

Acoustic assessment of proposed new mechanical services equipment

753-755 Wilmslow Road, Didsbury



Client: Chapman Ventilation Limited

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CONTENTS

0. SUMMARY	2
1. INTRODUCTION	3
2. ACOUSTIC CRITERIA	3
3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS	4
4. SOUND LEVEL SURVEY	5
5. ACOUSTIC ASSESSMENT.....	8
6. RECOMMENDATIONS FOR NOISE AND VIBRATION CONTROL TREATMENTS	12
6.1 Duct-Mounted Attenuators	12
6.2 Acoustic Panelled Enclosure	12
6.3 Catering Condenser Acoustic Louvre Treatment	12
6.4 Air Conditioning Condenser Acoustic Treatment	13
6.5 Vibration Isolators.....	13
7. CONCLUSION.....	13
Appendix A	A
Appendix B	B

0. SUMMARY

- 0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of new mechanical services equipment associated with a proposed Franco Manca restaurant at 753-755 Wilmslow Road, Didsbury.
- 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 requirements of Manchester City Council's requirements. An assessment of the potential for disturbance to nearby residential occupants has been undertaken following the procedures set out in British Standard BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- 0.3. Closest residential dwellings have been identified as apartments within the 1st and 2nd floors of the development property, along with residential windows of properties on Grange Lane.
- 0.4. A sound level survey has been carried out in the vicinity to establish the existing background sound level. Representative background sound levels to the rear of the site were measured at LA90 39dB during the latest operating times of the restaurant, and LA90 34dB during later, more sensitive night-time periods when the restaurant will be closed but the proposed catering condenser may still be operating. To the front, measured background sound levels during the operating times of the restaurant were LA90 39dB. The existing acoustic climate in the vicinity is currently dominated by vehicle traffic along with some pedestrian activity to the front. Although not witnessed, it is anticipated that sound levels to the rear during the evening will likely incorporate some noise from existing mechanical systems which were observed serving other nearby properties.
- 0.5. Calculations using manufacturer's sound level data for the new equipment confirm that the worst-case rating level will be LAr 34dB outside the most-affected residential properties during the restaurant operating times, and LAr 7dB during periods with the restaurant closed, when assessed in accordance with BS 4142:2014+A1:2019. This is at least 5dBA below the prevailing background sound level and complies with Manchester City Council's typical requirements.
- 0.6. Noise from the proposed equipment should not be disturbing or detrimental to the amenity of any nearby residential occupants. The assessment includes benefit of noise-control treatments as set out in this report and no further mitigation measures would be necessary.

1. INTRODUCTION

New mechanical services equipment associated with ventilation and air conditioning is to be installed at 753-755 Wilmslow Road, Didsbury.

ACA Acoustics Limited has been commissioned by Chapman Ventilation Limited 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.

The assessment is required to support a planning application to Manchester City Council for the development.

This report presents results of the sound level survey, calculations, assessment, and recommendations for suitable noise control treatments to comply with the required criteria.

2. ACOUSTIC CRITERIA

It is understood that Manchester City Council would require mechanical services equipment to adhere to a condition similar to the following, taken from a previous project in the City.

Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.

The scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The approved scheme shall be completed before the premises is occupied.

Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the noise criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Although not specifically noted, as this condition refers to the 'rating level' it is anticipated that the assessment should be carried out in accordance with BS 4142:2014+A1:2019.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

A planning application is to be submitted for a proposed restaurant at ground floor and basement level. New mechanical services equipment associated with ventilation and air conditioning to the restaurant is proposed as part of the development.

The surrounding area is a mixture of residential properties, retail, offices, and other commercial units.

A marked-up aerial photograph, showing the nominal location of new mechanical plant and the adjoining residential windows is shown in Figure 1 and below.

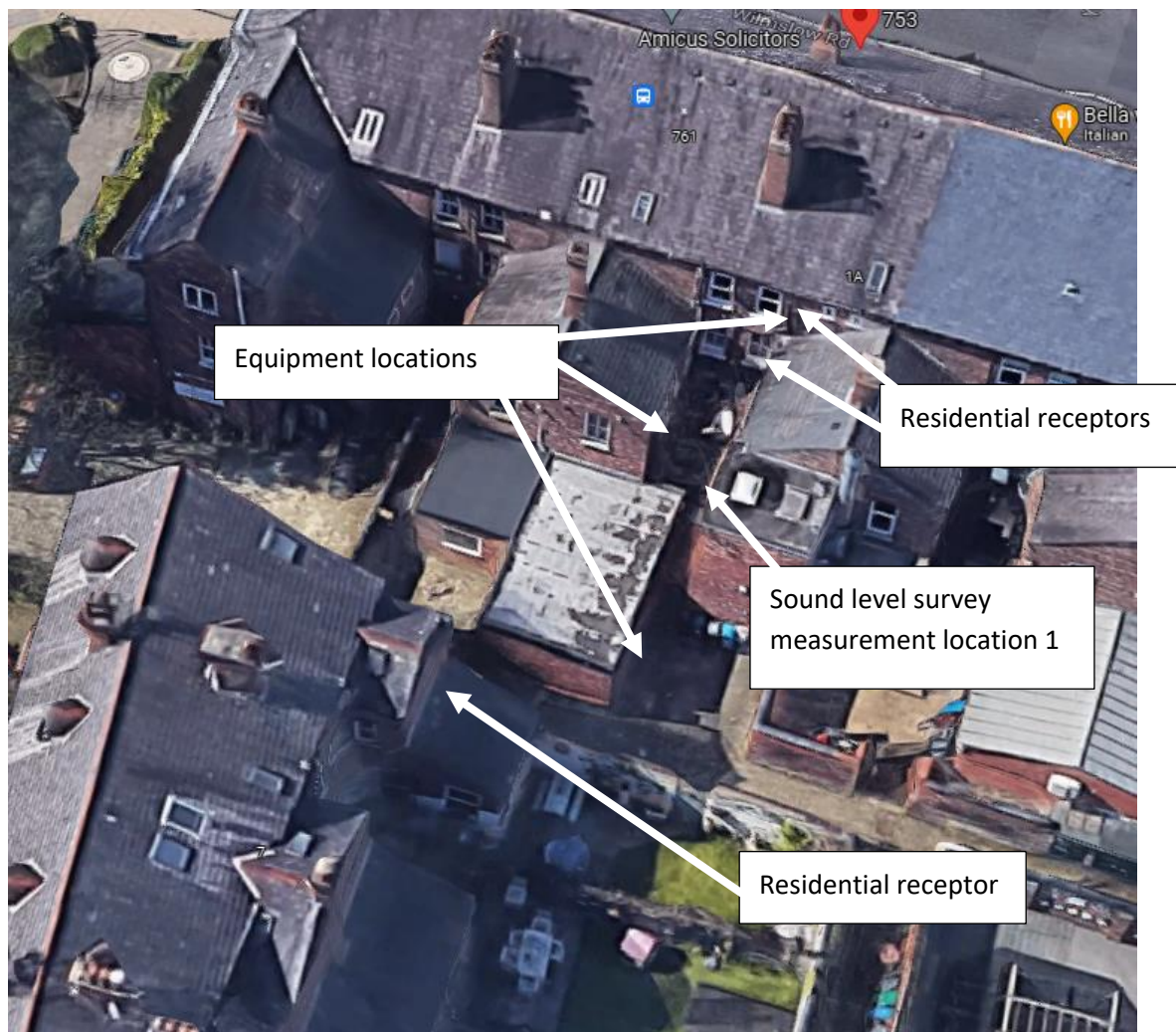


Figure 1: Aerial photograph of the rear of the site identifying closest residential windows (available at www.google.com/maps)

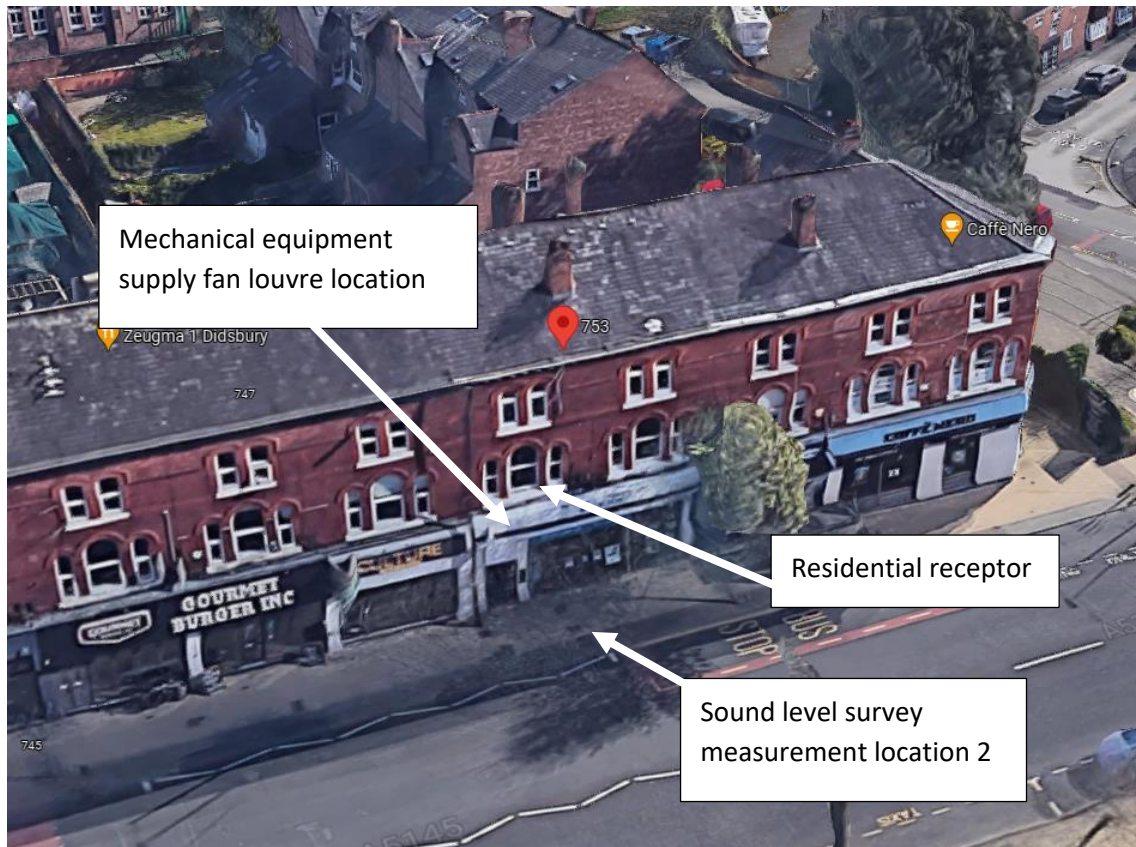


Figure 2: Aerial photograph of the front of the site identifying closest residential receptors (available at www.google.com/maps)

The proposals are for the installation of three extract fans, including a flue extraction system, general purpose extract, and toilet extract, all to be installed to the rear, alongside two air conditioning units, and a catering condenser. The supply fan will be ducted to the front facade.

It is understood the equipment will operate over the proposed operating times of the restaurant (up until 00:00 hours). The catering condenser at the rear, however, 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 existing background sound levels in the vicinity. Details of the sound level survey carried out by ACA Acoustics are provided below.

A 24-hour unmanned background sound level survey measurement position was selected within the rear courtyard of the building at a position equivalent to windows of the neighboring residential

property. To obtain levels at the front façade, a manned sound level survey was carried out during the late evening period until the latest operating times of the equipment at 00:00 hours.

The survey was carried out between 20th and 21st December 2021. The manned survey at the front of the site was undertaken during the night of the 20th December 2021. The weather remained dry and calm throughout the surveys. The survey was conducted typically following procedures set out in BS 4142:2014+A1:2019.

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

Equipment	Serial Number
Attended survey to the front façade: NTi Audio Class 1 sound level meter type XL2	A2A-06294-E0
Unattended survey to the rear façade: Svantek Class 1 sound level meter type SV 307	84914
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	83826

Table 1: Equipment used for the sound level survey

Results of the unmanned survey are shown in Figure 3 below.

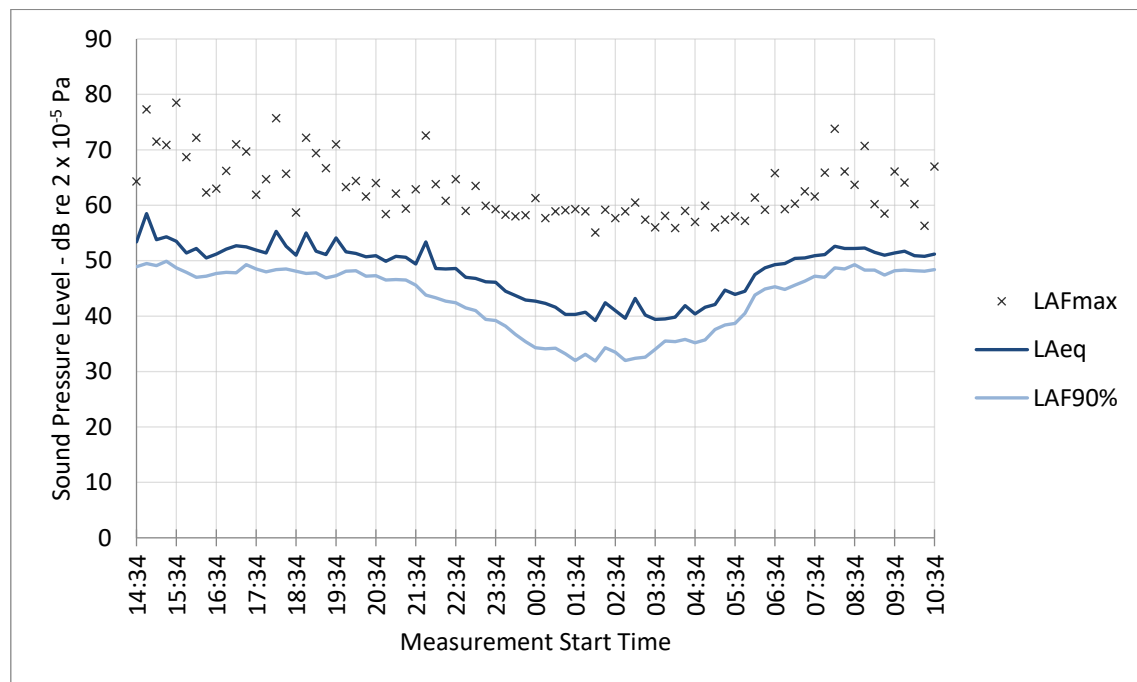


Figure 3: Sound level survey results

In accordance with BS 4142:2014+A1:2019, the prevailing background sound level is not necessarily the lowest recorded values but rather the level that best represents the typical background sound

level in the area over a defined period. A statistical analysis of the background sound levels measured between the hours of 23:00 to 00:00 has been carried out. The analysis generally follows suggested guidance contained in Section 8 of the Standard. Distribution of the measured LA90 sound levels during the latest operating times of the new equipment are shown below. Analysis of levels measured overnight (23:00 – 07:00) is also included.

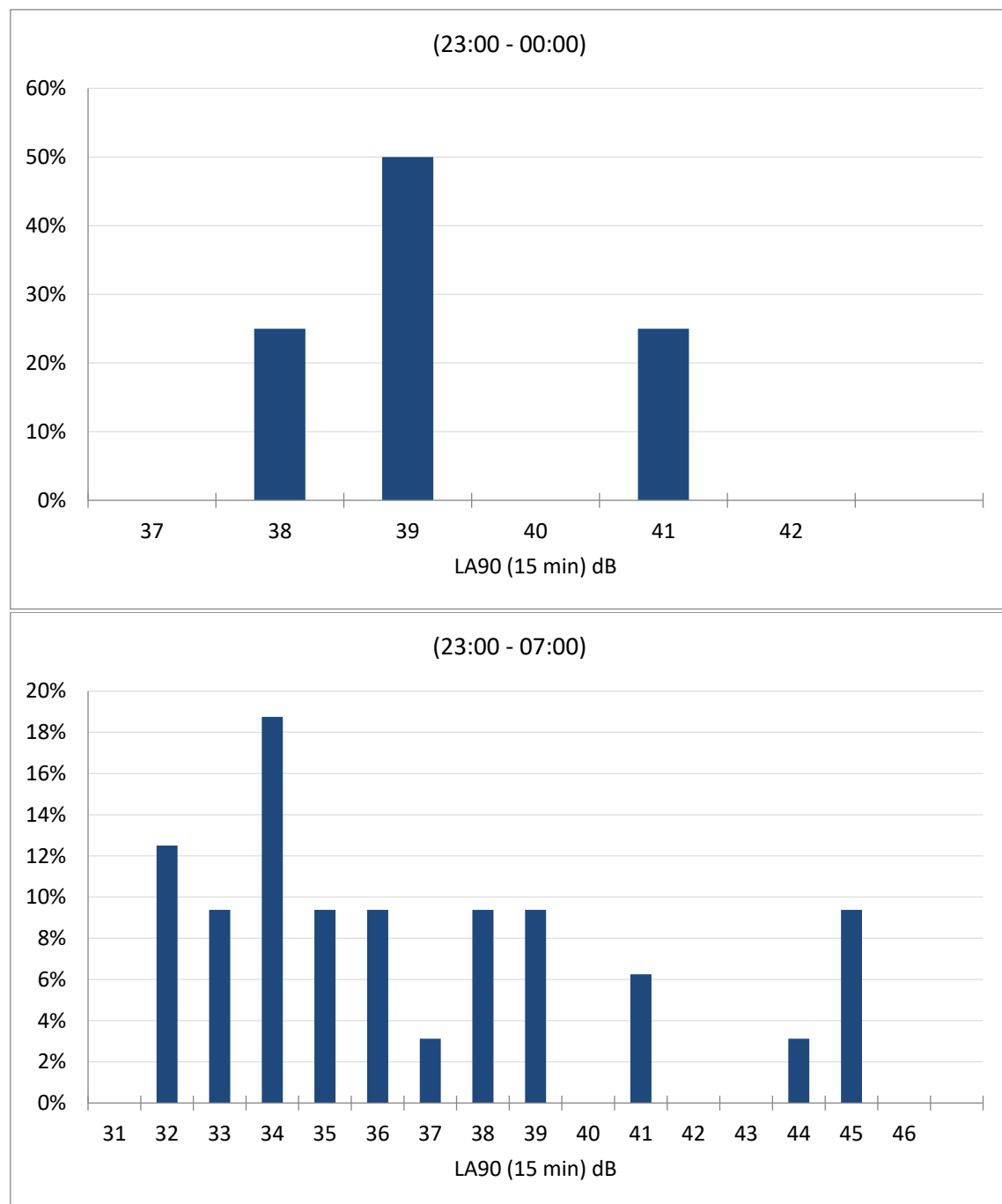


Figure 4: Statistical analysis of measured LA90 sound levels

Figure 4 confirms that over the latest operating times of the restaurant the representative background sound level is LA90 39dB. Levels over night, when the catering condenser will be

operating, were at or above LA90 34dB for approximately 81% of the time. These percentages are significant enough not to reflect occasional or transient situations and therefore to ensure a robust assessment it is proposed that they are taken as being representative of the acoustic climate in the vicinity.

To the front of the site, levels were measured between the hours of 23:45 and 00:15 hours. The lowest 15-minute measurement over this period was LA90 39dB. This level was witnessed as being representative of the area, and was free of any non-typical events. The acoustic climate to the front of the property during the manned survey consisted primarily of traffic activity.

In accordance with criteria issued by Manchester City Council, the cumulative rating level of the new plant during the restaurant opening hours shall be designed to not exceed a level of LAr 34dB to the front and rear, and LAr 29dB overnight to the rear. These levels are 5dBA below the respective representative background sound levels.

5. ACOUSTIC ASSESSMENT

The development includes the installation of new air conditioning and catering condensers, along with new ventilation fans. Confirmation of the equipment models used in the assessment is provided in Table 2 below.

Reference	Equipment Model	Quantity
CU 1	Toshiba RAV-GM1401 ATP-E	1
CU 2	Toshiba RAV-GM1401 ATP-E	1
CU 3	Danfoss Optyma - MPYM014MPP00G	1
EF1	Flueboost 350	1
EF2	Systemair K250 L Sileo	1
EF3	Systemair K200 L Sileo	1
SF1	Helios SKR 400/60/35	1

Table 2: 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 emissions from the proposed plant to outside the nearest noise-sensitive windows. The models for the fans incorporate corrections from

the ductwork system in accordance with CIBSE Guide B4. Environmental corrections are calculated using the assessment method of ISO 9613-2:1996.

The cumulative calculated specific sound level from the plant to outside nearby residential windows with all plant operating is shown in Table 3. Summary printouts from the calculation models are included in Appendix A.

Receptor Location	Assessment period	Calculated Specific Sound Level
Rear top floor windows of 753-755 Wilmslow Road	Restaurant opening hours	24
Rear first floor windows of 753-755 Wilmslow Road	Restaurant opening hours	28
Rear first floor windows of 753-755 Wilmslow Road	24-hours	20
Front first floor windows of 753-755 Wilmslow Road	Restaurant opening hours	29
First floor windows of Properties on Grange Lane	Restaurant opening hours	20
First floor windows of Properties on Grange Lane	24-hours	9

Table 3: Calculated cumulative equipment sound levels at 1m outside noise-sensitive windows

Assessment of the calculated specific sound levels in accordance with BS 4142:2014+A1:2019, as required by Manchester City Council, is provided in Table 4 and Table 5 below.

It has been assumed that the condensers will operate for around 50% of the relevant assessment period, switching on/off as required by the load on the system. This is accounted for in the condenser calculation sheets included in Appendix A. Where the operating time is greater than the intermittent acoustic feature correction would reduce proportionally, resulting in a similar rating level at the receptor.

Description	Rear First Floor Windows of 753- 755 Wilmslow Road	Front First Floor windows of 753-755 Wilmslow Road	Relevant Clause	Commentary
Calculated specific sound level to noise- sensitive windows	L _{Aeq} 28dB	L _{Aeq} 29dB	7.1 7.3.6	All plant operating. Refer calculation sheets in Appendix A
Background sound level	L _{A90} 39dB	L _{A90} 39dB	8.1.3 8.3	Measured background sound level during latest restaurant operating times
Acoustic feature correction	Intermittency +3dB Impulsivity +3dB	Mechanical Character +3dB	9.2	A penalty has been applied for adverse characteristics when all plant is operating simultaneously.
On time correction	0dB	0dB	7.3	
Rating level in accordance with BS 4142	L _{Ar} 34dB	L _{Ar} 32dB	9.2	
Excess of rating level over background sound level	-5dB	-7dB	11	Assessment indicates negligible likelihood of adverse impact

Table 4: BS 4142:2014+A1:2019 Assessment for all plant operating during the restaurant operating period to outside closest noise sensitive windows

Description	Rear First Floor Windows of 753- 755 Wilmslow Road	Relevant Clause	Commentary
Calculated specific sound level to noise-sensitive windows	LAeq 20dB	7.1 7.3.6	Catering condenser operating. Refer calculation sheets in Appendix A
Background sound level	LA90 34dB	8.1.3 8.3	Measured background sound level during latest restaurant operating times
Acoustic feature correction	0dB	9.2	The specific sound level is significantly below the background sound level. Noise from the plant will be largely inaudible and no correction is applicable.
On time correction	0dB	7.3	
Rating level in accordance with BS 4142	LAr 20dB	9.2	
Excess of rating level over background sound level	-14dB	11	Assessment indicates negligible likelihood of adverse impact

Table 5: BS 4142:2014+A1:2019 Assessment catering condenser operating overnight to outside closest noise sensitive windows

Table 4 and Table 5 both show the cumulative rating level of the proposed new equipment will be at least 5dBA below the representative background LA90 sound level to outside the closest noise-sensitive properties at any time. This achieves the criteria of both Manchester City Council.

During periods of the day where the background sound level is higher or times when some of the equipment is not operating, such as when air conditioning condensers cycle on and off depending on the load on the system, sound levels from the equipment will be even further below the prevailing background sound level.

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, allowing a reduction through partially open windows of 15dBA, as recommended in BS 8233:2014, worst-case sound levels inside the neighbouring dwellings due to the proposed new equipment will be approximately 13dBA. This is significantly below guideline levels for a good standard of amenity in bedrooms at night 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.

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. The assessment includes benefit of noise control treatments as set out in Section 6.

6. RECOMMENDATIONS FOR NOISE AND VIBRATION CONTROL TREATMENTS

6.1 Duct-Mounted Attenuators

It is recommended that attenuators are installed to the atmospheric and room sides of the supply and extract fans. Insertion loss performance for the required attenuators is included in a schedule in Appendix B of this report.

The attenuators should be installed immediately adjacent to the fan.

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 and air volume requirements.

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 Acoustic Panelled Enclosure

It is advised that the kitchen extract fan is housed within an acoustic panelled enclosure. This would typically be formed from 50mm thick acoustic panels incorporating 18swg steel outer casing, 50mm mineral wool insulation and perforated steel inner casing. The enclosure should be enlarged such that the flexible connections are housed internally within the enclosure. Apertures in the panels where the duct penetrates the enclosure should be sealed airtight with foam strips and a non-hardening flexible mastic.

6.3 Catering Condenser Acoustic Louvre Treatment

It is advised that an acoustic louvre is applied surrounding the catering condensing unit, with no gaps at the edges. A suitable louvred enclosure would typically be formed from 300mm deep acoustic louvres such as Allaway Acoustic's AL3015 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.

6.4 Air Conditioning Condenser Acoustic Treatment

It is recommended that the air conditioning condensers are 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.

6.5 Vibration Isolators

The fans will be structurally connected to the residential properties above. To ensure structure borne noise from the equipment is not disturbing to occupants of the residential units within the development site itself it is recommended all new mechanical equipment is installed on vibration isolators.

Isolators for the fans should provide minimum 25mm deflection at the working load.

7. CONCLUSION

A planning application is being prepared to include the installation of new mechanical services equipment associated with a restaurant development at 753-755 Wilmslow Road, Didsbury.

ACA Acoustics have undertaken a background sound level survey in the vicinity and calculated sound emissions from the proposed equipment using manufacturer's published acoustic data, following principles set out in BS 4142:2014+A1:2019.

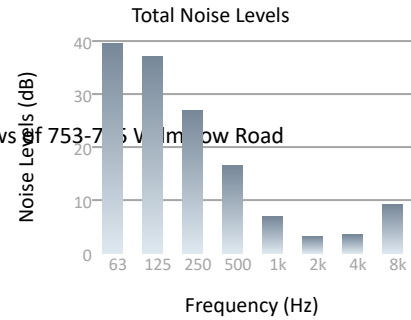
The calculated rating level for the new plant to the most-affected residential window is L_{Ar} 34dB. This is 5dBA below the prevailing background sound level in the vicinity. At this level, the new plant is described in BS 4142:2014+A1:2019 as having only a low impact. Sound emissions from the new equipment comply with the requirements of Manchester City Council.

It is the author's opinion that, allowing for the recommended noise control treatments set out in this report, the proposed new mechanical services equipment will not be detrimental to the amenity of nearby residential occupants.

Appendix A

Acoustic Calculations

Project Name	753-755 Wilmslow Road, Didsbury
Project Reference	211210
Reference	Restaurant opening time: Rear top floor windows
Description	
Noise Limit	34
dBA	24

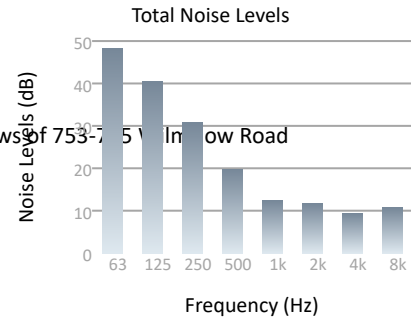


Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF1 Discharge	1	23	19	17	3	-8	-2	0	0
EF2 Discharge	1	36	35	20	-3	-10	-8	-1	8
EF3	1	32	30	20	4	-12	-8	-11	-5
EF1 Breakout	1	24	10	9	3	-9	-11	-18	-27
EF2 Breakout	1	14	15	15	10	3	0	-9	-16
AC-CU1	1	30	24	13	3	-9	-18	-24	-36
AC-CU1	1	30	24	13	3	-9	-18	-24	-36
C-CU2	1	28	24	22	14	3	-8	-8	-12

211210-ER-1

Project Name	753-755 Wilmslow Road, Didsbury
Project Reference	211210
Reference	Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road
Description	
Noise Limit	34
dBA	28



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF2 Discharge	1	37	36	21	-2	-9	-7	0	9
EF3	1	32	30	21	5	-11	-8	-10	-4
EF1 Discharge	1	43	33	25	9	-3	3	4	-1
EF1 Discharge	1	18	12	6	-12	-20	-11	-5	-5
AC-CU1	1	33	27	14	2	-11	-21	-28	-38
EF2 Breakout	1	21	26	24	16	11	10	6	2
EF1 Breakout	1	31	21	18	9	-1	-1	-3	-9
AC-CU1	1	33	27	14	2	-11	-21	-28	-38
C-CU2	1	31	27	22	14	3	-7	-4	-7
EF1 Inlet	1	34	27	19	7	-4	-1	-7	-12
EF2 Inlet	1	44	32	16	-9	-25	-24	-20	-17

211210-ER-2

Project Name 753-755 Wilmslow Road, Didsbury

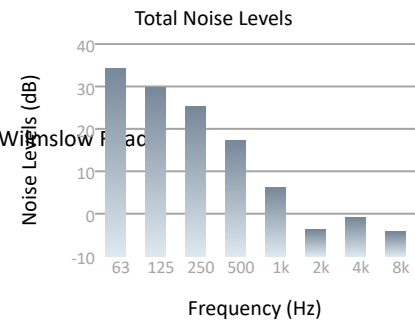
Project Reference 211210

Reference Overnight: Rear first floor windows of 753-755 Wilmslow Road

Description

Noise Limit 34

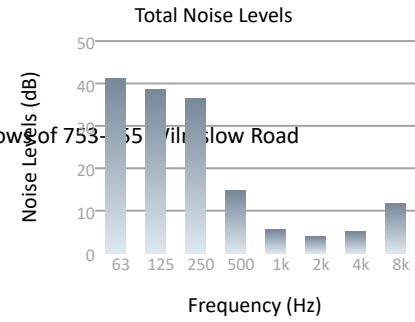
dBA 20



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
C-CU2	1	34	30	25	17	6	-4	-1	-4

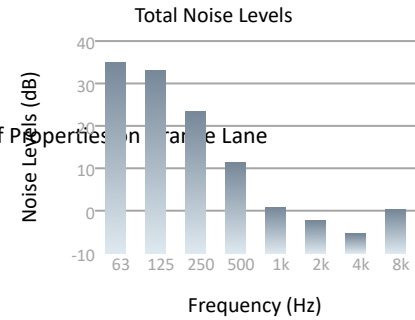
Project Name	753-755 Wilmslow Road, Didsbury
Project Reference	211210
Reference	Restaurant opening time: Front first floor windows of 753-755 Wilmslow Road
Description	
Noise Limit	34
dBA	29



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
SF1 Inlet	1	41	39	36	15	6	4	5	12

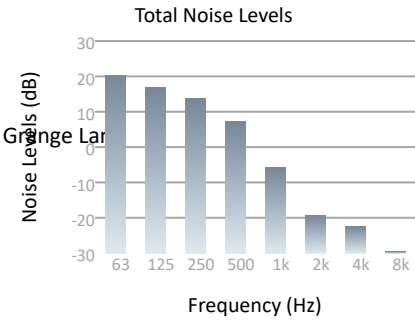
Project Name	753-755 Wilmslow Road, Didsbury
Project Reference	211210
Reference	Restaurant opening time: First floor windows of Properties on Parlane Lane
Description	
Noise Limit	34
dBA	20



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
EF1 Discharge	1	11	4	-1	-19	-27	-18	-12	-14
EF2 Discharge	1	25	24	9	-14	-22	-19	-13	-4
EF3	1	34	32	22	6	-10	-6	-9	-2
EF1 Breakout	1	17	8	7	-1	-13	-16	-24	-34
EF2 Breakout	1	7	13	13	6	-1	-5	-15	-23
AC-CU1	1	23	22	11	-1	-13	-23	-30	-43
AC-CU2	1	23	22	11	-1	-13	-23	-30	-43
C-CU2	1	17	14	11	4	-9	-22	-25	-32

Project Name	753-755 Wilmslow Road, Didsbury
Project Reference	211210
Reference	Overnight: First floor windows of Properties on Ginge Lane
Description	
Noise Limit	29
dBA	9



Noise Sources

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
C-CU2	1	20	17	14	7	-6	-19	-22	-29

211210-ER-6

Calculation Sheet

EF1 Discharge to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1 Discharge									
Noise Levels		63.0	64.0	66.0	65.0	63.0	59.0	57.0	50.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT1-EF1									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	1.6								
		-10.0	-18.0	-24.0	-35.0	-41.9	-29.0	-21.0	-14.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	2.6								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-2.8	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	2.5								
Face Velocity (m/s)	2.6								
		-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.2	-0.1	0.0	0.0
External Grille Directivity									
		-0.2	-1.2	-2.8	-5.5	-8.6	-12.0	-15.0	-15.0

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	5.0								
Source Height (m)	9.0								
Receiver Height (m)	7.5								
Q Factor - Junction									
		-16.4	-16.4	-16.4	-16.4	-16.4	-16.4	-16.5	-17.0
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		23.4	19.5	16.6	3.1	-8.0	-2.5	0.4	0.0

Calculation Sheet

EF2 Discharge to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2 Discharge									
Sound Power Levels		78.0	81.0	75.0	63.0	63.0	62.0	57.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT2-EF2									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	35.0								
Face Velocity (m/s)	0.8								
		-12.0	-21.0	-33.0	-45.0	-55.0	-51.0	-39.0	-23.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	1.1								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	1.1								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-0.9	1.1	0.6	0.1	0.0
External Grille Directivity									
		0.0	0.7	0.9	1.0	1.1	1.4	1.6	1.6

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	5.0								
Source Height (m)	3.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.3	-16.7
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		37.3	36.1	21.0	-1.7	-9.5	-6.8	-0.2	9.3

Calculation Sheet

EF3 to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF3									
Sound Power Levels		75.0	75.0	71.0	67.0	64.0	62.0	55.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT3-EF3									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	0.7								
		-8.0	-14.0	-22.0	-33.0	-44.0	-35.0	-27.0	-16.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.3	-0.1	0.0	0.0
External Grille Directivity									
		-0.2	-1.2	-2.8	-5.5	-8.6	-12.0	-15.0	-15.0
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	10.0								
Source Height (m)	2.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-22.2	-22.2	-22.2	-22.2	-22.2	-22.3	-22.5	-23.4
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		32.4	30.4	20.5	4.9	-11.4	-7.6	-9.8	-3.7

Calculation Sheet

SF1 Inlet to Restaurant opening time: Front first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - SF1 Inlet									
Noise Levels		69.0	69.0	74.0	63.0	56.0	53.0	50.0	48.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT4-SF1 Inlet									
Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	3.5								
		-8.0	-14.0	-22.0	-32.0	-32.6	-29.5	-24.9	-15.9
Rect Duct Losses									
		-0.6	-0.4	-0.3	-0.1	-0.1	-0.1	-0.1	-0.1
End Reflection									
		-7.5	-3.5	-1.3	-0.4	-0.1	0.0	0.0	0.0
External Grille Directivity									
		-0.4	-1.2	-2.7	-4.4	-6.2	-8.1	-8.6	-8.6
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	1.0								
Source Height (m)	2.7								
Receiver Height (m)	4.5								
Q Factor - Plane									
		-11.3	-11.3	-11.3	-11.3	-11.3	-11.3	-11.3	-11.5
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Front first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		41.2	38.5	36.4	14.8	5.6	4.0	5.1	11.8

Calculation Sheet

EF1 Discharge to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1 Discharge									
Noise Levels		63.0	64.0	66.0	65.0	63.0	59.0	57.0	50.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT1-EF1									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	1.6								
		-10.0	-18.0	-24.0	-35.0	-41.9	-29.0	-21.0	-14.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	2.6								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	2.6								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-2.8	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	2.6								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
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)	1.0								
Source Height (m)	4.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.1
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		43.5	32.6	24.6	8.6	-3.1	2.6	3.6	-0.5

Calculation Sheet

EF1 Discharge to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1 Discharge									
Noise Levels		63.0	64.0	66.0	65.0	63.0	59.0	57.0	50.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT1-EF1									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	1.6								
		-10.0	-18.0	-24.0	-35.0	-41.9	-29.0	-21.0	-14.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	2.6								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-2.8	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	2.5								
Face Velocity (m/s)	2.6								
		-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.2	-0.1	0.0	0.0
External Grille Directivity									
		-0.5	-3.8	-8.2	-15.0	-15.0	-15.0	-15.0	-15.0

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	5.0								
Source Height (m)	9.0								
Receiver Height (m)	4.5								
Q Factor - Plane									
		-21.6	-21.6	-21.6	-21.6	-21.6	-21.6	-21.8	-22.3
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant									
opening time: Rear first floor windows									
Sound Pressure, Lp									
of 753-755 Wilmslow Road		17.9	11.6	6.1	-11.6	-19.6	-10.7	-4.8	-5.4

Calculation Sheet

EF2 Discharge to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2 Discharge									
Sound Power Levels		78.0	81.0	75.0	63.0	63.0	62.0	57.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT2-EF2									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	35.0								
Face Velocity (m/s)	0.8								
		-12.0	-21.0	-33.0	-45.0	-55.0	-51.0	-39.0	-23.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	1.1								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	1.1								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-0.9	1.1	0.6	0.1	0.0
External Grille Directivity									
		0.0	0.7	0.9	1.0	1.1	1.4	1.6	1.6

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	15.0								
Source Height (m)	3.5								
Receiver Height (m)	4.5								
Q Factor - Plane									
		-28.5	-28.5	-28.6	-28.6	-28.6	-28.7	-29.0	-30.3
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure, Lp		24.9	23.7	8.6	-14.1	-21.9	-19.2	-12.9	-4.3

Calculation Sheet

EF3 to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF3									
Sound Power Levels		75.0	75.0	71.0	67.0	64.0	62.0	55.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT3-EF3									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	0.7								
		-8.0	-14.0	-22.0	-33.0	-44.0	-35.0	-27.0	-16.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.3	-0.1	0.0	0.0
External Grille Directivity									
		-0.2	-1.2	-2.8	-5.5	-8.6	-12.0	-15.0	-15.0
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	6.0								
Source Height (m)	2.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-18.0	-18.0	-18.0	-18.0	-18.0	-18.1	-18.2	-18.8
ISO 9613 Barrier Attenuation									
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure, Lp		33.6	31.6	21.7	6.1	-10.2	-6.5	-8.5	-2.1

Calculation Sheet

EF1 Discharge to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1 Discharge									
Noise Levels		63.0	64.0	66.0	65.0	63.0	59.0	57.0	50.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT1-EF1									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	1.6								
		-10.0	-18.0	-24.0	-35.0	-41.9	-29.0	-21.0	-14.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	2.6								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-2.8	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	2.5								
Face Velocity (m/s)	2.6								
		-0.9	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.2	-0.1	0.0	0.0
External Grille Directivity									
		-0.5	-3.8	-8.2	-15.0	-15.0	-15.0	-15.0	-15.0

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	15.0								
Source Height (m)	9.0								
Receiver Height (m)	4.5								
Q Factor - Plane									
		-28.9	-28.9	-28.9	-28.9	-29.0	-29.0	-29.4	-30.7
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure, Lp		10.6	4.3	-1.3	-19.0	-26.9	-18.2	-12.5	-13.8

Calculation Sheet

EF2 Discharge to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2 Discharge									
Sound Power Levels		78.0	81.0	75.0	63.0	63.0	62.0	57.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT2-EF2									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	35.0								
Face Velocity (m/s)	0.8								
		-12.0	-21.0	-33.0	-45.0	-55.0	-51.0	-39.0	-23.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	1.1								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	1.1								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-0.9	1.1	0.6	0.1	0.0
External Grille Directivity									
		0.0	0.7	0.9	1.0	1.1	1.4	1.6	1.6

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	4.0								
Source Height (m)	3.5								
Receiver Height (m)	7.5								
Q Factor - Junction									
		-17.1	-17.1	-17.1	-17.1	-17.1	-17.1	-17.2	-17.7
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		36.4	35.2	20.1	-2.6	-10.4	-7.7	-1.1	8.3

Calculation Sheet

EF3 to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF3									
Sound Power Levels		75.0	75.0	71.0	67.0	64.0	62.0	55.0	51.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT3-EF3									
Discharge Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	0.7								
		-8.0	-14.0	-22.0	-33.0	-44.0	-35.0	-27.0	-16.0
Rect Duct Losses									
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
End Reflection									
		-11.8	-6.9	-3.1	-1.1	-0.3	-0.1	0.0	0.0
External Grille Directivity									
		-0.2	-1.2	-2.8	-5.5	-8.6	-12.0	-15.0	-15.0
ISO 9613 Environmental Corrections									
Horiz. Distance (m)	10.0								
Source Height (m)	2.5								
Receiver Height (m)	7.5								
Q Factor - Junction									
		-23.0	-23.0	-23.0	-23.0	-23.0	-23.1	-23.3	-24.3
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		31.6	29.6	19.7	4.1	-12.2	-8.4	-10.7	-4.6

Calculation Sheet

EF1 Inlet to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF1 Inlet									
Noise Levels		61.0	62.0	62.0	61.0	57.0	55.0	50.0	44.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT5-EF1 Inlet									
Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	40.0								
Face Velocity (m/s)	1.6								
		-7.0	-12.0	-16.0	-23.0	-27.0	-19.0	-14.0	-9.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	2.6								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Bend Loss									
Width (m)	0.3								
Height (m)	0.3								
Face Velocity (m/s)	2.6								
Bend Type - Radius									
Type - Unlined Radius Bend									
		0.0	-1.0	-2.0	-3.0	-3.0	-3.0	-3.0	-3.0
Rect Duct Losses									
Width (m)	0.3								
Height (m)	0.3								
Length (m)	1.0								
Face Velocity (m/s)	2.6								
		-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
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)	1.0								
Source Height (m)	1.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.1	-12.4
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		34.5	26.6	18.6	6.6	-4.4	-1.4	-6.5	-11.8

Calculation Sheet

EF2 Inlet to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - EF2 Inlet									
Sound Power Levels		79.0	77.0	75.0	63.0	63.0	59.0	58.0	52.0
Silencer									
Silencer Type - Rectangular									
Silencer Reference - ATT6-EF2 Inlet									
Width (m)	0.6								
Height (m)	0.6								
% Free Area (%)	35.0								
Face Velocity (m/s)	0.8								
		-10.0	-17.0	-28.0	-38.0	-51.0	-43.0	-33.0	-20.0
Duct Break-Out									
		-12.8	-15.8	-18.8	-21.8	-24.8	-27.8	-32.8	-36.8
ISO 9613 Calculation									
Horiz. Distance (m)	1.0								
Source Height (m)	1.5								
Receiver Height (m)	4.5								
Q Factor - Junction									
		-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.1	-12.4
ISO 9613 Barrier Attenuation									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		44.2	32.2	16.2	-8.8	-24.8	-23.9	-19.9	-17.2

Calculation Sheet

AC-CU1 to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - AC-CU1								
Sound Power Levels	77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments								
Treatment - AE2								
	-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity								
	2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-9.4	-9.7	-11.4	-13.5	-16.0	-18.8	-21.6	-22.3
On Time Correction								
	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver								
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp	33.0	26.6	14.0	1.9	-10.7	-21.4	-28.4	-38.3

Calculation Sheet

AC-CU1 to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - AC-CU1									
Sound Power Levels		77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments									
Treatment - AE2									
		-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity									
		2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergance									
		-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation									
		3.0	2.2	2.2	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-9.4	-9.7	-11.4	-13.5	-16.0	-18.8	-21.6	-22.3
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		33.0	26.6	14.0	1.9	-10.7	-21.4	-28.4	-38.3

Calculation Sheet

C-CU2 to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - C-CU2									
Sound Power Levels		62.0	60.0	60.0	58.0	54.0	50.0	45.0	38.0
Noise Control Treatments									
Treatment - AL1									
		-5.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0
Dc - Condenser Directivity									
		4.8	3.2	0.6	-2.6	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergance									
		-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation									
		3.0	2.2	2.2	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-7.7	-6.9	-6.8	-6.6	-6.2	-5.1	-2.3	-2.3
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		31.2	26.7	22.2	14.2	3.2	-6.7	-4.0	-7.3

Calculation Sheet

C-CU2 to Overnight: Rear first floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - C-CU2								
Sound Power Levels	62.0	60.0	60.0	58.0	54.0	50.0	45.0	38.0
Noise Control Treatments								
Treatment - AL1								
	-5.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0
Dc - Condenser Directivity								
	4.8	3.2	0.6	-2.6	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-7.7	-6.9	-6.8	-6.6	-6.2	-5.1	-2.3	-2.3
External Receiver								
External Receiver - Overnight: Rear first floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp:	34.3	29.7	25.2	17.2	6.2	-3.7	-1.0	-4.3

Calculation Sheet

AC-CU1 to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - AC-CU1									
Sound Power Levels		77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments									
Treatment - AE2									
		-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergance									
		-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation									
		3.0	0.8	1.2	1.5	1.5	1.5	1.5	1.5
Abar - Barrier Attenuation									
		-8.5	-6.9	-8.3	-10.2	-12.2	-14.6	-17.3	-20.1
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure Lp		23.4	21.7	10.7	-0.8	-12.9	-23.4	-30.4	-43.4

Calculation Sheet

AC-CU2 to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - AC-CU2									
Sound Power Levels		77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments									
Treatment - AE2									
		-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergence									
		-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation									
		3.0	0.8	1.2	1.5	1.5	1.5	1.5	1.5
Abar - Barrier Attenuation									
		-8.5	-6.9	-8.3	-10.2	-12.2	-14.6	-17.3	-20.1
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure Lp		23.4	21.7	10.7	-0.8	-12.9	-23.4	-30.4	-43.4

Calculation Sheet

C-CU2 to Restaurant opening time: First floor windows of Properties on Grange Lane

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - C-CU2									
Sound Power Levels		62.0	60.0	60.0	58.0	54.0	50.0	45.0	38.0
Noise Control Treatments									
Treatment - AL1									
		-5.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0
Dc - Condenser Directivity									
		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergance									
		-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation									
		3.0	1.9	2.1	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-8.5	-8.0	-9.2	-10.9	-13.0	-15.4	-18.0	-20.9
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane									
Sound Pressure, Lp		17.4	13.7	10.7	4.2	-8.9	-22.4	-25.4	-32.4

Calculation Sheet

AC-CU1 to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - AC-CU1									
Sound Power Levels		77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments									
Treatment - AE2									
		-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity									
		2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergance									
		-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8
Agr - Ground Attenuation									
		3.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-8.0	-7.4	-7.8	-8.4	-9.5	-11.1	-13.1	-15.6
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		29.9	24.5	13.2	2.5	-8.5	-18.1	-24.3	-36.3

Calculation Sheet

AC-CU1 to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - AC-CU1									
Sound Power Levels		77.0	78.0	75.0	72.0	69.0	63.0	58.0	50.0
Noise Control Treatments									
Treatment - AE2									
		-14.0	-16.0	-23.0	-30.0	-37.0	-39.0	-38.0	-39.0
Dc - Condenser Directivity									
		2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergance									
		-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8
Agr - Ground Attenuation									
		3.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-8.0	-7.4	-7.8	-8.4	-9.5	-11.1	-13.1	-15.6
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		29.9	24.5	13.2	2.5	-8.5	-18.1	-24.3	-36.3

Calculation Sheet

C-CU2 to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Noise Source									
Noise Source - C-CU2									
Sound Power Levels		62.0	60.0	60.0	58.0	54.0	50.0	45.0	38.0
Noise Control Treatments									
Treatment - AL1									
		-5.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0
Dc - Condenser Directivity									
		4.8	3.2	0.6	-2.6	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence									
		-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3
Aatm - Atmospheric Absorption									
		0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8
Agr - Ground Attenuation									
		3.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3
Abar - Barrier Attenuation									
		-7.0	-5.3	-2.4	-2.2	-2.3	-2.3	-2.3	-2.3
On Time Correction									
On Time (%)	50.0								
		-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
External Receiver									
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road									
Sound Pressure, Lp		27.6	23.9	22.2	14.2	2.7	-8.3	-8.5	-12.0

Calculation Sheet

C-CU2 to Overnight: First floor windows of Properties on Grange Lane

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - C-CU2								
Sound Power Levels	62.0	60.0	60.0	58.0	54.0	50.0	45.0	38.0
Noise Control Treatments								
Treatment - AL1								
	-5.0	-6.0	-8.0	-11.0	-18.0	-25.0	-20.0	-16.0
Dc - Condenser Directivity								
	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergence								
	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation								
	3.0	1.9	2.1	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-8.5	-8.0	-9.2	-10.9	-13.0	-15.4	-18.0	-20.9
External Receiver								
External Receiver - Overnight: First floor windows of Properties on Grange Lane								
Sound Pressure, Lp:	20.4	16.8	13.7	7.2	-5.9	-19.4	-22.4	-29.4

Calculation Sheet

EF1 Breakout to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 Breakout								
Noise Levels	67.0	62.0	69.0	69.0	67.0	67.0	64.0	56.0
Noise Control Treatments								
Treatment - AE1								
	-13.0	-17.0	-24.0	-30.0	-38.0	-39.0	-41.0	-39.0
Dc - Condenser Directivity								
	2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-8.0	-7.4	-7.8	-8.4	-9.5	-11.1	-13.1	-15.6
External Receiver								
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp	23.9	10.5	9.2	2.5	-8.5	-11.1	-18.3	-27.3

Calculation Sheet

EF2 Breakout to Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF2 Breakout								
Sound Power Levels	44.0	50.0	51.0	46.0	41.0	39.0	32.0	28.0
Noise Control Treatments								
Treatment - none								
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dc - Condenser Directivity								
	2.2	-2.1	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3	-27.3
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.3	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-8.0	-7.4	-7.8	-8.4	-9.5	-11.1	-13.1	-15.6
External Receiver								
External Receiver - Restaurant opening time: Rear top floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp	13.9	15.5	15.2	9.5	3.5	-0.1	-9.3	-16.3

Calculation Sheet

EF2 Breakout to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF2 Breakout								
Sound Power Levels	44.0	50.0	51.0	46.0	41.0	39.0	32.0	28.0
Noise Control Treatments								
Treatment - none								
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dc - Condenser Directivity								
	4.8	3.2	0.6	-2.6	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.2	2.3	2.2	2.3
Abar - Barrier Attenuation								
	-7.7	-6.9	-6.8	-6.6	-6.2	-5.1	-2.3	-2.3
External Receiver								
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp	21.3	25.7	24.2	16.2	11.2	10.3	6.0	1.7

Calculation Sheet

EF1 Breakout to Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 Breakout								
Noise Levels	67.0	62.0	69.0	69.0	67.0	67.0	64.0	56.0
Noise Control Treatments								
Treatment - AE1								
	-13.0	-17.0	-24.0	-30.0	-38.0	-39.0	-41.0	-39.0
Dc - Condenser Directivity								
	4.8	3.2	0.6	-2.6	-3.0	-3.0	-3.0	-3.0
Adiv - Geometrical Divergence								
	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8	-22.8
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5
Agr - Ground Attenuation								
	3.0	2.2	2.2	2.2	2.2	2.3	2.3	2.3
Abar - Barrier Attenuation								
	-7.7	-6.9	-6.8	-6.6	-6.2	-5.1	-2.3	-2.3
External Receiver								
External Receiver - Restaurant opening time: Rear first floor windows of 753-755 Wilmslow Road								
Sound Pressure, Lp	31.3	20.7	18.2	9.2	-0.8	-0.7	-3.0	-9.3

Calculation Sheet

EF1 Breakout to Restaurant opening time: First floor windows of Properties on Grange Lane

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF1 Breakout								
Noise Levels	67.0	62.0	69.0	69.0	67.0	67.0	64.0	56.0
Noise Control Treatments								
Treatment - AE1								
	-13.0	-17.0	-24.0	-30.0	-38.0	-39.0	-41.0	-39.0
Dc - Condenser Directivity								
	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergence								
	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation								
	3.0	0.8	1.2	1.5	1.5	1.5	1.5	1.5
Abar - Barrier Attenuation								
	-8.5	-6.9	-8.3	-10.2	-12.2	-14.6	-17.3	-20.1
External Receiver								
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane								
Sound Pressure, Lp	17.4	7.8	6.7	-0.8	-12.9	-16.4	-24.4	-34.4

Calculation Sheet

EF2 Breakout to Restaurant opening time: First floor windows of Properties on Grange Lane

	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Noise Source								
Noise Source - EF2 Breakout								
Sound Power Levels	44.0	50.0	51.0	46.0	41.0	39.0	32.0	28.0
Noise Control Treatments								
Treatment - none								
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dc - Condenser Directivity								
	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Adiv - Geometrical Divergence								
	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1	-34.1
Aatm - Atmospheric Absorption								
	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.5	-1.7
Agr - Ground Attenuation								
	3.0	0.8	1.2	1.5	1.5	1.5	1.5	1.5
Abar - Barrier Attenuation								
	-8.5	-6.9	-8.3	-10.2	-12.2	-14.6	-17.3	-20.1
External Receiver								
External Receiver - Restaurant opening time: First floor windows of Properties on Grange Lane								
Sound Pressure, Lp	7.4	12.8	12.7	6.2	-0.9	-5.4	-15.4	-23.4

Appendix B

Typical Noise Control Treatments

Schedule of Noise Control Treatments

Reference	Location	Description	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
AE2	CUs	Environlite Acoustic Enclosure	14	16	23	30	37	39	38	39
AE1	EF1	50mm Thick Panel	13	17	24	30	38	39	41	39
AL1	Catering Condenser	AL3015	5	6	8	11	18	25	20	16

Attenuator Schedule

Reference	Location	Description	Insertion Losses (dB)							
			63	125	250	500	1k	2k	4k	8k
ATT1-EF1 Discharge		1500L 40% Free Area c/w Melinex	10	18	24	35	42	29	21	14
ATT2-EF2 Discharge		1500L 35% Free Area	12	21	33	45	55	51	39	23
ATT3-EF3 Discharge		1200L 40% Free Area	8	14	22	33	44	35	27	16
ATT4-SF1 Inlet		1200L 40% Free Area	8	14	22	33	44	35	27	16
ATT5-EF1 Inlet		900L 40 % Free Area c/w Melinex	7	12	16	23	27	19	14	9
ATT6-EF2 Inlet		1200L 35% Free Area	10	17	28	38	51	43	33	20

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.