Environmental Quality, Dept. of

Land Quality - Coal

Chapter 6: Blasting for Surface Coal Mining Operations

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DEPARTMENT OF ENVIRONMENTAL QUALITY

LAND QUALITY DIVISION

CHAPTER 6

BLASTING FOR SURFACE COAL MINING OPERATIONS

Section 1. **General.**

(a) The permittee shall comply with all applicable State, local and Federal laws and regulations and the requirements of this Chapter in the use of explosives.

(b) Blasts that use more than five pounds of explosives or blasting agent shall be conducted according to the schedule required under Section 3.

(c) All persons working with explosive material shall be, or be under the direct supervision of, an experienced, trained, and competent person who understands the hazards involved and who:

(i) Possesses current knowledge of the local, State and Federal laws and regulations applicable to this work; and

(ii) Has obtained a certificate of completion of training and qualification as required by State law.

(d) Blasting operations within 500 feet of active underground mines require approval of the State and Federal regulatory authorities concerned with the health and safety of underground miners.

(e) Blasting signs clearly warning that explosives are in use in particular areas, explaining blast-warning and all-clear signals, and explaining the marking of blast areas, shall be posted at all public entrances to the permit area. Signs containing "blasting area" shall be posted along the edge of any blasting area that comes within 100 feet of any public road right-of-way and at the point where any other road provides access to the blasting area.

Section 2. **Preblasting Survey.**

(a) On the request of a resident or owner of a man-made dwelling or structure that is located within one-half mile of any part of the area covered under the term of the permit, the applicant or permittee shall conduct a preblasting survey. The request may be made either directly to the applicant or permittee with confirming documents forwarded to the Administrator, or to the Administrator with confirming documents forwarded to the applicant or permittee. The operator shall promptly conduct a preblasting survey of the dwelling or

structure and promptly prepare a written report of the survey. An updated survey of any additions, modifications, or renovations shall be performed by the operator if requested by the resident or owner. The operator shall determine the condition of the dwelling(s) and structure(s) and document any preblasting damage and other physical factors that could reasonably be affected by the blasting. Assessments of structures such as pipes, cables, transmission lines, and wells and other water systems shall be limited to surface condition and other readily available data. Special attention shall be given to the preblasting condition of wells and other water systems used for human, animal, or agricultural purposes and to the quantity and quality of the water.

(b) A written report of the survey shall be prepared and signed by the person who conducted the survey. The report shall include recommendations of any special conditions or proposed adjustments to the blasting procedures outlined in this Section which should be incorporated into the blasting plan to prevent damage. Copies of the report shall be provided to the person requesting the survey and to the Administrator. The person requesting the survey may submit any written disagreements he has with the results of the survey to the permittee and the Administrator.

(c) Any surveys requested more than three days before the planned initiation of blasting shall be completed by the operator before the initiation of blasting.

Section 3. **Public Notice of Blasting Schedule.**

(a) At least 30 days, but not more than 60 days before beginning a blasting program in which more than five pounds of explosives or blasting agent are detonated, the permittee shall publish a blasting schedule in a newspaper of general circulation in the locality of the proposed site. Copies of the schedule shall be distributed by mail to local governments, public utilities and to each residence or owner of a man-made dwelling or structure within one-half mile of the blasting sites described in the schedule. The residents or owners within one-half mile shall also be notified of the manner for requesting a preblasting survey. The permittee shall republish and redistribute the schedule by mail at least every 12 months. The permittee also shall revise and republish the schedule at least 30 days, but not more than 60 days, prior to blasting whenever the area covered by the schedule changes or time periods significantly differ from the prior announcement. Blasting schedules shall identify as accurately as possible the location of the blasting sites and the time periods when blasting will occur. The blasting schedule shall contain at a minimum:

(i) Name, address and telephone number of the operator;

(ii) Identification of the specific areas in which blasting will take place;

(iii) Dates and time periods when explosives are to be detonated;

(iv) Methods to be used to control access to the blasting area; and

(v) Types and patterns of audible warnings and all-clear signals to be used before and after blasting.

Section 4. **Blasting Standards.**

(a) General.

(i) Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availability of ground or surface waters outside the permit area.

(ii) All blasting shall be conducted during time approved by the Administrator and announced on the blasting schedule. Based on public requests or other considerations, including the proximity to residential areas, the Administrator may limit the area covered, timing and sequence of blasting. Blasting shall be conducted between sunrise and sunset unless night-time blasting is approved by the Administrator based on public protection and annoyance considerations.

(iii) Blasting may not be conducted at times different from those announced in the blasting schedule except in conditions where operator or public safety requires unscheduled detonation or for emergency blasting actions. Reasons for unscheduled detonation shall be documented.

(iv) Warning and all-clear signals of different character that are audible within a range of one-half mile from the point of the blast shall be given. All persons within the area covered under the term of permit and those who reside or regularly work within one-half mile of this same area shall be notified of the meanings of the signals in the blasting schedule.

(v) Area of control. Access to the blasting area shall be controlled to protect the public and livestock from the effects of blasting and to prevent unauthorized entry. Access control shall continue until the permittee's authorized representative has determined that no unusual circumstances such as imminent slides or undetonated charges exist and access to and travel in or through the area can safely resume.

(vi) Areas in which charged (loaded) holes are awaiting firing shall be guarded against unauthorized entry.

(b) Limitations.

(i) Airblast shall not exceed the values specified below at any dwelling, public building, school, church, and community or institutional building outside the permit

area, unless the building is owned by the operator and not leased to another, or, if leased, the lessee signs a waiver relieving the operator from meeting the limitations. If necessary to prevent damage, the Administrator shall specify lower maximum allowable airblast levels.

Lower frequency limit of measuring system, Hz (+3dB)	Maximum level in dB
0.1 Hz or lower-flat response [1]	134 peak
2 Hz or lower-flat response	133 peak
6 Hz or lower-flat response	129 peak
C-weighted, slow response [1]	105 peak dBC

[1] Only if approved by the Administrator.

(A) The operator shall conduct periodic monitoring to ensure compliance with the airblast standards. The Administrator shall request monitoring in certain instances, including but not limited to complaints, blasting in sensitive areas, and in areas where there is reason to believe airblast limits may be exceeded. The measuring systems shall have an upper-end flat frequency response of at least 200 Hz.

(ii) Flyrock shall not be cast from the blasting site more than half the distance to the nearest occupied structure or beyond either the permit boundary or the area of control required under (a)(v) above.

(iii) In all blasting operations except as specified below, the maximum ground vibration shall not exceed the values approved in the blasting plan. The maximum ground vibration at the location of any dwelling, public building, school, church, and community or institutional building outside the permit area shall not exceed the values established by paragraph (iv), the scaled-distance equation of paragraph (v), the blasting level chart of paragraph (vi), or by the Administrator under paragraph (vii). All other structures such as water towers, pipelines, tunnels, dams, impoundments, and underground mines, shall be protected from damage by establishment of a maximum allowable limit on ground vibration, submitted by the operator in the blasting plan and approved by the Administrator. The ground vibration standards do not apply at structures owned by the operator and not leased to another, or, if leased, the lessee signs a waiver relieving the operator from meeting the limitations.

Distance (D) from the Blasting Site in feet	Maximum allowable peak particle velocity (Vmax) for ground vibration in inches/second[1]	Scaled distance factor to be applied without seismic monitoring[2]
0 to 300	1.25	50
301 to 5000	1.00	55
5001 and beyond	0.75	65

[1] Ground vibration shall be measured as the particle velocity. Particle velocity shall be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the three measurements.

[2] Applicable to the scaled-distance equation of Paragraph (v).

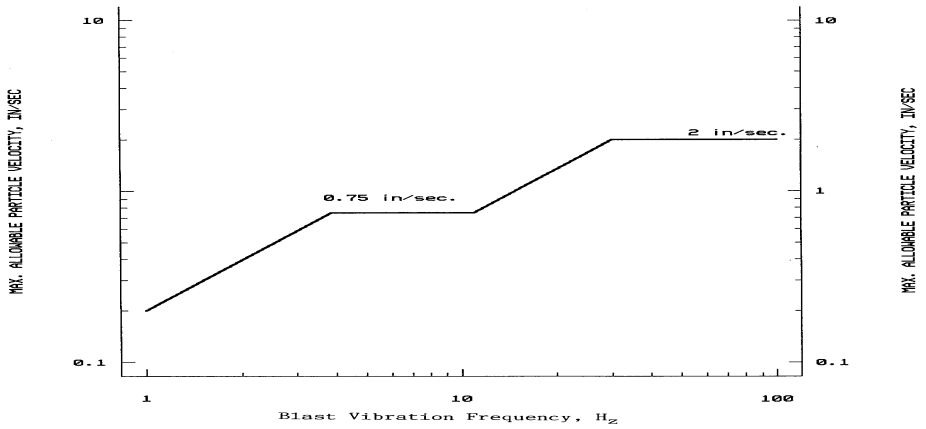
(iv) Maximum peak particle velocity applicable when seismograph records are provided for each blast:

(v) An operator may use the scaled-distance equation, $W=(D/Ds)^2$ to determine the allowable charge weight of explosives to be detonated in any eight millisecond period, without seismic monitoring; where W = the maximum weight of explosives, in pounds; D = the distance, in feet, from the blasting site to the nearest protected structure; and Ds = the scaled-distance factor, which may initially be approved by the Administrator using the values for scaled-distance factor listed in paragraph (iv) above.

(A) Upon written request by the operator with seismographic records, the Administrator may authorize a modified scaled-distance factor. The modified scaled-distance factor shall be determined such that particle velocity of the predicted ground vibration will not exceed the prescribed maximum allowable peak particle velocity of paragraph (iv) above, at a 95 percent confidence level.

(vi) An operator may use the ground vibration limits in Figure 1 (blasting-level chart) to determine the maximum allowable ground vibration. A seismograph record including both particle velocity and vibration frequency levels shall be provided for each blast. The method for the analysis of the predominant frequency contained in the blasting records shall be approved by the Administrator before application of this alternative blasting criterion.

FIGURE 1
ALTERNATIVE BLASTING LEVEL CRITERIA



(Source modified from Figure B-1, Bureau of Mines R18507)

(vii) The maximum allowable ground vibration shall be reduced by the Administrator beyond the limits otherwise provided by paragraphs (iv)-(vi), if necessary to provide damage protection. The Administrator may require an operator to conduct seismic monitoring of any or all blasts or may specify the location at which the measurements are taken and the degree of detail necessary in the measurements.

(c) Blast Design. Permit requirements pertaining to blasting are located in Chapter 2, Section 2(b)(v).

(i) Anticipated blast design(s) shall be submitted if blasting operations will be conducted within:

(A) 1,000 feet of any building used as a dwelling, public building, school, church, or community or institutional building outside the permit area; or

(B) 500 feet of an active or abandoned underground mine.

(ii) The blast design may be presented as part of a permit application or at a time, before the blast, approved by the Administrator.

(iii) The blast design shall contain sketches of the drill patterns, delay periods, and decking and shall indicate the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected, as well as a discussion of design factors to be used, which protect the public and meet the applicable airblast, flyrock, and ground-vibration standards in (b) above.

(iv) The blast design shall be prepared and signed by a certified blaster.

(v) The Administrator may require changes to the design submitted.

Section 5. **Records of Blasting Operations.**

(a) A record of each blast, including seismograph reports, shall be retained for at least three years and shall be available for inspection by the Administrator and the public on request. The record shall contain the following data:

(i) Name of permittee, operator, or other person conducting the blast;

(ii) Location, date and time of blast;

(iii) Name, signature, and certification number of blaster conducting the blast;

(iv) Identification, direction and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, and community or institutional building outside the permit area neither owned nor leased by the permittee;

(v) Weather condition;

(vi) Type of material blasted;

(vii) Sketches of the blast pattern including number of holes, burden, spacing, decks and delay pattern;

(viii) Diameter and depth of holes;

(ix) Types of explosives used;

(x) Total weight of explosives used per hole;

(xi) Maximum weight of explosives detonated within any eight millisecond period;

(xii) Initiation system;

(xiii) Type and length of stemming;

(xiv) Mats or other protections used;

(xv) Seismograph and airblast records, where required, including:

(A) Type of instrument, sensitivity, and calibration signal or certification of annual calibration;

(B) Exact location of instrument and the date, time, and distance

from the blast;

(C) Name of person and firm taking the seismograph reading;

(D) Name of person and firm analyzing the seismograph record; and

(E) The vibration and/or airblast level recorded.

(xvi) Reasons and conditions for each unscheduled blast.

Section 6. **Blaster Certification.**

(a) General.

(i) The Department of Environmental Quality, Land Quality Division and the State Inspector of Mines will jointly administer this Section by Memorandum of Understanding.

(b) Definition.

(i) A blaster or shot-firer is a person directly responsible for the use of explosives in surface coal mining operations or surface blasting operations incident to underground coal mining operations.

(c) Requirements.

(i) All blasting operations shall be conducted under the direction of a certified blaster having a minimum of two years of blasting experience.

(ii) Certificates of blaster certification shall be carried by blasters or shall be on file at the mine site during blasting operations and shall be exhibited to any authorized State or Federal inspector upon request.

(iii) A blaster and at least one other person shall be present in the blasting area at the firing of a blast.

(iv) Persons responsible for blasting operations at a blasting site shall be familiar with the operator's blasting plan and site-specific performance standards.

(d) Training.

(i) The Department of Environmental Quality, Land Quality Division, shall establish or approve training programs for persons seeking to become certified as

blasters. These training programs shall include:

(A) Selection of the type of explosives to be used;

(B) Determination of the properties of explosives which will produce desired results at an acceptable level of risk;

(C) Handling, transportation, and storage of explosives;

(D) Geologic and topographic considerations of blast designs;

(E) Design of a blast hole with critical dimensions;

(F) Pattern design, field layout, and timing of blast holes;

(G) Field applications of blast designs;

(H) Loading blast holes, including priming and boostering;

(I) Initiation systems and blasting machines;

(J) Blasting vibrations, airblast, and flyrock, including monitoring techniques and methods to control adverse affects;

(K) Secondary blasting applications;

(L) Current Federal and State rules applicable to the use of explosives;

(M) Blast records;

(N) Schedules;

(O) Preblasting surveys, including availability, coverage, and the use of in-blast designs;

(P) Blast plan requirements;

(Q) Certification and training;

(R) Signs, warning signals, and site control; and

(S) Unpredictable hazards, including lightning, stray currents, radio waves, and misfires.

(ii) Reciprocity of blaster's certificates from other approved State or Federal programs will require approval of the Administrator and the State Mine Inspector and at a minimum, knowledge of site-specific performance standards and blasting plan.

(e) Examination.

(i) To attain certification, a candidate must receive a passing score on the written and oral examinations which are prepared and approved by the Administrator.

(ii) The written examination for candidates for blaster certification shall test their competence in and practical application of the topics set forth in Section 6(d).

(iii) The oral examination for candidates for blaster certification shall test the use of explosives in relation to site-specific performance standards and the blasting plan under which they will be operating.

(f) Issuance of Certification.

(i) Certificates will be issued to those candidates receiving a passing score on the certification examination. The certification will expire five years from the issuance date.

(g) Renewal.

(i) Certificates may be renewed upon completion of the training, examination and certification program as required by the Administrator.

(h) Revocation.

(i) Following written notice and opportunity for hearing, the blasting certification will be revoked or suspended upon finding of:

(A) Noncompliance with any blasting-related order of Land Quality Division or the State Inspector of Mines;

(B) Unlawful use in the workplace of, or current addiction to, alcohol, narcotics, or other dangerous drugs;

(C) Violation of any provision of the State or Federal explosives laws or regulations; and

(D) Providing false information or a misrepresentation to obtain certification.

(ii) If advance notice and opportunity for hearing cannot be provided, an

opportunity for a hearing shall be provided as soon as practical following the suspension or revocation.

(iii) Upon notice of revocation, the blaster shall immediately surrender to the Land Quality Division the revoked certification.

(i) Maintenance of Certificates.

(i) Certificates will be protected from loss, theft, or unauthorized duplication and any such occurrence shall be reported to the Land Quality Division immediately.

(ii) Certificates shall not be assigned or transferred.

(iii) The blasters shall not delegate their responsibilities to any individual who is not a certified blaster.