

Traffic Noise



Noise is *unwanted sound*. Noise is sound that has the element of being an uninvited guest, like insects at a picnic. Noise disturbs us – and highway traffic noise can be a dominant source of noise in both urban and rural environments.

Measuring Sound and Noise

The intensity of sound is measured in *decibels (dB)*. Decibels combine the magnitude of the sound with how people respond to it. A level of 0 dB is the Threshold of Hearing, the quietest sound a person with perfect hearing can detect. A level around 140 dB is the Threshold of Pain, a level almost certain to cause pain. Prolonged exposure to

sound that loud will lead to hearing damage. Traffic noise changes as different vehicles pass by the listener. In order to quantify these changes, we use a measure of noise called the *Equivalent Sound Level (Leq)*, which is an average of many different sound levels (decibels) over time. It is also expressed in decibels.

What is a Noise Source, Receiver, and Path?

Source

The *source* of highway noise is a vehicle. Trucks usually dominate highway noise levels. On heavily traveled roads, cars usually produce a steady level of noise, punctuated by trucks. Highways with a large number of trucks and lighter auto volumes can be the most annoying because of the intrusive nature of truck noise.

Receiver

The *receiver* is a location where people are bothered by the traffic noise. KDOT's primary concerns are for residences, schools, churches, etc. An important question about receivers is, "Are they impacted by the traffic noise?" The Federal Highway Administration (FHWA) defines an *impact* as occurring any time the Leq nears 67 dB for most types of receivers. KDOT uses an impact criteria of 66 dB for the Leq. KDOT also considers a receiver to be moderately impacted when its Leq increases by 11 dB above current levels after the highway project is built, and severely impacted when the increase is 16 dB or more. *When an impact as defined above occurs, KDOT will consider abatement analysis.*



Path: Distance and Barriers

The *path* is the area between the source and the receiver. Two factors must be considered with respect to the path: the **distance** from the source to the receiver and the presence of **noise barriers**.

As the *distance* from the source increases, the Leq at the receiver decreases. For highways, the Leq is reduced 3 dB each time the distance is doubled. For example, if the Leq is 70 dB at 50 feet, it will be 67 dB at 100 feet, and 64 dB at 200 feet. The smallest change in noise levels people can detect is 3 dB.

Noise Barriers

A *noise barrier* can be a wall, an earth berm, or a combination wall and berm. Many are made of concrete. When a noise barrier is placed between the source and the receiver, the sound waves have to bend over and around it, which reduces the noise levels.

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Barrier Height

To reduce noise, a barrier must break the *line of sight* between the source and the receiver. A barrier that just breaks the line of sight provides a reduction of 5 dB.

The height of the barrier must be increased by two feet for each additional decibel of noise reduction desired.

Barrier Length

Sound bends around and over barriers, so they must not have gaps. They must also go past the last receivers or wrap around them. Generally, the barrier must extend 400 feet past the last receiver for every 100 feet of distance to the barrier. This *4 to 1 rule of thumb* usually means it is not feasible to build barriers along streets with numerous driveways and intersections.

Considering Noise Barriers

KDOT will consider constructing noise walls as part of highway construction or reconstruction projects. The factors that influence KDOT's decision include:

- Documented impacts
- A reduction of at least 5dB is reasonably attainable
- Documented support of local officials and affected residents
- Cost effectiveness
- Positive aesthetic impacts
- Minimum maintenance cost

KDOT's goals for noise barriers it builds include:

- A noise reduction of at least 5 to 7 dB at the first row of receivers.
- Effective aesthetic and architectural integration into the community.
- Citizen involvement in decision making.
- Careful attention to neighborhood safety issues like fire access, security, and drainage.
- Careful attention to driver safety, including line of sight and emergency vehicle access.

Some typical decibel levels

Rural farm - *serene* - 20 to 30 dB.

Peaceful subdivision - *quiet* - 40 to 50 dB.

Urban freeway shoulder - *noisy* - 70 to 80 dB.

Adding Traffic

Adding lanes generally does not cause noticeable increases in noise levels. If a four-lane highway is widened to five lanes, it could carry 25 percent more traffic. This will usually cause the Leq to increase by only 1 dB, well below what people can hear. Doubling the traffic volume could increase the Leq by about 3 dB, the smallest change in noise level a person can detect. KDOT takes into consideration how noisy the highway was before the widening, so barriers might be built to reduce the noise levels **below** what they once were.

Development and Traffic Noise

KDOT works with local agencies to discourage noise-sensitive development from locating near highways. Its policies on noise analysis are progressive and projects receive careful study to see if barriers are warranted. KDOT uses computer models and noise measurement equipment operated by highly-qualified noise analysts.

Barriers and Aesthetics

The noise barriers built in Kansas are made of concrete, which is attractive and durable. Some local jurisdictions may choose to fund some additional aesthetic enhancements. KDOT's maintenance staff responds quickly to problems such as graffiti.

NOISE BARRIERS

- ✓ Are most effective within 200 feet of a road, usually the first row of homes
- ✓ Can cut the loudness of traffic noise up to a half
- ✓ Do not block all traffic noise
- ✓ Must be tall and long with no openings

For a helpful brochure about noise walls, visit the Federal Highway Administration at www.fhwa.dot.gov/environment

NOTE: This information is available in alternative accessible formats. To obtain an alternative format, contact the Bureau of Transportation Information, Eisenhower Building, 700 SW Harrison, 2nd Floor West, Topeka, KS, 66603-3754, or (785) 296-3585 (Voice)/Hearing Impaired - 711.