RESIDENTIAL SOUND INSULATION PROGRAM

Pre- & Post-Construction Noise Audits

CDA
CHICAGO DEPARTMENT OF AVIATION

O'HARE & MIDWAY
INTERNATIONAL AIRPORTS

Pre- & Post-Construction Noise Audits
General Overview

- What is a noise audit?
  - An acoustical test used to measure the noise reduction properties of a home in its existing condition (pre-construction noise audit) and then again after sound reducing modifications have been completed (post-construction noise audit).
  - Conducted on 20% of the dwelling units in a phase.
- Why are they conducted?
  - They are used to verify the effectiveness of the noise reducing treatments provided by the RSIP.

Sound: Vibrations (or waves) transmitted through a solid, liquid or gas.

Sound Pressure Level: a logarithmic measure of the effective sound pressure of a sound relative to a reference value expressed in decibels.

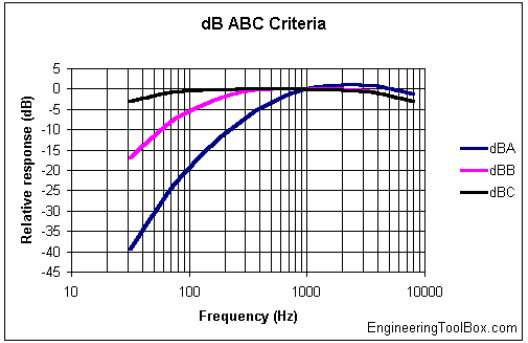
Decibel (dB): logarithmic scale use to measure sound pressures ranging from the threshold of hearing (20 micro pascals or 0 dB) to the threshold of pain (120 -140 dB).

Frequency: the number of complete sound waves that pass a given point in a given time measured in Hertz (one complete cycle per second). Typically refers to the pitch of a sound.

- A healthy human ear is capable of detecting sounds between 20 Hertz to 20,000 Hertz and is most sensitive in the 1,000 to 6,000 Hertz range.
- Aircraft noise generally falls in the 50 to 5,000 Hertz range.

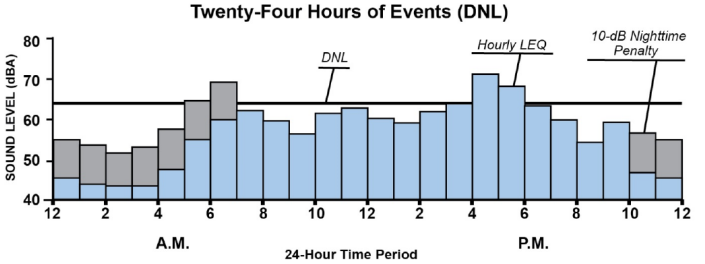
Pre- & Post-Construction Noise Audits
General Overview

Weighting Networks: Filters applied to sound pressure levels to account for the human auditory response.



Sound Exposure Level (SEL): the constant level in decibels which, lasting for one second, has the same amount of acoustic energy as a given noise event.

Day-Night Average Sound Level (DNL): the A-weighted equivalent sound level (LEQ) for a 24-hour period with an additional 10 dB penalty imposed on the equivalent sound levels from the hours of 10 pm to 7 am.



SOURCE: Noise Exposure Map Report, December 2018.
PREPARED BY: Fort Lauderdale –Hollywood International Airport, December 2018.

Pre- & Post-Construction Noise Audits

FAA Airport Improvement Program Guidelines

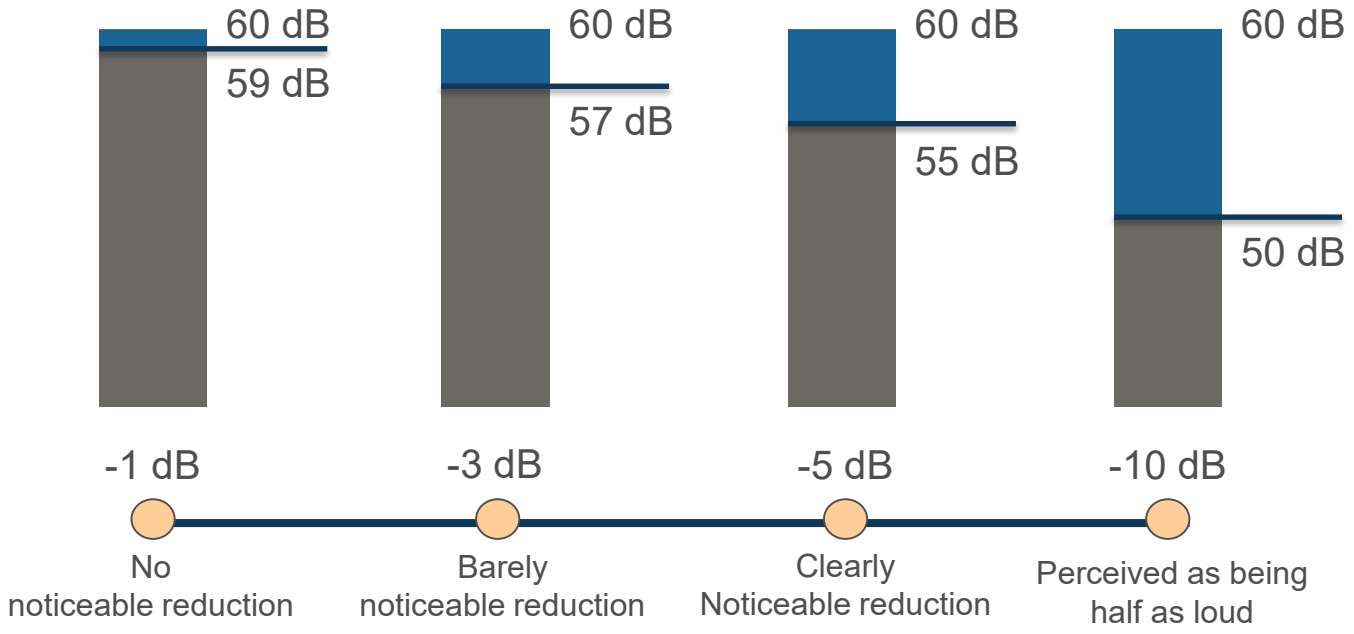
FAA Noise Reduction Goals:

1) Reduce the average interior noise level of the habitable rooms of the home by at least 5 decibels.

2) Bring the average interior DNL of the habitable rooms of the home below 45 decibels.

Pre- & Post-Construction Noise Audits

Human Perception of Changing Decibel Levels



Pre- & Post-Construction Noise Audits
General Overview

The two most common methods for conducting a noise audit:

Aircraft Overflight Method:
- Noise Source – flyover aircraft events

Artificial Source Method:
- Noise Source – loudspeaker & pink noise

Pre- & Post-Construction Noise Audits
Aircraft Overflight Method

Testing Process Highlights:

- One interior sound level meter per habitable room being tested
- One exterior sound level meter
- Event triggering used to log A-weighted SEL for each aircraft flyover event
- The difference between the exterior SEL and interior SEL provides a noise level reduction (NLR) for each event
- Aircraft events are logged until an average NLR can be obtained with a 90% confidence interval of 2 dB or less

Pre- & Post-Construction Noise Audits
Artificial Source Method

Testing Process Highlights:

- Loudspeaker placed on exterior of the home
- Signal supplied through a noise generator
- Data collected on interior and exterior of each habitable room being tested (50 Hertz to 5,000 Hertz)
- Outdoor-Indoor Noise Reduction (OINR) determined for each frequency band
- Subtracted OINR values from known exterior aircraft spectrum to determine an interior noise level
- Total A-weighted interior level subtracted from total exterior level to provide NLR

JAMIE L. RHEE, COMMISSIONER

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