

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

15058-R05-A

15 June 2022

Bonded Warehouse, Manchester

Plant noise egress assessment

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Summary

Sandy Brown has been commissioned by AWAS Bonded Ltd to provide acoustic advice in relation to Bonded Warehouse, Manchester.

Plant noise egress limits have previously been determined following an environmental noise survey, and are detailed in Sandy Brown report 15058-R02-F.

Plant noise measurements have previously been carried out to determine the plant noise levels installed to the roof of the Bonded Warehouse, as set out in Sandy Brown report 15058-R04-B. The previous assessment show that plant noise egress due to the rooftop plant items will meet the plant noise egress limits at all nearby noise sensitive premises.

As additional plant items have been installed to the roof, plant noise measurements have been carried out to determine the noise levels of these items. The noise survey was carried out on 7 June 2022.

An assessment to determine the plant noise egress level at the nearest noise sensitive premises from the latest installed plant equipment has been carried out. The assessment shows that plant noise egress due to the rooftop plant items will meet the plant noise egress limits at all nearby noise sensitive premises

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1 Introduction

Sandy Brown has been commissioned by AWAS Bonded Ltd to provide acoustic advice in relation to Bonded Warehouse, Manchester.

Plant noise measurements have been carried out to determine the plant noise levels installed to the roof of the Bonded Warehouse subsequent to a survey and assessment carried out in August 2020, detailed in Sandy Brown report 15058-R04-B. The noise survey was carried out on 7 June 2022.

An assessment to determine the plant noise egress level at the nearest noise sensitive premises, in comparison to plant noise egress criteria presented in Sandy Brown report 15058-R02-F from the rooftop plant is set out within this report.

2 Site description

2.1 The site and its surroundings

The Bonded Warehouse is on the site of the former Granada Studios. The building has the following uses, as follows:

- Level 1: Approximately half the existing floor plate is B1 offices (B1), with the remainder designated as light industrial / drinking establishment / leisure (B2/A4/D2). This includes music studios.
- Level 2: Majority of the floorplate are office use (B1) with a small ancillary area of retail / cafe.
- Level 3: Majority of the floorplate are office use (B1) with a small ancillary area of retail / cafe.
- Level 4-Level 6 are offices (B1).

The site location (in orange, towards the centre of the image) is shown in Figure 1 in relation to its surroundings.

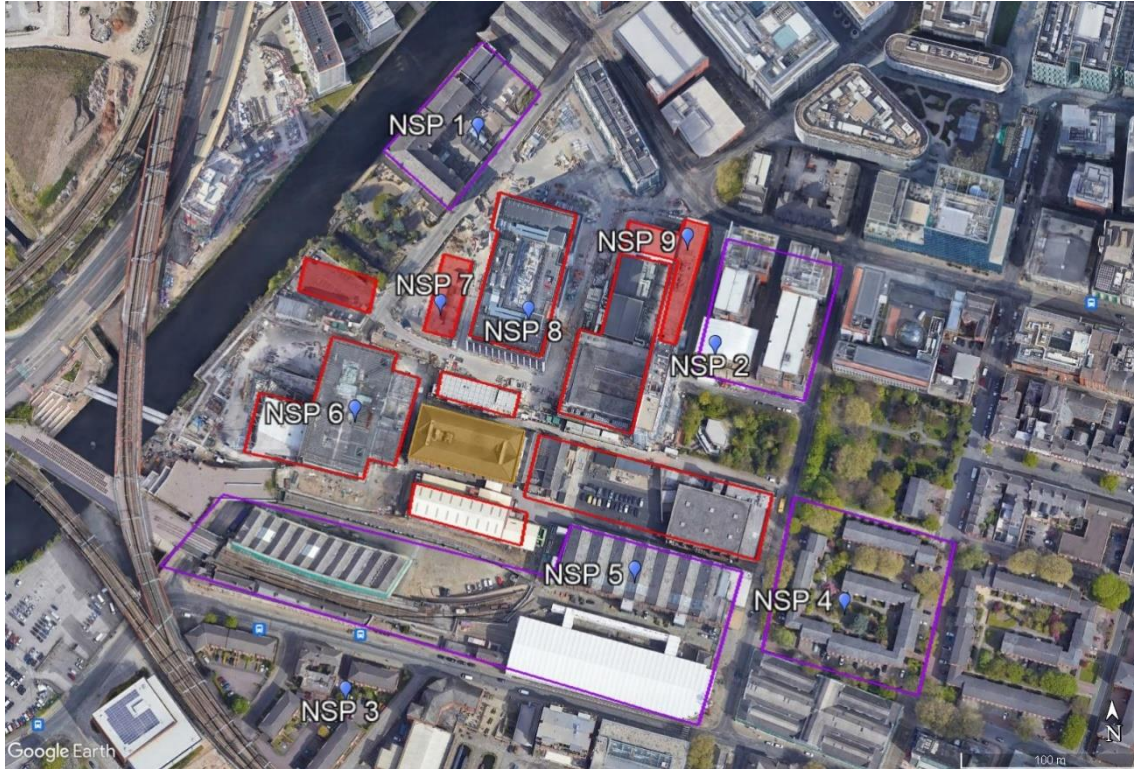


Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The nearby existing sensitive premises (NSP) are indicated in Figure 1 with blue markers.

NSP 1 refers to the Marriott Hotel on Water Street. NSP 2 refers to residential buildings along Lower Byrom Street and Atherton Street, and the proposed Manchester Grande Hotel. NSP 3 refers to various residential buildings along Liverpool Road. NSP 4 refers to the residential properties between Byrom Street and Lower Byrom Street. NSP 5 is the Museum of Science and Industry.

The Bonded Warehouse sits in the centre of the St John's Masterplan with proposed developments to the north, east and west of the site; these are highlighted red in Figure 1. Where developments include residential premises, they are shaded red in the image.

The Factory cultural centre is proposed directly to the west of the Bonded Warehouse, referred as NSP 6. To the north-west, two residential towers are proposed; Union Tower 1 and 2, referred as NSP 7. NSP 8 refers to the proposed Manchester Goods Yard and Old Granada Studios scheme to the north of the site. To the north-east is the redevelopment of the Old Granada Studios buildings, referred as NSP 9. To the east of the site are the proposed buildings associated with the Versa Manchester Studios development.

3 Building services noise egress limits

3.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

3.2 Local Authority criteria

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* (May 2022), which states the following in relation to plant noise egress:

'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.'

Corrections for tonal or attention catching characteristics would need to be applied to the rating level in accordance with BS4142:2014.

3.3 Plant noise limits

3.3.1 Basic limits

Based on the above criteria, the cumulative noise level resulting from the operation of all new plant should not exceed the limits set out in Table 1 as set out in Sandy Brown report 15058-R02-F. The names of the following buildings have been updated to the latest information as per website <https://www.enterprisecityuk.com/wp-content/uploads/2021/11/Enterprise-City-Masterplan-Download-Nov-21-22.11.21.pdf>:

- Union Tower 1 and Tower 2 (Vita Living)
- Old Granada Studios (Versa Manchester Studios)
- Manchester Goods Yard.

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

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{Aeq} (dB)
<i>Near the Marriot Hotel, Union Tower 1 and Tower 2, Old Granada Studios</i>	
Daytime (07:00-23:00)	46
Night-time (23:00-07:00)	45
<i>Liverpool Road, The Museum of Science and Industry</i>	
Daytime (07:00-23:00)	50
Night-time (23:00-07:00)	44
<i>Lower Byrom Street, South Village</i>	
Daytime (07:00-23:00)	46
Night-time (23:00-07:00)	40
<i>The Factory, Manchester Goods Yard</i>	
Daytime (07:00-23:00)	50

The limits set out in Table 1 do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed further in Section 3.3.2.

3.3.2 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment is not appropriate, then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

4 Noise measurements

A noise survey was carried out on 7 June 2022 by Rita Campos and Jules Cochard to determine the noise level from the plant items located on the Bonded Warehouse roof installed after August 2020.

During the survey, it was not possible to measure the individual condensers due to the setup of the system. It is understood that the ventilation system was running close to maximum duty when the measurements of the condensers were taken. Due to technical issues, one of the condensers would not start when the measurements were carried out. This condenser is shown in yellow in Figure 3. The manufacturer's noise data has been used to perform the assessment, it can be found in Appendix B.

The sound level meter was calibrated before and after the measurements were taken and no significant deviation occurred.

4.1 Measurement locations

The measurement locations are set out in Figure 2. Plant items that were previously measured are highlighted in Figure 3, these are part of the assessment in Sandy Brown report R04-B.

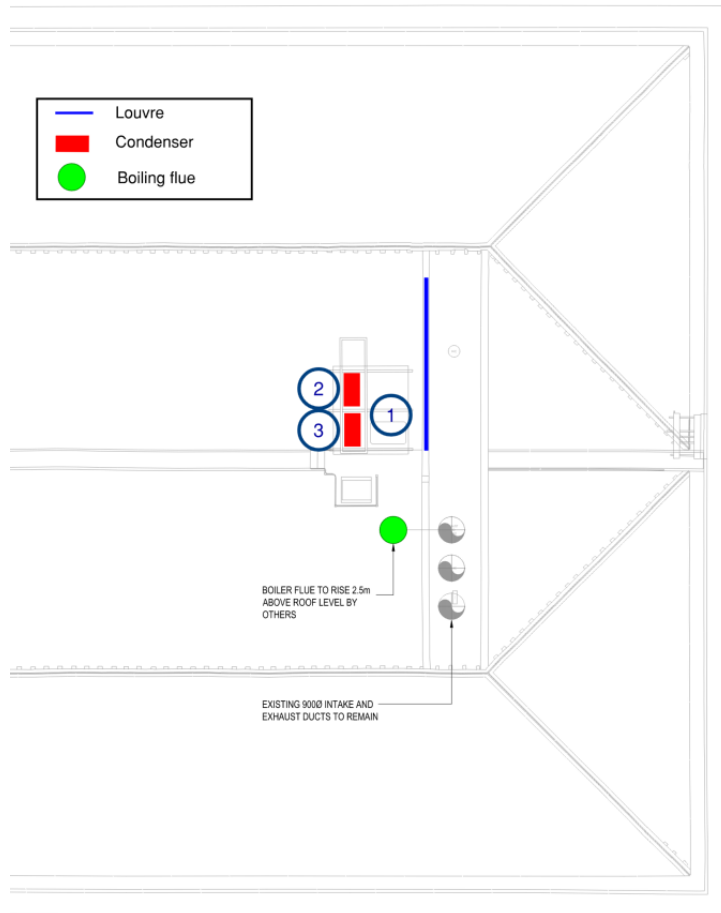


Figure 2 Measurement locations

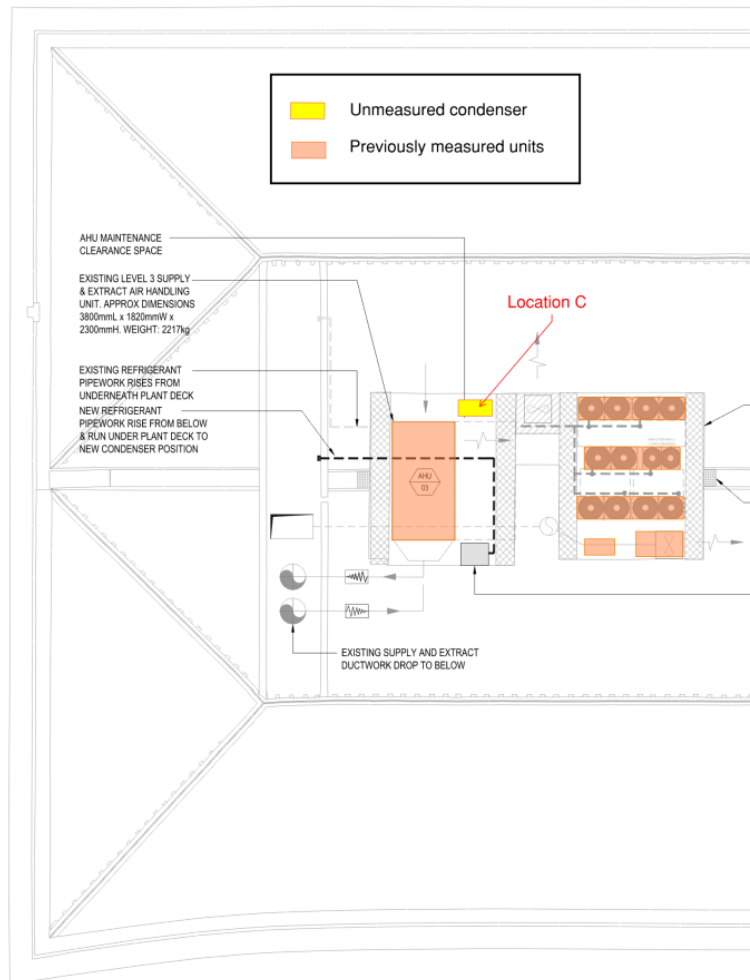


Figure 3 Unmeasured condenser at location C and previously measured plant item locations

4.2 Noise levels

The results of the free-field noise measurements conducted are summarised in Table 2. To minimise the influence of intermittent non-plant noise sources such as construction noise or distant sirens, the background sound level (L_{A90}) has been used to quantify the continuous noise from the plant.

Table 2 Summary of plant noise measurements

Position (refer to Figure 2)	Noise source	Distance from source (m) ^[1]	Sound pressure level(dB)	
			$L_{A90,5min}$	$L_{Aeq,5min}$
1	Louvre/ Boiler flue	1	64	65
1	Louvre only (for completeness only)	1	61	62
2	Condenser, North-East	0.4	61	63
3	Condenser, South-East	0.25	61	62

^[1] This is the distance from the source that the measurement was carried out.

When measuring the condensers, it was not possible to carry out noise measurements at 1 m in all locations due to access restrictions.

5 Plant noise egress assessment

An assessment has been carried out to determine the likely noise from the plant items to the nearest noise sensitive receivers.

5.1 Basis

5.1.1 Condenser at location C

As it was not possible to measure the noise levels of the condenser at location C, the manufacturer's noise data has been used within the calculations. The condenser model number is PUZ-ZM125VKA. This is as set out on the unit. The noise data is presented within Table 3. This information is also presented within Appendix B.

Table 3 Manufacturer's noise data for PUZ-ZM125VKA unit

Unit	Sound pressure level at 1m, L_{eq} (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
PUZ-ZM125VKA	53	55	50	48	45	41	35	28

5.1.2 Attenuation

A summary of the distances used in the assessment are set out in Table 4.

Table 4 Summary of distances from plant item to NSP

Noise sensitive receiver	Distance from plant item to NSP (m)	
	Measurement position 1-3	Measurement position 4
NSP 1	150	140
NSP 2	135	165
The Factory	50	20
Union Towers	75	55
NSP 5	65	100
Manchester Goods Yard	60	60
Old Grenada Studios	110	135

For barrier attenuation, it has been assumed that NSP 5 will be screened from plant items 1 to 4. For the rest of the plant items there is assumed line of sight to the noise sensitive receiver.

5.1.3 Attention catching features

Regarding intermittency, the plant noise limits have been set to be at least 5 dB below the representative background noise level at each noise sensitive receiver. As such, any intermittency is not expected to be readily distinctive against the residual acoustic environmental. On site, the assessed plant items were not observed to be intermittent. Therefore, no corrections for intermittency are considered to be appropriate.

Regarding tonality, a subjective assessment on site was carried out and no discernible tones were noted. In line BS 4142, an objective assessment using the one-third octave band method has been carried out. To the majority of plant items, no tones are noted. For the plant item (condenser) corresponding to measurement position 2 on Figure 2, a tone was noted in the 200 Hz one-third octave band. As such, a 6 dB correction has been applied for this plant item at each noise sensitive receiver. This is included within the values set out in the following section.

5.2 Predicted plant noise egress levels

The noise levels expected at the closest noise sensitive receivers to the Bonded Warehouse are set out in Table 5. As the noise measurement carried out were free-field, a 3 dB facade correction has been applied to allow comparison to the plant noise egress limits.

Table 5 Summary of plant noise assessment

Noise sensitive receiver	Predicted noise level from plant items, L_{Aeq} (dB)
NSP 1 – Marriott Hotel	34
NSP 2 – Residential buildings along Lower Byrom Street and Atherton Street	32
NSP 6 - The Factory	49
NSP 7 - Union Towers	42
NSP 5 – Museum of Science and Industry	29
NSP 8 - Manchester Goods Yard	42
NSP 9 - Old Granada Studios	34

All of the predicted noise levels from the rooftop plant items meet the most onerous plant noise egress criteria in Table 1.

Appendix A

Survey details

Equipment

The attended noise measurements were taken using a Rion NL-52 sound level meter and a Bruel & Kjaer 2250 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/01143564	Rion	15 Dec 22	TCRT20/1738
Microphone	UC-59/10153	Rion	15 Dec 22	TCRT20/1738
Pre-amp	NH-25/43581	Rion	15 Dec 22	TCRT20/1738
Calibrator	NC-74/34125432	Rion	16 Mar 23	TCRT21/1181

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meter used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Appendix B

Condenser manufacturer's noise data

PUZ-ZM125VKA
PUZ-ZM125YKA
PUZ-ZM140VKA
PUZ-ZM140YKA

MODE	SPL(dB)	LINE
COOLING	50	○—○
HEATING	52	●—●

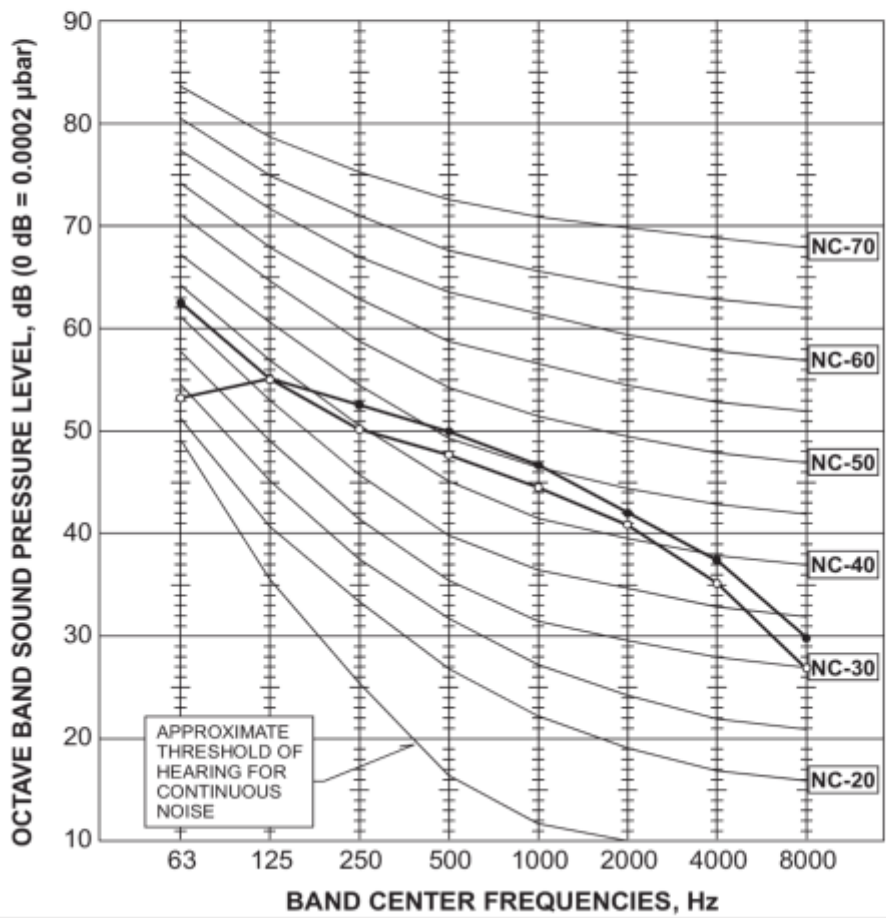


Figure 4 Condenser PUZ-ZM125VKA noise data