December 8, 2009 Via e-mail: johnstonken8@gmail.com

Mr. Ken Johnston
Las Pilitas Resources, LLC
P.O. Box 875
Santa Margarita, CA 93453

Re: General Blast Plan and Vibration Predictions for your Las Pilitas Rock Quarry Project, Located at 6600 Calf Canyon Highway, Santa Margarita, San Luis Obispo County, California.
G&A Project No. 2009-16.01

Dear Mr. Johnston:

At your request and authorization, Gasch & Associates and Gasch Geophysical Services, Inc. (G&A) has completed a general blast plan and vibration predictions for your Las Pilitas Quarry Project located at 6600 Calf Canyon Highway in Santa Margarita, San Luis Obispo County, California.

The general blast plan includes specifications for the use of explosives and blasting, limiting ground vibrations and air-overpressure levels, records requirements, and safety and warning programs and vibration predictions based on project parameters that you have supplied and typical quarry blasting methods.

Ultimately, the blaster-in-charge is responsible for all aspects and results of carrying out the blasting program.

We trust that this is the information you require; however, should you have comments or questions, please contact our Rancho Cordova office at your convenience. Thank you for this opportunity to be of service.

Sincerely,

GASCH & ASSOCIATES
GASCH GEOPHYSICAL SERVICES, INC.

Kent L. Gasch
Professional Geophysicist No. 1061

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1.0. INTRODUCTION

Las Pilitas Quarry is a granite rock quarry. Blasting is necessary to extract the rock for further processing. Rock is removed by establishing a series of benches and slopes. Blasting operations involve drilling along the mining face and the placement and detonation of charges. The blasted rock is then removed for further processing.

1.1. Quarry Site

The site is located at 6600 Calf Canyon Highway (Highway 58). The site consists of approximately 260 vacant acres of hills with steep slopes, of which, only 55 acres will be disturbed. The site is located approximately 3.7 miles northeast of the City of Santa Margarita, in San Luis Obispo County, California;. Elevations range from 1,000 feet above sea level (asl) to 1,475 feet asl. The site is currently accessed via unimproved agricultural roads, west of the intersection of Highway 58 and Parkhill Road.

1.2. Adjacent Structures and Facilities

The site is bordered by vacant land. The closest residence is approximately 300 feet southeast of the southernmost corner of the mine. This structure is a single family dwelling. The Calf Canyon to Cuesta Pipeline crosses south and southeast of the Site. It is as close as 200 feet, but averages around 350 feet from the planned working area.

2.0. DEFINITIONS

Acceleration – The rate of change of velocity with respect to time. Acceleration is expressed in units of relative gravity (g's) or in inches per second squared (in/sec^2).

Air Blast - An airborne shock wave or acoustic transient generated by an explosion.

Air-Overpressure (air blast) – See Air Blast. Air-overpressure is expressed in units of pounds per square inch (psi) or decibels (dBL).

Blaster-in-Charge or Blasting Supervisor – the single designated and licensed person with complete responsibility and authority over all decisions involving safe handling, use and on-site security of explosives.

Back Break - Rock broken beyond the limits of the last row of holes in a blast.

Bench - A horizontal surface at the top of a vertical or near vertical rock face where blast holes are drilled vertically or inclined down into the material to be blasted. The height and width of a bench can vary from a few meters up to 100 feet (30 meters) and is common in quarries and mines.

Bench Blasting – An excavation method where benches are blasted in steps. This method utilizes one or several rows of blast holes that are drilled parallel to the vertical or inclined free face.

Blast Area - The area of a blast within the influence of flyrock, gases, and concussion.

Blasting Log - A written record of information about a specific blast as required by law or regulation.

Burden - The distance from the borehole and the nearest free face or the distance between boreholes measured perpendicular to the spacing. Or the total amount of material to be blasted by a given hole, usually measured in cubic yards or tons.

Decking - An explosive charge in a single hole separated from other charges in the blast-hole by stemming or an air cushion.

Delay - A distinct pause of predetermined time interval between detonation or initiation impulses, to permit the firing of explosive charges separately.

Electric Detonator – A detonator that is initiated by means of an electric current.

Electronic (Digital) Detonator – A detonator in which the time delay and other logic functions are provided by programmable microchip circuitry within the detonator which allow for precise and accurate delay timing.

Flyrock - Rocks propelled from the blast by the force of the explosion.

Free Face - A rock surface exposed to air or water that provides room for expansion upon fragmentation; sometimes called an open face.

Hangfire – The detonation of an explosive charge at some non-determined time after its normally designed firing time.

Maximum Charge Weight per Delay – The maximum charge per delay is the sum of the weight of all charges firing within any 8-millesecond time period. For purposes of ground vibration control, any charges firing within any 8-millisecond time period are considered to have a cumulative effect on ground vibration and air-blast effects.

Misfire - A blast or specific borehole that failed to detonate as planned.

Non-electric Detonator - Detonators that do not require the use of electrical energy to function.

Peak Particle Velocity (PPV) – The maximum ground vibration velocities measured by the three mutually perpendicular components of the blasting seismograph. The seismograph measures ground vibration in the vertical, longitudinal and transverse directions. PPV units are expressed in inches per second (in/sec) or millimeters per second (mm/sec).

Peak Vector Sum (PVS) – The square root of the sum of the squared values of the three components of PPV measured at the same time.

Powder Factor – Pounds of explosive per cubic yard of rock.

Pre-compression - The failure of an explosive charge to properly detonate caused by transient shock pressures produced by detonations of other charges firing on earlier delay periods.

Production Holes – Blast holes in the main body of the rock mass being removed by drilling and blasting.

Scaled Distance – The distance from a blast measured in feet, divided by the square root of the charge per delay period measured in pounds. Scaled distance values are used in calculations to predict and evaluate ground vibrations. For air-blast calculations, the cube root scaling method is used and distance is divided by the cube root of the maximum charge per delay. For example; if a blast 300 feet away, using 100 pounds of explosive per delay would yield a scaled distance of; $\frac{300}{\sqrt{100}} = 30$

Spacing - The distance between boreholes. In bench blasting, the distance is measured parallel to the face and perpendicular to the burden.

Stemming – An inert material of dense consistency such as crushed rock or rock chips that is placed in the unloaded collar of blast holes for the purpose of confining the explosive charges and controlling rock movement and air-blast. Stemming can also be used between explosive charges when the blast holes are decked (deck loading).

Warning Signal - A visible or audible signal that is used for warning personnel in the vicinity of the blast area of an impending explosion.

3.0. QUARRY BLASTING PLAN

3.1. General Objective

To process granite rock into construction materials, requires the use of heavy equipment and controlled blasting.

3.2. Rock Type and Characteristics
The type of rock native to this area is granite. The typical characteristics of granite are as follows:
• Specific gravity = 2.5 to 2.9
• Density = 167.41 lbs /cu. ft. = 2.26 ton/cu. yd.

4.0. CONTROLLED BLASTING

4.1. Controlled Blasting Techniques
The blasting contractor shall take all necessary steps and use all available blasting techniques to limit the adverse effects of fly rock, misfires, ground vibration and air blast. The use of a seismograph at the nearest structure shall be used and monitored to ensure compliance with Federal, State, and local regulations.

4.2. Conceptual Blasting Plan
The Blaster-in-Charge will submit a plan of the details of the planned blast. The plan shall include a plan view showing typical blast hole locations and spacing and the diameter and loading details for the boreholes in vertical section. Explosive types, explosive amounts, priming methods, initiator types, delay periods and locations, charge firing times, stemming type and quantities and sub drilling. Methods of drilling, including equipment descriptions and techniques for ensuring proper blast hole placement and alignment. Initiation system hook-up methods and method of primary initiation.

The plan shall also include a plan for preventing damage to nearby facilities and adjacent structures, including methods to control flyrock, air-overpressure and ground vibrations with calculations showing predicted levels of vibration at the nearest structures.

4.3. Blast Site Inspections
The blasting contractor shall inspect the blast area for potential hazards. Inspected areas include but are not limited to;

A. The immediate blast area
B. The high-wall face
C. The geology of the rock to identify;

1. Seams or areas of weak geology, such as decomposed granite
2. Potential slide areas
3. Voids
4. Loose rocks
5. Fractures, or
6. Any rock mass defects.

4.4. Blasting Safety Plan

A complete description of the clearing and guarding procedures that will be employed to ensure personnel, staff, visitors and all other persons are at safe locations during blasting. This information will include details regarding visible warning signs or flag, audible warning signals, method of determining blast areas (all areas affected by any potentially harmful blast effects), access blocking methods, guard placement and guard release procedures, primary initiation method and the system by which the Blaster-in-Charge will communicate with site supervisory personnel.

4.5. Employee Safety Meeting

Before loading operations begin, the blaster-in-charge shall direct that a safety meeting be held for all blasting contractor's employees on site. Information regarding the hazards observed during the blast site inspection as well as pertinent safety instructions shall be provided to the workers. The blaster-in-charge shall issue directives and supervision to all blasting contractor's employees as to their responsibility and duties for the day. The blaster-in-charge shall be the man-in-charge of the blast site. The blaster-in-charge shall assume all responsibilities and perform all duties as required under the CAL-OSHA and MSHA regulations.

4.6. Blast Site Security

The blast site shall be barricaded and/or designated as off-limits to quarry personnel during loading operations. All access entry points onto the blast site shall be barricaded and monitored. Markers, barricades, signs and/or barrier tape shall be used to designate the blast site. Entry into the blast site by unauthorized personnel shall be prohibited. Only the blaster-in-charge shall have the authority to grant permission for entry onto the blast site. No quarry equipment shall encroach within 50 feet of the designated blast site.

4.7. Loading Holes

All loading of explosives shall be under the direction and supervision of the blaster-in-charge. The blaster-in-charge shall be responsible for the following:

A. Type of explosive used
B. Quantity of explosive used
C. Actual placement of explosives in hole
D. Delay timing of shot
E. Back-filling or stemming of each hole
F. Tie-in and/or hookup of the initiation system
G. Coordination of personnel evacuated in blast area
H. Blast area security
I. Activation of the warning signals
J. Detonation of the shot
K. Post-blast inspection
L. Handle any unexpected or unusual events such as;
1. Fly-rock incidents

2. Personal injuries
3. Equipment or structure damage, or
4. Misfires or hangfires.

4.8. Initiation Systems

All down-hole-delay and surface-delay detonators used to initiate a blast shall be of a non-electric, shock-tube type system or electronic (digital) detonators. Detonation cord shall not be used on the surface to tie-in or hook-up a shot.

4.9. Blasting Hours

Blasting shall occur between the hours of 7:00 am and 6:00 pm, Monday through Friday. No blasting is allowed after sunset.

4.10. Pre-Blast Notifications

The contractor shall be responsible for all required notifications. The blasting contractor shall notify the following;
A. All regulatory agencies requiring notification,
B. All law enforcement agencies requiring notification,
C. All emergency services requiring notification,
D. Designated quarry personnel requiring notification, and
E. All residents or owners requesting notification

5.0. PRE-BLAST PROCEDURES

5.1. Blast Site Preparation

The blast site shall have unobstructed access for emergency services, mining equipment, and vehicle entry. All hazards, such as, loose boulders, under-cuts, and trip and fall hazards, shall be noted or resolved before drilling begins.

5.2. Drilling Operations

The drilling pattern shall be determined by the size and depth of area to be excavated, distance to adjacent developments or structures, geology of the rock formations and the size of required equipment.

Typical drill pattern parameters:
• Hole burden= 20 to 40 times the hole diameter
• Hole spacing= 1 to 1.8 times the burden
• Subdrill= 0.2 to 0.5 times the burden
• Minimum Bench Height= 3 times the burden

Adjustments shall be made after each blast to achieve the optimum hole size/drill pattern ratio to maximize production while minimizing fly-rock and ground vibration.

Drilling Procedures:

- Driller is to drill clean holes with substantial collars to maintain the integrity of the hole.
- Driller shall complete a daily "drill log" and submit such log to their Supervisor.
- Driller is to check each hole for voids, water and any obstruction that might interfere with the loading of such hole. Driller is to note such information on daily "drill log" and mark such hole(s) for easy identification.

5.3. Blast Warnings Signs/Signals

Blasting signs reading "Danger Blasting Area" shall be conspicuously placed along the edge of any blasting area that comes within 100 feet of any public road right-of-way, and at the point where any other road provides access to the blasting area; and at all entrances to the permit area from public roads or highways.

The blasting contractor shall post at all entrances to the facility a sign designating the sequence and type of pre-blast and post-blast warning signals.

A pre-determined signaling system shall be established before blasting is to commence. All warning systems must meet CAL-OSHA, MSHA and the quarry operator's requirements.

A typical warning signal uses an air horn as follows:

WARNING SIGNAL Five minutes prior to blast
"A one-minute series of long audible signals"

BLASTING SIGNAL One minute prior to blast
"A series of short audible signals"

BLASTER-IN-CHARGE Immediately prior to blast
Blaster-in-Charge yells "Fire in the Hole" three times. After the third yell, blaster detonates the blast.

ALL CLEAR SIGNAL Following blast site inspection
"One prolonged audible signal"

Sufficient quarry personnel and blasting contractor personnel shall be stationed around the blast area to prevent access. Guards are to have direct communication with the blaster-in-charge, by direct line-of-sight or through radio communication. Guards must be able to notify the blaster-in-charge immediately if the secured area has been breached. The blast will be aborted until the area has been cleared.

Before the blaster in charge can start the 5 minute countdown he must have uninterrupted radio or visual contact with all guards and receive a report from each post that each area is clear. Once all areas are secured, the 5 minute "warning signal" will be administered. During this time the blaster-in-charge will insure that all personnel and equipment have been removed and the blast site is secure. Only after the final security check has been completed, the blaster-in-charge will move to the initiation site and sound the 1 minute "blasting signal." During the 1 minute countdown, the blaster-in-charge will receive a second report from the security posts. After all areas have reported "All Clear" and the blast zone is deemed secured, the blaster-in-charge will yell "fire in the hole" three times and then initiate the blast.

6.0. POST-BLAST PROCEDURES

6.1. Post-Blast Re-Entry

A. Only the blasting contractor shall be allowed to re-enter the blast area.
B. Re-entry shall be allowed after the smoke, fumes and dust have cleared.
C. The shot shall be checked for any safety concerns or unusual occurrences such as a misfire, hangfire or unsafe geology.
D. The blaster-in-charge shall authorize the "All Clear" signal to be sounded, only after the area is deemed safe-to-enter.

6.2. Misfire Prevention

The best way to prevent a misfire is to become thoroughly familiar with the causes and follow good blasting practices. Common causes of misfires are the following;

A. Poor connections,
B. Electric and non-electric detonators,
C. Mixing detonators from different manufacturers,
D. Improper hook-ups between detonators,
E. Improper delay timing,
F. Premature energy path disruption,
G. Explosive column-shift cutoff,
H. Inferior products, and
I. Human error.

6.3. Misfire Disposal

If a misfire occurs, the disposal shall be handled by;

A. Staying out of the blast site for at least 30 minutes following electric or non-electric blasting.
B. An experienced individual familiar with the explosive materials and initiation systems used in the blast.
C. An individual trained in the proper techniques for handling, neutralizing and disposing of the explosives in a safe manner.
D. Personnel who has firsthand knowledge of how the blast was loaded or must have accurate records and data giving detailed information on the type, weight, and location of all explosive materials and initiation system components used.

E. Personnel who can analyze all information completely and create a plan of action to safely handle, neutralize, and dispose of the explosives involved.
F. An individual familiar with the specific Federal, State, and local regulations governing the handling of misfires.

6.4. Blasting Records

The blaster-in-charge shall complete a Blasting Record after each blast that identifies the following;

A. Customer Name
B. Date/Time of blast
C. Location of the blast
D. Timing Diagram
E. Drill pattern
F. Hole diameter
G. Hole depths
H. Sub-drill depth
I. Stemming type and depth
J. Total number of holes in blast
K. Distance and direction to nearest structure
L. Scaled distance
M. Maximum pounds per delay
N. Typical hole diagram
O. Description of products used in blast including;
1. Manufacturer's name
2. Product name
3. Product size
4. Product quantity used
P. Location of seismograph (distance & direction from blast)
Q. Ground vibration and air overpressure results
R. Date of last Manufacturer's calibration
S. Blaster's signature

The Blast Record shall contain all the information required to re-create the blast site, locate blast holes and shot/loading details. The Blast Record is a legal document and must meet the Federal, State, and local regulation regarding the documentation of a blast.

6.5. As-Built Blast Reports

A diagram of the blast pattern after the blast indicating any holes not drilled, holes drilled but not loaded, additional holes drilled, charge in hole spacing (decking) changes in pattern of delay or changes in loading of holes. Include notes as to why changes were made.

Comments by the Blaster-in-Charge regarding misfires, unusual results or unusual effects. Date and exact firing time of blast and name, signature and license number with expiration date of the Blaster-in-Charge.

7.0. EXPLOSIVES HANDLING PROCEDURES

7.1. Transportation and Delivery of Explosives

All explosives shall be transported and delivered to the site in accordance with all applicable federal, state and local codes, laws, regulations and ordinances.

The blasting contractor and/or the explosive delivery company must show evidence of compliance of the following requirements:

A. Copy of driver's current CDL with HAZMAT endorsement,
B. Current USDOT HAZMAT Certificate of Registration,
C. Maintain a current California HAZMAT Transportation License,
D. Current enrollment in a drug screening program according to USDOT CFR Title 49 regulations.
E. Maintain a general liability insurance policy for explosive transportation for not less than $5,000,000.

All vehicles and explosive transport magazines are to conform to all Federal, State and local regulations associated with the transportation and handling of explosives. All drivers of explosive laden vehicles shall be properly trained and licensed in accordance with all Federal, State and local agencies and regulations.

7.2. Use and Handling of Explosives

The blasting contractor shall possess the following:

A. A current Explosive License or Permit issued by the BATF&E for the proper classification of operation.
B. Current "Responsible Persons" and "Employee Possessor" forms for all applicable personnel.
C. Current "Certificate of Eligibility" for all applicable personnel.
D. A current MSHA Identification Number.
E. Current Part-46 training and refresher training documentation.
F. A current CAL-OSHA Identification Number.

The use and handling of all explosive materials shall be done by fully trained and experienced personnel. All Blasters shall possess a current blasting license issued by CALOSHA and be experienced in quarry blasting. All of the blasting contractor's employees must be trained in accordance with CAL-OSHA and MSHA requirements and possess certification of such training. All persons that handle explosive materials, have control over them, or access to them, must not be persons prohibited as defined in Section 555.11 of CFR (ATF Rules).

The blasting contractor shall provide and maintain, on site, all required and necessary **Material Safety Data Sheets (MSDS)** for inspection and use in the event of an emergency. All unused explosive material shall be properly removed from the premises.

7.3. Storage of Explosives

No explosives are to be stored on site.

8.0. PRE-BLAST NOTIFICATION AND SURVEY

8.1. Notification

At least 30 days before initiation of blasting, the blasting contractor or their agent shall notify, in writing, all residents or owners of dwellings or other structures located within 1500 feet of the permit area of upcoming blasting operations. Resident/owner notifications shall include the following information:

A. The blasting contractor's name, address and telephone number.
B. That a pre-blast survey is available at no charge.
C. The purpose of the pre-blast survey.
D. Requests for a pre-blast survey must be made in writing and sent directly to the blasting contractor.
E. A 24-hour notification of actual date and approximate time of blast before a blasting event.

8.2. Pre-Blast Survey

Upon receipt of a request for a pre-blast survey, the blasting contractor or their agent shall complete a pre-blast inspection and prepare a report that documents the existing condition of the structure and surrounding facilities or improvements. An updated survey of any additions, modifications, or renovations shall be performed by the contractor, if requested by the resident or owner.

Documentation of the existing conditions of the structures and improvements shall be made by identifying and recording all visible cosmetic and structural defects using a high quality video camera with accompanying soundtrack. Time and date shall be displayed on the video media. Significant defects shall also be documented with high quality still photographs where appropriate.

8.3. Pre-Blast Survey Report

The pre-blast survey report shall include a summary of the survey and include any diagrams, field notes, sketches and videos and photos of the surveyed structure(s) and be signed by the person who conducted the survey. Copies of the report shall be provided to the person requesting the survey. If the person requesting the survey disagrees with the content contained therein, he or she may submit to the blasting contractor or their agent, a detailed description of the specific areas of disagreement. Disagreements shall be noted in the report and field checked to satisfy the person of concern. Any surveys requested more than 21 days before the planned initiation of blasting shall be completed by the blasting contractor or their agent before the initiation of blasting.

9.0. BLAST MONITORING PLAN

9.1. Monitoring

Las Pilitas Resources shall employ a qualified person to monitor the ground vibrations and air-overpressure of the blasts.

Las Pilitas Resources shall furnish, install, operate and maintain a minimum of one vibration seismographs to be deployed at the perimeter of structures of concern and based on the calculations of the predicted vibration levels for each blast.

9.2. Vibration and Air-Overpressure Limits

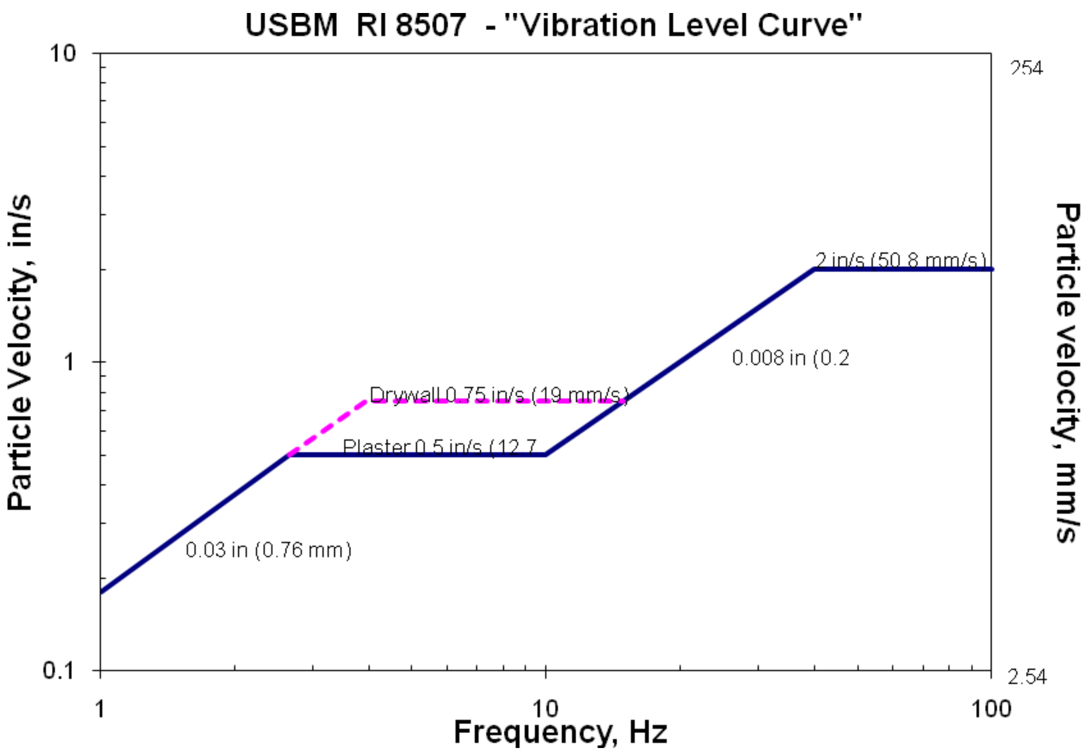
Monitor vibrations by measuring the peak particle velocity (PPV) in the ground adjacent to the structure or point of concern. PPV is defined as a maximum of the three velocity components measured in three mutually perpendicular directions at any point in time.

Based on the San Luis Obispo County vibration regulations (Title 22 – Land Use, Chapter 22.10, section 22.10.170-Vibration) the site and its operations are exempt from county standards, however, as a good neighbor policy, generally accepted vibration levels should be considered and are shown in the following table.

Structure Type	Vibration Frequency (cycles/second)	Peak Particle Velocity (inches/second)
Relatively new residential structure with wallboard walls	Below 40 Above 40	0.75 2.0
Older residential structure with plaster walls	Below 40 Above 40	0.5 2.0
Industrial (more substantial than residential)	--	2.0
Buried utility pipe, cable or utility poles: Government owned concrete or steel structures; grouted or treated foundations or embankments	--	2.0
Steel pipes, high pressure pipelines or high strength steel reinforced concrete foundations such as those associated with heavy civil structures	--	4.0

Air-overpressure shall not exceed 133 decibels (dBL) or 0.0129 psi.

The "Safe PPV Limits" for various frequencies of ground recommended by the US Bureau of Mines (USBM), are represented by the curve shown below (Siskind et al, 1980). These limits, usually applied in most California jurisdictions, are specifically intended to protect typical wood frame homes. Significantly higher PPV limits, ranging from 5.0 to 20 in/s, are used to protect buried pipes and other heavy civil structures (Revey, 2006).



A typical quarry blast program would cover an area of approximately 200 feet in length by 50 feet in width by 50 feet deep. This equates to approximately 18,500 cubic yards. The blasting pattern would be 10 foot by 10 foot with 4½-inch diameter drill holes drilled 50 feet deep, plus an additional 5 feet of sub-drilling. These holes would be loaded with a 1 pound cast booster and an emulsion product of ammonium nitrate and fuel oil (ANFO) to a level of about 10-feet below ground surface (bgs). The space from 10-feet bgs to surface would be backfilled with crushed rock for stemming to confine the explosive energy to the rock being blasted. This explosive volume of 45 feet of loaded hole would yield approximately 263 pounds of explosives per hole. Since controlled blasts are initiated on a delay system, each hole detonates individually (this is based on the 8 millisecond (ms) delay rule which considers the maximum charge weight that is detonated within any given 8 ms time interval).

For the above stated blasting program, it would be common to start the blast by initiating 2 holes together and then delaying the remaining holes in a specific pattern chosen by the blaster. If we use the explosive volume of 2 holes, the maximum pounds per delay would be 526 pounds (2 holes X 263 pounds per hole = 526 pounds).

9.2.1. Peak Particle Velocity

Predictions of peak particle velocity (PPV) values are calculated using the maximum pounds per delay and the distance to the nearest structure of concern. Using the following industry standard equation, an estimation of the PPV can be calculated:

$$PPV = 242[D/W^{1/2}]^{-1.6}$$

Where PPV is in inches/second
242 is the upper bound factor for typical data*
D is the distance (in feet) from the impact
W is the maximum weight of the explosives per delay, in this example, 526 pounds).
-1.6 is the attenuation slope

*The upper bound factor, also known as the H factor, is for typical down-hole blasting which means that approximately 90% of the time (at random sites) the vibration level will not exceed this amount (Oriard, 2002).

The calculated vibration levels for the typical quarry blast outlined above and using variable distances (D) to structures of concern, vibrations predicted for distances between 300 feet and 1,000 feet are as follows:

Predicted PPV (in/sec)*	**H Factor**	**Distance (in feet)**	**Maximum Pounds per Delay**
3.96	242	300	526
2.50	242	400	526
1.75	242	500	526
1.30	242	600	526
1.02	242	700	526
0.82	242	800	526
0.68	242	900	526
0.58	242	1000	526

***** It must be noted that the H factor is only an estimate (and expectedly conservative). The geology at the site will determine the actual H factors. Homogeneity and hardness of the rock, the number of fractures and amount of decomposing granite all affect the actual vibration levels. It is not uncommon for granite rock to have H factors that range from higher than 400 to as low as 40, however these extremes are rare. Typical H factors range from around 100 to

250. As the H factor decreases, the expected vibration levels will also decrease, conversely, the greater the H factor, the greater the expected vibration levels. Test blasts must be performed in order to determine a typical range of H factors prior to production blasting.

9.3 Instrumentation Requirements

A direct reading velocity seismograph that adheres to the performance specifications for blasting seismographs adopted by the International Society of Explosives Engineers (ISEE) shall be used to monitor ground vibration and air-overpressures resulting from blasting operations.

Seismographs shall be considered approved only if the instrument meets the following criteria, as suggested by the International Society of Explosives Engineers (ISEE):

9.3.1. For ground vibration measurements, the instrument shall:

1) have a frequency response range from 2 – 250 hertz, within zero to -3 dB of an ideal flat response.
2) have an accuracy of ± 5% or 0.02 in/sec, whichever is larger between 4 and 125 Hz.
3) have a seismic range from 0.02 in/sec. to 10 in/sec.

9.3.2. For air overpressure measurements, the instrument shall:

1) have a flat frequency response over the range of 2 to 250 hertz between -3dB roll off points.
2) have an accuracy of ± 10% or ± 1 dB, whichever is larger, between 4 and 125 Hz.
3) have a range of 88 to 148 dBL

9.3.3 The instruments must also have the following:

1) A digital sampling rate shall be 1024 samples/sec or greater, per channel.
2) shall be capable of measuring and recording particle velocity in three mutual perpendicular directions.
3) shall be capable of performing a dynamic field calibration during monitoring and shall be calibrated on a yearly basis.
4) Current calibration certificates must available, upon request.

10.0. RERENCES

Oriard, L.L. (2002). Explosive Engineering, Construction Vibrations and Geotechnology. International Society of Explosive Engineers: Cleveland, OH.

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