



# INSULATING YOUR HOME AGAINST AIRCRAFT NOISE



Tempe Aviation Commission

This guide is provided by the Tempe Aviation Commission  
City of Tempe, 255 E. Marigold Lane, Tempe, Arizona 85281.

## Why we made a guide:

This guide has been developed in response to requests from Tempe residents asking for information about how to reduce interior noise levels in homes.

It enables homeowners to share information about sound transmission and how to do home noise insulation upgrades.

It also includes information about the Residential Sound Mitigation Services (RSMS) from the City of Phoenix offered to single family homes within the a federally recognized 65 DNL contour area around the Phoenix Sky Harbor International Airport.

### Disclaimers:

This pamphlet is intended to be used as an informational guide. It is not intended for use as a "How To" manual.

Insulating a home for noise reduction tends to tighten a home. Homeowners should have their homes tested for indoor air quality before and after home modifications.

Homeowners should consult with professional contractors for their home's individual needs as to Heating, Venting, Air Conditioning (HVAC), windows and doors, etc.

The City of Tempe claims no responsibility for decisions homeowners make based on the information contained in this pamphlet.

Any modifications completed by homeowners are the sole responsibility of the homeowner.



## Some Basics about Noise

### How Outside Noise Gets Inside a Home:

Sound travels from the exterior to the interior of a home in two ways: through solid structural elements and through the air. Although sound energy in the form of vibrations can be deflected by solid structural elements (walls) of a home, some of those vibrations can make it through the walls and into a home. Openings in a home, such as space around windows and doors, mail slots and vents, allow air to travel directly from the exterior to the interior of a home.

### Reducing Sound Transmission Into a Home:

**NRL:** A home's Noise Level Reduction (NLR) is the number of decibels a home attenuates from its exterior to interior when all openings (windows and doors) are closed.

**STC:** A measure of a material's ability to insulate against sound; the higher the STC rating, the better insulating properties it will have. City of Phoenix has been applying design standards of at least STC 40 for windows and STC 35 for doors in their designs for insulating home eligible to receive RSMS under the City of Phoenix Community Noise Reduction Program.

**DNL:** Averaged Day-Night-(sound) Level over 24-hours with a 10 decibels penalty added for night time sound from 07:00 p.m. to midnight from midnight to 7:00 a.m. local time. The Federal Aviation Administration guidelines for giving aid to residential noise compatibility projects at airports stipulate that for residences located in areas where exterior noise exposure amounts to 65 DNL, the design upgrade of residential structures included in the project should result in an NLR of least 20 decibels in major habitable rooms. This means that a single aircraft overflight producing 65 decibels of sound on the ground should not produce sound levels inside an attenuated home of more than 45 decibels.



Wherever air can infiltrate a home, so also can sound!

Homes constructed in warmer climate the NRL would typically be less than homes in cold climates where homes typically would provide a NRL of between 27 and 30 decibels without additional measures to insulate against outside noise depending on its age and design.

## Insulating Your Home

### Windows and Doors:

A home's interior noise level can be reduced through differing degrees of treatment. For instance, some homes may only need their windows or doors reconditioned, while others may need all new windows or a combination of the two. To ensure the tightness necessary to achieve NLR, homeowners may be able to recondition their home's existing prime windows or doors by:

- Re-glazing panes that are loose
- Replacing cracked panes
- Installing weather stripping (to both windows and doors)
- Adding insulation to weight cavities
- Installing vinyl jamb liners
- Trimming sides of existing sashes to fit with new jamb liners

In more severe cases, complete replacement of window sashes or the entire window or door may be necessary. Windows generally allow more noise inside a home than do walls. Because of this, the more space windows take up on a wall the more the overall noise protection decreases. Using STC rated acoustical windows, which are tested by commercial laboratories and given STC rating based on their ability to reduce sound transmission, typically does more to improve the sound insulation performance than any other design modification. These products are not available through the standard building supply stores. Contractors with experience in doing residential acoustical improvement work would be able to give advice on how your home could benefit from replacing windows and doors with STC rated products. Typically when acoustical storm windows and doors are installed, two inches of dead air space is created between the prime window or door and the storm. This dead air space acts to prevent noise from entering a home. Casement windows alone do not provide a high STC rating and acoustical storm windows cannot be installed outside the crank-out windows.

Some primary approaches for reducing sound transmission into a home are:

1. Elimination of openings
2. Using Higher rated Sound Transmission Class (STC) windows and doors
3. Add mass to walls and ceilings



New acoustic products are superior, but are also expensive. Acoustical windows and doors are significantly different from regular products. They may have thicker glass and a higher grade of aluminum, which act to prevent sound from entering a home, and are also very effective at reducing air infiltration. These products are not available through the standard building supply stores.

## Windows and Doors Cont.:

Some options for casement windows include:

- Replacing windows with custom, acoustically rated casement windows with extra thick glass
- Replacing windows with a new slider or double hung window with an acoustical storm.
- Install an acoustical storm panel directly below skylight in skylight shaft.
- Adding an interior glazing panel to the existing casement window at the screen location (not recommended for bedroom windows for safety and code reasons)

## Walls and Attic:

### Insulation of Sidewalls and Attic

- Insulating sidewall cavities to capacity. (This does not apply to homes with brick, stucco or stone exterior siding.)
- Insulating attic areas to capacity, or up to 14 inches. Your attic should have at least 12 inches (R-38) of insulation.
- Consult a home insulation contractor.



## Vents:

Baffle roof vents in attic spaces to minimize noise transmission while still allowing airflow. A baffle can be as simple as installing insulation board under the roof vent, while leaving both ends open to allow the vent to operate normally.

- Vent Baffling
  - Attic vent baffling
  - Roof vent baffling
  - Chimney treatment (if required)
  - Mail slot sealing
- Sealing attic bypasses (This is more a treatment to improve indoor air quality and to keep the warm, moist air from migrating to the attic spaces.)

## Air Cooling Units:

### Wall Mounted Units:

Through-the-wall air conditioning units are not recommended, as they allow air, and thus noise, to infiltrate the home. To reduce sound entering through a wall mounted cooler:

- Insert a horizontally “L” shaped duct extension between the wall and the cooler. This will require the installation of a new support stand and slab for the cooler.
- Add acoustically designed “upducts” in the ceiling of each room to allow proper circulation of air while windows are closed.

### Roof Mounted Units:

- Check that the roof duct penetration area is tightly sealed
- Insulate ductwork inside the attic
- Check that all joints are sealed

### Tightness and Ventilation:

Acoustic modifications tend to make houses “tighter.” For health and safety purposes, the following is suggested:

- Have your home checked for tightness after acoustical retrofits are completed.
- Have your indoor air quality tested by a qualified professional.
- Correct any problems with venting or carbon monoxide production.
- Ensure that the air conditioning & heat pump unit has enough capacity for adequate fresh airflow. Upgrade to a higher capacity unit or e.g. install quiet, low volume exhaust fans as needed to maintain a balanced ventilation system.
- Have your, furnace/boiler, water heater, and other gas combustion appliances checked by a professional.





## ADDITIONAL RESOURCES

**“New Construction Acoustical Design Guide”** Wyle Laboratories  
[www.wyleacoustics.com](http://www.wyleacoustics.com)

**“FAA Guidelines for the Sound Insulation of Residences Exposed to Aircraft Noise”**  
Federal Aviation Administration prepared by Wyle Labs, October 1992 (can be found on [www.wyleacoustics.com](http://www.wyleacoustics.com) web site)

**“A Do-It-Yourself Guide to Energy Star Home Sealing: Sealing Air Leaks and Adding Attic Insulation”** United States Environmental Protection Agency Office of Air and Radiation (6202J) EPA 430-F-04-024, November 2004.  
1-888-782-7937  
[www.energystar.gov](http://www.energystar.gov)

**Arizona Registrar of Contractors** Check if a contractor is licensed  
<http://www.rc.state.az.us>

