

# Acoustic assessment of proposed new mechanical services equipment

121-122 Broad Street, Reading, RG1 2BH



Client: Diverse Dining

Report Reference: 231212-R001

Date: 22<sup>nd</sup> February 2024

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|           |            |                         |                            |
|-----------|------------|-------------------------|----------------------------|
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## 0. SUMMARY

- 0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of proposed new mechanical services equipment associated with a new Shake Shack location to be installed at 121-122 Broad Street, Reading.
- 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.
- 0.3. A survey has been carried out in the vicinity to establish existing background sound levels. The representative background sound levels are LA90 40dB during the restaurant opening hours and LA90 38dB overnight at the monitoring position. Based on Reading Borough Council's criteria, the rating sound level from the new plant should not exceed the measured representative background sound level outside the closest noise-sensitive windows.
- 0.4. The most noise-sensitive residential receptor (NSR) has been assessed as the top floor windows of Premier Suites, located on Minster Street approximately 55 meters away from the proposed plant.
- 0.5. Calculations using manufacturer's sound level data for the new equipment, allowing for the recommendations as set out in this report, confirm that the rating level from the new equipment at the receptor is LAr 34dB at the receptor during the restaurant opening hours and LAr <10dB overnight, achieving a low likelihood of adverse impact.
- 0.6. Noise from the proposed equipment will not be disturbing or detrimental to the amenity of any nearby residential or other noise-sensitive receptors and complies with the planning requirements of Reading Borough Council.

## 1. INTRODUCTION

New mechanical services equipment associated with a Shake Shack is to be installed at 121-122 Broad Street, Reading.

ACA Acoustics Limited has been commissioned by the client to carry out an assessment of noise emissions from the proposed mechanical plant and, where necessary, to make recommendations for a mitigation scheme to ensure that the amenity of nearby noise-sensitive properties is not compromised.

This report presents results of the sound level survey, computer modelling, and assessment.

## 2. ACOUSTIC CRITERIA

Based on planning conditions imposed on a recent similar development within the Borough, it is anticipated that Reading Borough Council will require the rating level of the new equipment, when assessed in accordance with BS 4142:2014+A1:2019, to not exceed the background sound level.

The criteria are applicable over a period of 60 minutes during the daytime (07:00 to 23:00 hours) and 15-minutes overnight (23:00 to 07:00 hours) and measured at a position 1m external to noise sensitive façades (typically outside residential windows).

At this level noise from the new equipment will be low, should not increase the prevailing background sound level and would not be detrimental to the amenity of nearby residents.

## 3. REVIEW OF SITE LOCATION

New mechanical equipment, comprising of a kitchen extract fan, supply fan, an air conditioning unit, a cold-room condenser, and a freezer room condenser are being installed in the lightwell of 121-122 Broad Street, Reading.

The most noise-sensitive residential receptor (NSR) has been assessed as the top floor windows of Premier Suites, on Minster Street, indicated by the NSR1 label below.

A marked-up aerial image is included in Figure 1, identifying the location of the proposed equipment and sound level survey measurement position. The measurement position was within a similar lightwell to the receptor windows, and is considered to be representative of the background sound levels.

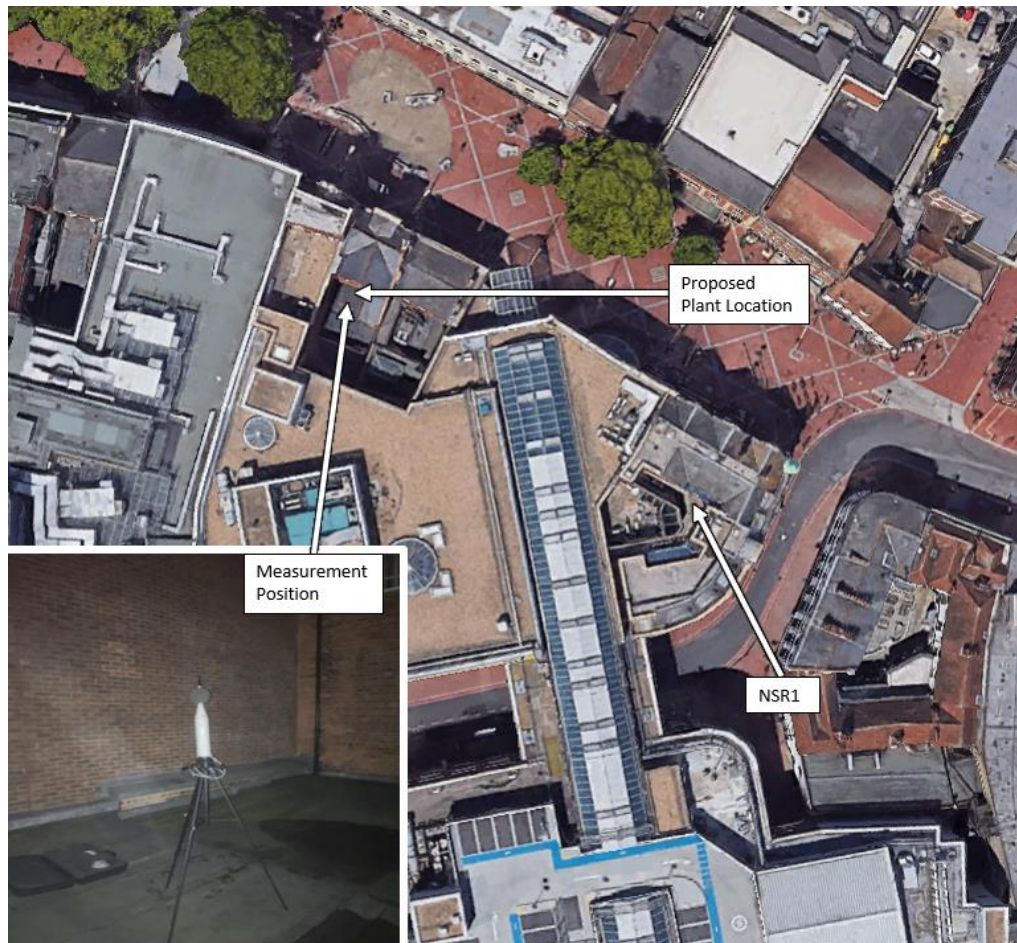


Figure 1: Equipment location, measurement position, and closest receptor (available at [google.com/maps](https://www.google.com/maps))

Proposed operating times of the equipment are during the restaurant opening hours, understood to be until 23:00 hours. The catering condensing units will have the potential to operate over a 24-hour period.

#### 4. SOUND LEVEL SURVEY

To assess sound levels from the new mechanical equipment, it is necessary to establish 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. This position was considered as being representative of the NSR1 receptor. The survey was set up by Alfie Morgan of ACA Acoustics and conducted between the 18<sup>th</sup> and 19<sup>th</sup> of December 2023.

The microphone was set up on a flat roof in the lightwell of 121-122 Broad Street, Reading, this position will be representative of the acoustic climate at the nearest residential windows.

During the survey, the soundscape in the vicinity was influenced predominantly by low level road traffic on nearby routes.

The following equipment was used during the survey. An on-site calibration check was conducted on the sound level meter prior to the survey and repeated after with no deviation noted.

| Equipment                                                    | Serial Number |
|--------------------------------------------------------------|---------------|
| Svantek Class 1 sound level meter type SV307                 | 84914         |
| Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003 | 83826         |

Table 1: Equipment used for the sound level survey

Meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

Results of the survey are shown in graphical form in Figure 2 below.

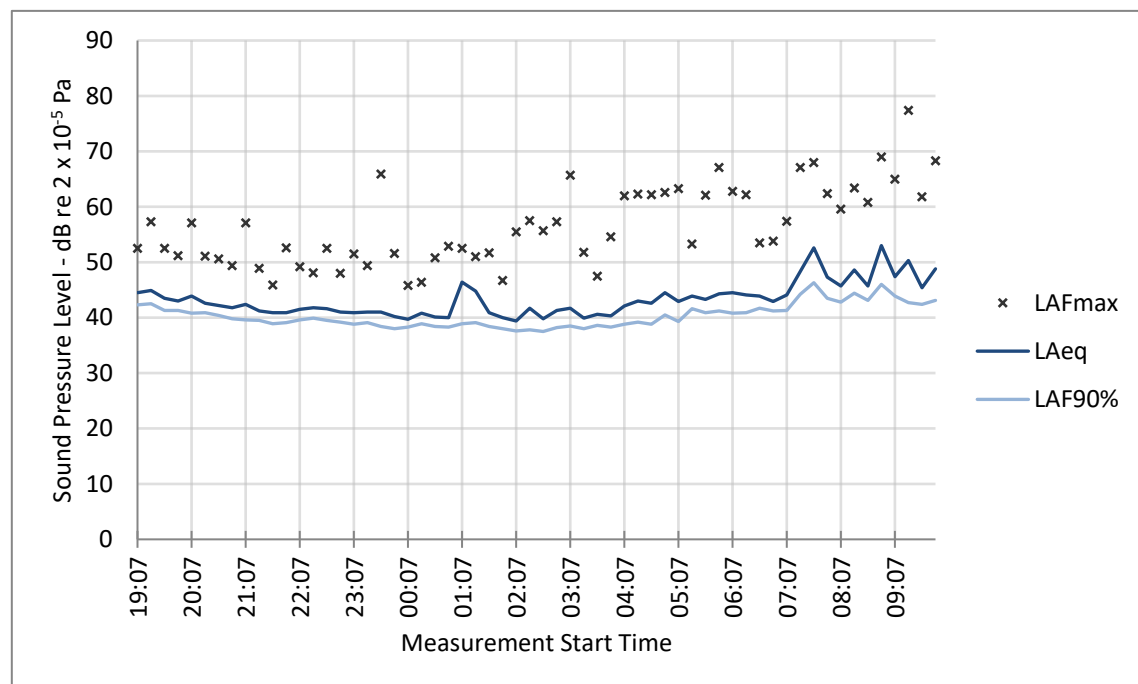


Figure 2: Sound level survey results – 18/12/23 to 19/12/23

In accordance with the methodology set out in BS 4142:2014+A1:2019, the background sound level is not necessarily the lowest recorded value. Instead, the background sound level should be a level which is representative of the underlying soundscape at the receptor location.

A statistical analysis of the measured LA90 results during the proposed operating times of the new plant and overnight is shown in Figure 3 and Figure 4 below, following guidance set out in the Standard.

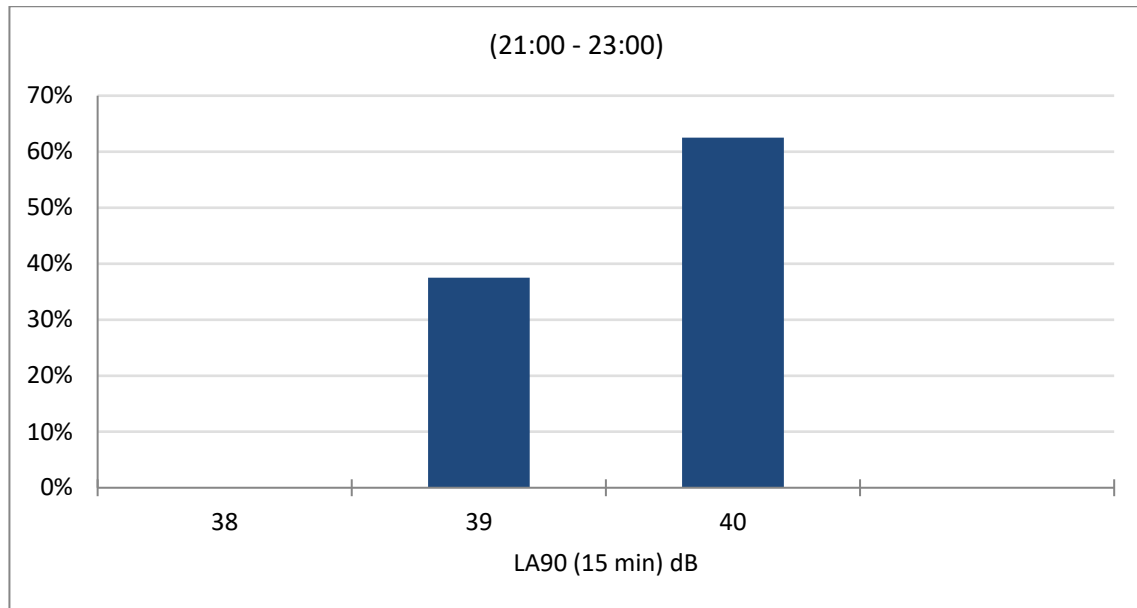


Figure 3: Statistical analysis of measured LA90 sound levels during the latest restaurant opening hours

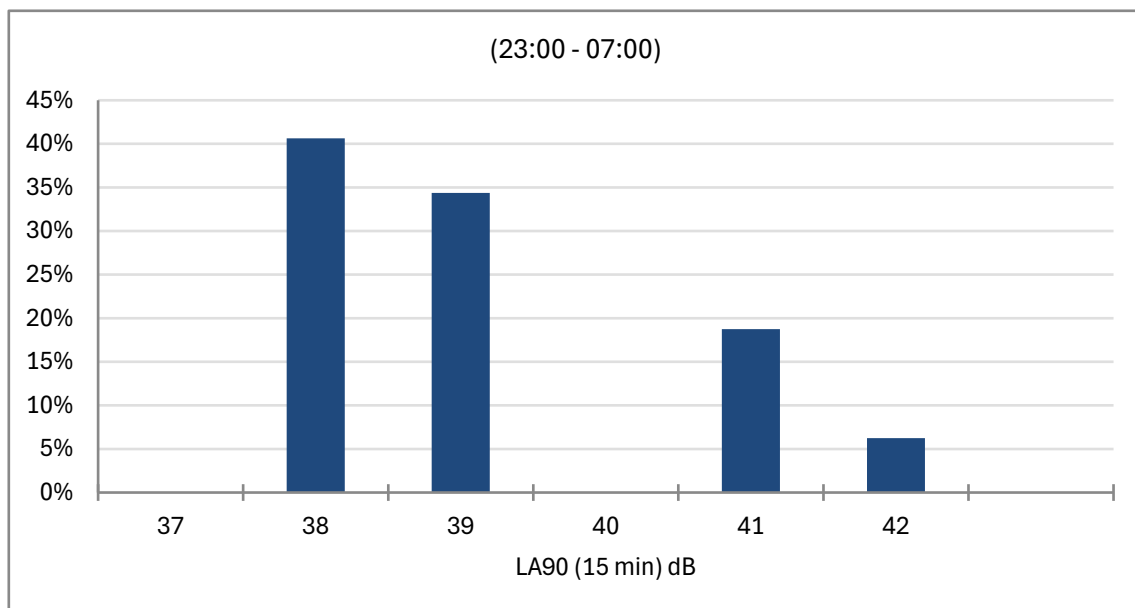


Figure 4: Statistical analysis of measured LA90 sound levels overnight

Based on the survey results, the author considers a level of LA90 40dB is representative of the background sound level during the most sensitive restaurant opening hours, and LA90 38 is representative of the background sound levels overnight when the catering condensers may remain operating.

Summary results of the survey are provided in Table 2 below.

| Receptor | Period                          | Representative Background Sound Level LA90 |
|----------|---------------------------------|--------------------------------------------|
| NSR1     | Latest restaurant opening hours | 38dB                                       |
|          | Overnight                       | 40dB                                       |

Table 2: Summary sound level survey results

## 5. ACOUSTIC ASSESSMENT

The development includes the installation of new extract and supply fans. Confirmation of the equipment models used in the assessment is provided in Table 3 below.

| Description    | Equipment Model                  | Airflow (m3/s) | Sound Level (LwA)                                | Quantity |
|----------------|----------------------------------|----------------|--------------------------------------------------|----------|
| EF1            | Estoc Targe 80-630-3             | 1.93           | Inlet: 87dB<br>Discharge: 90dB<br>Breakout: 73dB | 1        |
| SF1            | Systemair MUB 062 630D4 Multibox | 3.48           | Inlet: 91dB<br>Outlet: 91dB<br>Breakout: 64dB    | 1        |
| AC-1           | Panasonic U-140PZ3E5             | N/A            | 74dB                                             | 1        |
| CU-1 Cold-room | J&E Hall JEHR-0170-N2-M-3        | N/A            | 65dB                                             | 1        |
| CU-2 Freezer   | J&E Hall JEHS-0300-B2-L-3        | N/A            | 65dB                                             | 1        |

Table 3: Proposed new mechanical equipment used in the assessment

A computer model has been used to calculate the noise contribution from the proposed plant to outside nearest noise-sensitive windows, using manufacturer's published sound data for the proposed new plant. Ductwork system losses have been calculated in accordance with CIBSE Guide B4 *Noise and vibration control for HVAC*. Environmental corrections have been calculated in accordance with ISO 9613-2.

The assessment has been undertaken using drawing reference's '14748-01-A0 to 14748-05-A0 (inclusive) and '23358 rev 4', as provided by the client.

Mitigation recommendations outlined in Section 6 of this report are included in the computer model.

The cumulative calculated specific sound level to outside the most sensitive receptors with all equipment operating is shown in Table 4 below. Summary printouts from the calculation models are included in Appendix A.

| Receptor Location                                          | Calculated Equipment Sound Level |
|------------------------------------------------------------|----------------------------------|
| NSR1 (All plant operating during restaurant opening hours) | 31dBA                            |
| NSR1 (Catering condensers operating only overnight)        | <10dBA                           |

*Table 4: Calculated cumulative equipment sound levels at 1m outside noise-sensitive windows*

Assessment of the calculated rating levels in accordance with BS 4142:2014+A1:2019 is provided in Table 5 below.

| Description                                        | R1 Receptor<br>(All Plant during restaurant opening hours) | R1 Receptor<br>(Catering condensers only overnight) | Relevant Clause | Commentary                                                                                                                                                                                                                                                                    |
|----------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Calculated specific sound level to receptor        | LAeq 31dB                                                  | LAeq <10dB                                          | 7.1<br>7.3.6    | New equipment operating. Refer to calculation sheets in Appendix B                                                                                                                                                                                                            |
| Background sound level                             | LA90 40dB                                                  | LA90 38dB                                           | 8.1.3<br>8.3    | Measured representative background sound level.                                                                                                                                                                                                                               |
| Acoustic feature correction                        | 3dB                                                        | 0dB                                                 | 9.2             | Due to proposed equipment being mechanical in nature a feature correction of 3dB has been applied during the operating hours of the restaurant. Overnight the equipment is significantly below the measured background sound level and therefore no correction is applicable. |
| Rating level                                       | LAr 34dB                                                   | LAr <10dB                                           | 9.2             |                                                                                                                                                                                                                                                                               |
| Excess of rating level over background sound level | -6dB                                                       | >-20dB                                              | 11              | Assessment indicates low likelihood of adverse impact.                                                                                                                                                                                                                        |

*Table 5: Assessment of results in accordance with BS 4142:2014+A1:2019*

Table 5 shows the rating level of the proposed new equipment will be below the 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, rather than simply adhering to numerical values. Considering the calculated numerical value of the specific sound levels, 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 16dBA (31dBA – 15dBA). This is significantly below guideline levels for daytime resting in living rooms and bedrooms of LAeq 35dB, 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.

### 6.2. Vibration Mitigation

To control potential for structure-borne noise and vibration from the fans affecting adjoining occupants, it is recommended that the fans are installed on spring type vibration isolators providing minimum 25mm deflection at the working load, and that flexible connections are fitted between the fans and adjoining ductwork both sides.

All condensers should be installed on rubber or neoprene turret type isolators or pads, providing typically 8mm deflection at the working load. Should it be required, these could be upgraded to 25mm deflection steel spring mounts at a later stage.

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](http://www.allawayacoustics.co.uk)).

## 7. CONCLUSION

A planning application is to be submitted for the installation of new mechanical plant and equipment associated with a Shake Shack at 121-122 Broad Street, Reading.

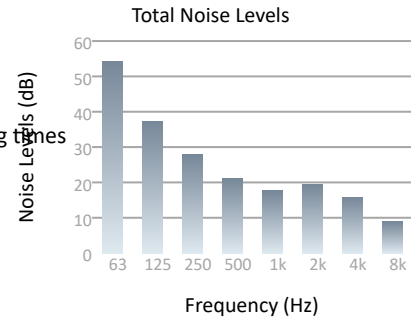
ACA Acoustics have undertaken an assessment of noise from the proposed equipment using manufacturer's published acoustic data. Calculated cumulative rating levels from the plant does not exceed the background sound level during proposed operating times of the equipment when assessed at 1m from the closest noise-sensitive windows of residential receptors.

The author considers that allowing for the proposed mitigation scheme in this report, the proposed equipment achieve the Local Authority's planning requirements for this development and will not be detrimental to the amenity of nearby noise-sensitive occupants.

## Appendix A

### Acoustic Calculations

|                          |                                                       |
|--------------------------|-------------------------------------------------------|
| <b>Project Name</b>      | Shake Shack 121-122 Broad Street, Reading             |
| <b>Project Reference</b> | 231212                                                |
| <b>Reference</b>         | Top floor of Premier Suites Equipment operating times |
| <b>Description</b>       |                                                       |
| <b>Noise Limit</b>       | 40                                                    |
| <b>dBA</b>               | 30.6                                                  |

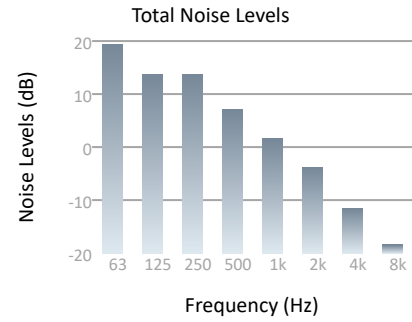


## Calculated Lp at Receptor

| Reference     | Quantity | Noise Levels (dB) |      |      |      |       |       |       |       |
|---------------|----------|-------------------|------|------|------|-------|-------|-------|-------|
|               |          | 63                | 125  | 250  | 500  | 1k    | 2k    | 4k    | 8k    |
| SF1 inlet     | 1        | 27.9              | 35.2 | 24.7 | 17.1 | 11.4  | 12.1  | 9.8   | 4.1   |
| SF1 Breakout  | 1        | 13.1              | 23.5 | 5.7  | -4.9 | -4.0  | -7.4  | -15.6 | -29.3 |
| EF1 Discharge | 1        | 38.6              | 22.1 | 15.6 | 15.8 | 14.9  | 18.0  | 14.4  | 7.0   |
| EF1 Breakout  | 1        | 44.8              | 25.3 | 16.5 | 5.6  | 2.0   | 0.7   | -4.6  | -13.2 |
| AC-1          | 1        | 22.8              | 19.3 | 15.5 | 11.6 | 9.0   | 6.7   | -3.6  | -15.2 |
| CU-1 Coldroom | 1        | 16.8              | 12.3 | 11.5 | 3.6  | -1.0  | -7.3  | -14.6 | -26.2 |
| CU-2 Freezer  | 1        | 15.8              | 8.3  | 9.5  | 4.6  | -2.0  | -6.3  | -14.6 | -19.2 |
| EF1 Discharge | 1        | 51.5              | 23.2 | 6.2  | -5.7 | -15.3 | -19.3 | -28.4 | -40.3 |
| EF1 Inlet     | 1        | 49.4              | 21.0 | 17.3 | 2.9  | -4.2  | -9.5  | -18.8 | -33.4 |
| SF1 Outlet    | 1        | 25.4              | 30.0 | 20.3 | 11.9 | 1.8   | -0.5  | -9.8  | -24.4 |

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|                          |                                           |
|--------------------------|-------------------------------------------|
| <b>Project Name</b>      | Shake Shack 121-122 Broad Street, Reading |
| <b>Project Reference</b> | 231212                                    |
| <b>Reference</b>         | Top floor of Premier Suites Overnight     |
| <b>Description</b>       |                                           |
| <b>Noise Limit</b>       | 38                                        |
| <b>dBA</b>               | 9.3                                       |



## Calculated Lp at Receptor

| Reference     | Quantity | Noise Levels (dB) |      |      |     |      |      |       |       |
|---------------|----------|-------------------|------|------|-----|------|------|-------|-------|
|               |          | 63                | 125  | 250  | 500 | 1k   | 2k   | 4k    | 8k    |
| CU-1 Coldroom | 1        | 16.8              | 12.3 | 11.5 | 3.6 | -1.0 | -7.3 | -14.6 | -26.2 |
| CU-2 Freezer  | 1        | 15.8              | 8.3  | 9.5  | 4.6 | -2.0 | -6.3 | -14.6 | -19.2 |

231212-ER-2-R001

## Calculation Sheet

## SF1 inlet to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |             |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k          |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |             |             |
| Noise Source - SF1 inlet                                                  |                                   |             |             |             |             |             |             |             |
| <b>Noise Levels</b>                                                       | <b>85.0</b>                       | <b>95.0</b> | <b>90.0</b> | <b>88.0</b> | <b>86.0</b> | <b>82.0</b> | <b>79.0</b> | <b>73.0</b> |
| <b>Silencer</b>                                                           |                                   |             |             |             |             |             |             |             |
|                                                                           | -4.0                              | -7.0        | -11.0       | -15.0       | -18.9       | -14.0       | -12.0       | -7.0        |
| <b>Rect Duct Losses</b>                                                   |                                   |             |             |             |             |             |             |             |
|                                                                           | -1.2                              | -0.8        | -0.6        | -0.2        | -0.2        | -0.2        | -0.2        | -0.2        |
| <b>End Reflection &amp; Directional Directivity</b>                       |                                   |             |             |             |             |             |             |             |
|                                                                           | -3.0                              | -0.5        | 0.6         | 1.2         | 1.5         | 1.6         | 1.6         | 1.6         |
| <b>Dc - Reflections &amp; Directivity</b>                                 |                                   |             |             |             |             |             |             |             |
|                                                                           | 9.0                               | 9.0         | 9.0         | 9.0         | 9.0         | 9.0         | 9.0         | 9.0         |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |             |             |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |             |             |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8        | -6.4        |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |             |             |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |             |             |
|                                                                           | -15.1                             | -17.7       | -20.4       | -23.0       | -23.0       | -23.0       | -23.0       | -23.0       |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |             |             |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |             |             |
| <b>Sound Pressure, Lp:</b>                                                | <b>27.9</b>                       | <b>35.2</b> | <b>24.7</b> | <b>17.1</b> | <b>11.4</b> | <b>12.1</b> | <b>9.8</b>  | <b>4.1</b>  |

## Calculation Sheet

## EF1 Discharge to Top floor of Premier Suites Equipment operating times

|                                                     |     | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |             |
|-----------------------------------------------------|-----|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                                     |     | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k          |
| <b>Noise Source</b>                                 |     |                                   |             |             |             |             |             |             |             |
| Noise Source - EF1 Discharge                        |     |                                   |             |             |             |             |             |             |             |
| <b>Sound Power Levels</b>                           |     | <b>113.0</b>                      | <b>94.0</b> | <b>87.0</b> | <b>84.0</b> | <b>81.0</b> | <b>78.0</b> | <b>73.0</b> | <b>67.0</b> |
| <b>Silencer</b>                                     |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -4.0                              | -7.0        | -10.0       | -13.9       | -14.9       | -9.9        | -7.9        | -5.0        |
| <b>Bend Loss</b>                                    |     |                                   |             |             |             |             |             |             |             |
| Width (m)                                           | 0.5 |                                   |             |             |             |             |             |             |             |
| Height (m)                                          | 0.5 |                                   |             |             |             |             |             |             |             |
| Face Velocity (m/s)                                 | 7.7 |                                   |             |             |             |             |             |             |             |
| Bend Type - Radius                                  |     |                                   |             |             |             |             |             |             |             |
| Type - Unlined Radius Bend                          |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -1.0                              | -2.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        |
| <b>Bend Loss</b>                                    |     |                                   |             |             |             |             |             |             |             |
| Width (m)                                           | 0.5 |                                   |             |             |             |             |             |             |             |
| Height (m)                                          | 0.5 |                                   |             |             |             |             |             |             |             |
| Face Velocity (m/s)                                 | 7.7 |                                   |             |             |             |             |             |             |             |
| Bend Type - Radius                                  |     |                                   |             |             |             |             |             |             |             |
| Type - Unlined Radius Bend                          |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -1.0                              | -2.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        |
| <b>Rect Duct Losses</b>                             |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -6.0                              | -4.0        | -3.0        | -1.0        | -1.0        | -1.0        | -1.0        | -1.0        |
| <b>End Reflection &amp; Directional Directivity</b> |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -19.5                             | -14.0       | -9.4        | -4.3        | -1.2        | 0.3         | 1.0         | 1.4         |
| <b>Dc - Reflections &amp; Directivity</b>           |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         |
| <b>Adiv - Geometrical Divergence</b>                |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | -45.9                             | -45.9       | -45.9       | -45.9       | -45.9       | -45.9       | -45.9       | -45.9       |
| <b>Aatm - Atmospheric Absorption</b>                |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8        | -6.5        |
| <b>Agr - Ground Attenuation</b>                     |     |                                   |             |             |             |             |             |             |             |
|                                                     |     | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         |

|                                                                                 | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |            |
|---------------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
|                                                                                 | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k         |
| <b>Abar - Barrier Attenuation</b>                                               |                                   |             |             |             |             |             |             |            |
|                                                                                 | -3.0                              | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0        | -3.0       |
| <b>External Receiver</b>                                                        |                                   |             |             |             |             |             |             |            |
| External Receiver - Top floor of<br>Premier Suites Equipment operating<br>times |                                   |             |             |             |             |             |             |            |
| <b>Sound Pressure, Lp:</b>                                                      | <b>38.6</b>                       | <b>22.1</b> | <b>15.6</b> | <b>15.8</b> | <b>14.9</b> | <b>18.0</b> | <b>14.4</b> | <b>7.0</b> |

## Calculation Sheet

## EF1 Discharge to Top floor of Premier Suites Equipment operating times

|                                                                           |      | Octave Band Centre Frequency (Hz) |             |             |             |              |              |              |              |
|---------------------------------------------------------------------------|------|-----------------------------------|-------------|-------------|-------------|--------------|--------------|--------------|--------------|
|                                                                           |      | 63                                | 125         | 250         | 500         | 1k           | 2k           | 4k           | 8k           |
| <b>Noise Source</b>                                                       |      |                                   |             |             |             |              |              |              |              |
| Noise Source - EF1 Discharge                                              |      |                                   |             |             |             |              |              |              |              |
| <b>Sound Power Levels</b>                                                 |      | <b>113.0</b>                      | <b>94.0</b> | <b>87.0</b> | <b>84.0</b> | <b>81.0</b>  | <b>78.0</b>  | <b>73.0</b>  | <b>67.0</b>  |
| <b>Silencer</b>                                                           |      |                                   |             |             |             |              |              |              |              |
| Silencer Type - Rectangular                                               |      |                                   |             |             |             |              |              |              |              |
| Silencer Reference - EF1 Attenuator                                       |      |                                   |             |             |             |              |              |              |              |
| Width (m)                                                                 | 0.6  |                                   |             |             |             |              |              |              |              |
| Height (m)                                                                | 0.6  |                                   |             |             |             |              |              |              |              |
| % Free Area (%)                                                           | 45.0 |                                   |             |             |             |              |              |              |              |
| Face Velocity (m/s)                                                       | 11.9 |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -4.0                              | -7.0        | -10.0       | -13.8       | -14.6        | -9.8         | -7.7         | -4.9         |
| <b>Bend Loss</b>                                                          |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -1.0                              | -2.0        | -3.0        | -3.0        | -3.0         | -3.0         | -3.0         | -3.0         |
| <b>Bend Loss</b>                                                          |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -1.0                              | -2.0        | -3.0        | -3.0        | -3.0         | -3.0         | -3.0         | -3.0         |
| <b>Rect Duct Losses</b>                                                   |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -1.8                              | -1.2        | -0.9        | -0.3        | -0.3         | -0.3         | -0.3         | -0.3         |
| <b>Duct Break-Out</b>                                                     |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -5.8                              | -8.8        | -11.8       | -14.8       | -17.8        | -20.8        | -25.8        | -29.8        |
| <b>ISO 9613 Calculation</b>                                               |      |                                   |             |             |             |              |              |              |              |
| Horiz. Distance (m)                                                       | 55.0 |                                   |             |             |             |              |              |              |              |
| Source Height (m)                                                         | 4.5  |                                   |             |             |             |              |              |              |              |
| Receiver Height (m)                                                       | 4.5  |                                   |             |             |             |              |              |              |              |
| Q Factor - Junction                                                       |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -36.8                             | -36.8       | -36.9       | -36.9       | -37.0        | -37.3        | -38.6        | -43.2        |
| <b>ISO 9613 Barrier Attenuation</b>                                       |      |                                   |             |             |             |              |              |              |              |
|                                                                           |      | -11.1                             | -12.9       | -15.2       | -17.8       | -20.6        | -23.0        | -23.0        | -23.0        |
| <b>External Receiver</b>                                                  |      |                                   |             |             |             |              |              |              |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |      |                                   |             |             |             |              |              |              |              |
| <b>Sound Pressure, Lp:</b>                                                |      | <b>51.5</b>                       | <b>23.2</b> | <b>6.2</b>  | <b>-5.7</b> | <b>-15.3</b> | <b>-19.3</b> | <b>-28.4</b> | <b>-40.3</b> |

## Calculation Sheet

## EF1 Inlet to Top floor of Premier Suites Equipment operating times

|                                                                           |      | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|---------------------------------------------------------------------------|------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                                           |      | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                                       |      |                                   |             |             |             |             |             |              |              |
| Noise Source - EF1 Inlet                                                  |      |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                                       |      | <b>110.0</b>                      | <b>87.0</b> | <b>89.0</b> | <b>80.0</b> | <b>76.0</b> | <b>74.0</b> | <b>71.0</b>  | <b>65.0</b>  |
| <b>Rect Duct Losses</b>                                                   |      |                                   |             |             |             |             |             |              |              |
|                                                                           |      | -0.6                              | -0.4        | -0.3        | -0.1        | -0.1        | -0.1        | -0.1         | -0.1         |
| <b>Duct Break-Out</b>                                                     |      |                                   |             |             |             |             |             |              |              |
|                                                                           |      | -8.1                              | -11.1       | -14.1       | -17.1       | -20.1       | -23.1       | -28.1        | -32.1        |
| <b>ISO 9613 Calculation</b>                                               |      |                                   |             |             |             |             |             |              |              |
| Horiz. Distance (m)                                                       | 55.0 |                                   |             |             |             |             |             |              |              |
| Source Height (m)                                                         | 1.0  |                                   |             |             |             |             |             |              |              |
| Receiver Height (m)                                                       | 4.5  |                                   |             |             |             |             |             |              |              |
| Q Factor - Junction                                                       |      |                                   |             |             |             |             |             |              |              |
|                                                                           |      | -36.8                             | -36.8       | -36.9       | -36.9       | -37.0       | -37.4       | -38.6        | -43.3        |
| <b>ISO 9613 Barrier Attenuation</b>                                       |      |                                   |             |             |             |             |             |              |              |
|                                                                           |      | -15.1                             | -17.7       | -20.4       | -23.0       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                                  |      |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |      |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                                |      | <b>49.4</b>                       | <b>21.0</b> | <b>17.3</b> | <b>2.9</b>  | <b>-4.2</b> | <b>-9.5</b> | <b>-18.8</b> | <b>-33.4</b> |

## Calculation Sheet

## SF1 Outlet to Top floor of Premier Suites Equipment operating times

|                                                                           |      | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |              |
|---------------------------------------------------------------------------|------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
|                                                                           |      | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k           |
| <b>Noise Source</b>                                                       |      |                                   |             |             |             |             |             |             |              |
| Noise Source - SF1 Outlet                                                 |      |                                   |             |             |             |             |             |             |              |
| <b>Noise Levels</b>                                                       |      | <b>86.0</b>                       | <b>96.0</b> | <b>92.0</b> | <b>89.0</b> | <b>82.0</b> | <b>83.0</b> | <b>80.0</b> | <b>74.0</b>  |
| <b>Rect Duct Losses</b>                                                   |      |                                   |             |             |             |             |             |             |              |
|                                                                           |      | -0.6                              | -0.4        | -0.3        | -0.1        | -0.1        | -0.1        | -0.1        | -0.1         |
| <b>Duct Break-Out</b>                                                     |      |                                   |             |             |             |             |             |             |              |
|                                                                           |      | -8.1                              | -11.1       | -14.1       | -17.1       | -20.1       | -23.1       | -28.1       | -32.1        |
| <b>ISO 9613 Calculation</b>                                               |      |                                   |             |             |             |             |             |             |              |
| Horiz. Distance (m)                                                       | 55.0 |                                   |             |             |             |             |             |             |              |
| Source Height (m)                                                         | 1.0  |                                   |             |             |             |             |             |             |              |
| Receiver Height (m)                                                       | 4.5  |                                   |             |             |             |             |             |             |              |
| Q Factor - Junction                                                       |      |                                   |             |             |             |             |             |             |              |
|                                                                           |      | -36.8                             | -36.8       | -36.9       | -36.9       | -37.0       | -37.4       | -38.6       | -43.3        |
| <b>ISO 9613 Barrier Attenuation</b>                                       |      |                                   |             |             |             |             |             |             |              |
|                                                                           |      | -15.1                             | -17.7       | -20.4       | -23.0       | -23.0       | -23.0       | -23.0       | -23.0        |
| <b>External Receiver</b>                                                  |      |                                   |             |             |             |             |             |             |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |      |                                   |             |             |             |             |             |             |              |
| <b>Sound Pressure, Lp:</b>                                                |      | <b>25.4</b>                       | <b>30.0</b> | <b>20.3</b> | <b>11.9</b> | <b>1.8</b>  | <b>-0.5</b> | <b>-9.8</b> | <b>-24.4</b> |

## Calculation Sheet

## SF1 Breakout to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |              |              |
| Noise Source - SF1 Breakout                                               |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                                       | <b>65.0</b>                       | <b>78.0</b> | <b>63.0</b> | <b>55.0</b> | <b>56.0</b> | <b>53.0</b> | <b>46.0</b>  | <b>37.0</b>  |
| <b>Noise Control Treatments</b>                                           |                                   |             |             |             |             |             |              |              |
| Treatment - none                                                          |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0          |
| <b>Dc - Directivity</b>                                                   |                                   |             |             |             |             |             |              |              |
| DI Index - 6dB                                                            |                                   |             |             |             |             |             |              |              |
|                                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8         | -6.4         |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |              |              |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          | 3.0          |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |              |              |
|                                                                           | -15.1                             | -17.7       | -20.4       | -23.0       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                                | <b>13.1</b>                       | <b>23.5</b> | <b>5.7</b>  | <b>-4.9</b> | <b>-4.0</b> | <b>-7.4</b> | <b>-15.6</b> | <b>-29.3</b> |

## Calculation Sheet

## EF1 Breakout to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |              |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k           |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |             |              |
| Noise Source - EF1 Breakout                                               |                                   |             |             |             |             |             |             |              |
| <b>Sound Power Levels</b>                                                 | <b>96.0</b>                       | <b>79.0</b> | <b>73.0</b> | <b>65.0</b> | <b>62.0</b> | <b>61.0</b> | <b>57.0</b> | <b>53.0</b>  |
| <b>Noise Control Treatments</b>                                           |                                   |             |             |             |             |             |             |              |
| Treatment - none                                                          |                                   |             |             |             |             |             |             |              |
|                                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          |
| <b>Dc - Directivity</b>                                                   |                                   |             |             |             |             |             |             |              |
| DI Index - 6dB                                                            |                                   |             |             |             |             |             |             |              |
|                                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |             |              |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |             |              |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8        | -6.4         |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |             |              |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |             |              |
|                                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0       | -23.0        |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |             |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |             |              |
| <b>Sound Pressure, Lp:</b>                                                | <b>44.8</b>                       | <b>25.3</b> | <b>16.5</b> | <b>5.6</b>  | <b>2.0</b>  | <b>0.7</b>  | <b>-4.6</b> | <b>-13.2</b> |

## Calculation Sheet

## AC-1 to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |             |              |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k           |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |             |              |
| Noise Source - AC-1                                                       |                                   |             |             |             |             |             |             |              |
| <b>Noise Levels</b>                                                       | <b>74.0</b>                       | <b>73.0</b> | <b>72.0</b> | <b>71.0</b> | <b>69.0</b> | <b>67.0</b> | <b>58.0</b> | <b>51.0</b>  |
| <b>Noise Control Treatments</b>                                           |                                   |             |             |             |             |             |             |              |
| Treatment - none                                                          |                                   |             |             |             |             |             |             |              |
|                                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          |
| <b>Dc - Directivity</b>                                                   |                                   |             |             |             |             |             |             |              |
| DI Index - 6dB                                                            |                                   |             |             |             |             |             |             |              |
|                                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |             |              |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |             |              |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8        | -6.4         |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |             |              |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |             |              |
|                                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0       | -23.0        |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |             |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |             |              |
| <b>Sound Pressure, Lp:</b>                                                | <b>22.8</b>                       | <b>19.3</b> | <b>15.5</b> | <b>11.6</b> | <b>9.0</b>  | <b>6.7</b>  | <b>-3.6</b> | <b>-15.2</b> |

## Calculation Sheet

## CU-1 Coldroom to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |              |              |
| Noise Source - CU-1 Coldroom                                              |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                                       | <b>68.0</b>                       | <b>66.0</b> | <b>68.0</b> | <b>63.0</b> | <b>59.0</b> | <b>53.0</b> | <b>47.0</b>  | <b>40.0</b>  |
| <b>Noise Control Treatments</b>                                           |                                   |             |             |             |             |             |              |              |
| Treatment - none                                                          |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0          |
| <b>Dc - Directivity</b>                                                   |                                   |             |             |             |             |             |              |              |
| DI Index - 6dB                                                            |                                   |             |             |             |             |             |              |              |
|                                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8         | -6.4         |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |              |              |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          | 3.0          |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |              |              |
|                                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                                | <b>16.8</b>                       | <b>12.3</b> | <b>11.5</b> | <b>3.6</b>  | <b>-1.0</b> | <b>-7.3</b> | <b>-14.6</b> | <b>-26.2</b> |

## Calculation Sheet

## CU-2 Freezer to Top floor of Premier Suites Equipment operating times

|                                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|---------------------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                                       |                                   |             |             |             |             |             |              |              |
| Noise Source - CU-2 Freezer                                               |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                                       | <b>67.0</b>                       | <b>62.0</b> | <b>66.0</b> | <b>64.0</b> | <b>58.0</b> | <b>54.0</b> | <b>47.0</b>  | <b>47.0</b>  |
| <b>Noise Control Treatments</b>                                           |                                   |             |             |             |             |             |              |              |
| Treatment - none                                                          |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0          |
| <b>Dc - Directivity</b>                                                   |                                   |             |             |             |             |             |              |              |
| DI Index - 6dB                                                            |                                   |             |             |             |             |             |              |              |
|                                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                                      |                                   |             |             |             |             |             |              |              |
|                                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8         | -6.4         |
| <b>Agr - Ground Attenuation</b>                                           |                                   |             |             |             |             |             |              |              |
|                                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          | 3.0          |
| <b>Abar - Barrier Attenuation</b>                                         |                                   |             |             |             |             |             |              |              |
|                                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                                  |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Equipment operating times |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                                | <b>15.8</b>                       | <b>8.3</b>  | <b>9.5</b>  | <b>4.6</b>  | <b>-2.0</b> | <b>-6.3</b> | <b>-14.6</b> | <b>-19.2</b> |

## Calculation Sheet

## CU-1 Coldroom to Top floor of Premier Suites Overnight

|                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|-----------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                       |                                   |             |             |             |             |             |              |              |
| Noise Source - CU-1 Coldroom                              |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                       | <b>68.0</b>                       | <b>66.0</b> | <b>68.0</b> | <b>63.0</b> | <b>59.0</b> | <b>53.0</b> | <b>47.0</b>  | <b>40.0</b>  |
| <b>Noise Control Treatments</b>                           |                                   |             |             |             |             |             |              |              |
| Treatment - none                                          |                                   |             |             |             |             |             |              |              |
|                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0          |
| <b>Dc - Directivity</b>                                   |                                   |             |             |             |             |             |              |              |
| DI Index - 6dB                                            |                                   |             |             |             |             |             |              |              |
|                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                      |                                   |             |             |             |             |             |              |              |
|                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                      |                                   |             |             |             |             |             |              |              |
|                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8         | -6.4         |
| <b>Agr - Ground Attenuation</b>                           |                                   |             |             |             |             |             |              |              |
|                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          | 3.0          |
| <b>Abar - Barrier Attenuation</b>                         |                                   |             |             |             |             |             |              |              |
|                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                  |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Overnight |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                | <b>16.8</b>                       | <b>12.3</b> | <b>11.5</b> | <b>3.6</b>  | <b>-1.0</b> | <b>-7.3</b> | <b>-14.6</b> | <b>-26.2</b> |

## Calculation Sheet

## CU-2 Freezer to Top floor of Premier Suites Overnight

|                                                           | Octave Band Centre Frequency (Hz) |             |             |             |             |             |              |              |
|-----------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
|                                                           | 63                                | 125         | 250         | 500         | 1k          | 2k          | 4k           | 8k           |
| <b>Noise Source</b>                                       |                                   |             |             |             |             |             |              |              |
| Noise Source - CU-2 Freezer                               |                                   |             |             |             |             |             |              |              |
| <b>Noise Levels</b>                                       | <b>67.0</b>                       | <b>62.0</b> | <b>66.0</b> | <b>64.0</b> | <b>58.0</b> | <b>54.0</b> | <b>47.0</b>  | <b>47.0</b>  |
| <b>Noise Control Treatments</b>                           |                                   |             |             |             |             |             |              |              |
| Treatment - none                                          |                                   |             |             |             |             |             |              |              |
|                                                           | 0.0                               | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0          |
| <b>Dc - Directivity</b>                                   |                                   |             |             |             |             |             |              |              |
| DI Index - 6dB                                            |                                   |             |             |             |             |             |              |              |
|                                                           | 6.0                               | 6.0         | 6.0         | 6.0         | 6.0         | 6.0         | 6.0          | 6.0          |
| <b>Adiv - Geometrical Divergence</b>                      |                                   |             |             |             |             |             |              |              |
|                                                           | -45.8                             | -45.8       | -45.8       | -45.8       | -45.8       | -45.8       | -45.8        | -45.8        |
| <b>Aatm - Atmospheric Absorption</b>                      |                                   |             |             |             |             |             |              |              |
|                                                           | 0.0                               | 0.0         | -0.1        | -0.1        | -0.2        | -0.5        | -1.8         | -6.4         |
| <b>Agr - Ground Attenuation</b>                           |                                   |             |             |             |             |             |              |              |
|                                                           | 3.0                               | 3.0         | 3.0         | 3.0         | 3.0         | 3.0         | 3.0          | 3.0          |
| <b>Abar - Barrier Attenuation</b>                         |                                   |             |             |             |             |             |              |              |
|                                                           | -14.4                             | -16.9       | -19.7       | -22.5       | -23.0       | -23.0       | -23.0        | -23.0        |
| <b>External Receiver</b>                                  |                                   |             |             |             |             |             |              |              |
| External Receiver - Top floor of Premier Suites Overnight |                                   |             |             |             |             |             |              |              |
| <b>Sound Pressure, Lp:</b>                                | <b>15.8</b>                       | <b>8.3</b>  | <b>9.5</b>  | <b>4.6</b>  | <b>-2.0</b> | <b>-6.3</b> | <b>-14.6</b> | <b>-19.2</b> |

## Appendix B

### Noise Control Treatments

## Attenuator Schedule

| Reference      | Location | Description                    | Insertion Losses (dB) |     |     |     |    |    |    |    |
|----------------|----------|--------------------------------|-----------------------|-----|-----|-----|----|----|----|----|
|                |          |                                | 63                    | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| SF1 Attenuator |          | 600L 45% Free Area             | 4                     | 7   | 11  | 15  | 19 | 14 | 12 | 7  |
| EF1 Attenuator |          | 600L 45% Free Area c/w Melinex | 4                     | 7   | 10  | 14  | 15 | 10 | 8  | 5  |

Notes:

1. All dimensions in mm
2. Performance shown as static insertion loss. Dynamic insertion loss performance allowing for airflow generated noise is shown on the relevant calculation sheet.
3. Selections are nominal and the successful supplier should ensure their proposal achieves the minimum required static and dynamic insertion loss performance.