026824-R02-A

19 May 2026

Condenser, Freetrade Exchange Building

Plant commissioning and assessment

SANDY BROWN
ACOUSTICS

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Version	Date	Comments	Author	Reviewer
A	19 May 26		GM	MH

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Summary

Sandy Brown has been commissioned by CST Limited Partnership to assess noise from the addition of a condenser unit on the roof of Freetrade Exchange, 37 Peter Street, Manchester, M2 5GB.

A noise impact assessment is required in response to Manchester City Council (MCC) planning condition 3b, which states that prior to operation of the scheme, a verification report confirming that the proposals comply with MCC criteria is provided, followed by post-completion testing to confirm that the noise criteria have been met.

The verification report was issued in December 2025 following baseline noise measurements on the roof and an assessment of the proposed condenser. This memo presents the results of the post-completion testing demonstrating compliance with condition 3b.

Plant noise measurements have been carried out to determine whether there will be any increase in noise emissions following the installation of the condenser on the plant deck of Freetrade Exchange. These post-completion measurements were undertaken on 18 May 2026.

The existing rooftop plant deck is substantial, and noise from services equipment dominates the sound environment across the roof. A comparison of noise levels at various locations with the new condenser unit turned off and on has been carried out to confirm the previous assessment findings; that the condenser will not cause any increase in overall noise emissions from plant equipment.

The results clearly demonstrate that noise levels on the rooftop are not adversely affected by the additional condenser. This confirms that the new condenser unit is significantly quieter than existing items of plant.

Calculations have been carried out to predict the worst-case noise rating levels of the condenser at the closest noise sensitive receptors. The results indicate that the plant noise egress criteria are achieved at all noise sensitive receptors for both day and night periods. It is considered that this will be sufficient to discharge planning condition 3b.

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1 Introduction

Sandy Brown has been commissioned by CST Limited Partnership to assess noise from the addition of a condenser unit on the roof of Freetrade Exchange, 37 Peter Street, Manchester, M2 5GB.

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The verification report was issued in December 2025 following baseline noise measurements on the roof and an assessment of the proposed condenser. This memo presents the results of the post-completion testing demonstrating compliance with condition 3b.

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2 Site description

2.1 The site and its surrounding

The site is in central Manchester on Peter Street. It is bounded to the north by Bootle Street, to the east by Southmill Street, to the south by Peter Street, and to the west by commercial premises on Marron Place. The site location in relation to its surroundings is shown in Figure 1, outlined in red.



Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The adjacent premises are as follows:

- Forty-Seven Hotel to the east shown in purple in Figure 1
- Radisson Hotel to the south shown in green
- Commercial premises to the west shown in orange
- Commercial premises to the north shown in blue.

3 Development proposals

The proposals include for the installation of a new Daikin FAA100BUV1B condenser unit to the rooftop plant area. The condenser unit is proposed to serve the comms rooms and therefore may be required to operate throughout the day and the night. The condenser unit will only operate in cooling mode.

The installed location of the condenser is shown in purple in Figure 2.

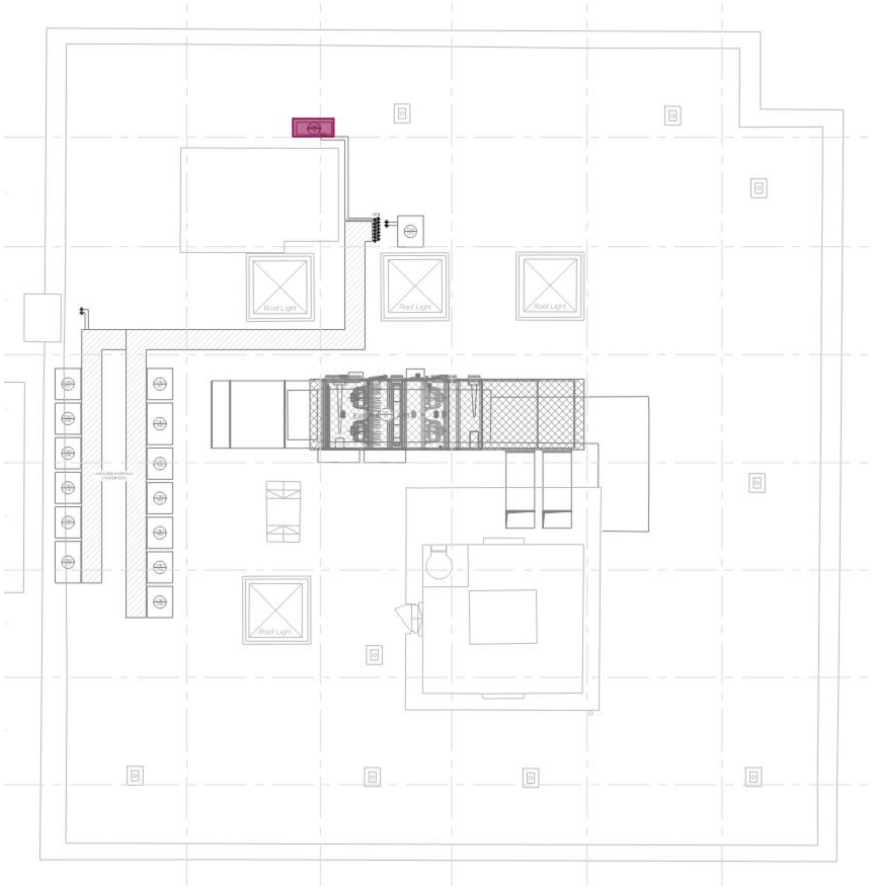


Figure 2 Condenser unit location

4 Acoustic criteria

4.1 Planning condition 3b

The Manchester City Council (MCC) planning condition 3b states:

> *'b) Prior to the first operation of the plant hereby approved, a verification report, which will include post-completion testing, shall be submitted to and approved in writing by the Local Planning Authority to validate that the plant achieves a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'*

4.2 Local authority criteria

MCC provides guidance in relation to plant noise emissions in Planning and Noise Technical Guidance document dated October 2022 states the following in relation to plant noise egress:

'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 (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.

4.3 Plant noise limits

Based on the previous acoustic survey as detailed in 026824-R01-A *Noise survey and plant noise egress assessment*, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 1.

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 sound levels by the addition of 3 dB (as per the guidance provided in BS 8233:2014 Section G.2.1). In this case these limits would apply at the Forty-Seven Hotel, the Radisson Hotel, and commercial receptors to the north and east shown in Figure 1.

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

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, $L_{Aeq,15min}$ (dB)
Day (07:00-23:00)	55
Night (23:00-07:00)	54

[1] The limits set out in Table 1 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses.

Compliance with limits shall be determined with reference to BS 7445: Part 3: 1991 *Description and measurement of environmental noise, Part 3. Guide to application to noise limits.*

Within the context of this assessment, compliance with these limits shall be demonstrated where there is no change in the existing plant noise levels with the condenser operational.

5 Noise survey method

The sample measurements and information described in this report are provided in accordance with requirements of BS 7445, as referenced in Appendix A.

At each position the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 1.5 m away from any other reflective surface.

Attended sample measurements were taken at 10 positions around the rooftop plant area. These are indicated in Figure 3 as Positions 1 to 10, with the condenser shown in purple. The

measurements were carried out on 18 May 2026. Three measurements were taken at each position. Each measurement was one minute in duration.

Samples were taken of the existing plant and at various locations around the roof perimeter with the newly commissioned unit turned off (ie baseline measurements). Measurements undertaken at Positions 7 – 10 were carried out with the new condenser unit both off and then operating at worst case design duty (ie maximum cooling).

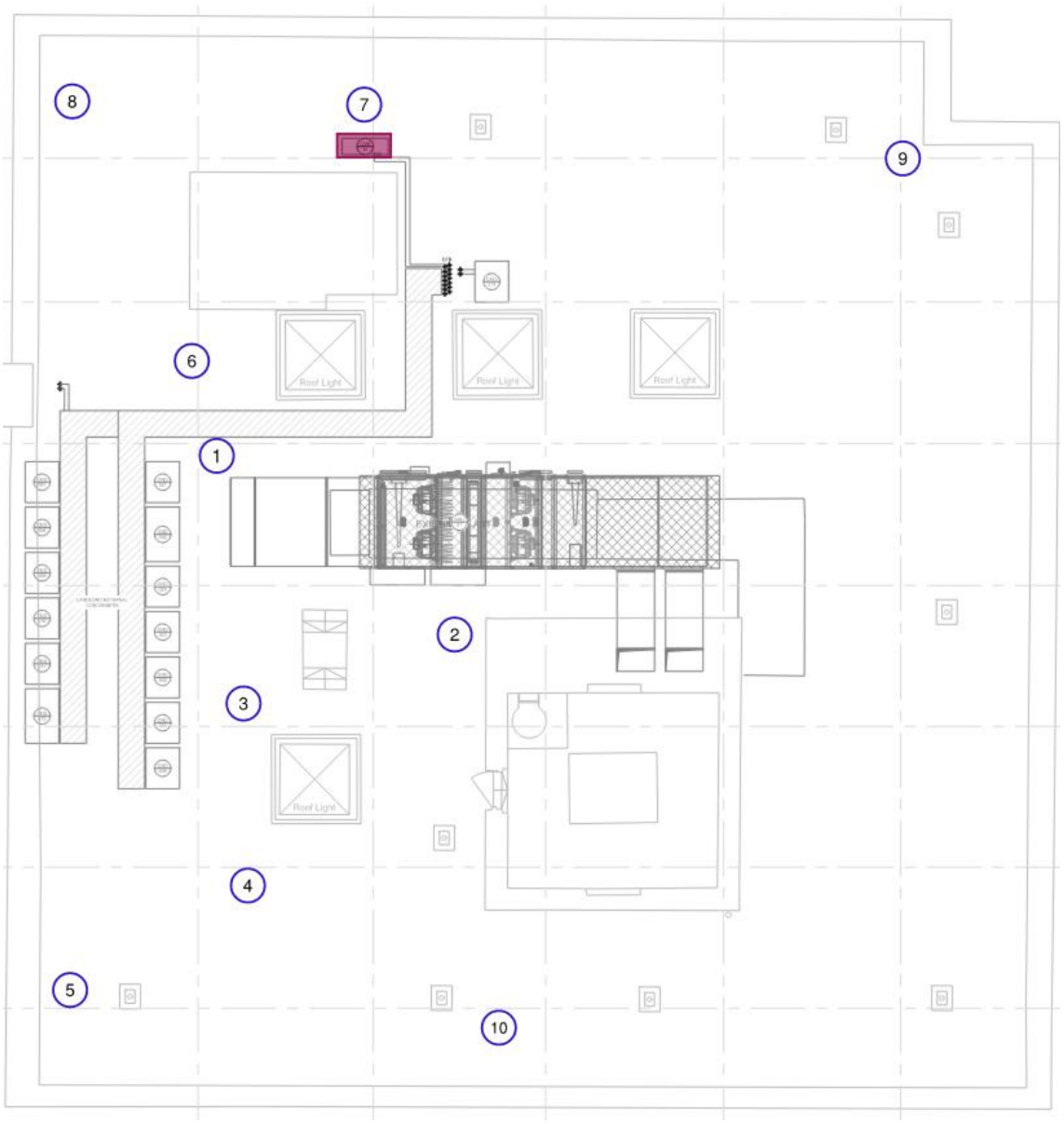


Figure 3 Sample measurement locations

Details of the equipment used for the commissioning measurements and the noise indices measured are provided in Appendix A.

Weather conditions during the survey were appropriate and are described in Appendix A.

6 Noise survey results

6.1 Observations

The dominant noise source observed at the site during the survey was existing rooftop plant. Less significant noise sources included distant construction noise and state rooftop plant from the Forty-Seven Hotel, measured at position 9.

6.2 Measurement results

The baseline noise measurement results are summarised in

A summary of noise levels and key sources recorded during the attended measurements with the new condenser unit not operational are presented in Table 2 .

Table 2 Commissioning measurement results (new condenser off)

Position	Sound pressure levels (dB)			Observed noise sources
	L_{Aeq}	L_{AFmax}	L_{A90}	
1	75	78	74	AHU Intake dominant
2	78	80	77	Small plant room exhaust + contributions from other existing rooftop plant
3	71	74	70	AHU casing breakout + contributions from other existing rooftop plant
4	73	75	72	Systemair fanbox dominant with breakout from surrounding system
5	69	78	68	AHU System exhaust
6	67	70	66	Noise from existing rooftop plant, mainly AHU intake
7	58	65	57	Noise from existing rooftop plant, mainly AHU intake/breakout
8	60	62	59	Noise from existing rooftop plant, mainly AHU intake/breakout
9	58	64	57	Noise from plant on Freetrade and Forty-Seven hotel rooftops
10	61	64	61	Breakout from AHU dominant

The noise on the rooftop was dominated by the existing plant for Positions 1 to 6. The average sound pressure level was in the region of L_{Aeq} 67 - 78 dB. Noise levels at Positions 7 to 10 are lower as they are further away from the existing plant, however, they include contributions from multiple plant items and plant noise is still dominant.

A summary of noise levels measured at Positions 7-10 with the new condenser unit turned on is shown in Table 3.

Table 3 Commissioning measurement results (new condenser switched on)

Position	Sound pressure levels (dB)			Observed noise sources
	L_{Aeq}	L_{AFmax}	L_{A90}	
7	58	62	57	Noise from existing rooftop plant, mainly AHU intake/breakout
8	60	63	59	Noise from existing rooftop plant, mainly AHU intake/breakout
9	59	61	58	Noise from plant on Freetrade and Forty-Seven hotel rooftops
10 [1]	62	65	61	Breakout from AHU dominant

[1] Light rain occurred during this measurement; this has not significantly affected the measured noise levels (ie within 1 dB of that measured at this position when no rain occurred).

The noise on the rooftop was dominated by the existing plant for Positions 7 to 10. The average sound pressure level was in the region of L_{Aeq} 58-62 dB.

7 Noise impact assessment

An analysis of measured noise levels with the condenser unit on and off has been shown in . This presents the results for both average ambient (L_{Aeq}) and background (L_{A90}) parameters.

Table 4 Measured noise level comparison

Position	Sound pressure level (dB)			
	Average noise level (L_{Aeq})		Background noise level (L_{A90})	
	Condenser off	Condenser on	Condenser off	Condenser on
7	58	58	57	57
8	60	60	59	59
9	58	59	57	58
10	61	62	61	61

For Positions 9 and 10, there was a 1 dB change in the ambient noise levels when the condenser was operational. This is within the measurement tolerance of a Type 1 sound level meter. It is not significant and can be ascribed to natural variance in sound levels during the survey period.

A comparison shows that for Positions 7 and 8, there is no change in the ambient or background noise levels whether the condenser was operational or not. The results therefore indicate that the sound pressure level of the condenser is at least 10 dB below the noise levels measured at Position 7 (ie, L_{Aeq} 48 dB at 1 m).

In practice, this represents an absolute worst case. Manufacturers data for the condenser in cooling mode quotes a sound power level L_{WA} of 65 dB, which for hemispherical radiation would equate to L_{Aeq} 57 dB at 1 m (ie, 9 dB higher than can be estimated from the verification measurements).

Calculations have also been undertaken to predict noise levels at the closest noise sensitive receptors. These calculations consider distance attenuation and are based on the worst-case sound pressure level of the unit of L_{Aeq} 57 dB at 1 m. As no spectral manufacturer data is available, a representative spectrum has been used and is shown in Table 5.

Table 5 Condenser unit representative sound pressure spectrum

Unit	Sound pressure level, L_{eq} at 1 m(dB) [1] Octave-band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Daikin FAA100BUV1B	62	60	61	55	52	44	36	35

[1] Representative spectrum corrected to achieve L_{Aeq} 57 dB at 1 m.

The worst-case noise rating levels calculated at noise sensitive receptors are shown in Table 6. The full calculations are provided in Appendix D. It is confirmed by the engineer undertaking the measurements that the new condenser had no attention catching features and that penalty corrections under BS 4142 are not applicable.

Table 6 Calculated sound rating levels at 1 m from noise sensitive receptors

Noise sensitive receptor	Calculated sound rating level at 1 m from the facade, $L_{Ar,Tr}$ (dB)	Assessment against criteria, $L_{Ar,Tr}$ 55 (day), 54 (night), (dB)
Forty-Seven Hotel	35	-19
Radisson Hotel	28	-26
Commercial premises to the north	45	-10
Commercial premises to the east	42	-13

The results demonstrate that noise levels from the condenser are significantly below the noise limits at all locations.

This, and the rooftop measurements with the plant turned on and off, are evidence that the plant noise egress criteria are achieved at all noise sensitive receptors for both day and night periods.

8 Conclusion

Plant noise measurements have been carried out to determine whether there will be any increase in noise emissions following the installation of the condenser on the plant deck of Freetrade Exchange. These post-completion measurements were undertaken on 28 May 2026.

The existing rooftop plant deck is substantial, and noise from services equipment dominates the sound environment across the roof. A comparison of noise levels at various locations with the new condenser unit turned off and on has been carried out to confirm the previous assessment findings; that the condenser will not cause any increase in overall noise emissions from plant equipment.

The results clearly demonstrate that noise levels on the rooftop are not adversely affected by the additional condenser. This confirms that the new condenser unit is significantly quieter than existing items of plant.

Calculations have been carried out to predict the worst-case noise rating levels of the condenser at the closest noise sensitive receptors. The results indicate that the plant noise egress criteria are achieved at all noise sensitive receptors for both day and night periods. It is considered that this will be sufficient to discharge planning condition 3b.

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Appendix A

Survey details

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Reference standards

- BS 7445 Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*
- BS 7445: Part 2: 1991 *Description and measurement of environmental noise, Part 2. Guide to the acquisition of data pertinent to land use*.

Equipment

The noise measurements were taken using a Rion NL-52 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	12 Dec 26	TCRT24/1898
Microphone	UC-59/10153	Rion	12 Dec 26	TCRT24/1898
Pre-amp	NH-25/43581	Rion	12 Dec 26	TCRT24/1898
Calibrator	NC-74/34257023	Rion	12 Dec 26	TCRT24/1895

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.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg, L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS 7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended noise measurements, the weather was generally clear and dry, except for light rain that occurred at Position 10 during the plant on condition.

These weather conditions are considered suitable for obtaining representative measurements.

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Appendix B

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied 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 accounted for 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 of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

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

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Appendix C

Calculation details

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Project number	026824	**Project name**	Freetrade Manchester
Calculation revision	A		
Calculation by	GM	**Date created**	19/05/2026
Checked by	MH	**Date checked**	19/05/2026
Calculation description	Forty-Seven Hotel - Night time criteria		

Comments	**Octave band centre frequency (Hz)**								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dBA**
Condenser									
Sound pressure level at 1m	62	60	61	55	52	44	36	35	57
Additional source directivity; Q = 2	3	3	3	3	3	3	3	3	
Total sound pressure level at 1m	65	63	64	58	55	47	39	38	60
Losses									
Distance attenuation - Point source, r=26m	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	
Total losses	*28*	*28*	*28*	*28*	*28*	*28*	*28*	*28*	
Sound pressure level after losses	37	35	36	30	27	19	11	10	32
Facade correction	3	3	3	3	3	3	3	3	
Total facade sound pressure level at receptor	40	38	39	33	30	22	14	13	35
Criteria									
Criteria									54
Difference									-19

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Project number	026824	**Project name**	Freetrade Manchester
Calculation revision	A		
Calculation by	GM	**Date created**	19/05/2026
Checked by	MH	**Date checked**	19/05/2026
Calculation description	Radisson Hotel receptor - Night time limits		

Comments	**Octave band centre frequency (Hz)**								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dBA**
Condenser									
Sound pressure level at 1m	62	60	61	55	52	44	36	35	57
Additional source directivity; Q = 2	3	3	3	3	3	3	3	3	
Total sound pressure level at 1m	65	63	64	58	55	47	39	38	60
Losses									
Distance attenuation - Point source, r=57m	35.1	35.1	35.1	35.1	35.1	35.1	35.1	35.1	
Total losses	*35*	*35*	*35*	*35*	*35*	*35*	*35*	*35*	
Sound pressure level after losses	30	28	29	23	20	12	4	3	25
Facade correction	3	3	3	3	3	3	3	3	
Total facade sound pressure level at receptor	33	31	32	26	23	15	7	6	28
Criteria									
Criteria									54
Difference									-26

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Project number	026824	**Project name**	Freetrade Manchester
Calculation revision	A		
Calculation by	GM	**Date created**	19/05/2026
Checked by	MH	**Date checked**	19/05/2026
Calculation description	Commercial premises to the north - Daytime limits		

Comments	**Octave band centre frequency (Hz)**								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dBA**
Condenser									
Sound pressure level at 1m	62	60	61	55	52	44	36	35	57
Additional source directivity; Q = 2	3	3	3	3	3	3	3	3	
Total sound pressure level at 1m	65	63	64	58	55	47	39	38	60
Losses									
Distance attenuation - Point source, r=8m	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	
Total losses	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	
Sound pressure level after losses	47	45	46	40	37	29	21	20	42
Facade correction	3	3	3	3	3	3	3	3	
Total facade sound pressure level at receptor	50	48	49	43	40	32	24	23	45
Criteria									
Criteria									55
Difference									-10

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Project number	026824	**Project name**	Freetrade Manchester
Calculation revision	A		
Calculation by	GM	**Date created**	19/05/2026
Checked by	MH	**Date checked**	19/05/2026
Calculation description	Commercial premises to the west - Daytime limits		

Comments	**Octave band centre frequency (Hz)**								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**dBA**
Condenser									
Sound pressure level at 1m	62	60	61	55	52	44	36	35	57
Additional source directivity; Q = 2	3	3	3	3	3	3	3	3	
Total sound pressure level at 1m	65	63	64	58	55	47	39	38	60
Losses									
Distance attenuation - Point source, r=12m	21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6	
Total losses	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	
Sound pressure level after losses	43	41	42	36	33	25	17	16	39
Facade correction	3	3	3	3	3	3	3	3	
Total facade sound pressure level at receptor	46	44	45	39	36	28	20	19	42
Criteria									
Criteria									55
Difference									-13

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