

BLASTING PLAN

(1)(a) Types and Approximate Amounts of Explosives to be used for Each Type of Blasting Operation

Ammonium nitrate, fuel oil (ANFO) and emulsions in bag or bulk form are utilized in normal blasting operations. The amount of explosives used will vary due to geology, required post-blast profile and/or method of extraction, i.e. loading equipment. The approximate average powder factors are anticipated to be as follows: (1) conventional dragline overburden at 0.65 lb/cubic yard; (2) cast blast dragline overburden at 0.95 lb/cubic yard; (3) truck/shovel prestrip overburden at 0.60 lb/cubic yard; and (4) truck/shovel coal at 0.50 lb/ton.

(1)(b)(i) Procedures Used for Drilling Patterns

Blast patterns are designed and engineered to achieve maximum fragmentation and displacement while minimizing vibration and flyrock. Design criteria for a typical blast pattern account for material type, depth of cut, and desired effects (fragmentation or cast blast). Bore hole diameter is selected based on available equipment and desired charge distribution. Using historical powder factors, burden and spacing are selected for the pattern. Holes may be designed for either vertical or angle drilling.

Once designed, the pattern is transferred to on-board GPS location systems on the drilling equipment. This allows the drill to tram directly to the design location of each hole and drill to the designed depth. Alternatively, where on-board GPS is unavailable, hole locations are surveyed and marked out. In cases where precise hole locations are less critical, such as coal blasting, drilling patterns may be oriented from an existing face location and measured in by hand.

In general, SCM uses drill holes that range in diameter from 7-7/8 to 12-1/4 inches. The depths drilled for coal blasts range from 30 to 80 feet. Overburden blasts, including prestrip and cast, are drilled to depths of 10 to 180 feet. The number of holes per blast varies widely depending upon the pattern size and location. The following table shows average blasting specifications for typical operations.

Type	Average Depth (ft)	Burden (ft)	Spacing (ft)
Coal	80	32	30
Overburden	140	32	30
Prestrip	75	32	30
Cast Blasting	180	30	30

(1)(b)(ii) Procedures Used for Charging and Packing of Holes

ANFO in bulk form is normally used when water problems are not evident. ANFO/emulsion blends or bagged ANFO are used when water or damp conditions are present in the borehole. When bulk ANFO or ANFO/emulsion blend is used, a primer is placed on or near the bottom of each borehole, and then the desired amount of explosive product is augured into the hole. This method encases the primer in the blasting agent which insures good contact.

Packing (stemming) for boreholes is determined by the material being blasted and by environmental conditions. Cuttings are used as stemming when drilling in unfrozen and/or dry material.

Sometimes crushed scoria is used as stemming material in overburden boreholes during wet or frozen conditions. Depth of stemming is based upon depth and diameter of holes drilled, spacing and powder factor. Presplit holes may be left unstemmed.

(1)(b)(iii) Types of Fuses and Detonation Controls

Electronic, shock tube and primacord initiation systems are used throughout the blasting operation. Millisecond delay timing is used on the surface and downhole to reduce ground shock, air blast and risk of cutoffs. Blast detonation is initiated with either an electronic blasting box, remote shock tube starter, or other shock tube-type starters.

(1)(b)(iv) Procedures Used for Sequencing and Timing of Firing Holes

Sequencing is accomplished by placing delays between each row in the pattern and between holes in a row. Electronic detonators or surface and downhole delays may be used to accomplish the desired timing.

(1)(b)(v) Recording and Retaining Procedures for the Above

A record of each blast, including seismographic reports as required, will be retained for at least 3 years and made available for inspection by the MDEQ and the public upon request. Blasting records will be complete and accurate at the time of inspection. All information pursuant to ARM 17.24.626 will be collected and retained on file at the mine for three years. Pursuant to ARM 17.24.626(l)(k), the maximum pounds of explosives detonated within an eight millisecond delay period will be calculated by multiplying the maximum number of holes detonated within eight milliseconds by the pounds of explosives in the blast hole with the most pounds of explosives. More precise accounting of the pounds per eight milliseconds requirement will be used if exceeding the scaled distance factor becomes an issue and no seismic data is available. Quarterly blasting report copies are sent to MDEQ. A copy of the Blasting Report Form is located at the end of this Section. Procedures for blasting and monitoring near Cultural Resource Site 24BH404 are specified in Section 17.24.318.

(1)(c) Blast Warnings and Site Access Control Procedures

Warnings and all clear signals will be audible within a range of one-half mile from the point of blast. All persons within the permit area will be notified of the meaning of signals through appropriate instructions and signs posted on all entrances to the permit area. SCM will use an electric siren for warning and all clear signals. The warning signal will consist of twelve short wails given at least 60 seconds before detonation. The all clear signal will consist of four long wails given after the explosion, and after an authorized representative has determined that no hazards such as imminent slides or undetonated charges exist, and that access to and travel through the area can safely resume. In the interest of safety, or to standardize warning signals with other mines in the area, SCM may at some point determine that another system of warning signals is appropriate. In that event, SCM will advise the MDEQ of any changes, and make all other necessary notifications and publications.

Access to the blasting area will be regulated to protect the public and livestock from effects of blasting. Unauthorized re-entry to the blasting area will be forbidden until SCM's authorized representative has determined no hazards exist and travel through the area can safely resume. Areas which contain charged holes will be guarded, barricaded and posted, or flagged against unauthorized entry.

(1)(d) Description of Blast Monitoring Equipment

Except as allowed by the MDEQ, maximum peak particle velocity of ground motion in any direction will not exceed the allowable limits on the Table 310-1 at the immediate location of any dwelling, public building, school, church, or commercial or institutional building. Where used, vibration monitoring equipment will record peak particle velocity (in/s) in 3 mutually perpendicular directions. The monitors will be capable of recording the range of peak particle velocities shown on Table 310-1. Maximum peak particle velocity is the largest of 3 measurements. The MDEQ may reduce maximum peak particle velocity allowed if it determines that a lower standard is required because of population density or land use, age or type of structure in the area, geology or hydrology of the area, frequency of blasts or other factors. Maximum peak particle velocity of ground motion does not apply to property inside the permit area that is Company owned or Company owned and leased to another party (except as specified in Section 318).

Blasting is conducted in such a manner as to avoid adverse impacts and changes in the course, channel or availability of ground or surface water outside the permit area.

Alternatively, SCM may use an equation for determining maximum weight of explosives that may be detonated within any 8 millisecond period, and if blasting is conducted in accordance with the equation, the MDEQ will consider vibrations to be within the allowable peak particle velocity limit. In determining maximum allowable weight of explosives to be detonated within any 8 millisecond period, SCM will use the following equation:

$$W = (D/D_s)^2$$

Where: W = Maximum weight of explosives (in pounds) per 8 millisecond period

D = Distance in feet to the nearest dwelling not owned by the operator

D_s = Scaled distance factor

D_s is determined from the following chart in Table 310-1 below from MDEQ Administrative Rules of Montana 17.24.624(11) and from Addendum 318(A). MDEQ approves use of a modified equation as presented in Addendum 318(A) and allowed under 17.24.625(2) to determine maximum weight of explosives per delay for blasting initiated in Pit #4 of the SCM. The modified equation was used to calculate the scale distances (D_s) shown in Table 310-1 below.

Table 310-1

Distance (D) from blasting site (feet)	Maximum allowable peak particle velocity (V max) for ground vibration (in/sec)	Scale-Distance factor (Ds) to be applied without seismic monitoring	PIT #4 BLASTING Modified Scale-Distance factor (Ds) ^B to be applied without seismic monitoring
0 to 300	1.25	50	31
301 to 5,000	1.00	55	36
5,001 and Beyond	0.75	65	43
^A Cultural Resource Site 24BH404	See Section 17.24.318	n/a	See Section 17.24.318

^ASee Addendum 318(A) and Section 318 for compliance requirements.

^BSee Addendum 318(A) for development of the modified equation $Ds = (224.47 / V \max)^{(1/1.517)}$.

Where a seismograph is used to monitor velocity of ground motion, and the maximum allowable peak particle velocity limit is not exceeded, the scaled distance equation need not be used. If the equation is not used, however, a seismographic record of each blast must be kept. SCM recognizes the MDEQ may require a seismographic recording of any or all blasts.

SCM recognizes the MDEQ may approve use of ground vibration limits as an alternative to 17.24.625(1) and 17.24.625(2) if requested by the operator and approved by the department.

(1)(e) Preblasting Survey Recording and Reporting Plan

Resident Request of a Preblasting Survey: SCM will advise, in writing, all residents or owners of dwellings or other structures within one-half mile of the permit area how to request a preblasting survey.

Late Instructions for Request of a Preblasting Survey: SCM will complete any survey requested more than 10 days before the planned initiation of blasting.

Field Survey of Dwellings or Structures: Any resident or owner of a man-made dwelling or structure located within one-half mile of the permit area, may submit to the MDEQ a request for a preblasting survey. SCM will then conduct a survey of the dwelling or structure, and submit the results to the MDEQ.

Preblasting Survey Assessments: The survey will be conducted by personnel approved by the MDEQ, who, upon examining the condition of the dwelling or structure, will document any preblasting damage and other physical factors that could reasonably be affected by blasting. Assessments of such structures will be limited to surface condition and other readily available data. Special attention will be given to the preblasting condition of wells and other water systems used for human, animal or agricultural purposes and to quantity and quality of water.

Preblasting Survey Assessment Report: A written report of the survey will be prepared and signed by the person who conducted the survey. Recommendations regarding special conditions or proposed adjustments to blasting procedures will be included. Copies of the report will be provided to the person requesting the survey and to the MDEQ.

(1)(f) Unavoidable Hazardous Conditions Resulting in Deviations from the Blasting Schedule

Blasting will not be conducted at times different from those announced in the blasting schedule except in emergency situations where rain, lightning, or other atmospheric conditions, or operator or public safety, requires unscheduled detonation. In addition to required warning signals, oral notices will be provided to persons within one-half mile of the blasting site.

A complete written report of off-schedule blasting will be filed with the MDEQ not later than 3 days after such blast. The report will include reasons for the delay, including why the blast could not be held over to the next scheduled blasting period, when the blast actually was conducted, warning notices given and a copy of the blast record.

(1)(g) Structures to be Protected and Design Factors to Meet Applicable Airblast, Flyrock and Ground Vibration Standards

Airblast will be controlled so that it will not exceed the values as specified in Section 17.24.624(6)(a) at any dwelling, public building, school, church, or commercial, public, or institutional structure, unless the structure is owned by Spring Creek Coal LLC and is not leased to any other person. Spring Creek will conduct periodic monitoring to ensure compliance with airblast standards.

Efforts will be made to minimize off-site damage from blasting concussions or vibrations. Except where lesser distances are approved by the MDEQ, blasting will not be conducted within:

- (A) 1000 feet of any building used as a dwelling
- (B) 500 feet of facilities not controlled by Spring Creek Coal LLC
- (C) 500 feet of underground mine

If so ordered by the MDEQ, a blast design plan will be submitted to protect the above facilities. The plan will contain information required in this rule and will be signed by a certified blaster.

Flyrock will not be cast from the blasting vicinity more than half the distance to the nearest dwelling or other occupied structure, and in no case beyond the property line owned or leased by SCM.

Blasting activities will be carefully planned and supervised to prevent injury to persons, damage to public or private property outside the permit area, adverse effects on any underground mine, and change in the course, channel, or availability of ground or surface waters outside the permit area.

SHOT #	9999
DATE OF BLAST:	4/4/2019
TIME OF BLAST:	4:10 PM

BLASTER IN CHARGE:	JASON RIEDESEL
CERTIFICATION #	C06008
# BLASTING CREW:	4

CLOUD CONDITIONS:	PARTLY CLOUDY
TEMPERATURE:	55 °F
WIND SPEED / DIR.:	5 MPH ENE

LOCATION OF BLAST:			
QUARTER:	SE	1/4	SE 1/4
SECTION:	30		
RANGE:	R40E		
TOWNSHIP:	T8S		

SITE DESCRIPTION:	
PIT:	PIT 6
CUT:	CUT 05
MATERIAL BLASTED:	COAL

Check all that apply:

INITIATION TYPE	
NON-EL:	☒
ELECTRONIC:	☐

DRAFT

NEAREST STRUCTURE	LIMIT - VIB./ SDF	DIRECTION	DISTANCE	MAXIMUM		LIMITING SITE
			FEET	LBS*	# HOLES**	
PIERCE PROPERTY	0.75 / 65	NE	14,652	121,781	2	YES
ROCK ART SITE	4.0 / 14.23	SSE	18,367	1,332,674		NO

*MAX LBS is the maximum total pounds allowed to be detonated within any eight-millisecond period. ACTUAL LBS is = or less than this.

**MAX # HOLES is the ACTUAL maximum number of holes detonated within any eight-millisecond period.

PATTERN TYPE:	STAGGERED
TOTAL # HOLES:	200
PIT WIDTH (ft):	200

BURDEN (ft):	30
SPACING (ft):	30
HOLE DIAMETER:	9"

AVG HOLE DEPTH (ft):	50
STEM TYPE:	DRILL CUTTINGS
STEM DEPTH (ft):	25

Check all that apply:

TYPE OF EXPLOSIVES USED	AN	80,000	LBS
	EMULSION 100%	75,000	LBS
	F.O. GALLONS	700	GAL
	F.O. LBS	4,970	LBS
	BULK ANFO:	84,970	LBS
	BLEND %:	45%	
	3/4 LB CST BOOSTERS:	21	EACH
		16	LBS
	TOTAL LBS USED:	164,966	LBS
	MAX LBS PER 8 MS:	825	LBS

TONS	360,000
YARDS	0
POWDER FACTOR	0.46

METHOD OF PROTECTION	
Secured all access with guards in radio contact.	

DELAY TYPE	ELECTRONIC		EACH
	9 MS:	100	EACH
	17 MS:	100	EACH
	25 MS:		EACH
	42 MS:	8	EACH
	65 MS:		EACH
	100 MS:		EACH
	TOTAL USED:	208.00	EACH

DET CORD		
25 GR:		FEET
50 GR:	850	FEET

COMMENTS:

SIGNATURE OF BLASTER IN CHARGE:		
CERTIFICATION #	C06008	DATE