



ACOUSTICALLY OPTIMIZED DOAS DESIGNS

Several factors should be considered when designing and selecting dedicated outdoor air systems (DOAS) to help minimize sound impacts. Proactively addressing acoustic concerns with commercial HVAC equipment during the design phase is more effective than dealing with sound-related issues later on. Learn how specific design choices and quality features contribute to minimizing radiated sound in commercial spaces.

ACOUSTIC CONSIDERATIONS FOR COMMERCIAL HVAC EQUIPMENT

Many urban communities have seen increases in population density and, as a result, redevelopment. As populations increase, designing an attractive place to live, work, or play is crucial. In the design or retrofitting of a building, it's important to consider environmental impacts on building occupants and neighboring facilities. One of those factors is the sound emitted by building operations such as HVAC equipment.

Noisy HVAC equipment can be a nuisance, but fortunately there are many options to help reduce sound levels while ensuring occupant comfort. Selecting the right internal components and casing construction features significantly reduces sound produced by commercial HVAC units.

TYPICAL APPLICATIONS

Several types of commercial buildings may require or benefit from minimizing sound from the HVAC system. For example, there may be city ordinances or proximity of neighbors to consider. Examples include:

- Schools in residential neighborhoods
- Multi-family housing units, condos, or high-rise buildings where tenants are sensitive to sound
- Hospitals where radiated sound directly affects patient care and experience
- Government buildings with sound requirements or regulations

- Laboratories
- Multi-tenant retail or office buildings

In all cases, it is important to consider the unit's placement and orientation. During the design phase, awareness of a unit's proximity to barriers, walls, partitions, patios, and other obstructions is critical, as these factors all impact acoustical performance.



HOW CAN SOUND BE MINIMIZED?

Incorporating low sound components in DOAS equipment helps reduce overall sound levels. Low sound component options include:

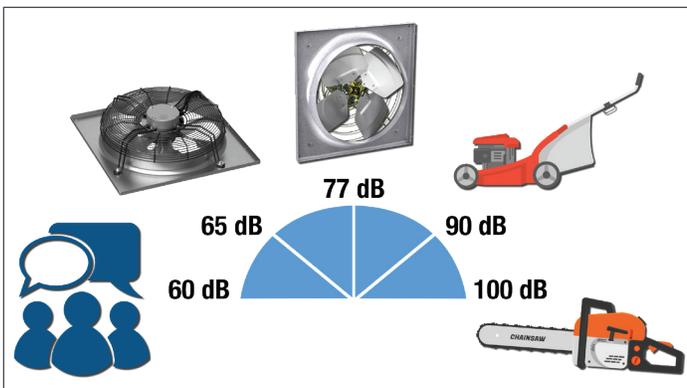
Compressors: Inverter compressors modulate, which increases efficiency when full load operation is not needed. At part load conditions, this component will also have added sound benefits compared to a digital compressor. Digital compressors engage and disengage the scroll in the compressor to maintain desired conditions. On a part load day, this can cause increased sound levels compared to an inverter compressor, which will decrease its speed to maintain the same conditions, at a reduced sound level.

Condenser Fans: Mounted on top of the unit's exterior, condenser fans can be a major source of sound for roof-mounted HVAC equipment. Swept blade fan designs have noticeably quieter operation compared to standard paddle fans.

Supply/Exhaust Fans: Direct drive plenum fans can modulate, which reduces sound levels when full airflow is not required. As a result, these fans are quieter and easier to control than belt-driven fans. Electronically-commutated motors also contribute to quieter operation.

SOUND MINIMIZING COMPONENT OPTIONS

Component	Standard Offering by Most Manufacturers	Lower Sound Option Provided by Valent
Compressors	Digital scroll compressor	Inverter scroll compressor
Condenser Fans	Paddle fan	Swept blade fan
Supply/Exhaust Fans	Belt-driven fan	Direct drive fan



Sound impacts in HVAC equipment can be reduced by selecting components with lower sound features. On average, condenser fans with a swept blade design are up to 12 decibels quieter than traditional paddle fans.

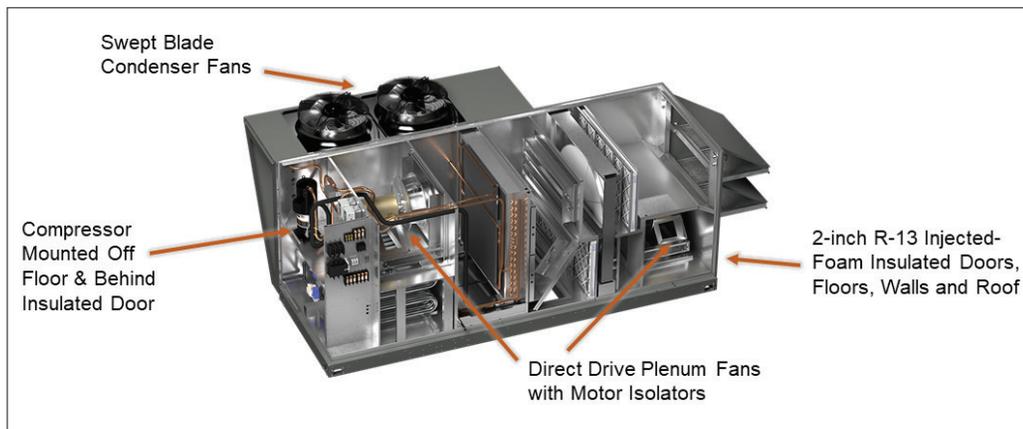
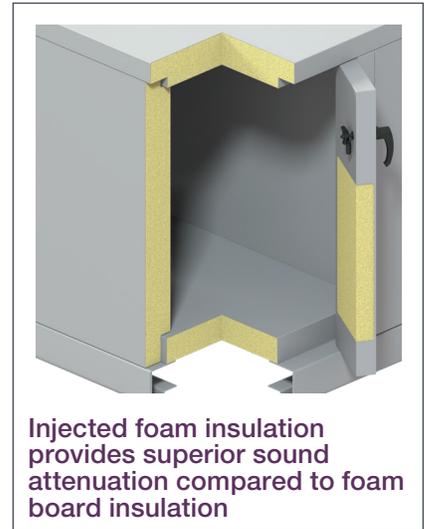
There are several component choices that can benefit the unit's acoustic performance, and design choices made by the manufacturer can also impact sound, such as:

Insulation: Properly insulating HVAC equipment with high R-value insulation serves several purposes, not least of which is minimizing leakage and sound. Specifically, 2-inch R-13 injected-foam insulation is less likely to have voids than foam board insulation. Providing an insulated base and insulating the wall between the airstream and compressors also prevents sound from transmitting into the building.

Refrigerant Circuit Design: In addition to the type of compressor, the number of compressors also has an impact on sound. A single circuit design that uses only one compressor may be quieter than a multi-circuit design.

Compressor Mounting: Compressors are often mounted directly on the floor of the unit, but less sound will be radiated if the compressors are mounted off the floor. Mounting on a separate, insulated shelf within the unit is a great option to reduce sound.

Fan Mounting: Motor isolators installed beneath supply and exhaust fans reduce noise and vibration.



Design choices and low sound component standardization provide quieter operation for DOAS equipment.

SUMMARY

Designing acoustically optimized commercial HVAC equipment with low sound components and features provides a better experience for building occupants and owners. Design engineers should consider the range of options when specifying DOAS equipment, especially in dense urban areas or where neighboring spaces and tenants may be sound sensitive.



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