Characteristics of Noise

People hear and respond to aircraft sound differently. When assessing sound, three features are used to measure noise:

Decibels (dB): Acoustic energy of the sound vibration expressed in terms of sound pressures.

Frequency (Hz): Number of times per second the air vibrates or oscillates.

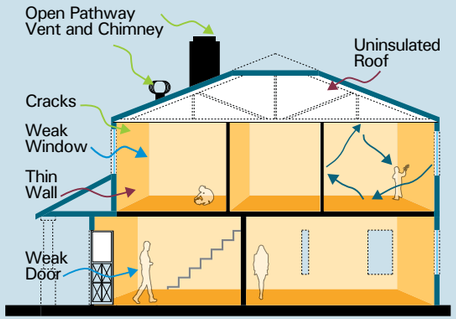
Duration: Length and time a sound can be detected.

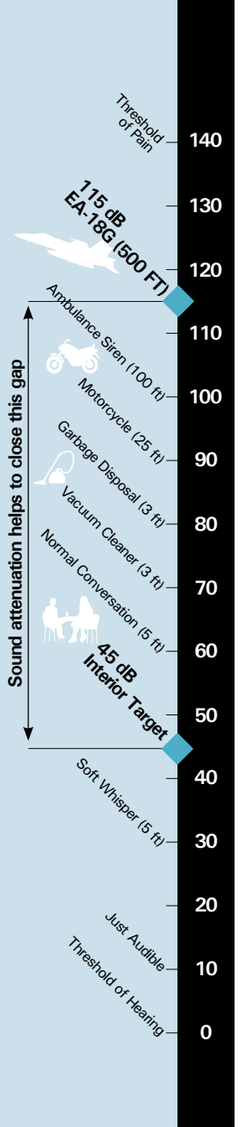
These features are critical to understanding what happens when one is exposed to a passing jet aircraft (i.e., EA-18G). An unprotected person 500 feet away from a departing jet would experience a peak sound of 115 dB. The diagram to the right showcases exposure to an EA-18G in comparison to other common noises. This also illustrates how sound attenuation can bring interior noise down to comfortable levels.

How Noise Gets In

Noise enters homes and affects perceived sound through:

- Openings and cracks in the building envelope
- Weak windows and doors
- Uninsulated walls and roofs
- Reverb or echoing off hard surfaces





For More Information

A local sound attenuation professional (e.g., architect or builder) should always be consulted to recommend the most appropriate measures for individual circumstances. In addition to local building codes, here are a number of general resources that may be helpful as you start this planning process:

Builders Challenge Guide to 40% Whole-House Energy Savings in the Marine Climate, Pacific Northwest National Laboratory, 2010.
apps1.eere.energy.gov/buildings/publications/pdfs/building_america/marine_40_guide.pdf

New Construction Acoustical Design Guide for MCAS Cherry Point, Wyle Laboratories, 2004.
198.23.228.133/wp-content/uploads/2014/01/MCAS-Cherry-Point-Acoustical-Design-Guide.pdf

Airport Cooperative Research Program Report 89: Guidelines for Airport Insulation Programs. Transportation Research Board of the National Academics, 2013.
www.trb.org/Main/Blurbs/169358.aspx

Guidelines for Sound Insulation of Residences Exposed to Aircraft Operations. Department of the Navy Naval Facilities Engineering Command, 2005.
www.fican.org/pdf/Wyle_Sound_Insulation.pdf

If noise interruptions persist, complaints can be directed to NASWI's comment line at (360) 257-6665, or via e-mail: comments.NASWI@navy.mil.

NAS WHIDBEY ISLAND

Prepared by MAKERS Architecture and Urban Design, LLP

MAKERS
architecture · planning · urban design

SOUND ATTENUATION GUIDE

Steps to Reduce Aircraft Noise in Your Home

This education tool is not a definitive design guide. A local sound attenuation professional should always be consulted to evaluate and recommend the most appropriate sound attenuation measures for your situation and budget.

Sound Attenuation Techniques

For homes located in areas exposed to high noise levels, standard building construction methods do not adequately protect residents from aircraft noise. While it is not practical or cost-effective to completely sound-proof a home, a combination of relatively straightforward techniques listed on this page can significantly lower interior noise levels. These strategies will be most beneficial in areas of the home that are used regularly, such as bedrooms, living rooms, and/or other areas where low noise levels are desired.

1a. Eliminate Openings

Openings such as through-wall penetrations, leaks around doors and windows, and cracks in the roof serve as an unintentional pathway for noise.

2a. Address Weak Windows and Doors

Improving acoustical properties of windows and doors is one of the most effective methods of lowering overall sound transmission into a home.

3a. Add Mass to Walls and Roof

Walls and ceilings can either contribute or detract from noise reduction.

4a. Absorb Reverb:

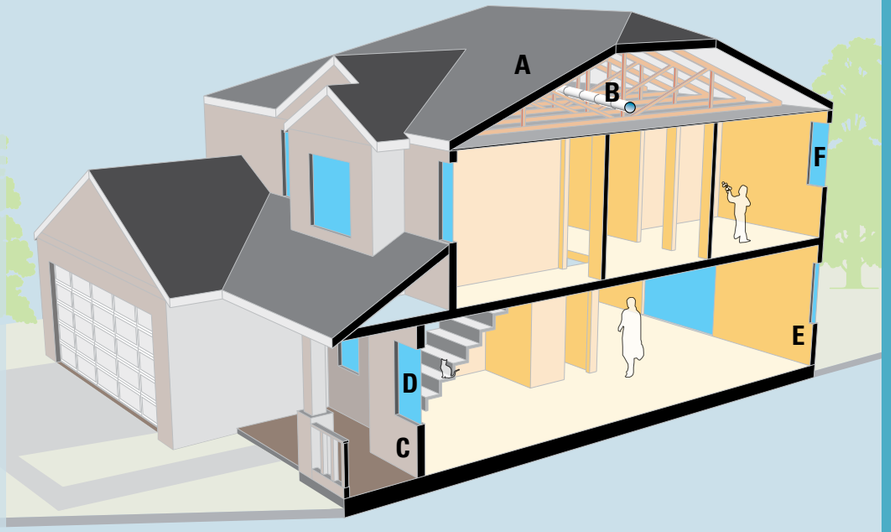
Adding materials will help absorb sound that reverberates between hard surfaces.

How Noise Stays Out, A Case Study

Military Housing, Coupeville, WA

Forest City Enterprises has built thousands of homes. When recently contracted to build a home near NASWI, Forest City modified their design to significantly reduce the impacts of aircraft noise inside the home.

Basic strategies were done to meet local building codes and Washington State Energy Code. Beyond this, the builder employed techniques to reduce noise by over 35dB in all habitable rooms. Specific building modifications and products utilized are described below.



Incorporating Energy Efficiency

Both federal and local government agencies offer financial incentives to increase energy efficiency. Incentives range from personal, property, sales and corporate tax credits to rebates, grants, and loans. As many sound attenuation techniques also help to increase energy efficiencies, you may be eligible for one or more of the financial incentives listed below:

Energy Star

www.energystar.gov/

U.S. Department of Energy

energy.gov/eere/wipo/weatherization-assistance-program

Puget Sound Energy

pse.com/Pages/default.aspx

A

Baffle roof vents are designed to minimize noise transmission while still allowing airflow in the attic.

B

The combination heat pump and air conditioning allows windows to remain shut if desired.

C

Continuous plywood sheathing attaches to the exterior side-wall of the framing and adds extra mass to the walls.

D

Operable windows employ weatherstripping on all four sides to create a compressed airtight seal when closed.

E

Thick interior gypsum board is fastened to the framing to reduce vibration.

F

Thick glass windows with a large amount of space between panes block the transmission of both heat and sound.

Sound Attenuation Techniques (Expanded)

	Renovation	New Construction
1b. Eliminate Openings		
Install and/or maintain weatherstripping to seal around windows and doors. Ensure ducts are straight, properly connected, sealed, and caulked where needed. Utilize durable, compressible neoprene weatherstripping over felt or other porous material that easily allows sound to pass through.	O	O
Install a heating, ventilation, and air conditioning (HVAC) system to provide fresh air circulation for various uses in occupied rooms without the need to operate windows, or doors. Consider utilizing above-head fans, or ground-source heat pumps if available.	O	O
Eliminate any small openings, including mail slots, through-wall fan vents that are not ducted, milk delivery slots, or attic openings.	O	O
2b. Address Weak Windows and Doors		
Reduce exterior windows and doors so they comprise no more than 30% of total exterior wall area.		O
Incorporate windows with a Sound Transmission Class (STC) rating above 40 with the greatest glass thickness and amount of air space between glass. If a less expensive solution is desired, ask for a dual-pane window with dissimilar glass.	O	O
Install vinyl or wood windows. Aluminum conducts sound and should typically be avoided.	O	O
Avoid hollow core doors and install solid wood or insulated core doors. Ensure doors are gasketed to prevent sound from passing between the door and the jamb or sill.	O	O
Locate secondary windows and doors to create an additional air space.	O	O
3b. Add Mass to Walls and Roof		
Incorporate heavy materials (i.e., concrete block or masonry) for exterior wall construction.		O
Design 2x6 inch wall framing when possible and fill with foam or paper insulation.	O	O
Add extra layers of interior drywall. Use vinyl or cement board with staggered studs or other methods to minimize vibration between drywall and framing.	O	O
Have enclosed attic space above habitable rooms and avoid cathedral, open beam, or flat roof shape.		O
Increase insulation on roof. Apply over six inches of insulation to the floor of attic spaces.	O	O
Consider integrating secondary features along an exterior walls (e.g., closets, cabinets, bookcases, staircases, garages, enclosed porches, etc.)		O
4b. Absorb Reverb		
Add upholstered furniture, drapes, and carpeting to rooms where applicable.	O	O
Wrap attic-located mechanical systems (e.g., beams, ducts, and pipes) in insulation where possible and use rubber or other material to minimizes vibration.		O