Rock Splitters Inc.

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May 14, 2020

Szecon Development
PO Box 27
Andover, MA 01810

Re: Proposed Blast Plan
Patrick's Place
Melrose, MA

Dear Mr. Sean Szekley:

The following document provides the processes and proposed blast plan for the excavation of bedrock in the project identified above. These processes and procedures are followed by Rock Splitters Inc. (RSI) employees to ensure the safe use of explosives.

Safety

It is the policy of Rock Splitters, Inc. to ensure that all employees are aware of and properly trained in the recognition, control, transport and use of Explosives and to observe all State and Federal Laws and Regulations. All employees on this project will have the appropriate licensing and Certifications required by the State of Massachusetts. Prior to the transport of any hazardous material for any project or transfer the Blaster in Charge involved with the project will according to the Rock Splitters, Inc. Safety Plan Section 13.5 perform a Job Safety Analysis (JSA).

All blasts will be monitored with seismographs set up in accordance with the I.S.E.E. Field Practice Guideline for Blasting Seismographs. The seismographs will be set up prior to each blast at the closest structure(s) to the blast and all readings will be provided to the Melrose Fire representative on site.

Misfire procedure will follow the 527 CMR 1 and referencing NFPA 495 10.5 which follows:

"10.5 Misfires.

10.5.1 Where a misfire is found, the blaster-in-charge shall provide the proper safeguards for excluding all personnel from the blast area.

10.5.2 Misfires shall be reported to the supervisor immediately.

10.5.3 No additional work, other than that necessary to remove the hazard, shall be performed.

10.5.3.1 Only those persons needed to do such work shall remain at the blast site.

10.5.4 No attempt shall be made to extract explosive materials from a misfired hole.

10.5.4.1 A new primer shall be inserted, and the hole re-blasted.

10.5.4.2 Where re-blasting presents a hazard, the explosive materials shall be permitted to be washed out with water, or, where the misfire is under water, blown out with air.

10.5.5 Whenever there is a misfire, all personnel shall remain at a safe distance for at least 15 minutes (30 minutes if electronic or cap and fuse initiation is used).

10.5.6 Misfires shall be the responsibility of the person in charge of the blasting operation.

10.5.7 Where a misfire is suspected, all initiating circuits (electric or nonelectric) shall be traced carefully and a search made for unexploded charges.

10.5.8 No drilling, digging, or picking shall be permitted until all misfires have been detonated or until the authority having jurisdiction approves the resumption of work."

Blasting Procedures

Prior to the start of any blasting project RSI performs a site visit to obtain firsthand knowledge of any potential constraints or concerns presented by the City/Town, physical site, client or abutters. The most prominent concerns RSI has found with this site riprap wall on an adjacent property approximately 80.0 feet from the proposed blasting. The following procedures express the methods we will employ to safely minimize the above concerns. The technical section that follows illustrates the actual blast design that will allow us to achieve a safe and productive outcome on this project.

Prior to any blasting taking place a pre-blast survey will be offered to all residents within 250 feet of any area being blasted. These surveys are in compliance with Mass. 527 CMR 1 and are paid for by RSI.

We will begin by performing a test blast adjacent to an area that is already to grade, which will provide relief for the blast. The purpose of the test blast(s) is to determine rock response, peak particle velocities (PPV's) and fragmentation results based on our proposed blast patterns, borehole diameters and product selection. It is important to note that all blasting will be directed toward the pre-excavated area for maximum relief.

To minimize the potential for fly rock or excessive air overpressures we will be using rubber mats to cover all blasts. As an additional measure to minimize the potential for fly rock, excessive air overpressures or excessive ground vibrations each impending blast location will have the faces excavated to provide for proper relief and allow the blaster in charge to view conditions prior to loading any blast holes in the proposed round.

Blast Warning Signal signs will be placed according to the requirements of 527 CMR 1 and additional signs will be posted at all potential entries to the site. Prior to the initiation of any blasts it is our blaster in charge that will be responsible for ensuring the designated blast site and blast area are cleared of all non-essential personnel. Once this has been established our Blast Warning Signal sequence may begin. We currently use electric rechargeable sirens with an audibility of greater than 500 feet. The Blast Warning Signal sequence is as follows: Warning Signal, three long blasts/whistles/sirens five (5) minutes prior to the shot, Blast Signal, two long blasts/whistles/sirens one (1) minute prior to the shot and the All Clear Signal, one long blasts/whistles/sirens after the blast area has been inspected by the blaster in charge.

Test and Production Blasting Technical Data

Our first test blast is designed for a 4.0 - 5.0 foot cut using a borehole depth of 8.0 feet. Spacing of the holes will be 4.0 feet and the burden will be 4.0 feet and the initial borehole diameter is to be 2.50 inches. The maximum depth of blasting for the drain trench is 8.0 feet. The production profile underneath utilizes a 5.0 foot burden by 5.0 foot spacing designed for a7.0 - 10.0 foot cut with a total depth of 12.0 feet. This spacing is typical for small production blasting. The explosives will be initiated using a non-electric system and we will be initiating one hole per delay. The diagram below shows the plan view of the pattern with the timing sequence and the profile shows a typically loaded hole. The encircled numbers are in milliseconds. This will maintain one hole per delay.

We are providing two profile scenarios for the expected site conditions; the first is for the test blast and production blasting if the results meet expectations, the second scenario illustrates a broader pattern for areas requiring deeper cuts and to accommodate local site conditions. This is necessary as the type of explosive product will vary according to local geologic and site conditions. Please note that the positioning of the millisecond delay initiators allows the blaster to control the movement and direction with a great degree of accuracy. The table below the diagrams shows the expected peak particle velocities for the average bounds of experience where $K = 160$ which is the value adopted in the formula accepted by the State of Massachusetts for predicting peak particle velocity.

Test and Production Blast Timing Sequence (4.0 ft. by 4.0 ft. x 8.0 ft.)

e 88000

e 60000

e 80000

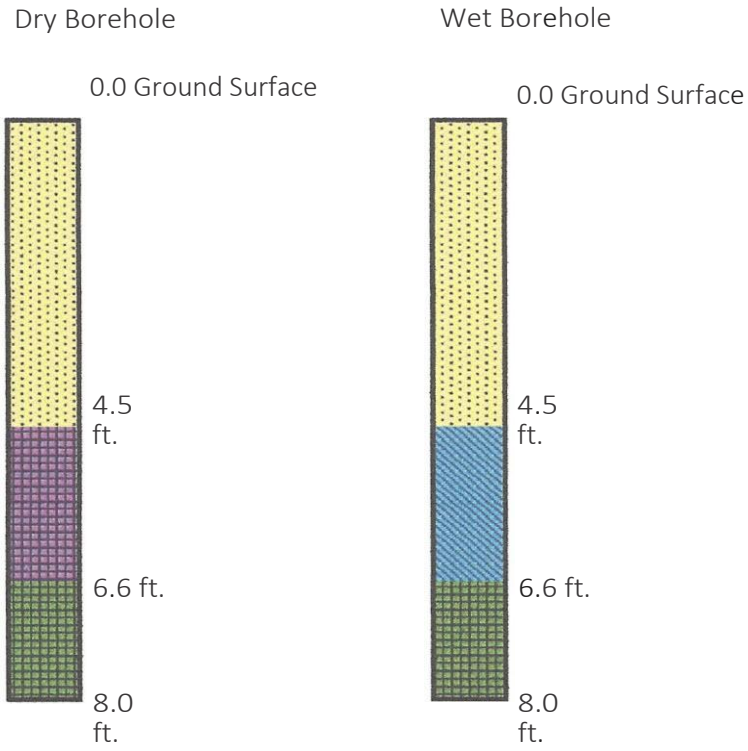
Test and Production Blast Timing Sequence (5.0 ft. x 5.0ft. x 12.0ft.)

800088

GG80GG

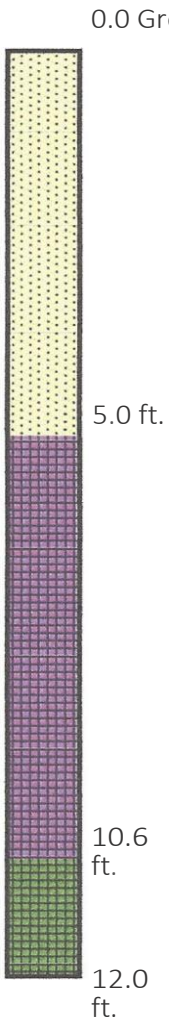
G8G8GG

Explosive Column Loads

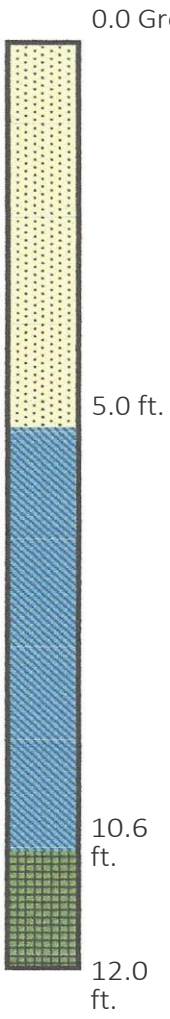


NOT TO SCALE

Dry Borehole



Wet Borehole



NOT TO SCALE

In the above column load diagrams, the products used are as follows:

Stemming - 3/8-inch crushed stone

Amex AN prills. Amex has an S.G. of 0.84 glcc with a VOD of 13,000 ft/s. This product is not detonator sensitive.

Fortel Extra 2.0 x 16.0. Fortel extra is a booster sensitive emulsion with an S.G. of 1.26 g/cc with a VOD of 16,000 ft/s,

PowerPro 1.5 x 16 Extra gelatin with an S.G. of 1.51 g/cc, average weight per stick 1.92 pounds. Extra Gelatin is detonator sensitive with a VOD of 17,400 *ftls*

The table below displays the expected peak particle velocities at varying distances from the blast. The accepted formula used for predicting peak particle velocity (PPV) is I60(SDy1.6. Where 160 often referred to as the K factor is a variable that reflects the average rock response during typical construction blasting. The 160 factor has been accepted and is required for use when submitting blast analysis plans in accordance with CMR 1. Depending on rock mineralogy and quality i.e. competence, frequency of jointing or fracturing the K factor may be found to be greater or less than the average of 160. SD, known as scale distance is the ratio of the actual distance to the area of concern divided by the square root of the maximum pounds of explosive initiated during an 8 millisecond period.

Peak Particle Velocity (PPV) Prediction Table				
Distance (ft.)	Scale Distance	Scale Distance	PPV from trench blast	PPV from production blast
50	21.74	14.71	1.16	N/A
60	26.09	17.65	0.87	N/A
70	30.43	20.60	0.68	N/A
80	34.78	23.54	0.55	1.02
90	39.13	26.48	0.45	0.85
100	43.48	29.42	N/A	0.71
125	54.35	36.78	N/A	0.50
150	65.22	44.14	N/A	0.37
175	76.09	51.49	N/A	0.29
200	86.96	58.85	N/A	0.24
225	97.83	66.21	N/A	0.20
250	108.70	73.56	N/A	0.16

The table below lists the anticipated elastic displacement values using the maximum predicted peak: particle velocities from the table above.

Elastic Displacement Prediction Table

Distance from blast	Max. Wt. lbs.	PPV (in/s) @ K=160	Lowest expected frequency (Hz)	Elastic Displacement (in.)
50	5.29	1.16	40	0.004618627
60	5.29	0.87	40	0.00345003
70	5.29	0.68	40	0.002695926
80	5.29	0.55	40	0.002177313
90	11.55	0.85	40	0.003368045
100	11.55	0.71	40	0.002845548
110	11.55	0.61	40	0.00244308
120	11.55	0.53	40	0.002125573
130	11.55	0.47	40	0.001870064
140	11.55	0.42	40	0.001660967
150	11.55	0.37	40	0.001487373
160	11.55	0.34	40	0.001341448
170	11.55	0.31	40	0.00121744
180	11.55	0.28	40	0.001111041
190	11.55	0.26	40	0.001018967
200	11.55	0.24	40	0.000938681

It is important to note that the above timing, spacing and explosive's types are proposed based on previous experience. Unseen geologic conditions may warrant changes in any or all of the parameters related to the blasting in order to maintain public safety.

As mentioned in the Blasting Procedures, relief is tantamount in ensuring safe blasting. Relief is the area which allows the expanding fragmented rock to safely move allowing for a high degree of control in designing and directing the results of a blast.

To advance and capitalize on the safety provided by the above conditions RSI is confident that by limiting shot size that blasting can safely be conducted without producing excessive vibration or air-blast and eliminating the opportunity for fly rock.

We appreciate having the opportunity to assist in this project and request that if you have any questions or concerns regarding this document you contact us at once.

Respectfully,

Brian W. Decot
President

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