STATE OF WEST VIRGINIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF MINING AND RECLAMATION

INSTRUCTIONS FOR COMPLETING

BLASTING LOG

**For DMR Form EB-37**

### GENERAL INFORMATION

The blast log must be completed within 24 hours of the shot. If there are any unusual events associated with the blast, the log must be completed that day by the blaster-in-charge before leaving the mine site. A shot number should be used to consecutively number each blast for a permit.

# Permittee

The permittee is the Article 3 permit holder name as it appears on the approved DEP Surface Mining Permit (MR-2). List the full name, not partial or abbreviated. Typically, this permit name should be the same as on the approved blasting map and correspond directly with the permit number associated with the blasting activities on this blast log. The permittee is also identified on the sign (also known as the permanent monument) located at the mine site entrance.

# Permit Number

The permit number is the DEP-assigned number for the specific surface mine where the blasting activities are being conducted. This number will be the same as the permit number as it appears on the blasting map. This permit number corresponds with the blasting plan approved for this surface mine. A typical permit number has an alpha prefix followed by a four-digit number followed by two digits that represent the year the application was submitted (i.e. S-4001-04). The permit number is identified on the sign located at the mine site entrance. This is not the MSHA or NPDES permit number for the mine.

# Operator Name

The operator name is the name of the company mining the coal as it appears on the DEP-approved MR-19. The MR-19 form allows a company to mine coal on the permit that is not the permit holder.

# Date/Time

This is the date and time that the shot was detonated. If there are misfires, the details of detonation of those misfires, including time, should be noted on page 2 in the comment section of the blast log.

# Company Conducting Blast

Provide the name of the company conducting the blasting if different from the permittee or operator. Provide the full name of the shot service provider, with no abbreviations.

# Location of Blast

This is the location of the blast identified by grid and/or GPS. The grid is located on the blasting map and is normally no larger than 250’ x 250’. If grids are larger, the blaster should identify what area of the grid the blast is located by use of quadrants, as identified in the permit application. When blasting within 1,000 feet of protected structures, a more accurate method of locating the blast should be used in addition to grids. Use of GPS is strongly recommended to provide accurate distance to structures and location of the blast. Include the name of the coal seam associated with the overburden or binder being blasted. The type of shot (i.e. binder, cast, production, contour, breakdown, pre-split, bolder, etc.) should be identified.

# Nearest Protected Structure

Protected Structure is defined by 199CSR 2.36 as any of the following structures that are situated outside the permit area: an occupied dwelling, a temporarily unoccupied dwelling which has been occupied within the past 90 days, a public building, a habitable building for commercial purposes, a school, a church, a community or institutional building, a public park or a water well. Identify the full name of the homeowner or structure owner and include the structure number from the blasting map. The structure name may change with a change in ownership, but the structure number as shown on the approved blast map will never change. The structure numbers indicated on the blasting map are also listed in Section T of the mining permit.

## Direction and Distance to Nearest Protected Structure (feet)

The **direction** is always orientated from the blast site to the structure using compass points and/or azimuth (with zero degrees being due north). The **distance** is to be measured from the shot location to the nearest protected structure. If GPS is not used to identify the blast site dimension and location, the distance from the nearest corner of the blasting grid to the protected structure as measured on the blasting map will be used to provide the most conservative blast design when the exact location of the blast cannot be determined. Provide the distance to the nearest protected structure, no matter how far away. The compass bearing should be used to define the direction from the shot to the nearest protected structure. When using GPS for location, also provide the NAD settings for the GPS (i.e. NAD27, NAD83, etc). These should be the same as those identified on the blasting map.

# Nearest Other Structure

List type of structure, owner’s name and structure number as shown on the blast map. Other structures are defined as, but not limited to, outbuildings, gas lines, water lines, towers, airports, underground mines, tunnels, dams, gas wells, etc. Provide the type of nearest other structure as identified on the blast map. Gas wells identified on the approved blasting map as plugged are not considered structures that must be protected. When plugged gas wells are encountered, go to next nearest other structure for blast design and performance compliance. If the other structure is closer than the nearest protected structure and you do not have an approved waiver allowing alternate peck particle velocities (PPVs), then you must apply the allowable scale distance limits or maximum vibration limits for this shot to this other structure as specified in 199CSR1 for protected structures. If the nearest other structure has an approved waiver to exceed the PPV, design to the next nearest structure. List both on the blast log. Waivers for alternate PPVs at other structures shall not reduce the level of protection for the nearest protected structure.

1. **Direction and Distance to Nearest Other Structure (feet)**

The direction and distance is to be measured from the shot location to the nearest other structure using the same criteria as measuring nearest protected structures. If GPS is not used to identify the blast site dimension and location, the distance form the nearest corner of the grid to the other structure as measured on the approved blasting map will be used to provide the most conservative blast design when the exact location of the blast cannot be determined. Provide the distance to the nearest other structure if within 7/10-mile radius. The compass bearing should be used to define the direction from the shot to the nearest other structure.

# Weather Conditions

Be as descriptive and accurate as possible. List estimated values if actual measurements are not available for temperature, precipitation, sky condition, wind speed, and the compass direction that the wind is blowing from the shot.

# Type(s) of Material Blasted

List the type of geology including voids, mud seams, fractures, subsidence cracks, etc. Attach drill logs if utilized for identifying geology type and the anomalies identified above.

1. **Mats or Other Protection Used**

List any safety or protective measure taken, i.e. cleared blast area, blocked all roads, used warning signals, backfilling or padding provided for secondary blasting, etc.

### BLAST INFORMATION

1. **Type(s) of Explosives:**

**Blasting Agent:** List type of blasting agent and include percent blend of emulsion to ANFO, if applicable.

**Density:** Provide blasting agent density and/or density of blended products in specific gravity or in g/cc.

**15. High Explosives** (boosters, primers, detonator cord)

List brand and type of boosters, the individual unit weight of the boosters and the total number of boosters used for this blast. This is the total count of high explosive boosters consumed in the shot. Also, provide length and grains per foot of detonator cord if utilized.

1. **Total Weight of Explosives:**

Provide the total weight of the blasting agent in pounds and the total weight of boosters (primers) detonated in this shot. List the sum weight of the total blasting agent and the total high explosives used.

1. **Blasthole Data:**

Provide the total **number of holes** loaded, **diameter** of holes in inches, and **depth** of holes in feet. List the **depth** of the longest hole. The **depth** is the length of the borehole as measured by the blaster. Include sub drilling, if applicable. Provide **burden** in feet, as measured perpendicular to the free face. Provide **spacing** in feet, as measured parallel to the free face (or perpendicular to the burden). This is typically the distance between holes in individual rows. If you have a combination shot that would cause varying hole depth, diameter, stemming, burden and/or spacing, note it in the comments and illustrate details in the sketchon the back. List worst-case information in **Blasthole Data** blanks provided on front.

1. **Powder Column**

The total length of explosives placed in the blasthole, in feet. In the case of decks, provide the details and dimensions on page 2 of the log.

1. **Stemming:**

The **length** (of stemming) is the measured distance in feet from the collar of the borehole to the top of the explosive column. In the case of air decks, where the stemming is not directly on top of the powder column, the **length** is the distance from the borehole collar to the top of the packing device supporting the stemming. Identify the type of stemming material used, i.e. drill cuttings, gravel, etc. Do not include backfill or decks in **length** of stemming. **Backfill** is the material placed in the borehole by the blaster before loading the hole with explosives. Where backfilling or decking is involved, the blast hole should be dimensioned on the sketch (page 2) to identify actual length of stemming and length of the powder column.

# Delay Type, Brand and Delay Periods

Provide type, brand (manufacturer), and both surface and in-hole delay periods for all detonators utilized in this shot. Identify the length of surface and in-hole hole detonators leads.

# Maximum Weight of Explosives Allowed per Delay Period

Calculate the maximum weight of explosives allowed utilizing the appropriate scaled distance formula to the nearest structure. Identify which formula is used by either circling the appropriate formula on the log, or by showing the scaled distance calculation in the blank provided. Include the result in pounds of explosive in the blank provided.

1. **Maximum Weight of Explosives Used per Delay Period**

This is the total weight of explosives in pounds of all holes or decks detonated in any 8-millisecond time period. This includes all overlaps, which are evidenced by the firing time for each hole as shown on the sketch.

1. **Weight of Explosives Used per Hole or Deck**

This is the calculated maximum weight of explosives in pounds used per hole or deck, initiated by a single detonator. List any variations in blast hole loading or decks on page 2 of the log.

1. **Method of Firing and Type(s) of Circuits**

Provide the type of firing method and type of initiating system (i.e. electric, non-electric, electronic, remote control, stomper, snap gun, electric cap, sequential timer, nonel, shock tube, detonating cord, optimizer, etc).

### SEISMOGRAPH DATA

This section should be filled out by the blaster or company providing the seismic monitoring. If there was a problem with the shot, the seismograph data should be filled out within 24 hours. A copy of the seismic data needs to be attached to the blast log, including full wave form recordings, if available. If seismographs are used to monitor this blast, but not required for compliance (i.e. the blast is designed using the scale distance formula), the records of the seismographs shall still be made a part of the blasting log and maintained with the blast logs for review. A copy of the certificate of annual calibration for the seismograph shall be maintained at the mine site.

1. **Date and Time of Recording from the Seismogram**

This is the date and time from the seismic recording and should correlate with the vibration and air blast monitoring of this blast.

1. **Type (Brand and Model Number) of Instrument**

List model number, manufacturer, or type of the seismic instrument utilized for monitoring this blast event.

1. **Sensitivity**

Provide the lower frequency limit of the airblast measuring system in hertz (Hz). This is for the establishment of the maximum allowable limit on airblast(dB) as specified at 199CSR1 3.6.c.1. of the rules.

1. **Name of Person and Company Who Installed Seismograph**

Provide the name of individual and the company he or she represents who installed the seismograph for monitoring of this blast. If there are multiple seismographs installed for monitoring of this blast, attachments may be used to provide the required data.

1. **Name of Person Taking Readings**

Provide the name of the person that downloads the seismic and air blast data from the seismograph(s) utilized for the monitoring of this blast.

1. **Name of Person and Firm Analyzing Readings**

Provide the name of the person and the company he or she represents who analyzed the seismic recordings from the data obtained from the seismograph. This is the person who reviews the seismic data and identifies what recordings are of blasts and what are not recordings of blasts. The seismic data of the blast shall include full waveform seismograms including the calibration signal. If there are no events triggered by a blast, then the calibration signal associated with this blast event should be provided to indicate the seismograph was functioning properly.

1. **Signature of Person Analyzing Readings**

This is the signature of the person listed in the item above.

1. **Location of Seismograph**

Provide the type of structure, name of the structure owner and structure number from the blast map. Include the distance from the seismograph to the blast that is being monitored.

1. **Trigger Levels**

Provide seismograph trigger levels for both the ground vibrations in inches/second and for airblast in dB set for initializing the instrument. The recording time is the length of the vibration recording time for an event in seconds.

#### Vibrations Recorded

List for this blast the seismic data recorded in the three mutually perpendicular directions as identified on the seismic record of ground vibration velocities. The values must be listed for the maximum vibration velocities (inches/second, ips) measured in the **longitudinal, transverse, and vertical** directions as recorded by the seismograph for this blast. List the maximum-recorded **air blast** in decibels (dB) for this blast. Attach to this blast log a printout tape or copy of downloaded data for this blast, including full waveform recordings.

1. **Frequency**

List the recorded frequency in hertz (Hz) of the **longitudinal, transverse, and vertical** ground vibrations and **air blast** records associated for the maximum values measured for this blast as listed above.

# Sketch of Holes and Delays

Provide a plan view sketch of the blast design (i.e. a proportional representative drawing). Identify each hole in the blast site including the orientation of the free face(s) relative to the blast site. The direction and distance to the nearest protected structure and nearest other structure should be identified on the sketch. Show a north arrow, orientate the blast site and structures accordingly.

Provide the firing time of each hole or deck. Show all surface delays between holes and rows. If all down hole detonators are the same millisecond delay, indicate on the sketch with a note and surface timing of each hole may be shown. However, if the blast design has different down hole delays, the actual down hole timing for initiation of the powder column must be shown when timing out the shot. Provide a sketch of the blast hole to depict each different hole/deck design, including dimensions (feet). If there are different blast hole loading configurations, identify what holes the cross section(s) is depicting in your blast design including depth (feet) and diameters (inches). Identify physical conditions surrounding the blast site, i.e. shot material, solid, open face, etc.

1. **Comments**

Provide a brief explanation of the blast. List any abnormalities such as flyrock, wet holes, etc., or any other unusual circumstances associated with this blast. Any details of misfires and secondary detonation(s) associated with the blast should be described. An explanation for any unscheduled detonations outside the approved times in the blasting schedule should be described in detail as well as the name and time of contact with DMR personnel providing approval for the unscheduled blast. Identify any excessive air blasts or ground vibrations resulting from this blast and the cause. Training by the blaster in charge for blasting personnel in the safe use of explosives may be detailed including the names of blasting crew members being trained.

1. **Blaster Information**

Print legibly the full name of the blaster-in-charge. The signature of blaster-in-charge must be included. Provide the current Surface Mine Blaster Certification number as issued by the DEP’s Office of Explosives and Blasting for the blaster-in-charge. The blaster-in-charge is the certified person responsible for supervising the loading and detonation of a blast.

**Definitions**

Term “structure” and “other structure”:

**Structure** as defined under 38CSR2 2.118

Structure means, except as used in the context of subsection 3.8 of this rule, any man-made structures within or outside the permit areas which include, but are not limited to: dwellings, outbuildings, commercial buildings, public buildings, community buildings, institutional buildings, gas lines, water lines, towers, airports, underground mines, tunnels, and dams. The term does not include structures built and/or utilized for the purpose of carrying out the surface mining operation (this takes in protected structures and other structures).

3.8 of this rule reads:

“New and Existing Structures and Support Facilities:

3.8a. Each application for a permit will contain a description, plans, and drawings for each support facility to be constructed, used, or maintained within the proposed permit area…

3.8b. Each application shall contain a description of each existing structure or facility proposed to be used in connection with or to facilitate the surface mining and reclamation operation…”

**Protected Structure** as defined under 38CSR2 2.97

Protected structures means for purposes of blasting, dwellings, public buildings, schools, churches, or community or institutional buildings.

**Community or Institutional Building**

As defined under 38CSR2 2.34

Community or institutional building means any structure, other than a public building or an occupied dwelling, which is used primarily for meetings, gatherings or functions of local civic organizations or other community groups; functions as an educational, cultural, historic, religious, scientific, correctional, mental health or physical health care facility; or is used for public services, including, but not limited to, water supply, power generation or sewage treatment.

**Public Building**

As defined under 38CSR2 2.98

Public building means any structure that is owned or leased by a public agency or used primarily for public business or meetings.

Blasting control for OTHER STRUCTURES are defined under **199CSR-1, 3.7.a.** as all other structures in the vicinity of the blasting area which are not defined as protected structures in subsection 2.35 of this rule shall be protected from damage by establishment of a maximum allowable limit on ground vibration, specified by the operator in the blasting plan and approved by the Secretary. If alternate maximum allowable limits on vibrations are not included on the approved blast plan, the operator shall comply with the limits specified for protected structures as identified in 199CSR-1, 3.6.h. and 3.6.i. of the rules. The plan submitted under this subsection shall not reduce the level of protection for other structures otherwise provided for in this rule.