

## CHAPTER 9

### PREPARATION OF WATER CONTROL DOCUMENTS

#### 9-1. Basic Documents

a. Types of Documents. The basic documents for management of water control projects or systems of projects consist of one or more of the following:

- Standing Instructions to Project Operators for Water Control
- Water Control Plans
- Water Control Manuals
- Flood Emergency Plans/Initial Reservoir Filling Plans

b. Types of Projects. All water control projects are defined and categorized in the following paragraphs according to size and complexity in order to select the minimum amount of documentation that is needed for a given project. These projects may include lakes and reservoirs, locks and dams, controlled channels and floodways, gated saltwater and hurricane barriers, backwater projects, or large pumping plants.

(1) Type I. Type I projects are relatively small water resources projects that require closing or opening of water passageways, such as floodwalls and culverts using stop logs, sand bags, etc. Also included are uncontrolled weirs, fuseplugs and pump stations at small, non-hazardous impoundments, and small gated structures. The Engineering Division furnishes water control requirements to the Operations Division for inclusion in the O&M manual. However, the Operations Division is normally responsible after that time for any water data collection, monitoring of project conditions, operations, project integrity, and reporting to higher authority.

(2) Type II. These are relatively small water resources projects and require simple, straightforward water control procedures, such as opening or closing minor floodgates or operating stationary pumping facilities. Operation of the structures depends on hydrometeorological conditions that can be expressed in very simple terms to the project operators, such as reaching a given water level. Many of these structures are unattended and usually require a full-open or full-closure action, as opposed to graduated gate operations. Day-to-day monitoring of project conditions may not be

required.

(3) Type III. Examples of water resources projects categorized as Type III include reregulating structures, locks and dams and completely uncontrolled projects. Timely reporting of project conditions can be vital. A water control plan is needed to assure that all objectives for regulation of a project are satisfactorily met. A water control manual is needed when the project is a part of a multiproject system. Real-time water control management is the responsibility of water control managers in the Engineering Division within the appropriate District and/or Division office.

(4) Type IV. These are major water resources projects that involve complex water control procedures, regardless of frequency of use. Type IV projects may include reservoirs, lakes, major diversion structures, pumping facilities and floodways. Complexities may be due to project size, hydrometeorological impacts, discharge facilities, water control objectives, and constraints on water control. During unusual hydrometeorological conditions, the structures are normally attended and normally require water control decisions on a daily basis by water control managers in the District office. However, they may be controlled remotely by communication command systems. Extensive water data collection, hydrologic forecasting, and coordination are often required.

c. Scope of Documentation. There are several projects where water control complexity may not be sufficient to require extensive documentation of water control procedures. For this reason the scope of documentation has been scaled to match the various types of projects discussed above. Type I projects seldom require any water control documentation because of their simplicity. However, in the event it is needed, the Engineering Division furnishes the water control procedures to the Operations Division for inclusion in the O&M Manual for the project. Because of the necessity to make a clear distinction between water control procedures and physical operation, Type I projects are the only projects where water control documentation is included in O&M Manuals. Water control documentation for Types II, III, and IV projects are discussed in the following paragraphs.

#### 9-2. Standing Instructions to Project Operators for Water Control

a. "Standing Instructions to Project Operators for Water Control" are essential to ensure efficient and safe operation of the project at all times. The instructions apply to damtenders, power plant superintendents, lock masters, resource managers, etc. Any physical operating constraints should be clearly outlined to ensure

that water control features are operated in a safe manner and within design limitations during all phases of project life, including the construction phase. Particular care in this regard is exercised during initial acceptance testing of the regulating features of the project.

b. Exhibit A summarizes the information to be included in "Standing Instructions to Project Operators". These instructions must be kept distinct and separate from O&M manuals and are required for all Type II, III, and IV projects. However, the instructions should be referenced within O&M and natural disaster activity manuals, as appropriate. It is important that the instructions provide the only source of information on the regulation of projects for water control that is included in such documents. Therefore, the hydraulic and hydrologic aspects of any operation plans in O&M manuals and similar documents must be limited to the "physical operation" of structures, such as the manipulation of gates, placement or removal of stoplogs, operation of pumps, etc. Thus, the operation plans will apply to physical operation and not to water control (see Exhibit A).

### 9-3. Water Control Plans

a. General. The water control plan for a project is the principal item among the various documents discussed in this chapter. An "Interim Water Control Plan" is prepared when a project is under construction; a "Preliminary Water Control Plan" is prepared well before the time full-scale operation begins; and a "Final Water Control Plan" is prepared within 1 year after operation begins.

b. Interim Water Control Plan During Construction. To ensure that water resource projects perform safely and effectively during construction or modification, it is essential that the "Interim Water Control Plan" be prepared for Type III and IV projects. This is accomplished prior to the date alteration of the watercourse first occurs, or when the construction site becomes subject to flood damage. Interim water control plans remain in force until the project is formally accepted for full-scale normal operation and therefore are prepared prior to completing the "Preliminary Water Control Plan" for Type III and IV projects. The interim plan includes, but is not limited to, the following:

(1) a description of hydraulic features to be provided to protect the project during each phase of construction, including compliance with ER 1110-2-2901;

(2) a plan for water control management during each phase of

construction with references to the maps and plates and including identification of all water data collection stations, parameters measured, and data transmission modes, and an explanation of the method used and time required to forecast streamflow at the construction site during a flood event;

(3) identification of any special conditions during construction that may cause operational constraints;

(4) a description of the impacts of overtopping cofferdams, diversion dikes or embankments at the project site, of flooding borrow areas, and of high stages and high streamflow velocities in general;

(5) safety precautions and appropriate warning systems for potential hazards to upstream and downstream properties or residents, and plans for minimizing the adverse effects associated with partially completed relocations or incomplete flowage rights;

(6) map(s) showing each construction phase, and plan views and cross-sections of diversion dikes;

(7) plates such as discharge rating, stage duration, and flow frequency curves for natural and modified conditions, and degree of protection provided during each construction phase (discharge, stage and freeboard); and

(8) instructions to protect operators regarding constraints on the physical operation of completed or partially completed water control features of the project for interim regulation in general, and for acceptance testing.

c. Preliminary Water Control Plans. A "Preliminary Water Control Plan," pertinent data, filling schedule for storage projects, and "Preliminary Standing Instructions" are prepared at least 60 days prior to completion of construction. The "Preliminary Water Control Plan" is prepared using the outline in Exhibit B for Type III projects or in ETL 1110-2-251 (Chapter VII) for Type IV projects. The relationship with any neighboring water resource project is explained, and the plans for storage projects always include drawdown requirements. Sufficient tables and graphs are included to enable understanding of the preliminary plan.

d. Final Water Control Plans. A "Preliminary Water Control Plan" is replaced by a "final" plan for Type III projects or by a water control manual in final form for a Type III and IV project, as appropriate, within one year after the project is placed in operation.

9-4. Water Control Manuals

a. Water Control Manuals for Individual Projects

(1) Water control manuals are prepared for Type III and IV projects for two main purposes:

- documentation of the water control plan
- a reference source for higher authority and for new personnel who will become concerned with, or responsible for, regulation of the water control project

(2) A manual is prepared for each Type III and IV project as required within one year after the project is placed in operation. The primary reasons for preparing a separate (individual) manual (or appendix to a master manual) for a water control project are:

- to facilitate the use of specific information such as instructions, plates, tables, diagrams and charts for expeditious assessment of prevailing runoff events
- to aid in the water control decision-making process on a real-time basis

(3) Since the main purpose of a manual is for daily use in water control for essentially all foreseeable conditions affecting a project or system, appreciable effort should be made to prepare a usable manual. Essentially all chapters and exhibits in a water control manual should focus on full understanding of the water control plan. Descriptions of structures and water control conditions that constitute an integral part of a project, such as reregulation, pumpback or diversion facilities, should be included in the same (individual) water control manual. The water control plan for a neighboring project within the same system that is not an integral component of the subject project should be presented in a separate individual manual. The required scope of certain chapters or topics in water control manuals for individual projects may be less extensive for those projects within basins or systems where Master Water Control Manuals are either available or planned for the near future. This would be the case when hydrologic forecasting is a broad areal task that encompasses watersheds for more than one structure or project. In this case, information on forecasting may be limited in the individual project manual, with major emphasis presented in a master manual.

b. Master Water Control Manuals

(1) A Master Water Control Manual may be prepared for a system of water resource projects. Appropriate cross referencing between a master manual and appendixes (individual project manuals or plans, as required) can serve to reduce the scope of information regarding specific subjects in one of the compilations. The following subjects are well suited for detailed discussion in a master manual for a water resource system:

- climate of basin and general hydrometeorology
- hydrometeorologic network and data collection
- hydrologic forecasting
- description of the overall integrated Water Control Plan to accomplish "system" objectives
- management of water control activities

(2) The scope and complexity of the last three items above indicate when a master manual is needed for a water resource system. The extent of the first and second items, either individually or collectively, would not constitute sufficient reason to compile a master manual. All charts, graphs, diagrams and other items pertaining to individual projects are presented in the appendixes to the master manual i.e., in the individual project manuals.

c. Initial Reservoir Filling Plans and Flood Emergency Plans

(1) General. It is necessary to prepare emergency procedures for all Corps-built dams to be used in the event that critical conditions develop during the life of the project that may lead to failure of the dam or result in controlled or uncontrolled releases of water resulting in downstream damage. This concern has been directed at recognizing potential dangers, outlining what actions should be taken, and assuring key individuals are aware of their responsibilities or at least have ready access to a plan of action outlining their roles. While the Corps must be continually on the alert for signs of weakening or undue stress within our dams, there are certain critical periods/conditions during the life of a dam that warrant special attention:

- During construction after diversion.
- During construction after closure.

- During initial filling of the conservation pool and the flood control pool.
- During spillway operation, surcharge operation, and possible overtopping.
- During evacuation of the flood control pool.

(2) Plan of Action. Plans of action, for the most part, required for the above periods/conditions would be parallel and duplicate each other. Also, the basic objective of these plans is essentially the same, namely, to provide a ready reference for both Corps personnel and local authorities to identify early signs of potentially dangerous conditions and the subsequent actions to be taken including notification of key personnel, immediate corrective action, and evacuation of downstream areas, if necessary. Therefore, rather than developing a separate plan for each of the above periods/conditions, a single report should be developed to contain contingency plans that will satisfy requirements for potential critical condition occurrences.

(a) The report will contain or refer to water control plans. Water control plans, as described in Chapter 7 of ETL 1110-2-251, are primarily intended for application after the dam is essentially complete. Potential dangerous conditions could exist during project construction; consequently, ER 1110-2-240 requires that water control and contingency plans be developed for use from the date that water is stored behind a partially completed dam until the project is accepted for normal operations. Plans developed for this report may be incorporated, in part or totally, into respective water control manuals.

(b) The development of evacuation plans is the responsibility of the state or local officials. ER 1130-2-419 further requires that appropriate state and local officials be contacted to suggest that evacuation plans be developed as part of the overall dam safety program. Pertinent project information such as dam failure inundation maps should be provided to assist in plan preparation. Therefore, contingency plans may be submitted without the evacuation plans.

(c) The report should be incorporated into the project's Operation and Maintenance (O&M) Manual as an appendage, or by reference to the O&M manual, etc. Inundation maps, included with the flood emergency plans, are no longer required to be placed in water control manuals. Copies of the report should be provided to local authorities, FEMA, respective CONUS Army Headquarters, and the Governor of affected state(s).

(3) New Corps Reservoir Projects. A design memorandum on initial reservoir filling plans will be developed during early construction stages, in accordance with ETL 1110-2-231, for all new Corps reservoir projects. As a minimum, the report should address the following:

- reservoir regulations during project construction stage(s)
- water control plan
- project surveillance
- cultural site surveillance
- flood emergency plan
- public affairs
- safety plan
- transportation and communications

(4) Existing Corps Reservoir Projects. Existing Corps projects, where the maximum pool (top of flood pool) has not been experienced, should be reviewed for compliance with requirements as outlined in Paragraph (3) above. For those conditions where contingency plans have not been documented and potential danger still exists due to filling and/or impounded storage, a report should be developed outlining those plans. The document may be titled "Flood Emergency Plan" providing that additional initial filling requirements are deemed not to have significant potential impacts on the safety of the structure. However, such a determination does not preclude the "Flood Emergency Plan" from containing or making appropriate references to water control plans, project surveillance, cultural site surveillance, safety plan, transportation and communications, etc. The plans are prepared as described in "Flood Emergency Plans" 19/. A review should be made of those projects that have filled or have been nearly full to determine whether problems were experienced during their initial fillings. If the review surfaces experienced problems and if the problems are likely to reoccur during subsequent fillings, a filling plan should be developed for those potentially hazardous conditions.

#### 9-5. Format of Water Control Documents

a. General. Standing instructions to project operators, water control plans, and water control manuals are prepared using the suggested format and content shown in Exhibits A and B and ETL 1110-2-251, respectively. The chapter titles shown in ETL 1110-2-251 should be considered for all master and individual project water control manuals, even though some of the chapters may require only limited information on the subject. Topic and subtopic titles may be varied slightly to fit the project at hand.

b. Tables, Graphs, and Plates. Tables and graphs less than one-half page in size may be dispersed throughout the text as they are referred to. All remaining tables and graphs are best included with the plates in the back of the document to facilitate narrative continuity within the text, labeling them as plates rather than tables or graphs. Interrelated graphs and tables may be placed on the same plate whenever possible.

c. Use of the Terms "Regulation" and "Operation". When preparing a water control document, the term "regulation" is used to define either: (1) water control plans, procedures, and decisions that are normally determined by water control managers (hydrologic or hydraulic engineers); or (2) legal rules, agreements or contracts, e.g., Section 7 Flood Control or Navigation Regulations, FERC license, Water Supply Contracts, and Rulings of Interstate Compacts. The term "operation" is used in relation to the physical manipulation of spillway gates, outlet works or instrumentation associated with projects, insofar as practicable. Such a distinction in written form between "regulation" and "operation" will facilitate a better understanding of the water control documents.

d. Document Identity. All water control narrative instruction and related material are documented and bound under separate cover from Operation and Maintenance, Emergency Operation, and Natural Disaster Activity Manuals. This separation enables a better understanding of "water control management" and "physical operation" aspects of water resource projects.

#### 9-6. Coordination of Water Control Documents

a. General. The Division Commanders are responsible for approving water control plans and manuals (see ER 1110-2-240).

b. Coordination. Water control documents are prepared by or under the direction of water control managers in the Engineering Division. The documents are coordinated within the District and/or

Division offices and, when appropriate, with local, state and Federal agencies for "review and comment" prior to approval in final form. Water control managers in the District offices also take the initiative to maintain close contact with the Division Water Control Centers or other water control management elements during development and revision of water control documents. A checkpoint meeting may be appropriate after completing either a water control plan or manual in draft form. This applies to initial and revised plans and manuals, both for individual projects and for water resource systems.

c. Water Management Agreements. Any inter-agency water management agreements proposed by a District, such as Memorandums of Understanding, are submitted to the Division Water Control Center or other water control management element for review and approval prior to consummation. Some examples are: Section 7 Flood Control Regulations; Water Supply Contracts; Power License Contracts; Field Working Agreements; Memorandums of Understanding; and letters from other agencies, minutes of River Basin Commissions, Compacts or Coordinating Committees requesting, acknowledging or concurring in certain important or unusual aspects of the plan for water control.

EXHIBIT A

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR<sup>1/</sup>

FOR WATER CONTROL  
(largest bold type)

STRUCTURE OR PROJECT NAME  
(large bold type)

STREAM

River Basin

Exhibit \_\_\_\_\_<sup>2/</sup>

to the

Water Control Plan (or Manual)

for

(Parent Project Name)

District Office

U. S. Army Corps of Engineers

Date

<sup>1/</sup> Required for all Type II, III and IV projects (see Paragraph 9-1b).

<sup>2/</sup> Omit for Type II projects that are not in a water resource system.

Information to be Included in  
STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL<sup>1/</sup>  
(PROJECT NAME)

Type      Project

PHOTOGRAPHS OF ALL WATER CONTROL STRUCTURES (TYPE II PROJECTS ONLY)

TABLE OF CONTENTS

PERTINENT DATA

1. BACKGROUND AND RESPONSIBILITIES.

a. General Information.

(1) Reference compliance with Paragraph 9-2 of EM 1110-2-3600 and ER 1110-2-240, and state that a copy of these Standing Instructions must be kept on hand at the project site at all times, and that any deviation from the Standing Instructions will require approval of the District Commander.

(2) Identify authorized project purposes and all water control objectives.

(3) Identify chain of command and the entity to which the project operation is responsible for water control actions.

(4) State project location and brief description of water control structures.

(5) Describe constraints on physical operation of the water control structure.

(6) Include a statement as to whether O&M is by the Corps or by local interests, and a statement as to whether it is a local protection project. Reference the Code of Federal Regulations (CFR Title 33, Part 208.10) when it applies.

b. Role of the Project Operator.

(1) Normal Conditions (not dependent on day-to-day instruction). Applies to all Type II and some Type III projects.

Include the following statements..."The Project Operator is responsible for water control actions during normal hydrometeorological conditions (non-flood, non-drought) without daily instruction. However, the water control manager should be contacted any time conditions are such that consultation or additional instruction regarding water control procedures is needed."

OR...Normal Conditions (dependent on day-to-day instruction). Applies to some Type III and most Type IV projects. When appropriate, state that..."The Project Operator will be instructed by water control managers on a daily basis for water control actions under normal conditions".

(2) Emergency Conditions (flood or drought). Same as above, as appropriate, during flood events and other emergency conditions.

## 2. DATA COLLECTION AND REPORTING.

a. Normal Conditions. Instructions for collecting water data under normal hydrometeorological conditions, and instructions for reporting the water data to the District office.

b. Emergency Conditions. Same as the above during flood events and other emergency conditions. Specify more intensive requirements when appropriate.

c. Regional Hydrometeorological Conditions. State that..."The Project Operator will be informed by the water control manager of regional hydrometeorological conditions that may/will impact the structure."

## 3. WATER CONTROL ACTION AND REPORTING.

a. Normal Conditions. Specific step-by-step instructions for water control action under normal hydrometeorological conditions, taking into account any constraints on water control or physical operation, and specific step-by-step instructions for reporting the action and any unusual conditions to the water control manager.

b. Emergency Conditions. Same as the above during flood events and other emergency conditions.

c. Inquiries. State that..."All significant inquiries received by the Project Operator from citizens, constituents or interest groups regarding water control procedures or actions must be referred directly to water control managers."

d. Water Control Problems. State that... "The water control manager must be contacted immediately by the most rapid means available in the event that an operational malfunction, erosion, or other incident occurs that could impact project integrity in general or water control capability in particular."

e. Communication Outage. Specific step-by-step instructions for water control action in the event a communication outage with the water control manager occurs during either normal or emergency conditions, considering constraints.

PLATES (to support the above, use 11-inch binding edge).

a. Map of the project area showing the water control structures, streams, levees, dikes, channels, water data stations and parameters measured, with a vicinity map insert depicting the drainage area above the project.

b. Schematic drawing of the project facilities, including a plan and profile of water control structures which show key water levels (headwater and tailwater), and other pertinent information.

c. Forms for collecting water data, reporting water data, and reporting water control actions.

d. Discharge rating curves, if appropriate, with key elevations identified and a rating table inserted on the graph.

e. Water control diagrams and release schedules, if appropriate, for normal and emergency conditions, and for communication outages.

f. List of points of contact in District and/or Division office.

g. Other supporting plates, if needed.

1/ Required for all Type II, III and IV projects. Include project name and type in heading. Include water management symbol in upper left corner, and date in upper right corner of each page.

EXHIBIT B

WATER CONTROL PLAN<sup>1/</sup>  
(largest bold type)

STRUCTURE OR PROJECT NAME  
(large bold type)

Stream

River Basin

Appendix \_\_\_\_\_

to the

Master Water Control Manual

for

(Parent Project Name)

District Office

U.S. Army Corps of Engineers

Date

<sup>1/</sup> This format is used for Type III projects only (see Paragraph 9-3); i.e., when a water control manual is not prepared. Use the format of Chapter VII in ETL 1110-2-251 for Type III & IV projects; i.e, when a water control manual is prepared.

Minimum Requirements for

WATER CONTROL PLAN

(PROJECT NAME)  
Type III Project<sup>1/</sup>

PHOTOGRAPH OF ALL WATER CONTROL STRUCTURES

TABLE OF CONTENTS

PERTINENT DATA

- Information in Concise Summary Form -

1. INTRODUCTION. State the requirement for the Water Control Plan (ref ER 1110-2-240, ref Part 208.10 of CFR, Title 33, when applicable, and state as Type III project), project authorization, purpose, location, description, and completion date of the principal and related projects.
2. PROJECT FEATURES. Description of all water passageways (discharge facilities, inflow and outflow channels, etc.), related water resource projects, and all public use facilities.
3. HYDROMETEOROLOGY AND WATER QUALITY<sup>2/</sup>. Watershed description, climate, runoff, table showing average monthly precipitation in inches and average monthly runoff in both inches and cfs, water quality, design conditions, water passageway characteristics, data collection stations and maintenance of instrumentation, data collection procedure and reporting (refer to exhibit on Standing Instructions to the Project Operator), method of preparing hydrologic forecasts if done in-house, and source, access procedure and overall suitability of forecasts if obtained from NWS.

- Detailed Information -

4. WATER CONTROL PLAN<sup>3/</sup>. Overall summary of the water control plan, including objectives and major constraints, followed by: specific objectives, the regulating procedures, and the beneficial effects of regulation for each water control objective. Address the following objectives, as appropriate: flood control (include regulation for design flood), navigation, water supply, water quality, fish and wildlife, hydropower, recreation, and any other water control objectives and incidental achievements. The discussions should include examples of regulation and any constraints.

5. PROJECT MANAGEMENT<sup>2/</sup>. Project owner, role of the regulating office (water control managers, and summarize requirements for the Water Control Morning Report for the subject project); role of the Project Operator (refer to exhibit on Standing Instructions); communication between the District office and project operator; coordination with local, state and other Federal agencies, if required, and future changes to the project and the impact on water control.

PLATES (using 11-inch binding edge, label tables not in text as plates).

- a. Map and plan of project area with vicinity map insert.
- b. Plan and profile of structure clearly showing all discharge facilities.
- c. Data collection network map (designate auto-recording, auto-reporting and key control point(s)).
- d. Water Control Diagram (guide curve), with release schedule and explanatory notes, when applicable.
- e. Discharge rating curves with rating table insert (designate important related elevations).
- f. Hydrograph examples of water control regulation (inflow and outflow), with hyetographs (for floods of record and the design flood).
- g. Frequency and duration curves for headwater or pool and control point or tailwater (discharge and stage).
- h. Other plates as required for the project at hand.

EXHIBITS.

- a. Detailed Pertinent Data.
- b. Other Exhibits, as appropriate.
- c. Memorandum of Understanding or other Agreement.
- d. Standing Instructions to the Project Operator for Water Control (see Exhibit A).

1/ This format applies only to Type III projects where the scope of water management does not require preparation of an individual water control manual. However, the water control plan should be appended to the Master Water Control Manual when the project is in a water resource system. The plans and standing instructions for water control structures in the system may be prepared and submitted for approval prior to the master manual, if desired, to expedite the most essential documentation requirements. Include project name and project type in heading.

2/ Detailed presentation of these topics in the system master manual is preferred when one is prepared.

3/ See Chapter VII of ETL 1110-2-251 for further guidance.