TRANE® TRACKS
TECHNICIAL NEWSLETTER

Winter 2009 / 2010

This three part newsletter series titled:
Sound Ratings & Transmissions
will focus on:

--Sound Definition & Ratings
--Airborne Sound Transfer
--Structureborne Sound Transfer

Today's Topic:

Structureborne Sound

TRANE®
It's Hard To Stop A Trane®.

The Goal of Minimizing Structureborne Sound is Simple:

ISOLATE THE SYSTEM FROM THE HOME

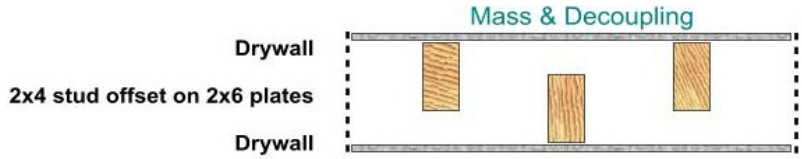
"A rigidly mounted machine transmits its internal vibratory forces directly to the supporting structure. However, by inserting resilient mountings (vibration isolators) between the machine and supporting structure, the magnitude of transmitted force can be reduced to a small fraction of the force applied to the rigid foundation"
(ASHRAE 2007 Fundamentals Handbook)

Solid structures are efficient transmission paths for sound. Even small amounts of vibration can generate a sound complaint.

The picture on the right show the exposed trusses on a flat roof application. A unit placed on a flat roof can radiate sound and vibration energy directly into the home.

If you are using redwood for a stand, the longer and heavier the wood the better--a 4x6 timber will absorb more energy than a 3x4. Leave the boards in full 8 foot lengths when possible and always place isolation pads between the unit and wood timber. While metal stands & curbs may be cosmetically appealing, they often transmit more sound & vibration into the structure.

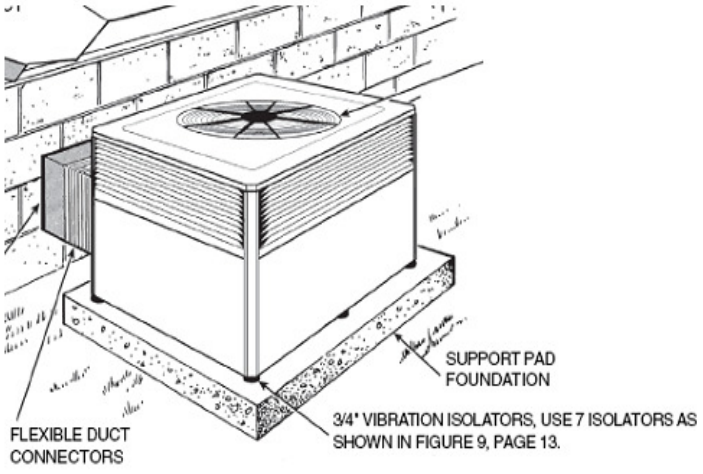
Sound engineers often recommend decoupling construction techniques to minimize sound and vibration transfer. Studs inside the wall cavity are offset; virtually eliminating the structureborne sound path. This decoupling technique is naturally applied in pitched roof applications.



Outside of some structural bracing, the rafters in the lower picture do not make direct contact with the ceiling joists. This dramatically reduces structureborne sound transmission and typically provides a quieter installation.

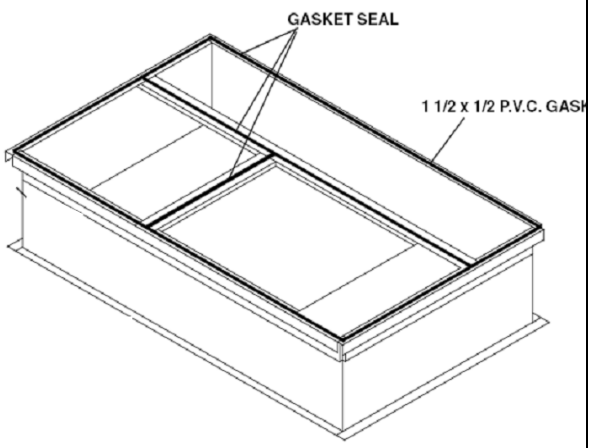
A system must be isolated from a stand or curb to minimize sound & vibration transmission. There should be no metal to metal contact between the system & stand.

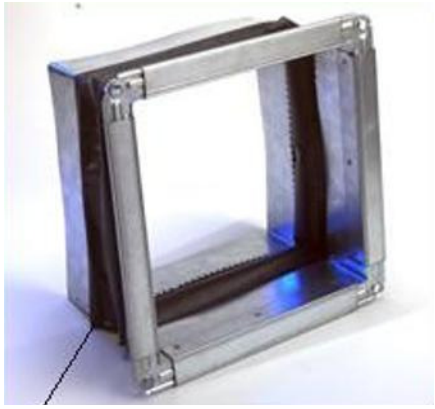
The picture below is taken from the Trane Installers Guide and shows the placement of the isolation pads. These should be applied to ground and roof mount applications.



Curb applications can be more challenging in eliminating metal to metal contact. A gasket seal should always be placed between the unit and curb as well as the unit and ductwork. Evaluate all areas where the unit overlaps the curb & ensure there are no metal to metal contact points.

You may use a double layer of gasket across the curb & ductwork if sound & vibration transfer is a concern.





Metal duct is another path for structureborne sound transmission. Canvas connectors should be used to break the metal to metal contact and eliminate this transfer path. This is noted in the Installer's Guide:

The supply and return air ducts should be connected to the unit with flame retardant duct connectors.

While canvas connectors will remove structureborne sound transmissions; they will not reduce air noise due to high velocity rates or turbulence from inefficient duct fittings. Refer to ACCA Manual D for proper duct design techniques.

The last area of focus is the refrigerant lines & electrical connections.

Minimize contact points between the refrigerant lines (or hard drawn electrical conduit) and the structure of the home. A liquid line resting on sheetrock will send vibration energy directly into the home. Support the lines by using hangers or duct strap—eliminate all contact points on the trusses and sheetrock whenever possible.

Adding a bend in the lines will reduce the amount of compressor energy transferred into the home (as pictured on the right). Always evaluate your total line set length as elbows add restriction and increased equivalent length.

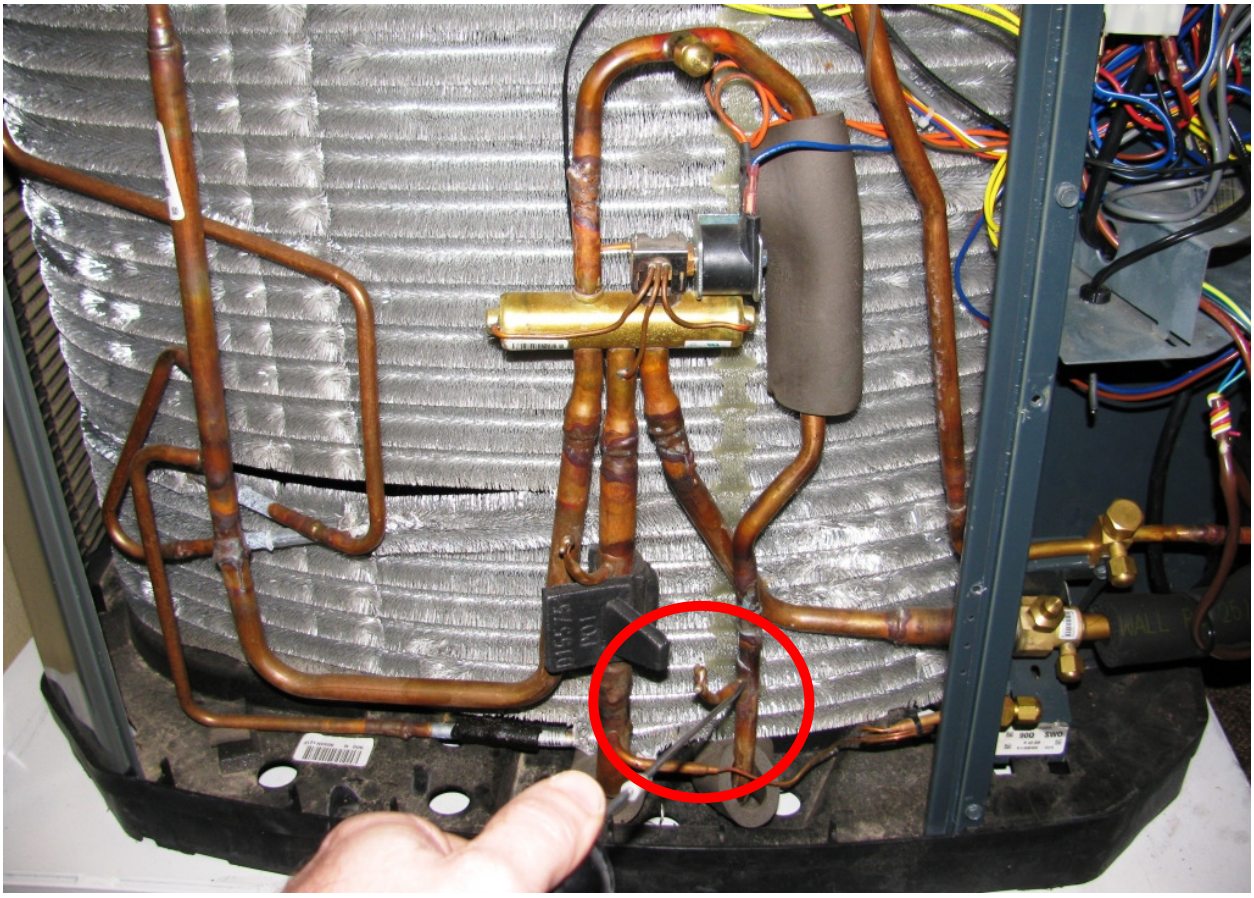
Use caution with short direct line set penetrations as shown in the picture below--this one generated a line set noise complaint.

Look for kinks in the line set. Kinks will not only restrict refrigerant flow, but will generate turbulence and velocity issues—this can often be heard as a "whistle".

Just like blowing across the top of a soda bottle, refrigerant flow through a line set can generate a whistle affect. Whistle noises can be found in any part of a system or line set; but they are typically found in areas of high velocity such as discharge lines.

The best way to diagnose a line set noise is with an automotive stethoscope—an inexpensive tool that can be picked up most auto parts stores. You can also use a long handled screwdriver by placing the handle to your ear and the blade on the refrigerant line.

Move the tip of the scope around the system; the sound will get louder as you approach the source. The picture below shows the tip of the scope being placed on the discharge charging port. Focus on Schrader cores, charging ports, expansion valves, and bends or kinks in the refrigerant line sets. Other areas such as reversing valves & king valves will generate turbulence, but are less likely to generate a whistling sound complaint.



In summary: Listen for the sound the homeowner is complaining about and ensure you are in agreement that an abnormal sound exists. Isolate the system components and determine which component (or combination of components such as compressor **and** outdoor motor) is causing the issue. Determine if the sound is airborne or structureborne and the easiest way to resolve the complaint. With any luck, the complaint is being generated by a defective component. If not; then the installation environment must be evaluated the modified.

New Technical Service Guide

Service Guide - Residential Comfort Systems

A Comprehensive Reference for Service of Residential Air Conditioning, Heat Pump & Gas Furnace Systems

- Features over 500 pages of information, trouble-shooting/service procedure walk-throughs, and technical data such as defrost control specs, compressor specs, etc.
- Color photos, illustrations, charts, graphs and tables clearly explain and detail each topic.
- Integrated with Service Facts
- Sections are tabbed and indexed for quick reference.
- Durable coil-bound construction means this book is suited for use in the service truck and the classroom.
- Printed on heavy duty paper to hold up to heavy usage.
- Registration of this book includes downloadable updates and addendums to keep up with the most current data.
- Republished annually

Topics Covered

Air Conditioning

Refrigerants & Oils
Sequence of Operation
Subcooling & Condensers
Superheat
Line Sets
Air Volume Measurement
Charging Procedures
Compressor Diagnostics
Condenser Fan Motors
Diagnostic Problems

Heat Pump

Sequence of Operation
Defrost Control Boards
Charging Procedures
Refrigeration Cycle Problems

Furnace

Sequence of Operation
Gas Combustion & Input Check
Measuring Inlet Supply Gas Pressure
Gas Pressure Adjustment (Two-Stage)
Gas Press. Adjustment (Sealed Combustion)
Gas Pressure Adjustment (Non-Direct Vent)
PSC Shaded Pole Induced Draft Motors
Variable Speed Induced Draft Motors
ECM Induced Draft Motor/Blower
ECM Motor Test
Control Voltage Transformers
Flame Roll-Out Limit Switches
Vent Pressure Safety Switches
Main Air Limit Switches
Hot Surface Ignitors
Measuring Flame Current

Reference Materials

Troubleshooting Flow Charts
Miscellaneous References

Order your copy direct through Comfortsite.
Click on the "**Marketing Center**" tab in the left tool bar,
then the "**Order Marketing Materials**" link and type in:

034-3458-01

This easy to use 500 page reference manual is only $59.95 and a valuable tool for every service truck.