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	Project Operations  FLOOD CONTROL OPERATIONS AND MAINTENANCE POLICIES	
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Project Operations  
FLOOD CONTROL OPERATIONS AND MAINTENANCE POLICIES

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This regulation supersedes Engineer Regulations (ER) 1130-2-339, dated 29 October 1973; and 1130-2-419, dated 9 April 1982.

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## CHAPTER 1 - INTRODUCTION

1-1. Purpose. This regulation, in addition to ER 1130-2-500, establishes the policy for the operation and maintenance (O&M) of USACE flood control and related structures at civil works water resource projects and of USACE-built flood protection projects operated and maintained by non-Federal sponsors.

1-2. Applicability. This regulation applies to all USACE commands having responsibility for civil works functions.

1-3. References.

- a. Section 2 of the Flood Control Act of 1937.
- b. Section 3 of the River and Harbor Act of 1945.
- c. Section 14 of the Flood Control Act of 1946.
- d. Section 205 of the Flood Control Act of 1948
- e. Public Law (PL) 84-99, Federal Water Conservation Act of 1965, as amended, (16USC 460-1. Et seq.)
- f. PL 91-611 (84 Stat. 1818), Section 221 of the Flood Control Act of 1970.
- g. 33 Code of Federal Regulations (CFR), Chapter II, Part 208, Flood Control Regulations.
- h. Engineer Regulation (ER) 11-2-240, Civil Works Activities - Construction & Design.
- i. ER 500-1-1, Natural Disaster Procedures.
- j. ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures.
- k. ER 1110-2-101, Reporting Evidence of Distress of Civil Works Structures
- l. ER 1110-2-1156, Dam Safety - Organization, Responsibilities, and Activities.
- m. ER 1110-2-1200, Plans and Specifications.
- n. ER 1110-1-1801, Construction Foundation Report.
- o. ER 1110-2-1901, Embankment Criteria and Performance Report.
- p. ER 1130-2-500, Project Operations - Partners and Support (Work Management Policies)
- q. ER 1165-2-119, Modifications to Completed Projects.

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- r. EM 1110-2-2200, Gravity Dam Design.
- s. EM 1110-2-2300, Earth and Rock-Fill Dams General Design and Construction Considerations.
- p. Corps-wide Dam Safety Training Course for Project Field Personnel, dated 31 March 1978.
- q. Evacuation Plans for Areas Downstream of Corps Dams and Corps/State Cooperation on Safety Review of Corps Dams, dated 20 March 1978.

1-4. Glossary.

- a. MAJOR STRUCTURAL/OPERATIONAL DEFICIENCY. A deficiency that could cause or lead to a failure of the flood control project.
- b. MINOR STRUCTURAL/OPERATIONAL DEFICIENCY. A deficiency that will not cause a failure of the flood control project, but if not rectified could eventually become a major deficiency or hinder the operational capability of the project.

## CHAPTER 2 - DAM OPERATIONS MANAGEMENT

2-1. Purpose. This chapter establishes the policy for managing and operating dams safely and effectively. For the purpose of this regulation, the term dam includes all dam and reservoir projects and those navigation dams which, should they fail, would have a potential for loss of life or high property damage. (This regulation does not address the policy, responsibility and guidance for water control activities/reservoir regulation).

2-2. Policy. It is the policy of the Corps of Engineers that:

a. An emergency plan for each dam shall be prepared and retained at both the District and Project offices. The district is responsible for keeping the emergency plan accurate, complete and current.

b. A dam safety training program will be conducted for O&M personnel at the project level. The program will be reviewed periodically for accuracy and completeness and revised as necessary.

c. The O&M Manual, Water Control Manual, and other pertinent technical information, including any changes to the manuals, the project documentation listed in the Appendix A to Engineer Regulation (ER) 1110-2-100, and copies of all periodic inspection reports prepared under ER 1110-2-100 shall be kept at the project for ready reference.

2-3. Emergency Plan. This plan shall include:

a. An Emergency Notification Procedure, supplementing ER 1110-2-101, local reporting, and notification procedures for serious abnormal conditions shall be developed in writing to provide for safety of people in the vicinity of the dam and also trigger immediate response for remedial assistance to the dam. (See also ER 1110-2-1156.)

b. A description or list of conditions leading to emergency situations and ways of dealing with them should they occur.

c. Reservoir de-watering procedure.

d. Dam failure inundation maps.

e. Listing of location, types, and quantity of emergency repair materials and equipment.

f. Details outlining responsibilities for inspection and execution of emergency repairs.

g. List of contractors available within a reasonable distance of the dam.

2-4. Dam Safety Training. Dam safety training should be given to all new employees and contract workers shortly after starting duty at high hazard dams. A dam safety training program for O&M personnel, complete with retraining every four years and on-going operational exercises, that addresses the following items shall be implemented by district commanders:

a. Discussion of basic typical design considerations for various types of construction,

including hydraulic considerations, foundation factors, etc.

- b. Procedures for monitoring potential problem areas.
- c. Dam safety features in design and construction.
- d. Normal operation, surveillance, monitoring and reporting procedures.
- e. Emergency Operations, surveillance, monitoring and reporting procedures.

2-5. Responsibilities.

a. Operations Project Managers are responsible for ensuring implementation of the training programs and operational exercises, and for tracking of personnel participation.

b. District commanders (and the New England MSC Commander) are responsible for developing training programs, operational exercises, management practices and appropriate surveillance programs which complement periodic inspection programs performed under ER 1110-2-100, ensuring that dams under their jurisdiction shall be operated properly, and monitoring their surveillance programs to ensure that they are current and effective, and that recommended repairs necessary to ensure the integrity of the project are scheduled and budgeted. On dam projects where O&M work is contracted, necessary Corps staff shall be retained to assure sufficient supervision under all conditions. The District Operations Division, with coordination of the Engineering Division, shall be responsible for maintaining all related referenced material in a current and effective condition.

c. MSC commanders are responsible for reviewing district management practices and inspection programs, and providing guidance and assistance as necessary.

2-6. Evacuation Plan. Development of an evacuation plan is a non-Federal responsibility. Each district shall identify and contact appropriate State or local officials and suggest that evacuation plans be developed as part of the overall dam safety program. Pertinent information regarding the project, including dam failure inundation maps, should be provided to assist in preparation of the plans.

2-7. Inspections. Operations field personnel shall make routine inspections of vital areas of each dam at intervals that shall ensure safety and operating reliability. A record of each inspection shall be made showing the date, identification of the inspector, abnormal or changed conditions relating to the vital area, and the name of the person to whom a report was made regarding such conditions.

## CHAPTER 3 - INSPECTION OF FEDERAL FLOOD CONTROL PROJECTS OPERATED AND MAINTAINED BY NON-FEDERAL SPONSORS

3-1. Purpose. This chapter establishes the policy for the inspection of Federal flood protection projects which have non-Federal sponsors responsible for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) or as otherwise specified in Project Cooperation Agreements (PCA), Local Cooperation Agreements (LCA), and other agreements based on Section 221 of the Flood Control Act of 1970 (Public Law (PL) 91-611) or other legislation. The primary purposes of these inspections are to prevent loss of life and catastrophic damages; preserve the value of the Federal investment; and to encourage non-Federal sponsors to bear responsibility for their own protection. This program (Inspection of Completed Works) should assure sponsor compliance with existing agreements that the structures and facilities constructed by the United States for flood protection will be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

3-2. Policy. It is the policy of the Corps of Engineers that:

- a. the project structures and facilities shall operate as intended.
- b. MSC and district commanders shall ensure that:
  - (1) essential maintenance work is performed in accordance with existing agreements,
  - (2) that the requirements of Part 208.10 of 33 Code of Federal Regulations (CFR) are met.
- c. Any project which cannot qualify for emergency rehabilitation under PL 84-99, will not be inspected under this chapter.
- d. Projects are inspected for compliance on a scheduled basis.

3-3. General.

a. A schedule to perform inspections shall be developed in accordance with the following guidance. Projects shall be rated in accordance with the Overall Project Rating scale provided in Appendix C. The Overall Project Rating scale in Appendix C is intended for Corps use to help establish scheduling and budget priorities for inspections of completed works. Project Rating scales for sponsor recognition may be developed on a district or division basis. Projects that protect urban areas or ones where failure would be catastrophic and result in loss of life should be inspected annually. The inspection frequency of rural projects or channels on which there is at least a Overall Project Rating of "Good" will be initially scheduled for an inspection every second year and increasing to every third year as the Overall Project Rating continues to be "Good" or better. Projects which do not have at least a Overall Project Rating of "Good" will be scheduled for an inspection every year. Districts and MSCs shall maintain periodic contact with the sponsors of projects regardless of frequency of on-site inspections. Out-of-cycle inspections may be performed, if necessary.

b. Projects authorized under Section 2 of the Flood Control Act of 1937, Section 3 of the River and Harbor Act of 1945, Section 14 of the Flood Control Act of 1946, and Section 205 of

the Flood Control Act of 1948 need not be inspected unless they could potentially be eligible for emergency rehabilitation under PL 84-99.

c. An inspection guide to support the ratings in Appendix C and to categorize the projects in accordance with Appendix D shall be developed and kept up-to-date by each MSC or district and shall be utilized as appropriate.

d. The maintenance of non-Federally operated and maintained flood protection projects shall be considered deficient when the non-Federal sponsor has not fulfilled its OMRR&R obligation in accordance with the requirements of Part 208.10 of 33 CFR, and/or the requirements of an agreement (e.g., Section 221, LCA, PCA, etc.) with the Federal Government.

e. Minor deficiencies that will not significantly affect the attainment of project benefits shall not be reported unless the non-Federal sponsor indicates that it does not intend to fulfill its obligation to correct the deficiencies or is unable to fulfill its responsibility for OMRR&R.

f. Completed projects maintained by non-Federal sponsors may fall into one of the categories in Appendix D. Category 1 and 2 projects will be inspected in accordance with this chapter. Category 3 projects are addressed in paragraph 3-3g. Projects in the category "other" may be addressed as a modification to a completed project under ER 1165-2-119.

g. The Corps response to projects with inadequate maintenance (category 3) will be a progression of steps tailored to each specific situation. The steps are as follows for projects where continued maintenance is justified:

(1) Notify the sponsor of the deficiencies. Prior to implementing Step 2, the District Commander should meet with the sponsor explain the gravity of the situation, the potential consequences and the future actions the Corps may take.

(2) Write a letter to the Governor of the state and other state agencies to enlist state participation in efforts to resolve the maintenance problems.

(3) Inform Federal Emergency Management Agency (FEMA) of the condition of the project. Make the lack of adequate maintenance, and the potential consequences, a matter of public knowledge -- by whatever means prudent and most suitable to the specific situation. If the sponsor, the local governmental body (if different from the sponsor), or the state desire to hold a public meeting to air and discuss the problem, participate fully. Meetings should, however, in all cases be arranged by non-Federal interests and held under their auspices.

(4) If acceptable actions are not taken by the non-Federal sponsor, take action to remove project from the Inspection of Completed Works program eligibility and from eligibility for emergency rehabilitation under PL 84-99.

(5) Initiate legal action in an effort to enforce, through the court, sponsor fulfillment of maintenance responsibilities under the assurance of local cooperation or project cooperation. This is not a ritual step. It is listed as a step to indicate that, if good cases can be made, one or more trial actions could be brought. Litigation by the Corps against a local government is an exceptional undertaking and should be initiated only after a thorough review of all pertinent considerations. Any such litigation must be cleared through CECC-K before being brought.

(6) Using the authority of Section 216, prepare and transmit a report to Congress that:

(a) recommends authorization of a new project with a Section 221 (Flood Control Act of 1970) agreement (if a willing sponsor is available): or

(b) recommends reauthorization of the project along with measures to eliminate hazards.

h. In no case does the policy allow for Federal expenditures to correct problems caused by lack of adequate local maintenance

i. The Corps response for all category 2 projects and agricultural category 3 projects where the threat to human life is not a factor shall be limited to Steps 1 through 3. Steps 1 through 5 shall be applicable for category 3 urban projects and agricultural projects that involve a threat to human life. For projects where continued maintenance is not justified, the Corps shall work with non-Federal sponsor and the locals to see if any project related hazards can be eliminated.

3-4. Reports. Reports on flood protection projects where maintenance is considered to be deficient will be submitted annually on ENG Form 4390-R to CECW-OM. Details of the deficiencies will be contained in the inspector's report and the report form and in the correspondence with the sponsors, copies of which are to be submitted with the report form. Special problems or conditions will be noted. Since not all eligible projects will be inspected annually, maintenance deficient Corps constructed, non-Federal sponsor operated flood control projects identified by other means maybe reported. Negative reports will be submitted. This report has been assigned Reports Control Symbol DAEN-C WO-40 and will be submitted to HQUSACE (CECW-OM) Washington, D.C. 20314-1000, prior to 31 December for the previous fiscal year.

FOR THE COMMANDER:

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OTIS WILLIAMS  
Colonel, Corps of Engineers  
Chief of Staff

## APPENDIX A

### Dam Safety Training for Project Personnel

A-1. A major requirement identified under the National Dam Safety Program is the need for training Corps operations people in dam safety. The primary objective of such training is to qualify personnel working at each dam project to recognize signs of structural distress and to become familiar with procedures which must be implemented upon finding evidence of such distress.

A-2. Because of the diversity of civil works dam projects, including differences in design considerations, instrumentation, operating procedures and other such factors, site-specific training will provide a better learning experience than a standardized general course. For this reason, Divisions and Districts will be responsible for developing and providing dam safety training.

A-3. An outline for general guidance in development of a dam safety course follows in this appendix. The outline reflects minimum course content, but actual site specific training may be varied or expanded to meet the needs of project personnel. Development of the course should be coordinated with the local training officer to ensure that official training records indicating course attendance and completion can be maintained. These records should be kept on file at the employee's project office. Rosters or project personnel which indicate dates of attendance and course completion will also be maintained at each project office. These records should be available for inspection during command or periodic inspections. Progress of the program will be monitored from the annual Government Employees Training Act Report.

#### A-4. Dam Safety Training Course Outline

##### 1. Purpose of Training Program.

###### a. Basic Objectives

b. History of Dam Failures. (Reference: Lessons from Dam Incidents, International Commission on Large Dams, 1973; Inspection, Maintenance and Rehabilitation of Old Dams, ASCE, 1974; Safety of Small Dams, ASCE, 1975; The Evaluation of Dam Safety, ASCE, 1977).

c. Films or Slides Depicting Dam Safety Problems or Failures. (Reference: Existing Southwestern Division Film, a new film is being produced by SWD).

##### 2. Dam Safety Features in Design and Construction.

a. Design Philosophy for Dams. (Reference: EM 1110-2-2200, EM 1110-2-2300).

b. Design Assumptions, Construction History, Salient Features and Regulating Philosophy for the Project (Reference: ER 1110-1-1801, ER 1110-2-1901, ER 1110-2-100).

c. Past Monitoring, Experiences and Performance for Projects. (Reference: ER 1110-2-100).

3. Normal Operation, Surveillance, Monitoring and Reporting Procedures.
  - a. The Value and Use of Instrumentation.
  - b. Effect of Pool Rises on Monitoring Requirements.
  - c. Reservoir Regulation Manuals.
  - d. Day-to-Day Surveillance.
  - e. Documentation of Plans, Records, Reports, etc.
  - f. Generalizations on What Is and What Is Not Critical to Safety of the Structure.
  - g. Public Relations with Local Communities.
  - h. Coordination and Notification to Downstream Water Users and Recreationists on Controlled Releases and Flushing Operations.
4. Emergency Operation, Surveillance, Monitoring and Reporting Procedures.
  - a. Observation of Evidence of Distress.
  - b. Methods of Treating Obvious Safety Problems.
  - c. Knowledge of Potential Flood Areas Downstream.
  - d. Alerting Corps Offices to Emergency Conditions.
  - e. Alerting Police and Local Civil Defense Groups to Emergency Conditions.

## APPENDIX B

### Evacuation Plans for Areas Downstream of Corps Dams and Corps/State Cooperation on Safety Review of Corps Dams

B-1. Dam failures causing extensive loss of life and destruction of property in the United States in recent years have focused much attention on dam safety. On 23 April 1977 the President directed all Federal agencies with responsibilities for dam safety to review their dam building practices and procedures which could affect the safety and integrity of the structures. As a result of the review directed by the President and an internal review performed by the Corps task group shortly after failure of the Teton Dam, we have undertaken numerous actions to modify our practice for design, construction and operation of Corps reservoir projects. One important item as a result of the Teton Dam failure and the review of our procedures is the need to develop evacuation plans for areas downstream of Corps dams. Based on the national interest in this subject and the Corps leading role in dam safety, all Corps dams should have emergency evacuation plans which include inundation maps for areas that have potential for flooding in the event of sudden dam failure. Further information on this follows in this appendix.

B-2. Another item related to dam safety is the request by State Agencies to participate in the review of the design, construction and inspection of Corps dams. Guidelines to be used when a request is made by State Officials follows in this appendix.

B-3. We are convinced that we have an outstanding program for ensuring that our projects are designed, constructed and operated safely. In our decentralized program we place much responsibility on our field offices to ensure that our dam safety program is carried out according to our established procedures.

#### B-4. Guidance for Developing Evacuation Plans for Areas Downstream of Corps Dams

a. Background. For several years we have been providing inundation maps to the State of California which delineate the areas below Corps reservoir projects that would be affected by sudden failure of the dams. We have also embarked on a similar program for Corps dams in Alabama. Other states are expected to ask for similar information. The Federal Energy Regulatory Commission (FERC), under their licensing authority, requires that each dam with a FERC license have an emergency evacuation plan.

b. Procedure. There are several methods available for determining the area subject to flooding from sudden dam failure. However, a general consensus among experts in dam break flood routing is that the complete solution of the unsteady flow equation, such as Hydrologic Engineering Center's "Gradually Varied Unsteady Flow Profile Program," should be used for dams located upstream of urban areas. For dams upstream of essentially rural flood plains, simplified methods such as "Dimensionless Graphs" or "Modified Puls" may be used. Assistance in the selection of methods or in the application of methods may be obtained from the Hydrologic Engineering Center, the Waterways Experiment Station, or HQUSACE; however, approval authority for the method(s) to be used remains with the Division Engineer.

c. Schedules and Funding. The work should be scheduled over a reasonable period of time and funded from project O&M accounts for completed projects and from Construction General funds for projects currently under construction. State officials should be notified that

such information is being developed and will be available upon completion of the studies.

#### B-5. Guidelines for State Involvement in Safety of Corps Reservoir Projects

a. When requested by the state, the Corps will furnish survey reports, design memoranda, plans and specifications, inspection reports and any other published reports on Corps projects within the state. The Corps will consider any comments and suggestions that the state makes in review of the documents; however, Corps reports, design memoranda, and plans and specifications will not be subject to the approval of the state agency.

b. When requested by the state, the Corps will arrange for state personnel to visit dam sites during the construction phase of the project. Comments and suggestions by the state personnel will be entertained, but Corps work will not be subject to approval of state officials. Also, it should be made clear that the Corps of Engineers cannot delegate its responsibilities for Corps projects.

c. When requested by the state, state officials will be permitted to attend periodic inspection of Corps projects as observers and inspection reports will be furnished to state officials for information and review.

d. The Corps has no authority to reimburse the state for its costs associated with review and/or inspection of Corps projects.

e. Upon request of state officials, the extent of our intended cooperation may be confirmed in letter form for information; however, execution of agreements or understandings, or the exchange of memoranda which give the appearance, or have the effect, of diluting full and exclusive Corps responsibility for dam safety are prohibited.

## APPENDIX C

### OVERALL PROJECT RATING

C-1. EXCELLENT - No major deficiencies. None or few minor new deficiencies. All old deficiencies noted in the last inspection have been corrected.

C-2. VERY GOOD - No major deficiencies. Several new minor deficiencies. Most old deficiencies noted in the last inspection have been corrected.

C-3. GOOD - Few or no new major deficiencies. Numerous new minor deficiencies and/or several old minor deficiencies noted in the last inspection have not been corrected. Annual maintenance performed, but additional effort is needed.

C-4. FAIR - Major deficiencies that if not corrected immediately may lead to or cause deterioration of the project such that is incapable of providing the maximum flood protection. Little or no evidence of minimum maintenance performed. A greater effort is required to reduce deficiencies.

C-5. POOR - Major deficiencies such the structural integrity or the flood control project will probably not withstand a major flood event. Little or no evidence of maintenance performed.

## APPENDIX D

### CATEGORIES OF COMPLETED PROJECTS

(1) Projects are maintained in accordance with the agreement between the Corps and the non-Federal sponsors. The projects are expected to perform as designed. These projects are inspected as necessary.

(2) Some maintenance deficiencies exist, but the project would probably provide design level protection (in some instances it may be presumed that continued neglect will result in a category (3) situation).

(3). Maintenance deficiencies are such that the project would probably fail during floods of design or lesser magnitude.

(Other) Project cannot be expected to provide the degree of protection intended when built because of changed conditions, failure of the design to function as expected, construction deficiency or a combination of these factors. Maintenance deficiencies may or may not exist.

