

**APPENDIX D**

**FEDERAL  
OSM REGULATIONS**

**CFR 48**



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# Subchapter M—Training, Examination, and Certification of Blasters

## Part 850—Permanent Regulatory Program Requirements—Standards for Certification of Blasters

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AUTHORITY: Pub. L. 95-87, 30 U.S.C. 1201 *et seq.*

SOURCE: 48 FR 9492, Mar. 4, 1983, unless otherwise noted.

### Section 850.1 Scope.

This part establishes the requirements and the procedures applicable to the development of regulatory programs for training, examination, and certification of persons engaging in or directly responsible for the use of explosives in surface coal mining operations.

### Section 850.5 Definition.

As used in this part—

*Blaster* means a person directly responsible for the use of explosives in surface coal mining operations who is certified under this part.

### Section 850.10 Information collection.

The information collection requirements contained in this part have been approved by the Office of Management and Budget under 44 U.S.C. 3507 and assigned clearance number 1029-0080. The information is being collected to meet the requirements of sections 503, 515, and 719 of Pub. L. 95-87. This information will be used by the regulatory authority to assist in implementing the blaster certification program. The obligation to respond is mandatory.

### Section 850.12 Responsibility.

(a) The regulatory authority is responsible for promulgating rules governing the training, examination, certification and enforcement of a blaster certification program for surface coal mining operations. When the regulatory authority is a State, the State shall submit these rules of the Office of Surface Mining for approval under Parts 731 and 732 of this chapter.

(b) The regulatory authority shall develop and adopt a program to examine and certify all persons who are directly responsible for the use of explosives in a surface coal mining operation within 12 months after approval of a State program or implementation of a Federal program or within 12 months after March 4, 1983 of this rule, whichever is later. The Director may approve an extension of the 12-month period upon a demonstration of good cause.

[48 FR 9492, Mar. 4, 1983, as amended at 48 FR 44781, Sept. 30, 1983]

## Section 850.13 Training.

(a) The regulatory authority shall establish procedures which require that —

- (1) Persons seeking to become certified as blasters receive training including, but not limited to, the technical aspects of blasting operations and State and Federal laws governing the storage, transportation, and use of explosives; and
- (2) Persons who are not certified and who are assigned to a blasting crew or assist in the use of explosives receive direction and on-the-job training from a blaster.

(b) The regulatory authority shall ensure that courses are available to train persons responsible for the use of explosives in surface coal mining operations. The courses shall provide training and discuss practical applications of —

(1) Explosives, including —

- (i) Selection of the type of explosive to be used;
- (ii) Determination of the properties of explosives which will produce desired results at an acceptable level of risk; and
- (iii) Handling, transportation, and storage;

(2) Blast designs, including —

- (i) Geologic and topographic considerations;
- (ii) Design of a blast hole, with critical dimensions;
- (iii) Pattern design, field layout, and timing of blast holes; and
- (iv) Field applications;

(3) Loading blastholes, including priming and boosting;

(4) Initiation systems and blasting machines;

(5) Blasting vibrations, airblast, and flyrock, including —

- (i) Monitoring techniques, and
- (ii) Methods to control adverse affects;

(6) Secondary blasting applications;

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

(8) Blast records;

(9) Schedules;

(10) Preblasting surveys, including —

- (i) Availability,
- (ii) Coverage, and
- (iii) Use of in-blast design;

(11) Blast-plan requirements;

(12) Certification and training;

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

(14) Unpredictable hazards, including —

- (i) Lightning,
- (ii) Stray currents,
- (iii) Radio waves, and
- (iv) Misfires.

## Section 850.14 Examination.

- (a) The regulatory authority shall ensure that candidates for blaster certification are examined by reviewing and verifying the—
  - (1) Competence of persons directly responsible for the use of explosives in surface coal mining operations through a written examination in technical aspects of blasting and State and Federal laws governing the storage, use, and transportation of explosives; and
  - (2) Practical field experience of the candidates as necessary to qualify a person to accept the responsibility for blasting operations in surface coal mining operations. Such experience shall demonstrate that the candidate possesses practical knowledge of blasting techniques, understands the hazards involved in the use of explosives, and otherwise has exhibited a pattern of conduct consistent with the acceptance of responsibility for blasting operations.
- (b) Applicants for blaster certification shall be examined, at a minimum, in the topics set forth in Section 850.13(b).

## Section 850.15 Certification.

- (a) *Issuance of certification.* The regulatory authority shall certify for a fixed period those candidates examined and found to be competent and to have the necessary experience to accept responsibility for blasting operations in surface coal mining operations.
- (b) *Suspension and revocation.*
  - (1) The regulatory authority, when practicable, following written notice and opportunity for a hearing, may, and upon a finding of willful conduct, shall suspend or revoke the certification of a blaster during the term of the certification or take other necessary action for any of the following reasons:
    - (i) Noncompliance with any order of the regulatory authority.
    - (ii) Unlawful use in the work place of, or current addiction to, alcohol, narcotics, or other dangerous drugs.
    - (iii) Violation of any provision of the State or Federal explosives laws or regulations.
    - (iv) Providing false information or a misrepresentation to obtain certification.
  - (2) 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, revocation, or other adverse action.
  - (3) Upon notice of a revocation, the blaster shall immediately surrender to the regulatory authority the revoked certificate.
- (c) *Recertification.* The regulatory authority may require the periodic reexamination, training, or other demonstration of continued blaster competency.
- (d) *Protection of certification.* Certified blasters shall take every reasonable precaution to protect their certificates from loss, theft, or unauthorized duplication. Any such occurrence shall be reported immediately to the certifying authority.
- (e) *Conditions.* The regulatory authority shall specify conditions for maintaining certification which shall include the following:
  - (1) A blaster shall immediately exhibit his or her certificate to any authorized representative of the regulatory authority or the Office upon request.
  - (2) Blasters' certification shall not be assigned or transferred.
  - (3) Blasters shall not delegate their responsibility to any individual who is not a certified blaster.

**Section 780.13 Surface Mining Permit Application**  
**Operation plan: Blasting.**

- (a) *Blasting plan.* Each application shall contain a blasting plan for the proposed permit area, explaining how the applicant will comply with the requirements of Section 816.61 through 816.68 of this chapter. This plan shall include, at a minimum, information setting forth the limitations the operator will meet with regard to ground vibration and airblast, the bases for those limitations, and the methods to be applied in controlling the adverse effects of blasting operations.
- (b) *Monitoring system.* Each application shall contain a description of any system to be used to monitor compliance with the standards of Section 816.67 including the type, capability, and sensitivity of any blast-monitoring equipment and proposed procedures and locations of monitoring.
- (c) *Blasting near underground mines.* 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.

[48 FR 9806, Mar. 8, 1983]

**Section 816.61 Use of Explosives: General requirements—Surface Mining**

- (a) Each operator shall comply with all applicable State and Federal laws and regulations in the use of explosives.
- (b) Blasts that use more than 5 pounds of explosive or blasting agent shall be conducted according to the schedule required under Section 816.64.
- (c) *Blasters.*
  - (1) No later than 12 months after the blaster certification program for a State required by Part 850 of this chapter has been approved under the procedures of Subchapter C of this chapter, all blasting operations in that State shall be conducted under the direction of a certified blaster. Before that time, all such blasting operations in that State shall be conducted by competent, experienced persons who understand the hazards involved.
  - (2) Certificates of blaster certification shall be carried by blasters or shall be on file at the permit area during blasting operations.
  - (3) A blaster and at least one other person shall be present at the firing of a blast.
  - (4) Any blaster who is responsible for conducting blasting operations at a blasting site shall:
    - (i) Be familiar with the blasting plan and site-specific performance standards; and
    - (ii) Give direction and on-the-job training to persons who are not certified and who are assigned to the blasting crew or assist in the use of explosives.
- (d) *Blast design.*
  - (1) An anticipated blast design shall be submitted if blasting operations will be conducted within —
    - (i) 1,000 feet of any building used as a dwelling, public building, school, church, or community or institutional building outside the permit area; or
    - (ii) 500 feet of an active or abandoned underground mine.
  - (2) The blast design may be presented as part of a permit application or at a time, before the blast, approved by the regulatory authority.
  - (3) 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 Section 816.67.

- (4) The blast design shall be prepared and signed by a certified blaster.
- (5) The regulatory authority may require changes to the design submitted.

[48 FR 9492, Mar. 4, 1983, and 48 FR 9806, Mar. 8, 1983, as amended at 51 FR 19461, May 29, 1986]

#### **Section 816.62 Use of explosives: Preblasting survey.**

- (a) At least 30 days before initiation of blasting, the operator shall notify, in writing, all residents or owners of dwellings or other structures located within 1/2 mile of the permit area how to request a preblasting survey.
- (b) A resident or owner of a dwelling or structure within 1/2 mile of any part of the permit area may request a preblasting survey. This request shall be made, in writing, directly to the operator or to the regulatory authority, who shall promptly notify the operator. 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.
- (c) The operator shall determine the condition of the dwelling or structure and shall document any preblasting damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, and cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data.
- (d) The written report of the survey shall be signed by the person who conducted the survey. Copies of the report shall be promptly provided to the regulatory authority and to the person requesting the survey. If the person requesting the survey disagrees with the contents and/or recommendations contained therein, he or she may submit to both the operator and the regulatory authority a detailed description of the specific areas of disagreement.
- (e) Any surveys requested more than 10 days before the planned initiation of blasting shall be completed by the operator before the initiation of blasting.

[48 FR 9807, Mar. 8, 1983]

#### **Section 816.64 Use of explosives: Blasting schedule.**

##### **(a) General requirements.**

- (1) The operator shall conduct blasting operations at times approved by the regulatory authority and announced in the blasting schedule. The regulatory authority may limit the area covered, timing, and sequence of blasting as listed in the schedule, if such limitations are necessary and reasonable in order to protect the public health and safety or welfare.
- (2) All blasting shall be conducted between sunrise and sunset, unless nighttime blasting is approved by the regulatory authority based upon a showing by the operator that the public will be protected from adverse noise and other impacts. The regulatory authority may specify more restrictive time periods for blasting.
- (3) Unscheduled blasts may be conducted only where public or operator health and safety so require and for emergency blasting actions. When an operator conducts an unscheduled blast, the operator, using audible signals, shall notify residents within 1/2 mile of the blasting site and document the reason for the unscheduled blast in accordance with Section 816.68(p).

(b) *Blasting schedule publication and distribution.*

- (1) The operator shall publish the blasting schedule in a newspaper of general circulation in the locality of the blasting site at least 10 days, but not more than 30 days, before beginning a blasting program.
- (2) The operator shall distribute copies of the schedule to local governments and public utilities and to each local residence within 1/2 mile of the proposed blasting site described in the schedule.
- (3) The operator shall republish and redistribute the schedule at least every 12 months and revise and republish the schedule at least 10 days, but not more than 30 days, before blasting whenever the area covered by the schedule changes or actual time periods for blasting significantly differ from the prior announcement.

(c) *Blasting schedule contents.* The blasting schedule shall contain, at a minimum—

- (1) Name, address, and telephone number of operator;
- (2) Identification of the specific areas in which blasting will take place;
- (3) Dates and time periods when explosives are to be detonated;
- (4) Methods to be used to control access to the blasting area; and
- (5) Type and patterns of audible warning and all-clear signals to be used before and after blasting.

[48 FR 9807, Mar. 8, 1983]

**Section 816.66 Use of explosives: Blasting signs, warnings, and access control.**(a) *Blasting signs.* Blasting signs shall meet the specifications of Section 816.11. The operator shall—

- (1) Conspicuously place signs reading "Blasting Area" 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; and
- (2) At all entrances to the permit area from public roads or highways, place conspicuous signs which state "Warning! Explosives in Use," which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.

(b) *Warnings.* Warning and all-clear signals of different character or pattern that are audible within a range of 1/2 mile from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within 1/2 mile of the permit area shall be notified of the meaning of the signals in the blasting schedule.(c) *Access control.* Access within the blasting area shall be controlled to prevent presence of livestock or unauthorized persons during blasting and until an authorized representative of the operator has reasonably determined that—

- (1) No unusual hazards, such as imminent slides or undetonated charges, exist; and
- (2) Access to and travel within the blasting area can be safely resumed.

[48 FR 9807, Mar. 8, 1983]

**Section 816.67 Use of explosives: Control of adverse effects.**

(a) *General requirements.* 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 surface or ground water outside the permit area.

(b) *Airblast*—

(1) *Limits.*

(i) Airblast shall not exceed the maximum limits listed below at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area, except as provided in paragraph (e) of this section.

| <i>Lower frequency limit<br/>of measuring system,<br/>in Hz (<math>\pm 3</math> dB)</i> | <i>Maximum level,<br/>in dB</i> |
|---|---------------------------------|
| 0.1 Hz or lower—flat response <sup>1</sup> . . . . .                                    | 134 peak.                       |
| 2 Hz or lower—flat response . . . . .   | 133 peak.                       |
| 6 Hz or lower—flat response . . . . .   | 129 peak.                       |
| C-weighted—slow response <sup>1</sup> . . . . .   | 105 peak dBC.                   |

<sup>1</sup> Only when approved by the regulatory authority.

(ii) If necessary to prevent damage, the regulatory authority shall specify lower maximum allowable airblast levels than those of paragraph (b)(1)(i) of this section for use in the vicinity of a specific blasting operation.

(2) *Monitoring.*

(i) The operator shall conduct periodic monitoring to ensure compliance with the airblast standards. The regulatory authority may require airblast measurement of any or all blasts and may specify the locations at which such measurements are taken.

(ii) The measuring systems shall have an upper-end flat-frequency response of at least 200 Hz.

(c) *Flyrock.* Flyrock travelling in the air or along the ground shall not be cast from the blasting site—

- (1) More than one-half the distance to the nearest dwelling or other occupied structure;
- (2) Beyond the area of control required under Section 816.66(c); or
- (3) Beyond the permit boundary.

(d) *Ground vibration*—

(1) *General.* In all blasting operations, except as otherwise authorized in paragraph (e) of this section, the maximum ground vibration shall not exceed the values approved in the blasting plan required under Section 780.13 of this chapter. The maximum ground vibration for protected structures listed in paragraph (d)(2)(i) of this section shall be established in accordance with either the maximum peak-particle-velocity limits of paragraph (d)(2), the scaled-distance equation of paragraph (d)(3), the blasting-level chart of para-

graph (d)(4) of this section, or by the regulatory authority under paragraph (d)(5) of this section. All structures in the vicinity of the blasting area, not listed in paragraph (d)(2)(i) of this section, such as water towers, pipelines and other utilities, tunnels, dams, impoundments, and underground mines, shall be protected from damage by establishment of a maximum allowable limit on the ground vibration, submitted by the operator in the blasting plan and approved by the regulatory authority.

(2) *Maximum peak particle velocity.*

- (i) The maximum ground vibration shall not exceed the following limits at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area.

| <i>Distance (D), from the blasting site, in feet</i> | <i>Maximum allowable peak particle velocity (Vmax) for ground vibration, in inches/second<sup>1</sup></i> | <i>Scaled-distance factor to be applied without seismic monitoring<sup>2</sup> (Ds)</i> |
|--|---|---|
| 0 to 300.....  | 1.25  | 50  |
| 301 to 5,000.....                                    | 1.00  | 55  |
| 5,001 and beyond.....                                | 0.75  | 65  |

<sup>1</sup> 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.

<sup>2</sup> Applicable to the scaled-distance equation of paragraph (d)(3)(i) of this section.

- (ii) A seismographic record shall be provided for each blast.

(3) *Scale-distance equation.*

- (i) 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 8-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 regulatory authority using the values for scaled-distance factor listed in paragraph (d)(2)(i) of this section.
- (ii) The development of a modified scaled-distance factor may be authorized by the regulatory authority on receipt of a written request by the operator, supported by seismographic records of blasting at the minesite. The modified scale-distance factor shall be determined such that the particle velocity of the predicted ground vibration will not exceed the prescribed maximum allowable peak particle velocity of paragraph (d)(2)(i) of this section, at a 95-percent confidence level.

(4) *Blasting-level chart.*

- (i) An operator may use the ground-vibration limits in Figure 1 to determine the maximum allowable ground vibration.
  - (ii) If the Figure 1 limits are used, a seismographic 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 regulatory authority before application of this alternative blasting criterion.
- (5) The maximum allowable ground vibration shall be reduced by the regulatory authority beyond the limits otherwise provided by this section, if determined necessary to provide damage protection.

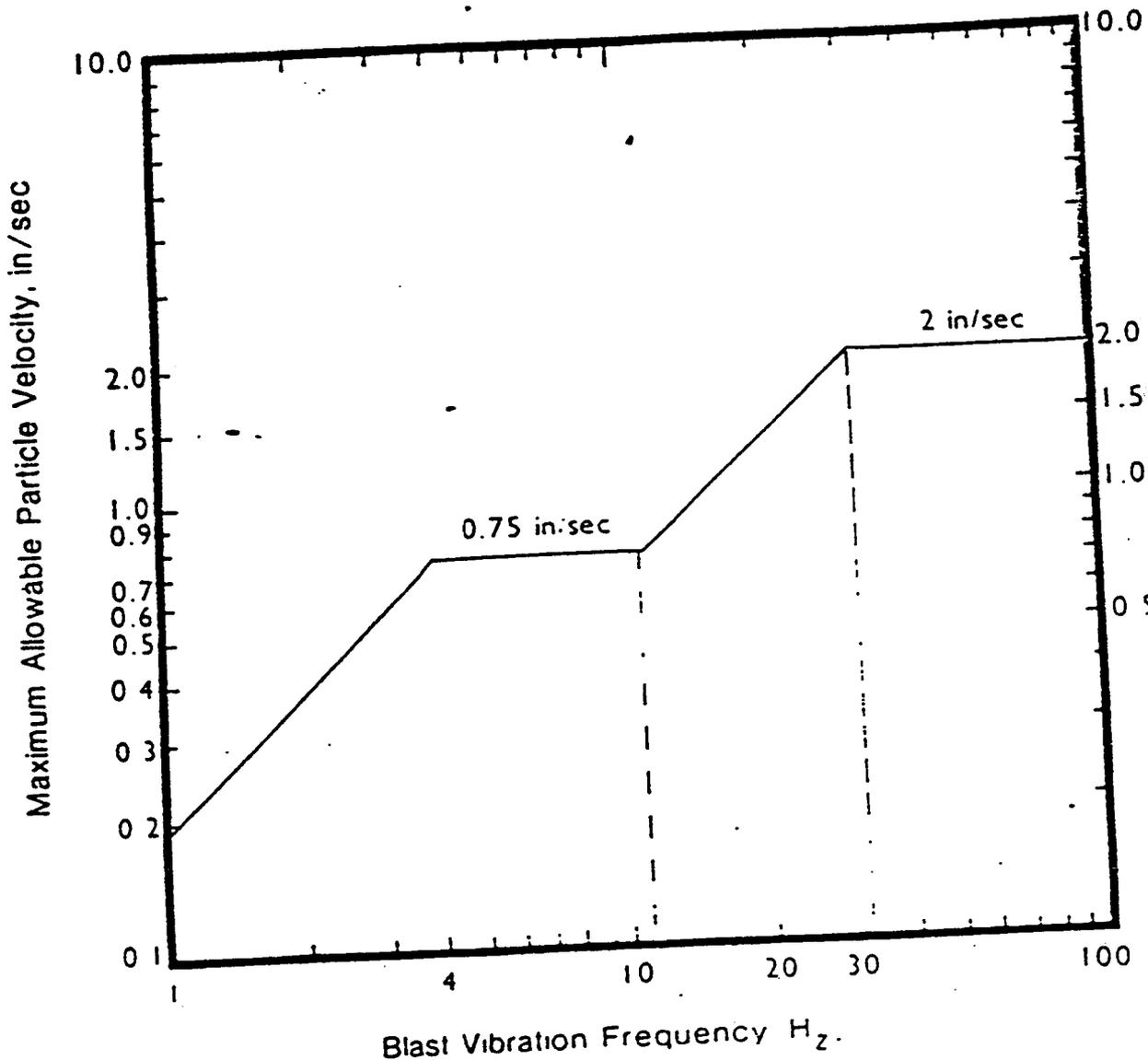


Figure 1: Alternative blasting level criteria. (Source: Modified from Figure B.1, Bureau of Mines R18507)

- (6) The regulatory authority 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 measurement.
- (e) The maximum airblast and ground-vibration standards of paragraphs (b) and (d) of this section shall not apply at the following locations:
  - (1) At structures owned by the permittee and not leased to another person.
  - (2) At structures owned by the permittee and leased to another person, if a written waiver by the lessee is submitted to the regulatory authority before blasting.

[48 FR 9807, Mar. 8, 1983, as amended at 48 FR 44780, Sept. 30, 1983]

#### **Section 816.68 Use of explosives: Records of blasting operations.**

The operator shall retain a record of all blasts for at least 3 years. Upon request, copies of these records shall be made available to the regulatory authority and to the public for inspection. Such records shall contain the following data:

- (a) Name of the operator conducting the blast.
- (b) Location, date, and time of the blast.
- (c) Name, signature, and certification number of the blaster conducting the blast.
- (d) Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described in Section 816.67(e).
- (e) Weather conditions, including those which may cause possible adverse blasting effects.
- (f) Type of material blasted.
- (g) Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
- (h) Diameter and depth of holes.
- (i) Types of explosives used.
- (j) Total weight of explosives used per hole.
- (k) The maximum weight of explosives detonated in an 8-millisecond period.
- (l) Initiation system.
- (m) Type and length of stemming.
- (n) Mats or other protections used.
- (o) Seismographic and airblast records, if required, which shall include—
  - (1) Type of instrument, sensitivity, and calibration signal or certification of annual calibration;
  - (2) Exact location of instrument and the date, time, and distance from the blast;
  - (3) Name of the person and firm taking the reading;
  - (4) Name of the person and firm analyzing the seismographic record; and
  - (5) The vibration and/or airblast level recorded.
- (p) Reasons and conditions for each unscheduled blast.

[48 FR 9809, Mar. 8, 1983]

#### **Section 817.61 Use of explosives: General requirements — Underground Mining**

- (a) Sections 817.61-817.68 apply to surface blasting activities incident to underground coal mining, including, but not limited to, initial rounds of slopes and shafts.
- (b) Each operator shall comply with all applicable State and Federal laws and regulations in the use of explosives.

(c) *Blasters.*

- (1) No later than 12 months after the blaster certification program for a State required by Part 850 of this chapter has been approved under the procedures of Subchapter C of this chapter, all surface blasting operations incident to underground mining in that State shall be conducted under the direction of a certified blaster. Before that time, all such blasting operations in that State shall be conducted by competent, experienced persons who understand the hazards involved.
- (2) Certificates of blaster certification shall be carried by blasters or shall be on file at the permit area during blasting operations.
- (3) A blaster and at least one other person shall be present at the firing of a blast.
- (4) Any blaster who is responsible for conducting blasting operations at a blasting site shall:
  - (i) Be familiar with the site-specific performance standards; and
  - (ii) Give direction and on-the-job training to persons who are not certified and who are assigned to the blasting crew or assist in the use of explosives.

(d) *Blast design.*

- (1) An anticipated blast design shall be submitted if blasting operations will be conducted within—
  - (i) 1,000 feet of any building used as a dwelling, public building, school, church or community or institutional building; or
  - (ii) 500 feet of active or abandoned underground mines.
- (2) The blast design may be presented as part of a permit application or at a time, before the blast, approved by the regulatory authority.
- (3) 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 Section 817.67.
- (4) The blast design shall be prepared and signed by a certified blaster.
- (5) The regulatory authority may require changes to the design submitted.

[48 FR 9492, Mar. 4, 1983, and 48 FR 9809, Mar. 8, 1983, as amended at 51 FR 19461, May 29, 1986]

**Section 817.62 Use of explosives: Preblasting survey.**

- (a) At least 30 days before initiation of blasting, the operator shall notify, in writing, all residents or owners of dwellings or other structures located within 1/2 mile of the permit area how to request a preblasting survey.
- (b) A resident or owner of a dwelling or structure within 1/2 mile of any part of the permit area may request a preblasting survey. This request shall be made, in writing, directly to the operator or to the regulatory authority, who shall promptly notify the operator. 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.
- (c) The operator shall determine the condition of the dwelling or structure and shall document any preblasting damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, and cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data.

- (d) The written report of the survey shall be signed by the person who conducted the survey. Copies of the report shall be promptly provided to the regulatory authority and to the person requesting the survey. If the person requesting the survey disagrees with the contents and/or recommendations contained therein, he or she may submit to both the operator and the regulatory authority a detailed description of the specific areas of disagreement.
- (e) Any surveys requested more than 10 days before the planned initiation of blasting shall be completed by the operator before the initiation of blasting.

[48 FR 9809, Mar. 8, 1983]

**Section 817.64 Use of explosives: General performance standards.**

- (a) The operator shall notify, in writing, residents within 1/2 mile of the blasting site and local governments of the proposed times and locations of blasting operations. Such notice of times that blasting is to be conducted may be announced weekly, but in no case less than 24 hours before blasting will occur.
- (b) Unscheduled blasts may be conducted only where public or operator health and safety so requires and for emergency blasting actions. When an operator conducts an unscheduled surface blast incidental to underground coal mining operations, the operator, using audible signals, shall notify residents within 1/2 mile of the blasting site and document the reason in accordance with Section 817.68(p).
- (c) All blasting shall be conducted between sunrise and sunset unless nighttime blasting is approved by the regulatory authority based upon a showing by the operator that the public will be protected from adverse noise and other impacts. The regulatory authority may specify more restrictive time periods for blasting.

[48 FR 9809, Mar. 8, 1983]

**Section 817.66 Use of explosives: Blasting signs, warnings, and access control.**

- (a) *Blasting signs.* Blasting signs shall meet the specifications of Section 817.11. The operator shall—
  - (1) Conspicuously place signs reading "Blasting Area" 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; and
  - (2) At all entrances to the permit area from public roads or highways, place conspicuous signs which state "Warning! Explosives in Use," which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.
- (b) *Warnings.* Warning and all-clear signals of different character or pattern that are audible within a range of 1/2 mile from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within 1/2 mile of the permit area shall be notified of the meaning of the signals in the blasting notification required in Section 817.64(a).
- (c) *Access control.* Access within the blasting areas shall be controlled to prevent presence of livestock or unauthorized persons during blasting and until an authorized representative of the operator has reasonably determined that—
  - (1) No unusual hazards, such as imminent slides or undetonated charges, exist; and
  - (2) Access to and travel within the blasting area can be safely resumed.

[48 FR 9810, Mar. 8, 1983]

**Section 817.67 Use of explosives: Control of adverse effects.**

(a) *General requirements.* 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 surface or ground water outside the permit area.

(b) *Airblast—*

(1) *Limits.*

(i) Airblast shall not exceed the maximum limits listed below at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area, except as provided in paragraph (e) of this section.

| <i>Lower frequency limit<br/>of measuring system,<br/>in Hz (<math>\pm 3</math> dB)</i> | <i>Maximum level,<br/>in dB</i> |
|---|---------------------------------|
| 0.1 Hz or lower—flat response <sup>1</sup> . . . . .                                    | 134 peak.                       |
| 2 Hz or lower—flat response . . . . .   | 133 peak.                       |
| 6 Hz or lower—flat response . . . . .   | 129 peak.                       |
| C-weighted—slow response <sup>1</sup> . . . . .   | 105 peak dBC.                   |

<sup>1</sup> Only when approved by the regulatory authority.

(ii) If necessary to prevent damage, the regulatory authority may specify lower maximum allowable airblast levels than those of paragraph (b)(1)(i) of this section for use in the vicinity of a specific blasting operation.

(2) *Monitoring.*

(i) The operator shall conduct periodic monitoring to ensure compliance with the airblast standards. The regulatory authority may require airblast measurement of any or all blasts and may specify the locations at which such measurements are taken.

(ii) The measuring systems used shall have an upper-end flat-frequency response of at least 200 Hz.

(c) *Flyrock.* Flyrock travelling in the air or along the ground shall not be cast from the blasting site—

- (1) More than one-half the distance to the nearest dwelling or other occupied structure;
- (2) Beyond the area of control required under Section 816.66(c); or
- (3) Beyond the permit boundary.

(d) *Ground vibration—*

(1) *General.* In all blasting operations, except as otherwise authorized in paragraph (e) of this section, the maximum ground vibration shall not exceed the values approved by the regulatory authority. The maximum ground vibration for protected structures listed in paragraph (d)(2)(i) of this section shall be established in accordance with either the maximum peak-particle-velocity limits of paragraph (d)(2), the scaled-distance equation of paragraph (d)(3), the blasting-level chart of paragraph (d)(4) of this section, or by the regulatory authority under paragraph (d)(5) of this section. All structures in the vicinity

of the blasting area, not listed in paragraph (d)(2)(i) of this section, such as water towers, pipelines and other utilities, tunnels, dams, impoundments, and underground mines, shall be protected from damage by establishment of a maximum allowable limit on the ground vibration, submitted by the operator and approved by the regulatory authority before the initiation of blasting.

(2) *Maximum peak particle velocity.*

- (i) The maximum ground vibration shall not exceed the following limits at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area.

| <i>Distance (D), from the blasting site, in feet</i> | <i>Maximum allowable peak particle velocity (Vmax) for ground vibration, in inches/second<sup>1</sup></i> | <i>Scaled-distance factor to be applied without seismic monitoring<sup>2</sup> (Ds)</i> |
|--|---|---|
| 0 to 300.....  | 1.25  | 50  |
| 301 to 5,000.....                                    | 1.00  | 55  |
| 5,001 and beyond.....                                | 0.75  | 65  |

<sup>1</sup> 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.

<sup>2</sup> Applicable to the scaled-distance equation of Paragraph (d)(3)(i) of this section.

- (ii) A seismographic record shall be provided for each blast.

(3) *Scaled-distance equation.*

- (i) 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 8-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 regulatory authority using the values for scaled-distance factor listed in paragraph (d)(2)(i) of this section.
- (ii) The development of a modified scaled-distance factor may be authorized by the regulatory authority on receipt of a written request by the operator, supported by seismographic records of blasting at the minesite. The modified scaled-distance factor shall be determined such that the particle velocity of the predicted ground vibration will not exceed the prescribed maximum allowable peak particle velocity of paragraph (d)(2)(i) of this section, at a 95-percent confidence level.

(4) *Blasting-level chart.*

- (i) An operator may use the ground-vibration limits in Figure 1 to determine the maximum allowable ground vibration.

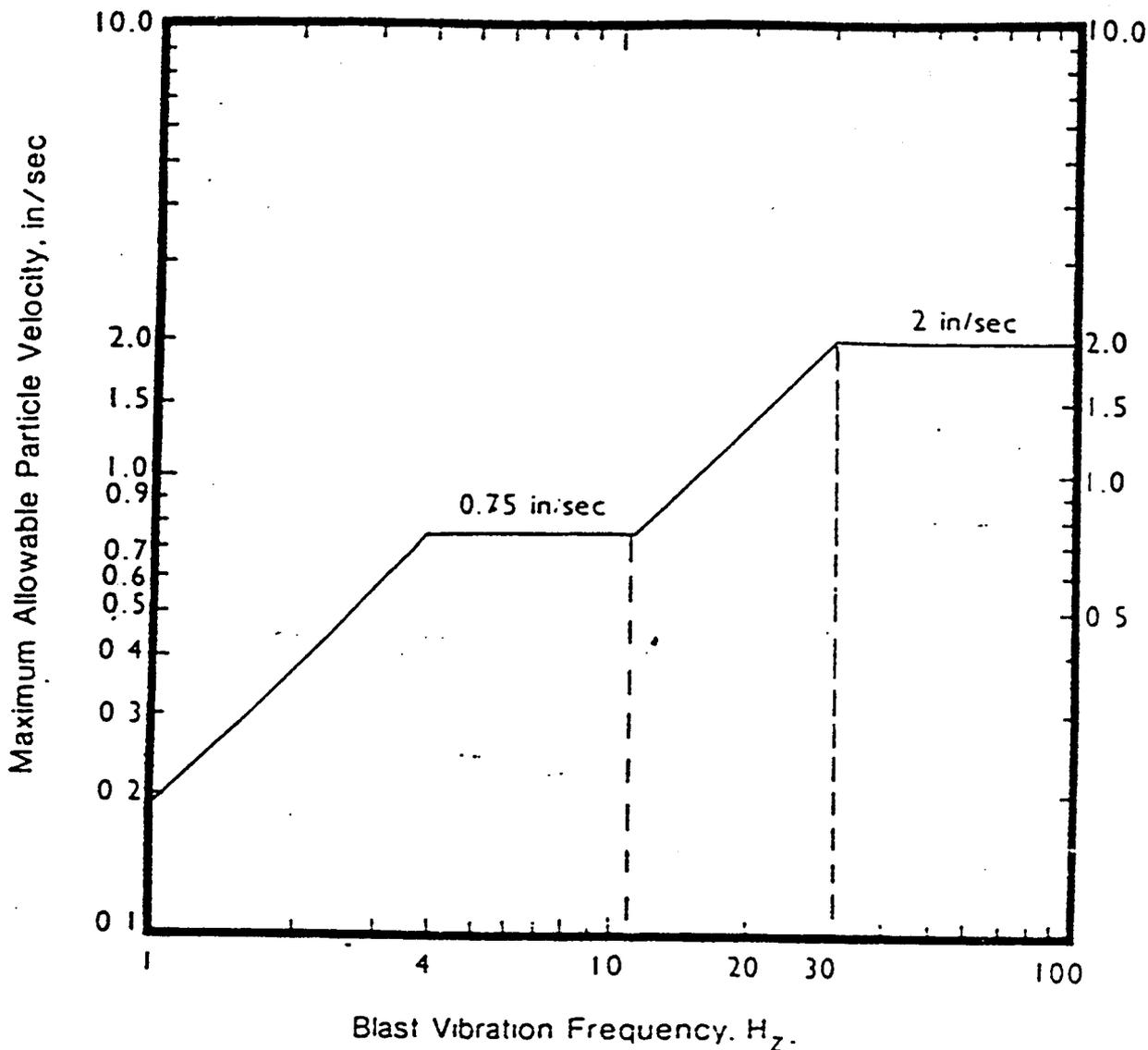


Figure 1: Alternative blasting level criteria. (Source: Modified from Figure B.1, Bureau of Mines R18507)

- (ii) If the Figure 1 limits are used, a seismographic 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 regulatory authority before application of this alternative blasting criterion.
- (5) The maximum allowable ground vibration shall be reduced by the regulatory authority beyond the limits otherwise provided by this section, if determined necessary to provide damage protection.
- (6) The regulatory authority 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 measurement.
- (e) The maximum airblast and ground-vibration standards of paragraphs (b) and (d) of this section shall not apply at the following locations:

- (1) At structures owned by the permittee and not leased to another person.
- (2) At structures owned by the permittee and leased to another person, if a written waiver by the lessee is submitted to the regulatory authority before blasting.

[48 FR 9810, Mar. 8, 1983, as amended at 48 FR 44781, Sept. 30, 1983]

**Section 817.68 Use of explosives: Records of blasting operations.**

The operator shall retain a record of all blasts for at least 3 years. Upon request, copies of these records shall be made available to the regulatory authority and to the public for inspection. Such records shall contain the following data:

- (a) Name of the operator conducting the blast.
- (b) Location, date, and time of the blast.
- (c) Name, signature, and certification number of the blaster conducting the blast.
- (d) Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described in Section 817.67(e).
- (e) Weather conditions, including those which may cause possible adverse blasting effects.
- (f) Type of material blasted.
- (g) Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
- (h) Diameter and depth of holes.
- (i) Types of explosives used.
- (j) Total weight of explosives used per hole.
- (k) The maximum weight of explosives detonated in an 8-millisecond period.
- (l) Initiation system.
- (m) Type and length of stemming.
- (n) Mats or other protections used.
- (o) Seismographic and airblast records, if required, which shall include—
  - (1) Type of instrument, sensitivity, and calibration signal or certification of annual calibration;
  - (2) Exact location of instrument and the date, time, and distance from the blast;
  - (3) Name of the person and firm taking the reading;
  - (4) Name of the person and firm analyzing the seismographic record; and
  - (5) The vibration and/or airblast level recorded.
- (p) Reasons and conditions for each unscheduled blast.

[48 FR 9811, Mar. 8, 1983]



# **APPENDIX E**

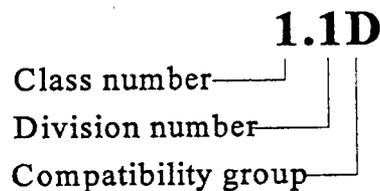
## **FEDERAL DOT EXPLOSIVE CLASSIFICATIONS**



# FEDERAL DOT EXPLOSIVE CLASSIFICATIONS

Although the certified blaster normally does not transport explosives materials on public roads, and thus would not be required to comprehend all Department of Transportation (DOT) Regulations, all regulatory agencies recognize the DOT classification system for explosives identification. A select portion of the regulation CFR 49, Part 172 Subparts D, E, and F, hazardous materials marking, labeling, and placarding, is included to assist the blaster in identification of the explosive products received, stored, and used.

In the past DOT used an explosive classification identification system consisting of Class A, Class B, Class C, and Blasting Agent. Because of global trade requirements, the United States has adopted the United Nations (UN) classification system for hazardous materials. This system uses a three character code to identify hazardous materials. This number is required to be on shipping papers, on shipping containers and on vehicle placards carrying the material.



The first number in the classification code is the Class Number. Explosives materials all fall under Class 1. There are 9 different class numbers as shown below

- Class 1 - Explosives
- Class 2 - Gases (flammable, non-flammable, compressed, , or poisonous)
- Class 3 - Flammable and Combustible Liquids
- Class 4 - Flammable Solids
- Class 5 - Oxidizers and Organic Peroxides (ammonium nitrate is an oxidizer)
- Class 6 - Poisonous and Infectious Materials
- Class 7 - Radioactive Materials
- Class 8 - Corrosive Materials
- Class 9 - Miscellaneous Hazardous Materials

The second or division classification number ranks the materials hazard within the classification group. In the explosives class there are 6 divisions, 1 being the most hazardous, 6 the least. To simplify the division classification, this study guide compares them to the old DOT classifications.

- Division 1 - Extremely sensitive Class "A" Explosives
- Division 2 - Class "A" or Class "B" Explosives
- Division 3 - Class "B" Explosives
- Division 4 - Class "C" Explosives (limited quantities of Class "A" or "B")
- Division 5 - Blasting Agents
- Division 6 - No Applicable Hazard Class in Old DOT System

The third character or letter classifies the materials compatibility. The chart below provides an overview of the compatibility classification.

| Description of substance or article to be classified   | Group |
|--|-------|
| Primary explosive substance  | A     |
| Article containing a primary explosive substance and not containing two or more effective protective features  | B     |
| Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance  | C     |
| Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features.                       | D     |
| Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing flammable liquid or hypergolic liquid)   | E     |
| Article containing a secondary detonating explosive substance with its means of initiation, with a propelling charge (other than one containing flammable liquid or hypergolic liquid) or without a propelling charge  | F     |
| Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide or flammable liquid or gel or hypergolic liquid) | G     |
| Article containing both an explosive substance and white phosphorus  | H     |
| Article containing both an explosive substance and flammable liquid or gel   | J     |
| Article containing both an explosive substance and a toxic chemical agent  | K     |
| Explosive substance or article containing an explosive substance and presenting a special risk (e.g., due to water-activation or presence of hypergolic liquids, phosphides or pyrophoric substances) needing isolation of each type   | L     |
| Articles containing only extremely insensitive detonating substances   | N     |
| Substance or article so packed or designed that any hazardous effects arising from accidental functioning are limited to the extent that they do not significantly hinder or prohibit fire fighting or other emergency response efforts in the immediate vicinity of the package   | S     |

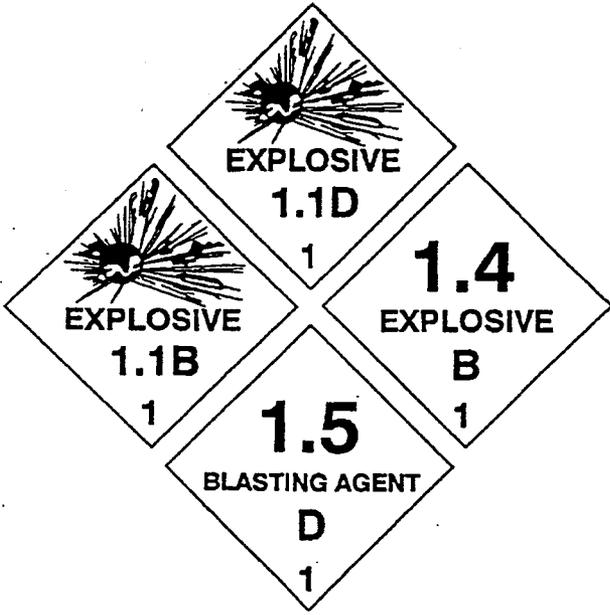
Although it is not obvious from the chart above, explosives manufactured do not fit into every category. In fact commercial explosives used a surface mining operation fall mainly into four (4) categories. These are 1.1B and 1.1D (Class A), 1.4B (Class C) and 1.5D (Blasting Agents). The chart that follows indicates the current classifications with the common commercial explosives in bold type.

|       | HAZARD DIVISION |      |      |      |      |      |       |
|-------|-----------------|------|------|------|------|------|-------|
| GROUP | 1.1             | 1.2  | 1.3  | 1.4  | 1.5  | 1.6  | TOTAL |
| A     | 1.1A            | -    | -    | -    | -    | -    | 1     |
| B     | 1.1B            | 1.2B | -    | 1.4B | -    | -    | 3     |
| C     | 1.1C            | 1.2C | 1.3C | 1.4C | -    | -    | 4     |
| D     | 1.1D            | 1.2D | -    | 1.4D | 1.5D | -    | 4     |
| E     | 1.1E            | 1.2E | -    | 1.4E | -    | -    | 3     |
| F     | 1.1F            | 1.2F | 1.3F | 1.4F | -    | -    | 4     |
| G     | 1.1G            | 1.2G | 1.3G | 1.4G | -    | -    | 4     |
| H     | -               | 1.2H | 1.3H | -    | -    | -    | 2     |
| J     | 1.1J            | 1.2J | 1.3J | -    | -    | -    | 3     |
| K     | -               | 1.2K | 1.3K | -    | -    | -    | 2     |
| L     | 1.1L            | 1.2L | 1.3L | -    | -    | -    | 3     |
| N     | -               | -    | -    | -    | -    | 1.6N | 1     |
| S     | -               | -    | -    | 1.4S | -    | -    | 1     |
| TOTAL |                 |      |      |      |      |      | 35    |

Many transportation vehicles also contain four (4) digit numbers which assist in providing positive identification of the contents in the vehicle. The more common numbers seen on explosives vehicles are:

- 1492 - Ammonium Nitrate
- 1993 - Fuel Oil
- 0331 - ANFO (Ammonium Nitrate and Fuel Oil)
- 0332 - Emulsion

Identification markings typical on packaging and vehicle placards is show in the illustration below:



0332

