

Acoustic Consultancy Report

92991/3/2/2 External Plant Assessment

Report Prepared For

Butler And Young Associates Alexandra Road, Camden 07 August 2024

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i) Executive Summary

New mechanical plant is to be installed across the Alexandra and Ainsworth Estate, in London.

LCP has been commissioned to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The design criterion is as follows:

23 dB LAeq, T at 4m, nearest residential window.

The design as proposed and assessed will achieve the required criteria provided the proposed design detailed in section 4.1 of this report is implemented; the calculated rating levels are as follows:

23 dB L_{Aeq, T} at 4m, nearest residential window.

This report concludes that the design criteria can be achieved.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	7 th August 2024	Initial Issue	VB	RM



1. Introduction

New mechanical plant is to be installed across the Alexandra and Ainsworth Estate, in London.

LCP has been commissioned to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The report details recommendations for necessary noise mitigation where necessary.

The guidance in this report is on the basis that the mechanical plant will be consistently operating over a 24hour period.

2. Survey

2.1. Site Description

The site layout together with the measurement position is shown in the drawing contained within Appendix A.

2.2. Receiver Location

The site was surveyed to determine the location of the most affected receiver.

The nearest residential receiver are located above the existing pump houses. This is shown in the site plan and proposed plant location in Appendix A and Appendix B respectively.

2.3. Local Noise Climate

The predominant local noise sources were frequent rail traffic from the adjoining London Overground train line and, to a lesser extent, road traffic from local road networks.

2.4. Measurements

The noise monitoring took place on the 24th July 2024 from 23:00hrs to 02:00hrs on the 25th July 2024. The measurement period was considered sufficient to establish the representative background sound levels corresponding to the operational period of the plant.

The weather conditions monitored during the survey are shown in the following table.

Weather	Value
Average Wind Speed	1m/s
Wind Direction	North-east
Cloud Cover	20%
Temperature	18°C
Precipitation	None

Table 1: Weather Conditions at Measurement Location



2.5. Measurement Results

The measured statistical broad-band sound pressure levels are shown within Appendix C. The representative background and ambient sound level(s) obtained being as follows:

Measurement Position	LAeq, 3 hours Night*	Lago, 15 mins Night*
MP1	49	36
MP2	44	33
MP3	43	33
MP4	59	38
MP5	61	34
MP6	62	33

Table 2: Representative background sound levels, dB re 2x10⁻⁵ Pa

* Day and Night periods are defined as between 07:00 - 23.00 and 23:00 - 07:00 respectively.

3. Evaluation of Design Criteria

3.1. BS4142:2014

BS4142:2014 states that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

Table 3: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact
0 dB	Indication of low impact

Certain acoustic features can increase the significance of impact. The specific sound level should be corrected if a tone, impulse or other acoustic feature is expected to be present.

Table 4: Corrections for acoustic features, subjective method

Acoustic Feature	Correction, dB					
	Just Perceptible	Clearly Perceptible	Highly Perceptible			
Tonality	2	4	6			



Acoustic Feature	Correction, dB						
	Just Perceptible	Clearly Perceptible	Highly Perceptible				
Impulsivity	3	6	9				
Other Characteristics		3					
Intermittency		3					

Typically the acoustic feature correction would not be expected to exceed 10dB.

Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty.

3.2. World Health Organisation Night Noise Guidelines for Europe (2009)

The WHO's document 'Night Noise Guidelines for Europe (NNG) states the following:

"...it is recommended that the population should not be exposed to night noise levels greater than 40 dB of $L_{night,}$ outside during the part of the night when most people are in bed."

It then goes on to say "An interim target (IT) if 55 dB $L_{night, outside}$ is recommended in the situations where the achievement of NNG is not feasible in the short run for various reasons."

3.3. World Health Organisation (WHO) Guidelines for Community Noise (1999)

The WHO's 'Guidelines for Community Noise' gives the following relevant noise criteria:

Specific Environment	L _{Aeq, T} dB	Time Base (hours)	L _{Amax} , fast dB
Outdoor living area (serious annoyance, daytime and evening)	55	16	-
Outdoor living area (moderate annoyance, daytime and evening)	50	16	-
Dwelling, indoors	35	16	-
Inside bedrooms	30	8	45
Outside bedrooms	45	8	60
Outdoors in parkland and conservation areas*	-	-	-

Table 5: Guideline values for community noise, from Guidelines for Community Noise (WHO, 1999)

* Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low

The WHO's 'Guidelines for Community Noise' also gives the following general guidance on the expected sound insulation performance of a façade with a partly open window, it states that:



"At night, sound pressure levels at the outside facades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} , so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB."

3.4. BS8233:2014

The criteria offered in BS8233 for residential buildings are largely based on the recommendations made in the Guidelines for Community Noise.

Using the general guidance from above, on the expected sound insulation performance of a façade with a partly open window, the criteria shown in the table below have been adapted from the criteria offered in table 4 of BS8233 in order to obtain acceptable external noise levels.

The noise levels shown should be treated as overall noise levels, i.e., the combination of all existing noise levels at the site, and noise levels from any proposed plant or activity.

Table 6: External ambient noise levels for dwellings, based on BS8233, dB re 2x10⁻⁵ Pa

Activity	Location	Time period			
Activity	Location	07:00 to 23:00	23:00 to 07:00		
Resting	Living Room	50 LAeq,16 hour	-		
Dining	Dining Room/area	55 L _{Aeq, 16 hour}	-		
Sleeping (daytime resting)	Bedroom	50 L _{Aeq, 16 hour}	45 L _{Aeq, 8 hour}		

In addition to the above criteria, BS8233 goes on to say:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 $L_{Aeq, T}$, with an upper guideline value of 55 dB $L_{Aeq, T}$ which would be acceptable in nosier environments."

The above criteria are in line with the recommendations made in WHO's 'Guidelines for Community Noise'.



3.5. Local Authority Requirements

The Local Authority, London Borough of Camden, provided the following guidance within their Local Plan dated 2017.

"We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity."

Noise sensitive receptor	Assessment Location	ent Design LOAEL Period (Green)		LOAEL to SOAEL (Amber)	SOAL (Red)		
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background		
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBLAmax	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB	'Rating level' greater than 5dB above background and/or events exceeding 88dBLAmax		

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

3.6. Recommended Residential Design Rating Level

On the basis of the above the recommended residential design rating level should therefore be:

Residential Design Rating Level

Representative LA90, 15 mins - 10 dB

3.7. Design Rating Levels

The design levels to be adopted for this project are set out in table 7.



Receiver Premises	Design Level (Night), LAeq, 8 hr
Nearest residential window to pump room A1	28
Nearest residential window to pump room A2	24
Nearest residential window to pump room A3	24
Nearest residential window to pump room A4	23
Nearest residential window to sub-pump room A5	23
Nearest residential window to pump room B1	23
Nearest residential window to pump room B2	23
Nearest residential window to pump room B3	23
Nearest residential window to sub-pump room B	23
Nearest residential window to pump room C1	26
Nearest residential window to pump room C2	23
Nearest residential window to pump room C3	23

Table 7: Design rating levels, dB re 2x10⁻⁵ Pa

4. Review of Current Design

4.1. Current Design

The proposed plant shall be housed within a sub-pump/pump room. Pump rooms A1, A2, A3, A4, B1, B2, B3, C1, C2, and C3 do not require ventilation therefore the external façade shall comprise of a solid panel with solid access doors. Sub-pump room A5 and B do require ventilation therefore the external façade construction shall comprise of an acoustic louvre and access door. The advised external façade construction is provided in the table below.

Location	Construction	Octave Band Centre Frequency (Hz)							D	
		63	125	250	500	1k	2k	4k	8k	I W
Pump rooms A1, A2, A3, A4, B1, B2, B3, C1, C2, and C3	Solid panel	10	16	21	30	35	43	45	42	33
Sub-pump room A5 and B	Acoustic louvre*	7	7	10	17	29	30	27	21	21

Table 8: Advised external façade acoustic performance, dB

* data based on Caice SH300.



The mechanical plant within has been discussed below relating to each sub-pump/ pump room.

Pump room A1, A2, A3, and A4 shall each house two Grundfos Hydro MPC-E 3 CRIE 5-9, which will both have the potential to operate at any one time.

Sub-pump room A5 shall house two Grundfos 20-4 N-FGJ-A-E-HQQE heat pumps and two Grundfos Hydro MPC-E 3 CRIE 5-9 all of which will have the potential to operate at any one time

Pump room B1, B2, and B3 shall each house one Grundfos Hydro MPC-E 2 CRIE 10-5.

Sub-pump room B shall house three Grundfos CRIE 10-5 A-CA-A-E-HQQE heat pumps however only two will have the potential to operate at any one time.

Pump room C1, C2, and C3 shall each house one Grundfos Hydro MPC-E 2 CRIE 5-9.

The reverberation time within each the sub-pump/pump rooms should not exceed 1.0 seconds.

The residential windows do not have direct line of sight to the sub-pump/pump rooms. Several overhang above, or in the instance of sub-pump room B, the property is set back with a balcony screen, which is included in the calculations in section 4.2.

The guidance in this report is on the basis that the mechanical plant will be consistently operating over a 24-hour period.

4.2. Calculated Results

Calculations of the predicted noise levels have been carried out with the appropriate corrections for geometric attenuation, barrier effect, reflective surfaces and multiple source addition.

The design rating levels to be adopted for this project, together with the predicted noise levels, are set out in the table below.

Receiver Premises	Approximate Distance (m)	Design Level (Night) L _{Aeq, 8 hr}	Predicted Level L _{Aeq,T}
Nearest residential window to pump room A1	4	28	18
Nearest residential window to pump room A2	4	24	18
Nearest residential window to pump room A3	4	24	18
Nearest residential window to pump room A4	4	23	18
Nearest residential window to sub-pump room A5	11	23	22

Table 9: Design and predicted rating levels, dB re 2x10⁻⁵ Pa



Receiver Premises	Approximate Distance (m)	Design Level (Night) L _{Aeq, 8 hr}	Predicted Level L _{Aeq,T}
Nearest residential window to pump room B1	4	23	23
Nearest residential window to pump room B2	4	23	23
Nearest residential window to pump room B3	4	23	23
Nearest residential window to sub-pump room B	25	23	23
Nearest residential window to pump room C1	4	26	16
Nearest residential window to pump room C2	4	23	16
Nearest residential window to pump room C3	4	23	16

Plant noise level data used in this assessment are contained within Appendix D.

Calculations are shown within Appendix E.

5. Conclusion

An environmental noise survey has been undertaken in order to establish the representative background sound levels local to the site generally in accordance with the method contained within BS4142: 2014.

Calculations have been carried out to determine the noise levels at the nearest receiver premises. The calculations show that with the implementation or the proposed design detailed in section 4.1 of this report the design criteria will be met.



Appendix A: Site Plan





Appendix B: Proposed Plant Location





The image below depicts the overhang of the residential dwellings above the proposed pump rooms located at ground level.





Sub pump room A5



of Sub Plant Ro om A - Exi



Visualisation of Sub Plant Room A - Proposed



Sub pump room B



Visualisation of Sub Plant Room B (to right) - Proposed



Sub-pump room A5



Sub-pump room B





Pump rooms A1, A2, A3, and A4



Pump rooms B1, B2, and B3









Appendix C: Measurement Data

													-								-	
		Elapsed time L	AFmax [dB] L	ASmax [dB] 1	/1 Octave L	bəz						-	otal 1/1	Octave Lz9	0						-	otal
No.	Date & time	[hh:mm:ss]			63	125	250	500	1000	2000	4000	8000	Aeq	63	125	250	500	1000	2000	4000	8000	A90
MP1	24/07/2024 23:16:56	00:15:00	69.2	63.2	57.6	51.6	48.6	47.7	47.4	43.4	37.5	31.2	51.1	44.2	40.7	39.8	38.7	38.4	34.8	29.0	21.6	43.3
MP1	25/07/2024 00:24:54	00:15:00	72.4	67.4	52.5	45.1	44.1	44.1	44.7	40.7	34.4	29.1	48.0	38.8	36.6	35.4	33.8	32.8	29.4	23.4	17.2	37.8
MP1	25/07/2024 01:17:30	00:15:00	58.9	54.4	52.1	44.8	42.2	40.9	41.6	37.8	29.2	20.8	44.9	38.6	36.2	35.0	32.2	30.7	26.7	21.0	15.8	36
													48.7									36
MP2	24/07/2024 23:33:38	00:15:00	63.5	58.9	50.1	45.2	42.7	41.7	39.6	38.2	36.6	31.1	45.3	40.5	38.5	36.5	34.3	33.5	31.3	28.5	22.3	39.3
MP2	25/07/2024 00:42:02	00:15:00	75.3	68.7	51.0	46.6	44.5	43.0	40.1	38.7	34.6	27.4	45.6	39.2	37.2	34.5	31.2	30.3	27.5	23.3	17.4	35.6
MP2	25/07/2024 01:34:18	00:15:00	56.8	54.8	46.3	43.6	39.1	35.0	33.3	30.4	24.8	18.2	38.3	39.1	37.7	34.8	28.9	26.7	22.3	17.1	14.5	33.4
													44.1									33
MP3	24/07/2024 23:51:18	00:15:00	63.2	60.6	53.4	54.4	48.6	41.2	37.6	36.3	36.9	31.4	45.9	41.3	38.4	35.4	32.4	30.8	27.6	24.9	18.9	37.2
MP3	25/07/2024 00:58:30	00:15:00	69.7	62.1	49.4	45.3	41.3	39.1	36.7	34.4	32.0	25.9	42.2	41.6	37.7	34.9	30.0	27.8	23.9	19.2	15.2	34.4
МРЗ	25/07/2024 01:51:26	00:15:00	49.7	46.9	48.1	45.0	39.9	35.1	31.6	30.3	29.2	23.0	38.6	41.8	38.6	35.2	29.3	25.3	20.5	16.5	14.5	33.1
													43.2									33
MP4	24/07/2024 23:15:00	00:15:00	77.9	77	61.3	60.3	56.9	58.2	57.7	51.5	43.7	36.3	60.7	43.8	43.1	43.1	37.7	37.0	31.9	23.8	16.2	41.7
MP4	25/07/2024 00:12:10	00:15:00	76.2	75.2	57.6	57.1	57.0	57.1	55.7	49.9	42.2	30.8	59	39.7	40.9	39.7	36.2	34.5	29.2	21.1	15.2	39.3
MP4	25/07/2024 01:16:14	00:15:00	76.4	75.4	62.0	59.4	55.9	55.1	52.8	48.4	42.4	31.6	57	38.3	40.3	39.6	34.2	31.6	26.3	19.5	15.3	37.6
													59.2									38
MP5	24/07/2024 23:33:08	00:15:00	17	76.1	62.8	58.7	56.1	55.1	54.9	52.8	50.0	38.7	59.4	39.9	40.3	38.9	36.7	34.2	28.7	21.3	15.4	39.3
MP5	25/07/2024 00:28:44	00:15:00	83.5	82.5	61.2	57.2	57.3	61.7	60.6	56.3	50.5	38.8	64	38.4	38.8	35.9	33.6	31.6	25.4	17.4	14.4	36.3
MP5	25/07/2024 01:32:44	00:15:00	75.1	74.1	64.8	59.0	55.3	55.6	54.5	48.4	43.2	35.2	57.9	37.7	38.0	35.1	31.7	28.8	22.1	15.6	14.2	34.4
													61.2									34
MP6	24/07/2024 23:50:34	00:15:00	81	80.3	63.8	63.0	61.3	62.4	60.8	56.5	50.6	40.1	64.6	40.5	40.4	37.6	35.3	34.1	28.0	18.8	14.6	38.7
MP6	25/07/2024 00:46:56	00:15:00	81.2	80.2	55.4	53.6	51.9	58.0	57.1	52.1	44.8	37.4	60.2	36.4	36.1	33.4	31.1	28.8	23.2	16.4	14.3	33.7
MP6	25/07/2024 01:49:10	00:15:00	80.9	79.8	62.4	56.8	53.8	56.9	55.4	52.4	46.5	41.7	59.4	36.0	36.6	33.6	30.6	26.8	21.2	15.9	14.3	32.9
													62.0									33

MP1, 2, and 3

Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11258 (next cal due 04/03/25) Start gain +0.04 End gain -0.01
 - Svantek pre-amplifier SV12L S/N: 13111 with GRAS microphone capsule 40AE S/N: 241965

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10893 (next cal due 24/08/24) complying with Class 1 specification of BS EN 60942:2003, calibration level 114.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

MP4, 5, and 6

Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11205 (next cal due 08/04/25) Start gain +0.34 End gain 0.42
 - Svantek pre-amplifier SV12L S/N: 13245 with GRAS microphone capsule 40AE S/N: 75181

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10890 (next cal due 24/01/25) complying with Class 1 specification of BS EN 60942:2003, calibration level 114.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.



Appendix D: Plant Data

Plant noise data used in the preceding assessment follow.

Plant	Distance	Octave	Band C	entre Fi	requenc	y (Hz)				1
Fidilt	(m)	63	125	250	500	1k	2k	4k	8k	LPA
Grundfos CRIE 10-5 A-CA-A-E- HQQE heat pumps	1	23	40	50	62	65	62	59	50	69
Grundfos CRIE 20-4 N-FGJ-A-E- HQQE heat pumps	1	30	44	56	67	68	66	63	59	73
Grundfos Hydro MPC-E 2 CRIE 5-9	1	8	28	43	54	62	58	52	44	64
Grundfos Hydro MPC-E 2 CRIE 10-5	1	23	40	50	62	65	62	59	50	69
Grundfos Hydro MPC-E 3 CRIE 5-9	1	8	28	43	54	62	58	52	44	64

Table 10: Manufacturer's plant sound pressure data, dB re $2x10^{-5}$ Pa

Table 11: Calculated plant sound power data used in calculations, dB re 10^{-12} W

Diant	Octave	Band C	entre Fi	requenc	y (Hz)				1
Fidit	63	125	250	500	1k	2k	4k	8k	∟WA
Grundfos CRIE 10-5 A-CA-A-E-HQQE heat pumps	34	51	61	73	76	73	70	61	79
Grundfos CRIE 20-4 N-FGJ-A-E-HQQE heat pumps	41	55	67	78	79	77	74	70	83
Grundfos Hydro MPC-E 2 CRIE 5-9	19	39	54	65	73	69	63	55	75
Grundfos Hydro MPC-E 2 CRIE 10-5	34	51	61	73	76	73	70	61	79
Grundfos Hydro MPC-E 3 CRIE 5-9	19	39	54	65	73	69	63	55	75



Appendix E: Calculations

Sub-pump room A5

Plant Noise Data (Sound Power Levels):

	h Midth	Unioht	Leon	Inite						6			<	Inite
		IIIĥioLi	Facade	CIIIIS	63	125	250	500	1000	2000	4000	8000	t	OIIIIS
Grundfos CRIE 20-4 N-FGJ-A-E-HQQE			1	ε	41	55	67	78	79	77	74	70	83	dB
Grundfos CRIE 20-4 N-FGJ-A-E-HQQE			1	ε	41	55	67	78	79	77	74	70	83	dB
Grundfos Hydro MPC-E 3 CRIE 5-9			٢	ε	19	39	54	65	73	69	63	55	75	đB
Grundfos Hydro MPC-E 3 CRIE 5-9			1	ε	19	39	54	65	73	69	63	55	75	dB

Room Dimensions:

Description	Value	Units
Plant Room Length	8	ε
Plant Room Width	4.5	٤
Plant Room Height	3	ε
Plant Room Volume	108	m ³

Structural Details:

Description	Value	Units
Façade Length	8	E
Façade Height	3	ε
Façade Area	24	m2

Partition Sound Reduction Index:

Factoritie 63 125 250 500 1000 2000 7 7 101 X 101 27 27 21 22 dB dB M UIII X 101 X 11 29 27 21 22 dB 20 21 22 dB 20 21 22 dB 20 21 22 dB 20 21 22 dB 21 22 dB 20 21 22 dB 21 22 21 22 21 21 21 22 21 21 22 21 21 22 21 22 21 22 21 22 21 22 21 22 21 22 21 22 21 22 21 22 23	Docarintion			Uctave	Band Cen	tre Freque	ncy Hz			٥	Inite	100
Façade Sound Reduction Index 7 7 7 10 17 29 30 27 22 dB		63	125	250	500	1000	2000	4000	8000	Å	5	
	Façade Sound Reduction Index	7	7	10	17	29	30	27	21	22	đb	

Reverberation Time:

Jaerrintion				Octave	Band Cen	tre Freque	ncy Hz			Inite	Dof
		63	125	250	500	1000	2000	4000	8000	5	
Plant Room Reverberation Time	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	s	1

Docenintion			Octave	Band Cen	tre Freque	ency Hz			<	linite	Q) of
	63	125	250	500	1000	2000	4000	8000	t	01115	22	
Total Sound Power L _w	44.0	58.1	70.2	81.2	83.0	80.6	77.3	73.1	87	dB	83	1,6
Plant Room Reverberant L _p	34.6	48.7	60.8	71.8	73.6	71.2	67.9	63.7	78	dB	74	1,6
Facade Break-out Lw	45.2	59.3	68.4	72.4	62.1	58.8	58.5	60.3	11	dВ	69	



	3k				¥.	0												
	4 8	╞			<u></u>	0												
tion (2k	f			2K	~												
ttenual values	¥	F	ĺ	effect	ŧ	e	ĺ											
tional A egative	500			Ground	500	e												
Addit (N	250			0	250	e												
	125				125	e												
	63				8	e												
sen	8 8				8	2												
ative v:	k 41	-			2K 4	。 。												
or) Neg	¥	╞			¥	0												
tenuat	500	F		ditions	200	•												
(e.g. af	250			eric col	250	0												
sesso-	125	L		mosphi	125	•												
	63			A	% 83	0												
9 . 5		e)	-		PC RH													
Façade orrectic	3dB	Yes			F	13												
e g		0																
al to	(3dB)																	
effectio	und, 1=								Ϋ́	0	45							
R B	gro,	~			0												_	
ŝ	_	-18	~		008 0	41- 12			8K		61		0				8	
ŧ	_	-18	1 effects		3 400K	-14			4k		61		0				-12	
2k		-18	s ground		3 2000	-12			2k		99		0				-15	
¥	_	-15	remover		1000	6-			¥,		48		•				-12	
500		-12	raction :		500	-9			205		40		•				÷	
250		φ	dge diffi		250	1-			250		¥		•				ę	
125		Υ	Top ex	Loss:	125	9-			125		37		•				6	
83		ņ	plane	erence	8	<u>9</u> -			8	_	8		•				Ŷ	
ar	1	180	ground	ath Diff	id path nce	0				Marua	rick we		e				e	
Angu		110-	abum at	arrier P.	Cakulate differe	0.1					10mm t		mproor				mproor	
			e zero d	8	- 2 2 2						ypical 1		P				5	
Ð		ſ	eferenct		Barrie recei: distan	3.6					-							
o. off		-	9 - Sel rt		surce to arrier Mance	8.0												
ź	_		h positive		ан Gip Sip													
9		40	must be		Barri heigl	2.5												
(I) (I)		ş	heights i		Edge Traction													
	1		A		4	ank												
Grou facto (receiv	2	0.0	tion	_	e = 2	· leave b.												
ctor tet 0	-	0	+ diffract	edge = :	cal edge	arrier =												
n ar		ľ	Edge	Top é	Vertic	No be											(uo	
factor	-	0.0															orrectiv	
5 4 0		$\left \right $				puno											effect c.	
Receive		2.5				nous gr											Iround	
8 I						ion of pc											uding 5	
Sour	ľ	0		0 =	f = 1	= Fract							noi				oss (inc.	
tiever tre (m)		1.0	od factor	sround -	s groun	ground			ler SR				M Derat				arrier k	
Rec		Ē	Groun	Hard 6	Poron.	Mond			Barri				Barrie				Net b.	
Lw	dB(A)	2						Ļ		_								
erical 1+8)	dB(A)	2			dB(A)	8	æ		dB(A)	8		(B(A)	10	10		dB(A)	22	33
emi-she istance	8	8		e)	¥	15	15		8	4		¥	11	1	-	×	5	2
LOG(d	44	59		3 barrie	. 4k	14	14		14k	9		4	80	**	r Lp xesent		-3	-
-p, assi .w +20*	K 2k	56		toluding	K 2k	1 14	4		X 2k	6 2		k 2k	5	с С	Receive rier, if p	¥ 2k	-1-	•
-w) (if I ert to L	00 11	12 62		r Lp (e)	100	24 2	14 2		00 11	1.		≑ ≋	6 81	8	gated h	11	3	0
rel (Lp/I	250 5	88	9613	Receiver	5 052	3	34		250 5	1		20 50	11 1	1	Mit: (includ	250 51	24 2	24 24
Ind Lev	125 1	59	rith ISO	UL.	125	28	28	I	125 2	32 .		125 2	7	4		125 1	19	10
Sou	8	45	lance w		8	16	16		63	45		8	-29	-29		3	8	a
f.dist.			accord					iteria	NR	12								
Ref	_		1 out in		ŧ	rocm		ō	ſ	1	L	t	room		ţ		room	
ant		mooud,	 carried 		đ.	Pump	Tota					2	Pump	Tota	đ		Pump	Total
<u>م</u>		Pum	ulations															
er,		-	SC		fet	÷	Ιİ					Je.	÷		tef.		÷	



Sub-pump room B

Plant Noise Data (Sound Power Levels):

Plant Description	Innath	MEdth	Loioht	Distance	Inite			Octave	Band Cent	re Freque	ncy Hz			v	Inite
	Leugu		nigion	Facade		63	125	250	500	1000	2000	4000	8000	¢	
Grundfos CRIE 10-5 A-CA-A-E-HQI	QE			-	 ε	34	51	61	73	76	73	70	61	80	dB
Grundfos CRIE 10-5 A CA A E HQI	QE			-	ε	34	51	61	73	76	73	20	61	80	ß

Room Dimensions:

Nant Room Length 7.5 m Pant Room Width 3 m Pant Room Height 3 m Pant Room Volume 67.5 m ³	escription	Value	Units
Italit Room Width 3 m Italit Room Height 3 m Italit Room Volume 67.5 m ³	lant Room Length	7.5	ε
Nant Room Height 3 m ³ Plant Room Volume 67.5 m ³	lant Room Width	3	ε
Nant Room Volume 67.5 m ³	lant Room Height	3	ε
	lant Room Volume	67.5	m³

Structural Details:

Description	Value	Units
Eaçade Length	7.5	ω
Façade Height	3	ω
[–] açade Area	22.5	2m

Partition Sound Reduction Index:

			Octave	Band Cen	tre Freque	ncy Hz			٥	Inite	Dof
	63	125	250	500	1000	2000	4000	8000	<u>~</u> 2		
agade Sound Reduction Index	7	7	10	17	29	30	27	21	22	dB	

Reverberation Time:

Docerintion					Octave	Band Cen	tre Freque	ncy Hz			Inite) of
			63	125	250	500	1000	2000	4000	8000		
Plant Room Reverberation Time	0.5 s	►	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	s	1

Docortinition			Octave	Band Cent	rre Freque	ncy Hz			<	nite	Q	Dof
	63	125	250	500	1000	2000	4000	8000	ť	01115		
Total Sound Power L _w	37.0	54.0	64.0	76.0	79.0	76.0	73.0	64.0	83	dB	79	1,6
Plant Room Reverberant L _p	29.6	46.6	56.6	68.6	71.6	68.6	65.6	56.6	75	dB	72	1,6
Façade Break-out Lw	38.9	55.9	62.9	67.9	58.9	54.9	54.9	51.9	67	dB	65	

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	× 8k				8 8	3														
-	4 14				4	3														
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dditior (Neg	20 21			Go	20															
×	25 22				25 21	 														
	33 1				12															
	- 8k				*	-2	ĺ													
i value:	4k				4k	7														
egative	2k				2k	0														
tor) N	1k			2	ŧ	0														
attenus	200			onditio	200	0														
6 G :	5 250			heric co	5250	0														
Losse	3 12	-		tmospl	3 12	0														
8	9			•	%	80														
р "Б		ľ			SC RH															
Façade	3dB	Yes			-	13														
е Б		0																		
al to	=3dB)		ĺ											ļ						
effectio	und, 1=									Rw	12	12								
a R	gro				•															
8	_	Ŷ	-		1 8000	-2				8	12	12		-					7	
4k		7	effects		4000	Ŷ				4k	13	13		-					7	
2k		η	ground		2000	9				2k	₽	13		-					2	
ŧ		Ϋ	emoves		1000	9				ŧ	13	13		-					5	
200		η	action re		500	-2				200	6	σ		-					5	
250		ņ	ge diffra		250	9				250	2	1		~					ę	
125		η	Top ed(:sso	125	9				125	υ	9		0					Ŷ	
8		ę	ane	ence L	8	Ŷ				8	s	9		9					Ŷ	
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Angula		45(-3dE	um at gr	ier Patl	kulated differenc	0.00						-		proom					proom	
ĉ			ero dati	Barr	8									Pum					Pum	
8		•	'ence zé		Barrier to receiver listance	3.0														
Ě	_		net refer		8 - 8	-														
No. o		-	altive - s		Source barrie distanc	22.0														
و		28	t be pos		Barrier	4.3	1													
8	_	-	the mus		e tion															
dB(J		36-	A heig		Edg. diffract	-														
round tctor	1-0	0.0			C 1	e blank														
5 4 8		Í	action	Ξ	dge = 2	r = leaw														
Ground factor	-	0.0	tige diffr	agba qo	artical e.	o barriet														
5 2 2 2	-		ш	7	×	ž													ction)	
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aurce		3.0				iction of													ncludin	
e So		ĺ		0 = F	t = pur	vd = Fra				77				ation					i) ssol .	
sciever Ince (m		25.0	ind fact	1 ground	us grou	d groun				Trier SR				ier Der.					barrier	
, Diete	8		Grou	Haro	Poro	Moxe				Bar				Barr					Net	
Ľ	1) dB(r	67			2			1		e			-					1		
erical 2)+8)	dB(A	67			dB(≠	8	8			1)Bb	8		dRin	~	~			dB(A	8	23
istance	K 8k	52		er)	8 7	13	13	Ц		8 X	4		ßk	0	6		•	8K	9	9 (
umes h 'LOG(d	41	5		g barri	41	3 17	11:	Ц		41	9	-	44	1	1	r Lp	presen	4	1 10	1 10
-p, assi .w +20*	K 2k	35 6		tcluding	k 2k	2 18	2 18	Ц		K 2k	6		cess 2k	6	6 6	Receive	rier, ff)	× 24	5 11	5 11
w) (f L ert to L	30 11	8 5		r Lp (ex	1	1 22	3	H		11 00	5 15		N EX	6 11	11 5.	gated	ing bar	100	# #	4 1
el (Lp/L	50 51	9	3613	eceiver	50 51	36 3	36 3	H		50 51	5		20 50	0	3	MR	(includ	50 51	20	20 2
nd Lew ation to	125 2	56 6	th ISOS	ĸ	125 2	19 2	19 2	Η		125 2	32 2		2	13	-13			125 2	14	14 2
Sou radi	83	8	ance wi		8	2	2			8	45		8	43	-43			8	7	5
dist.			accords						terla	¥	2									
Ref.			out in a		¥	00m			ť	Ż	1		¥	moo			z		moo	
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ц.		Pump	stions c																	
Ref.	_	-	Calcula		Yet.	+							Ref.	1 F		2	Yel.		-	
	_		. ~	-												_			- 24	



Pump rooms A1, A2, A3, and A4

Plant Noise Data (Sound Power Levels):

internet.

Francescription Early muture Francescription Early muture Francescription Early muture Earl	Inite		OCTAVE BANG	Centre Freq	uency nz			-	nite
Grundios Hydro MPC-E 3 CRIE 5-9 T <tht< th=""> T <tht< th=""> T <tht< th=""> T T <tht<< th=""><th>63</th><th>125</th><th>250 5</th><th>1000</th><th>2000</th><th>4000</th><th>8000</th><th>י </th><th>2</th></tht<<></tht<></tht<></tht<>	63	125	250 5	1000	2000	4000	8000	י 	2
Grundfore Hundrow MDC_E 3 CPIE 5.0 54	m 19	39	54 6	5 73	69	63	55	75	щ,
	m 19	39	54 6	5 73	69	63	55	75	щ

Room Dimensions:

Description	Value	Units
Plant Room Length	4	w
Plant Room Width	2.5	ш
Plant Room Height	3	ш
Plant Room Volume	30	еш

Structural Details:

Description	Value	Units
Façade Length	2.5	ш
Façade Height	з	ш
Façade Area	7.5	2m

Partition Sound Reduction Index:

Decription			OCIAVE	Daria Cell	anhau ar	псупг			٥	llnite	Dof
	63	125	250	500	1000	2000	4000	8000	2	5110	
Façade Sound Reduction Index	10	16	21	30	35	43	45	42	33	dB	
											Ī

Reverberation Time:

			Octave B	and Centr	e Freque	ncy Hz			Inite	jog
	63	125	250	500	1000	2000	4000	8000		
Plant Room Reverberation Time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	s	٢

Docerintian			Octave	Band Cent	re Freque	ncy Hz			4	Inite	QN	Dof
	63	125	250	500	1000	2000	4000	8000	t	51110		
Total Sound Power L _w	22.2	42.0	57.0	68.0	76.0	72.0	66.0	58.0	78	dB	76	1,6
Plant Room Reverberant L _p	18.4	38.2	53.2	64.2	72.2	68.2	62.2	54.2	75	dB	72	1,6
Façade Break-out Lw	18.5	32.3	42.3	44.3	47.3	35.3	27.3	22.3	49	dB	47	



	Additional Attenuation (Negative values)	3k 63 125 250 500 1k 2k 4k 8k			Ground effect	8k 63 125 250 500 1k 2k 4k 8k	0 3 3 3 3 3 3 3 3														
	agade Losses (e.g. attenuator) Negative values rection dB	3dB 63 125 250 500 1k 2k 4k 8	Yes 3		Atmospheric conditions	T *C RH % 63 125 250 500 1k 2k 4k 8	15 80 0 0 0 0 0 0 0														
	Reflections F (additional to dB coi	ground, 1=3dB)	۰ ۵							Rv	0	45									
Ì	¥8		•			8000	8			8		61			•					8	
	4		0	1 effects		9 4000	-19			4¥		61			•					នុ	
	× 2k	_	•	es grount		00 2000	4 -17			k 2k		9 26			0					7 -20	
$\left \right $	1	_	0	on remov	_	00 10	11 -1			100		40 4			0					14 -1	
-	220		•	diffractio		250 5	6			250 5		, g			0					12	
	125			lop edge	:ss	125	-1			125		37			0					1	
ľ	8		•	ane 1	rence Lo	8	9			8		33			•					ę	
	Angular Directionality		None	ro datum at ground p	Barrier Path Differ	Calculated path difference	0.36				Maruta	al 110mm brick wall			Pumproom					Pumproom	
	8			vence ze		Barrier to receiver distance	2.0					Typic									
ŀ	No. off	_	-	ve - set refe		lource to barrier listance	2.0														
	2		26	st be positiv	_	Barrier S. height d	2.0														
	(A)		-23	heights mut	_	Edge	-														
	Ground factor	5	0.0	N A		= 2 di	ave blank														
	Ground factor	-	0.0	tige diffraction	sp edge = 1	artical edge =	barrier = lec														
	Ground factor	-	0.0	ш	70	×	ž													correction)	
	Receiver heicht fe		2.0				yrous ground													round effect.	
	Source heinht	ŀ	0.0			-	Fraction of po													(including g	
	eciever		4.0	und factor	d ground = 0	ous ground =	ad ground = 1			rrier SR					rier Deration					barrier loss	
	N. R	3(A)	61	8	Har	Pon	Mox			Ba					Bar					Net	
ŀ	3.0	B(A) dE	49			(V)	z	ষ্ঠ		(F)	53			(B(A)	12	12			(A)	18	18
	mi sheric tance)+6	8k d	2		_	84	æ	8		8 8	4			8 8	4	4			8k G	-15	6-
	Imes her LOG(dis	4k	27		p barrier,	4k	13	13		4k	9			4	2	2	9	oresenu)	4	9	9
	Lp, assu Lw +201	Ik 2k	17 35		xcluding	Ik 2k	13 21	33 21		1k 2k	12 9		tcess	÷ %	21 12	31 12	Receive.	Liner, E	IK 2K	1 91	1 1
	o/Lw) (F twent to	500	44 4		ver Lp (e	200	8	30		200	16		ú	200	14 2	14	litigated	te Guilon	200	16	16 1
	Level (Lr on to cor	250	42	SO9613	Receiv	250	8	82		250	82			22	9	9	2		220	16	16
	Sound L radiatio	3 125	8 32	ce with It		3 125	18	1 18		3 125	5 32			22	11 -14	M -14			3 125	8	8
	Ref.dist.	ø	-	out in accordance		۲ ۳	4 room	4	Criteria	NR 6	12 4.		1	9	room 4	٩	,	Ĕ	9	T moou	
	plant		Pumproom	ions carried		đ	Pumpr	Total					Plan	:	Pumpo	Total	i	đ.		Pumpr	Total
	Ref.		-	Calculat	-	Ref	-						Ref				2	lian I		-	



Pump rooms B1, B2, and B3

Plant Noise Data (Sound Power Levels):

Blast Description	Inneth	MEdeb	Unioht		 Inite			Octave E	sand Centi	e Frequer	cy Hz			<	Inite
	Leugu		IIIAI	Facade	OIIIIS	63	125	250	500	1000	2000	4000	8000	¢	01110
Grundfos Hydro MPC-E 2 CRIE 10-5	5			0.5	ε	34	51	61	73	76	73	70	61	80	dB

Room Dimensions:

Description	Value	Units
Plant Room Length	4	Е
Plant Room Width	4	ε
Plant Room Height	3	ш
Plant Room Volume	48	em ³

Structural Details:

Description	Value	Units
Façade Length	4	ш
Façade Height	3	ш
Façade Area	12	2m

Partition Sound Reduction Index:

becrintion			Octave	Band Cen	tre Freque	incy Hz			٥	Inite	Dof
	63	125	250	500	1000	2000	4000	8000	Ž	01113	
açade Sound Reduction Index	10	16	21	30	35	43	45	42	33	dB	

Reverberation Time:

				Octave	Band Cen	tre Freque	ncy Hz			Inite	j.c
		63	125	250	500	1000	2000	4000	8000	51110	
Plant Room Reverberation Time	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	s	٢

			Octave	Band Cen	tre Freque	ncy Hz			4	- Harden	đ	900
	63	125	250	500	1000	2000	4000	8000	٤		ž	
Total Sound Power L _w	34.0	51.0	61.0	73.0	76.0	73.0	70.0	61.0	80	Яþ	76	1,6
Plant Room Reverberant L _p	28.1	45.1	55.1	67.1	70.1	67.1	64.1	55.1	74	dB	70	1,6
Façade Break-out Lw	32.4	43.4	48.4	51.4	49.4	38.4	33.4	27.4	52	đВ	49	



		8k		Π		š	3	1													
		4k				ŧ	e														
	ation s)	2k				2k	e														
	Attenu: e value	1k			d effect	1k	3														
	litional Negativ	500			Groun	500	e														
	Ado	5 250				5 250	e														
		3 12				3 12	3														
		8k e				8	0														
	s values	4k				¥	0														
	Vegativ	2k				2k	•														
	uator) I	0 1k			ions	0 1k	0														
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	sses (e.	125 3			spheri	125 3	0														
	٩	63			Atm	8	0														
	ę		n	_		C RH 3	8														
	açade	3dB	Yes			÷	\$														
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	alto	=3dB)																			
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	4 k			fects		4000 8	-19			4k		61			0					ន	
	2k		•	"ound ef-		2000	-17			2k		99			0					-20	
	ŧ		•	moves g		1000	-14	ĺ		¥		48			•					-11	
	200		•	Action rel		500	-11			200		40			•					-14	
	250		•	tge diffra		250	6			250		g			•					-12	
	125		•	Top ed.	Loss:	125	-1			125		37			•					1	
2	8	_	•	d plane	flerence	8	9			8	70	ell 33			•					•	
	Angular		None	atum at ground	rrier Path Dif	Calculated path difference	0.36				Manu	10mm brick we			mproom					mproom	
	ę		0	erence zero d	Ba	Barrier to receiver distance	2.0					Typical 1			9					Pu	
	No. off		÷	sitive - set ref		Source to barrier distance	2.0														
	ę		29	ist be po		Barrier height	2.0														
	dB(A)		-23	Al heights m.		Edge diffraction	÷														
	Ground factor (receiver)	0-1	0.0	ction	÷	ge = 2	= leave blank														
	Ground factor (middle) 0	-	0.0	Edge diffra	Top edge =	Vertical edg	No barrier :													(uc	
	Ground factor (source) 0-	-	0.0				pur													Tect correctic	
	Receiver		2.0				of porous grov													ing ground et	
	Source		0.0	br.	1=0	ind = 1	vd = Fraction .			~					ation					loss (includ)	
	teciever tance (n		4.0	hund fact	d grount	ous gror	ed groun			Irrier SR					rier Der					barrier	
ĺ	.v. R	(V)	52	S	Har	Por	Mba			Ba					Bat					Net	
ĺ		B(A) dE	22			B(A)	8	38		B(A)	23			(A)	15	15			B(A)	8	23
	ance)+8	8k di	27	H		8k di	13	13		8k d	4			8k di	σ	б			8k di	-10	-7
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Pump rooms C1, C2, and C3

Plant Noise Data (Sound Power Levels):

loot Description	- and the	INESIAL	Unior44	Listalice	laite			Octave E	and Centr	e Frequen	cy Hz			~	1 Inite
	rengu		IIIĥiau	Facade		63	125	250	500	1000	2000	4000	8000	4	OIIIIS
Srundfos Hydro MPC-E 2 CRIE 5-9	_			0.5	ε	19	39	54	65	73	69	63	55	75	dB

Room Dimensions:

Description	Value	Units
Plant Room Length	4	ш
Plant Room Width	2.5	ш
Plant Room Height	£	ш
Plant Room Volume	08	em ³

Structural Details:

		2
Description	value	Units
Façade Length	2.5	ε
Façade Height	3	ε
Façade Area	7.5	m2

Partition Sound Reduction Index:

bo e criminian			Octave	Band Cen	tre Freque	ncy Hz			٥	Inite	Dof
	63	125	250	500	1000	2000	4000	8000	2	0	
açade Sound Reduction Index	10	16	21	30	35	43	45	42	33	dB	

Reverberation Time:

Docorintion				Octave	Band Cen	tre Freque	ncy Hz			Inite	Po f
		63	125	250	500	1000	2000	4000	8000	51110	
Plant Room Reverberation Time	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	s	~

Description			Octave	Band Cent	tre Freque	ncy Hz			~	1 Inite	QN	Dof
	63	125	250	500	1000	2000	4000	8000	¢	01110		
Total Sound Power L _w	19.5	39.0	54.0	65.0	73.0	0.69	63.0	55.0	75	đb	73	1,6
Plant Room Reverberant L _p	15.6	35.2	50.2	61.2	69.2	65.2	59.2	51.2	72	dB	69	1,6
Façade Break-out Lw	16.6	30.4	40.4	42.4	45.4	33.4	25.4	20.4	47	dB	45	



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Appendix F: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting

Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).

Airborne Noise

Noise transmitted through air.

Ambient Noise

The total noise level including all 'normally experienced' noise sources.

dB or Decibel

Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:

30 dB + 30 dB ≠ 60 dB

30 dB + 30 dB = 33 dB

$D_{nTw} \textbf{+} C_{tr}$

The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.

D	Is simply L1 – L2.
D _{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D _{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.
Ctr	Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.

Frequency (Hz)

Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.

Insertion Loss, dB

The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.

L_{A90, T}

The 'A' weighted noise level exceeded for 90% of the time period T, described or measured. The '90' can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.

L_{Aeq, T}

The 'A' weighted 'equivalent' noise level, or the average noise level over the time period T, described or measured.

L_{Amax}

The 'A' weighted maximum measured noise level. Can be measured with a 'slow' (1 sec) or 'fast' (0.125 sec) time weighting.

L_{Amin}

The 'A' weighted minimum measured noise level.



NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf}, RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

$\mathbf{R}_{\mathbf{w}}$

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to 2x10⁻⁵ Pa.

Subjective Effect of Changes in Sound Pressure Level

The table below details the subjective effects of variations in sound pressures (adapted from Bies and Hansen).

Difference between background noise and rating levels	Increase in ambient noise level in 'real terms'	Change in apparent loudness
+ 10 dB	+ 10 dB	Twice as loud
+ 5 dB	+ 6 dB	Clearly noticeable
0 dB	+ 3 dB	Just perceptible
-10 dB	0 dB	No change

W

Watts, the SI unit to describe power, after engineer James Watt.