

Acoustic Report

Fixed Plant Noise Survey and Impact Assessment ASDA Stores Ltd – Tilehurst

Our Reference – J2637-R1

Survey Date – 16th to 17th August 2017

Survey and Report by – Paul Horsley MIOA

Report compiled by: Paul Horsley MIOA

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A handwritten signature in blue ink, appearing to read 'P. Horsley', with a long horizontal flourish extending to the right.

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1.0 Client

Yorkshire Building Services Ltd
Access Works
Martin Street
Birstall
WF17 9PJ

2.0 Site

ASDA Stores Ltd – Tilehurst
67 Honey End Lane
Tilehurst
Reading
Berkshire
RG30 4EL

3.0 Aims

The aim of this report is to determine the current baseline noise levels due to the existing plant, equipment and activities at the ASDA Store, Tilehurst.

Assess the potential noise impact of the proposed plant installation at the above Asda Store, in accordance with the requirements of BS4142: 2014.

Provide design target noise limitations and mitigation recommendations, as necessary, for the additional plant in order to preserve the existing amenity of the nearby residential premises.

4.0 Location and Description of Noise Sources

The ASDA Store – Tilehurst is located along Honey End Lane, within a purpose built mixed use retail and residential area of Tilehurst.

The store comprises of a single storey shopping unit, external service yard area and customer carpark area to the west of the store building, with access from Honey End Road to the east of the site. The plant is located along the external roof ridge of the store in an east west direction.

The site is bounded to the south by residential premises along Cockney Hill, some m from the roof mounted plant area. The eastern site boundary is formed by Honey End Lane itself with a roundabout to the north east. Beyond is Berkshire Healthcare NHS, Prospect Hospital and training facility, positioned 100m from the roof plant. The northern site boundary is formed by the carpark and shops of Meadway Shopping Centre. This shopping centre consists of the ground floor shop units with residential housing located above, having an access balcony along the facade of the houses. The residences are located 80m from the roof top plant, having a direct line of sight of the plant. There are further residential premises positioned beyond the western car park boundary, along Stoneham Close, at a distance of 200m from the plant, however, these premises are positioned behind a slope and perimeter wall.

The primary noise sources within the vicinity of the site are due to traffic movements along Honey End Lane and the distant A4 trunk road to the south of the site.

The sources under investigation are the plant items located along the roof ridge area of the store.

The store is open from 07.00 hours to 23.00 hours Monday to Saturday and Sunday 10.00 to 16.00, with all plant and equipment operating to suit and the refrigeration equipment operating 24 hours on a demand basis.

5.0 Guidance on the Assessment of Noise Levels.

The purpose of any criterion or standard for environmental noise should be to safeguard against unacceptable levels of community response, deemed as a feeling of annoyance during daytime or disturbance at night. WHO defines annoyance as “a feeling of displeasure evoked by noise.”

The main source of information relating to noise and the community response are field studies including noise measurements and social surveys. They attempt to establish a correlation between the two sets of results.

In the absence of any definitive guidance and in order to establish suitable noise criteria, it is necessary to rely on general guidance and assessment methods used for community noise sources. Discussions on the current methods are given below.

5.1 BS4142:2014 'Method for Rating and Assessing Industrial and Commercial Sound'

This recently revised standard provides a method for rating and assessing sound of an industrial and/or commercial nature. The method uses outdoor sound levels to assess the likely effect of sound on people who might be inside or outside a dwelling or premises used for residential purposes. It is limited to applicable sounds and is not intended for noise amounting to nuisance or rating noise outside the scope of the Standard.

Unlike the previous version of the Standard, rating levels are not prescriptive, but more context based, with the following applicable to rating values:

- Typically, the greater this difference (variance between impact of background and rating level), the greater the magnitude of impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.
- A difference of around +5 dB is an indication of an adverse impact, depending upon the context.
- The lower the rating level is relative to the measured sound level, the less it is that the specific sound source will have an adverse impact or a significant impact. Where the rating does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon context.

The Standard introduces additional rating elements, these being subject assessments of tonality, and impulsivity of a sound source, with weighted rating values accordingly applied at the judgment of the assessor.

The introduction of Uncertainty has been applied to the measured values; again, consideration of this is left to the professional executing the survey and assessment. However, steps are provided within the Standard for the reduction of uncertainty in both measurement and calculations of the sound source and rating value.

Actual meteorological conditions are now required to be recorded and reported upon for the survey and report.

5.2 World Health Organisation 1999 "*Guidelines for Community Noise*"

This document provides a review of the effects of noise and a description of the principles of the WHO health criteria and guidelines for Community Noise.

The effects of noise in dwellings are identified as sleep disturbance, annoyance and speech interference. For bedrooms, the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB LAeq for continuous noise and 45 dB L_{Amax} for sound events. At night time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value is equivalent to that specifies in the Criteria 12 document; however it is now assumed that the noise reduction from outside to inside with the window open is 15 dB.

To enable casual conversation indoors during the daytime, the sound level of the interfering noise should not exceed 35 dB LAeq.

To protect the majority of people from being **seriously** annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being **moderately** annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq.

Table 1 of the document summarises the guideline values for community noise in specific environments and includes the noise indices to be adopted. Significantly, the corresponding time base to be used for the assessment is also included.

The relevant extracts of Table 1 are reproduced thus:

Specific Environment	Critical health effect (s)	LAeq dB	Time Base hours	LAMax dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate Annoyance, Daytime and evening	50	16	-
Dwelling, Indoors	Speech intelligibility & moderate annoyance daytime & evening.	35	16	-
	Sleep Disturbance, night-time	30	8	45
Outside Bedroom	Sleep disturbance, window open (Outdoor Values)	45	8	60

5.3 Subjective Impression of Noise Level Differences

The following Table provides a semantic scale that may be used to “subjectively” rate changes in sound pressure level.

Subjective effect of changes in sound pressure level

Change in sound level dB	Change in Power		Change in apparent loudness
	Decrease	Increase	
3	1/2	2	Just perceptible
5	1/3	3	Clearly noticeable
10	1/10	10	Half / Twice as loud
20	1/100	100	Much quieter / louder

After Bies and Hansen

The above table is taken from Professor Colin H Hansen’s publication “Fundamentals of Acoustics” page 41, for the Department of Mechanical Engineering, University of Adelaide.

This table also appears in “Engineering Noise Control” by Colin Hansen and David Bies, a comprehensive reference book, amongst others.

6.0 Survey Equipment

Integrating Sound Level Meter, RION NA-27, Type 1, Serial No 431986

RION UC-53A Microphone Serial No 35771

RION NC-74 Calibrator Serial No 530712

Windshield

Tripod

7.0 Survey Method

The writer carried out a baseline noise survey on 16th to 17th August 2017 in accordance with the requirements of BS4142:2014.

LA_{eq} , LA_{10} , LA_{90} and LA_{Max} indices sound measurements were taken using the sound analyser.

The measurement indices noted above are defined as follows:

LA_{eq}, T	the "A" weighted equivalent continuous noise level of sample period T
LA_{10}, T	the "A" weighted level exceeded for 10% of sample period T
LA_{90}, T	the "A" weighted level exceeded for 90% of sample period T
LA_{max}	The "A" weighted maximum level during the sample period T

The sound level meter was calibrated before and after the measurements using the calibrator to ensure accuracy of the results. No variations were noted between calibrations and the results obtained can be deemed to be an accurate representation of the levels recorded.

In order to determine the effect of the store activities, plant and equipment on the existing background level, sound recordings were taken at closest noise sensitive residential premises. Measurements made over 15 minute interval continuous periods. These intervals were deemed to be an adequate to represent the areas activities for the period in which it was monitored. The monitoring was repeated to collect representative data of the area noise climate for the area for daytime and nighttime periods. Close quarter's plant noise was measured on a reduced time period to suit.

Refer to Appendix A for a marked up locational plan of the store and survey points.

8.0 Prevailing Weather Conditions

16th to 17th August 2017, 16-20 °C, overcast sky, Wind 0 to 2 mph

Road surfaces were dry

Relative Humidity ranged from 72% to 84%

Atmospheric pressure were steady at 1015 mb throughout the assessment period

9.0 Noise Survey Results

During the monitoring period noise samples were recorded using a 1/1 Octave Centre Band analysis. These monitoring samples were collected from the relevant locations at the closest noise sensitive residential premises likely to be affected by the proposed works, generally, at the same locations during the monitoring periods. This was to establish the general noise climate of the area and to allow for a determination of the limiting noise levels for any future development.

The table of results on the following page indicates the noise levels recorded for the various locations selected during the monitoring period, with a brief description of the noise sources contributing to the monitored noise levels recorded.

An overview of monitoring positions is given below:-

1. Location 1 relates to the premises at Meadway Shopping Centre outside No 23 along the 1st floor balcony.
2. Location 2 relates to the premises of No 117 Cockney Hill south of the store.
3. Location 3 relates to the Berkshire Hospital along the western façade of the building.

10.0 Noise Survey Results Table

ASDA TILEHURST SITE - NOISE SURVEY RESULTS TABLE

Map Location	Description of Location	Survey Period	Data ID	L _{Amax} dB	L _{Aeq} dB	L _{A10} dB	L _{A90} dB	Survey Duration	Durvey Date	Start Time	Source Description
1	Outside No 23 Meadway Shopping Centre Residence	NIGHTTIME	21	52.6	43.7	45.3	42.1	00:15:00.00	16-08-2017	23:59:05	ASDA roof plant audible. Low distant traffic along Honey End Lane and at a distance.
			22	47.0	43.2	44.5	42.1	00:15:00.00	16-08-2017	00:14:05	
			23	50.6	43.4	44.3	42.2	00:15:00.00	16-08-2017	00:29:05	
			24	48.6	42.7	45.0	39.8	00:15:00.00	16-08-2017	00:44:05	
			25	50.1	41.1	42.9	38.9	00:15:00.00	16-08-2017	00:59:05	
3	Outside the Western Façade of Berkshire Hospital		26	54.2	46.5	49.4	42.1	00:15:00.00	16-08-2017	01:17:26	Very low ASDA roof plant audible. Passing traffic dominant source when present. Distant traffic background.
			27	53.7	42.1	43.3	40.3	00:15:00.00	16-08-2017	01:32:26	
			28	52.1	43.2	45.9	39.7	00:15:00.00	16-08-2017	01:47:26	
			29	51.7	44.1	46.1	40.7	00:15:00.00	16-08-2017	02:02:26	
			30	52.7	43.7	46.0	40.2	00:15:00.00	16-08-2017	02:17:26	
2	Outside No 117 Cockney Hill Residence		31	40.4	38.8	39.7	38.4	00:15:00.00	16-08-2017	02:36:19	Very low ASDA roof plant audible. Distant traffic background hum.
			32	55.5	42.0	42.2	39.6	00:15:00.00	16-08-2017	02:51:19	
			33	41.2	40.0	40.5	39.4	00:15:00.00	16-08-2017	03:06:19	
			34	40.7	39.8	40.4	39.3	00:15:00.00	16-08-2017	03:21:19	
			35	41.9	40.2	41.1	39.2	00:15:00.00	16-08-2017	03:36:19	
1	Outside No 23 Meadway Shopping Centre Residence	DAYTIME	38	62.1	54.3	56.0	52.0	00:15:00.00	17-08-2017	09:26:25	Traffic movements along Honey End Lane and accessing carpark spaces dominant source. No ASDA plant audible.
			39	66.7	54.7	56.6	51.7	00:15:00.00	17-08-2017	09:41:25	
			40	64.0	54.9	57.0	52.3	00:15:00.00	17-08-2017	09:56:25	
			41	58.7	53.9	56.0	51.3	00:15:00.00	17-08-2017	10:11:25	
			42	71.0	56.1	58.4	53.0	00:15:00.00	17-08-2017	10:26:25	
2	Outside No 117 Cockney Hill Residence		43	67.8	58.3	63.9	51.6	00:15:00.00	17-08-2017	10:45:11	Traffic movements along Honey End Lane dominant source. No ASDA plant audible.
			44	65.2	60.8	64.3	56.9	00:15:00.00	17-08-2017	11:00:11	
			45	63.8	58.7	61.9	52.2	00:15:00.00	17-08-2017	11:15:11	
			46	67.3	59.8	63.8	52.8	00:15:00.00	17-08-2017	11:30:11	
			47	59.9	55.9	58.1	53.6	00:15:00.00	17-08-2017	11:45:11	
3	Outside the Western Façade of Berkshire Hospital		48	48.8	44.1	47.6	41.7	00:15:00.00	17-08-2017	12:08:04	Traffic movements along Honey End Lane dominant source. No ASDA plant audible.
			49	51.0	46.3	47.9	43.4	00:15:00.00	17-08-2017	12:23:04	
			50	48.5	44.4	46.9	41.9	00:15:00.00	17-08-2017	12:38:04	
			51	52.8	48.3	50.8	45.2	00:15:00.00	17-08-2017	12:53:04	
			52	50.6	45.2	47.6	42.5	00:15:00.00	17-08-2017	13:08:04	

11.0 Discussion and Design Targets

The noise experienced at the closest residences was primarily due to traffic noise from the local road network during daytime periods. The existing ASDA roof plant was audible during the quieter nighttime assessment periods, albeit very low volume.

The purpose behind any noise assessment is to rate noise produced to establish if nearby residential dwellings will be subjected to undue disturbance due to unwanted excessive external noise produced by the store plant.

The average recorded nighttime background level outside the residential premises of Cockney Hill was 39 LA₉₀ dB with an ambient level of 40 LA_{eq} dB. If BS4142 rating method were to be utilized, then the aim would be to have a rating of -10 dB below this recorded value for any incumbent plant. Above this level noise is likely to increase the existing background level, in contravention to the local authority requirements and may be noticeable and a possible detrimental issue. Based upon this a maximum rating level could be up to 29 dBA during nighttime periods, for any incumbent noise source without giving rise to justifiable complaints, provided that it is not tonal in nature.

If we take the WHO criteria and guidance for community noise, summarized above, which indicates that a maximum noise level for continuous sources could be as high as 45 dB, when considered outside a noise sensitive dwelling, with a maximum single event value of 60 dB.

WHO makes no reference to localized background noise levels and only deals with the internal noise sensitive location of the bedroom of dwellings at critical time periods. It is to WHO that we will rate the noise from this site for existing and maximum future noise levels.

Below is a table relating the existing noise levels recorded at the closest dwellings to the site with WHO maximum guidelines for nighttime periods of operation, since the plant will operate after 23.00 hours.

Reference	Location	Average Nighttime Recorded Noise Levels dB		
		LAeq	LA90	LAFMax
Recommended Levels	WHO Guidance	45.0	-	60.0
Location 1	No 23 Meadway Shopping Centre Residential Premises (North)	42.0	41.0	52.6
Location 2	No 117 Cockney Hill Premises (South)	40.0	39.0	55.5
Location 3	Berkshire Hospital (East)	44.0	40.0	54.2

As can be seen from the above table these noise levels are below for all premises with view to either the ambient and maximum noise permitted by WHO to ensure compliance with undisturbed sleep within residential dwellings.

The above figures represent the recorded values for the area and include for all the existing activities of the store. Provided that any incumbent plant cumulative output contribution, operational between 06.00 hours and midnight on a demand basis, does not exceed these values, when considered outside the closest residences, there is no reason to suspect that complaints will be forthcoming to noise.

Also taking account of the subjective effect of noise level changes, we find that an increase in noise levels of +3 dB is just perceptible. Provided that any replacement plant operations do not provide an increase in the baseline background level of more than +3 dB, then there will be no perceivable change in the pre-existing levels. This is provided that the introduced plant does not produce any tonal output.

Based upon the above information, it is advisable to set the output noise level design target for any new incumbent plant contribution of -10 dB below the pre-existing background level, this target will ensure that there is no increase in the background level, when considered outside the noise sensitive residential premises. The table below indicates the output design target noise levels for any new incumbent plant.

Assessment Location	Recorded Background Noise Levels dB		New Incumbent Plant Cumulative Operational Design Target Levels dB	
	Day LA90	Night LA90	Day LAeq	Night LAeq
No 23 Meadway Shopping Centre Residential Premises (North)	52.0	41.0	42.0	31.0
No 117 Cockney Hill Premises (South)	54.0	39.0	44.0	29.0
Berkshire Hospital (East)	44.0	40.0	34.0	30.0

12.0 Impact Assessment of Proposed Incumbent Plant

There is a proposal to install 2 No additional fixed plant items at the ASDA Tilehurst store.

The new plant will operate accordingly for the area served as noted below.

12.1 Plant Noise Data

The manufacturer's noise data proposed for this site are as follows:

Plant	Sound Level Data, dB	
	Sound Pressure Level	Sound Power Level
1 No Lennox FAH230DNM1M	100% Load - 59 dBA at 10m	90 LWA
	Night Setback – 54 dBA at 10m *	85 LWA *
1 No Lennox FAH120DNM1M	100% Load - 57 dBA at 10m	88 LWA
	Night Setback – 52 dBA at 10m *	83 LWA *

*Only relevant if plant is operational after 23.00 hours or before 07.00 hours.

Refer to Appendix D for Plant Data Sheets.

The finalized position of the main Lennox units will be on the roof of the store along the ridge line between the existing fixed plant installations.

Refer to the drawing No M 01 for further details, a copy appearing in Appendix C of this report.

For the purposes of the impact assessment we shall deal with the noise generated by the Lennox units for both daytime and nighttime periods before 07.00 hours and after 23.00 hours) with consideration made to the closest noise sensitive residential premises, assuming normal operating output noise levels for the relevant time period. The noise level of the existing baseline within the vicinity of the ASDA Store will be utilized within the assessment.

Assuming both plant items operate simultaneously the total noise contribution will be the addition of the 2 No sources, this equates to 61 dBA at 10m daytime and 56 dBA at 10m nighttime periods.

The distance to the noise sensitive premises from the proposed Lennox units on the roof of the store will be as follows, based upon the advised plant location:

Loc 1-No 23 Meadway Shopping Centre residence	70m north
Loc 2-No 117 Cockney Hill residence	70m south
Loc 3-Berkshire Hospital	100m east

All other noise sensitive residential premises are located in excess of this distance and as such if the plant can be demonstrated to operate without causing any undue loss of amenity at this closest position, then it follows that the residential premises positioned at a greater distance will also have no detrimental loss of their pre-existing amenity.

12.2 BS4142:2014 Assessments – Unmitigated

For robustness the following are assessments in accordance with BS4142: 2014, which have been based upon the proposed un-attenuated plant operating on output modes relevant to the period of day assessed.

All readings have been rounded to the nearest whole number.

12.2.1 BS4142:2014 Assessment – Meadway Shopping Centre Premises (north)

Description	Indices	Sound Level Daytime	Sound Level Nighttime	Comments
Specific plant noise level contribution	dBA at 10m	61 dB	56 dB	Based upon manufacturer's data
Distance Correction	-20 Log r, dB	-17 dB	-17 dB	Based upon 70m
Barrier Attenuation	dBA	-5 dB	-5 dB	Reduction based upon grazing effect of roof perimeter
Resultant Contribution Due to Specific Plant Item Only	dBA	38 dBA	33 dBA	
Residual Sound Level taken from outside the premises	L_{Aeq} (15 Mins)	55 dB	42 dB	Traffic being dominant source.
Background Noise Level	L_{A90} (15 mins)	52 dB	41 dB	Background level consisted of sources noted above.

Proposed specific sound source	L_{Aeq}	38 dB	33 dB	Non applicable as this is a calculated value.
Acoustic feature correction		+ 4 dB	+ 4 dB	BS4142:2014 acoustic correction for perceptible tonality
Rating Level	Value + 4dB =	42 dB	37 dB	
Background Noise Level	L_{A90} (15 mins)	52 dB	41 dB	
Excess of Rating over background sound level	Plant - BG	= -10 dB	= -4 dB	
The excess of -10 dB for daytime and -4 dB for nighttime is below the level in which the plant is audible above existing background activities and is classified as producing no adverse impact due to the operation when considered outside the premises at Meadway Shopping Centre residences, north of the proposed plant location.				
Uncertainty of the assessment There is uncertainty in the calculation as it is based upon a noise value with a correction applied which may account for a minimal variation in the actual values for the plant at this location. The uncertainty is not significant as the rating is so low and the value is in context with the actual area. The measurements presented indicate that the confidence of the rating for the specific source since the vales used are based upon manufacturer's data provided and the background is based upon measured values adjacent to the residential premises under consideration during weather conditions considered acceptable for executing measurements.				

A rating value of -10 dB daytime is achieving the design target set at -10 dB however, -4 dB nighttime is not achieving the target value even though it is insignificant and not likely to give rise to justifiable complaints.

The design target levels have achieved by the specific plant items when consider at this location and are actually -3 dB below the target of 42 dBA for daytime, however, the nighttime design target has not been met and is assessed as +2 dB above the target set at 31 dBA for nighttime periods.

Further mitigation measures are necessary to allow achievement of the design intent when considered at this location.

12.2.2 BS4142:2014 Assessment – Cockney Hill Premises (south)

Description	Indices	Sound Level Daytime	Sound Level Nighttime	Comments
Specific plant noise level contribution	dBA at 10m	61 dB	56 dB	Based upon manufacturer's data
Distance Correction	-20 Log r, dB	-17 dB	-17 dB	Based upon 70m
Barrier Attenuation	dBA	-10 dB	-10 dB	Reduction based upon barrier effect of roof perimeter
Resultant Contribution Due to Specific Plant Item Only	dBA	33 dBA	28 dBA	
Residual Sound Level taken from outside the premises	L _{Aeq} (15 Mins)	59 dB	40 dB	Traffic dominant source.
Background Noise Level	L _{A90} (15 mins)	54 dB	39 dB	Background level consisted of sources noted above.
Proposed specific sound source	L _{Aeq}	33 dB	28 dB	Non applicable as this is a calculated value.
Acoustic feature correction		+ 2 dB	+ 2 dB	BS4142:2014 acoustic correction for just perceptible tonality
Rating Level	Value + 2dB =	35 dB	30 dB	
Background Noise Level	L _{A90} (15 mins)	54 dB	39 dB	
Excess of Rating over background sound level	Plant - BG	= -19 dB	= -9 dB	

The excess of -19 dB for daytime and -9 dB for nighttime is below the level in which the plant is audible above existing background activities and is classified as producing no adverse impact due to the operation when considered outside the premises at Cockney Hill, south of the proposed plant location.

Uncertainty of the assessment

There is uncertainty in the calculation as it is based upon a noise value with a correction applied which may account for a minimal variation in the actual values for the plant at this location. The uncertainty is not significant as the rating is so low and the value is in context with the actual area. The measurements presented indicate that the confidence of the rating for the specific source since the values used are based upon manufacturer's data provided and the background is based upon measured values adjacent to the residential premises under consideration during weather conditions considered acceptable for executing measurements.

A rating value of -19 dB daytime and -9 dB nighttime are insignificant and not likely to give rise to justifiable complaints, however, the nighttime value is +1 dB above the limiting design target.

The design target levels have been achieved by the specific plant items when consider at this location and are actually -9 dB below the target of 44 dBA for daytime, and -1 dB below the target set at 29 dBA for nighttime periods.

Further mitigation measures are necessary when considered at this location to achieve the design intent.

12.2.3 BS4142:2014 Assessment – Berkshire Hospital (east)

Description	Indices	Sound Level Daytime	Sound Level Nighttime	Comments
Specific plant noise level contribution	dBA at 10m	61 dB	56 dB	Based upon manufacturer's data
Distance Correction	-20 Log r, dB	-20 dB	-20 dB	Based upon 100m
Barrier Attenuation	dBA	-10 dB	-10 dB	Reduction based upon barrier effect of building
Resultant Contribution Due to Specific Plant Item Only	dBA	31 dBA	26 dBA	
Residual Sound Level taken from outside the hospital	L_{Aeq} (15 Mins)	46 dB	44 dB	Traffic dominant source.
Background Noise Level	L_{A90} (15 mins)	44 dB	40 dB	Background level consisted of sources noted above.
Proposed specific sound source	L_{Aeq}	31 dB	26 dB	Non applicable as this is a calculated value.
Acoustic feature correction		+ 2 dB	+ 2 dB	BS4142:2014 acoustic correction for just perceptible tonality
Rating Level	Value + 2 dB =	33 dB	28 dB	
Background Noise Level	L_{A90} (15 mins)	44 dB	40 dB	
Excess of Rating over background sound level	Plant - BG	= -11 dB	= -12 dB	

The excess of -11 dB for daytime and -12 dB for nighttime is below the level in which the plant is audible above existing background activities and is classified as producing no adverse impact due to the operation when considered outside the Berkshire Hospital, east of the proposed plant location.

Uncertainty of the assessment

There is uncertainty in the calculation as it is based upon a noise value with a correction applied which may account for a minimal variation in the actual values for the plant at this location. The uncertainty is not significant as the rating is so low and the value is in context with the actual area. The measurements presented indicate that the confidence of the rating for the specific source since the values used are based upon manufacturer's data provided and the background is based upon measured values adjacent to the residential premises under consideration during weather conditions considered acceptable for executing measurements.

A rating value of -11 dB daytime and -12 dB nighttime are insignificant and not likely to give rise to justifiable complaints, and that further mitigation measures are not necessary when considered at this location.

The design target levels have been achieved by the specific plant items when considered at this location and are actually -3 dB below the target of 34 dBA for daytime and -4 dB below the target set at 30 dBA for nighttime periods.

12.3 Point of Clarification.

The above BS4142:2014 assessment has provided rating values for the specific plant item when introduced into the roof plant area at the ASDA Tilehurst store. Whilst it does not include the contribution of the existing plant in the introduced noise value, the ambient and background noise level recorded outside the premises considered do include these items. As such the rating value accounts for the pre-existing plant operational output within the calculated rating for the introduced plant.

12.4 Proposed Un-Attenuated Plant Installation Rating Summary

Location	Period	Specific Proposed Plant Rating Level dBA	Existing Background Level LA90 dB	BS4142 Rating Value dB	Calculated Direct Contribution dBA	Design Target	Variance dB
Meadway Shopping Centre (North)	07.00- 23.00	42	52	-10	38	42	-4
	23.00- 07.00	37	41	-4	33	31	+2
Cockney Hill (South)	07.00- 23.00	35	54	-19	33	44	-11
	23.00- 07.00	30	39	-9	28	29	-1
Mount Road (West)	07.00- 23.00	33	44	-11	31	34	-3
	23.00- 07.00	28	40	-12	26	30	-4

As can be seen from the above calculation summary, the rating values are classified as below the area background in the majority of cases and are in context.

The specific value of the new incumbent plant operation, which may be 24 hours 7 days a week, is at all locations achieving the required design target, with the exception of the nighttime values at the nearby residential premises.

Based upon the above additional mitigation measures are necessary in order to achieve the design intent of -10 dB below the pre-existing background level and -10 dB BS4142:2014 rating values accordingly.

12.5 Mitigation Recommendations

In order to achieve the design intent of -10 dB below existing background level for all nearby noise sensitive locations, additional mitigation measures will be necessary to the incumbent plant installation.

It is recommended that the fresh air intake apertures of the air handling units are provided with an inline attenuator.

The inline attenuators are recommended to be installed between the fresh air intake cowl and the unit body. The attenuators will need to be 600mm long and possess the following minimum insertion loss characteristics:

Freq Hz	63	125	250	500	1K	2K	4K	8K
Insertion Loss, dB	6	10	13	19	24	22	15	14

Inclusion of the above in-line attenuators will reduce the output contribution from the AHU's by a minimum -10 dB. This is exceeding the minimum requirements of up to 6 dB reduction necessary to fully comply with the design target of -10 dB below background and a maximum BS4142:2014 rating of -10 dB.

Refer to Appendix E for the calculation data sheets.

12.6 Proposed Mitigated Plant Installation Rating Summary

Location	Period	Specific Proposed Plant Rating Level dBA	Existing Background Level LA90 dB	BS4142 Rating Value dB	Calculated Direct Contribution dBA	Design Target	Variance dB
Meadway Shopping Centre (North)	07.00- 23.00	28	52	-24	28	42	-14
	23.00- 07.00	23	41	-18	23	31	-8
Cockney Hill (South)	07.00- 23.00	23	54	-31	23	44	-21
	23.00- 07.00	18	39	-21	18	29	-11
Mount Road (West)	07.00- 23.00	21	44	-23	21	34	-13
	23.00- 07.00	16	40	-24	16	30	-14

The re-assessment values for the BS4142:2014 ratings have resulted in the removal of the acoustic feature forfeit, included in the un-mitigated assessments.

As can be seen from the above, inclusion of the attenuation measures proposed for the fresh air intake for the air handling units will allow the plant to achieve the stringent design target for the area of at least -10 dB below both background and BS4142:2014 rating values.

13.0 Report Summary

A baseline acoustic assessment of the existing noise levels produced by the plant, equipment and activities of the ASDA store, Tilehurst has been undertaken in accordance with BS4142:2014.

The primary existing noise sources in the vicinity of the nearby residential premises are due to traffic flow along road network.

There is a proposal to install 2 No Lennox AHU's within the plant area of the roof of the ASDA store.

The un-mitigated BS4142:2014 ratings of the plant have been completed and found to be producing rating values ranging between -4 dB to -19 dB below the existing background level, however, the design intent is for a minimum -10 dB rating value.

Design target values have been applied to the plant output when considered at the nearby noise sensitive premises. On several occasions the design intent has not been met and additional mitigation measures will need to be considered.

Mitigation in the form of in-line attenuation installed between the fresh air intake cowl and the unit body have been proposed. Inclusion of the attenuation will reduce the plant output at source by -10 dB.

A re-appraisal of the resultant values indicate that the design intent of -10 dB has been shown to be achieved with the mitigation measures proposed for the plant.

Appendix A Locational Plan and Survey Points

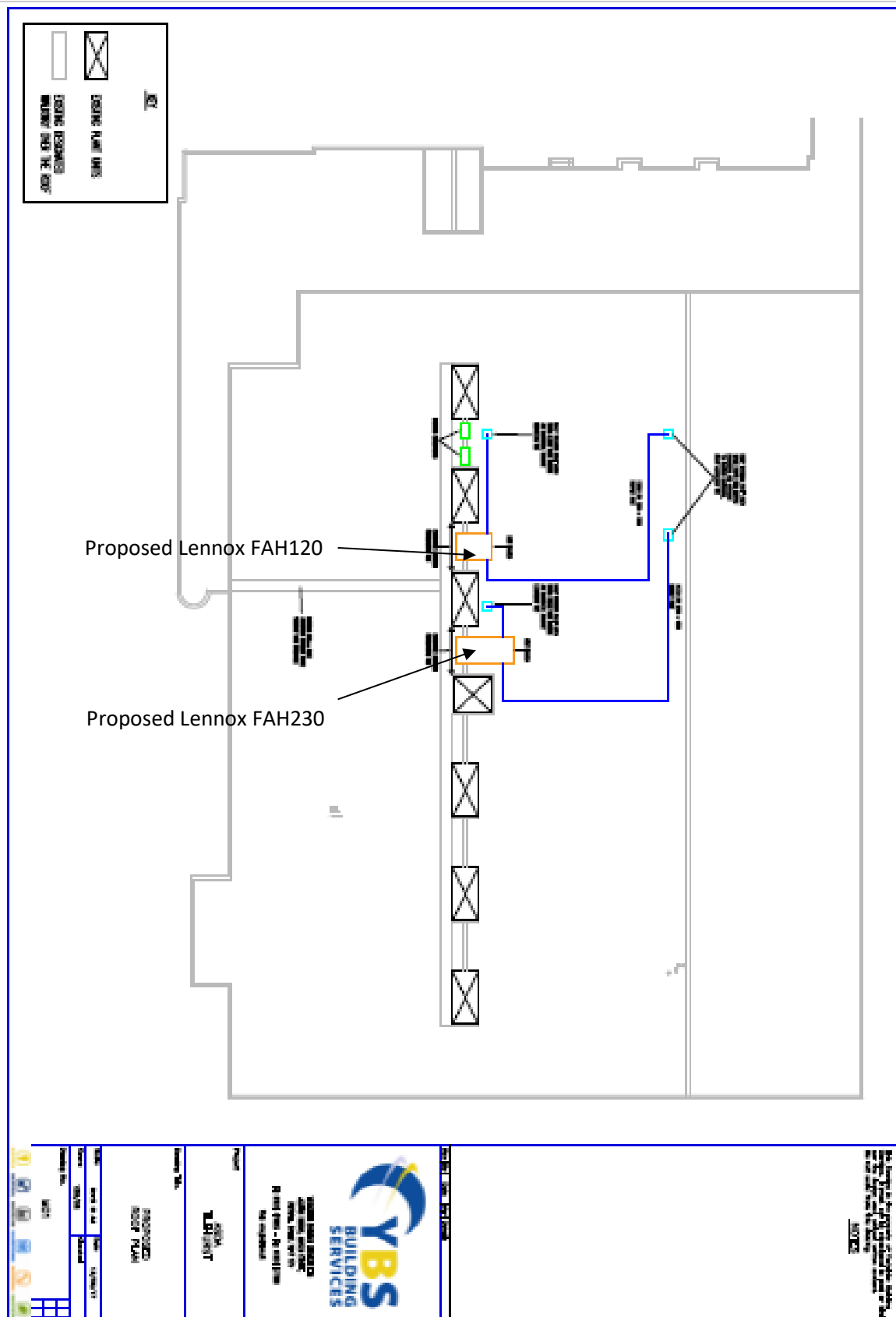


Appendix B - Noise Recording Frequency Analysis Results Table

ASDA TILEHURST SITE - NOISE SURVEY FREQUENCY ANALYSIS RESULTS TABLE

						Linear Leq dB Sound Pressure Levels									
Map Location	Description of Location	Survey Period	Data ID	LAmix dB	LAeq dB	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	LA10 dB	LA90 dB
1	Outside No 23 Meadway Shopping Centre Residence	NIGHTTIME	21	52.6	43.7	52.6	46.7	42.4	41.1	38.7	35.5	30.2	21.6	45.3	42.1
			22	47.0	43.2	57.2	47.4	42.8	41.7	37.6	33.9	28.8	20.3	44.5	42.1
			23	50.6	43.4	58.7	49.8	43.5	41.0	37.8	34.4	29.2	20.2	44.3	42.2
			24	48.6	42.7	59.2	48.8	44.2	40.3	37.1	32.8	26.9	18.6	45.0	39.8
			25	50.1	41.1	56.4	46.1	40.4	38.1	36.7	31.6	25.9	17.1	42.9	38.9
3	Outside the Western Façade of Berkshire Hospital		26	54.2	46.5	58.5	48.6	46.0	40.4	42.2	39.8	32.0	22.9	49.4	42.1
			27	53.7	42.1	53.1	44.1	40.3	38.0	37.6	34.8	28.5	24.5	43.3	40.3
			28	52.1	43.2	53.3	47.4	42.2	38.3	39.2	35.6	27.8	19.4	45.9	39.7
			29	51.7	44.1	55.8	46.0	44.0	40.0	39.9	36.3	29.0	20.4	46.1	40.7
			30	52.7	43.7	53.1	46.4	43.7	39.3	39.5	36.1	29.3	21.1	46.0	40.2
2	Outside No 117 Cockney Hill Residence		31	40.4	38.8	47.0	42.0	36.9	36.9	35.4	27.0	20.2	16.0	39.7	38.4
			32	55.5	42.0	48.7	42.9	38.8	39.2	39.3	31.2	22.6	17.2	42.2	39.6
			33	41.2	40.0	47.5	42.1	38.4	37.7	36.9	28.4	18.5	14.3	40.5	39.4
			34	40.7	39.8	49.2	43.1	37.7	37.4	36.6	28.4	18.9	14.8	40.4	39.3
			35	41.9	40.2	48.4	43.0	38.1	37.4	37.1	29.8	20.9	15.9	41.1	39.2
1	Outside No 23 Meadway Shopping Centre Residence	DAYTIME	38	62.1	54.3	60.5	53.8	52.2	52.5	49.6	46.0	41.4	34.6	56.0	52.0
			39	66.7	54.7	60.8	55.2	52.3	51.5	50.4	47.1	41.5	34.8	56.6	51.7
			40	64.0	54.9	61.9	57.7	52.3	51.5	50.5	47.4	41.9	34.3	57.0	52.3
			41	58.7	53.9	60.6	59.4	51.7	50.4	49.5	45.8	40.5	32.4	56.0	51.3
			42	71.0	56.1	61.4	58.5	53.9	52.5	51.0	49.5	44.5	37.0	58.4	53.0
2	Outside No 117 Cockney Hill Residence		43	67.8	58.3	60.1	55.8	55.2	54.3	55.4	50.2	42.1	34.8	63.9	51.6
			44	65.2	60.8	64.9	57.9	58.4	56.0	56.6	54.1	48.3	40.3	64.3	56.9
			45	63.8	58.7	64.2	56.6	56.2	54.6	55.7	50.6	42.5	34.4	61.9	52.2
			46	67.3	59.8	67.9	62.6	59.0	54.7	55.4	53.2	46.9	34.9	63.8	52.8
			47	59.9	55.9	71.9	61.3	53.8	50.2	51.8	47.5	39.9	30.8	58.1	53.6
3	Outside the Western Façade of Berkshire Hospital		48	48.8	44.1	60.3	46.1	44.0	40.9	40.2	33.4	26.5	21.0	47.6	41.7
			49	51.0	46.3	58.9	49.2	44.8	42.5	42.6	38.2	27.8	20.0	47.9	43.4
			50	48.5	44.4	56.9	46.1	43.8	41.4	41.0	34.7	24.6	17.3	46.9	41.9
			51	52.8	48.3	63.5	52.6	48.4	46.0	42.9	40.5	30.7	20.3	50.8	45.2
			52	50.6	45.2	54.4	49.7	43.1	42.0	41.0	37.3	29.0	20.5	47.6	42.5

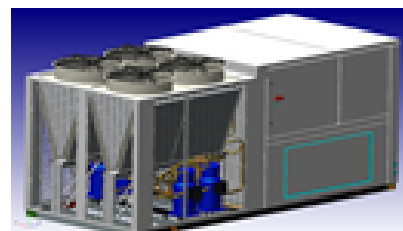
Appendix C – Proposed Plant Installation Drawing No M01



Appendix D Lennox Data Sheets

n° 91803 : 24 July 2017	Heat pump ROOFTOP Flexair  by LENNOX 1 x FAH230DNM1M	LENNOX 
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DIMENSIONS FOR THE UNIT EXCLUDING ACCESSORIES



Length	Width	Height	Operating weight
6171	2268	2232	2360 *

Non-certified pictures

(*) The weight values are provided as an indication. For helicopter or special crane transportation, plan to check the weight before the job.

ACOUSTIC DATA

Outdoor Part load									
Lenx 21%	83	dB(A)	Lp	54	dB(A)				
Lenx 47%	88.8	dB(A)	Lp	55.8	dB(A)				

Outdoor Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Lenx	Lp
58.9	62.7	72.2	80.1	77.8	80.3	73.9	87.9	83.8	58.8

Supply Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Lenx Sound power	
50.4	61.7	77.1	85.9	88.3	89.8	83.2	82.8	93.3	

Return Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Lenx Sound power	
49.1	59.9	75.8	77.3	77.4	83.4	88	83	88.2	

Lenx Sound power dB(A)

Lp: Sound pressure at 10 m dB(A)

Global sound power level measured in compliance with ISO STANDARD 3744

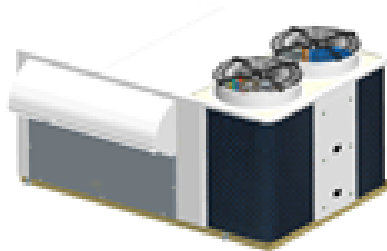
Values are displayed according to norm EN12102

Tolerance to +/- 3 dB(A)

Due to LENNOX [supplying](#) commitment to quality, specifications subject to change without notice and without incurring liability

n° 616012 : 31 July 2017	Heat pump ROOFTOP Flexair* by LENNOX 1 x FAH120DNM1M (Reference model: FAH120)	LENNOX R410A ENERGY EFFICIENT CLASS A++
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DIMENSIONS FOR THE UNIT EXCLUDING ACCESSORIES



Length	Width	Height	Operating weight
8814	2246	1760	1200 *

Non-certified pictures

(*) The weight values are provided as an indication. For helicopter or special crane transportation, plan to check the weight before the job.

ACOUSTIC DATA

		Outdoor Part load			
Low 21%	83	dB(A)	Lp	52	dB(A)
Low 47%	84.4	dB(A)	Lp	53.4	dB(A)

Outdoor Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Low	Lp
59.8	59.6	72.1	76.9	75.5	76.2	79.5	83.4	87.6	56.6

Supply Spectrum per octave band dB(A) (Full load)								Low Sound power
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
48	57.8	73.5	84	88.7	85.7	87.1	83.3	93.3

Return Spectrum per octave band dB(A) (Full load)								Low Sound power
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
49.5	57	76.4	76.3	76.2	76.6	84.3	83.7	88.5

Low Sound power dB(A)

Lp: Sound pressure at 10 m dB(A)

Global sound power level measured in compliance with ISO STANDARD 3744

Values are displayed according to norm EN12102

Tolerance to $\pm$ 3 dB(A)

Appendix E Mitigation Calculation Data Sheets

Paul Horsley Acoustics Ltd 1 UPPER LANE, GOMERSAL WEST YORKSHIRE, BD19 4JD Tel/Fax 01274 879 020 E: paul.horsley@homecall.co.uk				ATMOSPHERIC CALCULATION DATA											
Project: YBS LTD - ASDA TILEHURST				Q: J2637											
Fan Details: AHU				Room / Area Served: FAH 230 UNIT											
D U C T A T T E N U A T I O N	Fan Duty:	2.71 m^3/s	2.71 N/m^2	SWL	63	125	250	500	1k	2k	4k	8k			
	Type	Description	Mtrs/No. off	Dimension	86	79	81	80	78	79	76	87			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
		#N/A			0	0	0	0	0	0	0	0			
	OWN DATA			FAI Attenuation	6	10	13	19	24	22	15	14			
Grille size: 2100 mm X 600 mm				Grille location: 2 1=Free Space, 2=Flush, 3=Jn. of 2 surfaces, 4=Corner											
End Reflection Loss: 1.26 m^2				3	1	0	0	0	0	0	0				
Sound Power Leaving:				77	68	68	61	54	57	61	73				
Sound Power to Outlet: 2.71 m^3/s 100 %				0	0	0	0	0	0	0	0				
Distance to Listener: 10 Metres				-31	-31	-31	-31	-31	-31	-31	-31				
Directivity Factor: 1.26 m^2				6	8	8	9	9	9	9					
Direct SPL:				52	45	45	39	32	35	39	51				
Resultant SPL:				52	45	45	39	32	35	39	51				
NR Level Required: NR45				71	61	54	48	45	42	40	38				
Attenuation Required:				0	0	0	0	0	0	0	13				
dBA Correction:				-26	-16	-9	-3	0	1	1	-1				
A-Weighted Equivalent:				26	29	36	36	32	36	40	50				
Resultant dBA Level (with no attenuation): 51 dBA															
Selection:				1	2	3	NR65	87	78	72	68	65	62	61	59
Type:							NR60	83	74	68	63	60	57	55	54
Length:							NR55	79	70	63	58	55	52	50	49
Width:							NR50	75	65	59	53	50	47	45	43
Height:							NR45	71	61	54	48	45	42	40	38
Air Volume:							NR40	67	57	49	44	40	37	35	33
Pressure Loss:							NR35	63	52	45	39	35	32	30	28
Price:							NR30	59	48	40	34	30	27	25	23
							NR25	55	44	35	29	25	22	20	17
Completed By: ph				Date: 11.10.17											

Paul Horsley Acoustics Ltd

1 UPPER LANE, GOMERSAL
WEST YORKSHIRE, BD19 4JD
Tel/Fax 01274 879 020

E: paul.horsley@homecall.co.uk

ATMOSPHERIC CALCULATION DATA

Project: **YBS LTD - ASDA TILEHURST**

Q: **J2637**

Fan Details: **AHU**

Room / Area Served:

FAH 120 UNIT

Fan Duty:	m^3/s	N/m^2	SWL	Spectrum	63	125	250	500	1k	2k	4k	8k
	1.42				82	76	81	80	76	75	77	85
DUCT ATTENUATION	Type	Description	Mtrs/No. off	Dimension								
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
		#N/A			0	0	0	0	0	0	0	0
OWN DATA				FAI Attenuation	6	10	13	19	24	22	15	14
Grille size: 1900 mm X 600 mm					Grille location: 2		1=Free Space, 2=Flush, 3=Jn. of 2 surfaces, 4=Corner					
End Reflection Loss: 1.14 m^2					3	1	0	0	0	0	0	0
Sound Power Leaving:					73	65	68	61	52	53	62	71

Sound Power to Outlet:	1.42	m ³ /s	100	%	0	0	0	0	0	0	0	0	
Distance to Listener:	10	Metres			-31	-31	-31	-31	-31	-31	-31	-31	
Directivity Factor:	1.14	m ²			6	7	8	9	9	9	9	9	
Direct SPL:					48	41	45	39	30	31	40	49	
Resultant SPL:					48	41	45	39	30	31	40	49	
NR Level Required:					NR45	71	61	54	48	45	42	40	38
Attenuation Required:					0	0	0	0	0	0	0	0	11
dBA Correction:					-26	-16	-9	-3	0	1	1	-1	
A-Weighted Equivalent:					22	25	36	36	30	32	41	48	
Resultant dBA Level (with no attenuation):					49	dBA							
Selection:	1	2	3	NR65	87	78	72	68	65	62	61	59	
				NR60	83	74	68	63	60	57	55	54	
Type:				NR55	79	70	63	58	55	52	50	49	
Length:				NR50	75	65	59	53	50	47	45	43	
Width:				NR45	71	61	54	48	45	42	40	38	
Height:				NR40	67	57	49	44	40	37	35	33	
Air Volume:				NR35	63	52	45	39	35	32	30	28	
Pressure Loss:				NR30	59	48	40	34	30	27	25	23	
Price:				NR25	55	44	35	29	25	22	20	17	

Completed By: **ph**

Date: **11.10.17**