Noise Impact Assessment

Site Address: The Burlington Hotel, Marine Parade, Worthing, BN11 3QL

Client Name: MTC Planning & Design Ltd.

Project Reference No: NP-010704-2

Authorisation and Version Control		
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Amendment History		
Revision	**Date**	**Summary of Amendments**
01	24/07/2024	Original acoustic assessment (ref. NP-010704) updated to include noise emissions from the kitchen extraction and supply systems.
02	06/08/2024	Assessment updated to include further information regarding adjacent noise-sensitive receptors.

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Delivering sustainable development by promoting good health and well-being through effective management of noise.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to provide a noise impact assessment for the installation of fixed plant ('the Proposed Development') at The Burlington Hotel, Marine Parade, Worthing, BN11 3QL ('the Site').

The applicant is preparing to submit a planning application to Worthing Borough Council (the Local Planning Authority, 'LPA'). This report has been prepared to accompany the planning application.

A noise survey has been undertaken to establish the prevailing background sound levels at the closest Noise Sensitive Receptors ('NSRs'). This report details the existing background sound climate and the noise 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.

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy, and guidance have been considered to ensure good acoustic design in the assessment:

- National Planning Policy Framework (2023)
- Noise Policy Statement for England (2010)
- British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for the installation of a roof mounted solar energy conversion system, and kitchen extraction / supply systems. The proposed layouts of the PV and kitchen extraction systems are shown in the figures below.

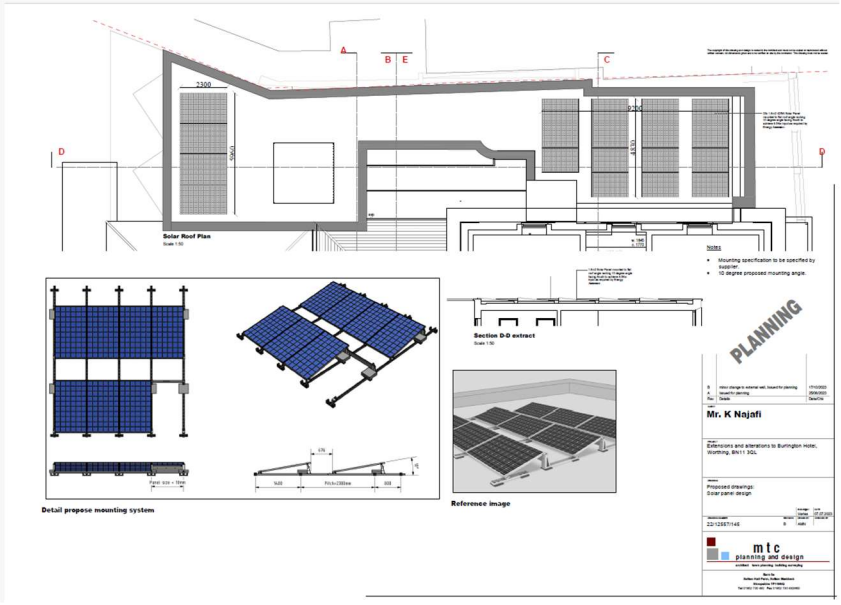


Figure 1 – PV Panel Layout

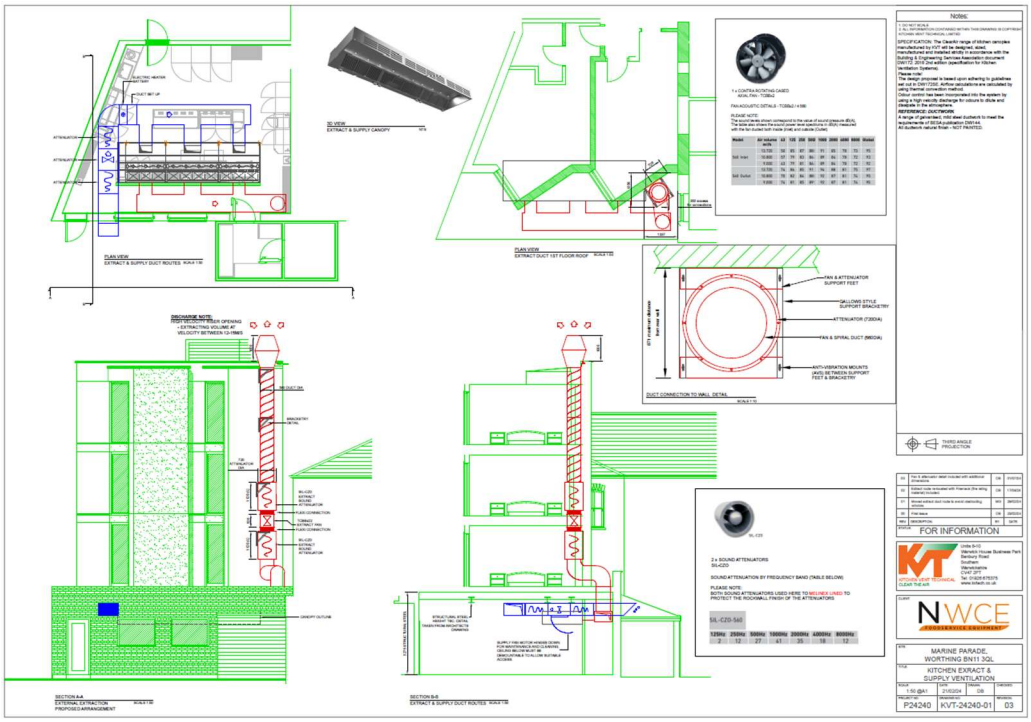


Figure 2 – Kitchen Extraction and Supply Layout

It is expected that the extraction and supply systems will operate during the opening times of the kitchen exclusively, which are as follows:

- 7:00 – 10:00 hours for breakfast servings.
- 12:00 – 21:00 hours for lunchtime, afternoon functions, and evening servings.

2. Environmental Noise Survey

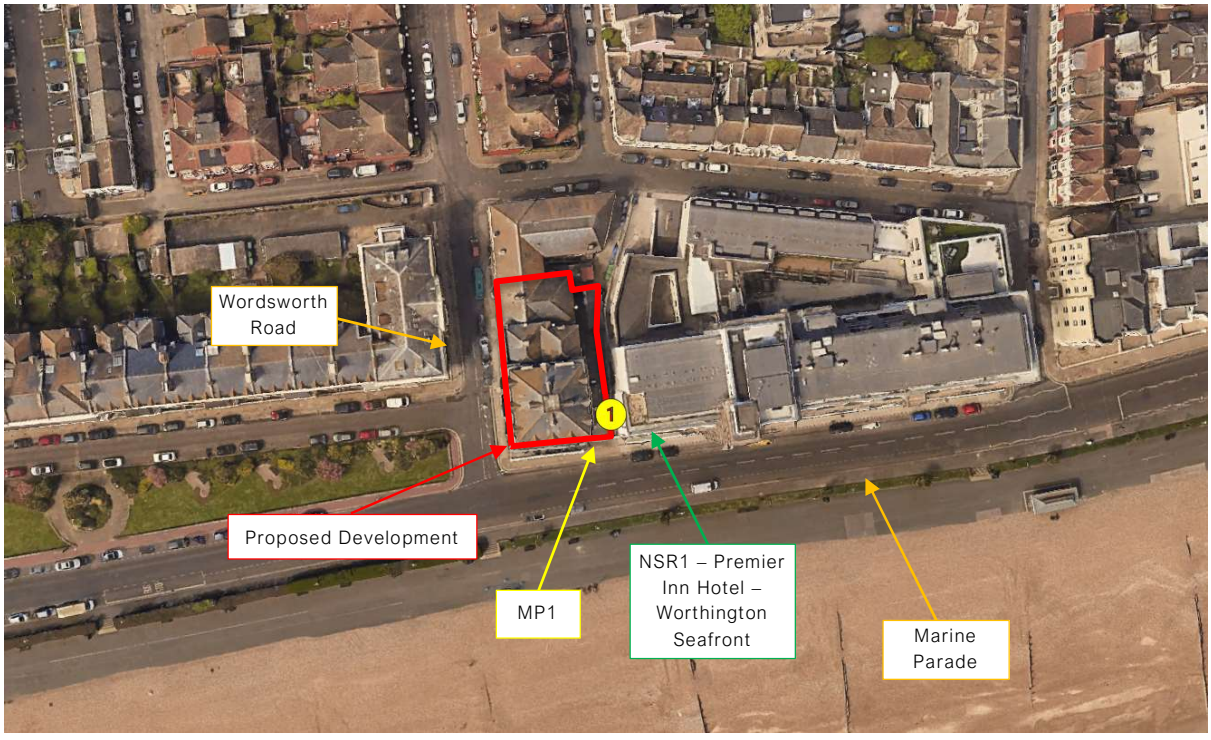
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. Weather conditions recorded during the environmental sound survey and details of the surveying equipment used can be found in Appendix D.

Location	Survey Dates	Measurement Particulars
MP1	07/02/2024 – 08/02/2024	Equipment mounted on a tripod on the flat roof of the proposed development site. The microphone was positioned approximately 1.5m above the roof and at least 1.5m from any other large reflective surface. A 130mm diameter windshield was fitted to the microphone. The equipment was field calibrated before and after the survey; negligible drift was noted. Appropriate façade corrections have been applied to the measurement results.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2024 Google, Imagery ©2024 Bluesky, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, Map data ©2024

Figure 3 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is located at the intersection of Wordsworth Road and Marine Parade, overlooking the English Channel. The immediate surrounding area consists primarily of residential buildings, and the closest NSR (NSR1) is the neighbouring 'Premier Inn' hotel (Worthington Seafront), situated approximately 3m to the east of the site. The area is relatively busy, and the noise profile is dominated by road traffic noise emissions.

2.3 Environmental Noise Survey Results

Background Sound Level Analysis

The following section outlines the measured background sound levels that have been used as the baseline for the subsequent BS4142 noise assessment. The figures below show histogram graphs of the background sound levels measured during both the daytime and night-time periods. The time history results can be found in Appendix D.

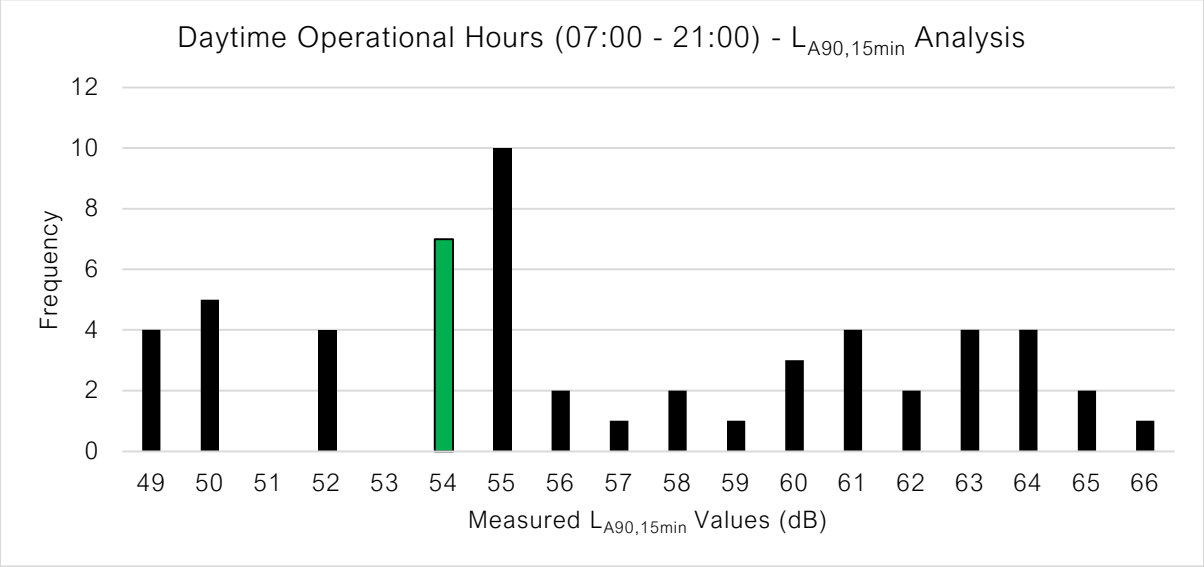


Figure 4 – MP1 Background Sound Level Analysis – Daytime

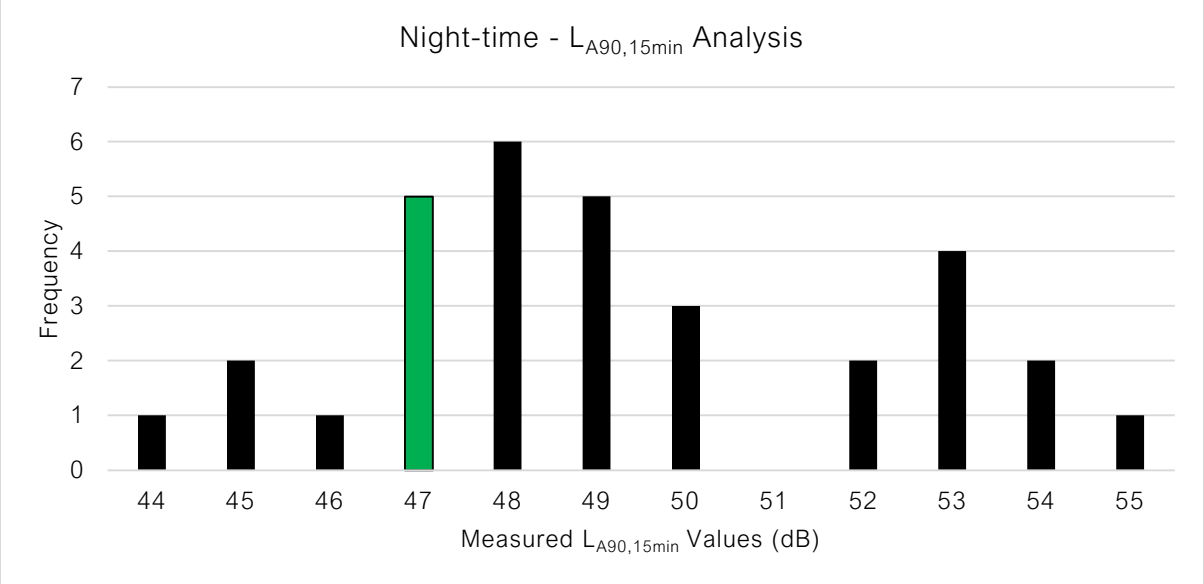


Figure 5 – MP1 Background Sound Level Analysis – Night-time

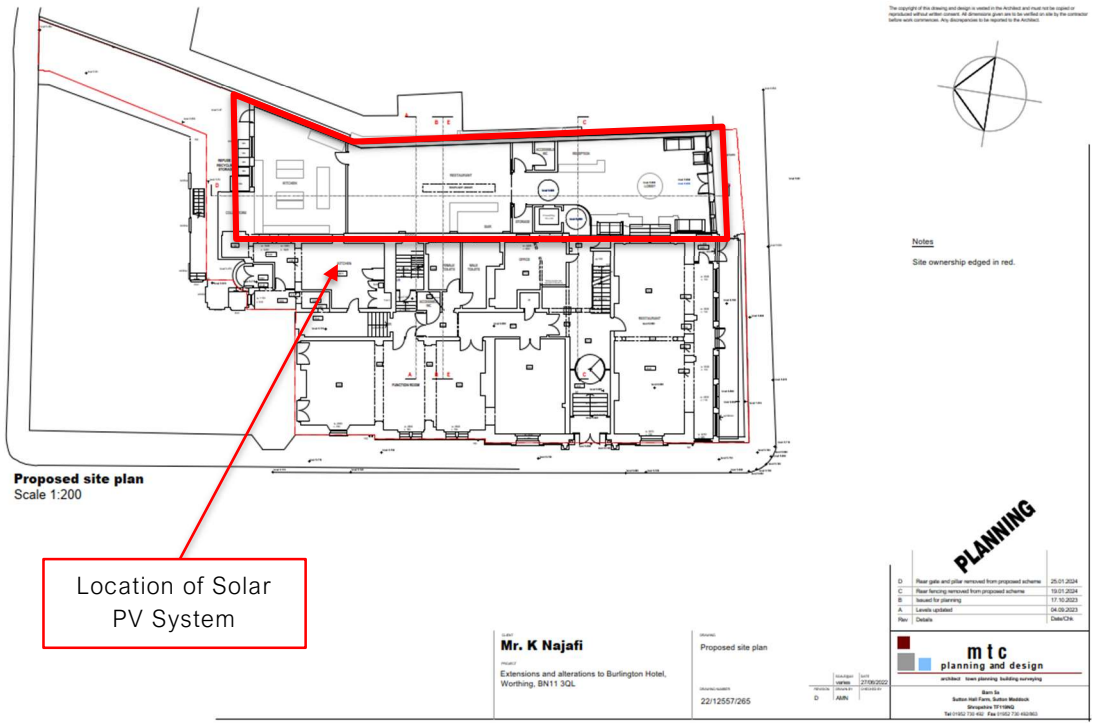
As can be seen in the figures above, the modal $L_{A90,15min}$ values measured during the daytime and night-time periods are 55 dB and 48 dB, respectively. However, to present a robust assessment, values of **54 dB** and **47 dB** are deemed to be the 'lowest typical' background noise levels and will be used in the subsequent assessment.

3. BS4142 Noise Impact Assessment

3.1 Photo Voltaic System

It is intended that 'Trina 430' PV panels are installed with a 'Solis-3P8K-S5 inverter'. It is assumed that certain aspects of the system, such as the inverter and battery storage elements could operate 24-hours a day (depending on demand).

The figure below shows the location of the PV panels.



Drawing Ref No. 22/12557/265 - D from 'MTC Planning and Design'

Figure 6 – Proposed Development Location

The PV panel supplier has stated that the only noise generating element of the system is the inverter (Solis-3P8K-S5). It is shown in the datasheet for the inverter (found in Appendix E) that the unit noise emissions have been measured at less than **30 dBA**. Whilst the measurement distance is not specified, in the experience of NOVA Acoustics, measurements for domestic equipment such as this are generally taken at a distance of either 1m or 3m. Given that the lowest typical background noise level during the night-time is **47 dBA**, and that the closest NSR is 3m from the site boundary, the specific noise emissions from the inverter are expected to be a minimum of **17 dB** below the background. At this level, the noise emissions are likely to be entirely inaudible at the closest NSRs, and as such, a rating penalty would not be required.

Overall, this assessment result would be classed as **'Low Impact'** when assessed with BS4142, and **'No Observed Effect Level' ('NOEL')** when assessed with the NPSE and NPPF.

3.2 Kitchen Extraction and Supply Systems

It is intended that the following extraction and supply system elements will be installed:

Extraction

- 1no. TCBBx2 / 4 560 fan with 1no. SIL-CZO silencer between the fan and the external terminus.

Supply

- IRT/4-400 B fan with an IAA-400 rectangular silencer between the fan and the external terminus.

The following table shows the 1/1 octave frequency band sound power levels of the system elements that are used in the subsequent calculations. As the supply fan will be located within the building, the breakout noise emissions will not be included in the assessment.

Description	1/1 Octave Frequency Band (Hz, L_W, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
TCBBx2 / 4 560 Extract Fan Outlet	100	102	94	94	94	87	80	76	95
TCBBx2 / 4 560 Extract Fan Breakout [1]	100	97	83	77	74	64	56	52	84
IRT/4-400 B Supply Fan [2]	84	91	83	79	74	70	64	59	82

Notes:

[1] *Fan encased in 0.6mm steel.*

[2] *Shown on the datasheet as 'Working Point 5'.*

Table 2 – Sound Power Levels of Extract and Supply Fans

The following table shows the performance values for the silencers that are intended to be installed within the ductwork.

Description	1/1 Octave Frequency Band (Hz, Insertion Loss, dB)							
	63	125	250	500	1k	2k	4k	8k
Extract Duct Silencer (SIL-CZO)	2 [1]	2	12	27	41	35	18	12
Supply Duct Silencer (IAA-400)	3 [1]	5	12	20	25	23	15	10

Notes:

[1] *Assumed insertion loss value.*

Table 3 – Silencer Insertion Loss Values

3.3 BS4142 Noise Impact Assessment

The BS4142 noise impact assessment is presented in the following table.

The following assumptions are used in the calculations:

- The closest unassociated NSR windows are a minimum of **10m** from the extract and supply system elements, however, in order to provide a robust assessment, the adjacent commercial property (Imperial China Restaurant) will be considered in the assessment.
- The system elements will be located at the following distances from the closest window of the Imperial China Restaurant:
    - Extract ductwork terminus – **9m**.
    - Extract fan – **6m**.
    - Supply ductwork terminus – **5m**.
- Noise from the extraction outlet and breakout noise from the fan casing is expected to propagate with a Q factor of 2 (one reflective plane).
- Noise from the supply outlet is expected to propagate with a Q factor of 4 (two reflective planes).
- As previously stated, the supply fan noise emissions have been calculated using the values for **'Working Point 5'**. If this is not correct, further assessment will be required.
- The operational hours of the extraction and supply systems will be 07:00 – 10:00 hours and 12:00 – 21:00 hours.

Further to the above, it must be ensured that all system elements are located a minimum of **5m** from any associated hotel window.

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Cumulative Specific Sound Level at Imperial China Restaurant (L_{eq})	77	74	60	54	50	41	38	39	61
Acoustic Feature Correction	In accordance with the subjective method of BS4142, a +4 dB penalty for 'clearly perceptible' tonality has been applied to account for the tonality produced by kitchen extraction / supply systems.								+4
Rating Sound Level at NSR1 ($L_{A,Tr}$)	Specific sound level plus rating penalties.								65
Background Sound Level	$L_{A90,15min}$ shown in Figure 4.								54
Exceedance of L_{A90}	$L_{A,Tr} - L_{A90,15min}$.								**+11**
BS4142 Assessment Outcome	'Significant Adverse Impact, dependent on context'.								
NPPF & NPSE Outcome	'Significant Observed Adverse Effect Level' ('SOAEL').								
Mitigation measures are required to reduce noise impact.									

Table 4 – BS4142 Assessment – Pre-mitigation

3.4 Recommendation & Mitigation Measures

In order to achieve the criteria, it is recommended that the following mitigation measures are implemented:

- The output silencer should be upgraded. The proposed insertion loss values are shown in the table below.

Description	1/1 Octave Frequency Band (Hz, Insertion Loss, dB)							
	63	125	250	500	1k	2k	4k	8k
Recommended Insertion Loss Values	4	8	15	30	35	35	20	10

Table 5 – Proposed Silencer Insertion Loss Values

The system designer (KVT) has stated that a silencer has now been specified that can achieve this level of attenuation. Datasheets are available from the manufacturer upon request.

- An enclosure should be installed around the extraction fan that can provide the following insertion loss values:

Description	1/1 Octave Frequency Band (Hz, Insertion Loss, dB)							
	63	125	250	500	1k	2k	4k	8k
Recommended Insertion Loss Values	6	10	10	10	10	10	10	10

Table 6 – Proposed Enclosure Insertion Loss Values

It is understood that the extraction fan will be located within a chimney structure. Providing the chimney is constructed from 0.6mm steel / aluminium and the fan is fully covered with 50mm mineral wool insulation (min. density 10kg/m^3), the insertion loss values should be achieved.

The BS4142 assessment considering the effects of the mitigation can be seen in the table below.

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Cumulative Specific Sound Level at Imperial China Restaurant (L_{eq})	71	65	52	45	41	33	35	40	52
Acoustic Feature Correction	In accordance with the subjective method of BS4142, a +2 dB penalty for 'just perceptible' tonality has been applied to account for the tonality produced by kitchen extraction / supply systems.								+2
Rating Sound Level at NSR1 ($L_{A,Tr}$)	Specific sound level plus rating penalties.								54
Background Sound Level	$L_{A90,15min}$ shown in Figure 4.								54
Exceedance of L_{A90}	$L_{A,Tr} - L_{A90,15min}$.								0
BS4142 Assessment Outcome	'Low Impact, dependent on context'.								
NPPF & NPSE Outcome	'No Observed Adverse Effect Level' ('NOAEL').								
Mitigation measures are not required.									

Table 7 – BS4142 Assessment – Post-mitigation

4. Conclusion

The development has been assessed against the requirements of BS4142 and the LPA's policies and guidance, and a mitigation scheme has been provided to ensure the adopted criteria can be achieved.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

- The silencer located between the extraction fan and the output terminus should be upgraded to provide the insertion loss values shown in Table 5. The system designer (KVT) has stated that a silencer has now been specified that can achieve this level of attenuation. Datasheets are available from the manufacturer upon request.
- An enclosure should be installed around the extraction fan that can provide the insertion loss values shown in Table 6. This could be achieved by ensuring the chimney structure surrounding the fan is constructed from a minimum of 0.6mm steel / aluminium and the fan is fully covered with 50mm mineral wool insulation (min. density 10kg/m^3).
- All extraction and supply system elements should be installed a minimum of **10m** from any unassociated residential receptor window and **5m** from any associated window (Burlington Hotel).
- All system elements should be installed at the following distances from the closest window of the Imperial China Restaurant (as a minimum):
    - Extract ductwork terminus – **9m**.
    - Extract fan – **6m**.
    - Supply ductwork terminus – **5m**.

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

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
Background Sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for N% of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10\log_{10}(p/p_0)^{2.}$ Where: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)

Appendix B – Standards, Legislation, Policy, and Guidance

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

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. 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 180e, 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 191 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 191 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:

1) Avoid significant adverse impacts on health and quality of life.
2) Mitigate and minimise adverse impacts on health and quality of life.
3) 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 refers to the situation where impact 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"*.

This is further expanded using the updated "Noise Exposure Hierarchy Table" which includes an additional level of impact referred to as the 'No Observed Adverse Effect Level' ('NOAEL'). It is stated that at this level: *"noise can be heard, but does not cause any change in behaviour, attitude or other physiological response"*. In addition, noise at this level *"can slightly affect the acoustic character of the area but not such that there is a change in the quality of life".*

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 recognising the constraints of the site.

B.3 – BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'.

Overview

BS4142 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 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 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142 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, 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 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 +2dB is applicable for a tone which is "just perceptible", +4dB where a tone is "clearly perceptible", and +6dB where a tone is "highly perceptible".

b) Impulsivity

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

c) Other Sound Characteristics

BS4142 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 +3dB can be applied."

d) Intermittency

BS4142 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 +3dB 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 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."

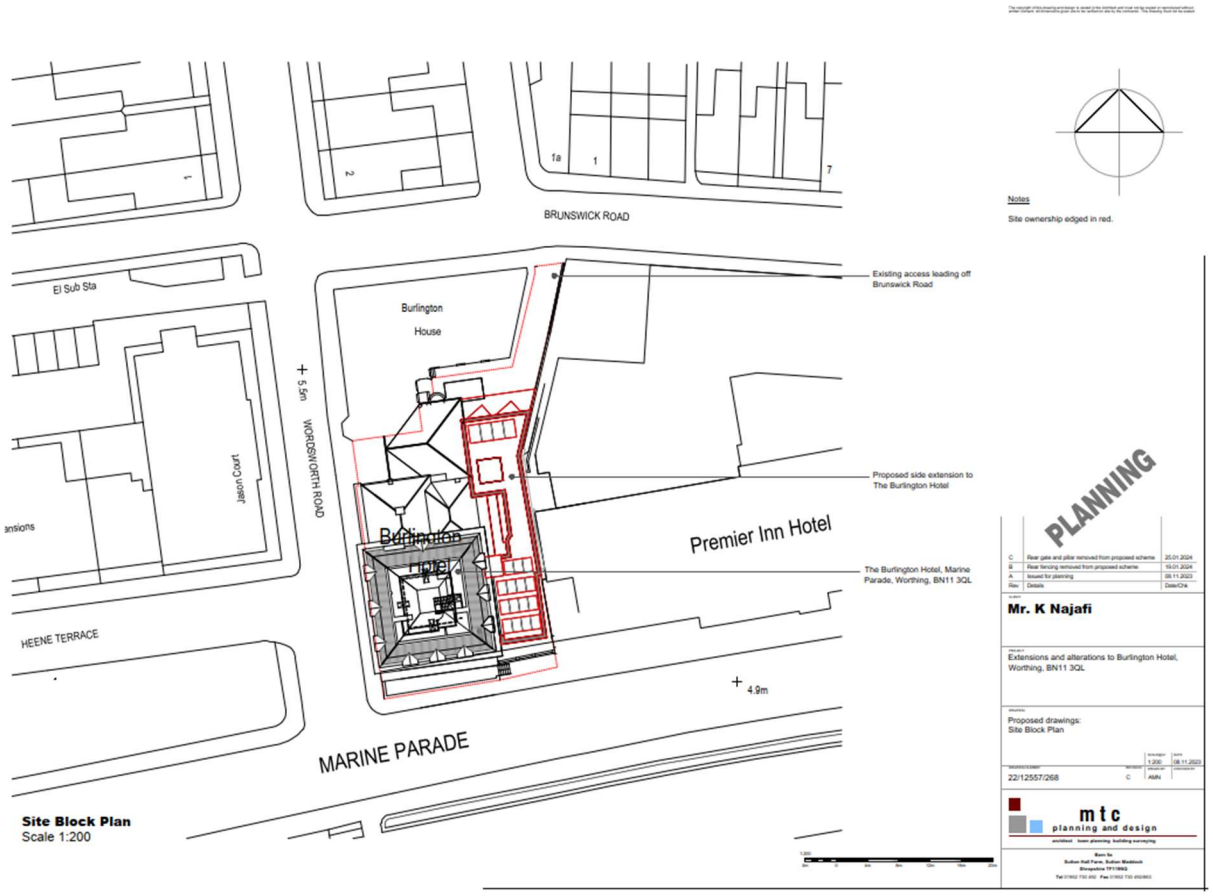
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

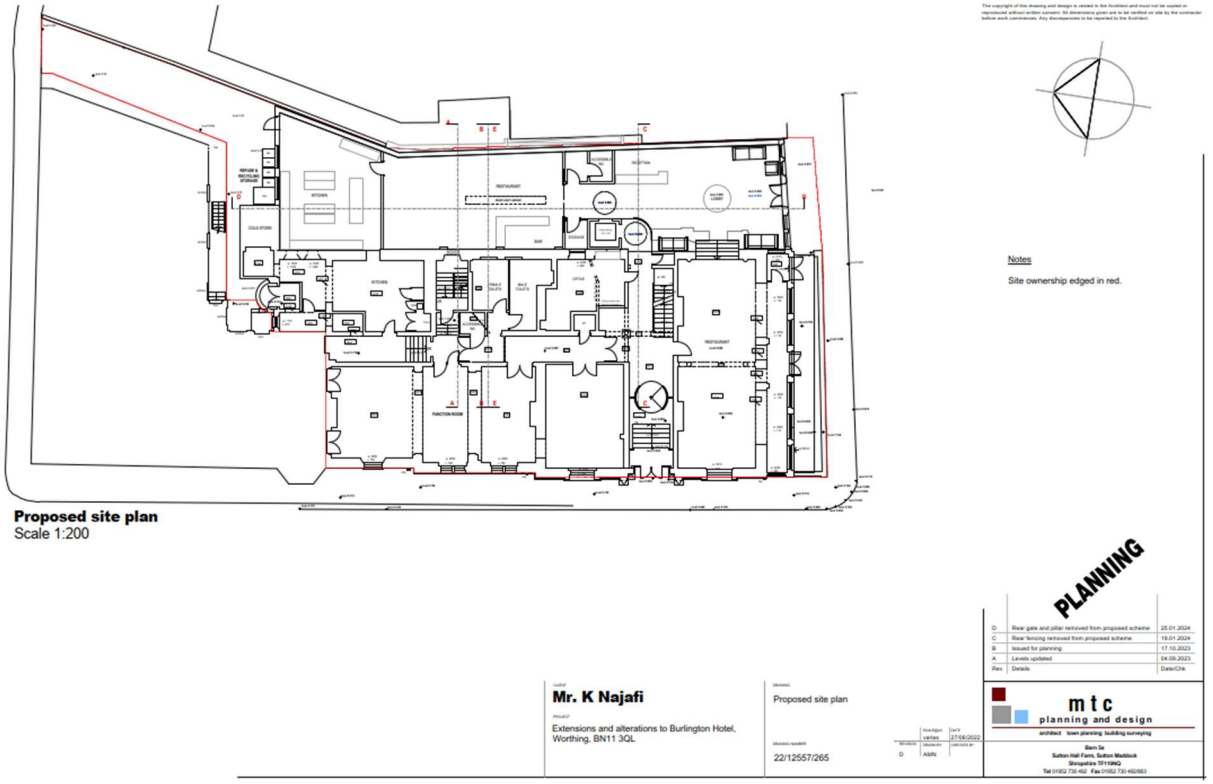
Interpreting the guidance given in BS4142, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10dB above the background sound level is likely to be an indication of a 'Significant Observed Adverse Effect Level'.
- A rating sound level that is +5dB 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 low impact and would therefore classify as 'No Observed Adverse Effect Level'.
- At levels significantly below the measured background sound level (i.e. greater than 10dB), this is an indication of a 'No 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 – Location and Site Plans





Appendix D – Environmental Survey

D.1 – Time History Noise Data

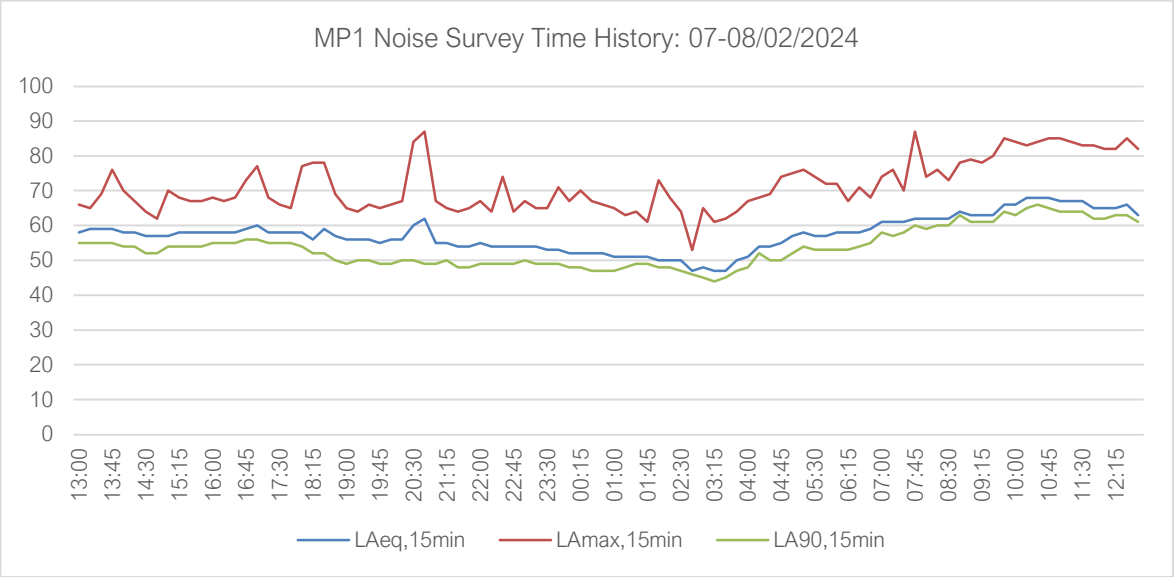


Figure 7 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
CESVA SC420 Class 1 Sound Level Meter	T244499	≤0.1
CESVA CB006 Class 1 Calibrator	902441	

Table 8 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with negligible deviation noted. 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 localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and 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 – Graham Road, Worthing (Approx. 536m NE of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
07/02/2024: 00:00 – 23:59	5.6 – 10.5	0.0 – 2.5	E	0.0 – 7.7
08/02/2024: 00:00 – 23:59	5.8 – 10.9	0.0 – 2.5	SSE	1.6 – 8.1

Table 9 – Weather Conditions

Appendix E – Manufacturers' Datasheets

3P 4G

8kW

4G NEW



Solis 3P 4G Three Phase Inverter

- Solis 4G Three Phase Range
- 160V-850V MPPT voltage range-ultra low startup
- Dual MPPT design with precise MPPT algorithm
- THDi<1.5%, low harmonic distortion against grid
- Over 98.7% Max.efficiency
- RS485, WiFi/LAN/GPRS (optional) interface
- Multiple protections levels
- WiFi monitoring available-iphone and android app available
- 5 years standard warranty, 20 years optional upgrade

Model:

Solis-3P8K-4G

Features:

THDi	IP65	160-850	AFCI	WiFi/GPRS	App Store
<2%		MPPT voltage range	Optional	Real time monitoring	App Store

Datasheet

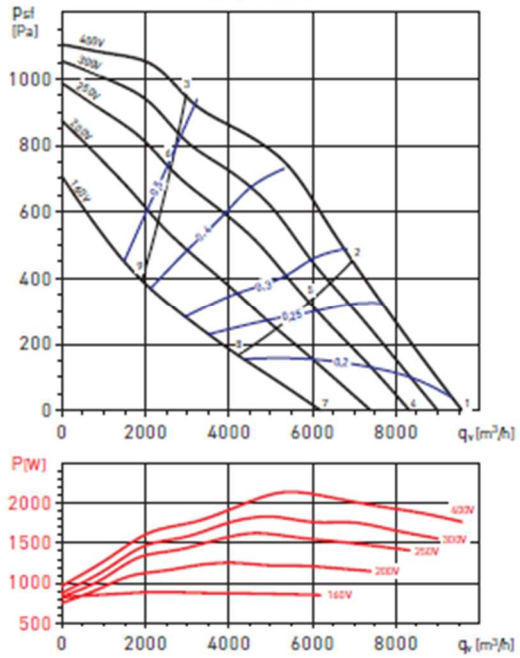
Model	Solis-3P8K-4G
Energy Source	PV
Input Side(DC)	
Max. DC input power(kW)	9.6
Max. DC input voltage(V)	1000
Start-up voltage(V)	180
MPPT voltage range(V)	160-850
Max. input current per MPPT(A/B)	11A+11A
MPPT number/Strings per MPPT input	2 / A:1; B:1
Output Side (AC)	
Rated output power(kW)	8
Max. apparent output power(kVA)	8.8
Max. output power(kW)	8.8
Rated grid voltage(V_{ac})	400
Grid voltage range(V)	313-470
Rated grid frequency(Hz)	50/60
Operation phase	three
Rated grid output current(A)	11.5
Max. output current(A)	13.4
Power Factor (at rated output power)	0.8 leading ... 0.8 lagging
THDI (at rated output power)	<2%
DC injection current	<0.5%In
Grid frequency range(Hz)	47-52 or 57-62
Efficiency	
Max.efficiency	98.7%
EU efficiency	98.1%
MPPT efficiency	>99.5%
Protection	
DC reverse-polarity protection	Yes
Short circuit protection	Yes
Output over current protection	Yes
Output over voltage protection	Yes
Insulation resistance monitoring	Yes
Residual current detection	Yes
Surge protection	Yes
Islanding protection	Yes
Temperature protection	Yes
Integrated DC switch	Optional
General Data	
Dimensions(mm)	310W*538H*158D
Weight(kg)	14.1
Topology	Transformerless
Self consumption (night)	<1W(Night)
Operating ambient temperature range	-25~60℃
Ingress protection	IP65
Noise emission(typical)	<30 dBA
Cooling concept	Natural convection
Max.operation altitude	4000m
Designed lifetime	>20 years
Grid connection standard	EN50438, G59/3, AS4777, VDE0126-1-1, IEC61727, VDE N4105
Relative humidity	0~100%
Safety/EMC standard	IEC62109-1/-2, AS3100
Features	
DC connection	MC-4 matable
AC connection	IP67 rated plug
Display	LCD,2*20 Z.
Communication connections	4 pins RS485 connector
Warranty	5 years standard (extend to 20 years)

IN-LINE RECTANGULAR DUCT FANS
IRB-IRT Series

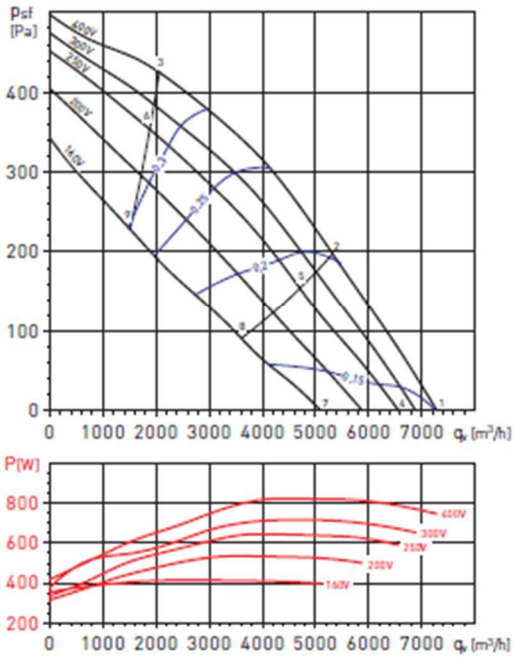
PERFORMANCE CURVES

- q_v: Airflow in m³/h.
- p_{sf}: Static pressure in Pa.
- SFP: specific fan power in W/m³/h (blue curves).
- P: Input power in W.
- Performance data in accordance with ISO 5801.

IRT/4-400 B



IRT/6-400



Sound power level spectrums in dB(A)

Working point		63	125	250	500	1.000	2.000	4.000	8.000	LwA
1	Inlet	66	80	83	87	85	83	75	70	91
	Outlet	62	85	89	93	93	89	81	75	98
	Radiated	62	72	73	78	72	69	62	56	81
2	Inlet	61	78	78	81	79	76	70	63	86
	Outlet	59	80	83	87	87	80	73	66	92
	Radiated	57	70	68	72	66	62	56	49	76
3	Inlet	62	76	75	78	76	73	68	62	83
	Outlet	62	77	81	84	84	77	71	66	89
	Radiated	58	68	65	70	63	59	54	48	74
4	Inlet	64	79	79	83	81	79	71	65	88
	Outlet	61	82	85	89	89	85	76	70	94
	Radiated	60	73	70	75	69	65	58	51	78
5	Inlet	58	75	73	76	74	71	65	58	82
	Outlet	56	76	80	82	82	74	67	61	87
	Radiated	54	69	63	68	62	57	52	44	73
6	Inlet	60	73	71	74	72	69	64	58	79
	Outlet	59	73	77	80	79	73	66	61	84
	Radiated	56	66	62	65	59	55	50	44	70
7	Inlet	62	74	71	75	72	68	63	54	80
	Outlet	58	76	78	80	80	74	67	60	85
	Radiated	58	67	61	66	60	54	50	40	71
8	Inlet	57	69	64	67	64	60	54	46	73
	Outlet	57	74	71	72	71	64	57	51	79
	Radiated	53	62	55	58	51	46	42	33	64
9	Inlet	56	64	62	65	62	60	55	47	70
	Outlet	55	67	68	71	70	64	58	53	76
	Radiated	52	57	52	56	50	46	42	34	61

Sound power level spectrums in dB(A)

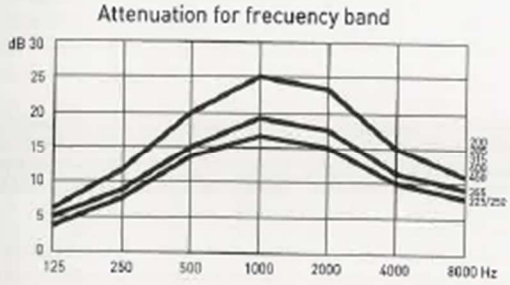
Working point		63	125	250	500	1.000	2.000	4.000	8.000	LwA
1	Inlet	63	76	75	77	76	73	66	59	83
	Outlet	62	78	81	84	85	78	71	64	89
	Radiated	60	67	67	67	63	60	51	63	73
2	Inlet	57	72	70	72	70	66	60	53	78
	Outlet	57	73	77	79	78	71	64	58	84
	Radiated	55	64	62	62	57	54	45	56	68
3	Inlet	60	70	67	69	66	64	59	53	75
	Outlet	58	70	72	75	74	67	61	55	79
	Radiated	57	61	58	59	53	51	44	57	66
4	Inlet	63	75	73	74	73	69	63	54	80
	Outlet	62	78	78	81	81	74	68	60	86
	Radiated	61	64	63	62	59	54	48	38	69
5	Inlet	57	70	67	68	66	62	56	49	74
	Outlet	59	73	73	75	74	67	60	54	80
	Radiated	55	60	58	56	52	48	41	33	64
6	Inlet	56	66	64	66	64	61	56	50	72
	Outlet	56	69	69	71	70	64	58	52	76
	Radiated	54	56	55	54	50	47	41	34	61
7	Inlet	61	65	66	67	65	61	57	46	73
	Outlet	59	67	72	74	74	66	62	52	79
	Radiated	59	51	57	55	51	47	41	31	63
8	Inlet	54	59	61	61	58	55	48	40	66
	Outlet	53	61	66	68	66	59	53	46	72
	Radiated	52	45	52	48	44	40	33	25	57
9	Inlet	53	57	58	59	57	55	49	41	65
	Outlet	52	59	63	65	64	57	51	45	69
	Radiated	51	43	49	47	43	40	34	26	55

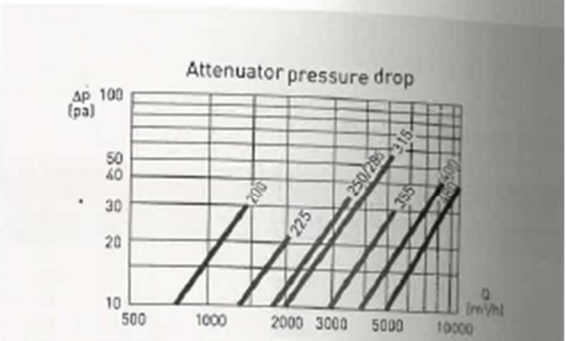
MOUNTING ACCESSORIES
Air vents (Air inlets)



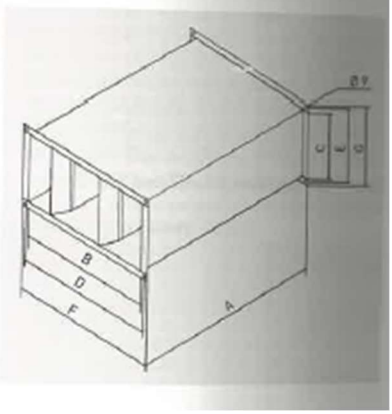
IAA

Sound attenuators
Designed to reduce in-duct sound levels.
All models are designed in 1m length.





Model	A	B	C	D	E	F	G	Weight (kg)
IAA-200	1000	400	200	420	220	440	240	18,6
IAA-225	1000	500	250	520	270	540	290	23,0
IAA-250	1000	500	300	520	320	540	340	23,0
IAA-285	1000	600	300	620	320	640	340	28,2
IAA-315	1000	600	350	620	370	640	390	30,0
IAA-355	1000	700	400	720	420	740	440	34,6
IAA-400	1000	800	500	820	520	840	540	44,2
IAA-450	1000	1000	500	1020	520	1040	540	56,0





1 x CONTRA ROTATING CASED
AXIAL FAN - TCBBx2

FAN ACOUSTIC DETAILS - TCBBx2 / 4 560

PLEASE NOTE:
The sound levels shown correspond to the value of sound pressure dB(A),
The table also shows the sound power level spectrums in dB(A) measured with the fan ducted both inside (inlet) and outside (Outlet)

Model	Air volume m³/h	63	125	250	500	1000	2000	4000	8000	Global
560 Inlet	13.720	50	85	87	88	91	85	78	73	95
	10.800	57	79	83	86	89	84	78	72	93
	9.000	63	79	81	86	89	84	78	72	92
560 Outlet	13.720	74	86	85	91	94	88	81	75	97
	10.800	70	82	84	88	92	87	81	74	95
	9.000	74	81	85	89	92	87	81	74	95



SIL-CZO

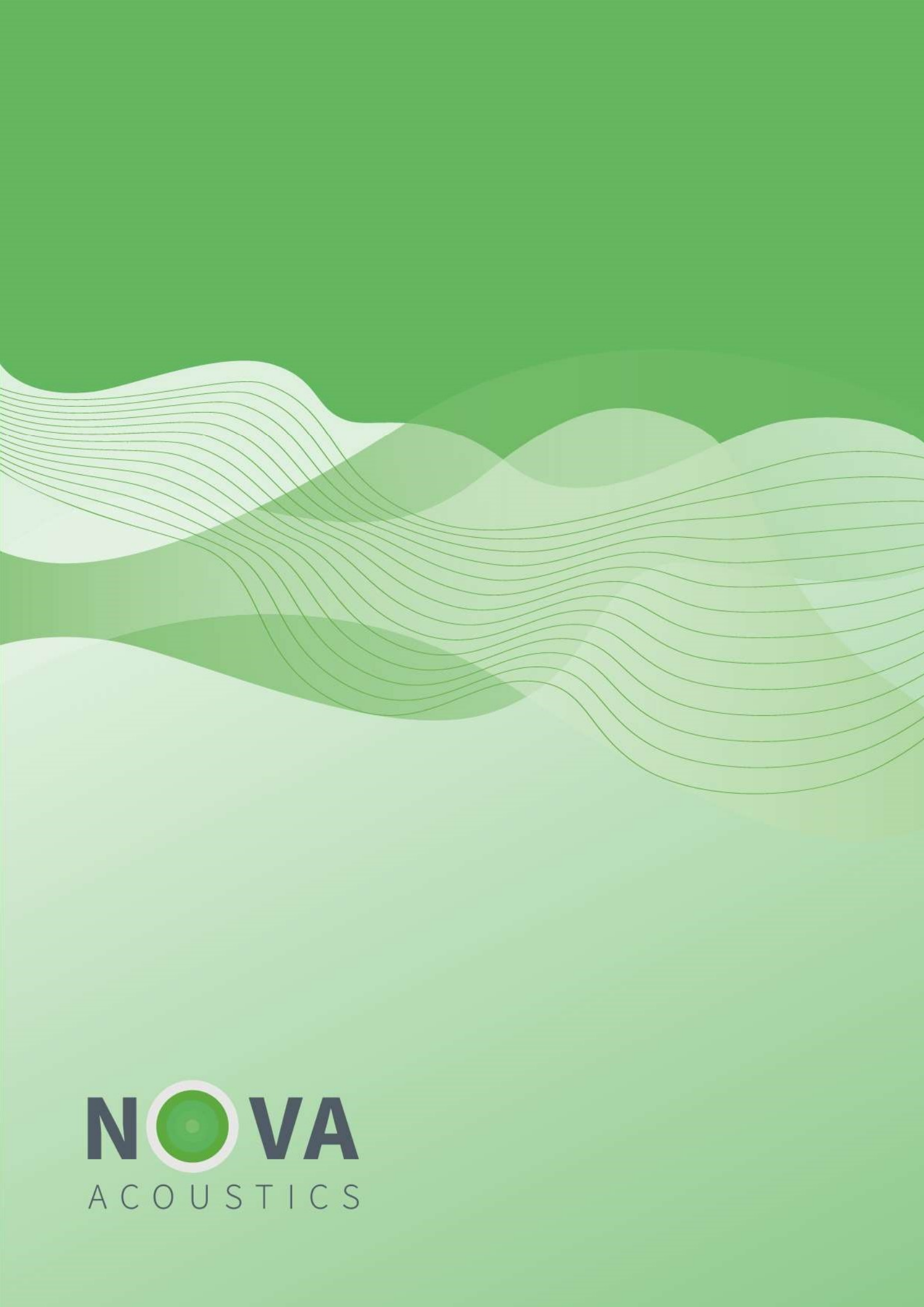
2 x SOUND ATTENUATORS
SIL-CZO

SOUND ATTENUATION BY FREQUENCY BAND (TABLE BELOW)

PLEASE NOTE:
BOTH SOUND ATTENUATORS USED HERE TO MELINEX LINED TO PROTECT THE ROCKWALL FINISH OF THE ATTENUATORS

SIL-CZO-560

125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
2	12	27	41	35	18	12


NOVA
ACOUSTICS