Part 520 – Soil and Water Resource Development

Subpart C – Dams

520.20 General

A. Dams are essential to soil and water resource development. To ensure safety, dams need controls to protect life and property.

B. NRCS requires uniform, high-quality standards in the planning, design, and construction of dams to ensure consistently safe and efficient performance.

520.21 Definition and Classes

A. As used in this manual, a dam is an artificial barrier, together with any associated spillways and appurtenant works, that impounds, may impound, or diverts water.

B. Storage is the capacity of the reservoir, in acre-feet, below the elevation of the crest of the lowest auxiliary spillway or below the elevation of the top of the dam if there is no open channel auxiliary spillway.

C. Overall height is the difference in elevation in feet between the top of the dam and the lowest elevation at the downstream toe.

D. Effective height is the difference in elevation, in feet, between the lowest open channel auxiliary spillway crest and the lowest point in the original cross section on the centerline of the dam. If there is no open channel auxiliary spillway, the top of the dam becomes the upper limit.

E. NRCS classifies dams according to the potential hazard to life and property if the dam should suddenly breach or fail. Dam classification requires consideration of existing and future downstream development, including controls for future development. The potential hazard from failure determines the classification of a dam as follows.

(1) Low Hazard Potential.—Dams in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.
(2) Significant Hazard Potential.—Dams in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, or minor railroads, or interrupt service of relatively important public utilities.
(3) High Hazard Potential.—Dams where failure may cause loss of life or serious damage to homes, industrial or commercial buildings, important public utilities, main highways, or railroads.

F. Some dams have greater significance than others because of their potential to affect public safety. Although the public's concern for safety of dams often corresponds with the size of the dam and reservoir, small dams may also present a hazard. In addition, while some dams initially may present no hazard in terms of loss of human life, their degree of hazard can change because of downstream development. Because of this and the need to manage an overall NRCS program for dam safety, the Director, Conservation Engineering Division (CED), must maintain a national inventory of NRCS-assisted dams. Each State conservation engineer (SCE) must maintain the State inventory. NRCS considers dams meeting any of the following criteria as NRCS inventory dams:

(1) All significant and high hazard potential dams.
(2) Low hazard potential dams more than 6 feet in National Inventory of Dams (NID) height and with an NID storage of 50 acre-feet or more.

(3) Low hazard potential dams with an NID height of 25 feet or more and an NID storage of more than 15 acre-feet.

G. For the purposes of the NRCS inventory, U.S. Army Corps of Engineers (USACE) definitions apply as follows:

(1) Dam Height.—The vertical distance between the lowest point on the crest of the dam and the lowest point in the original streambed. Height of the dam is expressed in feet and rounded to the nearest foot.
(2) Structural Height.—The vertical distance from the lowest point of the excavated foundation to the top of the dam. Top of dam refers to the parapet wall and not the crest. Structural height is expressed in feet and rounded to the nearest foot.
(3) Hydraulic Height.—The vertical difference between the maximum design water level and the lowest point in the original streambed. Hydraulic height is expressed in feet and rounded to the nearest foot.
(4) NID Height.—Maximum value of dam height, structural height, and hydraulic height.
(5) Maximum Storage.—The total storage space in a reservoir below the maximum attainable water surface elevation, including any surcharge storage. Maximum storage is expressed in acre-feet.
(6) Normal Storage.—The total storage space in a reservoir below the normal retention level, including dead and inactive storage and excluding any flood control or surcharge storage. Normal storage is expressed in acre-feet.
(7) NID Storage.—Maximum value of normal storage and maximum storage.

H. NRCS must keep the NRCS inventory of dams current and accurate. SCEs are responsible for maintaining all inventory fields and updating the hazard classification of each project dam as required in Title 180, National Operations and Maintenance Manual (NOMM).

I. States must use the Web-based application GeoObserver for Dams to maintain the NRCS inventory of dams. User Guide 210-14-6, "GeoObserver for Dams," contains instructions for accessing GeoObserver for Dams.

J. The Director, CED, provides each SCE, and may provide other employees selected by the SCE, permission to access GeoObserver for Dams to edit the inventory in their State. The Director, CED may provide other NRCS employees the necessary permission to access GeoObserver for Dams to view all or portions of the NRCS inventory of dams.

K. Because the NRCS inventory of dams contains sensitive data, and data intended for agency use only, NRCS limits access. The Director, CED, submits portions of the data as required by law, to USACE for inclusion in the NID. USACE provides public access to portions of the NID. As needed, the Director, CED will provide USACE the names of NRCS employees requesting access to nonpublic portions of the NID.

520.22 Design Criteria

A. Low hazard potential earth dams with a product of storage times the effective height of the dam of less than 3,000 acre ft^2 and with an effective height of the dam of 35 feet or less must meet or exceed the requirements of Conservation Practice Standard (CPS) Pond (Code 378).

B. Low hazard potential earth dams whose product of storage times the effective height of the dam is 3,000 acre ft^2 or more, those more than 35 feet in effective height, and all significant hazard potential and high hazard potential dams must meet or exceed the requirements of Technical Release (TR) 210-60, "Earth Dams and Reservoirs."

C. Dams of materials other than earth must comply with the applicable portions of CPS Pond (Code 378) and TR 60. Other features must meet or exceed the requirements as stated in other applicable NRCS standards.

520.23 Classification

A. Classification of dams is determined at the time of inventory and evaluation and verified immediately prior to construction. The person having the appropriate engineering job approval authority (section 501.4 of this manual) is responsible for the classification.

B. Documentation of the classification of dams is required. Documentation must include but is not limited to location and description of the dam, configuration of the valley, description of existing development (houses, utilities, highways, railroads, farm or commercial buildings, and other pertinent improvements), potential for future development, recommended classification, and signatures of those performing and concurring in the classification. When using breach routings as part of the classification process, documentation must also include results obtained from the breach routings.

C. If there are indications that any existing dam is misclassified, including changes resulting from downstream development, proposals for reclassification must be submitted to the SCE for action. If the SCE approves, NRCS officially reclassifies the dam. When this occurs, the SCE must document the case file, make proper notification, and update the inventory of NRCS assisted dams.

520.24 Special Considerations

A. Criteria in addition to the requirements in CPS Pond (Code 378) and TR 60 apply for some dams.

(1) Dams in series, dams with drainage areas of more than 10-square miles, and dams located in regions of high earthquake hazard require special considerations.
(2) Design low hazard potential dams for municipal or industrial water supplies with minimum criteria equivalent to criteria used for significant hazard potential dams.
(3) Do not construct high hazard potential dams and those with permanent storage over an active fault without the concurrence of the Director, CED.

B. Local experience, State laws and regulations, site conditions, or other special features may require the use of more stringent criteria to ensure a satisfactory dam.

520.25 Clearing Reservoirs

A. Clear reservoir areas to facilitate the movement of water, to provide for the proper functioning of outlets and spillways, to provide convenient access to dams and related structures for operation and maintenance, and to comply with State and local laws and regulations.

B. Use the following minimum standards to determine the clearing required for reservoir areas:

(1) Dry Dams.—Minimum requirements include—
  (i) Clear reservoir areas for a distance of 200 feet upstream from the principal spillway inlet, except that no clearing is necessary above the elevation of the top of the inlet.
  (ii) Clear areas immediately upstream from auxiliary spillways to the extent required to permit spillways to function properly.
(2) Dams That Retain Water in a Reservoir.—This includes dams with space allocated for sediment storage and dams that provide water storage for beneficial use. Minimum requirements include—
  (i) Clear reservoir areas at least up to the elevation of the crest of the lowest ungated principal spillway inlet.

(ii) Consider allowing less clearing for a specific site if the structure incorporates fish and wildlife features and the sponsor or owner requests that the area not be cleared, or if the cost of clearing is disproportionate to the other costs of the structure and lack of clearing will not interfere with the functioning of the reservoir. The minimum area cleared must extend the full length of the dam for a distance of 400 feet upstream from the principal spillway and include the area upstream from the auxiliary spillway to the extent required for it to function properly. The operation and maintenance plan must include specific procedures addressing the potential for debris on the upstream slope of the dam and around the principal spillway.

520.26 External Reviews for Dam Safety

A. Definition of an External Review.—An external review is an examination and evaluation of procedures used and decisions made during the design and construction of a dam by peers from outside NRCS or from an organizational unit other than the one responsible for the design and construction. Section 511.2 of this manual provides the meaning of "design" used here.

B. Purpose of an External Review.—External reviews ensure that design and construction procedures and decisions reflect safety considerations and economy. The reviewer must determine whether the methods of analyses are appropriate and the assumptions are justified by the site conditions and whether the results are reasonable. An external review is not a substitute for expertise needed during design and construction.

C. Design Review.—Perform design reviews as established in section 511.5 of this manual. Perform independent reviews for quality assurance as established in section 501.5 of this manual. An independent review may only be considered an external review if the office performing the independent review had little or no role in the design.

D. Determination of Need for an External Review.—The SCE must evaluate all dams proposed for construction, modification, or repair to determine the need for an external review. The SCE must determine the need for an external review during preliminary design (see section 511.2C of this manual). For project structures, the SCE must determine the need for an external review during planning.

(1) For high hazard potential dams, factors to consider include the level of risk, size of the dam, reservoir volume, complexity of site geology, complexity and margin of safety reflected by the design layout and construction methods, and other unique condition or complexity noted during planning, design, or construction.
(2) To determine the need for an external review for all other dams, consider site complexity, unique design features, or other special conditions requiring special expertise.

E. Procedure for Establishing an External Review

(1) The SCE and the Director, CED, on class-VIII jobs will make a joint recommendation to the State Conservationist on the need for an external review. The recommendation must be supported by a justification statement and include a brief description of the site, the proposed structure layout, composition of technical specialists making up the review team, and other essential data. This becomes part of the design folder. The initiation of an external review may occur at any stage of the design or construction process.
(2) The State Conservationist is responsible for implementing the external review and advising the Director, CED, of the plan to conduct the external review.
(3) When recommending an external review, the State Conservationist must request a list of employees and others qualified to make the review from the Director, CED.

(4) The State Conservationist makes the necessary arrangements for appointing the review board and assigning their responsibilities. If the board is composed of more than one member, the State Conservationist must designate a chairperson.
(5) The State Conservationist must permit the review board to make reviews at the times they determine necessary. The review assignment must require evaluation until construction is completed.

520.27 Emergency Action Plans – High Hazard Potential Dams

A. Applicability.—An emergency action plan must be prepared for each high hazard potential dam for which NRCS provides technical or financial assistance. The State Conservationist must ensure that an emergency action plan is prepared prior to the initiation of construction.

B. Inundation Maps.—SCEs provide appropriate inundation maps needed for emergency action plans. These maps define areas that would be affected in an emergency and provide other appropriate information. The inundation areas to be delineated on the maps must show the following:

(1) Outflow from routing the auxiliary spillway hydrograph (or larger hydrograph) through the spillways and downstream.
(2) Discharge due to a sudden breach of the dam. Unless otherwise determined by the SCE, the conditions at the time of breach may be water level in the reservoir at or above the crest elevation of the lowest open channel auxiliary spillway and "nonstorm" conditions downstream of the dam.
   (i) For dams in series, make an evaluation to determine whether the breach of an upstream dam would endanger a downstream dam. If the upstream breach endangers a downstream dam, base the breach inundation map on multiple failures.
   (ii) For dams not in series affecting a common downstream area, it is usually adequate to consider the failure of each dam individually unless circumstances would warrant analysis of multiple failures.

520.28 Potential Impact Area – Low Hazard Potential Dams of Inventory Size and All Significant Hazard Potential Dams

A. Applicability.—For each low hazard potential dam of inventory size and each significant hazard potential dam, determine the potential inundation area in event of a breach. Complete this as part of the hazard classification (section 520.21E) and its documentation (section 520.23B of this subpart).

B. Requirements

(1) The potential impact area may be determined by performing breach routings or by other methods.
(2) Clearly describe the potential impact area by the use of maps, narrative description, or both. In addition to the description of the area, precautions outlining the desire to exclude future development within the impact area must be included. These precautions may be specific (e.g., if based on breach inundation studies) or may point out the need for breach routings in the future if development is ever considered. The landowner or sponsor should be made aware of the potential impact area as early as practicable and before expending significant resources in design.

C. Distribution

(1) As early as practicable prior to the initiation of construction, the State Conservationist must officially transmit the description of the potential impact area and precautions on

development to the owner or sponsor. It is the responsibility of the owner or sponsor to transmit the description of the potential impact area and precautions on development to—

(i) The local land-use control agency or county.

(ii) The State agency responsible for dam safety.

(iii) The conservation districts and others, as appropriate.

(2) If requested by the owner or sponsor, or if the owner or sponsor fails to act, the State Conservationist must make the specified notification.