



Noise Impact Assessment of the installation of Extraction System and Condenser Units for German Doner Kebab (GDK) Store

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Site Address: Unit B, 5/10 New Road, Gravesend, DA11 0AA

Date: 10/02/2022



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Executive summary

An environmental noise survey and noise impact assessment have been undertaken at Unit B, 5/10 New Road, Gravesend, DA11 0AA to assess the potential increase in noise levels from the installation of the proposed extraction system and condensers units on the surrounding Noise Sensitive Receptors. The measured background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

The BS4142:2014 assessment of the proposed Extract, Air Conditioning and Refrigeration System indicates that, provided the units are installed as specified within this report and the recommendations are implemented, the Rating Noise Level should not exceed the background sound level. This indicates low impact in accordance with BS4142:2014 and 'No Observed Effect Level' when assessed in accordance with the NPSE and NPPF.

An overview of the recommendations can be found below:

Recommendations and Mitigation Measure Overview

- All mechanical plant should be fitted on appropriate anti-vibrational mounts.
- The make, model, location and any assumed noise emissions of the external units should not be altered. If alterations to the specification and location of the units take place, further assessment should be applicable.

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the installation of the proposed mechanical plant for a German Doner Kebab (GDK) Store (the Proposed Development') at Unit B, 5/10 New Road, Gravesend, DA11 0AA ('the Site').

The applicant is preparing a planning application to be submitted ('the Application') to Gravesham Borough Council.

The following technical noise assessment has been prepared to support the planning application to Gravesham Borough Council. This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with; ISO9613 – 1 ISO 9613-2 - Attenuation of sound during propagation outdoors prediction methodology, to predict sound levels at the NSR;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2019), Noise Policy Statement for England (2010) and British Standard BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area at the closest sensitive receptor (NSR), an environmental sound survey has been carried out from the 26/01/2022 to the 28/01/2022. The monitoring position was chosen in order to collect representative sound levels at the NSR during the typical operational periods of the proposed development. The monitoring location is shown in Figure 1.0.



Figure 1.0 - Indicative Site Layout

Context & Subjective Impression

The area surrounding the site is primarily commercial with few residential dwellings. All the premises along New Street and Princess Street are commercial on the ground floor and also on the above floors. Many of the existing commercial units, for example, 'McDonald's', 'Burguer King', 'Greggs', among others are similar in nature to the Proposed Development. Therefore, it is understood that the proposed GDK store will be in line with the current environment. The noise profile of the area is dominated by road traffic, deliveries and patron noise at the front of the site. At the rear, the main noise sources are distant traffic and deliveries and patron noise breaking out the gallery at Wakefield Street. It is also audible plant noise from the surrounding commercial premises.

The proposed external plant units will be located on the roof as per the image below:



The client has stated that the proposed plant may operate at any time during day and night time indistinctively. The table below outlines the background sound levels, during the operational period of the plant, that will be used as the baseline for the noise assessment. Further summary results for the entire measurement period can be found in Appendix D.

Table 1.0 – Background Sound Level Summary Results

As can be seen in the table above the lowest measured $L_{A90,15min}$ value is 47.0 dB. This is the lowest background sound level measured during the entire environmental survey, hence, it is deemed 'Typical' and will be used in the following analysis providing a robust assessment.

3. BS4142:2014 Noise Assessment

The following section of the report analyses the expected impact of the noise emissions associated with the proposed units. The following equipment is to be installed:

Plant Equipment	No.	Specific Noise Level @ 1m * ¹	Distance to NSR	Specific Noise Level at NSR* ²	Acoustic Feature Correction * ³
CUSTOMER AC CONDENSER – MHI FDC200VSA	1	59.0	34m	28.0	Tonality +2
KITCHEN & B.O.H DUCTED AC CONDENSER – MHI FDC200VSA	1	59.0	34m	28.0	
WALK IN FRIDGE CONDENSER - TBC	2	51.0* ⁴	34m	23.0	
KITCHEN EXTRACT FAN – SYSTEMAIR MUB062 630D4-A2 IE2 with Silencer * ⁵	1	78.0	34m	41.0	
KITCHEN SUPPLY FAN - FLAKT WOODS 56JM with Silencer * ⁵	1	75.0	34m	26.0	
Cumulative Rating Noise Level $L_{AR,TR}$ @ NSR				44.0 dBA	

Table 2.0 – Plant Noise Emissions

*¹ The specific noise has been determined taking into account the heating cycle (refer to datasheets in Appendix E), representing the worst-case scenario.

*² The noise level at the NSR has been calculated using the following equation $20\log(r1/r2)$ and the calculation files on Appendix D.4.

*³ The new source cannot be measured because it is only proposed, but the characteristics of similar sources can subjectively be assessed. A penalty must be added for perceptible tonality.

*⁴ Units have not been proposed at the time of the assessment. Acoustic data from a previous report (Ref. 5750OW) has been used.

*⁵ We have not been provided with a proposed silencer specification. A minimum insertion loss (10dB) of the silencer has been assumed as did on a previous report (Ref. 5750OW).

The BS4142 Assessment of the proposed extraction and condenser units is outlined in the table below.

Results	NSR Sound Level (dB)	Notes
Rating Sound Level	44.0	Acoustic feature corrections as shown in Table 2.0.
Background Sound Level	47.0	As shown in Table 1.0
Excess of Rating over Background Sound Level	-3.0	The assessment indicates; Negligible Impact, Dependant on Context

Table 3.0 – BS4142:2014 Noise Assessment

Discussion

The assessment above indicates that the rating level is below the background sound level at the noise sensitive receptor by 3 dB. This indicates the potential for Negligible Impact, Dependant on Context impact on the surrounding residential Noise Sensitive Receptors.

Given the outcome of the assessment, no further mitigation measures are required.

3.1.1 Recommendations & Mitigation

The following section outlines the mitigation measures that are necessary to reduce the impact of the proposed external mechanical plant.

- All mechanical plant should be fitted on appropriate anti-vibrational mounts.
- The make, model, location and any assumed noise emissions of the external units should not be altered. If alterations to the specification and location of the units take place, further assessment should be applicable.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log ₁₀ (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L _{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 - National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 - Noise Policy Statement for England (2010)

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;*
- Mitigate and minimise adverse impacts on health and quality of life;*
- Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 - British Standard BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ ‘specific sound level’, immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a ‘typical’ background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

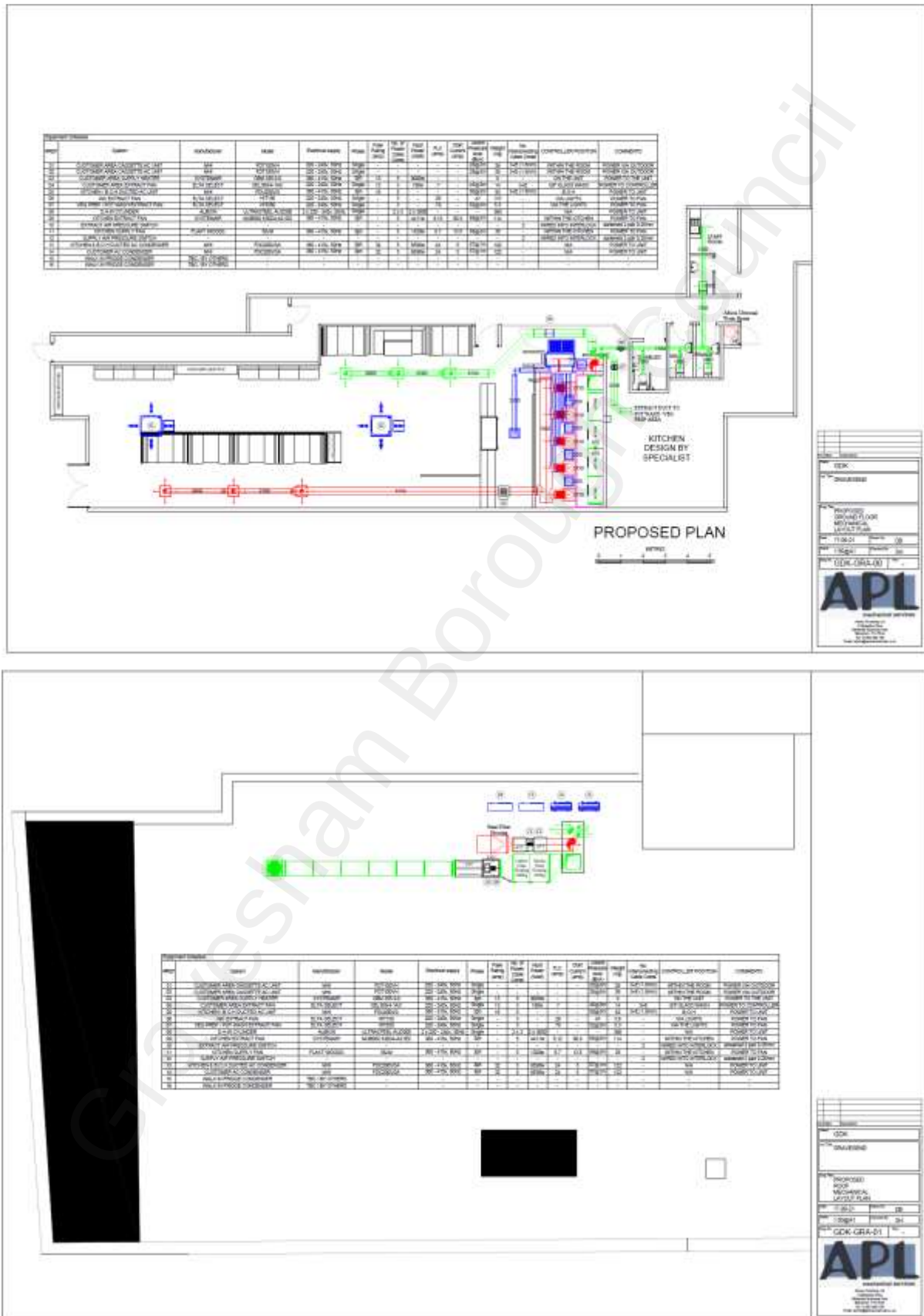
- “Typically, the greater this difference, the greater the magnitude of the impact.”
- “A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”
- “A difference of around +5dB is likely to be an indication of an adverse impact, depending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

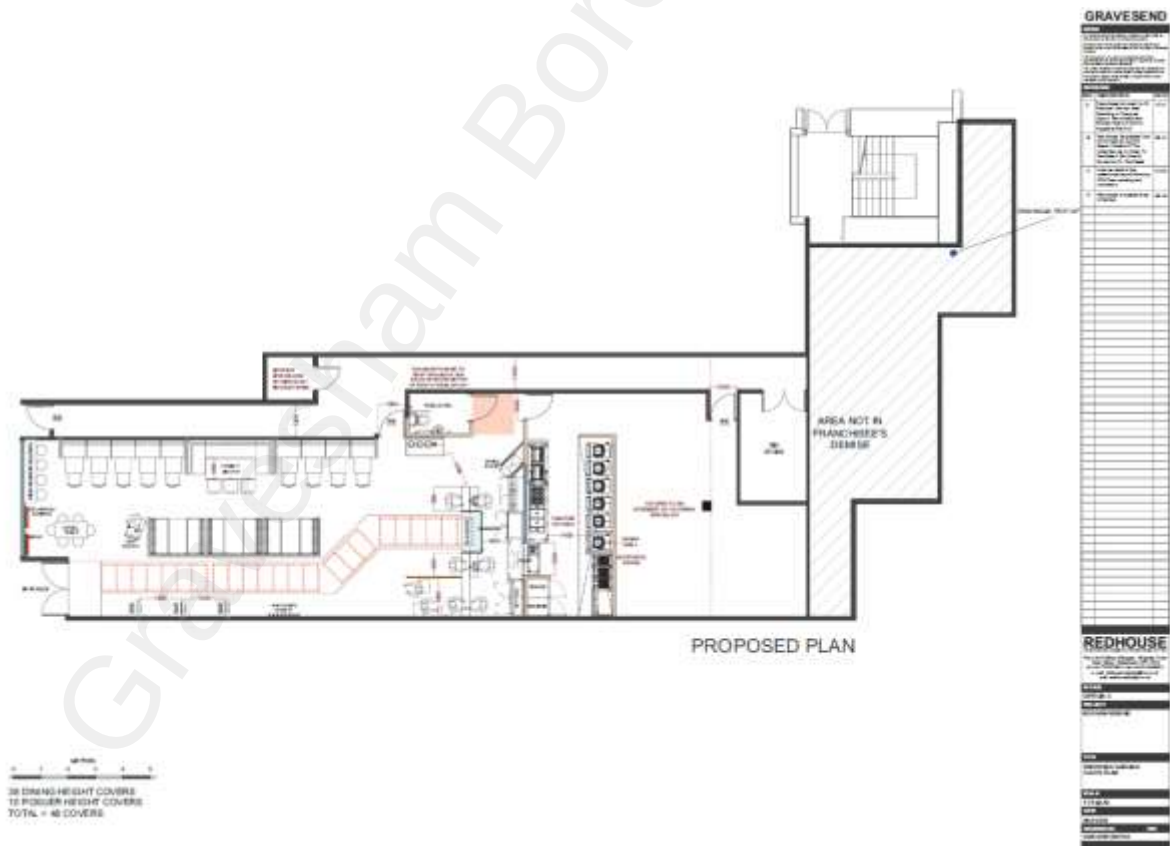
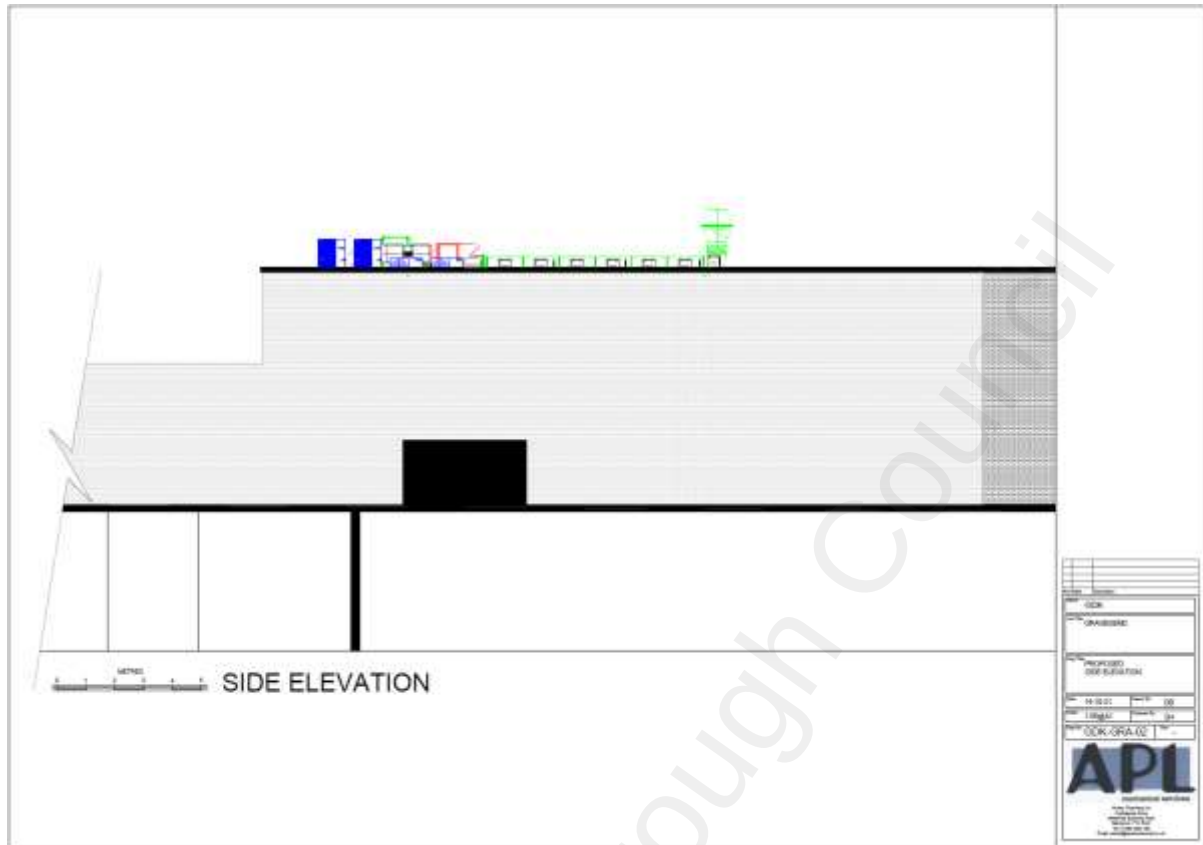
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix C – Site Plans





Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

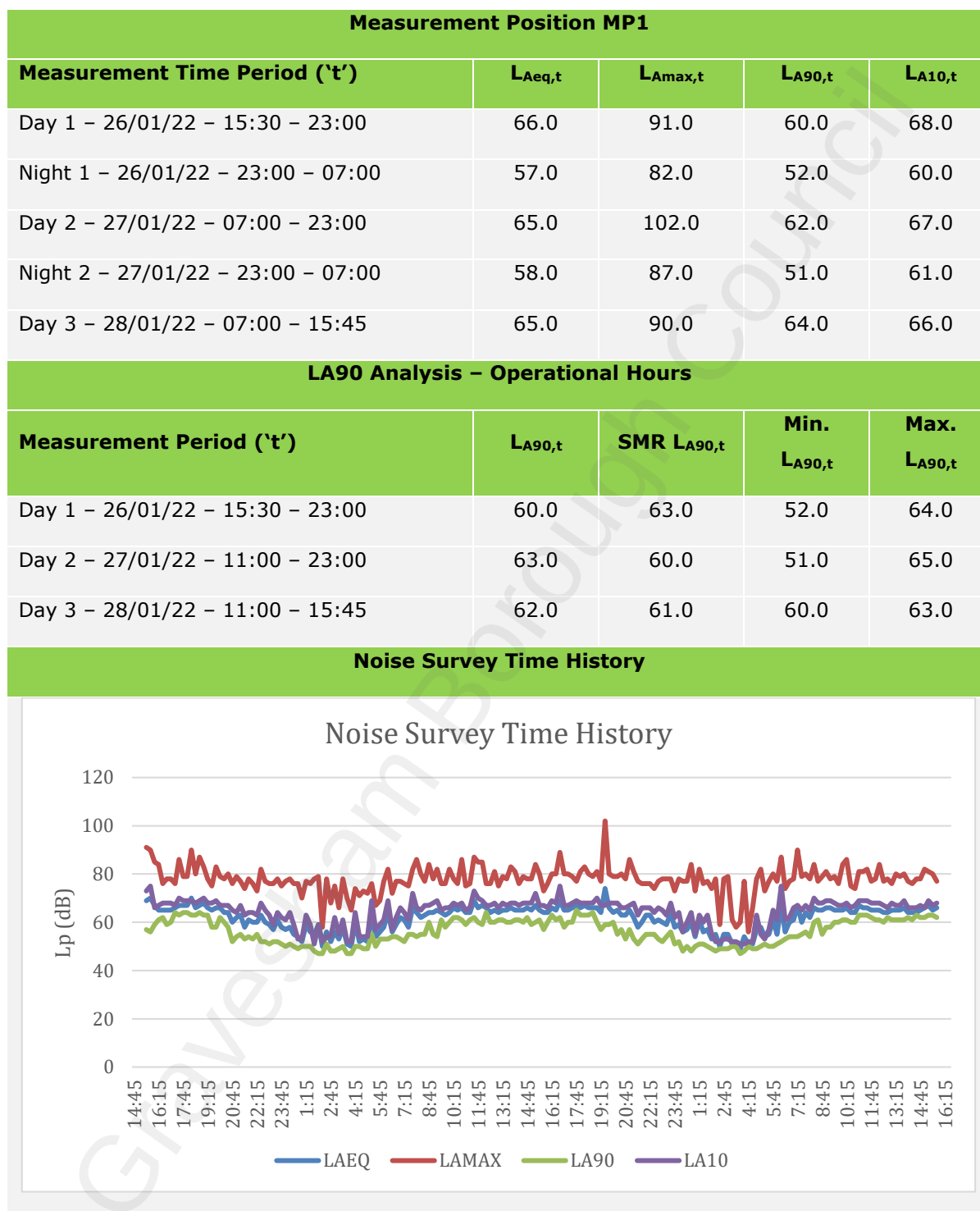


Table 4.0 – Sound Survey Summary Results

D.2 Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
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CESVA TA120 Class 1 Sound level meter	T248630	≤0.5
CESVA CB006 Class 1 Calibrator	902441	

Table 5.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the monitoring equipment the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions – Welling				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
Day 1 – 26/01/22 – 00:00 – 23:59	2.3 – 7.7	0.0	WSW	0.0 – 10.4 (mean 0.4)
Day 2 – 27/01/22 – 00:00 – 23:59	4.6 – 11.4	0.0	W	0.0 – 6.1 (mean 1.1)
Day 3 – 28/01/22 – 00:00 – 23:59	2.6 – 10.1	0.0	WSW	0.0 – 8.2 (mean 1.6)

Table 6.0 – Weather Summary

D.4 Duct Calculations

Description	63 Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
1. Lw of fan	75	77	81	83	82	79	74	67
2. Uncertainties	3	3	3	3	3	3	3	3
3. Room and Terminal effect	0	0	0	0	0	0	0	0
4. Allowance for end reflection	-8	-4	-1	0	0	0	0	0
5. Ductwork attenuation	0	0	0	0	0	0	0	0
6. Elbow attenuation x 2No. (lined)	0	0	0	0	0	0	0	0
7. Silencer/s	-10	-10	-10	-10	-10	-10	-10	-10
8. Weighting (A)	-26	-16	-9	-3	0	1	1	1
9. Resulting Lw	34	50	64	73	75	73	68	61
10. spherical propagation (10logQ/4πr ²)	-38.6	-38.6	-38.6	-38.6	-38.6	-38.6	-38.6	-38.6
11. Laeq at NSR	-4.6	11.4	25.4	34.4	36.4	34.4	29.4	22.4
12. GobaL LAeq at NSR	40.5							

Table 7.0 – Duct Calculations – Extract Fan

Description	63 Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
1. Lw of fan	78	81	76	77	74	71	67	63
2. Uncertainties	3	3	3	3	3	3	3	3
3. Room and Terminal effect	0	0	0	0	0	0	0	0
4. Allowance for end reflection	-8	-4	-1	0	0	0	0	0
5. Ductwork attenuation	0	0	0	0	0	0	0	0
6. Elbow attenuation	0	0	0	-8	-4	-3	-3	-3
7. Silencer/s	-10	-10	-10	-10	-10	-10	-10	-10
8. Weighting (A)	-26	-16	-9	-3	0	1	1	1
9. Resulting Lw	37	54	59	59	63	62	58	54
10. spherical propagation ($10\log Q/4\pi r^2$)	-41.6	-41.6	-41.6	-41.6	-41.6	-41.6	-41.6	-41.6
11. Laeq at NSR	-4.6	12.4	17.4	17.4	21.4	20.4	16.4	12.4
12. GobaL LAeq at NSR	26.4							

Table 8.0 – Duct Calculations – Supply Fan

Appendix E – Equipment Technical Data Sheets

Product Data sheet for FDF200VSAPVD2
Multi Split PAC - Floor Standing





Indoor Unit : FDF100VD2 x 2



Outdoor Unit : FDC200VSA

FDF200VSAPVD2

19.0 (5.2 ~ 22.4)

Specifications

R410A

Indoor unit			FDF100VD2 x 2		
Outdoor unit			FDC200VSA		
Power source			3 Phase 380-415V, 50Hz / 380V, 60Hz		
Nominal cooling capacity (Min-Max)			kW	19.0 (5.2 ~ 22.4)	
Nominal heating capacity (Min-Max)			kW	22.4 (3.3 ~ 25.0)	
Power Consumption		Cooling/Heating	kW	6.74 / 6.42	
EER/COP		Cooling/Heating	kW	2.82 / 3.49	
Inrush current			A	5	
Max. current			A	20	
Sound power level ¹⁾	Indoor ²⁾	Cooling/Heating	dB(A)	65 / 65	
	Outdoor	Sound power level	dB(A)	72 / 74	
Sound pressure level ²⁾	Indoor ³⁾	Cooling (P-H)(H)(Me/La)	dB(A)	54 / 50 / 48 / 44	
	Indoor	Heating (P-H)(H)(Me/La)	dB(A)	54 / 50 / 48 / 44	
	Outdoor	Cooling/Heating	dB(A)	58 / 59	
	Air flow	Indoor ²⁾	Cooling (P-H)(H)(Me/La)	m ³ /min	29 / 26 / 23 / 19
Indoor		Heating (P-H)(H)(Me/La)	m ³ /min	29 / 26 / 23 / 19	
Outdoor		Cooling/Heating	m ³ /min	135 / 135	
Exterior dimensions	Indoor	HeightxWidthxDepth	mm	1,850 x 600 x 320	
	Outdoor	HeightxWidthxDepth	mm	1,300 x 970 x 370	
Net weight		Indoor/Outdoor	kg	52 / 115	
Refrigerant Type GWP			R410A/2088		
Ref.piping size		Liquid/Gas	mm	9.52(3/8") / 22.22(7/8")	
Refrigerant line (one way) length			m	Max.70	
Vertical height differences		Outdoor is higher/lower	m	Max.30 / Max.15	
Outdoor operating temperature range			Cooling ⁴⁾	°C	-15~50

Square duct fans



Square duct fans

MUB

The MUB fans have impellers with backward curved blades, manufactured from polyamide (size 355), aluminium (size 400-560), welded steel painted in RAL 5002 (size 100 630D4-L). The MUB 355-500 is equipped with external rotor motors, fully speed controllable. MUB 500-560DV, DS are driven by an IEC standard motor. For size 630D4-A2, 630D4-L and 710D6-A speed control is only possible by using a frequency converter.

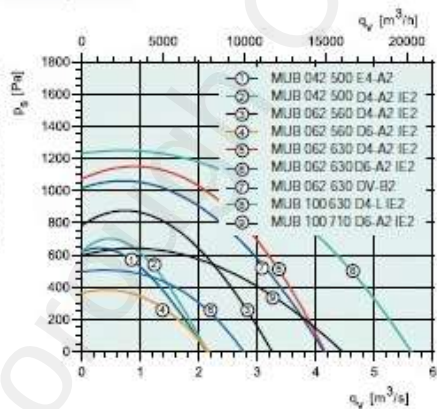
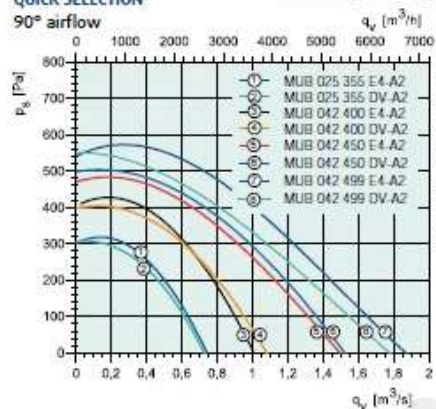
All single speed motors are in IE2 execution and possible to control via frequency converter. The three phase motors are D/Y connected for two speed operation. Motor protection is done by thermal contacts, which have to be connected to an external motor protection device.

The casing consists of a corrosion-resistant aluminum frame with fiberglass reinforced plastic corners of PA6; highly shock resistant. The double skin panels are manufactured from galvanized steel with 20 mm mineral wool insulation.

To avoid condensation the profile is provided with a separate chamber to fix screws. The Multibox fans are delivered for straight through airflow but can easily be rebuilt due to removable panels. This allows flexible ventilation solutions. The MUB can also be used as extract- or supply air unit in air handling units. Installation in any mounting position is possible.

QUICK SELECTION

90° airflow



ELECTRICAL ACCESSORIES



S-ET/STDT
p. 341-342



RTRE p. 320



REU p. 320



REE p. 321



RTRD/RTRDU
p. 321



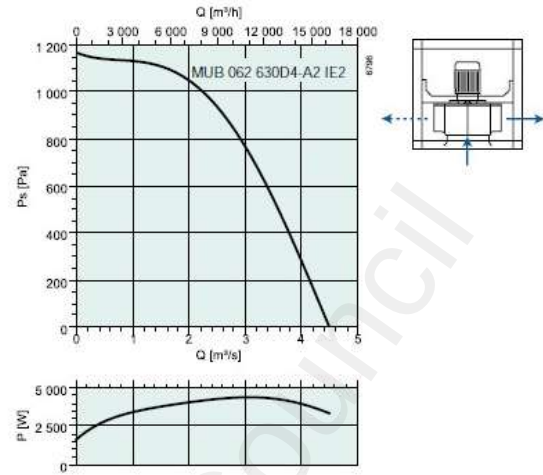
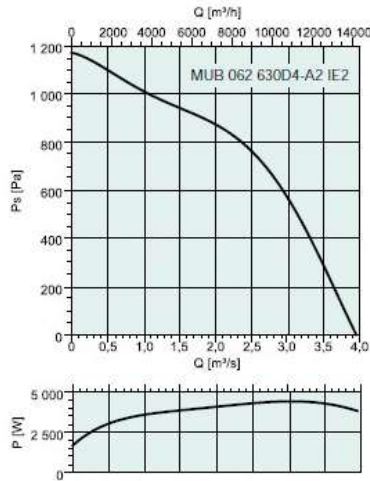
FRQ p. 325



S-DT2 SKT
p. 340

MUB		042 500	062 560	062 560	062 630	062 630	062 630	100 630	100 710
Art no.		33542	33543	33544	33545	33546	2150	33549	33548
Techn.data is relating to 90° outlet		D4-A2 IE2	D4-A2 IE2	D6-A2 IE2	D4-A2 IE2	D6-A2 IE2	DV-B2	D4-L IE2	D6-A2 IE2
Voltage/Frequency	V/50 Hz	400 3~	400 3~	400 3~	400 3~	400 3~	400 3~	400 3~	230D/400 3~
Power at shaft (P2)	W	1500	2200	750	4000	1500	3890	4000	2200
Current	A	3.39	4.64	1.98	8.12	3.61	6.4	8.12	5.1
Max air flow	m³/s	2.15	3.25	2.19	3.89	2.76	4.17	5.07	4.47
R.p.m.	min-1	1400	1420	905	1450	940	1370	1450	945
Max temp. of transported air	°C	40	40	40	40	40	40	40	40
Sound pressure level at 3 m	dB(A)	55	56	47	68	53	69	74	59
Weight	kg	68	99	117	135	130	145	160	160
Insulation class, motor	F	F	F	F	F	F	F	F	F
Enclosure class, motor	IP 55	IP 55	IP 55	IP 55	IP 55	IP 55	IP 54	IP 55	IP 55
Motor protection	-	-	-	-	-	-	STDT 16	-	-
Speed control, five-step	FRQ5(S)-4A	FRQ5(S)-10A	FRQ5(S)-4A	FRQ5(S)-10A	FRQ5(S)-4A	RTRD 14	FRQ5(S)-10A	FRQ5(S)-10A	FRQ5(S)-10A
Speed control, 2-step	-	-	-	-	-	S-D2SKT	-	-	-
Speed control, stepless	FRQ(S)-4A	FRQ(S)-10A	FRQ(S)-4A	FRQ(S)-10A	FRQ(S)-4A	-	FRQ(S)-10A	FRQ(S)-10A	FRQ(S)-10A
Wiring diagram p. 391-400	13b Y	13b Y	13b Y	13b D	13b Y	18	13b D	13b Y	13b Y

Square duct fans



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	86	73	75	79	81	80	77	72	65
L_{wA} Outlet	88	75	77	81	83	82	79	74	67
L_{wA} Surrounding	75	62	64	68	70	59	66	61	54

Measurement point: 1,95 m³/s; 911 Pa

CASED AXIAL
JM AEROFOIL

PRODUCT FACTS

- Air flow up to 20.0 m³/s
- Static pressures up to 1000 Pa
- Fans tested to ISO5801 and ISO448
- High energy efficiency
- Low installed noise levels
- Motor protection and terminal block IP55
- Larger sizes available please enquire for more information

ELECTRICAL SUPPLY

220-240V/50Hz/74 s 380-420V/50Hz/34

TEMPERATURE RANGE

-40°C to 50°C as standard 50°C to 70°C must be run at full speed only.

SIZES

315, 355, 400, 450, 500, 560, 630, 710, 800, 900 & 1000 mm

IMPELLERS

A unique high efficiency aerofoil section blade with a smoothed hub and clamp plate for adjustable pitch angle availability.

Woods Impellers are all high pressure die cast to offer thin aerofoil sections for low generation of noise. Every cast aluminium component is X-ray examined using Dual Time Radiography Inspection prior to assembly. The maximum pitch angles shown allow for speed control by frequency inverter (3ph only).

MOTORS

All motors are totally enclosed air stream rated class F insulation. Constructed from aluminium or cast iron as standard with special "T" slot, or pad mounted fittings. Single speed motors are suitable for speed control by voltage regulation where indicated. Three phase motors are suitable for use with frequency inverters, suitable for turn down to 20% of maximum speed. Two speed motors are available on request. Suitable for horizontal or vertical shaft operation. Supplied IP55, with removable drain plugs.

Sealed for life bearings lubricated with wide temperature range grease. The BT and CT frames are fitted with overload protection thermostat as standard. BT-380 frame motors are fitted with Thermistor DRP. These motors are suitable for inverter/speed control down to 20% of full speed and where within scope incorporate IE2 compliant motors.



CASING

JM Aerofoil fans are available in either a long cased form, complete with an externally mounted pre-wired electrical terminal box, or short cased for duct or plate installation. Casings are spun from sheet steel with integral pre-drilled and radiused inlet flanges. The galvanneal finish gives a high resistance to corrosion and is ideal for industrial as well as internal use.

PRODUCT CODE

63JM/20/4/6/36

- 63 - denotes the fan impeller diameter in centimetres
- JM - denotes fan type
- 20 - denotes impeller hub diameter in centimetres
- 4 - denotes a nominal 4 pole speed
- 6 - denotes the number of blades
- 36 - denotes the pitch angle for the required duty

ACCESSORIES (Pages 250-257) - CONTROLLERS (Pages 249-257)



PRODUCT AND ELECTRICAL DETAILS - 315-355 MM, 2 POLE

Ref	Product Code	Product Number	Pitch Angle (°)		Speed rev/min	Motor	Rating (kW)	Full Load Current (A)	Starting Current (A)	Wiring Diagram (CD)	Speed Controller			Sound Levels
			Min	Max							Electronic	Transformer	Inverter	
1	31JMv/14/2/6/33	JV346202	25	33	2760	BT9	0.58	1.45	5.7	CD3020	N/A	N/A	IDDXF54 2.2	63
2	35JMv/14/2/6/34	JV386201	31	34	2760	80	1.32	2.79	14.5	CD3020	N/A	N/A	IDDXF54 3.7	65

For ErP efficiency ratings and grades please refer to our Fan Selector for more information. Sound pressure levels quoted are at the inlet, and are average dBA at 3m distance over a sphere at the mid point at the highest angle given, under free field conditions. These are presented for comparative purposes only. For speed controllers please see pages 219-267.

Technical Data Sheet

JM Aerofoil

Project Name	: jm single phase pdf
Quotation Number	:
Customer	: nfs
FanCode	56JM/15/4/5/32
FanDiameter/Size	560mm
Blades	5
FanSpeed	1420 rpm
Velocity	10.0 m/s
BladeAngle	32°
Form of Running	B
FanCasing	Long
RequestedDuty	2.45m³/s @ 192 Pa (static)
OutletDynamic Pressure	60 Pa
DutyShaft Power	0.955kW
MaxShaft Power	0.974kW
Total Efficiency	65 %
MotorFrame	CT8
MotorRating	0.970kW
Full LoadCurrent	6.7A
StartingCurrent	13.5A
MotorMounting	Pad
ElectricalSupply	220-240 Volts 50 Hz 1 Phase
StartType	DOL
MotorWinding	Standard
Enclosure	StandardAll
AirDensity	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
ProductNumber	DX571456

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA@ 3m**
Inlet*	78	81	76	77	74	71	67	63	85	59
Outlet*	79	81	76	77	74	71	68	64	85	59
Breakout*	69	60	50	52	49	44	49	40	70	35
* Lw dB re 10 ⁻¹² W									** dBA re 2x10 ⁻⁵ Pa	

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum FVL, therefore recommend using an auto transformer speed controller for noise sensitive applications.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt2, 1985 under Ducted conditions. The single figure provided is the overall inlet sound pressure level at the specified distance, under spherical, free field conditions. Breakout levels stated are estimated from induct sound power levels and are provided for guidance.