

Vol. 43—No. 181  
9-18-78  
BOOK 2:  
Pages  
41661—41940

Proposed  
Rules  
for  
Permanent  
Regulatory  
Program

mark-up

BOOK 2 OF 2 BOOKS  
MONDAY, SEPTEMBER 18, 1978  
PART III



---

DEPARTMENT OF  
THE INTERIOR  
Office of Surface Mining  
Reclamation and  
Enforcement

SURFACE COAL MINING  
AND RECLAMATION  
OPERATIONS

Proposed Rules for Permanent  
Regulatory Program

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

**Introduction**

Part 780 is proposed to establish the heart of the permit application; the mining operations and reclamation plan. The regulatory authority will utilize this information, together with the description of the existing environmental resources obtained under Part 779 to predict whether the lands to be mined can be reclaimed and if the operations can be conducted in compliance with the environmental protection performance standards of Part 816, Subchapter K.

**§ 780.11 Operation plan: General requirements.**

Authority for this Section is Sections 102; 501(b); 503; 507(b); 508(a); 510(b); and 515(b) of the Act. This Section would require that each application contain a description of the proposed mining operations, including a narrative of mining methods and procedures proposed to be used in the operation of the mine. Paragraph (2) of this Section would require the narrative to explain the construction, modification, use and maintenance and removal of certain mine operation facilities.

The requirements of this Section are designed to aid the regulatory authority in determining whether the applicant can meet the following performance standards of Subchapter K:

Sec. 780.11(a)(1).....	Sec. 816.62
Sec. 780.11(a)(2)(ii).....	Sec. 816.39
Sec. 780.11(a)(iii).....	Secs. 816.46, 816.48 and 816.91
Sec. 780.11(a)(iv).....	Secs. 816.21-816.24, 816.71-816.73, 816.100-816.106
Sec. 780.11(a)(2)(v).....	Secs. 816.32-816.36 and 816.59
Sec. 780.11(a)(2)(vi).....	Secs. 816.81-816.88 and 816.91-816.93
Sec. 780.11(a)(2)(vii).....	Sec. 816.39
Sec. 780.11(a)(2)(viii).....	Secs. 816.41-816.46, 816.50 and 816.56

**§ 780.12 Operations plan: Blasting.**

Authority for this Section is Sections 507(g) and 508(a)(13) of the Act. This Section requires that each application for a surface mining permit provide a narrative description of the blasting operations to be used in the proposed mining operations. Specific information about the types and amounts of explosives, their handling and use are required in paragraphs (a)-(g). This is necessary for the proper evaluation by the regulatory authority of the possible environmental and public safety consequences of the use of explosives during the proposed mining operation and are needed to determine whether the applicant can meet the performance standards found in Sections 816.41,

816.60 and 816.61-816.68 of subchapter K.

**§ 780.13 Operations plan: Maps and plans.**

Authority for this Section is Sections 102; 201(b); 501(b); 503; 504; 507(b); 507(g); 508(a); 517; and 522(e)(4) of the Act. In addition to the narrative plans to be required by the preceding Sections, this Section of Part 780 would require each application to include maps and plans relevant to the proposed operation. Some of these maps and plans would have to be prepared by specified professionals as required under Sections 507 and 508 of the Act. Accurate maps and plans are needed by the regulatory authority to properly determine whether the planned operation should be approved, modified, or disapproved.

The requirements of this Section are designed to aid the regulatory authority in determining whether the applicant can meet numerous performance standards. The Subsection of 780.13 and the performance standards are designed to provide information as follows:

Sec. 780.13(a).....	Secs. 816.21-816.24, 816.31-816.32, 816.36; 816.38-816.39; 816.41; 816.43-46; 816.49; 816.56; 816.59; 816.71-816.73; 816.79; 816.81; 816.83; 816.87-816.77; 816.91; 816.101; 816.121-816.124; and 816.133.
Sec. 780.13(b).....	Sec. 816.124.
Sec. 780.13(c)(1).....	Sec. 816.39.
Sec. 780.13(c)(2).....	Secs. 816.21-816.24; 816.21-816.24; 816.31-816.32; 816.43-816.46; 816.56; 816.71-816.73; 816.81; 816.83; 816.91-816.93; and 816.99-816.101.
Sec. 780.13(c)(13).....	Secs. 816.36; 816.39; 816.81; 816.91; and 816.95.
Sec. 780.13(c)(4).....	Secs. 816.21-816.24; 816.71-816.73; 816.81-816.88; and 816.101-816.105.
Sec. 780.13(c)(5).....	Secs. 816.43-816.50; 816.55; 816.83; and 816.91.
Sec. 780.13(c)(6).....	Sec. 816.95.
Sec. 780.13(c)(7).....	Secs. 816.39; 816.81; 816.83; 816.86; and 816.91.
Sec. 780.13(c)(8).....	Sec. 816.97.
Sec. 780.13(c)(9).....	Secs. 816.61; 816.68.
Sec. 780.13(c)(10).....	Secs. 816.46; 816.49; 816.91-816.93.
Sec. 780.12(c)(11).....	Secs. 816.56; 816.73-816.76; 816.81; 816.91; 816.100-816.106; and 816.133.
Sec. 780.13(c)(12).....	Secs. 816.41-816.42; 816.52; 816.95; and 816.97.
Sec. 780.13(c)(13).....	Sec. 816.133.

**§ 780.14 Air pollution control plan.**

Section 780.14 of the proposed regulations would establish the permit application requirements, so that the regulatory authority is provided with comprehensive and reliable information on the air quality impact of the

proposed surface coal mining operation. This Section is intended to assure that proposed surface coal mining operations meet all national ambient air quality standards and any other applicable Federal or State air quality standards.

In general, the proposed regulations are structured on both a regional and a projected production level basis. This is proposed, in part, because of the current status of technical literature and air quality regulations in the field. The regulations also recognize the potential variations in air quality impact depending upon climate, geology and operating characteristics of surface coal mining operations in different parts of the country.

*Legal authority:* Permit application regulations for air quality are supported by Sections 102, 201(c), 501(b), 503(a) and (b), 507(b), 508(a)(9), 515(b)(4), and 515(b)(24) of the Act. Specifically, Congress in Section 515(b)(4) of the Act provides that all operators shall:

(S)tabilize and protect all surface areas including spoil piles affected by the surface coal mining and reclamation operation to effectively control erosion and attendant air and water pollution. (Emphasis added)

Thus, if a surface area is affected by surface coal mining and reclamation operations, the operator must effectively control attendant air pollution. The phrase "surface coal mining and reclamation" operation is broadly defined in the Act to mean surface mining operations and all operations necessary and incident to reclamation. Section 701(28), 30 U.S.C. Section 1291. The office believes that haul roads and access roads must be controlled because the definition of the phrase "surface coal mining" includes not only activities conducted on the surface of lands in connection with the surface mine, but also haul roads and access roads.

To implement this performance standard Congress has required that each permit application contain the steps to be taken to comply with applicable air quality laws and regulations. Section 508(a)(9), 30 U.S.C. 1258. The surface mining permit cannot be approved unless the regulatory authority finds in writing that the permit application meets requirements of the Act including the requirement to effectively control air pollution from all surface areas. Sections 515(b)(1)-(2), 30 U.S.C. Sections 1260(b)(1)-(2).

The permit application requirements listed in Subsections 780.14(a), (b) and (c) are the first critical steps in the process of assuring that all surface coal mining operations effectively control air pollution from all surface areas.

strength of rock and geometry of failure of rock and soil when subjected to tensile or compressive stress prior to mining. These tests allow characterization of bedrock and unconsolidated material (*Dunrud and Osterwald, 1978, p. 22; Bureau of Reclamation, 1973, p. 600.*)

Slaking tests, properly called slaking durability index tests, are designed to simulate, in an accelerated way, failures due to wetting, drying, and abrasion of rocks subjected to atmospheric stresses (*Franklin and Chandra, 1972, p. 337.*)

The Office requests comment and will work with MHSA to determine whether information already required by MHSA on roof stability would satisfy this requirement in whole or in part.

Technical references used were:

(i) Dunrud, S.R., and Osterwald, F.W. 1978, Effects of coal mine subsidence in the western Powder River Basin, Wyoming: U.S. Geol. Survey Open-File Report 78-473, 71 p.

(ii) Franklin, J.A., and Chandra, R., 1972, The slake durability test: *International Journal of Rock Mechanics and Mining Sci.* v. 9, no. 3, p. 325-338.

(iii) Lambe, T.W., and Whitman, R.V., 1969, *Soil Mechanics*: New York, John Wiley 553 p.

(iv) U.S. Bureau of Reclamation, 1973, *Design of small dams*: Dept. Interior, Washington, D.C., 2nd edition, 816 p.

(v) For the area overlying underground mine workings, chemical analysis of the coal seam and lower part of the overburden will be needed to determine whether the coal seam will be acid or iron-bearing, so that appropriate mine drainage controls can be planned for as part of the proposed operations. This information would be obtained through chemical analysis of the coal samples and strata immediately around the seam. The principal elements to be analyzed, initially, include the various combinations of iron sulfide and associated elements. See *U.S. Department of Agriculture Handbook No. 523 of Agriculture Handbook No. 525; U.S.E.P.A. Manual for Testing Overburden and Mine Spoils 1978.*

**PART 784—UNDERGROUND MINING PERMIT APPLICATIONS—MINIMUM REQUIREMENTS FOR RECLAMATION AND OPERATIONS PLAN**

*Introduction*

Part 784 for underground mining activities is proposed to correspond to Part 780 for surface mining activities. Part 784 sets forth the minimum requirements for approval of regulatory program provisions for mining operations and reclamation plans. Legal authority for this Part and the basis and purpose is the same as for Part

780, except to the extent that the following differences between underground mining activities and surface mining activities have been identified.

The Office has, as required by Section 516 of the Act, considered whether distinct differences exist between surface and underground mining for these permit application requirements. Some differences have been identified and are discussed in detail below. Also, because the order of individual sections of Part 784 is not the same as for Part 780, appropriate identification and cross-referencing is provided.

The Office will consider whether other differences exist as a result of comments received and may modify the provisions of Part 784 accordingly.

*Air Quality Control Plan*

1. The Office has tentatively decided not to require detailed air quality control plans under Part 784, because of the lack of data on the national and regional impacts of underground mining activities on air quality.

The Office has decided not to require blasting plans for underground mining activities, because of the infrequency of surface blasting associated with those activities.

**§ 784.12 General requirements for reclamation and operations plan.**

3. The authority, basis and purpose of this section are the same as these for section 780.19 of this Subchapter.

**§ 784.13 Protection of hydrologic balance.**

4. The authority, basis and purpose of this section are the same as for section 780.21. In addition, this section provides for long-term control of permanent seals of waters inundating abandoned underground mine operations, by requiring appropriate plans as part of the application.

These plans would contain the information needed by the regulatory authority to determine if the proposed operations can be conducted during and after mining, to meet the requirements of sections 817.13-817.15 of Subchapter K.

First, for new mines in acid or iron-bearing coalseams, locations of entries must be specified to preclude gravity discharges. See section 516(b) of the Act. Particularly important for the regulatory authority, will be sufficient soils, geologic and hydrology data to assess whether mine entries can be reasonably expected to hold seals for the long-term period after cessation of mining, in view of the historic experience with the difficulties in maintaining those seals without leakage or collapse.

If these plans cannot establish that drainage will be held within the underground workings, then the applicant would, of course, be required to

propose adequate plans for the use of necessary treatment facilities to ensure that mine drainage is discharged out of the underground working in accordance with section 817.42 of Subchapter K.

The following technical literature supports this requirement.

(1) Ciolkosz, E. J. and L. T. Kardos, 1973, *Soil as a Medium for the Renovation of Acid Mine Drainage*, Office of Water Resources Research.

(2) Doyle, 1978 *Mine Sealing, Deep Coal Mining Waste Disposal Technology*, Noyes Data Corporation, Park Ridge, N.J., 1970

(3) Garrett, W.S. and Campbell, L. T., 1961, *Design and Construction of Underground Bulkheads and Water Barriers*, 7th Commonwealth Mining and Metallurgical Congress, Johannesburg, Vol. 3, 1283-1301;

(4) Halleburton Company, *New Mine Sealing Techniques for Water Pollution Abatement*, Federal Water Quality Administration, U.S. Department of Interior.

(5) Holuber and Penrose 1977, *Laboratory Study of Self-Sealing Limestone Plugs for Mine Openings*, EPA 4043019-73-041 and 67012-73-081.

(6) Moebs, N. N. and Krickovic, S., 1970 *Air Sealing Coal Mines to Reduce Water Pollution*, BOM RI 7354;

(7) USEPA, 1975, *Criteria for Developing Pollution Abatement Programs for Inactive and Abandoned Mine Sites*, EPA-440/9-75-008;

(8) USEPA, 1973, *Processes, Procedures and Methods to Control Pollution from Mining Activities*, EPA-430/9-73;

**§ 784.14 Reclamation and operations plan: Post-mining land uses.**

5. The authority basis and purpose of this section are the same as for section 780.23 of this Subchapter.

**§ 784.15 Operations and reclamation plan: Ponds, impoundments, banks and dams and embankments.**

6. The authority, basis and purpose of this section are the same as for 780.25 of this Subchapter.

**§ 784.16 Protection of public parks and historic places.**

The authority, basis and purpose for this section are the same as for Section 780.31 of this Subchapter.

**§ 784.17 Relocation or use of public roads.**

The authority, basis and purpose for this Section are the same as for section 780.33 of this Subchapter.

**§ 784.18 Underground Development Waste.**

The authority, basis and purpose of this section are the same as for section 780.35 of this Subchapter.

remaining coal. The regulation would, if adopted, require the operator to conduct mining operations so as to maximize resource recovery. This would be accomplished by mining all available coal at a minesite which it is economically feasible to extract.

The authority for this proposed Section is found in Sections 102, 201, 501, 503, 504, 510, and 515 of the Act.

The Office considered including specific language requiring the recovery of all coal economically feasible to be recovered from a site, but did not include such language in the proposed regulations. The proposed regulations would instead be satisfied by a good faith demonstration by the operator to the regulatory authority that all coal which is economically feasible to recover will be mined.

The most commonly mentioned percentages were 85, 90, and 95. These alternatives were not included for three reasons. First, it is difficult to precisely define the amount of coal existing at a site prior to mining, because of variable thickness of seams and partings, variable quality of the coal, and variations in depth of overburden. Second, health and safety considerations may preclude attainment of fixed percentages of recovery. Third, constant variation in thickness of seams, quality of coal, depth of overburden, and mining conditions would require a continuous monitoring and detailed ongoing exploration program which is believed to be beyond the capability of the regulatory authority to undertake or oversee. However, the Office will continue to consider whether fixed percentage recovery standards should be required.

Public comment on an express requirement for recovery of coal economically feasible to recover versus this implied requirement is invited.

A second alternative of requiring a separate list of cost variables and resource figures from the operator was also considered but not included at this time. Public comment is invited on the utility of requiring this information in permit application, for use by the regulatory authority according to a fixed formula for determining economic feasibility of recovery.

The reader's attention is directed to proposed regulations for determining recoverable reserves under a Federal lease, recently published by the United States Geological Survey, 43 Fed. Reg. 29631 (July 10, 1978).

Under the proposed regulations published today, the regulatory authority would monitor the mining operations to assure that the operator is proceeding in compliance with the mining plan and with the determination of recoverable coal. Variations in recoverability may be necessary where dictated by quality of coal resources, by health

and safety considerations, by the geometry of the mine workings, and by other factors.

#### § 816.61-816.68 Use of explosives.

These Sections are being proposed to protect the safety and property of the public, underground mines, and ground and surface waters outside of permit areas from blasting performed in surface coal mining activities.

Prior to the enactment of Pub. L. 95-87, the Subcommittee on Energy and Environment of the House Committee on Interior and Insular Affairs heard extensive testimony on the extent and the nature of the hazards associated with blasting in surface mining. *Surface Mining Control and Reclamation Act of 1977: Hearings on H.R. 2 before the Subcommittee on Energy and Environment of the House Comm. on Interior and Insular Affairs, 95th Cong., 1st Sess. (1977).* Those hearings indicated that the process by which coal is surface mined required a great deal of blasting to fracture the rock strata which overlies the coal seam.

When explosives are detonated, large amounts of energy are rapidly released by means of a chemical reaction. **The most dramatic effect of the release of these vast quantities of energy is the generation of flying debris, rocks, dust, and other materials which, during the blast, can be lofted in the air and dropped directly upon persons and property near strip mine sites.** *Ibid.* This "flying debris" can be widespread and has resulted in people being killed by rocks crashing through their roofs. *Id.* at 289, 305, 313. Hearings, *supra*, Appalachian Peoples Service Organization); 211 (Statement of Judy Stephenson, Director, Save Our Mountains, Inc.).

In addition, blasting causes "air blast." The noise and concussions resulting from air blasts produce severe annoyances to people caught in the wake of an air blast pressure wave and often cause damage in forms of:

"electrical black-outs from destroyed transformers and downed lines, the obstruction of stream beds, damage to structural foundations, damage to sidewalks, cracking or separation of masonry, doors thrown out of plumb, windows cracked by excessive air pressure or concussion, damage to walls and paneling and loosening of cabinet fixtures."

Hearings, *supra* Part II at 284, 13 (Testimony of Center for Science in the Public Interest); Hearings, *supra* Part III at 25 (Testimony of Rev. R. Baldwin Lloyd, Appalachian Peoples Service Organization); 210 (Earl Cheatwood, Alabama Needs Federal Coal Surface Mining Legislation). Hearings, *supra* Part IV at 227 (Testimony of Northern Plains Resource Council.)

The cumulative effects of the damage inflicted upon the victims of mine blasting have been enormous. Property damage in Appalachia alone was estimated at \$1.5 billion for the years 1965-1975. Hearings, *supra* Part II at 283. In at least one State, private insurance firms and Federal agencies have denied property insurance and guaranteed loans for prospective purchasers of dwellings near mines as a result of the damage caused by surface mining blasting. *Ibid.*

Sections 816.61-816.68 are proposed under the authority of Section 102, 201, 501, 503, 504, 515, 517 and 719 of the Act.

B. Materials used by OSM to develop these regulations include:

1. Ashley, C., and Parkes, D. B., 1976, *Blasting in Urban Areas: Tunnels & Tunnelling* (British Tunnelling Society), Sept. 1976, p. 60-67.

2. Barnes, Jack (John B.), 1977, *The effects of strip mine blasting on residential structures—Aysshire Mine, Warwick and Vanderburg Counties, Indiana*: Paper presented to the Indiana Academy of Science, Indianapolis, Ind., Oct. 28, 1977, 19 p.

3. Coal Mine Health and Safety Act of 1977 and 75 CFR, Subpart N.

4. Grim, E. and Hill, R., 1974, *Environmental Protection in Surface Coal Mining* (U.S. Environmental Protection Agency, No. 1BB040).

5. Kentucky Department of Mines and Minerals, 1977, Laws and regulations governing explosives and blasting: Lexington, Ky., p. 1.

6. Maryland Geological Survey, Bureau of Mines, 1973, Blasting restrictions (08.06.05.09) and Regulations governing blasting (08.06.05), in Bituminous coal strip mines and auger regulations, Maryland Department of Natural Resources Rules and Regulations, p. 23.

7. Medearis, Kenneth, 1976, *The development of rational damage criteria for low-rise structures subjected to blasting vibrations*: A Report of the National Crushed Stone Association: Kenneth Medearis Associates, Fort Collins, Colo., and Valley Forge, Pa., 94 p. (duplicated report).

8. Miller, P. H., (no date), *Blasting vibrations and air blast*: Park Central, Ill., Atlas Powder Co., 16 p.

9. Nicholls, H. R., Johnson, C. F., and Duvall, W. I., 1971, *Blasting vibrations and their effects on structures*: U.S. Bureau on Mines Bulletin 656, p. 13-29.

10. Old Ben Coal Company, Comments to Office of Surface Mining (1978).

11. Pennsylvania Department of Environmental Resources, Rules and Regulations, Title XXV, Pennsylvania Code, Ch. 211.

12. Research Energy of Ohio, Inc., Comments to Office of Surface Mining, 1978.

13. Siskind, D. E., 1977, *Structure vibrations from blast produced noise*, in 18th International Rock Mechanics Symposium, June 1977, Keystone, Colo.: Proceedings, p. 1A3-1-1A3-5.

14. Siskind, D. E., Stachura, V. J., and Radcliffe, K. S., 1976, *Noise and vibrations in residential structures from quarry production blasting—measurements at six sites in Illinois*: U.S. Bureau of Mines Report of Investigation RI 8168, 17 p.

15. Siskind, D. E., and Stachura, V. J., 1977, *Recording system for blast noise measurement*: Sound and vibrations Journal, p. 20-23.

16. Siskind, D. E., and Summers, C. R., 1974, *Blast noise standards and instrumentation*: U.S. Bureau of Mines, Environmental Research Program, Technical Progress Report ("TPR 78").

17. University of Maryland, *An Investigation into Delay Blasting*, 1975, NSF Contract APR 75-05171 to the University of Maryland and Subcontract No. M-218907 to Martin Marietta Laboratories.

Section 816.61 contains general requirements for the use of explosives. Under the provisions of proposed Sections 816.61 and 816.64(e) all blasting operations involving the use of more than the equivalent of 5 pounds of TNT would be required to be conducted according to published time schedules.

Five pounds equivalent of TNT has been selected on the basis of blasting experience which shows that charges of this size can cause significant disturbance when used in an improper blast design. Since commercial explosives and blasting agents have approximately the same energy as TNT, the five pound limit would apply to all commercial blasting products.

Section 816.61 would provide for the protection against the adverse effects of blasting by specification of certain minimum training requirements for the personnel used by the industry to conduct blasting operations. Persons working with explosives would be required to be familiar with the **Mine Safety and Health Administration (MSHA) regulations, in order to protect the health and safety of workers and the general public.** They would also have to be familiar with the **Bureau of Alcohol, Tobacco, and Firearms, Department of Treasury regulations to assure that explosives do not fall into unauthorized hands.** The proposed requirement for current and valid certificates would be accomplished under the training and certification programs to be instituted under proposed Subchapter M, as part of the permanent regulatory program.

The preblasting survey requirement proposed under Section 816.62 is mandated under Section 515(b)(15)(E) of the Act. That Section of the Act expressly establishes the one-half mile distance requirement. Provision is made for requiring approval by the regulatory authority of those persons actually performing the survey on behalf of the mining operator to insure that the survey procedures will be competently performed. Public comments and suggestions are requested with respect to the minimum standards, if any, which OSM should require be met by a person to be approved by the regulatory authority to conduct preblasting surveys. Such comments should be supported where possible, by appropriate technical literature.

The object of the survey would be twofold. One is to increase communication between the mining entity and the public about blasting operations. Therefore, survey procedures are proposed with a minimum level of formality. The second object of the survey is to provide for the establishment of a preblasting record as to the existing condition of structures and other physical facilities within the survey area, so that operations may be designed to avoid damage and to provide a baseline record against which the effects of the mining-related blasting can be assessed.

Examination of relevant technology thus far has revealed no current, reliable methods for either predicting the weights of individual charges that would prevent damage to structures or determining the condition of structures in terms of resistance to vibration of structural and nonstructural elements. As a result, the procedures for pre-blasting surveys are limited to determining the conditions of relevant structures and to document any pre-blasting damage. However, because technology for the types of prediction and determination discussed here may be developing for useful application, the Office specifically invites comments and supporting materials as to whether additional or modified procedures from those set forth in the proposed text should be required in the final regulations.

The interim program regulations require the schedule to specify time increments of not more than 4 hours, but not to cover all hours of the working day. The wording in those regulations has been subject to various interpretations. The permanent program regulations propose to leave the number and length of time increments open but restrict the aggregate length of the time increments to four hours per day. This change clarifies the requirement and would still give the

mine operator sufficient flexibility to carry out routine blasting activities.

The proposed **blasting schedule** would inform local residents of their right to a preblasting survey and advise them of how to obtain such a survey. The resident would also be told how the public will be protected from inadvertently entering the blasting area. Audible blast warnings and all-clear signals would be described. A description of emergency situations which will permit the operator to deviate from the schedule will be part of the schedule.

The Office has considered whether the **notice** should be required to contain the weight and types of explosives to be used. However, because these will vary with each blast, it was decided that this information need not have to be in the notice. Available information also indicates that it is not possible to predict, in advance, all emergency conditions that can occur when blasting. The notice, therefore, would identify the types of emergencies (defined in Section 816.65) that the regulatory authority has approved for blasting at other than scheduled times.

Under proposed paragraph 816.65(a)(1), blasting would be restricted to daylight hours, with provision for the regulatory authority to further limit the times of blasting. Blasting would be restricted to daylight hours for two reasons.

First, blasting at night significantly increases hazards to mine workers and makes site access-security and protection of the public much more difficult. Second, blasting at night is much more disruptive to the peace and comfort of nearby residents. The overwhelming majority of surface mines already restrict their blasting activities to daylight hours without unduly hampering the efficiency of operations.

The interim program regulations require notification of the meaning of the **warning signals** to be given only to "persons within the permit area". Because many people may commute to work regularly within the permit area, the proposed permanent program regulations would require notification to these persons so that they may be afforded the same protection as local residents.

Under paragraph 816.65 (a)(4), specific quantitative standards are proposed to control the adverse effects of **air blast** resulting from blasting in surface mining operations. Air blast is a compression wave that travels through the atmosphere in much the same way as a sound wave. It is caused when energy from the explosion is released directly into the atmosphere or by the movement of the ground surface after blasting. (Miller, (no date), pp. 10-15).

When air blast is audible to the human ear, it is called noise. When air blast creates low frequency energy and is inaudible, it is called concussion. Air blast is measured as an overpressure (air pressure above atmospheric pressure), either in pounds per square inch (psi) or in decibels (dB).

Air blast can cause both structural damage and annoyance to people and animals. Air blast can cause external masonry and internal plaster to crack and can damage windows. The most common effects of air blast are: (1) disturbances created by the rattling of windows, panels and doors which give the impression that the structure is vibrating; and, (2) generation of loud noise which may be beyond human tolerance. High levels of low frequency air blast can cause hearing damage, even though the human hearing system does not register the sensation as sound. Siskind and Summers TPR-78, pp. 15-16.

The method proposed for controlling air blast is a scale of decibel peak standards. An alternative control considered by the drafters was a requirement for the stemming of all blast holes. Stemming is a procedure where explosives placed in a bore hole are covered with fill material, to damp the blast effect. Miller, (no date) at 14. At the time of the promulgation of the interim performance standards, it was determined that the prescribed amounts of stemming was impossible to comply with under many conditions. See 42 Fed. Reg. 62658 (Dec. 13, 1977). No further information on this issue has come to the attention of the Office. However, if such information becomes available, the Office will further consider the advisability of promulgation of stemming requirements. Accordingly, comments on the use of stemming as a means for the national regulation of air blast are specifically invited.

A decibel scale is a logarithmic scale directly related to overpressure and is the scale commonly used to measure sound and airblast. All airblast instrumentation measures in decibel units. Various instruments respond to different frequency spectra in measuring airblast. To avoid undue restrictions on the type of instrumentation that an operator can use to measure airblast, the Bureau of Mines has developed a table, shown in Paragraph 816.65(a)(6), allowing for variations in instrumentation frequency response. Air blast frequency is measured in Hertz (Hz) which is equivalent to cycles per second.

Airblast levels and appropriate measurement instrumentation specifications are presented in the table. The values were derived from structure response data collected by two ongoing Bureau of Mines research projects

("Airblast Assessment and Control" and "Determination of Criteria for Ground Vibration Damage from Surface Mine Blasting"). These two projects are scheduled to be finished October 1, 1978, and there are plans to publish the complete results of both projects in the fall of 1978.

The Bureau of Mines plotted and analyzed hundreds of structure response, ground vibration, and airblast time histories. The Bureau of Mines derived an appropriate airblast vs. ground vibration equivalence, consistent with the latest data on structure response, damage, and tolerable levels. While further analysis is planned on both the currently existing body of data and additional measurements, the values in the table are believed to represent the latest state-of-the-art in understanding airblast effects on structures and methods of airblast measurement. (Bureau of Mines summaries of this research have been submitted to the Office and are available in the OSM Administrative Record.)

Two independent approaches were used to derive the values in the table. The more rigorous analysis involved determination of the structure response associated with the already recommended 1.0 inch per second ground vibration. Plots were made of the data within four classes: one-story homes, two-story homes, corner responses (structural), and mid-wall responses (non-structural).

The airblast response data were then similarly analyzed, except that the above four categories were each examined for six frequency intervals, including the four included in the table. The results of this series of comparisons were within a narrow range, probably because the two natural frequencies of structure corners and walls are within fairly narrow ranges.

The mid-wall and corner motions could be controlled by peak-flat (0.1-500 Hz) airblasts of 135 to 137 dB-linear, and C-slow maximums of 109-112 dBC. The corner responses, which are related to potential damage, justified a maximum airblast level of 137 dB-linear, when the most disadvantageous combination of structure response to ground vibration and structure response to airblast was considered. Consequently, the use of 135 dB-linear (0.1 Hz) represents a small safety factor over the ground vibration standard of 1.0 in/sec. This factor was needed to reduce human annoyance factors, due to mid-wall motions and associated rattling. C-weighted-slow responses were similarly analyzed with the maximum value of 109 dBC-slow recommended for the same reason.

A second, independent technique was used to analyze the airblast response data, involving displacement-

produced strain which is related to cracking in interior walls. Displacement itself is not a good damage descriptor because of its frequency dependence (unlike particle velocity). However, the structure walls and corners have definite frequency ranges, so an analysis was performed to determine the airblast levels associated with the lowest damage case, 0.016 inches maximum wall displacement. For both mid-walls and gross-structure motions (corners), the most strict values were derived by taking the lowest natural frequencies typically encountered, 12 Hz and 6 Hz, respectively. In all cases, the associated airblast damage level for both one and two story homes equaled or exceeded the 135 dB-linear (0.1 Hz) peak linear and 109 dBC-slow, with most values within a few dB of these limits. The compatible results of these two independent analyses lends considerable strength and validity to the results.

The use of the C-slow scale has been recommended by the Committee on Hearing and Bioacoustics Working Group 69 to the U.S.E.P.A.. It is uncertain whether this method is superior to peak-linear but it does provide a logical alternative airblast monitoring system and is under continuing study.

Siskind, 1974 (TPR-78) was based on a few mine blasts and an analysis of a great deal of other data. The values recommended in the table in Section 816.65(a)(6) are slightly stricter than TPR-78, with the 6 Hz value of 130 dBL in the table corresponding to the recommended absolute minimum damage level of 136 dB-linear (5 Hz) of TPR-78. Consequently, these recommendations should not only prevent airblast damage, but also should reduce annoyance factors.

The industry is believed to be capable of meeting the airblast values, if proper blast designs are utilized. This will require additional care by operators with thin parting layers and other confinement problems, as poorly stemmed charges can easily exceed the values specified. Most mining operations and blast engineering consultants have equipment which has flat frequency response down to 5 Hz, and will be designing to meet the 130 dB criterion.

Proposed Section 816.65(a)(6) has been drafted to indicate that any one of the four specified frequency ranges may be used to characterize airblast.

Under paragraph 816.65(a)(7) the Office proposes to condition the use of explosives within specified distances, upon prior approval of the regulatory authority and other relevant entities. The Office is aware that blasting can be conducted safely within the distances set forth in the proposed regulations. However, the legislative history of the Act and technical studies re-

viewed show that significant adverse effects still continue to occur to persons and property at distances both within and beyond those limits being proposed. Accordingly, the Office proposes to establish distance limits to protect public health and safety.

The Office has considered arguments that these restrictions conflict with the provisions of Section 522(e) of the Act, because the proposed regulation's distances are more stringent than those of the Act. Subsections 522(e)(4)-(5) of the Act prohibit any coal mining within 300 feet of certain structures and 100 feet of public roads and cemeteries. However, the Office has decided that the blasting distance restrictions do not conflict with Section 522(e), as was recognized in consideration of a similar regulation under the interim regulatory program, *Surface Mining Regulation Litigation*, 11 ERC 1593, 1603, (D.D.C., 1978). As the court held there, the limitation on blasting by distance restriction, coupled with the requirement of prior approval of the regulatory authority, is within the power of the Office to promulgate under Section 515(b)(15) of the Act because it is not an absolute prohibition on mining as is contained in Section 522(e) of the Act.

The proposed blasting distance restrictions are based on several factors. First, is the recognition that Congress was itself specifically aware that blasting damage can extend far beyond a few hundred feet from the site of the blast. Even early versions of the bill recognized that blasting could cause damage far beyond the permit area. Section 515(b)(15) of the 1974 Act limited the type of explosives and detonating equipment based upon the conditions of the site "so as to prevent (i) injury to persons, (ii) damage to public and private property outside the permit area." (Emphasis supplied.) This subsection remained intact in the final bill. See Section 515(b)(15)(C) of the Act.

During its consideration of the bill in the 1977 session, Congress approved a number of amendments to provide greater protection to residents who lived outside the permit area. One of the amendments, later Section 515(b)(15)(E), provided for a pre-blasting survey upon the request of a resident or owner of a structure within one-half mile of the permit area. In expressing his support for this amendment, Congressman Udall said:

"This problem has been one of the most troublesome for individuals living in such areas. The gentleman offered several amendments to protect homeowners and to provide notice in case of blasting. I think this is a good amendment and strengthens the bill. 123 Cong. Rec. H. 3825 (April 29, 1977).

Most significantly, during the hearings conducted by the House Subcommittee prior to the passage of the Act, it was indicated that the Congress expressly expected that the Office would promulgate regulations to establish the type of blasting distance restrictions now being proposed and that such restrictions were already being achieved by the industry. During those hearings, one group testifying proposed additions to the draft Section 515(b)(15) of the Act, including an absolute ban on strip mining within 1000 feet of any occupied dwelling, public building, school, church, community center, public park, or cemetery. This recommendation was based on extensive travel throughout the coal fields and findings that blowouts on the sides of highwalls would throw flyrock out on a neighboring community for a distance of about 1000 feet. *Hearings on H.R. 2 before the Subcommittee on Energy and Environment of the House Committee on Interior and Insular Affairs, 95th Cong., 1st Sess. (1977), Part II at 286-289.* Congressman Seiberling, the Chairman of the Subcommittee, indicated that this should be implemented by way of regulation, rather than amendment of the Act. *Id.*, at 293.

That Subcommittee also heard from one of the largest mining industrial groups in the country on the feasibility of these distance restrictions:

"We have solved the blasting problem in Pennsylvania. We are closely regulated. Our mine inspector has to approve our blasting procedure and the plan on which we are going to notify the people. . . . The State of Pennsylvania has a standard for the maximum size of a blast for strip mining. We are not permitted to exceed that standard. *When we get closer to buildings and homes than 1,000 feet, we often must reduce that standard.*" *Hearings, supra Part III at 89.* (Statement of W. Harger, President, Western Pennsylvania Surface Mine Operators' Association). (Emphasis added).

In addition, Congress' specific expectation that the Office establish specific distance restrictions on blasting, technical studies received by it show that the proposed limits of 1,000 feet from buildings and 500 feet from other facilities are well within the ranges of damage caused by blasting involved in mining. A study performed by a professor of geology at Indiana State University indicated that there was structural damage caused by blasting within a 2½ mile radius of the Ayrshire Mine in Warrick County, Ind. John Barnes, 1977. See 123 Cong. on Residential Structures-Ayrshire Mine (1977). See 123 Cong. Rec. 8133 (May 20, 1977). Vibration damage to natural

scenic formations in the West has been noted as far as one-quarter of a mile (1,320 feet) from the site of the blast. (*Grim and Hill*, 1974, p. 93.) Instrumentation currently in use is capable of measuring noise and vibration in order to assess damage from blast vibrations at distances up to 1,000 feet from the blast. (*Siskind and Stachura*, 1977.)

The distance limitation for blasting within 500 feet of an underground mine is expressly required by Section 515(b)(12) of the Act. The Office is soliciting suggestions on the definition of the active workings of a mine for these purposes. It is not the intent of the Office to prohibit blasting from the vicinity of inactive portions of underground mines; in circumstances where there is no risk of danger to life, property or the environment.

Under the proposed regulations, approval of the regulatory authority for waiver of the distance limits would depend primarily upon the results of a preblasting survey or other appropriate investigation. Similar criteria have been previously upheld for the interim regulatory program in *Surface Mining Regulation Litigation*, *supra*, 11 ERC at 1603.

The Office considered requiring a waiver from affected landowners before mining within the 1,000-foot distance limit would be approved. However, the landowner is believed to be adequately protected by other portions of the blasting regulations, principally by the requirement that the person conducting blasting demonstrate to the regulatory authority that blasting within the 1,000-foot distance limit can and will be done safely.

The Office has proposed a requirement for flyrock limitations and solicits suggestions on this subject. Bureau of Mines contract report J0366017, by Management Science Associates, identifies flyrock as the major cause of in-mine accidents. A further study has been funded to quantify the flyrock problem. The requirement which is being proposed for flyrock limitation would prohibit rock from being thrown outside the mine property boundaries, would prohibit rock from being thrown more than half the distance from the blast to the nearest dwelling, other inhabited structure, or right-of-way, and would prohibit rock from being thrown past the regulated access zone specified in proposed Section 816.65(a)(4).

To prevent injury to persons and damage to structures within and around the area of operations from the effects of ground vibration caused by blasting, the Office proposes to establish a maximum peak particle velocity limitation of not more than 1 inch per second at the immediate location of those structures.

Blasting causes large amounts of energy to be released in the form of vibrations; that is, shock waves radiating from the site of the blast. It is this shock wave that fragments the rock near boreholes in which explosives are detonated. As the shock waves travel or propagate, they stabilize and become seismic waves. Seismic waves which propagate through the earth are called body waves. Those which propagate along the surface of the earth or travel to the surface and are reflected back into the earth are called surface waves. (Miller (no date)).

These seismic waves displace the rock or soil particles of which the earth is composed, causing these particles to oscillate. Particle velocity defines "... how fast a particle or structure is moved by passing seismic waves, measured in inches (millimeters) per second." (Grim and Hill, 1974 page 94). It is the speed at which the passing seismic waves move the ground under structures that determines the likelihood of damage. *Ibid.*

To prevent such damage, the Office proposes to adopt a regulatory scheme whereby the peak-particle velocity would always be limited at a minimum to 1 inch per second. Allowance is also made for the regulatory authority to reduce this limit in particular cases so as to account for certain listed site-specific characteristics. Subsection 816.65(j). Further, to ease in application of the 1-inch per second limit in the field, blasting vibrations would be considered to be within that limit if a distance-to-charge weight, per delay of explosives, formula set out at Subsection 816.65(m) is followed.

The proposed 1 inch per second peak particle velocity limit is based primarily upon Subsection 515(b) (10) and paragraph 515(b)(15)(c) of the Act and a review of technical materials. Those materials reveal a correlation between damage to structures and ground motion, such that the Office believes it necessary to limit particle velocity to a maximum of 1 inch per second to prevent such damage.

The first study considered by the Office was that of Nicholls, 1971. That study represents the culmination of a 10-year study by the Bureau of Mines to analyze the effects of ground vibrations and air blast on structures. In the course of its work, the Bureau conducted its own experiments and reviewed previously published data in order to establish reliable damage criteria. The Bureau concluded that peak particle velocity was more closely associated with damage to structures than any other single measurement. Nicholls, 1971, p. 22. The Bureau recommended 2 inches per second as a "safe vibration criterion", that is, the point at which, in its view, there "appears" to be a reasonable separation between

the safe and the damage zones. Nicholls, 1971, p. 23. The Bureau classed 2 inches per second as a "probability type criterion." BOM 656, p. 24. By this it meant that at a peak particle velocity of 2 inches per second the probability of damage was small. The Bureau acknowledged, however, that "the safe vibration criterion is not a value below which damage will not occur and above which damage will occur." *Ibid.*

Because damage still occurred at the 2-inch per second level, according to Nicholls, the Office finds that a 1-inch per second limit is needed. The 1-inch per second level is derived from Figure 3.7 of Nicholls, 1971, p. 25. As that scattergram indicates, 1-inch per second is the point at which damage did not occur.

In addition, OSM believes that the following factors, when weighed with Nicholls, 1971, further support the selection of a 1-inch per second limit. Many of the complex questions involving damage caused by blasting in coal surface mining were not investigated by the Bureau of Mines. Nicholls, 1971, was based not upon blasting in coal surface mining, but blasting in quarries, at construction sites, and mechanical simulations of actual blast vibrations. Conditions unique to surface coal mining justify a more stringent standard.

Generally, surface mining involves greater amounts of explosives, shots of longer duration, and more frequent firing than does quarrying; for instance. Cumulative effects of repeated blasting, even at low peak particle velocities, could increase the severity of the damage caused by blasting. Barnes, 1977. The geology of the blasting site may affect the propagation of seismic waves. Nicholls, 1971, p. 53; Barnes, 1977, at 13. The frequency of waves and their effect upon structures may be an important factor in determining damage caused by blasting. Medearis, 1976, p. 1. Where the frequencies of the ground vibration and the resonant frequency of the structure being vibrated are the same or nearly the same, there is a greater potential for damage. This seems to be the case in surface mining. Medearis, 1976, p. 53. These factors make surface coal mine blasting potentially more damaging than the blasting on which BOM 656 is based.

In addition to Nicholls, 1971, other technical studies reviewed by the Office support a 1-inch per second limit. The study of Barnes, 1976 investigated damage to structures in the vicinity of surface coal mining operations in Indiana and primarily used the number, length and width of structural cracks as indication of damages. This was essentially the same methodology as was employed by Ni-

cholls and the studies reviewed in Nicholls, 1971. Barnes' observations show that blasting at 2 inches per second may cause damage. Barnes, 1976, at 12.

Ashley and Parkes, 1976 is a study of problems encountered by two British companies in constructing tunnels in urban areas. For protection of property in good repair, those authors recommend a 1-inch per second standard. In addition to technical studies, the Office also notes that at least one of the largest coal producing States adopted a 1-inch per second standard to regulate surface coal mine blasting prior to enactment of the Act. 25 Pa. Code Section 211.45.

Compliance with a peak particle velocity of 1, rather than 2 inches per second, involves only the reduction in the maximum weight of explosives in pounds per millisecond delay period. It does not require the installation and use of additional special control equipment. Information provided to the Office by one industry member and an engineering firm indicate that mining operations can be consistently conducted within the 1-inch per second limit. Comments of Old Ben Coal Company, 1978 (112 of 155 blasts had a velocity of less than 0.5 inch per second); Comments of Research Energy of Ohio, Inc. 1978.

Under the proposal, achievement of the 1-inch per second limit may, in general, be made in either of two ways. First, blasting will be deemed to be in compliance with the 1-inch per second limit if conducted according to the standard equation at Subsection 816.65(m). As an alternative, seismograph measurements can be used to establish that blasting is conducted without exceeding the 1-inch per second limit.

The first alternative, use of a standard equation, is based upon a standard formula for determining the weight of explosives that, if detonated at intervals of 8 milliseconds or longer, will not cause peak particle velocities to exceed 1-inch per second at specified distances. This formula was derived from a special study done for the Office by the Bureau of Mines which is available for public inspection in the Washington office and copies of which will be made available for inspection upon request at the regional offices.

Coal mine blast vibration data were analyzed and the scale factor of 60 was derived empirically. The scale factor is defined as the distance from the blast to the structure of interest, divided by the square root of the maximum weight of explosive fired per delay. The table in proposed subsection 816.65(m) correlates the distance and charge weight needed for a scale factor of 60. The table distances are minimum distances which must be maintained between the blast and a

structure for the given charge weight. For instance the distance 300, divided by the square root of 25, the charge weight, equals a scaled distance of 60.

The regulation in proposed subsection 816.67(b), would provide for the use of a lower scaled distance, upon approval of the regulatory authority, if the mine operator can prove, through submission of blasting reports including seismograph records, that this lower scaled distance will not produce vibrations greater than 1 inch per second. Nicholls, 1971, determined that a scaled distance of 50 would protect against vibrations greater than 2 inches per second. The Bureau of Mines study done for the Office determined that the scaled distance of 60 would protect against vibrations greater than 1 inch per second.

A millisecond is 1/1000 of a second. A millisecond delay between explosions is used to prevent vibrations produced by two explosive charges from reinforcing each other and producing higher vibration levels. Nicholls, 1971, determined that a delay interval of 8 milliseconds or greater will prevent such reinforcement. The Office considered raising this minimum delay interval to 17 milliseconds, based on *An Investigation into Delay Blasting*, 1975, the University of Maryland, which showed that delay electric blasting caps can have significant errors in firing time. However, the delay electric blasting caps manufactured by duPont, Atlas, and Hercules, the only domestic manufacturers, all have minimum delay intervals of 25 milliseconds, which will prevent vibration reinforcement even with these inaccuracies. When detonating cord delays are used, they are initiated in a series sequence one after the other. Therefore, the likelihood that two 8 millisecond detonating cord delays will fire within a short enough time period to significantly reinforce each other is very small.

Extending the delay interval to 17 milliseconds would introduce a hazard. Because the delay elements are initiated sequentially on the ground surface, some charges will detonate before all the initiators in a blast have been activated. This increases the possibility of differential burden movement which will separate the charge in the blasthole. This results in undetonated explosive being left in the burden after blasting. This undetonated explosive is prone to detonation by the subsequent activities of heavy equipment. In view of the foregoing discussion, the 8 millisecond delay interval has been retained.

Under the alternative method of implementation of the 1-inch per second limit, seismographic measurements could be used. This could be done in two ways. First, seismograph records

of every shot would be obtained. Proposed subsection 816.67(a). Second, seismographs would be used to develop sufficient data to establish that use of a modification to the standard weight-distance equation of Subsection 816.65(m) would still result in compliance with the 1-inch per second limit. Proposed subsection 816.67(b). The latter provision is based on recognition that there may be peculiarities of certain site-specific factors warranting a change from use of the standard equation. All such changes would, however, be first approved by the regulatory authority. If deemed necessary, the regulatory authority could require a seismograph recording of all blasts.

As an additional safeguard, the Office is also proposing an additional peak-particle velocity ground motion limitation on blasting. Subsection 816.65(n). This requirement would prevent structures and persons from being subjected to excessive vibrations which approach steady state. Human beings are known to be more disturbed by steady state vibrations than by brief, impulsive type vibrations. Structures are also more responsive to steady state vibrations, especially when the frequency of the vibration approximates the resonant frequency of the structure.

The Office is also soliciting suggestions on the use of surface delay systems in conjunction with in-hole delays, either electric or nonelectric. Combinations of surface and in-hole delay systems result in more scatter or randomness in initiator firing times. However, in many instances these systems have proved to be very useful in reducing ground vibrations. The Office feels that these systems should be used only where blasting reports, accompanied by seismograph records, demonstrate that a particular delay pattern will not produce peak particle velocities greater than 1 inch per second.

As was discussed above, in conjunction with the 1-inch per second ground motion limit under Section 816.65, the Office proposes to allow the use of seismographs as an alternative to the standard explosives weight-distance formula. It is also proposed under Section 816.67, that the regulatory authority may require persons engaged in blasting to make seismographic recordings, even if the standard formula is being adhered to. This authority is provided to insure that the standard formula factors are effective for limiting ground motion from blasting in all relevant situations and for identifying those cases where additional precautions are needed to preclude damage or injury to the public and the environment from blasting.

Seismograph records may be used to establish the validity of using a modi-

fied equation to limit ground vibrations to 1 inch per second. If this proposed Section is adopted, upon receipt of a petition accompanied by appropriate blasting reports and seismograph records, the regulatory authority could approve the use of a scaled distance less than 60 if it has been shown that the reduced scaled distance will not result in vibrations greater than 1 inch per second. The requirement that the seismograph record contain a calibration signal of the gain setting is to assure that the gain setting used in calculating the vibration level is identical to that used during the recording process.

#### § 816.71-816.73 Disposal of excess spoil.

Spoil disposal practices in surface mining over the years have had a major impact on the environment and represented a significant hazard to life and property. The requirements set forth in these Sections of the proposed regulations protect life, property, and the environment by establishing criteria for proper disposal of fill material to achieve adequate drainage control and stability. The requirements in the interim program performance standards are proposed to be broadened to include alternatives of utilizing the West Virginia method of rock core drainage. The use of this method has been controversial. It is highly touted in practice by operators, and eyed somewhat skeptically by the engineering profession.

Authority for these proposed Sections is found in Sections 102, 201, 501, 503, 504, 507, 508, 510, and 515 of the Act.

Literature utilized in the preparation of these proposed regulations includes:

1. American Society of Civil Engineers; "Geotechnical Practice for Disposal of Solid Waste Materials," A.S.C.E. Symposium—March 1977, Ann Arbor, Mich.
2. American Society of Civil Engineers, "Stability and Performance of Slopes and Embankments," August 1969. American Society of Civil Engineers, *Stability of Rock Cuts*, Edited by E. J. Cording, 1972.
3. American Society for Testing and Materials, "Instruments and Apparatus for Soil and Rock Mechanics," *Special Technical*.
4. American Society for Testing and Materials, 1976. Soil and rock; building stones; peat; part 19. AM. Soc. Test Matter.
5. Bishop, A. W., and Henkel, D. J., *The Measurements of Soil Properties in the Triaxial Test*, Edward Arnold, Ltd., London, England, 1962.
6. Bishop, A. W., "The Stability of Taps and Spoil Heaps," *Quarterly Journal of Engineering Geology*, Vol. 6, 1973.

types of mining should appropriately be reflected in the regulations.

#### § 817.39 Support facilities and utility installations

This proposed Section is substantially identical to the corresponding Section of Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the approach and statutory authority of this Section. In addition to the Sections of the Act cited in those portions of the Preamble, this Section is based on Section 516 of the Act. While OSM considers the appropriate support facility and utility installation requirements to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards, public comment is invited on how the differences in the effects of these types of mining should appropriately be reflected in the regulations.

#### §§ 817.41-817.57 Hydrologic balance

With the exception of Section 817.50 and a possible Section 817.51, all of these proposed Sections are substantially identical to their corresponding Section in Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the technical basis, alternatives considered, and statutory authority. In addition to the Sections of the Act cited in those portions of the Preamble, these Sections of Part 817 are based on Section 516 of the Act. While OSM considers the effects on the hydrologic balance to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards, public comment is invited on how the differences in the effects of these types of mining should appropriately be reflected in the regulations.

Section 817.50 provides for the protection of the mining area's hydrologic balance by requiring that mining operations be conducted so as to preclude uncontrolled discharge of mine water. Uncontrolled discharges (mine drainage) have been a primary cause of adverse impacts upon water quality and ecology in the past (Biesecker and George, 1966; Braley, 1954; Grubb and Ryder, 1972; Sidio and Mackenthun, 1963; Turner, 1958; and Warner, 1973). However, this problem can be controlled in underground mines through the proper location, design, construction, utilization, and sealing of drifts, adits, and slopes (EPA, 1973). Use of these methods to control drainage during the active mining phase is to be supplemented with collection and conveyance of drainage to treatment facilities as necessary to comply with applicable standards and limitations prior to discharge to receiving streams.

The outright prohibition on gravity discharges from certain new drift mines is required under paragraph 516(b)(12) of the Act.

The Office considered requiring all drift mines which are opened after the effective date of this Part to comply with proposed subsection 817.50(c), rather than making the requirements applicable only to mines opening after approval of the State or Federal program. The Office believes that until a regulatory authority is identified and approved by the Secretary and empowered to administer a regulatory program, it will be unfair to the operator to make this provision apply, since determination of whether a coal seam involved is "acid-producing" or "iron-producing" would not have been made. Public comment on this issue is solicited, however.

Section 817.51 was originally established to identify requirements necessary to protect the recharge capacity of aquifers affected by the underground mining activities. However, since the structural integrity of water bearing formations should not be significantly affected by underground mining, the recharge capacity of the formations should be maintained without any special precautions. Consequently, Section 817.51 has been omitted from the draft regulations. Comments are solicited as to any requirements that may be needed to protect the recharge capacity of water bearing formations from underground mining activities.

#### § 817.59 Coal recovery

This proposed Section addresses two persistent problems of coal development: loss of resource when a mining operation does not recover all the available coal at a mining site and recurrent environmental degradation when a land is reentered after one mining operation to recover such coal. The regulation requires the operator to conduct mining operations so as to maximize resource recovery by mining all available coal at a mine site which it is economically feasible to extract.

The Authority for this proposed Section is found in Sections 102, 201, 501, 503, 507, 510, and 516 of the Act.

Alternatives similar to these considered for proposed Section 816.59 were considered by the drafters, and the reader is invited to refer to the Preamble portion on Section 816.59 for further information on issues considered. In addition to those issues, a more fundamental one might be addressed by commenters, and that is the appropriateness of a coal recovery standard for underground mining. In this regard, the reader is referred particularly to Sections 102(k) and 515(b)(1) of the Act.

#### §§ 817.61-817.68 Use of explosives

Sections 817.61-817.68 are being proposed as regulations to protect the lives and property of the public, underground mines, and ground and surface waters outside of permit areas, from adverse effects of blasting performed on the surface, where surface blasting is required in the development and support of underground mining operations. The interim regulatory program has no provision for regulating surface blasting required for the development and support of underground mining operations. However, surface activities in support of underground mining often require fairly large blasts for facing up at adit entries for leveling ground for surface structures, and initial blast rounds for shafts and adits. These blasts may present damage and injury hazards equivalent to those of surface mine blasting. To protect the public from the adverse effects of these blasts, Sections 817.61-817.68 are required.

Several Sections of the proposed regulations for surface blasting in support of underground mining are substantially identical to the proposed regulations for surface mine blasting (Sections 816.61-816.68). Rather than repeat the discussion of those Sections, the reader is referred to the appropriate Sections of the surface coal mine performance standard Preamble, which contains the rationale for many of the proposed blasting rules and a discussion of alternatives considered.

Sections 817.61-817.68 are proposed under Sections 102, 201, 501, 503, 504, 516, and 719 of the Act.

Materials used by OSM to develop these regulations include—

1. Ashley, C., and Parkes, D.B., 1976, *Blasting in Urban Areas: Tunnels & Tunneling* (British Tunneling Society), Sept. 1976, p. 60-67.
2. Grim, E., and Hill, R., *Environmental Protection in Surface Coal Mining* (U.S. Environmental Protection Agency, No. 1BB040).
3. Barnes, Jack (John B.), 1977, *The Effects of Strip Mine Blasting on Residential Structures—Ayrshire Mine, Warrick and Vanderburgh Counties, Indiana*: Paper presented to the Indiana Academy of Science, Indianapolis, Ind., Oct. 28, 1977, 19 p. (Author is associated with Indiana State University Evansville, Evansville, Ind.)
4. Kentucky Department of Mines and Minerals, 1977, *Laws and regulations governing explosives and blasting*: Lexington, Ky., p. 1.
5. Maryland Geological Survey, Bureau of Mines, 1973, *Blasting restrictions. Regulations governing blasting in Bituminous coal strip mines and auger regulations*: Maryland Department of Natural Resources Rules and Regulations, p. 23.
6. Medearis, Kenneth, 1976, *The Development of Rational Damage Criteria for Low-Rise Structures Subjected to Blasting Vibrations*—a report of the National Crushed Stone Association: Kenneth Medearis Asso-

ciates, Fort Collins, Colo., and Valley Forge, Pa., 94 p. (duplicated report).

7. Miller, P.H., (no date), *Blasting vibrations and air blast*: Park Central, Ill., Atlas Powder Co., 16 p.

8. Nicholas, H.R., Johnson, C.F., and Duvall, W.I., 1971, *Blasting vibrations and their effects on structures*: U.S. Bureau of Mines Bulletin 656, p. 13-29.

9. Old Ben Coal Company, Comments to Office of Surface Mining (1978).

10. Pennsylvania Department of Environmental Resources, Rules and Regulations, Title XXV, Pennsylvania Code, Ch. 211.

11. Siskind, D.E., 1977, *Structure vibrations from blast produced noise*, in 18th International Rock Mechanics Symposium, June 1977, Keystone, Colo.: Proceedings, p. 1A3-1-1A3-5.

12. Siskind, D.E., Stachura, V.J., and Radcliffe, K.S., *Noise and vibrations in residential structures from quarry production blasting—measurements of six sites in Illinois*: U.S. Bureau of Mines Report of Investigation R.I. 8168, p. 17, 1976.

13. Siskind, D.E., and Stachura, V.J., 1977, *Recording system for blast noise measurement*: Sound and vibrations Journal, p. 20-23.

14. Siskind, D.E., and Summers, C.R., 1974, *Blast noise standards and instrumentation*: U.S. Bureau of Mines, Environmental Research Program, Technical Progress Report TPR 78, p. 16, table 4.

15. Coal Mine Health and Safety Act of 1977; 75 CFR, Subpart N.

16. *An Investigation into Delay Blasting*, 1975, NSF Contract APR 75-05171 to the University of Maryland and Subcontract #M-218907 to Martin Marietta Laboratories.

The Office considered including a proposed Section 817.63 to require that underground coal mine blasting be conducted in accordance with appropriate MSHA requirements set forth in CFR 75-Subpart N. However, it was considered that such a requirement would not advance the purposes of the Act and that MSHA could adequately enforce its own requirements. Public comments are elicited on the appropriateness of the alternative the office rejected.

Proposed Section 817.65 states that this Section applies only to blasting conducted on the surface. Rather than require a blasting schedule similar to Section 816.64 of the proposed surface coal mine regulation, this section would require a 24-hour 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 better served by receiving notification the day before any blasting is done. The mine operator will be relieved of the task of publishing and republishing a blasting schedule. The remainder of Section 817.65 is identical to Section 816.65 proposed for surface coal mine blasting. The reader is referred to that Section portion of the Preamble which discusses proposed Section 816.65 for detailed discussion.

Proposed Sections 817.61, 817.62, 817.66, 817.67, and 817.68 are substantially identical to proposed Sections 816.66, 816.67, and 816.68. The reader is referred to the appropriate portions of the Preamble to Part 816 for detailed discussion.

#### §§ 817.71-817.73 Disposal of underground development waste and excess spoil

The Office believes that underground development waste disposal operations should be required to be conducted in the same manner as excess spoil disposal in surface mining. Accordingly these proposed Sections are similar in all significant details to proposed Sections 816.71-816.73. The reader may find a discussion of the technical basis, authority, and alternatives considered in the Preamble.

In addition to the Sections of the Act cited in the discussion of Sections 816.71-816.73 these proposed Sections 817.71-817.73 are based on Section 516 of the Act.

The public is requested to comment on any appropriate basis for varying the requirements for underground development waste fills from those proposed for excess spoil in proposed Sections 816.71-816.73.

#### §§ 817.81-817.88 Coal processing waste

These proposed Sections are substantially identical to the corresponding Sections of Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the technical basis, alternatives considered, and statutory authority for these Sections. In addition to the Sections of the Act cited in those portions of the Preamble, these Sections are based on Section 516 of the Act. While the Office considers coal processing waste consideration to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards, public comment is invited on how the differences in these types of mining should appropriately be reflected in this portion of the proposed regulations.

#### § 817.89 Disposal of non-coal wastes

This proposed Section is substantially identical to the corresponding section of Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the technical basis, alternatives considered, and statutory authority for this Section. In addition to the Sections of the Act cited in those portions of the Preamble, this Section is based on Section 516 of the Act. While the Office considers the appropriate disposal of noncoal waste to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards,

public comment is invited on how the differences in these types of mining should appropriately be reflected in the regulations. In particular, comments are solicited on the appropriateness of the disposal of noncoal waste, both from onsite and from offsite, in abandoned underground workings.

#### §§ 817.91-817.93 Coal processing waste: Dams and embankments

These proposed Sections are substantially identical to the corresponding Sections of Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the technical basis, alternatives considered, and statutory authority for these Sections. In addition to the Sections of the Act cited in those portions of the Preamble, these Sections are based on Section 516 of the Act. While the Office considers the appropriate coal processing waste dams and embankment considerations to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards, public comment is invited on how the differences in these types of mining should appropriately be reflected in the regulations.

#### § 817.95 Air resources protection

This proposed Section is substantially identical to the corresponding Section of proposed Part 816. The reader is referred to the appropriate portions of the Preamble for Part 816 for information concerning the technical basis, alternatives considered, and statutory authority for this Section. The only provision of a substantial nature that was deleted from this Section for underground mining addressed the problem of fugitive dust resulting from wind erosion on spoil piles. This problem is greatly reduced when considering underground mining because less spoil is stored on the surface. As a result, the spoil disposition need not be required to be oriented in the same manner as in surface mining operations. In addition to the Sections of the Act cited in those portions of the Preamble, this Section is based on Section 516 of the Act. While the Office considers the effect on air resources to be sufficiently similar in surface and underground mining to warrant substantially identical performance standards, public comment is invited on how the differences in the effects of these types of mining should appropriately be reflected in the regulations.

#### § 817.97 Protection of fish and wildlife

This proposed Section is substantially identical to the corresponding Section of Part 816. The reader is referred to the appropriate portion of the Preamble for Section 816.97 for information concerning the technical basis, al-

ral surface water, streams, drainways, or irrigation ditches within the proposed mine plan area or adjacent areas;

(f) Location and elevation of discharge of industrial wastes to surface or ground-waters within the proposed mine plan area, or at points in adjacent areas to surface waters which flow into the proposed mine plan area;

(g) Boundaries and elevations of existing or previously surfaced-mined areas within the proposed mine plan area;

(h) Location, elevation and dimensions of existing areas of spoil, waste, refuse and topsoil preservation, dams, other impoundments, and water treatment or air pollution control facilities within the proposed permit area;

(i) Location and depth of water, gas or oil wells within the proposed permit area; and

(j) Sufficient slopes to adequately represent the existing land surface configuration of the mine plan area, measured and recorded according to the following:

(1) Each measurement shall consist of an angle of inclination along the prevailing slope extending 100 linear feet above and below or beyond the coal outcrop or the area to be disturbed; or, where this is impractical, at locations specified by the regulatory authority.

(2) Where the area has been previously mined, the measurements shall extend at least 100 feet beyond the limits of mining disturbances, or any other distance determined by the regulatory authority to be representative of the premining configuration of the land.

(3) Slope measurements shall take into account natural variations in slope so as to provide accurate representation of the range of natural slopes and shall reflect geomorphic differences of the area to be disturbed.

(4) Slope measurements may be made from existing topographic maps showing contour lines, having sufficient detail and accuracy consistent with the submitted mining and reclamation plan.

(5) Contour lines shall be based on intervals of a maximum of 5 feet where the slope of the land is twenty (20) degrees or less and a maximum of 10 feet where slopes are greater than 20 degrees.

**§ 779.26 Soil resources description.**

(a) A soil map shall be prepared that delineates those portions of the mine plan area of different soil morphology and soil environment. The soil map shall provide adequate information to establish present and potential productivity levels of the land and to aid in the classification, stockpiling, and use of soil materials during mining

and reclamation operations. The soil resources description shall also provide adequate information to predict the potential for reestablishing vegetation and the proposed postmining use.

(b) The applicant shall supply such other information as required by the regulatory authority.

**PART 780—SURFACE MINING PERMIT APPLICATION—MINIMUM REQUIREMENT FOR RECLAMATION AND OPERATION PLAN**

Sec.

780.1 Scope.

780.2 Objectives.

780.4 Responsibilities.

780.11 Operation plan: General requirements.

780.12 Operation plan: Blasting.

780.13 Operation plan: Maps and plans.

780.14 Air pollution control plan.

780.15 Fish and wildlife plan.

780.17 Reclamation plan: Introduction.

780.19 Reclamation plan: General requirements.

780.21 Reclamation plan: Protection of hydrologic balance.

780.23 Reclamation plan: Post-mining land uses.

780.25 Reclamation plan: Ponds, impoundments, banks, and dams and embankments.

780.27 Reclamation plan: Surface mining near underground mining.

780.29 Diversions.

780.31 Protection of public parks and historic places.

780.33 Relocation or use of public roads.

780.35 Disposal of excess spoil.

780.37 Transportation facilities.

**AUTHORITY:** Sections 102, 201, 501, 503, 504, 506, 507, 508, 509, 510, 515, 517, and 522, Pub. L. 95-87, 91 Stat. 445 (30 U.S.C. 1202, 1211, 1251, 1253, 1254, 1256, 1257, 1258, 1259, 1260, 1265, 1267, and 1272.)

**§ 780.1 Scope.**

This part provides the minimum requirements for the Secretary's approval of provisions of regulatory programs for the mining operations and reclamation plan portions of applications for surface coal mining activities permits, except to the extent that different requirements for those plans are established under part 785 of this subchapter.

**§ 780.2 Objectives.**

The objectives of this part are to establish the minimum requirements under regulatory programs for the contents of mining and reclamation plan portions of applications for permits, so that the regulatory authority is provided with comprehensive and reliable information on proposed surface coal mining and reclamation operations, and to insure that such operations are allowed to be conducted only in compliance with the Act, this chapter, and the regulatory program.

**§ 780.4 Responsibilities.**

(a) It is the responsibility of the applicant to provide to the regulatory authority all of the information required by this part, except where specifically exempted in this part.

(b) It is the responsibility of State and Federal governmental agencies to provide information to the regulatory authority where specifically required in this part.

**§ 780.11 Operation plan: General requirements.**

Each application shall contain a description of the proposed mining operations within the mine plan area, including, at a minimum, the following:

(a) A narrative description of the type and method of coal mining procedures and proposed engineering techniques, anticipated annual and total production of coal, by tonnage, and the major equipment used or proposed to be used for all aspects of such operations.

(b) A narrative explaining the construction, modification, use, maintenance, and removal of the following facilities within the proposed mine plan area:

- (1) Major buildings and other facilities;
- (2) Utilities services;
- (3) Dams and impoundments;
- (4) Overburden and topsoil handling and storage areas and structures;
- (5) Coal removal, handling, storage, cleaning, and transportation areas and structures;
- (6) Waste and refuse removal, handling, storage, transportation, and disposal areas and structures;
- (7) Mine facilities and layout; and
- (8) Water and air pollution control facilities.

**§ 780.12 Operations plan: Blasting.**

Each application shall contain a blasting plan for the affected area, explaining how the applicant intends to comply with the requirements of 30 CFR sections 816.61 through 816.68 and including the following information:

(a) Types and approximate amounts of explosives to be used for each type of blasting operation to be conducted;

(b) Description of procedures and plans for recording and reporting to the regulatory authority blasting information to be collected during the operation. The plan shall contain the following information—

- (1) Drilling patterns, including size, numbers, depths, spacing, and configuration of holes;
- (2) Charge and packing, placement of holes;
- (3) Types of fuses and detonation controls; and
- (4) Sequence and timing of firing holes.

(c) Description of blasting warning and site access control equipment and procedures;

(d) Description of types, capabilities, sensitivities, and locations of use of blasting monitoring equipment and procedures; and

(e) Description of plans for recording and reporting to the regulatory authority the results of preblasting surveys, if required, and of the blasting monitoring program.

#### § 780.13 Operations plan: Maps and plans.

Each map, plan, and cross-section shall delineate the location on the permit area where the performance standards in 30 CFR 816 apply. Areas that were mined under the initial regulatory program or that were mined before February 3, 1978 shall also be delineated on the map. Each application shall contain maps, plans, and cross-sections of the permit area in accordance with the following provisions:

(a) Maps and plans shall have a scale of 1:25,000 or larger. Cross-sections shall have a scale prescribed by the regulatory authority. The maps, plans, and cross-sections shall show the mining operations to be conducted and the lands to be affected throughout the operation.

(b) Any change in a facility or feature caused by the proposed mining operation shall be described if the facility or feature was shown on the map and plan required by 30 CFR 779.24 and 779.25.

(c) The following shall be shown and, for subparagraphs 5, 6, 10, and 13 of this paragraph the maps and plans shall be prepared by, or under the direction of, and certified by a qualified professional geologist, with assistance from experts in related fields such as land surveying and landscape architecture.

(1) Buildings, utility corridors and facilities to be used within the mine plan area;

(2) The area of land to be affected within the permit area, according to the sequence of mining and reclamation;

(3) Each coal storage, cleaning and loading area;

(4) Each topsoil, overburden, refuse, spoil, and waste storage area;

(5) Each water diversion, collection, conveyance, treatment, storage, and discharge facility to be used;

(6) Each air pollution collection and control facility;

(7) Each source of and facility relating to coal processing and pollution control waste disposal;

(8) Each facility to be used to protect and enhance fish and wildlife and related environmental values;

(9) Each explosive storage and handling facility;

(10) Locations, design, and construction specifications of each sedimentation pond, permanent water impoundment, coal processing waste bank, and coal processing waste dam and embankments in accordance with 30 CFR 780.25 and disposal of excess spoil in 30 CFR 780.35.

(11) Each profile, at cross-sections specified by the regulatory authority, of the anticipated final surface configuration to be achieved for the affected areas;

(12) Location of each water and air quality, and wildlife monitoring point; and

(13) Location and specifications for each facility that will remain on the mine plan area as a permanent feature, after the completion of surface coal mining and reclamation operations.

#### § 780.14 Air pollution control plan.

(a) For those operations with projected production rates exceeding 1,000,000 tons of coal per year and located west of the 100th meridian west longitude, the application shall contain an air pollution control plan which includes the following:

(1) An air quality review demonstrating that total suspended particulate matter emissions from the proposed surface coal mining operation, in conjunction with all other applicable particulate matter emission increases or reductions, would not cause or contribute to exceedances of any national ambient air quality standard in any air quality control region; or cause or contribute to exceedances of other applicable Federal or State air quality standards;

(2) An ambient air quality monitoring program to provide adequate annual and 24 hour total suspended particulate matter sampling data to evaluate the ambient air quality impact of the surface coal mining operation. (See 40 CFR 50.7).

(3) A plan for fugitive dust control practices as required under section 816.95, of subchapter K and necessary to achieve and maintain national ambient air quality standards and other applicable Federal and State air quality standards.

(b) For those operations with projected production rates less than or equal to 1,000,000 tons of coal per year and located west of the 100th meridian west longitude, the application shall contain an air pollution plan which includes the following:

(1) An air quality review, if, as determined by the regulatory authority, the applicants proposed surface coal mining operation, in conjunction with other existing and proposed major emitting facilities in the air quality control region or subregion, may:

(i) Cause or contribute to exceedances of any national ambient air quality standard in any air quality control region; or

(ii) Cause or contribute to exceedances of any other applicable Federal or State air quality standard;

(2) An ambient air quality monitoring program to provide adequate annual and 24 hour total suspended particulate matter sampling data to evaluate the ambient air quality impact of the surface coal mining operation. (See 40 CFR 50.7);

(3) A plan for fugitive dust control practices as required under section 816.95 of subchapter K and necessary to achieve and maintain National Ambient Air Quality Standards and other applicable Federal and State air quality standards.

(c) For those operations located east of the 100th meridian west longitude, each application shall contain an air pollution control plan which includes the following:

(1) An air quality review, if, as determined by the regulatory authority, the applicant's proposed surface coal mining operation, in conjunction with other existing or proposed major emitting facilities in the air quality control region or subregion, may:

(i) Cause or contribute to exceedances of any national ambient air quality standard in any air quality control regions; or

(ii) Cause or contribute to exceedances of any other applicable Federal or State air quality standards;

(2) An ambient air quality monitoring program, if, as determined by the regulatory authority, necessary to provide adequate annual and 24 hour total suspended particulate matter sampling data to evaluate the ambient air quality impact of the surface coal mining operation; (See 40 CFR 50.7)

(3) A plan for fugitive dust control practices as required under section 816.95 of subchapter K and necessary to achieve and maintain National Ambient Air Quality Standards and other applicable Federal and State air quality standards.

#### § 780.15 Fish and wildlife plan.

Each application shall contain a fish and wildlife plan, which provides:

(a) A statement of how the applicant proposes to use the best technology currently available for the site so that affected areas are reclaimed to a condition which will enhance fish, wildlife, and related environmental values.

(b) If the applicant determines that it will not be practicable to achieve a condition which clearly shows a trend toward enhancement of fish and wildlife resources at the time revegetation has been successfully accomplished under 30 CFR 816.111 through 816.117, the applicant shall state—

diminution, or interruption resulting from the surface coal mining activities.

**§ 816.55 Hydrologic balance: Discharge of water into an underground mine.**

Surface water shall not be diverted into underground mine workings unless the person who conducts the surface mining activities demonstrates to the satisfaction of the regulatory authority that the diversion will—

(a) Abate water pollution or otherwise eliminate public hazards resulting from underground mining; and

(b) Be discharged as a controlled flow meeting the water quality requirements of Section 816.52 for pH and total suspended solids except that the total suspended solid concentrations may be exceeded only if the suspended material is approved by the regulatory authority or is limited to—

(1) Coal processing waste;

(2) Fly ash from a coal-fired facility;

(3) Sludge from acid drainage treatment facility;

(4) Flue gas desulfurization sludge;

(5) Inert materials used for stabilizing underground mines or;

(c) Underground mine development wastes; and

(7) The discharge will not cause, result in or contribute to a violation of applicable water quality standards; and

(d) Minimize disturbance to the hydrologic balance.

**§ 816.56 Hydrologic balance: Post-mining rehabilitation of sedimentation ponds, diversions, impoundments, and treatment facilities.**

Before abandoning the permit area, the person who conducts the surface mining activities shall restore all permanent sedimentation ponds, diversions, impoundments, and treatment facilities to meet the original design criteria for the permanent structures and impoundments.

**§ 816.57 Hydrologic balance: Stream buffer zones.**

(a) No land within 100 feet of a perennial stream or a stream with a macro-invertebrate biological community shall be disturbed by surface mining activities except in accordance with Section 816.44 unless the regulatory authority specifically authorizes surface mining activities closer to or through such a stream upon finding—

(1) That the original stream channel will be restored; and

(2) During and after the mining, the water quantity and quality from the stream section within 100 feet of the surface mining activities shall not be adversely affected.

(b) The area not to be disturbed shall be designated a buffer zone and marked as specified in Section 816.11.

**§ 816.59 Coal recovery.**

Surface mining activities shall be conducted so as to maximize the utilization and conservation of the coal so that re-affecting the land in the future through surface coal mining operations is minimized.

**§ 816.61 Use of explosives: General requirements.**

(a) Each person who conducts surface mining activities shall comply with all applicable local, State, and Federal laws and regulations and the requirements of Sections 816.61-816.68 in the storage, handling, preparation, and use of explosives.

(b) Blasting operations that use more than the equivalent of 5 pounds of TNT shall be conducted according to a time schedule approved by the regulatory authority.

(c) All blasting operations shall be conducted by experienced, trained, and competent persons who understand the hazards involved. Each person responsible for blasting operations shall—

(1) Have demonstrated a knowledge of, and shall comply with, MSHA safety requirements and U.S. Department of Treasury security requirements;

(2) Be capable of using mature judgment in all situations;

(3) Be in good physical condition and not addicted to intoxicants, narcotics, or other similar types of drugs;

(4) Possess current knowledge of the local, State, and Federal laws and regulations applicable to the work; and

(5) Possess a valid certificate of completion of training and qualification as required by 30 CFR 850 and 851.

**§ 816.62 Use of explosives: Pre-blasting survey.**

(a) On the request to the regulatory authority by a resident or owner of a man-made dwelling or structure that is located within one-half mile of any part of the permit area, the person who conducts the surface mining activities shall conduct a pre-blasting survey of the dwelling or structure and submit a report of the survey to the regulatory authority and to the person requesting the survey.

(b) Each person who conducts surface mining activities shall utilize personnel approved by the regulatory authority to conduct the survey to determine the condition of the dwelling or structure and to document any pre-blasting damage and other physical factors that could reasonably be affected by the blasting. Assessments of structures such as pipes, cables, transmission lines, and wells and other water systems shall be limited to surface condition and readily available data. Special attention shall be given to the pre-blasting condition of wells

and other water systems used for human, animal, or agricultural purposes and to the quantity and quality of the water.

(c) A written report of the survey shall be prepared and signed by the person who conducted the survey. The report shall include recommendations of any special conditions or proposed adjustments to the blasting procedure which should be incorporated into the blasting plan to prevent damage. Copies of the report shall be provided to the person requesting the survey and to the regulatory authority.

**§ 816.64 Use of explosives: Public notice of blasting schedule.**

(a) *Blasting schedule publication.* (1) Each person who conducts surface mining activities shall publish a blasting schedule at least 10 days, but not more than 20 days, before beginning a blasting program in which explosives that use more than the equivalent of 5 pounds of TNT are detonated. The blasting schedule shall be published in a newspaper of general circulation in the locality of the blasting site.

(2) Copies of the schedule shall be distributed by mail to local governments and public utilities and by mail or delivered to each residence within one-half mile of the permit area described in the schedule. Copies sent to residences shall be accompanied by information advising the owner or resident how to request a pre-blasting survey.

(3) The person who conducts the surface mining activities shall republish and redistribute the schedule by mail at least every 3 months.

(b) *Blasting schedule contents.* (1) A blasting schedule shall not be so general as to cover all working hours but shall identify as accurately as possible the location of the blasting sites and the time periods when blasting will occur.

(2) The blasting schedule shall contain at a minimum—

(i) Identification of the specific areas in which blasting will take place. Each specific blasting area described shall be reasonably compact and not larger than 300 acres;

(ii) Dates and time periods when explosives are to be detonated. That such periods shall not exceed an aggregate of 4 hours in any one day;

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

(iv) Types of audible warnings and all-clear signals to be used before and after blasting; and

(v) A description of emergency situations referred to in Section 816.65(a)(2) which have been approved by the regulatory authority for blasting at times other than those described in the schedule.

(c) *Public notice of changes to blasting schedules.* Before blasting in areas or at times not in a previous schedule, the person who conducts the surface mining activities shall prepare a revised blasting schedule according to the procedures in paragraphs (a) and (b) of this Section.

§ 816.65 Use of explosives: Surface blasting requirements.

(a) All blasting shall be conducted between sunrise and sunset. The regulatory authority may specify more restrictive time periods based on public requests or other considerations including the proximity to residential areas.

(b) Blasting shall be conducted at times announced in the blasting schedule, except in those emergency situations approved by the regulatory authority where rain, lightning, other atmospheric conditions, or operator or public safety require unscheduled detonation.

(c) Warning and all-clear signals of different character that are audible within a range of one-half mile from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within one-half mile of the permit area shall be notified of the meaning of the signals through appropriate instructions. These instructions shall be periodically delivered or otherwise communicated in a manner which can be reasonably expected to inform such persons of the meaning of the signals. Each person who conducts surface mining activities shall maintain signs in accordance with Section 816.11(f).

(d) Access to the blasting area shall be regulated to protect the public and livestock from the effects of blasting. Access to the blasting area shall be controlled to prevent unauthorized entry at least 10 minutes before each blast and until an authorized representative of the person who conducts the surface mining activities has reasonably determined—

(1) That no unusual circumstances, such as imminent slides or undetonated charges, exist; and

(2) That access to and travel in or through the area can safely resume.

(e) Areas in which charged holes are awaiting firing shall be guarded, barricaded and either posted or flagged against unauthorized entry.

(f)(1) Airblast shall be controlled so that it does not exceed the values specified below at any dwelling, public building, school, church, or commercial or institutional building, unless such building is owned by the person who conducts the surface mining activities, is not leased to any other person and is located within the permit area:

Lower frequency limit of measuring system, Hz (+3dB)	Maximum level in dB
0.1 Hz or lower—flat response.....	135 peak.
2 Hz or lower—flat response.....	132 peak.
6 Hz or lower—flat response.....	130 peak.
C = weighted, slow response.....	109 C.

(2) In all cases except the C-weighted slow, the systems used shall have a flat frequency response of at least 500 Hz at the upper end. The C-weighted shall meet the standard American National Standards Institute (ANSI) S1.4-1971 specifications. The ANSI S1.4-1971 is hereby incorporated by reference. This work is incorporated as it exists on the date of adoption of this Part, and notice of changes made in these materials will periodically be published in the FEDERAL REGISTER. ANSI S1.4-1971 is available for inspection in OSM regional offices and in OSM's office in the Department of Interior, 18th and C Streets, N.W., Washington, D.C. 20240.

(3) The person who conducts blasting may satisfy the provisions of this Section by meeting any of the four specifications in the chart in paragraph (f)(1) of this Section.

(g) Except where lesser distances are approved by the regulatory authority, based upon a pre-blasting survey or other appropriate investigation, blasting shall not be conducted within—

(1) 1,000 feet of any building used as a dwelling, school, church, hospital, or nursing facility;

(2) 500 feet of facilities including, but not limited to, disposal wells, petroleum or gas-storage facilities, municipal water-storage facilities, fluid-transmission pipelines, gas or oil-collection lines, or water and sewage lines; and

(3) 500 feet of the active workings of an underground mine except with the concurrence of the Mine Safety and Health Administration.

(h) Flyrock from blasting shall be restricted as follows:

(1) No flyrock shall be cast beyond the line of property owned or leased by the person who conducts the surface mining activities without the consent of the landowners of adjacent areas.

(2) No flyrock shall be cast more than half the distance from the blast to the nearest dwelling, public building, school, church, commercial or institutional building, road or railroad. This shall not apply to any structure or right-of-way on land owned by the person who conducts the surface mining activities and not leased to any other person.

(3) No flyrock shall be cast beyond the area of regulated access required under paragraph (d) of this Section.

(4) These restrictions shall apply to material which travels along the ground surface as well as that which travels through the air.

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

(j) In all blasting operations, except as otherwise authorized in this Section, the maximum peak particle velocity shall not exceed 1 inch per second at the location of any dwelling, public building, school, church, or commercial or institutional building. The regulatory authority may reduce the maximum peak particle velocity allowed if it determines that a lower standard is required because of density of population or land use, age or type of structure, geology or hydrology of the area, frequency of blasts, or other factors.

(k) The maximum peak particle velocity does not apply to property within the permit area that is owned by the person who conducts the surface mining activities and is not leased to any other person.

(l) An equation for determining the maximum weight of explosives that can be detonated within any 8-millisecond period is in paragraph (m) of this Section. If the blasting is conducted in accordance with this equation, the velocity is deemed to be within the 1-inch-per-second limit.

(m) (1) The maximum weight of explosives to be detonated within any 8 millisecond period may be determined by the formula  $W = (D/60)^2$  where  $W$  = the maximum weight of explosives, in pounds, that can be detonated in any 8-millisecond period, and  $D$  = the distance, in feet, to the nearest dwelling, school, church, or commercial or institutional building.

(2) For distances between 300 and 5,000 feet, solution of the equation results in the following maximum weight:

Distance, in feet (D)	Maximum weight in pounds (W)
300	25
350	34
400	44
500	69
600	100
700	136
800	178
900	225
1,000	278
1,100	336
1,200	400
1,300	469
1,400	544
1,500	625
1,600	711
1,700	803
1,800	900
1,900	1,002
2,000	1,111

## PROPOSED RULES

Distance, in feet (D)	Maximum weight in pounds (W)
2,500	1,736
3,000	2,500
3,500	3,403
4,000	4,444
4,500	5,625
5,000	6,944

(n) If on a particular site the peak particle velocity exceeds one-half inch per second after a period of 1 second following the maximum ground particle velocity, the blasting procedures shall be revised to limit the ground motion.

(o) Electric or non-electric delay systems combining surface delays with in-hole delays may be used to reduce vibrations if approved by the regulatory authority. Requests to use such systems shall be accompanied by blasting reports and seismograph records of test blasting on the site showing that the delay pattern does not produce peak particle velocities in violation of this Section.

**§ 816.67 Use of explosives: Seismographic measurements.**

(a) Where a seismograph is used to monitor the velocity of ground motion and the peak particle velocity limit of 1 inch per second is not exceeded, the equation in Section 816.66(m) need not be used. If the equation is not being used, a seismograph record shall be obtained for each shot.

(b) The use of a modified equation to determine maximum weight of explosives for blasting operations at a particular site may be approved by the regulatory authority on receipt of a petition accompanied by reports including seismograph records of test blasting on the site. In no case shall the regulatory authority approve the use of a modified equation where the peak particle velocity of 1 inch per second required in Section 816.66(j) would be exceeded.

(c) The regulatory authority may require a seismograph record of any or all blasts.

**§ 816.68 Use of explosives: Records of blasting operations.**

A record of each blast, including seismograph reports, shall be retained for at least 3 years and shall be available for inspection by the regulatory authority and the public on request. The record shall contain the following data:

(a) Name of the person conducting the blast.

(b) Location, date, and time of blast.

(c) Name, signature, and license number of blaster-in-charge.

(d) Direction and distance, in feet, to the nearest dwelling, school, church, or commercial or institutional building either—

(1) Not located in the permit area; or

(2) Not owned nor leased by the person who conducts the surface mining activities.

(e) Weather conditions.

(f) Type of material blasted.

(g) Number of holes, burden, and spacing.

(h) Diameter and depth of holes.

(i) Types of explosives used.

(j) Total weight of explosives used.

(k) Maximum weight of explosives detonated within any 8 millisecond period.

(l) Maximum number of holes detonated within any 8 millisecond period.

(m) Methods of firing and type of circuit.

(n) Type and length of stemming.

(o) Mats or other protections used.

(p) Type of delay detonator and delay periods used.

(q) Seismographic records, where required, including the calibration signal of the gain setting and—

(1) Seismographic reading, including exact location of seismograph and its distance from the blast;

(2) Name of the person taking the seismograph reading; and

(3) Name of the person and firm analyzing the seismographic record.

**§ 816.71 Disposal of excess spoil: General requirements.**

(a) Spoil not required to achieve the approximate original contour shall be hauled or conveyed to and placed in designated disposal areas within a permit area other than mine working or excavations, only if the disposal areas are authorized for such purposes in the approved mining and reclamation permit and only in accordance with Sections 816.71-816.73. The spoil shall be placed in a controlled manner to ensure—

(1) That leachate and surface runoff will not degrade surface or ground waters or exceed the effluent limitations of Section 816.42;

(2) Stability of the fill; and

(3) That the land mass is suitable for reclamation and revegetation compatible with the natural surroundings.

(b) The fill shall be designed using recognized professional standards, certified by a registered professional engineer, and approved by the regulatory authority.

(c) All vegetative and organic materials shall be removed from the disposal area and the topsoil shall be removed, segregated, and replaced under Sections 816.21-816.23 before spoil is placed in the disposal area. If approved by the regulatory authority, organic material may be used as mulch or may be included in the topsoil to control erosion, to promote growth of vegetation, or to increase the moisture retention of the soil.

(d) Slope protection shall be provided to minimize surface erosion at

the site. All disturbed areas including diversion ditches that are not riprapped shall be vegetated upon completion of construction.

(e) The disposal areas shall be located on the most moderately sloping and naturally stable areas available as approved by the regulatory authority. If such placement provides additional stability and prevents mass movement, fill materials suitable for disposal shall be placed upon or above a natural terrace, bench, or berm.

(f) The spoil shall be hauled or conveyed and placed in a controlled manner, concurrently compacted as necessary to ensure mass stability and prevent mass movement, covered, and graded to allow surface and subsurface drainage to be compatible with the natural surroundings, to ensure long-term stability.

(g) The final configuration of the fill must be suitable for postmining land uses approved in accordance with Section 816.124 except that no depressions or impoundments shall be allowed on the completed fill.

(h) Terraces shall not be constructed unless approved by the regulatory authority.

(i) Where the slope in the disposal area exceeds 1v:2.8h (36 percent), or such lesser slope as may be designated by the regulatory authority based on local conditions, keyway cuts (excavations to stable bedrock), or rock toe buttresses shall be constructed to stabilize the fill. The slope of original ground at the toe of the fill shall not exceed 1v:5h (20 percent).

(j) The fill shall be inspected for stability by a registered engineer or other professional specialist approved by the regulatory authority during critical construction periods and at least quarterly throughout construction to ensure removal of all organic material and topsoil, placement of underdrainage systems, proper installation of surface drainage systems, proper placement and compaction of fill materials, and proper revegetation. The registered engineer or other qualified professional specialist shall provide to the regulatory authority a certified report within 2 weeks after each inspection that the fill has been constructed as specified in the design approved by the regulatory authority, and a copy of the report shall be retained at the minesite by the person who conducts the surface mining activities.

(k) (1) Coal processing wastes shall not be disposed of in head-of-hollow fills, and may only be disposed of in other excess spoil fills if such waste is—

(i) Placed in accordance with section 816.85;

(ii) Demonstrated to be nontoxic and nonacid forming; and

## PROPOSED RULES

(B) A letter identifying the State or Federal Government official with whom the reporting form was filed to meet NPDES permit requirements and the date of filing.

(2) After disturbed areas have been regraded and stabilized according to this Part, the person who conducts underground mining activities shall monitor surface water flow and quality. Data from this monitoring shall be used to demonstrate that the quality and quantity of runoff without treatment is consistent with the requirement of this Section to minimize disturbance to the prevailing hydrologic balance and with the requirements of this Part to attain the approved post-mining land use. These data shall provide a basis for approval by the regulatory authority for removal of water quality or flow control systems and for determining when the requirements of this Section are met. The regulatory authority shall determine the nature of data, frequency of collection, and reporting requirements.

(3) Equipment, structures, and other devices necessary to measure and sample accurately the quality and quantity of surface water discharges from the affected area, shall be properly installed, maintained, and operated and shall be removed when no longer required.

**§ 817.53 Hydrologic balance: Transfer of wells.**

(a) An exploratory or monitoring well may only be transferred for use as a water well with the prior approval of the regulatory authority. The surface owner shall submit a written request to the regulatory authority for approval of any well transfer.

(b) Upon an approved transfer of a well, the transferee shall—

(1) Assume primary liability for damages to persons or property from the well;

(2) Plug the well when necessary, but in no case later than abandonment of the well; and

(3) Assume primary responsibility for compliance with Sections 817.13-817.15 with respect to the well.

(c) Upon transfer of a well, the transferor shall—

(1) Be secondarily liable for damages;

(2) Be secondarily liable for plugging the well; and

(3) Be secondarily liable for compliance with Section 816.13-816.15 with respect to the well.

(d) Nothing in this Section shall be deemed to supersede or affect the applicability of any State law requirements with respect to a well transfer.

**§ 817.54 Hydrologic balance: Water rights and replacement.**

Any person who conducts in underground mining activities shall replace the water supply of an owner of interest in real property who obtains all or part of his supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source where the water supply has been affected by contamination, diminution, or interruption resulting from the underground mining activities.

**§ 817.55 Hydrologic balance: Discharge of water into an underground mine.**

Water from an underground mine shall not be discharged into other underground mine workings unless the person who conducts the underground mining activities demonstrates to the satisfaction of the regulatory authority that the discharge—

(a) Abates water pollution or otherwise eliminates public hazards resulting from underground mining activities;

(b) Is conveyed as a controlled flow; and

(c) Meets the water quality requirements of 817.42 for pH and total suspended solids except that the total suspended solid concentrations may be exceeded if the suspended material is approved by the regulatory authority or is limited to—

(1) Coal processing waste;

(2) Underground mine development waste;

(3) Fly ash from a coal-fired facility;

(4) Acid mine drainage sludge;

(5) Flue gas desulfurization sludge; or

(6) Inert materials used for stabilizing underground mines; and

(d) The discharge will not cause, result in, or contribute to a violation of applicable water quality standards.

(e) Minimizes disturbance to the hydrologic balance.

**§ 817.56 Hydrologic balance: Post-mining rehabilitation of sedimentation ponds, diversions, impoundments and treatment facilities.**

Before abandoning the permit area, the person who conducts the underground mining activities shall restore all permanent sedimentation ponds, diversions, impoundments and treatment facilities to meet the original design criteria for permanent structures or impoundments.

**§ 817.57 Hydrologic balance: Stream buffer zones.**

(a) No surface or underground area within 100 feet of a perennial stream or a stream with a macro-invertebrate biological community shall be disturbed by underground mining activities except in accordance with Section

817.44 unless the regulatory authority specifically authorizes underground mining activities closer to or through such a stream upon finding—

(1) That the original stream channel will be restored; and

(2) During and after the mining, the water quantity and quality from the stream section within 100 feet of the underground mining activities shall not be adversely affected.

(b) The area not to be disturbed shall be designated a buffer zone and marked as specified in Section 817.11.

**§ 817.59 Coal recovery.**

Underground mining activities shall be conducted so as to maximize the utilization and conservation of the coal so that reffecting the land in the future through surface coal mining operations is minimized.

**§ 817.61 Use of explosives: General requirements.**

(a) Each person who conducts underground mining activities shall comply with all applicable local, State, and Federal laws and regulations and the requirements of Sections 816.61-816.68, in the storage, handling, preparation, and use of explosives.

(b) Blasting operations at areas affected by surface operations and facilities that use more than the equivalent of 5 pounds of TNT shall be conducted according to a time schedule approved by the regulatory authority.

(c) All blasting operations shall be conducted by experienced, trained, and competent persons who understand the hazards involved. Each person responsible for blasting operations shall—

(1) Have demonstrated a knowledge of, and shall comply with, MSHA safety requirements and U.S. Department of Treasury security requirements;

(2) Be capable of using mature judgment in all situations;

(3) Be in good physical condition and not addicted to intoxicants, narcotics, or other similar types of drugs;

(4) Possess current knowledge of the local, State, and Federal laws and regulations applicable to the work; and

(5) Possess a valid certificate of completion of training and qualification as required by 30-CFR 850 and 851.

**§ 817.62 Use of explosives: Pre-blasting survey.**

(a) On the request to the regulatory authority by a resident or owner of a man-made dwelling or structure that is located within one-half mile of any part of the permit area, the person who conducts the underground mining activities shall conduct a pre-blasting survey of the dwelling or structure and submit a report of the survey to

the regulatory authority and to the person requesting the survey.

(b) Each person who conducts underground mining activities shall utilize personnel approved by the regulatory authority to conduct the survey to determine the condition of the dwelling or structure and to document any pre-blasting damage and other physical factors that could reasonably be affected by the blasting. Assessments of structures such as pipes, cables, transmission lines, and wells and other water systems shall be limited to surface condition and readily available data. Special attention shall be given to the pre-blasting condition of wells and other water systems used for human, animal, or agricultural purposes and to the quantity and quality of the water.

(c) A written report of the survey shall be prepared and signed by the person who conducted the survey. The report shall include recommendations of any special conditions or proposed adjustments to the blasting procedure which should be incorporated into the blasting plan to prevent damage. Copies of the report shall be provided to the person requesting the survey and to the regulatory authority.

**§ 817.65 Use of explosives: Surface blasting requirements.**

(a) The provisions of this Section apply only to blasting conducted on the surface.

(b) A resident or owner of a man-made dwelling or structure that is located within one-half mile of any area affected by surface operations or facilities shall be notified 24 hours prior to any blasting event required for facing-up operations.

(c) All blasting shall be conducted between sunrise and sunset. The regulatory authority may specify more restrictive time periods based on public requests or other considerations including the proximity to residential areas.

(d) Warning and all-clear signals of different character that are audible within a range of one-half mile from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within one-half mile of the permit area shall be notified of the meaning of the signals through appropriate instructions. These instructions shall be periodically delivered or otherwise communicated in a manner which can reasonably be expected to inform such persons of the meaning of the signals. Each person who conducts underground mining activities shall maintain signs in accordance with Section 817.11(f).

(e) Access to the blasting area shall be regulated to protect the public and livestock from the effects of blasting.

Access to the blasting area shall be controlled to prevent unauthorized entry at least 10 minutes before each blast and until an authorized representative of the person who conducts the underground mining activities has reasonably determined—

(1) That no unusual circumstances, such as imminent slides or undetonated charges, exist; and

(2) That access to and travel in or through the area can safely resume.

(f) Areas in which explosives are awaiting firing shall be guarded, barricaded and either posted or flagged against unauthorized entry.

(g) (1) Airblast shall be controlled so that it does not exceed the values specified below at any dwelling, public building, school, church, or commercial or institutional building, unless such building is owned or leased by the person who conducts the underground mining activities and is located within the permit area:

Lower Frequency Limit of Measuring System, Hz ( $\pm 3$ dB)	Maximum Level in dB
0.1 Hz or lower—flat response.....	135 peak.
2 Hz or lower—flat response.....	132 peak.
6 Hz or lower—flat response.....	130 peak.
C-weighted, slow response.....	109°C.

(2) In all cases except the C-weighted slow, the systems used must have a flat frequency response of at least 500 Hz at the upper end. The C-weighted must meet the standard ANSI S1.4-1971 specifications. The ANSI S1.4-1971 is hereby incorporated by reference. This work is incorporated as it exists on the date of adoption of this Part, and notice of changes made in these materials will periodically be published in the FEDERAL REGISTER. ANSI S1.4-1971 is available for inspection in OSM regional offices and in OSM's office in the Department of the Interior, 18th and C Streets NW., Washington, D.C. 20240.

(3) The person who conducts blasting may satisfy the provisions of this section by meeting any one of the four specifications in the chart in paragraph (g)(1) of this Section.

(h) Except where lesser distances are approved by the regulatory authority based upon a pre-blasting survey or other appropriate investigations, blasting shall not be conducted within—

(1) 1,000 feet of any building used as a dwelling, school, church, hospital, or nursing facility;

(2) 500 feet of facilities including, but not limited to, disposal wells, petroleum or gas-storage facilities, municipal water-storage facilities, fluid-transmission pipelines, gas or oil-collection lines, or water and sewage lines; and

(3) 500 feet of the active workings of an underground mine except with the

concurrence of the Mine Safety and Health Administration.

(i) Flyrock from blasting shall be restricted as follows:

(1) No flyrock shall be cast beyond the line of property owned or leased by the person who conducts the underground mining activities without the consent of the landowners of adjacent areas.

(2) No flyrock shall be cast more than half the distance from the blast to the nearest dwelling, public building, school, church, commercial or institutional building, road, or railroad. This shall not apply to any structure or right-of-way on land owned by the person who conducts the underground mining activities and not leased to any other person;

(3) No flyrock shall be cast beyond the area of regulated access required under paragraph (e) of this Section; and

(4) These restrictions shall apply to material which travels along the ground surface as well as that which travels through the air.

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

(k) In all blasting operations, except as otherwise authorized in this Section, the maximum peak particle velocity shall not exceed 1 inch per second at the location of any dwelling, public building, school, church, or commercial or institutional building. The regulatory authority may reduce the maximum peak particle velocity allowed if it determines that a lower standard is required because of density of population or land use, age or type of structure, geology or hydrology of the area, frequency of blasts, or other factors.

(l) The maximum peak particle velocity does not apply to property within the permit area that is owned by the person who conducts the underground mining activities and is not leased to any other person.

(m) An equation for determining the maximum weight of explosives that can be detonated within any 8-millisecond period is in paragraph (n) of this Section. If the blasting is conducted in accordance with this equation, the velocity is deemed to be within the 1 inch per second limit.

(n) (1) The maximum weight of explosives to be detonated within any 8 millisecond period may be determined by the formula  $W=(D/60)^2$  where  $W$ =the maximum weight of explosives, in pounds, that can be detonated in any 8-millisecond period, and  $D$ =the distance, in feet, to the nearest

dwelling, school, church, or commercial or institutional building.

(2) For distances between 300 and 5,000 feet, solution of the equation results in the following maximum weight:

Distance, in feet (D):	Max. weight, in pounds (W)
300	25
350	34
400	44
500	69
600	100
700	136
800	178
900	225
1,000	278
1,100	336
1,200	400
1,300	469
1,400	544
1,500	625
1,600	711
1,700	803
1,800	900
1,900	1,002
2,000	1,111
2,500	1,736
3,000	2,500
3,500	3,403
4,000	4,444
4,500	5,625
5,000	6,944

(o) If on a particular site the peak particle velocity exceeds one-half inch per second after a period of 1 second following the maximum ground particle velocity, the blasting procedures shall be revised to limit the ground motion.

(p) Electric or electric delay systems combining surface delays with in-hole delays may be used to reduce vibrations of approved by the regulatory authority. Requests to use such systems shall be accompanied by blasting reports and seismograph records of test blasting on the site showing that the delay pattern does not produce peak particle velocities in violation of this Section.

**§ 817.67 Use of explosives: Seismographic measurements.**

(a) Where a seismograph is used to monitor the velocity of ground motion and the peak particle velocity limit of 1 inch per second is not exceeded, the equation in Section 817.65(n) need not be used. If the equation is not being used, a seismographic record shall be obtained for each shot.

(b) The use of a modified equation to determine maximum weight of explosives for blasting operations at a particular site may be approved by the regulatory authority on receipt of a petition accompanied by reports including seismograph records of test blasting on the site. In no case shall the regulatory authority approve the use of a modified equation where the peak particle velocity of 1 inch per second required in Section 817.65(k) would be exceeded.

(c) The regulatory authority may require a seismograph record of any or all blasts.

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

A record of each blast, including seismograph reports, shall be retained for at least 3 years and shall be available for inspection by the regulatory authority and the public on request. The record shall contain the following data:

(a) Name of the person conducting the blast.

(b) Location, date, and time of blast.

(c) Name, signature, and license number of blaster-in-charge.

(d) Direction and distance, in feet, to the nearest dwelling, school, church, or commercial or institutional building either—

(1) Not located in the permit area; or

(2) Not owned nor leased by the person who conducts the underground mining activities.

(e) Weather conditions.

(f) Type of material blasted.

(g) Number of holes, burden, and spacing.

(h) Diameter and depth of holes.

(i) Types of explosives used.

(j) Total weight of explosives used.

(k) Maximum weight of explosives detonated within any 8 millisecond period.

(l) Maximum number of holes detonated within any 8 millisecond period.

(m) Methods of firing and type of circuit.

(n) Type and length of stemming.

(o) Mats or other protections used.

(p) Type of delay detonator and delay periods used.

(q) Seismographic records, where required, including the calibration signal of the gain setting and—

(1) Seismograph reading, including exact location of seismograph and its distance from the blast;

(2) Name of the person taking the seismograph reading; and

(3) Name of person and firm analyzing the seismograph record.

**§ 817.71 Disposal of underground development waste and excess spoil: General requirements.**

(a) Underground development waste and spoil not required to achieve the approximate original contour and which cannot be used as backfill in the underground mine shall be hauled or conveyed to and placed in designated disposal areas within a permit area other than mine working or excavations, only if the disposal areas are authorized for such purposes in the approved mining and reclamation permit and only in accordance with Sections 817.71-817.73. The material shall be placed in a controlled manner to ensure—

(1) That leachate and surface runoff will not degrade surface or ground waters or exceed the effluent limitations of Section 817.42;

(2) Stability of the fill; and

(3) The land mass is suitable for reclamation and revegetation compatible with the natural surroundings.

(b) The fill shall be designed using recognized professional standards, certified by a registered professional engineer, and approved by the regulatory authority.

(c) All vegetative and organic materials shall be removed from the disposal area and the topsoil shall be removed, segregated and replaced under Sections 817.21-817.23 before spoil is placed in the disposal area. If approved by the regulatory authority, organic material may be used as mulch or may be included in the topsoil to control erosion, to promote growth of vegetation or to increase the moisture retention of the soil.

(d) Slope protection shall be provided to minimize surface erosion at the site. All disturbed areas including diversion ditches that are not riprapped shall be vegetated upon completion of construction.

(e) The disposal areas shall be located on the most moderate sloping and naturally stable areas available as approved by the regulatory authority. If such placement provides additional stability and prevents mass movement, fill materials suitable for disposal shall be placed upon or above a natural terrace, bench, or berm.

(f) The fill materials shall be hauled or conveyed and placed in a controlled manner, concurrently compacted as necessary to ensure mass stability and prevent mass movement, covered, and graded to allow surface and sub-surface drainage to be compatible with the natural surroundings, to ensure long-term stability.

(g) The final configuration of the fill must be suitable for post-mining land uses approved in accordance with Section 816.124 except that no depressions or impoundments shall be allowed on the completed fill.

(h) Terraces shall not be constructed unless approved by the regulatory authority.

(i) Where the slope in the disposal area exceeds 1v:2.8h (36 percent), or such lesser slope as may be designed by the regulatory authority based on local conditions, keyway cuts (excavations to stable bedrock), or rock toe buttresses shall be constructed to stabilize the fill. The slope of original ground at the toe of the fill shall not exceed 1v:5h (20 percent).

(j) The fill shall be inspected for stability by a registered engineer or other professional specialist approved by the regulatory authority during critical construction periods and at least quar-