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Roof Plant Noise Assessment

Siren Craft Brew, E1-4 Friar Street

Roof Plant Noise Assessment

Project: SIREN CRAFT BREW, E1-4 FRIAR STREET

Report reference: RP01-23706-R0

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1. EXECUTIVE SUMMARY

- 1.1 Cass Allen has been instructed by Siren Craft Brew Ltd to assess the noise impact of new mechanical roof plant serving the ground floor brewery, Siren Craft Brew, at E1-4 Friar Street in Reading. The new roof plant is located on the Level 7 roof of Block E in the Station Hill development and therefore the planning conditions attached to the wider development apply.
- 1.2 The assessment was carried out in accordance with the requirements of Planning Condition 48 attached to the Station Hill development.
- 1.3 The plant noise limits established in the Cass Allen report *Discharge of Planning Condition 48* (RP03-19194-R3, Feb 2023) have been adopted for this assessment.
- 1.4 A 3D noise model of the roof and surrounding Station Hill development was constructed based on the existing development design and the roof plant layout. The noise model was used to calculate plant noise levels at the nearest noise-sensitive receptors.
- 1.5 The 3D noise model calculations indicate that the resultant noise levels at the noise-sensitive receptors are generally compliant with the requirements of Planning Condition 48. A minor (1 dB) exceedance of the specific sound level criterion is considered to be acceptable, as discussed in Paragraph 4.15.
- 1.6 It is our view that this report contains the information required to discharge Planning Condition 48.

2. INTRODUCTION

- 2.1 The assessment has been carried out in accordance with the requirements of Planning Condition 48 attached to the Station Hill development, which states:

Condition 48

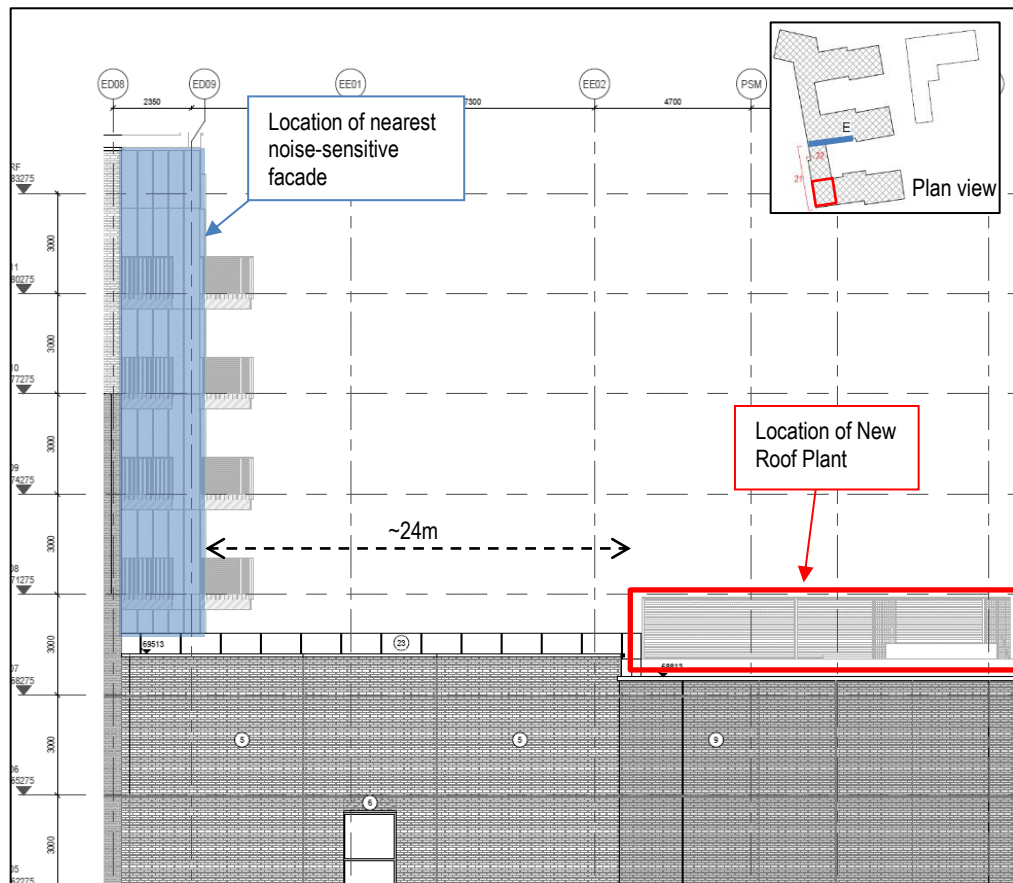
No mechanical plant, including kitchen extraction plant, shall be installed at any time until a noise assessment of the proposed mechanical plant has been submitted to and approved in writing by the Local Planning Authority. The Assessment shall be carried out in accordance with BS4142:2014 methodology. The predicted specific sound level ($LA_{eq,T}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive façade shall be at least 10dB below the pre-existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $LA_{r,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive façade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.

- 2.2 This report contains technical terminology; a glossary of terms can be found at www.cassallen.co.uk/glossary.

3. DEVELOPMENT DESCRIPTION

- 3.1 The Station Hill development comprises two large mixed-use blocks containing dwellings on the upper floors and communal amenities at ground and first floor levels. There are also a number of ground floor retail units facing onto Friar Street, including Units E1-4 where Siren Craft Brewery is located.
- 3.2 The new mechanical roof plant items are located on the Level 7 roof of Block E, overlooking the southern courtyard of the Station Hill development. The nearest noise sensitive receptors are located approximately 24 m to the North of the plant area.
- 3.3 The location of the new roof plant and the surrounding noise-sensitive receptors are shown in Figure 1 below. A drawing of the roof plant layout is provided in Appendix 1.

Figure 1 Roof Plant Location and Surrounding Noise-sensitive Facades



- 3.4 To address the requirements of Planning Condition 48, noise emissions from the new mechanical roof plant associated with the brewery at the position of the nearest noise-sensitive receptors have been assessed.

4. ROOF PLANT NOISE IMPACT ASSESSMENT

Design criteria – Mechanical plant noise

4.1 Planning Condition 48 requires that the new mechanical roof plant noise within the Station Hill development is assessed in accordance with BS4142:2014 - *Methods for rating and assessing industrial and commercial sound* (hereafter BS4142).

4.2 The BS4142 assessment methodology can be summarised as follows:

1. Measure the existing background noise levels (LA90,T dB) at the locations of nearby noise sensitive receptors during the quietest periods when the noise source(s) under investigation will operate
2. Predict or measure the noise emissions (LAeq,T dB) from the noise source(s) under investigation at the location(s) of the nearby sensitive receptors, and add corrections for any distinguishable acoustic features (e.g. tones, whines, screeches, hisses etc)
3. Subtract the measured background noise levels (item 1 above) from the measured or predicted rating noise levels (item 2 above) at each sensitive receptor. BS4142 states that:

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.

NOTE Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

4.3 Planning Condition 48 requires the following criteria be complied with:

- Specific plant noise levels (LAeq,T) at 1 metre outside the nearest noise-sensitive facade (i.e. habitable window of a dwelling) shall not exceed 10dB below existing background sound level (LA90,T). The specific sound level is the plant noise level alone, without the contribution from any other ambient sounds.
- Rated plant noise level (LAr,Tr) at 1 metre outside the nearest noise-sensitive facade shall not exceed the pre-existing background sound level (LA90,T). The rated plant noise level

is the specific sound level with any corrections applied for distinguishable acoustic features (tonality, impulsivity, intermittency).

- 4.4 The BS4142 plant noise limits stated within the Cass Allen report, *Discharge of Planning Condition 48* (RP03-19194-R3) which provided sufficient information to discharge Planning Condition 48 for the Station Hill development, have been adopted for this assessment. The plant noise limits are shown in Table 1 below.

Table 1 BS4142 Noise Limits - Free-field Levels

Location	Period
	Day-time/Evening (0700-2300hrs)
Nearest noise sensitive receptors (specific levels – 10dB below background)	33 dB LAeq
Nearest noise sensitive receptors (rated levels – equal to background)	43 dB LAr,Tr ¹

Note 1 These limits are 'rated' noise levels. Any mechanical plant noise emissions should have appropriate corrections for the character of the noise applied and still meet these limits.

Mechanical plant design

- 4.5 The new mechanical roof plant items associated with Siren Craft Brewery comprise ventilation and air conditioning units. The new roof plant is designed to run during brewery operating hours in the day and evening only (1000-2300hrs) with the extract fan automatically shutting off at 2300hrs, therefore only the daytime plant noise emissions have been assessed. The locations of the plant items are shown on the layout drawing, provided in Appendix 1.
- 4.6 A noise survey was conducted at the site on 04 July 2024 to measure the noise emissions of each new roof plant item running at maximum operating duty. The results and methodology of the noise survey are provided in Appendix 2.
- 4.7 During the survey the ambient noise levels were dictated by existing plant items located near to the new roof plant, therefore near-field measurements (within 1m) were taken for each plant item in order to reduce contamination from existing noise sources.
- 4.8 Details of the new plant items and the measured sound pressure levels are summarised in
- 4.9 Table 2 below, and further information can be found on the manufacturer datasheets in Appendix 3. Character corrections were applied as per BS4142 guidance to account for distinguishable acoustic characteristics of each plant item based on observations and data captured during the noise survey; details of the corrections are included in
- 4.10 Table 2.

Table 2 New Roof Plant Details and Measured Sound Pressure Levels

Equipment item	No.	Equipment Model	Measured Plant Noise Emissions		Character corrections applied, dB
			Measurement position	Sound Pressure Level, dB LAeq,T	
Kitchen Extract Fan	1	System Air MUB 062 630 D4 MULTIBOX	0.4m from Exhaust	59	N/A
			0.3m from KEF Box	60	+2 for tonality
			0.3m from Motor casing	64	+6 for tonality
Air Conditioning Units	4	Toshiba Rav GP1401AT-E1	0.3m from centre of unit	62	+2 for tonality

- 4.11 A 3D noise model of the roof and surrounding Station Hill development was constructed based on the existing development design and the roof plant layout. The plant noise items, including existing plant (e.g. existing extract fan), were input to the noise model based on the manufacturer and noise survey data. The sources were calibrated in the model based on the noise survey data for new and existing plant items at each measurement position. The existing plant items were then removed from the noise model to determine the new roof plant emissions in isolation.
- 4.12 The 3D noise model was used to predict noise emissions from new roof plant at the locations of surrounding noise sensitive receptors. The predictions assumed that all plant items were running simultaneously at the maximum operating duty (which is unlikely to occur regularly). The results of the predictions are shown in Appendix 3 and summarised in Table 3 below.

Table 3 Predicted Plant Noise Emissions from New Building - Free-field Levels

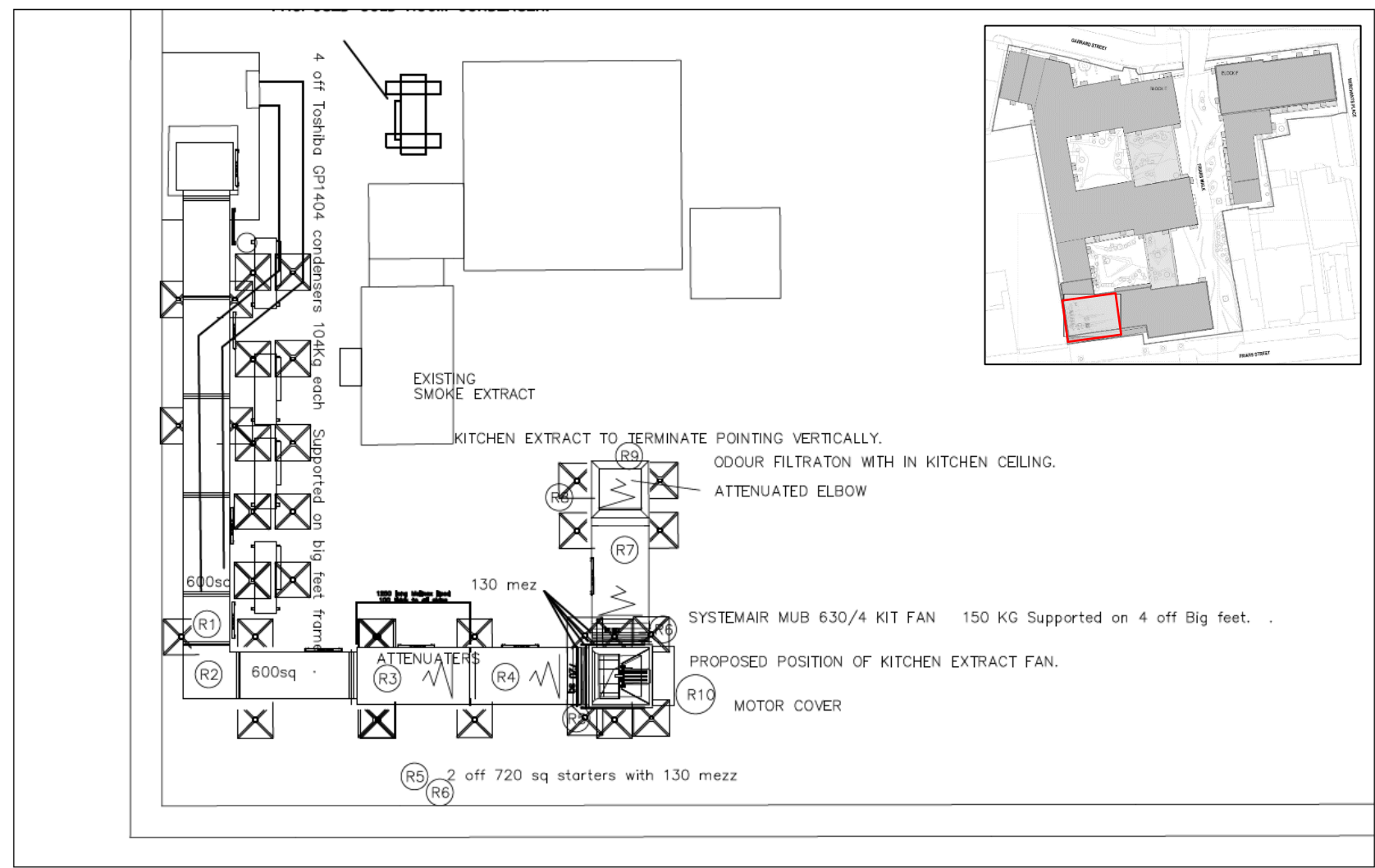
Location	Predicted Plant Noise Levels (dB)	Plant Noise Limits
		Day-time/Evening (0700-2300hrs)
Nearest noise sensitive receptors (rated levels – equal to background)	36 dB LA _r ,Tr	43 dB LA _r ,Tr
Nearest noise sensitive receptors (specific levels – 10dB below background)	34 dB LA _{eq}	33 dB LA _{eq}

- 4.13 It can be seen from Table 3 that the predicted rated plant noise levels at the nearest existing residential properties comply with the daytime rated plant noise limits.
- 4.14 It can be seen from the modelling snips in Appendix 3 and the results in Table 3 that the predicted specific plant noise levels comply with the specific plant noise limit at the nearest residential facades except for in one small area, where a minor exceedance of 1 dB is predicted.
- 4.15 A minor exceedance of 1 dB is considered to be acceptable for the following reasons:
- The area of the residential façade where the criterion is exceeded by 1 dB is very small.
 - The predictions are based on all plant items operating simultaneously at maximum operating duty. This is the worst-case scenario and is unlikely to occur regularly.
 - The predicted rated plant noise levels are significantly below the daytime plant noise limits at the residential facades and are therefore likely to be barely audible.
 - A difference of 1 dB is typically below the limit of human perception and therefore is unlikely to result in an adverse noise impact at the receptors.
- 4.16 The new mechanical roof plant is therefore considered to be compliant with the requirements of Planning Condition 48.
- 4.17 It is our view that this report contains the information required to discharge Planning Condition 48.

5. CONCLUSIONS

- 5.1 Cass Allen has been instructed by Siren Craft Brew Ltd to assess the noise impact of new mechanical roof plant serving the ground floor brewery, Siren Craft Brew, at E1-4 Friar Street in Reading.
- 5.2 The assessment was carried out in accordance with the requirements of Planning Condition 48 attached to the Station Hill development.
- 5.3 The plant noise limits established in the Cass Allen report *Discharge of Planning Condition 48* (RP03-19194-R3, Feb 2023) have been adopted for this assessment.
- 5.4 An attended noise survey was carried out at the site to measure the noise emissions from the new roof plant items.
- 5.5 A 3D noise model of the roof and surrounding Station Hill development was constructed based on the existing development design and the roof plant layout. The noise model was used to predict the specific and rated roof plant noise levels at the nearest noise-sensitive receptors.
- 5.6 The 3D noise model calculations indicate that the resultant noise levels at the noise-sensitive receptors are compliant with the requirements of Planning Condition 48. A minor exceedance of the specific sound level criterion is considered acceptable, as explained in Paragraph 4.15.
- 5.7 It is our view that this report contains the information required to discharge Planning Condition 48.

Appendix 1 Roof Plant Layout



Appendix 2 Survey Results

Survey Summary:

The survey comprised short-term operator attended noise measurements at the site. Noise levels at the site were generally dictated by road traffic on surrounding roads and noise from plant located on the roof of Station Hill residential Block E, associated with Siren Brewery.

Survey Period:

04/07/2024

Survey Objectives:

To measure noise levels from plant associate with the Siren Brewery on the roof of Station Hill.

Equipment Used:

Type	Manufacturer	Model	Serial Number
Sound level meter ¹	NTi Audio	XL2	A2A-15506-E0
Calibrator	Larson Davis	Type CAL200	15011

Note 1: All sound level meters were calibrated before and after measurement periods and no significant drift in calibration was found to have occurred. The results of the measurements are therefore considered to be representative.

Weather Conditions:

The observed weather conditions were acceptable for nearfield acoustic measurement throughout the attended survey periods

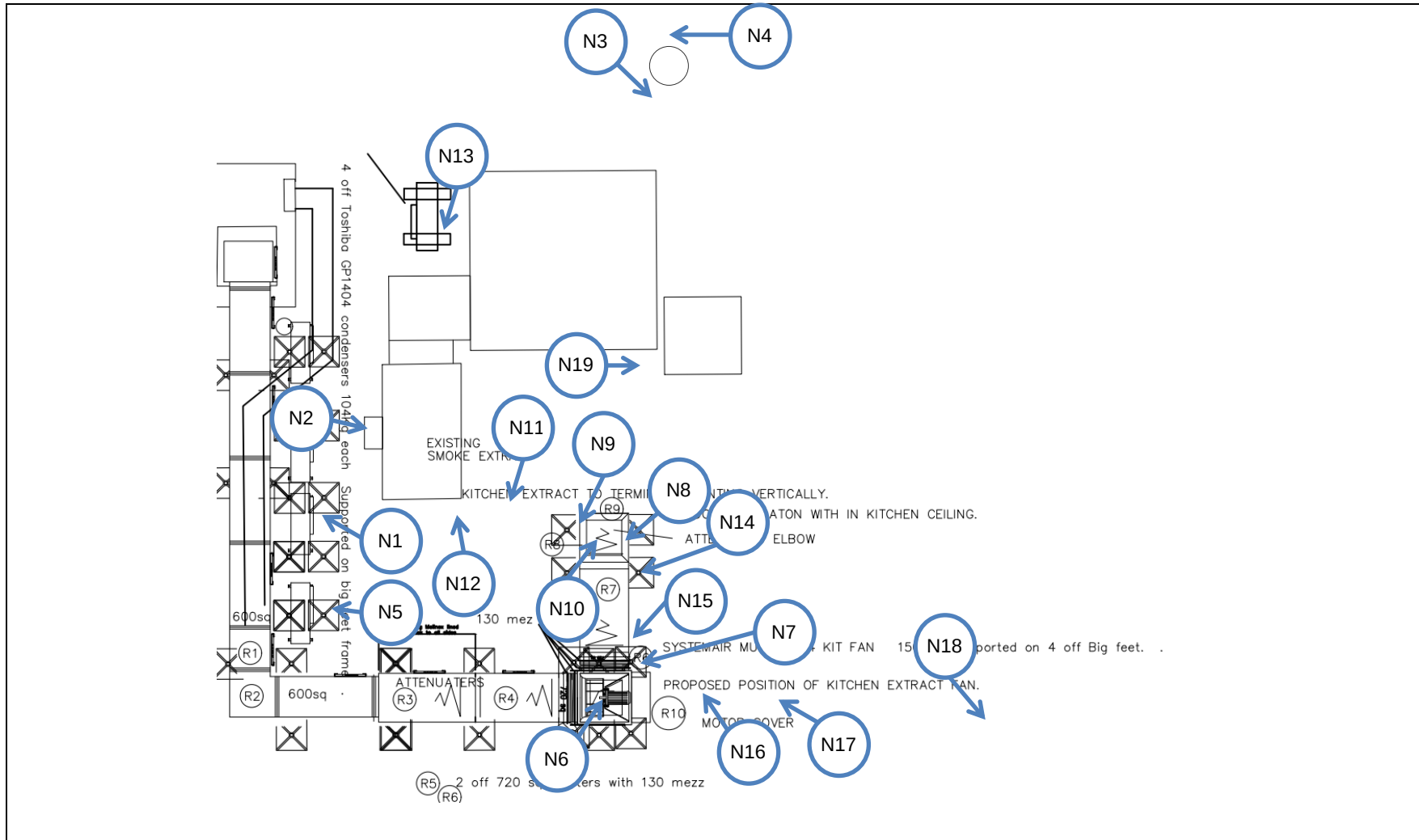
Measurement Positions:

Position (refer plan below)	Description
N1	Attended noise monitoring position. 1.5m above roof level. 0.3m from kitchen AC condenser (2 nd from the left).
N2	Attended noise monitoring position. 1.2m above roof level. 0.3m from smoke extract fan (SEF) control panel/ electrical box.
N3	Attended noise monitoring position. 1.2m above roof level. 0.3m from fresh air intake (FAI) vent.
N4	Attended noise monitoring position. 1.2m above roof level. 0.3m from FAI vent, opposite side to N3.
N5	Attended noise monitoring position. 1.5m above roof level. 0.3m from kitchen AC condenser (1 st on the left).
N6	Attended noise monitoring position. 0.3m above kitchen extract box fan (KEF) top panel.
N7	Attended noise monitoring position. 0.3m from KEF external controls casing circular hole.
N8	Attended noise monitoring position. 0.4m at approx. 30 degrees from KEF exhaust
N9	Attended noise monitoring position. 0.4m at approx. 30 degrees from KEF exhaust, opposite side to N8.
N10	Attended noise monitoring position. Approx. 0.15m from KEF exhaust.

Measurement Positions:

Position (refer plan below)	Description
N11	Attended noise monitoring position. Approx. 0.5m above roof level. 0.3m from KEF ducting, near to SEF.
N12	Attended noise monitoring position. 0.3m at approx. 15 degrees from SEF exhaust.
N13	Attended noise monitoring position. Approx. 0.5m from roof level. 0.3m from single AC condenser unit.
N14	Attended noise monitoring position. 0.3m from KEF exhaust, opposite side to N11.
N15	Attended noise monitoring position. Approx. 0.5m above roof level. 1m from KEF external controls casing circular hole, and 0.3m from duct wall.
N16	Attended noise monitoring position. Approx. 1.2m above roof level. 1m from KEF casing blank panel. No direct line of sight to circular hole.
N17	Attended noise monitoring position. Approx. 1.2m above roof level. 2m from KEF casing blank panel. No direct line of sight to circular hole.
N18	Attended noise monitoring position. Approx. 1.2m above roof level. 4m from KEF casing blank panel. No direct line of sight to circular hole.
N19	Attended noise monitoring position. Near to AOV with direct line of sight to KEF control casing hole.

Site Plan showing Measurement Positions:



Date	Position	Time	Meas. Length	LAeq, dB	LAmx, dB	Observations
04/07/2024	N1	15:38	22 secs	62	66	Kitchen AC barely audible. Max. duty simulated by turning AC fully down. Contaminated by existing smoke and environmental extract fan (SEF) and new kitchen extract fan (KEF).
		15:39	24 secs	60	64	
	N2	15:40	21 secs	63	66	High frequency tonal noise detected from controls box. (At 630Hz and 1.6kHz).
	N3	15:42	21 secs	61	64	Broadband fresh air intake fan noise.
	N4	15:43	21 secs	60	62	
	N5	15:44	21 secs	62	64	Kitchen AC barely audible. Contaminated by SEF and KEF.
	N6	15:51	21 secs	61	64	Distinct tonal noise from KEF box motor.
	N7	15:53	21 secs	62	65	Very distinct tonal noise from KEF motor – 5kHz and 10kHz.
	N8	15:55	21 secs	59	62	Predominantly low frequency noise from fans (63Hz to 200Hz), with some higher frequency tonal noise audible from KEF motor.
	N9	16:00	3 secs	64	66	Lower frequency dominating – 80Hz and 100Hz from KEF box.
	N10	16:01	22 secs	64	67	KEF and SEF broadband noise
	N11	16:03	21 secs	62	64	High frequency tonal noise from KEF motor and low frequency fan noise – 80Hz to 250Hz, and 800Hz to 1.6kHz.
	N12	16:07	21 secs	71	72	Consistent low frequency SEF noise
	N13	16:13	12 secs	62	67	Older single AC unit measurement emitting higher levels of mid-frequency noise, and tonal noise around 630Hz.
	N14	16:16	21 secs	62	64	Measurement of KEF contaminated.
	N15	16:20	21 secs	57	64	Very distinct tonal noise from the KEF casing hole at 5kHz and 10kHz. Low frequency fan noise also present and dictating average sound level.
	N16	16:21	11 secs	57	58	
	N17	16:22	11 secs	59	76	High frequency tonality reduced at 2m, and not perceivable at 4m.
	N18	16:23	11 secs	59	71	
	N19	16:26	17 secs	58	61	Tonal KEF noise clearly perceivable.

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Toshiba Air Conditioning - RAV-GP Data Sheet

RAV-GP1401AT-E Outdoor Unit

Features

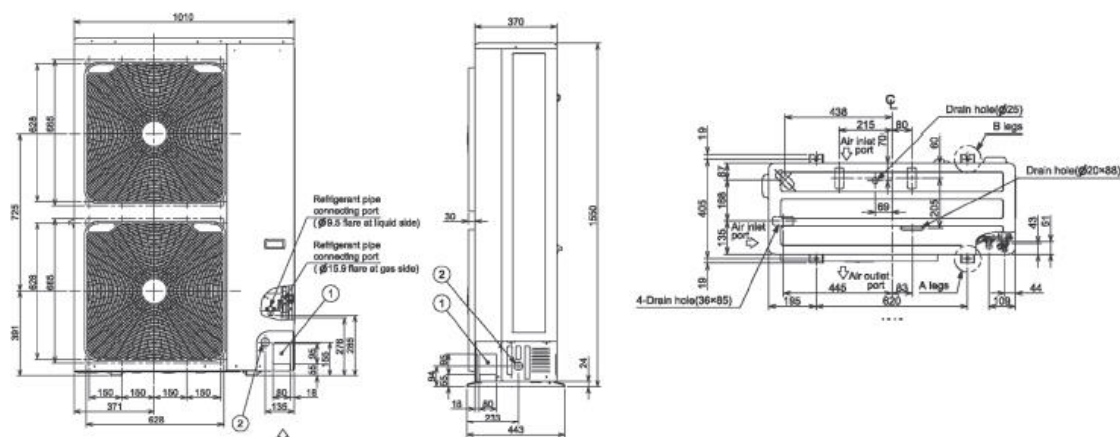
- Redesigned for use with refrigerant R32
- Wide operating range (cooling mode -15°C to +52°C)
- Auto-diagnostic function
- Flexible, can be utilised for single, twin, triple and quad indoor applications
- Compact size



Technical Data

Model reference			RAV-GP1401AT-E
Nominal	Cooling Capacity	kW	12.5
	Heating Capacity	kW	14.0
Operating Range	Cooling/Heating	°C	-15 to 52/-27 to 15
	Air Flow	m³/h - l/s	6960 - 1934
Sound	Pressure High Cooling/Heating	dB(A)	50/51
	Power High Cooling/Heating	dB(A)	67/68
Unit	Height x Width x Depth	mm	1550 x 1010 x 370
	Weight	kg	104
Pipe Connection	Flare Connections (gas - liquid)	inch	5/8 - 3/8
	Min.-Max. Length	m	3-75
	Maximum Height Difference	m	±30
	Drain Port Connection	mm	16
Refrigerant R32	Base Charge/Chargeless Length	kg/m	3.1/30
	Additional Charge Liquid Side	g/m	35
Run Current	Maximum	A	14.55
Power Cable	Outdoor to Indoor		3 core + earth
Power Supply	Suggested Fuse Size	V/ph/Hz-A	220-240/1/50-25

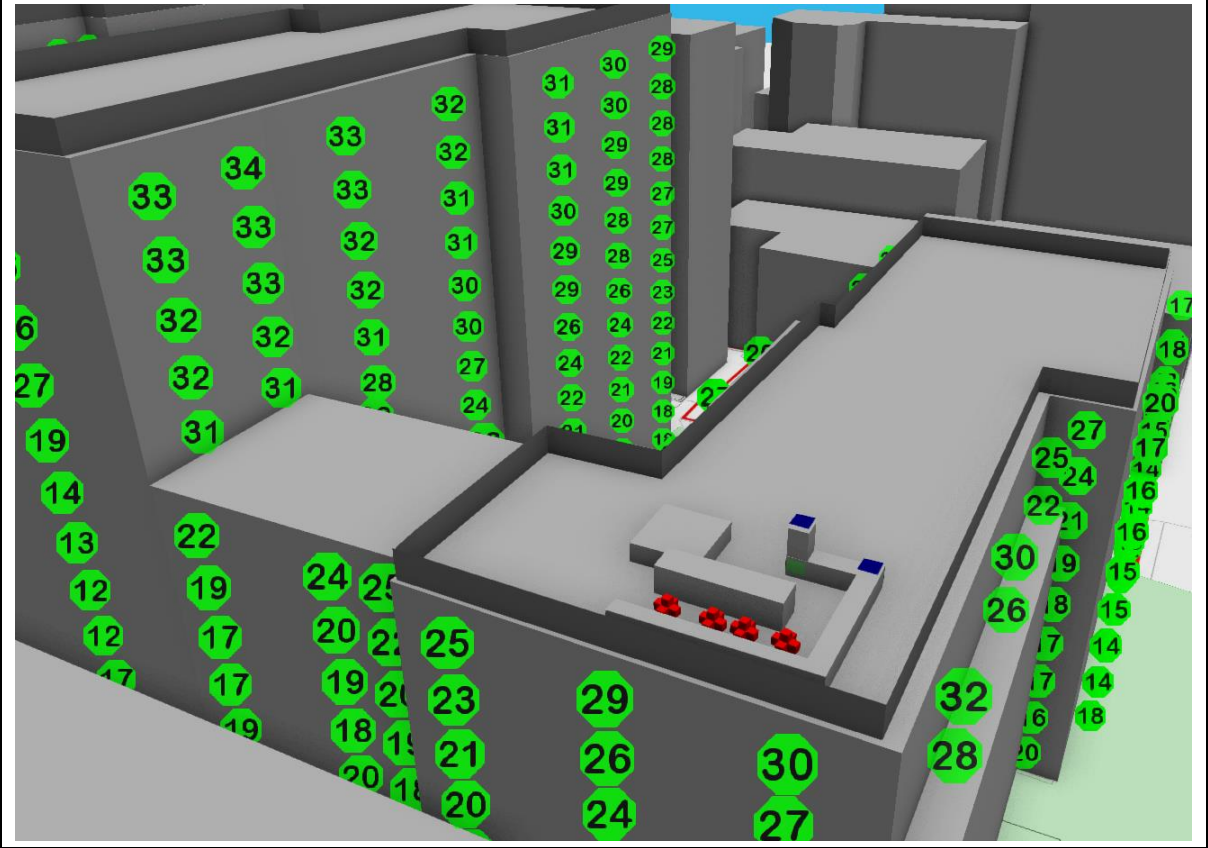
Dimensional Drawings



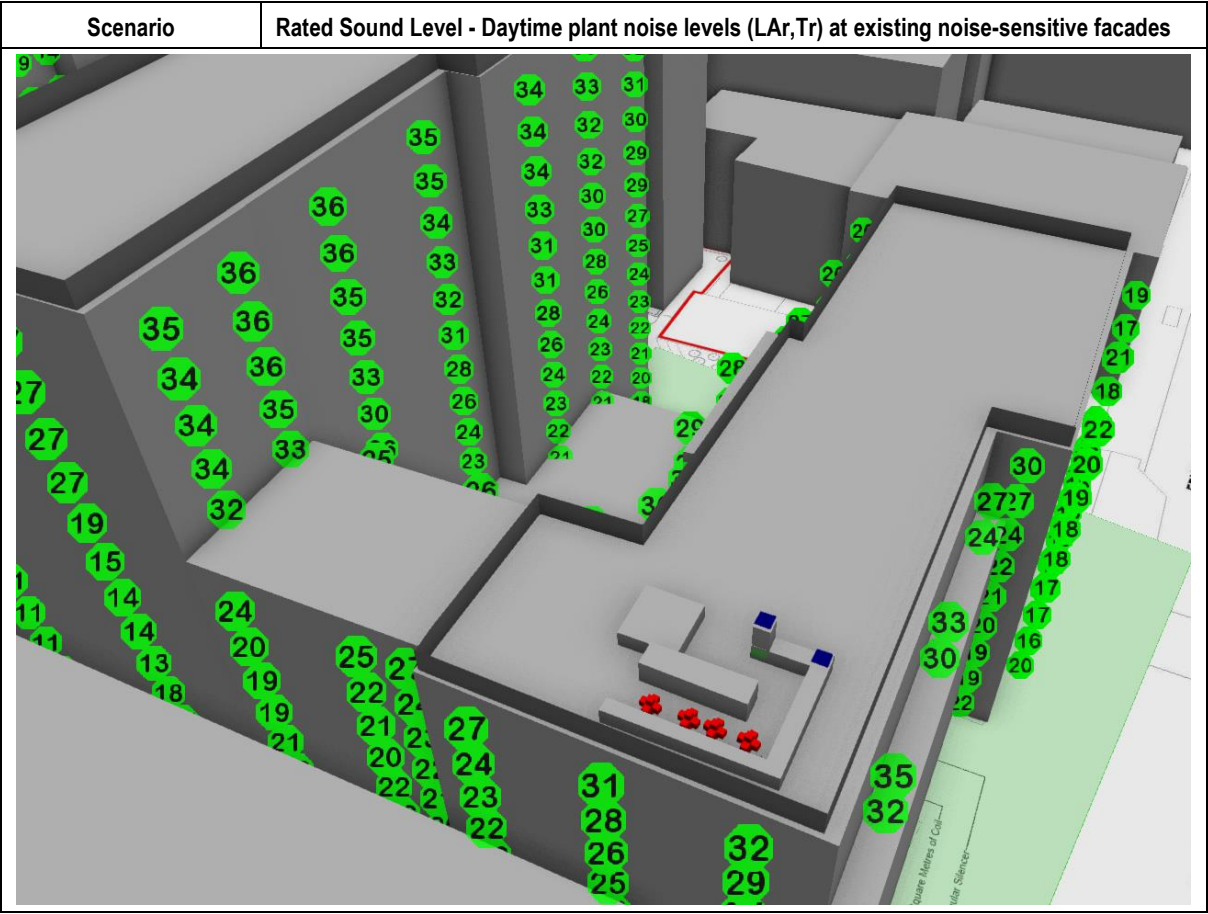
Appendix 4 Modelling Results

Modelling Software:	CADNA/A Version 2024
Modelled Scenarios:	Daytime plant noise emissions at the locations of the nearest noise-sensitive receptors
Data inputs:	- Noise survey results and manufacturer noise data - Project drawings and noise model for Station Hill development - New mechanical roof plant layout
Calculation Algorithms Used:	- ISO 9613-1:1993 Acoustics-Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere - ISO 9613-2:1996 Acoustics-Attenuation of sound during propagation outdoors – Part 2: General method of calculation

Modelling Printout:

Scenario	Specific Sound Level - Daytime plant noise levels (LAeq,T) at existing noise-sensitive facades
	

Modelling Printout:





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