Bet365, Zenith Building, Manchester

P1824-ADN003-BDH

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Acoustic Design Note 003

1.0 INTRODUCTION

This Acoustic Design Note (ADN) provides the results of the acoustic commissioning testing of the new back-up emergency generator as installed with the basement carpark of the Zenith Building, 26 Spring Gardens, Manchester, M2 1AB. The primary purpose of this assessment is to confirm the as installed generator and enclosure, with all specified noise mitigation, achieves compliance with the requirements of the noise related Planning Condition. The commissioning noise level measurements were conducted on Saturday 17 August 2019. The findings of acoustic commissioning survey are as follows:

- **The *Ambient Sound Level* measurements as conducted at each of the assessment locations (excluding Assessment Location 7) with the generator running demonstrate compliance with the specified noise criteria.**

- It was not possible to measure the noise level at Assessment Location 7 (at 1 metre from the generator extract ventilation louvre as located on Marriots Close) due to temporary Development site hoarding which restricted access to the ventilation louvre. However, this assessment location was specified for design compliance purposes and not to demonstrate compliance with the noise related Planning Condition.

- Due to a varying *Residual Noise Level* climate (most noticeably from patrons at the external seating area of the ground floor bar (Café Beermoth) of the Tootal Building which were not present during the *Ambient Sound Level* measurements), it was not possible to accurately correct the *Ambient Sound Level* measurements to account for the *Residual Noise Level* climate to determine the *Specific Sound Level* from the generator at each location. Therefore, the results presented in this report are reported as *Ambient Sound Levels* only. In effect, the noise contribution from the generator in isolation at each assessment location may be lower than that reported in this Acoustic Design Note.

Table 1 overleaf summarises the result of the acoustic commissioning testing.

Ref	Assessment Location	Acoustic Consideration	Noise criteria	Measured Level	Result
1	Consulate General of the Republic of Iraq office (external)	Noise egress from the open metal roller shutter door to the basement carpark	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade	≤63 dB $L_{Ar,Tr}$	**Pass**
2	Zenith Building Post Office (internal)	Noise transmission via separating floor	Reverberant sound pressure level limit of 45dB $L_{Aeq,T}$ within the Post Office	≤44 dB $L_{Aeq,T}$	**Pass**
3	Zenith Building offices (external)	Noise egress from the generator exhaust	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade	≤57 dB $L_{Ar,Tr}$	**Pass**
4	Tootal Building offices (external)	Noise egress from the extract ventilation louvres	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade	≤64 dB $L_{Ar,Tr}$	**Pass**
5	Zenith Building basement carpark (internal)	*Design compliance measurement*	Sound pressure level of 75dB $L_{Aeq,T}$ at 1m from any surface of the enclosure, with plant on full load	≤70 dB $L_{Aeq,T}$	**Pass**
6	Generator exhaust outlet aperture (external)	*Design compliance measurement*	Sound pressure level of 72dB $L_{Aeq,T}$ at 1m from aperture with plant on full load	≤53 dB $L_{Aeq,T}$	**Pass**
7	Generator extract ventilation louvre (external)	*Design compliance measurement*	Sound pressure level of 75dB $L_{Aeq,T}$ at 1m from the louvre, with plant on full load	*Not measured*	-

Table 1: Summary Results of the acoustic commissioning testing of the generator

2.0 ASSESSMENT CRITERIA

On 9 January 2019, planning permission for the proposed new back-up emergency generator was approved by Manchester City Council (application no. 121580/FO/2018, date of application: 16 November 2018) subject to a number of planning conditions. Condition 3 is pertinent to this assessment and states the following:

> '*…3) a) Any externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with the proposed acoustic levels and recommendations in the submitted Sol Acoustics Plant Noise Assessment Report Ref. P1824-REP01-BDH. Final details of the exact construction specification for the sound insulation shall be submitted to and approved in writing by the City Council as Local Planning Authority and the development shall be implemented in full in accordance with the approved details before the plant is first brought into use.*
>
> *b) Upon completion of the development and before any of the external plant is first operational, a verification report will be required to validate that the work undertaken confirms to the above noise criteria. The report shall give the results of post-completion testing to confirm that the proposed noise limits are being achieved once the plant and any mitigation measures have been installed. Any instances of non-conformity with the above criteria shall be detailed along with any measures required to ensure compliance. These measures shall be approved in writing by the City Council as Local Planning Authority and the development shall be implemented in full in accordance with the approved details before the plant is first brought into use.*
>
> *Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy*…'

The above Planning Condition references Sol's Environmental Noise Impact Assessment report (ref: P1824REP01-BDH, dated 15 November 2018). Sol Acoustics' report sets out a series of maximum permissible noise levels to be achieved by the back-up emergency generator at various locations, as based upon the MCC specified assessment criterion, as previously agreed with MCC on 30 October 2019, and the results of an environmental noise survey which was conducted on site by Sol in November 2018.

Following planning approval, the Supplier has since confirmed that the extract ventilation from the emergency generator enclosure would be required to be ducted to the existing extract ventilation louvres, as located within the southern façade of the Zenith Building overlooking Marriots Court at ground floor level. Intake air to the generator shall still be taken from the basement car park as previously proposed. The potential noise impact as expected from the extract ventilation louvres on the adjacent offices within the Tootal House building was not considered in the submitted Environmental Noise Impact Assessment but has subsequently been assessed by Sol (refer to Sol's Acoustic Design Note (ADN): P1824-ADN001-BDH, dated 20 March 2019).

Full details of the potential noise impact as expected on the surrounding noise sensitive receptors can be found in Sol's original report and subsequent ADN, as referenced above. A summary of the maximum permissible noise level limits at each of the identified assessment locations is presented in Table 2:

Ref	Assessment Location	Acoustic Consideration	Noise criteria
1	Consulate General of the Republic of Iraq office (external)	Noise via the open metal roller shutter door to the basement carpark	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade
2	Zenith Building Post Office (internal)	Noise transmission via separating floor	Reverberant sound pressure level limit of 45dB $L_{Aeq,T}$ within the Post Office
3	Zenith Building offices (external)	Noise via the generator exhaust	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade
4	Tootal Building offices (external)	Noise via the extract ventilation louvres	*Rating Level* limit of 64dB $L_{Ar,Tr}$ at 1m from the office façade
5	Zenith Building basement carpark (internal)	*Design compliance measurement*	Sound pressure level of 75dB $L_{Aeq,T}$ at 1m from any surface of the enclosure, with plant on full load
6	Generator exhaust outlet aperture (external)	*Design compliance measurement*	Sound pressure level of 72dB $L_{Aeq,T}$ at 1m from aperture with plant on full load
7	Generator extract ventilation louvre (external)	*Design compliance measurement*	Sound pressure level of 68dB $L_{Aeq,T}$ at 1m from the louvre, with plant on full load

Table 2: Summary of maximum permissible noise levels to be achieved by generator

It should be noted that Assessment Locations 5-7 are provided for design compliance purposes and are not representative of any nearby noise sensitive receptors. The assessment locations as identified above are shown in Figures 1 and 2 overleaf.

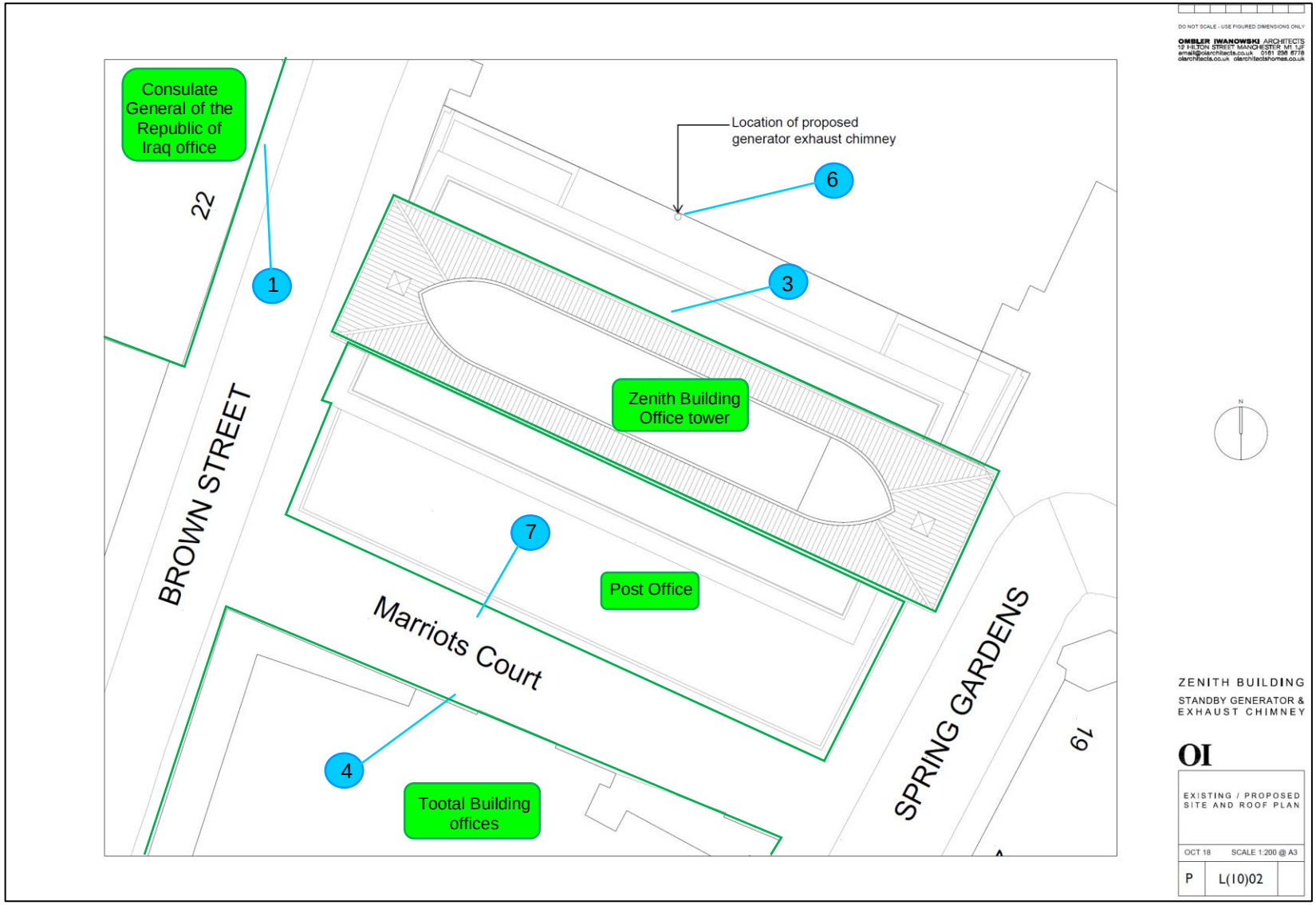

Figure 1: Location of the *external* assessment locations

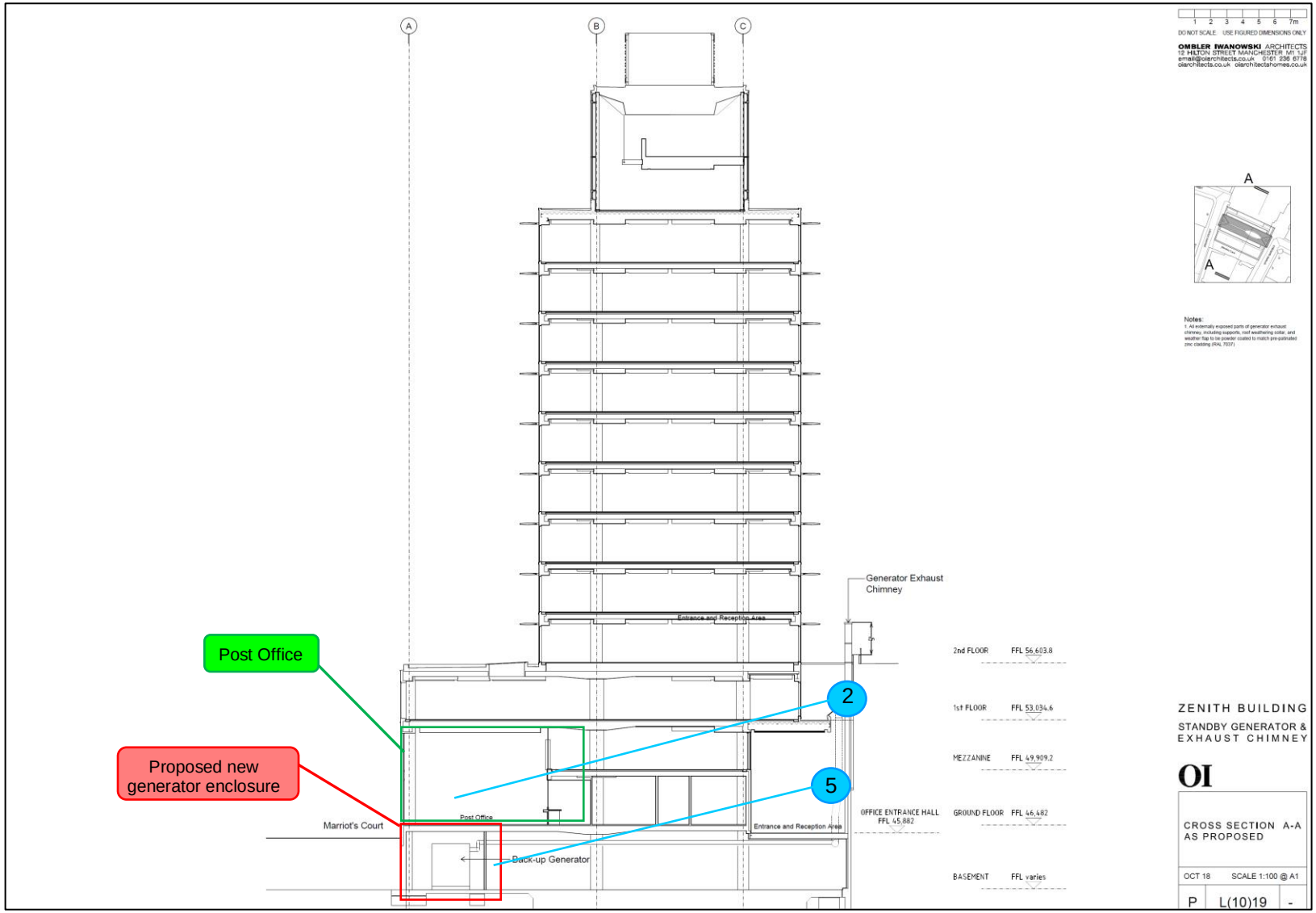

Figure 2: Location of the *internal* assessment locations

3.0 SURVEY METHODOLOGY

The acoustic commissioning testing of the as installed back-up emergency generator was conducted between c.17:00 hours and c.18:00 hours on Saturday 17 August 2019 by Brian Horner of Sol Acoustics. The survey time was pre-agreed to ensure that the access to the Post Office could be gained once staff and patrons have vacated the shop floor.

Upon arriving at site, Sol observed that the generator was already running and was being commissioned by the supplier. The supplier, Holborn, confirmed that the generator was operating at the intended design duty. Sol therefore commenced the necessary *Ambient Noise Level* measurements (i.e. noise level measurements including noise from the generator as well as noise from other environmental source) at each of the identified assessment locations. During the *Ambient Sound Level* measurements, it was noted that noise from other environmental noise sources was significant and variable (albeit compliance with the specified noise criteria was observed in all instances despite the noise contribution from other environmental noise sources).

Once the *Ambient Sound Level* measurements had been completed at each of the assessment locations, the generator was switched off and *Residual Sound Level* measurements (i.e. environmental noise levels in the absence of noise from the generator) were conducted at each assessment location. However, it was observed by Sol that the *Residual Sound Level* was again variable and had increased since conducting the *Ambient Sound Level* measurements (as due to increased activity in Manchester City Centre on a Saturday afternoon/evening, most noticeably from noise from patrons at the external seating area of the ground floor bar (Café Beermoth) of the Tootal Building who were not present during the *Ambient Sound Level* measurements).

Therefore, the reported noise level measurements at each assessment location are the as measured *Ambient Sound Level* measurements with the generator running and include the noise contribution from the environmental noise sources. The results are therefore not '*background corrected*'. The noise contribution from the generator, in isolation, at each of the assessment locations may therefore be lower than that reported herein.

4.0 SURVEY RESULTS

4.1 Assessment Location 1: Consulate General of the Republic of Iraq Office

Due to significant noise from other environmental noise source (most noticeably from Market Street to the north), it was not possible to accurately measure the noise levels as due to the operation of the generator at 1 metre from the Consulate General of the Republic of Iraq Office building. Therefore, noise was measured at 1 metre from the Zenith Building carpark entrance roller shutter (i.e. closer to the noise source). The noise levels at this position are therefore expected to be higher than that as expected at the office building as located at c.10 metres to the west.

A 'clearly perceptible' tonal character was observed from the generator at this assessment location. Therefore, a correction of +4dB has been applied to the as measured *Ambient Sound Level* to obtain the *Rating Level* in accordance with BS4142 assessment methodology. Table 3 compares the determined *Rating Level* from the Generator as assessed against the specified *Rating Level* criteria:

Event	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Plant Operating *(Ambient Sound Level),* dB $L_{eq,T}$	61	60	61	59	58	54	50	42	59
Rating Level (*Specific Sound Level* +4dB character correction), dB $L_{Ar,Tr}$									≤63
Specified Noise Criteria (*Rating Level* at 1m from the building façade), dB $L_{Ar,Tr}$									≤64
Result									**Pass**

Table 3: Assessment Location 1: Consulate General of the Republic of Iraq Office

The above *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the *Specific Sound Level* and resultant *Rating Level* of the generator at the Consulate General of the Republic of Iraq Office building, and at 10 metre distance from the measurement position, would be expected to be lower.

4.2 Assessment Location 2: Zenith Building Post Office (Internal)

Table 4 compares the spatially averaged *Ambient Sound Level*s as measured within the Post Office against the specified reverberant sound pressure level criteria:

Measurement Location	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
1 *(Ambient Sound Level),* dB $L_{eq,T}$	55	51	49	46	42	40	35	30	45
2 *(Ambient Sound Level),* dB $L_{eq,T}$	54	51	48	46	43	40	35	28	45
3 *(Ambient Sound Level),* dB $L_{eq,T}$	55	48	54	43	42	39	33	27	44
4 *(Ambient Sound Level),* dB $L_{eq,T}$	56	48	52	43	43	39	34	27	44
5 *(Ambient Sound Level),* dB $L_{eq,T}$	50	49	49	44	42	38	34	27	44
6 *(Ambient Sound Level),* dB $L_{eq,T}$	52	49	49	43	41	38	35	30	44
Spatial Average *(Ambient Sound Level),* dB $L_{eq,T}$	54	50	51	45	42	39	34	28	44
Specified Noise Criteria (reverberant sound pressure level limit within building), dB $L_{eq,T}$									≤45
Result									**Pass**

Table 4: Assessment Location 2: Zenith Building Post Office (internal)

The above *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the reverberant sound pressure level from the generator within the Post Office would be expected to be lower.

4.3 Assessment Location 3: Zenith Building Offices

It was not possible to measure at 1 metre from the façade of the first-floor offices of the Tootal House Office Building (at c.6 metres above roof level level). Therefore, noise level measurements were conducted at c.1m from the generator exhaust outlet aperture at 45° off-axis. A 'clearly perceptible' tonal character was observed from the generator at this assessment location. Therefore, a correction of +4dB has been applied to the measured *Ambient Sound Level* to obtain the *Rating level* in accordance with BS4142 assessment methodology. Table 5 compares the determined *Rating Level* from the generator as assessed against the specified *Rating Level* criteria:

Event	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Plant Operating *(Ambient Sound Level),* dB $L_{eq,T}$	59	55	55	53	52	49	44	35	53
Rating Level (*Specific Sound Level* +4dB character correction), dB $L_{Ar,Tr}$									≤57
Specified Noise Criteria (*Rating Level* at 1m from the building façade), dB $L_{Ar,Tr}$									≤64
Result									**Pass**

Table 5: Assessment Location 3: Zenith Building offices (at 1m from the generator exhaust aperture)

The above *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the *Specific Sound Level* and resultant *Rating Level* of the generator would be expected to be lower.

4.4 Assessment Location 4: Tootal Building Offices

A 'clearly perceptible' tonal character was observed from the generator at this assessment location. Therefore, a correction of +4dB has been applied to the as measured *Ambient Sound Level* to obtain the *Rating Level* in accordance with BS4142 assessment methodology. Table 6 compares the determined *Rating Level* from the generator as assessed against the specified *Rating Level* criteria.

Event	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Plant Operating *(Ambient Sound Level),* dB $L_{eq,T}$	67	66	58	56	57	56	52	46	60
Rating Level (*Specific Sound Level* +4dB character correction), dB $L_{Ar,Tr}$									≤64
Specified Noise Criteria (*Rating Level* at 1m from the building façade), dB $L_{Ar,Tr}$									≤64
Result									**Pass**

Table 6: Assessment Location 4: Tootal Building offices

The above *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the *Specific Sound Level* and resultant *Rating Level* of the generator would be expected to be lower.

4.5 Assessment Location 5: Zenith Building Basement Carpark (Internal)

Table 7 compares the determined Specific Level from the Generator as assessed against the specified reverberant sound pressure level criteria:

Event	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Plant Operating *(Ambient Sound Level),* dB $L_{eq,T}$	68	79	74	66	65	65	64	59	70
Specified Noise Criteria (Reverberant sound pressure level limit within building), dB $L_{eq,T}$									≤75
Result									Pass

Table 7: Assessment Location 5: Zenith Building Basement Carpark (internal)

The *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the reverberant sound pressure from the generator would be expected to be lower.

4.6 Assessment Location 6: Generator Exhaust Outlet Aperture

Table 8 compares the determined *Ambient Sound Level* from the generator as assessed against the specified sound pressure level criteria:

Event	**Unweighted Time-Averaged Sound Pressure Level, dB $L_{eq,T}$ At Octave Band Centre Frequency, Hz**								**dB(A)**
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Plant Operating *(Ambient Sound Level),* dB $L_{eq,T}$	59	55	55	53	52	49	44	35	53
Specified Noise Criteria (sound pressure level limit at 1m from generator exhaust outlet aperture), dB $L_{eq,T}$									≤72
Result									**Pass**

Table 8: Assessment Location 6: Generator Exhaust Outlet Aperture

The above *Ambient Sound Level* measurements include the noise contribution from other environmental noise sources. In the absence of noise from other environmental noise sources, the *Specific Sound Level* of the generator would be expected to be lower.

4.7 Assessment Location 7: Generator Extract Ventilation Louvre (External)

It was not possible to get access to the generator extract ventilation louvre during the survey due to the Development external site compound solid hoarding as located on Marriot's Close (see Figure 3 overleaf). Therefore, the noise levels at this position were not measured.

However, it shall be noted that the results of the noise level measurements at 1m from the Tootal building office façade as arising from the generator extract ventilation louvre confirm compliance with the specified noise criteria (see Section 4.4 Assessment Location 4).



Figure 3: Development site hoarding restricting access to generator extract ventilation louvre

Yours sincerely

For and on behalf of Sol Acoustics Limited

Brian Horner BSc MIOA
Associate Director