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Technical Note – External Plant Noise Emissions

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Technical Note No:	01	MLM Project Manager:	James Williams
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1 Introduction

MLM Consulting Engineers Ltd previously produced a Noise Assessment to accompany the planning application for the mixed-use development named Brill Place, Central Somers Town, Camden. Further to the original application, amendments to the scheme have been made and therefore the Environmental Health Department at the Council have requested an additional noise assessment, specifically addressing substation noise within the proposed development.

This document details our acoustic review of the substation and its impact on residential dwellings within the proposed dwelling. The substation is to be located on the ground floor, there is a void directly above the substation, and an apartment above the void.

This technical note provides an overview of the assessments undertaken to determine the expected substation noise level within the first floor apartment.

The following drawings were used as part of the assessment, as provided by dRMM Architects:

- 372-SK-SEC-116-00;
- 372-L00-201-06;
- 372-L00-202-05; and
- 372-L00-203-06.

The assessment is based on assumed substation noise levels taken from past projects.

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2 Substation Noise Impact Assessment

2.1 Noise Criteria

The noise criteria for the assessment have been provided by Nick Priddle, Noise Officer for Camden Council. These are provided in the Table below.

Table 1: BS8233:2014 Indoor Ambient Noise Level Guidance			
Activity	Location	Daytime	Night Time
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,16hour}$

It has been requested that the noise levels set out in the Table above be achieved in the 100Hz third-octave band. Additional comments from the Noise Officer are as follows:

"Before commencement of the permitted use, details shall be provided to show the internal noise levels required shall be met and the results submitted to the Local Planning Authority for approval. Additionally, to prevent the potential for structure borne noise transformers should be mounted on anti-vibration pads."

2.2 Substation Proposals and Noise Levels

Details on the substation specification are not currently available. To enable an assessment of the expected noise transfer, data from previous projects has been reviewed to ascertain a suitable source noise level. Table 2 shows the sound power level of an 800kVA substation.

Table 2: Substation Sound Power Level Data								
Substation Type	Octave Band Centre Frequency, Hz							Sound Power Level L_w dBA
	63	125	250	500	1000	2000	4000	
	Sound Power Level dB							
800kVA GM ES 4-6001	51	59	46	42	49	51	37	55

Table 3 shows low frequency sound pressure level measurements of a 1000kVA substation within a masonry enclosure.

Table 3: Substation Sound Pressure Level Data										
Substation Type	Table 2: Substation Noise Level Data									
	50	63	80	100	125	160	200	250	315	400
	Sound Pressure Level dB									
1000 kVA within masonry substation enclosure	54	50	45	46	39	36	40	33	35	31

2.3 Separating Elements

The Figure below shows a section drawing of the proposed substation. There is an apartment above the 'void above substation' shown below.

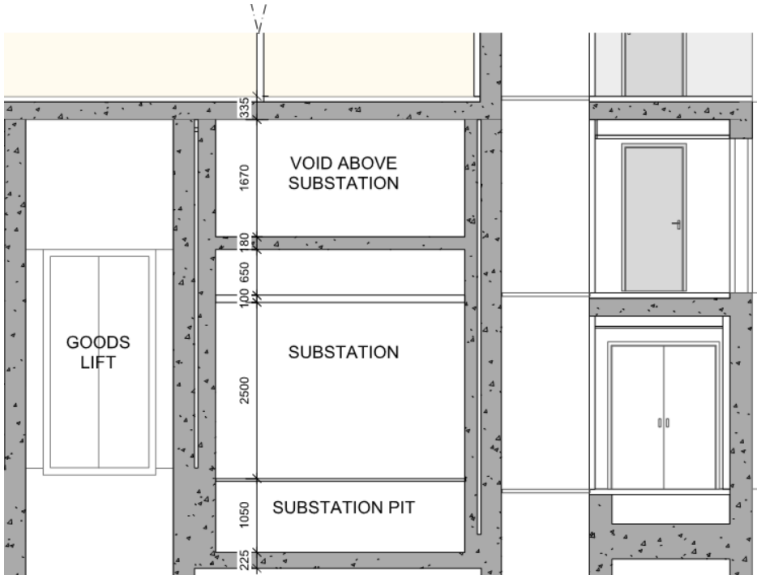

Figure 1: Substation Section

As shown above, the substation has a 180mm reinforced concrete ceiling, a 1670mm void above, and a minimum of 250mm concrete slab between the void and the residential apartment above. There is also a screed and floor finish zone within the apartment however these are not included as part of this assessment.

Laboratory test data for this precise floor build-up is not available. For the avoidance of doubt in any predictions made regarding the total sound reduction of the floor build-up, laboratory test data for a 200mm concrete slab has been used as a basis for assessment the noise transfer from the substation to the apartment. The sound reduction of this floor is presented in the Table below.

Table 4: Sound Reduction Performance - Concrete

Floor Build-up	Octave Band Centre Frequency, Hz							R_w (C_{tr}) (dB)
	63	125	250	500	1000	2000	4000	
	Sound Reduction Performance, R_w (dB)							
200mm in-situ reinforced concrete slab	36	42	41	50	57	60	65	54 (C: -2; Ctr: -5)

Estimates for the sound reduction of the proposed build-up are in excess of 10dB greater than those shown above and therefore predictions of noise transfer made using the data in Table 4 are expected to represent a worst-case scenario.

The reverberation time in the substation room has been calculated, using the Sabine method, to be approximately 2 seconds, based on exposed concrete finishes and a louvred door.

2.4 Receptor Room

The room directly above the substation, in the first floor apartment, is a bedroom. The living space of the same apartment is also partly above the substation however this room will be less affected by noise transfer from the substation.

The bedroom receptor has a floor area of approximately 12m^2, and an assumed height of 2.7m. It is assumed that the reverberation time in the bedroom will be approximately 0.5 seconds.

2.5 Expected Noise Transfer

Calculations have been undertaken in accordance with BS EN 12354-3:2000, based on the specifications and details set out above. The results are presented in the Table below. The first prediction was undertaken using the sound power level data in Table 2, the second is made using the sound pressure level data in Table 3.

Table 5: Expected Substation Levels in the Receptor Room

Substation Type	Octave Band Centre Frequency, Hz							Sound Pressure Level L_{eq} dBA
	63	125	250	500	1000	2000	4000	
	Sound Pressure Level dB							
800kVA GM ES 4-6001	20	21	9	0	0	0	0	10
1000 kVA within masonry substation enclosure	22	8	3	0	0	0	0	8

The noise limit, provided by Camden Council, is 30dBA L_{eq} in the 100Hz third-octave band. This frequency is included as part of the 125Hz octave band in Table 5 above. The octave-band level is the logarithmic summation of the third-octave bands 100Hz, 125Hz and 160Hz, and therefore the level at 100Hz in third-octaves can never be greater than that shown for the 125Hz octave band above.

The calculations demonstrate that substation noise levels in the nearest affected bedroom are not expected to exceed the Local Authority's requirements.

It should be noted that the sound reduction of the proposed floor is likely to be significantly greater than that used in this assessment, and therefore substation noise levels are likely to be even lower in the proposed bedroom than that shown above.

It should be ensured that the proposed substation noise levels are similar to those that have been assumed for this assessment.

2.6 Other Considerations

2.6.1 Vibration and Re-radiated Noise

In order to prevent detectable vibration from reaching the occupied areas of the building, and to control noise transmission resulting from the substation vibration, it is necessary to ensure that it is effectively isolated. This is achieved by mounting the machine on vibration isolators, normally comprising springs or rubber, neoprene or glass fibre blocks which are semi-compressed under the load of the plant and its

associated base. The lower the forcing frequency of the plant, the greater the static deflection needed to ensure good isolation at the forcing frequency. Electrical connections to vibrating plant should be looped to control vibration transmission into the building structure.

The design of the isolators is dependent on the specification of the substation which isn't currently available. Further design advice can be provided during detailed design where necessary. It is likely that the substation supplier will be able to provide isolators which are most suitable for the specification being installed.

2.6.2 External Noise Emissions

The substation room will have a louvred door and therefore noise will be transmitted externally. The Noise Officer stated that assessment of external noise was necessary for this assessment. Noise limits for external noise were provided as part of the original planning application, and it is expected that any noise breakout from the substation room should be considered as part of the building services noise assessment during detailed design.

3 Conclusions

Noise transfer from the proposed substation has been assessed to determine the level of expected noise transfer to the nearest habitable room within the proposed development. The assessment is based on the proposed layouts and floor build-ups; noise levels for the proposed substation are assumed based on data available from previous projects. Should the noise data for the proposed substation be higher than assumed, our assessment will need to be updated.

It has been demonstrated that the expected levels of substation noise in the nearest residential bedroom within the proposed development are compliant with the requirements provided by Camden Council.

Given the findings of this assessment, internal substation noise transfer should not provide a constraint to the granting of planning permission for the proposed development.