



Highway Traffic Noise and Noise Barriers

What Is Noise and How Does INDOT Analyze It?

Noise is defined as unwanted sound and can come from man-made and natural sources. INDOT is required by the Federal Highway Administration (FHWA) to establish traffic noise procedures that comply with federal regulations. The *INDOT Traffic Noise Analysis Procedure* defines a uniform process for evaluating noise impacts and potential mitigation measures on INDOT projects across the state.

Measuring Sound

Sound travels in waves and is measured in decibels (dB). Traffic noise studies use A-weighted decibels (dB[A]), which account for how humans perceive sound, as the ear is less sensitive to high- and low-pitched sounds. Traffic noise is typically measured using the average sound levels over one hour (Leq[H]).

How Traffic Affects Noise

The level of highway traffic noise depends on three factors:



Volume of traffic



Speed of traffic



Multi-axle vehicles
(e.g., trucks)

As any of these factors increase, noise levels increase.

Predicting Noise Levels

The FHWA Traffic Noise Model (TNM) uses traffic data (existing and future) and 3D data, including roadways, buildings, and terrain, to create a model that can predict noise levels during the noisiest hour of the day. Predicted noise levels are compared to measurements taken in the field to validate the model.

Identifying Impacts

Receptors (defined typically as homes, apartments, parks, trails, schools, businesses) are impacted by noise if existing or future traffic noise levels approach or exceed Federal Noise Abatement Criteria (NAC). For most properties, impacts occur when:

Predicted noise levels are		Noise levels are predicted to increase by
66 dB(A)	OR	15 dB(A)
or greater		or more

The analysis is based on noise levels experienced at commonly used outdoor areas, such as patios, apartment balconies, and playgrounds.

If noise impacts are identified as part of a project noise study, then INDOT is required to evaluate noise reduction measures such as installing noise barriers.

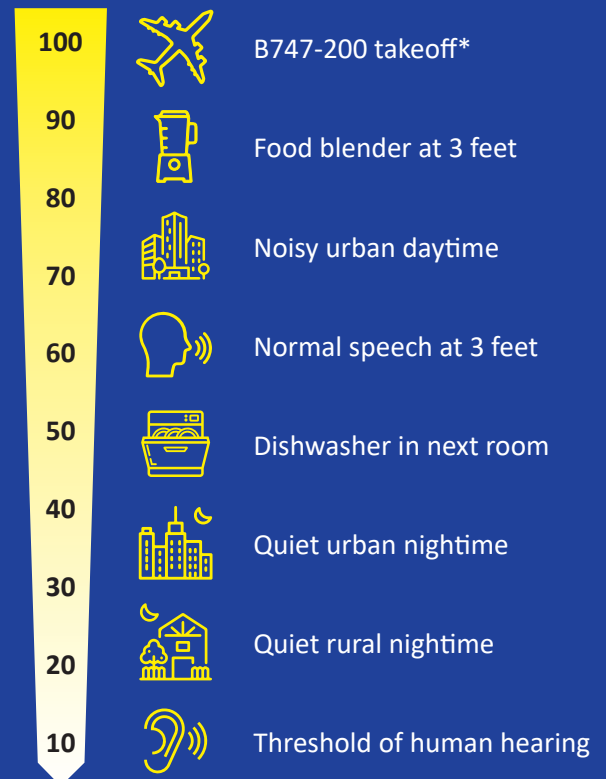
Common Noise Levels, How People Perceive Them

Decibels are measured on a logarithmic scale and typically range from 40 to 100 dB(A). Humans' perception of changes in noise levels:

Less than 3 dB(A) change	Not perceptible
3 dB(A) change	Barely perceptible
5 dB(A) change	Clearly perceptible
10 dB(A) change	Twice as loud

Comparison of Noise Levels

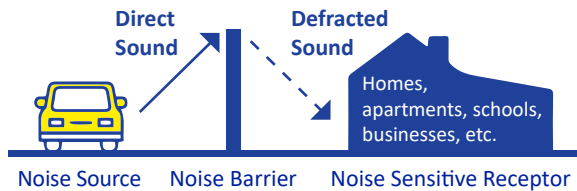
Measured in dB(A)



*As measured along the takeoff path 2 miles from the overflight end of the runway

Noise Mitigation

Noise barriers are the most common approach to mitigating noise impacts. Other options, such as relocating residences or moving the roadway, are typically impractical. Earthen barriers (e.g., berms) are also effective, but they typically require more land than barriers. Vegetation can reduce noise, but dense vegetation of 100 feet or more is typically required to be effective.



Noise barriers do not eliminate noise – they block the direct path of sound waves between the source (highway) and receptor (e.g., residence). For a noise barrier to work, it must be high enough and long enough to block the line of sight of the highway. Effective noise barriers can reduce noise levels by 5 to 10 dB(A) – a clearly perceptible amount.



Noise barrier located on I-69 just south of I-465 in Indianapolis

When Is a Noise Barrier Proposed?

INDOT proposes a noise barrier when a noise impact occurs and the barrier is feasible and reasonable.

A barrier is feasible if it meets **both** the following criteria:

- ▶ **Acoustic Feasibility:** The barrier achieves at least a 5 dB(A) reduction at a majority of the impacted receptors.
- ▶ **Engineering Feasibility:** The barrier is based on sound engineering practices and considers drainage, safety, utilities, access and maintenance needs.

A barrier is reasonable if it meets **all** the following criteria:

- ▶ **Cost-Effectiveness:** To be considered cost-effective, the barrier must not exceed 1,000 square feet per benefited receptor (minimum 5 dB(A) reduction). If a majority of the receptors was constructed prior to the roadway being constructed, the maximum square footage is increased to 1,250 square feet per benefited receptor.
- ▶ **Input from Residents and Property Owners:** Residents and property owners are surveyed and are considered heavily in the decision.
- ▶ **INDOT Design Goal:** The noise reduction design goal for Indiana is 7 dB(A) for a majority (greater than 50%) of the benefited first-row receptors.

Barrier Design

Noise barriers typically consist of concrete panels placed between steel supports. The height and length of a barrier are determined by the TNM analysis. The color and texture can vary, and INDOT seeks the input of adjacent property owners. Several INDOT-approved options are shown below. If local governments or neighborhood associations desire special aesthetic treatments beyond those offered by INDOT, they can contribute to cover the difference in cost.

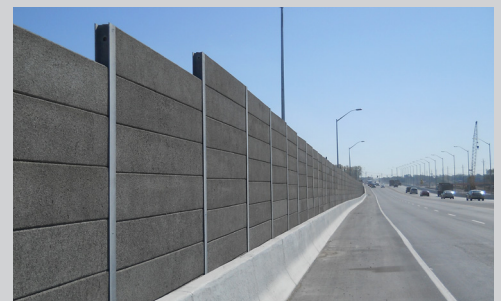
Common INDOT Barrier Treatments:



Ashlar Block



Red Brick



Plain Gray



Still have questions?
Contact INDOT Customer Service:



1-855-INDOT4U
(1-855-463-6848)



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