Preparing for a Blast

The key to making sure blasts are carried out successfully and safely is to know what the issues and concerns are when designing the blast.

When ODOT or a contractor is preparing for the blasting phase of a project, workers try to be thorough in identifying all elements of concern, but sometimes things are not obvious. This is why ODOT and the contractor need to rely on local knowledge of the surroundings. It is in the best interest of ODOT and the contractor to complete this work in a timely, efficient and safe manner.

Other methods that ODOT employs to ensure a successful and safe blasting operation:

- Require an approved blasting consultant to design/approve the blasting plans
- Perform pre-blast surveys. These are done either by or through the blasting contractor prior to the blast to document the condition of structures, foundations, and windows prior to exposure to vibration from blasting.
- ODOT reviews the submitted blasting plans prior to allowing the blasts to proceed
- Require ground vibration monitoring during the blasts
- Require that blast mats be laid upon the blast area to help contain flying rock
- Blasting contractors are licensed and bonded

For related information about the technical aspects of blasting, visit:

https://www.oregon.gov/odot/geoenvironmental

(click “Material Sources”)

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For more information about a specific project, contact “ASK ODOT” at:

1-888-275-6368 or
www.oregon.gov/ODOT/

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Rock Blasting and the Community

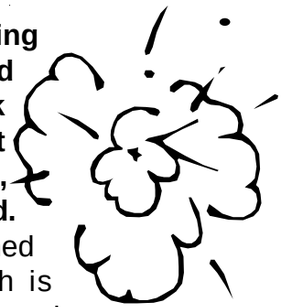
Oregon Department of Transportation

The Oregon Department of Transportation maintains quarries as part of a statewide material source network in order to obtain rock material used for construction, maintenance, and emergency repair projects.

This material is crushed and sorted for use in building and paving state highways and other public projects. The process to excavate the rock often requires blasting in the quarries. The potential damage from ground vibration, airblast (sound) and flying debris is a major concern to both ODOT and nearby residents.

Every effort is taken, however, by both ODOT and its blasting contractors to greatly minimize and eliminate potential impacts on neighboring properties from this type of work.

What is Blasting?



The purpose of blasting is to loosen and fragment in-place rock materials to a size that can be removed, transported or crushed. Often the rocks are turned into aggregate, which is used to build and pave roads.

Within the quarry, holes commonly 3½ inches in diameter are drilled down into the rock mass. The holes are filled with an explosive, which is a chemical mixture that reacts at a high speed to generate gas and heat. Upon initiation, this reaction causes tremendous outward pressures and energy.

Two basic forms of energy are released when explosives react: shock and gas. Shock energy is the pressure transmitted outward from the hole in the rock and causes microfractures to form and travel outward for a short distance. Gas energy is pressure caused by expanding gases, created by the chemical reaction. These gases follow the path of least resistance along existing and newly-formed fractures in the rock and cause the majority of rock breakage in quarry blasting.

Energy not used for rock breakage is wasted in the form of ground vibration and airblast. Ground vibrations are seismic waves that spread out along and through the ground from the drill hole and are measured with a seismometer. Vibrations, typically far below the levels required to produce damage to plaster or windows in houses, can be felt by humans.

Airblast is an airborne wave created by the blast and is observed by people as sound and pressure. Again, sound and pressure below the levels required to damage walls and windows, can be felt by humans.

Blasting & Groundwater

Blast vibrations are highly unlikely to permanently decrease groundwater quality, but can sometimes cause local and temporary cloudiness as sediments are dislodged.

These sediments can remain in suspension for days or weeks, but this is only temporary and aesthetic and does not suggest physical damage to the aquifer or well. In fact, **blast vibrations have been shown in a number of cases to improve the long-term water yield in aquifers** by “flushing out” fine sediments from between joints, allowing more permeability and overall storage.

What About Safety?

Extensive research about blasting has been conducted by the United States Bureau of Mines (USBM) and the Office of Surface Mining (OSM), universities, and private groups for more than 40 years. This has led to the development of acceptable vibration standards that greatly reduce the risk of off-site impacts. **Ground vibration levels have been set by law to avoid off-site damage and should feel the same as a loaded truck or bus going by 50 to 100 feet away.**

Studies have shown that significant fracturing in the rock around a typical blast hole is limited to a distance of 20-40 hole diameters, which is 6 to 12 feet for the commonly used 3½ inch hole. This short distance of fragmentation is evidenced by most quarry blastholes being spaced 6 to 14 feet apart; the explosive energy is insufficient to fracture the rock at any greater distance from each blasthole. When a confined explosive charge is detonated, the zone of permanently deformed material is ideally cone shaped with the point down, with very little fracturing below the blasthole.

Damage and injury from vibration, airblast and flying debris is still a concern. However, ODOT and its blasting contractors use a variety of safeguards, technology and knowledge to make this inherently dangerous task safe for themselves and surrounding property.