REF: L1190.1 V4

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12th March 2020

RE: STARBUCKS, 11 MONMOUTH St, LONDON
PLANT NOISE ASSESSMENT

Dear Mr Mills,

Following our recent correspondence, we are writing to you with respect to the above project, to provide a summary of a recent noise survey that was carried out at the above site and detailed assessment of noise impact from the selected equipment.

We understand that the site will accommodate the refurbishment of an existing high street shop into a Starbucks coffee shop, which will involve addition of new condensing plant.

We have undertaken a noise survey to establish the pre-development external noise levels during daytime hours.

For assessment of noise impact, we have followed the methodology set out in British Standard 4142:2014 *Method for Rating and Assessing Industrial and Commercial Sound*. This is considered to be the most relevant piece of guidance for the situation and our assessment is described in the following sections.

1.0 BS4142 CRITERIA…

BS4142 presents a method for determining the likelihood of complaints arising from noise levels associated with fixed sources. The procedure set out in the standard involves the comparison of two noise levels at a noise sensitive location, these are,

Rating Noise Level: The level of noise produced by the plant equipment when it has been corrected for tonal and temporal components.

Background Noise Level: The background noise measured as an L_{A90} (the noise exceeded for 90% of the time) when the plant equipment is not operating.

If the plant noise has any distinguishing characteristics such as tonal (e.g. whine, hiss, hum etc) or impulsive components (e.g. bangs, clicks, thumps etc), or if the noise is irregular enough to attract attention, then a penalty is applied depending on the severity of the characteristic.

To assess the likelihood of complaints, the difference between the *Rating Level* and the *Background Sound Level* is calculated. A simple comparison of these levels provides the outcome of the assessment as shown in Table 1.

Level Difference (Rating – Background) dB(A)	Assessment Conclusion
Around +10 or more	Likely to be an indication of a significant adverse impact, depending on the context
Around +5	Likely to be an indication of an adverse impact, depending on the context
Zero or less	Indication of the specific sound source having a low impact, depending on the context

TABLE 1: SUMMARY OF BS4142:2014 ASSESSMENT METHOD

The assessment conclusions are all subject to taking into consideration the context of the ambient noise at the site, the character of the specific noise and the sensitivity of the receptors.

Where the assessment takes place prior to the specific source of noise being installed, it is permitted to predict the noise level at the noise sensitive location.

2.0 OTHER DESIGN CRITERIA…

The assessment has considered The London Plan 2011 (with REMA to The London Plan 2013) and The Mayors Ambient Noise Strategy 2004. The key policies affecting the proposed development are understood to be as follows,

The London Plan Policy 7.15: Reducing Noise and Enhancing Soundscapes
Strategic

A. *The transport, spatial and design policies of this plan will be implemented in order to reduce noise and support the objectives of the Mayor's Ambient Noise Strategy.*

Planning decisions

B. *Development proposals should seek to reduce noise by:*
   a) *Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals*
   b) *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation*
   c) *Promoting new technologies and improved practices to reduce noise at source.*

The above is reiterated in The Ambient Noise Strategy Policy 69.

The assessment has also considered the Camden Local Plan 2017, which prescribes the following targets, *A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).*

In addition, we have also considered BS8233:2014 and the World Health Organisation guidance for noise levels which offer good external amenity. A good standard of external amenity is considered to be 55 dB(A) L_{Aeq} and below.

Furthermore, we would expect neighbouring dwellings to maintain reasonable internal noise levels with windows open for ventilation. The BS8233 guidance for reasonable internal noise during the day within a dwelling is 40 dB(A) L_{Aeq}. We would normally expect 10-15 dB(A) reduction through an open window and hence we would not expect the noise level from new plant equipment to exceed 50 dB(A) L_{Aeq} measured 1 m from the external building façade where there is an opening window.

The most onerous of the available criteria are expected to apply. In this case the assessment has been based on a *Rating Level* of no greater than 10 dB below *Background Sound Level*.

3.0 EXISTING BACKGROUND SOUND LEVELS…

There are no restrictions on the minimum duration of measurement of the *Background Sound Level* in BS4142, albeit to say they should represent the "*Typical*" background level when the new equipment will be in operation.

We have based our assessment on the equipment operating during the daytime only (07:00-23:00).

A survey of the pre-development noise environment was undertaken as part of the assessment, in a location which is representative of the pre-development *Background Sound Levels* at the nearest neighbouring properties.

The microphone was pole mounted to first floor level to within approximately 2 m of a reflecting plane. We have considered this to be façade level conditions.

These measurements have been carried out continuously with a logging period of 2 seconds.

The background and ambient sound at site are dominated by existing building services plant and road traffic.

For our assessment at the nearest noise sensitive neighbour, the most commonly measured *Background Sound Level* of 52 dB(A) L_{A90} has been used to represent the day period at façade level.

We have assessed the uncertainty associated with the measurement of the background sound level based on the measurement tolerance of a Class 1 sound level meter which conforms with IEC61672-1:2002. The typical uncertainty based on the frequency spectrum of road traffic noise on the measured background level is ±1 dB(A). We have included the uncertainty in our assessment.

Taking into consideration the measured levels, tolerances and corrections, and the uncertainty, the *Background Sound Level* used in our assessment is 51 dB(A) L_{A90} at façade level.

4.0 PROPOSED PLANT EQUIPMENT…

We understand that the proposed scheme includes 2 No condenser units installed within a small courtyard to the rear of the building. It is understood that these units will only operate during hours previously specified.

The proposed locations of the equipment are indicated on a marked-up plan included in the appendix to this letter.

The sound output data, available from the manufacturer for the proposed equipment is summarised in Table 2.

Ref	Make/Model	No Off	Sound Power Level (dB re 1 pW) 1/1 Octave Band Centre Frequencies (Hz)								A
			63	125	250	500	1k	2k	4k	8k	
COND 1	Toshiba RAV-GM1401ATP-E (Heating) {Note 1}	1	75	73	74	71	70	66	60	50	74
COND 2	Toshiba RAV-GM1101ATP-E (Heating) {Note 1}	1	76	77	75	72	69	65	58	51	74

TABLE 2: ESTIMATED SOUND POWER OF INSTALLED EQUIPMENT

{Note 1} For input to the modelling calculations the sound pressure data provided by the manufacturers has been approximately converted into a sound power level by correcting the sound pressure spectrum to match the A-weighted sound power level.

It is understood that an independent noise control specialist (Noico Ltd) has been appointed to design and build a bespoke enclosure system to reduce noise breakout. The insertion loss performance data of the proposed enclosure is summarised in Table 3. It should be noted that this is considered to be the absolute maximum reduction achievable given the limited space.

Ref	Attenuator	Insertion Loss Performance (dB) 1/1 Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Intake	Noico (Bespoke)	-7	-10	-16	-29	-44	-40	-29	-22
Exhaust		-7	-10	-14	-25	-33	-30	-25	-22

TABLE 3: ENCLOSURE INSERTION LOSS PERFORMANCE DATA

The Toshiba data does not differentiate the noise output levels of the intake and exhaust sections separately. We have therefore taken the overall level of both units within the enclosure and shared the total noise equally between the intake and exhaust.

5.0 SPECIFIC NOISE LEVEL…

We have modelled the propagation of sound from the plant equipment using the method described in ISO 9613-2. Further details of the calculation and methodology are given in the appendix.

The plant is located in a built-up urban area. It was therefore difficult to identify which of the nearby buildings were residential in nature. We have used one assessment location to represent the closest sensitive location as follows.

1. Receiver No 1. Most exposed (assumed) residential property at the Southern elevation overlooking the proposed plant location. The exact address in unknown. The assessment location is at first floor level at 1 m from the building façade.

The distance between the nearest source location and the receiver has been estimated using architectural drawings. The distance from the nearest building to each noise sensitive receiver is approximately 3 m.

The calculated *Rating Level* of the proposed equipment at the assessment location is 42 dB(A) L_{Aeq} 1 m from the façade of the receptor. The calculation of this value is described in more detail in the appendix.

The comparison of these noise levels against the target values, and the resulting conclusions are summarised in Table 4.

Survey Location	Period	Background Sound Level dB(A) L_{A90}	Predicted Rating Level dB(A) L_{Aeq}	Difference Rating - BG dB(A)	BS4142 Conclusion
1	Day 07:00 to 20:30	51 (52±1) (Façade)	42	-9	Low impact

TABLE 4: SUMMARY OF PREDICTED RATING NOISE LEVELS AT RECEIVER 1

The BS4142 outcome is that the noise level is an "*indication of the specific sound source having a low impact, depending on the context*". However, the expected noise levels from the proposed equipment are expected to fall marginally short of the local authority's noise targets during the day.

We have not included a correction for temporal or tonal components. This is considered a reasonable approach on the basis that all the equipment is new and will be installed correctly in accordance with the manufacturer's instructions. Should it transpire that the equipment has an undesirable acoustic characteristic, a penalty would be applied as described in BS4142 dependent on the prominence of the features.

6.0 CONCLUSIONS IN CONTEXT…

The context of the site is an urban location where noise levels generally consist of existing building services plant and road traffic noise.

The proposed mechanical plant is industrial in nature and would not generally be expected to be noticeable in this type of location during the day time hours of operation.

We are of the opinion that a target level that is 10 dB below that of the *Background Sound Level* is an onerous approach for the installation of the proposed plant.

As previously noted, it was observed on site that the surrounding buildings hosted multiple items of unattenuated condensing plant and air extraction units, which almost entirely dictates the ambient noise level. It is for this reason we believe a result of 9 dB below *Background Sound Level* to be acceptable.

It should be noted that it is commonly accepted that the onset of perception of change in loudness occurs at approximately +/- 3 dB. A 1 dB shortfall is therefore considered negligible.

7.0 EFFECTS OF UNCERTAINTY…

Where available we have included uncertainty in our calculations.

We have included the uncertainty in the measured values of *Background Sound Level*.

There are other sources of uncertainty in our assessment, such as, tolerances to be applied to manufacturers data, the variation in *Background Sound Level* on a different day, and the calculation tolerances for the propagation model.

The survey of the *Background Sound Level* has been undertaken in full accordance with BS7445 and ANC Green Book Guidance using laboratory calibrated measurement equipment. These precautions will minimise sources of uncertainty in the survey data. The current site conditions exhibit a low variability in the ambient and background sound levels and our data is considered to be a good representation of the site.

We do not expect the effects of uncertainty to have a significant effect on the outcome of our assessment.

8.0 ASSESSMENT CONCLUSION…

We have undertaken an assessment of the proposed new fixed building plant against the methodology set out in BS4142:2014 and to assess compliance with the local authority planning and requirements.

We have estimated the likely noise levels at the neighbouring property based on manufacturer's data, using a standard noise propagation and mapping tools.

Our assessment has concluded that the equipment will cause a low impact when assessed against the relevant standards, though marginally short of local authority targets. We are of the opinion that a shortfall of 1 dB is acceptable when maximising realistic noise control approaches.

I trust you find this assessment provides suitable information for consideration by the local authority. Please don't hesitate to contact me if you require anything further.

Yours sincerely,
For Red Twin Limited

Gavyn Bache

Gavyn Bache B.Sc.(Hons) PgD MIOA
Senior Consultant

RED TWIN LIMITED
Consultants in Acoustics

APPENDIX A – SITE PLANS…

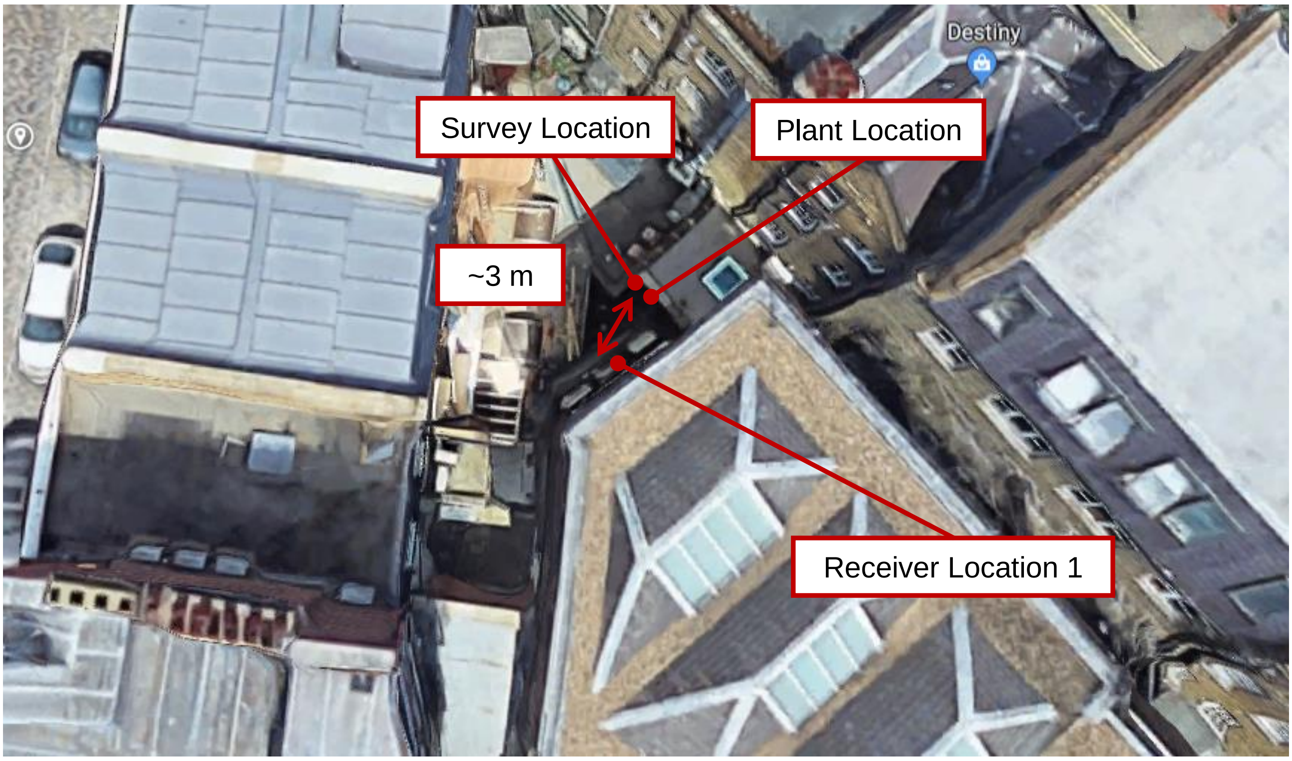


FIGURE 1: AERIAL VIEW OF SITE (NOT TO SCALE)

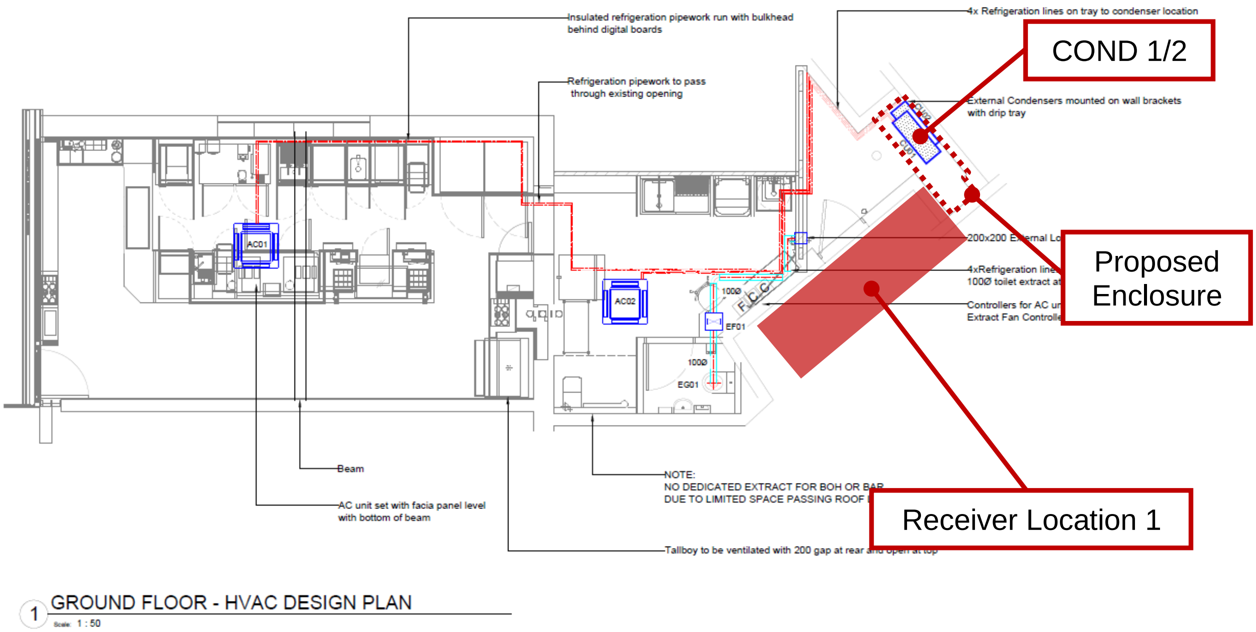


FIGURE 2: PROPOSED PLANT LAYOUT (NOT TO SCALE)

APPENDIX B – NOISE SURVEY DETAILS…

Address:
11 Monmouth St, London, WC2H 9EQ

Date
Monday 2nd December and Tuesday 3rd December 2019

Measurement Locations

1. The microphone location was situated c. 1-2 m from the Northern façade of the nearest building assumed to be residential. The microphone was pole mounted at c. 5 m above the ground.

Personnel
The survey was set up and left unattended by Gavyn Bache of Red Twin Limited.

Equipment
Brüel & Kjær 2250 hand held analyser, serial No 2832395 with a Bruel & Kjaer Type 4189 Microphone, serial No 3005055. The microphone was fitted with a UA-1404 windshield. The hand-held analyser, microphone and calibrator were laboratory calibrated on 28th February 2018 (Certificate No. U27914). The hand-held analyser calibration was checked before and after the measurements using the calibrator and a drift of 0.22 dB was observed during the survey which is not significant and no adjustments to the measurements have been made to the data.

Weather
The weather was suitable for noise measurement and was in accordance with BS7445 and ANC Green Book Guidelines throughout the survey period. Wind speed and direction was indiscernible due to coverage from the surrounding buildings.

Results
The survey measurements are summarised in the following table. Other parameters can be calculated from the data and the full data set is available upon request. Note, the data highlighted in red is irrelevant to the assessment.

Survey Comments
The background and ambient sound at site are dominated by road traffic and existing building services plant.

Location	Start Time	Duration	Parameter dB(A)			
			L_{AFmax}	L_{Aeq}	L_{A10}	L_{A90}
1	15:06:42	00:53:18	81	58	58	52
	16:00:00	01:00:00	83	55	55	52
	17:00:00	01:00:00	75	54	54	52
	18:00:00	01:00:00	77	54	54	52
	19:00:00	01:00:00	69	52	53	52
	20:00:00	01:00:00	75	57	57	54
	21:00:00	01:00:00	69	56	57	49
	22:00:00	01:00:00	64	49	50	48
	23:00:00	01:00:00	63	48	49	46
	00:00:00	01:00:00	66	48	49	45
	01:00:00	01:00:00	59	46	47	45
	02:00:00	01:00:00	55	46	47	44
	03:00:00	01:00:00	66	46	47	44
	04:00:00	01:00:00	54	46	47	44
	05:00:00	01:00:00	62	47	48	44
	06:00:00	01:00:00	72	51	51	48
	07:00:00	01:00:00	66	50	51	48
	08:00:00	01:00:00	63	51	52	50
	09:00:00	01:00:00	84	55	56	50
	10:00:00	01:00:00	74	56	56	53
	11:00:00	01:00:00	83	60	59	53
	12:00:00	00:01:08	75	63	67	57
Total	**15:06:42**	**11:54:26**	**84**	**56**	**56** {Note 1}	**52** {Note 1}

TABLE 5: MEASURED NOISE DATA – LOCATION 1 (FAÇADE LEVEL)

{Note 1} Most common.

FIGURE 3: PHOTOGRAPH OF SURVEY LOCATION 1 LOOKING DUE SOUTH (UPWARDS)

APPENDIX C – CALCULATION OF RATING LEVEL…

The noise output characteristics have been provided by the manufacturer. The attenuation corrections have been based on ISO 9613 *Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method Of Calculation*.

Description	1/1 Octave Band Centre Frequencies (Hz)								dB(A)
	63	125	250	500	1000	2000	4000	8000	
Enclosure Intake	76	75	75	72	70	66	59	51	74
Geometric Divergence -20xlog10(r)-11	-21	-21	-21	-21	-21	-21	-21	-21	-21
Floor Reflection (Source)	3	3	3	3	3	3	3	3	3
Wall Reflection (Source)	0	0	0	0	0	0	0	0	0
Floor Reflection (Receiver)	3	3	3	3	3	3	3	3	3
Directivity Attenuation	Not Included								
Atmospheric Attenuation	Not Included								
Ground Effect	Not Included								
Screening Attenuation	0	0	0	0	0	0	0	0	--
Mechanical Attenuation	0	0	0	0	0	0	0	0	--
Additional Mechanical Attenuation	-7	-10	-16	-29	-44	-40	-29	-22	--
Specific Noise Level (dB)	54	51	44	28	11	11	16	14	39
Correction for Tonality or Temporal Characteristics (dB)	0	0	0	0	0	0	0	0	0
Rating Level (dB)	**54**	**51**	**44**	**28**	**11**	**11**	**16**	**14**	**39**

TABLE 6: CALCULATION OF RATING NOISE LEVEL AT LOCATION NO 1 DUE TO ENCLOSURE INTAKE

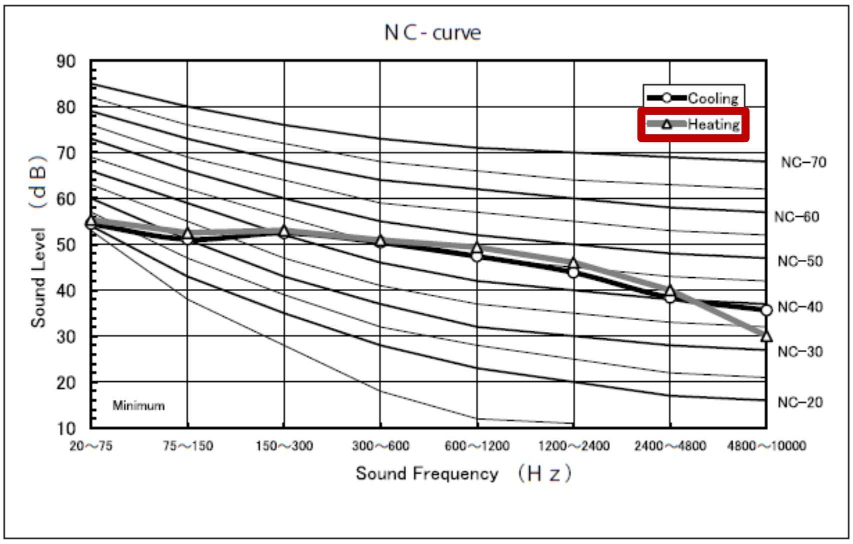
Description	1/1 Octave Band Centre Frequencies (Hz)								dB(A)
	63	125	250	500	1000	2000	4000	8000	
Enclosure Exhaust	76	75	75	72	70	66	59	51	74
Geometric Divergence -20xlog10(r)-11	-21	-21	-21	-21	-21	-21	-21	-21	-21
Floor Reflection (Source)	3	3	3	3	3	3	3	3	3
Wall Reflection (Source)	0	0	0	0	0	0	0	0	0
Floor Reflection (Receiver)	3	3	3	3	3	3	3	3	3
Directivity Attenuation	Not Included								
Atmospheric Attenuation	Not Included								
Ground Effect	Not Included								
Screening Attenuation	0	0	0	0	0	0	0	0	--
Mechanical Attenuation	0	0	0	0	0	0	0	0	--
Additional Mechanical Attenuation	-7	-10	-14	-25	-33	-30	-25	-22	--
Specific Noise Level (dB)	54	51	46	32	22	21	20	14	40
Correction for Tonality or Temporal Characteristics (dB)	0	0	0	0	0	0	0	0	0
Rating Level (dB)	**54**	**51**	**46**	**32**	**22**	**21**	**20**	**14**	**40**

TABLE 7: CALCULATION OF RATING NOISE LEVEL AT LOCATION NO 1 DUE TO ENCLOSURE EXHAUST

APPENDIX D – MANUFACTURERS DATA…

RAV-GM1101ATP-E/TR (*ATJP-E)

Measured point	Specification (dB) Cooling	Specification (dB) Heating
Horizontal 1.0 m	54	57



RAV-GM1401ATP-E/TR (*ATJP-E)

Measured point	Specification (dB) Cooling
Horizontal 1.0 m	55

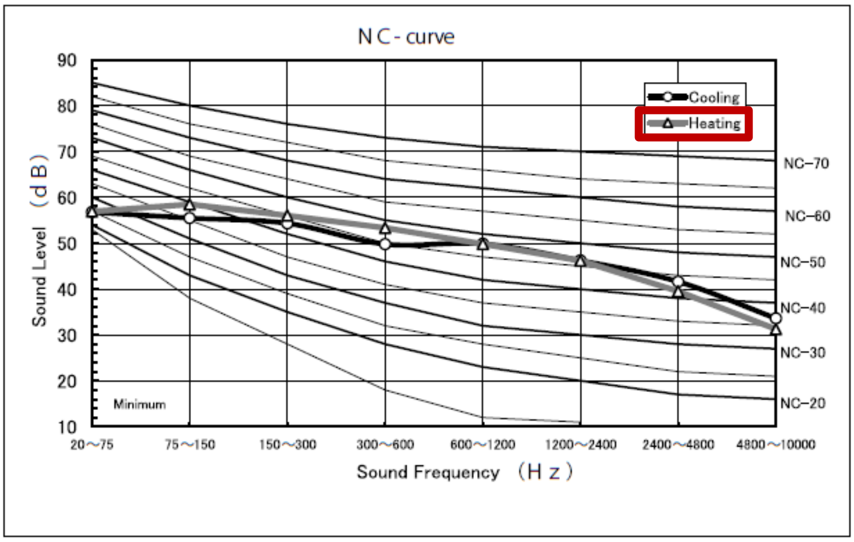


FIGURE 4: COND 1/2 SOUND PRESSURE DATA

RED TWIN LIMITED
Consultants in Acoustics

TOSHIBA Leading Innovation

6. Preliminary Specifications 4-Way Cassette (subject to change)

Model		RAV-RM561UTP-E	RAV-RM801UTP-E	RAV-RM1101UTP-E	RAV-RM1401UTP-E	RAV-RM1101UTP-E	RAV-RM1401UTP-E
	Outdoor unit	RAV-GM561ATP-E	RAV-GM801ATP-E	RAV-GM1101ATP-E	RAV-GM1401ATP-E	RAV-GM1101AT8P-E	RAV-GM1401AT8P-E
Cooling capacity	(kW)	5.0 < 1.5 - 5.6 >	6.7 < 1.5 - 8.0 >	9.5 < 3.0 - 11.2 >	12.0 < 3.0 - 13.2 >	9.5 < 3.0 - 11.2 >	12.0 < 3.0 - 13.2 >
Heating capacity	(kW)	5.3 < 1.5 - 6.3 >	7.7 < 1.5 - 9.0 >	11.2 < 3.0 - 13.0 >	13.0 < 3.0 - 16.0 >	11.2 < 3.0 - 13.0 >	13.0 < 3.0 - 16.0 >
Power supply			1 phase 220V-240V/50Hz, 1phase 220V/60Hz			3 phase 380V-415V/50Hz, 3phase 380V/60Hz	
Cooling	Running current (A)	7.31 - 6.70	10.4 - 9.54	13.95-12.75	20.75-19.00	4.65-4.25	6.90-6.35
	Power consumption (kW)	1.56	2.22	2.87	3.57	2.87	3.57
	Power factor (%)	97	97	94	94	94	94
	EER	3.21	3.02	3.31	2.80	3.31	2.80
Heating	Running current (A)	6.37 - 5.84	9.98 - 9.15	14.20-13.00	16.65-15.30	4.75-4.35	5.50-5.10
	Power consumption (kW)	1.36	2.13	2.93	3.46	2.93	3.46
	Power factor (%)	97	97	94	94	94	94
	COP	3.90	3.62	3.82	3.76	3.82	3.76
Maximum current	(A)	15.5	15.5	22.8	22.8	14.1	14.1
Indoor unit							
Appearance	Main unit	Zinc hot dipping steel plate					
	Ceiling panel – Model	RBC-U31PGPW-E , RBC-U31PGSPW-E					
	Ceiling panel – Panel colour	W:Moon-white(2.5GY 9.0/0.5)					
Outer dimension	Main unit – Height (mm)	256		319			
	Main unit – Width (mm)	840					
	Main unit – Depth (mm)	840					
	Ceiling panel – Height (mm)	30					
	Ceiling panel – Width (mm)	950					
	Ceiling panel – Depth (mm)	950					
Total weight	Main unit (kg)	20		24			
	Ceiling panel	4.2					
Fan unit	Fan	Turbo fan					
	Air flow H/M/L (m3/h)	1050/870/780	1230/960/810	2010/1440/1170	2100/1440/1230	2010/1440/1170	2100/1440/1230
	Motor (W)	14	20	68	72	68	72
Air filter		Standard filter (Long life filter)					
Sound pressure level	H/M/L (dB)	32/29/28	35/31/28	43/38/33	44/38/34	43/38/33	44/38/34
Sound power level	H/M/L (dB)	47/44/43	50/46/43	58/53/48	59/53/49	58/53/48	59/53/49
Connecting pipe drain port		VP25					
Outdoor unit							
Air Flow	(m3/h)	2,400	2,700	4,080	4,200	4,080	4,200
Outer dimension	Height (mm)	550		890		890	
	Width (mm)	780		900		900	
	Depth (mm)	290		320		320	
Total weight	Main unit (kg)	40	44	68		69	
Pipe	Min. length (m)	5					
	Max. total length (m)	30		50		50	
Flare Connections	Gas side (mm)	12.7	15.9				
	Liquid side (mm)	6.4	9.5				
Sound pressure	Cooling/Heating (dB)	46/48	48/52	54/57	55/57	54/57	55/57
Sound power	Cooling/Heating (dB)	63/65	65/69	70/74	70/74	70/74	70/74
Operating Range	Cooling (°C)	-15/46					
	Heating (°C)	-15/15					

FIGURE 5: COND 1/2 SOUND POWER DATA

NOICO NOISE CONTROL

'Quietly'
Celebrating over
30 Years
of Success

Founded in 1986

Noico Limited
Landmark House
Station Road
Hook
Hampshire RG27 9HA

Tel: 01256 766207
Email: sales@noico.co.uk
Web site: www.noico.co.uk

Designbrook Ltd
Unit 12, Indigo House
Mulberry Business Park
Wokingham, RG41 2GY

Date: 4th March 2020
Ref: 1912011-6

For the attention of Jeremy Mills

Dear Sirs

Re: Starbucks Monmouth Street

Further to your enquiry, our subsequent discussions and recent visit to the above referenced project site, after careful consideration and assessment, we are pleased to outline below our quotation and specification for your consideration.

It should be noted that the isolation switches serving the condensing units will require relocating from their current position (by others, not Noico Ltd).

Please note: a part of the enclosure forming the intake air path will obstruct/block light through part of a window above the guttering (located to the right of the condensing units as you face them).

Due to limited space availability around the plant and limitations of the plant being able to overcome external resistance, the amount of attenuation achievable is limited. Our calculations show that the very best that can be anticipated of our enclosure is a noise reduction in the region of 20dB(A). The pressure loss imposed by our enclosure, based upon both items of plant running in unison at 100% capacity, is 16pa.

Our current intake and exhaust attenuator selections have been tested to provide the following insertion loss (dB) levels which we suggest you forward to Red Twin for comment:

Frequency (Hz):	63	125	250	500	1k	2k	4k	8k
Intake:	07	10	16	29	44	40	29	22
Exhaust:	07	10	14	25	33	30	25	22

Scope of Work

Supply and installation of 1 no. acoustic enclosure, located within the rear courtyard at the above referenced project site. The enclosure shall be constructed from Noico 50mm deep acoustic panel-work, 900mm long intake splitters and 600mm long discharge splitters. An RSA/box section frame will support the enclosure and is to be affixed to adjoining walls. Internal plenum plates are to separate intake air from discharge. The discharge splitters/assembly shall be removable/demountable for service access to the plant contained within.

The inlet splitters/attenuation will be located above the condensing units and will terminate just below the coping stone.

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FIGURE 6: ENCLOSURE INSERTION LOSS DATA