PART III-C

BLASTING PLAN

PREPARED BY:

Michael E. Curtis

Blaster's Number
02453-04/14

III-C BLASTING PLAN

1. Ground vibration and airblast control.

(a) Check which of the following procedures will be used to limit ground vibrations?

(X) Maximum Peak Particle Velocity (By Seismograph)

Distance from Shot to Site	Maximum Peak Velocity
0 - 300 feet	1.25 inches/sec
301 - 5000 feet	1.00 inches/sec
5001 - beyond	0.75 inches/sec

( ) Scaled Distance Factor

Distance from Shot to Site *	SD Factor
0 - 300 feet	50
301 - 5000 feet	55
5001 - beyond	65

( ) Modified Scaled Distance Factor
(Approval from the Commission is required before this method can be used.)

( ) Blasting-Level Chart
(Approval from the Commission is required before this method can be used. See attached sheet.)

* Identify the structure used for measuring the scale distance. See "Scaled Distance Factor" above.

(b) Check which of the following maximum levels and corresponding microphone lower frequency limitations will be used.

( ) 105 dB peak - c-weighted - slow response *
( ) 129 dB peak - 6Hz or lower
(X) 133 dB peak - 2Hz or lower
( ) 134 dB peak - 0.1 Hz or lower *

2. Describe what variations will be made in the blasting operations to control and correct adverse effects due to blasting.

a) All designs will vary to obtain proper breakage and remain within the legal limits.
b) Delays will be varied to allow for longer delays between the rows than holes to promote forward rather than upward burden movement.
c) The drill pattern will be altered as needed. Variations to the detonation pattern to adjust the frequency of the vibrations of the blast in the direction of any structures.
d) The delay sequence will be adjusted as needed to control ground vibrations.
e) Stemming material (in this case) will be varied to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
f) Prior to the charging of a blast pattern, the drill operator will be consulted to determine if any litho logic changes, voids, or zones of weakness in the rock were noted during the drilling. If so, the charging sequence will be varied to accommodate these areas, by placing little or no explosives in the litho logic changes, voids, or zones of weakness to prevent blowouts.
g) The delay sequence will be adjusted as needed to control fly rock.
h) Increase stemming depth.
i) Varying burden and spacing distances.
j) If a blast is oriented where the primary or secondary relief face is positioned in the direction of an uncontrolled structure, and within 1500 feet of said structure, the burden and space on the corner hole will be increased to a distance equal to 1.5 times the normal design moving the hole at a near 45° angle away from the corner. Additional top stem will be added if needed to insure protection from ejection from the upper portion of the corner.

3. BLAST MONITORING

(a) Describe the blast monitoring equipment to be used (make and model). Will it monitor ground vibrations, air blasts, or both?

NOMIS 5200 - 2 Hz - Both or Equal Equipment
NOMIS 5300 - 2 Hz - Both or Equal Equipment
SSU1000D - 2 Hz - Both or Equal Equipment

(b) How will monitoring equipment be installed and activated?

Equipment will be installed on a temporary basis for one individual shot or on a semi-permanent basis for 24-hour monitoring. The equipment will be activated by the ground vibrations or airblasts. Transducers will be buried.

(c) Show the location of blast monitoring stations on the Permit Map or on a separate map with a scale of 1:24000 or smaller.

4. Is blasting proposed to be conducted within 500 feet of an active underground mine?

( ) YES (**X**) NO

If yes, concurrence from MSHA is required.

5. Will blasting be conducted within 500 feet of an abandoned underground mine or within 1000 feet of an occupied dwelling, church, school, community or institutional building?

(**X**) YES ( ) NO

If yes, provide the following information, either as a part of the permit application or at a later date, but before reaching the distance given above.

(a) A sketch showing the drill patterns to be used.
(b) Critical dimensions, i.e., burden, spacing, stemming, drill hole diameter, etc.
(c) Delay periods.
(d) Amount of decking.
(e) Type and amount of explosives to be used, including the loading weight (lbs. per foot of drill hole)
(f) Location and general description of the structures to be protected.
(g) Discuss the measures to be used in the blasting operations to protect the public from adverse effects of blasting.
(h) The plans are to be prepared and signed by a Certified Blaster.

See Attached Sheets.

6. **At what times will blasting be conducted?**

Monday through Saturday - Sunrise to Sunset

7. **Blasting signs, Warnings and Access Control**

Access will be controlled by using signs specifying "Blasting Area" on all roads to the blasting site. When charged holes are awaiting firing, the immediate area will be guarded or flagged against unauthorized entry. The Applicant's personnel will block all access roads to blasting area ten (10) minutes prior to detonation until an all clear is determined by an authorized representative of the company. Prior to detonation of blasts, the blast area, and all public roads within one thousand (1,000') feet measured horizontally from actual blast holes will be blocked off by employees to prevent entry. Any public water way will be monitored for individuals prior to blasting within one thousand (1,000') feet. Any personnel working on or near the rail road will be cleared when in the blast area. Mine management will be oriented to monitor the rail way during blasting and will have emergency telephone numbers available if needed. Audible warning signals will be given by horn located at or near the blasting site. Three (3) people will coordinate the blasting; the blaster, signalman and superintendent of the mine. The superintendent will clear the area and communicate with the blaster and signal man. Once a head count is taken the superintendent and the blaster will communicate to ensure the area is still clear. After verification the area is still clear the go ahead to blast will be given. After the blast the blaster will make sure the blast was successful and that no problems exist. He will then communicate with the signalman to sound an all clear and workers can return to their work area.

Warning signals will be as follows: Three (3) long soundings with a pause between for a warning, a five (5) minute wait, then two (2) long soundings with a pause between, then shoot, one (1) long sounding for an "all clear" signal after detonation.

8. Will blasting operation be conducted within 300 feet of an occupied dwelling, church, school, community or institutional building?

( ) YES (**X**) NO

Attachment III - C- 5

Typical Blast Design
Inside 1000 Feet of an Occupied Dwelling or Abandoned Underground Mine

Diameter of boreholes will range from 5 ½ inch to 7 7/8" inch

Explosives: ANFO with average density of 0.82 g/cc
25/75 blend density of 1.12 g/cc
40/60 blend density of 1.34 g/cc
50/50 blend density of 1.32 g/cc
BLENDS with density up to 1.34 g/cc
Sensitized Emulsion 1.25 g/cc

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Size of drill patterns will vary from as small as (50) feet to as much as (400) feet in length. Width of the bench will typically be 100 to 200 feet. Burden distances will be between (8) and (15) feet and spacing will be between (10) and (20) feet for overburden less than 20 feet. Burdens will be between (10) and (20) feet and spacing will range from (10) to (24) feet for overburden in excess of 20 feet and up to 40 feet. Overburden in excess of 40 feet the burden will range from (10) to (25) feet and spacing will range from (10) to (28) feet. If it all possible the hole depth to burden ratio will be kept above 1.5 to 1

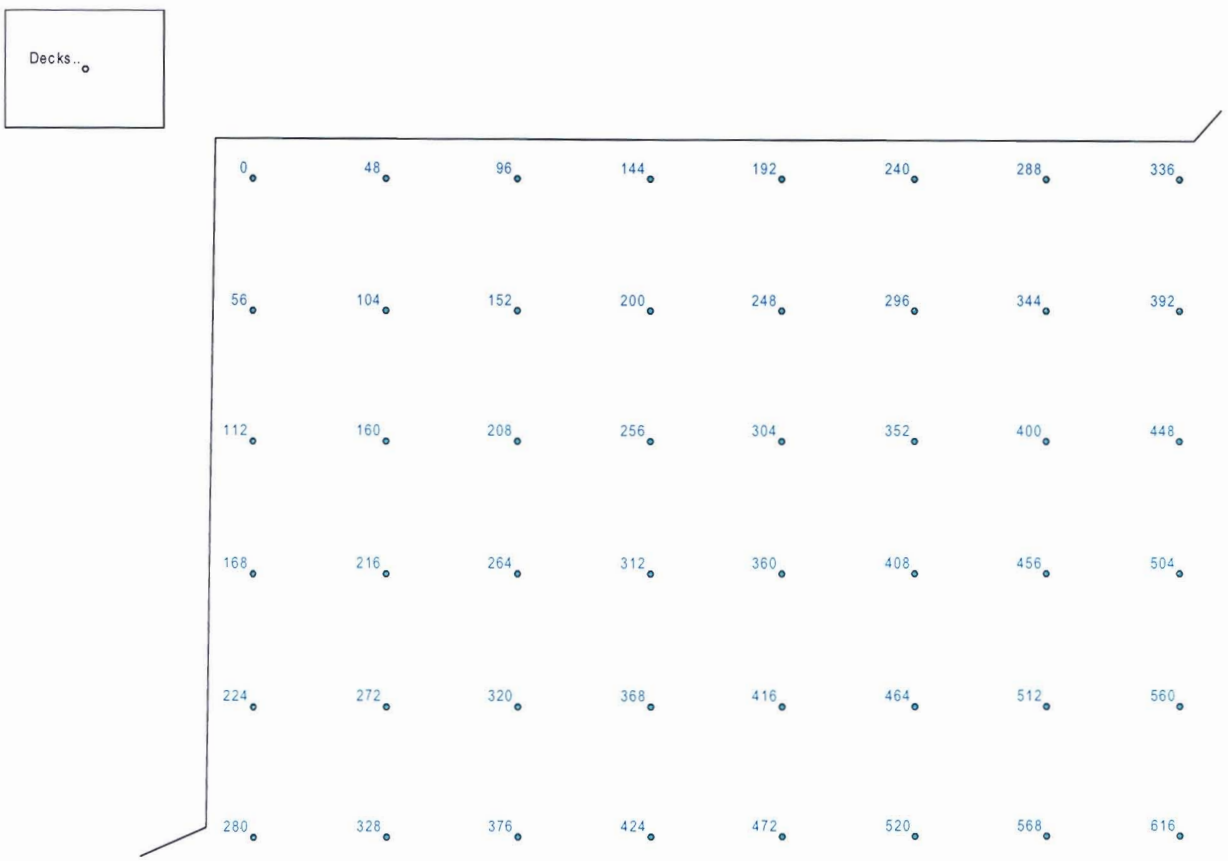
Stemming will be calculated using the ash formula of (.7 to 1.3) X the burden. Example 16B X .7 = (11' 2" min. stemming), if the ash formula is not used 85% of the borehole will be inert material.

Inert Decking will range from (3' to 8') inert material.

(1) Prior to drilling a blast pattern, the bench will be inspected to determine if any geologic inconsistencies are present which could result in weaker zones thus causing a blowout and fly rock. The drill pattern will be altered as needed.
(2) Prior to the charging of a blast pattern, the drill operator will be consulted to determine if any inconsistencies were encountered during the drilling of the blast pattern. If inconsistencies are found, the charging sequence will be altered to accommodate these inconsistencies to prevent blowouts.
(3) The charge column of the blast hole will be closely monitored to ensure that the amount of blasting agents are not in excess of the allowable design
(4) Prior to detonation of blasts the blast area will be patrolled, regulated and blocked off by employees to prevent unauthorized entry. Blast warnings will be given prior to each blast; Three (3) long soundings with a pause between for a warning, a five (5) minute wait, then two (2) long soundings with a pause between, then shoot, one (1) long sounding for an "all clear" signal after detonation. Each blast will be visibly monitored to determine whether or not fly rock occurred. All public roads within 1000 feet of the blast will be blocked prior to detonation of the blast.

Attachment III - C- 5

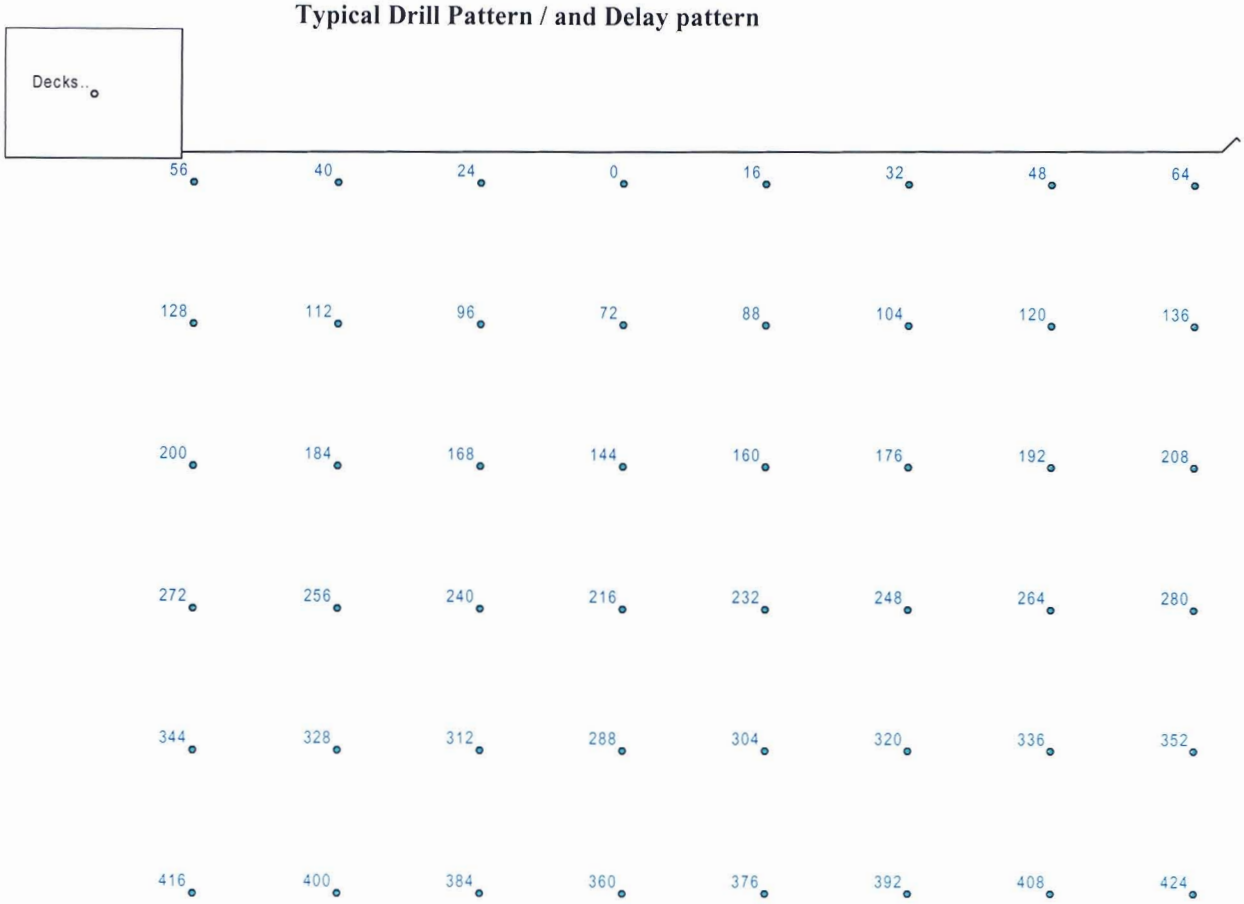
Typical Drill Pattern / and Delay pattern



Blast initiation will be performed with electronic detonators or non-electric detonators. Blasts will be delayed for optimum relief and performance. Timing delays may range from 1 to 10,000 ms.

Attachment III - C- 5

Typical Drill Pattern / and Delay pattern



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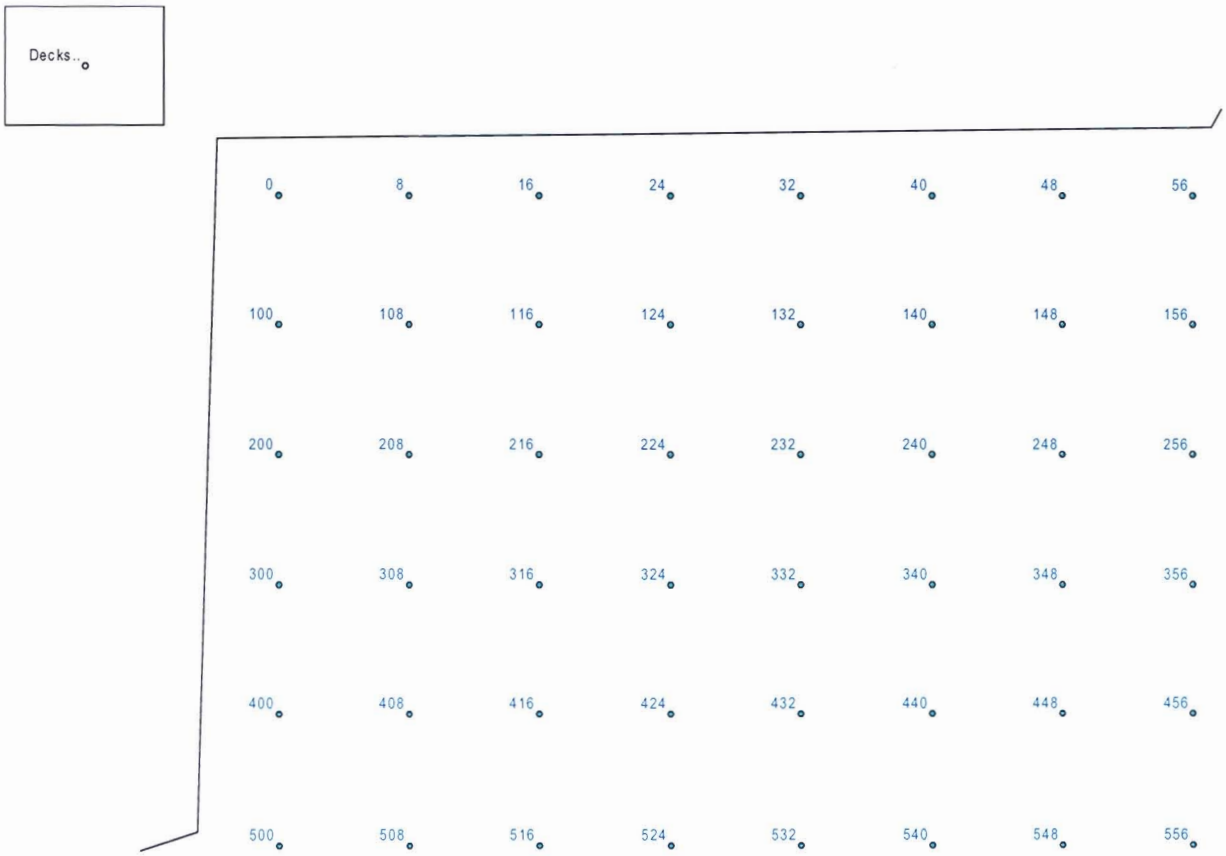

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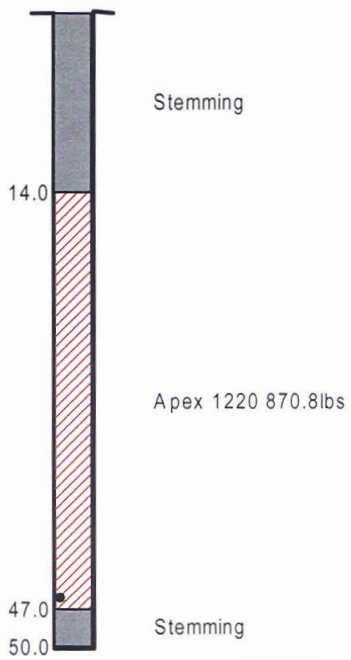
Attachment III - C- 5

Typical Borehole

Decked / Hole

Solid Column



Typical Loading Procedure
Old Underground Works

Burden = 14 ft Space = 14 ft Depth = 25 ft Borehole Diameter = 7 7/8"
Blasting Agent = Powernel 1500 Initiation = Electronic