

101 Princess Street Manchester, M1 6DD

Mechanical Services Plant Noise Impact Assessment

Report ref.

RK3198/20141/Rev 0

Issued to

Jones Lang LaSalle

Prepared by

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1. INTRODUCTION

Jones Lang LaSalle are seeking planning permission to remove some existing mechanical services plant equipment and install new replacement equipment at 101 Princess Street in Manchester. The new plant equipment is proposed to be located externally at roof level next to the existing units which is located opposite noise sensitive receptors. Accordingly, a noise impact assessment is required.

Spectrum Acoustic Consultants have been instructed by Jones Lang LaSalle to carry out a Noise Impact Assessment to support the application. This report is submitted with the intention of providing sufficient information to both inform and satisfy the requirements of the Local Planning Authority.

2. SITE DESCRIPTION & PROPOSALS

The site is located at 101 Princess Street, Manchester, M1 6DD. The seven storey high commercial building comprises of a night-club at basement level, with offices above. Princess Street bounds the site to the west and has a number of commercial properties located along it. Silver Street bounds the site to the north and has a seven storey high hotel building directly opposite (Townhouse Hotel Manchester). Abingdon Street bounds the site to the east and has a large ten storey high hotel building opposite (Hotel Brooklyn). To the south is Major Street which has a number of commercial buildings located on it, along with a car park. An existing site location plan is included in Appendix A.

Proposals involve removing some of the existing Mitsubishi air conditioning condenser units currently located at roof level. The intention is to install two new Daikin air conditioning condenser units in order to provide air conditioning in a more efficient manner to one of the office floors. The offices are used during the daytime only i.e. typically 08:00 to 18:00, Monday to Friday. Scheme proposals are included in Appendix B.

3. NOISE CRITERIA

3.1 BS 4142:2014 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

The noise impact assessment relating to mechanical plant will be carried out in accordance with the procedures set out in BS 4142:2014 *Methods for rating and assessing industrial and commercial sound*. The principle of BS 4142 is to determine an initial estimate of impact of industrial/commercial sound on nearby residents by comparing the Rating Level (sound level from the industrial/commercial source, with a correction applied for any acoustic features that characterise the sound) with the Background Sound Level (L_{A90} as measured in absence of the industrial/commercial source).

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *'a difference of around +10 dB or more is likely to be an indication of a significant adverse impact [...]. A difference of around +5 dB is likely to be an indication of an adverse impact [...]. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.'*

However, BS 4142 also advises that *'when making assessments and arriving at decisions [...] it is essential to place the sound in context'* so in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly.



For example it advises *'Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'*

It also indicates that impacts estimated during *'the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.'*

3.2 MANCHESTER CITY COUNCIL'S PLANNING & NOISE TECHNICAL GUIDANCE - NOISE AND VIBRATION FROM FIXED PLANT / EQUIPMENT

Noise from fixed plant, equipment or machinery can be very annoying and disruptive to people living nearby particularly where that item involved emits a noise with impulsive or tonal characteristics.

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'.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages.

Past experience has shown that this criterion can be readily achieved. Where available, product specification data for new items should be submitted with the acoustic report. Consultants should be using these to compare with data from the noise survey, and propose mitigation where the levels are above those specified in the criterion. Where this information is not available a consultant may choose to measure the noise levels generated by the equipment in question where the equipment has already been installed elsewhere (and in accordance with the guidance in BS 4142).

Where fixed plant, equipment or machinery is attached to a building the vibration caused by it can pass through the building structure and cause structure borne noise elsewhere in the building. Where it is to be installed in or on a building containing a noise sensitive use structure borne noise should be considered in the noise assessment and adequate control measures should be proposed. An example of where this would be required is where there is a proposal to install fixed plant or equipment on the roof of a residential apartment block.



4. BACKGROUND NOISE MEASUREMENT SURVEY

To inform the noise impact assessment, measurements of existing background noise levels were carried out during a noise survey conducted at the site from Friday 14 to Monday 17 May 2021. Weather conditions during the survey were generally mild and dry, with low wind speeds, presenting good conditions for noise measurement purposes.

Logger noise measurements were carried out on the roof of the building in accordance with BS 4142:2014. The monitoring location is considered representative of the nearest noise sensitive receptor location to the proposed plant equipment (Townhouse Hotel Manchester). Note, existing plant items located on the roof were not operating during the survey.

Measurements consisted of continuous 15 minute periods. The microphone was mounted on a pole at 2m above ground. The location of the microphone is shown on the existing site location plan included in Appendix A.

The following instrumentation was used during the survey.

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3027959
- Bruel & Kjaer Type 4189 Microphone s/n 3196073
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2688672

Before and after the survey, the sound level meter was field-calibrated in accordance with the manufacturer's guidelines, and no significant drift was observed. The meter, microphone and field calibrator are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

Measurements made were of the following parameters:

- Maximum Noise Level – defined as the maximum (L_{Amax} the maximum noise level)
- Residual Noise Level – defined as the Energy Average Level of a period, in the absence of noise from the proposed development (L_{Aeq})
- Background Noise Level – defined as level exceeded for 90% of a period, in the absence of the noise from the proposed development (L_{A90})

The measured noise profile at the noise monitoring location is shown in the following chart.

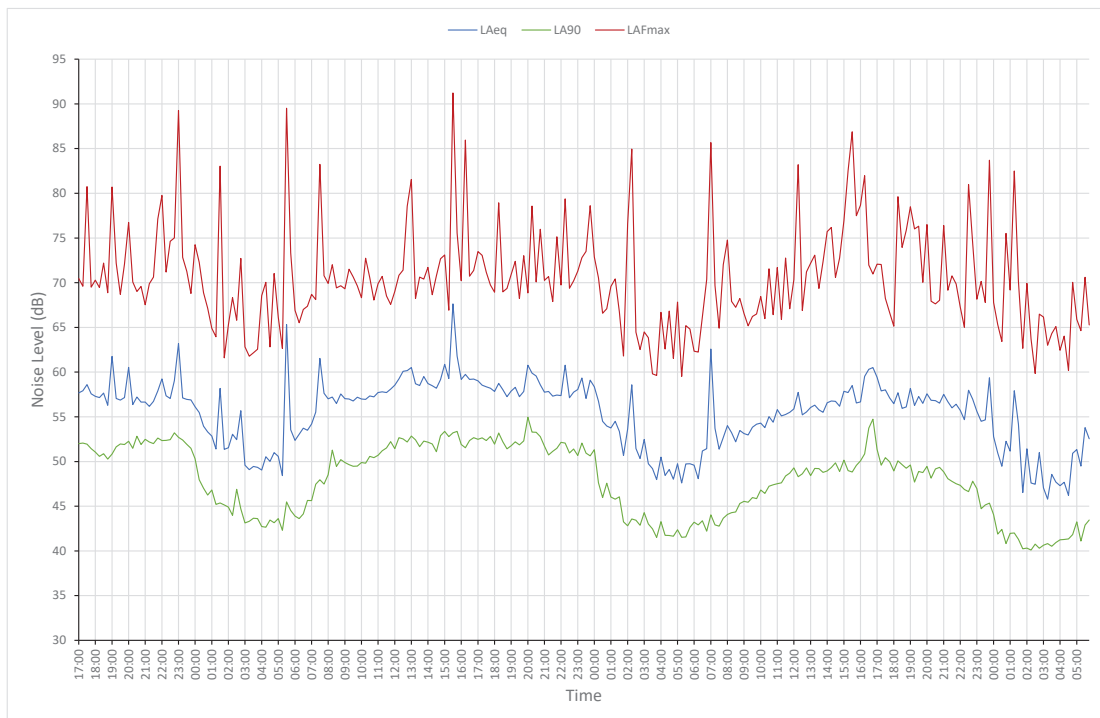


Chart 1: Ambient noise profile – Friday 14 to Monday 17 May 2021

When determining the representative background $L_{A90,T}$ level for the relevant period, BS 4142¹ guidance states “a representative level ought to account for the range in background levels and ought not automatically to be assumed to be either the minimum or modal value.” With this in mind, statistical analysis has been used to determine the typical background $L_{A90,T}$ noise level. This analysis derives the Mode, Mean and Mean -1 standard deviation values. Once these three values have been established, a judgement is made as to which value is considered representative. In this instance, the modal value is regarded as being representative.

Table 1 shows the representative background noise level measured during the daytime period when the plant items would be operating. Note, the equipment would only operate on weekdays. Consequently, the representative background level has been determined from the daytime measurements on the Friday and Saturday only.

Measurement Location	Period	Background Noise Level
Opposite Townhouse Hotel Manchester	07:00 – 20:00	$L_{A90,1hour}$ 52 dB

Table 1: Summary of the representative background noise level measured during the sensitive daytime period

As shown in Table 1, the representative background noise level at the nearest noise sensitive receptors to the proposed mechanical plant is $L_{A90,1hour}$ 52dB during the daytime when the new equipment would be operating. This reflects a typical steady noise profile controlled by traffic movements and other nearby mechanical plant in the area.

¹ BS 4142:2014 Methods for rating and assessing industrial and commercial sound



5. ASSESSMENT OF NOISE IMPACT

5.1 PROJECTED NOISE FROM MECHANICAL PLANT

The proposed new mechanical services plant items would be located close to the existing units on the roof of the building. The noise outputs (sound power levels) generated by the units are set out in Table 2 below.

Plant Item	No. of	Overall Sound Power Level dB(A)	Info	Proposal
Daikin REYQ18U Condenser Unit	x2	86	New	Install
Mitsubishi PUHZ-RP100VKA Condenser Unit	x4	66	Existing	Remove
Mitsubishi PUHZ-P250YKA2 Condenser Unit	x9	74	Existing	Remove x3
Mitsubishi SUZ-KA50VA6 Condenser Unit	x6	70	Existing	Remove

Table 2: Sound power levels of the existing and proposed external mechanical plant

Predictions of how the noise from each of the mechanical plant sources propagates to sensitive community receptors, together with the cumulative effect of these noise sources, has been determined by noise modelling using proprietary software (Predictor²) which meets the requirement of ISO 9613 Part 2:1996³. The noise model takes account of the following in its calculations procedures:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Detailed noise calculations, providing information on the total specific noise at each receptor, together with the contributions from each individual noise source, at each receptor location, are computed. To illustrate the scheme, a diagram showing the distribution and locations of mechanical plant noise sources, superimposed on a 3D view of the site, is included in Appendix C.

Note, the condenser units operate on thermostatic, speed and timer controls according to heat loads and occupation rates and so would not be operating 100% of the time. Whilst a typical on-time for this type of equipment might only 20-35%, a conservative and therefore more robust assessment assumes a 50% on-time for a typical worst-case scenario (ie 50% of all condensers operating at any one time).

Predicted specific noise levels from the existing and proposed new plant equipment at each of the nearby sensitive receptor location for the daytime operating scenario are provided in Table 3 below.

² *Bruel and Kjaer – Predictor V7 Environmental Noise Calculation Software Package, Type 7810*

³ *ISO 9613-2:1996 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine Noise Levels*



Receptor	L_{Aeq} dB(A)	L_{Aeq} Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
R1. Townhouse Hotel Manchester	47	29	34	38	43	41	34	29	19

Table 3: Predicted specific noise contribution from the existing and proposed new mechanical services plant at the nearest sensitive receptor location.

As indicated in Table 3, predicted noise levels at the nearest sensitive receptor location, from the existing and proposed new mechanical services plant would be L_{Aeq} 47dB.

5.2 MECHANICAL PLANT NOISE IMPACT ASSESSMENT

Table 4 shows a BS 4142 assessment covering the mechanical plant noise impact during the daytime. None of the mechanical plant items emit any distinct tones or impulses. Furthermore, as there has been existing plant operating in the vicinity of the nearest sensitive receptor for many years, the proposals would result in no change in the character of the noise currently experienced. Therefore, no acoustic feature correction has been included in the rating level.

Residential Position	Rating Level (dB)	Background L_{A90} (dB)	Assessment Level (dB) (Background excess)
R1. Townhouse Hotel Manchester	47	52	-5

Table 4: Predicted rating levels from mechanical plant at the nearest sensitive receptor location, compared with the representative daytime (07:00-20:00) background $L_{A90,1hour}$ level

During the daytime, the study predicts that at the nearest sensitive receptor location, the mechanical plant rating level would be 5dB lower than the background noise level. The difference between the rating level and background level is such that any uncertainty would have no significance on the outcome of the assessment. Furthermore, the nearest sensitive receptor is a hotel where guests stay for short periods of time. The times when guests typically stay at the hotel are usually outside of the hours of operation of the plant equipment. Therefore, when considering these contextual elements, the sensitivity of the receptor is less than that of a typical dwelling.

In view of the above, noise emitted from the plant equipment during the daytime would meet the requirements of Manchester City Council's Planning and Noise Technical Guidance. In line with BS 4142:2014 guidance, mechanical services plant would have a low noise impact.



6. CONCLUSIONS

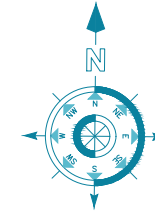
A noise assessment has been completed to consider the potential impacts of noise produced by existing and proposed new mechanical services plant at 101 Princess Street in Manchester.

A background noise measurement survey has been conducted at a location representative of the most sensitive receptor position to the plant and predictions of noise from the cumulative mechanical plant equipment has been completed, utilising a proprietary software package.

Noise limits for mechanical services plant have been established, based on the measured background noise levels, Manchester City Council's Planning and Noise Technical Guidance, as well as taking account of BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. Predictions have indicated that the overall noise levels from the equipment would meet noise limit objectives and consequently have a low impact.

APPENDIX A

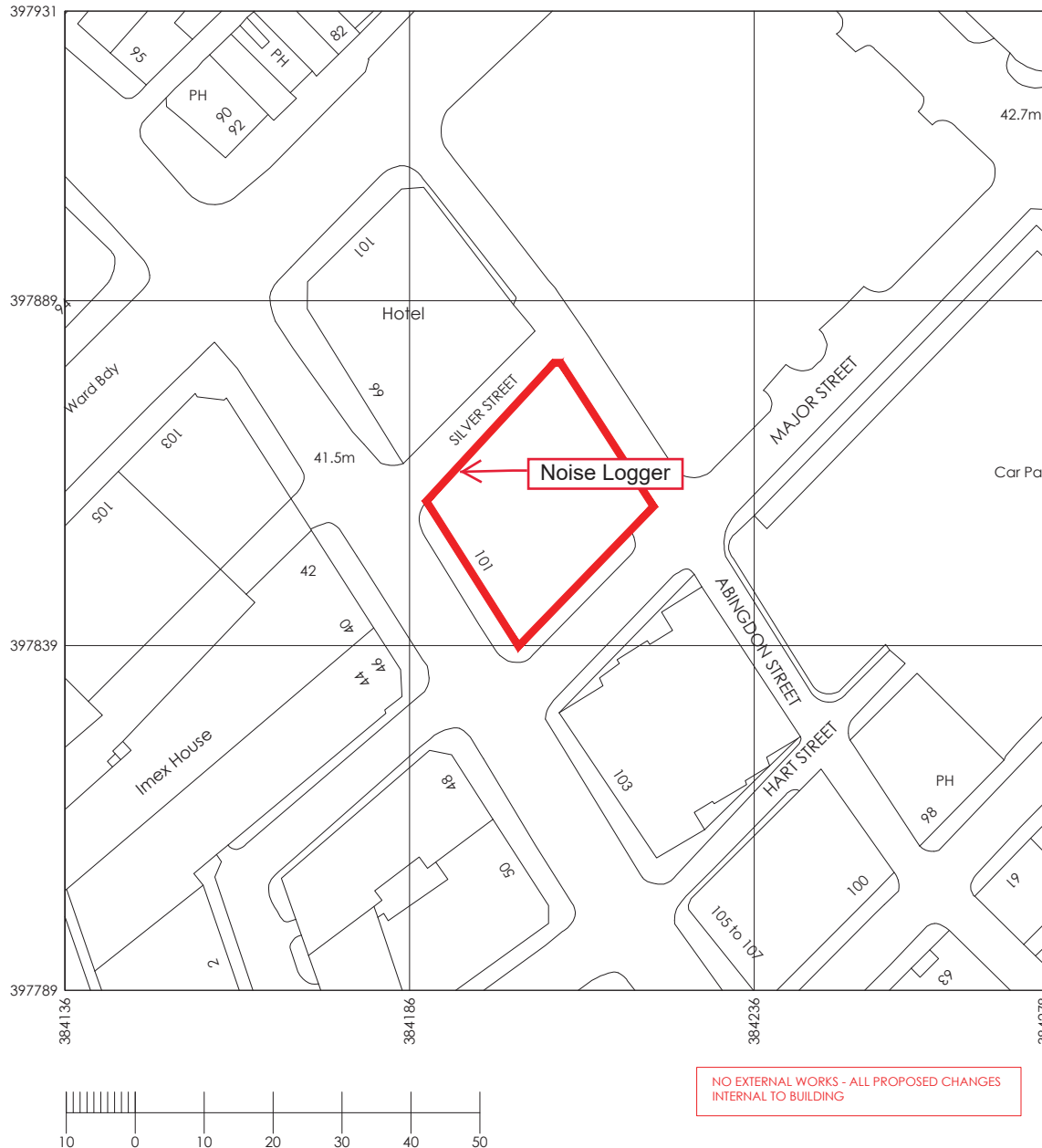
Existing Site Location Plan



Rev	Date	Description	Initials
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FOR CONSTRUCTION

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Date:	04.03.2021
Project Number:	1213
Scale:	1:500@A2
Drawn by:	FLC
Drawing Number:	1213-03-LP02



101 PRINCESS ST - MANCHESTER

SITE PLAN 1:500

bluesky Design
INTERIORS LIMITED

Studio 1, 169 High Street, Boston Spa, Leeds LS23 6BH
Tel: 01937 845 399 www.blueskydesigninteriors.co.uk

APPENDIX B

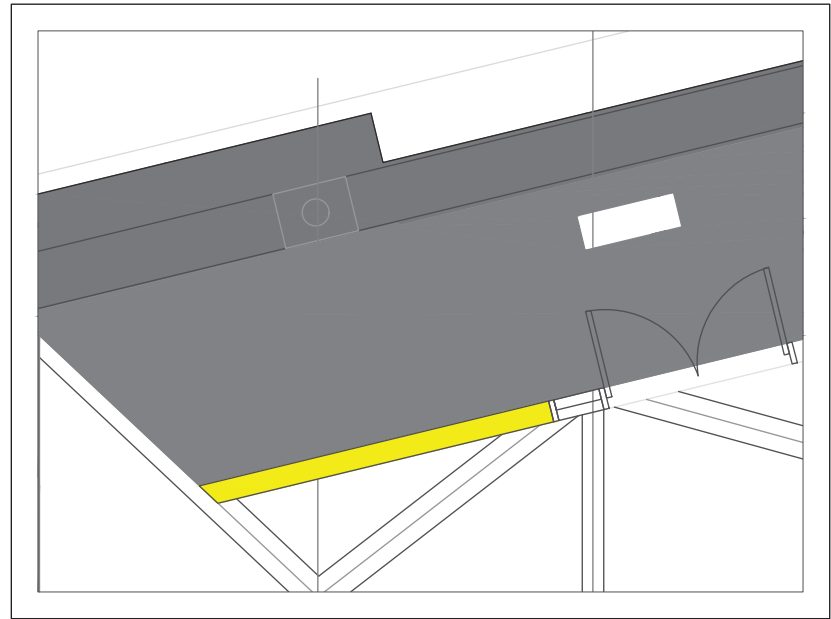
Scheme Proposals



Proposed Floor Plan 1:200

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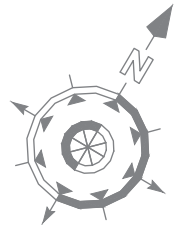
101 Princess Street, Manchester, M1 6DD



New wall location 1:50

scale 1:50 0 2.5m

 Location of new wall creation.



Client
Aberdeen Standard Investments

Project
101 Princess Street
Manchester
M1 6DD

Scale
As Shown @ A3

Date
March 2021

By
JA

Checked
KM



Description
Proposed Drawing
Silver Street Elevation

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Date By Chck'd

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A



Silver Street Elevation Proposed 1:50

scale 1:50 0 2.5m

101 Princess Street, Manchester, M1 6DD

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Project 101 Princess Street Manchester M1 6DD	

Scale As Shown @ A3	
Date March 2021	
By JA	Checked KM

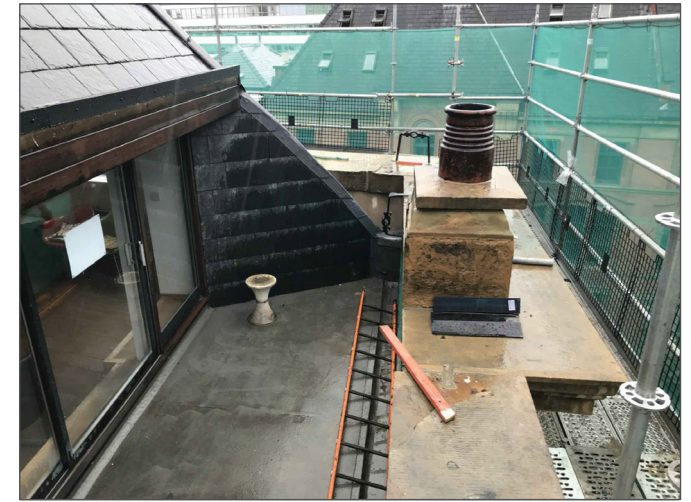
Rev	Description	Date	By	Chck'd

Description Proposed Drawing Silver Street Elevation - Works Location 1	
Job -	rev A
Drg 007	



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Manchester M1 4PB
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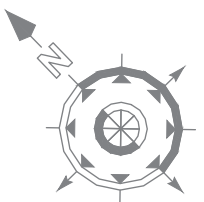


3no glazed panels / sliding doors to be removed.

Opening to be infilled and externally clad with slate to match existing roof covering demonstrated in the above.

Wall to be Building Regulations compliant.

Installation of plant equipment.





Silver Street Elevation Proposed 1:50

scale 1:50 0 2.5m

101 Princess Street, Manchester, M1 6DD

Client
Aberdeen Standard Investments

Project
101 Princess Street
Manchester
M1 6DD

Scale
As Shown @ A3

Date
March 2021

By
JA

Checked
KM

Rev Description

Date By Chck'd

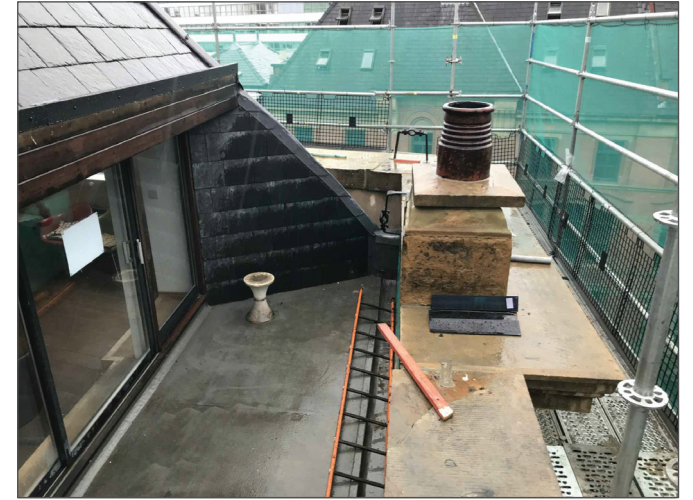


Description
Proposed Drawing
Silver Street Elevation - Works Location 2

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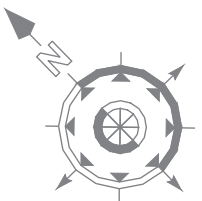


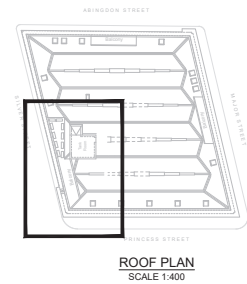
3no glazed panels / sliding doors to be removed.

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
IN ADDITION TO THE UNCHANGES NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:
CONSTRUCTION
MAINTENANCE/CLEANING
DECOMMISSIONING/DEMOLITION
IT IS ASSURED THAT ALL WORK WILL BE COVERED OUT BY COMPETENT CONTRACTOR PERSONNEL, WEAR APPROPRIATE, TO AN APPROVED METHOD STATEMENT

- NOTES
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 2. RCP / GRILLE LAYOUT TBC.

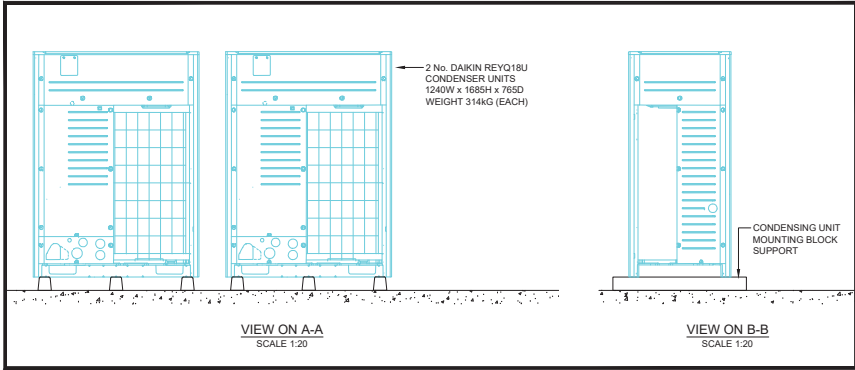
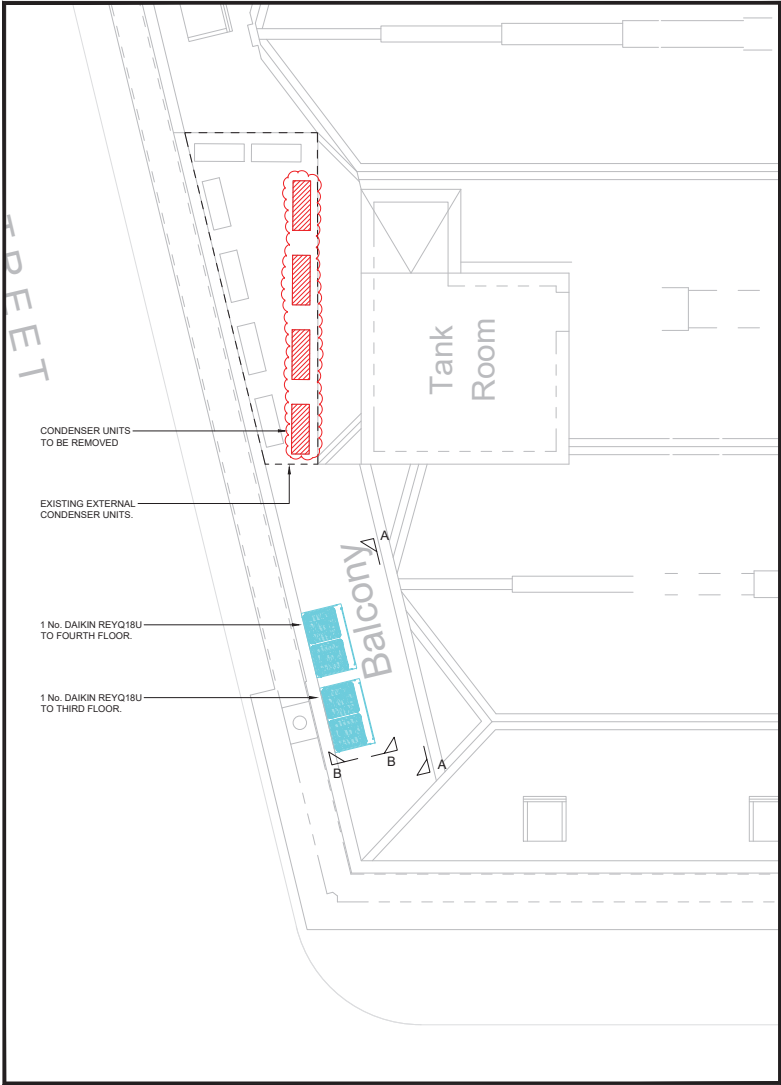


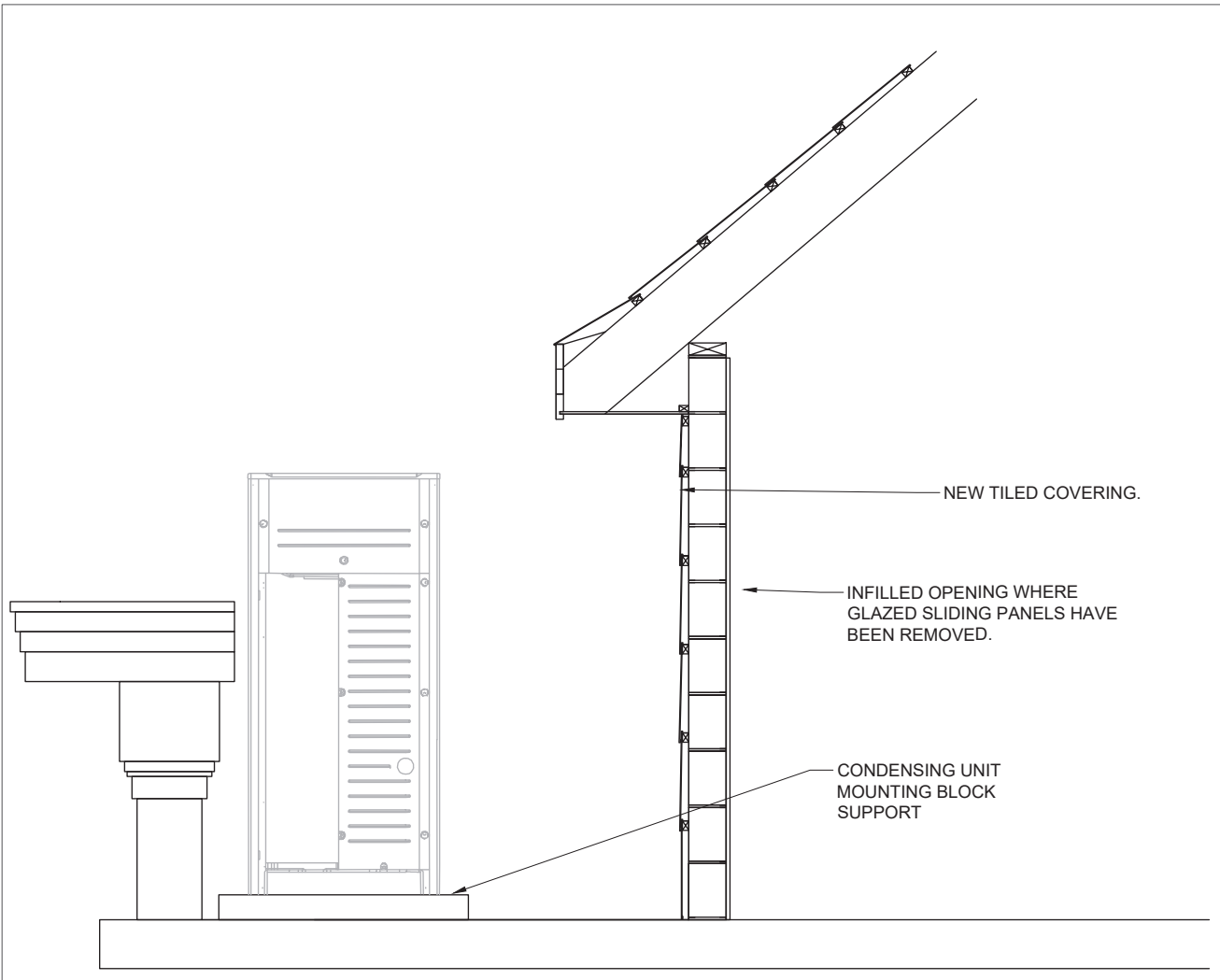
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P2	01-03-21	GENERAL UPDATE	LO
P1	24-02-21	VRV SELECTION UPDATE	LO
P0	09-02-21	FOR APPROVAL	LO
REV	DATE	DESCRIPTION	BY



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CLIENT	AberdeenStandard Investments		
PROJECT	101 PRINCESS STREET		
TITLE	ROOF LEVEL PROPOSED MECHANICAL SERVICES LAYOUT		
DATE	09-02-2021	DRAWN BY LO	CHECKED ND
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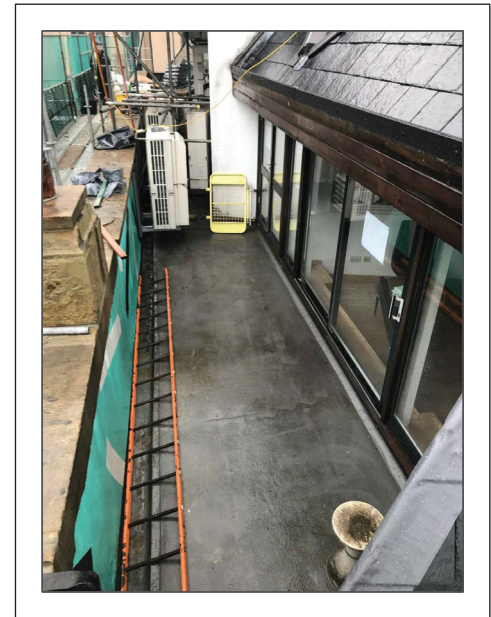




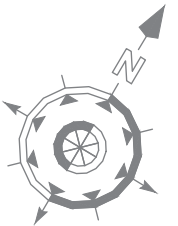
Existing Section 1:20

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101 Princess Street, Manchester, M1 6DD



Proposed Plant Location.

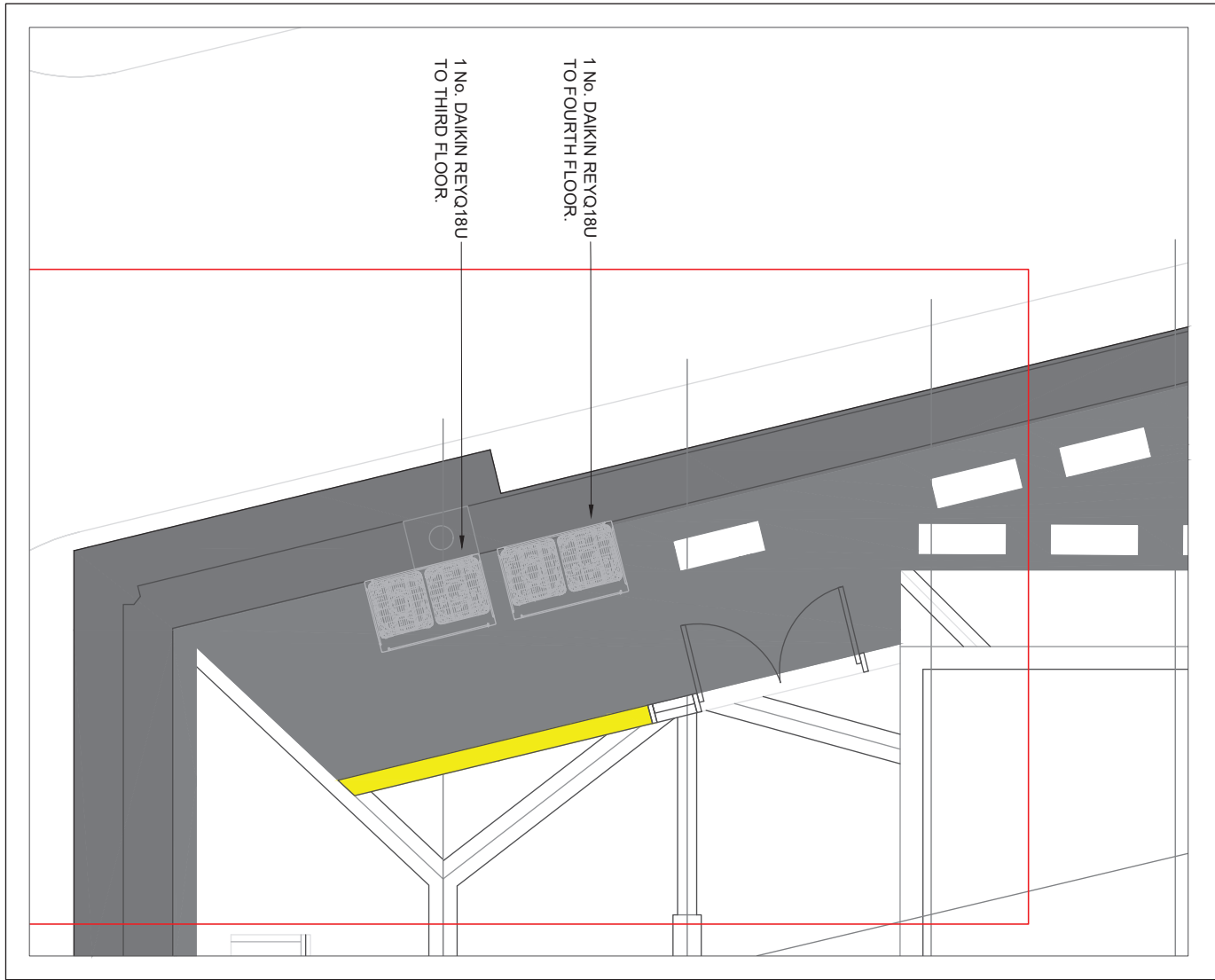


Client Aberdeen Standard Investments	
Project 101 Princess Street Manchester M1 6DD	

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Date March 2021	
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Drg 011 rev A				

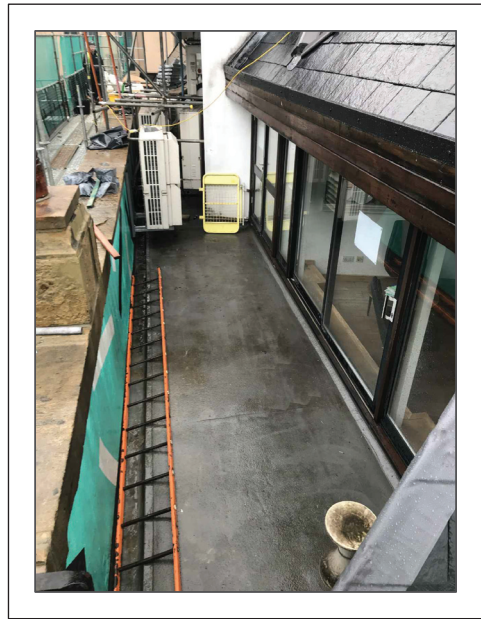
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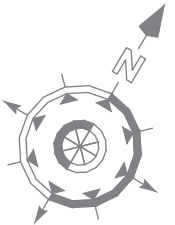
Proposed Plant Location 1:50

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101 Princess Street, Manchester, M1 6DD



Proposed Plant Location.



Client
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Project
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Description
Existing Drawing
Proposed Plant Location

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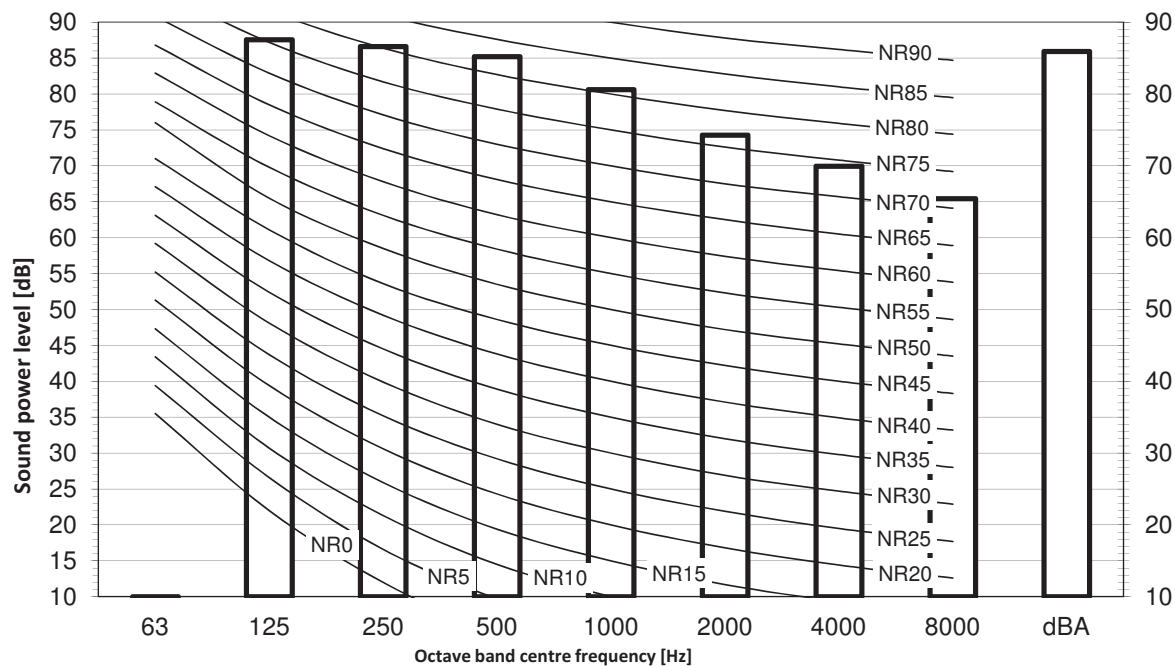
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11 Sound data

11 - 1 Sound Power Spectrum

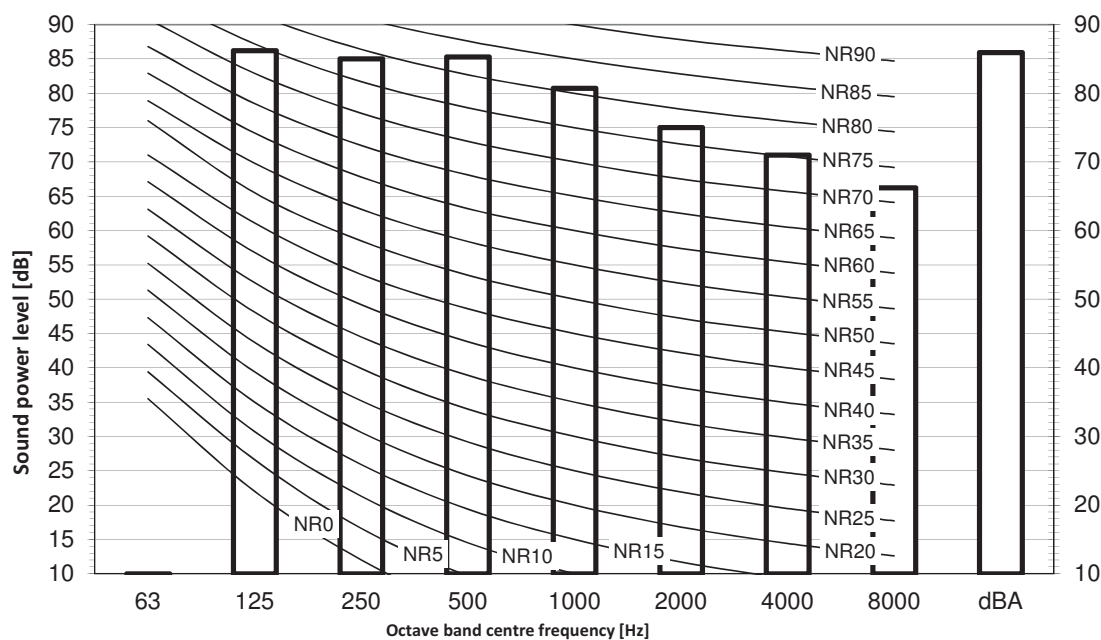
REYQ16T



- Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
 2. Reference acoustic intensity $0\text{dB} = 10^{-10}\text{E-}\mu\text{W/m}^2$.
 3. Measured according to ISO 3744

3D079911B

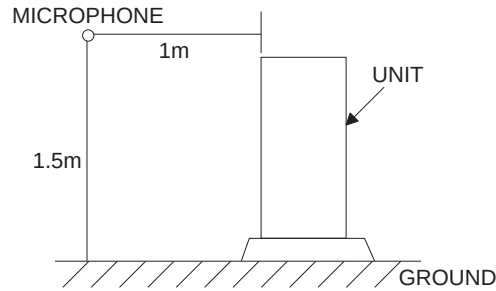
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- Notes :
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 3. Measured according to ISO 3744

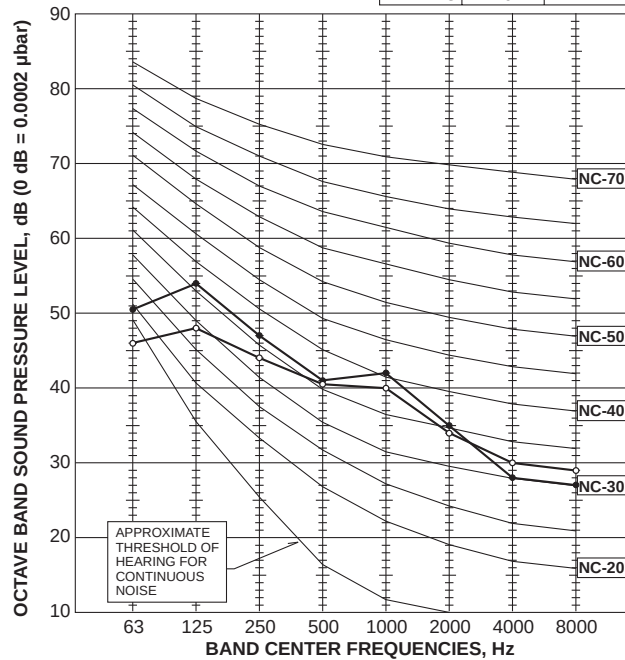
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5-4. NOISE CRITERION CURVES



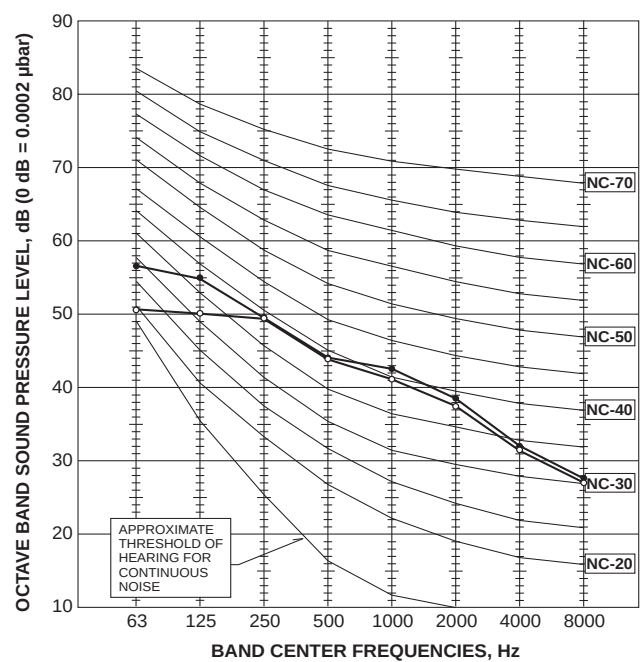
PUHZ-RP35/50VHA4

MODE	SPL(dB)	LINE
COOLING	44	○—○
HEATING	46	●—●



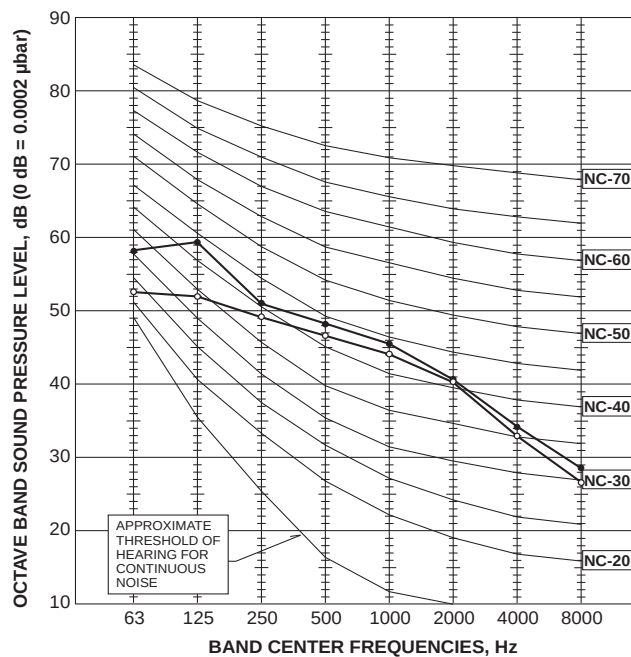
PUHZ-RP60VHA4 PUHZ-RP71VHA4

MODE	SPL(dB)	LINE
COOLING	47	○—○
HEATING	48	●—●



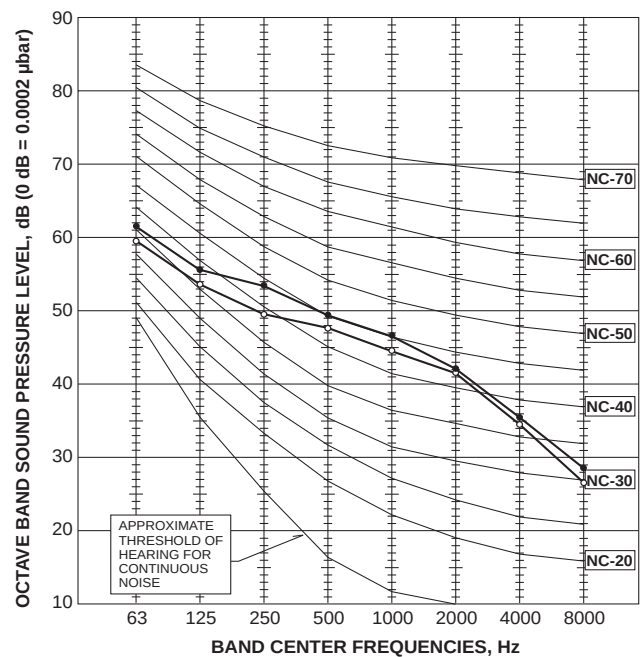
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MODE	SPL(dB)	LINE
COOLING	49	○—○
HEATING	51	●—●



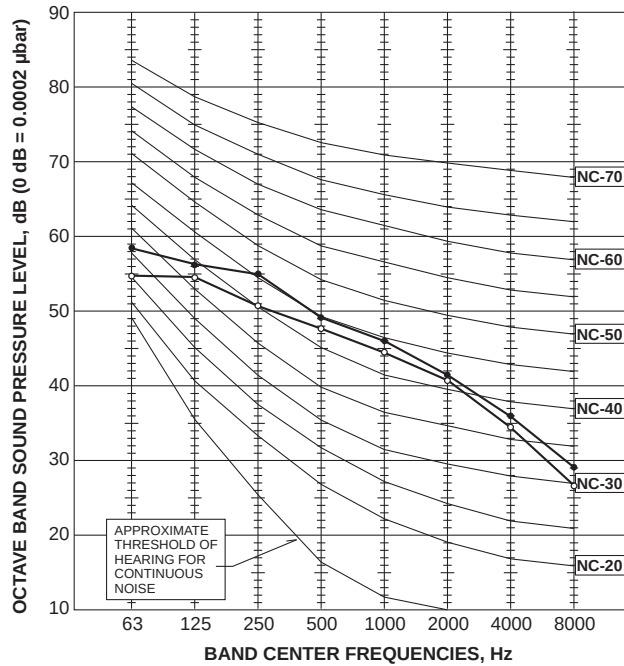
PUHZ-RP125VKA PUHZ-RP125YKA

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



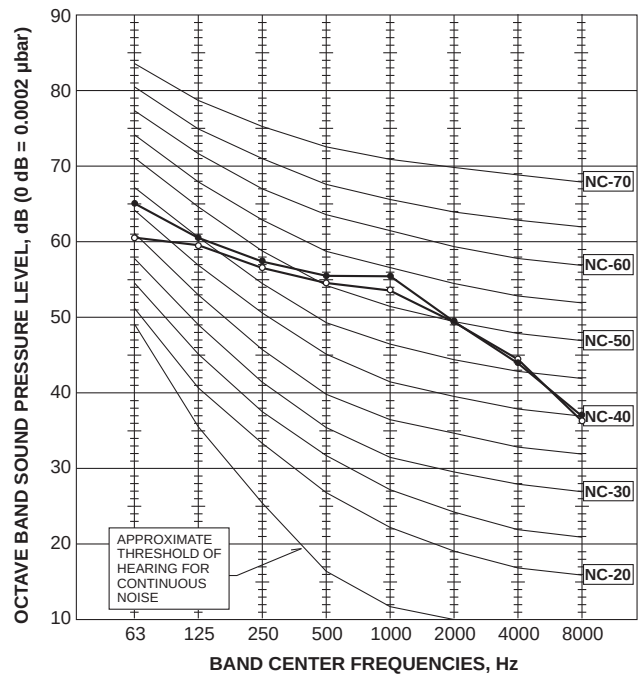
PUHZ-RP140VKA PUHZ-RP140YKA

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



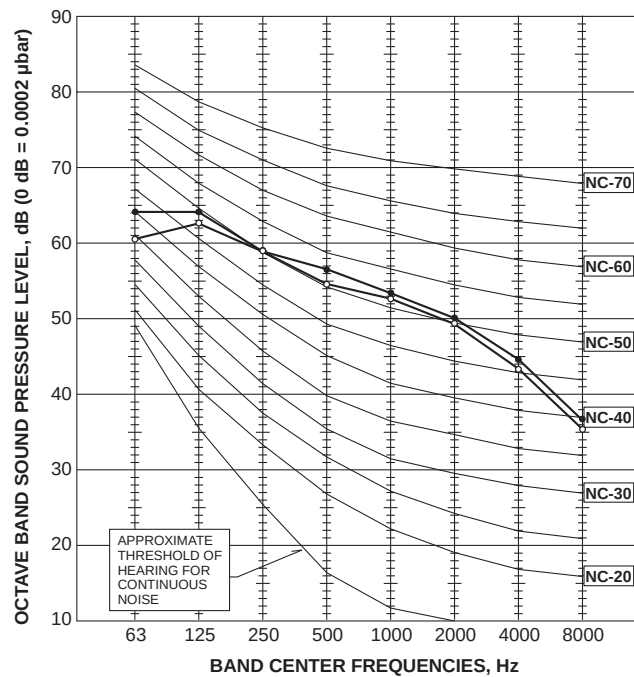
PUHZ-RP200YKA

MODE	SPL(dB)	LINE
COOLING	58	○—○
HEATING	59	●—●



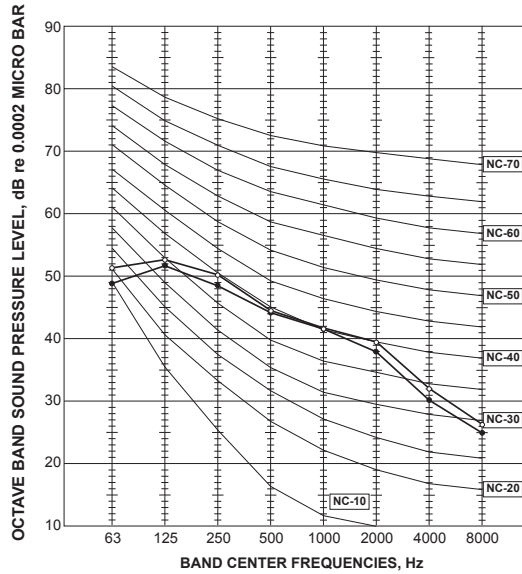
PUHZ-RP250YKA

MODE	SPL(dB)	LINE
COOLING	58	○—○
HEATING	59	●—●



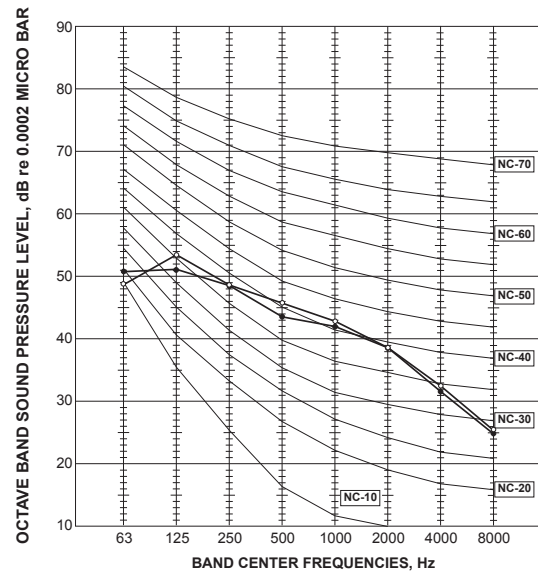
SUZ-KA25VA6.TH
SUZ-KA25VA6.TH-ER
SUZ-KA25VA6.TH-ET

FAN SPEED	FUNCTION	SPL(dB(A))	LINE
High Med.	COOLING	47	●—●
	HEATING	48	○—○



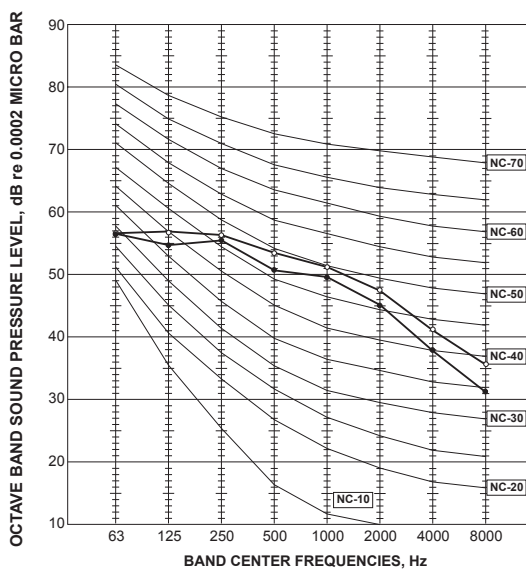
SUZ-KA35VA6.TH
SUZ-KA35VA6.TH-ER
SUZ-KA35VA6.TH-ET

FAN SPEED	FUNCTION	SPL(dB(A))	LINE
High Med.	COOLING	49	●—●
	HEATING	50	○—○



SUZ-KA50VA6.TH
SUZ-KA50VA6.TH-ER
SUZ-KA50VA6.TH-ET

FAN SPEED	FUNCTION	SPL(dB(A))	LINE
High	COOLING	52	●—●
	HEATING	52	○—○



Test conditions

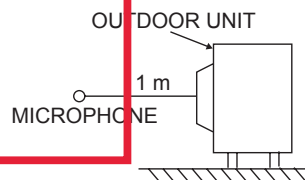
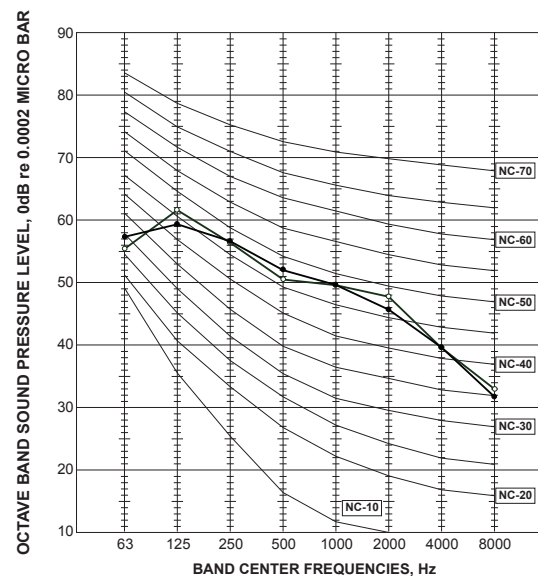
Cooling: Dry-bulb temperature 35°C

Heating: Dry-bulb temperature 7°C

Wet-bulb temperature 6°C

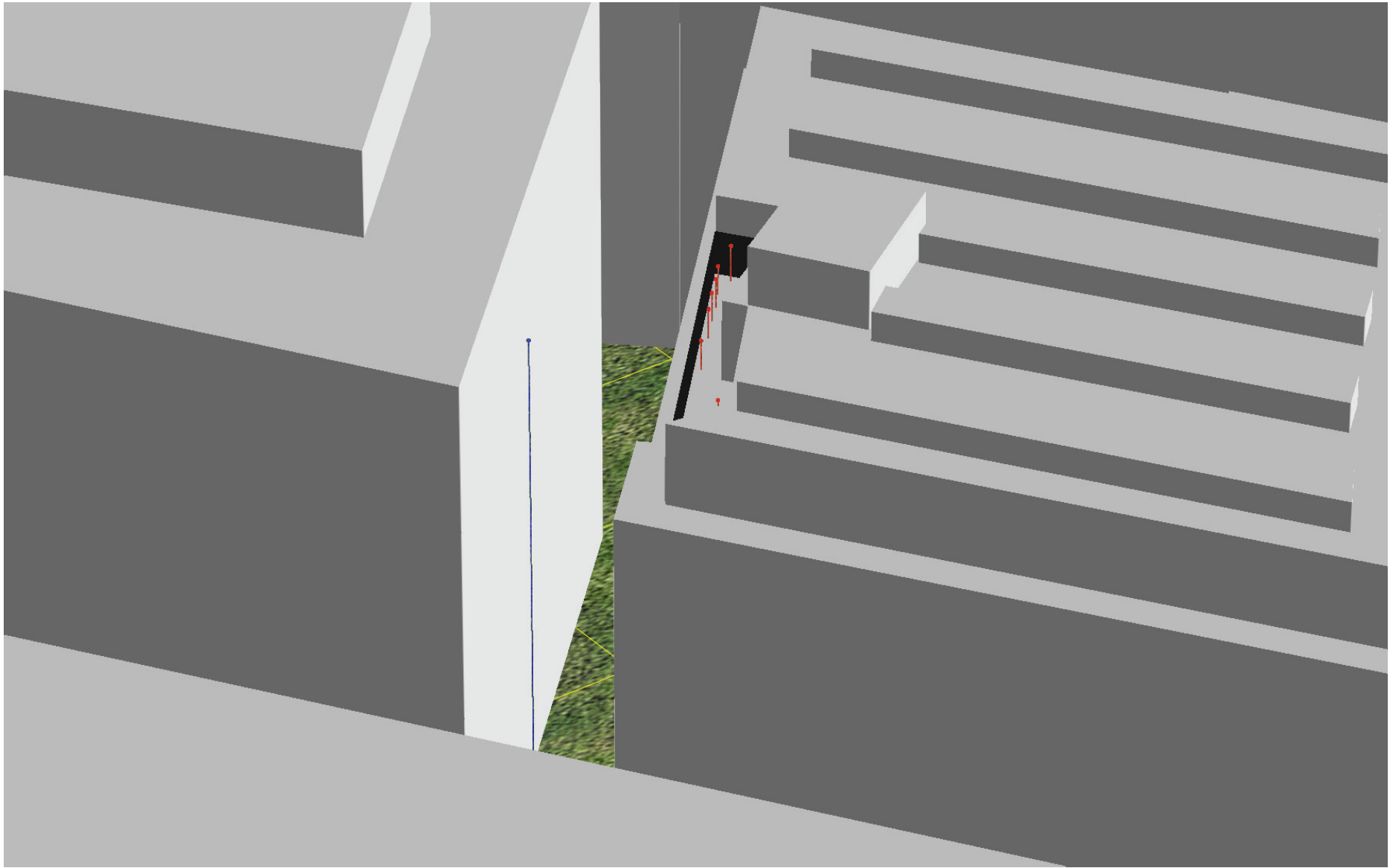
SUZ-KA60VA6.TH **SUZ-KA71VA6.TH**
SUZ-KA60VA6.TH-ER **SUZ-KA71VA6.TH-ER**
SUZ-KA60VA6.TH-ET **SUZ-KA71VA6.TH-ET**

FAN SPEED	FUNCTION	SPL(dB(A))	LINE
High	COOLING	55	●—●
	HEATING	55	○—○



APPENDIX C

Noise Prediction Model

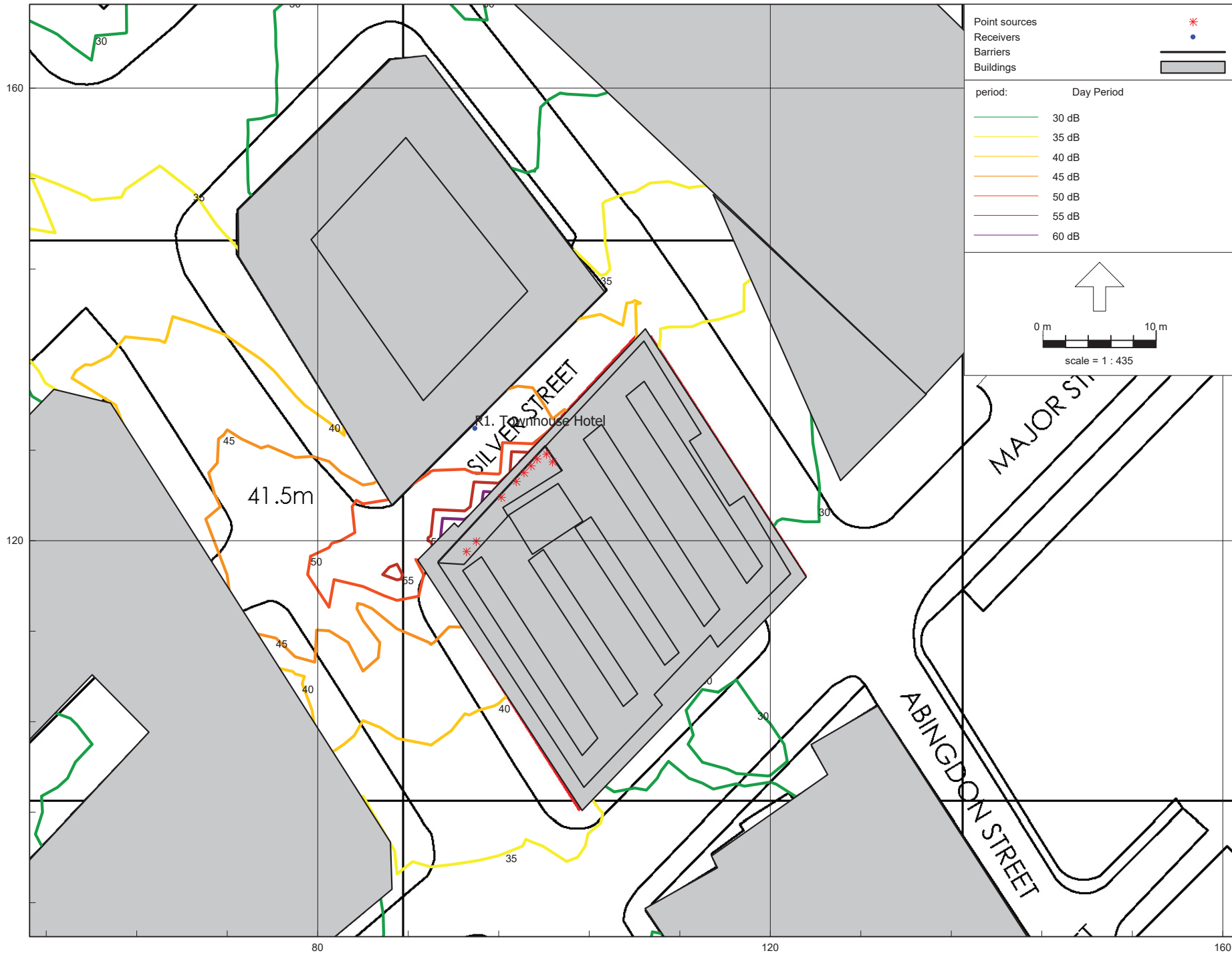


101 Princess Street, Manchester
Predicted Noise Levels - New & Existing Plant

Report: Table of Results
Model: Proposed Scheme - Rev 0
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name		Height	Day								
Receiver	Description		Total	63	125	250	500	1000	2000	4000	8000
_A	R1. Townhouse Hotel 99	17.00	47	29	34	38	43	41	34	29	19

All shown dB values are A-weighted



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