

**Facilities Instructions,
Standards, & Techniques
Volume 1-2
(Formerly Power O&M Bulletin No. 10)**

**OPERATIONS
AND
MAINTENANCE IMPROVEMENT PROGRAM**

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Engineering Division
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*The Appearance of the Internet Version of This Manual
May Differ From the Original, but the Contents Do Not*

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

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NOTE 1: This document has undergone a complete revision, therefore, there are no visible indications as to where revisions occurred. It is recommended that you review entire document.

NOTE 2: Underlining indicates that greater emphasis is required.

INTRODUCTION AND PURPOSE

General Guide

This bulletin summarizes current policies for power operations and maintenance improvement. Effectiveness of the improvement program should constantly be evaluated and substantial modifications of the material given here can occur. Consequently, information in this bulletin is to be considered as a general rule and may be superseded by subsequent correspondence and supplemented by individual project needs.

Need for Incident-free Performance

The modernization programs and applications of new technology has produced significant changes in operational modes and increased complexity of systems. With emphasis on automation and remote control, personnel are experiencing less direct contact with equipment and are becoming less familiar with its operation. Unfamiliarity and reduced contact creates greater potential for misoperation of equipment. Consequences of misoperation or misuses are now multiplied due to expanded systems interconnections and increased public scrutiny of mistakes. One small mistake by an individual may have impact on electrical service in several states.

Program Objective

Experience has shown that a percentage of system outages have been the result of human incident. Since the consequences of these incidents can be very costly either in terms of equipment damage, lost revenue, or jeopardy to life and property, it is necessary to place emphasis on a program to eliminate or reduce all incidents. The objective of this program is incident-free performance throughout the Bureau of Reclamation through adequate training, improved communications, and adequate facilities.

Attaining Incident-free Performance

It is recognized that in systems as large and complex as today's water and power facilities, it may not be realistic to expect that all O&M incidents can be eliminated. However, by using incident-free performance as a goal, and every incident demonstrating the need for a solution to a problem, and by diligent pursuit of these solutions, the frequency of incidents can be reduced. It has been possible in given areas to attain incident-free performance over prolonged periods. A very practical

objective is to attain incident-free performance for the day at hand and to plan for incident-free performance the next day. In this way, a long record of outstanding performance can be attained. Primary factors involved in attaining incident-free performance include: (1) an effective review whereby results are evaluated and incidents discussed; (2) adequacy of facilities and active pursuit of needed corrective measures; (3) adequacy of operating instructions; (4) an active training program for O&M personnel; (5) individual motivation to give required thought, care, and action; and (6) improved design process which could eliminate equipment or procedural deficiencies prior to O&M activities.

Implementation of Program

The individual effort of every member of the O&M team is required to insure successful implementation of the operations improvement program. This bulletin is intended to briefly discuss the essentials of the most important facets and to guide individual initiative.

REVIEW OF ADEQUACY OF FACILITIES

Objectives

This review should be carried out with three major objectives: (1) to locate and eliminate, if possible, all potential "trigger" or "operating booby trap" situations which could initiate equipment outage or endanger personnel; (2) to modify facility designs and/or operating procedures to prevent or minimize outages; and (3) to develop operating procedures for reliable communication which will expedite the restoration of normal service should a misoperation occur.

Items For Review of Facilities

Continuing reviews of adequacy of system equipment by O&M personnel should include the following items:

1. Adequacy of emergency preparedness procedures.
2. Review of plans and procedures to be implemented upon the occurrence of an event with environmental impact. (Oil spill, chemical contamination, PCB spill, etc.)
3. Actual relay settings for primary and backup relays to determine whether field settings agree with current records and if any temporary changes have been

made that require future action or whether new settings should be made in view of changed conditions.

4. Operators' instructions for procedures to be followed during emergencies. Such emergencies include loss of major generating units, power system disturbances, and incorrect functioning of any one or series of protective relays.
5. Underfrequency load-shedding or separation schemes.
6. Procedures for system restoration plan.
7. Adequacy of communications and accuracy of telemetered information during system outage conditions involving high or low frequency, abnormal voltage, and other unusual conditions.
8. Adequacy of station service power supply immediately after a major shutdown and for subsequent startup. Need for additional sources of emergency station-service supply and/or changes in circuit design to provide remote indication of critical equipment (such as breaker position) during outages. Black start: (a) requirement, (b) capability and (c) procedures.
9. Governor action and effect of droop setting following load rejection with respect to hunting and frequency control. Causes of abnormal consumption of the energy in governor oil tanks.
10. Review of performance of supervisory control and data acquisition (SCADA or PMSC) systems during system disturbance.
11. With increasing complexity of control equipment and diverse modes of operation of this equipment, it is more important than ever that standard nameplates for relaying, control, and switch identification be adhered to at all stations. Also, arrangement of devices on the control board to conform to standard arrangements shown by standard drawings prepared in the Denver office should be adhered to insofar as possible. Standard drawings are available for typical control board panels, such as for generators and other major equipment (see appendix A). A periodic review of existing nameplates should be conducted to ensure that:
 - a. Nameplates are located so that they are readily visible and so that each nameplate will identify the item of equipment for which it is intended without any doubt.
 - b. Nameplate engraving with high contrast and location are consistent for similar equipment.

- c. Control switch operation and escutcheon engraving are consistent for similar equipment.
- d. Normal lighting adequately illuminates nameplates.
- e. In locations where permanent emergency lighting has not been provided and it is a critical piece of equipment, provision should be made for portable emergency lighting and proper maintenance procedures.
- f. Nameplates, switch escutcheons, and mimic buses conform to standard drawings.

REVIEW OF ADEQUACY OF OPERATING INSTRUCTIONS

SOP'S (Standing Operating Procedures)

To minimize incidents, it is necessary to initiate and sustain a program at all projects having power facilities to periodically review and update SOP's for each major facility. The Regional Director's authority in this program emphasizes the importance of such action, and this support is shown by his annual certification (approval) of operating instructions for each facility in that Region. Copies of certified operating procedures are kept at the appropriate installation for reference, training, and use during emergencies, A copy is kept in the project and/or regional office for review of adequacy and up-to-date status of instructions, and in the Division of Engineering, D-8450, Denver, for review of program implementation.

Contents of SOP'S

SOP's are based on DOC's (Designers' Operating Criteria prepared in Denver), manufacturers' literature, engineering drawings, and regional and project procedures. They should include, among other items, instruction as to relays which must be blocked or removed from service while performing switching, sequence of switching operations, use of alternate communication facilities, information on operation of major equipment, etc. For SOP outline and preparation refer to "Power Facilities Supplement for Guide for Preparation of Standing Operating Procedures for Bureau of Reclamation Dams and Reservoirs." Copies of this publication are available from Project Operation Services Staff, D-5140.

Periodic Review of Instructions

Review of instruction given in SOP's and regional supplements to FIST Vol. 1.1 should be conducted at least annually to assure that the documents are complete and up to date. As discussed above, SOP's shall be annually certified as being current by the Regional Director.

TRAINING OF O&M PERSONNEL

Need For Training

More advanced designs of generators, transformers, and breakers, and associated automatic, semiautomatic, and remote supervisory control equipment are being installed in Reclamation stations; therefore, operating problems are becoming more complex. Uninterrupted service is a necessity, as even a brief outage of electrical service may result in considerable loss to some power consumers as well as loss of revenue and prestige to Reclamation. Only skilled and well-trained personnel can perform the tasks necessary for efficient, economical, and safe operation of facilities. A continuing training program will assist our O&M personnel in becoming better informed, more alert, and more safety conscious.

Training of Operators and Switchmen

As new personnel are employed to assist experienced operators, it is essential that they not only receive basic training regarding equipment, but also have the opportunity for training which will qualify them to fill more responsible positions as these become vacant. As plants and facilities become more complex, it is desirable that key operating positions be filled by employees who have a background of experience and training. The most efficient and experienced operators should be advanced in the Reclamation's organization to the positions of operating supervisors as they develop operating skills and gain background experience and knowledge in operations.

Three separate and distinct training programs are carried on concurrently for operating personnel to improve their knowledge of the operating principles of the electrical and

mechanical facilities and to prepare them for advancement to more responsible positions:

1. Training of Inexperienced Operating Personnel

Each project is responsible for training of new or inexperienced operating personnel and for the continued training of experienced operating personnel in its area. A series of lessons entitled, "Training Course for Power Operating Personnel" is available upon request to the Division of Engineering, D-8450, Denver, to assist project staff in this training. The lessons range in subject material from operation of hydraulic turbines to operation of interconnected systems and reflect equipment and practices in use Reclamation-wide.

Each lesson has been designed for self-study to assist inexperienced operating personnel in learning specialized subjects and challenge their attentiveness with a short test at completion. The lesson titles are:

- I Hydroelectric Power
- II Hydraulic Turbines
- III Governors for Hydraulic Turbines
- IV Alternators - Alternating-Current Generators
- V Alternating-Current Generator Components
- VI Alternating-Current Generator Excitation
- VII Alternating-Current Generator Excitation Control
- VIII Synchronization and Load Control
- IX Substations, Transformers, Circuit Breakers, and Regulators
- IX-A Substations, Transformers, Circuit Breakers, and Regulators, Con't.
- X Protective Relaying

- XI Transmission Lines and Their Operation
- XII Interconnected System Operation

Test and answer sheets are included separately for administration by local supervisors.

2. Operator Refresher Program

Refresher training of experienced plant operators is provided at the Western Area Power Administration (Western) Electric Power Training Center, (EPTC), Denver. This training is composed of two parts: (1) a series of brief lecture-discussion reviews of power system emergency considerations, power flow effects and methods of compensation, and other system-equipment relations, and (2) extended sessions of practice and demonstration on operating procedures, proper clearance procedures, and the effects of faults and equipment failures. All practice and demonstration sessions use the powerplant-transmission system simulator for "hands-on" realism.

It is desirable that prospective participants study the lessons described in Section 1. above and

	<u>Author</u>	<u>publisher</u>
Basic Math for Electrical, 5th Edition	Singer	McGraw-Hill
Electricity 1-7, 2nd Edition	Mileaf	Sams

Prospective participants should also know the fundamentals of basic mathematics including simple algebra, ratio and proportion, square and square roots, and right angle trigonometry before attending the training center.

3. Switching Operations Training Program

Each project is responsible for continuing training, certification, and recertification for all O&M personnel who perform switching operations in Reclamation facilities. Switching shall be performed only by authorized and certified personnel, and in the manner prescribed by FIST Vol. 1.1 "Power System Clearance Procedures." All Reclamation and foreign (non-Reclamation) personnel who perform switching operations in Reclamation facilities shall be initially certified to perform this work by instruction at each station to which they are assigned normal switching duties. During emergencies, this certification shall in no way restrict the use of certified switchmen at stations where they are not certified. Switchmen shall be trained and examined annually to verify that their knowledge of required procedures is complete and correct.

Annual recertification of switchmen is required and lists of qualified switchmen shall be updated as required by FIST Vol. 1.1 for each station where switching is performed.

Training, certification, and annual recertification of switchmen is the responsibility of each project. Annual examinations are prerequisite to certification for each switchman and shall include two segments: (1) written question-answer test, and (2) physical performance of a switching procedure. Recertification may be accomplished throughout the region on a continuing basis as dictated by the time available for this activity; however, recertification of all O&M personnel (Reclamation and foreign) who switch in Reclamation facilities shall be accomplished within a 1-year period, and each regional office should be aware of progress of this program through periodic reports on at least a quarterly basis. Specific reporting procedures will be arranged between the region and each field office. The examination shall preferably be given by members of the local operations staff as authorized by each region and shall include the following:

a. Question-answer written test. A list of questions covering switching procedures and FIST Vol. 1.1 requirements will be used. A sample list of questions is given in figure 1 for your information or use; however, actual questions used are left to the judgment of each project to apply to specific equipment or particular problems which may have arisen. The answers from switchmen may be given verbally or be written and may be given as closed book or open book examinations at the discretion of the local operations supervisor. The objective is to be sure that each switchman knows the correct answers to all questions.

b. Physical performance. Each switchman shall be given a switching program to perform in a station and shall be accompanied by the examining official. The switching program may be set up specifically for certification purposes or may be a program required routinely for facility operation. The objective is to be sure the switchman has a feel for, and adequate knowledge of, operation of the type of equipment he is certified to operate.

The examining official should conduct the examination in a manner conducive to discussion of problems with the switchman to assure that there are no misunderstandings and that the spirit of teamwork is enhanced. It may be necessary that all or portions of the examination be repeated with a particular employee to be sure that objectives of the certification program are achieved. If the individual does not meet the certification date plus 60 days, they will be suspended from switching duties until certified.

O&M Training Meetings

In addition to the formalized training outlined above, each project is responsible for carrying out an operations improvement training program whereby certified SOP's and

regional supplements to FIST Vol. 1.1 instructions are emphatically brought to the attention of all O&M personnel engaged in operations. Classes should periodically be held among them to assure that all concerned with operations understand this operations improvement program and the necessity and benefits to be gained. Teaching and reviewing basic fundamentals of proper operation with foremen, journeymen, and inspectors in operation, maintenance, and construction activities are of prime importance. Emphasis should be placed on discussion and understanding of relay and device function sheets for each station.

Reporting of O&M Training Meetings

A record of all O&M training meetings held should be made. A monthly report of progress on the operations improvement program; is desirable to inform regional management of progress being made. In order to provide uniformity in reporting training classes, use of a form similar to that shown in [figure 2](#) is suggested. Each regional office should maintain up-to-date records of training accomplished. Since it is often convenient and appropriate to combine operations improvement meetings with safety meetings, a consolidated report covering both of these phases of training is acceptable. When a meeting is held to cover both phases of training, it is important that each phase be given individual emphasis and that neither phase is neglected. Meetings covering both phases of training may be held as a part of regularly scheduled safety meetings or toolbox meetings. Safety meetings shall be held as provided in paragraph 365.2.7 of the Reclamation Instructions.

Training Aids and Subjects for O&M Meetings

Training aids that may be used for discussion purposes during O&M training meetings include SOP's, [FIST Vol. 5.2](#), FIST Vol. 1.1, DOC's, individual instruction manuals, one-line diagrams, manufacturer's instruction books on equipment, emergency operating procedures instructions, relay and device function sheets, catalog information, movie films, bulletins, tapes and slides. Material covered typically requires a minimum of 1 hour per meeting. The following list of subjects may be helpful in selecting material to be covered:

1. Review of electrical one-line diagrams is an essential part of the training program to keep O&M personnel from becoming "rusty." It serves to refresh their memory on the layout of the electrical switching facilities and keeps them familiar with any changes that have occurred. It is desirable for all personnel who do electrical switching to be capable of drawing, from memory, one-line diagrams of the switching facilities for which they are responsible. The diagrams should be drawn using standard symbols and include the buses, transformers, regulators, circuit breakers, disconnect and bypass switches, potential transformer, current transformers, capacitors and reactors on all major

circuits. Similar emphasis should be placed on high energy mechanical and hydraulic systems re: piping schematics or linkages.

2. Discussion of any incident/miscue summary reports for other projects. These reports should be studied and discussed to familiarize O&M personnel with circumstances surrounding operating incidents and equipment problems and draw attention to similar conditions which may exist at their own facilities. This is helpful in keeping operating personnel at all levels alert and aware of the importance of establishing a record of incident-free performance and sharing expertise and experience throughout Reclamation.

3. Instructions on operation of equipment can advantageously be given by a veteran member of the O&M staff having responsibility for the equipment. Instructions on the following topics are desirable: clearance and associated procedures, circuit breakers and associated relay operations, disconnecting switches, sectionalizing switches, ground switches, load break switches, gang-operated switches, potential transformers, potential devices, current transformers, power transformers, capacitor banks, batteries, battery chargers, gates, valves, turbines, unit waterways, generators, governors, station service systems, heating and ventilating systems, compressed air systems, drainage systems, equipment checks, reports and logging, communications, fire protection and annunciators. Personal safety should be emphasized in all discussions and instructions including coverage of Reclamation O&M Safety Standards (ROMSS).

4. Discussion of operating procedures including: responsibility of operators, switchmen, prearranged clearances, emergency clearances, numbering of switches, and safety rules.

5. Discussions of dispatching substation operations including: Special control switches, breaker indicating lights, precautions to be observed when synchronizing, reclosing relays, restoring service to loads, transmission loop and radio operation controlling lines, communications, switching order, substation and special reports, substation operating procedures, carrier-current relay functions, various types of relays, step-by-step procedures for testing various pieces of equipment, operating procedures for those transmission lines under the direct supervision of the dispatcher in the area, operating procedures for those transmission lines under local supervision in the area, and operating emergency procedures for the larger stations.

SWITCHMEN CERTIFICATION EXAMINATION QUESTION-SAMPLE

1. What is a Clearance?
2. What is the difference between a Clearance and a Hot Line Order?
3. When is a Clearance required?
4. At what stage of construction is a Clearance required?
5. Who can issue a Clearance?
6. Who is eligible to obtain a Clearance?
7. Who determines what persons shall be certified to perform switching?
8. What is the procedure for applying for and releasing Clearance?
9. What are the responsibilities of the holder of a Clearance to the other workmen working under his Clearance?
10. What must be done if the holder of a Clearance must leave the jobsite?
11. What is the procedure for obtaining and releasing a Hot Line Order?
12. If a PCB opens automatically after a Hot Line Order has been issued and hot line work is progress, what procedure will be followed?
13. What work, other than hot line maintenance, can be performed without a Clearance?
14. What must a switchman do before operating the switch that is indicated a^s the next step on the switching program form?
15. How are Clearances issued when foreign system workmen must work on or near USBR facilities?

Figure 1. Switchmen certification examination questions.

OPERATIONS IMPROVEMENT PROGRAM

Region _____ Project _____

Work Team _____ Date of Class _____

From _____ To _____ Hours _____ Meeting Place _____

Instructor _____ Title _____

Personnel Attending:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

ENTER UNDER APPROPRIATE HEADINGS SPECIFIC ITEMS COVERED

1. **Safe Clearance Procedures.** _____

2. **Standing Operating Procedures.** _____

3. **Switching Instructions.** _____

Figure 2. - Training report.

4. **Operations Improvement Reports.** _____

5. **Incident/Miscue Review.** _____

6. **Unscheduled Outages and/or Emergency Conditions.** _____

7. **Instructions Presented on Matters Covered Other Than Above.** _____

8. **Remarks.** _____

Figure 2. - Training Report, Continued

Signature	Title	Date
-----------	-------	------

Branch Head or Chief	Date
----------------------	------

Division Head or Chief	Date
------------------------	------

In duplicate to: Regional Director _____

Attention: _____

Figure 2. - Training report - continued.

TRAINING OF CONSTRUCTION PERSONNEL

Need

Several incidents have occurred which emphasize the need for greater coordination between construction and O&M forces. Close coordination of these activities is essential for the safety of personnel, protection of our facilities, and uninterrupted operation of facilities. Responsibility for coordinating these activities rests equally on construction and O&M supervisors.

Materials

Reclamation requirements and procedures relating to such activities are available in the following publications:

Construction Safety Standards

Standard Specifications Paragraph C-250, Safety Precautions in Energized Substations and Switchyards, including Special Work Permit, PO&M 169

FIST Vol. 1.1, Power System Clearance Procedure

Reclamation O&M Safety Standards

Comprehensive Construction Training Program

These publications are readily available, and personnel are generally acquainted with the procedures and safety requirements pertaining to their respective operations. However, it is evident, in reviewing the incidents which have occurred, that construction and O&M personnel are not always knowledgeable of the operation procedures and safety provisions pertaining to work performed by others which can and often do affect their own activities. An example is the power system clearance procedures, covered in FIST Vol. 1.1. Construction personnel engaged in work on, or adjacent, to energized facilities are required by Section 28 of the Reclamation Construction Safety Standards to be familiar with these procedures in order to coordinate their activities with O&M and to carry, on the construction with optimum safety.

Training Program

In order to ensure that construction personnel are thoroughly familiar with the power system clearance procedures and the safety requirements pertaining to these activities, the following training program shall be initiated and sustained. Construction engineers supervising work on or adjacent to energized facilities shall initiate and conduct a training program to familiarize their inspection personnel with the clearance and safety procedures contained in the following publications: FIST Vol. 1.1; standard specifications paragraph C-250, "Safety Precautions in Energized substations and Switchyards," and other pertinent specifications requirements. They shall coordinate these training efforts with the respective O&M staffs, particularly covering the review of clearance and other procedures set forth in FIST Vol. 1.1. Such training, while necessarily brief, shall be thorough and conducted on a formal and continuing basis.

Additionally, the pertinent provisions of the Construction Safety Standards should be reviewed, as well as the use of the Special Work Permit, PO&M 169. The training should include attendance of classes at the worksite to review operating instructions and existing conditions at that location.

Implementation

Following the initial training of construction inspectors, the training should be given to construction inspectors newly assigned to the worksite. In other words, no one should be assigned to inspection work of this type without previously taking the training. Contractor supervisors responsible for performing work adjacent to energized facilities should attend these training sessions. A record shall be kept of such training, together with the names of those having completed the training. The Regional Directors are requested to administer the program and to assist in the initiation of this training, keeping the Denver Office, Division of Safety and Division of Engineering, advised of their progress.

TRAINING OF NON-RECLAMATION PERSONNEL

Need for Training

Incidents have occurred in Reclamation facilities which have resulted in injuries or death of employees of other agencies (Federal or private) while working on the agency's equipment. Reclamation has many installations where employees of non-Reclamation agencies have access to Reclamation facilities where their equipment is located. Examination of accidents involving non-Reclamation personnel working inside Reclamation stations shows that non-Reclamation personnel involved often were not

following basic safety procedures. Disregard for safety precautions on the part of non-Reclamation personnel could eventually seriously affect Reclamation personnel and equipment located at the same facility. Further, complacency or failure on Reclamation's part to initiate appropriate action to correct the situation would have an adverse impact on industry's opinion of Reclamation's competence in power operation. While the non-Reclamation agency has the responsibility for the safety of its personnel, Reclamation has a duty to control access to its facilities to assure that work is accomplished or supervised by persons who have demonstrated the knowledge and competency to work safely at energized facilities.

Training Format

To achieve this goal, each region has been instructed to initiate a cooperative training program to limit access of non-Reclamation O&M personnel to Reclamation stations to those personnel who have been examined and trained as follows, or who are accompanied by and under the constant supervision of an employee who has been trained and examined as follows:

1. Instructed in the safety and operating requirements set forth in the Reclamation O&M Safety Standards and in FIST Vol. 1.1.
2. Familiarized with the physical layout of Reclamation's portion of the facility and Reclamation's SOP for the facility.
3. Familiarized with the interconnection of Reclamation and non-Reclamation equipment in the stations, with emphasis on unusual switching procedures or inherent "booby traps" in equipment.
4. Examined and found to be knowledgeable in the above procedures and competent in his field.

In lieu of the above, the non-Reclamation agency may have a system to certify personnel using other materials approved by Reclamation as meeting our requirement.

Such training and examination is also required of all Reclamation O&M personnel concerned with work on or near energized equipment and for non-Reclamation employees who operate Reclamation equipment.

OPERATIONS IMPROVEMENT REPORTING SYSTEM

Purpose of Reporting

Station inspections, routine operation and maintenance functions, and operating incidents ranging from incidents to near misses may all disclose a need for improvement in operating and maintenance practices or equipment installation and/or design practices. Also exceptional performance or recognition of an imminent problem in the operations arena should be documented and circulated if other Reclamation projects can benefit from the information (see figure 3). The purpose of this program is to allow the entire Reclamation to benefit from the experiences and expertise of each project. Distribution of the information received in this system to the appropriate operations and/or design organizations will result in a safer and more efficient operation of Reclamation's facilities.

Reports

The Special Recognition report (see fig. 3) should be filled out and transmitted to (1) provide recognition for a special act, process, or procedures and (2) allow the benefits of the idea to be shared by all Reclamation facilities. The Incident/Miscue reports shall be submitted on Form PO&M 171, "O&M Improvement Reporting System," to the Division of Engineering, Code D-5200, Denver Office, with a copy to the appropriate regional director (see fig. 4). The reports should contain sufficient detail to permit an understanding of the problem encountered and any recommended solutions for it, but should not contain confidential detailed information regarding operating incidents (such as names, locations, and equipment numbers). Distribution of PO&M-171 is optional and should be completed if it is felt that the incident provides benefits to other projects or has significant local consequences.

Use of O&M Improvement Reports

O&M Improvement Reports may indicate the need for:

1. Changes in operations or maintenance procedures
2. Further training of personnel
3. Changes in design practices
4. Changes in installation procedures

The reports should be used to identify problem areas, determine constructive solutions, and to inform other who may encounter similar problems. The Division of Engineering will distribute the information from the reports to the appropriate offices in Reclamation and will also prepare an annual summary of the reports.

SPECIAL RECOGNITION

Region:

Date: (Mon/Day/Year)

Location:

Employee(s) Involved:

Name:

Title:

Describe what they did, found, corrected:

Describe the Benefits: (Did it save equipment damage, prevent a potential unsafe condition, correct and improper procedure, provide more efficient operation?)

Supervisor's Signature

FTS Number

Copy to: D-5200, Regional Office

EMPLOYEE INCIDENTS

Purpose of Reporting

Every incident or miscue indicates a need for improvement in some respect. To promote improvement in operations and maintenance procedures, each incident must be reviewed and reports prepared. To profit from such experiences, it is necessary to analyze existing problems and study recommended solutions. Written reports are intended for this purpose.

Definitions of Employee Incident

It is essential that the definitions of incidents be sufficiently clear to permit meaningful analysis of problems. The use of standard definitions will promote uniformity and minimize inequities among regions. Toward that end, the definitions on PO&M-171 have been developed.

Formation of Review Boards

In cases of major incident involving personal injury, loss of life, serious damage to equipment or major system breakup, a review board shall be appointed by the Regional Director or higher authority and shall include a member from the Division of Engineering, D-5200, Denver Office. In all other cases, it is recommended that a project-appointed review board of one to three members conduct the investigation and write the reports, including statements covering actions already taken or recommended that will aid in preventing similar recurrences. In the case of incidents of a minor nature, it may be more effective if the project-appointed review board consists of local participants such as the plant superintendent, foremen, and co-workers of the individual involved in the error. Project safety and personnel staff members should be used as required in an ad hoc advisory capacity.

Need For Prompt Attention

It is essential that all incidents/miscues receive prompt attention, action, and response by the review board. The action taken on the incident by the review board should be made available to all personnel involved as quickly as possible. Swift review promotes better understanding by the review board members of the circumstances surrounding the incident and leads more directly to the cause and solution.

Reports

Two reports are to be prepared.

1. A detailed report giving all pertinent information for confidential use within the project or region. Each responsible project or office shall maintain a complete file of detailed reports for review by the region and D-5200.

2. An Operations Improvement Report (Form PO&M-171) for submission to the Division of Engineering, Denver Office, D-5200. The report is for the annual summary and provides an overview of the effectiveness of the program Bureau-wide. This report shall also be distributed Bureau-wide when other facilities will benefit or have significant consequences.

Incident/miscellaneous reports for internal project or regional use should contain sufficient detail for effective follow through by management. The suggested format is shown in [figure 5](#). Much attention should be given to items 4C and 4D, concerning cause and solution - steps taken to improve the reliability of electric service. The operations improvement reports will be used by the Division of Engineering, D-5200, Denver Office, to prepare periodic reports for Bureau-wide distribution.

Safety Reporting

All incidents resulting in property damage or personal injury shall be reported in accordance with standard safety reporting procedures as set forth in chapter 4, part 365, of Reclamation Instructions, series 350. The report of the review board prepared for internal project or regional use should accompany the accident report and may be used in lieu of the required narrative.

MOTIVATION FOR INCIDENT-FREE PERFORMANCE

Recognition of Outstanding Performance

The preparation, thought, and diligence in performing O&M action required for incident-free performance for a sustained period of time do not come easily. Much effort is required for their attainment. Perhaps the most effective motivation of employees to do a good job is the sense of satisfaction gained in the knowledge they are doing a good job. Inherent in this is knowledge that the group's (or individual's) supervisors recognize that a good job is being done. Individuals or groups that have demonstrated outstanding work under recognized conditions of exposure should be recognized or

acknowledged by letters of commendation or by use of the established procedures of the incentive awards program (RI part 361).

Special Awards

Outstanding actions by individuals or groups to prevent or minimize a hazardous condition or major equipment damage should be brought to the attention of the Chief, Division of Engineering, code D-5200, Denver Office, for consideration of recognition at regional, Reclamation or national levels.

Award Presentation

The key to motivation with an awards program is the prestige associated with the presentation and possession of the awards. The desired effect is that each potential awardee personally feels the recognition, appreciation, and respect that the award represents. To accomplish this, the award presentation should be carefully planned with emphasis on publicity through newspapers, press releases, and internal Bureau information channels, commenting on the significance of incident-free performance of power operations on the recipients of the awards.

REGIONAL ANNUAL SUMMARY REPORT

Requirement

In order to assure management awareness and emphasis on the operating training program, an annual summary report by members of the regional staff is recommended for each attended facility in its operating area. The summary report should cover status of updating of SOP's; training in safe clearance and equipment operating procedures and SOP's; status of annual certification of switchmen; and preparation, distribution, discussion of reports of employee incidents and miscues, and discussion of reports of special recognition, and special awards. The annual summary report should be used as a management tool in each region to assure that important phases of the operations improvement program are not overlooked and to assess effectiveness of improvements and corrective measures taken. These summaries should be available on request in each regional office.

INTERCHANGE OF INFORMATION BETWEEN OFFICES

As is the case in every continuing program, new ways should be sought to sustain interest and effectiveness of the operations improvement program by introduction of fresh materials, instruction methods, or other material. It is vital that there be a continuing interchange of information and ideas between all offices concerned. Only through continuing dedicated effort on the part of all individuals involved can this type of program achieve our common objective of incident-free performance and maintain enthusiasm in the program.

O&M IMPROVEMENT REPORTING SYSTEM

REGION:	REPORT NO.:	DATE: (Month/Day/Year)	TIME:
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TYPE OF REPORT: (Check One) Operating Incident <input type="checkbox"/> Design Problem <input type="checkbox"/> Installation Problem <input type="checkbox"/> Equipment Malfunction <input type="checkbox"/> Other <input type="checkbox"/>	FUNCTION BEING PERFORMED: (Check One) Operations <input type="checkbox"/> Maintenance <input type="checkbox"/> Installation <input type="checkbox"/> Construction <input type="checkbox"/> Other <input type="checkbox"/>
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RESULT OF INCIDENT
(Check Appropriate Item or Items)

Report Definition:

Endangered the life or wellbeing of any person	<input type="checkbox"/>
Caused damage to, or failure of, equipment	<input type="checkbox"/>
Caused an unintentional system or equipment outage	<input type="checkbox"/>
Caused incorrect operation of equipment	<input type="checkbox"/>
Inadvertently caused an abnormal or dangerous operating condition	<input type="checkbox"/>
Failed to act when the need for action was indicated	<input type="checkbox"/>
Violated a rule, standard practice, or standing operating procedure	<input type="checkbox"/>
Caused the incorrect formulation or execution of a switching order	<input type="checkbox"/>
Undesired operation due to incorrect equipment installation, misadjustments, or design deficiencies	<input type="checkbox"/>
Undesired operation due to mechanical failure of equipment or tools	<input type="checkbox"/>

CAUSE OF INCIDENT OR CONDITION
(Check Appropriate Item or Items)

Lack of attention	<input type="checkbox"/>
Failure to follow a proper procedure	<input type="checkbox"/>
Lack of communication	<input type="checkbox"/>
Unfamiliar with equipment	<input type="checkbox"/>
Unfamiliar with operating procedures	<input type="checkbox"/>
Poor documentation	<input type="checkbox"/>
Improper prepared procedure	<input type="checkbox"/>
Congested area	<input type="checkbox"/>
Under pressure	<input type="checkbox"/>
Poor design	<input type="checkbox"/>
Improper equipment	<input type="checkbox"/>
Carelessness	<input type="checkbox"/>
Improper installation	<input type="checkbox"/>
Other (Explain below)	<input type="checkbox"/>

SUGGESTED FORMAT FOR
DETAILED REPORT ON EMPLOYEE INCIDENTS
(Confidential Internal Use Only)

1. Heading on Report

The heading of the report shall incorporate in the following order:

- (a) The reference, "Employee Incident."
- (b) The name of the region, project, and station involved.
- (c) The name, job title, and grade of personnel involved.
- (d) The date of the occurrence.
- (e) Incident definition, from PO&M-171.

2. DESCRIPTION OF OCCURRENCE

Give as concisely as possible in the order undernoted a comprehensive description of the occurrence. Include all relevant information which would assist in conveying a clear understanding of what took place and the reasons for it, or which would be helpful in arriving at a judgment of the correctness of the conduct of the parties concerned. **A statement such as: Inattention to job at hand, is not sufficient.**

- (a) Events leading up to the occurrence, with remarks on time available, stress, disturbing, or distracting factors.
- (b) The fault occurrence.
- (c) The results, injuries, damage, service impairment.
- (d) The restoration of service.
- (e) Supplementary diagrams and sketches as required.

3. TITLES AND DUTIES

Indicate the titles and duties of the parties directly involved:

- (a) Normal duties.
- (b) Special duties, if there was any departure from the normal during the period under consideration.

4. BOARD OF REVIEW ANALYSIS AND RECOMMENDATIONS

- (a) Reduce the incident to the simplest possible statement of what took place from a point of view of conduct, especially commendable.
- (b) Comment on the correctness of conduct and the degree thereof, and mention any extenuating circumstances.
- (c) Indicate briefly the factors that would best summarize the incident as to cause. Attempt to answer such questions as: Incident in judgment? Failure to communicate?. Better or more extensive training needed? Management action needed? Inadequate facilities? Manufacturer/Design/Construction involvement?
- (d) State corrective actions recommended in light of the causes identified in 4(c) above. (Be specific.)

Figure 5. - Suggested format for detailed report on employee incident.

APPENDIX A

Standard Drawings List

The drawings included in this list illustrate the standard arrangement of devices and nameplates used in Reclamation installations.

1. 40-D-5775 - Duplex control board - Two lines with overcurrent relays - typical instrument and relay panels
2. 40-D-5776 - Duplex control board - One line with directional overcurrent relays
Typical instrument and relay panels
3. 40-D-5777 - Duplex control board -One line with directional comparison carrier relays-
Typical instrument and relay panels.
4. 40-D-5778 - Duplex control board - Transfer breaker - Transformer differential and
bus differential relays - Typical instrument and relay panels
5. 40-D-5779 - Duplex control board - Synchronizing equipment - Typical instrument
panel
6. 40-D-5786 - Duplex control board - One line with directional comparison carrier relays
and revenue metering - Typical instrument and relay panels
7. 40-D-5790 - Duplex control board - Breaker and one half scheme with transfer tripping
relays - Typical instrument and relay panels
8. 40-D-6124 - Control board - Breaker and one half scheme with directional comparison
relays - Standard nameplates
9. 40-D-6125 - Duplex control board - One line with transfer tripping relays - Typical
instrument and relay panels
10. 40-D-6130 - Control board - One line with distance and transfer trip relays - Standard
nameplates
11. 40-D-6133 - Standard designs - Mimic bus color standard
12. 40-D-6187 - Unit control board - Control, instruments, and relaying - Standard
nameplates
13. 40-D-6234 - Standard designs - Standard nameplates