

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Rooftop plant noise – assessment for planning

This memo details plant noise egress assessment to nearby noise sensitive premises against the requirements of the Local Authority.

Summary

Normally operating plant

Noise egress from normally operating plant is predicted to meet the relevant daytime and night-time limits.

Emergency plant

Noise egress from the generator is predicted to meet the daytime emergency plant noise limit.

Noise egress from the generator is predicted to exceed the night-time limit by 6 dBA.

It is understood that routine testing will be carried out during daytime hours only. As such, the predicted night-time exceedance is only expected to occur in the event of a life-safety emergency.

It may be possible to agree a relaxation against the night-time emergency plant limits on the basis that the generator would only operate during the night-time in a life-safety emergency. This would need to be agreed with the Local Authority.

If a relaxation cannot be agreed with the Local Authority then further attenuation is expected to be required to the generator.

Plant noise egress criteria

Plant noise egress criteria for the Rochdale Riverside Phase II development are set out within 20186-R08-B *Planning noise report* dated 20 November 2020, as summarised in Table 1. These are based on meeting the requirements of the Local Authority, based on the representative measured background sound levels during the environmental noise survey carried out in 2020.

Table 1 Plant noise limits at 1 m from the nearest noise sensitive premises – masterplan

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Daytime (07:00-23:00)	49
Night-time (23:00-07:00)	38

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These have been corrected relative to the measured free-field background noise levels by the addition of 3 dB.

These limits apply to normally operating plant. Emergency plant is typically subject to relaxed limits (10 dB above the limits Table 1).

Proposed rooftop plant

Plant noise data has been received via email on 7 October 2022, 12 October 2022, 6 December 2022 and 16 December 2022, as summarised below.

- 1 x Estoc Targe (PowerBox) 80-560-3 kitchen extract fan (see Table 2 and Table 4)
- 3 x AHU units (see Table 2 and Table 4), case breakout sound pressure level at 1 m:
 - 42 dBA for AHU A15547-01-C
 - 40 dBA for AHU A15547-02-C
 - 41 dBA for AHU A15547-03-C
- 5 x AC units:
 - 2 x Panasonic U-250PZH2E8 AC units (see Table 3)
 - 2 x Panasonic PACi AC units sound power level L_w 67 dBA each
 - 1 x Panasonic PZH3 AC unit sound power level L_w 69 dBA
- 4 x Panasonic CAHV-P500YB-HPB air source heat pumps (see Table 3)
- 13 x VRF units (see Table 3).

Table 2 Received plant noise data – Sound power levels

Plant item	Sound power level, L_w (dB)								dBA
	Octave-band centre frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	
<i>Kitchen extract fan</i>									
Exhaust	70	88	81	78	75	72	67	61	81
Breakout	49	75	68	61	58	57	53	49	67
<i>AHU A15547-01-C</i>									
Intake	69	74	73	67	60	53	47	37	69
Exhaust	71	75	73	74	75	71	66	60	78
<i>AHU A15547-02-C</i>									
Intake	66	64	69	64	58	52	49	38	65
Exhaust	69	66	72	71	74	71	67	60	78
<i>AHU A15547-03-C (intake)</i>	71	79	76	69	63	55	50	44	71

Table 3 Received plant noise data – Sound pressure level at 1 m

Plant items	Sound pressure level at 1 m, L_{eq} (dB)								
	Octave-band centre frequency (Hz)								
	63	125	250	500	1000	2000	4000	8000	dBA
Heat pumps	70	65	60	57	52	47	49	45	59
U-8MF3E8 VRF (12 units)	55	58	46	45	39	32	29	28	47
U-14MF3E8 VRF (1 unit)	59	66	58	53	48	39	35	29	56
U-250PZH2E8 (2 units)	63	65	64	61	59	54	50	45	64

Table 4 Received attenuator data

	Insertion losses, D_i (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Kitchen extract fan exhaust	5	12	16	22	28	20	18	12
AHU 01 intake	2	6	14	21	28	23	17	10
AHU 01 exhaust	2	6	11	21	28	23	17	10
AHU 02 intake	2	6	11	21	28	23	17	10
AHU 02 exhaust	2	6	11	21	28	23	17	10
KSF 01 (assumed to be AHU 03) intake	5	10	18	28	36	28	24	14

It is assumed that regenerated airflow noise through the attenuators is suitably controlled so as not to cause the noise egress limits to be exceeded.

Rooftop plant layouts

The latest rooftop plant layout *RR2-AME-B2-XX-DR-M-50009-(C02)-Roof Plant Layout* dated 27 October 2022 has been downloaded from Viewpoint For Projects and is used as basis for this assessment.

Generator

The following overall A-weighted sound pressure levels have been provided by the generator supplier:

- Standard acoustic enclosure: 73 dBA at 7m
- Attenuator & secondary silencer: 30 dBA at 35 m.

It is understood based on discussion with the generator supplier that the attenuator and secondary silencer noise data corresponds to the ducted exhaust and flue route.

Specific noise data for the case-breakout and intake noise levels from the generator have not been provided.

For the purposes of this assessment, a 50-50 split has been assumed between:

- Generator exhaust and flue
- Generator case-radiated and intake.

3D environmental noise model

Assessment has been carried out to predict plant noise egress to the nearby noise sensitive premises for normally operating plant. Calculations are based on all plant items running simultaneously.

A 3D environmental noise model of the site has been produced using the computational acoustic modelling package CadnaA (version 2022 MR 1).

The software carries out calculations using a ray tracing technique, and considers the effects of topography, reflections, screening and distance attenuation for noise sources to predict noise levels in three dimensions. Calculations are carried out in accordance with ISO 9613 *Attenuation of sound during propagation outdoors*.

Assessment

Normally operating plant

Plant noise egress levels of L_{Aeq} 38 dB are predicted at the worst-affected nearby noise sensitive premises to the north of the site along Yorkshire Street.

This meets both the daytime and night-time plant noise egress limit set out in 20186-R08-B *Planning noise report*.

Generator

Emergency plant is typically subject to a 10 dB relaxation, ie, emergency plant noise egress levels of $L_{Aeq,15min}$ 58 dB during the daytime, $L_{Aeq,15min}$ 49 dB during the night-time should be achieved at the nearby noise sensitive premises, subject to agreement with the Local Authority.

It is understood the proposed cladding to the rooftop plant room comprises:

- Profiled sheet metal
- 80 mm Rockwool insulation
- 12 mm RCM Y-wall sheathing board.

The cladding is predicted to provide sound insulation performance R_w+C_{tr} 37 dB.

There is a louvred double door, facing east. This is expected to be the weakest element acoustically.

A reverberation time of 1.5 s has been assumed for the rooftop plant room.

A plant noise egress level of $L_{Aeq,15min}$ 55 dB is predicted at the worst-affected nearby noise sensitive premises from the generator. This meets the daytime emergency plant noise limit but exceeds the night-time limit by 6 dBA.

It is understood that routine testing will be carried out during daytime hours only. As such, it may be possible to agree a relaxation against the night-time limits on the basis that the

generator would only operate during the night-time in a life-safety emergency. This would need to be agreed with the Local Authority.

If a relaxation cannot be agreed with the Local Authority, 6 dBA attenuation would need to be achieved to case-breakout noise and intake noise (based on the assumed specific contributions). Potential mitigation measures to be considered include:

- Reselection of generator unit
- Localised screening
- Acoustic louvred doors.

It is recommended that sound levels be verified by measurement once plant is installed and commissioned.