been given. These can be used in the selection of suitable plant.

Based on typical noise levels generated by the proposed plant, the noise emissions will be comfortably (10dB) below the determined limits during the day.

The plant is not expected to be running at night. However, if both items of plant are to run simultaneously mitigation measures have been given if required.

Table A1. Noise monitor data (façade levels)							
Start Time	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB	Start Time	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB
14:00	90.1	63.5	55.0	02:30	72.3	54.5	44.0
14:15	82.7	63.8	56.5	02:45	75.0	55.4	44.0
14:30	84.1	60.6	56.0	03:00	71.0	54.7	44.5
14:45	75.7	59.9	56.0	03:15	66.8	54.1	42.5
15:00	70.3	60.3	55.5	03:30	69.9	55.6	43.0
15:15	89.6	62.6	55.5	03:45	80.5	57.4	43.0
15:30	91.5	67.1	55.5	04:00	71.3	53.8	42.5
15:45	80.2	61.1	56.0	04:15	68.4	53.8	43.0
16:00	77.4	60.9	56.0	04:30	68.4	54.2	43.5
16:15	79.3	60.5	55.5	04:45	74.2	56.1	43.0
16:30	78.7	61.1	55.5	05:00	72.6	54.1	43.0
16:45	74.1	60.2	55.5	05:15	69.6	55.1	44.0
17:00	82.9	63.1	56.0	05:30	67.8	54.8	46.5
17:15	83.3	63.1	56.0	05:45	74.6	57.0	46.5
17:30	78.3	59.9	56.0	06:00	70.7	57.1	47.5
17:45	83.9	66.7	57.0	06:15	75.1	58.7	47.5
18:00	79.1	61.4	56.0	06:30	76.1	60.2	49.5
18:15	79.1	62.5	56.0	06:45	72.2	60.3	51.5
18:30	85.2	62.6	56.0	07:00	89.0	62.9	51.0
18:45	74.2	59.5	55.0	07:15	78.3	62.4	52.5
19:00	79.3	60.2	55.5	07:30	87.1	62.8	52.5
19:15	83.8	62.2	55.5	07:45	92.7	66.7	51.5
19:30	79.4	60.1	54.5	08:00	81.6	61.4	52.5
19:45	82.7	61.0	55.5	08:15	77.9	62.2	54.0
20:00	72.2	59.0	55.0	08:30	75.4	61.6	54.0
20:15	70.5	58.7	55.0	08:45	79.1	62.5	52.0
20:30	71.0	59.2	55.0	09:00	75.4	60.3	52.0
20:45	73.5	59.0	54.5	09:15	91.7	65.7	54.0
21:00	72.8	58.6	55.0	09:30	85.8	64.7	55.0
21:15	71.1	59.0	55.0	09:45	78.8	61.4	53.5
21:30	73.4	59.0	54.5	10:00	75.1	59.8	53.5
21:45	71.4	59.3	55.0	10:15	73.6	61.9	54.0
22:00	69.6	58.8	54.5	10:30	86.5	65.4	54.5
22:15	82.7	60.7	53.0	10:45	74.6	59.9	55.5
22:30	73.3	59.0	52.0	11:00	82.5	61.1	57.0
22:45	86.7	62.3	51.5	11:15	78.4	62.1	56.5
23:00	80.0	59.1	50.5	11:30	80.9	61.5	57.5
23:15	75.3	58.4	51.0	11:45	77.2	61.0	56.5
23:30	72.0	57.6	51.0	12:00	78.8	62.5	58.0
23:45	75.7	58.6	49.0	12:15	82.4	62.1	58.0
00:00	69.3	57.8	48.5	12:30	83.2	63.0	58.5
00:15	74.2	56.9	46.5	12:45	83.5	63.8	58.5
00:30	71.5	57.1	47.0	13:00	81.6	64.0	58.0
00:45	73.0	57.4	47.0	13:15	81.1	63.3	58.0
01:00	78.0	58.9	46.5	13:30	74.7	61.3	57.0
01:15	72.3	57.4	45.0	13:45	80.7	62.4	58.0
01:30	82.6	60.7	44.5	14:00	85.5	62.8	57.5
01:45	68.3	55.4	45.0	14:15	85.9	63.2	57.5
02:00	68.8	54.4	43.5	14:30	77.0	60.9	56.5
02:15	73.8	53.6	43.0				

Table A1. Calculation of noise limit within the plant room									
		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1000	2000	4000	
	Typical day (07:00 - 23:00hrs) background, L_{A90}								53
	Rating Level for parity to typical day background								53
	Calculation tolerance								3
	BS4142 character correction								3
	On-time correction for 100% operation								0
	Permissible Specific Level at dwelling								47
Receptor A	Distance correction, 10m								31.0
	Typical plant spectral correction	-0.4	5.6	1.6	-1.4	-7.4	-9.4	-16.4	
	Directivity correction: 45°,0°, 2000mm, 800mm	4.5	5.5	6.0	7.0	7.5	7.5	7.5	
	Reverberation in light well	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	Permissible sound power, L_w, at louvred plant room door	70.1	75.1	70.6	66.6	60.1	58.1	51.1	68.2
	Louvered door area, $2m^2$	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	Louvered plant room door insertion loss	2	2	2	2	3	3	3	
	Day L_{prev} limit in plant room	69.1	74.1	69.6	65.6	60.1	58.1	51.1	67.5
	Night L_{prev} limit in plant room								55.5
Receptor B	Distance correction, 19m								36.6
	Typical plant spectral correction	-0.4	5.6	1.6	-1.4	-7.4	-9.4	-16.4	
	Directivity correction: 30°,90°, 2000mm, 800mm	4.0	3.5	3.0	2.0	-11.0	-11.0	-11.0	
	Reverberation in light well	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	Permissible sound power, L_w, at louvred plant room door	76.2	82.7	79.2	77.2	84.2	82.2	75.2	87.5
	Louvered door area, $2m^2$	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	Louvered plant room door insertion loss	2	2	2	2	3	3	3	
	Day L_{prev} limit in plant room	75.2	81.7	78.2	76.2	84.2	82.2	75.2	87.4
	Night L_{prev} limit in plant room								75.4

Note: Typical night background noise level 12dB below the day value. The plant room noise limit is therefore 12dB below the day limit.