NOISE IMPACT ASSESSMENT REPORT

16 AVENUE ROAD, LONDON

MS LIN ZHU

NOVEMBER 2022

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Our Ref: **4885_002R_1-0_MR**

Client:	**Ms Lin Zhu**
Report by:	**Anderson Acoustics Limited** 3 Trafalgar Mews 15-16 Trafalgar Street Brighton BN1 4EZ
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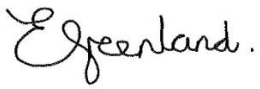
Reviewed	**Emma Greenland** **Principal Consultant** **PhD BEng MIOA**		**15 November 2022**
Approved	**Emma Greenland** **Principal Consultant** **PhD BEng MIOA**		**15 November 2022**

REVISION HISTORY

Version	Comments	Changes made by	Approved by
1.0	Final Version	MR	EG

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CONTENTS

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Ms Lin Zhu to conduct the noise impact assessment of the new external condensers serving the development at 16 Avenue Road, NW8 6BP, London Borough of Camden (LBC). This report will be submitted in support of the Planning Application for replacement condenser enclosure (Application ref: 2021/2384/P). A decision notice to this Planning Application has been issued and requires consideration be given to atmospheric noise emissions from the proposed plant at the nearest neighbouring noise sensitive properties in order to discharge Condition 10 (described in Section 2).

An initial Noise Impact Assessment Report was submitted for the initial Planning Application, assessing the initially proposed external condensers enclosure (report reference: 16 Avenue Road, Noise Impact Assessment, report Ref: 2932_001R_1-0, September 2016). Plant noise limits have been set based on the noise levels measured on site and reported in the initial NIA report.

An assessment of the impact of noise at the nearest noise sensitive premises from the proposed items of plant has therefore been conducted in accordance with the requirements of the London Borough of Camden (LBC) Planning Condition 10 and is reported herein.

The new proposal includes changes in the dimensions and shape of the enclosure, an open lid, façade louvres and three different condenser units to be provided with an acoustic enclosure.

The design proposal, as stated in the Design and Access Statement is as follows:

- *Existing masonry structure on NE corner of boundary wall is proposed to be demolished. It is poor quality shed/ structure with rendered walls, masonry columns & tiled roof.*
- *In previous planning consent, existing shed was proposed to be re-used as condenser enclosure. However, following detail design development of M&E scheme, it is deemed inadequate in terms of size & acoustic performance. Due to its poor state, it is also not possible to adapt it to new requirements.*
- *Hence, it is proposed to be demolished and replaced with similar size (albeit slightly bigger) open to air, brick enclosure.*

Other internal noise producing items which are ducted to external façade louvres are not specifically covered by Condition 10 (which specifically relates to the application for the replacement of the external condensers). These are not covered in detail in this report but will be selected and provided with the required noise attenuation such that noise will be negligible and will maintain the noise limits at the nearest NSRs stated in this report (taking into account combined noise levels from the external condensers enclosure).

2 ACOUSTIC DESIGN STANDARDS

Acoustic criteria is reproduced in this section.

Local Authority Planning Requirements – Planning Condition 10

Decision notice of the Planning Application (Application ref: 2021/2384/P) for the replacement of the external condensers units and enclosure includes Condition 10:

"*Prior to use of the development, details shall be submitted to and approved in writing by the Council, of the external noise level emitted from plant/ machinery/ equipment and mitigation measures as appropriate. The measures shall ensure that the external noise level emitted from plant, machinery/ equipment will be lower than the lowest existing background noise level by at least 5 dBA, by 10 dBA where the source is tonal, as assessed according to BS 4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity. A post-installation noise assessment shall be carried out where required to confirm compliance with the noise criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.*

Reason: To ensure that the amenity of occupiers of the development site/ surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment in accordance with the requirements of policies A1 and A4 of the London Borough of Camden Local Plan 2017."

British Standard 4142:2014 – Methods for rating and assessing industrial and commercial sound

Used for assessing the noise impact of industrial and commercial noise (such as fixed plant systems) on noise sensitive receptors and provides guidance as to the likely community response.

3 SITE LOCATION AND ENVIRONMENTAL NOISE LEVELS ON SITE

The site location is 16 Avenue Road, London, NW8 6BP, which is bounded by Avenue Rd to the west and residential properties to the north, east and south.

Secondary road traffic noise sources beyond the surrounding residential developments include Rudgwick Terrace to the north; Broxwood Way to the east and St. Edmund's Terrace to the south.

The site location, together with the nearest noise sensitive receptors are shown in Figure 3.1 below.

Figure 3.1: Site location ©2020 Google

An environmental noise survey was carried out on site as detailed in the Noise Impact Assessment Report submitted as part of the initial Planning Application (16 Avenue Road Noise Impact Assessment Report, 22 September 2026, Reference: 2932_001R_1-0).

Observations made during the noise survey indicated that the noise climate around the site was dominated by continuous road traffic noise from Avenue Road. Construction noise from neighbouring properties was also noticeable at times.

An unattended measurement located at the roof terrace of the existing building was undertaken to assess background sound levels representative of the levels at the façade of the nearest NSR.

4 PLANT NOISE LIMITING CRITERIA

4.1 Plant Noise Limits at The Nearest Noise Sensitive Receptors Windows

In accordance with Planning Condition 10, noise associated with fixed plant from the development will be set so that the external noise level of plant ($L_{Ar,Tr}$ dB) does not exceed a level 5 dB (by 10dB where the source is tonal) below the lowest existing background sound levels $L_{A90,T}$ dB when measured or calculated at 1 metre from the façade of the nearest noise sensitive receptor.

(In accordance with BS4142:2014, correction factors exceeding 5 dB may apply for noise sources that contain certain acoustic features such as tonality, impulsivity and intermittency, however 5 dB is referenced in the planning condition) .

Based on the spectral sound level data of the proposed condensers and on acoustic enclosure sound reduction levels (see Table 5.1 and Table 5.2), no correction factor for tonality has been applied. Based on the anticipated continuous operation of the condensers, no corrections for impulsivity or intermittency have been applied either.

Based on the established background sound levels during the daytime and night-time periods representative of the nearest noise sensitive receptor, limiting plant noise levels at the nearby noise sensitive receptors have been set as shown in Table 4.1 below.

Table 4.1: Measured background sound levels and limiting plant noise levels at NSRs

Period	Lowest measured background sound level $L_{A90,T}$ dB	Maximum Cumulative External Noise Level from external plant at 1 m from NSR $L_{Aeq,T}$ dB
Daytime	43	38
Night-time	37	32

5 PROPOSED EXTERNAL PLANT AND ENCLOSURE

3 no. Mitshubishi condensers PURY-EP200-YNW are proposed. Worst-case scenario noise levels corresponding to standard heating mode have been considered for both daytime and night-time operation. It is understood that during night-time, the units will operate at a reduced duty (low noise mode). Sound levels from the condensers are presented in Table 5.1:

Table 5.1: Condenser noise data (worst case heating mode)

Item	Model	Sound Pressure Level @ 1m L_{eq} (dB) (Standard Heating Mode)							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Condensers	PURY-EP200-YNW Standard heating mode	69	61	60.5	58	52	47.5	48	42.5
Condensers	PURY-EP200-YNW Low noise mode	43	49	42	40	36	33.5	37	35.5

It is understood that the condensers will be housed in an acoustic enclosure with sound reduction index performance shown in Table 5.2:

Table 5.2: Acoustic enclosure performance

Item	Sound Reduction Index (dB)							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Acoustic enclosure	5	9	14	20	30	30	27	20

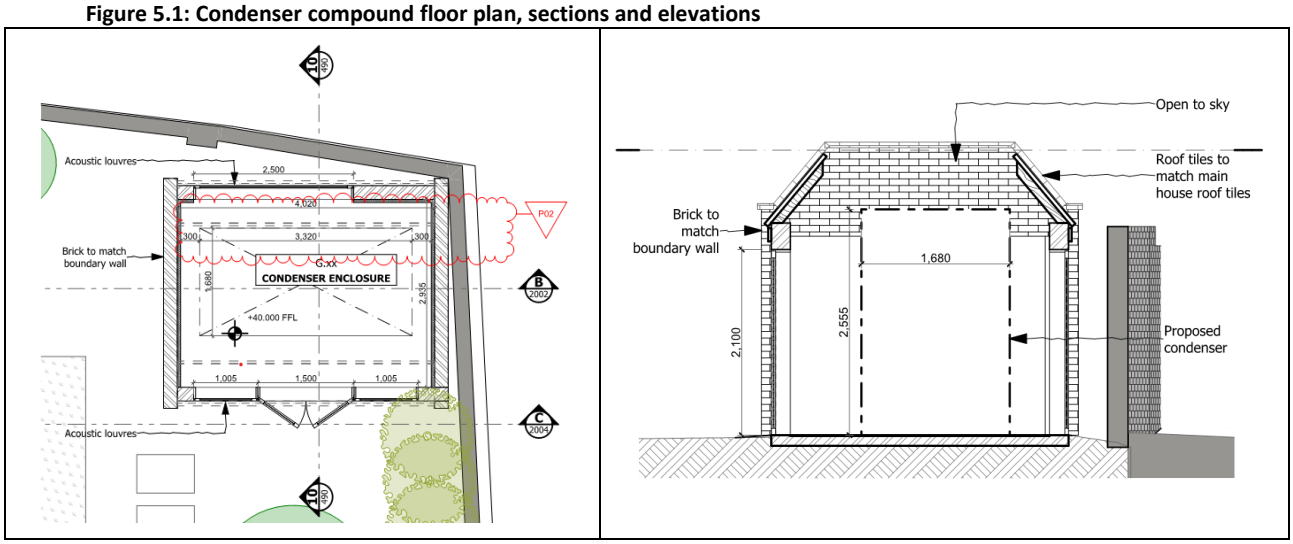
Standard acoustic louvres providing a minimum sound reduction of 10 dB R_w are proposed to the masonry compound.

In addition to the proposed acoustic enclosure which will enclose the 3 no. units and compound acoustic louvres, all the solid walls of the masonry enclosure (excluding the weather louvred areas) will be internally lined with Class A sound absorbent material such as Rockwool RW slab5, 75 mm (100 Kg/m^3); or similar and approved. Other options are:

- 50 mm polyurethane non-flammable acoustic foam;
- Other encapsulated mineral fibre insulation 50-75 mm thick, 33kg/m^3.

The proposed condenser enclosure plan and elevations are shown in Figure 5.1. The Architectural proposal drawing is included in Appendix B.

Figure 5.1: Condenser compound floor plan, sections and elevations



6 DISCHARGE OF PLANNING CONDITION 10

6.1 Acoustic Modelling Methodology

Free-field noise levels at 1 m outside the proposed building and nearest NSRs facades have been predicted using 3D noise mapping software (Cadna/A version 2019).

The model has been generated based upon the following assumptions:

› The ground between the enclosure and buildings has been modelled as soft ground (i.e. G = 0.2).

› External condensers compound location and dimensions have been taken from Architectural drawings.

› Nearest NSRs and storey heights have been taken from Google maps 3D views.

› Receivers have been modelled at window height in accordance with the above heights and layouts.

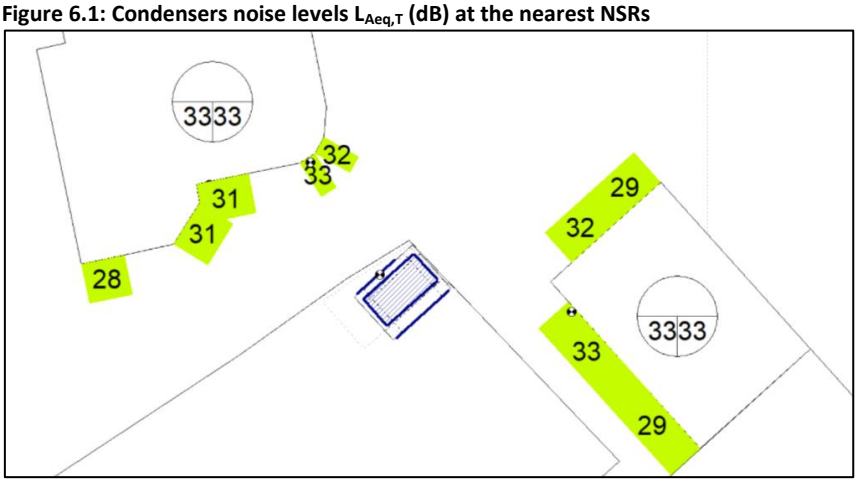
› Mechanical plant and equipment with sound pressure or sound power levels as well as proposed condensers acoustic enclosure as provided by ME7 Ltd M&E Consultants for the project.

› 3D noise map models typically have an uncertainty within a range of approximately +/- 3 dB.

6.2 Results of the Assessment

Figure 6.1 presents the predicted noise levels from the operation of the 3 no. condensers in standard mode at the nearest NSR.

Figure 6.1: Condensers noise levels $L_{Aeq,T}$ (dB) at the nearest NSRs



The highest predicted levels at the nearest NSRs windows are 32-33 dB L_{Aeq}. This comfortably meets the limit for daytime operation but would exceed the target limit during night-time operation by up to 1 dB However it is noted that the condensers are likely to operate in low noise mode during night-time operation, which is likely to result in a reduction of at least 1 dB. The 1 dB margin is considered to be within the margin of uncertainty of the assessment (see Appendix A) . In addition to this, a 1 dB L_{Aeq} difference in sound pressure levels is not generally perceptible by the human ear. Furthermore, BS 4142: 2014 also considers additional context to be appropriate where the background sound level is low. For example the internal plant noise level via open windows of the nearest residential development at night is likely to be less than 23 dBA, which would be well within the guideline indoor ambient noise levels in BS8233 :2014 of 30 dB L_{Aeq} for bedrooms at night.

Based on the results of the assessment, the noise limits set by Planning Condition 10 are expected to be achieved, given the expectation for operation at reduced duty during night time periods. In accordance with BS4142: 2014, the noise impact due to the operation of the condensers is considered to be low.

7 SUMMARY

This reports presents the results of the noise impact assessment for the 16 Avenue Road development, for the application for replacement of the external condensers and new acoustic enclosure

As described in the sections of the report, provided the expected operation, attenuation measures and sound reduction levels as described are adopted, the proposed external plant, is expected to achieve noise limits at the nearest noise sensitive receptors, demonstrating compliance with Planning Condition 10.

8 REFERENCES

1 Decision notice of Planning Application ref: 2021/2384/P: “Variation or Removal of Condition(s) Granted Subject to a Section 106 Legal Agreement”.

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

APPENDIX A

NOISE UNITS, GLOSSARY, NOISE CRITERIA

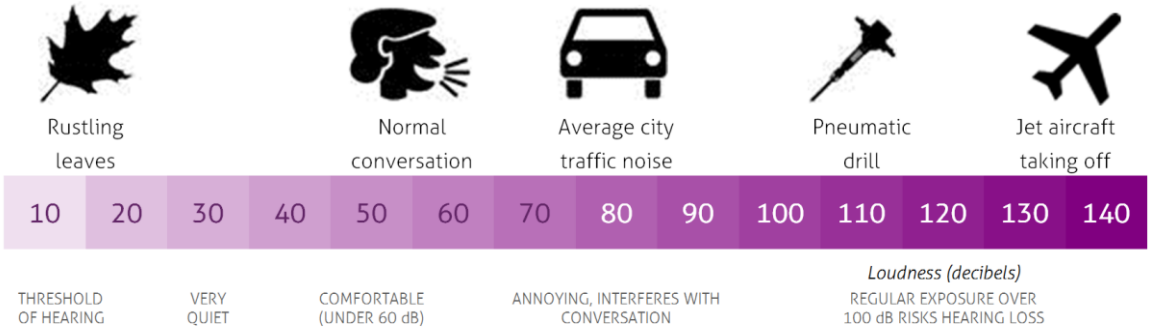
Noise units

There is a ten million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

$L_{A90,T}$ This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.

$L_{A1,T}$ This is the noise level exceeded for 1% of the measurement period and it is often used to represent typical maximum levels that occur during the measurement period (discrete events i.e. aircrafts or trains).

$L_{Aeq,T}$ This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.

$L_{Amax,F}$ This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken, or calculated to a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

BS 4142

BS 4142 provides methods for rating and assessing sound/noise of an industrial or commercial nature in relation to residential premises, hence its relevance here. The assessment methodology evaluates the "specific sound level" of each industrial or commercial sound source, corrects for distinguishable features to derive the "rating level", and compares this with the "background sound level".

The advice is that the background sound level ($L_{AF90,T}$) should be derived from continuous measurement of normally not less than 15 minute intervals over the period of interest, and that it should not be the lowest level, but representative of typical conditions at the noise-sensitive receiver(s) relevant to the periods of operation.

The specific sound level ($L_{Aeq,T}$) is obtained (by measurement or calculation) over a reference period of 1 hour in terms of the daytime (07:00 to 23:00) and 15 minutes during the night-time (23:00 to 07:00).
The rating level ($L_{Ar,Tr}$) is the specific sound level corrected to account for any acoustic features present in the sound in question, as experienced at the receptor, such as distinguishable, discrete, continuous note (a whine, hiss, screech or hum etc.) or distinct impulses (bangs, clatters or thumps etc.). Where no correction is warranted, the rating level is equal to the specific level.

The "subjective method" to calculate the rating level incorporates the following corrections (particularly appropriate for new sources that cannot be measured in-situ):

- Up to +6 dB due to tonality, subjectively this might be +2 for a tone that is just perceptible, +4 where it is clearly perceptible and +6 where it is highly perceptible.
- Up to+9 dB for impulsivity, subjectively this might be +3 for impulsivity that is just perceptible, +6 where it is clearly perceptible and +9 where it is highly perceptible; and
- Up to +3 dB for other acoustic features that are neither tonal nor impulsive, though readily distinctive at the receptor.

An "initial estimate" of the impact of the specific sound is calculated by subtracting the measured background sound level from the rating level. The following advice applies:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context.

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. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur.

Where the initial estimate of the impact needs to be modified due to the context, the assessment should take into account all pertinent factors, including:

- the absolute level of sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and

- the sensitivity of the receptor and whether dwellings will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

Helpfully, BS 4142 includes some example assessments. In one example, it is concluded that:

> "Although the plant noise is somewhat different in character to the residual acoustic environment the rating level of 30 dB is low and will have little impact on residents using their patio during the evening."

Under similar conditions it is stated:

> "In addition to the rating/background sound level comparison…" where "the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows… Other guidance, such as BS 8233, might also be applicable in this instance."

Another example concludes that:

> "…the residual acoustic environment varies considerably with time, which also tends to mask sound from the source, reducing its relative significance…"

An assessment, therefore, is effectively in two parts. The first part results in an initial indication of the impact, which is subsequently considered in terms the context unique to the situation at hand; and where this second part may require consideration of alternative guidance and metrics. Alternatively, the context can be considered upfront and a specific threshold (or set of thresholds) determined accordingly in place of the default values presented in points a) to d) quoted above.

Uncertainty

There is a degree of uncertainty associated with: the instrumentation itself; the use of instrumentation; the source data; the sound propagation model; and, of course, the subjective response of recipients.

In terms of the assessment presented above, uncertainty due to instrumentation error (from the environmental noise survey reported in the initial Noise Impact Assessment) was kept to a minimum by the use of the highest standard of instrumentation and by ensuring that all instrumentation is calibrated before and after each measurement period and was within accepted calibration intervals.
In terms of the baseline data, the management of uncertainty included carrying out the survey over a number of days, being mindful of the weather conditions, which were predominately dry and calm, and adopting the average values obtained for the period of operation.

In terms of the adopted source data and associated assumptions, it has greatly limited uncertainty by being able to use manufacturer tested data for the specific plant proposed.

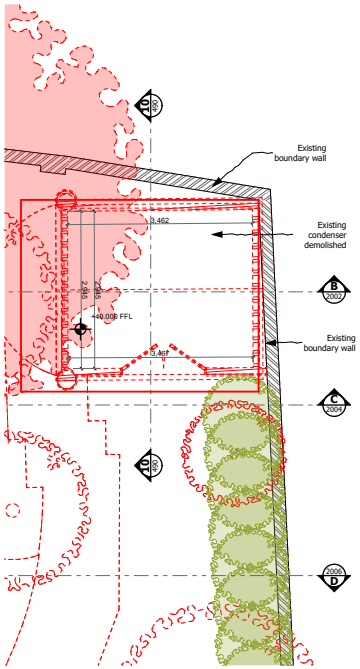
In terms of the calculation process and assessment great care was taken to construct the environmental 3D noise model, with the software being compliant with the relevant standard. Compared to purely spreadsheet-based calculations, the use of a model better allows for consideration of acoustic screening and reflections.

The worst-case assumption was made that all plant would be operating at full duty and at the same time also during night-time, although it is understood that a lower operation rate is proposed during this period.

On the whole, it is considered that uncertainty has been kept to a practicable minimum, and that, given the general worst-case approach, the effect of any uncertainty is more likely to result in a more favourable assessment than a less favourable one.

APPENDIX B

EXTERNAL CONDENSERS ARCHITECTURAL DRAWINGS



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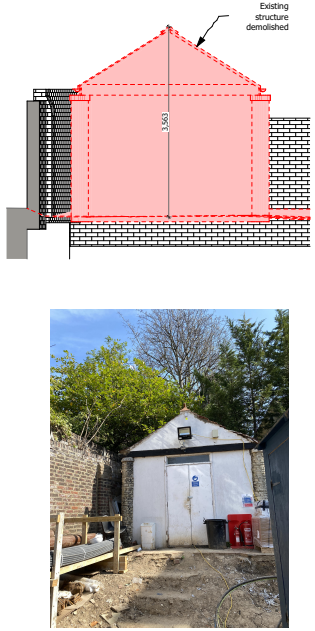
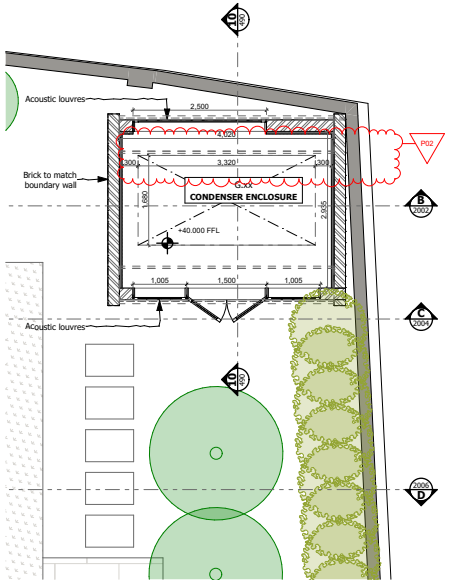
Existing Enclosure Ground Floor GA Plan



11 SCALE 1:50 @ A1, 1:100 @ A3
Existing Condenser Enclosure SW Elevation



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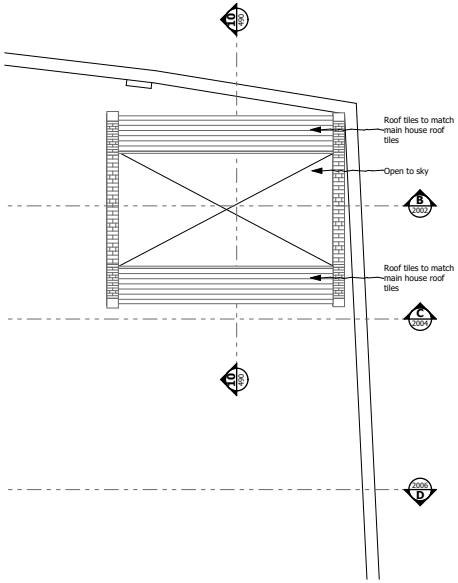
Proposed Condensor Enclosure GF - GA Plan



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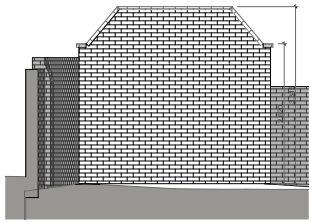
Proposed Condensor Enclosure FF - GA Plan



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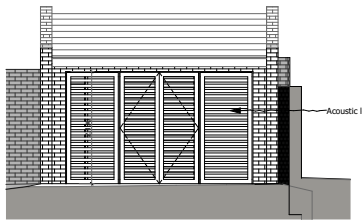
Condenser Enclosure Southwest Elevation



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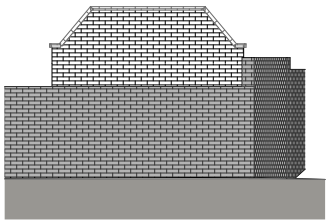
Condenser Enclosure Southeast Elevation



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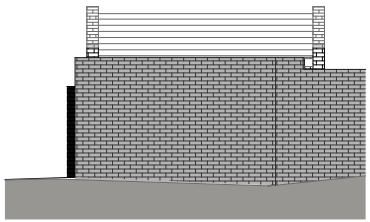
Condenser Enclosure Northhest Elevation



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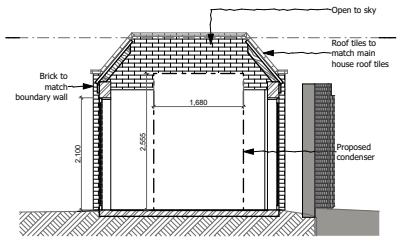
Condenser Enclosure Northweast Elevation



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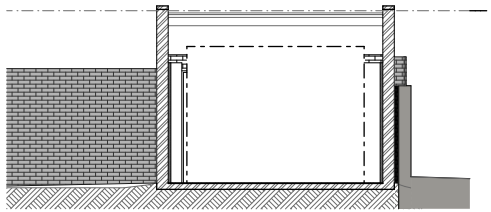
Section 10-10



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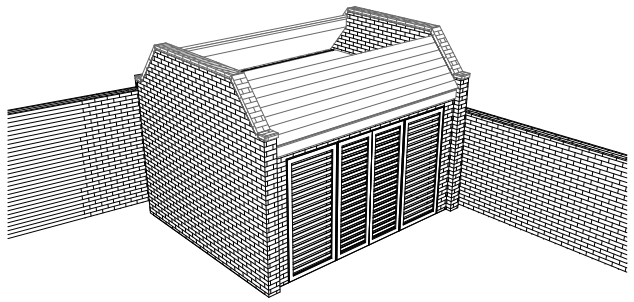
Section B-B



10 SCALE 1:125 @ A3
Outbuilding perspective

DO NOT SCALE FROM THIS DRAWING

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.
If in doubt, ask.

All SHH drawings to be read in conjunction with relevant SHH Finishes, Sanitaryware, Lighting & Ironmongery schedules.

Any discrepancies to be highlighted to SHH prior to procurement and in good time.

SCALE 1:50@A1, 1:100@A3
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Legends & Notes:

Rev	Date	Description	Alte	Chkd
P02	20/04/2022	Dims revised	AT	AT
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Client:
Private Client

Drawing Title:
GA PLANS
Condenser enclosure Proposal

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