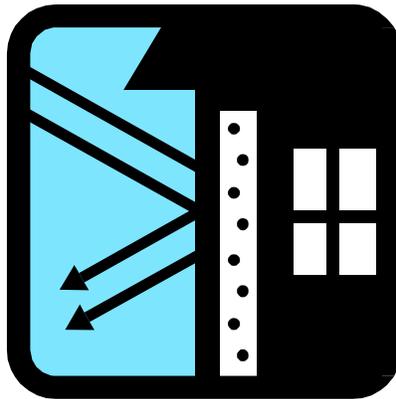


# TIPS FOR INSULATING YOUR HOME AGAINST AIRCRAFT NOISE



Provided by the  
Metropolitan Airports Commission  
Noise Program Office



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## INTRODUCTION

### The Purpose of This Guide

This guide has been developed in response to numerous requests from homeowners asking for information about methods the Metropolitan Airports Commission (MAC) has implemented successfully to reduce interior noise levels in homes. This guide is intended as a means to share information with homeowners about sound transmission; it explains the elements of the MAC's Residential Sound Mitigation Program within the federally-recognized 65 DNL contour area. ***This guide is not intended for use as a "how to" manual.***

### Who May Find This Guide Useful

- Homeowners/Homebuyers

## DISCLAIMERS

- This guide is intended to be used as an informational guide.
- Insulating a home for noise reduction tends to tighten a home. Homeowners may need their homes tested for indoor air quality before and after certain home modifications.

## NOISE CONTROL BASICS

### 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 of a home – such as walls – 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. **Wherever air can infiltrate a home, sound can as well.**

### Noise Level Reduction

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.

Homes constructed in cold climates like Minnesota typically provide a NLR of between 27-30 decibels without additional measures to insulate against noise. So, for example, if 75 decibels of sound were produced on the ground by a single aircraft overflight, 45 decibels of sound would be produced inside a home that attenuates 30 decibels.

## **Reducing Sound Transmission into a Home**

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

1. Eliminating openings
2. Using higher-rated Sound Transmission Class (STC) windows and doors
3. Adding mass to walls or ceilings
4. Adding absorptive materials between the studs or joists in a wall

The STC rating is a measure of a material's ability to insulate against sound; the higher the STC rating, the better insulating properties the material will have. ***The MAC's sound insulation program uses a standard of 40 STC.***

Generally, windows 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. Typically, using acoustical windows does more to improve the sound insulation performance than any other design modification does.

## **THE METROPOLITAN AIRPORTS COMMISSION'S (MAC) PROGRAM**

The MAC's Residential Sound Mitigation Program within the federally-recognized 65 DNL noise contour was very successful in reducing interior noise levels for homes within the most noise-impacted areas. According to homeowner surveys, the program has increased homeowners' enjoyment of their homes by making it easier to watch television, talk on the phone and sleep at night.

Below are the methods typically used to reduce transmission of exterior noise into a home; the MAC has employed all of these methods to some degree:

- Re-conditioning or replacement of prime windows/doors
- Installing acoustical storm windows/doors
- Adding wall and attic insulation
- Baffling roof and attic vents
- Installing central air -conditioning (if not existing)
- Modifying ventilation (when necessary for health and safety reasons)

### **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 *re-conditioned*, while others may need all new windows or a combination of the two.

To ensure the tightness necessary to achieve an STC 40 rating, homeowners may be able to re-condition their home's existing prime windows or doors by:

- Re-glazing panes that are loose
- Replacing cracked or broken panes
- Installing weather stripping (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.

The MAC's research showed that adding an operable acoustic storm window to a tight-fitting prime window results in an STC rating of 40. (A typical window with storm can provide an STC rating between 27 and 30.)

New acoustic products are superior, but are also more expensive. Acoustical storm windows and doors are significantly different from regular storms. 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.) 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 options for casement windows include:

- Replace windows with custom, acoustically-rated casement windows with extra-thick glass
- Replace windows with a new slider or double-hung window with an acoustical storm
- Add an interior glazing panel to the existing casement window at the screen location (not recommended for bedroom windows for safety and code reasons)

### **Insulate Attic and Sidewalls**

- Insulate attic areas to capacity, or up to 14 inches, whichever is applicable.
- Sidewall cavities should be insulated to capacity. (This does not apply to homes with brick, stucco or stone exterior siding.)
- Consult a home insulation contractor.

## **Baffle Roof 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 warm, moist air from migrating to the attic spaces, helping to reduce ice dams during the winter.)

## **Install Central Air-Conditioning**

Installing central air-conditioning or another type of cooling system allows people inside the home to be comfortable during the warmer months without the need to open windows and doors for a breeze.

Through-the-wall air-conditioning units are not recommended, as they allow air, and thus noise, to infiltrate the home.

The method and cost of adding central air-conditioning depends on a home's heating system. It is relatively easy, in most cases, to add a central air-conditioning system to homes with a forced air heating system. It becomes more difficult and costly with hydronic (boiler heat) or gravity (large "octopus" furnace) systems.

## **A Word about House "Tightness" and Maintaining Proper Ventilation**

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

- Have your indoor air quality tested by a qualified professional.
- Have your home's furnace/boiler, water heater, and other gas combustion appliances checked by a professional.
- Correct any problems with venting or carbon monoxide production.
- Install CO detectors in required areas.
- Ensure adequate fresh airflow through the house by installing a quiet, low-volume exhaust fan or a balanced ventilation system if necessary.
- Have your home checked for tightness after acoustical retrofits are completed.

## **ADDITIONAL RESOURCES**

### **Wyle Laboratories**

Website: [www.wyle.com](http://www.wyle.com)

“New Construction Acoustical Design Guide”

(<http://www.highpointnc.gov/plan/docs/AirportNoise/ConstGuide.pdf>)

### **Federal Aviation Administration**

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

([http://www.faa.gov/documentLibrary/media/advisory\\_Circular/150\\_5000\\_9a\\_withReport.pdf](http://www.faa.gov/documentLibrary/media/advisory_Circular/150_5000_9a_withReport.pdf))

### **United States Environmental Protection Agency**

Website: [www.energystar.gov](http://www.energystar.gov)

Phone: 1.888.782.7937

“A Do-It-Yourself Guide to Sealing and Insulating with Energy Star®: Sealing Air Leaks and Adding Attic Insulation”

([http://www.energystar.gov/ia/partners/publications/pubdocs/DIY\\_Guide\\_May\\_2008.pdf](http://www.energystar.gov/ia/partners/publications/pubdocs/DIY_Guide_May_2008.pdf))

### **Metropolitan Airports Commission**

Pat Mosites – Residential Noise Mitigation Program Manager

Phone: 612.713.7499

Address: 6040 28<sup>th</sup> Ave S, Minneapolis, MN 55450

Email: [pat.mosites@mspmac.org](mailto:pat.mosites@mspmac.org)