

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Zurich Insurance, Freetrade Exchange

Plant commissioning and assessment

London, Manchester, Edinburgh, Birmingham, Leeds, Bristol

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A	6 Jun 25		GM	VdH
B	10 Oct 25	Additional clarity on calculations included	GM	VdH

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Summary

Sandy Brown has been commissioned by Jones Lang LaSalle Limited to provide acoustic advice in relation to the proposed addition of a single 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 February 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 30 May 2025.

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 Jones Lang LaSalle Limited to provide acoustic advice in relation to the proposed development at 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 February 2025 following baseline noise measurements on the roof and an assessment of the proposed condenser. This memo represents 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 on the plant deck of Freetrade Exchange. The post-completion measurements were undertaken on 30 May 2025.

2 Site description

2.1 The site and its surrounding

The site is located 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 The development

A new condenser unit was installed to in the rooftop plant area. The condenser is to provide cooling to the comms room and will operate throughout the day and night.

The unit was installed in a different location than previously assessed. However, the unit is at a greater distance from the most sensitive receptors and has not adversely affected the outcome of the original assessment in that the change is considered acoustically beneficial.

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

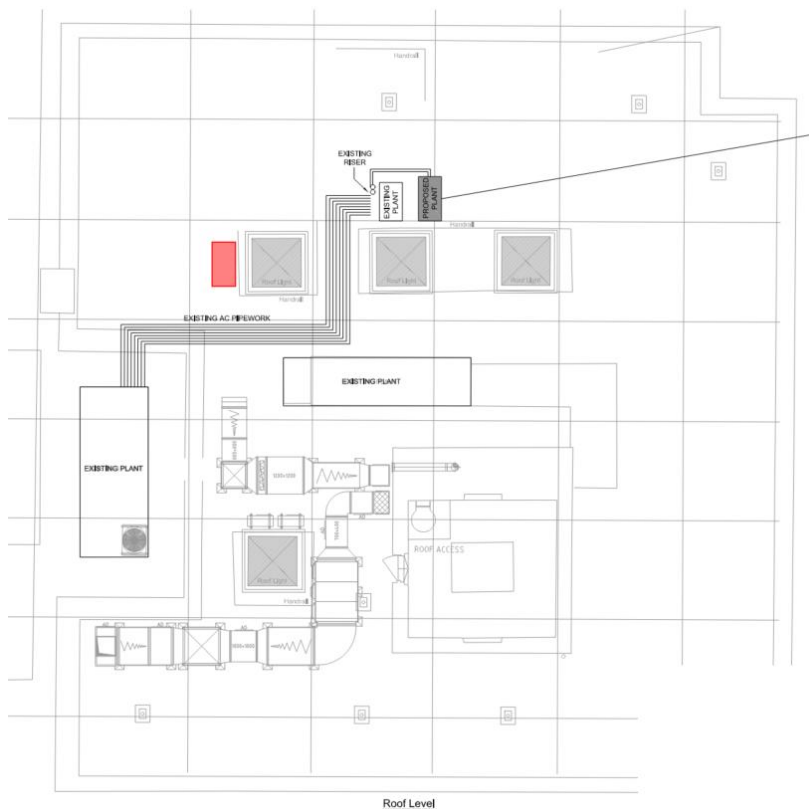


Figure 2 Condenser unit location

4 Acoustic criteria

4.1 Planning condition 3b

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

“b) Prior to the operation of the scheme a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.”

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 025583-R01-B *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 BS8233:2014 Section G.2.1). In this case these limits 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 premises

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. This is discussed in Appendix C.

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.

5.1 Baseline noise measurements

Measurements were previously taken of existing plant on 4 February 2025, as detailed in 025583-M001-A *Comments on rooftop condenser noise levels*. The measurement positions can be correlated with those shown in Figure 3 (Positions 1-6), typically 1 minute in duration under steady state conditions.

5.2 Commissioning measurements

Attended sample measurements were taken at nine positions around the rooftop plant area. These are indicated in Figure 3 as Positions 1 to 9. The measurements were carried out on 30 May 2025. Three measurements were taken at each position, ranging between 30 seconds to 1 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. Measurements undertaken at Positions 6 – 9 were carried out with the new condenser unit both off and then operating at normal design duty.

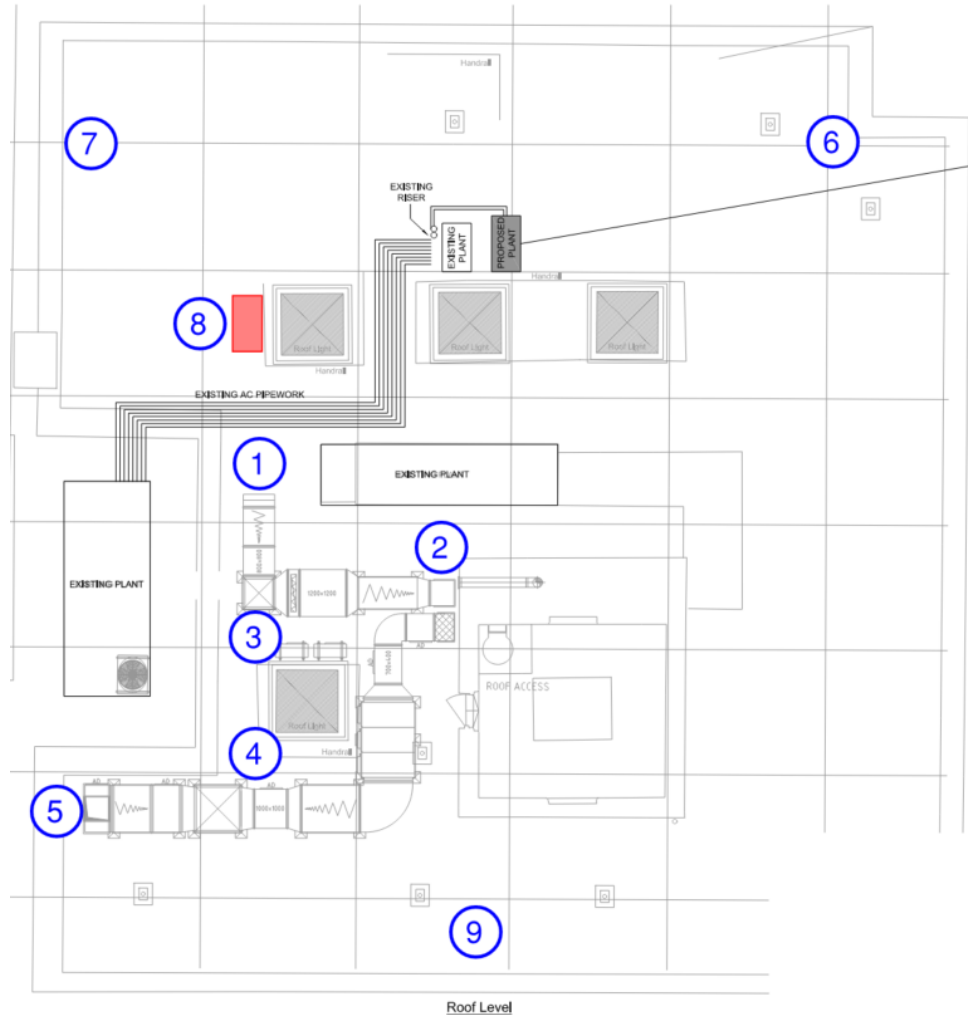


Figure 3 Sample measurement locations

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

5.3 Weather conditions

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

6 Noise survey results

6.1 Baseline noise measurement results

The baseline noise measurement results are summarised in Table 2. Note that the position references relative to the previous assessment have been updated to align with this report for ease of comparison.

Table 2 Baseline noise measurements (4 February 2025)

Position	Sound pressure levels (dB)			Observed noise sources
	L_{Aeq}	L_{AFmax}	L_{A90}	
1	70	73	67	AHU System intake
2	73	74	72	Small rooftop exhaust with breakout from surrounding system
3	69	73	67	J&E Hall condenser – intermittent operation
4	71	73	70	Systemair fanbox with a noticeable tonal element
5	68	71	67	AHU System exhaust
6	58	67	56	Contributions from rooftop plant on FreeTrade building and the Forty-Seven hotel building.

The noise on the rooftop was heavily dominated by the existing plant for Positions 1 to 5. The average sound pressure level was in the region of L_{Aeq} 68 - 73 dB. There is less than 3 dB variation between ambient sound pressure level and background noise level, confirming the subjective impression that the sound environment is controlled by steady state plant.

Noise levels at position 6 are lower as they are further away from the existing plant, but include contributions from rooftop plant on the Forty-Seven Hotel. Again, the baseline noise levels are dominated by plant equipment.

6.2 Commissioning measurements

6.2.1 Observations

The dominant noise source observed at the site during the survey was existing rooftop plant. Less significant noise sources included state rooftop plant from the Forty-Seven Hotel, measured at position 6.

6.2.2 Measurement results

A summary of noise levels and key sources recorded during the attended measurements with the new condenser unit not operational are presented in Table 3. The full measurement results are provided in Appendix B.

Table 3 Commissioning measurement results (new condenser off)

Position	Sound pressure levels (dB)			Observed noise sources
	L_{Aeq}	L_{AFmax}	L_{A90}	
1	73	77	72	AHU Intake dominant
2	75	76	74	Small plant room exhaust + contributions from other existing rooftop plant
3	72	74	71	AHU casing breakout + contributions from other existing rooftop plant
4	70	71	69	Systemair fanbox dominant with breakout from surrounding system
5	66	68	65	AHU System exhaust
6	57	61	56	Noise from plant on Freetrade and Forty-Seven hotel rooftops
7	60	62	59	Noise from existing rooftop plant, mainly AHU intake.
8	65	68	64	AHU intake dominant
9	60	62	60	Breakout from AHU dominant

The noise on the rooftop was again heavily dominated by the existing plant for Positions 1 to 5 and Position 8. The average sound pressure level was in the region of L_{Aeq} 66 - 75 dB. This is within 3 dB of the baseline survey, indicating that conditions at the time of the commissioning measurements are representative of normal operation.

Noise levels at Positions 6, 7, and 9 are lower as they are further away from the existing plant, however they do include contributions from multiple plant items and plant noise is still dominant.

A summary of noise levels measured at Positions 6 – 9 with the new condenser unit turned on is shown in Table 4.

Table 4 Commissioning measurement results (new condenser switched on)

Position	Sound pressure levels (dB)			Observed noise sources
	L_{Aeq}	L_{AFmax}	L_{A90}	
6	58	60	57	Noise from plant on Freetrade and Forty-Seven hotel rooftops
7	61	64	59	Noise from existing rooftop plant, mainly AHU intake.
8	65	68	64	AHU intake dominant
9	60	62	60	Breakout from AHU dominant

The noise on the rooftop was dominated by the existing plant for Positions 6 to 9. The average sound pressure level was in the region of L_{Aeq} 60-65 dB. Background noise levels were between L_{A90} 57-64 dB depending on position.

7 Noise impact assessment

An analysis of measured noise levels with the condenser unit on and off has been shown in Table 5. This presents the results for both average ambient (L_{Aeq}) and background (L_{A90}) parameters.

Table 5 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
6	57	58	56	57
7	60	61	59	59
8	65	65	64	64
9	60	60	60	60

For Positions 6 and 7, 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, is not significant and can be ascribed to natural variance in sound levels during the survey period. There was no change to the background noise level.

A comparison shows that for Positions 8 and 9, 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 8 (ie, L_{Aeq} 55 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 59 dB, which for hemispherical radiation would equate to L_{Aeq} 51 dB at 1 m (ie, 4 dB lower 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 representative spectral noise data from a similar condenser unit (no spectral manufacturer data is available). The representative spectrum and shown in Table 6.

Table 6 Worst case condenser octave band noise data

Unit	Sound pressure level, L_{Aeq} (dB) at 1 m ^[1]							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Condenser	60	58	59	53	50	42	34	33

^[1] Octave band sound power level representative spectra at L_{Aeq} 55 dB at 1m

The worst-case noise rating levels calculated at noise sensitive receptors are shown in Table 7. 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 7 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	32	-22
Radisson Hotel	26	-28
Commercial premises to the north	41	-14
Commercial premises to the east	45	-9

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 30 May 2025.

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.

Appendix A

Survey details

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 sample noise measurements were taken on 30 May 2025 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-52/01010788	Rion	20 Sep 25	TCRT23/1666
Microphone	UC-59/20416	Rion	20 Sep 25	TCRT23/1666
Pre-amp	NH-25/11436	Rion	20 Sep 25	TCRT23/1666
Calibrator	SV30A/10559	Svantek	20 Sep 25	TCRT23/1665

[1] 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 sample noise measurements, the weather was generally clear and dry and no rain occurred.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Full measurement results

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,30sec}$	$L_{AFmax,30sec}$	$L_{A90,30sec}$	
Condenser unit off					
1	14:21	73	77	72	AHU Intake dominant
	14:21	73	76	72	
	14:22	74	77	72	
2	14:23	74	75	74	Small plant room exhaust + contributions from other existing rooftop plant
	14:25	75	76	74	
	14:26	75	76	74	
3	14:28	72	74	71	AHU casing breakout + contributions from other existing rooftop plant
	14:29	72	74	71	
	14:30	72	73	71	
4	14:31	70	71	69	Systemair fanbox dominant with breakout from surrounding system
	14:32	70	72	69	
	14:32	70	71	69	
5	14:34	66	69	66	AHU System exhaust
	14:35	66	68	65	
	14:35	66	68	65	
6 ^[1]	14:40	57	59	56	Noise from plant on Freetrade and Forty-Seven hotel rooftops
	14:41	57	58	56	
	14:42	57	65	56	
7	14:44	59	61	58	Noise from existing rooftop plant, mainly AHU intake.
	14:45	60	62	59	
	14:46	60	62	59	
8	14:47	65	68	64	AHU intake dominant
	14:48	65	68	64	
	14:49	65	68	64	
9	14:51	60	62	60	Breakout from AHU dominant
	14:51	60	62	60	

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,30sec}$	$L_{AFmax,30sec}$	$L_{A90,30sec}$	
	14:52	60	62	60	
	Condenser unit on				
6 ^[1]	14:56	57	61	56	Noise from plant on Freetrade and Forty-Seven hotel rooftops
	14:57	58	60	57	
	14:58	58	60	57	
7	15:00	61	64	60	Noise from existing rooftop plant, mainly AHU intake. Distant construction driving max noise levels
	15:01	61	64	59	
	15:02	60	63	59	
8	15:04	65	68	64	AHU intake dominant
	15:04	65	68	64	
	15:05	65	68	64	
9	15:06	60	62	60	Breakout from AHU dominant
	15:07	60	62	60	
	15:08	61	62	60	

^[1] Measurements were 1 minute in duration.

Appendix C

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.

Appendix D

Calculation details

