— Ground Vibration Limits
— Blast Plans.

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ANTICIPATED BLAST DESIGN

Part III

Department of the Interior

Office of Surface Mining Reclamation and Enforcement

Surface Coal Mining and Reclamation Operations; Initial and Permanent Regulatory Programs; Use of Explosives

DEPARTMENT OF THE INTERIOR

Office of Surface Mining Reclamation and Enforcement

30 CFR Parts 715, 780, 816, and 817

Surface Coal Mining and Reclamation Operations; Initial and Permanent Regulatory Programs; Use of Explosives

AGENCY: Office of Surface Mining Reclamation and Enforcement, Interior.

ACTION: Final rule.

SUMMARY: The Office of Surface Mining Reclamation and Enforcement (OSM) is amending its rules governing the use of explosives. The rules revise the requirements relating to blasting standards, preblasting surveys, airblast, ground vibration and flyrock, monitoring of blasts, and blast design. Final rules are adopted for the initial regulatory program, and the permanent regulatory program. The rules govern the blasts associated with surface and underground mines. The effect of the rule is to provide increased flexibility to design professionals to meet the regulatory performance standards contained in this rule.

EFFECTIVE DATE: April 7, 1983.

FOR FURTHER INFORMATION CONTACT: Arthur Anderson, Office of Surface Mining, U.S. Department of the Interior, 1951 Constitution Ave., NW., Washington, DC 20240; 202-343-5954.

SUPPLEMENTARY INFORMATION:

I. Background.
II. Discussion of Rules Adopted and Responses to Comments.
III. Procedural Matters.

I. Background.

The Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 *et seq.* (the Act), sets forth initial regulatory procedures, permit requirements, and performance standards in Sections 502(c), 507(g), and 515(b)(15), respectively, governing the use of explosives in surface coal mining operations. Section 516 provides performance standards governing the surface effects of underground mining. Rules implementing those sections were published by OSM at 42 FR 62639 (December 13, 1977) under the initial regulatory program (30 CFR 715.19) and at 44 FR 14901 (March 13, 1979) under the permanent regulatory program (30 CFR 780.13, 816.11, 816.61-816.68, 817.11, and 817.61-817.68).

In litigation over the initial program rules, the U.S. Court of Appeals for the District of Columbia issued a decision on May 2, 1980. *In re: Surface Mining Regulation Litigation*, 627 F. 2d 1346 (D.C. Cir. 1980). That decision addressed two blasting issues: (1) The 1,000-foot limitation on blasting near houses, schools, and other buildings in § 715.19(e)(1)(vii), and (2) the 1.0-inch-per-second limitation on particle velocity produced by blasting in § 715.19(e)(2)(ii). The court ruled that the 1,000-foot limit was not authorized by Sections 522(e) (4) and (5) of the Act and that the 1.0-inch-per-second vibration limit was arbitrary and capricious because it lacked technical support.

On May 16, 1980, in litigation over the permanent program rules, the U.S. District Court for the District of Columbia remanded the 1,000-foot limitation on blasting in § 816.65(f). *In re: Permanent Surface Mining Regulation Litigation*, No. 79-1144 (D.D.C. May 16, 1980). The court did not invalidate the 1.0-inch-per-second vibration limitation, but at footnote 19 in its opinion the court recognized that the court of appeals had invalidated a similar provision in § 715.19(e)(2)(ii) in the initial program rules. To implement the court's decision, §§ 816.65(f) and 817.65(f) were suspended by notice at 45 FR 51549 (August 4, 1980).

In response to these decisions, amendments to the blasting rules were proposed at 46 FR 6982 (January 22, 1981). These proposed rules were later withdrawn, by notice at 46 FR 32455 (June 23, 1981) to allow OSM to undertake a more general review of all the blasting rules under the permanent regulatory program. On March 24, 1982, OSM proposed to amend many of the rules governing the use of explosives under the initial and permanent regulatory programs (47 FR 12760).

OSM today adopts many of the rules proposed on March 24, 1982. Final rules are adopted with regard to the use of explosives under the initial regulatory program (§ 715.19). Final rules are also adopted under the permanent regulatory program for surface (§§ 816.11 and 816.61-816.68) and underground (§§ 817.11 and 817.61-817.68) mines and with regard to blasting plans (§ 780.13) for surface mines.

II. Discussion of Rules Adopted and Responses to Comments

OSM received numerous comments on the proposed rules. Although public hearings were scheduled to be held in Washington, D.C.; Pittsburgh, Pa.; and Denver, Colo., no one requested the opportunity to speak at any of these hearings; therefore they were not held. Two requests for public meetings were filed. Meetings were held on June 9, 1982, in Washington, D.C., and on May 4, 1982, in Indianapolis, Ind.

Summaries of each of those meetings have been included in the Administrative Record.

The rules adopted today place increased responsibility on design professionals, such as certified blasters and blast vibration experts, in establishing the design standards to meet the regulatory performance standards contained herein. Those operators staying within the approved limits, complying with approved performance standards, and maintaining a responsible relationship with surrounding residents will be able to operate without additional constraint.

Technical References. In promulgating the previous permanent program rules governing blasting, OSM analyzed the technical references which were available through the fall of 1978. Those materials are listed at 44 FR 15179. OSM relied upon those references, as well as the following additional and, in some cases, more recent technical documents in the development of these revised rules:

Bollinger, G. A., 1971, Blast vibration analysis: Southern Illinois University Press, Carbondale and Edwardsville, 132 pp.

Braile, L. W., Sexton, J. L., Martindale, K. W., and Chiang, C. S., 1982, Seismic wave generation and preparation from coal mine blasts at the Wright mine, Warrick County, Indiana: Prepared by Department of Geosciences and Center for Earthquake Engineering and Ground Motion Studies, Purdue University, for U.S. Office of Surface Mining under contract J6211205, 344 pp.

Hemphill, Gary B., 1981, Blasting operations: McGraw-Hill Book Co., New York City, 258 pp.

Medearis, Kenneth, 1976, The development of rational damage criteria for low-rise structures subjected to blasting vibrations: National Crushed Stone Association, Washington, D.C., 94 pp.

Roth, Julius, Britton, K. C., Campbell, R. W., Ketler, W. R., 1977, Evaluation of surface Mining blasting procedures: Prepared by Management Science Associates for U.S. Bureau of Mines under contract J0366017, 152 pp.

Siskind, D. E., Stachura, V. J., Stagg, M. S., and Kopp, J. W., 1980, Structure response and damage produced by airblast from surface mining: U.S. Bureau of Mines Report of Investigations RI8485, 11 pp.

Siskind, D. E., Stagg, M. S., Stachura, V. J., 1979, Safe ground vibration and airblast criteria: 51st Annual Meeting, Eastern Section Seismological Society of America, October 1979, Blacksburg, Va.

Siskind, D. E., Stagg, M. S., Kopp, J. W., Dowding, C. H., 1980, Structure response and damage produced by ground vibration from surface mine blasting: U.S. Bureau of Mines Report of Investigations RI8507, 74 pp.

Stachura, V. J., Siskind, D. E., and Engler, A. J., 1981, Airblast instrumentation and measurement techniques for surface mine blasting: U.S. Bureau of Mines Report of Investigations RI8508, 53 pp.

Stagg, M. S., and Engler, A. J., 1980, Measurement of blast-induced ground vibration and seismograph calibration: U.S. Bureau of Mines Report of Investigations RI8506, 62 pp.

Swedish Detonic Research Foundation, 1978, Annual Report 1978: 14 pp.

U.S. Bureau of Mines, 1971, Blasting vibrations and their effects on structures: Bulletin 656, 105 pp.

Section 715.19

OSM proposed three options for amending 30 CFR 715.19(e)(2), which contains those parts of the initial regulatory program governing ground vibration. OSM is adopting a hybrid of the three options.

Comments on these three options and the ground vibration rule adopted today are discussed later in this rulemaking in conjunction with the rules adopted at § 816.67(d).

In its proposed rule OSM neglected to propose a rule comparable to previous § 715.19(e)(2)(iii), which made the maximum peak-particle-velocity standard inapplicable to property inside the permit area owned or leased by the permittee. In order to correct this oversight, OSM is adopting a new rule at § 715.19(e)(2)(iii), which provides the same exemption as found in the new permanent program rules under § 816.67(e). Previous § 715.19(e)(3) has also been removed and incorporated into § 715.19(e)(2), and previous paragraph (e)(4) has been redesignated as paragraph (e)(3).

One commenter suggested that the rules governing flyrock proposed on March 24, 1982, at §§ 816.67(c) and 817.67(c) should be adopted under the initial regulatory program at Part 715 as well. The commenter pointed out that flyrock should be regulated under the initial regulatory program as well as under the permanent regulatory program. OSM declines to adopt such a change for several reasons. First, OSM believes that flyrock is already regulated by § 715.19(e)(2)(i). Second, the initial regulatory program is of such limited applicability at this time that OSM expects that such a rule would be of limited value. If a compelling reason for such a rule becomes evident, OSM may, at a later date, determine that it would be useful to propose an initial regulatory program flyrock rule.

Section 780.13

Blasting plans outline the procedures the operator intends to follow in conducting blasting operations. Section 780.13 of 30 CFR requires each application for a permit for a surface coal mine to have a blasting plan, sets standards for blasting plans, and details the information which is to be submitted along with the permit application.

Section 780.13(a) requires the operator to demonstrate in the blasting plan that the operator will achieve the applicable performance standards. In the blasting plan the operator will explain how the performance standards set out in §§ 816.61–816.68 will be achieved. The plan will include information setting the applicable ground vibration and airblast limits and justifying the use of these limits. These limits are discussed more fully in the preamble in relation to § 816.67. The plan must also discuss steps to be taken to control the adverse effects of blasting operations.

Some commenters believed that the blasting plan requires excessive detail in descriptions of limits to be met in protecting structures and the public from damage. Section 507(g) of the Act mandates that an applicant outline in the application the procedures and standards to be used to meet the environmental protection performance standards of Section 515(b)(15) of the Act. Therefore OSM believes the requirement for explanations of the applicable ground vibration and airblast levels is justified.

A commenter requested clarification of the information and explanations required in a blasting plan and suggested that OSM should require identification of sensitive areas, and "worst case scenarios." The intent of these rules is to provide nationwide requirements for blasting plans as required by the Act. OSM does not believe that it is necessary specifically to require identification of sensitive areas and worst case scenarios in the blasting plan. The blasting plan must be sufficient in any case to demonstrate compliance with the applicable performance standards and the blasting plan may include such information as appropriate. Additionally, this information may be required under a State program in every case if deemed appropriate by the State regulatory authority. The commenter also felt that an explanation of how the applicant will meet the performance standards should be required. Such an explanation is required by the last sentence of § 780.13(a).

A commenter objected to the fact that no blasting plan is required for underground operations. Because of the generally limited extent of surface blasting associated with the underground mining, OSM does not believe it is necessary to require a blasting plan for underground operations. OSM's existing rules do not require blasting plans for underground mines nor has OSM proposed to require such plans. Accordingly, no requirement for an underground mining blasting plan is adopted today. However, the rules adopted today do require the submission of some information (specifically blast designs) prior to certain surface blasts incidental to underground mining. See the discussion accompanying § 817.61(d).

A commenter recommended that OSM require the inclusion in the blasting plan of details such as: (1) The names of certified blasters who will be supervising blasting, (2) lists of structures near blast sites, and (3) a copy of the blasting schedule in the blasting plan. OSM acknowledges that this information could be useful in some instances, but believes that this information is not always necessary to decide whether to issue a permit. In any event, this information will become available prior to blasting. (See §§ 816.61, 817.61, 816.68 and 817.68 for information on certified blasters and lists of structures; §§ 816.64 and 817.64, on blasting schedules; and § 779.24(d), on location of buildings and identification of their current use.) Moreover, regulatory authorities who desire additional information incidental to permitting may require it.

Commenters indicated concern about the lack of a requirement in § 780.13(a) for a certified blast design in all blasting plans and the identification of a certified blaster who is in charge of all blast plans. As to the latter comment, a certified blaster is required for all blasting operations. Identification of a specific certified blaster in the blasting plan would not influence the regulatory authority's decision to issue a permit and would unnecessarily reduce operator flexibility.

OSM rejects the suggestion that a certified blast design be required in all blasting plans. Such detail is unnecessary to assure safe blasting and is unnecessary for the regulatory authority to determine that the blasting will be conducted in accordance with the performance standards. It would be difficult or impossible to require and review blast design for every blast

which will occur. Some conditions are unknown at the time of permitting, and operators need flexibility to design blasts for conditions as they are encountered. Absence of a certified blast design in the blasting plan will not allow unrestricted blasting. The blasting plan must show the general approach to all blasts and how all performance standards set out in §§ 816.67 and 817.67 will be met. In addition, for some sensitive areas more complete analyses, including blast designs, must be submitted as required by new § 816.61(d).

Comments were received regarding OSM's proposed change to allow for blasting plan submissions at a time other than permit application. Commenters were concerned that this would limit the opportunity to comment on blasting plans. No such result is intended. As discussed below, OSM intends to allow later submission of certain blast designs, but these will not be considered to be part of the blasting plan. Although regulatory authorities could receive comments on blast designs, the purpose of having blast designs is largely served by their advance preparation and submission to the regulatory authority. Such submissions increase operator accountability and demonstrate compliance with performance standards. As indicated above, OSM does not believe that submission of detailed designs is necessary in the permit application to assure safe blasting in accordance with the performance standards.

Section 780.13(b), which has been adopted as proposed, provides that each application must contain a description of any system to be used to monitor compliance with the standards of § 816.67, including the type, capability, and sensitivity of any blast monitoring equipment and proposed procedures and locations of monitoring.

One commenter objected to listing capability and sensitivity of blast monitoring equipment in the description of the monitoring system to be used. OSM believes that this is important in assessing control of adverse effects, since the degree of sophistication and complexity of instruments may result in additional data by which to evaluate the damage potential. Seismographs can vary in type, capabilities, complexity of data records, and analytical ability. Therefore, the monitoring system used, including capabilities and sensitivities, may assist the regulatory authority in setting allowable limits for each blasting plan. For instance, operators using instruments with sensitivity to low frequency airblast (concussion) could be given different airblast limits than operators using less sensitive equipment. This could occur because one instrument's range will include more sound levels, whereas a less sensitive instrument might ignore some low frequency noise. It is also important for the regulatory authority to know the type and sensitivity of equipment in order to evaluate the information it receives.

Commenters objected to the proposed deletion (from OSM's previous rules) of the requirement that an operator specify the procedures by which an operator will meet recordkeeping requirements. OSM proposed to delete the list of data from § 780.13(b) because that data is required by § 816.68. OSM believes that the recordkeeping procedures set out in §§ 816.68 and 817.68 are sufficient to ensure that the records are complete and adequately kept. A further requirement that the operator indicate how the operator intends to keep such records would be unnecessarily repetitive. The rule adopted today, at § 780.13(a), continues to require an explanation of how the operator intends to comply with § 816.68. All that has been removed is the specific list of information the blasting plan must include. Therefore, Section 507(g) is satisfied without regulatory redundancy. False or inaccurate recording of information will be handled through enforcement of § 816.68 or § 817.68. Commenters raised questions about the ability of blasters to keep records without an adequate knowledge of terms. Knowledge of terms and the ability to keep records would be evaluated in the context of training, examination, and certification of blasters. (This is governed by 30 CFR Chapter VII, Subchapter M.) For permitting purposes, it should be sufficient to show that blasts will be conducted under the direction of certified blasters. Accordingly, OSM adopts no rule in Part 780 requiring operators to demonstrate a knowledge of blasting terminology prior to permitting. However, such a demonstration can be included as a facet of the certification program.

Commenters objected to deletion of previous § 780.13(f) requiring that the operator define what specific conditions might require deviations from blasting schedules. Control of all blasts should be under the cognizance of certified blasters who will be trained in recognizing and handling hazardous conditions. Trying to anticipate all potentially hazardous situations is nearly impossible since many may not occur or be discovered until after mining commences. Furthermore, variation of potentially dangerous conditions may warrant alternative action to that specified in a permit application.

Other commenters suggested that the description of the monitoring system required by proposed § 780.13(b) be optional or be submitted only if required by the regulatory authority. In proposing that portion of the rule OSM intended to leave discretion available to the regulatory authority under §§ 816.67(d)(1), (2), and (4) as to whether monitoring systems will be used or if an equation could be used instead. OSM did not intend to require monitoring of all blasts nor monitoring where none would be needed.

OSM has slightly reworded the final rule in §§ 816.67(d) and 817.67(d), adopting the suggestion offered by one of the commenters so as to avoid the appearance that monitoring is mandatory in all cases. (No seismic monitoring is required if ground vibration limits are set using the scale-distance equation of § 816.67(d)(3) and 817.67(d)(3).) However, if a monitoring system will be used, the permit application must contain its description.

OSM's proposed language at § 780.13(c) required additional information on blasts to be conducted within 1,000 feet of certain structures or 500 feet of underground mines. Several commenters objected to inclusion of regulatory provisions which limit blasting within 1,000 feet of certain structures and 500 feet of underground mines. OSM believes that such provisions are necessary and that ensuring proper blast design is important in these sensitive areas. If properly implemented, blast design will prevent damage to structures or underground mines. In addition, requiring blasting operations within 500 feet of active underground mines to be approved by both the regulatory authorities concerned with surface mining regulations and with the health and safety of underground miners will help guard against potential hazards of such blasting to underground miners.

A commenter recommended limiting the applicability of the 500-foot provision from underground mines to active mines, excluding abandoned workings. OSM has accepted this comment with respect to the joint approval requirements included in revised § 780.13(c). The language of the proposed rule has been revised to require the approval of the State and Federal regulatory authorities for health and safety of mines. Other mine safety and health agencies as well as MSHA

may be involved since many States have counterpart agencies with responsibility for health and safety of mines. The language adopted tracks the requirement set forth in Section 515(b)(12)(A) of the Act. There are no specific underground mining activities associated with abandoned underground mines that must be coordinated with surface mining activities. If an abandoned underground mine becomes active, the requirement for joint approval of the blasting would immediately become effective. This change does not preclude MSHA involvement, but provides for joint approvals by all agencies involved. OSM does not agree with the commenter with respect to limiting the submission of blast designs to active underground operations. This comment is further discussed below under § 816.61(d).

Blast design need not be part of the permitting requirements; therefore the requirement of blast designs has been moved into the performance standards section. These designs require a great deal of factual information which may not be developed until mining approaches these critical areas. Accordingly, while OSM has decided to adopt these blast design requirements, they will be included in the performance standards for blasting, rather than permitting. These rules and comments thereto are discussed below at §§ 816.61 and 817.61. OSM also hopes that this restructuring of the rule will eliminate any concern with respect to the performance standards and the unsuitability criteria of Section 522 of the Act. The provision for blast designs when blasting close to certain structures or underground mines is not a prohibition of mining, as previously found invalid by *In re: Permanent Surface Mining Regulation Litigation, supra*. Rather it is a requirement imposing additional standards where the greatest potential hazards exist. The requirement for additional compliance data when blasting within these limits is based on Sections 515(b)(12), 515(b)(15) and 516 of the Act (See also Roth and others, 1977).

Also in the above case, industry challenged OSM's authority to issue regulations governing blasting. OSM believes that it has such authority based upon the reasoning set forth in its brief to the U.S. Court of Appeals for the District of Columbia in the above case.

Section 816.11. Signs and markers. OSM proposed to delete the requirements of § 816.11(f) relating to blasting signs because its provisions would be duplicative of those in proposed §§ 816.66 and 817.66 or duplicative of rules of the Mine Safety and Health Administration. OSM is adopting these changes as proposed.

Commenters objected to the deletion of § 816.11(f) because, according to them, it was necessary to meet the requirements of Section 515(b)(15). OSM believes that the provision for flagging charged holes is chiefly designed to protect mine workers and it would be duplicative to require a second flagging provision in OSM's rules. The Mine Safety and Health Administration rules are adequate to protect mine workers and will also provide protection of other persons who may enter the property. § 816.61(a) requires compliance with all applicable State and Federal rules, which include those set by MSHA at 30 CFR 77.1303(g).

Section 816.61. Use of explosives: General requirements. OSM proposed to change the phrase "person who conducts surface mining activities" to "operator" in this section and throughout the blasting rules. OSM received no negative comments on this change. Accordingly, the change has been adopted as proposed.

Section 816.61(a)

Section 816.61(a) requires operators to comply with all State and Federal laws governing the use of explosives. One commenter indicated that proposed § 816.61(a) gave the regulatory authority power to enforce laws and regulations beyond those authorized by the Act. Section 515(b)(15) requires that general performance standards ensure that explosives are used in compliance with existing State and Federal law. In addition, provisions of Section 515(b)(15)(A) through (E) authorize requirements that are supplemental to existing law. Thus, OSM has the authority under the Act to require compliance with other State or Federal laws regarding the use of explosives in conjunction with any applicable regulations implementing those laws. This is not a change from OSM's existing rule or its existing authority.

Section 816.61(b)

OSM proposed no change to § 816.61(b). That section, which requires a schedule for blasts that use more than 5 pounds of explosives, is adopted without change. The blasting schedule requirements are discussed below at § 816.64.

Section 816.61(c)

OSM proposed in § 816.61(c) to retain the requirement that a blaster certified under Subchapter M of 30 CFR Chapter VII be responsible for all blasting operations. Among those activities cited both in existing § 816.61(c) and in the proposed rule were transportation, storage, and destruction of explosives within the permit area. Commenters suggested deleting transportation, storage, and destruction of explosives from the identified activities. Section 515(b)(15) of the Act requires that explosives be used in accordance with existing State and Federal laws; OMS believes that this includes the transportation, storage, and destruction of explosives. This section was revised in the blaster certification rule which was issued together with this final rule. (See 48 FR 9486, March 4, 1983.)

Section 816.61(d)

OSM proposed in § 780.13(c) to require designs for blasts to be conducted within 1,000 feet of buildings used as public buildings, dwellings, schools, community or institutional buildings or within 500 feet of an underground mine, to be included in the permit application. As discussed above, OSM has determined that this information is more properly obtained in conjunction with the performance at individual blasting operations and is therefore adopted as part of the performance standards for blasting in new § 816.61(d). Operators may continue to submit blast designs as part of the permit application, but may also do so at a later time prior to the blast as approved by the regulatory authority.

This new § 816.61(d) requires that additional design information must be provided when blasting will be conducted within 1,000 feet of any building used as a dwelling, public building, school, or community or institutional building or within 500 feet of an underground mine. Some commenters felt that the requirement that operators submit typical blast designs within 1,000 feet of buildings or 500 feet of underground mines was prohibited according to Judge Flannery's decision. *In re: Permanent Surface Mining Regulation Litigation, supra.* These commenters also felt that a typical design requirement would be unnecessary and is irrelevant.

OSM disagrees. As described above, Judge Flannery's decision struck down OSM's attempt to prohibit blasting within these areas. The rule adopted today does not prohibit blasting within 1,000 feet of buildings or 500 feet of underground mines. Rather it requires the operator to take extra steps in these areas to help ensure the prevention of damage. In this context, blast designs can be a useful tool. They assure adequate planning and, together with

the required direction by a certified blaster, ensure proper implementation. They allow regulatory authority involvement if necessary and provide a record if problems should occur.

The rule requires that the operator submit information outlining specific precautions to be taken and criteria to be implemented. Sketches of drill patterns, delay periods, and decking and the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected will be submitted. Thus, where the damage potential is highest, the regulatory authority will have the greatest information to ensure adequate protection.

The 1,000-foot distance has been selected so that the operator is alerted that special precautions are necessary to prevent property damage and personal injury when conducting blasting operations within this distance. The blast design required when blasting within this area: (1) Provides a preblasting record of the blast design, (2) provides notification to the regulatory authority so that monitoring may be scheduled if appropriate, and (3) ensures that a certified blaster has developed a specific blast design for such blasting. The requirement that a certified blaster prepare and sign the design imposes on the blaster the responsibility for designing the blast in a responsible manner. It also assures that a competent professional has designed the blast.

A commenter recommended limiting the 500-foot provision from underground mines to active mines, excluding abandoned and collapsed workings. The blast design requirement provides for extra protection when blasting near underground mines and recognizes the sensitivity of *all* these structures in accordance with Section 515(b)(12) of the Act.

Other commenters suggested changing the proposed requirement for "specific" blast designs to "standard" or "typical" designs to indicate the acceptability of a typical engineering design solution rather than submitting a series of specific designs and later amending these based on site-specific conditions encountered. Although the words "standard" or "typical" are insufficient to tie the design to the specific blast, OSM believes that the intent of this section will be preserved by using the term "anticipated" rather than "specific." Using the term "anticipated" will allow operators the flexibility to change the designs based on unexpected conditions encountered at particular sites without having to resubmit the designs to the regulatory authority. To the extent a single design is intended to be used on more than one occasion, it need not be submitted more than once, although each blast for which it is used should be identified.

Some commenters believed that the blast design requirement would be duplicative of the record required by § 816.68. OSM, however, believes that both are important; one is necessary for implementing the blast properly, and the other for postblast analysis. As in other professions, the use of a detailed design better ensures its completion. OSM recognizes that formal submission of written blast design is more stringent than other operating practices, but believes that appropriate additional protection will be afforded by such submissions, particularly when mining operations are conducted in residential or inhabited areas.

One commenter objected to the provision in proposed § 780.13(c)(2), that a blast design may be submitted at some time after the initial permit application, because the public may not be afforded adequate participation. OSM believes that the blast design is best submitted at the time when an area is ready to be mined. The rule, adopted in § 816.61(d)(2), allows the regulatory authority to specify a particular time for design submittal. The intent of the design is not primarily for public or regulatory review; rather it serves as a tool for the operator, blaster, and the blasting crew to understand the blast layout and implementation and for the regulatory authority to be advised of the blast parameters and timing, to initiate monitoring, if appropriate, and to ensure compliance with performance standards.

Proposed § 780.13(c)(5) would have allowed the regulatory authority to require a change in the blast design. This has been adopted in § 816.61(d)(5). Some commenters stated that no benefit would result from regulatory authority revision of blast design. OSM recognizes that the certified blaster must retain primary design responsibility. However, the regulatory authority should have the authority to require changes in the design if it believes that required performance standards will not be met.

Commenters felt that proposed § 780.13(c)(6), which required 30-day notice to property owners whose structures are within 1,000 feet of the blasting site, would conflict with § 816.64(b) which requires similar notice via blasting schedules. OSM agrees and has chosen not to adopt the requirement proposed at § 780.13(c)(6).

Section 816.62. Use of explosives: Preblasting survey.

Section 816.62(a)

A number of commenters requested specific time frames for requesting and conducting preblasting surveys. OSM had originally proposed to have notification of the availability of preblasting surveys distributed with the blasting schedule. In response to the comments, a provision has been added as § 816.62(a) which requires an operator, at least 30 days prior to the initiation of the blasting, to notify in writing residents within one-half mile of the permit area of the procedures for requesting a preblasting survey. This notice may be accompanied by a copy of the blasting schedule. The 30-day notice requirement is set to give a resident sufficient time to request a survey and an operator adequate time within which to complete the survey. This change has been made because OSM agrees with those commenters who believed that it is feasible for preblasting surveys to begin earlier than blasting schedules are set. Preblasting surveys may be conducted independently of the actual blasting schedules. Furthermore, the earlier such surveys are requested and completed, the more flexibility the operator will have in scheduling blasts.

Several commenters requested that time limits be placed on preparation of preblasting surveys and for the filing of disagreements. The rules as adopted require operators to provide property owners or residents at least 30 days of notice for requesting blasting surveys, and to promptly complete the survey upon request. Section 816.62(e) has been added to clarify that for those surveys that have been requested at least 10 days prior to the scheduled initiation of blasting, completion of the survey is required prior to the initiation of blasting. If a survey is requested less than 10 days prior to the scheduled initiation of blasting, the operator should take all reasonable measures to complete the survey in a timely manner. Individual regulatory authorities may impose additional time limits if appropriate for the region or locale. OSM has declined to attach a time limit within which to file disagreements. Such a time limit would not necessarily serve the regulatory process. However, it should be recognized that disagreements which are filed promptly or prior to the start of blasting will be more likely to be satisfactorily resolved between the operator and resident than those filed long after the report has been completed and blasting has begun.

Section 816.62(b)

Section 816.62(b) of the final rule allows the owner or resident of a manmade structure within one-half mile of the permit area to request the operator to provide a preblasting survey by writing directly to the operator or to the regulatory authority, who then will request the operator to conduct the survey. Although one commenter objected to this proposal, OSM believes it provides needed flexibility and could expedite the preblasting survey process. An operator is required to conduct the survey promptly and to promptly prepare the report.

Another commenter objected to the requirement for requesting surveys in writing, citing previous preambles as allowing verbal requests. Although the Act does not mandate written requests for a survey, it is the best method to provide control over the request and survey production process, without placing undue burdens on the regulatory authority manpower or on persons requesting surveys. Moreover, the written request will serve as a verification of the request and trigger action by the operator in timely conduct of the survey.

Updated surveys may be requested by the owner or resident at any time. If a structure is enlarged, renovated or modified after a survey is completed, an update to the preblasting survey must be performed if requested.

Other commenters believed that the second sentence of Paragaph (b) should be rewritten to clarify the roles of the requester, the operator, and the regulatory authority in requesting, initiating, and conducting preblasting surveys. OSM has accepted these comments and has edited the sentence slightly to help clarify its intent.

A commenter indicated the need to include owners of property such as pipelines, water wells, and utility towers in the list of those notified for preblasting surveys. OSM does not consider the language of the Act or the rules to limit the preblasting survey to residences or buildings. Section 515(b)(15)(E) of the Act refers to manmade structures and therefore includes any structure such as dams, utility stations, pipelines, etc.

Commenters suggested that the proposed system of preblasting surveys would not protect operators from false damage claims. As a solution they suggested operators should have the right to request preblasting surveys. The preblasting survey provisions of the Act only provide the owner or resident the opportunity to request preblasting surveys. If the operator wishes to conduct a survey, a specific request could be made to the owner of the particular structure. If concern of false claims persists where a property owner does not request or refuses to allow a preblasting survey to be conducted, the operator should ensure that the blasting is carefully monitored.

Commenters objected to the requirement of a preblasting survey within one-half mile of a "permit area" while other requirements, such as notification in proposed § 816.64(b)(2), were keyed to the "blasting site." All blasting sites are contained within a permit area. Section 515(b)(15)(E) of the Act offers every resident or owner within one-half mile of any portion of the permit area the opportunity for a preblasting survey. Therefore, OSM has adopted the regulatory provisions which gives all owners and residents within one-half mile of the permit area the opportunity to receive a preblasting survey before blasting begins on any portion of the permit area. OSM believes that any other regulation would conflict with the language of the Act.

Section 816.62(c)

Under § 816.62(c) as adopted, preblasting surveys will address the condition of the structure and document any preblasting damage or structural defects. Assessments of structures such as pipelines, cables, transmission lines, and wells, cisterns, and other water systems will be required, but such assessments may be limited to surface conditions and other readily available data. The person conducting the survey must give special attention to such water systems and should document all available data and determine whether such additional analysis is appropriate, based upon the significance of the water system, its vulnerability, and the availability of data.

Commenters objected to OSM's proposal to require that special attention be given to water wells because recent studies have proven that blast vibrations have little effect on water quantity and quality. Other commenters believed that assessment of quality and quantity of water is essential in surveys involving wells. Such information is believed important for both the user and the operator, since hydrologic impacts can be caused both by mining and blasting. The degree of detail may be determined for each case by the regulatory authority, depending on the nature and amount of water or structures involved. Based on these comments the last sentences of § 816.62(c) have been rewritten to clarify OSM's intent.

Section 816.62(d)

Section 816.62(d), which was proposed as § 816.62(c), requires the person completing the survey to sign it and provide a copy of the report to the regulatory authority and the person requesting the survey. This section also allows the person who requested the survey to note disagreement with the contents by submitting a written detailed description of the disagreement.

A commenter requested that the owner or resident sign the preblasting survey indicating concurrence. OSM declines to adopt such a requirement which it believes is unnecessary. OSM believes that allowing residents or property owners to file their disagreements is adequate.

OSM's proposed rules had specified that the original of the survey be provided to the regulatory authority. Commenters suggested that either a copy or the original be provided to the regulatory authority. OSM accepts this suggestion and has adopted appropriate regulatory language.

A commenter objected to the omission in the proposed rule of a mechanism to resolve disagreements in survey data. OSM declines to adopt this suggestion. OSM believes that the regulatory authority is responsible to insure that blasting surveys are complete and accurate. Further, the regulatory authority could direct that inadequate surveys be redone. However, OSM does not believe it necessary to require that any disputes be resolved by the regulatory authority, but only that the survey, including the description of disputed results, should serve as a record of the condition. It should be noted that the regulatory authority could take appropriate action to ensure that surveys are complete and if a serious potential danger exists could incorporate restrictions into the blasting plan and performance standards.

Section 816.64. Use of explosives: Blasting schedules. The title of new § 816.64 has been shortened to "Use of explosives: Blasting schedules" as was proposed.

Section 816.64(a)

OSM has revised § 816.64(a)(1) to clarify the fact that the regulatory authority may limit the timing of blasts, the area covered by a blasting schedule, and the sequence of blasting. The proposal only mentioned limitations pertaining to hours per day, times per day, or number of blasts per day. As adopted § 816.64(a)(1) will allow blasting only at times approved by the regulatory authority and announced in

the blasting schedule. The regulatory authority's decision restricting blasts must be justified on the basis of public health and safety or welfare. OSM has not adopted the proposed requirement that limitations on blasting be based on written submissions only. However, every determination must have an adequate basis.

OSM believes that prevention of excessive noise, especially in populated and residential areas, is within the ambit of "health and safety or welfare." Thus if noise from blasting will disrupt nearby residents, blasting may be limited to times which create the least discomfort. OSM believes that certain site-specific conditions, such as residential surroundings, may require prohibition of nighttime blasting. The final rule has been revised to require such prohibitions, if conditions warrant.

Several commenters objected to the proposed removal of regulations absolutely limiting the times of blasting (previous §§ 816.64(b)(2)(ii) and 816.65(a)) or the blasting area (previous § 816.64(b)(2)(i)). The old rules set absolute limits on the number of hours per day, nighttime blasting, and the size of an area covered under one blasting schedule. OSM recognizes that such limits may be useful under some conditions. For this reason OSM has decided to retain the requirement that blasting be conducted between sunrise and sunset. That requirement is contained in § 816.64(a)(2). The final rule provides flexibility to the regulatory authority to impose more restrictive time periods or to allow nighttime blasting based upon a showing by the operator that the public will be protected from adverse noise and other impacts.

OSM does not believe, however, that national limits on the size of the blasting area or number of hours of blasting per day are necessary. The final rule deletes the prior absolute constraints of 4-hour aggregate amount of blasting per day, and 300-acre maximum blasting areas. These standards presented limits which in some cases were arbitrary or too stringent for an operator to develop an effective schedule. Individual regulatory authorities may impose such restrictions or other more stringent limitations on a site-specific or statewide basis as appropriate. Restraints on the total time of blasting is more a function of planning. The blasting schedule is required, and adherence to the schedule is expected. The regulatory authority must review and approve the times for blasting in the blasting schedule. To make the schedule work, the operator must control production, loading, delivery, and other physical factors to meet his schedule. Where the regulatory authority determines that blasting should be limited, it should impose such limits. In the absence of such a determination, the operator must conform to the approved blasting schedule.

OSM had proposed to relax some restrictions governing unscheduled blasts. Commenters objected that the specific restrictions on unscheduled blasting were omitted. In some instances, such as unusual weather conditions or unavoidable delays, public or operator safety may dictate unscheduled detonations. Obviously, where public or operator safety so require, unscheduled blasting is appropriate. However, OSM has declined to adopt the portion of the proposal which would have allowed unscheduled blasts in nonemergency situations. Thus, while OSM recognizes that some blasting activities such as the construction of roads or the creation of faceups are nonperiodic, these nonemergency blasts should be planned, scheduled, and announced in advance in the blasting schedule. Thus, § 816.64(a)(3) allows unscheduled blasts only in emergency situations. However, schedule changes for nonemergency blasts may be made between 10 and 30 days before blasting begins under § 816.64(b)(3).

Because unscheduled blasts will only be conducted in emergency situations, OSM has adopted the requirement of notification of all residents within one-half mile of the blasting site when unscheduled blasts will occur by requiring that audible notification take place. This allows for more efficient notification of every one within one-half mile, and such notification can be provided more quickly. Commenters expressed concern that in emergencies such as adverse unexpected weather conditions it might be impossible to notify all residents orally. Accordingly, in these situations, audible signals may be used.

Some commenters suggested adding a provision for the resolution of disputes with regulatory authorities regarding blasting schedules.

Apparently, the commenter was concerned with possible problems caused by disapproval of proposed blasting schedules. OSM believes that no such provision is necessary. In making the determination to restrict blasting, the regulatory authority must determine that such limits are reasonable and necessary in order to protect the public health and safety and welfare. OSM believes that standard is sufficiently objective to minimize disputes.

Section 816.64(b)

OSM is adopting paragraph (b)(1) of § 816.64 and most of paragraph (b)(2) as proposed. These require newspaper publication of the blasting schedule between 10 and 30 days before blasting is to begin and set the requirements for distribution of the blasting schedule to local governments, public utilities, and residences within one-half mile of the blasting site. The term "blasting site" here is the area formed by the perimeter of the blast holes.

One commenter felt that publication of a blasting schedule 10–30 days in advance would be too difficult. He suggested that production schedules could not be set that far in advance. OSM believes it is important for operators to undertake sufficient planning and preparation so that they know their schedule with sufficient certainty to allow publication of schedules well in advance. Accordingly, OSM has adopted the requirements as proposed.

OSM had proposed that information on how to obtain preblasting surveys should be provided when copies of the blasting schedule were distributed. OSM received comments that 10–30 days were insufficient to conduct preblasting surveys. Both operator and regulatory authority commenters felt that additional notification of the availability of preblast surveys should be provided. Accordingly, OSM has provided that notice of availability of preblasting surveys may be distributed separately from and earlier than the blasting schedule. As discussed earlier, preblasting survey information is required to be distributed according to § 816.62(a).

Notification of blasting as required by Section 515(b)(15)(A) of the Act and by the regulations is provided by three methods: (1) Schedules published in newspapers, (2) schedules delivered to persons living within one-half mile of the blasting site, and (3) daily notification of blasts through audible signals to locations within at least one-half mile of the blasting site (required by § 816.66(b)).

Section 816.64(c)

Section 816.64(c), setting forth the blasting schedule contents, is adopted as proposed. As indicated above, the final rule removes the constraints of 4-hour aggregate per day, daylight-only blasting (upon approval of the regulatory authority), and 300-acre blasting areas. Such restrictions may be

imposed by individual regulatory authorities under § 816.64(a), as appropriate.

Section 816.65

As proposed, OSM has deleted previous § 816.65 and recodified its requirements as follows:

The requirements contained in previous § 816.65 (a) and (b), which set forth limitations on the hours and times of blasting, are adopted in amended form in § 816.64(a), which is discussed above. The requirements contained in previous § 816.65(c), pertaining to audible signals, are adopted in an amended form in § 816.66. OSM has deleted the requirement of periodic notification of meanings of warnings and all-clear signals. Those notifications are adequately provided through blasting signs and the blasting schedule.

Previous § 816.65(d), limiting access to blasting areas, has been rewritten and renumbered as new § 816.66(c), which is discussed below.

Previous § 816.65(e), governing airblast, has been adopted in amended form as § 816.67(b).

Previous § 816.65(f), pertaining to blasting within 1,000 feet of certain buildings and 500 feet of other facilities, was proposed to be incorporated in amended form in § 780.13(c). Instead it has been adopted in amended form as § 816.61(d), which is discussed above.

Previous § 816.65(g), governing flyrock, has been adopted as § 816.67(c), which is discussed below.

Previous § 816.65(h), containing a general performance standard requiring blasting to be conducted to prevent injury or damage, has been adopted as § 816.67(a), which is discussed below.

Requirements similar to those in previous § 816.65(i), which contained maximum peak-particle-velocities for blasting, have been adopted in amended form in § 816.67(d).

The requirements of previous § 816.65(j), identifying the circumstances where less stringent performance standards apply, have been adopted as § 816.67(e).

Previous § 816.65 (k) and (l), containing alternative means to determine peak-particle-velocities, have been modified and adopted as part of § 816.67(d).

Section 816.66. Use of explosives: Blasting signs, warnings, and access control. Section 816.66 contains provisions for blasting signs and warning procedures throughout the permit area. It also contains the physical access and control requirements to fulfill the notification provisions of § 515(b)(15)(A) and the public protection provisions of § 515(b)(15)(C) of the Act.

Section 816.66(a)

New § 816.66(a)(1) includes provisions from previous § 816.11(f)(1) and the proposed rule, and requires that the operator 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. Notice along any road that provides access to a blasting area will ensure that anyone entering the blasting area is aware that blasting is taking place.

New § 816.66(a)(2) includes provisions from previous § 816.11(f)(2), and, at all entrances to the permit area from public roads or highways, requires signs which state "Warning! Explosives in Use." These signs must clearly list and describe the meaning of the audible blast warning and all-clear signals and explain the marking of blasting areas and charged holes.

In addition, all signs used to mark blasting areas must conform to the specification for signs and markers set out in § 816.11.

A State regulatory authority commenting on the proposal recommended that signs required under proposed § 816.66(a)(1) contain the warnings and explanations required for signs under proposed § 816.66(a)(2), because in some instances the signs referenced in § 816.66(a)(1) may be closer to the blasting site than those at entry points (referenced in § 816.66(a)(2)). OSM has not accepted this recommendation. The "Blasting Area" signs are intended to warn people of the limits of and to stay out of the area where blasting will take place. The more complete description of paragraph (a)(2) is intended to provide guidance to persons who may need to enter the permit area of precautions to follow when within the permit area.

Commenters objected to the 100-foot requirement and suggested that signs be required only when a public road right-of-way occurs within 50 feet of the blasting area, citing that more signs would be required than under the previous rules. OSM disagrees since the previous rules required signs on roads within 100 feet of the permit area but required signs at 50 feet when roads were actually within the permit area. OSM has adopted a consistent 100-foot distance in order to simplify the requirements.

A commenter suggested adding to § 816.66(a)(2) the phrase "awaiting firing" after "charged holes." OSM has accepted this suggestion, recognizing the need to clearly advise personnel entering the mine site of the precautions to be taken to prevent injury.

Section 816.66(b)

New § 816.66(b) requires the use of audible warning and all-clear signals of different pattern. It also requires notification of the meaning of the signals to those who work within the permit area and those who reside or regularly work within one-half mile of the permit area.

Several commenters objected to the term "different character" in proposed § 816.66(b) regarding the application of audible signals, assuming this meant different sounds, sounds with different tonal qualities. OSM recognizes this concern and has replaced "character" with "character or pattern" to allow use of the same instrument to make the sound in a different pattern to differentiate between "warning" and "all-clear."

Section 816.66(c)

New § 816.66(c) requires the controlled restriction of access to the blast area until hazards no longer exist and access can be safely resumed. Both livestock and persons are protected. Also it requires that no unusual hazards such as imminent slides or undetonated charges exist.

A commenter objected to the deletion of the first sentence of § 816.65(d) restricting access to areas subject to flyrock, when it was redesignated § 816.66(c). By including the phrase "within the blasting area" in § 816.66(c), OSM intends to encompass all areas where the hazards of flyrock are present. Therefore § 816.66(c) controls the same area where access was previously controlled under § 816.65(d).

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

Section 816.67(a)

OSM is adopting § 816.67(a) as proposed. The rule requires that blasting 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. This provision, which is the successor to previous § 816.65(h), implements Section 515(b)(15)(C) of the Act.

Commenters objected to the requirement in proposed § 816.67(a) which requires blasting to be conducted in such a way as to prevent the "change in the course, channel, or availability of ground or surface waters outside the permit area." The commenters felt that it

would be impossible to distinguish between changes resulting from blasting and those resulting from other mine-related operations. The requirements of § 816.67(a) are adopted from Section 515(b)(15) of the Act which specifically requires that blasting be conducted in that manner. Furthermore, since OSM's permitting regulations at § 786.19(c) require the finding that damage will be prevented with respect to hydrology outside of the permit area resulting from mining, no blasting could be permitted which would result in material offsite hydrologic damage.

Section 816.67(b)

Airblast limits. OSM is adopting a slightly modified version of the airblast rule from that proposed in § 816.67(b). Airblast limits must be met at any dwelling, public building, school, church, or community or institutional building outside the permit area, with the exception of certain structures owned by the operator and covered by § 816.67(e). OSM has lowered the allowable airblast limit from that proposed for measuring systems with lower frequency limits below 6 Hz (hertz) from 130 to 129 dB (decibels). This has been done at the request of a commenter who indicated that the higher airblast limit was inconsistent with data published by the Bureau of Mines in RI8485 (Siskind and others, 1980).

In addition, OSM has retained separate airblast limits from previous § 816.65(e)(1) for c-weighted, slow response measuring systems and flat response measuring systems with a lower frequency limit of .1 Hz or lower. These peak limits are 105 dBC and 134 dB, respectively, and are consistent with BOM data. The c-weighted, slow response limit is the same as the previous rule and the .1 Hz or lower system limit than the previous rule. The use of of both of these measuring systems must be approved by the regulatory authority.

Several commenters suggested that airblast limits should not apply at locations where a structure is owned by an operator. It appears that there was some confusion as to the applicability of § 816.67(e). In its proposal OSM intended that Paragraph (e) apply to such structures for both airblast and ground vibration. In order to clarify the applicability of the exception in § 816.47(e), the phrase "except as provided in Paragraph (e) of this section" has been added to the end of the airblast standard in § 816.67(b)(1)(i).

A commenter suggested inclusion in § 816.67(b)(1)(ii) of specific rulemaking and public hearing procedures for reduction of the airblast standard. In its proposal OSM intended that the maximum allowable airblast standard applicable to a specific mine may be modified by the regulatory authority if OSM's permanent program limits appear to create excessive levels which may cause damage. To clarify its intent, OSM has revised § 816.67(b)(1)(ii) and inserted the phrase "for use in the vicinity of the specific blasting operation." Rulemaking procedures are not required for changes to the standards that are not of general applicability.

Another commenter believed that OSM's proposed language which included the word "may" and also the requirement "if necessary" gave the regulatory authority too much discretion to decline to reduce the maximum airblast limit, if it determined that a lower value is necessary to prevent damage. OSM believes that imposition of a lower value is properly within the discretion of the regulatory authority. However, should the regulatory authority determine a lower value to be necessary it must set a lower value. For this reason the final rule contains the language under which the regulatory authority determines whether or not imposition of a lower limit is necessary, and, if so, must reduce the limit.

Commenters objected to proposed § 816.67(b)(1)(iii) because it placed a burden on operators to evaluate "adverse atmospheric conditions." OSM agrees that there is no need to have such a specific requirement. Accordingly, proposed § 816.67(b)(1)(iii) has not been adopted. However, the requirement to meet applicable airblast standards is general and applies regardless of atmospheric conditions.

Airblast monitoring. A commenter on proposed § 816.67(b)(2)(i) suggested that airblast measurements should be required at the location and occurrence of every seismographic reading. In considering this provision, OSM recognizes the need for ensuring that airblast levels are met, but also believes that the location of seismographic monitoring, for instance, may not be the critical or appropriate location for airblast monitoring. Wind, temperature, and overcast weather can affect the maximum airblast location. Therefore, the final rule includes a general provision for periodic airblast monitoring by the operator in which the locations and the periods of such monitoring are left to the discretion of operators and the regulatory authority. A sentence has been added to the § 816.97(b)(2)(i) to emphasize that the regulatory authority may specify monitoring locations and determine which blasts have to be monitored.

A commenter was dissatisfied with the explanation in the preamble to § 816.67(b)(2) (47 FR 12766) concerning airblast monitoring "at or near the nearest structure." The issues raised are: (1) When is a notice of violation issued for exceeding airblast standards? and (2) where should monitoring be located? In response, OSM notes that airblast limits apply at any location where damage may occur (*i.e.*, the location of any structure, not necessarily the nearest). Therefore, a monitor located at any structure which records a value exceeding the maximum value for that frequency would record a violation. The location may not be the nearest structure because wind conditions may focus airblast away from near structures to those at greater distances from the blast. Although OSM is not requiring specific locations to be monitored, the operator is responsible to insure that such airblast monitoring does take place to assure compliance with airblast limits at all locations.

Section 816.67(b)(2)(ii) specifies the sensitivity of airblast monitoring equipment, requiring the upper end of the response range of the measuring system to have a flat frequency response of at least 200 Hz. A commenter objected to the provision in proposed § 816.67(b)(2)(iii) which would have allowed the regulatory authority to approve alternative measuring systems for airblast. As discussed in the preamble to the proposed rules (47 FR 12766), some suitable alternative monitoring systems exist, such as a 0.1 Hz- or a C-weighted instrument. As described above, OSM has inserted limits for these particular alternatives in the final that will provide equivalent levels of protection. Therefore proposed § 816.67(b)(2)(iii) is unnecessary and has not been adopted.

Section 816.67(c)—Flyrock. OSM has adopted § 816.67(c) approximately as proposed. The final rule is essentially the same as previous § 816.65(g). Flyrock includes material either travelling along the ground or in the air. It may not be cast more than one-half the distance to the nearest dwelling or other occupied structure nor beyond the area of regulated access. It may not be cast off the permit area.

Comments varied on the items to be included as flyrock. OSM, in review of these comments intends to include rock, mud, and debris as flyrock. It should be noted that flyrock is considered to be cast, projected, or thrown, not drifting smoke or dust particles of fragmented rock. Several commenters disagreed

with the provision limiting flyrock range to one-half the distance to the nearest inhabited structure. These commenters cited this restriction as contrary to other departmental requirements for maximum coal recovery. Others cited this provision as providing a degree of safety in excess of that required by the Act. OSM has opted to retain the provision for one-half the distance, but has limited its applicability to dwellings or other occupied structures. This places the burden on operators to provide appropriate design restraints when mining close to such dwellings or structures, such as additional stemming, burden, or mats to prevent flyrock. Section 522(e)(5) of the Act limits mining within 300 feet of occupied dwellings, subject to valid existing rights or unless a waiver is obtained from the owner. Such a waiver does not, however, waive the protection of § 816.67(c)(1) from flyrock or other adverse effects of blasting.

OSM has also chosen to retain the prohibition against casting flyrock beyond the permit boundary limit, rather than allowing operators to cast it on the land owned or leased by the operator.

Unless such land is permitted, access control is not provided, and public protection might be jeopardized.

A commenter suggested including public road rights-of-way in § 816.67(c)(1). OSM considered this addition, but rejected it because such areas will be protected according to either § 816.66(c)(2) or § 816.67(c)(3) which prevents flyrock from being cast outside the permit boundary or the area of control under § 816.66(c).

A commenter raised the question of defining the blasting site as the location from which flyrock distances are measured. OSM agrees with explosives industry terminology which generally refers to the limits of a blasting site as encompassing an area contained within the perimeter formed by the exterior charged holes. This differs from the area of regulated access (blasting area) referred to in § 816.66(a)(1) and § 816.66(c). The blasting area reflects the area where danger from flyrock exists for mine workers and persons potentially entering the mine site.

Commenters requested the phrase: "from the blasting site" be changed to "from its point of origin" in § 816.67(c) referring to the precise location of the flyrock. Determining the exact point of origin of flyrock is generally impossible after blasting has occurred, and therefore the language "from the blasting site" has been adopted as proposed.

Section 816.67(d)—Ground vibration. Section 515(b)(15)(C) of the Act requires the regulatory authority to establish limits on the use of explosives based on physical conditions of the site so as to prevent injury to persons and damage to public and private property outside the permit area. Ground vibration is among the most relevant factors which must be considered.

OSM has proposed three options for the control of ground vibration. The final rule governing ground vibration incorporates aspects of each of the three options proposed. The three options were: (1) A peak-particle-velocity for each permit based on site-specific data, (2) A variable ground-vibration limit based on distance to the nearest structure; and (3) A constant particle-velocity criterion of 1.0 inch per second at any structure outside the permit area. The discussion which follows first describes the rule that is adopted and then responds to specific comments on the various alternatives.

The rule adopted today sets limits on the allowable ground vibration (i.e., peak-particle-velocity) at certain types of protected structures to ensure the prevention of damage. These include dwellings, public buildings, schools, churches, or community of institutional buildings outside the permit area.

Peak-particle-velocities have been selected which reasonably assure that structures will be protected from damage. Blasts conducted close to structures where the frequency of ground vibration is generally highest will be allowed to have higher peak-particle-velocities. Further away, where potentially damage-causing lower frequencies would predominate, a lower peak-particle-velocity is mandated. For structures which are not buildings, the operator must submit a value for regulatory authority approval.

Three methods for ground-vibration limitation are provided in §§ 816.67(d)(2), (3) and (4) for the use of operators. These methods vary in their complexity and expense in application.

First, peak-particle-velocities are set for use with seismic monitoring. Section 816.67(d)(2)(i) provides specific numeric limits for ground vibration for use with general seismic monitoring and equivalent scaled-distance factors. These limits provide the protection to structures including residences, based on an analysis of the damage recorded by the RI8507 study (Siskind and others, 1980). The specific limits are described below, together with OSM's justification therefor.

Second, as an alternative provided under § 816.67(d)(3)(i), an operator may use a scaled-distance equation which determines charge-weights (the weight of explosives) based on the distance of the blast to the nearest structure. The equation is used to determine the allowable charge-weight per delay without mandatory seismic monitoring. Under § 816.67(d)(3)(ii) operators may, with regulatory authority approval, develop and use a modified scaled-distance equation.

Third, under § 816.67(d)(4) the operator is allowed to conform to maximum peak-particle-velocities that vary by frequency. In those situations an operator must use sophisticated seismic monitoring which records the frequency content of the ground vibrations. A detailed discussion of this paragraph is included below.

Under § 816.67(d)(5), the regulatory authority may reduce ground vibration levels on a site-specific basis if necessary to provide sufficient damage protection. Generally seismic monitoring is at the option of the operator; however, under § 816.67(d)(6) the regulatory authority may require it and specify locations for such monitoring.

Under § 816.67(e) the operator may exceed the prescribed ground-vibration levels at structures owned by the operator with the written waiver of any lessees.

In selecting particle-velocity limits, OSM has considered the differences between performance criteria, design standards, and the range of potential damage based on these parameters.

In controlling ground vibration, information such as geology, hydrology, seismic characteristics, distances to structures, and the amount of explosives must be evaluated. These factors, plus the level of fragmentation necessary, must be considered in setting the pattern of drill holes, selecting of explosives, and determining charge-weight. Design standards for ground vibration, such as burden, spacing, stemming, and subdrilling were not mandated by the previous rules and are not found in the final rule. Such design considerations are more appropriately applied by the certified blaster. The performance criteria to be met for ground vibration must be based on the ground-vibration levels predicted to cause damage. To stay within these levels, design parameters which are intended to keep ground vibration at or below the maximum allowable level must be used. Ground-vibration limits which protect homes and buildings from damage have been predicted from research studies. One Bureau of Mines study, RI8507 by Siskind and others (1980), provides a consolidation of such studies for the purpose of developing safe limits. The study recommended a 0.75 inch-per-second standard for dwellings with

gypsum-board interiors and 0.50 for plaster-on-lath interiors. These recommended limits have been highly criticized by operators, explosives users, explosives engineers, explosives manufacturers, and others as overly stringent. Some claim that these limits result from misinterpretation of the data. Also, portions of the RI8507 study have been cited for inaccurate data and damage findings, placing some question on the conclusions and recommendations of the study. A number of comments contained such criticism.

OSM considers RI8507 as the most up-to-date consolidation of research data for evaluation of blast-induced damage, but agrees that the interpretation of the data raises some questions. OSM utilizes the study's data base to support the regulatory limits on blasting, but does not accept the study's recommended standards. From the data on page 16 of RI8507, OSM concludes that design indicators, relating design to performance levels such as the weight of explosives per delay, do not consistently produce absolutely predictable uniform levels of performance. Thus a blast using a specific charge-weight of explosives may result in a range of particle-velocities, and repeated blasts at that charge-weight may result in somewhat different ranges. Use of scaled-distance factors as design guides produces ranges of results as depicted on Figure 11 of RI8507. (For example, the range of expected particle-velocities for different mining blasts for a scaled-distance of 100 is from 0.015 to 0.20 inch per second, a factor of 1,333 percent.) Therefore, an operator attempting to meet a 1.0-inch-per-second standard would not design for a blast with a peak particle velocity of 1.0 inch per second, but rather would design for a blast with an expected range of peak particle velocities not to exceed 1.0 inch per second. The design range for a 1.0-inch-per-second limit from Figure 11 is 0.15 to 1.0 inch per second with a scaled-distance of 30. A scaled-distance of 55 results in a range of lower values. When monitored with seismographs, this approach will require careful application of design criteria to fall within the maximum limit. Without seismic monitoring, conservative safety factors must be applied to assure compatible performance for regulatory compliance.

Because OSM believes operators must design to achieve lower levels than the maximum permissible, setting a 1.0-inch-per-second performance level is believed by OSM to result in actual readings in the range 0.30 to 0.70 inch per second. This range is consistent with the recommendations in RI8507 (Siskind and others, 1980). OSM believes that a 1.0-inch-per-second peak-particle-velocity will prevent the occurrence of threshold damage and has set such a standard in § 816.67(d)(2)(i) for distances of 301 to 5,000 feet from the blasting site to the nearest building.

Several commenters objected to the use of the RI8507 study. The report incorporates and consolidates field data and laboratory experiments conducted in the definition of damage produced by blast vibrations. In addition to the conclusions reached, which have been the subject of much dispute, it has several chapters dealing with the fundamentals of ground vibration and airblast, including ground-vibration propagation with scaled-distance, response-spectra analysis applications, interior considerations such as amplification, and a chapter on failure characteristics of materials which relates damage potential to the inability of materials to undergo deformation and withstand stress or strain.

Commenters' concerns focused on the adequacy of the new structures and data observed, the relevance of the old study data, and the definition of the terms "threshold," "minor," and "major" damage. In developing these rules, OSM has relied upon the new data in RI8507 which was collected on actual structures in a controlled manner using highly complex and sensitive monitoring equipment. OSM followed the suggestion of commenters and used such data as a basis for its regulatory actions.

In review of damage data in the RI8507 study in Figure 46 on page 51, as related to the readings in Table 1 on page 10 of that report, OSM finds that threshold damage did not occur until considerably higher levels than the report's conclusions indicate. For instance, "structure 51" incurred damage from all recorded blasts except one at 0.5 inch per second. Threshold damage ranged from levels of 1.04 to 7.25 inches per second, but the damage which was observed at 1.04 inches per second immediately followed six higher recordings in the following order: 1.16, 1.22, 2.84, 1.24, 1.86, and 10.21 inches per second. OSM believes that if the structure had not been weakened by the six successive stronger blasts, a vibration of 1.04 inches per second may not have damaged it. "Structure 27" recorded damage at the lowest reading of the new data in RI8507 (0.72 inch per second). This value followed blasts at the following levels: 1.38, 1.89, 1.91, 2.33, 3.73, 5.31, 2.34, and 1.22 inches per second. Of these, only blasts with ground vibrations recorded at 1.91 and 5.31 inches per second were attributed with threshold damage. Numerous blasts with considerably higher values did not result in damage.

The data below taken from Report RI8507 demonstrate that the range of threshold damage occurred at 0.75 to 2.0 inches per second, with the majority of damage points concentrated between 1.0 and 2.5 inches per second, whereas, no nondamage points were observed above 2.0 inches per second. Of the structures presented as new damage points on Figure 46 of RI8507, the following data are evaluated:

Structure No.	Material type	Number of observations		Number of damage points	
		<1.0[1]	>1.0[1]	<1.0[1]	>1.0[1]
19	Plaster/lath.	29	16	1	5
20	Gypsum board.	13	2	2	1
27	Plaster/lath.	1	9	1	2
51	Plaster/lath/brick.	1	11	0	[2]13
58	Gypsum board/brick.	1	5	0	5
61	Gypsum board/plaster.	1	1	1	1
Total		46	44	4	27

[1] Inch per second.
[2] Questionable data plotting.

Based on the above table, 91 percent of blasts observed below 1.0 inch per second did not cause damage. Of the 4 blasts observed below 1.0 inch per second that caused damage, one at 0.72 inch per second followed two blast observations greater than 1.0 inch per second (2.34 and 1.22) which did not result in damage. Therefore, the 0.72 value is questionable as the actual damage-producing blast. Another damage value of 0.79 followed a nondamage value of 1.10 inches per second.

Therefore, OSM considers the 1.0-inch-per-second standard adopted in § 816.67(d)(2)(i) for the range of 300 to 5,000 feet to provide a degree of protection consistent with the Act, because (1) The range of threshold damage appears to occur at levels above 1.0 inch per second; (2) the range of recordings in field blasts designed to meet a maximum limit of 1.0 inch per second will infrequently reach 1.0 inch per second with expected results in the range from 0.30 to 0.90 inch per second; and (3) the ground-vibration criteria coupled with other limitations on adverse effects from blasting will tend to require design considerations which lead to cumulative protection (*i.e.*,

separate constraints on flyrock and airblast will limit charge-weight, dimensions, and explosive characteristics).

Several commenters compared the recommended levels in the RI8507 study (Siskind and others, 1980) to the values OSM proposed in Option I for structure type and frequency.

As can be seen from the following comparison, the recommended peak-particle-velocities of the study are lower than those in OSM's proposal.

Structure type	RI8507 recommended at 40 Hz (in/sec)	OSM rule at 10 Hz (in/sec)
2	0.50	0.75
3	0.75	1.00

2. Older homes more than 20 years old with construction elements such as plaster-on-lath interiors and deteriorated or rigid, easily fractured construction materials.

3. Modern homes less than 20 years old with gypsum-board interiors, reinforced concrete or concrete masonry unit foundations, and other wood-frame and wood-clad structure.

In response to these commenters, OSM recognizes the need for blasting levels which prevent damage. However, in review of the data contained in Figure 46 of RI8507, OSM observes that the lowest damage value associated with blasts affecting plaster-on-lath interiors was 0.72 inch per second on "structure 27," and the lowest value affecting gysum-board interiors was about 0.79 inch per second on "structure 20." Structures such as "51" (plaster/lath/brick), "19" (plaster/lath), and "58" (gypsum board/brick) showed the occurrence of threshold damage at blasts ranging from 0.85 to 5.75 inch per second with the majority of points between 1.0 and 3.0 inches per second.

Imposing a ground-vibration level of 0.5 inch per second for such structures would protect these structures, but OSM believes this level is overly conservative. A value of 0.75 inch per second would also have provided protection. OSM believes that if a blast is designed to avoid exceeding the limit, the design level will have to be far less than the maximum, because predictability of the maximum particle velocity is difficult unless a conservative scaled-distance equation is applied. OSM expects that blast designers would have to use design criteria of 0.3 to 0.5 inch per second to meet a 0.75-inch-per-second performance standard. Under a 1.0-inch-per-second standard, only rarely are values expected actually to reach the maximum levels. Actual recorded vibration levels are expected to range from 0.30 to 0.90 inch per second. The setting of particle velocity limits, rather than specifying design parameters for different types of structures ensures protection and allows the blaster reasonable latitude in conducting the shot. Such practices ensure protection consistent with the parameters of the RI8507 study (Siskind and others, 1980) without penalizing the operator by restrictive performance levels. The possibility of every blast reaching a constant 1.0-inch-per-second level is small. Furthermore, an occasional blast which reaches that level does not present a high degree of damage potential. Additionally, if blasting levels do consistently reach the prescribed standard and the regulatory authority considers this a potentially damaging level, it is authorized in §816.67(d)(3)(ii) to reduce the allowable maximum standard to a lower value.

One commenter agreed that the concepts applied by OSM were valid, but disagreed with the specific values proposed and the claimed oversimplification of the ground-vibration issue. The commenter recommended a constant 1.0-inch-per-second standard be mandated in the final rule. OSM, in developing the final rule, has incorporated suggestions from various commenters and under § 816.67(d)(2)(i) has applied a constant 1.0-inch-per-second value over a normal operating range of 300 to 5,000 feet, recognizing the occurrence of high frequency close to structures and low frequencies which would exist if the vibration intensity carried beyond 5,000 feet. This does not preclude low frequency from occurring in close-in blasts or high frequency from occurring at distances greater than 5,000 feet. However, based on the data found in RI8507, a constant 1.0-inch-per-second standard would have prevented at least 85 percent of the damage points, and it is noted that 15 observations produced no damage above the 1.0-inch-per-second particle-velocity level.

In § 816.67(d)(20)(i), ground-vibration limits within 300 feet and beyond 5,000 feet are different from the 1.0-inch-per-second standard. Based on the predominant occurrence of high frequency vibration near the blasting site, OSM allows a 25-percent higher particle-velocity limit within 300 feet of a blasting site. The higher level would only be allowed for residences within 300 feet after owner approval and when prior blast designs must also be submitted to the regulatory authority. The additional constraints when blasting within 300 feet, as well as the probability of higher frequencies, justify the increase to 1.25 inches per second.

Conversely, at distances beyond 5,000 feet, levels at 0.75 inch per second must be observed with due regard to the potential for potentially damaging low frequency vibrations.

Commenters called OSM's attention to the study conducted at the Wright Mine in Warrick County, Ind., by Braile and others (1982). This study only dealt with the propagation of ground-vibration waves: data was observed for the site-specific geology and geologic type but no analysis of damage was conducted. The conclusions support the limits on blasting which produces low frequency ground vibrations and long duration surface waves, because such occurrences raise damage potential as well as result in annoyance to residents. The study concludes that vibrations at 5,000 feet could be perceptible and disturbing to persons inside a structure. However, the study does not indicate a damage threshold for these low frequency waves. Other studies suggest that the results achieved by the peak-particle-velocity standards prescribed today will prevent damage from low frequency blasts. Because OSM is statutorily charged only to prevent damage to structures and injury to persons, OSM has based blast limits on avoidance of physical injury or damage rather than annoyance.

Many commenters suggested that OSM consolidate proposed Options 1 and 3, while others supported variable peak particle velocity as a function both of frequency and distance from the blasting site. Several commenters recommended proposed Option 1 because it (1) Considered levels of protection by structure type as well as frequency and (2) allowed a 2.0-inch-per-second maximum peak particle velocity under some site-specific conditions, whereas Options 2 and 3 apply generally conservative limits and equations. Based on these comments, OSM has adopted a variant of Option 1 in the form of Figure 1 as an alternative method of determining peak particle velocity. This provision, § 816.67(d)(4), provides a site-specific approach to blasting restrictions based on carefully monitored frequency of the blast and provides adequate flexibility for State program adaption. The derivation of the values used in this alternative is described below.

An operator-commenter preferred proposed Option 1 because it allowed limits to be set based on site-specific conditions. Other commenters objected to Option 1 because it contained values believed to be too permissive and would

be difficult to implement due to the variety of structure types, frequency verification, and monitoring constraints. The commenters also felt that levels for Type 4 structures would be too restrictive. OSM believes that the final rule reflects the positive aspects of Option 1, flexibility and site-specific levels, but only places the requirement of stringent monitoring and data development on those choosing to undertake such a sophisticated approach. OSM has decided not to adopt different standards for different types of structures because such a rule would be unnecessarily complex, would require an extensive analysis of structures surrounding the blasting site and would be difficult to enforce.

Some commenters expressed support for the Option 1 standards, because it appeared to be the only limit restricting ground vibration at the location of utilities (buried pipes, etc.). OSM did not intend that Option 1 be the only protection for pipelines, underground mines, water towers, impoundments, and tunnels, but recognizes that these structures are less susceptible to damage than buildings and residences. Therefore, OSM has included a provision under § 816.67(d)(1) to limit ground vibration at such structures as determined by the regulatory authority. Currently, the Mine Safety and Health Administration requires levels less than or equal to 2.0 inches per second for underground mines.

Some commenters preferred Option 3, but suggested a modification to allow values greater than 1.0 inch per second in areas specifically approved by the regulatory authority. In the new rule being adopted, OSM has incorporated two provisions allowing such values. First, at distances less than 300 feet an upper limit of 1.25 inches per second has been established in § 816.67(d)(2)(i) because of the frequency considerations; however, as noted throughout the comments, lack of substantiating data precludes incorporating limits in excess of 1.0 inch per second as proposed in Option 2 for distances between 300 and 3000 feet. Second, the use of alternative blasting criteria under § 816.67(d)(4), the limits of which are specified in Figure 1, will allow values up to 2.0 inches per second if site conditions warrant for blast frequencies in excess of 30Hz.

A commenter suggested that the only acceptable safe blasting criteria would be a variable limit with frequency similar to proposed Figure 1, or the use of response-spectra analysis requiring investigation of the natural frequency of the structure to be protected and relating this information to the blast vibration frequencies. OSM acknowledges that response-spectra analysis as used in the RI8507 study (Siskind and others, 1980) and by vibration consultants provides a unique solution because it sets allowable limits accurately by predicting the range of potential damage. However, OSM believes that a much more general standard must be authorized for application at coal mines where 200 to 1,000 houses may be involved. OSM does not want to discourage the use of response-spectra analysis, especially where a regulatory authority determines that a lower standard should apply. This technique if applied on a case-by-case basis might prove to be the best substantiation of the actual damage range. In order to allow such technique and to provide operators the option to increase particle velocities above the maximum limits set for general compliance, OSM has included in § 816.67(d)(4) an alternative method using Figure 1. Using this option requires monitoring of particle velocity at the frequency levels, which may be augmented by response spectra for confirmation of the structure's interaction with the monitored wave forms. In using this alternative, the seismographic record will provide evidence of regulatory compliance, as well as evidence of damage potential for information of nearby homeowners.

A commenter, objecting to all options presented in the proposed rules, cited difficulty in the application of proposed Option 1, disputed the assumption that frequency decreases linearly with distance from the blasting site as found in proposed Option 2, and did not like the inclusion of the alternative blasting criteria under proposed Option 3.

Commenters also believed that proposed Option 3 ignored structural response, claiming that single value limits are an oversimplification of blasting effects and misleading to further study.

As described above, the new rule combined the three options; it allows the application of three levels of ground-vibration control: (1) Seismic monitoring of peak particle velocity, (2) use of a scaled-distance equation without monitoring, and (3) complex monitoring of velocity at associated frequencies. Each allows a somewhat different approach to control of blasts, but each provides equivalent levels of damage prevention.

Several commenters suggested adding the use of vector-sum seismographs to the peak-particle-velocity component concept of § 816.67(d)(1)(i). OSM recognizes that some monitoring equipment records vector sum and that requiring component seismographs may be expensive for the operator. To avoid this unnecessary burden, OSM has allowed, but does not require, the use of vector-sum units. The Bureau of Mines has concluded that component velocity is the best indicator of damage potential and thus recommends limits and readings be in component format. The values listed for acceptable vector sum limits are identical for component limits, ensuring conservative results when using a vector-sum instrument. OSM recognizes that this will produce conservative monitoring standards, but a general conversion of component to vector-sum equivalent is not available.

Commenters were concerned that OSM's 1.0-inch-per-second standard would not provide adequate protection of sensitive structures. OSM believes that the limit of 1.0-inch per second over the range from 300 to 5,000 feet does set a limit which considers structural response. Setting a universally applied limit assumes that structures to be protected have natural frequencies in the range of 10–20 Hz (hertz). At frequencies between 10 and 20 Hz the safe vibration level recommended in RI8507 ranges between 0.75 and 1.40 inches per second. As indicated in OSM's evaluation of data from RI8507, the range of threshold damage appears to begin at levels greater than 1.0 inch per second. Therefore, a 1.0-inch-per-second standard provides protection within this range over the broad range of distances.

A commenter objected to the prohibition placed on mining within 300 feet of a dwelling without owner approval and within 300 feet of public buildings. The commenter felt that such limitations were inappropriate and could interfere with maximum coal recovery. Section 522 of the Act prohibits any mining operations within 300 feet of public buildings or dwellings (without owner consent) subject to valid existing rights. Rules governing these areas are set forth at 30 CFR Parts 761 and 769. It would be duplicative to restate them in conjunction with the blasting rules. Accordingly, the proposed language in § 816.67(d) has not been adopted.

Section 816.67(d)(1) sets levels for structures other than buildings. This new rule places the burden of setting particle-velocity limits for these structures on the operator and the regulatory authority. Operators would propose standards for structures, and the regulatory authority would approve or modify them.

Various commenters made recommendations regarding scaled-distance equations, a variant of which was proposed for all three options. Some commenters agreed with the correlation values proposed (e.g., $Ds=55$ correlating to 1.0 inch per second) while others believed that $Ds=60$ should be used to correspond to 1.0 inch per second, stating that it would better meet the requirements of the Act. Another commenter objected to the use of scaled distance as a safe blasting criterion. That commenter presented information attempting to refute the accuracy of scaled distance as a predictor at any specific value. OSM based the correlation values proposed (47 FR 12768) on the blast data contained on pages 10–17 of the RI8507 study and believes use of scaled distance will prevent damage in more than 99 percent of blasts as described below.

The use of the scaled-distance equations of § 816.67(d)(3) provides an operator with the option of not monitoring every blast to ensure compliance with the specified maximum ground-vibration level. Siskind and others (1980) in the RI8507 study collected and consolidated blast vibration data from blasting at various distances and blasting parameters. When displayed and analyzed, these data provide a line representing the mean occurrence of a specific particle velocity for a specified scaled-distance level. The equation adopted in § 816.67(d)(3) divides distance from the blast to the structure to be protected by a scaled-distance factor to yield the square root of the total charge weight of explosives which may be detonated in any 8-millisecond period: $(D/Ds)=\sqrt{W}$, where D=the distance from the blast to the structure to be protected, Ds=the scaled-distance factor, and W=the charge weight of explosives.

The values of ground vibration measured at location D from the blast reflect the actual measured ground vibration. Mean curves were developed as part of the RI 8507 study based on the actual ground vibrations measured. (See p. 14 of the RI 8507 study.) The mean portrayed thereon reflects an averaging of values above and below the curve at any scaled-distance factor. The curve representing a 95-percent-confidence level for specific vibration levels is obtained statistically, resulting in a similar curve two standard deviations above the mean. This results in a level providing 95-percent confidence that actual monitoring will fall at or below the predicted ground vibration. OSM has selected scaled-distance factors taken from the standard deviation curve. Coupled with the remote possibility of damage at the predicted level, these factors will afford a degree of protection in excess of 99 percent for the structure to be protected.

Some commenters felt that the proposed scaled distance of 70 in Option 1 was too conservative. Under the final rule, the maximum scaled-distance factor will be 65. Under the tables in new §§ 816.67(d)(2)(i) and 817.67(d)(2)(i), the scaled distance of 65 is applied only when the distance to the nearest building is greater than 5,000 feet. This will allow the use of a maximum of 5,900 pounds of explosives per 8-millisecond delay period at a distance of 5,000 feet. OSM does not believe this limit will constrain an operator unduly since explosive technology has developed delay blasting techniques available to conduct large blasts using this amount per delay. The scaled-distance denominator of 65 corresponds to a 0.75-inch-per-second peak particle velocity. In setting this peak particle velocity, OSM recognizes the need for lower ground vibration at locations of lower frequency. After traveling 5,000 feet, the intensity of a seismic wave should dissipate below the 0.75 peak-particle-velocity level; thus the standard should rarely be exceeded.

Some commenters contended that the proposed equation $W=D^{1.5}/90$ in Option 2 was too conservative for the large areas blasted in the West. OSM has not adopted that optional equation because it was too stringent at long distances and not stringent enough when structures were within 500 feet. Therefore, its applicability would have been limited to the distances between 1,000 and 3,000 feet, whereas the scaled-distance equation adopted in this new rule, using $Ds=55$, can be applied at distances between 300 and 5,000 feet.

OSM believes that the 55 level for Ds over the 300 to 5,000 foot range provides sufficient protection; as described earlier, a 1.0 inch-per-second level reflects an appropriate standard to provide damage protection.

Section 816.67(d)(3)(ii) allows the operator flexibility in modifying the scaled-distance factor Ds to allow for higher or lower scaling factors. The provision requires that after the operator correlates the mean occurrence of particle velocity with scaled distance, the modified value for the scaled-distance factor Ds must reflect a point that is two standard deviations above the mean regression curve. This correlation value provides a 95-percent-confidence level that the maximum allowable particle velocity will not be exceeded. A technical guidance document will be made available by OSM demonstrating the application of the modified equation and its derivation.

One commenter suggested that a lower limit be established on modified scaled-distance below which the regulatory authority would not set a standard. OSM has not accepted the suggestion. OSM believes that a 1.0-inch-per-second standard over the normal working distances provides adequate protection in general blasting practice, but recognizes that structure condition, geology, and vibration frequency affect damage potential and are site specific. The Act requires site-specific limits for use of explosives, and values as low as 0.5 inch per second may be necessary. The setting of a lower value is more appropriately left to the discretion of the regulatory authority at the time of evaluating the site-specific conditions.

Certain site-specific conditions warrant higher bore hole loadings per delay, but protection of people and property must be assured. Other site-specific conditions may warrant reduction of allowable peak particle velocity and the lowering of the weight of explosives per delay (i.e., higher scaled-distance factors). The provisions of § 816.67(d)(5)(ii) require the regulatory authority to take action if necessary to provide damage protection. Critical factors in assessing damage probability include distance to the nearest structure and charge weight.

A commenter objected to the proposed term "in the vicinity of the mine" with respect to proposed § 816.67(d)(3)(iii) which would have required regulatory authorities, upon requests from owners and residents, to evaluate the maximum allowable ground-vibration standard. The same commenter felt that "vicinity" could mean 100 feet or 100 miles. The commenter suggested that such requests be limited to structures within one-half mile of the permit area. OSM believes that the proposed provision is unnecessary. Upon request from a resident, or for any other reason, the regulatory authority may require seismic monitoring of blasts and may reduce ground vibration limits if conditions warrant. Thus, the regulatory authority has ample authority to protect those in the vicinity of the blasting.

As mentioned above, § 816.67(d)(4) presents a third optional ground-vibration standard. This is based on the standard proposed as Figure 1 in Option 3 in the proposed rule. It requires more stringent monitoring than the normal peak particle velocity and allows more flexibility to operators to use greater

charge weights. The limits are set forth in a graphic distribution of maximum allowable particle velocity versus blast vibration frequency. These are shown in a new Figure 1 to be included as part of the rule. Commenters requested that the limits of proposed Figure 1 be revised. Several commenters wanted this criterion to be the only one to apply to regulation of ground vibration. Others objected to the use of the criterion altogether and suggested its deletion. OSM has included the criterion as an alternative to allow flexibility by operators and regulatory authorities if they wish to conduct the more extensive monitoring required. The alternative blasting criterion (new Figure 1) differs slightly from that proposed. One commenter suggested retention of the proposed curve above 20 Hz, but a limit of 1.0 inch per second for the portion of the curve below 20 Hz. Another commenter provided a rationale for adjusting the cutoff point for the 2.0-inch-per-second standard from 40 Hz to 30 Hz, since the interaction with an amplification of natural frequencies of residential structures primarily occurs in the 5 to 20 Hz range. The suggestion to rely on a constant 1.0-inch-per-second limit up to 20 Hz has been rejected because it fails to acknowledge the impact of predominant low-level blast vibration frequency within the range of 5 to 10 Hz.

In determining the values in Figure 1, OSM has adopted the Bureau of Mines proposal cited in Appendix B of RI8507 (Siskind and others, 1980). For frequencies up to 4 Hz, a constant maximum amplitude of 0.030 inch will be allowed. (Under this standard, amplitude is related to particle velocity through the use of the equation $V=2\pi fA$, where V is the particle velocity, f is the frequency, and A is the amplitude.) Over this frequency range the maximum allowable particle velocity increases from 0.19 inch per second to 0.75 inch per second. At frequencies of 4 through 11 Hz a constant allowable particle velocity of 0.75 inch per second is set.

The level over the range 4 to 11 Hz was set at 0.75 inch per second rather than 1.0 inch per second to acknowledge the need to reduce particle velocity at low frequencies. Over the frequency range of 11 through 30 Hz, a constant amplitude of 0.0107 inch is allowed. This correlates to maximum particle velocities of 0.75 inch per second to 2.0 inch per second. Above 30 Hz, a constant peak particle velocity of 2.0 inches per second will be allowed.

A commenter cited concern with varying threshold levels on the basis of structure type and vibration frequency and allowing a maximum level of 2.0 inches per second. These commenters felt that proposed Option 1 would be the most beneficial in regulating the industry. OSM does not believe that a general limit of 2.0 inches per second provides adequate protection. In the previous rules, a peak particle velocity of 2.0 inches per second was allowed in some instances only when applying stringent monitoring techniques. In the final rule, the particle-velocity standard sought by the commenter is allowed under § 816.67(d)(4) at frequencies above 30 Hz, but only under well-monitored and controlled conditions that require seismic monitoring using equipment recording both particle-velocity data and vibration frequency levels to assure continuous compliance.

A commenter raised the problem of determining predominant frequency in applying proposed Option 1 dealing with the structure tables. This problem also exists in implementing the alternative blasting criteria of Figure 1. Therefore, a provision has been added to § 816.67(d)(4) to require approval of the method to be used in evaluating and ultimately establishing the predominant frequency at which vibration levels occur.

A commenter felt that the proposed alternative blasting criterion of Figure 1 was overly stringent and too expensive for most operators. They also were concerned about the possibility of rendering existing monitoring equipment obsolete by this rule. OSM has included new Figure 1 in the final rule for optional application. Some operators may find the economic outlay beneficial to production and the protection of nearby structures; those who do not need not use this alternative method of determining maximum ground vibration. Other provisions of the rules allow conventional monitoring and use of equations without monitoring.

Commenters requested clarification as to what was required to evaluate blast vibration frequency. They wanted to know whether visual inspection of seismographic records was adequate or whether electronic anlaysis of frequency would be required. Under § 816.67(d)(4), which requires regulatory authority approval of the method of analysis of the predominant frequency contained in the blasting records, visual inspection may be adequate if traces are distinct and only a few frequencies are contained in the wave-form. However, seismographic consultants have found that various waves with multiple frequencies typically are contained in the blasting record. In those cases, electronic analysis is necessary to separate the wave traces and analyze each intensity and frequency. OSM does not intend to mandate electronic analysis; rather the determination of what type of analysis is appropriate should be made by the regulatory authority.

Commenters did not believe that frequency analysis, which requires sophisticated equipment, should be required in all cases. Except when the criteria of § 816.67(d)(4) are used, the final rule leaves frequency analysis to the discretion of the regulatory authority. OSM recognizes its value as an indicator of vibration damage probability, but also recognizes the complexity and expense in its application, as well as the uncertainties in determining specific frequency levels.

Commenters referred to human annoyance from blast vibrations. Human response has been addressed by the RI8507 study (Siskind and others, 1980) and other researchers in the ground-vibration field. OSM concludes that the limits on airblast provide the most appropriate basis for minimizing disturbance to nearby residents. In addition, there does not appear to be a standardized correlation between ground vibration levels and degrees of annoyance, apart from injury and damage. OSM believes that through an effective public relations program and communication with nearby residents much anxiety over annoyance can be mitigated.

A commenter complained that OSM had not satisfied its obligations under the Administrative Procedure Act (APA) by indicating a preferred course of action. The APA requires that an agency publish an explanation of its proposed action sufficient to allow for meaningful comments. Due to the complexity of these issues OSM devised several regulatory approaches and has explained each of them with sufficient specificity to attract the numerous comments it has received. A decision on which option to adopt was not made until after evaluation of all the comments received. This new rule adopted by OSM falls well within the range of the alternatives proposed.

Section 816.67(e)

New § 816.67(e) excludes from ground vibration and airblast limits structures owned by the operator and those owned by the operator and leased to others if waivers are obtained from the lessees. Commenters requested that the exclusion for structures owned by the operator and leased to others apply to all options. This was the intent of the proposed rule, but was misinterpreted

as applying only to Option 3. This section has been retained in the final rule as § 816.67(e).

Section 816.68. Use of explosives: Records of blasting operations. As proposed, the new § 816.68 requires the operator to maintain blasting records for at least 3 years and to make them available for inspection by the regulatory authority or the public on request. This is required in Section 515(b)(15)(B) of the Act. Among the information which must be included is the name of the operator; the location, date, and time of the blast; the name signature, and certification number of the blaster conducting the blast; identification, direction, and distance from the nearest blast hole to the nearest dwelling or other structure outside the permit area; weather conditions described in more detail below; the type of material blasted; sketches of blast pattern including number of holes and the burden, spacing, decks, and delay pattern; the diameter and depth of holes, the type of explosives used; the total weight of explosives used per hole; the maximum weight of explosives detonated within any 8-millisecond period; the initiation system; type and length of stemming; and mats or other protection used.

Section 816.68(o) includes the requirement that if seismographic and airblast records are required, they should include a record of the instrument type, its sensitivity and calibration signal or the certification of annual calibration; location, date, time, and distance the instrument is from the blast; the person's name and firm who obtained the readings, and the person's name and firms analyzing the seismographic record; and vibration and/or airblast levels recorded. In addition § 816.68(p) provides that information stating the reasons and conditions for each unscheduled blast shall be contained within the record.

Commenters objected to deletion of specific weather characteristics listed in the previous rules. These commenters reasoned that these conditions may assist in determining adverse effects due to blasting focused by weather such as: clouds, wind, and temperature inversions. OSM believes the commenter is correct, but a blaster in the field may not know if an inversion exists or what the specific wind velocity is. The requirement of this data could result in inaccurate entries leading to false interpretation of impacts of weather. OSM acknowledges the potential impacts on blasting of temperature inversions, wind direction, and velocity and has inserted a provision for the blaster to estimate any adverse weather conditions which might exist.

A commenter objected to the deletion of previous § 816.68(1) establishing the number of holes to be detonated in any 8-millisecond-delay period because providing this information places no great burden on the operator. OSM believes this information summarizes data which are insignificant in the total blast record and are not necessary for assuring compliance with the rules. Another commenter believed that physical separation can provide the same effect as an 8-millisecond delay. OSM agrees. The 8-millisecond separation was determined by the Bureau of Mines as the minimum delay period to separate charges to reflect nonadditive ground-vibration levels when measured at some distance from the blast. However, this concept assumes that delay holes are at the same distance from the seismograph. In situations where holes are varying distances from the recorder, physical distance separation will delay arrival times of the ground vibration at a structure. This is variable, dependent on the velocity that the seismic wave travels in the specific geologic material.

A commenter objected to OSM's proposed deletion of the requirement that operators keep a record of the number of persons in the blasting crew. OSM believes that a specific number of persons should not be regulated on a national basis. The entry in OSM's old rules served the requirement governing crew size found in 30 CFR Part 850 which has been proposed for change. If a crew size is imposed by a State program, an appropriate entry could be required by the State. Accordingly, OSM has adopted no change to reinstate this entry.

A commenter suggested amending the entry under § 816.68(o)(3) to include the name of the person and firm conducting seismographic tests. OSM believes this to be an acceptable inclusion. Accordingly, OSM has adopted this requirement.

A commenter suggested including the frequency of recorded blast vibration in the seismic record. Not all records produced by seismographs in use in the industry today produce frequency spectra. Most recordings must be analyzed on complex systems to identify trace frequencies as expressed in the RI8507 report (Siskind and others, 1980). As discussed above, the use of a vibration criterion based on frequency monitoring is required in § 816.67(d)(4) in those situations where such sophistication is necessary. However, imposing this condition on all monitored blasts would be overly stringent and unnecessary.

A commenter objected to inclusion of the amount of information required by proposed § 816.68(g) stating that sketches should only be required if blasts are conducted within 1,000 feet from a dwelling or other structure. OSM believes the record is important for reference purposes to ensure the mitigation of damage. Moreover, OSM's regulation of aspects of the blast such as burden, spacing, decking, and delays is mandated by the Act. Other information proves valuable if a complaint arises. Also, an operator who maintains this type of record may revise future blast design if problems occur. OSM believes this degree of information is within that envisioned by the Act, and the final rule adopts the requirement. Commenters also felt that too much information was required for a single sketch. OSM accepts the comment that a single sketch may be cluttered and allows multiple sketches to reflect this information if a single sketch cannot be made.

A commenter believed that all blasts should be certified as designed by a certified blaster in the record. OSM does not require every blast to be designed by a certified blaster. Rather, they must be carried out by certified blasters. Since blast patterns and delays may be designed by someone other than the blaster carrying out the blast, the name of the designer may not be available. Furthermore, OSM requires certifications of blast designs when blasting is conducted within 1,000 feet of structures. OSM therefore has not added such a provision to its recordkeeping rules.

A commenter suggested limiting the data kept in records required by § 816.68(j) on explosives to total explosives used per blast rather than explosives per hole. OSM believes this information is necessary to evaluate the amount of explosives per delay. Furthermore, the per-hole information requirement is taken from the Section 515(b)(15)(B) of the Act. OSM agrees that total charge weight information is important, but recognizes that it is available by totalling all holes. Therefore, it is not considered to be necessary as additional data to be entered. Accordingly, OSM has not adopted such a provision.

A commenter requested that a provision be made in § 816.68(o) to allow "annual calibration" to relieve operators from showing calibration signals on each record. The commenter argued that some seismographs do not

have calibration signals integral with the records. OSM has adopted this provision in the final rule.

A commenter suggested deletion of the requirement in proposed § 816.68(o)(2) for location of the instrument and the date and time of the blast. OSM believes that this information is necessary to ensure that the operator is utilizing the monitoring system agreed to in the permit, and that the data recorded can be traced to a specific blast.

A commenter requested deletion of the requirement in proposed §816.68(p) of the names of persons notified when unscheduled blasts are conducted. As discussed above in conjunction with § 816.64(a)(2), OSM is deleting the requirement of verbal notification of area residents of unscheduled blasts. Instead, audible signals will be used. Weather and other site-specific conditions which necessitate unscheduled blasts may not allow notification to individual residences. Accordingly, OSM does not require records of individuals notified.

A commenter requested confirmation of the availability of blasting records to the public. Both § 816.68 and the Act require the operator to provide access to the blasting records for public inspection upon request. A commenter objected to the degree of detail made available to the public in the records required by § 816.68, stating that it exceeds the requirements of the Act. OSM recognizes that the information required in § 816.68 exceeds that specifically listed in Section 515(b)(15)(B) of the act. OSM requires additional information to evaluate the performance levels of rules implemented pursuant to Sections 515(b)(15)(C), (D), and (E) and 719 of the Act. The additional information relates to performance standard found in §§ 816.61 through 816.67. Such information is necessary to determine whether performance levels were attained. Segregating in the record the items listed in the Act to be available for public inspection is impractical and unnecessary. The commenter failed to demonstrate any harm that would occur through the public disclosure of the additional information. OSM therefore, has chosen to require the entire blasting record to be made available for public inspection.

Rules governing use of explosives associated with underground mining. The performance standards adopted in this rule governing the use of explosives associated with underground mining are identical to those governing surface mining except as noted below. Most offsite impacts, such as airblast and ground vibration, for surface blasting incident to underground mines are not substantially different from those for blasting at surface mines. OSM only regulates the surface impacts of blasting from underground mines, which are derived almost exclusively from surface blasting associated with such mines. This is not a change from the previous rules which also only regulated surface blasting activities incident to underground mining.

Only one difference exists between the two sets of rules in Parts 816 and 817. This relates to the use of blasting schedules. Rather than requiring a blasting schedule, § 817.64 will require weekly notice prior to any surface blasting in support of underground coal mining. Because of the occasional, sporadic nature of surface blasting in support of underground coal mining, the public will be sufficiently served by receiving notification weekly, but not less than 24 hours before any blasting occurs. The mine operator also will be relieved of the task of publishing and republishing a blasting schedule.

Blast design. OSM had proposed to place blast designs among the permitting requirements of § 780.13 for surface mines. No similar planning requirement was included for underground mines because blasting plans are not required for underground mines.

As described above, in adopting the final rules governing surface mines, OSM has shifted the requirement for blast design from the blasting plan section to the general performance standards requirement. This has been done for several reasons: (1) To emphasize the fact that the requirement for special information when blasting within sensitive areas is not a prohibition of mining within these areas, but a protection of structures more likely to suffer damage; (2) To ensure that blast designs are prepared in advance for blasting in areas where the possibility of damage is greatest; (3) To provide the regulatory authority with the greatest information when blasting will be conducted in sensitive areas to allow for monitoring or review of blast designs.

A number of commenters urged that blast designs also be required for underground mines. Because surface blasts may be equally damaging when associated with underground mines, OSM has adopted a requirement in § 817.61(d) identical to the blast design requirement of § 816.61(d).

Blasting schedules. Several commenters objected to the proposed retention of the previous 24-hour notice requirement for notification of local residents within one-half mile of the blasting site in proposed § 817.64(a). Since underground mines have a reasonably constant area of surface disturbance and the time period in which surface blasting would be performed is limited, OSM has rewritten the notification provisions for underground mines to require notification of residents within the ½ mile of the blasting site and local governments. The rule also allows weekly schedules to be distributed. This concept is envisioned to provide the advanced written notice required by statute, while recognizing the infrequent and limited blasting operations used in surface operations of underground mine development. The rule allows daily notification as in the previous rule, but also allows an operator to publish a schedule of weekly blasting events to avoid daily notification. This final rule is envisioned to allow flexibility in use of notification procedures.

Signs and markers. It was mentioned by several commenters that the introductory language to proposed § 817.66(a) used the wrong wording for the underground section. This has been corrected by removing the introductory language and restructuring the provision to parallel § 816.66. New § 817.61(a) limits the applicability of § 817.66 to surface blasting activities incidental to underground coal mining.

Addition of Figure 1. The addition of Figure 1 to §§ 715.19(e)(2)(ix), 816.67(d), and 817.69(d) is discussed in the preamble under the "Ground Vibration" section.

III. Procedural Matters

Federal Paperwork Reduction Act

The information collection requirements in existing 30 CFR Parts 715, 780, 816, and 817 were approved by the Office of Management and Budget (OMB) under 44 U.S.C. 3507 and assigned new clearance numbers 1029-0007, 1029-0036, 1029-0047, and 1029-0048 on April 1, 1981. This approval was identified in "Notes" at the introduction to 30 CFR Parts 715, 780, 816, and 817 under the old numbers R0494, R0606, R0618, and R0619 (all under No. B-190462). OSM has codified the OMB approvals under the new §§ 715.10, 780.10, 816.10, and 817.10 (47 FR 33683, August 4, 1982) and has received new OMB approval of these information collection requirements.

The information required by 30 CFR Part 715 will be used by the regulatory authority in monitoring blasting operations. This information required by 30 CFR Part 715 is mandatory.

The information required by 30 CFR Part 780 will be used by the regulatory authority to determine whether the applicant can meet the environmental protection performance standards of the regulatory program. This information required by 30 CFR Part 780 is mandatory.

The information required by 30 CFR Parts 816 and 817 will be used by the regulatory authority to monitor surface and underground mining activities to ensure that they are conducted in a manner which preserves and enhances environmental and other values of the Act. This information required by 30 CFR Parts 816 and 817 is mandatory.

Executive Order 12291

The DOI has determined that this document is not a major rule and does not require a regulatory impact analysis under Executive Order 12291.

Regulatory Flexibility Act

The DOI certifies that this document will not have a significant economic effect on a substantial number of small entities and therefore does not require a regulatory flexibility analysis under Pub. L. 96-354.

National Environmental Policy Act

Revision of § 715.19 of the initial program regulations is deemed not to be a major Federal action within the meaning of the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4332, as stated in Section 501(a) of the Surface Mining Control and Reclamation Act of 1977 (the Act), 30 U.S.C. 1251, and a detailed statement on the analysis of the environmental impacts of its revision is not required.

Amendments relating to use of explosives in 30 CFR Parts 780, 816 and 817, have been considered in relation to revisions of certain other rules in OSM's Final Environmental Statement OSM-EIS-1: Supplement. The final supplement is available in OSM's Administrative Record in Room 5315, 1100 L Street, NW., Washington, D.C., or may be obtained by mail from Mark Boster, Chief, Branch of Environmental Analysis, Room 134, Interior South Building, U.S. Department of the Interior, Washington, D.C. 20240. This preamble serves as the record of decision under NEPA. These final rules are the same as the preferred alternatives published in Volume III of the final EIS and analyzed in the EIS.

List of Subjects

30 CFR Part 715

Coal mining, Environmental protection, Surface mining, Underground mining.

30 CFR Part 780

Coal mining, Reporting requirement, Surface mining.

30 CFR Part 816

Coal mining, Environmental protection, Reporting requirements, Surface mining.

30 CFR Part 817

Coal mining, Environmental protection, Reporting requirements, Underground mining.

Agency Approval. Section 516(a) requires that, with regard to rules directed toward the surface effects of underground mining, OSM must obtain written concurrence from the head of the department which administers the Federal Coal Mine Health and Safety Act of 1969. OSM has obtained the written concurrence of the Assistant Secretary for Mine Safety and Health, U.S. Department of Labor.

Accordingly, 30 CFR Parts 715, 780, 816, and 817 are amended as set forth herein.

Dated: February 28, 1983.

William P. Pendley,

Acting Assistant Secretary, Energy and Minerals.

PART 715—GENERAL PERFORMANCE STANDARDS

1. Section 715.19 is amended by revising Paragraphs (e)(2)(ii) and (e)(2)(iii) and removing Paragraphs (e)(2)(iv)–(e)(2)(vi) to read as follows:

§ 715.19 Use of explosives.

* * * * *

(e) * * *

(2) *Blasting standards.* (i) * * *

(ii) *Ground vibration.*—(A) *General.* In all blasting operations, except as otherwise authorized in Paragraph (e)(2)(iii) of this section, the maximum ground vibration shall not exceed a value approved by the regulatory authority. It shall be established in accordance with the maximum peak-particle-velocity limit of Paragraph (e)(2)(ii)(B), the scaled-distance equation of Paragraph (e)(2)(ii)(C), or the blasting-level chart of Paragraph (e)(2)(ii)(D), or such other standard established under Paragraph (e)(2)(ii)(E), of this section. All structures in the vicinity of the blasting area, not listed in Paragraph (e)(2)(ii)(B), 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.

(b) *Maximum peak-particle velocity.* (*1*) 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.

Distance (*D*) from 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 5,000	1.00	55
5,001 and beyond	0.75	65

[1] Ground vibration shall be measured as 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 (e)(2)(ii)(C)(*1*) of this section.

(*2*) A seismographic record shall be provided for each blast.

(C) *Scaled-distance equation.* (*1*) The 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 (e)(2)(ii)(B)(*1*), of this section.

(*2*) 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 (e)(2)(B)(*1*) of this section at a 95-percent confidence level.

(D) *Blasting-level chart.* (*1*) An operator may use the ground-vibration limits in Figure 1 to determine the maximum allowable ground vibration.

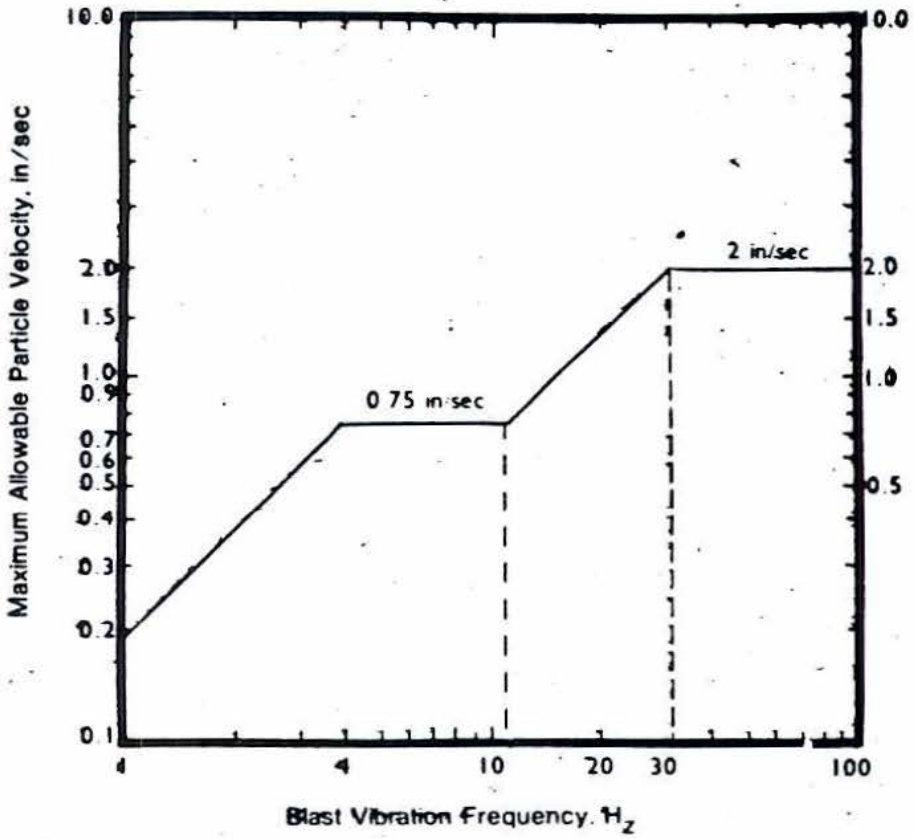

Figure 1. Alternative blasting level criteria

(Source: Modified from figure B-1, Bureau of Mines RI 8507)

(2) 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.

(E) 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.

(F) The regulatory authority may require an operator to conduct seismic monitoring of any or all blasts and may specify the location at which the measurements are taken and the degree of detail necessary in the measurement.

(iii) If blasting is conducted in accordance with Paragraph (e)(2)(i) of this section, the maximum ground-vibration and airblast standards shall not apply at the following locations:

(A) At structures owned by the permittee and not leased to another person.

(B) 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.

* * * * *

§ 715.19 [Amended]

2. Section 715.19 is amended by removing Paragraph (e)(3) and redesignating Paragraph (e)(4) as Paragraph (e)(3).

PART 780—SURFACE MINING PERMIT APPLICATIONS—MINIMUM REQUIREMENTS FOR RECLAMATION AND OPERATION PLAN

3. Part 780 is amended by revising § 780.13 to read as follows:

§ 780.13 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 §§ 816.61–816.68 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 § 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.

PART 816—PERMANENT PROGRAM PERFORMANCE STANDARDS—SURFACE MINING ACTIVITIES

§ 816.11 [Amended]

4. Section 816.11 is amended by removing paragraph (f) and redesignating paragraph (g) as paragraph (f).

5. Section 816.61 is amended by revising paragraphs (a) and (b) and adding paragraph (d) to read as follows:

§ 816.61 Use of explosives: General requirements.

(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 § 816.64.

* * * * *

(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 pubic and meet the applicable airblast, flyrock, and ground-vibration standards in § 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.

6. Section 816.62 is revised to read as follows:

§ 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 ½ mile of the permit area how to request a preblasting survey.

(b) A resident or owner of a dwelling or structure within ½ 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.

7. Section 816.64 is revised to read as follows:

§ 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 ½ mile of the blasting site and document the reason for the unscheduled blast in accordance with § 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 ½ 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.

§ 816.65 [Removed]

8. Section 816.65 is removed.

9. Section 816.66 is added to read as follows:

§ 816.66 Use of explosives: Blasting signs, warnings, and access control.

(a) *Blasting signs.* Blasting signs shall meet the specifications of § 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 ½ 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 ½ 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.

10. Section 816.67 is revised to read as follows:

§ 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.

Lower frequency limit of measuring system, in Hz (±3 dB)	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 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 § 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 § 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 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 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:

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 5,000	1.00	55
5,001 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 (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, $W=(D/D)^2$, 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.

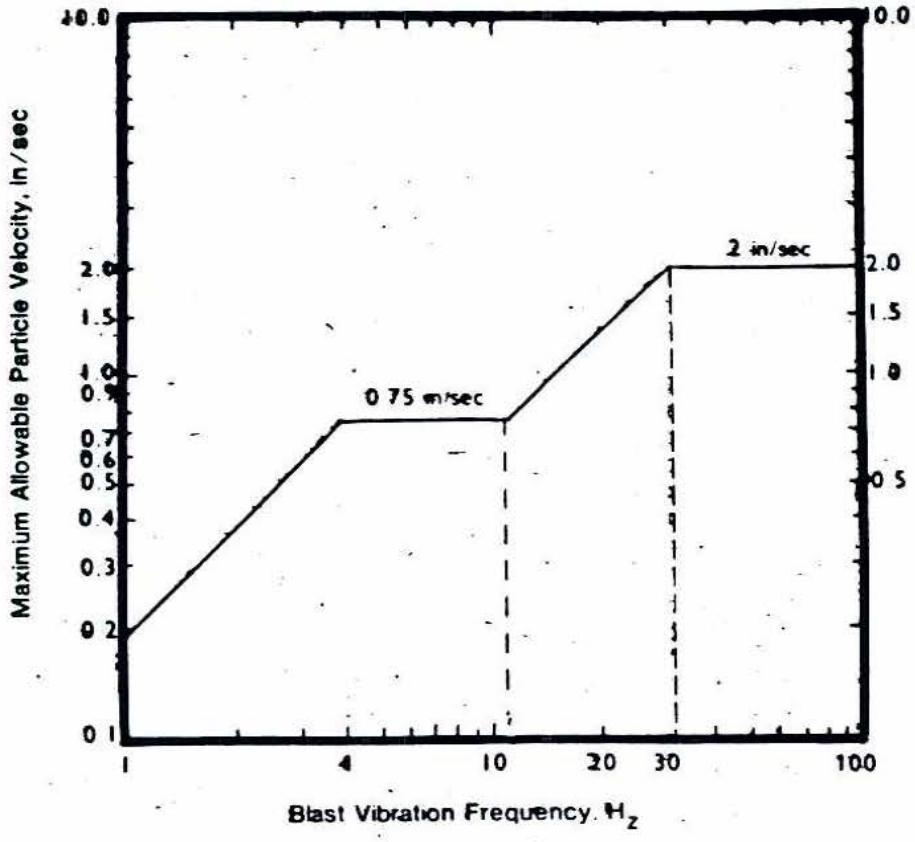

Figure 1 Alternative blasting level criteria
(Source Modified from figure B-1, Bureau of Mines RI 8507)

(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.

11. Section 816.68 is revised to read as follows:

§ 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 § 816.67(e).

(e) Whether 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.

PART 817—PERMANENT PROGRAM PERFORMANCE STANDARDS—UNDERGROUND MINING ACTIVITIES

§ 817.11 [Amended]

12. Section 817.11 is amended by removing paragraph (f) and redesignating paragraph (g) as paragraph (f).

13. Section 817.61 is amended by revising paragraphs (a) and (b) and adding paragraph (d) to read as follows:

§ 817.61 Use of explosives: General requirements.

(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.

* * * * *

(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 § 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.

14. Section 817.62 is revised to read as follows:

§ 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 ½ mile of the permit area how to request a preblasting survey.

(b) A resident or owner of a dwelling or structure within ½ 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.

15. Section 817.64 is revised to read as follows:

§ 817.64 Use of explosives: General performance standards.

(a) The operator shall notify, in writing, residents within ½ 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 ½ mile of the blasting site and document the reason in accordance with § 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.

§ 817.65 [Removed]

16. Section 817.65 is removed.

17. Section 817.66 is added to read as follows:

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

(a) *Blasting signs.* Blasting signs shall meet the specifications of § 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 ½ 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 ½ mile of the permit area shall be notified of the meaning of the signals in the blasting notification required in § 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.

18. Section 817.67 is revised to read as follows:

§ 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.

Lower frequency limit of measuring system, in Hz (±3 dB)	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 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 § 817.66(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:

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 5,000	1.00	55
5,001 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 (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.

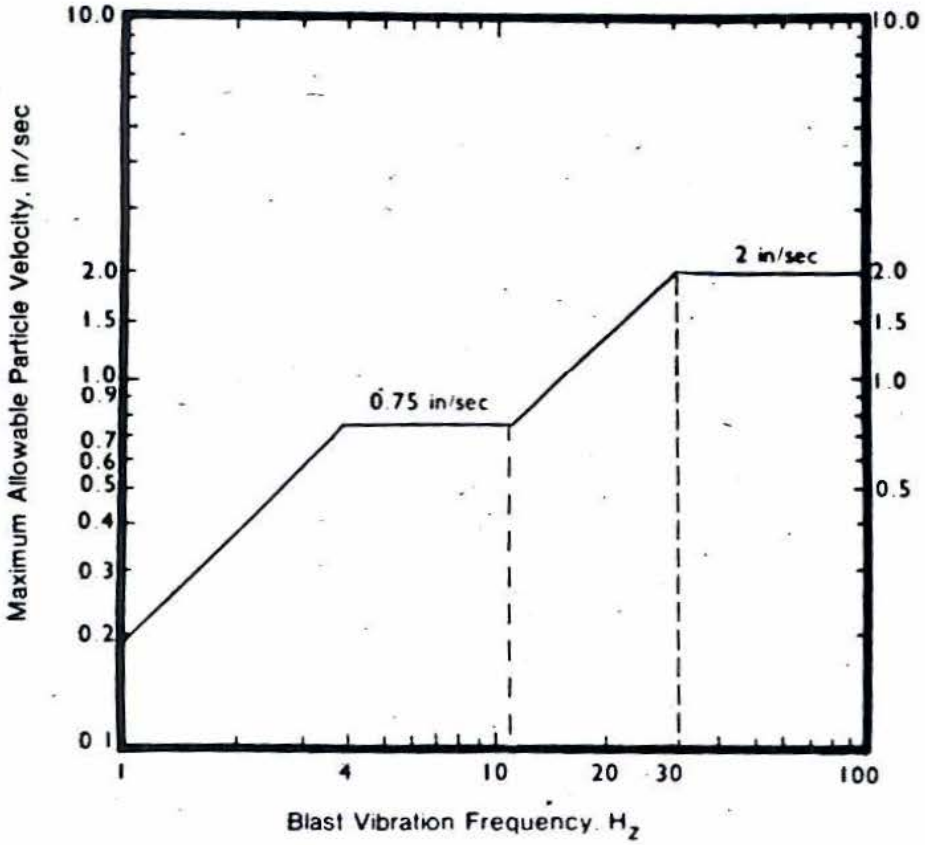

Figure 1 Alternative blasting level criteria

(Source Modified from figure B-1, Bureau of Mines RI 8507)

(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 and 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.

19. Section 817.68 is revised to read as follows:

§ 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 § 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.

Authority: Pub. L. 95–87, 30 U.S.C. 1201 *et seq.*

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