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Decarbonisation Phase 2 Project, Hitchin Town Hall & Museum, Decarbonisation Project, Brand Street, Hitchin SG5 1HX

250633

Noise Impact Assessment

Sustainability at our core.

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Noise Impact Assessment



Executive Summary

Couch Perry Wilkes Acoustics have been commissioned by North Hertfordshire District Council (NHDC) to undertake a noise impact assessment in support of the decarbonisation phase 2 project development which includes the installation of new air source heat pump (ASHP) plant at Hitchin Town Hall and Museum (HTHM) located at Brand St, Hitchin SG5 1HX.

Discussion with North Herts District Council (NHDC) concluded that the Rating Sound Level inclusive of acoustic features for new fixed mechanical plant should not exceed the existing measured background noise levels.

A review of the site during the on-site walkover and via Google Maps revealed up to 4no noise sensitive receptors (NSRs) for consideration in the noise impact assessment.

An external noise survey was carried out at the site and the dominant noise sources found to be from road traffic. Plant noise limits were subsequently deduced from the on-site noise survey data and NHDC Rating Sound Level criteria.

The proposed building services plant including 4no. ASHP units, 1no. AHU, and 1no. inverter heat pump were reviewed and incorporated into a 3-dimensional computer noise model for the prediction of plant noise at adjacent NSRs during daytime hours only as per the operating time of the facility.

Rating Sound Levels were subsequently estimated from predicted Specific Sound Level in accordance with BS 4142 guidance and assessed against the on-site measured background noise levels. The noise impact assessment predicts that a low impact at the NSRs during HTHM operating hours, and as such it is expected that the building services proposals would comply with NHDC plant noise limits.

Noise Impact Assessment



1.0 Introduction

Couch Perry Wilkes Acoustics have been commissioned by North Hertfordshire District Council (NHDC) to undertake a noise impact assessment in support of the proposed development at the Hitchin Town Hall and Museum (HTHM) located at Brand Street, Hitchin SG5 1HX.

The HTHM serves as a cultural hub with museum galleries, a performance hall, and spaces for community events and meetings. A significant refurbishment was undertaken in 2015 introduced upgraded museum displays, a modern reception area, and enhanced facilities for visitors and events.

As part of this assessment, the following works have been undertaken:

- a) Consultation with NHDC on plant noise emission criteria for new fixed mechanical plant.
- b) A baseline environmental noise survey to assess Background Sound Levels and to derive plant noise emission limits for the noise impact assessment.
- c) Modelling and prediction of plant noise levels at the nearest noise sensitive premises to the Site against the requirements of NHDC, and recommendations for the control of noise, where necessary.

Supporting appendices are provided, including a glossary of common acoustic terms within Appendix A.

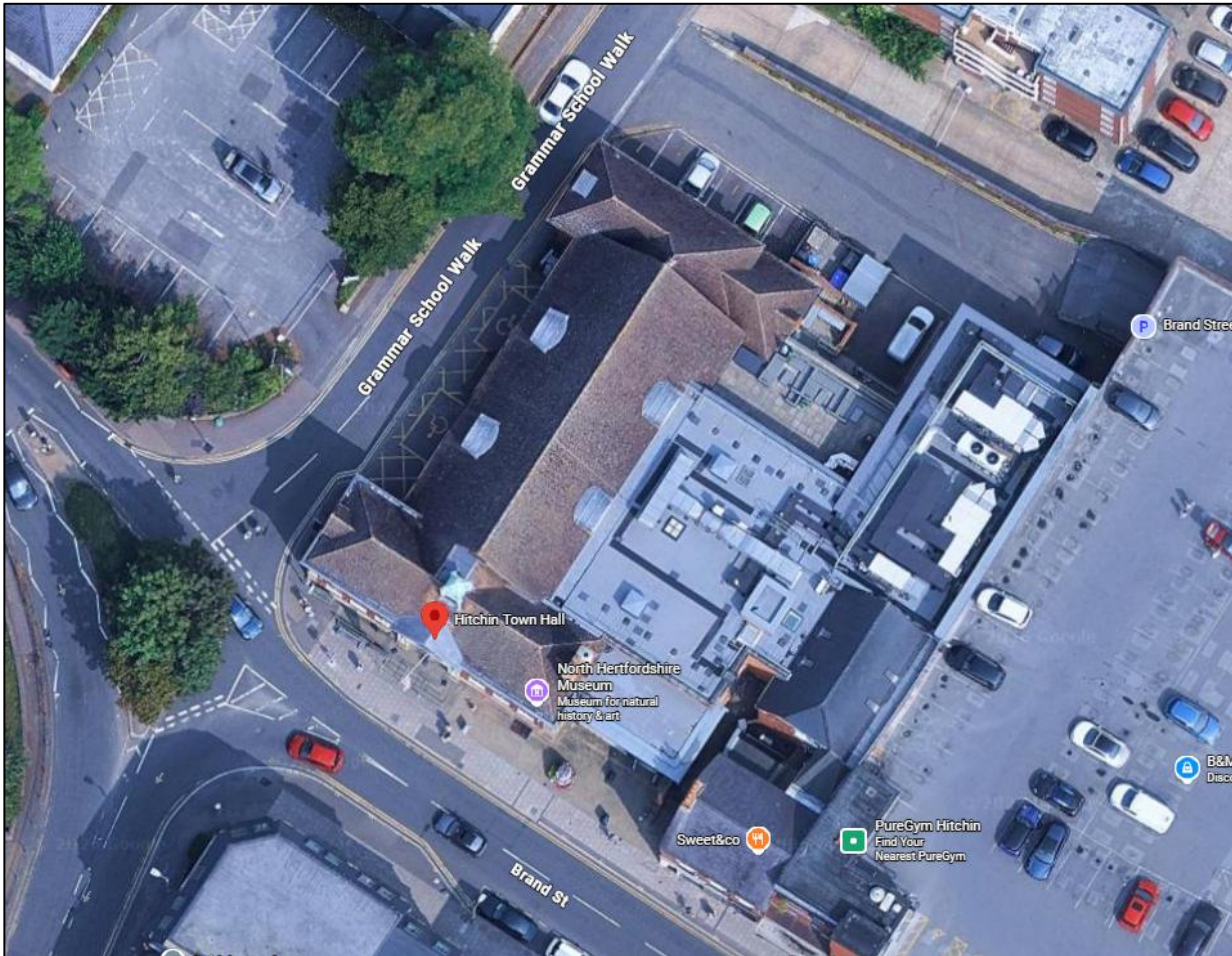
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2.0 Site Location and Development Proposals

The proposed development at HTHM includes a decarbonisation programme of stripping out of gas boilers from ground and mezzanine plant room and the installation of low temperature air source heat pumps (ASHP), and an air handling unit (AHU).

Figure 2.1 presents the HTHM site location.

Figure 2.1 HTHM Site (Google Maps).



3.0 Noise Criteria

3.1 National Planning and Policy Framework (NPPF)¹

The National Planning Policy Framework (NPPF) emphasizes the importance of local planning authorities in making decisions that improve the economic, social, and environmental conditions of their areas. Paragraph 198 of NPPF in particular 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.”*

3.2 Noise Policy Statement England (NPSE)²

The Noise Policy Statement for England (NPSE) aims 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. It sets out the Government's planning policies for England and how these should be applied. The NPSE provides a framework for locally prepared plans for housing and other development, including noise considerations. The NPSE considers concepts from toxicology that can be applied to noise impacts. The concept details noise levels, at which the effects of an exposure may be classified into a specific category. The classification categories as detailed within the NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

It is important to note that the NPSE does not provide specific levels for classification categories NOEL, LOAEL, or SOAEL, as these should be determined on a case-by-case basis with the aims as follows:

1. Avoidance of adverse effects on health and quality of life
2. All reasonable steps should be taken to mitigate and minimise the effects where the impacts lay between LOAEL and SOAEL.
3. To improve health and quality of life through the pro-active management of noise while also considering the principles of sustainable development.

¹ National Planning Policy Framework, Ministry of Housing, Communities & Local Government 2024.

² Noise Policy Statement for England, Department for Environment Food and Rural Affairs 2010.

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3.3 NHDC Local Authority Plant Noise Criteria

Discussion with Senior Environmental Protection & Housing Officer Alan Stone of NHDC via email on 17th March 2026 has confirmed that the Rating Sound Level inclusive of noise limits from new fixed mechanical plant noise at noise sensitive receptors shall not exceed measured Background Sound Levels.

3.4 British Standard BS 4142³

It is common industry practice for plant noise levels to be assessed in accordance with BS 4142: 2014+A1:2019³.

This British Standard guidance document describes methods for rating and assessing sound of an industrial and/or commercial nature for the purposes of: (a) investigating complaints, (b) assessing sound from proposed, new, modified or additional sources of sound of an industrial/commercial nature, and (c) assessing sound at proposed new residential premises.

In summary, the procedure compares the measured (or predicted) sound level from the source (known as the Specific Sound Level immediately outside of the dwellings with the Background Sound Level (notated $L_{A90,T}$) that exists in the absence of the source in question. If the sound is tonal, impulsive, intermittent or otherwise distinctive in character at the assessment location then a character correction of between 0 dB and +9 dB is added to the Specific Sound Level (correcting for the influence from any residual sound) to obtain the Rating Level (notated $L_{Ar,Tr}$).

After making any relevant corrections the Background Sound Level is subtracted from the Rating Level and an initial estimate of the potential impact of the sound source in question is made with consideration to the following:

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB or more 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.

In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the standard places emphasis upon an appreciation of the “context” in which the sound occurs in arriving at any decision. Pertinent factors may include the nature of the neighbourhood, the absolute level of sound and background sound level, the character and level of sound, the sensitivity of the receptor and whether the residential premises incorporate design measures that ensure good internal acoustic conditions such as façade treatment, ventilation and acoustic screening.

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

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4.0 Noise Survey

4.1 Noise Survey Methodology

The noise survey was undertaken by Peter Kahn MIOA between 13th – 16th March 2026 to measure the baseline noise levels for use in the noise impact assessment. Weather conditions⁴ during the noise survey were mostly dry with a short spell of light rain on Saturday 15th March between 12:00 to 18:00, and wind speed from the southwest. The noise survey duration is considered to have been taken long enough to capture suitable weather conditions as per BS7445-1⁵ and for use in this noise impact assessment report.

Table 4.1 presents noise equipment used during the noise survey. Calibration certificates are available upon request.

Table 4.1 Noise Survey Equipment Details.

Equipment	Serial Number
NTi Sound Level Meter	A2A-21318-E0
Norsonic 1255 Calibrator	125526121

4.2 Noise Climate, Sensitive Receptors, and Survey Location

The dominant noise source affecting the HTHM site was observed to be from road traffic noise from the adjacent road network including Bedford Street, Brand Street, Paynes Park, and Grammar School Walk.

The nearest noise sensitive receptors (NSRs) to the proposed plant at HTHM are described in Table 4.2 and shown in Figure 4.1.

Table 4.2 Noise Sensitive Receptors and Approximate Distance to HTHM.

Sensitive Receptor	Type of Receptor	Description / Name	Approximate Distance from HTHM Plant to NSR
1	Residential	Croft Court located to the north at Grammar School Walk, Hitchin SG5 1JD.	38 metres
2	Healthcare	NHS Centenary House located to the northwest at Grammar School Walk Stevenage SG5 1JN.	33 metres
3	Religious	Friends (Quaker) Meeting House to the west at 1 Paynes Park, Hitchin SG5 1EH.	47 metres
4	Residential	Latchmore Court located to the south at Brand Street, Hitchin SG5 1Hx	28 metres

The noise meter was located on the northern roof area of HTHM as shown by L1 in Figure 4.1, and image affixed to Appendix B.

⁴ Time and date [link](#).

⁵ British Standard BS 7445-1:2003 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures.

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Figure 4.1 Noise Sensitive Receptors and Unattended Noise Survey Location L1 (Modified Google Maps).



4.3 Noise Survey Results

A summary of the noise monitoring data (L1) is presented in Table 4.3 while the noise survey time history and site photo is presented in Appendix C.

Table 4.3 Unattended Noise Survey (L1) Results.

Date and Start Time	Duration	Background Sound Level dB L _{A90,5min} ¹
12:30 13/03/2026 to 10:30 16/03/2026	07:00 – 23:00	47
	23:00 – 07:00	43

Note:

1. The reported L_{A90} figures are the statistical modal over the given time period.

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5.0 Plant Noise Impact Assessment

5.1 Operational Plant Noise Limits

Based upon the unattended noise measurement Background Sound Levels, derived plant noise limits inclusive of acoustic feature (Rating Sound Level) for the new fixed building services plant associated with HTHM are presented in Table 5.1 for daytime hours as HTHM and its building services plant is understood to only operate during daytime hours.

Table 5.1: Rating Sound Level Limits for New Fixed Building Services Plant.

Rating Sound Level Limit During Plant Operating Period, $L_{Ar, Tr}$ (dB)
Daytime (07:00 – 23:00)
47

5.2 Plant Sound Power Levels

The following items comprise the plant proposals at HTHM with the capacity to radiate noise to atmosphere. Figure 5.1 presents their location at the HTHM site.

1. Ground level ASHPs (3no.) adjacent to north façade enclosed by a screen having height 2.5m.
2. Rooftop air handling unit (1 no.) break-out noise.
3. Rooftop air handling unit (1 no.) fresh air inlet and exhaust noise.
4. Rooftop inverter heat pump (1 no.).

Figure 5.1 Proposed ASHPs, Air Handling Unit, and Heat Pump Location (Left) and Proposed Rooftop Plant Layout (Right) .

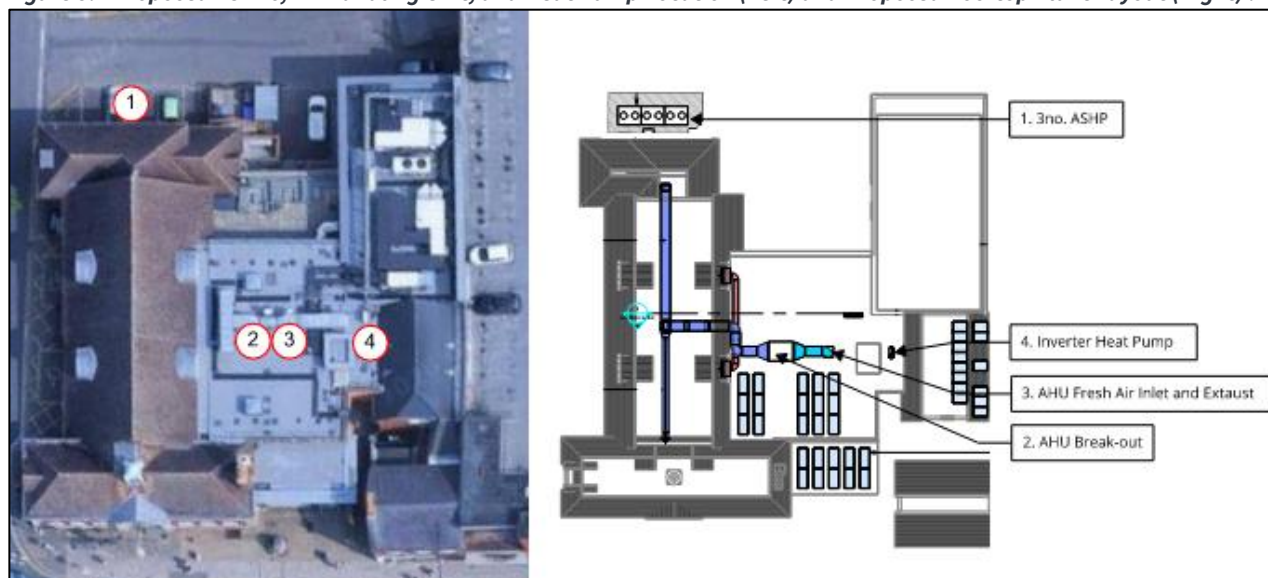


Table 5.2 presents the sound power/pressure levels associated with the proposed HTHM plant .

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Table 5.2 Proposed Plant Sound Power or Pressure Level per Unit (dB) in Octave Bands.

Plant Model Quantity Sound Power or Sound Pressure	Sound Power L_w or Sound Pressure Level L_p (dB) in Stated Octave Band Frequency (Hz)								
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	L_w dBA or L_p dBA at 1m
Carrier Model 61AQ 420P 4 units L_w	83	89	94	87	82.5	78.5	75.5	72.5	L_w 97 dBA
Systemair AHU Geniox Core 18, Fresh Air Inlet 1 unit L_w	63	77	69	66	61	56	50	49	L_w 68 dBA
Systemair AHU Geniox Core 18 Exhaust Air 1 unit L_w	71	84	75	78	75	72	68	64	L_w 80 dBA
Systemair AHU Geniox Core 18 Break-out 1 unit L_w	64	70	57	54	51	45	41	24	L_w 58 dBA
Mitsubishi Heat Pump MXZ-5F102VF 1 unit L_p at 1 m	65	60	67	55	49	45	43	34	L_p 55 dBA at 1 m

5.3 Noise Control

ASHP Attenuator and Compressor Jacket

Noise control mitigation is proposed for the ASHP units which includes the use of discharge attenuators on the fans and a compressor jacket which can provide up to 23 dB in noise emission reduction. Appendix C presents the proposed noise control product for information.

AHU Fresh Air Inlet and Exhaust Attenuators

Table 5.3 presents a minimum silencer insertion loss for the AHU fresh air inlet and exhaust which have been incorporated into the noise model predictions.

Table 5.3: AHU Fresh Air Inlet and Exhaust Minimum Dynamic Insertion Loss (dB).

Dynamic Insertion Loss (dB) in Stated Octave Band Frequency (Hz)							
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
2	4	7	13	19	22	14	10

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5.4 Noise Methodology and Prediction Results

5.4.1 Methodology

Cumulative noise predictions have been carried out at each NSR using Cadna environmental noise software with the sound power/pressure level of the proposed units. The prediction calculations have been based on the following:

- Noise predictions are carried out in accordance with BS EN ISO 9613-2⁶.
- Noise levels from manufacturer supplied plant noise data as per Table 5.2.
- The following modelling inputs have been used for the noise prediction:
 - The proposed plant is understood to operate during daytime hours only for up to 60 minutes, and as such no on-time correction has been included.
 - A robust acoustic feature correction of 5 dB has been considered to account for tonality and other distinct features associated with the proposed plant.
 - The fans and compressors associated with the plant are considered to operate at a constant RMP and therefore temporal variation is not considered over the assessment period.
 - The plant items have been modelled as point sources in the noise predictions as the distance from the units to the receivers exceeds twice the largest dimension of the source thereby complying with ISO 9613 for point source propagation.
 - Noise predictions are carried out at 1 metre from building facades of each NSR.

Table 5.3 summarises the global modelling configuration parameters used in the predictions.

Table 5.3: List of Global Noise Modelling Configuration Parameters and Values.

Parameter	Value
Industry standards	ISO 9613
Co-ordinates system	British Transverse Mercator Co-ordinates
Max order of reflections	2.0
Ground absorption	0.1
Building absorption	0.5

5.4.2 Noise Prediction Results

The highest predicted Specific Sound Level for NSRs 1 to 4 are presented in Table 5.4 and shown in Figure 5.2 and Figure 5.3.

Table 5.4: Daytime Noise Prediction Results for NSRs 1 to 4.

NSR	Specific Noise Level Ls (dBA)
1	39
2	37
3	23
4	32

⁶ ISO 9613-2:2024 Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoor.

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Figure 5.2 Daytime Predicted Specific Sound Level for NSRs 1 to 4 (View to northeast).



Figure 5.3 Daytime Predicted Specific Sound Level for NSRs 1 to 4 (View to southwest).



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5.5 Assessment

Table 5.5 presents the plant noise assessment for each NSR during daytime hours.

Table 5.5 Daytime Plant Noise Impact Assessment.

NSR	Rating Sound Level $L_{A,T,r}$ (dB)	Daytime Plant Noise Limit (dB)	Excess Above Plant Noise Limit (dB)
1	$39 + 5 = 44$	47	-3
2	$37 + 5 = 42$	47	-5
3	$23 + 5 = 28$	47	-19
4	$32 + 5 = 37$	47	-10

5.6 Context and Discussion

An indicative assessment has been undertaken to understand the likely noise impact of the proposed plant units will impact upon NSRs adjacent to HTHM.

The location of HTHM is adjacent to a 4-way road junction where road traffic dominates the environmental noise climate. The proposed rooftop plant items have been modelled inset on the roof, while the ASHP units located externally at ground level on the north façade. Both the rooftop AHU and ground level ASHPs have been modelled with noise control.

The indicative assessment results show that with the inclusion of noise control mitigation on the ASHP and AHU as outlined in this report, the predicted Rating Sound Levels during daytime hours will fall below the limiting daytime criteria and result in a low noise impact upon the NSRs.

Based on the assessment, the likelihood of any adverse effects is predicted to be low when assessed in accordance with BS 4142, and with NHDC plant noise criteria.

5.7 Assumptions and Limitations

The calculations are based on the proposed plant selection and proposed location provided by the project building services engineers at the time of writing this noise impact assessment. Should the plant proposals change, then additional calculations may be required.

All reasonable steps to reduce the level of uncertainty of the measurement and assessment have been undertaken. Reviews of the captured survey data identified a consistent noise environment with its environmental noise sources (road, rail, and aircraft) with a typical diurnal pattern observed over the measurement period. Calculations were undertaken using industry standard propagation methodology. Input data for the 3D model was obtained from a range of sources to best replicate the site environment including OpenStreetMap, available site plan drawings, and 3D imagery within Google Earth.

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Appendix A – Glossary of Acoustic Terminology

The following table contains a list of some of the most frequently used acoustic terms we use in our reports. An explanation of what each of the terms means is also provided.

Term	Definition
Decibel, dB	Is a unit of measurement of sound and is expressed on a logarithmic (base 10) scale. The human ear has a large dynamic range in sound reception, the logarithmic scale is a convenient way of compressing a range of sound pressures into a smaller range of numbers.
Sound Pressure Level, L_p	$L_p = 20 \log_{10} \left(\frac{P_{rms}}{P_{ref}} \right) dB$ This is the pressure deviation against a reference pressure caused by a passing sound wave. Where P_{rms} is the root mean square measured pressure and P_{ref} is the reference pressure, which is 2×10^{-5} pascals for air.
Sound Power Level, L_w	$L_w = 10 \log_{10} \left(\frac{P}{P_0} \right) dB$ This is the total sound energy radiated from a given source. P_0 is the reference sound power level (1×10^{-12}) and the measured power.
Noise Rating Level, NR dB	Commonly used when describing noise from building services systems. This is a single figure value derived by plotting a noise spectrum against a set of curves. The lowest curve under which the level fits is the resulting NR level. The overall NR value is the highest of the individual NR values for each frequency band.
Frequency, Hz	$f = \frac{1}{T} = \frac{v}{\lambda}$ Where f is the frequency, T is the time to complete one cycle, v is the speed of sound and λ is the wavelength of a given sound pressure wave. Different frequencies are divided into octave and one third octave bands.
Frequency Weightings	Weightings are often applied to a spectrum of sound and act as a filter to account for different sensitivities and conditions. Weightings are often used to present a single figure value from a spectrum of sound.
A-weighted sound pressure level, L_{pA}	The sound pressure level with the A-weighting applied. The A-weighting is used for most environmental noise measurements and is used to weight a spectrum of sound to match the sensitivity of the human ear.
Measurement Time Weightings, Fast, Slow	Depending upon the measurement in question the time response of a sound level meter can be adjusted. For most measurements the Fast time weighting is selected (F) however, a slow time weighting (S) is often used to for the measurement train noise and vibration.
Equivalent continuous A-weighted sound pressure level,	An energy average and defined as the level of sound which, through a given period of time (T) would equate to the same A-weighted sound energy as the actual measured fluctuating sound.

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Term	Definition
$L_{Aeq,T}$	
Octave Band	A frequency band where the upper frequency of the band is twice the frequency of the lower limit.
Maximum noise Level, L_{AFmax}	With the meter set with a fast time response, F, this is the maximum instantaneous noise level measured during a given period of time.
Percentile level, $L_{AN,T}(L_{A90,T}, L_{A10,T})$	A sound pressure level which is exceeded for a given N% of a specified time period with an A-weighting and measured with a fast time response.
Background Sound/Noise Level, L_{A90}	Typically, these are amongst the lowest noise levels referenced over a given period and act to describe the noise level that is consistently exceeded 90% of the time. The background sound level excludes short term, intermittent noise sources and often acts to describe noise sources that operate consistently through a given period.
Ambient Noise Level	The most commonly used value to describe the ambient noise level the L_{Aeq} . It is the noise level in a given environment whilst it is subject to all of its normal sources of noise.
Rating Level, $L_{Ar,Tr}$	As defined in BS 4142. The equivalent continuous A-weighted sound pressure level that includes corrections for the presence of any acoustic characteristics such as tonality, impulsivity and intermittency.
Reverberation Time, T	The time needed for the sound pressure level to decrease by 60 dB after the sound source has stopped, often written RT60. T is often followed by descriptors to present type of reverberation time value. For example, a T_{mf} is the mid-frequency (500 Hz – 2 kHz) reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Absorption, A	$A = \alpha S$ This is a measure of how much sound energy is absorbed by a material rather than reflected. Acoustic absorption is derived from the multiplication of the absorption coefficient by the surface area, $S \text{ m}^2$ of a given material.
Absorption Class, A - E	The process of classifying materials into discreet Classes A-E, with Class A having the highest level of absorption. Each class band has upper and lower reference curve for absorption coefficients between 200 Hz and 5 kHz. Materials should be tested in accordance with BS EN ISO 354 and classified according to BS EN ISO 11654.
NRC	A single-number value ranging from 0 (no absorption) – 1 (100% absorption) describing the absorption performance of a material. NRC of a material is calculated by averaging its Sound Absorption Coefficients between 250 Hz – 2 kHz.
Sound Insulation	The capacity of building elements to reduce sound transmission between spaces across a range of frequencies.

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Term	Definition
Sound Reduction Index, R	$R = L_1 - L_2 + 10 \log_{10} \left(\frac{S}{A} \right) \text{ dB}$ A laboratory measure of the sound insulation performance of a material in a given frequency band or range. Where L_1 is the average sound pressure level in the source room and L_2 is the average sound pressure level in the receive room, S is the area of the tested element and A is the equivalent sound absorption area.
Weighted Sound Reduction Index, R_w	A single figure value derived from a range of frequencies that characterises the sound reduction of a material. A reference curve is compared to the measured sound reduction indices and is adjusted until the total of unfavourable deviations below the reference curve is as close to but does not exceed 32.
Weighted Level Difference, D_w	$D = L_1 - L_2$ The difference in noise level between a source room and a receive room. Where L_1 is the average sound pressure level in the source room and L_2 is the average sound pressure level in the receive room. The difference is then weighted and stated as a single figure.
Standardized Weighted Level Difference, D_{nTw}	$D_{nT} = D + 10 \log_{10} \left(\frac{T}{T_0} \right) \text{ dB}$ Where D is the measured level difference standardised for the reference reverberation time, T_0 and then weighted.
Weighted, Normalised Flanking Level Difference, D_{nFw}	The level difference via a flanking element, such as a mullion or ceiling detail, which is normalised and weighted.
Weighted, Normalised Element Level Difference, D_{new}	The level difference through a small element such as a trickle ventilator, which is normalised and weighted.
C_{tr}	A spectrum adaption term applied to the sound insulation single-number values (R_w , D_w , and $D_{nT,w}$). The C_{tr} adaption term acts to describe the performance of an element in the context of low frequency noise, such as that generated by traffic.
Impact Sound	Is the noise generated by an impact on a structure, such as walking or weight drops.
Weighted standardized impact sound pressure level, $L_{nT,w}$	$L_{nT} = L_i - 10 \log_{10} \left(\frac{T}{T_0} \right) \text{ dB}$ Where L_i is the measured impact sound pressure level standardised for the reference reverberation time, T_0. It is used to describe the impact sound insulation performance of a floor. This is a measured noise level in a receive room generated by a standardised impact source in the room above.
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence. A dynamic insertion loss, DIL, would include the impact of any regenerated noise.
Cross-talk	This references noise transmission via ventilation duct or similar air path between rooms.

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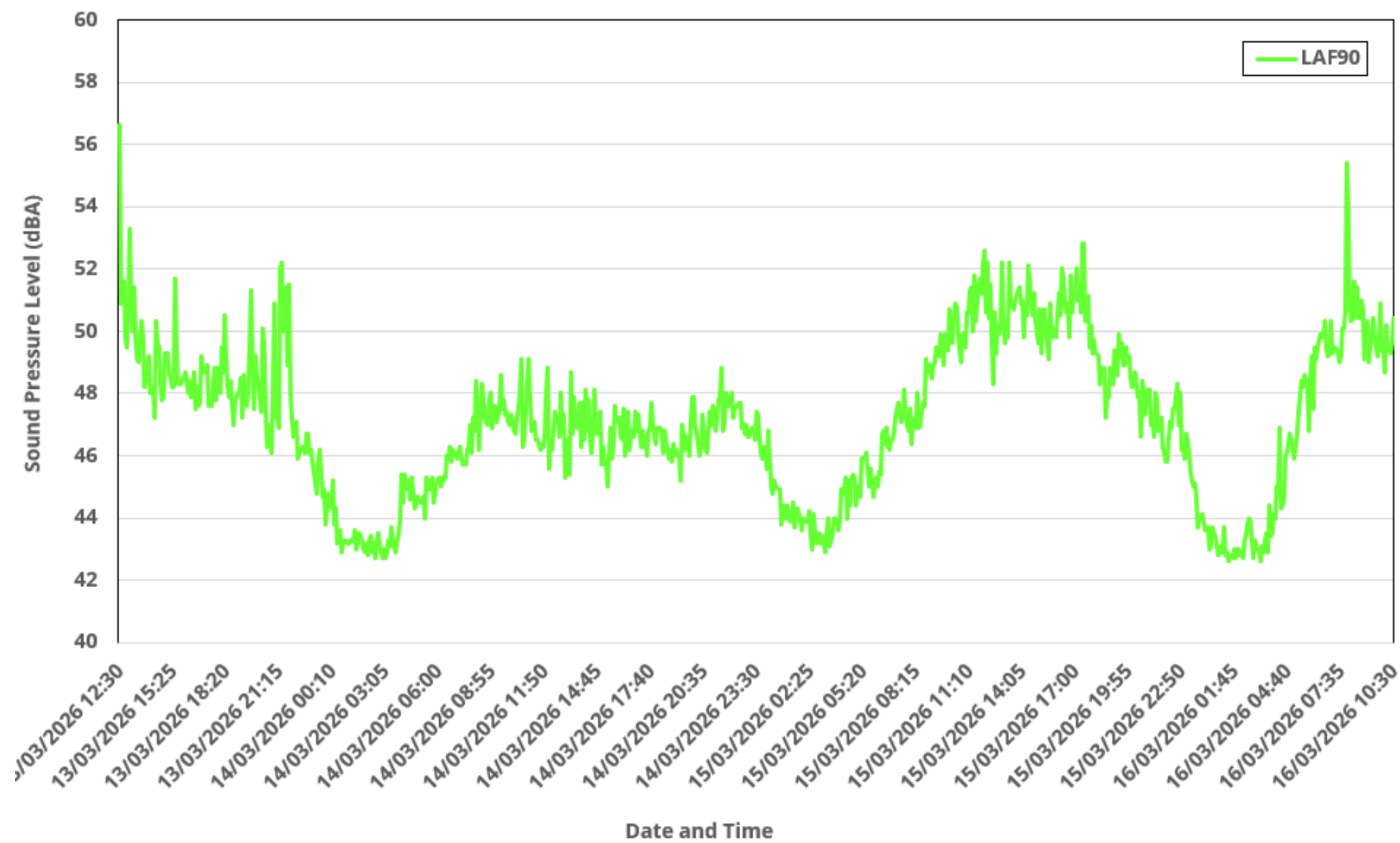
Term	Definition
Vibration	The vibratory motion of a surface can be described by the displacement (m), velocity (m/s) or the acceleration (m/s²) of its oscillation. Depending upon the circumstance it is often useful to quantify the magnitude of vibration in a range of ways, including Peak to Peak, Peak, r.m.s. and dB. A reference level of 10-6 m/s² r.m.s. is usually used for acceleration.
Ground borne noise	Where the noise propagation path from a source is transmitted through the ground into a structure and is radiated via the structure, such as noise experienced from an underground train within a building above ground.
Structure borne noise	Noise caused by vibrating of elements of a structure, the source of which is within a building or structure with common elements.
Vibration Dose Value, VDV	$VDV = (\int_0^T a^4(t) dt)^{\frac{1}{4}}$ Where a(t) is the frequency weighted acceleration (m/s²), T is the total measurement period in seconds, VDV is the Vibration Dose Value (m/s^{1.75}) and is the dose a person is expected to be exposed to over the course of the day or night.
Estimated Vibration Dose Value, eVDV	$eVDV = k \cdot a_{rms} \cdot t^{0.25}$ Where k is a constant for crest factors (typically 1.41), a_{rms} is the weighted rms acceleration and t is the cumulative time of the period Typically used on short duration measurements of transients with known durations and occurrences

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Appendix B – Unattended Noise Survey Time History and Site Photo

HTHM Unattended Noise Survey L1
Background Noise Level LAF90 Time History



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Appendix C – Proposed AHSP and AHU Plant Datasheets

Carrier ASHP

Standard Report

Jonathan Cash (17/03/2026 08:12:44)

61AQ 420P (3 x 61AQ 140)

Inverter Scroll Air-to-Water R-290 High temperature Heat Pump

Performance Information⁽³⁾

Mode		Heating
Instantaneous Heating Capacity ⁽¹⁾	kW	341
Heating Capacity ⁽²⁾	kW	290
Heating Efficiency (COP) ⁽²⁾	kW/kW	1.35
Unit Power Input ⁽²⁾	kW	216
Sound power level (L _{WA}) ⁽²⁾	dB(A)	89.5
Sound Pressure Level at 10.0m (L _{pA}) ⁽²⁾⁽⁵⁾	dB(A)	58.0
Minimum Capacity ⁽⁴⁾	kW	92.4
Maximum Capacity	kW	290

(1) Not certified value not taking the potential hot gas defrost cycles into account resulting of the climatic outdoor conditions.
(2) All performances are compliant with EN14511 -3:2022. Sound power level according to ISO9614 -1.
(3) Performances are calculated in standard configuration.
(4) Due to the minimum flow rate, a lower hot water temperature might have to be specified to achieve this performance.
(5) Estimated average sound pressure L_p at a given distance on a reflective surface in a free field environment (directivity 2).

R-290
AQUASNAP

Non contractual picture

Operating Conditions

System element		Heating
Water heat exchanger		
Fluid Type		Fresh Water
Fouling Factor (sqm·K)/kW		0.000
Leaving Temperature °C		75.0
Entering Temperature °C		70.0
Fluid Flow l/s		16.7
Hydraulic Module		
External Static Pressure kPa		100
Pump Power Input kW		5.33
Air heat exchanger		
Entering dry bulb Air Temperature °C		-4.0
Entering Wet bulb Air Temperature °C		-5.0
Entering Air Relative Humidity %		79
Altitude m		0

Unit Standard Features

- Full inverter
- Ultra Low Noise
- Water filter
- Protection and anti intrusion grilles
- Evaporator & hydraulic module frost protection
- Drain pan defrost resistance heater
- Antifreeze relieve valve
- Gas separator
- Multiple setpoint management options
- Gestion pompe externe à vitesse variable
- Night mode (Noise & capacity reduction)
- Multiple schedule
- Smart Energy Metering (Electrical consumption/Performances)
- Contact for leak detector
- Modbus or Bactnet communication gateway
- Boiler(0/1) and external heater management (3 stages 0/1)
- SGR ready
- DHW & Legionella prevention management
- Management of 2 heating zones

Unit Configuration

3A	Corrosion protection traditional coils
116V	HP VSD single-pump hydraulic module
159C	Refrigerant leak detector (Infra Red)
275A	HP SMS Sequencer (4 units)
308	Anti-vibration mounts (kit)

Unit Information

Unit	140	140	140
Manufacturing Source(s)	Montluel's factory - France		
	Montluel's factory - Spain		
Refrigerant type	R-290		
Refrigerant Weight kg	7.80	7.80	7.80
Tonnes CO2 Equivalent Tonnes	0.0234	0.0234	0.0234
Category PED	CAT III	CAT III	CAT III
Number of Refrigerant Circuit	2	2	2
Number of Compressor	2	2	2
Number of Fan	2	2	2
Operating			
Weight kg	1196	1196	1196
Length mm	1815	1815	1815
Width mm	2267	2267	2267
Height mm	2045	2045	2045
Shipping (B)			
Weight kg	1184	1184	1184
Length mm	1815	1815	1815
Width mm	2267	2267	2267
Height mm	2045	2045	2045

(B) Delivered separately in several units.

Electric Information

Unit	140	140	140
Unit Voltage V~Ph+Hz	400-3-50		
Standby Power W	160	160	160
Power Factor	0.93	0.93	0.93
Maximum Current A	134	134	134
Startup Current A	<RLA	<RLA	<RLA

Documentation

	Technical documents (OM, PSD, ...)
	TDS

The unit is not certified but composed by certified modules.

Combined units or modular chiller array rating is outside of the scope of the AHRI Air-Cooled Water-Chilling Packages Certification Program. Individual unit ratings are subject to the governing documents of the AHRI Certification Program. Unit is certified in accordance with EN Standards 14511 and 14825 Standard Rating Conditions.

Packaged Chiller Bulletin-EMEA v5.30.0.0 (date 16/02/2026)

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Noise Impact Assessment



Detailed acoustic report

Jonathan Cash (17/03/2026 08:12:44)

61AQ 420P (3 x 61AQ 140)

Inverter Scroll Air-to-Water R-290 High temperature Heat Pump

Octave Band Center Frequency	Hz	Acoustic information in heating mode							
		63	125	250	500	1K	2K	4K	8K
		Full Load							
Sound Power at unit acoustic center	dB	83.0	89.0	94.0	87.0	82.5	78.5	75.5	72.5
A-Weighted Sound Power	dBA	57.0	72.5	85.5	83.5	82.5	79.5	76.5	71.5
Sound pressure at specified distance in a free field	dB	51.0	57.0	62.0	55.0	50.5	46.5	43.5	40.5
A-Weighted Sound Pressure Level	dBA	25.0	41.0	53.5	52.0	50.5	48.0	44.5	39.5

Tolerance on Global Level +/- 4dB(A)

Acoustic Notes

d - Horizontal Distance From Chiller to Receiver = 10.0 m
 Estimated Sound Power levels - dB re: 1 picowatt
 Estimated Sound Pressure levels - dB re: 20 micropascal
 Estimated sound levels given above are assumed to originate at the unit acoustic center.



Sound Power level L_w in accordance with ISO 9614. Sound levels are calculated in cooling mode with compressor(s), fan(s) and pump(s) at nominal stage or speed if present for air temperature near 20°C and water leaving temperature near 7°C. The sound levels by octave band are guideline values only and not contractually binding.

Estimated average sound pressure L_p at a given distance on a reflective surface in a free field environment (directivity 2).

The unit is not certified but composed by certified modules.

Combined units or modular chiller array rating is outside of the scope of the AHRI Air-Cooled Water-Chilling Packages Certification Program. Individual unit ratings are subject to the governing documents of the AHRI Certification Program. Unit is certified in accordance with EN Standards 14511 and 14825 Standard Rating Conditions.

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Packaged Chiller Builder-EMEA v5.30.0.0 (date 16/02/2026)

Noise Impact Assessment



Carrier ASHP Noise Control

PERFORMANCE VERIFICATION FOR 61AQ ATTENUATION SYSTEM

JANUARY 2026



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Noise Impact Assessment



Performance Results for Carrier 61AQ Attenuation system

Isolated Systems Ltd (ISL), has developed and tested an attenuation system for application on the new range of Carrier Air to Water & Air Source Heat Pump units – hereinafter referred to as the 61AQ range – that utilise a new, natural refrigerant – R290, or Propane.

The system comprises of the following discrete entities:

1. A flexible acoustic compressor jacket
2. A cylindrical straight-through type fan-mounted attenuator
3. A special gasket to sit between the composite fan upstand and the galvanised attenuator

In ideal conditions, based upon the individual acoustic performance of the jacket and the attenuator, the resultant reduction should be approximately 23 dB(A) overall.

The jacket on its own provides an independently verified attenuation level of 8 dB(A). However, this is strictly applicable to noise from the compressor only.

Based upon the given performance data for the attenuator, this should provide an overall reduction of ~23 dB(A), to the fan noise only.

The acoustic performance of the system has been validated under operational site conditions; however, it should be noted that these tests were conducted under conditions that were effectively optimal for field verification purposes. As with all aftermarket acoustic mitigation products, a certain degree of variation in performance is inherent, due to differences in site-specific environmental and/or installation conditions.

The results of the site-based testing indicate that the system provides an overall attenuation performance of ~20 dB(A). This figure correlates very well with the predicted performance figures given previously and is not considered to be a significant deviation.

Noise Impact Assessment



Performance Results for Carrier 61AQ Attenuation system

Compressor Jacket construction

The ISL flexible acoustic compressor jacket is a 4-piece item constructed as follows:

- Silicone-coated glass fibre cloth outer layer (*with Velcro strips to secure*)
- Internal advanced Viscoelastic polymer damping membrane
- High Density Rockwool

It is designed to fit around the compressor, as indicated in the following 2 images:

Image 1: Unjacketed compressor



Image 2: Jacketed compressor



Noise Impact Assessment



Performance Results for Carrier 61AQ Attenuation system

Attenuator construction

The attenuator is constructed of 0.9mm galvanised sheet metal, with a 50mm mineral wool acoustic layer.

The gasket has been developed using an Isolated Systems proprietary material, AN1, which is a 3mm thick acoustic neoprene. The gasket used on the 61AQ is a triple-ply construction, to aid with dampening any vibrations from the body of the machine.

Indicative Field Installation



**silencers in the image above are powder-coated, as standard to match the ASHP unit colour*

Noise Impact Assessment

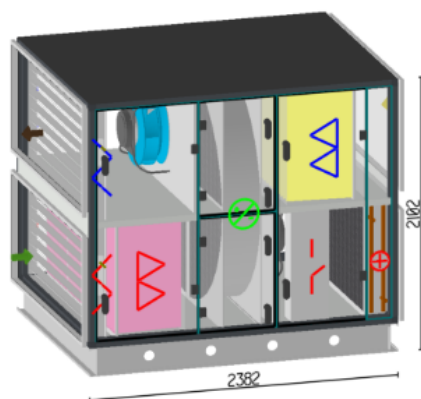


Systemair Air Handling Unit

Quotation no. NHDC Decarbonisation
Project NHDC Decarbonisation, Phase 2
Plant no. AHU/External

Unit no.: 20
Date 09/02/2026
Page 1/18

Description: Geniox Core 18 - Roof (Polyvinyl chloride roof)
Unit width / Weight: 1882 mm / 1112 kg
Delivery: 1 sections; Mounted on 218 mm base frame



Unit			
Unit color Insulation Hygienic	ZincMagnesium 60 mm mineral wool / Density 60 kg/m3 Standard		
Control system	Access control system		
Power supply Unit	L1 + L2 + L3 + N + PE (3x400V) 50 Hz / 13.8 A		
Sound break out Supply air	58 dB(A) 78 dB(A)		
Supply Air/fan data	Air density 1.205 kg/m³		
Airflow Face velocity Ext. Δp	2.70 m³/s 1.82 m/s 450 Pa		
Supply air, Winter Summer	22.0°C / RH 34% 24.0°C / RH 62%		
Filter Stages	ePM1 60% (F7)		
Fan Voltage Rated current RPM	EC Blue ZAmid - 3.40 kW 3x400 V 5.40 A 1500 RPM		
Heating, water Fluid	20.9 kW ; 15.6/22.0°C Fluid 80/60°C ; 5.4 kPa ; 0.26 l/s ; Ø 1 1/4" / 1 1/4"		
Extract Air/fan data	Air density 1.205 kg/m³		
Airflow Face velocity Ext. Δp	2.70 m³/s 1.82 m/s 450 Pa		
Filter Stages	ePM10 60% (M5)		
Fan Voltage Rated current RPM	EC Blue ZAmid - 3.40 kW 3x400 V 5.40 A 1467 RPM		
Energy	Dimensioning	Average	Fans [8760 hours]
Heat Recovery EN308 (Dry)	80.5 % 80.5 %	80.5 % 80.5 %	
SFPv *)	1.95 kW/(m³/s)	1.95 kW/(m³/s)	46103 kWh

*) Values include speed control; SFPv = clean - and SFPe = dimensional-filter pressure drop



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Systemair - Air handling unit design SystemairCAD 2.0 Geniox-1/C2025-12.38.M4 | 09/02/2026

Noise Impact Assessment



Quotation no. NHDC Decarbonisation
Project NHDC Decarbonisation, Phase 2
Plant no. AHU/External

Unit no.: 20
Date 09/02/2026
Page 7/18

Technical specification

Unit

Frequency band [Hz]	63	125	250	500	1K	2K	4K	8K	Total
Sound power level	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB(A)]
Supply air	70	82	75	76	72	68	64	57	78
Outdoor air	63	77	69	66	61	56	50	49	68
Exhaust air	71	84	75	78	75	72	68	64	80
Extract air	64	76	69	65	59	54	48	48	67
Sound break out	64	70	57	54	51	45	41	24	58

Casing

Panels	Steel sheets coated with ZM310, corrosion class C5
Frame profiles	Steel profiles coated with ZM310, corrosion class C5
Mullion profiles	Steel profiles coated with ZM310, corrosion class C5
Corners	PA6 fiber reinforced
Insulation	60 mm mineral wool / Density 60 kg/m3
Corrosion protection	Class C5 according to EN ISO 12944-2:2018
Operating pressure	0 - 2000 Pa (Geniox10 - Geniox31)
Operating temperatures	-40/+40 °C (Standard) -40/+60 °C (Special design)
Classifications	EN 1886, 2. edition 2008
Mechanical Strength	Class D1(M)*
Casing air leakage	-400 Pa: Class L1(M)* and standard L2(RU)** +700 Pa: Class L1(M)* and standard L2(RU)**
Filter by-pass leakage	-400 Pa: Class G1-F9 +400 Pa: Class G1-F9
Thermal transmittance	Class T2(M)*
Thermal bridging factor	Class TB3(M)*

Acoustic insulation of casing	Octave band Hz	Insulation dB
	63	10
	125	17
	250	24
	500	31
	1000	29
	2000	28
	4000	29
	8000	34

Roof	Polyvinyl chloride roof
Door retainers are included	
* (M) = Classification according to EN1886 Modelbox test GX 66/60-3-RW	
** (RU) = Classification according to EN1886 real unit test	

Feet or baseframe

Feet or baseframe	Baseframe
Baseframe height	218 mm
Corrosion protection	Class C5 according to EN ISO 12944-2:2018

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Systemair - Air handling unit design SystemairCAD 2.0 Geniox-1/C2025-12.38.M4 | 09/02/2026

Noise Impact Assessment

Mitsubishi Inverter Heat Pump

Air Conditioning

Product Information



MXZ-F

Multi-Split System

R32 Inverter Heat Pump

Mseries Mr.Slim

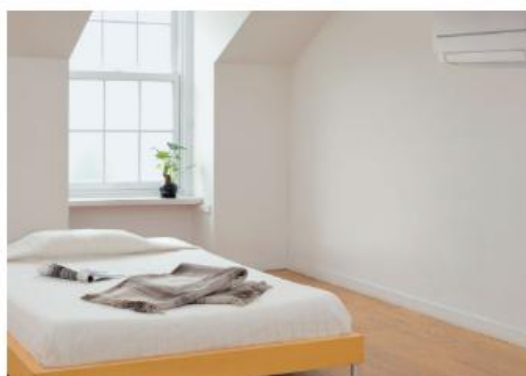
The **MXZ-F Multi-Split outdoor unit range** gives our customers the ultimate in flexibility for their air conditioning projects.

Connectable to M Series and Mr Slim indoor units, the range boasts 8 models from 3.3kW (2 connection) to 12.2kW (6 connection). This multi-split capability covers a huge range of applications from a 2 bedroom loft conversion to a 6 room office space.

R32

Key Features & Benefits:

- Specific customer needs are met by allowing multiple indoor unit types and capacities to be mixed across individual rooms
- Inverter controlled outdoor units provide economic and efficient solutions for multi-room applications
- Stylish air conditioning for modern spaces through connection to our award winning M Series MSZ indoor units
- Helps our customers meet their corporate social responsibility targets by using lower GWP R32 refrigerant

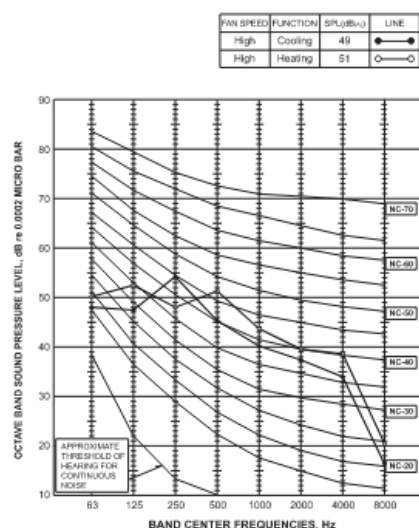


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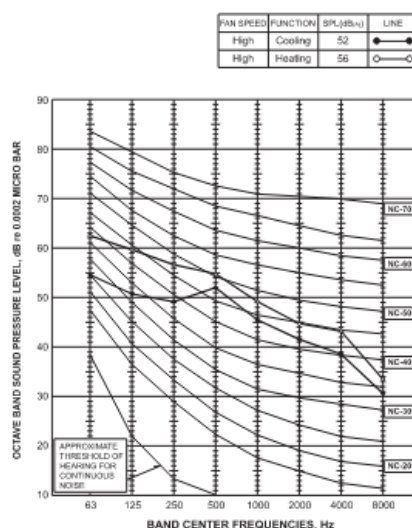
Noise Impact Assessment



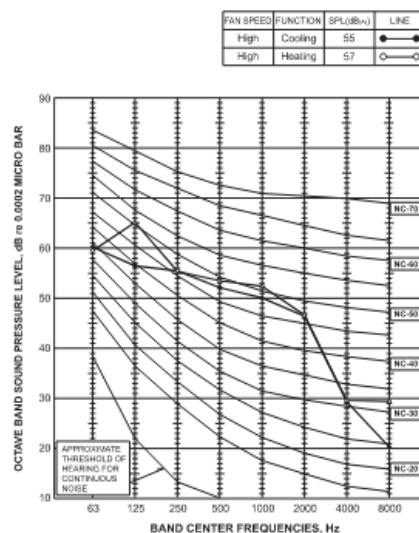
MXZ-4F83VF MXZ-4F83VF2



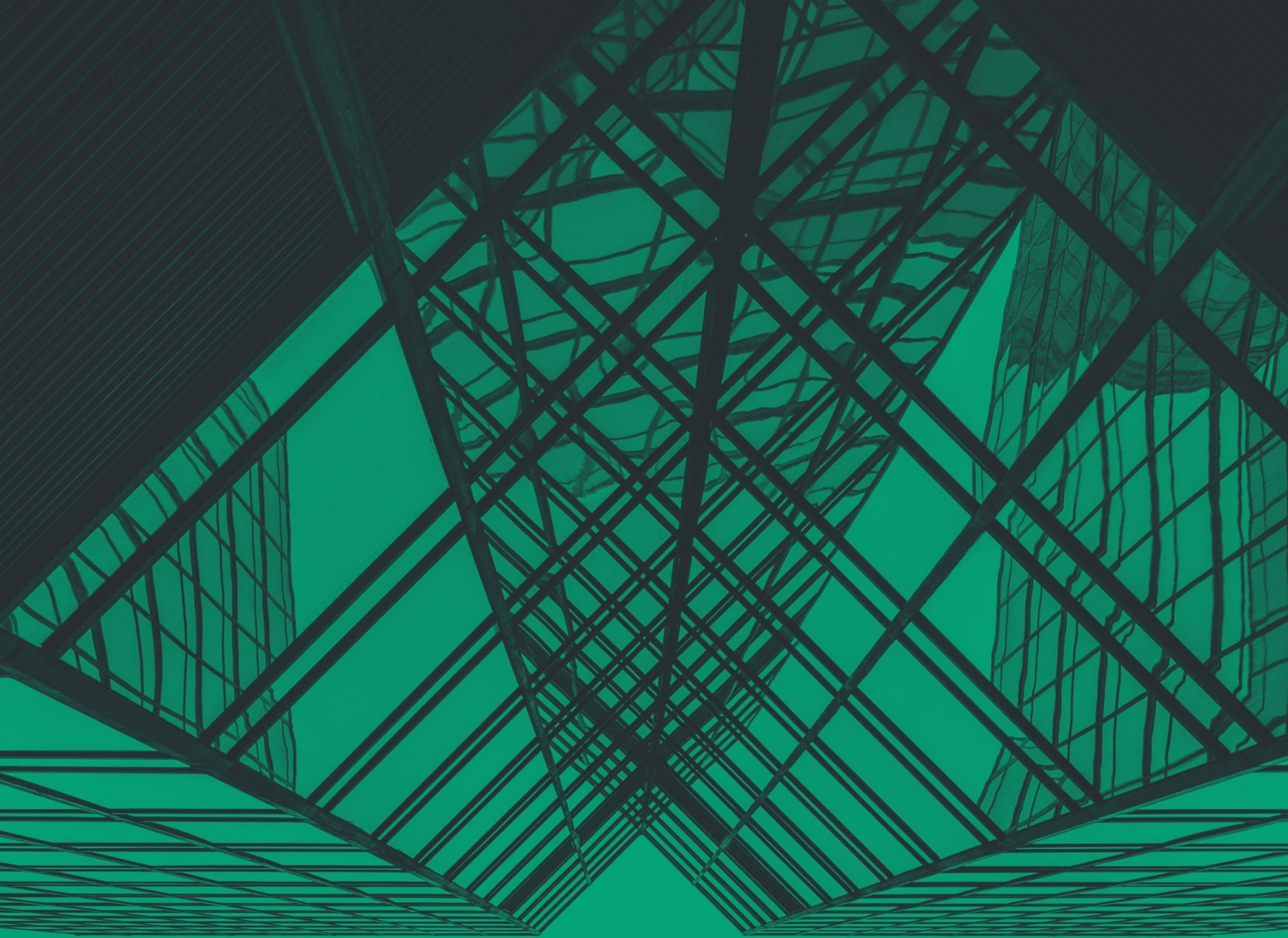
MXZ-5F102VF MXZ-5F102VF2



MXZ-6F120VF2 MXZ-6F122VF



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