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	Engineering and Design PERIODIC INSPECTION AND CONTINUING EVALUATION OF COMPLETED CIVIL WORKS STRUCTURES	
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CECW-EP

Regulation
No. 1110-2-100

15 February 1995

**Engineering and Design
PERIODIC INSPECTION AND CONTINUING EVALUATION
OF COMPLETED CIVIL WORKS STRUCTURES**

1. Purpose.

This regulation provides the policy, defines the objectives and responsibilities, and establishes the procedures by which the Corps of Engineers assures the safety, continuing structural integrity, and operational adequacy of its major Civil Works projects.

2. Applicability.

This regulation applies to all HQUSACE elements, major subordinate commands (MSC), districts, and field operating activities having responsibility for Civil Works projects.

3. References.

- a. Federal Guidelines for Dam Safety, dated June 25, 1979.
- b. Federal Power Act (41 Stat. 1063, U.S.C. 791-823), 10 June 1920, as amended (FPA).
- c. Water Resource Development Act of 1986, PL 99-662.
- d. AR 335-15, Management Information Control System.
- e. ER 1110-2-101, Reporting of Evidence of Distress of Civil Works Projects.
- f. ER 1110-2-110, Instrumentation for Safety - Evaluations of Civil Works Projects.
- g. ER 1110-2-111, Periodic Safety Inspection and Continuing Evaluation of USACE Bridges.
- h. ER 1110-2-1150, Engineering and Design for Civil Works Projects.

i. ER 1110-2-1156, Dam Safety - Organization, Responsibilities, and Activities.

j. ER 1110-2-1942, Inspection, Monitoring and Maintenance of Relief Wells.

k. ER 1130-2-339, Inspection of Local Flood Protection Projects.

l. ER 1130-2-419, Dam Operations Management Policy.

m. EM 1110-2-1908, Instrumentation of Earth and Rock Fill Dams.

n. EM 1110-2-2002, Evaluation and Repair of Concrete Structures.

o. EM 1110-2-4300, Instrumentation for Concrete Structures.

p. ETL 1110-2-231, Initial Reservoir Filling.

q. ETL 1110-2-346, Structural Inspection and Evaluation of Existing Welded Lock Gates.

r. ETL 1110-2-351, Structural Inspection and Evaluation of Existing Spillway Gates.

s. Policy Guidance Letter (PGL) No. 39, Responsibilities for Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R), dated 13 November 1992.

4. Policy.

a. Civil Works structures whose failure or partial failure could jeopardize the operational integrity of the project, endanger the lives and safety of the public or cause substantial property damage shall be periodically inspected and evaluated to ensure their structural stability, safety,

and operational adequacy. This policy will be accomplished as follows:

(1) The inspections and evaluations shall be supported by appropriate instrumentation programs that provide the timeliness and level of accuracy needed for evaluations under all operating conditions. During periods when a reservoir will be above the maximum pool of record or above a threshold level established from past performance, an appropriate team shall be dispatched to the dam to monitor and evaluate performance. A report of performance outlining the findings and evaluation shall be prepared and submitted to the MSC for review within 30 days after the event. Special inspections shall be performed during and immediately after any unusual loading events. Evaluation reports shall provide a basis for initiating timely remedial or rehabilitation measures.

(2) For those facilities constructed by the Corps and turned over to others for operation and maintenance, the operating entity is responsible for periodic inspection and evaluation. The Corps may conduct the inspection and write the report, on behalf of the Project Sponsor, provided appropriate procedural and financial reimbursement arrangements are made. The inspection will be conducted in accordance with appropriate guidance contained in the operation and maintenance manual for the facility and in accordance with applicable portions of this regulation. In the future, although the Project Cooperation Agreements (PCA) will include language on the inspection responsibilities, the operating entity shall again be notified, at the time of its acceptance of the structure, of the inspections and observations considered appropriate and its consequent responsibilities. Dams built by the Corps and turned over to others for OMRR&R shall have, in the O&M manual, requirements that the Corps will conduct the first and second inspections and/or first filling inspection in accordance with this regulation. See ETL 1110-2-231 for the initial reservoir filling and surveillance plan. This is to insure design/construction quality. See Policy Guidance Letter No. 39, dated 13 November 1992 for Corps and sponsor responsibilities. Under PL 99-662, Section 103, j(2)(B), the government may terminate or adjust the rights and privileges of the non-Federal interest to

project outputs under the terms of the agreement. See structural flood model PCA, Article VIII, Paragraph B and Article XIV.

(3) Under the authority of ER 1130-2-339, the Corps, at government expense, will participate in the inspection of a sponsor operated and maintained structure (e.g., local flood protection project) with the operating entity to assure that the operating entity is conforming to the requirements of the PCA, the agreed upon inspection program, and operation and maintenance program.

(4) In cases where the ownership of major elements of a project is divided between the Corps and other organizations, government or municipal, the Corps will inspect those features of the non-Corps elements which could adversely affect the stability, safety, or operation of the Corps-owned portion of the project. This includes features not constructed by the Corps.

(5) Non-Federal dams located upstream of a Corps project may have a substantial bearing on the safety of the Corps project. When structures of the Corps project are inspected, it may be appropriate to evaluate the safety of the upstream non-Federal dam(s) and to ascertain operational procedures or emergency situations which could make excessive demands on a Corps project. These structures should be inspected when their failure could cause overtopping of the Corps project and the upstream dam is not regulated by the Federal Energy Regulatory Commission (FERC) or by an active State Dam Safety Program. Every effort should be made to encourage owners of such projects to comply with the National Dam Safety Guidelines.

(6) Federally owned dams (non-Corps) on a military installation may have a substantial bearing on the safety of life and could endanger downstream property. The Corps may inspect such dams upon request from the installation having ownership or control of the facility. The inspections and reports shall be accomplished on a cost reimbursable basis. This policy extends to non-Federally owned dams on a military installation where the safety of life and Federal property is in jeopardy if a failure should occur. These inspections shall be performed and

documented in the same manner as the Corps dams.

b. It is essential that the Corps maintain institutional knowledge and technical expertise in the disciplines related to dam design and safety. An important component of this knowledge is gained by the conduct of periodic inspections by district engineering, construction, and operations personnel. Many "lessons" are learned over a long period of dam observations and analyses. These lessons are then applied by the multi-disciplinary inspection team to the design, construction, operation, and maintenance of existing and future projects. Since Districts must remain fully responsible for all decisions made as a result of the inspection program (the decisions are governmental functions that may not be contracted), it would be inappropriate to fully contract the inspection program. On the other hand, where manpower constraints exist, inspections may be augmented by contracts. Care must be taken to maintain in-house capability for the on-site conduct of the program and continue to keep the involved disciplines (design, construction, and operations personnel) fully integrated in project inspections.

5. Program Implementation.

Periodic inspection programs shall be established on the basis of project size, importance, or the potential hazard they present. MSC commanders are responsible for program management and oversight. District commanders are responsible to implement the requirements of this regulation.

a. Frequency of Inspections. Periodic inspections shall be conducted as outlined below:

(1) Dams and Appurtenant Structures. The guidance for developing the interval of inspections for dams and appurtenant structures is set forth in the following subparagraphs. This guidance does not preclude other intervals of inspection as the situation or structural integrity warrants, nor does this preclude the surveillance plan for the initial filling of Corps reservoirs as prescribed by ER 1110-2-1150 and ETL 1110-2-231.

(a) Initial Periodic Inspection. The first periodic inspection and evaluation of a new earth

and rock-fill dam shall be carried out immediately after topping out and prior to impoundment of the pool. The initial inspection of concrete dams shall be accomplished immediately prior to impoundment of reservoir water.

(b) Second Periodic Inspection. The second inspection for new earth and rock-fill dams shall be made at a reasonable stage of normal operating pool. The second inspection of concrete dams shall be made when the reservoir water attains the normal operating pool. In either case, no later than one year after initial impoundment has begun.

(c) Subsequent Periodic Inspections. Subsequent inspections for concrete structures, and earth/rock-fill dams and embankments will be made at one-year intervals for the following four years, at two-year intervals for the next four years and then extended to five-year intervals if warranted by the results of the previous inspections.

(d) Intermediate Inspections. For projects on a five-year cycle, an intermediate inspection of all or some of the features may be scheduled, if warranted. Selection shall be based on consequences of failure, age, degree of routine observation, a natural event such as an earthquake, performance record and history of remedial measures. Intermediate inspections shall also be made of any portion of a project exposed during dewatering that could not be accomplished during the scheduled periodic inspection and between periodic inspections for certain projects on a five-year cycle. A summary of intermediate inspections is to be included in the next periodic inspection report.

(e) Informal Inspections. Employees at the project are to make frequent observations of the dam and appurtenances and of operation and maintenance. The purpose is to identify and report abnormal conditions in accordance with training instructions and guidance. Any unusual conditions that seem critical or dangerous should be reported immediately using proper procedures and channels.

(2) Navigation Structures. The guidance for developing the interval of inspections for dams with locks is set forth in the following subparagraphs.

This frequency is different than for flood control dams because of the levels of risk involved. Normally the risks of a navigation dam failure would be the economic consequences due to loss of the navigation pool, instead of the risks to human life in downstream communities associated with the loss of a flood control reservoir. This guidance does not preclude other intervals of inspection as the situation or structural integrity warrants.

(a) **Initial Periodic Inspection.** The initial periodic inspection of navigation projects shall be made immediately prior to flooding of cofferdams, culverts or chambers.

(b) **Second Periodic Inspection.** A second inspection of new or major rehabilitated navigation projects shall be made no later than one year after the new operating pool has been attained.

(c) **Subsequent Periodic Inspections.** Subsequent inspections are not to exceed five years, without obtaining prior approval by HQUSACE.

(d) **Intermediate Inspections.** Intermediate inspections shall be made of any portion of a project exposed during dewatering that could not be accomplished during the scheduled periodic inspection. The intermediate inspection trip reports shall be included in the next periodic inspection report.

(3) **Other Corps Owned and Operated Structures.** This includes major levees, flood walls, pumping stations, and other pertinent civil works structures. The MSC is responsible for establishing the periodic inspection intervals of these items, but they are not to exceed five years without HQUSACE approval. The inspection intervals are to be defined within the Operation and Maintenance (O&M) manual prepared for each project. Such projects designed and constructed by the Corps, but operated and maintained by the sponsor, will have the inspection intervals defined in the O&M manual.

b. **Report.** A formal technical report of inspection, entitled Periodic Inspection Report of (project name) Project, shall be prepared for permanent record, reference, and as a basis for

needed remedial work for all periodic and intermediate inspections. This report shall be based on a detailed, systematic technical inspection and evaluation of each structure and its individual components regarding its safety, stability, and operational adequacy. See Appendix A for report content, format.

(1) Inspections or routine observations indicating that the safety of a structure is in jeopardy shall also be reported in accordance with ER 1110-2-101.

(2) Inspections indicating the necessity for project modifications, repairs, rehabilitation, replacement or need for further study beyond the scope of normal maintenance shall be reported to the MSC as part of the endorsement transmitting the report. Inspection reports of conditions requiring major modification shall contain a statement as to whether studies will be pursued under authority of the Major Rehabilitation Program, or the Dam Safety Assurance Program.

c. **Report Approval Authority.** MSC commanders are delegated authority to approve inspection reports. HQUSACE approval is required for periodic inspection reports only when a specific request is made by HQUSACE that the inspection report be submitted to HQUSACE for approval due to extraordinary circumstances.

d. **Report Submittal Schedule.** A periodic inspection report requiring HQUSACE approval is to be submitted (ATTN: CECW-E) by the MSC commander as follows: inspection reports shall be submitted within 60 days after the inspection. Reports Control Symbol (RCS) is exempt based on AR 335-15, paragraph 5-2e(8). For reports approved at the MSC level, the MSC commander may establish its submittal requirements. MSC shall submit one information copy of inspection reports to HQUSACE (ATTN: CECW-E) upon the resolution or incorporation of MSC's comments. The commanders of CEPOD and CENED, as operating MSCs will insure that their approval process includes an in-depth, rigorous review, in a manner similar to higher authority oversight. The MSC commander shall complete action on all periodic inspection and evaluation reports within 60

days after the initial receipt of the report. This should include satisfactory resolution to all review comments.

e. **Obligation to Others.** In those cases where ownership of major elements is divided between the Corps and others, information pertinent to the condition of project elements owned by others, as observed by the Corps inspection team, shall be furnished to the co-owner. The district will also furnish this information to the FERC, when hydro-electric power projects are under the purview of the Federal Power Act (41 Stat. 1063, U.S.C. 791-823) 10 June 1920, as amended (FPA). Owners of such FERC licensed facilities shall be advised that the information made available by the Corps will not be presented as representing results of inspections performed for the licensee by the Corps and is not a substitute for the FERC inspection under the FPA.

6. Instrumentation.

Instrumentation is essential in evaluating the performance and will be incorporated in the project structures as appropriate to measure and monitor forces, pressures, loads, stresses, displacement, alinement, plumb and other conditions related to monitoring the structural safety and stability. The scope of the instrumentation shall be indicated in the "Instrumentation" design memorandum and updated by subsequent inspections, evaluations and performance record. See EM 1110-2-1908 and EM 1110-2-4300 for instrumentation guidance.

7. Responsibilities.

a. The engineering division of the district office will be responsible for:

(1) Formulating the inspection plans, conducting the inspections, processing and analyzing the results of the instrument observations, evaluating the condition of the structures, recommending the schedule of the next inspection, and preparing and submitting the periodic inspection and evaluation reports.

(2) Preparing an annual report which summarizes the periodic inspection and evaluation program for the 12-month period ending 30

September. The report should include the number, type and list of structures inspected and district cost of inspections including reports, average cost of inspections, and a brief narrative on the major findings of both full periodic inspections and evaluations and interim inspections. This data is required for the biannual report to Federal Emergency Management Agency (FEMA) on the Corps Dam Safety program. The report shall be submitted to the MSC office by 31 October with information copy provided to HQUSACE (CECW-EP). The FEMA report covers Federal Agency dam safety activities on a FY basis, with agency input due to FEMA in December of each odd year.

(3) Coordinating with the operations division of the district offices to ensure that sufficient funding for inspections is requested in the Operations and Maintenance, General budget.

(4) Notifying operations division personnel of the inspection for their assistance and participation. For those projects or structures being inspected for the first time, personnel from the construction division shall be invited to participate. An invitation to the appropriate State Dam Safety official to attend the inspection shall be made. If hydropower is a feature of the project, FERC should be invited. Operations division personnel in turn are to ensure that project personnel are prepared for the inspection and provide support as necessary.

(5) Forwarding the approved periodic inspection and evaluation report to the district operations division for implementation of recommendations.

(6) Ensuring that the inspection team is comprised of the expertise necessary to execute a thorough and technically sound inspection. Needed expertise may be obtained from HQUSACE, other FOAs, or by contract. HQUSACE personnel will not normally participate in inspections unless requested or when project conditions dictate. See Appendix A, paragraph 3 for further details.

(7) Maintain assurances that sponsors with OMRR&R responsibilities are performing as required under the PCA agreements.

b. The engineering directorate of MSC offices shall provide oversight and management for this program. The director of engineering is responsible for the selection and approval of structures to be included in the program and for maintaining a list of the selected projects and structures, maintaining the five-year schedule of inspections, and the status of reports and recommendations. The inspection schedule shall be revised annually, and shall contain the dates of inspections for the coming fiscal year. As a minimum, the MSC office shall:

(1) Provide representation at the first and second inspections, the inspection of high hazard structures, inspections of structures that have experienced a change in operation such as a change in the normal pool level or structures that have experienced a pool of record, inspections of dewatered structures, gates and operating equipments, and inspections of structures whose condition or performance has warranted more frequent attention.

(2) Provide the review and monitoring of data collection, processing, evaluation, and inspection activity.

(3) Determine the frequency and scope of future inspections, and maintain the inspection schedule.

(4) Establish and maintain an MSC-wide database which will include periodic inspection schedules and history of project remedial measures. The history of remedial measures that are implemented by hired labor or contract will include project deficiencies, status of deficiencies, completion dates, estimates, actual expenditures,

funding sources and priority levels.

8. Program Review.

At the end of each fiscal year, the district shall review and set priorities for the recommended actions from this program for the next budget submission.

9. Reporting Distress.

Refer to ER 1110-2-101 for procedures when reporting evidence of distress.

10. Funding.

Funding for the periodic inspection report for each project shall come from the district's fiscal year allocation for the inspection and preparation of the report. Costs incurred by Headquarters and MSCs will be funded from the General Expense appropriation.

a. Funding for the inspection and evaluation program during the period of construction shall be under Cost Code 51, Appropriation 96X3122, Construction, General. The term "period of construction" is defined as the period from the issuance of the solicitation of the first construction contract to the date the District Engineer notifies the sponsor in writing of the government's determination that construction is complete.

b. Funding for the inspection and evaluation program after the project components are placed in operation shall be under Appropriation 96X3123, Operation and Maintenance, General.

FOR THE COMMANDER:

1 Appendix
APP A - Inspection and Evaluation
Program Procedures


R. C. JOHNS
Colonel, Corps of Engineers
Chief of Staff

APPENDIX A
INSPECTION AND EVALUATION PROGRAM PROCEDURES

1. Project Documentation.

All engineering data relating to project structures inspected should be collected and permanently retained in appropriate files at the project site and available to the inspection team during the inspection. Project engineering data shall also be retained at the district office. In the absence of on site administrative headquarters, the data shall be retained at the nearest field office. These documents and drawings shall be considered as permanent engineering data, subject to retirement or disposal only upon termination of operation of the project. These data shall consist of but not limited to the following:

- a. All previous Periodic Inspection Reports.
- b. Records of inspections by project personnel and interim inspections by district personnel.
- c. Design Memoranda to include principal design assumptions and stability and stress analysis, slope stability, seepage and settlement analyses, consolidation, shear, permeability, compaction, classification tests or summaries thereof, and contract plans and specifications.
- d. Typical as-built plans, elevation, and sections.
- e. Selected as-built drawings of important project features, to include details such as instrumentation, internal drainage, transition zones, or relief wells, and reports of any special investigations.
- f. Foundation data and geological features, including boring profiles, foundation mapping, and subsurface exploration results.
- g. Location of borrow areas and identification of embankment, filter, riprap, large stone sources.
- h. Laboratory Reports:
 - (1). As-built properties of foundation and

embankment materials, such as shear strength, unit weight, and water content and classification. The number of control tests and undisturbed record sample tests should be included.

- (2). Physical, chemical, and thermal properties of concrete and concrete materials.
- (3). Summary of concrete mixture proportions and control procedures.
 - i. Identification of concrete material sources.
 - j. Construction history records, including diversion schemes and construction sequences shown on appropriate drawings.
 - k. Details of the overall instrumentation program to include predicted performance and record of actual observations, and annual updated evaluations.
 - l. Operations and Maintenance Manual.
 - m. Water Control Manual.
 - n. Copy of PCA.
 - o. Dam Safety Information:
 - (1). Project copy of "Federal Guidelines for Dam Safety".
 - (2). Emergency Action Plans – complete with the emergency identification subplan (Federal), emergency operations and repair subplan (Federal), full scale inundation maps (Federal), notification subplan (Federal and non-Federal) and evacuation subplan (non-Federal).
 - (3). Records of dam safety training for project personnel.
 - (4). Surveillance plan of the project that includes events and threshold reservoir levels that initiate observations and/or inspections and reporting procedures.

- (5). List of local contractors and construction materials available for use in emergency situations.
- (6). Physical security plan for the project.
- p. Manufacturers data for purchased items.

2. Inspection Program.

a. Initial Pre-inspection Brochure. A technical brochure shall be prepared in advance of the first project inspection in order to familiarize inspection team members with general features of the project. In as much detail as possible, this brochure shall include a technical summary of the structural, material, and foundation conditions, instrumentation data, including settlement monuments, location of instrumentation and description of reservoir operations procedures, if pertinent. Also, the brochure shall include, as appropriate, pertinent project data, layout and typical section drawings, Federal and non-Federal responsibilities for OMR&R, summaries of sub-surface soil profiles and boring logs, and the checklist developed for conducting the inspection. Pre-inspection brochures shall be completed and distributed to inspection team members at least 30 days prior to the inspection date.

b. Pre-inspection Packets. A technical pre-inspection packet shall be prepared in advance of all subsequent project inspections in order to familiarize inspection team members with general features and history of the project. This packet should include a project access map, history of project deficiencies and remedial measures, technical summaries of the structural, material, and foundation conditions, and description of reservoir operations procedures, if pertinent. Also include plots of most recent instrumentation data, including settlement monuments, and location of instrumentation. Also, the packet should include, as appropriate, project data, layout and typical section drawings, Federal and non-Federal responsibilities for OMR&R, summaries of sub-surface soil profiles and boring logs, and the checklist developed for conducting the inspection. Packets may be tailored to each discipline to avoid excessive reproduction. Pre-inspection packets shall be completed and distributed to inspection

team members at least 15 days prior to the inspection date.

c. Inspection Procedures. A systematic plan will be established for the inspection and operation of those features related to the safety and stability of the structure and to the operational adequacy of the project. Operational adequacy means the inspecting, testing, operating, and evaluation of those components of the project whose failure or failure to operate properly could impair the operational capability and/or usability of the structure. Where the operation of these components is vital to the safe operation of the project under emergency conditions, these components will be operated by emergency power at least annually. Emergency generators should be tested under load on more frequent intervals to maintain their integrity. In addition, standby emergency generating systems shall be reviewed and tested during the scheduled inspection to assure the inspection team that all critical project features can be operated under emergency conditions or in the absence of the normal source of power. The testing of emergency power should include the maximum power demand that could be expected in emergency situations. As much as possible the operation and or inspection of all the features should be conducted during the scheduled inspection. The inspection of the remaining features may be conducted during a period of 30 days before the main inspection. Inspection of project features that are best scheduled more than 30 days in advance of the periodic inspection will require notification and approval of the engineering directorate of the MSC office. If appropriate, a video of the event could document pertinent results of the pre-inspection for showing at the regularly scheduled inspection. The systematic inspection plan shall also provide as appropriate, the examination and the operation of, but not be limited to, the following:

(1) Flood and outlet control gates (including flood gates in levees or flood walls), navigation lock gates and valves, emergency closure gates and bulkheads, associated hoists and operating machinery (including safety devices such as limit switches and fail-safe interlocks), flood control pumps and related equipment, and cathodic protection systems.

- (2) Structural details of roadways, parapets, retaining walls, spray walls, building walls and floors, conduits, intake towers, bridges to gate towers, piers, monoliths, steel sheet pile features.
- (3) Concrete surfaces.
- (4) Structural cracking and deterioration of material.
- (5) Joints and joint materials, including relative movement at joints between structures or portions of structures.
- (6) Water passages.
- (7) Foundation drains, joint drains, face drains.
- (8) Spillways, spillway buckets and stilling basins and outlet channels including submerged features as necessary.
- (9) Embankment cracks, bulging, and sliding.
- (10) Condition of abutment and embankment junctions.
- (11) Vertical and horizontal alignment of the embankment or structure crest, slope, or toe area.
- (12) Unusual movement or cracking at or beyond the embankment or slope toe.
- (13) Seepage through or under embankment or abutment slopes.
- (14) Sloughing or erosion of embankment or abutment slopes.
- (15) Condition of riprap, armor or other slope protection.
- (16) Reservoir rim conditions. (Can be limited to known areas of potential concern).
- (17) Conditions of relief wells, collector pipes, inspection manholes, or other features of seepage control systems. (ER 1110-2-1942).
- (18) Conditions of instrumentation, and most

recent measurements prior to the inspection. (ER 1110-2-110).

d. A detailed checklist shall be developed by each technical specialty for each structure in order to ensure an adequate examination coverage for each feature. The facility's instrumentation shall be included in the checklist to ensure that data are regularly collected and analyzed and to ascertain whether the instruments are in a proper operating condition.

e. Photographs. In order to more accurately portray conditions and changes in conditions of surfaces and structural details, color photographs are encouraged. In addition to photographs, video film is encouraged for use in monitoring areas of concern. This is especially useful for comparing movement, water leakages, wave action, etc.

f. Examination of Deteriorated Concrete Structures. If the inspection reveals the need for any type of in-depth evaluation to determine the cause of deterioration or malfunction and to make sound recommendations for remediation, the need for the investigation shall be stated in the periodic inspection report. Guidance on repair of concrete is given in EM 1110-2-2002.

g. Steel Structures. Steel structures shall be inspected for structural and operational adequacy. Those structures involved directly in the safety of the project shall receive special consideration. ETL 1110-2-346 and ETL 1110-2-351 provide guidance for such inspection and evaluation.

h. Riprap. Material sources which have unsatisfactory performance records shall be identified, reported and eliminated from further use.

3. Composition and Qualifications of Inspection Team.

Inspection team personnel will consist of individuals qualified by experience in the project management, design, construction, and operation of the project, and of individuals with appropriate specialized knowledge in structural, mechanical, electrical, hydraulic, and embankment design, geology, soil mechanics, concrete materials, and construction

procedures. A representative(s) of the sponsor is to be invited to be part of this team. In every case, the inspection team qualifications may vary with the complexity of the facility and with the level of inspection. All team members should receive training in the inspection procedures. Training Aids for Dam Safety (TADS) modules are recommended as a minimum for each team member, as well as a thorough understanding of this ER. The dam safety office of each MSC and district is responsible for scheduling this training.

4. Inspection Report Content.

The periodic inspection report shall present the results of each general project inspection. The title of this report should indicate the name of the project, watercourse, state, project features, and inspection number and date, in that order. An example of an appropriate title is: "Beech Fork Lake Project; Twelvepole Creek, West Virginia; Dam, Outlet Works and Spillway; Periodic Inspection Report No. 1, September 1992". Report No. 1 (report of initial inspection) shall provide a general project description and present the results of the initial inspection. Reports of subsequent inspections shall be supplementary to the initial report and will be numbered sequentially with the initial report; i.e., Report No. 2 would describe inspection number 2, etc.

a. Initial Report. To the extent possible, major elements of this report are:

(1) An executive summary of the major items found in the inspection. Include a statement stating the projects ability to continue acceptable and safe operation.

(2) A general project description including layouts and typical section for the purpose of familiarization with general features of the project.

(3) List of project documents and engineering data that identifies the status and location of the project documents.

(4) Results of examination for each feature, including a statement as to its ability to function as designed and copy of the completed inspection

checklist.

(5) Evaluation and summaries of the observations and inspection of instrumentation (ER 1110-2-110) and relief wells (ER 1110-2-1942) with comparison to design predictions and actual conditions that signal changes in the structures performance.

(6) Where appropriate, statements, or exhibits summarizing the duration and frequency of spillway and control gate operations, including heads or velocities, and number of lock filling and emptying operations.

(7) Technical assessment of the causes of distress, of abnormal conditions, and evaluation of the behavior, movement, deformation, and loading of the structure and its individual components. If such assessment can not be accomplished within the time allotted to complete the inspection report, a preliminary assessment should be discussed with a plan scheduled to complete the assessment.

(8) Color photographs with an appropriate caption, including the date taken.

(9) A discussion of the deficiencies, the proposed remedial measures, with sketches if appropriate, related maintenance operations and both the cost estimates and a completion schedule.

(10) A discussion of the overall structural and individual project components stability, safety, and operational adequacy compared to its intended purpose(s) for the conditions with and without the recommended remedial measures.

(11) Recommendations should indicate the required action, proposed schedule and priority of action, and proponent. Also recommendations for the next periodic inspection, including a proposed date for the inspection, should be indicated.

(12) Views of the non-Federal sponsor on any of the above should be included (if applicable).

(13) Appendices shall include, as appropriate: pre-inspection packets; trip reports; plots of instrumentation data; inspection checklist; results of

crack surveys; correspondence that documents the performance of the project; the results of special investigations; and the status and location of the project documents required by this regulation and ER 1130-2-419.

b. Subsequent Reports. Subsequent reports shall generally follow the requirements of paragraph 5.a below, however should also include:

(1) Brief summary of past performance and problems and concentrate on the new and continuing conditions that affect or may affect the overall safety and operational capability of the structure.

(2) A discussion on maintenance and remedial activities to include materials used, application techniques, and performance shall be included.

(3) A discussion on recommended remedial measures not completed since the previous inspection report will also be included.

(4) Copies of selected drawings should be included; however, extensive reproduction of previously published drawings shall be avoided. As a minimum, a location and vicinity map which also show project access shall be included, as well as a general plan which shows each feature discussed in the report. The names and stationing shall be consistent on the drawings, narrative, and photograph captions.

(5) A summary of the projects bridge inspections that may impact project safety or access during emergency conditions shall be included. ER 1110-2-111 provides guidance on bridge inspections.

5. Inspection Report Format.

a. Reports shall generally be organized as follows:

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1. Executive Summary, including a statement regarding the projects safety status for continued operation.

2. General Statement of Inspection Program (include statement on hazard classification and report approval authority).

3. Description of the Project.

4. Brief Project Summary.

- (a) Construction conditions.
- (b) Project characteristics.
- (c) History of remedial measures.
- (d) Deficiencies corrected since last inspection.
- (e) Past deficiencies not yet corrected.
- (f) Non-Federal sponsor OMRR&R responsibilities (if applicable).

5. Inspection Results. (Reference to trip reports or appendices is not acceptable).

6. Recommendations.

Appendices

I History of Remedial Measures.

II Photographs.

III Figures.

IV Inspection Checklist.

V Summary of Inspection Notes.

VI Intermediate Trip Reports (documentation only, not to replace the narrative in the body of the report).

VII Instrumentation Data and/or Plots. Data should contain all figures since the last inspection and have sufficient background data to support the report discussion, conclusions and recommendations. Reproduce the plan of instrument locations in each report. Cross-sections showing piezometric data should show design uplift assumptions along with the current pressure line.

VIII Results of Crack Surveys.

IX Listing of the status of engineering and

operation design data, manuals, reports and correspondence as required by this regulation, ER 1130-2-419 and others as deemed necessary to provide comprehensive project documentation.

X Status of Dam Operation Management Policy (DOMP) training. (ER 1130-2-419).

b. Text. All sections and paragraphs shall be numbered and lettered and shall be on 8 1/2 by 11-inch paper with a 1-inch margin on the left side. Reproduction shall be any available process with printing done head-to-head, if possible.

c. Drawings. Drawings or plates shall normally be 8 1/2 by 11-inch with sufficient margin on the left for binding. Foldouts normally shall not exceed 20 inches. Drawings and photos may be included in the text or placed entirely in the Appendix. However, any figure or drawing in the text should support the written material.

d. Binding and cover. Reports shall have flexible paper or card stock, hidden-hinge covers with fasteners that facilitate removal and insertion of pages and drawings. Information to be on the cover will be as described in paragraph 5 above.

Also, the name of the preparing agency and the date of inspection shall be shown on the cover.

6. Distribution of Inspection Reports.

a. Six copies of those reports to be approved by HQUSACE shall be submitted to CECW-EP. The views and recommendations of the MSC commander shall be included in the transmittal correspondence. Transmittal correspondence shall also state the MSC's position on the return of copies in excess of HQUSACE needs.

b. For those reports approved at the MSC level, the MSC Commander shall transmit to CECW-EP one copy of each report including submittal and approval correspondence. The approving officer shall receive the inspection report within 60 days after the inspection is completed.

c. Upon approval of the inspection report, one copy together with a copy of all correspondence bound under the front cover, will be sent by the originating district directly to the Waterways Experiment Station, ATTN: Research Center Library, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199. A copy of the transmittal letter to WES is to be provided to the MSC.