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Project Operations
HYDROELECTRIC POWER OPERATIONS AND
MAINTENANCE GUIDANCE AND PROCEDURES
POWER REVIEW OF OPERATIONS AND MAINTENANCE

CONTENTS

<u>Paragraph</u>	<u>Page</u>
1. Purpose.....	1
2. Applicability.....	1
3. Distribution Statement.....	1
4. Responsibilities.....	1
5. Power Review of Operations & Maintenance (O&M) Program.....	3
6. Checksheets.....	4
7. Annual Hydroelectric Review.....	5
8. Comprehensive Hydroelectric Review (CHR).....	5
9. Qualifications.....	7
10. CHR Recommendations.....	8
11. Collective Bargaining Agreements.....	11
Appendixes	
A. HydroAMP Project Codes.....	12
Glossary.....	13

1. Purpose. This chapter establishes the guidance for the Power Review of Operations and Maintenance (PRO&M) of U.S. Army Corps of Engineers (USACE) hydroelectric power projects. The PRO&M Program provides periodic review of each hydroelectric power project and its associated facilities to evaluate the application and effectiveness of power O&M. This document provides practical guidance to USACE personnel who are preparing for, conducting, and following up on reviews under the PRO&M Program. To ensure consistency and accountability of power O&M throughout USACE, the PRO&M Program is conducted according to USACE Regulations, Pamphlets, Manuals and Circulars. Bureau of Reclamation Facilities Instructions, Standards, and Techniques (FIST) volumes are utilized where no USACE policy exists.

2. Applicability. This circular applies to all USACE commands having responsibilities for USACE hydroelectric power projects.

3. Distribution Statement. Approved for public release; distribution is unlimited.

4. Responsibilities. A successful PRO&M requires active participation at every organizational level. Further explanation is included under Annual Hydroelectric Review and Comprehensive Hydroelectric Review paragraphs. The following are responsibilities of the organizations and individuals involved in the PRO&M Program:

a. HQUSACE.

(1) Provide oversight of the PRO&M Program.

(2) Approve Workgroup members.

(3) Appoint the Workgroup Chair and at-large members.

(4) Publish and distribute Workgroup Chair and member appointment letters to Major Subordinate Commands (MSCs).

(5) Transmit an annual memorandum to the MSCs regarding CHRs scheduled for that fiscal year.

b. Workgroup.

(1) Approve reviewers and team leads; maintain a master list of approved personnel available for CHRs.

(2) Schedule CHRs in coordination with the National Hydropower Operations & Maintenance Practices Advisory Committee (NHOMPAC).

(3) Conduct CHRs:

(a) Appoint the Review Team in coordination with the NHOMPAC.

(b) Prepare the annual memorandum for HQUSACE to submit to MSCs to inform them of upcoming CHRs.

(c) Assist Review Teams through the review process.

(d) Coordinate, finalize, distribute, and post CHR reports.

(4) Track completion of CHR reports.

(5) Assist with AHRs.

(6) Manage oversight of recommendations (complete and incomplete) throughout USACE.

(7) Inform HQUSACE of the status of the PRO&M Program, including complete and incomplete recommendations.

(8) Maintain PRO&M Program information and documents including CHR report templates and checksheet templates.

(9) Initiate revisions to existing documentation and develop new documentation, as applicable.

(10) Develop and facilitate PRO&M Program training.

(11) Maintain the CHR master schedule.

(12) Track and monitor the costs associated with conducting reviews.

(13) Look at emerging issues and track systemic/key issues.

(14) Collect feedback on the PRO&M Program and revise the program as applicable.

(15) Coordinate the PRO&M Program with associated USACE programs.

(16) Provide coaching, mentoring, advice, and feedback for approved reviewers.

c. Major Subordinate Commands (MSCs).

(1) Assist the Workgroup in scheduling CHRs.

(2) Issue the 120-day memorandum to the District.

(3) Ensure AHRs are conducted annually and are completed in a timely manner.

(4) Provide review and oversight of AHRs.

(5) Submit AHRs to the Workgroup once approved.

(6) Provide oversight and status update of AHR and CHR recommendations and submit them to the Workgroup.

(7) Provide training candidate recommendations to the Workgroup.

(8) MSC Hydropower Business Line Manager appoints representatives for the Workgroup.

(9) Review CHR report before finalization.

d. District Offices.

(1) Budget for the AHR and CHR as required.

(2) Respond to the 120-day memorandum.

(3) Recommend individuals for PRO&M training and shadow opportunities.

(4) Support the PRO&M program including allowing District/Project staff to serve as Review Team members, Workgroup members, etc.

(5) Provide a corrective action plan and tracking sheet updates to the MSC for the CHR findings.

e. Project Offices

(1) Complete AHRs as required.

(2) Provide funding for CHRs.

(3) Enter and track Category 1 and 2 findings in the USACE maintenance management system.

(4) Support the PRO&M program including allowing Project staff to serve as Review Team members, Workgroup members, etc.

5. Power Review of O&M Program. The PRO&M Program includes two types of reviews, the AHR and CHR. Together, these are intended to be a comprehensive assessment of the power O&M practices at each hydroelectric project. The PRO&M Program addresses the following specialty areas: (1) electrical maintenance; (2) mechanical maintenance; (3) operations; and (4) management. The PRO&M Program is not intended to include comprehensive condition assessment. It is also not intended to be a comprehensive safety review, although, safety is addressed to the degree that it is directly applicable to power O&M.

a. **Systemic Issues.** Systemic issues are those identified as a problem due to issues inherent in the overall system, rather than due to specific, individual, or isolated factors. Systemic issues may be inherent within a district, an MSC, or throughout USACE. The Workgroup identifies these issues and includes them in an annual report, which is submitted to NHOMPAC.

b. **Schedules.**

(1) **CHR Schedule.** A CHR is scheduled take place once every 6 years. The Workgroup will schedule the CHR in coordination with the MSC and ensure the review is completed in a timely manner.

(2) **AHR Schedule.** The MSC will ensure the AHR is completed each year a CHR is not required.

c. **Funding.**

(1) **Review Costs.** Funding for CHRs and AHRs is the responsibility of the project. CHR costs applicable to specific projects (i.e., site visit travel costs; and labor for pre-visit preparation, site visit, and report preparation) are funded by a direct charge process so that a project only pays for a review in the year that it is conducted.

(2) **Reviewers from Other Agencies.** At times, reviewers from other agencies may be used to strengthen the review; they are also direct funded by the project.

(3) **Shadow Costs.** Labor and travel costs of shadows are provided by the shadow's duty station. Sometimes, shadows from other agencies attend the reviews with permission of the Review Team Lead and Site Review Coordinator; these shadow costs are the responsibility of those agencies.

(4) **Observers.** On occasion, agency representatives or other individuals (e.g., Power Marketing Agency representatives, customers, HQUSACE Hydropower Business Line Manager, etc.) may attend a CHR as an observer. These costs are covered by those agencies or the applicable offices. The MSC, in coordination with the Review Team Lead, will approve all observers.

(5) **Estimated Costs.** Estimated costs of reviews vary according to the size of the facilities being reviewed. Size category definitions, classification of specific reviews by size, and estimated costs are provided by the Workgroup.

6. **Checksheets.** The checksheet is the most important review tool and forms the foundation of AHRs and CHRs. The checksheets differ for each type of review, but they all cover the four specialty areas. Electronic checksheet templates will be provided by the Workgroup. AHR checksheets may be requested by a Review Team in preparation for or during a CHR. Preparing checksheets for a CHR can be very time consuming, so adequate time and personnel should be allotted for the task.

7. Annual Hydroelectric Review.

a. Scope. The intent of the AHR is to ensure that projects meet minimum requirements of power O&M practices through self-reviews. Specific items, including systemic issues, are identified in the AHR checksheet templates.

b. Frequency. AHRs are conducted on an annual basis, excluding years when a CHR is performed.

c. Responsibility. AHRs are coordinated and directed by the MSC and conducted by project personnel. Personnel involved in the AHR must have an understanding of one of the four specialty areas.

d. Review Documentation. AHR documentation includes the checksheet; a short summary report, if needed; and a written status of progress on recommendations from previous CHRs. The MSC will submit the documentation to the Workgroup.

8. Comprehensive Hydroelectric Review.

a. Scope. The CHR serves as an extensive O&M review of power facilities in the electrical maintenance; mechanical maintenance; operations; and management specialty areas. CHRs can identify and highlight systemic problems and successes within a district, an MSC, or throughout USACE.

b. Frequency. CHRs are conducted at each project every 6 years.

c. Responsibility. CHRs are coordinated and directed by the Workgroup in coordination with the MSC. Reviewers involved in the CHR must be approved by the Workgroup in the specialty areas they are reviewing.

d. CHR Team. CHRs are conducted by a Review Team appointed by the Workgroup, which consists of reviewers and shadows. Each team includes a reviewer for each of the specialty areas; one of the reviewers will also serve as the Review Team Lead. Reviewers conduct their specialty area of the review, prepare recommendations, and draft their report sections. For smaller facilities, some specialty areas may be combined for efficiency (e.g., one reviewer covering both operations and management). Additional reviewers may be added for very large projects or where multiple projects within a geographical area are combined. The following describes the responsibilities of Review Team participants.

(1) Review Team Leads. The Review Team Lead will be selected by the Workgroup from outside the MSC being reviewed. The Review Team Lead performs these duties in addition to those of a reviewer:

(a) Leads the Review Team through all phases of the review including acquiring and distributing drawings, checksheets, and other data.

(b) Provides the cost estimate of the review to the MSC Hydropower Business Line Manager.

(c) Works with the Site Review Coordinator to develop the agenda and ensure that the onsite visit meets the needs of the Review Team and project personnel.

(d) Facilitates the CHR report preparations, making sure the Review Team understands the report template, editing the report for consistency, and ensuring that any comments received are considered.

(e) Provides the final signed report to the Workgroup Chair. The Workgroup is available to assist the Lead in organizing, planning, and following up after the review.

(f) Provides shadow feedback to the Workgroup.

(2) Reviewers. The Reviewers will be selected by the Workgroup from outside the District being reviewed. Reviewers perform these duties:

(a) Conduct the review in their specialty area(s)

(b) Draft their report sections, including recommendations.

(c) Mentor shadows during the review

(d) Provides shadow feedback to the Review Team Lead.

(3) Shadows. A shadow participates fully in a review, working with a reviewer and fulfilling duties as assigned. Shadows should have technical expertise in the specialty area they are reviewing. Generally, shadows are chosen from outside the district being reviewed.

e. Site Review Coordinators. The MSC must ensure an individual is appointed to be the Site Review Coordinator to help facilitate the CHR. The Site Review Coordinator works with the Review Team Lead to coordinate logistics and ensure that all aspects of the review are accomplished, including collecting and transmitting drawings, checksheets, and other required data.

f. Coordination.

(1) 120-Day Memorandum. No less than 120 days before the onsite CHR, the MSC Operations Chief will transmit the 120-day memorandum to the District Chief, Operations Division. A template will be provided by the Workgroup.

(2) Conference Call. A month before the CHR, the Review Team Lead will conduct a conference call between the Review Team, the Site Review Coordinator, MSC Hydropower Business Line Manager (BLM) and other interested parties to discuss onsite visit logistics and any outstanding items.

g. Data Submittal. The Review Team must receive requested drawings and data at least

3 weeks prior to the site visit to have adequate time to study them.

h. Briefings. The Review Team will conduct an in-briefing upon arrival to orient the team and project personnel. The review agenda and safety requirements will be discussed at this time. Upon completion of the onsite review, an exit briefing must be conducted with the project to discuss the preliminary CHR findings. The District Operations Chief, District Hydropower BLM, the MSC Hydropower BLM and other interested parties will be invited to participate in the briefings.

i. CHR Report.

(1) A formal report must be prepared detailing the findings of the CHR. Review Team participants and Workgroup Chair will sign the report. A standard report template will be used to facilitate this process and will be provided by the Workgroup.

(2) An initial draft report will be submitted to the MSC Hydropower Business Line Manager, District POCs and the Project for review within 30 days after the end of the review. Review comments are due to the Review Team Lead 14 days after receipt of the report. The Review Team will consider, address and provide response to all review comments.

(3) A final draft report will be submitted to the MSC, District and Project for review within 75 days after the end of the review. Review comments are due to the Review Team Lead 14 days after receipt of the report. The Review Team will consider, address and provide response to all review comments. The MSC should be satisfied with the final draft report after the Review Team has addressed all comments otherwise Paragraph 8-11 e., Dispute Resolution, will be used to address any unresolved issues.

(4) Final CHR reports will be submitted to the Workgroup Chair within 120 days after the end of the review. The Workgroup Chair will issue the final CHR report to the MSC within 30 days of receipt. The MSC Operations Chief will endorse and distribute the final CHR report to the District.

(5) All issued reports will be posted.

9. Qualifications. Review Team participants are required to have the following: technical expertise in one of the four specialty areas; a thorough knowledge of applicable requirements and respective standards; and the interpersonal skills needed to work effectively with project personnel. Review Team members must have completed requisite safety and occupational health training to carry out their duties (e.g., if entering permit-required confined spaces [PRCS], they must have PRCS training). The specific qualifications for each type of Review Team participant are as follows:

a. Shadow. Must have attended the PRO&M Training Workshop.

b. Reviewer. In addition to shadow qualifications, reviewers must have met the following qualifications:

- (1) Participated as a shadow of a reviewer in at least one review and received a recommendation from the reviewer and the corresponding Review Team Lead.
- (2) Received a recommendation from the MSC Hydropower Business Line Manager.
- (3) Received approval from the Workgroup.

c. Review Team Leads. In addition to reviewer requirements, Review Team Leads must have met the following requirements:

- (1) Performed at least one review and received a recommendation from their Review Team Lead.
- (2) Received a recommendation from the MSC Hydropower Business Line Manager.
- (3) Received approval from the Workgroup.

10. CHR Recommendations. Recommendations are made based on deficiencies identified while the Review Team is onsite. The Review Team will recommend an action to correct each deficiency identified. Recommendations should be clear, concise, limited to one deficiency, and achievable. Bundling deficiencies under one recommendation are not allowed. Recommendations cannot be made concerning project staffing.

a. Categorizing. Recommendations resulting from a review fall into one of the following categories:

- (1) Category 1. Category 1 recommendations involve the correction of severe deficiencies where immediate and responsive action is required to ensure the following:
 - (a) Structural integrity (operating equipment necessary to prevent catastrophic failure).
 - (b) Compliance with legal or regulatory requirements:
 - i. Power-related safety practices (necessary to protect the life or health of employees, visitors, or the public).
 - ii. Entities regulating power system reliability/stability (e.g., NERC Regional Reliability Organization, etc.).
- (2) Category 2. Category 2 recommendations cover a wide range of deficiencies where action is needed to:
 - (a) Prevent or reduce further damage.
 - (b) Preclude possible structural failure or operational disruption.
 - (c) Meet mandatory requirements of safety, management, operational, maintenance, or industry standards.

(3) Category 3. Category 3 recommendations are considered to be sound and beneficial suggestions to improve or enhance O&M.

b. Collaboration. Prior to making a recommendation, the Review Team should be in ongoing discussions with the project regarding the proposed recommendation. The project may have information that was not available to the reviewer. Before determining that a recommendation should be categorized under Category 1, the Review Team should have discussions and reach a consensus to ensure consistency with the Category 1 definition.

c. Numbering. A unique identifying number will be assigned to each recommendation resulting from a CHR. The identifying number defines the Project (see Appendix A), calendar year of the review in which the recommendation is made, followed by C for comprehensive; a letter designating the specialty area of the recommendation; the category of the recommendation; and a unique, sequential identifier (e.g., A, B, C, etc.).

(1) Specialty Area Designators. The following specialty area designators are used to sort data (e.g., for deferred maintenance reporting):

- (a) E = electrical maintenance.
- (b) M = mechanical maintenance.
- (c) O = operations.
- (d) G = management.

(2) Example. The identifying number for the first Category 2 mechanical maintenance recommendation at project XXX resulting from a CHR conducted in calendar year 2015, is XXX-2015C-M-2-A. The second Category 2 mechanical maintenance recommendation from this same review would be XXX-2015C-M-2-B, and so on.

d. References to Standards. Category 1 and 2 recommendations must be substantiated by a reference to a standard. A standard cited in a Category 1 or Category 2 recommendation should provide as much detail as reasonable to allow the specific requirement(s) to be located (e.g., FIST 6-1, Sec. 9.3.D, Engineer Manual [EM] 385 1-1, etc.), and it should be in effect at the time of the review. Category 3 recommendations should refer to a sound best practice when one is applicable.

e. Dispute Resolution. Before final approval of the CHR report, every effort will be made to resolve disagreements regarding report findings or recommendations informally between the Review Team, Site Review Coordinator, District and MSC staff. Where disputes cannot be resolved at this level, the Workgroup Chair in coordination with the MSC Hydropower BLM will advise the National Hydropower BLM who will make a determination.

f. Tracking. All CHR Category 1 and Category 2 findings will be tracked in the USACE Maintenance Management System; Facilities Equipment and Maintenance system

(FEM).

(1) An individual work order is required for each Category 1 and Category 2 finding. The following fields must be entered in each work order::

(a) The local work type field must be Power Review.

(b) Enter the following in the description field: Power Review Finding: Unique Identifying Number. (e.g. Power Review Finding: XXX-2015C-M-2-A)

(2) The status of a recommendation is identified by one of the following:

(a) APPROVED - This status includes recommendations that have not been started but are ready to begin execution of the remedy.

(b) IN PROGRESS – This status indicates the recommendations are actively being worked.

(c) CLOSED - This status includes those recommendations for which all work has been accomplished to rectify the deficiency found during the review and the proper documentation and coordination has occurred to complete the recommendations.

(d) CANCELLED - This status includes those recommendations that a subsequent Review Team recommends for deletion based on sound technical judgment or changes in conditions or standards.

g. Completing Recommendations.

(1) Category 1. Based on the severity of the deficiency and condition at the time of the review, the Review Team may prescribe an appropriate timeframe for completing the recommendation. Suggested remedial measures are discussed at the exit briefing and included in the CHR report. Within 30 days following receipt of Category 1 recommendations, the Project will provide plans and a schedule for completing them to the District Chief, Operations Division, MSC Hydropower Business Line Manager and the Workgroup Chair.

(2) Category 2. Within 180 days following receipt of Category 2 recommendations, the Project will provide plans and a schedule for completing them to the District Chief, Operations Division, MSC Hydropower Business Line Manager and the Workgroup Chair. Category 2 recommendations are encouraged to be acted upon as soon as possible following receipt of the CHR report.

(3) Category 3. Category 3 recommendations are to be considered prior to the next AHR.

(4) Recommendations for District Office Resolution. Some recommendations are directed to the District Chief, Operations Division, for resolution. These are usually systemic in nature, affect more than one facility, and require technical investigations or policy decisions.

11. Collective Bargaining Agreements. Collective bargaining unit (union) agreements must be observed and respected while conducting a PRO&M. Since collective bargaining agreements vary from location to location, it is the responsibility of the project management to ensure that all union considerations are addressed. All Review Team participants must abide by local agreements.

FOR THE COMMANDER:

A handwritten signature in black ink, appearing to read 'J. Dalton', written over a horizontal line.

JAMES C. DALTON, P.E.
Director of Civil Works

1 Appendix
(See Table of Contents)

APPENDIX A
HydroAMP Project Codes

<i>PLANT CODE</i>	<i>PLANT NAME</i>	<i>PLANT CODE</i>	<i>PLANT NAME</i>	<i>PLANT CODE</i>	<i>PLANT NAME</i>
ALT	ALLATOONA	EUF	EUFAULA	LMN	LOWER MONUMENTAL
ALF	ALBENI FALLS	FTG	FORT GIBSON	MCN	MCNARY
BRK	BARKLEY	OFP	FORT PECK	MLF	MILLERS FERRY
BEA	BEAVER	OFR	FORT RANDALL	195	NARROWS
OBB	BIG BEND	FOS	FOSTER	NOR	NORFORK
BCL	BIG CLIFF	OGA	GARRISON	OOA	OAHE
197	BLAKELY MT	OGP	GAVINS POINT	OHK	OLD HICKORY
BON	BONNEVILLE	GPR	GREEN PETER	OZK	OZARK
BB	BROKEN BOW	GRF	GREERS FERRY	PHI	PHILPOTT
BUF	BUFORD	HST	HARRY S TRUMAN	RDW	RD WILLIS
BLS	BULL SHOALS	HTW	HARTWELL	RFH	RF HENRY
CRT	CARTERS	HCR	HILLS CREEK	RBR	RICHARD B RUSSELL
CHL	CENTER HILL	IHR	ICE HARBOR	RSK	ROBERT S KERR
CTM	CHEATHAM	JPP	J PERCY PRIEST	SRB	SAM RAYBURN
CHJ	CHIEF JOSEPH	JST	J STROM THURMOND	SMF	ST MARYS FALLS
CLC	CLARENCE CANNON	WDF	JM WOODRUFF	STS	ST STEPHENS
CDH	CORDELL HULL	JDA	JOHN DAY	STK	STOCKTON
CGR	COUGAR	JHK	JOHN H KERR	TBR	TABLE ROCK
DHL	DALE HOLLOW	KEY	KEYSTONE	TKF	TENKILLER FERRY
DAR	DARDANELLE	LRL	LAUREL	TDA	THE DALLES
187	DE GRAY	LIB	LIBBY	WFG	WALTER F GEORGE
DEN	DENISON	LGS	LITTLE GOOSE	WBF	WEBBERS FALLS
DET	DETROIT	LOP	LOOKOUT POINT	WPT	WEST POINT
DEX	DEXTER	LOS	LOST CREEK	WHT	WHITNEY
DWR	DWORSHAK	LWG	LOWER GRANITE	WLC	WOLF CREEK

Glossary.

h. 120-Day Memorandum. A memorandum provided no less than 120 days before the CHR that notifies the project that a CHR will be performed. The memorandum identifies the review team members, funding requirements and information to be provided by the project in advance of the review.

i. Annual Hydroelectric Review (AHR). A type of PRO&M that is performed on a hydroelectric power project annually. This is a self-review performed by project personnel.

j. Checksheet. A template that is used for capturing data during an AHR or CHR. The checksheets vary for each type of review (see paragraph 8-5). The checksheets identify requirements (e.g., a task, test, etc.) that must be done in order to comply with a particular standard (e.g., USACE, FIST, Occupational Safety and Health Administration, Institute of Electrical and Electronics Engineers, North American Electric Reliability Corporation [NERC], etc.). There is also a Met/Not Met column to indicate whether that requirement was fulfilled; those that are not fulfilled are also referred to as deficiencies.

k. Comprehensive Hydroelectric Review (CHR). A type of PRO&M that is performed on a hydroelectric power project once every 6 years. This is a comprehensive review performed by the Review Team.

l. National PRO&M Workgroup (Workgroup). A national team consisting of members from each Major Subordinate Command (MSC) that operates and maintains hydropower projects. The workgroup assists with oversight and facilitation of the PRO&M Program.

m. Review Team. A team that conducts the CHR. Review Teams consist of workgroup approved reviewers and shadows. Each team includes an approved reviewer for each of the specialty areas; one of the approved reviewers is also the Review Team Lead.

n. Shadow. Shadowing is an effective means of training personnel new to the review process, increasing the number of reviewers and improving the overall quality of the program. A shadow participates fully in a review, working with an approved reviewer and performs aspects of the review as assigned.

o. Specialty Area of O&M (specialty area). The following four specialty areas are covered by a PRO&M: electrical maintenance, mechanical maintenance, operations, and management.