

55 Portland Street, Manchester

Noise Impact Assessment

Russells Construction

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1.0

Introduction

1.0 Introduction

This report is prepared by Cundall in support of discharging Conditions 16 and 17 attached to Planning Permission Ref. 119265/FO/2018 issued by Manchester City Council for the development of a new-build 329-bed Clayton Hotel at 55 Portland Street, Manchester.

The site is bound by Sackville Street and the Manchester One office building to the east, Major Street and the NCP Car Park to the south, the Brooklyn Hotel adjacent to the west and leisure venues across Portland Street to the North. The approximate location of the development is marked up in red on Figure 1 below.

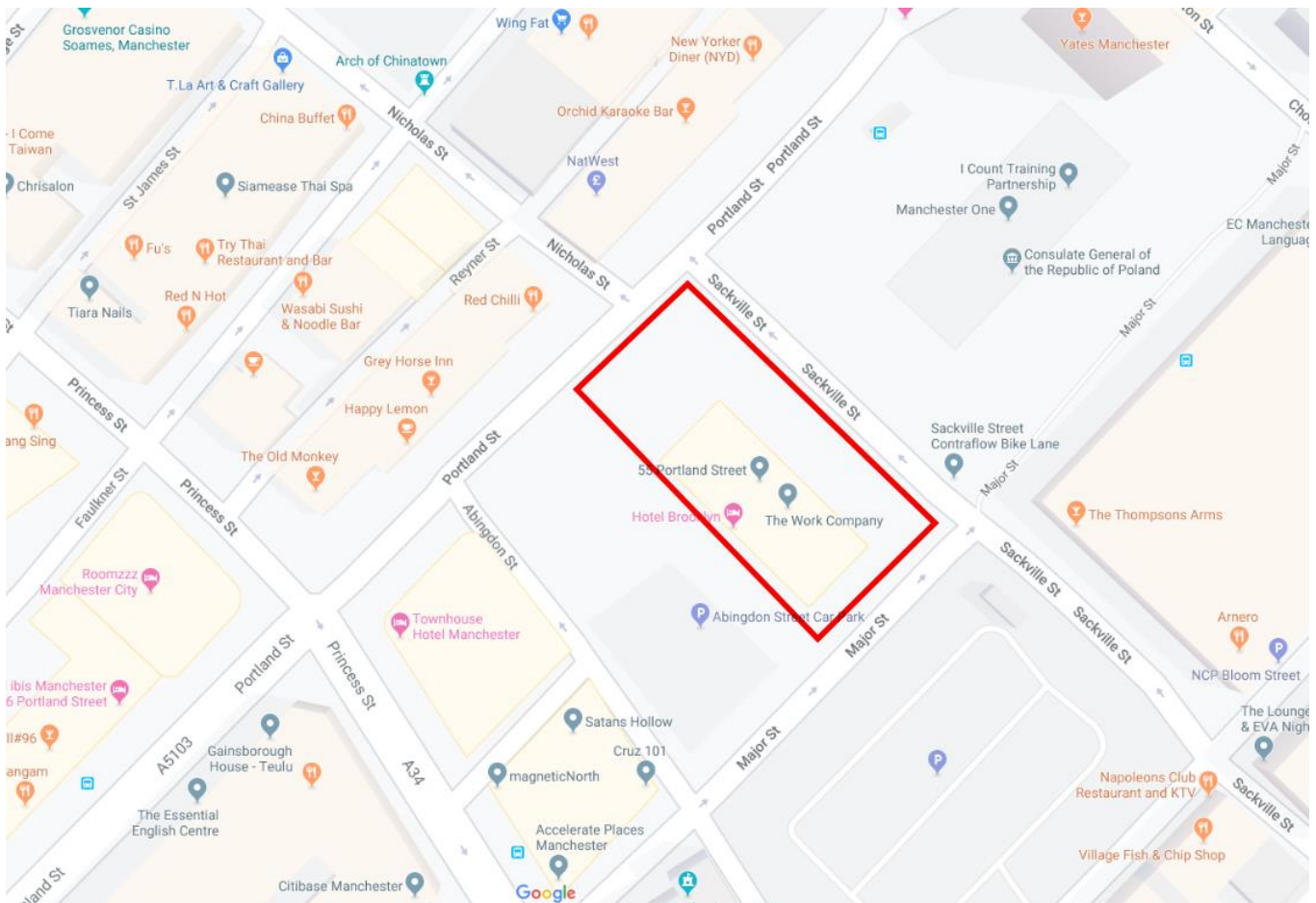


Figure 1: Approximate site boundary location in red

The wider area is characterised by a mix of uses including primarily office and leisure with several hotels along Portland Street.

In summary, the design proposals include the construction of a 16-storey block accommodating:

- 329 bedrooms between Levels 02 and 16;
- A Reception and a Bar / Restaurant on Level 00;
- Meeting rooms and a Gym on Level 01;
- Staff ancillary spaces on Level 02;
- External plant items located on Level 13 and on Roof level and a Plant room on Basement level.

To establish the prevailing noise climate across the existing site, noise surveys have been undertaken by Fisher Acoustics between the 8 and 9 October 2019. The purpose of the assessment is to evaluate the reported findings in relation to the proposed scheme being brought forward and, if required, to provide recommendations for noise mitigation

measures in order to achieve a comfortable internal acoustic environment, in line with the relevant standards and the requirements of Manchester City Council.

The assessment and recommendations within this report are based on MEP and Architectural information provided to Cundall up to January 2020. The scope of the assessment is based on technical guidance, good practice techniques and extensive previous experience of similar projects.

2.0

Relevant Standards and Guidance

2.0 Relevant Standards and Guidance

This section of the report outlines the key legislation and guidance relevant to the assessment of noise for a development of this type.

2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published by Defra in March 2010. This NPSE sets out the long-term vision of Government noise policy:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

The NPSE long term vision is supported by the following aims:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.”*

2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was originally published in March 2012 and amended in July 2019. The NPPF is part of government reform to make the planning system less complex and more accessible, and to promote sustainable growth. It replaces existing national planning policies such as Planning Policy Guidance PPG24: Planning and Noise.

The NPPF states:

“170 - Planning policies and decisions should contribute to and enhance the natural and local environment by;

*e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or **noise pollution** or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;”*

and

“180 - Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;”*

2.3

2.3 Local Authority requirements

2.3.1 Planning Conditions - Condition 16

Condition 16 issued by Manchester City Council (MCC) as part of the Planning Permission Ref. 119265/FO/2018 states:

“16) Before any use hereby approved commences, the premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority.

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy.

Whilst the above condition does not set any quantitative limits for break-out noise, Section 3.6.1.2 of the Manchester City Council (MCC) ‘Planning & Noise – Technical Guidance’ document states the following with respect to limits for entertainment noise when structurally detached from receiving buildings:

“A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be ‘audible’ in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location. “

It is considered that ensuring break-out noise does not exceed the above MCC Noise Policy limits should be sufficient to demonstrate compliance with the requirements of Condition 16.

2.3.2 Condition 17

Condition 17 of the same Planning Permission states:

17) Before first occupation of the development the building, together with any externally mounted ancillary equipment, shall be acoustically insulated in accordance with a scheme submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment.

Reason - To safeguard the amenities of the occupiers of nearby residential and office accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.”

It is considered that ensuring plant noise emission limits achieve the following requirements identified in Section 3.6.1.5.1 of the MCC Noise Policy Document should be sufficient to demonstrate compliance with Condition 17:

“Many of the noise complaints Environmental Health receive about noise from plant, equipment and machinery specifically concern the character of the noise emitted. Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

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”

3.0

Site Context

3.0 Site Context

3.1 Overview

The sixteen-storey new-build development is located on the corner of Portland Street and Sackville Street in Manchester city centre. It is adjacent to an open NCP Sackville Street car park to the south, the multi-storey NCP Chorlton Street car-park and the Manchester One office building to the east, and a newly developed hotel building immediately to the west.

There are several food and drink establishments across Portland Street to the north with the nearest one approximately 50 m to the north-west, as well as the Canal Street bars and restaurants, approximately 75 m to the south.

3.2 Fisher Acoustics noise survey

Environmental noise measurements have been undertaken by Fisher Acoustics between 7–11 August 2015 and between 17–20 June 2017. Details about the methodology, equipment used, and measurement data are outlined within Report Ref: PR0581-Rep01C-MPF “Environmental Noise Study” Rev C, issued by Fisher Acoustics on 8 February 2018.

The noise measurements have been undertaken at positions representative of the facades of the proposed Hotel development, as shown in the figure below. The measurement periods have been reported as follows:

Position	Measurement start date	Measurement end date
1	Friday, 7 August 2015	Sunday, 9 August 2015
2	Friday, 7 August 2015	Sunday, 9 August 2015
3	Sunday, 9 August 2015	Tuesday, 11 August 2015
4	Friday, 7 August 2015	Sunday, 9 August 2015
5	Saturday, 17 June 2017	Tuesday, 20 June 2017
6	Saturday, 17 June 2017	Tuesday, 20 June 2017
7	Saturday, 17 June 2017	Tuesday, 20 June 2017

Table 1 - Reported Fisher Acoustics survey periods



Figure 2 - Figure 2 of Fisher Acoustics' report "Noise survey measurement locations"

The noise climate at the times of surveying was reported within the Fisher Acoustics Noise Study as follows:

"The long-term noise environment around the Application Site is currently determined by the following principal external noise sources:

- *Road traffic on Portland Street*
- *Road traffic on Sackville Street*

There are a number of bars and night clubs in the vicinity of the Site. In particular, Cruz 101 is located at the junction of Major Street and Abingdon Street. However, there was no audible noise egress from the night club. Relatively small number of patrons of the night club gathered on Abingdon Street to smoke.

Low-frequency music noise egress from Yates at 49 Portland Street, approximately 105 metres from the location of the proposed hotel was audible at the Site during the noise survey conducted in August 2015. However, the Designated Premises Supervisor (DPS) for Yates changed in September 2015. It is believed that the change in DPS has resulted in a change to the levels of music noise egress from Yates, as no music noise from Yates was audible at the Site during the noise survey conducted in June 2017 or during two subsequent weekend night time site visits.

Music noise egress from The Thompson Arms was audible at the proposed Site during the noise survey conducted in June 2017."

3.2.1 Results summary

A summary of the measured noise levels has been reproduced below:

	Measured Noise Level					
	Daytime (defined as 7 am to 11 pm)			Night time (defined as 11 pm to 7 am)		
Measurement Location	dB, LAeq	dB, LAmax	dB LA90	dB, LAeq	dB, LAmax	dB LA90
1	65 to 68	64 to 100	52 to 69	68 to 69	64 to 99	54 to 68
2	67	68 to 86	58 to 70	-	-	-
3	60 to 62	58 to 98	51 to 62	59 to 65	59 to 89	52 to 67
4	59 to 64	58 to 95	51 to 63	63 to 64	60 to 91	54 to 69
5	66 to 69	61 to 102	50 to 70	63 to 68	54 to 100	50 to 69
6	65 to 68	58 to 100	48 to 72	63 to 67	56 to 98	48 to 70
7	57 to 59	53 to 99	47 to 67	57 to 63	55 to 97	46 to 64

Figure 3 - Table 3 of Fisher Acoustics' report "Summary of measured environmental noise levels"

The report explains that *"The statistical noise levels ('LAmax' and 'LA90') given in Table 3 show the range of noise levels measured over the sample periods. The quoted average (LAeq) noise levels are the average noise levels measured over the full daytime or night time periods in question at each measurement position."*

It can be seen from these measurement results that the anticipated noise levels at the hotel façades would be:

- Up to 69 dB LAeq,T during the daytime and up to 68 dB LAeq,T / 100 dB LA_{F,max} during the night-time at facades directly overlooking Portland Street; and
- Up to 68 dB LAeq,T during the daytime and up to 67 dB LAeq,T / 98 dB LA_{F,max} during the night-time at facades directly overlooking Saville Street.

For facades which are set slightly back or are screened from the roadsides, noise levels can be seen to marginally reduce to ≤ 59 dB LAeq,T during the daytime and 63 dB LAeq,T during the night-time, with LA_{F,max} levels up to 97 dB.

3.3 Cundall noise survey

An additional noise survey has been undertaken by Cundall between 17:00 hours on Thursday 6 February and 09:00 hours on Friday 7 February 2020 at a location representative of the worst-case quietest background noise climate at an upper floor level the proposed new development.

The sound level meter was projected out of a 10th floor window of the Manchester One office building on 53 Portland Street. The approximate location is shown in the figure below.

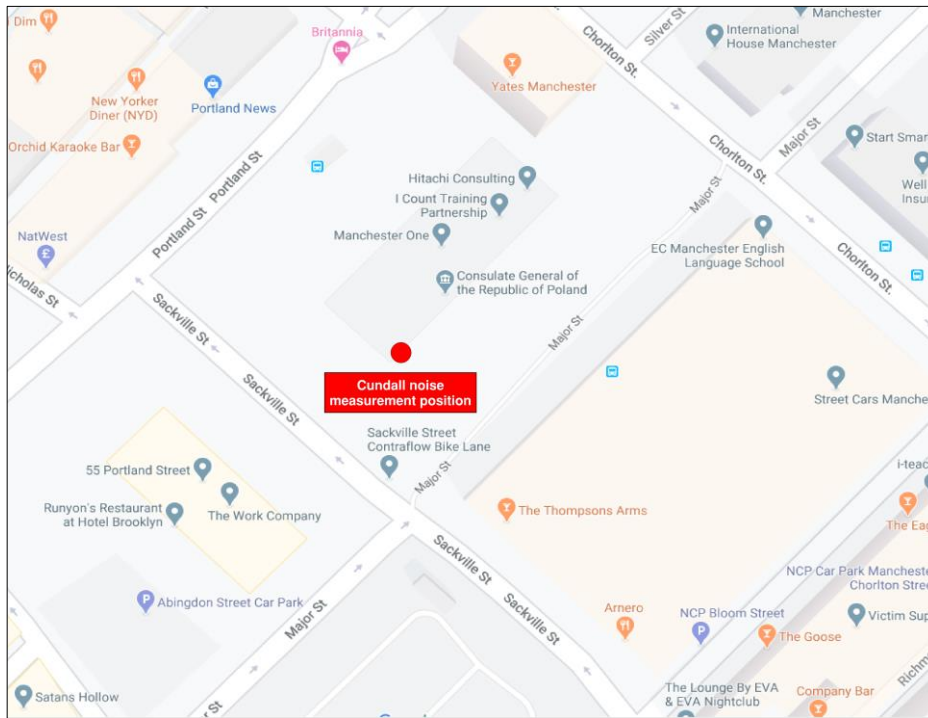


Figure 4 - Indicative location of Cundall's noise measurement position

The weather conditions during the survey were calm and dry, with temperatures around 4°C and wind speeds below 5 m/s.

Noise measurements were made using an NTi Type XL2 sound level meter (serial number A2A-16315-E0), generally in accordance with BS 7445:2003. The meter was field calibrated before and after with no significant drift witnessed. Calibration certificates for all equipment are available upon request.

Monitoring equipment was set up by competently trained Cundall staff and all measurements have been reported for free-field conditions. Subjective impressions from site were that the noise climate was generally dictated by road traffic from the local network.

3.3.1 Results summary

A summary of the average ambient noise levels recorded is detailed within Table 2 below. The values are the logarithmically averaged $L_{Aeq,15min}$, the maximum $L_{AFmax,15min}$ and the range of $L_{A90,15min}$ and $L_{A10,15min}$ values measured. All values have been rounded to the nearest integer value and are given in dBA.

Assessment period	Duration	Measured L _{Aeq,T} (dB)	Highest L _{AFMax} (dB)	Range L _{A10,15min} (dB)	Range L _{A90,15min} (dB)
Daytime	17:00 – 23:00 hrs	62	-	59 – 66	56 – 63
	07:00 – 09:00 hrs				
Night-time	23:00 – 07:00 hrs	60	83	57 – 66	54 – 62

Table 2 - Summary of noise measurement data

Full single-figure survey results are presented in Appendix C of this report.

4.0

Condition 16 – Noise Break-out Assessment

4.0 Condition 16 – Noise Break-out Assessment

In order to assess any potential adverse noise impacts on the nearest noise sensitive receptors, an assessment of the noise breakout from the proposed Ground Floor Bar/Reception has been undertaken.

In the absence of confirmed operating times for these areas, a likely worst-case scenario has been assumed for 24/7 use.

The location of this space is shown on the figure below.

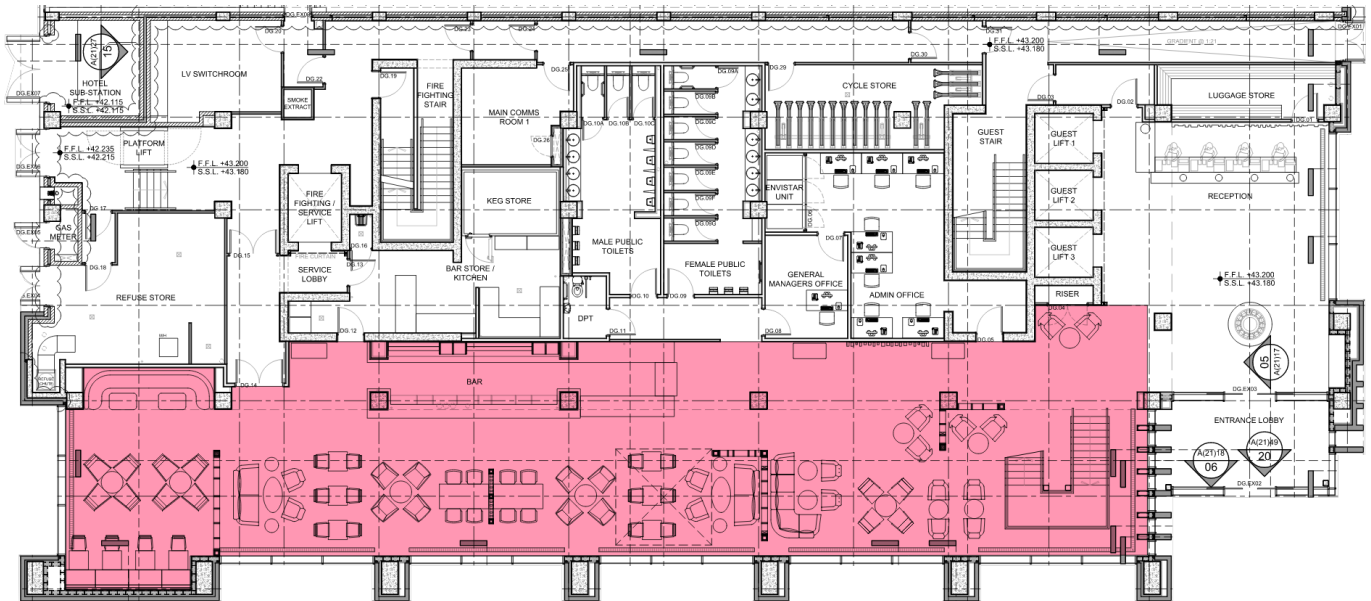


Figure 5 - Level 00 Bar / Restaurant location

4.1 Noise limiting criteria

The nearest noise-sensitive receptor to the façade of the Clayton Hotel development where the Ground Floor Bar/Reception is located at Brooklyn Hotel on Portland Street, approximately 25 m to the east.

Based on the requirements of Condition 16 and the requirements within Section 3.6.1.2 of Manchester City Council's Technical Guidance Document (outlined in Section 2.3 of this report), sound emissions associated with amplified sound from this new development are limited to 10 dB below the existing background level per octave band (L_{90}), when measured at 1 m from the nearest noise-sensitive receptors.

It is considered hotel bedrooms most susceptible to Restaurant/Bar break-out noise are those overlooking Major Street which are partially shielded from Portland Street and have lower existing background levels at the façade. The Cundall survey carried out as detailed in Section 3.3 is considered representative of external background levels at these rooms, for which the octave band information of the lowest $L_{A90,15min}$ periods during daytime and night-time are shown below:

Period	Octave band data for lowest dB $L_{90,15min}$					
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Daytime (07:00 – 23:00 hrs)	52	51	48	48	42	31
Night-time (23:00 – 07:00 hrs)	49	48	46	46	40	30

Table 3 - Octave band results for lowest day and night background measurements

Based on the lowest measured background levels stated above, Table 4 below presents the highest permissible level of sound impact from amplified sound associated with the new development, when measured at 1 m from the Brooklyn Hotel.

Receptor	Period	Limiting levels for entertainment noise, dB $L_{eq,15min}$					
		125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Brooklyn Hotel façade facing Major Street	Daytime (07:00 – 23:00 hrs)	42	41	38	38	32	21
	Night-time (23:00 – 07:00 hrs)	39	38	36	36	30	20

Table 4 - Proposed limiting levels for amplified sound

4.2 Assumed internal levels and building fabric

In order to assess any potential adverse noise impact on nearby noise sensitive premises, an assessment of noise break-out from the proposed Ground Floor Bar / Reception has been undertaken. To represent a robust worst-case scenario, library data of a busy bar playing amplified music at a level of 85 dBA has been used as the basis for the assessment.

	Octave band centre frequency (Hz)						A-weighted sound pressure level (dB)
	125	250	500	1k	2k	4k	
Assumed 'worst-case' sound pressure level within Ground Floor Bar / Reception	81	84	81	82	76	73	85 dBA

Table 5 - Assumed worst case sound pressure levels

4.3 Breakout Noise Assessment

The proposed external wall build-up to the proposed new hotel development is understood to be as follows:

- Precast fair faced concrete external cladding panel
- 125 mm cavity with 50 mm Rockwool rainscreen duo insulation
- 12 mm cement bonded particleboard
- 150 mm SFS external wall system fully filled with 150 mm Rockwool RWA45 insulation
- Two layers of 15 mm British Gypsum WallBoard with skim finish

In addition, a minimum R_w 47 dB acoustic performance has been specified by Fisher Acoustics for glazing elements to the Ground Floor Bar/Reception area.

The relevant spectral sound reduction indices of these elements have been assumed to be as follows;

Element	Sound reduction index (dB)						
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	R_w
External Wall ^[1]	45	50	55	58	57	64	57
Glazing ^[2]	29	37	42	44	48	50	47
[1] Values have been predicted based on modelling the external wall acoustic performance in the acoustic prediction software, Insul.							
[2] Based on spectral values given by Fisher Acoustics							

Table 6 - Sound reduction indices

The relative contributions of these façade elements on the total composite sound reduction index must take into consideration the areas of each as a ratio of the total façade area. Measurements have been taken using elevation

drawings provided by Leach Rhodes Walker Architects (Drawing nos. L(20)21 RevL and L(20)22 RevP). These have found the areas of the façade elements to be approximately as follows;

- 140m² of external wall
- 245m² of glazing

Based on assumed internal levels within the Bar/Restaurant and the Gym, the composite sound reduction indices of the external façade, and level of distance attenuation to the nearest noise sensitive receptor (NSR), the following table summarises the assessment with reference to prevailing night-time background levels:

	Octave band centre frequency (Hz)						A-weighted sound pressure level (dB)
	125	250	500	1k	2k	4k	
Assumed 'worst-case' sound pressure level within Ground Floor Bar / Reception	81	84	81	82	76	73	85 dBA
Composite sound insulation provided by external façade	31	39	44	46	50	52	-
Distance attenuation (based on 25m distance to nearest NSR)	14	14	14	14	14	14	-
Calculated level at NSR (internal SPL minus façade SRI minus distance attenuation)	36	31	23	22	12	7	27 dBA
Existing night-time background level	49	48	46	46	40	30	54 dBA
Assessment of external noise-breakout relative to existing background	-13	-27	-23	-24	-28	-23	-27 dBA

Table 7 - Noise breakout calculation

It can be seen from the table above that noise levels are likely to be at least 10 dB below prevailing background levels in each individual octave band and would therefore be considered compliant with MCC entertainment noise policy.

If amplified music is anticipated within the proposed unit, it is advised that a noise limiter is introduced within the PA system signal chain to ensure that the above assumed octave-band 'worst-case' sound pressure levels are not exceeded.

5.0

Condition 17 – External Plant Assessment

5.0 Condition 17 – External Plant Assessment

Conditions 17 issued by Manchester City Council as part of the planning permission for the development states:

"Before first occupation of the development the building, together with any externally mounted ancillary equipment, shall be acoustically insulated in accordance with a scheme submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment.

Reason - To safeguard the amenities of the occupiers of nearby residential and office accommodation, pursuant to policies SP1 and DM1 of the Core Strategy."

5.1 Noise sensitive receptors

The nearest noise-sensitive receptors to the proposed development are the adjacent Brooklyn Hotel facades. It is considered that the measurements undertaken by Fischer Acoustics are representative of the prevailing background noise climate at the identified receptors.

5.2 Limiting plant levels

Limiting plant noise levels have been set out by Fisher Acoustics based on their noise survey data and are reproduced below.

Location	Rating noise level (dB LAeq)	
	Daytime (07:00 hrs to 23:00 hrs)	Night time (07:00 hrs to 23:00 hrs)
Portland Street	45	45
Abingdon Street	42	41
Major Street	42	41
Sackville Street	43	43

Figure 6 - Table 7 of Fisher Acoustics' report - "Environmental noise limits for non-emergency building services plant"

The levels are set at 5 dB below prevailing background noise levels ($L_{A90,T}$) when measured at 1.5 m from the nearest residential window, in accordance with the Manchester City Council's noise criteria.

These criteria refer to the plant rating levels, including corrections for sound characteristics such as tonality, intermittency, impulsivity or other features outlined within British Standard 4142: 2014, and apply to the cumulative level of impact from all external building services plant associated with the development.

5.3 Environmental noise model

A 3D environmental noise model has been developed by Cundall in order to predict and assess the cumulative noise generated by the proposed rooftop plant at nearest noise-sensitive receptors.

Based on assumptions outlined in this report, it has been predicted that noise level limits from the normal operational plant will be exceeded without the use of attenuation packages and/or amended operating schedule on the noisiest items of plant.

Attenuation measures are proposed to see that these noise limits are met, and the requirements of Condition 17 are achieved.

5.3.1 Noise model input and assumptions

It has been confirmed with AB Engineering (the Project's building services design consultants) that the new development will necessitate the installation of the following new external plant items:

- 1no. AHU on Level 13 terrace;
- 5no. AHU's on Roof level, and
- 17no. VRF condensers on Roof level

Rooftop plant units have been included in the noise model based on manufacturers' noise level data as provided by AB Engineering. This data has been summarised in the table below, while relevant data sheet extracts are presented in Appendix A of this report:

Plant ref	Qty	Item	Sound power level per octave band, dB Lw								
			63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
AHU 05	1	Supply inlet	60	66	58	54	52	49	38	26	58
		Extract outlet	62	72	69	72	73	71	70	62	78
		Casing breakout	65	69	53	47	45	45	42	30	55
AHU 06	1	Supply inlet	70	74	73	66	67	64	59	49	72
AHU 07	1	Supply inlet	63	62	57	53	52	47	38	26	56
		Extract outlet	72	81	76	81	82	78	76	72	86
		Casing breakout	71	74	57	53	52	50	49	40	61
AHU 08	1	Supply inlet	61	72	67	61	59	55	49	35	65
		Extract outlet	73	83	80	80	80	78	79	72	86
		Casing breakout	72	77	63	57	55	53	55	43	64
AHU 09	1	Supply inlet	63	71	63	57	50	45	36	26	60
		Extract outlet	72	78	76	76	75	78	71	65	82
		Casing breakout	71	73	59	50	48	52	47	36	60
AHU 10	1	Supply inlet	63	71	63	57	50	45	36	26	60
		Extract outlet	72	78	76	76	75	78	71	65	82
		Casing breakout	71	73	59	50	48	52	47	36	60
CU01, CU02, CU14, CU16	4	Casing breakout [1]	69	64	64	62	57	52	47	40	63
CU03, CU12, CU15, CU17	4	Casing breakout [1]	76	63	63	60	54	50	45	40	61
CU04, CU06, CU08, CU10, CU13	5	Casing breakout [1]	77	68	66	61	56	54	51	44	64
CU05, CU07, CU09, CU11	4	Casing breakout [1]	74	64	67	65	60	55	50	46	66
Note [1]: Sound pressure level at 1m.											

Table 8 - Sound power data for current rooftop plant selection

In the absence of specific plant operating schedule, it has been assumed that all external items of plant will operate simultaneously during the day and night-time. If the design proposals differ from this, information should be provided to Cundall for reassessment of the predicted noise impacts.

The currently proposed rooftop plant layout is shown in Appendix B of this document.

In addition to the outlined external items, there are a number of internal plant items which have been excluded from this assessment, as follows:

- 4no. AHU's on ground, first and second floor levels,
- 1no. Combined Heat and Power unit in a Rooftop plant room,
- 1no Emergency plant generator.

5.3.2 Current noise prediction results

Based on the drawing in Appendix B, SoundPLAN 8.0 acoustic software has been used to build a noise model of the site and its surroundings. A 3D screenshot of the Clayton Hotel's rooftop with the proposed plant units is shown in the figure below. The locations of the various external noise sources are shown by blue spheres and proposed screens are shown in brown.

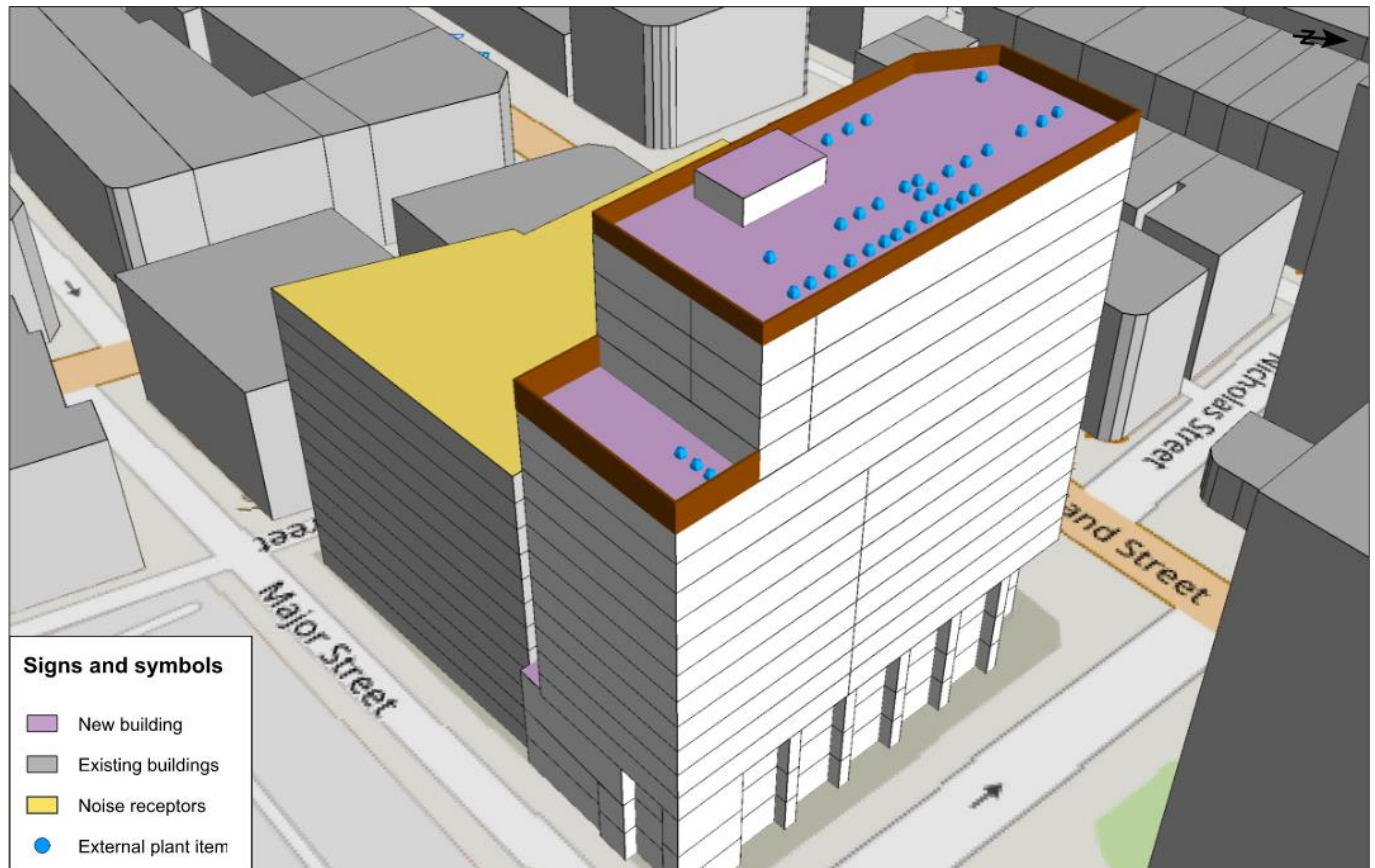
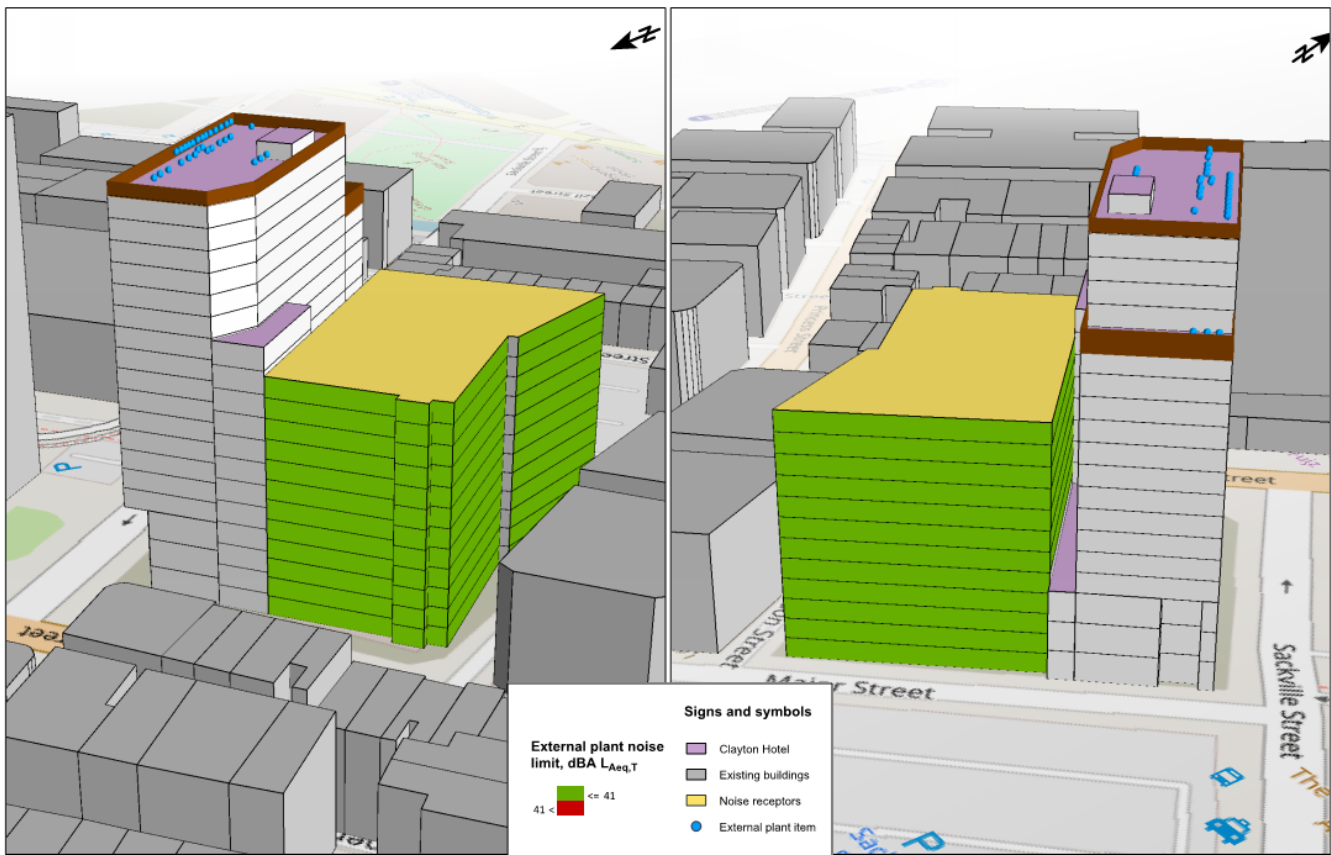


Figure 7 - 3D plant layout

Façade noise maps for the worst-case daytime and night-time facade impact levels is presented below. Levels referred to in the following sub-sections are 'free-field' values at 1 m from the buildings' façades.



It can be seen from the image and the table above that the worst-case noise levels at the façades of the proposed and its adjacent hotel development are lower than the most onerous 41 dB $L_{A,T}$ external plant noise limit outlined in the beginning of this section.

6.0

Conclusions

6.0 Conclusions

Prevailing noise levels at the site of the proposed development have been measured both by third party acoustic consultancies, with further supplementary surveys undertaken by Cundall in order to inform existing background noise levels at nearby noise sensitive premises.

Limiting noise levels have been provided for external noise impacts at existing nearby noise-sensitive receptors, in order to minimise the potential for adverse noise effects in line with Local and National Planning Policy.

An assessment of noise break out from the Ground Floor Bar/Reception area has indicated cumulative entertainment noise levels at the nearest existing receptor to the development site are predicted to be at least 10 dB lower than the existing background levels within each octave band, and hence the requirements of Planning Condition 16 are considered to have been met.

An assessment of proposed items of noise generating plant has indicated cumulative noise levels at the nearest existing receptor to the development site will be lower than the limits set by Fisher Acoustics, and hence the requirements of Planning Condition 17 are considered to have been met.

Appendices

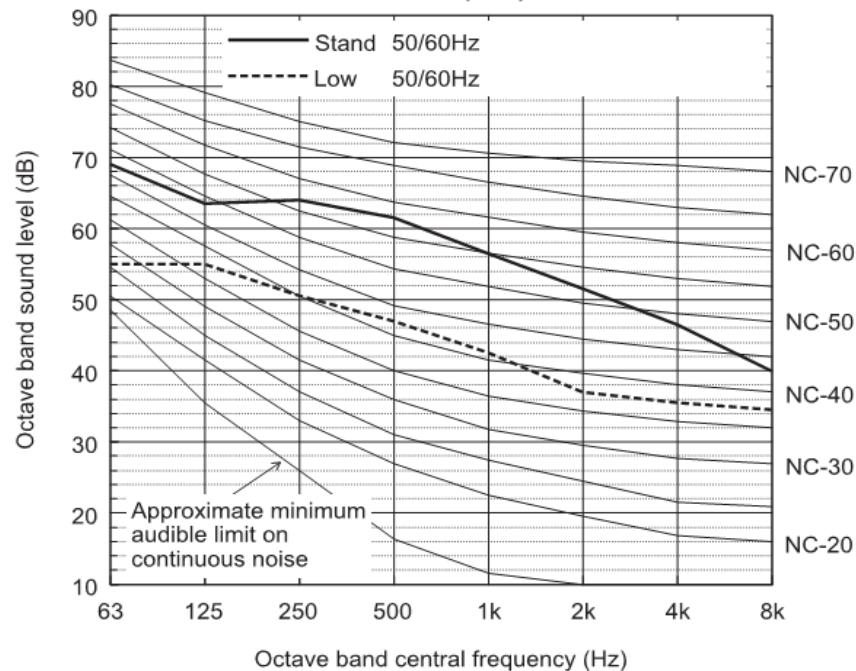
Appendix A Plant Manufacturers' Noise Data



OUTDOOR UNITS		PURY-M200YNW-A1	PURY-M250YNW-A1	PURY-M300YNW-A1	PURY-M350YNW-A1 X 2HBC	PURY-M350YNW-A1	PURY-M350YNW-A1 X 2HBC	PURY-M400YNW-A1	PURY-M450YNW-A1	PURY-M500YNW-A1
CAPACITY (kW)	Heating (nominal)	25.0	31.5	37.5	37.5	45.0	45.0	45.0	56.0	58.0
	Cooling (nominal)	22.4	28.0	33.5	33.5	40.0	40.0	45.0	50.0	56.0
	High Performance Heating (UK)	25.0	31.5	37.5	37.5	42.8	42.8	42.8	50.4	52.2
	COP Priority Heating (UK)	22.8	28.7	32.3	32.3	38.7	38.7	38.7	49.3	51.0
	Cooling (UK)	20.1	25.1	30.0	30.0	35.8	35.8	40.3	44.8	50.1
POWER INPUT (kW)	Heating (nominal)	6.39	9.15	11.00	10.33	13.14	12.16	14.08	16.18	18.26
	Cooling (nominal)	5.53	8.40	11.65	9.88	14.83	12.15	15.15	15.47	22.25
	High Performance Heating (UK)	7.73	11.07	15.07	14.15	18.00	16.66	16.33	18.77	21.18
	COP Priority Heating (UK)	6.39	9.15	11.00	10.33	13.14	12.16	13.66	15.69	17.71
	Cooling (UK)	3.21	4.87	6.76	5.73	8.66	7.05	9.85	10.06	14.46
COP / EER (nominal)		3.91 / 4.05	3.44 / 3.33	3.40 / 2.87	3.63 / 3.39	3.42 / 2.67	3.70 / 3.29	3.55 / 2.97	3.46 / 3.23	3.45 / 2.51
SCOP / SEER ¹		-	-	-	-	-	-	-	-	-
MAX No. OF CONNECTABLE INDOOR UNITS		30	37	45	45	35	35	40	45	50
MAX CONNECTABLE CAPACITY		50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity	50-150% O/U Capacity
AIRFLOW (m ³ /min)	High	170	185	240	240	250	250	315	315	295
	Gas	19.05 (3/4")	22.2 (7/8")	22.2 (7/8")	22.2 (7/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")	28.58 (1-1/8")
PIPE SIZE mm (in)	Uliquid	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")	19.05 (3/4")	19.05 (3/4")	19.05 (3/4")
	Heating / Cooling	59.0 / 59.0	61.0 / 60.5	67.0 / 61.0	67.0 / 61.0	64.0 / 62.5	64.0 / 62.5	69.0 / 65.0	70.0 / 65.5	64.5 / 63.5
SOUND PRESSURE LEVEL (dBa)		59.0 / 59.0	61.0 / 60.5	67.0 / 61.0	67.0 / 61.0	64.0 / 62.5	64.0 / 62.5	69.0 / 65.0	70.0 / 65.5	64.5 / 63.5
SOUND POWER LEVEL (dBa)		78.0 / 76.0	80.0 / 78.5	86.5 / 80.0	86.5 / 80.0	83.0 / 81.0	83.0 / 81.0	88.0 / 83.0	89.0 / 83.0	84.0 / 82.0
WEIGHT (kg)		227	227	227	227	270	270	273	293	337
DIMENSIONS (mm)	Width	920	920	920	920	1240	1240	1240	1240	1750
	Depth	740	740	740	740	740	740	740	740	740
	Height (1798mm without legs)	1858	1858	1858	1858	1858	1858	1858	1858	1858
ELECTRICAL SUPPLY ¹		380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz	380-415v, 50Hz
PHASE ¹		Three	Three	Three	Three	Three	Three	Three	Three	Three
STARTING CURRENT (A) ¹		8	8	8	8	8	8	8	8	8
NOMINAL SYSTEM RUNNING CURRENT (A) ¹ Heating/Cooling [MAX]		10.2 / 8.8 [16.1]	14.6 / 13.4 [22.5]	17.6 / 18.6 [25.6]	16.5 / 15.8 [26.6]	21.0 / 23.9 [31.6]	19.5 / 19.4 [31.6]	22.5 / 24.2 [39.3]	25.9 / 24.8 [40.2]	29.2 / 35.6 [56.6]
GUARANTEED OPERATING RANGE (°C) Heating / Cooling		-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52	-20/-15.5 / -5/-52
FUSE RATING (MCB sizes BS EN 60847-2) - (A) ¹		1 x 20	1 x 25	1 x 32	1 x 32	1 x 32	1 x 32	1 x 40	1 x 50	1 x 63
MAINS CABLE No. Cores ¹		4	4	4	4	4	4	4	4	4
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) R32 (GWP 675)		5.2 / 3.5	5.2 / 3.5	5.2 / 3.5	5.2 / 3.5	8 / 5.4	8 / 5.4	8 / 5.4	10.8 / 7.3	10.8 / 7.3
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t) R32 (GWP 675)		13.5 / 9.1	13.5 / 9.1	15.5 / 10.5	15.5 / 10.5	15.5 / 10.5	15.5 / 10.5	19.5 / 13.2	19.5 / 13.2	19.5 / 13.2

Notes: ¹SEER/SCOP available separately in the 'City Multi VRF Seasonal Efficiency' document. Based on Ecodesign Lot 21/6 to EN14825 standard. ¹A separate power supply is required for each module. Where more than one figure is quoted there are multiple modules. Specification subject to change. R410A equivalent systems are also available - please contact your local sales office for further information.

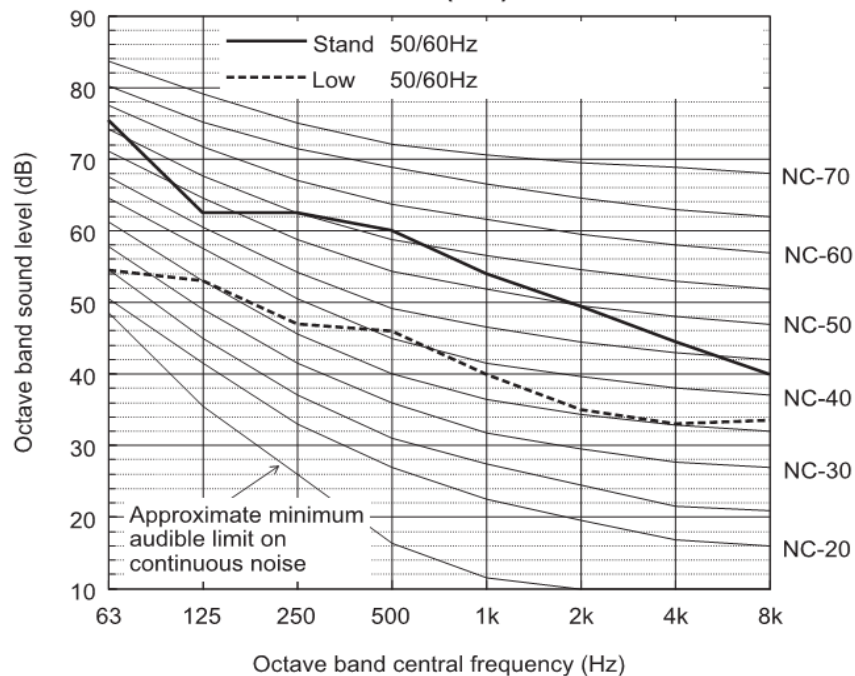
Sound level of PURY-M350YNW-A1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	69.0	63.5	64.0	61.5	56.5	51.5	46.5	40.0	62.5
Low noise mode	50/60Hz	55.0	55.0	50.5	47.0	42.5	37.0	35.5	34.5	49.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

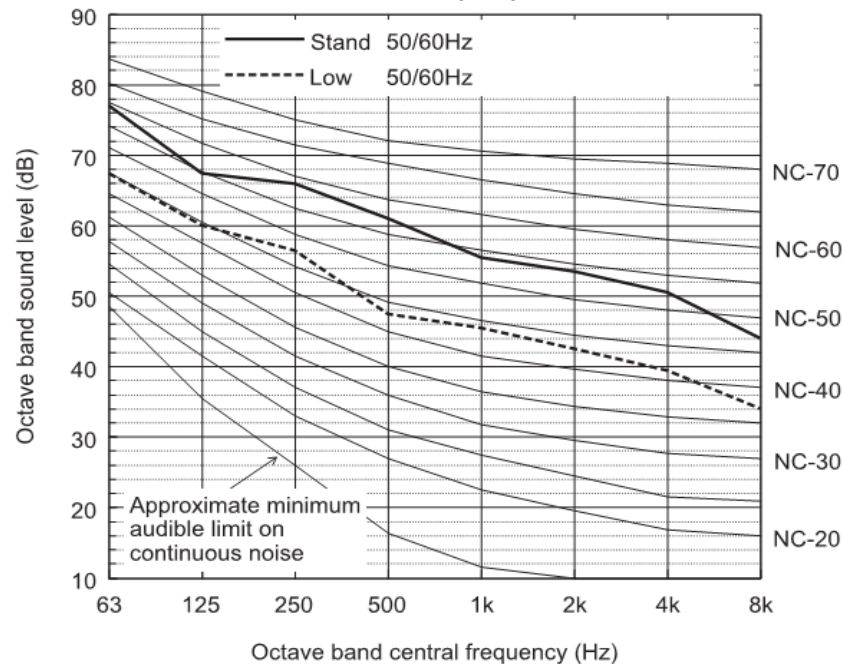
Sound level of PURY-M300YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	75.5	62.5	62.5	60.0	54.0	49.5	44.5	40.0	61.0
Low noise mode	50/60Hz	54.5	53.0	47.0	46.0	40.0	35.0	33.0	33.5	47.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

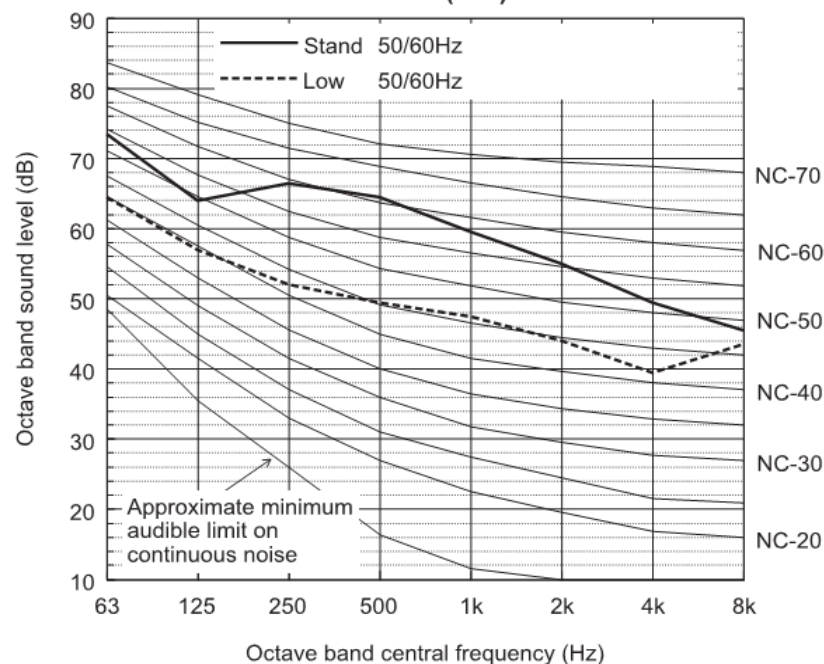
Sound level of PURY-M500YNW-A1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	77.0	67.5	66.0	61.0	55.5	53.5	50.5	44.0	63.5
Low noise mode	50/60Hz	67.5	60.0	56.5	47.5	45.5	42.5	39.5	34.0	53.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Sound level of PURY-M450YNW-A1(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	64.0	66.5	64.5	59.5	55.0	49.5	45.5	65.5
Low noise mode	50/60Hz	64.5	57.0	52.0	49.5	47.5	44.0	39.5	43.5	53.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

AHU01:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Total</i>	
Supply air:										/	
To surroundings	59	55	51	41	41	38	35	27	dB	48	dB(A)
Outdoor air	56	55	59	58	52	48	43	35	dB	58	dB(A)
Supply air	62	62	70	68	71	66	62	58	dB	74	dB(A)
Extract air:											
To surroundings	60	56	52	42	42	40	36	28	dB	49	dB(A)
Extract air	57	55	61	59	54	51	44	36	dB	60	dB(A)
Exhaust air	65	65	73	71	74	71	67	64	dB	78	dB(A)
Total:											
To surroundings	63	59	55	45	45	42	39	31	dB	52	dB(A)

AHU02:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Total</i>	
Supply air:										/	
To surroundings	59	57	52	43	41	38	35	26	dB	49	dB(A)
Outdoor air	54	55	61	60	53	50	45	35	dB	60	dB(A)
Supply air	62	64	71	70	71	66	62	57	dB	74	dB(A)
Extract air:											
To surroundings	60	56	55	46	43	40	37	30	dB	51	dB(A)
Extract air	57	54	64	62	55	53	47	40	dB	62	dB(A)
Exhaust air	65	65	76	75	75	71	68	66	dB	79	dB(A)
Total:											
To surroundings	63	60	57	48	45	42	39	31	dB	53	dB(A)

AHU03:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	59	56	51	41	41	39	35	27	dB	48	dB(A)
Outdoor air	56	55	59	58	52	49	44	35	dB	59	dB(A)
Supply air	62	63	70	68	71	67	62	58	dB	74	dB(A)
Extract air:											
To surroundings	58	55	50	41	40	38	35	26	dB	47	dB(A)
Extract air	57	54	58	58	52	49	43	35	dB	58	dB(A)
Exhaust air	63	64	71	70	72	69	66	62	dB	76	dB(A)
Total:											
To surroundings	62	59	54	44	44	42	38	30	dB	51	dB(A)

AHU04:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	61	57	56	46	46	47	40	31	dB	53	dB(A)
Outdoor air	58	57	63	64	57	55	47	38	dB	64	dB(A)
Supply air	64	64	75	73	76	75	67	62	dB	80	dB(A)
Extract air:											
To surroundings	60	57	55	45	46	46	40	31	dB	53	dB(A)
Extract air	59	57	63	64	57	54	47	38	dB	64	dB(A)
Exhaust air	65	66	76	74	78	77	71	67	dB	82	dB(A)
Total:											
To surroundings	64	60	59	49	49	50	43	34	dB	56	dB(A)

AHU05:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	64	67	50	44	43	42	39	28	dB	53	dB(A)
Outdoor air	60	66	58	54	52	49	38	26	dB	58	dB(A)
Supply air	69	76	71	73	75	73	70	64	dB	79	dB(A)
Extract air:											
To surroundings	58	64	49	43	41	41	39	26	dB	51	dB(A)
Extract air	55	65	58	55	51	48	40	23	dB	57	dB(A)
Exhaust air	62	72	69	72	73	71	70	62	dB	78	dB(A)
Total:											
To surroundings	65	69	53	47	45	45	42	30	dB	55	dB(A)

AHU06:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	69	70	57	49	46	44	43	32	dB	57	dB(A)
Outdoor air	70	74	73	66	67	64	59	49	dB	72	dB(A)
Supply air	73	77	75	74	74	71	70	64	dB	79	dB(A)

AHU07:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	67	64	52	45	42	40	38	28	dB	52	dB(A)
Outdoor air	63	62	57	53	52	47	38	26	dB	56	dB(A)
Supply air	72	73	73	74	74	71	69	64	dB	78	dB(A)
Extract air:											
To surroundings	68	73	56	52	52	50	49	40	dB	60	dB(A)
Extract air	60	72	64	60	61	59	53	42	dB	66	dB(A)
Exhaust air	72	81	76	81	82	78	76	72	dB	86	dB(A)
Total:											
To surroundings	71	74	57	53	52	50	49	40	dB	61	dB(A)

AHU08:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	69	73	59	56	51	48	48	37	dB	60	dB(A)
Outdoor air	61	72	67	61	59	55	49	35	dB	65	dB(A)
Supply air	74	82	80	85	83	79	79	73	dB	88	dB(A)
Extract air:											
To surroundings	69	75	60	51	52	51	54	42	dB	62	dB(A)
Extract air	64	73	68	61	65	61	61	46	dB	69	dB(A)
Exhaust air	73	83	80	80	80	78	79	72	dB	86	dB(A)
Total:											
To surroundings	72	77	63	57	55	53	55	43	dB	64	dB(A)

AHU09:

Sound data (sound power)

<i>Frequency band</i>	63	125	250	500	1k	2k	4k	8k		<i>Tota</i>	
										<i>l</i>	
Supply air:											
To surroundings	67	69	55	47	43	47	40	29	dB	56	dB(A)
Outdoor air	63	71	63	57	50	45	36	26	dB	60	dB(A)
Supply air	72	78	76	76	75	78	71	65	dB	82	dB(A)
Extract air:											
To surroundings	68	70	56	47	47	51	46	35	dB	58	dB(A)
Extract air	64	73	65	58	57	53	47	38	dB	63	dB(A)
Exhaust air	72	78	76	76	75	78	71	65	dB	82	dB(A)
Total:											
To surroundings	71	73	59	50	48	52	47	36	dB	60	dB(A)

AHU10:

Sound data (sound power)*Frequency band*

Supply air:

To surroundings

Outdoor air

Supply air

Extract air:

To surroundings

Extract air

Exhaust air

Total:

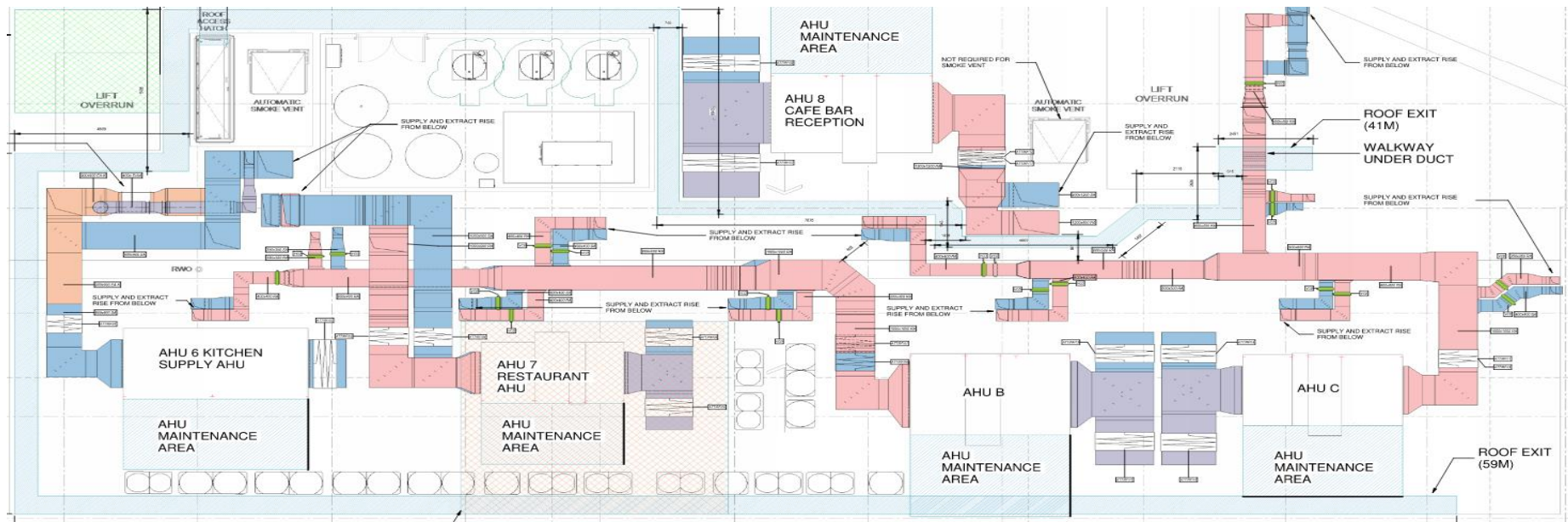
To surroundings

63	125	250	500	1k	2k	4k	8k		<i>Total</i>	
									<i>/</i>	
70	72	58	50	46	50	43	32	dB	59	dB(A)
66	74	66	60	53	48	39	29	dB	63	dB(A)
75	81	79	79	78	81	74	68	dB	85	dB(A)
70	72	58	49	47	52	46	35	dB	59	dB(A)
66	74	66	60	56	52	46	37	dB	64	dB(A)
74	80	78	78	77	80	73	67	dB	84	dB(A)
73	75	61	53	50	54	48	37	dB	62	dB(A)

Appendix B External Plant Layouts



Drawing Ref: 3863-ABE-XX-ZZ-DR-M-5713 "Ventilation Level 13 & 14" issued by AB engineering on 01 April 2019



Drawing Ref: 3863-ABE-XX-RF-DR-M-5716 "Ventilation Layout - Roof" issued by AB engineering on 01 April 2019

Appendix C Noise Survey Data

Start date and time		L _{Aeq}	L _{AFMax}	L _{A10}	L _{A90}
06/02/2020	17:00	61	74	63	59
06/02/2020	17:15	60	70	61	58
06/02/2020	17:30	60	75	62	58
06/02/2020	17:45	60	77	61	58
06/02/2020	18:00	60	79	62	58
06/02/2020	18:15	58	68	59	56
06/02/2020	18:30	60	70	61	57
06/02/2020	18:45	61	78	62	58
06/02/2020	19:00	61	78	63	58
06/02/2020	19:15	61	72	62	59
06/02/2020	19:30	60	72	63	57
06/02/2020	19:45	61	77	63	58
06/02/2020	20:00	59	70	61	57
06/02/2020	20:15	61	71	64	58
06/02/2020	20:30	60	67	61	58
06/02/2020	20:45	60	70	61	58
06/02/2020	21:00	61	67	63	60
06/02/2020	21:15	61	82	62	58
06/02/2020	21:30	62	84	61	57

Start date and time		L _{Aeq}	L _{AFMax}	L _{A10}	L _{A90}
06/02/2020	21:45	62	85	62	57
06/02/2020	22:00	62	79	63	59
06/02/2020	22:15	60	72	64	57
06/02/2020	22:30	60	73	62	58
06/02/2020	22:45	60	74	61	58
06/02/2020	23:00	60	69	63	58
06/02/2020	23:15	61	69	63	58
06/02/2020	23:30	61	71	63	58
06/02/2020	23:45	61	73	63	58
07/02/2020	00:00	58	71	60	56
07/02/2020	00:15	59	66	61	56
07/02/2020	00:30	60	71	62	57
07/02/2020	00:45	59	68	60	56
07/02/2020	01:00	58	64	59	56
07/02/2020	01:15	59	70	60	57
07/02/2020	01:30	57	72	58	54
07/02/2020	01:45	56	68	58	55
07/02/2020	02:00	57	69	59	55
07/02/2020	02:15	61	83	61	55

Start date and time		L _{Aeq}	L _{AFMax}	L _{A10}	L _{A90}
07/02/2020	02:30	57	68	58	56
07/02/2020	02:45	59	74	61	56
07/02/2020	03:00	59	69	62	56
07/02/2020	03:15	58	68	60	56
07/02/2020	03:30	61	76	63	58
07/02/2020	03:45	60	71	62	56
07/02/2020	04:00	56	68	58	55
07/02/2020	04:15	58	65	61	55
07/02/2020	04:30	56	68	58	54
07/02/2020	04:45	56	75	57	54
07/02/2020	05:00	59	68	61	55
07/02/2020	05:15	60	75	63	57
07/02/2020	05:30	59	74	62	55
07/02/2020	05:45	58	66	60	56
07/02/2020	06:00	61	71	62	59
07/02/2020	06:15	62	70	63	59
07/02/2020	06:30	63	76	65	62
07/02/2020	06:45	64	71	66	62
07/02/2020	07:00	63	72	65	62
07/02/2020	07:15	64	76	65	62
07/02/2020	07:30	64	75	65	63
07/02/2020	07:45	64	84	65	63
07/02/2020	08:00	64	77	66	63

Start date and time		L _{Aeq}	L _{AFMax}	L _{A10}	L _{A90}
07/02/2020	08:15	64	85	64	64
07/02/2020	08:30	64	72	64	64
07/02/2020	08:45	64	71	64	64
07/02/2020	09:00	64	79	64	64

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