

## **Noise, Vibration and Harshness (NVH)**

Noise is any undesirable sound, usually unpleasant in nature. Vibration is any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down. Harshness is a ride quality issue where the vehicle's response to the road transmits sharply to the customer. Harshness normally describes a firmer than usual response from the suspension system. NVH is a term used to describe these conditions, which result in varying degrees of dissatisfaction. Although a certain level of NVH caused by road and environmental conditions is normal, this section is designed to aid in the diagnosis, testing and repair of NVH symptoms.

### **Acceptable NVH**

All internal combustion engines and drivelines produce some noise and vibration; operating in a real world environment adds noise that is not subject to control. Vibration isolators, mufflers and dampers reduce these to acceptable levels. A driver who is unfamiliar with a vehicle can think that some sounds are abnormal when actually the sounds are normal for the vehicle type. As a technician, it is very important to be familiar with vehicle features and know how they relate to NVH symptoms and their diagnosis. For example, if the vehicle has automatic overdrive, it is important to test drive the vehicle both in and out of overdrive mode.

### **Glossary of Terms**

#### **Amplitude**

The quantity or amount of energy produced by a vibrating component (G-force). An extreme vibration has a high amplitude. A mild vibration has a low amplitude. See Intensity.

#### **Boom**

Low frequency or low pitched noise often accompanied by a vibration. Also refer to Drumming.

#### **Buffet/Buffering**

Strong noise fluctuations caused by gusting winds. An example would be wind gusts against the side glass.

#### **Buzz**

A low-pitched sound like that from a bee. Often a metallic or hard plastic humming sound. Also describes a high-frequency vibration. Vibration feels similar to an electric razor.

#### **Chatter**

A pronounced series of rapidly repeating rattling or clicking sounds.

#### **Chirp**

A short-duration, high-pitched noise associated with a slipping drive belt.

#### **Chuckle**

A repetitious, low-pitched sound. A loud chuckle is usually described as a knock.

**Click**

A sharp, brief, non-resonant sound, similar to actuating a ball point pen.

**Clonk**

A hydraulic knocking sound. Sound occurs with air pockets in a hydraulic system. Also described as hammering.

**Clunk/Driveline Clunk**

A heavy or dull, short-duration, low-frequency sound. Occurs mostly on a vehicle that is accelerating or decelerating abruptly. Also described as a thunk.

**Conductor**

The components that carry (transmit) a vibration frequency from the originator to the reactor.

**Cycles Per Second**

Cycles per second. Same as hertz (Hz).

**Cracks**

A mid-frequency sound, related to squeak. Sound varies with temperature conditions.

**Creak**

A metallic squeak.

**Cycle**

The process of a vibrating component going through a complete range of motion and returning to the starting point.

**Decibel (dB)**

A unit of measurement, referring to sound pressure level, abbreviated dB.

**Drone**

A low-frequency, steady sound, like a freezer compressor. Also described as a moan.

**Drumming**

A cycling, low-frequency, rhythmic noise often accompanied by a sensation of pressure on the ear drums. Also described as a low rumble, boom or rolling thunder.

**Flutter**

Mid to high intermittent sound due to air flow. Similar to a flag flapping in the wind.

**Frequency**

The rate at which a cycle occurs within a given time.

**G-force**

The additional load or weight produced in an object during acceleration. When measuring the level or amplitude of a vibration without sound, the unit G is added to associate the force of the vibration to gravity. This is similar to measuring the weight of an object, which is also a function of gravity.

### **Gravelly Feel**

A grinding or growl in a component, similar to the feel experienced when driving on gravel.

### **Grind**

An abrasive sound, similar to using a grinding wheel, or rubbing sand paper against wood.

### **Hertz (Hz)**

A unit of measure used to describe noise and vibration concerns expressed in cycles per second.

### **Hiss**

Steady, high-frequency noise. Vacuum leak sound.

### **Hoot**

A steady, low-frequency tone, sounds like blowing over a long neck bottle.

### **Howl**

A mid-range frequency noise between drumming and whine. Also described as a hum.

### **Hum**

Mid-frequency steady sound, like a small fan motor. Also described as a howl.

### **Intensity**

The physical quality of sound that relates to the strength of the vibration (measured in decibels). The higher the sound's amplitude, the higher the intensity and vice versa. See Amplitude.

### **Knock**

A heavy, loud, repetitious sound, like a knock on the door.

### **Moan**

A constant, low-frequency tone. Also described as a hum.

### **Ping**

A short-duration, high-frequency sound, which has a slight echo.

### **Pitch**

The physical quality of sound that relates to its frequency. Pitch increases as frequency increases and vice versa.

### **Pumping Feel**

A slow, pulsing movement.

**Rattle**

A random and momentary or short-duration noise.

**Reactor**

The component, or part, that receives a vibration from an originator and conductor and reacts to the vibration by moving.

**Roughness**

A medium-frequency vibration. A slightly higher frequency than a shake. This type of vibration is usually related to drivetrain components.

**Rustling**

Intermittent sound of varying frequency, sounds similar to shuffling through leaves.

**Shake**

A low-frequency vibration, usually with visible component movement. Usually relates to tires, wheels, brake drums or brake discs if it is vehicle speed sensitive, or engine if it is engine speed sensitive. Also referred to as a shimmy or wobble.

**Shimmy**

An abnormal vibration or wobbling, felt as a side-to-side motion of the steering wheel in the driveshaft rotation. Also described as waddle.

**Shudder**

A low-frequency vibration that is felt through the steering wheel or seat during light brake application.

**Slap**

A resonance from flat surfaces, such as safety belt webbing or door trim panels.

**Squeak**

A high-pitched transient sound, similar to rubbing fingers against a clean window.

**Squeal**

A long-duration, high-pitched noise.

**Tap**

A light, rhythmic or intermittent hammering sound, similar to tapping a pencil on a table edge.

**Thump**

A dull beat caused by 2 items striking together.

**Tick**

A rhythmic tap, similar to a clock noise.

**Tip-In Moan**

A light moaning noise heard during light vehicle acceleration, usually between 40-100 km/h (25-65 mph).

**Transient**

A noise or vibration that is momentary, a short duration.

**Vibration**

Any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down.

**Whine**

A constant, high-pitched noise. Also described as a screech.

**Whistle**

High-pitched noise with a very narrow frequency band. Examples of whistle noises are a turbocharger or air flow around an antenna.

**Wind Noise**

Any noise caused by air movement in, out or around the vehicle.

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