BIRMINGHAM COAL & COKE CO., INC.
GOODEN CREEK NO. 2 MINE, P-39--

P A R T I I I - C

BLASTING PLAN

PREPARED BY:

_____

Eddie Johnson

Alabama Certified Blaster Number 2035

BIRMINGHAM COAL & COKE CO., INC.
GOODEN CREEK NO. 2 MINE, P-39--

III-C BLASTING PLAN

1. Ground vibration and airblast control.

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

(XX) 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.

Whenever blasting is being conducted within 500 feet of an occupied dwelling of if more than three (3) decks of explosives per hole, seismograph will be used; otherwise scale distance will be used in all other instances.

(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
(XX) 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.

(1) All designs will vary to obtain proper breakage and remain within the legal limits.
(2) Delays will be varied to allow for longer delays between the rows than holes to promote forward rather than upward burden movement.
(3) The drill pattern will be altered as needed. Varying the detonation pattern to adjust the frequency of the vibrations of the blast in the direction of any structures.
(4) The delay sequence will be adjusted as needed to control ground vibrations.
(5) Stemming material (in this case) will be varied to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
(6) 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.
(7) The delay sequence will be adjusted as needed to control fly rock.
(8) Increase stemming depth.
(9) Varying burden and spacing distances.

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 (XX) 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?

(XX) 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 the proximity of the blast area that may be affected by flyrock will be blocked off by employees a minimum of one thousand (1,000') feet measured horizontally from actual blast holes to prevent entry. 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 (XX) NO

ATTACHMENT III-C-2

The primary concerns or primary potential adverse effects caused by blasting are airblasts, ground vibrations, and flyrock. Listed below are measures which will be employed at all times to prevent or minimize airblasts, ground vibrations, flyrock and to protect the public from adverse effects due to blasting operations.

Measures to be employed in an effort to protect the public from adverse affects due to blasting will include the following:

Airblasts will be minimized by:

(1) Covering all surface detonating cords with earthen material to confine their blasts.
(2) By maintaining a stemming of a minimum of twelve (12) feet. The stemming material will consist of drill cuttings. Where the twelve (12) foot minimum cannot be maintained or problems arise, stemming material will be placed in the borehole at least two-thirds of the depth (example 12' borehole will have 8' of stemming). This procedure will be used beyond five hundred (500) feet of an occupied dwelling. However, the Ash Formula will be used if it can be demonstrated in the field to be effective. The Ash formula of 0.7 times the burden will be used to determine the length of the stemming. Stemming material (if the Ash Formula is used) will be varied to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
(3) Burden distance will be maintained at the designed amount to ensure no face blowouts occur causing airblasts.
(4) Drill patterns will be drilled accurately ensuring that the proper burden and spacing is maintained.
(5) Blasting during times of temperature inversions (during the early morning and late afternoons) will be limited.
(6) Delays will be varied to allow for longer delays between the rows than holes to promote forward rather than upward burden movement.
(7) Delaying in rows will be maintained to less than the speed of sound detonation per foot.
(8) Long delays that may cause a hole to become unburdened before it fires will be avoided.

ATTACHMENT III-C-2
(CONTINUED)

Ground vibrations will be minimized by:

(1) Maintaining the designed blasthole patterns.
(2) Limiting the charge weight so as not to exceed the maximum peak particle velocity allowed by law.
(3) Maintaining the proper delays between rows and blastholes.
(4) Varying the detonation pattern to adjust the frequency of the vibrations of the blast in the direction of any structures.
(5) The delay sequence will be adjusted as needed to control ground vibrations.
(6) Where individual blasts are monitored with a seismogragh, as a starting point for the initial blasts, the weight of explosives to be detonated will be determined using the formula scaled distance factor $W = (D/SD)^2$ Factor, where SD Factor = 0 - 300 feet =50, 301 - 5000 feet = 55 and 5001 – beyond = 65, D = distance to receiver structure and W = pounds of explosives detonated per eight millisecond delay. Seismographic data obtained from the blast will be utilized to determine whether the ground vibrations approached the maximum allowable peak velocities shown at III-C.-1.-(a) and the charge weights of future blasts will be adjusted to assure that these maximum velocities are maintained.

Fly rock from a blast will be minimized by:

(1) By maintaining a stemming of a minimum of twelve (12) feet. The stemming material will consist of drill cuttings. Where the twelve (12) foot minimum cannot be maintained or problems arise, stemming material will be placed in the borehole at least two-thirds of the depth (example 12' borehole will have 8' of stemming). This procedure will be used beyond five hundred (500) feet of an occupied dwelling. However, the Ash formula will be used if it can be demonstrated in the field to be effective. The Ash formula of 0.7 times the burden will be used to determine the length of the stemming. Stemming material (if the Ash Formula is used) will be varied to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
(2) Burden distance will be maintained to the designed amount to prevent face blowout due to the burden distance being to small and to prevent blasthole blowout due to the burden distance being to great. Burden distances will be between seventeen (17) and twenty (20) feet and spacing between seventeen (17) and thirty (30) feet.
(3) 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 flyrock. The drill pattern will be altered as needed.
(4) Prior to the charging of a blast pattern, the drill operator will be consulted to determine if any lithologic 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 lithologic changes, voids, or zones of weakness to prevent blowouts.

ATTACHMENT III-C-2
(CONTINUED)

(5) The charge column of the blasthole will be closely monitored to ensure that the amount of blasting agents are not in excess of the allowable design maximum.
(6) The delay sequence will be adjusted as needed to control flyrock.
(7) Prior to detonation of blasts, personnel will block access roads to the blast area and all public roads within the proximity of the blast area that may be affected by flyrock will be blocked off by employees a minimum of one thousand (1000) feet measured horizontally from the actual blast holes to prevent entry. For shots detonated in close proximity to occupied dwellings, a visual inspection of the area will be made and verbal warning given to persons outdoors before the shot is detonated. Blast warnings will be given prior to each blast and all clear signals will be given after the blast when the blaster in charge determines that to be the case. Each blast will be visibly monitored to determine whether or not flyrock occurred.
Variations in the blasting operations that may be employed to control and correct adverse effects due to blasting will include the following:

Airblasts Problems:
Control and Corrective Measures

(1) Increase stemming depth.
(2) Vary stemming material to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
(3) Adjust burden distance to maintain the proper amount for the bore hole diameter.
(4) Have drill patterns lain out by more precise methods to ensure the shots occur as designed.
(5) Cease all blasting during times of temperature inversions (during the early morning and late afternoons).
(6) Increase delay times between the rows to promote forward rather than upward burden movement.
(7) Decrease delay times in holes that may become unburdened before it fires.
(8) Have qualified experts (geologists, blasting engineers, etc.) in the blasting field monitor, analyze and advise as to corrective measures.

Ground Vibrations Problems:
Control and Corrective Measures

(1) Have drill patterns lain out by more precise methods to ensure the shots occur as designed.
(2) Adjust charge weight.
(3) Adjust delay sequences as needed.
(4) Vary the detonation pattern to adjust the frequency of the vibrations of the blast in the direction of affected structures.
(5) Have qualified experts (geologists, blasting engineers, etc.) in the blasting field monitor, analyze and advise as to corrective measures.

Flyrock Problems:
Control and Corrective Measures

(1) Increase stemming depth.
(2) Vary stemming material to consist of sized crushed stone ranging in diameter from 1/4" to 3/4".
(3) Have drill patterns lain out by more precise methods to ensure the shots occur as designed.
(4) Vary burden distances.
(5) Have qualified experts (geologists, blasting engineers, etc.) in the blasting field monitor, analyze and advise as to corrective measures.
(6) In cases were the orientation of the highwall and the advancement of the pits are such that the face of the shot pattern is in the direction of an occupied dwelling creating the possibility that excessive flyrock may be thrown in the direction of an occupied dwelling, the operator or his authorized representative will

inform the resident of the situation prior to the shot, suggest temporary evacuation or that the resident stay inside until an all clear signal has been given.

(7) When more than three (3) rows are to be detonated at one time, provide at least 10 ms per foot of burden delay between rows(i.e. 20 feet of burden will have at least 200 ms delay between the rows)

Attachment III - C- 5

Typical Blast Design
Inside 1000 Feet

Diameter of boreholes will range from 6-3/4 inch to 7 7/8 inch

Explosives: ANFO with average density of 0.82 (12.70 lbs./ft up to 17.31 lbs./ft.)
25/75 blend density of 1.12
40/60 blend density of 1.34
50/50 blend density of 1.32
BLENDS with density up to 1.34 (20.76 lbs./ft up to 28.26 lbs./ft)
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) 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 (12) and (20) feet and spacing will range from (14) 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 (14) to (25) feet and spacing will range from (16) 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 (5’ to 8’) inert material.

The scale distance formula will be utilized on all shots to determine the amount of Explosives detonated in any (8 Ms.) time frame.

(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.

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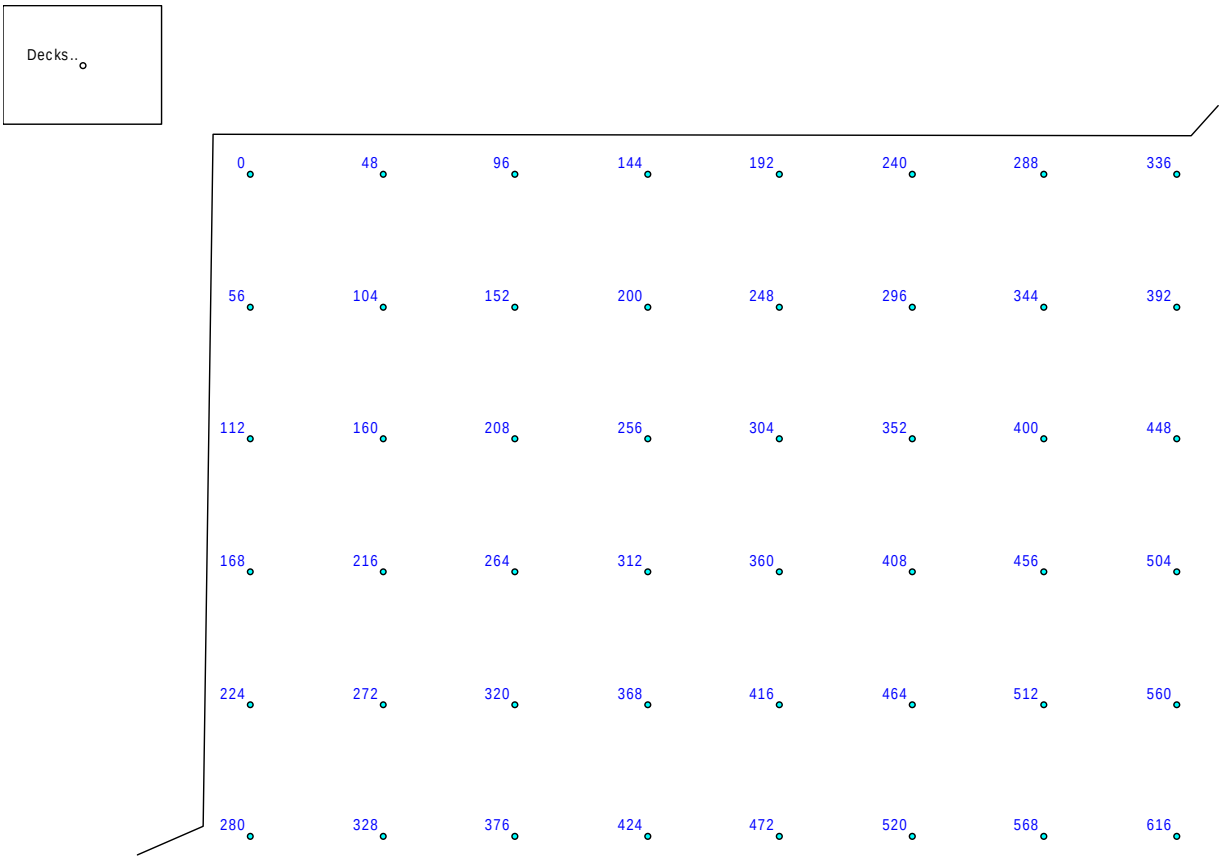
KNIGHT MINE, ASMC #P-3970

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.

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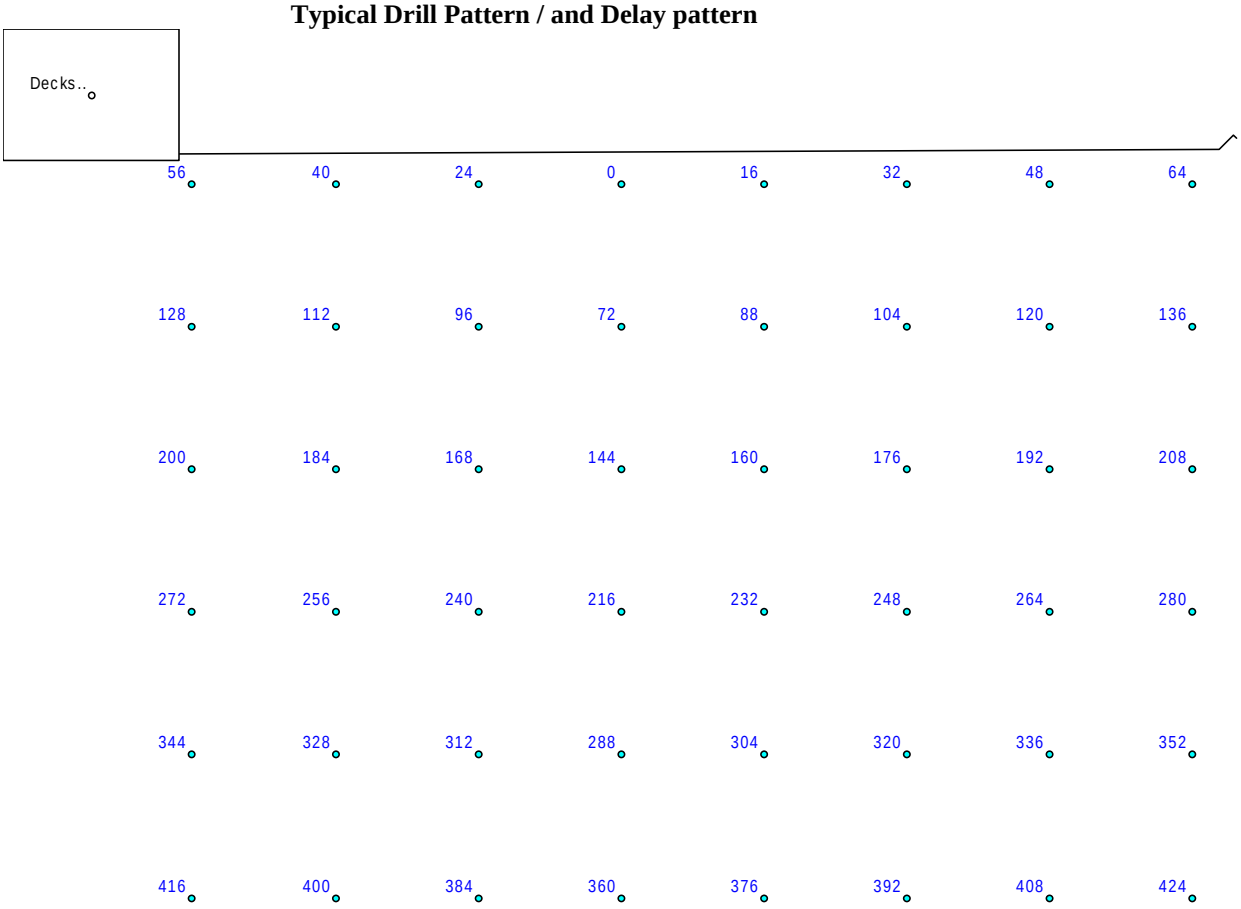
KNIGHT MINE, ASMC #P-3970

Attachment III - C- 5

Typical Drill Pattern / and Delay pattern



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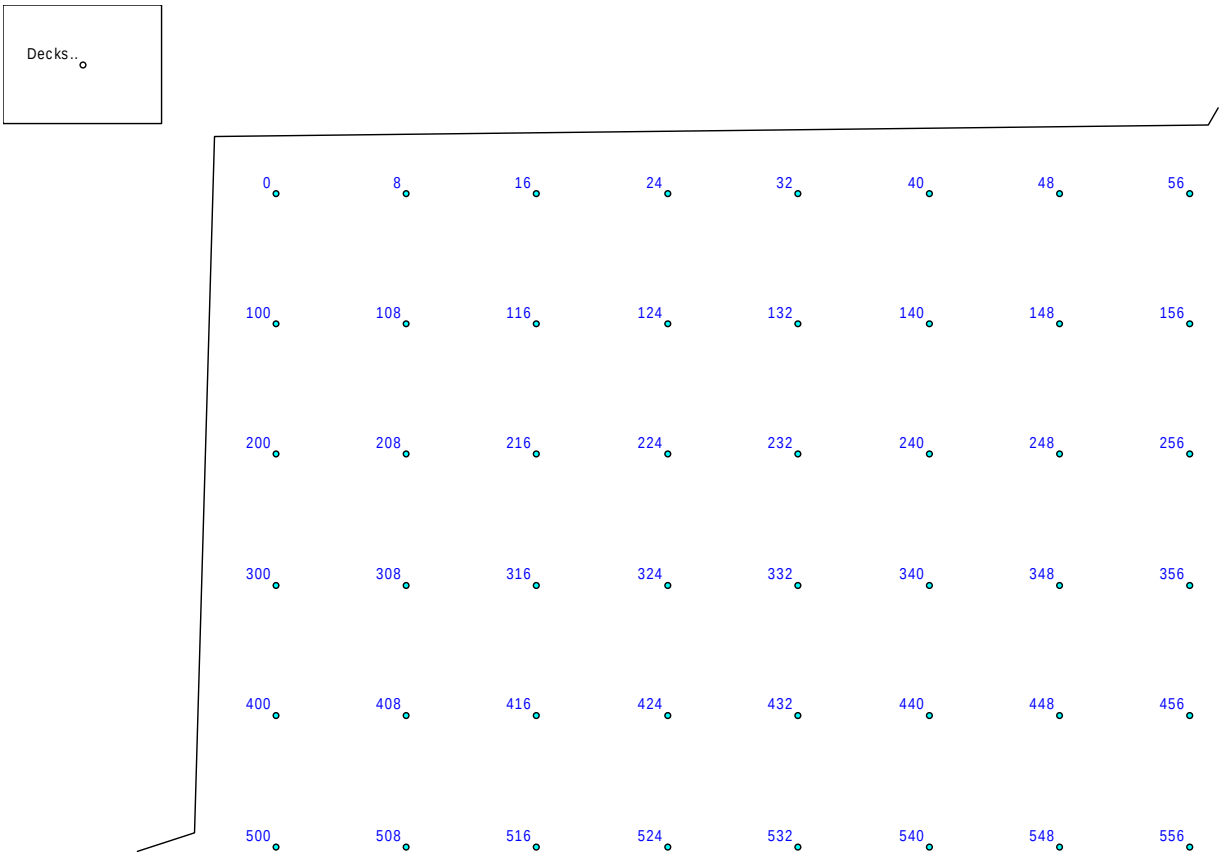
Attachment III - C- 5

Typical Drill Pattern / and Delay pattern



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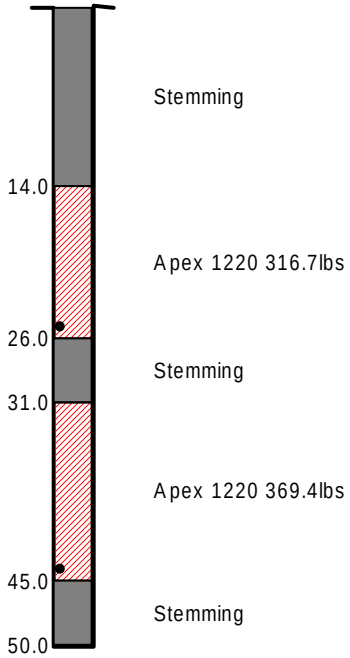
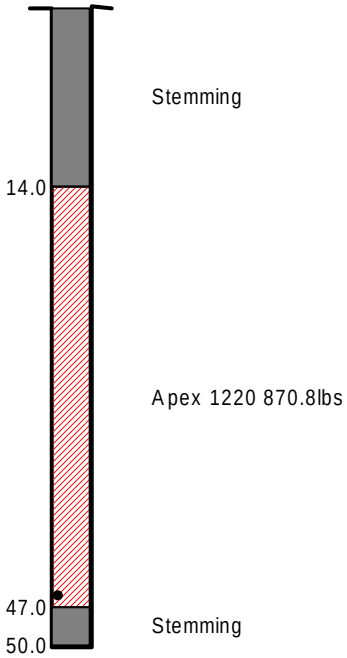
Typical Borehole

Decked / Hole



Solid Column



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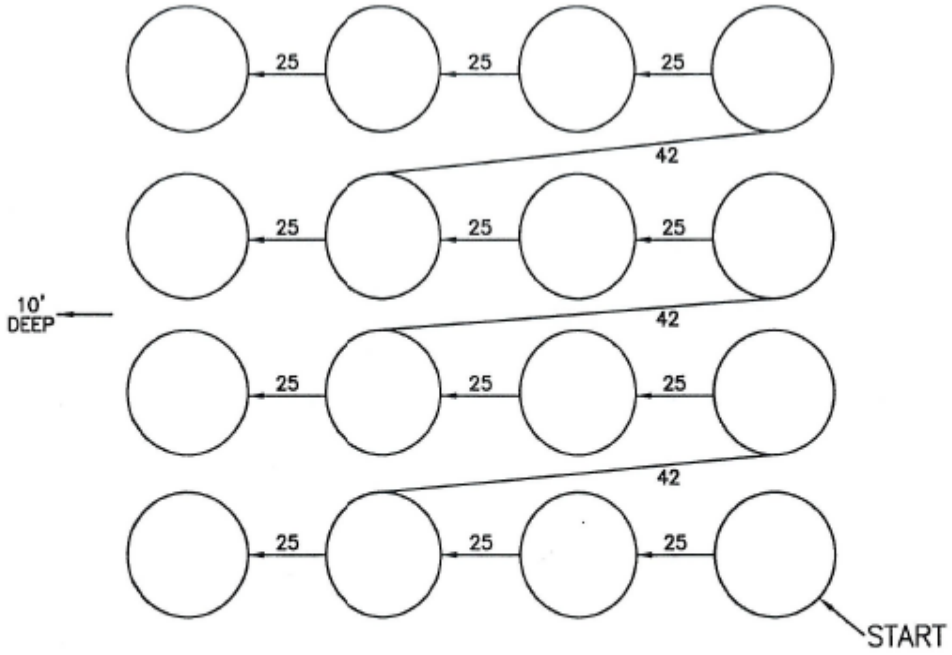

Typical 25/350ms E-Z det
Shot Delay

No Scale

Firing will be NON-ELECTRIC. The primary surface delays for shots will be 9 ms, 17 ms, 67 ms, and 84 ms, with E-Z dets 25/350 ms in the hole or equal. E-Z Dets, Snap Dets, or equal will be used only when there are no decks. For shots with two (2) or more decks the delay patterns in the ensign Bickford book or equal, on delays will be used. Decks will use a combination of downline delays of 500ms, 475ms, 450ms, 400ms, 375ms, and 350ms, or some combination thereof where necessary. In the event that deviations are required the following surface delays may be used: 25 ms, 75 ms, 100 ms, and 200 ms with E-Z Dets 25/350 ms in the hole or equal.

Burden will be determined by multiplying the borehole diameter in feet times 2 to 3. Spacing will be determined by multiplying the burden times 1 to 1.5.

Hole Diameter is 5 ½" – 7 7/8" inches depending on conditions & location.
7 7/8" Hole not allowed within 1000' feet.

Airblast will be controlled by maintaining sufficient stemming & additional burden where needed. Prior to detonation of the blasts area will be patrolled, regulated and blocked by employees to prevent unauthorized entry. Blast warnings will be given prior to each blast and all clear signals will be given after the blast and after the blaster in charge determines that is the case. The above are typical and may vary as conditions dictate.

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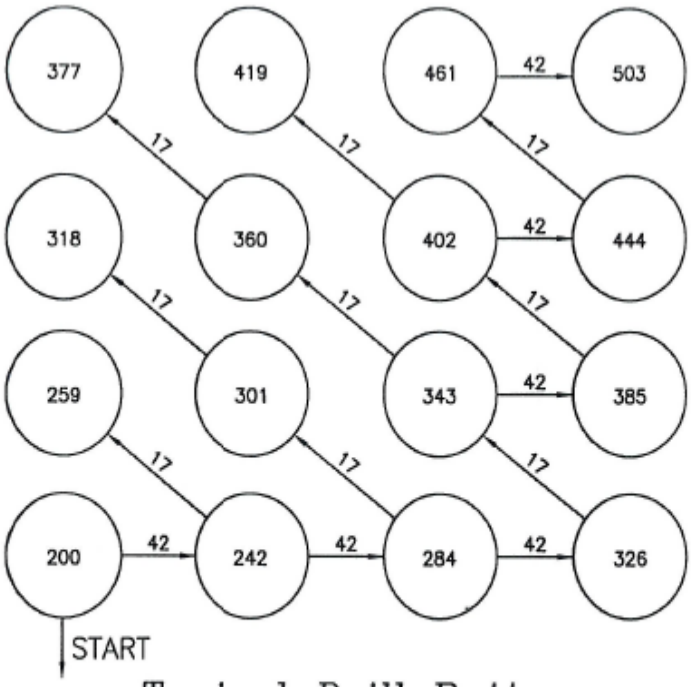

Typical Drill Pattern
Between 1000 Feet and Over

No Scale

Firing will be NON-ELECTRIC. The primary surface delays for shots will be 9 ms, 17 ms, 67 ms, and 84 ms, with E-Z dets 25/350 ms in the hole or equal. E-Z Dets, Snap Dets, or equal will be used only when there are no decks. For shots with two (2) or more decks the delay patterns in the ensign Bickford book or equal, on delays will be used. Decks will use a combination of downline delays of 500ms, 475ms, 450ms, 400ms, 375ms, and 350ms, or some combination thereof where necessary. In the event that deviations are required the following surface delays may be used: 25 ms, 75 ms, 100 ms, and 200 ms with E-Z Dets 25/350 ms in the hole or equal.

Burden will be determined by multiplying the borehole diameter in feet times 2 to 3. Spacing will be determined by multiplying the burden times 1 to 1.5.

Hole Diameter is 5 ½" – 7 7/8" inches depending on conditions & location.
7 7/8" Hole not allowed within 1000' feet.

Airblast will be controlled by maintaining sufficient stemming & additional burden where needed. Prior to detonation of the blasts area will be patrolled, regulated and blocked by employees to prevent unauthorized entry. Blast warnings will be given prior to each blast and all clear signals will be given after the blast and after the blaster in charge determines that is the case. The above are typical and may vary as conditions dictate.