

Acoustics report:

Carried out by: Green Energy Engineering Ltd 198A Lurgan Road Dromore BT25 1HL

On behalf of: Manchester Communication Academy 2 Silchester Dr, Manchester M40 8NT



This report presents an analysis of the acoustics and provides dB calculations associated with the air source heat pump (ASHP) installation planned for Manchester Communication Academy. The report includes an overview of ASHP operation, potential noise sources and recommendations for mitigating noise impact.

- An ASHP extracts heat from the ambient air and transfers it into a building for space heating or hot water supply. The ASHP system typically comprises an outdoor unit (compressor and fan) and an indoor unit (heat exchanger and circulation pump). The noise generated by the outdoor unit is the primary concern for noise impact assessment.

Potential Noise Sources

The following components in an ASHP system may contribute to noise generation:

- Compressor: The compressor pressurises the refrigerant and may produce a steady humming or vibrating sound during operation.
- Fan: The outdoor unit usually features a fan that circulates air over the heat exchanger. The fan noise can vary depending on its design and speed.
- Vibrations: Mechanical vibrations resulting from the operation of the compressor and other moving parts may contribute to the overall noise level.
- Water circulation pump: If applicable, the indoor unit's water circulation pump can generate noise during operation.

Noise Regulations for Educational Institutions

When installing an ASHP at a school, it is crucial to consider noise regulations specific to educational facilities. These regulations typically define acceptable noise levels during instructional hours, recess periods, and other school-related activities. Compliance with these regulations ensures a conducive learning environment and minimizes disturbance to students, teachers, and neighbouring properties.

dB Calculations

To assess the noise impact of the ASHP system, dB calculations have been carried out.

For the purpose of the calculation procedure the following notes have been issued:

Assessment position means a position one metre external to the centre point of any door or window to a habitable room of a neighbouring property as measured perpendicular to the plane of the door or window;

Habitable room means a room other than a hallway, bathroom, Canteen or Store;

Neighbouring property means any building used for any of the purposes of Class C Town and Country Planning (Use Classes) Order 1987 (as amended) (includes dwelling houses, hotels, residential institutions and houses in multiple occupation).

Noise Mitigation

Techniques To minimize the noise impact of the ASHP at the school, the following mitigation techniques can be implemented:

Proper location: Install the outdoor unit away from classrooms, quiet areas, and property boundaries to reduce noise transmission.

Sound barriers: Employ enclosures around the ASHP outdoor unit to minimize noise propagation.

Vibration isolation: Use anti-vibration mounts or pads to isolate the ASHP from the building structure, minimizing the transfer of vibrations.

Fan design: The Selected ASHP models with low-noise fan designs, such as those with aerodynamically optimized blades or variable-speed fans.

Regular maintenance: Implement a maintenance schedule to ensure proper functioning of the ASHP system and identify and address any abnormal noise issues promptly.

Conclusion

This report has provided an overview of the acoustics and dB calculations. By understanding potential noise sources, complying with noise regulations for educational institutions, conducting appropriate dB calculations, and implementing recommended noise mitigation techniques, the noise impact of the ASHP system can be minimized. This will help create a conducive learning environment for students while ensuring the efficient and quiet operation of the ASHP.

Selected ASHP Model for Manchester Academy

Selected ASHP Model: Carrier 61AF 022-105 Aquasnap air source heat pump

Quiet operation

Compressors

- Low-noise scroll compressors with low vibration level.
- The compressor assembly is installed on an independent chassis and supported by anti-vibration mountings.
- Dynamic suction and discharge piping supports, minimising vibration transmission (Carrier patent).

Evaporator section

- Vertical evaporator coils
- Anti-vibration mountings and optional grilles to protect the heat exchanger against possible shocks.
- Latest-generation low-noise Flying Bird fans, made of a composite material (Carrier patent), are now even quieter and do not generate intrusive low-frequency noise.
- Rigid fan installation for reduced start-up noise (Carrier patent).

Acoustics Calculations

Manchester Communication Academy 2 Silchester Dr, Manchester M40 8NT

MCA Acoustics Calcs				DB DISTANCE REDUCTION PLANNING FOR ASHP INSTALLATION COMPLIANCE IN PREMISES											
Installation Type 1 - 2 - 3 Surface Linked to Position								dB Calculation to Comply							
Q = 2			Q = 4			Q = 8		1	Max Noise	82					
								2	Q Type	2					
								3	D1 metres	12					
								4	D1 reading	-29					
								5	B1/B2 reduction	-10					
								6	1+4+5	43					
								7	40dB	40					
								8	40dB-6	3					
								9	40+higher of 6 or 7	0.5					
on 1 reflective surface			on 2 reflective surfaces			on 3 reflective surfaces		10	Pass if <45dB	43.5					
Surface Type	(D1) Distance from Heat Pump (metres) to Nearest Assessment Point														
	1	1.5	2	3	4	5	6	8	10	12	15	20	25	30	
Q2	-8	-11	-14	-17	-20	-21	-23	-26	-28	-29	-31	-34	-36	-37	
Q4	-5	-8	-11	-14	-17	-19	-20	-23	-25	-26	-28	-31	-33	-34	
Q8	-2	-5	-8	-11	-14	-16	-17	-20	-22	-23	-25	-28	-30	-31	
Where the distance is inbetween markers ex: 2.5 use the 2 marker level															
(B1) Where a solid brick or fence barrier exists obscuring 100% vision of ASHP a pump use attenuation correction reduction of -10dB															
(B2) Where a solid brick or fence barrier exists obscuring partial vision upto 25cm movement to view of ASHP a pump use attenuation correction reduction of -5dB															
MCS Standard background noise is set as 40dB															
Procedure to Calculate dB Compliance								(D2) Correction Chart							
STEP 1	Max sound level in Db from Manufactureer							Difference between step6 - step7 dB noise level				Add this correction to higher noise level			
								0				3			
STEP 2	Determine Q layout as illustrated above							1				2.5			
								2				2.1			
STEP 3	Distance to assessment point							3				1.8			
								4				1.5			
STEP 4	Obtain dB reduction from above table							5				1.2			
								6				1			
STEP 5	Establish barrier reduction							7				0.8			
								8				0.6			
STEP 6	Calculate sound pressure level = step1 + step4 + step5							9				0.5			
								10				0.4			
STEP 7	MCS background noise level set at 40dB							11				0.3			
								12				0.3			
STEP 8	Determine difference between ASHP and background noise = step7 - step6							13				0.2			
								14				0.2			
STEP 9	Final Result level = decibel correction + higher figure of step6 and step7							15				0.1			