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Forest Service Manual 7500 – Water Storage And Transmission

Chapter 7510 - Project Administration

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Posting Instructions Amendments are numbered consecutively by title and calendar year. Post by document; remove the entire document and replace it with this amendment. Retain this transmittal as the first page(s) of this document. The last amendment to this title was 7500-2011-1 to FSM 7500_zero_code.

Digest: Following is an explanation of the changes throughout the directive by section.

7510: Changes categorization of dams from A, B, C, and D and low, medium, and high hazard to low, significant, and high hazard potential classification throughout chapter.

7511: Removes caption and recodes direction to 7512. Establishes caption “Funding and Budgeting for Dams Operated by the Forest Service” and recodes direction on program budget instruction previously set out in 7514.

7511.1 thru 7511.3: Removes codes, captions, and obsolete direction.

7512: Removes caption and direction and recodes direction to FSM 7525 and FSM 7504. Establishes caption “Classification of Dams” and recodes to this section direction previously set out in 7511.

7513: Removes caption and direction and recodes direction to FSM 7530. Establishes caption “Documentation” and recodes to this section direction previously set out in 7515.

7514: Removes caption and direction and recodes direction to 7511. Recodes to this section caption and direction previously set out in 7516.

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7514.1 thru 7514.7: Establishes codes, captions, and sets forth direction various inspections.

7515: Removes caption and direction and recodes direction to 7513. Recodes to this section caption and direction previously set out in 7517.

7516: Removes caption and direction and recodes to 7514. Establishes caption and sets forth direction on “Remote Sensing on High Hazard Dams.”

7517: Removes caption and direction and recodes to 7515. Establishes caption Dam Failure Investigations and recodes to this section direction previously set out in 7518.

7518: Removes caption and direction and recodes direction to 7517. Establishes caption “Dam Security” and sets forth direction on dams with a high hazard classification that pose security concerns.

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7511 - Funding and Budgeting for Dams Operated by the Forest Service

The most current budget direction for administration, inspection, maintenance, and development of dams operated by the Forest Service is in each year's Forest Service program budget instructions.

7512 - Classification of Dams

The potential effect of dams on the safety and economy of downstream areas varies with the size of the dam and the amount and value of improvements and natural amenities downstream. The required scope of investigations, precision of design, quality and capacity of components, and subsequent cost vary with the hazard potential classification of the dam.

Minimum criteria for design, operation, maintenance, and monitoring of dams are based on their hazard potential classification. All factors that might influence the hazard potential classification must be evaluated during the design and design review of a dam.

7512.1 - Hazard Potential Classification

The definitions in FSM 7505 are used to classify potential hazards as low, significant, or high.

7513 - Documentation

Maintain the following records for dams operated by the Forest Service or the holder of a special use authorization on National Forest System lands:

1. National Dam Inventory. The national dam inventory provides the primary basis for administration of dams operated by the Forest Service on National Forest System lands.
2. Project File. The project file for a dam must be updated as needed over the life of the dam with information on problems encountered, hazard assessment, maintenance, operational changes, instrumentation, and inspections.
3. Operation and Maintenance Plans. An operation and maintenance (O&M) plan is required for all dams with a significant or high hazard potential classification. O&M plans may be prepared for dams with a low hazard potential classification if warranted based on their significance or complexity. O&M plans for new dams must be prepared during the design phase. O&M plans may cover more than one dam if they are of a similar type (FSH 7509.11, ch. 20).

The owner of a dam is responsible for preparing and maintaining an O&M plan for that dam. Ensure coordination with the Forest Service and appropriate State agencies in the preparation of O&M plans for dams operated by the holder of a special use authorization. Ensure that O&M plans for dams operated by the holder of a special use authorization are reviewed by a qualified engineer and approved by the authorized officer (FSM 2705).

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a. Updating O&M Plans. Revise O&M plans for dams as required by changes in project status (such as change of ownership, change in hazard potential classification, ditch bill easement designation, or reissuance of a special use authorization) or maintenance condition (such as dam rehabilitation or reconstruction). O&M plans must reflect current operating procedures and requirements for the corresponding dam.

A qualified engineer or other qualified Forest Service official shall monitor each dam operated by the holder of a special use authorization at least once every 5 years to ensure that the dam complies with the technical requirements of the authorization. Dams with a high hazard potential classification or unusual circumstances, such as the likelihood of an earthquake, a large flood, or vandalism, may necessitate more frequent monitoring.

b. Maintenance Categories. There are three maintenance categories:

(1) Priority 1 – Emergency. Maintenance is needed to correct deficiencies affecting the safety of the dam or the public or to correct conditions that may become critical to the safety of the dam or the public in the immediate future. Ensure that deficiencies in this category are corrected as soon as they are identified or that the dam is withdrawn from service or the storage is decreased to the extent needed to operate within acceptable parameters.

(2) Priority 2 – Non-Emergency. Maintenance is needed to restore functional use of the dam, correct unsightly conditions, or prevent more costly damage. Integrity of the dam and public safety are not threatened.

(3) Routine. Minor housekeeping maintenance is needed (such as vegetation removal, animal control, maintenance of drains, or debris removal from the spillway and embankment). This type of maintenance is typically included in the O&M plan.

7514 - Inspections

The Federal Guidelines for Dam Safety require periodic inspection and evaluation of dams to reduce the risk to human life and property from dam failure. The Forest supervisor develops a systematic dam inspection program for each administrative unit to identify routine maintenance and to disclose conditions which might threaten life and property, so that timely corrective action may be taken (FSM 7504).

Further direction regarding inspection programs is found in FSH 7509.11, chapter 40.

Most State regulations and Federal Power Act licenses require engineering inspection of non-Federal dams located on National Forest System lands. Some local agencies, such as municipal or county water agencies, flood control districts, and irrigation districts, make regularly scheduled inspections of dams under their jurisdiction. When the scope and quality of these inspections are comparable to Forest Service requirements, the regional forester shall work with appropriate State or local agencies to prevent duplication of effort. Agreements with these other agencies should include provisions for periodic joint inspections.

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The dam inspection program includes four types of inspections:

7514.1 - Informal and Special Inspections

1. Informal Inspections. Informal inspections may involve any Forest Service employee within the vicinity of any dam regulated or operated by the Forest Service. Informal inspections consist of observing and reporting unusual occurrences or potentially hazardous situations.

Any unusual conditions that seem critical or dangerous must be reported immediately to the local Forest Service official responsible for dams. Particular attention must be given to evidence of or changes in leakage, erosion, sinkholes, boils, seepage, slope instability, undue settlement, displacement, tilting, cracking, deterioration, improper functioning of drains and relief wells, and overtopping of the dam by flood waters.

2. Special Inspections. Special inspections must be performed by a qualified engineer immediately after any dam has experienced an unusual event, including but not limited to a large flood, first filling, major earthquake, and vandalism.

7514.2 - Operation & Maintenance (O&M) Inspections

A qualified engineer shall periodically review O&M and inspection records and shall make a thorough inspection of each dam operated by the Forest Service or the holder of a special use authorization. An O&M plan is prepared for dams operated by the Forest Service that contains a schedule for routine maintenance and a budget for funding maintenance and updating inventory.

A qualified engineer shall check operating logs periodically throughout the year for dams that have administrative limitations on water storage, reservoir elevation, or release imposed by the State or the Forest Service.

1. O&M Inspection Schedule. Establish an O&M inspection schedule in accordance with FSM 7514.5.

2. Correction of Identified Safety Deficiencies. When an inspection discloses O&M deficiencies, the Forest or Grassland supervisor shall:

a. For dams operated by the Forest Service, establish an O&M schedule to address those deficiencies based on their priority and available funding and schedule appropriate restoration and repairs.

b. For dams operated by the holder of a special use authorization, promptly notify the holder in writing of the deficiencies and, if required by State law or an MOU, furnish a copy of the notice to the State. The notice must:

(1) Describe the deficiencies and explain the nature and urgency of needed changes or repairs.

(2) Require the holder to submit a plan for correcting the deficiencies.

(3) Require the holder to certify by letter when the deficiencies have been corrected.

Any dam with deficiencies seriously affecting the integrity of the structure must be promptly repaired or wholly or partially removed from service until repairs are made (FSM 7503 and 7504.6). See FSM 2716 for direction on taking this type of administrative action.

7514.3 - Safety Inspections

Safety inspections must be performed on all dams with a high hazard potential classification. Safety inspections must be documented, must be conducted by a qualified engineer, and must encompass all pertinent information, including records on dam design, construction, instrumentation, operation, and maintenance and a detailed field evaluation of the dam and its appurtenant structures. Safety inspections must be based on current design standards and practices, including direction in FSM 7526. The effort and degree of detail involved for a safety evaluation should be correlated to the size of the dam. Forest Service staff should participate in safety inspections required under licenses issued pursuant to the Federal Power Act and administered by the Federal Energy Regulatory Commission.

Peer review of safety inspections by Federal, Forest Service, State, or other dam safety engineers is encouraged.

7514.4 - Hazard Assessments

A hazard assessment involves a probabilistic evaluation of the consequences of failure or misoperation of a dam or its appurtenances. A hazard assessment typically involves multiple inundation modeling scenarios of flooding generated by dam failure to develop an exceedance probability for loss of life, property, and environmental damage. The hazard potential classification for a dam is established based on the results of the hazard assessment.

The hazard potential classification for a dam may change over time. New downstream land uses and development, raising a dam to increase storage, or revisions to National Weather Service hydrometeorological reports could warrant changing the hazard potential classification of a dam. Therefore, periodic hazard assessments are required for dams with a significant or low hazard potential classification.

7514.41 - Safety Inspection and Hazard Assessment Schedule

Ensure that hazard assessments are performed and documented for dams with a significant or low hazard potential classification in accordance with FSM 7514, paragraph 5. Perform hazard assessments for these dams more frequently if increased downstream development is observed. Inundation mapping from previous hazard assessments may be utilized if no significant variations in the channel geometry are observed.

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1. Dams Operated by the Forest Service. The Forest Service is responsible for safety inspections and hazard assessments of dams it operates. These safety inspections and hazard assessments may be performed by other qualified agencies or licensed engineers under contract with the Forest Service.
2. Dams Operated by the Holder of a Special Use Authorization. Ensure that the holder of a special use authorization for a dam has safety inspections and hazard assessments of the dam performed by a qualified engineer or another qualified Federal or State agency.

7514.5 - Inspection Frequency

The following exhibit shows the inspection frequency for the inspection type and the potential hazard classification:

7514.5 – Exhibit 01

Inspection Frequency

Hazard Potential Classification	Inspection Type	Inspection Frequency	Level of Expertise Required
LOW	O&M	10 years	Qualified Engineer
	Hazard Assessment	10 years*	Qualified Engineer
	Special	**	Qualified Engineer
SIGNIFICANT	O&M	5 years	Qualified Engineer
	Hazard Assessment	5 years*	Qualified Engineer
	Special	**	Qualified Engineer
HIGH	O&M	1 year	Qualified Engineer***
	Safety	5 year	Qualified Engineer
	Special	**	Qualified Engineer
* Perform hazard assessments more frequently if increased downstream development is observed. ** A special inspection must be performed by a qualified engineer. *** A qualified engineer must review and approve in writing the annual O&M inspection reports for dams with a high hazard potential classification. At a minimum, the annual on-site inspection must be completed by someone familiar with the operation of the dam.			

7514.6 - Review and Approval of Safety Inspection Reports and Hazard Assessments

The regional director of Engineering is responsible for review and approval of safety inspection reports and hazard assessments (FSM 7504.5).

7514.7 - Dams Not Under Forest Service Jurisdiction

When a dam that is not under Forest Service jurisdiction is endangering National Forest System lands, promptly notify the regional forester, dam owner, and regulating agencies.

7515 - Emergency Action Plans

The forest supervisor prepares, trains personnel listed in, tests, implements, posts, and annually updates an emergency action plan (EAP) for all dams operated by the Forest Service with a high hazard potential classification. Ensures that the holder of a special use authorization for a dam with a high hazard potential classification prepares, trains personnel listed in, tests, implements, posts, and annually updates an EAP for the dam. Ensures coordination of development and revision of an EAP with agencies that have emergency management responsibilities at the Federal, State, and local levels (FSM7504). Each EAP must be tailored to site-specific conditions. EAPs must be tested every 5 years. See FSH 7509.11, chapter 50, for procedures and information on testing EAPs.

For proposed dams, prepare the EAP during the design stage. The EAP must reflect construction activities for new dams and major reconstruction activities for existing dams.

EAPs must include or address:

1. Notification Flowchart. The EAP must begin with one notification flowchart that clearly summarizes who is to be notified of an emergency and in what priority. The notification flowchart must include individual names and position titles; office, home, and cellular telephone numbers; e-mail addresses; alternative contacts; and means of communication.
2. Site-Specific Communications Network. Many dams located on National Forest System lands are remote and are not served by cellular telephone or normal radio signal service. When service is available in these remote locations, it can be unreliable, especially during storms with very heavy rainfall and high winds, which can cause interruption of communications during emergencies. Consider use of satellite telephone service or installation of temporary radio transmission facilities, such as VLF transmitters or repeaters, to secure communications in remote locations.
3. Emergency Detection, Evaluation, and Classification. If a potential or existing emergency condition at a dam is reported, the responsible qualified engineer shall determine, based on available data, when to access the dam to assess and abate the potential or existing emergency condition. The dam must be accessed by the most expedient means available.

The circumstances, events, or measures causing the existing or potential emergency condition shall be documented. Data and information collection systems (for example, early warning system hardware; graphing of the relationship of the elevation of the reservoir to storage and discharge from the spillway or other information related to abnormal reservoir levels; or an inspection, monitoring, or instrumentation plan) must be addressed in the EAP.

Procedures, aids, instruction, and provisions for evaluation of information and data to assess the severity and magnitude of any existing or potential emergency condition must be discussed in the EAP.

Dam emergency conditions are classified according to their severity and urgency. Use the following classifications for dam emergency conditions:

- a. Failure is imminent or has occurred. This is a situation where a failure has occurred, is occurring, or is about to occur.
 - b. Failure is developing. This is a situation where failure may eventually occur, but planned actions taken during certain events (such as major floods, earthquakes, or upon discovery of piping) may moderate or alleviate failure.
 - c. Non-failure emergency condition. This is a situation where there is no danger of failure, but given flow conditions, flooding is expected to occur downstream of the dam.
4. Responsibilities. Dam operators are responsible for implementing all elements of the EAP for their dam.
5. Preparedness. Preparedness actions are taken to prevent or mitigate dam failure and to facilitate response to emergencies. The EAP must describe preparedness actions to be taken before and after development of emergency conditions, including procedures for preventing emergency conditions from developing or warning of the development of emergency situations; operation of the dam to limit impacts in an emergency situation; and minimizing the extent of damage resulting from any emergency situation as it develops.
6. Inundation Maps. Inundation maps must be developed by the dam operator in coordination with appropriate State and local emergency management agencies. The inundation map must delineate the areas that would be flooded as a result of dam failure. At a minimum, inundation maps must include the peak discharge, maximum inundation elevation, and travel time to critical locations of the leading edge and peak of the flood wave from a dam break.
7. Appendices. Following the body of the EAP, an appendix must be included that contains information that supports and supplements the EAP. At a minimum, the appendix must include investigation and analyses of dam break floods; plans for training

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personnel listed in the EAP and for testing, implementing, updating, and posting the EAP; site-specific concerns; and the letter signed by the Forest or Grassland supervisor approving the EAP.

An EAP must be updated promptly after each change in listed personnel or their telephone numbers. A comprehensive review of the EAP must be made whenever safety inspections and hazard assessments are performed or reviewed (FSM 7514). The comprehensive review must include an assessment of the need for further training of personnel and testing of the EAP.

The EAP must be updated as necessary based on comprehensive reviews. Any changes in the EAP must be provided to all those who have a copy of it.

7516 - Remote Sensing on High Hazard Dams

To afford the maximum opportunity to alleviate problems that could threaten the integrity or operation of a dam remote sensing is required on all Forest Service operated dams with a high hazard potential classification.

7517 - Dam Failure Investigations

As soon as practicable, investigate and report a dam failure in accordance with FSH 7509.11, chapter 60. See FSM 6730 for additional guidance on investigations.

7518 - Dam Security

Dams with a high hazard potential classification pose a risk to life and property downstream if they are attacked, damaged, or misoperated by aggressors, intruders, or vandals. Dams with security concerns include those upstream from permanent populations, those with minimal freeboard, and those with gates or valves that have a discharge capacity greater than the estimated downstream channel capacity. Dams with these characteristics must be evaluated by a qualified engineer and modified as appropriate and to the extent practicable to implement the security practices in paragraphs 1 through 8. Any act that results in damage to or destruction of a dam constitutes an act of terrorism, which is a felony.

1. Where possible, restrict public vehicular access to the crest of a dam. Use gates or barriers to prevent public vehicular access when feasible.
2. Using barriers or structural hardening, as appropriate, restrict access to any discharge structure (such as outlet works and gated spillways) with the capacity to release flows exceeding downstream channel capacity.
3. Controls for operation of gates and valves should be within a locked and secure structure. The power supply for the operating equipment should generally be shut off until operation by authorized personnel is required.

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4. When control gates or valves are not within locked and secure structures, they must be individually locked.
5. Track and document the keys to all locks to ensure only authorized personnel have access to keys. An authorized Forest Service official shall have a complete set of keys to gates, valves, and control rooms for use in emergencies.
6. Instructions on operating gates, valves, and other critical equipment should not be accessible or in public view and should be kept only within secure structures or containers. The authorized Forest Service official shall have a complete set of operating instructions.
7. Post appropriate signs (such as “No Trespassing” or “Government Property—Authorized Personnel Only”) where public access is prohibited. Post signs along the security perimeter and access routes and near critical assets that direct the public to report suspicious activity and that include the telephone number for reporting it. Signing must meet applicable requirements of EM-7100-15, Sign and Poster Guidelines for the Forest Service. Particular emphasis should be placed on using regulatory colors and following traffic sign requirements, including a 4-inch minimum letter size, no more than 5 lines of text, and use of retro-reflective materials, when signs are intended to be read from vehicles.
8. Appropriate fencing with locked gates should be used, if possible, to delineate areas where public access is restricted for security purposes.

Ensure that EAPs include complete contact information for law enforcement and emergency management officials.