Acoustic Assessment of Proposed New Mechanical Services Equipment

287 Camden High Street, London

Client: Diverse Dining

Report Reference: 221018-R001

Date: 23rd November 2022

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CONTENTS

0. SUMMARY

0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of proposed new mechanical services equipment to be installed at 287 Camden High Street, London.

0.2. The assessment is required to provide evidence that noise emissions from the equipment will not be detrimental to the amenity of nearby noise-sensitive properties and complies with the Local Authority's requirements for such a development.

0.3. A survey has been carried out in the vicinity to establish existing background sound levels. The background sound levels during the most sensitive time of the proposed operating hours are LA90 50dB at the monitoring position and 47dB overnight.

0.4. The most significant residential noise-sensitive receptors (NSRs) have been assessed as the second-floor windows at the rear of 285 Camden High Street (NSR1) and the front of 248 Camden High Street (NSR2).

0.5. Calculations using manufacturers' sound level data for the new equipment, allowing for the recommendations as set out in this report, confirm that the sound level from the new equipment at the receptor is less than the criteria of LAeq 40dB at the receptor during the day and LAeq 37dB at the receptor overnight.

0.6. Noise from the proposed new equipment will not be disturbing or detrimental to the amenity of any nearby residential occupants and complies with the planning requirements of London Borough of Camden Council.

1. INTRODUCTION

New mechanical equipment is to be installed at 287 Camden High Street, London.

ACA Acoustics Limited has been commissioned to carry out an assessment of noise emissions from the proposed mechanical plant and, where necessary, make recommendation to reduce sound levels to ensure that the amenity of nearby noise-sensitive properties is not compromised.

This report presents results of the assessment.

2. ACOUSTIC CRITERIA

London Borough of Camden Council's policies relating to noise are set out in Appendix 3 of the Local Plan, which provides detailed noise thresholds to determine the potential acoustic impact of new developments.

In Summary, London Borough of Camden requires an assessment to be carried out in accordance with British Standard 4142:2014+A1:2019.

The scope of BS 4142:2014+A1:2019 advises that "*this British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature … to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*". BS 4142:2014+A1:2019 is commonly used to assess the potential for loss of amenity due to noise from mechanical services equipment and is considered appropriate for this application.

The assessment method of BS 4142:2014+A1:2019 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more intrusive to obtain a rating level. This rating level is compared against the prevailing background sound level outside the noise-sensitive property. Section 11 of BS 4142:2014+A1:2019 provides a commentary of the assessment result and advises that:

a) *Typically, the greater this difference* [between the rating level and the background sound level]*, the greater the magnitude of the impact.*
b) *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c) *A difference of around +5dB 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.

Rather than use the assessment of the impacts from the Standard, Camden requires that the calculated rating level is compared against noise-related conditions set out in Table C of the Appendix, as shown in Table 1 below:

Existing Noise Sensitive Receptor	**Assessment Location**	**Design Period**	**LOAEL (Green)**	**LOAEL to SOAEL (Amber)**	**SOAEL (Red)**
Dwellings	Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day	Rating level 10dB below background	Rating level between 9dB below and 5dB above background	Rating level greater than 5dB above background
Dwellings	Outside bedroom window (façade)	Night	Rating level 10dB below background and no events exceeding 57dB LAmax	Rating level between 9dB below and 5dB above background or noise events between 57dB and 88dB LAmax	Rating level greater than 5dB above background and/or events exceeding 88dB LAmax

Table 1: London Borough of Camden Noise Limits

The terms "LOAEL" and "SOAEL" are defined as the "Lowest Observed Adverse Effect Level" and "Significant Observed Adverse Effect Level" in the Planning Practice Guidance – Noise (PPG-N) and Noise Policy Statement for England (NPSE). The NPSE and PPG-N both require that significant adverse impacts are avoided and that where the impact lies somewhere between the LOAEL and SOAEL all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life, whilst considering the guiding principles of sustainable development as set out in the National Planning Policy Framework.

Assessment result criteria shown within Appendix A of Camden's Local Plan are more stringent than those set out in the British Standard and can therefore be taken to ensure a robust assessment. Compliance with the "Green" criteria or lower half of the "Amber" range will generally ensure no loss of amenity to nearby residents.

3. REVIEW OF SITE LOCATION

New mechanical equipment, comprising of a supply and two extract fans as well as four air conditioning condensers and two catering condensers, is being installed on the flat roof to the rear of the premises. The nearest residential windows are the second-floor windows at the rear of 285 Camden High Street (NSR1) and the front of 248 Camden High Street (NSR2).

Figure 1 below shows the location of the proposed equipment within the site.

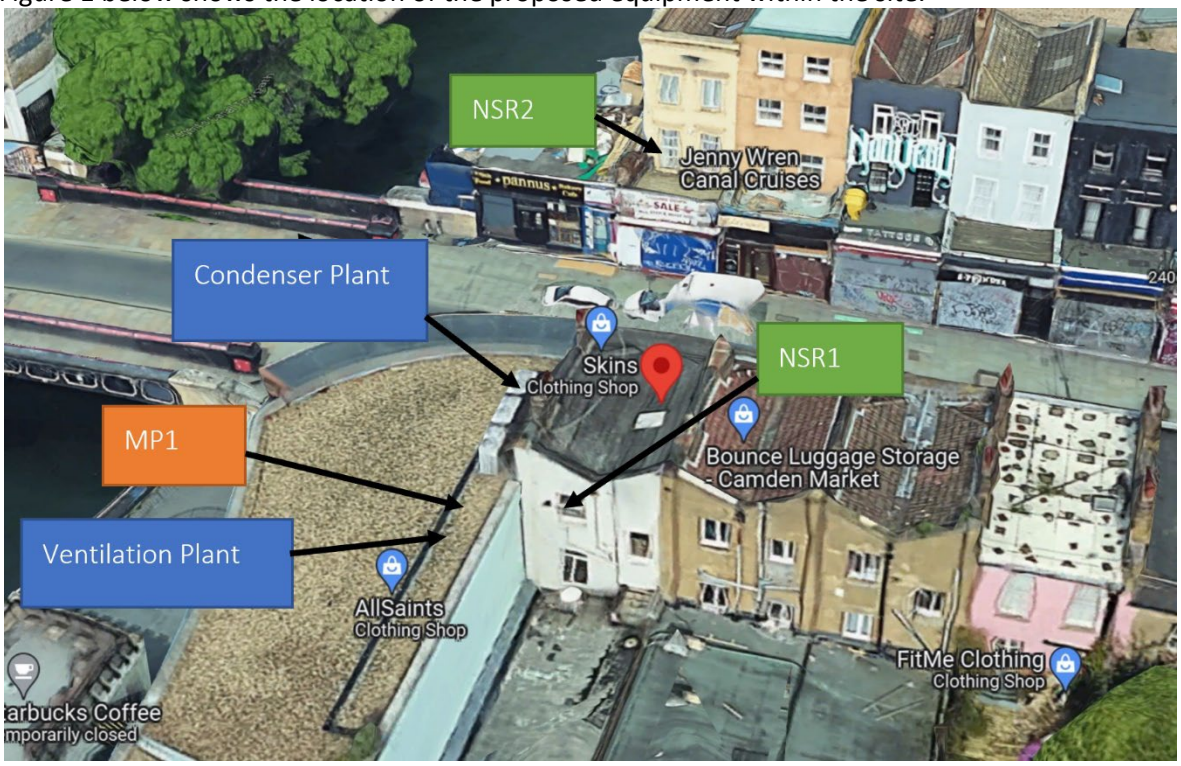


Figure 1: Satellite image showing equipment location and most noise-sensitive receptor

Proposed operating times of the equipment are understood to be between the hours of 11:00 – 00:00. However the two catering condensers have the potential to run 24/7.

4. SOUND LEVEL SURVEY

To assess sound levels from the new mechanical equipment, it is necessary to establish the representative background sound levels in the vicinity during the proposed plant operating times.

The background sound level was measured via an unattended survey at the position indicated in Figure 1 above (MP1). This position is assessed as being representative of the NSR1 and NSR2 receptors. The survey was conducted between the 7th and 8th November 2022.

During the survey, the acoustic environment at MP1 was varied and loud. Human generated noise - from both the High Street and the pubs over the water - road traffic and water noise from the lock were the primary contributors, along with third party plant. The most intrusive third-party plant was identified as the fan ducted to roof level to the South East.

The following equipment was used during the survey; the sound level meter was calibrated before the survey and checked after with no deviation noted.

Equipment	Serial Number
Svantek Class 1 sound level meter type SVAN 971, complete with MOLES weatherproof and lockable outdoor environmental kit	84045
Svantek calibrator type SV33B. Compliant to IEC 60942:2017	122245

Table 2: Equipment used

Weather conditions at the time of setting up the survey consisted of a muggy, overcast atmosphere with spells of light rain. The periods of rain have been discounted from the assessment and are not expected to have had any impact on the background level. Weather conditions have been reviewed at www.worldweatheronline.com, using the closest available commercial weather station. The extended nature of the survey ensures that a reasonable sample of results have been recorded with appropriate weather conditions. Meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

Results of the survey are shown in Figure 2 below.

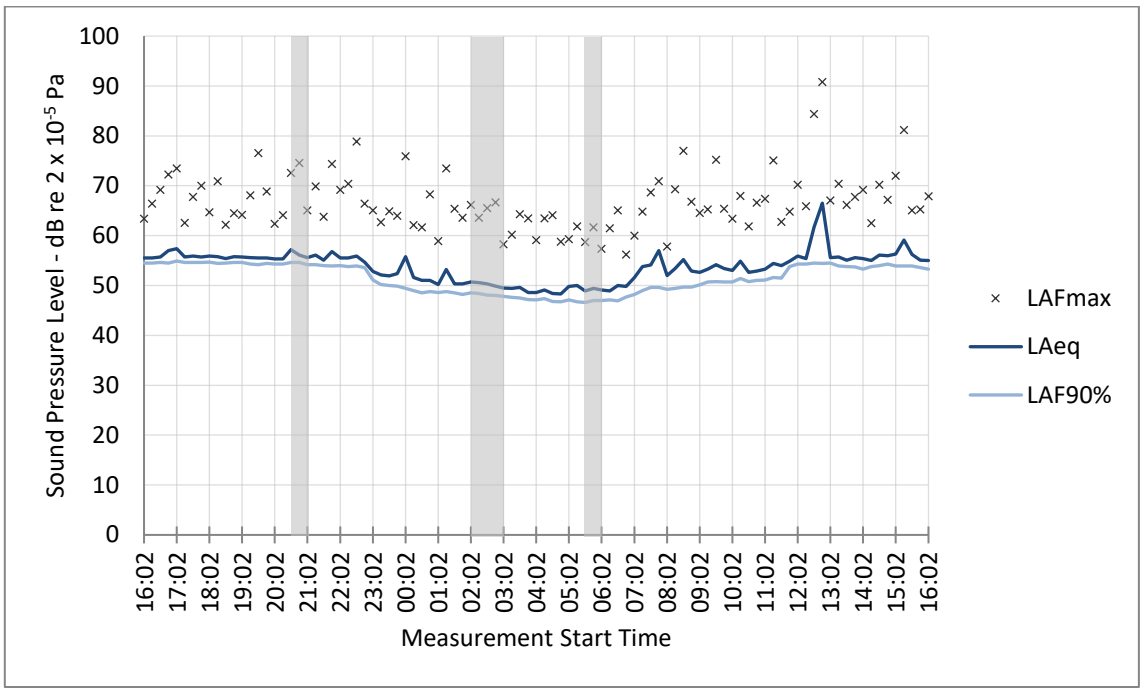


Figure 2: Sound level survey results at Position MP1 7th-8th November 2022

The pertinent results of the survey are summarised in Table 3 below.

Receptor	Period	Lowest Background Sound Level During Operating Period LA90	Criteria LAr
NSR1	Restaurant opening times 11:00-00:00	50dB	40dB
NSR2	Restaurant opening times 11:00-00:00	50dB	40dB
NSR1 Night	23:00-07:00	47dB	37dB
NSR2 Night	23:00-07:00	47dB	37dB

Table 3: Summary sound level survey results

5. ACOUSTIC ASSESSMENT

The development includes the installation of 2 new extract fans, a supply fan and 6 condensing units. All plant will be installed externally on the roof. Confirmation of the equipment models used in the assessment is provided in Table 4 below.

Description	Equipment Model	Quantity
Supply Fan	SystemAir MUB062 630D4	1
Kitchen Extract Fan	SystemAir MUB/T 062 560D4	1
General Extract Fan	Systemair 315 EC	1
AC Condenser	Panasonic U-200PE2E8A	1
AC Condenser	Panasonic U-140PZ3E5	2
AC Condenser	Panasonic U-71PZ3E5	1
Catering Condenser	JEHR-0170-B2-M-3	1
Catering Condenser	JEHR-0300-B2-L-3	1

Table 4: Proposed new mechanical equipment used in the assessment

Sound emissions from the mechanical equipment can be determined from manufacturer's published data.

A computer model has been used to calculate the noise contribution from the proposed plant to outside nearest noise-sensitive windows. The model incorporates losses within the ductwork system based on the calculation method of CIBSE Guide B4 Noise and vibration control for HVAC along with environmental corrections set out in ISO 9613-2:1996.

The assessment has been undertaken using drawing reference *22294 rev 3*, as provided by the client.

The assessment includes mitigation recommendations as outlined in Section 6.

Assessment of the calculated rating levels in accordance with BS 4142:2014+A1:2019 to outside the most sensitive receptors with all equipment operating is provided in Table 5 below.

Description	**NSR1**	**NSR2**	**NSR1 Night**	**NSR2 Night**	**Relevant Clause**	**Commentary**
Calculated specific sound level to receptor	LAeq 40dB	LAeq 27dB	LAeq 30dB	LAeq 10dB	7.1 7.3.6	New equipment operating. Refer to calculation sheets in Appendix A.
Background sound level	LA90 50dB	LA90 50dB	LA90 47dB	LA90 47dB	8.1.3 8.3	Measured representative background sound level.
Acoustic feature correction	0dB	0dB	0dB	0dB	9.2	The calculated specific sound levels do not indicate any tonal/impulsivity/inter-mittency component and the equipment will be significantly below the residual sound level.
Rating level	LAr 40dB	LAr 27dB	LAr 30dB	LAr 10dB	9.2	
Excess of rating level over background	**-10dB**	**-23dB**	**-17dB**	**-37dB**	**11**	**Assessment indicates negligible likelihood of adverse impact**

Table 5: BS 4142:2014+A1:2019 Assessment

Table 5 shows the rating level of the proposed new equipment will be more than 10dB below the representative background LA90 sound level to outside the closest noise-sensitive properties.

BS 4142:2014+A1:2019 requires an assessment to consider the context of the development as well as adhering to numerical values. Considering the calculated numerical value of the specific sound, allowing a reduction through partially open windows of 15dBA, as recommended in BS 8233:2014,

sound levels inside the neighbouring dwellings due to the proposed new equipment will be approximately 25dBA (40dBA – 15dBA). This is below guideline levels for sleeping in bedrooms of LAeq 30dB, set out in BS 8233:2014 and is further confirmation that sound levels from the new mechanical equipment should not be detrimental to the amenity of any noise-sensitive receptors in the vicinity.

Additionally, the proposals involve new items of mechanical equipment being introduced to an area with other commercial and retail uses in the vicinity. In this scenario, the change in acoustic character, and subsequent potential for loss of amenity, is lower than if, say, there were no other similar businesses in the area.

The author considers that the context of the assessment does not alter the initial estimate of the impact, and that sound levels from the new mechanical equipment should not be detrimental to the amenity of any residential occupiers in the vicinity.

6. ACOUSTIC MITIGATION TREATMENTS

As discussed in Section 5, noise control treatments have been included in the calculation model. Acoustic specification for the mitigation scheme is provided below.

6.1. Duct Mounted Attenuators

The calculation model includes benefit of duct-mounted attenuators to the fans. Schedule of minimum dynamic insertion loss performance for the attenuators along with description of typical silencer to comply with the specified performance is provided in Appendix B. Note that the dimensions and free-area shown are nominal and the successful supplier should confirm their own selections to meet the minimum specified insertion loss performance.

Any transformation sections between the fan and attenuator should be formed with double-skinned casings.

It is important airflow generated noise from the atmospheric terminal does not increase the cumulative sound level at nearby noise-sensitive properties. Suitable airflow velocity is dependent on the profile of the terminal used and should be verified with the manufacturer accordingly.

To control potential for structure-borne noise and vibration from the fans affecting adjoining occupants, it is recommended that the fans are installed on vibration isolators providing minimum 25mm deflection at the working load, and that flexible connections are fitted between the fans and adjoining ductwork both sides. Most acoustic hardware suppliers would be able to select suitable

isolators based on the fan weight and operating speed, including Allaway Acoustics Limited (www.allawayacoustics.co.uk).

6.2. High Performance Acoustic Enclosure

It is recommended that the Panasonic U-200PE2E8A condenser unit is installed in a high-performance acoustic enclosure such as those supplied by Environ Technologies Limited or equal and approved. Acoustic performance of a suitable enclosure is shown in Appendix B.

6.3. Louvred Enclosure

It is advised that an acoustic louvre is installed surrounding the 2 catering condensing units. A single louvre may be installed over all the condensers, with no gaps at the edges. A suitable louvred enclosure would typically be formed from 150mm deep acoustic louvres such as Allaway Acoustic's AL1515 model or equivalent. Minimum insertion loss performance for the louvres is shown on the schedule in Appendix B.

Structural supports/steelwork and access panels or doors may be required and should be determined by the successful supplier accordingly.

7. CONCLUSION

A planning application is to be submitted for the installation of new mechanical plant and equipment for a new restaurant at 287 Camden High Street, London.

ACA Acoustics have undertaken an assessment of noise from the proposed equipment using manufacturer's published acoustic data. Calculated rating level for the new plant is at least 10dB below the background sound level during operating times of the new equipment when assessed at 1m from the closest noise-sensitive windows of both receptors.

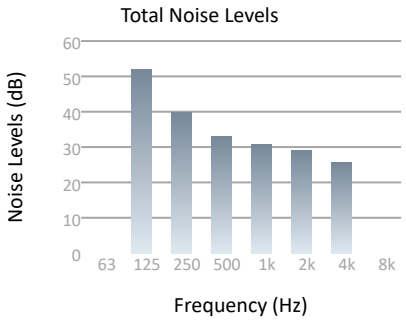
The author considers that allowing for the proposed mitigation scheme in this report, the proposed new air conditioning condenser and ventilation equipment achieve the Local Authority's planning requirements for this development and will not be detrimental to the amenity of nearby residential occupants.

Appendix A

Acoustic Calculations

Shake Shack Camden

Project Name	Shake Shack Camden
Project Reference	221018
Reference	NSR1
Description	Rear SF Window of 285 Camden High St
Noise Limit	40
dBA	39.5



Calculated Lp at Receptor

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF1	1	31.8	42.4	27.6	13.9	10.5	12.4	13.7	12.0
EF2	1	33.9	29.0	25.2	22.0	17.0	22.6	23.6	24.2
SF1	1	38.1	43.0	28.9	19.2	15.1	12.2	11.7	12.1
EF1 Breakout	1	28.7	46.7	28.9	20.2	20.9	20.7	15.2	5.7
EF2 Breakout	1	-	14.6	21.4	10.4	2.4	-8.7	-12.8	-
SF1 Breakout	1	33.8	46.7	31.6	23.3	23.8	19.9	11.3	-0.2
CU2	1	30.9	26.5	21.2	16.9	12.2	7.3	-2.2	-9.8
CU1	1	32.8	30.3	27.8	27.5	27.7	25.7	16.5	8.9
CU3	1	26.4	26.1	21.9	18.6	12.6	5.1	-4.7	-12.0
CU4	1	41.8	36.5	28.5	14.2	4.4	-3.9	-10.5	-20.7
CCU1	1	-	33.7	32.6	22.8	15.4	5.4	0.2	-4.7
CCU2	1	-	32.6	33.0	26.9	17.4	8.8	3.1	5.0
EF1	1	36.1	40.5	24.7	13.3	5.5	2.8	-3.0	-11.6
EF2	1	43.0	29.3	18.2	9.7	0.9	-0.1	-6.2	-10.2
SF1	1	40.4	37.5	15.7	8.8	5.0	-2.1	-11.7	-18.6

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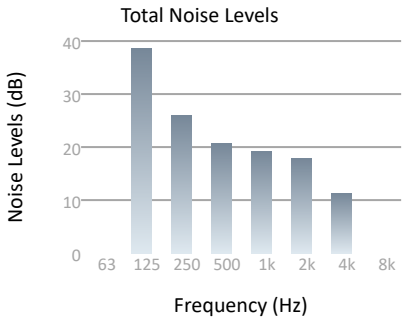
Shake Shack Camden

Project Name	Shake Shack Camden
Project Reference	221018
Reference	NSR2
Description	Front SF Windows of 248 Camden High St
Noise Limit	40
dBA	26.7



Calculated Lp at Receptor

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF1	1	17.2	27.8	13.0	-0.8	-4.2	-2.5	-1.7	-5.3
EF2	1	18.6	13.7	9.7	6.1	0.4	4.0	2.8	1.3
SF1	1	26.2	31.1	17.6	11.5	8.5	5.6	4.3	0.7
CU4	1	28.5	23.6	16.4	3.3	-4.7	-10.8	-15.3	-24.2
CU1	1	22.5	19.8	16.7	15.0	12.9	10.8	1.2	-7.7
CU2	1	22.2	19.4	16.3	14.6	12.5	10.4	0.8	-8.2
CU3	1	13.8	14.1	11.0	9.2	5.2	0.0	-7.6	-13.7
CCU1	1	-	14.5	13.3	3.5	-4.0	-14.1	-19.8	-26.7
CCU2	1	-	11.3	11.7	5.6	-4.0	-12.7	-19.0	-19.1
EF1 Breakout	1	13.8	31.9	14.0	5.4	6.4	7.2	-0.5	-12.1
EF2 Breakout	1	-	-3.2	0.9	-9.7	-16.9	-25.4	-29.7	-
SF1 Breakout	1	21.9	35.0	20.2	12.6	14.4	14.0	6.5	-5.2

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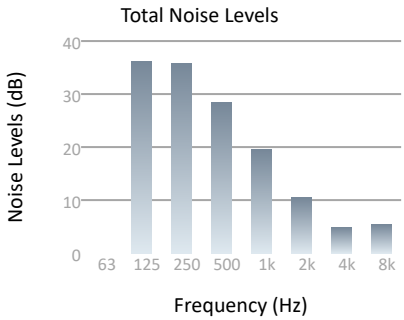
Shake Shack Camden

Project Name	Shake Shack Camden
Project Reference	221018
Reference	NSR1 Night
Description	Rear SF Window of 285 Camden High St
Noise Limit	37
dBA	30.3



Calculated Lp at Receptor

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
CCU1	1	-	33.7	32.6	22.8	15.4	5.4	0.2	-4.7
CCU2	1	-	32.6	33.0	26.9	17.4	8.8	3.1	5.0

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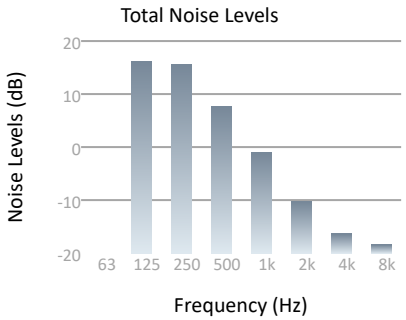
Shake Shack Camden

Project Name	Shake Shack Camden
Project Reference	221018
Reference	NSR2 Night
Description	Front SF Windows of 248 Camden High St
Noise Limit	37
dBA	9.9



Calculated Lp at Receptor

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
CCU1	1	-	14.5	13.3	3.5	-4.0	-14.1	-19.8	-26.7
CCU2	1	-	11.3	11.7	5.6	-4.0	-12.7	-19.0	-19.1

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Shake Shack Camden

Calculation Sheet

EF1 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1								
Noise Levels	**77.0**	**91.0**	**84.0**	**81.0**	**79.0**	**75.0**	**72.0**	**66.0**
Silencer								
	-6.9	*-12.0*	*-16.0*	*-22.6*	*-25.9*	*-18.6*	*-13.8*	*-9.0*
Bend Loss								
	0.0	*-1.0*	*-5.0*	*-7.8*	*-3.9*	*-3.0*	*-3.0*	*-3.0*
Rect Duct Losses								
	-0.3	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
End Reflection & Directional Directivity	*-7.6*	*-5.0*	*-4.8*	*-6.2*	*-8.3*	*-10.5*	*-10.9*	*-10.9*
Dc - Reflections & Directivity								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Adiv - Geometrical Divergance								
	-25.6	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.6*
Agr - Ground Attenuation								
	3.0	*1.5*	*0.8*	*0.7*	*1.3*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.2*	*-5.5*	*-5.4*	*-6.1*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**31.8**	**42.4**	**27.6**	**13.9**	**10.5**	**12.4**	**13.7**	**12.0**

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Calculation Sheet

EF2 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source								
Noise Source - EF2								
Noise Levels	**79.0**	**73.0**	**72.0**	**74.0**	**75.0**	**71.0**	**64.0**	**57.0**
Silencer								
	-6.0	*-11.0*	*-18.0*	*-26.0*	*-33.9*	*-27.0*	*-21.0*	*-13.0*
Rect Duct Losses								
	-0.4	*-0.2*	*-0.3*	*-0.2*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
End Reflection & Directional Directivity	*-11.3*	*-5.5*	*-1.4*	*0.9*	*2.2*	*3.0*	*3.6*	*3.7*
Dc - Reflections & Directivity								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-25.6	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.6*
Agr - Ground Attenuation								
	3.0	*1.5*	*0.8*	*0.7*	*1.3*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.7	*-6.1*	*-5.2*	*-4.8*	*-4.8*	*-3.1*	*-1.5*	*-1.5*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**33.9**	**29.0**	**25.2**	**22.0**	**17.0**	**22.6**	**23.6**	**24.2**

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Calculation Sheet

SF1 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - SF1								
Noise Levels	**85.0**	**95.0**	**90.0**	**88.0**	**86.0**	**82.0**	**79.0**	**73.0**
Silencer								
	-8.9	*-17.0*	*-26.7*	*-33.5*	*-33.8*	*-30.5*	*-26.8*	*-18.7*
Rect Duct Losses								
	-0.6	*-0.4*	*-0.3*	*-0.1*	*-0.1*	*-0.1*	*-0.1*	*-0.1*
End Reflection & Directional Directivity	*-7.3*	*-4.6*	*-4.0*	*-5.0*	*-6.6*	*-8.3*	*-8.7*	*-8.6*
Dc - Reflections & Directivity								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-28.2	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.9*
Agr - Ground Attenuation								
	3.0	*1.4*	*0.5*	*0.3*	*1.2*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.3*	*-5.4*	*-5.3*	*-6.4*	*-7.1*	*-7.7*	*-8.8*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**38.1**	**43.0**	**28.9**	**19.2**	**15.1**	**12.2**	**11.7**	**12.1**

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Calculation Sheet

EF1 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1								
Noise Levels	**77.0**	**91.0**	**84.0**	**81.0**	**79.0**	**75.0**	**72.0**	**66.0**
Silencer								
	-6.9	*-12.0*	*-16.0*	*-22.6*	*-25.9*	*-18.6*	*-13.8*	*-9.0*
Bend Loss								
	0.0	*-1.0*	*-5.0*	*-7.8*	*-3.9*	*-3.0*	*-3.0*	*-3.0*
Rect Duct Losses								
	-0.3	*-0.2*	*-0.1*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
End Reflection & Directional Directivity	*-7.6*	*-5.0*	*-4.8*	*-6.2*	*-8.3*	*-10.5*	*-10.9*	*-10.9*
Dc - Reflections & Directivity								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Adiv - Geometrical Divergance								
	-40.2	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.0*	*-3.4*
Agr - Ground Attenuation								
	3.0	*0.7*	*-0.2*	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-5.4*	*-4.6*	*-6.2*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**17.2**	**27.8**	**13.0**	**-0.8**	**-4.2**	**-2.5**	**-1.7**	**-5.3**

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Calculation Sheet

EF2 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source								
Noise Source - EF2								
Noise Levels	**79.0**	**73.0**	**72.0**	**74.0**	**75.0**	**71.0**	**64.0**	**57.0**
Silencer								
	-6.0	*-11.0*	*-18.0*	*-26.0*	*-33.9*	*-27.0*	*-21.0*	*-13.0*
Rect Duct Losses								
	-0.4	*-0.2*	*-0.3*	*-0.2*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
End Reflection & Directional Directivity	*-11.3*	*-5.5*	*-1.4*	*0.9*	*2.2*	*3.0*	*3.6*	*3.7*
Dc - Reflections & Directivity								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-40.8	*-40.8*	*-40.8*	*-40.8*	*-40.8*	*-40.8*	*-40.8*	*-40.8*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.0*	*-3.6*
Agr - Ground Attenuation								
	3.0	*0.6*	*-0.3*	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-5.4*	*-4.5*	*-6.2*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**18.6**	**13.7**	**9.7**	**6.1**	**0.4**	**4.0**	**2.8**	**1.3**

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Calculation Sheet

SF1 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - SF1								
Noise Levels	**85.0**	**95.0**	**90.0**	**88.0**	**86.0**	**82.0**	**79.0**	**73.0**
Silencer								
	-8.8	*-16.9*	*-26.0*	*-29.3*	*-28.8*	*-25.7*	*-23.0*	*-18.2*
Rect Duct Losses								
	-0.6	*-0.4*	*-0.3*	*-0.1*	*-0.1*	*-0.1*	*-0.1*	*-0.1*
End Reflection & Directional Directivity	*-7.3*	*-4.6*	*-4.0*	*-5.0*	*-6.6*	*-8.3*	*-8.7*	*-8.6*
Dc - Reflections & Directivity								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-40.2	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*	*-40.2*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.0*	*-3.4*
Agr - Ground Attenuation								
	3.0	*0.7*	*-0.2*	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-5.4*	*-4.6*	*-6.2*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**26.2**	**31.1**	**17.6**	**11.5**	**8.5**	**5.6**	**4.3**	**0.7**

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Calculation Sheet

EF1 to NSR1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1									
Noise Levels		**77.0**	**91.0**	**84.0**	**81.0**	**79.0**	**75.0**	**72.0**	**66.0**
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT1									
Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	11.1								
		-6.7	*-12.0*	*-15.9*	*-21.4*	*-23.3*	*-17.4*	*-13.2*	*-8.8*
Bend Loss									
		-1.0	*-2.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Bend Loss									
		-1.0	*-2.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Rect Duct Losses									
		-2.4	*-1.6*	*-1.2*	*-0.4*	*-0.4*	*-0.4*	*-0.4*	*-0.4*
Duct Break-Out									
		-3.8	*-6.8*	*-9.8*	*-12.8*	*-15.8*	*-18.8*	*-23.8*	*-27.8*
ISO 9613 Calculation									
Horiz. Distance (m)	6.0								
Source Height (m)	3.0								
Receiver Height (m)	1.0								
Q Factor - Junction									
		-18.0	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.1*	*-18.2*	*-18.8*
ISO 9613 Barrier Attenuation									
		-8.0	*-8.1*	*-8.4*	*-9.0*	*-10.0*	*-11.5*	*-13.4*	*-15.8*
External Receiver									
External Receiver - NSR1									
Sound Pressure, Lp:		**36.1**	**40.5**	**24.7**	**13.3**	**5.5**	**2.8**	**-3.0**	**-11.6**

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Calculation Sheet

EF2 to NSR1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2									
Noise Levels		**79.0**	**73.0**	**72.0**	**74.0**	**75.0**	**71.0**	**64.0**	**57.0**
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT2									
Width (m)	0.5								
Height (m)	0.5								
% Free Area (%)	40.0								
Face Velocity (m/s)	6.5								
		-6.0	*-10.9*	*-17.9*	*-25.5*	*-32.3*	*-26.2*	*-20.2*	*-12.9*
Rect Duct Losses									
		-0.4	*-0.2*	*-0.3*	*-0.2*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
Duct Break-Out									
		-6.8	*-9.8*	*-12.8*	*-15.8*	*-18.8*	*-21.8*	*-26.8*	*-30.8*
ISO 9613 Calculation									
Horiz. Distance (m)	4.0								
Source Height (m)	3.0								
Receiver Height (m)	1.0								
Q Factor - Junction									
		-15.0	*-15.0*	*-15.0*	*-15.0*	*-15.0*	*-15.1*	*-15.2*	*-15.5*
ISO 9613 Barrier Attenuation									
		-7.8	*-7.8*	*-7.8*	*-7.8*	*-7.8*	*-7.8*	*-7.8*	*-7.8*
External Receiver									
External Receiver - NSR1									
Sound Pressure, Lp:		**43.0**	**29.3**	**18.2**	**9.7**	**0.9**	**-0.1**	**-6.2**	**-10.2**

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Calculation Sheet

SF1 to NSR1

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - SF1									
Noise Levels		**85.0**	**95.0**	**90.0**	**88.0**	**86.0**	**82.0**	**79.0**	**73.0**
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT3									
Width (m)	0.8								
Height (m)	0.8								
% Free Area (%)	40.0								
Face Velocity (m/s)	11.7								
		-8.8	*-16.9*	*-26.0*	*-29.3*	*-28.8*	*-25.7*	*-23.0*	*-18.2*
Bend Loss									
		0.1	*-0.9*	*-3.9*	*-3.8*	*-2.0*	*-1.7*	*-2.2*	*-2.6*
Bend Loss									
		0.1	*-0.9*	*-2.6*	*-1.1*	*-1.2*	*-1.2*	*-1.8*	*-2.3*
Rect Duct Losses									
		-1.2	*-0.8*	*-0.6*	*-0.2*	*-0.2*	*-0.2*	*-0.2*	*-0.2*
Duct Break-Out									
		-8.8	*-11.8*	*-14.8*	*-17.8*	*-20.8*	*-25.8*	*-31.8*	*-33.8*
ISO 9613 Calculation									
Horiz. Distance (m)	6.0								
Source Height (m)	3.0								
Receiver Height (m)	1.0								
Q Factor - Junction									
		-18.0	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.1*	*-18.2*	*-18.8*
ISO 9613 Barrier Attenuation									
		-8.0	*-8.1*	*-8.4*	*-9.0*	*-10.0*	*-11.5*	*-13.4*	*-15.8*
External Receiver									
External Receiver - NSR1									
Sound Pressure, Lp:		**40.4**	**37.5**	**15.7**	**8.8**	**5.0**	**-2.1**	**-11.7**	**-18.6**

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Calculation Sheet

EF1 Breakout to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 Breakout								
Noise Levels	**56.0**	**74.0**	**56.0**	**47.0**	**47.0**	**45.0**	**38.0**	**29.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Directivity								
DI Index - 3dB								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-25.6	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.6*
Agr - Ground Attenuation								
	3.0	*1.5*	*0.8*	*0.7*	*1.3*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.7	*-6.1*	*-5.2*	*-4.8*	*-4.8*	*-3.1*	*-1.5*	*-1.5*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**28.7**	**46.7**	**28.9**	**20.2**	**20.9**	**20.7**	**15.2**	**5.7**

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Calculation Sheet

EF2 Breakout to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF2 Breakout								
Noise Levels	**38.0**	**48.0**	**56.0**	**57.0**	**55.0**	**49.0**	**44.0**	**33.0**
Noise Control Treatments								
Treatment - AJ1								
	-	*-8.0*	*-12.0*	*-24.0*	*-30.0*	*-35.0*	*-34.0*	-
Dc - Directivity								
DI Index - 3dB								
	-	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	-
Adiv - Geometrical Divergance								
	-	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	-
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	-
Agr - Ground Attenuation								
	-	*1.5*	*0.8*	*0.7*	*1.3*	*1.5*	*1.5*	-
Abar - Barrier Attenuation								
	-	*-4.2*	*-0.8*	*-0.7*	*-1.3*	*-1.5*	*-1.5*	-
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**-**	**14.6**	**21.4**	**10.4**	**2.4**	**-8.7**	**-12.8**	**-**

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Calculation Sheet

SF1 Breakout to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - SF1 Breakout								
Noise Levels	**65.0**	**78.0**	**63.0**	**55.0**	**56.0**	**53.0**	**46.0**	**37.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Directivity								
DI Index - 3dB								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-29.3	*-29.3*	*-29.3*	*-29.3*	*-29.3*	*-29.3*	*-29.3*	*-29.3*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*	*-1.0*
Agr - Ground Attenuation								
	3.0	*1.4*	*0.3*	*0.2*	*1.2*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.4*	*-5.4*	*-5.5*	*-7.1*	*-8.2*	*-9.6*	*-11.4*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**33.8**	**46.7**	**31.6**	**23.3**	**23.8**	**19.9**	**11.3**	**-0.2**

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Calculation Sheet

CU4 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU4								
Noise Levels	**81.0**	**80.0**	**81.0**	**77.0**	**75.0**	**71.0**	**67.0**	**61.0**
Noise Control Treatments								
Treatment - AE1								
	-11.0	*-13.0*	*-19.0*	*-28.0*	*-34.0*	*-36.0*	*-36.0*	*-37.0*
Dc - Condenser Directivity								
	1.1	*-0.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-37.8	*-37.8*	*-37.8*	*-37.8*	*-37.8*	*-37.8*	*-37.8*	*-37.8*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.7*	*-2.6*
Agr - Ground Attenuation								
	3.0	*1.3*	*-1.3*	*-1.6*	*0.8*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.1*	*-3.5*	*-3.1*	*-5.5*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**28.5**	**23.6**	**16.4**	**3.3**	**-4.7**	**-10.8**	**-15.3**	**-24.2**

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Calculation Sheet

CU1 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU1								
Sound Power Levels	**64.0**	**63.0**	**62.0**	**61.0**	**59.0**	**57.0**	**48.0**	**41.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-38.2	*-38.2*	*-38.2*	*-38.2*	*-38.2*	*-38.2*	*-38.2*	*-38.2*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.7*
Agr - Ground Attenuation								
	3.0	*1.3*	*-1.4*	*-1.8*	*0.8*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.1*	*-3.4*	*-3.0*	*-5.5*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**22.5**	**19.8**	**16.7**	**15.0**	**12.9**	**10.8**	**1.2**	**-7.7**

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Calculation Sheet

CU2 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU2								
Sound Power Levels	**64.0**	**63.0**	**62.0**	**61.0**	**59.0**	**57.0**	**48.0**	**41.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-38.6	*-38.6*	*-38.6*	*-38.6*	*-38.6*	*-38.6*	*-38.6*	*-38.6*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.8*
Agr - Ground Attenuation								
	3.0	*1.3*	*-1.5*	*-1.9*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.1*	*-3.3*	*-2.9*	*-5.5*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**22.2**	**19.4**	**16.3**	**14.6**	**12.5**	**10.4**	**0.8**	**-8.2**

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Calculation Sheet

CU3 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU3								
Noise Levels	**56.0**	**58.0**	**57.0**	**56.0**	**52.0**	**47.0**	**40.0**	**36.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-39.0	*-39.0*	*-39.0*	*-39.0*	*-39.0*	*-39.0*	*-39.0*	*-39.0*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.8*	*-2.9*
Agr - Ground Attenuation								
	3.0	*1.3*	*-1.6*	*-2.0*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.8	*-6.1*	*-3.2*	*-2.8*	*-5.5*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**13.8**	**14.1**	**11.0**	**9.2**	**5.2**	**0.0**	**-7.6**	**-13.7**

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Calculation Sheet

CU4 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU4								
Noise Levels	**81.0**	**80.0**	**81.0**	**77.0**	**75.0**	**71.0**	**67.0**	**61.0**
Noise Control Treatments								
Treatment - AE1								
	-11.0	*-13.0*	*-19.0*	*-28.0*	*-34.0*	*-36.0*	*-36.0*	*-37.0*
Dc - Condenser Directivity								
	1.1	*-0.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-24.0	*-24.0*	*-24.0*	*-24.0*	*-24.0*	*-24.0*	*-24.0*	*-24.0*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.5*
Agr - Ground Attenuation								
	3.0	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-8.3	*-7.1*	*-8.0*	*-9.3*	*-11.1*	*-13.3*	*-15.9*	*-18.6*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**41.8**	**36.5**	**28.5**	**14.2**	**4.4**	**-3.9**	**-10.5**	**-20.7**

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Calculation Sheet

CU1 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU1								
Sound Power Levels	**64.0**	**63.0**	**62.0**	**61.0**	**59.0**	**57.0**	**48.0**	**41.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-28.2	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*	*-28.2*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.9*
Agr - Ground Attenuation								
	3.0	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.5	*-5.7*	*-5.2*	*-3.8*	*-1.5*	*-1.5*	*-1.5*	*-1.5*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**32.8**	**30.3**	**27.8**	**27.5**	**27.7**	**25.7**	**16.5**	**8.9**

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Calculation Sheet

CU2 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU2								
Sound Power Levels	**64.0**	**63.0**	**62.0**	**61.0**	**59.0**	**57.0**	**48.0**	**41.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-27.0	*-27.0*	*-27.0*	*-27.0*	*-27.0*	*-27.0*	*-27.0*	*-27.0*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.7*
Agr - Ground Attenuation								
	3.0	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-10.6	*-10.8*	*-13.0*	*-15.5*	*-18.3*	*-21.1*	*-21.5*	*-21.5*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**30.9**	**26.5**	**21.2**	**16.9**	**12.2**	**7.3**	**-2.2**	**-9.8**

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Calculation Sheet

CU3 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CU3								
Noise Levels	**56.0**	**58.0**	**57.0**	**56.0**	**52.0**	**47.0**	**40.0**	**36.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Condenser Directivity								
	1.5	*-0.2*	*-2.3*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-25.6	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*	*-25.6*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.6*
Agr - Ground Attenuation								
	3.0	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-8.5	*-7.5*	*-8.7*	*-10.2*	*-12.3*	*-14.7*	*-17.4*	*-20.2*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**26.4**	**26.1**	**21.9**	**18.6**	**12.6**	**5.1**	**-4.7**	**-12.0**

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Shake Shack Camden

Calculation Sheet

CCU1 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU1								
Noise Levels	**-**	**62.3**	**64.2**	**58.6**	**55.2**	**49.2**	**43.1**	**36.4**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*	*-0.9*	*-3.0*
Agr - Ground Attenuation								
	-	*1.3*	*-1.7*	*-2.1*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.1*	*-3.1*	*-2.7*	*-5.4*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**-**	**14.5**	**13.3**	**3.5**	**-4.0**	**-14.1**	**-19.8**	**-26.7**

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Calculation Sheet

CCU1 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU1								
Noise Levels	**-**	**62.3**	**64.2**	**58.6**	**55.2**	**49.2**	**43.1**	**36.4**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*
Agr - Ground Attenuation								
	-	*1.4*	*1.3*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.2*	*-6.1*	*-6.3*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**-**	**33.7**	**32.6**	**22.8**	**15.4**	**5.4**	**0.2**	**-4.7**

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Shake Shack Camden

Calculation Sheet

CCU2 to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU2								
Noise Levels	**-**	**59.1**	**62.6**	**60.7**	**55.2**	**50.6**	**43.9**	**44.0**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*	*-0.9*	*-3.0*
Agr - Ground Attenuation								
	-	*1.3*	*-1.7*	*-2.1*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.1*	*-3.1*	*-2.7*	*-5.4*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**-**	**11.3**	**11.7**	**5.6**	**-4.0**	**-12.7**	**-19.0**	**-19.1**

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Calculation Sheet

CCU2 to NSR1

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU2								
Noise Levels	**-**	**59.1**	**62.6**	**60.7**	**55.2**	**50.6**	**43.9**	**44.0**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*
Agr - Ground Attenuation								
	-	*1.5*	*1.3*	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.2*	*-6.0*	*-6.2*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR1								
Sound Pressure, Lp:	**-**	**32.6**	**33.0**	**26.9**	**17.4**	**8.8**	**3.1**	**5.0**

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Calculation Sheet

CCU1 to NSR2 Night

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU1								
Noise Levels	**-**	**62.3**	**64.2**	**58.6**	**55.2**	**49.2**	**43.1**	**36.4**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*	*-0.9*	*-3.0*
Agr - Ground Attenuation								
	-	*1.3*	*-1.7*	*-2.1*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.1*	*-3.1*	*-2.7*	*-5.4*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2 Night								
Sound Pressure, Lp:	**-**	**14.5**	**13.3**	**3.5**	**-4.0**	**-14.1**	**-19.8**	**-26.7**

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Calculation Sheet

CCU1 to NSR1 Night

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU1								
Noise Levels	**-**	**62.3**	**64.2**	**58.6**	**55.2**	**49.2**	**43.1**	**36.4**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*	*-20.0*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*
Agr - Ground Attenuation								
	-	*1.4*	*1.3*	*1.5*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.2*	*-6.1*	*-6.3*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR1 Night								
Sound Pressure, Lp:	**-**	**33.7**	**32.6**	**22.8**	**15.4**	**5.4**	**0.2**	**-4.7**

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Calculation Sheet

CCU2 to NSR2 Night

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU2								
Noise Levels	**-**	**59.1**	**62.6**	**60.7**	**55.2**	**50.6**	**43.9**	**44.0**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*	*-39.3*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*	*-0.9*	*-3.0*
Agr - Ground Attenuation								
	-	*1.3*	*-1.7*	*-2.1*	*0.7*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.1*	*-3.1*	*-2.7*	*-5.4*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR2 Night								
Sound Pressure, Lp:	**-**	**11.3**	**11.7**	**5.6**	**-4.0**	**-12.7**	**-19.0**	**-19.1**

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Calculation Sheet

CCU2 to NSR1 Night

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - CCU2								
Noise Levels	**-**	**59.1**	**62.6**	**60.7**	**55.2**	**50.6**	**43.9**	**44.0**
Noise Control Treatments								
Treatment - LE1								
	-	*-4.0*	*-5.0*	*-8.0*	*-12.0*	*-16.0*	*-15.0*	*-13.0*
Dc - Condenser Directivity								
	-	*0.2*	*-1.8*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Adiv - Geometrical Divergance								
	-	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*	*-18.0*
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.3*
Agr - Ground Attenuation								
	-	*1.5*	*1.3*	*1.4*	*1.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-	*-6.2*	*-6.0*	*-6.2*	*-6.3*	*-6.3*	*-6.3*	*-6.3*
External Receiver								
External Receiver - NSR1 Night								
Sound Pressure, Lp:	**-**	**32.6**	**33.0**	**26.9**	**17.4**	**8.8**	**3.1**	**5.0**

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Calculation Sheet

EF1 Breakout to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 Breakout								
Noise Levels	**56.0**	**74.0**	**56.0**	**47.0**	**47.0**	**45.0**	**38.0**	**29.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Directivity								
DI Index - 3dB								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-40.5	*-40.5*	*-40.5*	*-40.5*	*-40.5*	*-40.5*	*-40.5*	*-40.5*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.0*	*-3.5*
Agr - Ground Attenuation								
	3.0	*1.3*	*-2.0*	*-2.5*	*0.6*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.7	*-5.9*	*-2.3*	*-1.5*	*-3.5*	*-1.5*	*-1.5*	*-1.5*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**13.8**	**31.9**	**14.0**	**5.4**	**6.4**	**7.2**	**-0.5**	**-12.1**

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Calculation Sheet

EF2 Breakout to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF2 Breakout								
Noise Levels	**38.0**	**48.0**	**56.0**	**57.0**	**55.0**	**49.0**	**44.0**	**33.0**
Noise Control Treatments								
Treatment - AJ1								
	-	*-8.0*	*-12.0*	*-24.0*	*-30.0*	*-35.0*	*-34.0*	-
Dc - Directivity								
DI Index - 3dB								
	-	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	-
Adiv - Geometrical Divergance								
	-	*-41.6*	*-41.6*	*-41.6*	*-41.6*	*-41.6*	*-41.6*	-
Aatm - Atmospheric Absorption								
	-	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.1*	-
Agr - Ground Attenuation								
	-	*1.3*	*-2.4*	*-2.9*	*0.5*	*1.5*	*1.5*	-
Abar - Barrier Attenuation								
	-	*-5.9*	*-2.0*	*-1.2*	*-3.6*	*-1.9*	*-1.5*	-
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**-**	**-3.2**	**0.9**	**-9.7**	**-16.9**	**-25.4**	**-29.7**	**-**

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Calculation Sheet

SF1 Breakout to NSR2

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - SF1 Breakout								
Noise Levels	**65.0**	**78.0**	**63.0**	**55.0**	**56.0**	**53.0**	**46.0**	**37.0**
Noise Control Treatments								
Treatment - None								
	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Dc - Directivity								
DI Index - 3dB								
	3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Adiv - Geometrical Divergance								
	-41.4	*-41.4*	*-41.4*	*-41.4*	*-41.4*	*-41.4*	*-41.4*	*-41.4*
Aatm - Atmospheric Absorption								
	0.0	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-1.1*	*-3.9*
Agr - Ground Attenuation								
	3.0	*1.3*	*-2.3*	*-2.8*	*0.5*	*1.5*	*1.5*	*1.5*
Abar - Barrier Attenuation								
	-7.7	*-5.9*	*-2.1*	*-1.2*	*-3.6*	*-1.8*	*-1.5*	*-1.5*
External Receiver								
External Receiver - NSR2								
Sound Pressure, Lp:	**21.9**	**35.0**	**20.2**	**12.6**	**14.4**	**14.0**	**6.5**	**-5.2**

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Appendix B

Noise Control Treatments

Shake Shack Camden

Schedule of Noise Control Treatments

Reference	Location	Description	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
LE1	Catering Condensers	AL1515	4	4	5	8	12	16	15	13
ATT1	EF1	700W x 700H x 900L 40 % Free Area c/w Melinex	7	12	16	23	27	19	14	9
ATT2	EF2	700H x 700W x 900L 40% Free Area	6	11	18	26	34	27	21	13
ATT3	SF1	900H x 900W x 1500L 40% Free Area	9	17	27	39	52	41	31	19
AE1	Panasonic U-200PE2E8A Unit	Environ Lite Acoustic Enclosure	11	13	19	28	34	36	36	37
AJ1	EF2	AG-Quilt V05	-	8	12	24	30	35	34	-

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