

Controlled Blasting at Quarries



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BETTER EXPLOSIVES TECHNOLOGY MINIMIZES THE IMPACT OF BLASTING

While we all strive for peace and quiet in our neighbourhoods, blasting is a necessary step in extracting aggregate at quarries. To ensure blasting affects nearby communities as minimally as possible, provincial government regulations set limits for noise and vibration produced by blasting at Ontario quarries. Every blast that takes place is closely monitored to ensure that these limits are followed.

Ontario quarries remove bedrock from the ground to produce aggregate materials for use in the various construction and infrastructure projects across the province. The first step in this process is the blasting of the rock. Explosive charges are placed within holes drilled into the rock at very specific places to maximize extraction.

The charges are then detonated to break and dislodge the rock. This technique is also used in mining, road construction, utility installations, and even residential basement excavations.

Once broken apart by the explosive forces, the fragmented rock can be easily handled, transported and processed to produce the range of aggregate materials required by the construction industry. In short, blasting is a safe and efficient way of accessing and extracting aggregate.

Blasting is an activity far removed from the cartoon depiction of a devious coyote with several sticks of red dynamite connected to a plunger that sets off the blast. Today's blasting professionals are trained and experienced in work that has become a science. Courses in explosives technology are taught in colleges and universities across Canada.

To ensure that every blast is efficient, safe and controlled, blasting professionals must comply with a range of federal and provincial laws that regulate their activities. Every aspect of the industry, from production to storage to transportation, as well as detonation, is regulated.

In Ontario, the three most relevant pieces of legislation are the Occupational Health and Safety Act, administered by the Ministry of Labour (MOL), Guideline NPC-119, administered by the Ministry of Environment and Climate Change (MOECC), and the Environmental Protection Act, also administered by the MOECC. These guidelines suggest limits for noise and vibration produced by blasting and are among the most stringent in North America. That's good news for our communities and local wildlife.



EFFECTS OF BLASTING

While every precaution is made and considered during a blasting operation, there are two effects that may be felt at an offsite location: vibration in the ground and concussion in the air (or noise). Both are regulated by MOECC and all blasts at a quarry must be controlled so that established limits are not exceeded at an offsite residence or at other sensitive land-use locations. Precise and detailed record keeping for each individual blast is required. Instruments called seismographs are used to measure vibration and sound pressure. The seismographs are tested and calibrated when they are set up to ensure accurate measurements.

The noise and vibration levels produced when a blast is set off are primarily based on two factors. The first is the technical specifics of the blast, such as size and depth of drilled holes, and are controlled by the blasting professional. The second is atmospheric conditions such as wind direction, humidity, temperature inversions or cloud cover. Additionally, the geologic setting, such as soil type, bedrock, water table level, and freeze/thaw conditions, can affect the noise and vibration levels resulting from a blast.

Every blast will generate noise and vibration that may be heard and felt on properties around a quarry. However, the vibration levels that will be experienced are normally lower and no more adverse than those caused by common household events such as a door slamming. Seismographs set up to monitor a nearby home often record higher vibration from activity in the home than from nearby blasting operations. No structural damage will occur due to noise or vibration that is within the limits established by MOECC.

Physical breaking or cracking of the rock is limited to a localized area around each blast hole. These cracks usually occur within several metres of the blast hole. Any offsite rock structure, aquifers or well installations are not affected.



DID YOU KNOW?

- 1** You may hear or feel a blast depending on your distance from the blasting site. Humans are very sensitive to noise and vibration. However, what you feel does not necessarily mean that damage is occurring.
- 2** People can “feel” vibration at a level around 0.14 mm/s.
- 3** The Ministry’s limit for vibration is 12.5 mm/s.
- 4** UAVS or drones are sometimes used to ensure the safety of personnel and that a blast has been set up properly.
- 5** Blasts are carefully designed and calculated by taking into consideration fragmentation desired, type of rock, and site conditions.
- 6** The facility keeps detailed records of each blast. The records typically contain the size, time, and location of the blast, the amount of explosives used, and the results of the monitoring.



REDUCING EFFECTS

There are a number of techniques commonly used throughout the industry to control impacts. In order to ensure that vibration and noise levels are within the MOECC regulations, blasts are carried out in accordance with blast design studies.

These reports are prepared by specialists prior to any blasting taking place. Historical background data collected from quarry operations throughout the province as well as data from scientific research organizations form the basis of the report. This data, combined with information supplied by explosives manufacturers, is used to develop a plan for the site of the proposed blasting activity.

The most critical blast design factor affecting ground vibration or noise is the amount of explosive detonated at any one instance during the blast. As a result, holes are detonated sequentially,

a few milliseconds apart, in order to control the overall impact.

If a quarry near your home is conducting blasting, there's no need to worry about random blasts taking place in the middle of the night or before you've had your morning coffee. Quarry staff will contact residents within 500 metres of the blast area who have requested advance notice of the blast to ensure their daily lives are not rudely interrupted.

In addition to community warnings, a siren or horn is sounded a few minutes in advance of every blast at the site. The purpose of this siren is to warn employees and workers in the quarry and allow the working area to be cleared. This siren will be audible at some offsite locations and will provide advance notice of an upcoming blast.

Written with files from P. Berger and Associates Inc. and GeoSonics Inc. by MHBC Planning, Aercoustics Engineerings, and Explotex Engineering.



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