FEDERAL REGISTER: 44 FR 30610 (May 25, 1979)

DEPARTMENT OF THE INTERIOR
AGENCY: Office of Surface Mining Reclamation and Enforcement (OSM)

30 CFR Parts 710, 715 and 717
Surface Mining Reclamation and Enforcement Provisions

ACTION: Final rules for initial regulatory program.

SUMMARY: The final regulations establish design criteria for sedimentation ponds and head-of-hollow and valley fills constructed during the initial regulatory program and affirm the buffer zone requirements established in the initial regulatory program. The regulations reflect the Secretary's reconsideration of the December 13, 1977 regulations in light of the directive of the District Court of the District of Columbia.

DATES: The final regulation establishing design criteria for head-of-hollow and valley fills is effective June 25, 1979. The final regulation establishing design criteria for sedimentation ponds will be effective 30 days following publication of notice in the Federal Register that the District Court for the District of Columbia has reviewed and approved the regulations.

ADDRESSES: (1) Director, Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior, South Building, 1951 Constitution Avenue, N.W., Washington D.C. 20240; (2) Administrative Record Office, Room 120, South Building, 1951 Constitution Avenue, N.W., Washington, D.C. 20240; telephone number 202-343-4728.

FOR FURTHER INFORMATION CONTACT: David R. Maneval, Assistant Director, Technical Services and Research, Office of Surface Mining, Department of the Interior, Washington, D.C. 20240, 202-343-4264.

SUPPLEMENTARY INFORMATION:

1. Section 501(a) of the Surface Mining Control and Reclamation Act requires the Secretary to promulgate regulations establishing an initial regulatory program for surface coal mining operations. The initial regulations were promulgated on December 13, 1977, 42 FR 62639 (Dec. 13, 1977). On February 27, 1978, the Secretary adopted interim final rules modifying the initial regulations controlling the design of sediment ponds. 43 FR 8090-93.

Portions of the initial regulations, including the amended design criteria for sediment ponds, were challenged by the coal industry pursuant to Section 526 of the Act in the District Court for the District of Columbia. As a result of that litigation, the Secretary was ordered to reconsider, in particular, 30 CFR 715.17(d)(3), 25 CFR 1779108(d)(3) (buffer zone), 30 CFR 715.17(e), 717.17(e) (sediment pond design criteria), 30 CFR 715.15(b), and 25 CFR 177.106(b) (head-of-hollow fills). See In Re Surface Mining Regulation Litigation, 452 F. Supp. 327 (1978) and 456 F. Supp. 1301 (1978).

The final regulations reflect the Secretary's reconsideration of the regulations for sediment ponds, head-of-hollow fills and buffer zones in light of the aforementioned directives of the District Court for the District of Columbia.

Head-of-Hollow, Valley Fill Sedimentation Pone Regulations for Initial Program. Since the regulations which are the subject of this notice were promulgated as proposed on November 14, 1978, the Department has published final regulations implementing Executive Order 12044, March 23, 1978. (43 CFR Part 14, 43 FR 58292-58301, December 13, 1978). The Part 14 regulations became effective on January 26, 1979.

The Department has been under a judicially imposed order to reconsider the regulations for head-of-hollow and valley fills and report to the Court on this reconsideration. Therefore, the Department has decided to utilize the exemption from procedural requirements for significant regulations found in 43 CFR 14.3(f). (See also, 42 FR 62640, December 13, 1977.)

All significant steps with respect to public participation under Part 14 had been completed in development of these final rules prior to the effective date of 43 CFR Part 14 on January 26, 1979. (See 43 CFR 14.1(c)(2).)

2. Valley and head-of-hollow fills. In litigation contesting the initial regulatory program, two specific provisions of Section 715.15 concerning underdrains and compaction of spoil in valley fills were challenged. On August 24, 1978, the District Court for the District of Columbia kept the regulations in force, but at the same time remanded the regulations for

reconsideration in light of the 1978 Skelly and Loy Report. See Surface Mining Regulation Litigation, 456 F. Supp. 1301 (1978).

After reconsideration of the regulations, OSM has decided to modify the initial regulation for head-of-hollow and valley fill construction. The new regulations would permit a modified West Virginia rock core system to be utilized at the discretion of the regulatory authority, and authorize special construction methods when the fill is composed predominately of durable rocks.

The definitions of head-of-hollow fill and valley fills have been modified to conform to the new regulations and describe more explicitly the slope criteria for the existing terrain at the fill site.

The definitions are promulgated under authority of Sections 102, 201, 501, 502, 515 and 516 of the Act.

The final rules delete the existing definition of valley fill and head-of-hollow fill in 30 CFR 710.5 and replace it with separate definitions for each term.

The principal sources of technical definitions are American Geological Institute, Glossary of Geology, 1972; American Society of Civil Engineers, Nomenclature of Hydraulics, 1962; U.S. Bureau of Mines, and Related Terms, 1968; Bituminous Coal Institute, Glossary of Current and Common Bituminous Coal Mining Terms, 1947; Soil Science Society of America, Glossary of Soil Science Terms, 1970; and Soil Conservation Society of America, Resources Conservation Glossary, 1976.

To be classified as either a head-of-hollow fill or a valley fill, the slope of the steepest section of existing topography within the fill site must be greater than 20 degrees, or the average slope of the profile of the valley from the toe of the fill must be greater than 10 degrees. If either of these two criteria are exceeded, then the fill is classified as either a head-of-hollow or a valley fill.

Twenty degrees is an acceptable test to determine steep areas in which extra precautions with spoil disposal are justified (see Section 515(d) of the Act).

Kentucky regulations require the slope of the existing ground at the toe of all fills to be 10 degrees or less (see also Skelly and Loy, 1977, p. II-3 and Huang, 1978, p. 5).

The top of head-of-hollow fills, when completed, must be at the same elevation as the adjacent ridgeline (see Greene and Rainy, 1975, pp. 1-8).

Comments were received regarding the feasibility of placing site limitations on these structures. Based on seven years of experience of the West Virginia Department of Natural Resources, OSM has decided to allow rock core fills of less than 250,000 cubic yards near the elevation of the coal seam when associated with contour mining.

Sections 715.15(a)-(d) Disposal of excess spoil.

30 CFR 715.15(a)-(d), along with the definitions of "head-of-hollow" and "valley fills" in Section 710.5, regulate excess spoil. Section 715.15(a) lists general requirements that apply to all fills, including those dealt with in Sections 715.15(a)-715.15(d). These requirements are basically safety and environmental protection standards which the engineer designing the disposal area must satisfy. If the particular spoil disposal area does not fall within the definitions of head-of-hollow or valley fill, the requirements of Section 715.15(a) are the governing regulations. If the spoil disposal area falls within the definition of valley fill, then in addition to the more general requirements of Section 715.15(a), the valley fill must also meet the requirements of Section 715.15(b). If the particular spoil disposal area falls within the definition of head-of-hollow fill, then in addition to the more general requirements of Sections 715.15(a) and 715.15(b) the fill must comply with Section 715.15(c). Section 715.15(d) provides an alternative method of constructing a head-of-hollow or valley fill.

These different approaches were adopted to allow increased flexibility for the operators and the State regulatory authorities while maintaining the public safety and environmental protection that Congress mandated.

The flatter fill areas are covered by the more general requirements of Section 715.15(a) since the risk of failure or pollution of ground or surface water may be less than in steeper areas.

For valley fills, Section 715.15(b) provides for a fill with a rock underdrain constructed with diversion ditches that carry surface water away from and around the fill. The engineered rock underdrain and diversion ditch system are necessary because valley fills black a path of water flow from a watershed above the valley fill. If the fill is a head-of-hollow fill, then there will be a smaller watershed, in which case Section 715.15(c) provides that the fill may be constructed with a rock chimney drain and water may be diverted toward the rock chimney. Section 715.15(d) governs a special type of either head-of-hollow or valley fill that is made up of at least 80 percent by volume of sandstone, limestone, or other durable rocks that do not slake in water. In such fills, internal drainage is more free and failure because of saturation is much less of a risk, and erosion should be minimal. Therefore, especial methods of construction are allowed.

Spoil disposal practices in mining operations have had a major impact on the environment and, in some cases, represented a significant hazard to life and property. The requirements outlined in these Sections of the final regulations provide positive measures to protect life, property, and the environment by establishing criteria for the disposal of excess spoil materials while achieving adequate drainage control and long-term stability. For reference to the potential environmental impacts of excess spoil disposal see: "Final Environmental Impact Statement OSM-EIS-1," pp. III-13-15, 40, 60-61.

If excess materials are improperly placed across drainage channels and provide inadequate drainage and stability, disturbance to the hydrologic balance and impact on safety could be profound. (Comptroller General of the U.S., 1977, pp. 1-2; Coalgate and others, 1973, pp. 93-94; Hopkins and others, 1975, p. 9; Taylor, 1948, pp. 406-407). The purpose of detailed construction standards for disposal of excess spoil is to construct fills which will not require, maintenance over the life of the fill. Fills constructed for highways, railroads and buildings are not only carefully engineered, but also monitored and maintained for their lifetime. In contrast, excess spoil fills are ultimately the responsibility of the surface landowner who is likely not to have the capital or equipment for long-term maintenance or remedial action. Therefore, it is essential to design and construct excess spoil fills properly.

Major issues which have been identified based on public comments were separated into five areas:

(1) Semantic interpretations of the terms "haul or convey" versus "transport and placed";

(2) durability requirements for rock used in underdrains;

(3) Life thicknesses for excess spoil placement;

(4) Allowance of alternative spoil disposal methods; and

(5) Provisions for the disposal of coal processing waste in excess spoil fills.

Each of the principal issues, as well as additional comments, are addressed below.

The authority for these proposed Sections is found in Sections 102, 201, 501, 502, 515, and 516 of the Act. The rationale for selecting the final regulations is found in the context of this general preamble discussion, the disposition of submitted comments related to the proposed regulations, and the preamble to the proposed regulations for these Sections.

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Applicable State and Federal laws comparable to or containing similar requirements include but are not limited to:

1. 30 USC 801. MSHA regulations.
2. 33 USC 1151-75 Water Pollution Control Act.
3. Chapter 30. Article 6 West Virginia Code -- "Surface Mining and Reclamation control Act".
4. Chapter 20 Article 6C, West Virginia code -- "The Coal Refuse disposal Control Act".
5. "Pennsylvania Clean Streams Law," 35 Pa. Stat. Annon, Section 691.1 et seq.
6. "Solid Waste Management Act," 35 Pa. Stat. Anon, Section 6001 et seq.
7. Title 25 Pennsylvania code, Chs. 95, 97, 101, 125.
8. Ch. 20 Art. 5. W. Va. Code, "Water Pollution Control Act".
9. 40 CFR 136. "Protection of the Environment".

SECTION 715.15(a) - DISPOSAL OF EXCESS SPOIL: GENERAL REQUIREMENTS.

Section 715.15(a) requires controlled placement utilizing current engineering practices common in embankment construction for all types of permanent fills. This Section implements the general requirements outlined in the Act and is applicable to all excess spoil disposal areas. For definition of the different types of fills see 30 CFR Section 710.5.

Disposal of excess spoil in designated offsite storage areas such as pre-existing mined benches is presently practiced in several States. In some areas, disposal of excess spoil has occurred without benefit of permits, sufficient bonding, or minimal provisions for environmental control. Under the interim regulations, Section 715.15(a)(1), disposal of excess spoil was to be permitted in areas only "other than mine workings or excavations." The Office recognizes the constructive and beneficial results for disposal of excess spoil in such workings or excavations, and strongly encourages this practice which is feasible and consistent with both the Act and the initial performance standards. As a result, the wording of Section 715.15(a)(1) has been modified to clarify the language.

Comments said the first cut or box cut spoils should not adhere to the same requirements as excess spoil. The commenters said Section 515(d) of the Act separates the requirements of steep versus flat slope areas regarding spoil disposal. The legislative history and the Act do not indicate that excess spoil regulations should be divided based upon mining terrain slopes. Therefore where box cut or first cut spoils are not required to achieve approximate original contour or cannot be handled in accordance with Section 715.14, they should be treated as any excess spoil and comply with the requirements of Section 715.15(a)-715.15(d).

Commenters objected to the use of the phrase "haul or convey" since the Act uses the language "transported and placed." The legislative history shows that "standards require controlled placement of spoil. Spoil must be transported-hauled by truck or other vehicle-placed and compacted..." (123 Cong. Rec. H-7584, July 21, 1977). The intent of the recommended change was to allow uncontrolled end-dumping of spoil as an acceptable method of spoil placement. This recommendation is rejected.

One commenter noted that the use of the word "replaced" in Section 715.15(a)(3) regarding topsoil appeared to be an error. He suggested use of the term "placed" as an alternative. This comment was rejected, as "replaced" is consistent with Section 715.16(a).

A commenter suggested that removal of topsoil, vegetative, and organic material was not necessary "in the nonstructural portion of the fill to insure stability." The Act, however, requires removal of topsoil in Section 515(b)(5); therefore, this comment is considered non-substantive and cannot be accepted.

Some commenters contended that all topsoil should be removed from the entire disposal area before any spoil is placed on it. This is not implied by the regulation. OSM recognizes that the entire removal of topsoil before spoil is placed in the area is undesirable. Concurrent removal of topsoil is accepted and desirable and minimizes the disturbances at the disposal site.

A commenter suggested that moderate slopes are not always stable because the parent bedrock which produces moderate slopes usually results in deeply weathered soils. He suggested that foundation investigations be required prior to fill placement. This comment was rejected, as placing this requirement in Section 715.15(a)(5) would be redundant because Section 715.15(a)(13) requires foundation investigations.

Commenters proposed a variance allowing small depressions or impoundments on the crest of fills, if demonstrated to be consistent with the postmining land use and stability of the fill. Commenters said that such impoundments would enhance postmining land uses, such as grazing. It is a commonly accepted engineering and construction practice to minimize infiltration of surface water into the fill mass so as to maintain the lowest possible hydrostatic pressure within the fill. (Hopkins and others, 1975; Cedegren, 1967; Chassie and Goughnour, 1976; U.S. Army Corps of Engineers, 1952). The existence of depressions or impoundments, regardless of size, can increase the phreatic surface within the fill. Therefore the prohibition of impoundments on fills is retained in Section 715.15(a)(7) in the final regulations.

Commenters argued that the prohibition of terraces in the proposed final regulations was inconsistent with the definition of approximate original contour in Section 701(2) of the Act. It is agreed that terraces, if properly constructed, are desirable to break long slopes, control erosion, and enhance stability. Therefore, the requirements of Section 715.15(a)(8) have been altered to allow terraces in accordance with Section 715.14 and if approved by the regulatory authority.(Curtis, 1971b, pp. 198-199; Curtis and Superfesky, 1978, p. 156; Figure 1; Skelly and Loy, and others, 1978, pp. 148-149).

Commenters raised objections to the specification in Section 715.15(a)(9) that the toe of the fills rest on a 20 degree or flatter slope. Since the consideration of the slope of natural ground at the toe of the fills is an integral part of a stability analyses, this requirement was deleted. (Huang, 1978, pp. 11-12; Lambe, 1969, pp. 366-367.)

Commenters said rock buttresses and keyway cuts are not always necessary (e.g., if the design achieves a 1.5 factor of safety). The use of keyway cuts and buttresses is intended to increase the stability of embankments where steep foundation conditions necessitate special treatment to resist the sliding movement created by the weight of the fill. (Chironis, 1977, p. 107; Huang, 1978, pp. 5, 11-12; Lambe, 1969, pp. 366-367; Loy and others, 1978, p. 9; Comptroller General of the U.S., 1977, pp. 1-2; Chassie and Goughnour, 1976, p. 66).Therefore, Section 715.15(a)(9) has been modified to reflect the change supported by commenters and to clarify the relation of this Section to the Act.

Commenters asserted that persons under the supervision of registered professional engineers should be allowed to conduct the inspections required in Section 715.15(a)(10). The language of Subsection (a)(10) states "registered professional engineer or qualified professional specialist." The should not preclude persons under the supervision of a registered professional engineer from making the inspection provided that they are indeed qualified. The requirement for inspection, certification, and record-keeping is consistent with 30 CFR 77-216-3, and the WV Code, Chapter 20, Article 5-D-9, and in keeping with construction standards for quality assurance.

At the request of one commenter, "critical construction periods" have been clarified in Section 715.15(a)(10). The commenter stated that without this clarification operators would be subject to an indeterminate number of inspections, which would increase cost. While most design and construction engineers should be able to provide guidance on critical construction periods, a list, which should not be considered all inclusive, has been provided in Section 715.15(a)(10).

Commenters suggest that inspection frequency be increased due to variations in embankment construction schedules. The quarterly inspection requirement is maintained as a minimum; however, the regulatory authority may increase the inspection frequency, if fill construction is so rapid that quarterly inspection will not be adequate to monitor construction practices effectively.

Commenters said coal processing waste should be allowed to be placed in head-of-hollow or valley fills. Some commenters asserted that the Office had no legal authority to exclude such waste under these Sections. Others asserted that since the Office allows the use of waste in dams and embankments, OSM should allow its use in head-of-hollow or valley excess spoil fills. They argued that the physical, chemical, and engineering qualities of such waste can be determined and its use adequately controlled so as to assure stability and environmental protection.

The Office accepted portions of these comments. The Office rejects the argument that the exclusion of coal processing waste is beyond its legal authority. It is essential to assure the long-term stability of large fills, especially in the steeper areas, such as the Appalachia coal fields. (H. Rept. No. 95-218, 95th Cong., 1st Sess., p. 114, 1977.) The period of time over which many fills are built and the increasing use of fills in current mining make it difficult for a regulatory authority to monitor construction. This difficulty coupled with serious concern about long-term stability and potential for ground and surface water pollution require thorough control.

Because the risks associate with excess spoil fills are less in flatter areas, the disposal of waste was allowed in spoil disposal areas which do not fall within the definition of head-of-hollow or valley fills. However, waste is still excluded from fills that fall within those definitions. This distinction was made because valley and head-of-hollow fills are in steeper areas where side slopes in excess of 20 degrees and average profiles in excess of 10 degrees are encountered. Fills in such steeper areas are more prone to failure, and the effects of failure more damaging.

Coal waste frequently has properties that contribute to instability, especially wet fine coal wastes (Coalgate and others, 1973, p. 6; Comptroller, General of the U.S., 1977, pp. 1-2). Moreover, depending on the characteristics of the coal seams being cleaned or processed, coal waste often has acid- or toxic- forming potential (Coalgate and others, 1973, pp. 14-18). The stability and toxic-forming characteristics of a given sample of coal waste can be determined by analysis. Depending on the analysis, the use of a given material may be authorized in a general manner, but more frequently a given coal waste will require special handing, such as mixing in a ratio or in a place with spoil being used in the fill. In the latter case, stability or freedom from toxic drainage is only assured when the waste is handled as prescribed. Moreover, the characteristics of the waste often change due to breakdowns or changes in the seam or seams of coal being processed.

Because of all these variables, regulatory control of fills including coal waste is much harder to achieve. The Office, therefore, decided to exclude coal waste from fills in steep areas. For fills in flatter areas, which generally pose less stability and toxic-formation problems, the Office allows the operator the flexibility of including coal waste, provided it is handled to minimize the problems that may be associated with its use.

In response to commenters' assertion that since coal waste is allowed in dams, it should be allowed in fills, it is noted that coal waste is allowed in dams under careful control, because dams are more highly engineered in general, typically built with greater quality control and are constructed over a shorter time. All these factors make regulatory control and environmental safeguards easier to achieve. Waste disposal areas designed and constructed specifically to handle coal processing waste, as specified in the regulations, therefore, are justified.

SECTION 715.15(b) - DISPOSAL OF EXCESS SPOIL VALLEY FILLS.

This Section establishes the requirements for valley fills. This type of fill is characterized by a structure located in a valley where the fill material has been hauled and compacted into place, with diversion of upstream drainage around the fill. For definition of "valley fill", see 30 CFR 710.5.

Some commenters asserted that the 1.5 static, long-term factor of safety requirement for fills was too stringent, while others supported it as necessary to provide adequate safeguards. Reduced factors of safety were considered as alternatives for all fills and also for remotely located fills.

The 1.5 factor of safety is standard engineering practice for earth and rockfill structures located where failure could cause loss of life or property damage (Canada Department of Energy, Mines and Resources, 1977, p. 80; Canada Department of Energy, Mines and Resources, 1972, pps. 5-27; MESA, 1975, p. 5.143; MESA, 1976b, p. 3; Lambe & Whitman, 1969, p. 373). MESA (1975, p. 5.143) and Canada Department of Energy, Mines and Resources, (1972, p. 5-27) recommend the use of reduced factors of safety when the potential of property damage and loss of life does not exist. Meyerhoff, 1970 (pps. 349-355) discusses the correlation of probability of failure with variability in strength parameters, foundation conditions, piezometric surface, and other assumptions utilized in the computations of safety factors. He recommends the standard for safety factors should be increased to 1.7 to account for these relationships, thus further reducing probability of failures. Bishop (1955, p. 7) states that even with high factors of safety, overstress can occur below a 1.8 factor of safety.

While most discussions of fills focus on the protection of life and property, the Act has also mandated the protection of the environment. The Office believes that the added degree of protection provided by increased factor of safety requirements even in remote areas, is warranted, and well justified due to the necessity for: (a) protection of the environment from excessive erosion, contribution of pollutants, and other adverse long-lasting effects of fill failures; (b) protection of existing life and property; (c) protection of life and property which may develop below originally remote areas; and (d) safeguards which must offset the lack of long-term maintenance over the life time of the fill.

Commenters objected to Section 715.15(b)(2)(ii), which requires subdrains to be protected by filter systems. Filters are state-of-the-art requirements to control migration of fines from the foundation or fill material into drains. In fills where drains become nonfunctional due to the migration of fines and subsequent blockage, failure is common. The control of seepage is one of the most critical areas of structural design. (ASCE, 1966, p. 550; Canada Department of Energy, Mines and Resources, 1977, pp. 5-18 to 5-58; Canada Department of Energy, Mines and Resources, 1972, pp. 5-9; Sherard and others, 1963, pp. 81-91; Terzaghi and Peck, 1967a, p. 57; Cedegren, 1967, p. 175; U.S. Army Corps of Engineers, 1952, pp. 10 and 16; U.S. Bureau of Reclamation, 1973, pp. 306-307; West Virginia Department of Natural Resources, 1975, p. 1; MESA, 1976b, p. 3; MESA, 1975, pp. 5.24-5.25 and 8.95-8.102); Comptroller General of the United States, 1977, p. 2; Coalgate and others, 1973, p. 95.) Therefore, OSM has not removed the filter requirement.

Comments were received regarding the minimum size requirements for underdrains and the gradation restrictions for the rock comprising the underdrains. None of the comments provided alternative drain sizes, but instead insisted upon the deletion of the table in Section 715.15(b)(2)(iii) and stressed reliance on site-specific engineering design. Another suggestion was to leave the table and allow the operator an option of submitting a site-specific design, including adequate drainage control.

The rock drain criteria in Subsection 715.15(b)(2)(iii) represent recommendations of current studies concerning valley fill design and construction. (West Virginia Department of Natural Resources, 1975, p. 56; Loy and others, 1978, pp. 6-8; Chironis, 1977, pp. 104-110.) The criteria attempt to strike a balance between site-specific drain design (based on in-depth determinations regarding anticipated flow rates, permeabilities, gradations and local geologic, topographic and hydrologic conditions) and the simplicity of standardized design. The methods used to obtain and place the materials are left to the permittee, and the sizes of the materials are not particularly large considering the amount of material involved. As a result, the requirements of Section 715.15(b)(2)(iii) remain unchanged.

The Office is aware of the problems with ensuring that rock size meets the requirements of Section 715.15(b)(2)(iii). In certain instances, the operator will have to provide multi-staged filter systems in order that the drain, filter, and fill achieve acceptable transitions.

In the table of Section 715.15(b)(2)(iii), commenters noted omission of a value specifying the height o drains in fills exceeding one million cubic yards in volume. This was a typographical error and should read "16 feet" in the final version (Chironis, 1977, p. 108).

Commenters questioned the durability standards set forth in the proposed regulations. Commenters noted the requirements differed from the material control specifications from which they were derived. While there existed a lack of clarity in the proposed Section 715.15(b)(2)(iv), the intention of the regulation was to insure that subdrain material be sufficiently durable to prevent degradation which could result in blockage of the drain and subsequent failure of the fill (Terzaghi and Peck, 1967a, p. 57; Cedergren, 1967, p. 175; U.S. Bureau of Reclamation, 1973, pp. 306-307; Loy and others, 1978, pp. 6-8; U.S. Army Corps of Engineers, 1952, p. 16). The regulations have been modified to correspond to the supporting technical specifications.

Since the availability of underdrain material capable of meeting these standards could be cost restrictive in some areas of the country the final regulations have been modified to allow underdrains which consist of nondegradable, non-acid or toxic-forming rock, which will not slake in water. This provides greater flexibility in that more frequent use of site available rock will be permitted.

The following list of references are provided as acceptable, but not exhaustive guidelines for determining the slake index of rock:

(a) DiMillio, Albert F., "Status of Shale Embankment Research", Public Roads, Vol. 41, No. 4, March 1978, pp. 153 to 161.

(b) Franklin, J. A., and Chandra, R., "The Slake-Durability Test", Pergamon Press, International Journal of Rock Mechanics and Mining Sciences, Vol. 9, No. 3, 1972, pp. 325 to 341.

(c) Heley, W., and Maclver, B.N., 1971, Development of Classification Index for Clay Shales, TRS-71-G, pp. 95, Report 1 Waterways Experiment Station, U.S. Army Corps of Engineers.

(d) Lutton, Richard J., 1977. Design and Construction of Compacted Shale Embankments, Vol. 3: (Slaking Indices for Design. FHWARD-77-1, 88 pp.).

(e) Underwood, Lloyd B., "Classification and Identification of Shales," ASCE Journal of Soil Mechanics and Foundations Division, Vol. 93, No. SM6, November 1967, pp. 97 to 116.

(f) Wood, L.E., and others, 1976 "Guidelines for Compacted Shale Embankments, VII Ohio River Valley Soils Seminar", pages 1 to 5, 1 table and 8 figures.

Commenters questioned the requirement in Section 715.15(b)(3) that eighteen-inch lifts be used in the construction of excess spoils embankments. Requirements for lift thickness in earth fill construction vary with the method of placement and the type of embankment, construction equipment used and gradation of the fill material. The boundary conditions, such as phreatic surfaces within the fill and adjacent areas, may vary from site to site and must be determined from onsite investigation or can be taken into account by conservative assumptions. The eighteen-inch lift thickness proposed in the regulations is based on literature which is applied to dams, groins, and highway embankments as well as spoil fills (43 FR 41761). After further examination of the problem and of the comments received, the Office has determined that larger lift thicknesses are consistent with stable fills in some areas (Chironis, 1977. p. 106; Greene and Raney, 1974, p. 8; U.S. Army Corps of Engineers, 1971, pp. K 10-39, M-15; U.S. Navy Bureau of Yards and Docks, 1971, table 9-3; Grim and Hill, 1974, p. 61). Accordingly, Section 715.15(b)(3) has been modified to allow lifts no greater than four feet in thickness, or less to achieve densities necessary to ensure mass stability, prevent mass movement, avoid, contamination of fill drainage systems, or the creation of voids. The regulatory authority has the discretion to require thinner lifts, if the gradation of the material warrants thinner lifts.

Commenters questioned the requirements in Section 715.15(b)(4) relative to stabilized diversions off the fill and the necessity for sediment control at the exit of diversions. Commenters said that stabilized channels "off the fill" created an unnecessary disturbance and that channels on the fill could protect that portion of the fill from erosion. Diversion of water away from the fill surface is considered sound engineering practice (Canada Department of Energy, Mines and Resources, 1977, pp. 58-59, 95-96; U.S. Environmental Protection Agency 1976b, pp. 32-33, 78; WVDNR, 1975, p. 2; EPA, 1976. Canada Department of Energy, Mines and Resources, 1972, p. 2-2 Coalgate and others, 1973, pp. 93-94; Calhoun, 1968, p. 79: Casagrande, 1978, pp. 3 of attachment; Loy and others, 1978, pp. 79 and 82; MESA, 1976b, p. 1; Comptroller General of the U.S., 1977, pp. 1-2). The material making up the fill structure is generally less resistant than the surrounding bedrock, thus, more stringent design criteria are necessary to protect against erosion of the diversion in the weaker material. The Office realizes that construction of diversions off the fill structure will affect more area than if the diversions were on the fill surface. However, based upon sound engineering practice, OSM believes that less environmental harm will result from retaining the requirement to build diversions off the fill structures. Consequently, the language of the regulations remains unchanged.

The use of the 100 year storm and 24-hour duration storm is discussed in the preamble for Section 715.17 and 715.15(c)(3) which is incorporated herein by reference.

Commenters said that sediment control should not be required at the discharge of the diversion carrying runoff from the drainage area above the fill. They assumed that this area was undisturbed. One commenter recommended sediment control be require only at those diversions carrying runoff from the fill surface. The proposed language has not been changed. Sediment load must be controlled from the fill area, from the diversion structure, or from mining activities existing above the fill. See Section 515(b)(10) of the Act.

SECTION 715.15(c) - DISPOSAL OF EXCESS SPOIL: HEAD-OF-HOLLOW FILLS.

Section 715.15(c) contains requirements for construction of head-of-hollow fills. These fills may be constructed with rock-core chimney drains or diversions, as for valley fills. The rock-core chimney drain system is designed to direct water falling off the surface of the fill to a central rock-core by means of surface grading. The rock-core extends from the toe to the head of the fill and from the base to the surface of the fill. A system of lateral underdrains will dispose of water from seeps emerging beneath the fill. Filters are provided for the core and subdrains. This fill construction method is relatively new, but as commenters point out, has been used with success in West Virginia for the past several years (Green 1978, p. 21).

Allowing rock-core chimney drains was based on the following course of events. On December 13, 1977, final rules were adopted for the interim regulatory program which covered the disposal of spoil from surface mining in areas other than mine workings or excavations, and authorized only the rock underdrain system of fill construction. Following adoption of the rules, the Office received petitions for change of the rules affecting head-of-hollow fills. The investigation of the petitions, as reflected in this preamble, has resulted in revisions to the rules.

Petitioners said the Office was being too narrow in defining only one construction method for building head-of-hollow fills. They claimed that the "rock-core system," authorized in West Virginia, provided as much or more protection as the "rock-underdrain system" in the interim program.

Fills built with the rock-core method are stable at present. However, the development of steady-state seepage through fill masses can take many years, and the results of such seepage may not be obvious for some time to come. The following discussion describes some of the problem areas which head-of-hollow fills.

On the one hand, several professional engineers stated the long-term clogging of the rock core by fine grained sediment in the drainage and in some cases piping (internal erosion) caused by the flow of water within the fill could lead to instability and potential failure of the fill (Loy and others, 1978, p. 106; Robins, and others, 1977, pp. 1-4; U.S. Congress: H. Rep. 218 95th Congress, 1st, sess. 1977 pp. 121-123). One commenter said the rock-core method should be prohibited because rock drains should only be used for passage of seepage or groundwater flows, not surface flow. The Office appreciates the possibility of siltation and blockage of the drain. As significant amounts of water are introduced into this system, there is an increased potential for blockage of the drain. A deposit of fines within the upper portion of the rock core can occur, since the core will act as an energy dissipater when flows from above the structure lose energy upon reaching the core. The hydraulic gradient increases as the water flows by gravity downward through the core. Thus, material surrounding the core becomes susceptible to piping, bringing more fines into the system.

On the one hand, the major advantage of the rock core construction appears to be its ability cope with long-term differential settlement of the fill that results in a surface grade towards the center of the fill, where settlement is usually greatest. In areas where settlement may reverse the slope of the crest of the fill (e.g., with water flowing away for the core), the designer may require additional camber.

In an effort to combat some of the problems identified with the rock-core method of excess spoil disposal, two requirements are added to decrease the potential for blockage of the core.

First, the rock-core system must be surrounded by a properly designed filter. This will reduce piping potential from groundwaters in the fill mass, and from flows through the core (see preamble Section 715.15(a)(1)). The construction control measures necessary to prevent contamination of the filters as the size of the collection area increases will prove difficult because the surface of the fill slopes toward the core, and surface runoff will carry large amounts of sediment onto the fill.

Second, these structures must be located in the upper reaches of valleys of hollows and be designed to fill the disposal site to the approximate elevation of the nearby ridge line (Greene & Raney, 1974, p. 7). The requirements are premised on widely accepted concepts. For a discussion of the necessity of filters, see the preceding preamble of Section 715.15(b)(2).

The need for minimizing or controlling the surface runoff above a site has been the basis of state-of-the-art diversion design. This concept applies to the head-of-hollow fill system. The combination of controlling surface and ground water flows will result in environmentally sound stable fills. This is accomplished by maintaining low phreatic surfaces and reduction of acid formation and erosion. (GAO, 1977, pp. 1, 48, 93-95; Chassie and Goughnour, 1976, pp. 65-66; Canada Department of Energy, Mines and Minerals, 1972, p. 2-2; Hopkins and others, 1975, p. 9; EPA, 1976b, pp. 32-33; Wahler, 1978, pp. 8, 56; Taylor, 1948, pp. 406-407; U.S. Department of the Navy, 1974, pp. 7-7-1; Loy and others, 1978, p. 82).

To date, the Office is not convinced that rock core fills are potentially less stable than the rock underdrain fills. Some engineers have expressed doubt that the rigorous West Virginia construction requirements could be adequately monitored in a State that was just beginning a strict inspection program and that inadequate engineering practices would be more likely to result in failure of the rock core system. The Office emphasizes that it is critical that the rock core maintain its permeability throughout. If one impermeable section of the core is constructed or if a section subsequently becomes impermeable, failure could result.

In summary, the rock-core method has been the subject of debate, but it reflects currently acceptable technology based upon the performance record of 250 fills (Green, 1978, p. 2). On the basis of the investigation, the Office is providing a revision to the regulations permitting the rock core system of head-of-hollow fills to be used at the discretion of the regulatory authority with adequate inspection and supervision. At the same time, the Office is instituting a formal study to investigate various types of fills.

The Office also has determined to permit the use of the rock-core system of disposal where the final crest of the fill is at or near the elevation of the coal seam. These type fills will be limited to disposal volumes of 250,000 cubic yards of less. (Heine, 1978, p. 1). The Office believes these fills are relatively small and that any increases in the risk of failure because of the use of the rock core drain is offset by their small size. However, these fills should also be located to minimize the upstream drainage area into the fill.

Section 715.15(c)(2) contains criteria for the rock chimney drain, including size, filters, drainage sump, terrace and grading requirements (West Virginia Department of Natural Resources, 1975, p. 76; Hinger, 1978, pp. 7-22). In response to reports on potential clogging of the rock core see general preamble discussion for section 715.15(c). Commenters said that clogging of the rock core will not be a problem because of revegetation requirements reducing sediment yield. This is only true after construction when the disturbed areas have been reclaimed successfully and erosion and sediment load entering the fill have been eliminated. During construction, the area above the fill is generally disturbed by haul roads and mining and reclamation operations which contribute sediment capable of plugging the core. The crest of the fill itself cannot be reclaimed, as is the outslope, therefore, sediment from the crest is also directed into the core.

Commenters were concerned about the expense and availability of enough rock to construct underdrains. Since no details were presented regarding cost, current practices or engineering which would substantiate this claim, and since, as discussed previously, the record contains numerous examples of fills constructed on all types of terrain, this comment was rejected. Moreover, the requirement for a rock underdrain is a critical element for safe fills. (See, preamble for Section 715.15(b).)

Section 715.15(c)(3) specifies the hydrologic design capabilities of the drainage control system. The 100-year frequently storm is a standard criterion for control of runoff above nonimpounding structures (West Virginia Department of Natural Resources, 1975, p. 2; MESA, 1976b, p. 1). The 24-hour duration storm was chosen over the 6-hour storm, because it generally results in a runoff volume and peak somewhat higher than that of the 6-hour in the same area (Chow, 1964, pp. 9-50 through 9-65; U.S. Department of Agriculture, Soil Conservation Service, 1972, Chapter 21; U.S. Weather Bureau, 1961, pp. 56-58).

A Commenter request clarification of the applicability of the final regulations to partially constructed hollow fills. Clarification is provided under the definition of "existing structure" in Section 710.5, and the preamble to Section 710.11.

SECTION 715.15(d) - DISPOSAL OF EXCESS SPOIL: DURABLE ROCK FILLS.

This Section provides an alternative method for disposal of excess spoil, as a result of numerous comments requesting allowances for practices which satisfy site-specific necessity. This Section is applicable in stances where durable rock can be demonstrated to exceed 80% of the volume of excess spoil and represents an addition to the proposed regulations.

Many comments support the adoption of site specific standards for durable rock fills. The Section has been adopted solely for durable rock fills. Many fill structures have been dumped in place (Divis and Sorenson, 1969, p. 18; U.S. Bureau of Reclamation, 1973, p. 60; Terzaghi and Peck, 1967a, pp. 599, 604; Huang, 1978, p. 5; Robins and others, 1977). As the state-of-the-art progressed, it became obvious to designers that this was a highly cost-effective method of construction (U.S. Department of Energy, 1978, p. 4; Young 1978, pp. 79-94; Goal and Leer, 1978, pp. 1-10 with Exhibits; Council on Wage and Price Stability/Regulatory Analysis Review Group, 1978, pp. 13-17; Loy and others, 1978, pp. 107-176). Little compactive effort or minimal hauling and handling is required, as the material consolidates under its own weight. In dams, where this method was widely utilized, the sole problem resulted from differential settlements of the structure, which created cracked, impermeable zones and other similar problems, which could lead to instability.

Other problems, such as infinite slope failures, resulted from the existence of outslopes at the angle of repose. These types of failures are generally shallow, but can become retrogressive (Canada Department of Energy, Mines and Resources, 1972, p. 2-3). In addition, if less durable or more impermeable zones were dumped, which created weak layers parallel to the outslope of the fill, failures could occur. (Canada Department of Energy, Mines and Resources, 1972, pp. 88-89; Taylor, 1948, p. 476; Loy and others, 1978, pp. 88-89).

Section 715.15(d) of the final regulations is based upon the premise that the solution to safe end-dumped fills is rock durability.

The existence of dumped rock fills was carefully considered. A number of the dumped rock embankments considered were made up of extremely durable igneous rock such as hornblende, granodorite, granite and quartz monzonite. These rocks are crystalline in structure and are thus generally more durable than sedimentary rocks. Even though the consideration of end-dumping this type of rock does not directly transfer to regions with sedimentary rock, it does show that rock must be durable when end-dumped.

The variability of excess spoil material supports the use of site specific design requirements. The Office has tried to strike a balance between objective standards and a multitude of possible alternative methods which address special situations, while still satisfying the objective standards required by law.

The concept presented by this Section has been supported by progressive generations of engineering design and appears to promote more cost effective spoil disposal. The following discussion details the requirements of the Section:

(1) The introductory paragraph of section 715.15(d) allows 80 percent durable rock to be placed in a single lift, it site-specific conditions and justification by experienced engineers warrant. Durable rock is determined by the slake durability index, as identified in the preamble to Section 715.15(b)(2)(iv). This introductory paragraph incorporates the requirements of Section 715.15(a) by reference.

(2) Section 715.15(d)(1) provides for the stable configuration of the fill by requiring controlled placement and the consideration and proper handling of less durable materials. This is consistent with the Act, Section 715.15(a)(6), and standard engineering practice (Canada Department of Energy, Mines and Resources, 1972, pp. 2-3 and 2-9).

(3) Section 715.15(d)(2) specifies stability analyses of the structure to show the long-term, static and dynamic factors of safety achieve 1.5 and 1.1, respectively. These requirements reflect the intent of the Act and provide accepted standards for stability, as discussed in the preamble to Section 715.15(b)(2).

(4) Section 715.15(d)(3) state criteria for achieving proper subsurface drainage control, which are consistent with Sections 715.15(a)(1)(i) and 715.15(b)(2). (See, preambles for Sections 715.15(a)(1)(i) and 715.15(b)(2).)

(5) Sections 715.15(d)(2), (5), (6), and (7) provide specific requirements for control of surface drainage, grading and terracing. The requirements parallel the comparable subsections of Sections 715.15(b) and 715.15(c).

The provisions of Section 715.15(d) reflect options developed after deliberation of the following items.

Literature used in consideration of alternatives for the regulations show that the Earth's crust is made up of approximately 35 percent clay-bearing rock (Franklin and Chandra, 1972, p. 325). This would include igneous, metamorphic, and sedimentary rocks. Sedimentary rocks are estimated to comprise as much as 82 percent shale, 12 percent sandstone and 6 percent limestone. Mason (1966, p. 153), Drnevich and others, (1976, pp. 50-51), Weigle (1966, p. 67), Huang (1978, p. 10) and Cumming and others (1965, p. 10) have shown that surface mine spoils are composed of relatively high concentrations of clay and silt-sized particles. Some commenters have criticized the Office for applying criteria which address earthfill structures, when most mines are dealing with rockfill. While OSM realizes that overburden materials are of variable grain size, plasticity and permeability, the Office is of the opinion that the excess spoil problem involves both earth fill and rockfill.

As literature has shown, overburden materials may contain silt and sandsize particles. The ability of these materials to withstand weathering and deterioration is dependent upon the type of sediment which occurs as an initial deposit before consolidation and upon the type of cementing material which consolidates the sediment into rock (Mason, 1966, pp. 153-156). Drnevich and others (1976, p. 58) and the U.S. Department of the Navy (1974) p. 7-7-14) have shown that surface mine spoils or soils with silt size particles lose shear strength with time due to exposure to water and weathering. Shales have historically caused many geotechnical problems from improper treatment and required elaborate remedial design (Chassie and Goughnour, 1976, pp. 65-66; Shamburger, and others, 1975, pp. 1-8; Bragg and others, 1975 pp. 1-5; and DiMillio, 1978, p. 153). These types of materials require special consideration and cannot be indiscriminately disposed of. Past excess spoil disposal practices, both in drainways and over mine bench outslopes have resulted in numerous safety and environmental problems where spoil was placed by gravity methods. (Appalachian Regional Commission and the Department for Natural Resources and Environmental Protection 1974, pp. 5-7; Weigle, 1966, p. 67; Robins, and others, 1977, pp. 1-3; Loy and others, 1978, pp. 69-74; and Plass, 1967, p-1).

Comments, which were pertinent to the inclusion of this Section in the regulation, questioned the specificity of excess spoil disposal requirements.

The majority of the comments discussed the lack of flexibility in the proposed regulations for designs of a site-specific or innovative nature. Other comments agreed with the former group, with the exception that they also proposed specific criteria for adoption. Essentially these criteria from the latter group of commenters have been adopted as shown in the context of the final regulations. (U.S. Department of Energy, 1978, pp. 1-15; Casagrande, 1978, Attachment, pp. 1-4; NCA/AMC, 1978, pp. S-190 through S-194; Young, 1978, pp. 15-17; and Ettinger, 1978, pp. 7-22).

OSM believes that the adopted regulatory scheme provides for a site specific design for each valley, head-of-hollow, or other excess spoil disposal The final interim regulations ensure flexibility in that:

(a) The proposed criteria in the regulations have been retained to allow a type of design which is similar to a handbook approach.

(b) The criteria have been amended in final form to allow the construction of durable rock fills.

(c) Overview evaluations of different fill construction techniques will be performed through the further research by OSM.

(d) The Office also believes that the opportunity for innovative, flexible design in mining and reclamation practices is permitted.

While the Office has allowed the use of end-dump durable rock fills, it recognizes several areas which may need consideration during design. The end-dump method inherently produces large quantities of sediment due to the active free face. The free face is unreclaimed until completion and thus may require large or frequently cleaned sediment control structures, the sediment control should be close enough to the structure to serve its purpose, but not so close as to be subject to the consequences of shallow or deep movement at the free face.

The proper handing of less durable materials may become a qualify control problem. It is essentially that week zones are placed in a way to contribute to stability. Mining operations with variable duration of exposure of excess spoil could conceivably require two or more types of disposal areas.

3. Buffer zones. Pursuant to the decision of the District Court for the District of Columbia, In re Surface Mining Regulation Litigation, 456 F. Supp. 1301 (1978), the Secretary was required to receive additional comments concerning the buffer zone requirements of Section 715.17(d). The court reasoned that although the Secretary had pointed to ample support for the regulation, the sources relied upon in the Government's brief were not listed in the certified index in reference to Section 715.17(d)(3). Therefore, the Secretary was directed to reconsider the regulation in light of additional comments received. Section 715.17(d)(3) reads as follows:

(3) Buffer zone. No land within 100 feet of an intermittent or perennial stream shall be disturbed by surface coal mining and reclamation operations unless the regulatory authority specifically authorizes surface coal mining and reclamation operations through such a stream. The area not to be disturbed shall be designated a buffer zone and marked as specified in Section 715.12.

It is generally recognized that a buffer zone or "filter strip" of undisturbed land located between a disturbed area and a stream acts to protect the stream from sediment-bearing water flowing from the disturbed area. The vegetation and undisturbed soil within the filter strip has the effect of filtering significant amounts of polluted water before it directly enters the stream. Grim and Hill, 1974, Environmental Protection in Surface Mining of Coal, U.S. Environmental Protection Agency, p. 118.

The Grim and Hill, publication expressly states that, at a minimum, a 100-foot filter strip should be retained between a disturbed area (such as a haul road) and a stream (p. 118):

Experience has shown that a protective strip of absorbent undisturbed forest soil between the road and stream usually prevents muddy road water from reaching streams. This strip, often called a filter strip, should be wide enough to absorb all the muddy water that runs off road surfaces. A minimum distance of 100 feet (30.5 meters) is recommended between the road and stream.(Footnote omitted.)

An identical recommendation is contained in guidelines for Construction of Mine Roads, Region 10, U.S. Environmental Protection Agency, which is included as appendix D to Grim and Hill at p. 255. In addition, in Weigle (1965), the author recommends a filter strip at least 50 feet wide if the slope is nearly level. If the slope is very steep, i.e., 70 percent grade, a 165-foot wide filter strip is recommended. For medium slopes, i.e., 40 percent grade, a minimum 105-foot filter strip is deemed appropriate. Moreover, at least two State presently require 100-foot wide buffer zones between disturbed areas and streams. Alabama Guidelines for Minimizing the Effects of Surface Mining on Water Quality, p. 2; Kentucky Revised Statutes 350.085(4).

The Secretary's choice of the 100-foot buffer zone is well supported by technical literature and State legislation in the field.

In accordance with the court's order of August 24, 1978, the Office invited additional comments on the regulation and technical literature and State legislation supporting the requirement.

One commenter said the buffer zone regulation should not allow for surface mining through perennial streams. The same commenter added that surface mining in intermittent streams should only be authorized if provisions are made for diversions. No data were provided to support such recommendation.

The Office has decided to allow the regulatory authority the discretion to authorize surface mining within 100 feet of an intermittent or perennial stream provided that the other requirements of the Act and regulations are met. With properly constructed diversions and application of other sediment control measures the impact of mining within 100 feet of a stream can be minimized.

One commenter suggested that the technical literature was limited to protecting streams from sedimentation from haul roads. The Office believes that generally a filter strip is essential to capture sediment before overland flow reaches an intermittent or perennial stream. To the extent that exemptions are authorized from this requirement, the regulatory authority must assure that all other requirements of the regulations are met.

4. The design criteria for sediment ponds. In brief, the February 28, 1978, design criteria for sedimentation ponds required operators to: (a) consider surface area in the design of ponds in order to achieve effluent limitations; (b) provide a sediment storage volume equal to 0.i acre-feet per acre of disturbed area within the upstream drainage area unless the operator uses onsite or point-of-origin activities to reduce the required 0.2 acre-feet per acre of disturbed area storage volume; and (c) provide 24-hour theoretical detention time for inflow or runoff entering the (ponds) from a 10-year, 24-hour precipitation event. The 0.2 acre-feet per acre of disturbed area sediment storage volume requirement could also be reduced by the regulatory authority upon a showing that lesser sediment yields were appropriate. Additionally, a credit system was established to allow for the reduction of the 24-hour theoretical detention time.

On May 3, 1978, the District Court for the District of Columbia enjoined enforcement of the design criteria for sedimentation ponds contained at Sections 715.17(e) and 717.17(e) of the regulations until the Secretary considered comments on the interim final rules, published final rules and the court reviewed the merits of the rule. Based upon a prediction of imminent irreparable harm to plaintiffs coupled with a lack of an effective review remedy, the court found it necessary to stay the interim final rules to allow for adequate judicial review prior to making coal operators subject to the sediment pond design criteria.

Ten witnesses testified at a public hearing on the interim final rules on March 15, 1978, and 20 additional written comments were received by the close of the comment period on March 29, 1978. The preamble to the proposed rule discussed these comments. 43 FR 52734, 52739 (Nov. 14, 1978).

On December 14, 1978, the Office held an additional public hearing on the proposed rules for sediment ponds and head-of-hollow fills. Additional written comments were also received by the close of the comment period on December 18, 1978. Many of the commenters merely incorporated comments on the permanent program regulations by reference.

SECTION 715.17(e)(1)

General requirements. The Office has decided to require sedimentation ponds in conjunction with other sediment control measures as "best technology currently available" to prevent to the extent possible additional contributions of suspended solids to streamflow or runoff outside the permit area and to achieve and maintain applicable effluent limitations.

Sedimentation ponds are structures, including barrier dams or excavated depressions, which slow down water runoff to allow sediment to settle out. To effectively settle particles, sedimentation ponds must provide sufficient storage volume for both sediment and detained water. In addition to providing adequate storage volume, ponds must detain waste for a sufficient time to allow sediment to settle out.

It is established that sedimentation ponds used with other sediment control measures are "state-of-the-art" for controlling sediment movement from surface coal mining operations. The Environmental Protection Agency (EPA) has undertaken a number of studies to determine the best methods for controlling sediment laden flow. EPA studies have concluded that sedimentation ponds are the key to controlling sediment. According to EPA, such ponds are "the most effective structures for trapping sediment." The conventional method for controlling the mining operations is through the construction of a sediment pond to intercept the surface runoff before it leaves the mining site. Erosion and Sediment Control -- Surface Mining in the Eastern United States, at 65 (1976). Another EPA study indicates sedimentation ponds can be considered as the last opportunity to treat the runoff before the water leaves the mine area. Hill, Sedimentation Ponds -- A Critical Review, at 2 (Oct. 1976). According to one of the leading commentators in the field, sediment ponds should be located as close to the sediment source as possible and before drainageways reach the main stream. Grim and Hill, Environmental Protection in Surface Mining of Coal, EPA-670/2-74-093; at 103 (Oct. 1974).

Also, several states, including West Virginia, Pennsylvania, Kentucky and Montana now require sediment ponds to control sediment from mining operations. Hill, at 13 (1977).

The mechanics of sediment laden flow are complex. The major factors governing the efficiency of a sediment pond are the geometry of the basin, the inflow hydrograph, the inflow sediment graph, The outlet design, the flow pattern within the basin, the characteristics of the sediment and the settling behavior of the suspended sediment particles, the detention time, and where applicable, control devices within the basin which minimize short-circuiting, turbulence, and resuspension. Ward, Simulation of the Sedimentology of Sediment Detention Basins at 32 (1977).

The final sedimentation pond design criteria are supported by Section 102, 201(c), 501(b), 515(b)(10), 515(b)(24) and 516 of the Act. See also Surface Mining Regulation Litigation, 456 F. Supp. 1301 (D.D.C. 1978).

The office has considered alternatives. The rationale for selecting the final regulations in lieu of other alternatives is found in the context of this preamble discussion, the disposition of submitted comments related to the final regulations and the preamble to the proposed regulations.

The final design criteria for sedimentation ponds contain the following key requirements. Sedimentation ponds may be used individually or in series. Especially in mountainous areas, several small ponds may be more desirable than a single large pond because of topographic constraints. Several small ponds may also improve overall detention time. Moreover, one small pond can be used to remove the bulk of the large particles thus reducing the need to clean out a largest polishing pond. Hill, at 14 (1977); Erosion and Sediment Control at 54 (1976).

Sedimentation ponds must be constructed prior to any disturbance of the area to be drained into the pond and as near as possible to the area to be disturbed. Grim and Hill at 103 (1974). Generally, such structures should be located out of perennial streams to facilitate the clearing, removal and abandonment of the pond. Further, locating ponds out of perennial streams avoids the potential that flooding will wash away the pond. However, under design conditions, ponds may be constructed in perennial streams without harm to public safety or the environment. Therefore, the final regulations authorize the regulatory authority to approve construction of ponds in perennial streams on a site specific basis to take into account topographic factors. Hill at 11 (1976); Erosion and Sediment Control at 54 (1976).

In general various subsections of the regulations dealing with sedimentation ponds require the operator to demonstrate how elected options will meet design criteria. Several commenters desired clarification as to how this could be accomplished. The operators have the burden of providing adequate assurance or proof that the method proposed are effective and safe. Such proof can be presented for approval by the regulatory authority in many different forms, and is not specified in any specific format. Except as specified in the regulations, such forms may generally include but are not limited to the following:

a. Maps, graphs, or charts.

b. Valid reports of similar work performed by others.

c. Testimony by recognized professional, or

d. Actual laboratory experiments, and controlled field plot demonstrations.

The operator has the option of electing the most advantageous method. Final approval is still vested in the regulatory authority.

The following general comments were received on Section 715.17(e).

Commenters requested insertion of words in this section to point out the exemption from the requirement to construct ponds in order to track Section 715.17(a). Such insertions as "if necessary," or "as required" were suggested. This issue has been previously addressed in the context of whether sediment ponds are "best technology currently available." Operators will find that sedimentation ponds can be used to their benefit to reduce sediment and achieve effluent limitations. The insertion of the suggested wording might expand the narrow exemption contained in Section 715.17(a). To avoid any possibility that the exemption would be expanded by this language addition, the Office decided to reject the comment.

Commenters requested clarification of the terminology "disturbance of ths disturbed area" as used in the proposed regulations. Disturbance is a progressive process which can be considered as a deviation from a baseline condition. The wording has been clarified to reflect the requirement to construct a pond prior to any disturbance of the existing premining condition.

Commenters, suggested allowing construction of sedimentation ponds in intermittent and perennial streams. Because of the physical, topographic, or geographical constraints in steep slope mining area, the valley floor is often the only possible location for a sediment pond. Since the valleys are steep and quite narrow, dams must be high and must be continuous across the entire valley in order to secure the necessary storage.

These are two other alternatives. One would be to use an area to one side of the stream for the pond. This will not be physically possible in most cases, and if pursued, might cause serious additional disturbance to the environment. Kathuria at 4 (1976).

The other alternative would be to declare the area unsuitable for mining. Each case needs to be judged on it own. The office recognizes that mining and other forms of construction are presently undertaken in very small perennial streams. Many Soil Conservation Service (SCS) structures are also located in perennial streams. Accordingly, OSM believes these cases require thorough examination. Therefore, the regulations have been modified to permit construction of sedimentation ponds in perennial streams only with approval by the regulatory authority.

SECTION 715.17(e)(2) - SEDIMENT STORAGE VOLUME.

The regulations establish two methods for computing required sediment storage volume. First, the operator may utilize the Universal Soil Loss Equation (USLE), gully erosion rates and appropriate sediment delivery ratios to compute sediment yield. This method allows the operator maximum flexibility to account for site specific variations in sediment yield. The preamble to the proposed rules 43 Fed. Reg. 714.17(e)(2) 52470 (Nov. 14, 1978) supporting the selection of the USLE is incorporated herein by reference.

Under the second method, operators may utilize a general rule for computing sediment yield from the disturbed area. The operator may assume a sediment yield of.1 acre-foot for each acre of disturbed area. The regulatory authority is authorized to require greater sediment storage volume if necessary. A lesser sediment storage volume to.035 acre-foot for each acre of disturbed area may be authorized if the operator demonstrates that sediment removed by other sediment control measures is equal to the reduction in the pond sediment storage volume. Further discussion supporting this section is found in the preamble to the proposed regulations at 43 Fed. Reg. 52470 (Nov. 14, 1978).

The following comments were received on Section 715.17(e)(2).

Commenters requested technical justification for the option to construct sediment ponds having accumulative sediment volume from the drainage area to the pond for a minimum of three years. Commenters submitted no data to refute the design option. However, commenters said the majority of ponds had an operational life of less than six months. Commenters added that this was not the case with sedimentation ponds serving reclaimed areas, but few of the latter category were required due to consistent attainment of effluent limitations. Again, commenters failed to submit data supporting this assertion.

The final regulations include a three-year minimum sediment storage volume for ponds. Operators may use the USLE to compute required sediment storage volume to capture sediment yield for a minimum three-year period. As an alternative, operators may compute sediment storage volume based upon an initial requirement of 0.1 acre-foot for each acre of disturbed area within the upstream drainage area. These two options offer operators the flexibility to include site- specific variation in design of sediment ponds.

A three-year minimum storage volume is necessary to collect sediment during normal premining, and reclamation operations under the Act. Under prior state laws, the normal life of ponds designed for contour mines was usually from one to three years. For area mines it was usually much longer. Hill at 11 (1977). With the implementation of the Surface Mining Act, surface coal mining and reclamation operations will generally occur over a period much longer than three years. Premining and actual mining will normally occur over more than one year. Further, the pond may not be removed until the disturbed areas has been restored, the vegetation requirements of 715.20 are met, and the drainage meets applicable stream standards. Thus, a three-year minimum storage volume is not an excessive requirement.

In particular, vegetation standards require, as a minimum, vegetative cover capable of stabilizing the soil surface for erosion. Site-specific investigations in the western coal fields have shown that such stabilization may not occur within the first year or two after mining. Gullies formed on revegetated surfaces will often increase sediment yield. Moreover, internal drainage to graded, topsoil and seeded areas is possible. Hardaway and Kimball, Trip Report at 8, 12, 23 (1976). See also Dollhopt et al. 71-73 (1977). This type of extensive erosion after mining requires that sediment ponds be designed with a minimum sediment storage volume, of three years.

Moreover, data collected in Appalachia support a three-year sediment storage volume. According to one study, gullies can form after revegetation causing erosion, Curtis and Superfesky at 157 (1978). In addition, measurements of sediment accumulation in debris basins show highest sediment yield during the first six months following mining, with excess sediment yield during the first six months following mining. Curtis at 88 (1974). According to this study methods of mining and handling spoil affect sediment yield, and so does the speed with which vegetation is established. The Office considered that this study examined surface mining prior to implementation of the standards of the Act. Compliance with the Act should result in a reduction of sediment yields from surface mined lands. However, sediment yield is not only a function of operating practices, but also of revegetation which is more a function of climate, terrain and soil type. Normally in the east, revegetation will require, at the minimum, six months to stabilize the surface area with vegetation. Curtis at 88 (1978). Naturally in the arid west a considerably longer period will be required for adequate stabilization. Hardaway and Kimball at 8, 12, 23 (1976).All of these factors support a pond design standard which includes a sediment pond with a minimum three-year sediment storage volume.

One commenter wanted to create a larger sediment storage volume to reduce the frequency of sediment cleanout. The intent of this regulation is to specify the minimum sediment storage volume necessary for a well-constructed sediment pond. Accordingly the word "minimum" is added to clarify the point.

The use of the USLE for mined area was questioned by several commenters. They contend that although this method is well established for sheet erosion losses on agriculture land, it may not be truly accurate or useful in other areas. The Office has decided to retain the option to use the USLE to compute sediment storage volume procedures since making the USLE predictions is a well established and accepted practice of the engineering and scientific community. Meyer at 3 (1975); Haan at 5.1 (1978); Wischmeir (1965); USDA, 1975, Procedure for Computing Sheet, and Rill Erosion on Project Areas, SCS Technical, Release No. 5 (Rev.). The USLE recognizes the effects of the primary environmental and physiographic factors causing erosion, without having to establish site-specific conditions through field measurement of data.

The use of gully erosion rates and sediment delivery ration factors was questioned by some commenters. The Office has retained these requirements. The USLE considers only soil lost by sheet erosion. Where gullies are active, the eroded material must be accounted for in determining the sediment entering the pond. The SCS Technical Release No. 32 in one reference which gives procedures for determining the rate of gully development. Sediment delivery ratio is defined as $D = Y/A$ where Y is the sediment yield from a watershed and A is the gross erosion occurring on the watershed. Gross erosion is the sum of a sheet and rill erosion, gully erosion, and stream erosion. On active and properly reclaimed surface mines, sheet and rill erosion are the principal components of A. Haan and Barfield at 5.47 (1978). The sediment delivery ratio is necessary to account for eroded material which is deposited prior to entering the pond. Haan at 5 (1978); McKensie at 4 (1977).

One commenter questioned whether the regulatory authority should establish methods "for determining sediment storage volume." The Office agrees that this is not the proper role of a regulatory authority. Accordingly, the regulation has been changed by substituting the word "approved" for "established." With this concept, the operator will submit his methods for review and approval by the regulatory authority.

Commenters requested that reference and justification for using the USLE should be discussed. They stated that accumulated sediment volume can be estimated using the USLE or forms thereof. According to commenters, methods using gully erosion rates and sediment delivery ratios, either singly or in combination, which estimate sediment volume are not commonly used for surface mining.

Section 715.17(e)(2) authorize the use of the USLE, gully erosion rates, and the sediment delivery ration converted to sediment volume using the sediment density, or other empirical methods derived from regional sediment pond studies to determine the sediment storage volume.

Haan and Barfield (1978), ch. 5, discuss soil erosion and sediment yield similarities between surface mining and agricultural land. The similarities are helpful since agricultural erosion has been studied for many years resulting in the development of procedures for its prediction and control. Soil erosion results when soil is exposed to the erosive powers of rainfall and flowing water. It is not possible to conduct massive earth moving operations necessary for strip mining without exposing soil to these erosive forces. It is possible to use the USLE to plan the surface coal mining and reclamation operations so that sediment production can be reduced. Through the use of properly designed and constructed sediment detention structures containing adequate storage volume the adverse effects of mining on stream water quality can be essentially eliminated. (Haan and Barfield at 5.1 1978).

Commenters questioned the selection of sediment storage volume equal to 0.1 acre-foot for each acre of disturbed area within the upstream drainage area. Other commenters suggested that the 0.1 value be reduced to 0.035. The Office has retained this section of the regulations. This method is provided as an alternative choice to minimize the amount of onsite study for determining adequate sediment storage volume. If the operator utilizes on-site erosion and sediment control measures, such as prompt and progressive backfilling, prompt revegetation, and upstream sediment traps, the regulatory authority may approve a sediment storage volume not less than 0.035 acre-foot for each acre of disturbed area within the upstream drainage area. To obtain the reduction in sediment storage volume, the operator must show the sediment removed by other control methods is equal to the reduction in sediment storage volume. Grimm and Hill at 102 (1974). Thus, a sediment storage volume of 0.1 acre-foot per acre of disturbed area is the initial standard which can be adjusted downward to 0.035 upon proper demonstrations by the operator. A sediment storage volume of 0.035 acre-foot for each acre of disturbed area is a nationwide minimum sediment storage volume for sedimentation ponds. Simpson, Westmoreland Resources, comments on the Interim Final Rules, page 1 (March 23, 1978); National Coal Association, Comments, and data on the proposed interim regulatory program, section 715.17(e)(1), Oct. 1977. Robbins, Comments on the Interim Final Rules, at 16 (March 15, 1978).

Commenters suggested the minimum storage volume for sedimentation ponds was excessive. This volume is composed of storage for the runoff from the 10-year 24-hour precipitation event, and 0.1 acre-foot of storage for each acre of upstream disturbed area. A settling pond must include both a settling volume and a sediment volume to hold inflow for a sufficient period of time to allow sediment to settle and provide storage volume for such sediment. Therefore, a settling volume with a minimum detention time, and a sediment storage volume have been specified. Kathuria at 8 (1975); Grim at 106 (1974); Ward at 2 (June 1978).

SECTION 715.17(e)(3) - DETENTION TIME.

This section of the final regulations requires sediment ponds to be designed, constructed and maintained to detain sediment laden water for a period of time sufficient to allow the water to come to rest and clarify to assure the discharge from the pond meets water quality standards of the Act. The average time design inflow is detained in the pond is the theoretical detention time. Haan at 6.6 (1978). This measure of flow through velocity is an essential design criterion for sedimentation ponds. Haan at 6.6 (1978); Hill at 11 (1976); Kathuria at 8,56 (1976); Ward at 26 (1978); Janiak, Purification of Waters from Lignite Mines, at 59 (1975); USEPA Erosion and Sediment Control, Vol. 2, 51-79 (1976).

The regulations establish a 24-hour theoretical detention time as the initial design detention time for sediment ponds. The regulatory authority is authorized to lower the theoretical detention time upon adequate demonstrations by the person who conducts the surface mining activity. In no event may the regulatory authority lower theoretical detention time from 24 hours without a demonstration that water quality standards including effluent limitations will be achieved and maintained. The regulatory authority may require the pond design to include a theoretical detention time above 24 hours to meet water quality standards including effluent limitations. The regulatory scheme recognizes that to achieve the water quality standards of the Act, the operator must consider site-specific conditions such as soil type, particle size, particle specific gravity, slope, moisture conditions and other physical conditions. In addition, the final regulations recognize the importance of pond inflow and outflow design, and pond shape in determining necessary detention time. Further discussion supporting this section is found in the preamble to the proposed regulations at 43 FR. 52741, Nov 14, 1978.

The following comments were received on section 715.17(e)(3).

Most industry commenters suggested that the use of sedimentation ponds alone will not achieve EPA effluent limitations. Although some industry commenters concede that sediment ponds are the best technology currently available, the same commenters add that even the use of such technology will not achieve EPA effluent limitations. Commenters submitted no independent field data to show that properly designed sediment ponds would not achieve effluent limitations. Rather, commenters challenged the data base, methodology, recommendations and conclusions of the Kathuria study cited in the preamble to the proposed rules. 43 FR 52741, Nov. 14, 1978.

In particular, regarding the initial design criteria of a 24-hour theoretical detention time for the water inflow entering the pond from a 10-year 24-hour precipitation event, commenters suggested that this detention time would not necessarily result in a 94 percent removal efficiency which may be necessary to achieve effluent limitations. Commenters added that when particles in the inflow are less than 20 microns, a sediment pond built to OSM criteria will not settle out particles during high rainfall events. Commenters suggested that pond efficiency was more a function of surface area and inflow sediment concentration and velocity. According to commenters, chemical treatment will probably be a requirement rather than option to meet effluent limitations. Environmental group commenters said sediment ponds were the best technology currently available, but greater detention times and surface area would probable be required to meet effluent limitations.

Sedimentation ponds are the heart of the regulatory scheme. As discussed previously sedimentation ponds are the key to controlling sediment. Nonetheless, as industry commenters point out, sedimentation ponds alone may in some cases be insufficient to achieve and maintain applicable effluent limitations. Therefore, the Office has required the use of additional sediment control measures if necessary to achieve effluent limitations.

In addition to sediment ponds, operators must use, as necessary, straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds, and other measures that reduce overland flow velocity, reduce runoff volume, or trap sediment to meet effluent limitations. The effectiveness of such sediment control measures is well documented. Grim and Hill at 101-115 (1974), Erosion and Sediment Control 59-72 (1976).

Moreover, disturbing the smallest practicable area at any one time during the mining operation through progressive backfilling and grading, timely revegetation, retaining sediment within disturbed areas, and diverting runoff using protected channels or pipes through disturbed areas will effectively reduce sediment laden flow to sediment ponds thereby decreasing pond maintenance and increasing overall efficiency of sediment control measures employed. Grim and Hill at 101-115 (1974), Erosion and Sediment Control 59-72 (1976).

As commenters have repeatedly said, such sediment control measures will effectively reduce sediment laden flow from surface coal mining and reclamation operations. West Virginia Surface Mining and Reclamation Association, Comments on Interim Rules, Section 715.17(e) at 6 (1977), West Virginia Department of Natural Resources, Comments on Interim Rules, Section 715.17(e) 1 of 2 (1977).

The final design criteria for sedimentation ponds, in conjunction with other sediment control, are intended to achieve the water quality standards of the Act. The sediment pond design criteria requiring inflow detention time are critical to effective performance of sediment ponds. Under the final regulations, a 24-hour theoretical detention time for water inflow or runoff entering the pond from the 10-year 24-hour event is established as the threshold criteria for sediment ponds.

The regulatory authority may require additional detention time if necessary to achieve effluent limitations. Similarly, the regulatory authority may approve a lower detention time to 10 hours, when the person who conducts the surface mining activities can demonstrate that the process will achieve and maintain effluent limitations and is harmless to fish, wildlife and related environmental values.

The detention time requirements are based upon the following technical literature and comments. In 1976, EPA commissioned a study of nine selected sediment ponds in the States of Pennsylvania, West Virginia and Kentucky. Kathuria, Effectiveness of Surface Mine Sedimentation Ponds (1976). The conclusions and recommendations of this study demonstrate the need for and timeliness of the final design criteria for sediment ponds. According to the study, construction of ponds not in accordance with approved plans and specifications and poor subsequent maintenance of the ponds were the two major factors contributing to their poor performance. Moreover, the investigators found that timely removal and disposal of accumulated sediment, cleaning of clogged outflow pipes, repair of emergency spillways and embankment repair are extremely important for the proper functioning of sediment ponds and are usually overlooked. Kathuria at 3 (1976). Thus, the final regulation for sediment ponds are essential to assure that sediment ponds are properly designed, constructed and maintained to achieve the water quality goals of the Act.

The study identified three ponds which achieved EPA effluent limitations during both baseline (non-storm conditions) and storm conditions. Kathuria at 47, 48 (1976). Based upon these and other collected data which show that removal efficiency is a function of detention time, the study recommended that sediment ponds be designated and constructed with at least a 10-hour actual detention time. Kathuria at 8, 56 (1976).

Studies of actual pond detention time versus theoretical detention time have shown actual detention time to be 30 to 70 percent of theoretical detention time with most ponds falling into the lower category. Hill at 11 (1976). Assuming ponds are approximately 50 percent efficient, to achieve an actual detention time of 10 hours, as recommended by Kathuria, ponds should be designed with a theoretical detention time of approximately 20 hours. According to data collected by Kathuria, the pond will have a removal efficiency of 90 percent with this detention time. According to a simulation model run by Ward, removal efficiencies greater than 90 percent may be required if water quality standards are to be achieved. Ward at 30 (1978). Since according to Kathuria data, removal efficiency begins to level off at approximately 24 hours theoretical detention time because of the additional time required to settle particles less than 20 microns, the Office has decided to establish at 24-hour theoretical detention time as the initial design standards for sediment ponds.

Regarding industry's contention that when even small amounts of incoming sediment are less than 10 or 20 microns in size, effluent limitations will not be achieved, the Office emphasizes that three of the nine ponds tested by Kathuria meet effluent limitations during baseline and rainfall events with inflow containing sediment in the 10 to 20 micron particle size range. Kathuria at 89-100 (1976).

In addition, using Stoke's Law, which is an idealized formulation recognized as basic to all settling theory, a 20-micron particle would settle at a rate of approximately 2.4 ft/hr at 10 degree C, therefore falling 57 feet in a 24-hour period. A 10-micron particle under the same conditions settles at approximately 0.6 ft/hr falling 14.4 feet in 24 hours.

Of course, short-circuiting and eddy currents make the real world situation different from the ideal situation expressed by the Stoke's Law approach. Assuming the pond to be approximately 50 percent efficient, the average actual detention time (as opposed to the theoretical 24-hour detention time) would be 12 hours. Twelve actual hours detention time should be ample to remove the 20-micron particles and most of the 10-micron particles. For the majority of the runoff events, the detention time achieved will be significantly higher than 24 hours, thus offering additional removal capability. The Office believes, therefore, that sediment ponds will generally be effective in removing particles 10 microns and larger.

To the extent that inflow volume or sediment concentration become factors in failing to achieve water quality standards, operators should consider locating ponds out of perennial streams and utilize measures to control the inflow rate to sediment ponds. For example, Kathuria found that Pond 2 which met effluent limitations had the benefit of initial settling of inflow in a pit area. The surge effect from a rainfall event was reduced by controlled pumping of influent to the pond. Pond 6 also had a portion of the inflow pumped from the maining pit area to the sediment pond. Kathuria at 22, 31-34 (1976). Other measures can also be applied to reduce the surge effect of a rainfall event. Erosion and Sediment Control 59-72 (1976), Grim and Hill 101-115 (1974), Hill at 14 (1976).

With the proper design construction and maintenance of sediment control measures including sediment ponds, the Office believes that water quality standards of the Act can be met. To the extent that particle size distribution precludes attainment of water quality standards even with application of these sediment control measures, the operator must use flocculants to achieve water quality standards. Hill at 6 (1976).

The Office emphasizes that Congress was well aware that best technology for sediment control could necessarily include the use of flocculants. In discussing best technology currently available, the House Committee on Insular Affairs stated:

One example of the best available technology for sediment control, which is applicable throughout the United States and can be used on amine-by-mine or a multiple mine basis, is that technology employed at the surface coal mine of the Washington Irrigation and Development Company. This mine is located in the Hanaford Creek drainage, south of Centralia, Washington. The general geographic characteristics of this area are common to other coal areas.... In this instance, in order to meet year-round water quality standards for migrating fish, the company designed a relatively inexpensive method of settling virtually all of the sediment in the surface runoff from the mining operation. Several sets of double siltation entrapment ponds were constructed on the small tributaries leaving the mine property. Elimination of sediment loads is achieved through a two-stage process, with the initial gravity settling occurring in the first pond and the introduction of a biologically inert flocculation compound into the flow between ponds. This results in a discharge that contains even less silt than the normal background flow.... H. Rept. 95-218, 114, 115 (1977).

Thus, Congress clearly contemplated the use of flocculants to achieve water quality standards. Further,,Congress intended that such innovative technology should be transferred to other coal fields. In this regard, the Committee added:

This technology sets a standard for the industry and is representative of the innovation the mining industry can achieve when required to meet specific water standards as a precondition to operation. It should be noted that this approach is applicable not only in area-type mining situations but also in the mountain mining operations in the Appalachian coal fields, where such facilities might serve more than one specific mine site in a small drainage area. H. Rept. 95-218, 115 (1977).

Moreover, the Committee was well aware that control costs would increase with the use of flocculants. Nonetheless, the Committee stressed that achieving water quality standards must be the guiding principle under the Act. To remove any doubt with respect to whether water quality standards should yield to cost considerations, the Committee said:

The bill requires that the standard for siltation control should be the best available technology in recognition that the application of such technology might well increase present siltation control costs of some mine operations. However, the Committee rejected the notion that the standards should be adjusted to what individual mine operators state they can or cannot afford. The Committee's action requires the adjustment of operation to the environmental protection standards rather than the opposite. With this approach, the Committee believes that operators will find the right combination of techniques to meet the siltation on the most cost-effective basis. H. Rept. 95-218, 115 (117).

Thus, Congress intended that operators use flocculants if necessary to achieve and maintain water quality standards.

Congress' belief that flocculants are available to effectively control sediment in the submicron size range is buttressed by testimony on flocculants received during public hearing on the proposed rules. During hearings in Charleston, West Virginia on the proposed rules for the permanent program, a vendor of such chemical agents testified to their effectiveness in facilitating the capture of submicron size sediment. Public Hearing 450-459 (Oct. 26, 1978). Therefore, the Office has included flocculants as best technology currently available if necessary to achieve and maintain water quality standards.

Commenters suggested that the term detention time be more precisely defined in the regulations. Theoretical detention time is determined by a flood routing procedure for the design event. Haan, at 2.91, 4, 8, and 4.17, 6.6 (1978). The routing procedure balances the design release rate and the available storage (settling storage). The balance achieved assures that water will be released rapidly enough to prevent overtopping the dam, and that it will be released slowly enough to allow proper settling for the design event. Soil Conservation Service National Engineering Handbook Chapters 15 and 17 (1971). As the release rate is decreased, the amount of storage is increased and the outflow hydrograph is lengthened (because the settling storage is released over a greater length of time). The net effect of a smaller release rate is greater distance between the centroids of the inflow and outflow hydrographs, thus, giving a larger theoretical detention time. The determination of the centroid (of the outflow hydrograph) is an analytical procedure discussed in Haan and Barfield, at 6.6 (1979).

Commenters questioned the selection of a 10-year 24-hour precipitation event as the design criterion for a sediment pond.

The selection of a 10-year 24-hour precipitation event as the inflow design criterion for sediment ponds is based upon Section 515(b)(10)(B)(i) of the Act which requires the Office to assure that additional contributions of stream flow do not exceed applicable Federal law. Under the Clean Water Act, EPA effluent limitations are applicable to coal mining operations, 40 CFR Section 434. According to EPA regulations, treatment facilities to meet such effluent limitations should be constructed to include the volume which would result from a 10-year 24-hour precipitation event. See also Grim at 241 (1974). To assure a uniform regulatory scheme and enable the regulatory authority to measure compliance with both EPA effluent limitations and OSM standards, the Office has decided that sediment ponds should be designed to control a 10-year 24-hour precipitation event. This should also reduce the regulatory burden on the operator by eliminating confusion between EPA regulations and OSM regulations.

Commenters questioned the requirement that chemical treatment processes be designed by a professional engineer. Commenters specifically questioned the ability of even a few professional engineers to properly design chemical treatment processes. They also noted that EPA does not require that a professional engineer design treatment processes. This Office also determined that designing processes for chemical treatment of water will require special expertise. Accordingly, the Office removed the restriction, thus permitting the operator to use the services of any qualified persons.

Commenters questioned whether qualified operators approved by the regulatory authority should operate chemical treatment processes. Commenters said that approval by the regulatory authority was not necessary. Other commenters were concerned about apparent conflict with recent UMW wage contract agreements. Other commenters said OSM was without statutory authority to require certification of waste-water treatment operators.

The Office has decided to delete the requirement for a qualified person approved by the regulatory authority to operate a treatment process. This additional flexibility should avoid any conflicts with UMW wage contract agreements. It is emphasized, however, that operators have the burden of achieving and maintaining effluent limitations. The operator is therefore responsible for selecting a qualified person to operate a chemical treatment process to meet such limitations.

A few commenters suggested removal of "chemical" in reference to treatment processes. Commenters said that inclusion of "chemical" in the regulations would decrease development of alternative methods, because the term "chemical" excluded other methods which were mechanical, or electrical.

The Office has retained this terminology. Alternative sediment control measures are permitted under Section 715.17. Chemical treatment which may include flocculants is an option chosen by the operator if approved by the regulatory authority. Chemicals used as flocculants include both organic and inorganic compounds that effectively cause the coalescing of individual particles and their resulting increased rate of settling.

SECTION 715.17(e)(4) - DEWATERING.

This Section of regulations requires a non-clogging dewatering device (which can be a principal spillway) to achieve and maintain the required theoretical detention time. The dewatering device and the principal spillway are required to pass the runoff resulting from a 10-year 24-hour precipitation event without use of the emergency spillway. If the design flow passes through the emergency spillways, there is no practical way to detain it. Thus, the detention time would be inadequate. For this reason, flow through the emergency spillway is restricted to precipitation events exceeding the 10-year 24-hour event. Erosion and Sediment Control -- Surface Mining in the Eastern United States, Vol. 2 at 55-80 (1976); Hill at 17 (1976); Haan at 6.1-6.27 (1978).

The sediment pond dewatering device may be designed in a number of ways. One method is to place the inlet of the principal spillway (usually a pipe spillway) at the elevation of the required sediment storage. A second method would be to place the inlet of the principal spillway at an elevation above the required sediment storage elevation. If this latter alternative is selected, sediment cleanout would not be necessary when sediment accumulate to 60 percent of the required sediment volume. However, the reduction in settling storage must not reduce the actual detention time below the theoretical detention time.

SECTION 715.17(e)(5) - SHORT-CIRCUITING.

This Section of the regulations requires each person who conducts surface mining activities to design, construct and maintain sedimentation ponds to prevent short-circuiting to the extent possible. Short-circuiting is defined as a process which transports sediment through a pond in less than the detention time required for sediment to settle out. Short-circuiting can be caused by improper pond construction, high velocity jet action of incoming water, wave action and inlet and outlet design. Hill at 10 (1976); Kathuria at 84 (1976).

Methods of preventing short-circuiting include baffles, partitioning the pond into chambers, maintaining a length to width ratio of five to one, constructing an energy dissipator at the pond entrance, modifying the inlow, or adding two or more basins in series. Erosion and Sediment Control -- Surface Mining in the Eastern United States, at 68 (1976). See also Ward, at 57 (1977); Janiak, at 59 (1975); Kathuria at 58 (1976).

Commenters said it is impossible to "prevent" short-circuiting. Therefore the regulations should require only that operators "minimize" short-circuiting.

To accommodate this concern while at the same time assure an enforceable standard, the Office has modified the language of the regulation to required that operators prevent short-circuiting to the extent possible. Thus, the burden is on the operator to show that all available methods have been utilized to prevent short-circuiting.

SECTION 715.17(e)(6) - EFFLUENT LIMITATIONS.

This Section of the final regulations provides that the design, construction and maintenance of sedimentation ponds or other control measures will not relieve the person from compliance with applicable effluent limitations contained in 30 CFR 715.17(a). The additional design flexibility provided to operators is thus coupled with the responsibility to achieve and maintain water quality standards. This minimum requirement is mandated by Section 515(b)(10)(B)(i) of the Act which provides that in no event may this Office authorize the discharge of suspended solids in excess of requirements set by applicable state or Federal law. See also 121 Cong. Rec. 6201 (1975).

Commenters suggested that operators should be relieved from compliance with effluent limitations if the design criteria for sedimentation ponds were met. Many of the same commenters said there should be minimal or no design criteria for sedimentation ponds.

As stated previously the Office is without authority to relieve operators from compliance with Section 715.15(b)(10)(B)(i) of the Act. Further, as a result of extensive industry comment, considerable flexibility has been added to the final regulations. For example, pond detention times and sediment storage volume may be lowered upon proper demonstration. In addition, no surface area requirements are included in the design criteria. These modifications have been made because industry has said it should have the flexibility to use alternative means to meet effluent limitations. With this additional flexibility, operators and their engineers will need a guiding limitation to properly design, construct and maintain sediment ponds. Moreover, the Office must be assured that the measures approved by the regulatory authority are effectively controlling the discharge of suspended solids. The effluent limitations provide this essential standard to measure the effectiveness of the sediment control system.

SECTION 715.17(e)(7) - PRINCIPAL AND EMERGENCY SPILLWAY.

The regulations require the design, construction and maintenance of principal and emergency spillways to safely pass a 25-year, 24-hour precipitation event or larger event specified by the regulatory authority. As provided in Section 715.17(e)(4), the principal spillway must dewater the sediment pond at a rate to achieve and maintain the required detention time during a 10-year, 24-hour precipitation event. To assure that the emergency spillway is used only for precipitation events exceeding a 10-year, 24-hour event, the final regulations prohibit any discharge through the emergency spillway during the passage of runoff resulting from such an event and lesser events. The minimum capacity of the emergency spillway should be that required to pass the runoff from a 25-year, 24-hour event less any reduction due to flow in the principal spillway. Erosion and Sediment Control, Vol. 2, 50-69 (1976); Haan, 6.26-6.27 (1978); SCS, Pond 278-313 (1977).

Commenters questioned whether the regulatory authority should specify spillway grades and water velocities. These commenters said that the regulatory authority should assume liability in case of failure. In consideration of these comments, the regulations permit the operator to select spillway grades and velocities with final approval resting with the regulatory authority. The purpose of the grade and velocity requirements is to provide protection against downstream scouring by released water. This modification recognizes that the operator has the responsibility to design a safe sediment control system and bears liability in the event of failure.

Commenters questioned whether only events greater than the 10-year, 24-hour magnitude were permitted to pass over the emergency spillway. Some commenters interpreted the proposed regulations to allow a "lesser precipitation event" to pass through the emergency spillway. The intent at the final regulation is to provide for the detention of any and all events less than or equal to the 10-year, 24-hour event, for the required time period. For example, the emergency spillway may not be located at an elevation where the 5-year, 24-hour precipitation event might be discharged through the spillway. Such action would short-circuit the detention time for the runoff volume of the 10-year, 24-hour precipitation event. Grim at 241 (1974); Erosion and Sediment Control as 65 (1976); Haan at 6.27 (1978).

SECTION 715.17(e)(8) - SEDIMENT REMOVAL.

This section of the final regulations provides for the timely maintenance of sediment ponds. A properly designed sediment pond poorly maintained will not achieve water quality standards. Kathuria at 3, 47, 48 (1976). To assure that the sediment pond contains adequate unoccupied sediment volume, sediment must be removed from sediment ponds when the volume of sediment accumulates to 60 percent of the design sediment storage volume. The regulatory authority is authorized to allow sediment removal when the permanent sediment storage is decreased to 40 percent of the total sediment storage volume if additional sediment storage volume is provided above that required for the design sediment storage and theoretical detention time is maintained.

These requirements are necessary to assure that the pond has adequate sediment storage as a reserve for future precipitation events inasmuch as runoff events are not entirely predictable. Additionally, the remaining water volume (40 percent of required sediment volume) reduce the velocity of inflows and allows for resuspension of previously settled sediment. When resuspension occurs, the concentration of suspended solids exceed the concentration of the inflow to the pond. Erosion and Sediment Control -- Surface Mining, the Eastern United States Vol. 2 at 53 (1976); Hill at 11, 13, 14 (1976); Kathuria, Effectiveness of Surface Mine Sedimentation Ponds, EPA-600/2-76-17 at 3 (1976); Haan at 6.1-6.27 (1978).

Commenters questioned sediment removal requirements. Some commenters want to utilize 100 percent of the storage volume for sediment prior to cleanout while others suggested 70, 80 or another percentage without technical justification.

The Office has decided to retain the sediment removal requirements. Timely removal and disposal of accumulated sediment is extremely important for the proper functioning of a sedimentation pond. This maintenance is too often overlooked. Kathuria at 3, 25, 28, 31 (1976). Actual operational experience show that some sediment ponds fill up with sediment after only one moderate storm. Grim at 106 (1974).

A number of studies have recommended criteria for timely removal of sediment from ponds. One commentator said ponds should be cleaned when storage capacity is reduced to 40 to 50 percent of design capacity. Hill at 11 (1976). Another commentator recommends that ponds should require maintenance when 60 percent full. Grim at 106. See also Erosion and Sediment Control, Vol. 2 at 53 (1976). Based upon those studies and to assure effective maintenance of sedimentation ponds, the Office has decided to require removal when sediment accumulation reaches 60 percent.

SECTION 715.17(e)(9) - FREEBOARD.

This section of the final regulations requires a one-foot freeboard above the water surface in the pond with the emergency spillway flowing at design depth. The purpose of freeboard is the protection of the embankment against overtopping created by wave action. U.S.D.A. Technical Release No. 60, "Earthdams and Reservoirs," Erosion and Sediment Control, Vol. 2 at 65 (1976); SCS (No.) Pond 378-2 (1977); Grim at 241 (1974).

Commenters suggested deleting the freeboard requirements. They said freeboard requirements are specified by MSHA for large ponds, and should not be included in these regulations. Commenters did not provide any information on other methods to prevent overtopping created by wave action. Therefore, the comment was rejected.

SECTION 715.17(e)(11) - EMBANKMENT SETTLEMENT.

This section of the final regulations requires the construction height of the dam to be increased a minimum of five percent over the design height to allow for settlement. The regulatory authority may authorize an exemption from this requirement if it has been demonstrated that the material used and the design will ensure against all settlement. Erosion and Sediment Control at 69 (1976); SCS (No.) Pond 378-2 (1977).

Commenters suggested deletion of Section 715.17(e)(11). The commenters stated that section 715.17(e)(10) and Section 715.17(e)(16) effectively considered the intent of this section by using the term "settled embankment." Other commenters suggest that the requirement apply only to the embankment in the immediate vicinity of the emergency spillway. Because settlement of an earth embankment is uncertain, an overage is included for safety. The value of five percent may still be insufficient if the construction methods will not meet the criteria specified for compaction. Soil Conservation Services Practice Standards 378-pond at 378-2 and 378-7; USDI Bureau of Reclamation at 202 (1960). In such cases the designer should make the appropriate design allowances. The retention of this section is necessary to protect against failure of embankments.

SECTION 715.17(e)(13) - EMBANKMENT SLIDE SLOPES.

To assure embankment stability, this Section of the regulations requires the combined upstream and downstream side slopes of the settlement embankment to be not less than 1v:5h with neither steeper than 1v:2h. SCS (No.) Pond 378-2 (1977).

A correction was made to the first line of this subsection because a key word "combined" had been omitted between the word "the" and upstream. This omission is verified by referral to the SCS (No.) Pond 378-3 (1977).

While the embankment stability analysis may allow slopes steeper than 1v:2h, the procedure requires an intensive geologic investigation and testing. The side slope criteria specified for small ponds is standard for most small dams and has proven adequate. The Office considers this alternative design a sounder approach, as many designers do not have the facilities to perform complex investigations. This slope criteria also provides additional protection against erosion due to impacting rain and runoff. Moreover, the slope is not so steep as to impede good surface stabilization by vegetation.

SECTION 715.17(e)(14) - EMBANKMENT FOUNDATION.

This Section of the regulations requires the embankment foundation to be cleared of all organic matter with surfaces sloped to no steeper than 1v:1h and the entire foundation surface scarified. SCS (No.) Pond 378-1, 7 (1977); Erosion and Sediment Control, Vol. 2 at 69 (1976).

Commenters suggested deletion of the 1v:1h slope criteria between the foundation and the embankment materials, because such requirements will result in occupation of excessive areas by the foundation. The Office has retained this section of the regulations. The basic concept for this specification is to ensure an adequate seal between the excavated slope of the foundation and the embankment materials, both on the bottom and the side slopes. Steeper slope criteria could result in additional shear at this important junction. The requirement is retained to ensure the creation of an adequate and safe junction of these two materials. SCS (No.) Pond 378-2 (1977).

SECTION 715.17(e)(15)(16) - FILL MATERIAL.

These Sections of the final regulations require fill material to be free of sod, large roots, and other large vegetative matter, and frozen soil, and in no case may coal processing waste be used. The placing and spreading of fill material must be started at the lowest point of the foundation. The fill must be brought up in horizontal layers of such thickness as is required to facilitate compaction and meet the design requirements of the regulation. SCS (No.) Pond 378-7 (1977); Erosion and Sediment Control, Vol. 2 at 69 (1976).

Commenters requested permission to use coal processing waste as a fill material in embankment construction. The commenters said coal processing waste could serve as a supplement to embankment materials in areas where soil and rock material were limited. The use of the waste would also allow a desirable use for these products.

Coal processing waste may not be used to construct embankments. Several problems are involved in using coal processing wastes. See the preamble discussion under disposal of excess spoil (Section 715.15(a)-(d)). Due to the difficulty in obtaining the required compaction thin lift thickness is usually required. Other problems are the potential for spontaneous combustion resulting from the inflammable nature of the waste and the potential for acid and toxic forming material within the waste. For these reasons, coal processing waste was not included in the list of approved construction materials. See also McKenie, at 3, 4 (1977).

Commenters said authorizing the regulatory authority to specific lift thickness and compaction requirements was beyond the scope of the Act.

Section 515(b)(10)(B)(ii) of the Act provides that sedimentation ponds must be constructed as designed and approved in the reclamation plan. This provision of the Act is intended to assure that the regulatory authority has the authority to require the design of sediment ponds to meet the requirements of the Act. Moreover, Section 510(a) authorizes the regulatory authority to grant, require modification of or deny plans to construct sediment ponds. The Office therefore believes the Act authorizes the regulatory authority to specify lift thickness and compaction requirements for sediment ponds. Such measures are essential for erosion control and stability. SCS (No.) Pond 378-7 (1977).

SECTION 715.17(e)(17) - EMBANKMENTS GREATER THAN 20 FEET IN HEIGHT.

This section of the regulations establishes more stringent design standards if the pond embankment is more than 20 feet in height or has a storage volume of 20 acre-feet or more. Under either of these conditions, the combination of principal and emergency spillways must safely discharge the runoff from a 100-year, 24 hour precipitation event or larger event as specified by the regulatory authority.

The embankment must also be designed with a static safety factor of at least 1.5 or higher safety factor as determined by the regulatory authority. Further, appropriate barriers must be provided to control seepage along conduits that extend through the embankment. Finally, the criteria of the Mine Safety and Health Administration as published in 30 CFR 77.216 must be met. SCS (No.) Pond 378-2-3 (1976); Erosion and Sediment Control. Vol. 2 at 59-69 (1976); SCS Technical Release No. 60, at 5.1 and 5.4. See also preamble discussion to Section 816.72, 44 Fed. Reg. 15205-6 (March 13, 1979).

Commenters questioned the need for additional design criteria for large dams.

The general design criteria for principal and emergency spillways, and embankments are drawn from technical literature which distinguishes between large and small sediment ponds. SCS (No.) Pond 378 (1977); Grim at 239 (1974).
To prevent more extensive damage to public health and safety and the environment resulting from a failure of a dam capable of releasing a large volume of water, the Office has decided to impose additional safety requirements for such structures.

SECTION 715.17(e)(20) - INSPECTIONS.

This Section of the final regulations requires all ponds to be examined for structural weakness, erosion and other hazardous conditions in accordance with 30 CFR 77.216-3. With approval of the regulatory authority, dams not meeting the criteria of 30 CFR 77.216-3 must be examined at least four times per year.

Commenters were opposed to weekly inspections for all ponds including those not meeting the size or other criteria in accordance with MSHA requirements 30 CFR 77.216-3. According to commenters the small size and brief duration of these impoundments make weekly examinations for structural weakness, erosion, and other hazardous conditions unnecessary.

The Office has decided to modify this Section to allow for inspections on a less frequent basis. Since the ponds are small and have been designed and constructed according to section 715.17, weekly inspection and subsequent reporting required under MSHA for large impoundments might have no significant value.

SECTION 715.17(e)(21) - REMOVAL OF SEDIMENTATION PONDS.

This Section of the final regulations provides that no pond may be removed until the disturbed area has been restored and the vegetative requirements of Section 715.20 are met. Additionally, the drainage entering the pond must meet applicable State and Federal water quality requirements for receiving streams.

The Office believes there is sufficient control within the regulation for the regulatory authority to approve any changes or amendments pertaining to long term control.

Another commenter requested that the landowner should have a role in determining the postmining use of the sedimentation pond. The Office interprets this comment to apply to cases where the landowner is not the operator. Such decisions would have to be mutually agreed upon by the two parties and in accordance with approved postmining land uses.

SECTION 715.17(e)(22)

This section of the regulations allows for special sediment control measures, in addition to a sediment pond, where surface mining activities are proposed to be conducted on steep slopes. The exemption from constructing a sediment pond in accordance with the design criteria of this section is authorized only after a demonstration that a sediment pond constructed according to paragraph (e) of this section would jeopardize public health and safety or result in contributions of suspended solids to streamflow in excess of the incremental sediment volume trapped by the additional pond size required. To qualify for an exemption from the pond design criteria, the operator should submit a quantitative analysis demonstrating jeopardy to public health and safety or demonstrating sediment flow to streamflow in excess of the incremental sediment volume trapped by the additional pond size required. The operator must also demonstrate that every effort has been made within the requirements of the regulations to mitigate the possibility of making the required findings. For example, the operator is not entitled to an exemption if a pond is proposed for a main watershed when it can be located out of the watershed. The regulations have been clarified to specify that the exemption is limited to design criteria. Requirements such as compliance with effluent limitations (Section 715.17(e)(6)) and design by a registered professional engineer (Section 715.17(e)(18)) may not be varied.

This section of the regulation also requires the design, construction and maintenance of a sediment pond as near as physically possible to the disturbed area which complies with the design criteria of paragraph (e) to the maximum extent possible. In addition, a detailed plan and commitment specifying sedimentation control measures is required.

Some commenters suggested that the exemption should be limited to preexisting structures only. According to such commenters, there is no need to grant an exemption for a new operation as a well planned steep slope operation should be able to meet the pond design criteria. One commenter added that the exemption should only be granted by OSM.

The Office has decided to retain the section as proposed. It is emphasized that the exemption is for the interim program only and operators are not relieved from effluent limitations or the requirement to build a sediment pond. Additionally, with the submission of necessary plans and maps detailing the location and effectiveness of necessary sediment control measures, the public will be able to adequately monitor the implementation of this provision.

SECTION 717.17(E) - SEDIMENT PONDS -- UNDERGROUND MINING

These Sections are substantially identical to corresponding Sections in 715.17(e). The reader is referred to the appropriate portions of the Preamble Sections 715.17(e) 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, Sections 717.17(e) is based on Section 516 of the Act.

The disposition of comments on Section 715.17(e) is incorporated herein by reference. Other comments relating solely to underground mining operations are responded to as follows:

Commenters said the requirements to construct a sedimentation pond before any disturbance to the area is unnecessary for underground mining operations. The commenters state that underground mining operations do not create situations where water would be polluted.

Sedimentation ponds are required prior to any mining disturbance of the disturbed area. Generally, underground mining activities includes an exploratory drilling program, excavating and developing a bench or a working area or constructing mine portals or shafts, excavating access and haulage roads from the mine site to a power source, and construction of a tipple and coal preparation plant. In view of these surface disturbances, a sediment pond must be included to collect the sediment from these activities. Therefore, the Office has retained this Section.

The preamble discussion for Section 715.17(e)(2) is incorporated herein by reference.

One commenter requested clarification regarding the applicability of Section 717.17(e)(22) to drift underground mines on steep slopes. The commenter suggested that when the pond is placed in the main drainage of the watershed the pond will be extremely large.

Section 717.17(e)(22) allows an exemption from the pond design criteria only after a demonstration that the ponds designed in conformance with the design criteria will jeopardize public health or welfare or increase sediment yield. Under Section 717.17(e)(1)(ii), sediment ponds are to be located out of perennial streams unless approved by the regulatory authority. The Office does not envision the regulatory authority authorizing the construction of sediment ponds in perennial streams in those situations where the pond would jeopardize public health and safety. Therefore, this exemption would normally apply in situations where a pond is proposed to be located out of a perennial stream and it still poses a threat to public health and safety.

Dated: May 17, 1979.
Joan M. Davenport, Assistant Secretary, Energy and Minerals. {30628}

PART 710 -- INITIAL REGULATORY PROGRAM

A. 30 CFR Section 710.5 Definitions is amended as follows:

1. The definitions of head-of-hollow fill and valley fill are revised.

SECTION 710.5 - DEFINITIONS.

HEAD-OF-HOLLOW FILL means a fill structure consisting of any material, other than coal processing waste and organic material, placed in the uppermost reaches of a hollow where side slopes of the fill measured at the steepest point are greater that 20 degree or the profile of the hollow from the toe of the fill to the top of the fill is greater than 10 degree. In fills with less than 250.00 cubic yards of material, associated with contour mining, the top surface of the fill will at the elevation of the coal seam. In all other head-of-hollow fills, the top surface of the fill, when completed, is at approximately the same elevation as the adjacent ridge line, ad no significant area of natural drainage occurs above the fill draining into the fill area.

VALLEY FILL means a fill structure consisting of any material other than coal waste and organic material that is placed in a valley where side slopes of the fill measured at the steepest point are greater than 20 degree or the profile of the hollow from the toe of the fill to the top of the fill is greater than 10 degree. {30628}

PART 715 -- GENERAL PERFORMANCE STANDARDS

A. 30 CFR Section 715.15(a) and (b), is amended as follows:

1. Paragraphs (a) and (b) are revised.

2. New paragraphs (c) and (d) are added.

SECTION 715.15

(a) Disposal of excess spoil: general requirements.

(1) Spoil not required to achieve the approximate original contour within the area where overburden has been removed shall be hauled or conveyed to and placed in designated disposal areas within a permit area, if the disposal areas are authorized for such purposes in the approved permit application in accordance with Sections 715.15(a)-(d). The spoil shall be placed in a controlled manner to ensure -- {30629}

(i) That leachate and surface runoff from the fill will not degrade surface or ground waters or exceed the effluent limitations of Section 715.17(a)

(ii) Stability of the fill; and

(iii) That the land mass designated as the disposal area is suitable for reclamation and revegetation compatible with the natural surroundings.

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

(3) All vegetative and organic materials shall be removed from the disposal area and the topsoil shall be removed, segregated, and stored or replaced under Section 715.16. If approved by the regulatory authority, organic material may be used as mulch or may be included in the topsoil to control erosion, promote growth of vegetation, or increase the moisture retention of the soil.

(4) Slope protection shall be provided to minimize surface erosion at the site. Diversion design shall conform with the requirements of Section 715.17(c).All disturbed areas, including diversion ditches that are not riprapped, shall be vegetated upon completion of construction.

(5) 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.

(6) The spoil shall be hauled or conveyed and placed in horizontal lifts 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 and ensure a long-term static safety factor of 1.5.

(7) The final configuration of the fill must be suitable for postmining land uses approved in accordance with Section 715.13, except that no depressions or impoundments shall be allowed on the completed fill.

(8) Terraces may be utilized to control erosion and enhance stability if approved by the regulatory authority and consistent with Section 715.14(b)(2).

(9) 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. Where the toe of the spoil rests on a downslope, stability analyses shall be performed to determine the size of rock toe buttresses and key way cuts.

(10) The fill shall be inspected for stability by a registered engineer or other qualified professional specialist experienced in the construction of earth and rockfill embankments at least quarterly throughout construction and during the following critical construction periods: (1) removal of all organic material and topsoil, (2) placement of underdrainage systems, (3) installation of surface drainage systems, (4) placement and compaction of fill materials, and (5) 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. A copy of the report shall be retained at the minesite.

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

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

(ii) Demonstrated to be consistent with the design stability of the fill.

(12) If the disposal area contains springs, natural or manmade watercourses, or wet-weather seeps, an underdrain system consisting of durable rock shall be constructed from the wet areas in a manner that prevents infiltration of the water into the spoil material. The underdrain system shall be protected by an adequate filter and shall be designed and constructed using standard geotechnical engineering methods.

(13) The foundation and abutments of the fill shall be stable under all conditions of construction and operation. Sufficient foundation investigation and laboratory testing of foundation materials shall be performed in order to determine the design requirements for stability of the foundation. Analyses of foundation conditions shall include the effect of underground mine workings, if any, upon the stability of the structure.

(14) Excess spoil may be returned to underground mine workings, but only in accordance with a disposal program approved by the regulatory authority and MSHA.

(b) Disposal of excess spoil: Valley fills.

Valley fills shall meet all of the requirements of Section 715.15(a) and the additional requirements of this Section.

(1) The fill shall be designed to attain a long-term static safety factor of 1.5 based upon data obtained from subsurface exploration, geotechnical testing, foundation design, and accepted engineering analyses.

(2) A subdrainage system for the fill shall be constructed in accordance with the following:

(i) A system of underdrains constructed of durable rock shall meet the requirements of Paragraph (2)(iv) of this Section and:

(A) Be installed along the natural drainage system;

(B) Extend from the toe to the head of the fill; and

(C) Contain lateral drains to each area of potential drainage or seepage.

(ii) A filter system to insure the proper functioning of the rock underdrain system shall be designed and constructed using standard geotechnical engineering methods.

(iii) In constructing the underdrains, no more than 10 percent of the rock may be less than 12 inches in size and no single rock may be larger than 25 percent of the width of the drain. Rock used in underdrains shall meet the requirements of Paragraph (2)(iv) of this Section. The minimum size of the main underdrain shall be:

Total amount of fill material	Predominant type of type of fill material	Minimum size of drain, in feet	
		Width	Height
Less than 1,000,000 yd 3	Sandstone	10	4
Do	Shale	16	8
More than 1,000,000 yd 3	Sandstone	16	8
Do	Shale	16	16

(iv) Underdrains shall consist of nondegradable, non-acid or toxic forming rock such as natural sand and gravel, sandstone, limestone, or other durable rock that will not slake in water and will be free of coal, clay or shale.

(3) Spoil shall be hauled or conveyed and placed in a controlled manner and concurrently compacted as specified by the regulatory authority, in lifts no greater than 4 feet or less if required by the regulatory authority to --

(i) Achieve the densities designed to ensure mass stability; {30630}

(ii) Prevent mass movement;

(iii) Avoid contamination of the rock underdrain or rock core; and

(iv) Prevent formation of voids.

(4) Surface water runoff from the area above the fill shall be diverted away from the fill and into stabilized diversion channels designed to pass safely the runoff from a 100-ˆear, 24-hour precipitation event or larger event specified by the regulatory authority. Surface runoff from the fill surface shall be diverted to stabilized channels off the fill which will safely pass the runoff from a 100-year, 24-hour precipitation event. Diversion design shall comply with the requirements of Section 715.17(c).

(5) The tops of the fill and any terrace constructed to stabilize the face shall be graded no steeper than 1v:20h (5 percent: The vertical distance between terraces shall not exceed 50 feet.

(6) Drainage shall not be directed over the outslope of the fill.

(7) The outslope of the fill shall not exceed 1v:2h (50 percent). The regulatory authority may require a flatter slope.

(c) Disposal of excess spoil: Head-of-hollow fills.

Disposal of spoil in the head-of-hollow fill shall meet all standards set forth in Sections 715.15(a) and 715.15(b) and the additional requirements of this Section.

(1) The fill shall be designed to completely fill the disposal site to the approximate elevation of the ridgeline. A rock-core chimney drain may be utilized instead of the subdrain and surface diversion system required for valley fills. If the crest of the fill is not approximately at the same elevation as the low point of the adjacent ridgeline, the fill must be designed as specified in Section 715.15(b), with diversion of runoff around the fill. A fill associated with contour mining and placed at or near the coal seam, and which does not exceed 250,000 cubic yards may use the rock-core chimney drain.

(2) The alternative rock-core chimney drain system shall be designed and incorporated into the construction of head-of-hollow fills as follows:

(i) The fill shall have, along the vertical projection of the main buried stream channel or rill a vertical core of durable rock at least 16 feet thick which shall extend from the toe of the fill to the head of the fill, and from the base of the fill to the surface of the fill. A system of lateral rock underdrains shall connect this rock core to each area of potential drainage or seepage in the disposal area. Rocks used in the rock core and underdrains shall meet the requirements of Section 715.15(b)(2)(iv). {30630}

(ii) A filter system to ensure the proper functioning of the rock core shall be designed and constructed using standard geotechnical engineering methods.

(iii) The grading may drain surface water away from the outslope of the fill and toward the rock core. The maximum slope of the top of the fill shall be 1v:33h (3 percent). Instead of the requirements of Section 715.15(a)(7), a drainage pocket may be maintained at the head of the fill during and after construction, to intercept surface runoff and discharge the runoff through or over the rock drain, if stability of the fill is not impaired. In no case shall this pocket or sump have a potential for impounding more than 10,000 cubic feet of water. Terraces on the fill shall be graded with a 3- to 5-percent grade toward the fill and a 1-percent slope toward the rock core.

(3) The drainage control system shall be capable of passing safely the runoff from a 100-year, 24-hour precipitation event, or larger event specified by the regulatory authority.

(d) Disposal of excess spoil: Durable rock fills.

In lieu of the requirements of Sections 715.15(b) and 715.15(c) the regulatory authority may approve alternate methods for disposal of hard rock spoil, including fill placement by dumping in a single lift, on a site specific basis, provided the services of a registered professional engineer experienced in the design and construction of earth and rockfill embankments are utilized and provided the requirements of this Section and Section 715.15(a) are met. For this Section, hard rock spoil shall be defined as rockfill consisting of at least 80 percent by volume of sandstone, limestone, or other rocks that do not slake in water. Resistance of the hard rock spoil to slaking shall be determined by using the slake index and slake durability tests in accordance with guidelines and criteria established by the regulatory authority.

(1) Spoil is to be transported and placed in a specified and controlled manner which will ensure stability of the fill.

(i) The method of spoil placement shall be designed to ensure mass stability and prevent mass movement in accordance with the additional requirements of this Section.

(ii) Loads of noncemented clay shale and/or clay spoil in the fill shall be mixed with hard rock spoil in a controlled manner to limit on a unit basis concentrations of noncemented clay shale and clay in the fill. Such materials shall comprise no more than 20 percent of the fill volume as determined by tests performed by a registered engineer and approved by the regulatory authority.

(2)(i) Stability analyses shall be made by the registered professional engineer. Parameters used in the stability analyses shall be based on adequate field reconnaissance, subsurface investigations, including borings, and laboratory tests.

(ii) The embankment which constitutes the valley fill or head-of-hollow fill shall be designed with the following factors of safety:

Case	Design condition	Minimum factor of safety
I	End of construction	1.5
II	Earthquake	1.1

(3) The design of a head-of-hollow fill shall include an internal drainage system which will ensure continued free drainage of anticipated seepage from precipitation and from springs or wet weather seeps.

(i) Anticipated discharge from springs and seeps and due to precipitation shall be based on records and/or field investigations to determine seasonal variation. The design of the internal drainage system shall be based on the maximum anticipated discharge.

(ii) All granular material used for the drainage system shall be free of clay and consist of durable particles such as natural sands and gravels, sandstone, limestone or other durable rock which will not slake in water.

(iii) The internal drain shall be protected by a properly designed filter system.

(4) Surface water runoff from the areas adjacent to and above the fill shall not be allowed to flow onto the fill and shall be diverted into stabilized channels which are designed to pass safely the runoff from a 100-year, 24-hour precipitation event. Diversion design shall comply with the requirements of Section 715.17(c).

(5) The top surface of the completed fill shall be graded such that the final slope after settlement will be no steeper than 1v:20h (5 percent) toward properly designed drainage channels in natural ground along the periphery of the fill. Surface runoff from the top surface of the fill shall not be allowed to flow over the outslope of the fill.

(6) Surface runoff from the outslope of the fill shall be diverted off the fill to properly designed channels which will pass safely a 100-year, 24-hour precipitation event. Diversion design shall comply with the requirements of Section 715.17(c). {30631}

(7) Terraces shall be constructed on the outslope if required for control of erosion or for roads included in the approved postmining land use plan. Terraces shall meet the following requirements:

(i) The slope of the outslope between terrace benches shall not exceed 1v: 2h (50 percent.).

(ii) To control surface runoff, each terrace bench shall be graded to a slope of 1v:20h (5 percent) toward the embankment. Runoff shall be collected by a ditch along the intersection of each terrace bench and the outslope.

(iii) Terrace ditches shall have a 5-percent slope toward the channels specified in paragraph (6) above, unless steeper slopes are necessary in conjunction with approved roads.

B. 30 CFR SECTION 715.17(E) IS AMENDED AS FOLLOWS:

1. Paragraph (e)(1)-(e)(9) are revised.

2. New paragraphs (e)(10)-(22) are added.

SECTION 715.17

(e) Hydrologic balance: Sedimentation ponds.

(1) General requirements.

Sedimentation ponds shall be used individually or in series and shall --

(i) Be constructed before any disturbance of the undisturbed area to be drained into the pond;

(ii) Be located as near as possible to the disturbed area and out of perennial streams; unless approved by the regulatory authority;

(iii) Meet all the criteria of this Section.

(2) Sediment storage volume.

Sedimentation ponds shall provide a minimum sediment storage volume equal to --

(i) The accumulated sediment volume from the drainage area to the pond for a minimum of 3 years. sediment storage volume shall be determined using the Universal Soil Loss Equation, gully erosion rates, and the sediment delivery ratio converted to sediment volume, using either the sediment density or other empirical methods derived from regional sediment pond studies if approved by the regulatory authority; or

(ii) 0.1 acre-foot for each acre of disturbed area within the upstream drainage area or a greater amount if required by the regulatory authority based upon sediment yield to the pond. The regulatory authority may approve a sediment storage volume of not less than 0.035 acre-foot for each acre of disturbed area within the upstream drainage area, if the person who conducts the surface mining activities demonstrates that sediment removed by other sediment control measures is equal to the reduction in sediment storage volume.

(3) Detention time. Sedimentation ponds shall provide the required theoretical detention time for the water inflow or runoff entering the pond from a 10-year, 24-hour precipitation event (design event). Theoretical detention time is defined as the average time that the design flow is detained in the pond; and is further defined as the time difference between the centroid of the inflow hydrograph and the centroid of the outflow hydrograph for the design event. Runoff diverted under Sections 715.17(c) and 715.17(d), away from the disturbed drainage areas and not passed through the sedimentation pond need not be considered in sedimentation pond design. In determining the runoff volume, the characteristics of the mine site, reclamation procedures, and onsite sediment control practices shall be considered. sedimentation ponds shall provide a theoretical detention time of not less than twenty-four hours, or any higher amount required by the regulatory authority, except as provided under subparagraphs (i), (ii), or (iii) of this paragraph.

(i) The regulatory authority may approve a theoretical detention time of not less than 10 hours, when the person who conducts the surface mining activities demonstrates that --

(A) The improvement in sediment removal efficiency is equivalent to the reduction in detention time as a result of pond design. Improvements in pond design may include but are not limited to pond configuration, in-flow and out-flow facility locations, baffles to decrease in-flow velocity and short-circuiting, and surface areas; and

(B) The pond effluent is shown to achieve and maintain applicable effluent limitations.

(ii) The regulatory authority may approve a theoretical detention time of not less than 10 hours when the person who conducts the surface mining activities demonstrates that the size distribution or the specific gravity of the suspended matter is such that applicable effluent limitations are achieved and maintained.

(iii) The regulatory authority may approve a theoretical detention time of less than 24 hours to any level of detention time, when the person who conducts the surface mining activities demonstrates to the regulatory authority that the chemical treatment process to be used --

(A) Will achieve and maintain the effluent limitations; and

(B) Is harmless to fish, wildlife, and related environmental values.

(iv) The calculated theoretical detention time and all supporting documentation and drawings used to establish the required detention times under subparagraphs (3)(i)-(iii) of this Section shall be included in the permit application.

(4) Dewatering. The water storage resulting from inflow shall be removed by a nonclogging dewatering device or a conduit spillway approved by the regulatory authority, and shall have a discharge rate to achieve and maintain the required theoretical detention time. The dewatering device shall not be located at a lower elevation than the maximum elevation of the sedimentation storage volume.

(5) Each person who conducts surface mining activities shall design, construct and maintain sedimentation ponds to prevent short-circuiting to the extent possible.

(6) The design, construction, and maintenance of a sedimentation pond or other sediment control measures in accordance with this Section shall not relieve the person from compliance with applicable effluent limitations as contained in 30 CFR 715.17(a).

(7) There shall be no out-flow through the emergency spillway during the passage of the runoff resulting from the 10-year, 24-hour precipitation event or lesser events through the sedimentation pond.

(8) Sediment shall be removed from sedimentation ponds when the volume of sediment accumulates to 60 percent of the design sediment storage volume. With the approval of the regulatory authority, additional permanent storage may be provided for sediment and/or water above that required for the design sediment storage. Upon the approval of the regulatory authority for those cases where additional permanent storage is provided above that required for sediment under Paragraph (2) of this Section, sediment removal may be delayed until the remaining volume of permanent storage has decreased to 40 percent of the total sediment storage volume provided the theoretical detention time is maintained.

(9) An appropriate combination of principal and emergency spillways shall be provided to safely discharge the runoff from a 25-year, 24-hour precipitation event, or larger event specified by the regulatory authority. The elevation of the crest of the emergency spillway shall be a minimum of 1.0 foot above the crest of the principal spillway. Emergency spillway grades and allowable velocities shall be approved by the regulatory authority.
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(10) The minimum elevation at the top of the settled embankment shall be 1.0 foot above the water surface in the pond with the emergency spillway flowing at design depth. For embankments subject to settlement, this 1.0 foot minimum elevation requirement shall apply at all times, including the period after settlement.

(11) The constructed height of the dam shall be increased a minimum of 5 percent over the design height to allow

for settlement, unless it has been demonstrated to the regulatory authority that the material used and the design will ensure against all settlement.

(12) The minimum top width of the embankment shall not be less than the quotient of (H+35)/5, where H is the height, in feet, of the embankment as measured from the upstream toe of the embankment.

(13) The combined upstream and downstream side slopes of the settled embankment shall not be less than 1v:5h, with neither slope steeper than 1v:2h, Slopes shall be designed to be stable in all cases, even if flatter side slopes are required.

(14) The embankment foundation areas shall be cleared of all organic matter, all surfaces sloped to no steeper than 1v:1h, and the entire foundation surface scarified.

(15) The fill material shall be free of sod, large roots, other large vegetative matter, and frozen soil, and in on case shall coal-processing waste be used.

(16) The placing and spreading of fill material shall be started at the lowest point of the foundation. The fill shall be brought up in horizontal layers of such thickness as is required to facilitate compaction and meet the design requirements of this Section. Compaction shall be conducted as specified in the design approved by the regulatory authority.

(17) If a sedimentation pond has an embankment that is more than 20 feet in height, as measured from the upstream toe of the embankment to the crest of the emergency spillway, or has a storage volume of 20 acre-feet or more, the following additional requirements shall be met:

(i) An appropriate combination of principal and emergency spillways shall be provided to discharge safely the runoff resulting from a 100-year, 24-hour precipitation event, or a larger event specified by the regulatory authority.

(ii) The embankment shall be designed and constructed with a static safety factor of at least 1.5, or a higher safety factor as designated by the regulatory authority to ensure stability.

(iii) Appropriate barriers shall be provided to control seepage along conduits that extend through the embankment.

(iv) The criteria of the Mine Safety and Health Administration as published in 30 CFR 77.216 shall be met.

(18) Each pond shall be designed and inspected during construction under the supervision of, and certified after construction by, a registered professional engineer.

(19) The entire embankment including the surrounding areas disturbed by construction shall be stabilized with respect to erosion by a vegetative cover or other means immediately after the embankment is completed. The active upstream face of the embankment where water will be impounded may be riprapped or otherwise stabilized. Areas in which the vegetation is not successful or where rills and gullies develop shall be repaired and revegetated in accordance with Section 715.20.

(20) All ponds, including those not meeting the size or other criteria of 30 CFR 77.216(a), shall be examined for structural weakness, erosion, and other hazardous conditions, and reports and modifications shall be made to the regulatory authority, in accordance with 30 CFR 77.216-3. With the approval of the regulatory authority, dams not meeting these criteria (30 CFR 77.216(a)) shall be examined four times per year.

(21) Sedimentation ponds shall not be removed until the disturbed area has been restored, and the vegetation requirements of Section 715.20 are met and the drainage entering the pond has met the applicable State and Federal water quality requirements for the receiving stream. When the sedimentation pond is removed, the affected land shall be regraded and revegetated in accordance with Sections 715.14, 715.16, and 715.20, unless the pond has been approved by the regulatory authority for retention as being compatible with the approved postmining land use. If the regulatory authority approves retention, the sedimentation pond shall meet all the requirements for permanent impoundments of Section 715.17(k).

(22) (i) Where surface mining activities are proposed to be conducted on steep slopes, as defined in Section 716.2 of this chapter, special sediment control measures may be followed if the person has demonstrated to the regulatory authority that a sedimentation pond (or series of ponds) constructed according to paragraph (e) of this section --

(A) Will jeopardize public health and safety; or

(B) Will result in contributions of suspended solids to streamflow in excess of the incremental sediment volume trapped by the additional pond size required.

(ii) Special sediment control measures shall include but not be limited to --

(A) Designing, constructing, and maintaining a sedimentation pond as near as physically possible to the disturbed area which complies with the design criteria of this section to the maximum extent possible.

(B) A plan and commitment to employ sufficient onsite sedimentation control measures including bench sediment storage, filtration by natural vegetation, mulching, and prompt revegetation which, in conjunction with the required sediment pond, will achieve and maintain applicable effluent limitations. The plan submitted pursuant to this paragraph shall include a detailed description of all onsite control measures to be employed, a quantitative analysis demonstrating that onsite sedimentation control measures, in conjunction with the required sedimentation pond, will achieve and maintain applicable effluent limitations, and maps depicting the location of all onsite sedimentation control measures.

PART 717 -- UNDERGROUND MINING GENERAL PERFORMANCE STANDARDS

A. 30 CFR Section 717.17(e) is amended as follows:

1. Paragraphs (e)(1)-(e)(9) are revised;

2. New paragraphs (e)(10)-(23) are added.

SECTION 717.17 - PROTECTION OF THE HYDROLOGIC SYSTEM.

* * *

(e) Hydrologic balance: Sedimentation ponds.

(1) General requirements.

Sedimentation ponds shall be used individually or in series and shall:

(i) Be constructed before any disturbance of the undisturbed area to be drained into the pond and prior to any discharge of water to surface waters from underground mine workings;

(ii) Be located as near as possible to the disturbed area and out of perennial streams, unless approved by the regulatory authority,

(iii) Meet all the criteria of the Section.

(2) Sediment storage volume.

Sedimentation ponds shall provide a minimum sediment storage volume equal to -- {30633}

(i) The accumulated sediment volume from the drainage area to the pond for a minimum of 3 years or the life of the pond, whichever is greater. Sediment storage volume shall be determined using the Universal Soil Loss Equation, gully erosion rates, and the sediment delivery ratio converted to sediment volume. Conversions shall use either the sediment density or other empirical methods derived from regional sediment pond studies may be used if approved by the regulatory authority; or

(ii) 0.1 acre-foot for each acre of disturbed area within the upstream drainage area or a greater amount if required by the regulatory authority based upon sediment yield to the pond. The regulatory authority may approve sediment storage volume of not less than 0.035 acre-foot for each acre of disturbed area within the upstream drainage area, if the person who conducts the underground mining activities has demonstrated that sediment removed by other sediment control measures is equal to the reduction in sediment storage volume; and

(iii) The accumulated sediment volume necessary to retain sediment for 1 year in any discharge from the underground mine passing through the pond.

(3) Detention time. Sedimentation ponds shall provide the required theoretical detention time for the water inflow or runoff entering the pond from a 10-year, 24-hour precipitation event (design event), plus the average inflow from the underground mine. Theoretical detention time is defined as the average time that the design flow is detained in the pond; and is further defined as the time difference between the centroid of the inflow hydrograph and the centroid of the outflow hydrograph for the design event. Runoff diverted under Sections 717.17(c) and 717.17(d) away from the disturbed drainage areas and not passed through the sedimentation pond, need not be considered in sedimentation pond design. In determining the runoff volume, the characteristics of the mine site, reclamation procedures, and onsite sediment control practices shall be considered. Sedimentation ponds shall provide a theoretical detention time of not less than twenty-four hours, or any higher amount required by the regulatory authority, except as provided under Paragraphs (i)(ii), or (iii) of this Subsection.

(i) The regulatory authority may approve a theoretical detention time of not less than 10 hours, when the person who conducts the underground mining activities demonstrates that --

(A) The improvement in sediment removal efficiency is equivalent to the reduction in detention time as a result of pond design. Improvements in pond design may include but are not limited to pond configuration, in-flow and out-flow facility locations, baffles to decrease in-flow velocity and short-circuiting, and surface areas; and

(B) The pond effluent is shown to achieve and maintain applicable effluent limitations

(ii) The regulatory authority may approve a theoretical detention time of not less than 10 hours when the person who conducts the underground mining activities demonstrates that the size distribution or the specific gravity of the suspended matter is such that applicable effluent limitations are achieved and maintained.

(iii) The regulatory authority may approve a theoretical detention time of less than 24 hours to any level of detention time, when the person who conducts the underground mining activities demonstrates to the regulatory authority that the chemical treatment process to be used --

(A) Will achieve and maintain the effluent limitations;

(B) Is harmless to fish, wildlife, and related environmental values;

(iv) The calculated theoretical detention time and all supporting documentation and drawings used to establish the required detention times under Subparagraphs (3)(i)-(iii) of this Section shall be included in the permit application

(4) Dewatering. The water storage resulting from inflow shall be removed by a nonclogging dewatering device or a conduit spillway approved by the regulatory authority, and shall have a discharge rate to achieve and maintain the required theoretical detention time. The dewatering device shall not be located at a lower elevation than the maximum elevation of the sedimentation storage volume.

(5) Each person who conducts underground mining activities shall design, construct, and maintain sedimentation ponds to prevent short-circuiting to the extent possible.

(6) The design, construction, and maintenance of a sedimentation pond or other sediment control measures in accordance with this Section shall not relieve the person from compliance with applicable effluent limitations as contained in 30 CFR 717.17(a)

(7) There shall be no out-flow through the emergency spillway during the passage of the runoff resulting from the 10-year, 24-hour precipitation events and lesser events through the sedimentation pond, regardless of the volume of water and sediment present from the underground mine during the runoff.

(8) Sediment shall be removed from sedimentation ponds when the volume of sediment accumulates to 60 percent of the design sediment storage volume. With the approval of the regulatory authority additional permanent storage may be provided for sediment and-or water above that required for the design sediment storage. Upon the approval of the regulatory authority for those cases where additional permanent storage is provided above that required for sediment under Paragraph (2) of this Section, sediment removal may be delayed until the remaining volume of permanent storage has decreased to 40 percent of the total sediment storage volume provided the theoretical detention time is maintained.

(9) An appropriate combination of principal and emergency spillways shall be provided to discharge safely the runoff from a 25-year, 24-hour precipitation event, or larger event specified by the regulatory authority, plus any inflow from the underground mine. The elevation of the crest of the emergency spillway shall be a Minimum of 1.0 foot above the crest of the principal spillway. Emergency spillway grades and allowable velocities shall be approved by the regulatory authority.

(10) The minimum elevation of the top of the settled embankment shall be 1.0 foot above the water surface in the pond with the emergency spillway flowing at design depth. For embankments subject to settlement, this 1.0 foot minimum elevation requirement shall apply at all times, including the period after settlement.

(11) The constructed height of the dam shall be increased a minimum of 5 percent over the design height to allow for settlement, unless it has been demonstrated to the regulatory authority that the material used and the design will ensure against all settlement.

(12) The minimum top width of the embankment shall not be less than the quotient of (H +35)/5, where H, in feet, is the height of the embankment as measured from the upstream toe of the embankment.

(13) The combined upstream and downstream side slopes of the settled embankment shall not be less than 1v:5h, with neither slope steeper than 1v:2h, Slopes shall be designed to be stable in all cases, even if flatter side slopes are required.

(14) The embankment foundation area shall be cleared of all organic matter, all surfaces sloped to no steeper than 1v: 1h, and the entire foundation surface scarified. {30634}

(15) The fill material shall be free of sod, large roots, other large vegetative matter, and frozen soil, and in no case shall coal-processing waste be used.

(16) The placing and spreading of fill material shall be started at the lowest point of the foundation. The fill shall be brought up in horizontal layers of such thickness as is required to facilitate compaction and meet the design requirement of the Section. Compaction shall be conducted as specified in the design approved by the regulatory authority.

(17) If a sedimentation pond has an embankment that is more than 20 feet in height, as measured from the upstream top of the embankment to the crest of the emergency spillway, or has a storage volume of 20 acre-feet or more, the following additional requirements shall be met:

(i) An appropriate combination of principal and emergency spillways shall be provided to safely discharge the runoff resulting from a 100-year, 24-hour precipitation event, or a larger event specified by the regulatory authority, plus any in-flow from the underground mine.

(ii) The embankment shall be designed and constructed with an acceptable static safety factor of at least 1.5, or a higher safety factor as designated by the regulatory authority to ensure stability.

(iii) Appropriate barriers shall be provided to control seepage along conduits that extend through the embankment.

(iv) The criteria of the Mine Safety and Health Administration as published in 30 CFR 77.216 shall be met.

(18) Each pond shall be designed and inspected during construction under the supervision of, and certified after construction by, a registered professional engineer.

(19) The entire embankment including the surrounding areas disturbed by construction shall be stabilized with respect to erosion by a vegetative cover or other means immediately after the embankment is completed. The active upstream face of the embankment where water is being impounded may be riprapped or otherwise stabilized. Areas in which the vegetation is not successful or where rills and gullies develop shall be repaired and revegetated, in accordance with Section 717.20

(20) All ponds, including those not meeting the size or other criteria of 30 CFR 77.216(a), shall be examined for structural weakness, erosion, and other hazardous conditions and reports and notifications shall be made to the regulatory authority, in accordance with 30 CFR 77.216-3. With the approval of the regulatory authority, dams not meeting these criteria (30 CFR 77.216(a)) shall be examined four times per year.

(21) Sedimentation ponds shall not be removed until the disturbed area has been restored and the vegetation requirements of Section 715.20 are met and the drainage entering the pond has met the applicable State and Federal water quality requirements for the receiving stream. When the sedimentation pond is removed, the affected land shall be regraded and revegetated in accordance with Sections 717.14 and 717.20, unless the pond has been approved by the regulatory authority for retention as compatible with the approved post-mining land use 717.17(k). If the regulatory authority approves retention, the sedimentation pond shall meet all the requirements for permanent impoundments of Section 717.17(k).

(22)(i) Where surface mining activities are proposed to be conducted on steep slopes, as defined in Section 716.2 of this chapter, special sediment control measures may be followed if the person has demonstrated to the regulatory authority that a sedimentation pond (or series of ponds) constructed according to paragraph (e) of this section --

(A) Will jeopardize public health or safety; or

(B) Will result in contributions of suspended solids to streamflow in excess of the incremental sediment volume trapped by the additional pond size required.

(ii) Special sediment control measures shall include but not be limited to --

(A) Designing, constructing, and maintaining a sedimentation pond as near as physically possible to the disturbed area which complies with the design criteria of this section to the maximum extent possible.

(B) A plan and commitment to employ sufficient onsite sedimentation control measures including bench sediment storage, filtration by natural vegetation, mulching, and prompt revegetation which, in conjunction with the required sediment pond, will achieve and maintain applicable effluent limitations. The plan submitted pursuant to this paragraph shall include a detailed description of all onsite control measures to be employed, a quantitative analysis demonstrating that onsite sedimentation control measures, in conjunction with the required sedimentation pond, will achieve and maintain applicable effluent limitations, and maps depicting the location of all onsite sedimentation control measures.

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