SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Memo:	M070-A	**Date:**	13 December 2023
Project:	15037	**Pages:**	21
From:	Jose M. Gonzalez	**Reviewer:**	James Atha

Old Granada Studios

L2 and L10 rooftop noise egress reassessment – zones 4 and 5

This memo provides a noise egress assessment for the proposed Level 2 and Level 10 rooftop normally operating plant in operation.

Summary

A 3D acoustic model of the proposed hotel was created to assess noise egress from the noise generating plant associated with L2 and L10 rooftop plant areas.

The model has been used to predict plant noise levels at the nearest noise sensitive premises, and to provide with strategic mitigation guidance.

Noise egress criteria has been taken from our report 15037-R12-A *Plant noise egress assessment report - zones 4 and 5* dated 21 January 2022.

Noise data and an updated schedule for rooftop condensers operating in "Quiet mode" was received via email on 13 September 2023. Details of an updated screening proposals have also subsequently been received. As such, a revised assessment is presented below.

Based on the proposed plant items, attenuator selection, locations, level 10 screening, and screening and lid proposals to ODUs on Level 2, the predicted plant noise egress levels at the nearest noise sensitive premises exceed the plant noise egress limits. Guidance on additional mitigation measures have been provided. This includes:

Level 2 rooftop plant

- Induct attenuator to EF/02.02A&B – Extract
- Acoustic enclosure to EF/02.02A&B – Break out
- Acoustic louvre to one of the proposed open sides to Level 2 ODUs' Acoustic + screening and lid

Level 10 rooftop plant

One of the following mitigation options is recommended to control noise egress from the level 10 rooftop plant area:

Option 1:

- Provide acoustic packages to ODU/07/01 to ODU/07/04, ODU/08/01, ODU/09/01 and EF/10/01.
- Provide induct attenuator to EF/10/01 extract, and additional attenuation AHU10/02 to AHU10/04 exhaust terminations.
- Provide acoustic enclosures AHU10/01 to AHU10/04.

Option 2:

- Increase the extent of the proposed solid acoustic screening to be at least 2.35 m above rooftop level and along the full perimeter of level 10 plant area.
- Provide acoustic packages to ODU/07/01 and ODU/08/01, or reduce the duty of these units to operate in a low noise 'quiet' mode. Noise level contributions from units in quiet mode should be such that overall levels at the nearest noise sensitive premises are not exceeded during the day and at night. This will need to be reviewed.

Nearest noise sensitive receptors

The proposed development is outlined in yellow in Figure 1.

To the west of the site, the nearest and worst effected receptors are considered to be Manchester Goods Yard and 1 New Quay Street highlighted in red and pink respectively in Figure 1. These comprise of office premises and are therefore considered to only be a noise sensitive receptor during the daytime (07:00-23:00).

To the east of the site, the nearest and worst effected receptor is Bauhaus. This is a residential receptor, highlighted in blue in Figure 1. This receptor is noise sensitive during the day (07:00-23:00) and at night (23:00-07:00).

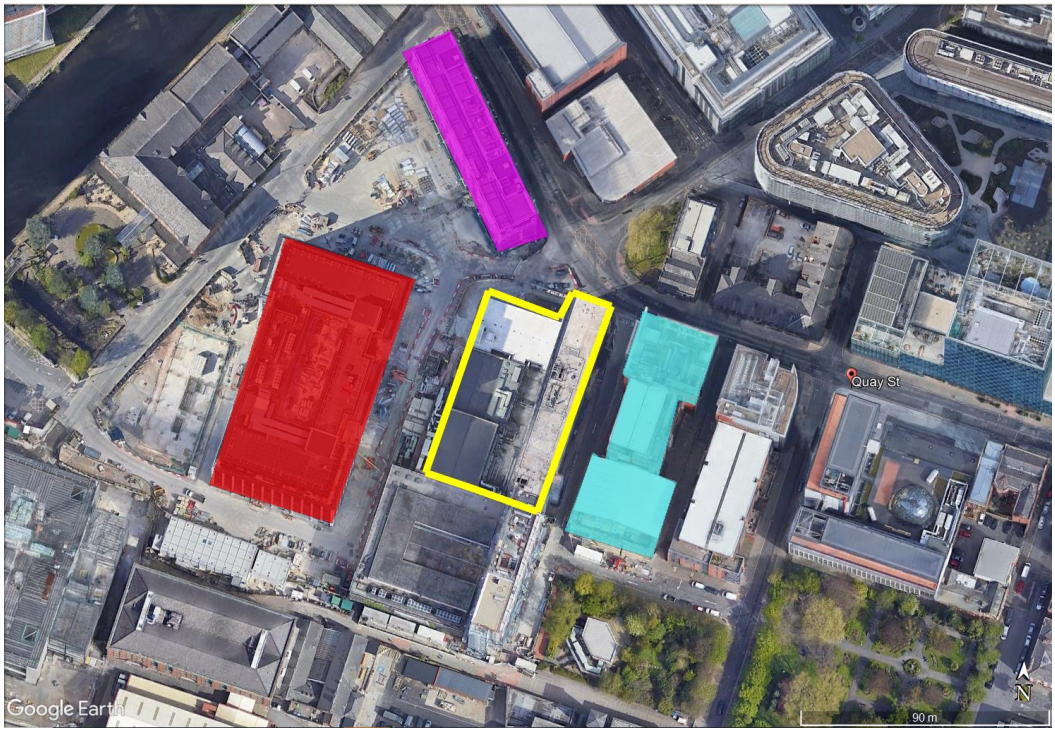


Figure 1 Site and its surrounding (courtesy of Google Earth Pro)

Criteria

Planning condition 15

Manchester City Council states the following in relation to planning condition 15 for application reference 127612/FO/2020

'*Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. The scheme shall be submitted to and approved in writing by the City Council as local planning authority prior to first occupation in order to secure a reduction in the level of noise emanating from the site. Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site, to safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy'*

Normally operating plant

Previously, octave band noise egress criteria were set for Old Granada Studios however the latest Manchester City Council plant noise egress criteria is provided within the 'Planning and noise technical guidance ' October 2022 and is as follows:

> *'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'*

As such, the octave band criteria have been converted to their corresponding broadband values.

Based on the above, the cumulative noise level resulting from the operation from all new plant at 1 m from the most affected windows of the nearest noise sensitive premises shall not exceed 5 dB below the minimum background (L_{A90}) external noise levels as per Table 1. This relates to the overall plant noise egress levels from the entire Old Grandad Studios development.

Table 1 Plant noise limits for overall OGS development.

	Plant noise limit at 1 m from noise sensitive receiver, L_{Aeq} (dB)	
Location	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
West and south of the site	46	45
East of the site	46	40

For Zone 4 and Zone 5, the overall limits have been reduced by 3 dB for receptors to the east allow for contributions from Zone 6.

For receptors to the west and south of the site, the Zone 6 noise sources are sufficiently distanced such that they will not have equal contributions to Zone 4 and Zone 5 at any of the same facade points.

Based on the above, the plant noise limits applicable to Zone 4 and Zone 5 are set out in Table 2.

Table 2 Plant noise limits for Zone 4 and Zone 5

	Plant noise limit at 1 m from noise sensitive receiver, L_{Aeq} (dB)	
Location	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
West and south of the site	46	45
East of the site	43	37

Corrections will need to be applied for any attention catching features in line with BS4142:2014.

Plant proposals

Zone 5 ground level louvered areas

Four louvred plant areas are proposed at the GF of Zone 5, facing Atherton Street.

These are shown in Figure 2.

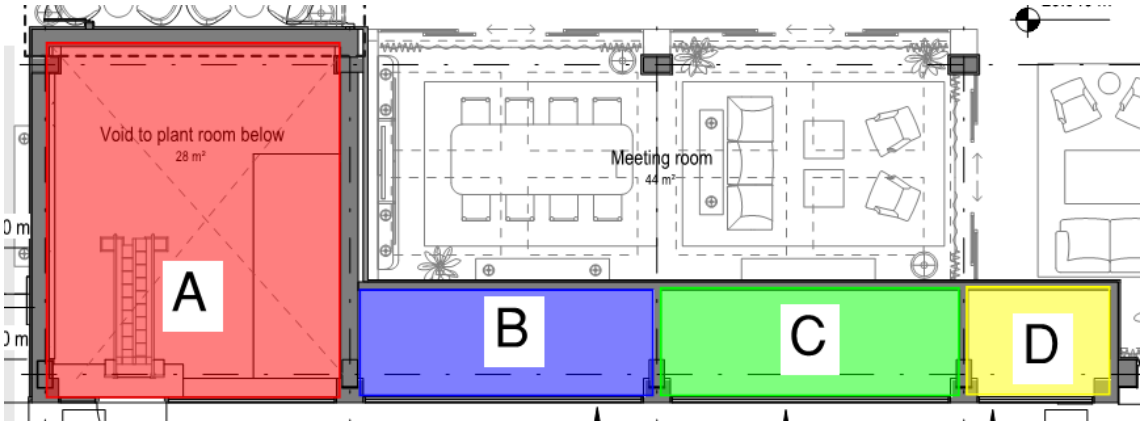


Figure 2 Zone 5 ground floor louvred plant areas

The following plant is proposed:

- Louvred area A leads to the lower ground plant room containing 2 x boilers, 3 x hot water heaters, 2 x boosted cold water pumps and 3 x sets of heat pumps
- Louvred area B and C each contain a Mitsubishi EP250
- Louvred area D contains no plant items.

The proposed items of plant at Level 2 and level 10 rooftop level are summarised below.

Level 2 rooftop

The proposed level 2 rooftop plant layout is shown in highlighted in blue in .

The following items of plant are proposed:

- 6 x AHUs highlighted in red in Figure 3
  - AHU 02/03 (PFP A3-0450 2.4kW 400V-3F M6F7)
  - AHU 02/07 (unit model AH 1925-5050-FG-WP)
  - AHU 02/04 (PFP A3-0355 2.1kW 400V-3F M6F6)
  - AHU 02/01 (PFP A3-0500 4.1kW 400V-3F M6H5)
  - AHU 02/05(PFP A3-0315 1.5kW 400V-3F M6F8)
  - AHU 02/02 (PFP A3-0355 2.1kW 400V-3F M6F6)

- 19 x ODUs highlighted in blue in Figure 3
  - ODU/LG/01 (Daikin REYQ14U)
  - ODU/00/01 (Daikin REYQ14U)
  - ODU/00/02 (Daikin REYQ10U)
  - ODU/01/01 (Daikin REYQ8U)
  - ODU/01/02 (Daikin REYQ8U)
  - ODU/01/03 (Daikin REYQ8U)
  - ODU/02/01 (Daikin REYQ8U)
  - ODU/02/02 (Daikin REYQ8U)
  - ODU/03/01 (Daikin REYQ8U)
  - ODU/03/02 (Daikin REYQ8U)
  - ODU/04/01 (Daikin REYQ8U)
  - ODU/04/02 (Daikin REYQ8U)
  - ODU/05/01 (Daikin REYQ8U)
  - ODU/05/02 (Daikin REYQ8U)
  - ODU/06/01 (Daikin REYQ8U)
  - ODU/06/02 (Daikin REYQ8U)
  - ODU/LG/02 (Daikin RXM50R)
  - ODU/01/04 (Daikin RXM35R9)
  - ODU/01/05 (Daikin RXM35R9)
- 2 x Extract fans highlighted in green in Figure 3
  - 1 x KRD 500/4/80/50 A Rectangular Box Fan (EF 02 01)
  - 1 x GBD 630/4 T 120 (CENT) (EF 02 02A&B)

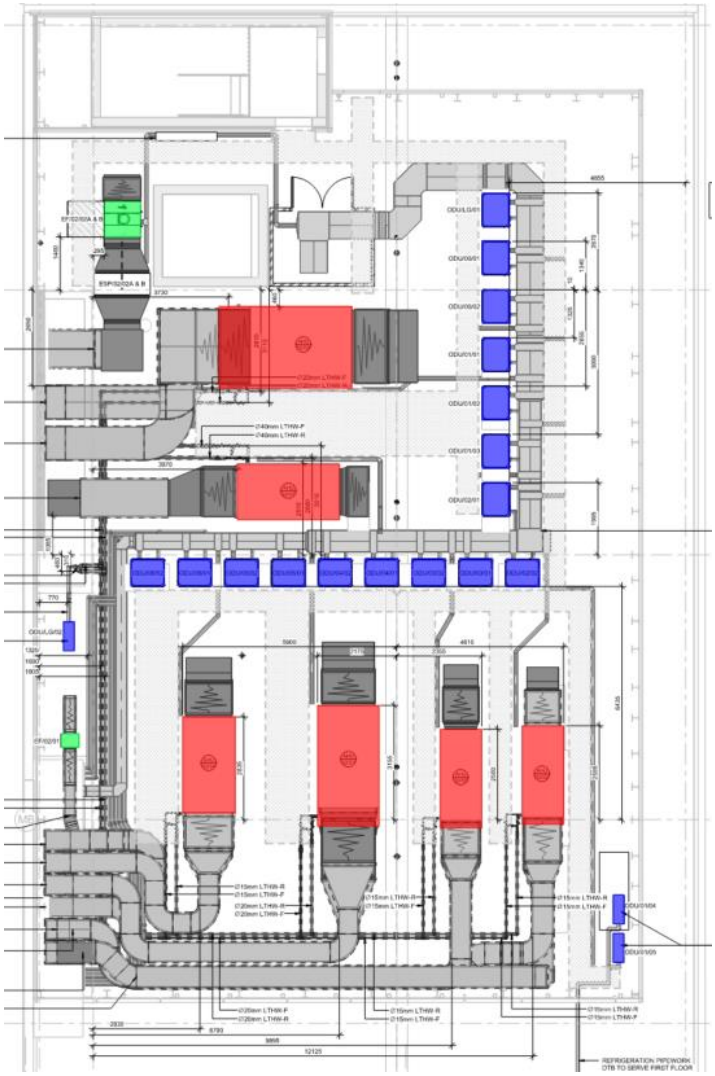


Figure 3 Level 2 proposed roof top layout

An acoustic screen with a lid is proposed around the ODUs at level 2. Details of this are provided later in this document.

Level 10 rooftop

The proposed roof top plant layout on level 10 is shown in Figure 4 and Figure 5.

The following items of plant are proposed:

- 5 x AHUs highlighted in pink in Figure 4 and Figure 5
  - AHU 10/01 (PFP A3-0450 2.4kW 400V-3F M6F7)
  - AHU 10/02 (PFP A3-0355 2.1kW 400V-3F M6F6)

  - AHU 10/03 (PFP A3-0450 2.4kW 400V-3F M6F7)
  - AHU 10/04 (PFP A3-0450 2.4kW 400V-3F M6F7)
  - AHU 10/05 (PFP A3-0500 4.1kW 400V-3F M6H5)
- 6 x ODUs highlighted in light blue in Figure 4
  - ODU/07/01 (Daikin REYQ8U)
  - ODU/07/02(Daikin RMX42R)
  - ODU/07/03 (Daikin RMX42R)
  - ODU/07/04 (Daikin RMX50R)
  - ODU/08/01 (Daikin REYQ24U)
  - ODU/09/01 (Daikin REYQ20U)
- 1 x Extract fan highlighted in orange in Figure 5
  - 1 x GBD 560/4 T 120 (CENT) (EF 10 01)

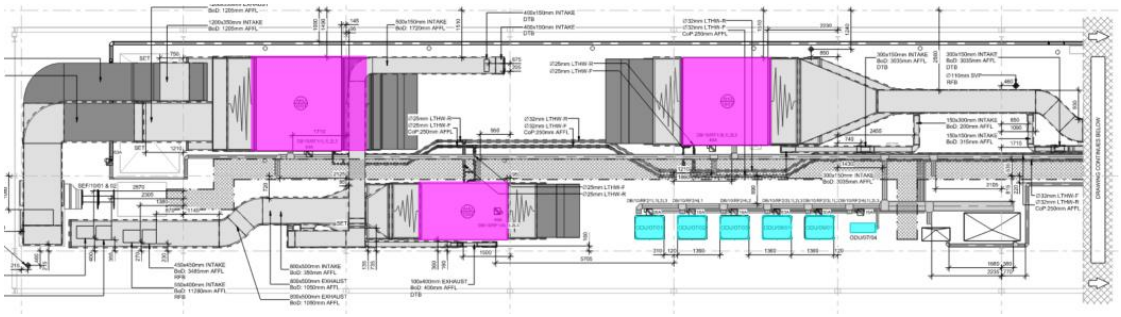


Figure 4 Level 10 plant layout 1

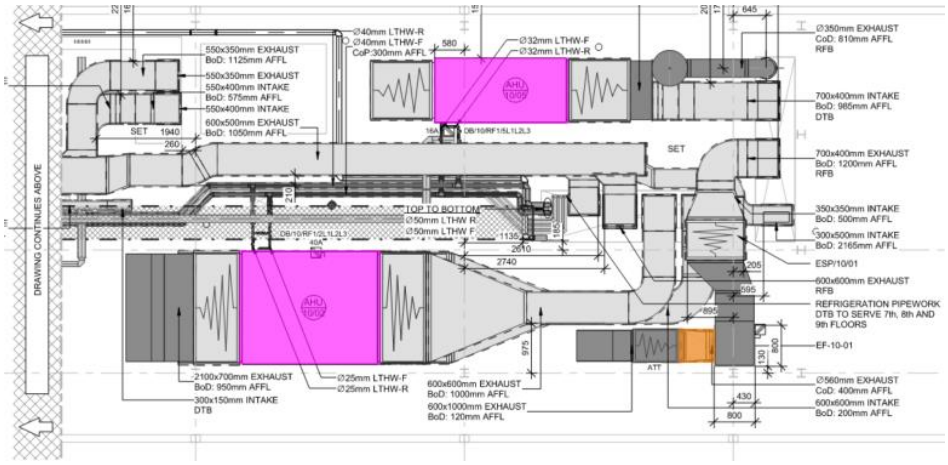


Figure 5 Level 10 plant layout 2

Plant selections and noise data

Zone 5 ground level louvered areas

Louvred area A

Noise levels within the LG plant room are limited to NR 70 with low frequency limits of 80 dB within the 63 Hz and 125 Hz octave bands.

Louvred area B and C

The following units are proposed behind louvred area B and louvred area C:

- 1 x Mitsubishi EP250
- 2 x Daikin RXM60R.

The sound pressure data provided for the Mitsubishi EP250 condenser is not at a stated distance, but it is assumed to be measured at 1 m. In addition, the data is provided as a broadband sound pressure level. For the purpose of this assessment, a representative spectrum has been used. This data for the EP250 is provided in Table 3.

The sound pressure data for the proposed Daikin RXM60R is summarised in Table 3.

Table 3 GF condenser sound pressure data

	Sound pressure level L_{eq} at 1 m(dB) Octave-band centre frequency (Hz							
	63	125	250	500	1000	2000	4000	8000
EP250	70	62	62	59	53	47	45	43
Daikin RXM60R	49	52	51	48	44	38	34	-

Mitsubishi condenser attenuation package for the proposed unit is summarised in Table 4

Table 4 Mitsubishi attenuation package

	Transmission loss (dB) Octave-band centre frequency (Hz							
	63	125	250	500	1000	2000	4000	8000
Mitsubishi condenser package	5	6	7	8	11	11	8	8

Manufacturer plant noise data

Noise data for the proposed equipment selections at the level 2 and level 10 roof top plant areas are summarised below.

Table 5 Level 2 and level 10 roof top plant selection

	Sound power level L_W (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
Level 2 rooftop plant								
EF/02.02A&B								
Extract[1]	-	96	90	86	83	80	75	69
Break out[1]	-	81	75	67	64	63	59	55
EF/02/01								
Extract[1]	-	71	66	58	54	48	45	47
Break out[1]	-	64	51	41	32	23	20	23
AHU 02/03								
Inlet	70	70	76	67	62	56	50	42
Inlet break out[2]								
Exhaust	72	76	74	75	76	72	67	61
Exhaust break out[2]	51	55	9	37	35	36	27	16
AHU 02/07								
Inlet	76	81	75	68	69	59	55	46
Inlet break out	69	70	55	53	54	53	45	35
AHU 02/04								
Inlet	66	64	69	64	58	52	48	37
Inlet break out[2]	49	46	38	34	34	34	36	28
Exhaust	68	65	71	70	73	70	66	59
Exhaust break out[2]	47	44	36	32	32	34	26	14
AHU 02/01								
Inlet	65	69	66	61	59	52	49	41
Inlet break out[2]	51	53	36	33	35	35	26	17
Exhaust	71	73	70	70	75	70	65	61

	Sound power level L_W (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
Exhaust break out[2]	50	52	35	32	34	34	25	16
AHU 02/05								
Inlet	64	64	70	61	56	49	44	33
Inlet break out[2]	50	48	47	28	27	32	28	13
Exhaust	70	67	74	67	69	68	64	57
Exhaust break out[2]	49	47	46	27	26	31	27	12
AHU 02/02								
Inlet	65	63	68	63	57	51	47	36
Inlet break out[2]	48	45	37	33	33	35	27	15
Exhaust	67	64	70	69	72	69	65	58
Exhaust break out[2]	46	43	35	31	31	33	25	13
ODU/LG/01 ODU/00/01	90	83	80	80	75	70	70	68
ODU/01/01 ODU/01/02	88	81	79	77	71	68	64	59
ODU/LG/02[2]	49	51	52	48	44	38	32	-
ODU/01/04[2] ODU/01/05[2]	53	54	51	50	45	40	36	28
Level 10 rooftop plant								
EF/10/01								
Extract[1]	-	92	86	82	79	76	71	65
Break out[1]	-	77	71	63	60	59	55	51
AHU 10/05								
Inlet	67	69	75	65	64	61	57	56
Inlet break out[2]	51	48	39	34	33	41	29	23
AHU 10/02								
Inlet	70	68	73	67	62	54	49	34

	Sound power level L_W (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
Inlet break out[2]	54	51	43	39	39	41	33	21
Exhaust	73	70	76	75	78	75	71	64
Exhaust break out[2]	52	49	41	37	37	39	31	19
AHU 10/01								
Inlet	71	71	75	69	63	56	49	35
Inlet break out[2]	58	57	47	41	41	43	34	23
Exhaust	74	78	76	77	78	74	69	6
Exhaust break out[2]	53	57	41	39	37	38	29	18
AHU 10/04								
Inlet	74	72	77	72	66	60	56	45
Inlet break out[2]	57	54	46	42	42	44	36	24
Exhaust	74	78	76	77	78	74	69	63
Exhaust break out[2]	53	57	41	39	37	38	29	18
AHU 10/03								
Inlet	74	72	77	72	66	60	56	45
Inlet break out[2]	57	54	46	42	42	44	36	24
Exhaust	76	80	78	79	80	76	71	65
Exhaust break out[2]	55	59	43	41	39	40	31	20
ODU/07/01	88	81	79	77	71	68	64	59
ODU/07/02[2]	48	52	51	47	42	37	30	-
ODU/07/04[2]	49	51	52	48	44	38	32	-
ODU/08/01[3]	96	91	87	86	78	76	73	70

[1] Presented data has been calculated from the A-weighted sound power levels received

[2] The presented level are sound pressure levels at 1 m

[3] This unit is formed of 1 x REYQ8U + 1 x REYQ16U, the predicted worst case sound power levels are presented

ODU noise data in quiet mode

Quiet mode noise data has been provided for 13 of the condenser units (ODUs), which are proposed to operate at a lower duty to reduce noise emissions (quiet mode). The noise data provided is presented in Table 6.

Table 6 Quiet mode condenser sound pressure level data

	Sound pressure level at 1 m L_{eq} (dB) at each octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
REYQ8U Quiet mode 1 (ODUs 05/02 and 06/02)	62	56	50	49	49	47	44	36
REYQ8U Quiet mode 2 (ODUs 02/01, 02/02, 03/01, 03/02, 04/01, 04/02, 05/01, 06/01)	55	55	48	47	47	45	43	34
REYQ8U Quiet mode 3 (ODU 01/03)	54	53	48	48	41	41	40	35
REYQ10U Quiet mode 1 (ODU 00/02)	62	56	50	49	49	47	44	36
REYQ20U Quiet mode 1 (ODU 09/01)	60	57	57	55	48	45	42	38

Currently proposed mitigation measures

Zone 5 GF louvred area A

To control noise emissions from louvred area A, a solid blanking panel will be provided to the rear of the louvres to provide a minimum sound insulation performance of R_w+C_{tr} 40 dB.

All atmospheric terminations are to be ducted, with the ductwork acoustically lagged with a 50 mm thick acoustic lagging with a minimum mass layer of 10 kg/m^2.

In duct attenuation

In-duct attenuators are shown to the air handling units and extract fans.

The proposed in-duct attenuator insertion loss proposed are summarised in Table 7.

Table 7 Proposed attenuator insertion losses

	Attenuator insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
EF/02/01 extract ATT-E-02-01A	2	3	6	15	19	14	13	10
AHU 02/03 Inlet – ATT-A-02-03A Exhaust – ATT-A-02-03D	3	7	12	18	26	21	18	11
AHU 02/07 Inlet – ATT-A-02-07A	5	9	14	19	25	19	16	10
AHU 02/02 Inlet – ATT-A-02-02A Exhaust – ATT-A-02-02D AHU 02/04 Inlet – ATT-A-02-04A Exhaust – ATT-A-02-04D	3	5	10	15	20	15	13	8
AHU 02/01 Inlet – ATT-A-02-01A Exhaust – ATT-A-02-01D AHU 10/05 Inlet – ATT-A-10-05A	3	7	12	19	28	23	20	12
AHU 02/05 Inlet – ATT-A-02-05A Exhaust – ATT-A-02-05D	3	6	11	16	22	17	15	9
EF/10/01 Exhaust – ATT-E-10-01B	7	11	17	22	30	21	17	11
AHU 10/02 Inlet – ATT-A-10-02A Exhaust – ATT-A-10-02D	8	12	18	24	32	25	20	13
AHU 10/01 Inlet – ATT-A-10-01A Exhaust – ATT-A-10-01D AHU 10/04	7	11	17	22	30	21	17	11

	Attenuator insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
Inlet – ATT-A-10-04A								
Exhaust – ATT-A-10-04D								
AHU 10/03								
Inlet – ATT-A-10-03A								
Exhaust – ATT-A-10-03D								

Acoustic screening

Acoustic screening is proposed around the ODUs on Level 2 which includes a lid, the proposed bus stop like configuration has an open side to access the ODUs as shown in Figure 6.

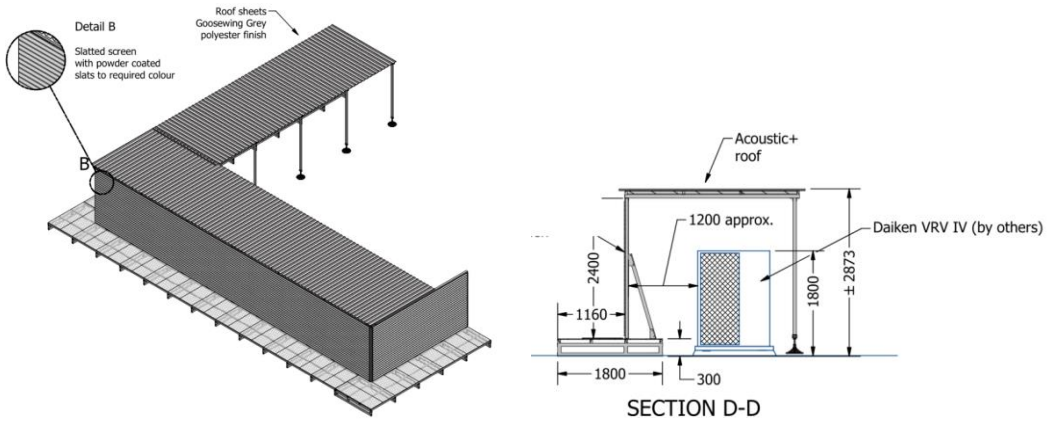


Figure 6 Proposed acoustic screening with acoustic lid

The screening and lid are proposed to be formed from an 'Acoustic +' product with the sound insulation and sound absorption performances set out in Table 8.

Table 8 Acoustic + screening and roof

	Octave-band centre frequency (Hz)						
Acoustic +	63	125	250	500	1000	2000	4000
Acoustic performance D_i (dB)	19	20	22	28	35	37	41
Sound absorption coefficient(α_w)	0.14	0.15	0.55	1.01	1.12	1.08	0.95

At level 10 rooftop, the proposed height of the Acoustic + screening is currently 2 m from rooftop level, the extent of the proposed screening is shown in Figure 7.

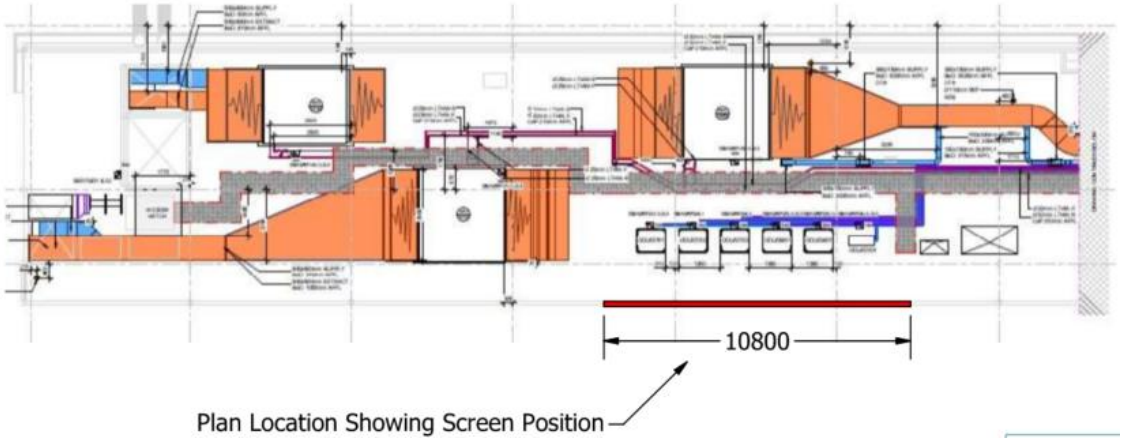


Figure 7 Except of DR898-2 rev A Acoustic plant screen

Plant noise egress assessment

Operational hours

It is understood that plant items will be capable of operated during the daytime (07:00-23:00) and night-time (23:00-07:00).

The assessment considers all plant operating simultaneously at design duty which is considered to be worst-case and unlikely to regularly occur in practice. The only exception to this is the units that are proposed to operate in 'quiet mode' where highlighted above.

Methodology

A 3D environmental noise model was created using CadnaA by Datakustik to assess noise egress from the proposed items of plant.

The model takes into account screening from surrounding buildings, distance attenuation. Ac screenshot from the model is provided in Figure 8.

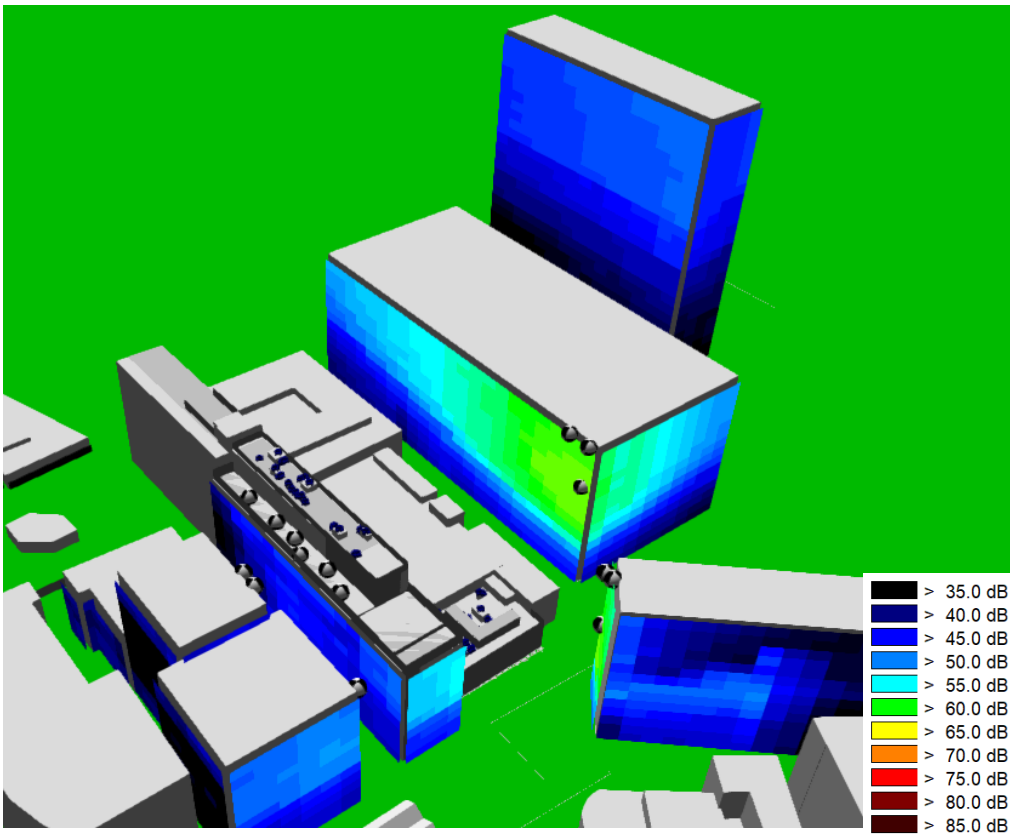


Figure 8 Screenshot of the 3D model showing predicted levels at nearest noise sensitive premises, L_{Aeq} (dB)

Predicted noise levels

Based on the above, the predicted noise levels at the nearest noise sensitive premises are summarised in Table 9.

Table 9 Predicted noise egress levels

Location	Predicted levels at 1 m from noise sensitive receiver, L_{Aeq} (dB)
Manchester Goods Yard to west	59
1 New Quay Street	59
Bauhaus to east	53
Hotel facade	61

The predicted noise levels at the nearest noise sensitive premises exceed the day and night plant noise egress limits. As such, further mitigation measures are required.

Additional mitigation measures

In addition to the currently proposed attenuation measures set out above, the following additional mitigation measures are required.

The mitigation measures set out are based on controlling plant noise egress to meet with the day and night limits at the nearest noise sensitive premises.

Level 2 extract fans

To control plant noise egress levels from the level 2 extract fans, the following additional mitigation is recommended.

- In-duct attenuation and acoustic packages with minimum insertion losses set out in Table 10 and Table 11 respectively.

Table 10 In-duct attenuator minimum insertion loss - EF/02.02A&B - Extract

	Minimum attenuator insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
EF/02.02A&B - Extract	-	17	15	20	22	19	16	12

The insertion losses for the extract fan can typically be achieved with a 1200 mm long attenuator.

The attenuator should be selected such that regenerated noise does not cause limits being exceeded.

Table 11 Acoustic enclosures minimum insertion loss Level 2 - EF/02.02A&B – Break out

	Minimum acoustic enclosure insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items and termination	63	125	250	500	1000	2000	4000	8000
EF/02.02A&B – Break out	-	2	4	2	2	4		-

Example suppliers of acoustic enclosures are provided below Table 15.

Acoustic louvre to the screened enclosure (ODUs)

An acoustic louvre capable of achieving the insertion loss set out in Table 12 is recommended to close off the side of the enclosure facing south, as per the mark-up in Figure 9.

Table 12 Acoustic louvre minimum transmission loss

	Minimum louvre insertion loss D_i (dB) Octave-band centre frequency (Hz							
Louvre	63	125	250	500	1000	2000	4000	8000
Type A (red in)	-	2	3	5	6	3	1	-

Example suppliers of acoustic enclosures/ louvres are provided below Table 15.

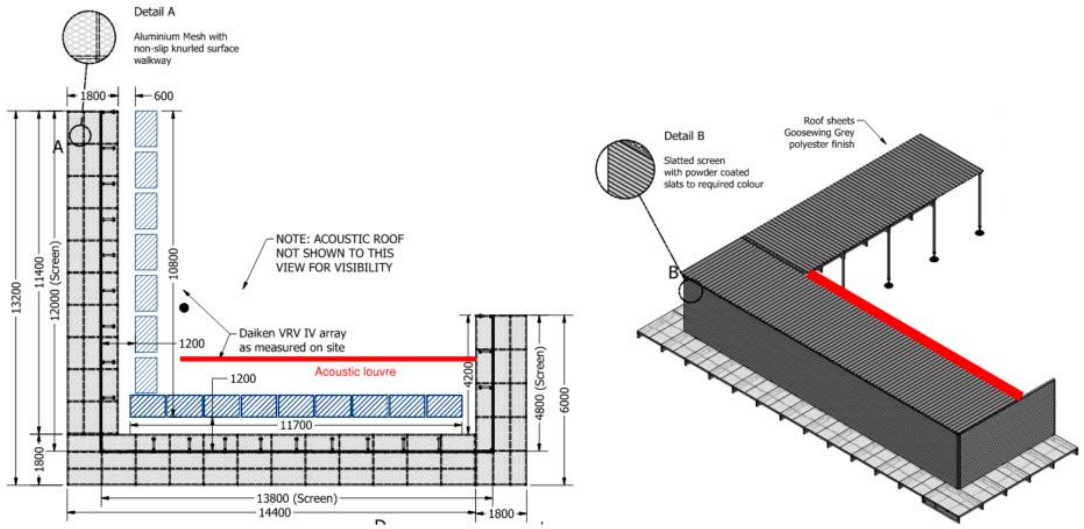


Figure 9 Location of acoustic louvre to close off enclosure

<u>Level 10 rooftop plant area</u>

To control noise egress levels from level 10 rooftop plant area, the following additional mitigation measures are recommended.

Option 1 (with currently proposed screening)

- Acoustic package with minimum insertion losses set out in Table 15

Table 13 Acoustic enclosures minimum insertion loss Level 10 – ODUs 08/01 and 07/01

	Minimum acoustic enclosure insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items	63	125	250	500	1000	2000	4000	8000
ODU 07/01	14	13	21	25	2	2	20	18
ODU 07/02	-	-	2	5	6	3	-	-
ODU 07/03	-	-	2	5	7	4	-	-

	Minimum acoustic enclosure insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items	63	125	250	500	1000	2000	4000	8000
ODU 07/04	-	-	2	5	8	4	-	-
ODU 08/01	22	23	28	34	33	31	31	28
ODU 09/01	-	-	7	12	10	8	8	4

- Acoustic package and induct attenuator to EF/10/01 set out in Table 14

Table 14 Acoustic enclosures minimum insertion loss Level 10 – EF/10/01

	Octave-band centre frequency (Hz							
Plant items	63	125	250	500	1000	2000	4000	8000
Extract- Induct attenuator insertion loss(dB)	-	13	10	8	6	12	12	12
Break out- Acoustic enclosure insertion loss loss D_i (dB)	-	11	12	12	15	14	10	10

The insertion losses for the EF/10/01 extract can typically be achieved by a 900 mm long attenuator.

Example suppliers of acoustic packages are provided at the end of the memo.

In addition to the above, other mitigation measures will be required, these are outlined below.

- Acoustic enclosures to control break out from AHU10/01 to AHU10/04
- Increased induct attenuators insertion loss to AHU10/02, AHU10/02 and AHU10/04 exhaust

The required mitigation measures for this option 1 are considered onerous and for ODU/08/01 difficult to practically be achieved at 63Hz octave band centre frequency. On this basis a further option is provided below.

Option 2 (with extended acoustic screening)

Extend the acoustic screening around the full perimeter of Level 10 plant area as shown in red in Figure 10, and increase the screening height to at least 2.35 m to control noise break out from extract fan and AHU break out noise. The proposed 'Acoustic + product with sound absorbent lining facing' would be acoustically suitable for this.

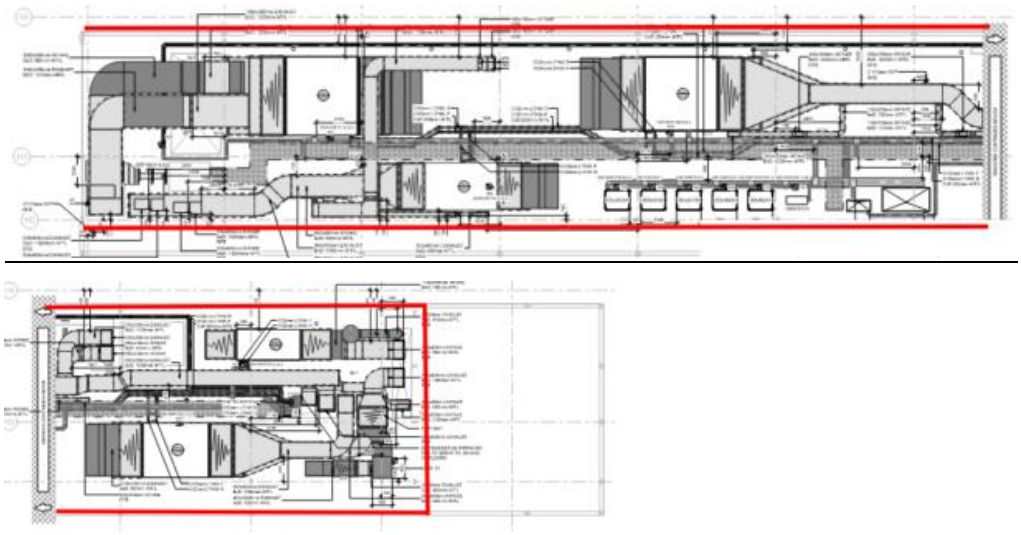


Figure 10 Level 10 recommended increased screening extent

In addition to the increased screening, noise emissions from ODUs 07/01 and 08/01 are to be reduced. Possible options for this are:

- Option A) Acoustic packages with minimum insertion losses set out in Table 15

Table 15 Acoustic enclosures minimum insertion loss Level 10 – ODUs 08/01 and 07/01

	Minimum acoustic enclosure insertion loss D_i (dB) Octave-band centre frequency (Hz							
Plant items	63	125	250	500	1000	2000	4000	8000
ODU 08/01	9	8	9	14	8	5	4	2
ODU 07/01	3	3	3	8	8	6	4	-

- Option B) ODU 07/01 and ODU 08/01 to operate in quiet mode, or re-select for quiet units. The noise level contributions from these units in quiet mode should be such that overall levels at the nearest noise sensitive premises are not exceeded during the day and at night. This will need to be reviewed.

Example suppliers

Example suppliers of acoustic louvres, attenuators and acoustic packages are provided below:

- Environ – www.environ.co.uk
- Ambient Acoustics – www.ambientacoustics.co.uk
- Wakefield Acoustics – www.wakefieldacoustics.co.uk
- Caice – www.caice.co.uk