WEST VIRGINIA DAM CONTROL REGULATIONS

DEPARTMENT OF NATURAL RESOURCES

CHAPTER 20-5D
Series XII-A
1981

SUBJECT: Rules and regulations pertaining to the placement, construction, enlargement, alteration, repair or removal of dams, to include application for approval, hazard potential, subsurface and geologic investigation, laboratory investigation, hydrology, runoff control, hydraulics, slope stability and protection, seepage analysis, settlement analysis, foundation analysis, liquefaction potential, quality control, maintenance and inspection.

SECTION 1. GENERAL

1A. Scope - These regulations establish general and specific rules for minimum design and construction standards for the construction, modification, or removal of dams. These rules include design and construction requirements for site preparation, subsurface investigation, sub-drainage systems, principal spillways, emergency spillways, slope stability, submission of plans, maintenance and inspection of dams.

1B. Authority - These regulations are issued under the authority of Article 5D, Chapter 20, Code of West Virginia.

1C. Effective Date -

1D. Filing Date -

SECTION 2. DEFINITIONS: UNLESS THE CONTEXT IN WHICH USED CLEARLY REQUIRES A DIFFERENT MEANING, AS USED IN THESE REGULATIONS OR AS REFERRED TO IN ARTICLE 5D, CHAPTER 20, CODE OF WEST VIRGINIA, THESE DEFINITIONS APPLY TO THE FOLLOWING DAM CONTROL REGULATIONS:

2.01. Channel Protection means any measures taken to prevent or control erosion, cavitation, or other destructive processes in channels such as diversion ditches and spillways.

2.02. Dangerous Condition means any structural, hydrologic, or hydraulic condition of a dam or its appurtenances which may lead to (1) failure of the dam and possible loss of human life and property, or (2) harm to the public health or welfare, or (3) harm to the environment.

2.03. Design Storm means predicted precipitation of given intensity, frequency, and duration based on United States Weather Bureau data.

2.04. Diversion Ditch means a designed channel constructed for the purpose of collecting and transmitting surface runoff.

2.05. Embankment means a man-made deposit of earth or waste materials, usually exhibiting at least one sloping face.

2.06. Emergency Spillway means a hydraulic structure designed to discharge water in excess of that which an impoundment is designed to store or which cannot be passed through a principal spillway.

2.07. Engineer means a registered professional engineer in accordance with Chapter 30, Article 15 of the Code of West Virginia (W.Va. State Registration Law for Professional Engineers).

2.08. Freeboard means the vertical distance between the lowest point of the crest of the embankment of a dam and the reservoir water surface.

2.09. Geotechnical Engineering means the application of soil mechanics, rock mechanics, and geology to the solution of problems involving engineering structures and their interaction with surrounding earth materials.

2.10. Hazard Potential means a classification rating assigned to a structure based on engineering evaluations and judgement predicting the damage to human life, property and environment should a failure of the structure occur.

2.11. Highway, Primary means those roadways which are designated as interstates, U.S. numbered highways or West Virginia numbered highways.

2.12. Highway, Secondary means those roadways which are designated by the West Virginia Department of Highways as county numbered routes.

2.13. Hydraulics means the study of the physical behavior of liquids, especially water, in natural or man-made systems or processes.

2.14. Hydrologic Analysis means a determination, using standard engineering methods, to establish surface water runoff for a specified design storm.

2.15. Hydrology means the science that deals with the occurrence and behavior of water in the atmosphere, on the ground and underground.

2.16. Impoundment means a closed basin constructed for the retention of water, sediment or waste.

2.17. Natural Drainway means any natural water course which may carry water to the tributaries and rivers of the watershed.

2.18. Principal Spillway means the hydraulic structure designed to discharge water stored between normal pool and the emergency spillway invert elevations.

2.19. Probable Maximum Precipitation means the depth-duration-area rainfall for a particular area that represents the maximizing of the most critical meteorological conditions that are considered possible of occurrence.

2.20. Safety Factor means the ratio of the available shear strength to the developed shear stress, or ratio of the sum of the resisting forces to the sum of the loading or driving forces, as determined by accepted engineering practices.

2.21. Sediment means solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.

2.22. Site means the actual or planned location of a dam including, but not limited to, appurtenant works, reservoir area, diversion ditches, sediment control facilities, and borrow areas.

2.23 Subsidence means a sinking, collapsing or cracking of a portion of the earth's surface resulting from the presence of a void or voids beneath the surface.

SECTION 3. REQUIREMENTS

3A. Requirements for a Certificate of Approval

3A.01. Applicability--An application and certificate of approval is required for any placement, construction, enlargement, alteration, repair or removal of a dam after June 13, 1973. The Director shall give notice to file an application for a certificate of approval to every owner of a dam completed prior to July 1, 1973. Any person who wishes to construct or remove a dam or who is notified by the Director shall (a) file an application for a certificate of approval with the Department, and (b) obtain from the Department a certificate of approval.

3A.02. Application Requirements--An application for a certificate of approval shall be prepared by or under the direct supervision of a registered professional engineer. The application shall include two sets of maps and drawings on standard 24" by 36" size plan sheets with three copies of an engineering report. The engineering report shall contain information in the following order: project narrative, design data, supporting calculations, specifications and reduced maps and drawings.

3B. Plan Requirements

3B.01. Narrative and Discussion

a. Project Narrative--A general narrative and discussion of the project shall be submitted to include as a minimum a discussion of existing site conditions, the design life of the facility, subsidence potential, design methodology backed up with design computations and data, method of construction to include clearing and grubbing, topsoil stockpiles,

construction of surface and subsurface drainage facilities, phases of construction, routine inspection and maintenance, and timetable of construction. A description of the duties, responsibilities and lines of communication between those persons responsible for the design and construction of the dam shall be included.

b. Emergency Procedures--All dam owners shall include as part of the narrative a list of the appropriate agencies including but not limited to the Department of Natural Resources, Office of Emergency Services and State and local law enforcement agencies to be contacted in the event a dangerous condition develops.

3B.02. Design Analysis

a. Hazard Classification

1. The hazard potential shall be determined by the applicant based on the potential loss that would result due to a failure and the classification determined as listed below:

(a) Class A--Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or secondary highways. Failure of the structure would cause only loss of the structure and loss of property use such as related roads, but with little additional damage to adjacent property. Any impoundment exceeding 25 feet in height or 200 acre-feet storage volume or having a watershed exceeding 500 acres shall not be a Class A structure.

(b) Class B--Dams located in predominantly rural agricultural areas where failure may damage isolated homes, primary highways

or minor railroads or cause interruption of relatively important public utilities. Failure of the structure may cause great damage to property and project operations.

(c) Class C--Dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or main railroads. This classification must be used if failure would cause possible loss of human life.

2. Evaluation of Dangerous Conditions--If a dangerous condition develops an engineering analysis shall be conducted. The evaluation should consider steepness of slopes, seepage, hydraulic deficiencies, and other pertinent factors. The evaluation should also consider the results of failure with respect to the hazard classification.

b. Initial Site Investigation

1. Site Selection

(a) Hazard Classification Evaluation

(1) A complete upstream and downstream hazard evaluation shall be conducted based on Section 3B.02a1. No dam shall be constructed so that upstream dwellings will be flooded during maximum pool conditions.

(2) A downstream flood routing must be performed to justify a hazard classification of A or B if dwellings are locate located downstream.

(b) Site Survey--A site survey must be conducted to establish baselines and elevations of the dam embankments, reservoir and

borrow areas, and appurtenant structures. The survey must locate all test pits, borings, mine openings, landslides, etc.

(c) Borrow Areas--Suitable borrow areas shall be evaluated for appropriate construction materials and required volume.

2. Geotechnical Investigation

(a) A subsurface investigation shall be performed. The quantity, location and depth of borings, test pits or trenches shall be adequate for evaluation of the bearing capacity and subsurface conditions for the proposed structure and may vary based upon the height, impoundment volume and hazard classification of the dam. Factors to be considered include depth of soil, characteristics of bedrock and determination of groundwater location. Results of in-situ testing and soil sampling shall be reported. Soil profiles may be required for critical locations in the structure, spillways and other pertinent locations which affect the safety of the structure. A geological study shall also be conducted to evaluate landslides, bedrock discontinuities such as soft seams, joints, joint systems, bedding planes, and fault zones which may adversely affect the structure's performance. Past and future mining to include height of seam, depth and cover rock of the seam, and previous or expected subsidence problems shall be considered where subsidence may affect the safety of the structure.

(b) Laboratory Investigation--Laboratory tests shall be conducted on all foundation and embankment materials to include soil classification through sieve hydrometer analysis, Atterburg limits, density, water content, compaction tests, shear strength, consolidation and permeability. Compaction curves shall be developed for all fill materials as appropriate.

3. Hydrologic Investigation

(a) A survey shall be conducted to determine soil types, land use, land slope, watershed area, runoff curve number, and any other factors needed to establish watershed characteristics.

(b) Stream flow analysis shall be conducted to determine stream flow quantity and quality.

(c) All necessary parameters to determine stream channel hydraulics shall be measured.

c. Hydrology and Hydraulics

1. Design Data Required--A summary of all hydrologic and hydraulic data determined in the initial site investigation and used in the analysis (Section 3B.02b) shall be included in table or figure form.

2. Design Requirements

(a) Design Storm--All dams shall be designed to meet the following minimum hydrologic criteria based on hazard classification:

(1) Class A dams shall be designed for a minimum of $P_{100}+0.12(PMP-P_{100})$ inches of rainfall in six (6) hours plus three (3) feet of freeboard. If the storage X effective height is less than 3,000 then Soil Conservation Pond Standard 378 may be substituted.

(2) Class B dams shall be designed for a minimum of $P_{100}+0.40\ (PMP-P_{100})$ inches of rainfall in six (6) hours plus three (3) feet of freeboard.

(3) Class C dams shall be designed for the probable maximum precipitation, or for 80 percent of the probable maximum precipitation plus three (3) feet of freeboard provided the watershed is less than ten (10) square miles in area.

(b) Storage and Discharge

(1) Class A dams must be provided with an open channel spillway. The dam must be capable of passing that portion of the design storm that cannot be safely stored in the impoundment. Ninety (90) percent of the stored portion of the design storm shall be discharged within ten (10) days after the storm event.

(2) Class B dams shall be designed with either an open channel spillway only, or with an emergency spillway and a principal spillway together. The dam must be capable of passing that portion of the design storm that cannot be safely stored in the impoundment. Ninety (90) percent of the stored portion of the design storm shall be discharged within ten (10) days after the storm event. Slurry impoundments shall be provided with a means of removing water to maintain the lowest practical water level.

(3) Class C dams may be designed in one of three ways:

-i- A dam designed without discharge structures shall be capable of storing a minimum of two (2) probable maximum storms. Water shall be removed from the impoundment to its lowest practical level by pumping or other means if storm water reduces the storage capacity to one (1) probable maximum storm or less.

-ii- A dam designed with a decant or principal spillway only shall be capable of storing one (1) probable maximum storm. Ninety (90) percent of the stored portion of the storm shall be discharged within ten (10) days after the storm event. Slurry impoundments shall be provided with a means of removing water to maintain the lowest practical water level.

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(c) Surface Drainage—A diversion sy... designed to protect the entire front slope of the dam from surf... runoff. All diversion systems shall exit safely beyond the toe of ... embankment in a natural drainway capable of carrying the design flow ... excessive erosion. The design storm for diversion systems shall be the 100 year, 6 hour duration storm event.

(d) Spillways

(1) All spillways shall exit an adequate distance beyond the toe of the embankment in a natural drainway to prevent erosion of the toe.

(2) Conduit spillway inlets must be protected by a designed trash rack and riser type spillways must be designed to prevent vortexing. An adequate foundation and bedding shall be designed for all conduits and risers. Anti-seep mechanisms shall be designed for all conduits. Conduit spillways shall be of sufficient strength to withstand the maximum load of fill above them and of suitable material to resist deterioration for the design life of the structure. Conduit spillways must also be designed to resist uplift pressures. The outlet of all conduits, where blockage by animals can occur, must be protected by an animal guard.

(3) All new freshwater dams must be designed with a gated drain pipe for draining the impoundment.

(e) Landslide Potential--When locating all hydraulic structures the potential for landslides or slope failures as determined in the initial site investigation shall be evaluated according to Sections 3B.02d4(c) and 3B.02d5.

3. Hydrologic Anaylsis

The hydrologic analysis shall be performed for the spillway and/or surface drainage system. This should include inflow hydrographs, stage storage curves, stage discharge curves and routings. The spillways shall safely discharge that portion of the design storm that is not stored in the reservoir. If a computer analysis is used, only the results of the analysis shall be included.

4. Hydraulic Analysis

Using current engineering practices, a hydraulic analysis must be performed for the spillways and surface drainage system. Typical cross-section design techniques can be used where constant slopes are encountered. All hydraulic structures shall be designed to safely control the velocity to prevent excessive erosion. Standard engineering practices shall be used to design rip-rap, non-flexible channel linings, bedding and energy dissipators.

d. Geotechnical Evaluation

1. Design Data--A summary of all geotechnical data determined in the initial site investigation (Section 3B.02b2) and used in the analysis shall be included in table or figure form.

2. Seepage Analyses--An analysis of seepage and its detrimental effects on structural integrity and on the environment shall be made. The analysis shall include consideration of potential piping in the embankment, foundation, and abutments. Seepage control will be required to insure stability of the embankment and adjacent areas. Drainage systems shall be designed and constructed of durable rock protected by a properly designed filter zone using standard geotechnical engineering design practices.

3. Foundation Stability—When locating dams, the potential for landslides as determined in the initial site investigation shall be evaluated according to Sections 3B.02d4(c) and 3B.02d5. Potential subsidence and settlement and their consequences must be considered using current engineering technology. Special attention should be given to differential settlement which could lead to cracking of the dam. Spillway pipes on compressible foundations must be protected from damage due to settlement. The foundation must have, or must be treated to have, adequate bearing capacity to support the embankment and any appurtenant works.

4. Stability Requirements

(a) Embankment stability--Slope stability analyses will be required for construction and long term conditions to achieve the following minimum factors of safety:

	Safety Factor
Normal and Maximum Pool Conditions	1.5
End of Construction (earthen dams)	1.3
Rapid Drawdown	1.2
Seismic	1.2

(b) Appurtenance Structural Stability—Embankments constructed as part of an appurtenant structure must achieve a static factor of safety of 1.5.

(c) Landslides--If landslides noted in the dam site or reservoir areas will cause instability of the dam or appurtenant structures, blockage of spillways and other critical drainage structures, or overtoppping of the dam by displacement of water in the reservoir area, such landslides shall be corrected to a minimum static factor of safety of 1.5.

(d) Special Considerations--Gravity Structures

-1- Overturning--The reaction of all forces must act within the middle one third of the base. Variation to this requirement may be given if detailed computations prove that overturning will not occur.

-2- Sliding--The dam must have a factor of safety against sliding of at least 4.0 for normal loading conditions and 1.5 for maximum loading conditions.

-3- Bearing--The factor of safety against bearing failure shall be at least 1.5 for maximum stress at the toe.

5. Stability Analyses--All slope stability analyses shall be performed using standard geotechnical engineering techniques. Exceptions to this requirement will be made only where there is sufficient evidence to indicate that slope failures will not occur.

6. Liquefaction--The potential for liquefaction must be considered. Safeguards against the development of this condition shall be required.

e. Instrumentation--Considerations for installation of instrumentation such as piezometers, settlement markers, slope indicators, and similar monitoring devices shall be included in the plan to monitor present conditions, construction conditions, and to verify design assumptions. A plan for monitoring these devices shall also be provided.

3B.03. Specifications--Specifications for site development shall be provided to include as a minimum:

a. clearing and grubbing

b. soil stockpiles

c. subdrain construction

d. slopes

e. grades

f. details of surface drainage facilities

g. spreading and compaction requirements to include lift thicknesses, moisture content and degree of compaction with appropriate compaction curves

h. material and/or gradation requirements for sub-drainage structures

i. pipes

j. concrete

k. anti-seep mechanisms

l. channel protection

m. installation and reading of monitoring devices

n. inspection and maintenance

o. revegetation

p. blasting safety

q. construction erosion and sediment control

r. cutoff trenches

3B.04. Maps and Drawings

a. Maps and plans shall be provided showing the site in relation to major highways, county seats, and major drainage. County highway maps may be used for this purpose.

b. A map showing the limits of the watershed with respect to the site shall be provided. The minimum mapping requirement shall be a 7 1/2 minute USGS map with the site plotted on it.

c. A plan view of the site shall be provided showing detailed contour intervals (5' maximum) including all disturbed and reservoir areas. Location of springs, seeps, underground mines, mine drainage and/or openings, the subdrain system, project stationing, cross-sections, borings and test pits, instrumentation, reference points and other pertinent data shall be included in the plan view.

d. Cross-sections of the dam transversely and longitudinally shall be provided showing original ground, sub-drain locations, elevations, benches, spillways, and other pertinent features of the site. A cross-section shall be provided for stability computations showing the site at critical areas with subsurface data plotted.

e. Cross-sections and profiles of major drainage facilities shall be provided. Additional cross-sections shall be taken in all critical areas such as curves and weak areas.

f. Construction drawings shall be provided for subdrains, spillways, anti-seep mechanisms, and other pertinent structures.

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(1) Removal of the Embankment—Th... ...pletely removed to approximate original contour. A p... removal shall be submitted.

(2) Filling in the Reservoir—The reserv... completely filled with suitable material in such a manner that ... a minimum long term static factor of safety of 1.5. A plan and ti... the modification shall be submitted.

(3) Breaching

(a) The embankment shall be breached with a desi... channel having the capacity to carry the peak runoff from the design storm corresponding to the dam's hazard classification. Channel protection shall be provided at least to a flow depth equal to the 100 year, 6 hour duration storm.

(b) Plans for removal shall be submitted which include a schedule for implementation.

SECTION 4. PERFORMANCE STANDARDS

4A. <u>Site Development and Construction</u>

4A.01. Site Preparation

a. Sediment Control—Approved sediment control facilities shall be installed prior to clearing and grubbing.

b. Clearing and Grubbing--Clearing and grubbing must be performed in foundation, borrow and soil stockpile areas. Clearing is required in the impoundment area unless otherwise approved.

c. Foundation Preparation--Preparation shall include installation of keyways and subdrains, removal of soft areas and similar site preparation operations dictated by the approved plan and site conditions. The foundation shall be inspected by the Director prior to placement of embankment materials.

4A.02. Construction Requirements

a. Placement of Materials

1. All fill must be placed in accordance with the approved plans and specifications for the particular site.

2. Compaction testing shall be done as dictated by design requirements and reported according to Sections 6A and 6B.

3. Drainage blankets, etc., shall be constructed in accordance with the approved plan. Filter material shall be tested for compliance with design gradations and results submitted according to Sections 6A and 6B. Drainage materials shall be placed in such a way as to prevent segregation and contamination. Concurrent covering of drainage facilities shall be done to prevent contamination or damage.

4. Grading

(a) The working surface and outslopes of the fill shall be concurrently graded through all phases of embankment construction.

(b) The top of the fill shall be crowned to provide positive drainage during construction.

(c) In all cases final grading shall be conducted in such a manner as to follow approved plans and to provide a surface for vegetation.

(d) Erosion control measures shall be implemented during construction to prevent excessive erosion.

b. Spillways and Appurtenances

1. Spillways and appurtenances shall be constructed according to the approved plans and specifications. Any changes and/or modifications must be approved by the Director prior to implementation.

2. When downslope placement of fill material is used in the construction of spillways, the fill material shall be compacted in horizontal layers to achieve the design configuration.

3. All rip-rap material shall be of hard, durable rock which is not acid-forming or toxic. Rip-rap shall be placed to prevent size segregation.

4. When bedding is used under rip-rap, the rock material shall be placed in a manner so as not to damage or contaminate the bedding.

5. When protective channel linings are required, the linings shall be installed as soon as the channel is constructed to grade according to the approved plans.

6. When concrete is used in construction of spillways and appurtenances, standard forming or placement techniques shall be used. The concrete shall be placed and cured in accordance with AASHTO specifications. Standard engineering tests shall be performed to insure that the concrete meets the design specifications and shall be reported in accordance with Sections 6A and 6B.

7. All pipes, risers, and appurtenances shall be installed according to the approved plans. Sufficient compaction testing shall be performed and reported according to Sections 6A and 6B to insure that fill material around pipes and appurtenances has been placed according to the approved plan. Sufficient fill shall be placed over pipes to prevent damage by heavy equipment.

4B. Operation and Maintenance

4B.01. All spillways and appurtenances shall be maintained to operate according to the design plans and specifications.

4B.02. Routine maintenance of spillways shall be performed. Maintenance shall include removal of sediment, brush, trees, rocks, rocks in stilling basins, and re-establishment of the structure to its original hydraulic design.

4B.03. All failures resulting from landslides or slope failures must be corrected immediately. Failures must be reported to the Director.

4B.04. Routine inspections shall be made of all hydraulic structures to insure proper operation. Special inspections shall be conducted whenever a significant flow through the structures has occurred.

4B.05. All pipes must be repaired or replaced when damaged, distorted, or otherwise fail to function properly according to the approved design.

4B.06. Leakage through joints, fissures, cracks through or under the spillway channel shall be immediately investigated and repaired.

4B.07. If erosion on the embankment face or abutments occurs, the area must be regraded and be provided with adequate drainage control and/or revegetation to prevent future occurrences.

4B.08. All gates must be serviced and operated at least annually to insure proper functioning.

4B.09. All concrete structures and channel linings must be maintained according to design and specifications.

4B.10. Access roads must be maintained to insure access for emergency inspections.

4B.11. The embankment shall be kept clear of trees and shrubs.

SECTION 5. INSPECTION AND QUALITY CONTROL

5A. Inspection During Construction

5A.01. Plans, specifications and all previous inspection reports shall be available at the construction site office for reference by construction personnel and the Director.

5A.02. A visual inspection for construction progress, determination of unstable conditions, conformance with plans, and quality control shall be held at least once every seven days. Inspections shall be held after heavy rainfall events to determine problems and remedial measures. Piezometers shall be monitored every seven days unless otherwise stated in the approved plan. This schedule may be changed by the Director depending on specific site conditions.

5B. Inspection of Completed Dams

5B.01. Until proper performance of the structure is evidenced, the

dam and appurtenances shall be inspected annually by an engineer(s) experienced in this respect. Should a storm of record occur (i.e. greater than or equal to a 100 year, 6 hour duration storm), a similar inspection shall be held. The inspection shall consider seepage, bulges, scarps, vertical displacement, excessive erosion, piping, maintenance deficiencies or other visual factors which could indicate potential failure of the embankment, spillways or appurtenances. Once proper performance of the structure is evidenced, the dam should be inspected at least once every two years by an engineer experienced in this respect. The inspection should include all items considered during the annual inspection.

5C. Inspections of Dams with Serious Problems

5C.01. Inspections shall be held at least once per month, or more often as required by the Director based on site conditions. The inspector shall consider steepness of slopes, seepage, bulges, scarps, vertical displacement, excessive erosion, piping, sudden changes in monitoring devices and other visible factors which could indicate potential failure of the embankment, spillways and other appurtenances.

SECTION 6. REPORTING REQUIREMENTS

6A. Monthly Progress Reports During Construction

A written report containing results of inspection of construction progress shall be submitted by the owner every month. The report

shall include but not be limited to a summary of instrumentation data, testing data, freeboard, crest elevation, water surface elevation, and specific construction problems. Upon completion of construction, notice shall be given to the Director.

6B. Post Construction Inspection Reports

A report shall be submitted by the owner reporting the findings of the inspection required in Section 5B. Certification that the dam and appurtenances are functioning as designed is required by the engineer making the inspection.

6C. Monthly Inspection Reports for Dams Under Construction with Serious Problems

A written report containing observations of the inspection required in Section 5C shall be submitted at least once per month.

6D. Emergency Condition Reporting

6D.01. In the event that a condition occurs which is dangerous to human life and property, the Director shall be notified by the fastest possible means and be followed up by a written notification that a dangerous condition exists and the measures proposed by the owner to abate the condition. An additional report shall be filed following abatement of the dangerous condition certifying that the remedial measures have been accomplished.

6D.02. Emergency Warning Systems--Owners of dams where a dangerous condition has developed must prepare and submit for approval

an emergency warning plan. This plan shall include, but not be limited to:

a. list of agencies involved in execution of the plan and their responsibilities,

b. list of persons including address and phone number who may be affected by failure of the dam, and

c. statement of conditions which require monitoring of the dam, monitoring and/or notification actions to be taken under various conditions, and persons responsible for these actions.

SECTION 7. CRITERIA FOR DESIGN, CONSTRUCTION, REPAIR, INSPECTION AND MAINTENANCE OF DAMS

A manual published by the Department entitled "Criteria for Design, Construction, Repair, Inspection and Maintenance of Dams" provides more detailed technical requirements than can be placed in these regulations. This manual is reviewed annually and revised as needed to reflect improved technology. The manual is available at the cost of publishing and handling from the Dam Control Section of the Division of Reclamation.