SECTION 7 VIBRATION

What is vibration?

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Because the motion is oscillatory, no net movement of the vibration element occurs, and the average of any of the motion descriptors is zero. For vibration, velocity represents the instantaneous speed of the motion and acceleration is the speed's rate of change.

The human body responds to the vibration velocity's average amplitude. A vibration decibel notation is commonly used to describe vibration. The vibration velocity level is reported in decibels relative to a level of $1x10^{-6}$ inches per second and is denoted as *VdB*.

In contrast to airborne noise, ground-borne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of human perception (around 65 VdB).

Most perceptible indoor vibration is caused by sources within buildings such as the operation of mechanical equipment, movement of people, or slamming of doors. Although the perceptibility threshold is about 65 VdB, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. This is a typical level 25 feet from a truck or bus lane, unless there are bumps in the road. Minor damage to fragile historic buildings can occur at vibration levels over 100 VdB.

How is vibration analyzed?

Because roadway traffic with rubber tires generates low levels of vibration, construction activities are the most likely cause of noticeable vibration. The I-405 Team's noise specialists evaluated typical vibration levels for various construction activities, to determine whether structures along I-405 could be potentially damaged.

What are the potential effects of vibration?

During operation, vibration levels will be similar to those currently occurring in the study area. No substantial vibration effects will occur.

During construction, various activities will create vibration. Heavy construction equipment (e.g., large bulldozers and loaded trucks) frequently generates between 85 and 87 VdB at 25 feet. Pile driving may generate between 104 and 112 VdB at 25 feet. The vibration energy from pile driving decreases to between 92 and 100 VdB at 100 feet.

The potential for minor damage to fragile structures is limited to approximately 25 feet from most construction activities and 100 feet from pile driving. People will feel minor ground movement at greater distances, but because the construction activities are temporary and there is negligible potential for damage to fragile structures, this will not constitute an impact.

A laser eye surgery facility, sensitive to vibrations, is located along Lind Avenue. Vibration impacts are not anticipated at this site because this facility will be acquired. No additional facilities or structures were identified as being sensitive to vibration.

How can the potential effects be minimized?

Construction crews may not conduct pile driving within 100 feet of fragile structures or sensitive vibratory uses. Large bulldozers and vibratory rollers may be operated over 25 feet from fragile structures or areas with sensitive uses. No fragile structures are expected to be affected by the Tukwila to Renton Project.