

CONSTRUCTION VIBRATIONS

A HOMEOWNER'S GUIDE TO UNDERSTANDING STRUCTURE RESPONSE TO CONSTRUCTION ACTIVITIES NEAR YOUR HOME AND PROPERTY

Prepared by



Vibration Monitoring

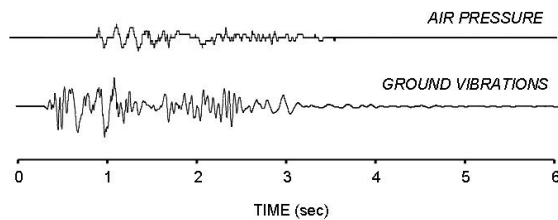
Blasting • Construction

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*Authored by Aimone Martin & Assoc, LLC

ROCK BLASTING

Rock blasting generates very low-level ground vibration and airblast (or air pressure), shown as time-histories below, that may travel away from the blast site to your structure. Your structure may pick up some of these vibrations, and you may feel or sense the resulting structure motions, depending on your level of activity at the time and characteristics of your structure. Ground vibrations are measured in terms of velocity (inches/second) while airblast is measured in units of sound or decibels (dB).



HOW WILL VIBRATIONS AND AIRBLAST AFFECT MY STRUCTURE?

Under normal circumstances, it is ground vibration, and not airblast, that correlate with structure damage but *only at very high* ground velocity levels, well above levels that you will experience.

The amplitude of ground vibrations at your structure will be very low and far below known levels that can cause cracking and other defects to occur. However, to many people, the inside “noise” associated with structure motion in response to ground vibrations may be alarming and leave the impression that structure damage is occurring.

Airblast does not cause structure damage at levels generated from rock blasting but rather may startle persons inside structures. Airblast can cause window panes to rattle and loose objects on walls to move.

In no case, will the amplitude of vibrations lead to wall cracking or foundation movements resulting in settlement or permanent structure distortions. It is not possible for low levels of ground vibrations from blasting activities to cause cracking in your structure.

HOW WILL VIBRATIONS AFFECT ME?

Your reactions to blasting vibrations depend on your personal levels of tolerance and activity at the time of blasting.

If you are busy at home and residing in a well-insulated structure that does not easily respond to vibrations, you may feel or sense very little. You may “hear” noise but perceive little in the way of vibrations. However, if you reside in a quiet environment or in a lightly-loaded structure, you may perceive the vibrations more readily.

Arizona Monitoring Services, along with the blasting company are working diligently to minimize the impacts of blasting in your community.

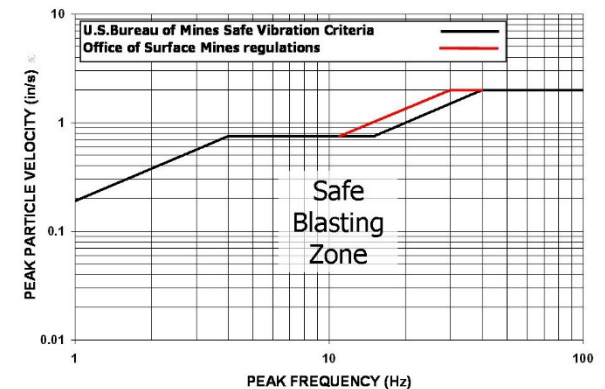
HOW DOES THE BLASTING COMPANY PROTECT NEAR-BY STRUCTURES?

Blasting is highly regulated by state and federal agencies. Blasters are trained, experienced experts in their field. They must comply with many strict safety and security regulations that cover licensing, permitting, transportation, storage, sale, and handling of explosives. Blasters also understand off-site impacts of blasting and know how to design each blast to minimize airblast and ground vibrations, keeping levels as low as practically possible while performing their job. Blasters know how to load each blasthole to minimize the explosive charge weights, to place the correct amount of crushed rock “stemming” material at the top of each blasthole to prevent airblast and to correctly time each blasthole detonation with millisecond (ms) delays.

Rock blasting is a common practice for new construction throughout the southwest. The blasting company and developer have your safety and the protection of your home in mind at all times.

WHAT ARE THE SAFE BLASTING GUIDELINES FOR VIBRATIONS AND HOW WILL MY STRUCTURE BE PROTECTED?

Safe blasting standards shown below were proposed by the U.S. Bureau of Mines, (USBM) in 1981 based on over 40 years of studies that included direct crack observations correlated with ground vibrations. The Office of Surface Mining adopted the USBM criteria as regulation (with modification shown) applied only to coal mine blasting. These frequency-based standards limit maximum ground velocity as a function of frequency at the peak velocity. Blasting below this line is safe as this line represents the 100-percentile (or level of assurance) that threshold cracking in the weakest structure materials, such as drywall, will not occur. Above this line, damage may occur at increasing intensities as peak velocity increases. These are the national standards to which our blasting operations will adhere.



Experts will monitor vibrations with seismographs

Seismographs will be used to measure and record vibrations and noise at structures nearest to the project. State-of-the-art digital seismographs will be employed by qualified engineers. This will assure vibrations are within the safe blasting zone. Vibration records will be provided to the contractor as well as permitting authorities. Your structure may be monitored while others may not. However, a large database of ground vibration measurements will be developed and relied upon to assure compliance with safe criteria for all surrounding structures.

OTHER CONCERNS AND FREQUENTLY ASKED QUESTIONS

Maybe 10 or 20 blasts will not harm my house, but what about continuously repeated blasting and long-term effects?

Many home owners accept that ground motions measured outside their home below the safe blasting criteria will not cause cracking today. But what about the future? Do the effects of repeated blasting accumulate in structures such that defects will start showing up long after the blasting is done? This question was carefully researched by the US Bureau of Mines (USBM) in a 2-year blasting study. The USBM determined that as long as blasting takes place within the safe criteria, structure wall strains are far below the “elastic” or recoverable limit and do not accumulate over time. There has never been any observed damaged from repeated effects and numerous researchers continue to study this topic.

I know new cracks have formed in my structure since blasting activities started

When vibrations are felt, it is human nature to start looking for structure cracking. Many home owners subsequently will find a number of cracks, noted for the first time, and associate them with blasting. Typically, these cracks were already present but not

noticed before blasting began. By adhering to safe vibration standards, *no cracking* will occur in your home. Therefore, before blasting begins, it is important for you to become acquainted with the existing conditions of your home. We encourage you to take a visual and photographic inventory of the condition of your walls and concrete slabs prior to the beginning of construction.

If blasting is not causing cracking in my home, then what is?

Cracking in structures is *normal and expected* over time. Cracks readily form in new construction for many reasons including subtle, differential soil deflections, natural aging of new construction materials, and changes in weather. Soil deflections up to 0.5 inches are normal. Larger deflections may be a sign of foundation problems. Shrinkage of new construction materials such as concrete, mortar, and wood framing is the largest contributor to structure cracking. Post-construction natural atmospheric humidity fluctuations create differential expansion and contraction of materials, resulting in potential wall and joint stresses, separations and cracking. Thermal stresses from daily temperature fluctuation also cause material expansion and contraction of stucco and drywall that may result in hairline cracks. Other common causes of cracking are poor soil conditions, lack of drainage control, high wind forces during storms, and simply the everyday wear and tear we impose on structures during use.

For more information and educational videos, visit:
www.arizonamonitoringservices.com/how-does-blasting-affect-my-home/