

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

NOTICE OF REVISED EMERGENCY
ACTION PLAN GUIDELINES

(Issued February 22, 1988)

Pursuant to the authority in Section 12.22(a)(1) of the Commission's Regulations, the Director, Office of Hydropower Licensing, has revised the guidelines for the preparation of emergency action plans (EAP). The guidelines have been revised to facilitate the preparation, annual review and updating of EAP's to ensure their effectiveness and workability. The guidelines should be used in conjunction with the instructions contained in Part 12, Subpart C of the Commission Regulations.

All EAP's, except for those at government dams, must comply with the format and criteria established in the revised guidelines. Therefore, all EAP's currently on file are to be revised, as necessary, by December 31, 1988, to comply with these guidelines.

Copies of the revised guidelines are available from the Director, Division of Inspections or the Regional Director.

GUIDELINES FOR PREPARATION OF EMERGENCY ACTION PLANS

1. Purpose. These guidelines are for the purpose of defining the requirements of an acceptable emergency action plan (EAP) and for facilitating its preparation and annual testing and update. An emergency is defined as an impending or actual sudden release of water caused by an accident to, or failure of, project structures. As required by Section 12.20(a) of the Commission's Regulations, every applicant for license or licensee/exemptee must develop and file an EAP with the Regional Director unless granted a written exemption in accordance with Section 12.21(a) of the Regulations.

When the applicant is not the owner of the dam nor is otherwise responsible for the maintenance, operation and monitoring of the dam, the applicant should request the owner of the dam to cooperate with it in preparing the EAP. In the event that an owner refuses to cooperate, the applicant should prepare the EAP to the best of its ability with the information available to it and provide it to the owner. If the owner indicates that it will not implement the EAP in the event of an emergency, the applicant should provide a copy of the EAP to the State agency responsible for dam safety and explain the situation to the agency. The applicant should also advise the Regional Director of the owner's lack of cooperation.

In the event of competing applications, if one of the applicants is the owner of the dam, it is that applicant's responsibility to develop an EAP. If none of the competing applicants is the owner of the dam, then it is the responsibility of the applicant first having its application on file to prepare the EAP.

2. Background. The "Guidelines for Preparation of Emergency Action Plans" were established in November 1979. The guidelines were subsequently included as the Appendix to Order No. 122 of the Commission's Regulations, issued January 21, 1981. Then, in accordance with the provisions of Section 12.22(a)(1) of the Commission's regulation, which states that "an emergency action plan must conform with the guidelines established, and from time to time revised, ...", the guidelines were revised on April 5, 1985, to provide more specific comprehensive guidance in the development of an EAP. Although the revised guidelines established a specific format to assist in preparing an effective, workable EAP, it was not mandatory that EAP's on file prior to April 5, 1985, comply with this format.

Since that time, experience has shown that the new format provides for a more workable EAP in that it includes a notification flowchart located at the front of the EAP and more clear, concise, easy-to-read inundation maps depicting the dam break scenario. In addition, experience indicates that a need exists for a periodic

reprinting and redistribution of the Commissions efforts to improve this aspect of its dam safety program. The EAP guidelines are further revised.

3. Scope. The guidelines establish a specific format (see Item 5, pages 4 thru 26) to assist in preparing an effective, workable EAP. The format was developed to include all the pertinent information required for the EAP itself and its accompanying appendix. In providing the appropriate information, the EAP should be site specific, reflecting mode of operation, internal and external means of communication, and interaction with appropriate agencies and owners of other sites. The format should be used in conjunction with the instructions contained in Part 12, Subpart C of the Commission's Regulations.

All EAP's, except for those at government dams, shall conform with the format and criteria established in Item 5 of these guidelines. In order to ensure every EAP currently on file with the Regional Director complies with the established format, every EAP filed prior to the date of issuance of these guidelines must be revised, as necessary, to conform with the format and then be completely redistributed to all participants, with three copies resubmitted to the Regional Director, no later than December 31, 1988. Subsequently, a completely reprinted copy of the most up-to-date EAP must be redistributed to all participants, including three copies to the Regional Director, on a five year cycle (as a maximum), commencing with December 31, 1993. During the intervening years, annual updates (which are to be submitted by December 31st of each year) may be made by issuing to all plan holders only those pages that contain updated information. Nevertheless, total reprintings of the EAP on more frequent basis are acceptable and commendable.

Under the provisions of Section 12.22(c) of the Commission's Regulations, each hydroelectric project under the jurisdiction of the Commission and located within a 10-mile radius of a nuclear power plant reactor must have a radiological emergency response plan to be implemented in the event of a severe accident or incident resulting in the release of radioactive materials from a nuclear plant. The guidelines for preparation of a radiological emergency response plan (see Item 6, pages 27-28) should be used in conjunction with the instructions contained in Section 12.22(c) of the Commission's Regulations.

When a project is located at a Federal Dam, a procedure for notifying the appropriate representatives of the Federal agency of an emergency condition must be available (see Item 7, page 28). The EAP at a government dam must also include the requirement that the Commission's Regional Director be notified immediately of the occurrence of an emergency situation.

4. Major Changes to the Guidelines. The following list briefly summarizes the major changes to the April 5, 1985 guidelines:

- a: All EAPs, except for those at a government dam, must comply with the established format by December 31, 1988 (Item 3, page 2).
- b. All EAPs must then be completely reprinted and issued on a five year cycle (as a maximum) beginning with December 31, 1993 (Item 3, page 2).
- c. All EAPs shall be issued in three-ring binders (Item 5, page 3).
- d. Requirements of an EAP at a Federal dam are specified (Item 7, page 28).
- e. The table of suggested breach parameters reflect the values currently recommended for dam break analyses (Item 5, pages 23 thru 26).
- f. The inundation maps must be prepared in accordance with the criteria set forth in Appendix C of the guidelines (Item 5, pages 17-18).
- g. As an immediate follow-up to the annual test, it must be verified that each participant contacted had the most up-to-date EAP available for use during an emergency (Item 5, page 20).
- h. A critique of each annual test must be furnished to the Regional Director by December 31 of each year (Item 5, page 20).
- i. Documentation should be provided on an annual basis to ensure that all participants have received the updates to the EAP (Item 5, page 21).

5. The Format. All EAPs, except for those at government dams, are to conform to the format and criteria established on the following pages (page 4 thru 26). This format should facilitate the preparation, updating, and annual review of an EAP. It should be used in conjunction with the instructions contained in Part 12, Subpart C of the Commission's Regulations. The format was developed to include all of the pertinent information to be included in the EAP as required by the Commission's Regulations. It is important that the inundation maps conform to the criteria discussed in Appendix C of these guidelines so that they will be of sufficient scale to clearly identify all impacted areas. The initial EAP shall be submitted in a three-ring binder, whereby outdated pages or the entire EAP (every five years) can be easily removed and replaced by updated information to ensure a complete, current, and workable plan.

EMERGENCY ACTION PLAN

[Name] of Development

Project No. [FERC No.]

Name of the licensee/exemptee/applicant:

Address:

Submitted [date]

Verification:

State of [],

County of [], ss:

The undersigned, being first duly sworn, states that [he, she] has read the following document and knows the contents of it, and that all of the statements contained in that document are true and correct, to the best of [his, her] knowledge and belief.

(Name of Person Signing)

(Title)

Sworn to and subscribed before me this [day] of [month], [year].

—

(Signature of Notary Public or other state
or local official authorized by law to
notarize documents).

SEAL

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I. Notification Flowchart

- C Provide a flowchart summarizing clearly who is to be notified and who is responsible for notifying which owner representative(s) and/or public officials(s), and in what priority for the following emergency situations:
 - A. Failure is imminent or has occurred.
 - B. Potentially hazardous situation is developing. Situation where a failure may develop, but pre-planned actions taken during certain events (such as major floods, earthquakes, evidence of piping, etc.) may prevent or mitigate failure. Even if failure is inevitable, more time is generally available than in situation A above to issue warnings and/or take preventative actions.
- C Include individual names and position titles, office and home telephone numbers, and alternate contacts and means of communication.
- C The flowchart should be easy to follow under emergency conditions and should normally be limited to one page for each failure mode. Color coding may prove helpful. (Detailed information supplementing the flowchart should be provided in Section III of the emergency action plan).
- C Additional copies of the flowchart should be readily available to each individual having responsibilities thereon, and should be kept up-to-date through tests and revisions.
- C Note: A sample flowchart is included on page 9 of these guidelines.

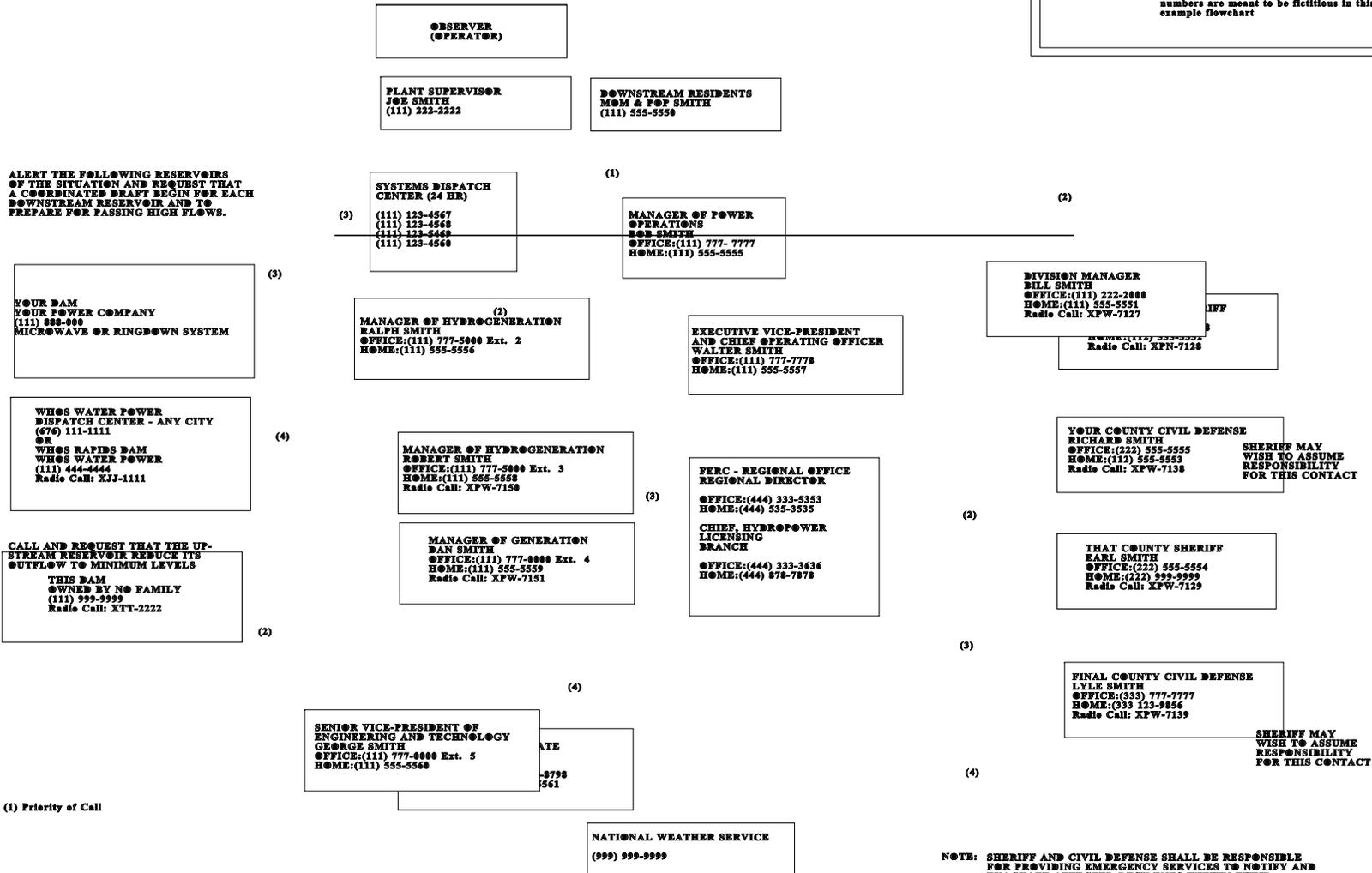
II. General Responsibilities Under the Emergency Action Plan

- C Advise the operators of the importance of the emergency action plan (EAP) and why the EAP is necessary. Describe operators duties in implementing the EAP. Give pointers on how to communicate the emergency situation to those who need to be contacted. Include samples of typical communications.

SMITH FAMILY HYDRO PLANT NOTIFICATION FLOWCHART
FERC PROJECT 99999

NOTE: This is only a sample notification flowchart. Each emergency situation should have its own flowchart showing the order of notification for that situation. Alternate measures of communication should be included in the flowchart as appropriate.

All names and telephone numbers/radio call numbers are meant to be fictitious in this example flowchart.



(1) Priority of Call

NOTE: SHERIFF AND CIVIL DEFENSE SHALL BE RESPONSIBLE FOR PROVIDING EMERGENCY SERVICES TO NOTIFY AND EVACUATE AFFECTED RESIDENTS WITHIN THEIR JURISDICTIONAL AREA.

DASHLINES ARE USED IN THE ABSENCE OF THE PLANT SUPERVISOR.

- C Describe specific actions operators are to take after implementing the EAP. For example, opening spillway gates, especially if a certain sequence is desired and opening/closing water intakes, as appropriate. Instructions for the operation of the project during the anticipated emergency should be provided.
- C Describe the chain of command. Licensee/exemptee/applicant (herein referred to as licensee) officials and alternates which must be notified should be designated and priority of notification determined. Notification of supervisory personnel on the licensee staff is desirable, if time permits. Advice may be needed concerning predetermined remedial action to delay, or mitigate the severity of, the failure. For example, a person may be dispatched to an unmanned dam during a major flood to observe and monitor the situation directly. The EAP should be coordinated with high enough levels of management to insure full awareness of organizational capabilities and responsibilities. It must always be developed as a result of coordination and consultation with other entities and agencies that will be affected by a failure, or have statutory responsibilities in warning and evacuation.
- C The person(s) authorized to notify officials should be determined and clearly set forth in each EAP. Under certain situations, such as where failure is imminent or has occurred, this authority may have to be delegated to the dam operator or local official and the responsibility should be clearly outlined in the EAP. The National Weather Service (NWS) has the general responsibility to issue flood warnings. Therefore, it may be beneficial to notify the NWS of any pending or actual dam break flooding so that its facilities could enhance warnings being issued.
- C Designate means for keeping local authorities advised of conditions at the dam. The Commission does not intend for licensees to usurp the responsibility of governmental elements for evacuation of people. However, there may be situations where routine notification will not suffice, such as a resident located just below the dam. In this case, the licensee should arrange to notify that person directly. This should be coordinated with the pertinent public officials.
- C Designate an EAP coordinator, who would be responsible for EAP related activities, including but not limited to, preparing revisions to the EAP, establishing training seminars for plant operator, coordinating the EAP test, etc. This person should be the EAP contact should any questions arise.

- C Include any other information considered pertinent.

III. Notification Procedures

- C Include in the notification portion of the EAP all persons to be notified as soon as an emergency situation develops. Include individual names and position titles, location, office and home telephone numbers, and radio communication frequencies and call signals, if available, for owner personnel, public officials, and other personnel, including alternates. For each emergency situation, clearly indicate who is to make a call and to whom it is to be made, and in what priority.
- C The number of persons to be notified by each responsible individual in the notification plan should be governed by what other responsibilities the person has been assigned.
- C Describe in detail the notification procedures for the two emergency situations:
 - A. Failure is imminent or has occurred.
 - B. Potentially hazardous situation is developing

Describe actions to be taken and contacts to be made. Priority of notification should address the actual emergency situation:

1. Detailed plan for notification

- Residents and property owners that are located immediately downstream of the dam within the boundary of potential inundation where available warning time is very limited. Give names and telephone numbers (day/night), and alternate means of communication. If not applicable, so state.

- Licensee personnel. Give names and telephone numbers (day/night) of responsible individuals and alternate means of communication.

☐ Law enforcement officials. Give names and telephone numbers (day/night) and alternate means of communication.

☐ Operators of other dams or water-retention facilities. Give names and telephone numbers (day/night) and alternate means of communication. If not applicable, so state.

☐ Appropriate Federal, State and local agencies. Give names and telephone numbers (day/night) and alternate means of communication. If not applicable, so state.

☐ Others, as appropriate. Give names and telephone numbers (day/night) and alternate means of communication.

2. Posting of the Notification Flowchart and distribution of EAP

☐ Describe where the notification flowchart for each emergency situation will be posted. It should be in a prominent location readily accessible at the project site near a telephone and/or radio transmitter. A copy of the complete emergency action plan should also be available to the operators and dispatch center personnel. (For more information, see Appendix D.1., page 21 of these guidelines)

☐ Distribute the EAP to operational and supervisory employees and others who will be required to take certain actions when the plan is put into effect.

IV. Mitigation Activities

A. General Provisions for Surveillance

C The EAP should contain a discussion of provisions for surveillance and detection of an emergency situation and should clearly indicate that it can be implemented in a timely manner. An important consideration in the effectiveness of the EAP is the prompt detection and evaluation of information obtained from instrumentation and/or physical inspection procedures.

- C Discuss time factor from actual emergency occurrence to awareness of emergency and its effect on the workability of the EAP. Timely implementation of the EAP is a crucial element in its effectiveness.
 - C Describe any other specific actions to be taken.
- B. Surveillance at remotely controlled or unattended dams (not manned on a 24-hour basis).
- C When a project is not continuously manned and failure would endanger human life or cause significant property damage, it is imperative that procedures be developed to promptly alert public safety officials responsible for evacuating residents that would be affected in the event of a project emergency. To promptly alert public safety officials of emergency conditions, a licensee's or exemptee's operators must receive a timely warning that an emergency has developed or is developing. The information received must be clear and concise so they may react with confidence and activate the emergency action plan, if necessary, without requiring personnel to visit the site to verify conditions.
 - C To meet these requirements, licensees and exemptees must install a remote surveillance system that includes instrumentation and telemetering facilities at the project site to provide a continuous reading of headwater and tailwater levels at an operations control center that is manned 24 hours a day, every day throughout the year. The system must include a computer at the operations center to monitor the data, and to activate an audible alarm whenever the rate of change of the headwater or tailwater over a given period of time exceeds prescribed limits. The alarm also should be activated if the headwater or tailwater elevations exceed prescribed maximum or minimum levels. All limits must be site specific. The limits programmed in a system must be adjustable to account for changes in headwater and tailwater levels that would occur during project operation, floods, maintenance, etc.
 - C Monitoring of the tailwater is required because it generally is more sensitive to changes resulting from a breach of the structures than the headwater. Such a system will more quickly alert operators in the control center to site conditions and help determine whether public safety officials should be notified. Since continuous readings of both

the headwater and tailwater are to be available, the operator can obtain a current reading at any time and check conditions at the site after an alarm is sounded. Provisions should be made for the alarm to sound when there is an interruption of power to, and loss of communication with, the monitoring instrumentation. When a dam tender lives close to the project, consideration also should be given to having an alarm in the dam tender's house. When power to or communication with the site instrumentation is interrupted, the project should be manned until conditions are returned to normal. Operation of the alarms should be checked periodically.

- C It is imperative that reaction time be minimized when inhabited structures are located downstream and close to the dam. When these conditions exist, special procedures should be included in the emergency action plan to notify the occupants of these structures. Local public safety officials should be fully involved in development of these procedures.
 - C Describe any instrumentation (such as audible/visual alarms, video cameras, etc.) for monitoring behavior of unattended dams and how warning systems would be implemented. Instrumentation responses should be instantaneous to facilitate immediate action by operators.
 - C Describe procedures for providing round the clock surveillance for periods of actual or forecasted high flows. It may be necessary to send an observer to the dam and not rely on the instrumentation.
 - C If this action is not applicable, so state.
- C. Response during periods of darkness
- C Describe actions to be taken to illuminate the spillway operating deck or other actions necessary to facilitate opening or closing of gates or other necessary actions. Describe emergency operation of spillway gates during power failures. Refer to F-3 of this section.
 - C Describe special procedures for contacting the proper personnel and officials.
 - C Discuss in detail expected response time.

- C Include any other special instructions to the operators.
- D. Response during periods of adverse weather
 - C Describe in detail actions to be taken. Action should be based on whether the dam is manned or unmanned.
 - C Describe methods of access (foot, boat, snowmobile, etc.).
 - C Discuss in detail expected response time.
 - C Include any other special instructions to the operator.
- E. Availability and use of alternative systems of communication
 - C Describe alternative channels of communication to be used in case of failure of the primary system or failure of other systems immediately available.
 - C Describe proper procedures to activate the alternative channels of communication. Remember that you direct these instructions to your employees.
 - C Include any other special instructions.
- F. Emergency supplies and resources
 - 1. Stockpiling of materials and equipment for emergency use or repair.
 - C Describe materials, their location and intended use. Materials should be as close as possible to the project site.
 - C Describe equipment to be used, its location and who will operate it.
 - C Describe how the operator is contacted.
 - C Include any other special instructions.
 - C If this action is not applicable, so state.

2. Coordination of flows

- C Describe the need for advanced coordination of flows based on weather and runoff forecasts. Include special instructions. Describe how the coordination is achieved and the chain of communication, including names and day/night telephone numbers of responsible personnel. The licensee is encouraged to coordinate with the National Weather Service (NWS) to monitor storms as well as the flood wave resulting from a dam break. The NWS may also be able to supplement the warnings being issued by using its own communication system.
- C Describe additional actions contemplated to respond to an emergency situation or failure at an unattended dam. Include periods of darkness, inclement weather, and non-business hours.
- C Describe actions to be taken to lower the reservoir water surface elevations. If not applicable, so state. Instruct operators on when and how this action should be taken.
- C Describe actions to be taken to reduce inflow to the reservoir from the upstream dams or control structures. If not applicable, so state. Instruct operators or other persons responsible for contact with other owners on when and how this action should be taken.
- C Describe actions to be taken to reduce downstream flows, such as increasing or decreasing outflows from downstream dams or control structures on the waterway on which the project is located or its tributaries. If not applicable, so state. Instruct operators on when and how this action should be taken.
- C Describe any other actions to be taken.

3. Alternative sources of power for spillway gate operation and other emergency uses.

- C Describe the alternative sources of power, their location, and mode of operation, and if portable, the means of

transportation and routes to be followed. Include the name and day/night telephone number of the operator.

C If this action is not applicable, so state.

4. Other actions devised to mitigate the extent of possible emergencies.

C Describe other site specific actions or conditions which in your judgment will contribute to mitigation of emergencies.

G. Other concerns and actions

C Describe any other concerns and actions to be taken.

V. Appendix

A. Description of the project

1. Provide a description of the project.
2. Provide a description of the upstream and downstream areas and topography.

B. Summary of study and analyses to determine extent of inundation

1. Identify and briefly describe the method selected to identify the inundated areas.
2. State all assumptions (including, but not limited to, reservoir inflow condition (normal or flood), temporal (time) and geometrical description of breach, Manning's "n" etc.) Several different assumptions could be made regarding the appropriate condition prevailing at the time of a dam failure.

However, it may be impractical to analyze each potential emergency which could be postulated. A fair weather dam break (reservoir at normal maximum full pool elevation, normal streamflow prevailing) is generally considered to have the most potential for loss of life. Therefore, the minimum condition to be considered is the fair weather dam break. However, failure during various flood flow conditions should be considered and should be used if they would identify special problems of flooding requiring changes and/or

additions to the notification procedures. The Commission, or its authorized representative, retains the right to require, on a case-by-case basis, an investigation of other flood flow scenarios to ensure that all communities requiring notification by local officials have been identified.

3. The domino effect - a sequential failure of a multiple number of downstream dams as a result of failure of the dam for which the emergency action plan is being prepared - must be considered on a case-by-case basis. If the assumed failure of the licensee's dam could promote the failure of any dams downstream, the licensee has the responsibility to consider the domino effect in the routing of the floodwave downstream. The floodwave should be routed to the point where it no longer presents a hazard to downstream life or property (including downstream dams). Therefore, the licensee, after assuming a hypothetical failure of its dam, should make assumptions on the possible failure downstream dams (based on engineering judgment). Generally, if the downstream dam is an earthfill dam, it would be appropriate to assume the dam would fail once it is overtopped. If the downstream dam is a concrete gravity dam, engineering judgment should be used to decide if the degree of overtopping of the dam could cause failure. If applicable, the details of domino effects should be described. If not applicable, so state.
4. Provide justification for each assumption. The assumptions made regarding the temporal and geometrical description of a breach is dependent on the type of dam being analyzed. Therefore, it is best to perform a sensitivity analysis in order to fully investigate the effects of a failure on downstream areas. Suggested breach parameters are included on page 23 thru 26 of these guidelines.
5. Provide an elevation view of the dam and indicate the assumed breach.
6. Describe special considerations (such as reservoir slope stability).
7. Provide other helpful information, as appropriate.
8. If a dam-break analysis was made, provide results of the study. Include peak discharges and elevations and key locations, floodwave travel time to critical locations, velocity of flood wave. If a

computer program was used, it may be appropriate to include a summary of the computer print-out.

9. Discuss where flood routing was terminated. It should usually be terminated where non-damaging flood levels are obtained. However, the flood routing may be terminated at a point where real-time flood warning information can be provided on a preplanned basis. (For example, if it is known that the time of failure was 12.:05, p.m. and the floodwave can be monitored, it may be possible to determine the floodwave will reach Town X at approximately 4:20 p.m.; hence, real-time flood warning information). If the flood routing is terminated before non-damaging levels are obtained, describe in detail the plan for establishing and implementing real-time flood warning information.

C. Inundation maps are required for all high and significant hazard developments unless an unusual condition exists. The requirements for an inundation map are as follows:

1. Identify the antecedent flow conditions on which the maps are based.
2. Describe how the inundation boundaries were plotted. As a minimum, show on the map and/or in a table the maximum inundation elevation and the travel time of the front of the dam break flood wave to critical locations.
3. The map should be developed at a scale sufficient to be used for identifying downstream inhabited areas within the area subject to possible danger. Inundated areas should be clearly identified. It may be appropriate to supplement the inundation maps with water surface profiles at critical areas showing the water surface elevation prior to failure and the peak water surface elevation after failure.
4. The best available topographic map should be used. The expected inundation following the assumed failure should be delineated on the map. The lines delineating the inundated area should be drawn in such thickness or form (solid line, dashed line, dotted line) as to identify the inundation limits as the main features of the map but not bold enough to obliterate houses or other features which are to be shown as being

inundated by the flood waters. Clarity is important. When plotting inundation limits between cross sections used for the analysis, the lines should reasonably reflect the change in water levels with consideration given to topographic patterns and both natural and manmade features. When inundation lines enter the area of an existing lake or reservoir, they should be so drawn as to represent an increase in the water level of such lake or reservoir. Should this increased water level overtop the dam, the appropriate inundation lines should be drawn downstream of such dam to represent expected inundation in the downstream channel up to a point where an increase in water level will no longer represent danger to life, health or property. The area between the inundation lines representing the water level may be shaded to distinguish the area of inundation. Care should be taken to select a shading which will not obliterate the background information shown on the map.

5. Describe the accuracy and limitation of the information supplied on the inundation maps and how best to use the maps. Since local officials are likely to use the maps for evacuation purposes, a note should be included on the map to advise that, because of the method, procedures, and assumptions used to develop the flooded areas, the limits of flooding shown and flood wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Actual areas inundated will depend on actual failure conditions and may differ from areas shown on the maps.
6. If inundation maps are to be shown on several pages, a map index should be included to orient the individual pages.
7. Include any other pertinent information.

D. Plans for posting the EAP and for training, testing and annual review.

1. Posting the EAP

- C An up-to-date copy of the flowchart and/or notification list should be posted in prominent locations readily accessible at the project site near telephones and/or radio transmitters. The flowchart should be posted at each phone and radio at the dam, powerhouse, and dispatch center, and at all other desirable locations. The locations of the posted flowchart should be stated in this section of the EAP.
 - C A copy of the complete up-to-date EAP should also be available to the operators and dispatch center personnel. The location of the EAP should be stated in this section of the EAP.
2. Annual training of project operators and other responsible personnel.
- C Include in this section a description of the detailed instructions to be given to the operators, attendants and other responsible personnel on how to respond properly to a project emergency. Include plans for discussing procedures to be followed through the emergency and describe the chain of command during day/night or non-business hours. Establish a schedule.
 - C Describe plans to hold refresher seminars with appropriate staff including operators. Establish a schedule.
 - C A statement on the annual training session should be included with the annual review of the EAP (see D.3, page 21). The statement on training should include the date of the training session, an attendance list of the personnel involved, and a summary of the topics discussed.
3. Annual review.
- C All aspects of the EAP are subject to periodic review and updating in accordance with the guidelines and the specific and detailed instructions contained in Section 12.24(a), (b), and (c) of the Regulations. A licensee must conduct a comprehensive review of the adequacy of the EAP at least once a year. During the review, a determination of any new

developments or other changes downstream or elsewhere will be made to determine whether any revisions to the current EAP are necessary. It is imperative that the licensee furnish the Regional Director and all other holders of the EAP updates to the EAP immediately upon becoming aware of necessary changes to keep the EAP workable. This includes revisions when phone numbers and/or name changes for Regional Office contacts.

- C Must annually furnish the Regional Director prior to December 31, with a statement that the EAP has been thoroughly reviewed and the date it was last tested, with inclusion of any needed revisions and updates or a statement that no revisions and updates or are needed. Provide all plan holders copies of all revisions. Mark pages "Revised MO/DA/YR/" and highlight revised material.

4. Test of the state of readiness.

- C Each licensee must annually test the state of training and readiness of key licensee personnel responsible for actions during an emergency to assure that they know and understand the procedures to be followed and actions required during an emergency. Such a test should include a drill simulating emergency conditions.
- C Describe the annual test. State who will be contacted, when and how. The annual test should involve a simulated drill for one of the emergency situations. Testing of remote sensing equipment at unmanned dams should be included. Coordination and consultation with local government, law enforcement officials and other organizations should be made in order to enhance the realism of the test. Their involvement is necessary to perfect the close coordination that is necessary for a successful execution of the EAP in an actual emergency.
- C Describe action to be taken.
- C State who determines if the test was successful.

- C The licensee must furnish the Regional Director, within thirty days of the date of the test, with a statement that the EAP has been tested and should include a critique of the test and any revisions or updates to the plan or a statement that no revisions or updates are needed as a result of the test. The critique should not only address concerns regarding telephone contacts, but should evaluate the time it took to complete the test and identify areas of improvement to shorten the time required to implement the EAP. The critique should also address the testing of emergency power sources, and remote surveillance systems used to signal an emergency situation. Immediately following the test, the licensee should verify that all participants had the most current EAP readily available. A verbal verification is acceptable since written documentation is to be provided by December 31, of each year. This should be documented in the critique.

- C At the Regional Director's discretion, the licensee may be requested to provide advance notice of when the test takes place so that it can be observed by FERC staff. The licensee may be directed by the Regional Director to conduct an in-depth test of its EAP procedures, to include active participation by State and local emergency preparedness agencies and licensee's personnel.

- C Copies of revisions to the EAP resulting from the annual test should be furnished to all persons to whom the existing EAP has been distributed. Mark pages "Revised MO/DA/YR" and highlight revised materials.

E. Documentation

- 1. Provide documentation of consultations with Federal, State and local agencies, including public safety and law enforcement bodies. Provide letters of acknowledgement from the contacted agencies.
 - C Letters should indicate that each agency involved understands its responsibility for alerting and/or evacuating the public in those areas within its jurisdiction.

 - C Documentation should be updated on an annual basis to ensure that all participants have received the updates to the EAP and have the most up-to-date EAP on file.

2. Provide letters or memoranda of contact
 - C Coordination is essential to ensure that local officials responsible for warning and evacuation of the public comprehend and accept their individual and group responsibilities. Participation in the preparation of the plan will enhance their confidence in the plan and in the accuracy of its components. Coordination will provide opportunities for discussion and determination of the order in which public officials should be notified, backup personnel, alternate means of communication, and special procedures for periods of darkness, inclement weather, non-business hours, etc. Differences in procedures for notification for different emergency situations should be coordinated prior to finalizing the notification plan(s).
 - C Advance preparations should include arrangements for such meeting(s) as are necessary with local and county governments, law enforcement officials, and other public officials who will be responsible for the warning and the evacuation of the occupants of the affected areas. The licensee should discuss the accuracy of the inundation maps or other means used to delineate the affected areas. Times available for response should also be discussed. Public officials to be notified and their priority of notification should be established. Special procedures should be developed for periods of darkness, inclement weather, and non-business hours.
 - C All positions critical to the execution of the emergency action plan should be covered 24-hours a day, 7-days a week. Alternative or backup personnel should be identified for all public officials to be notified. Alternative means of communication should be identified.
 - C Describe the coordination efforts. Include all letters directed by you to agencies or others and memoranda of meetings or conferences held.

TABLE 1
SUGGESTED BREACH PARAMETERS
 (Definition Sketch Shown in Figure 1)

Parameter	Value	Type of Dam
<u>Average</u> width of Breach (BR) (See Comment No. 1)	$\bar{BR} = \text{Crest Length}$	Arch
	$\bar{BR} = \text{Width of 1 or more Monoliths, usually } \bar{BR} \leq 0.5 W$	Masonry, Gravity
	$HD \leq \bar{BR} \leq 5HD$ (usually between 2HD & 4HD)	Earthen, Rockfill Timber Crib
	$\bar{BR} \geq 0.8 \times \text{Crest Length}$	Slag, Refuse
Horizontal Component of Side Slope of Brach (z) (See Comment No. 2)	$0 \leq z \leq \text{slope of valley walls}$	Arch
	$z = 0$	Masonry, Gravity, Timber Crib
	$3 \leq z \leq 1$	Earthen Engineered, Compacted)
	$1 \leq z \leq 2$	Slag, Refuse (Non-Engineered)
Time to Failure (TFH) (in hours) (See Comment No. 3)	$TFH \leq 0.1$	Arch
	$0.1 \leq TFH \leq 0.3$	Masonry, Gravity
	$0.1 \leq TFH \leq 1.0$	Earthen (Engineered, Compacted) Timber Crib
	$0.1 \leq TFH \leq 0.5$	Earthen (Non Engineered, Poor Construction)
	$0.1 \leq TFH \leq 0.3$	Slag, Refuse

Definition: HD - Height of Dam
 z - Horizontal Component of Side Slope of Breach
 \bar{BR} - Average Width of Breach
 TFH - Time to Fully Form the Breach
 W - Crest Length

Note: See page 29 for definition sketch

Comments: See Page 27-28

Comments:

1. $\bar{B}R$ is the average breach width, which is not necessarily the bottom width. $\bar{B}R$ is the bottom width for a rectangle, but $\bar{B}R$ is not the bottom width for a trapezoid.
2. Whether the shape is rectangular, trapezoidal, or triangular is not generally critical if the average breach width for each shape is the same. What is critical is the assumed average width of the breach.
3. Time to failure is a function of height of dam and location of breach. Therefore, the longer the time to failure, the wider the breach should be. Also, the greater the height of the dam and the storage volume, the greater the time to failure and average breach will probably be.
4. The bottom of the breach should be at the foundation elevation.
5. Breach width assumptions should be based on the height of the dam, the volume of the reservoir, and the type of failure, (e.g. piping, sustained overtopping, etc.).
6. For a worst-case scenario, the average breach width should be in the upper portion of the recommended range, the time to failure should be in the lower portion of recommended range, and the manning's "n" value should be in the upper portion of the recommended range. If a worst-case scenario is not used, a sensitivity analysis should be performed to fully investigate the impacts of a failure on downstream areas since the actual breach parameters will not be known. The sensitivity analysis will provide an estimate of the confidence limits and relative differences resulting from varying failure assumptions.
 - a. To compare relative differences in peak elevation based on variations in breach widths, the sensitivity analysis should be based on the following assumptions:
 1. Assume a probable (reasonable) maximum breach width, a probable minimum time to failure, and a probable maximum manning's "n" value. Manning's "n" values in the vicinity of the dam (up to several thousand feet or more downstream) should be assumed to be larger than the maximum value suggested by field investigations in order to account for uncertainties of high energy losses, velocities, turbulence, etc., resulting from the initial failure.

2. Assume a probable minimum breach width, a probable maximum time to failure, and a probable minimum manning's "n" value.
 - b. To compare differences in travel time of the flood wave, the sensitivity analysis should be based on the following assumptions:
 1. Use Criteria in a. 1.
 2. Assume a probable maximum breach width, a probable minimum time to failure, and a probable minimum manning's "n" value.

Plot the results of both runs on the same graph showing the changes in travel time with respect to distance downstream from the dam.
 - c. To compare differences in elevation between natural flood conditions and natural flood conditions plus dambreak, the sensitivity analysis should be based on the following assumptions:
 1. Route the natural flood without dambreak assuming a maximum probable manning's "n" value.
 2. Use criteria in a. 1.

Plot the results of both runs on the same graph showing changes in elevation with respect to distance downstream from the dam.
 - d. Investigations under both normal and flood flow conditions should be considered, as appropriate.
7. When dams are assumed to fail from overtopping, wider breach widths than those suggested on Table 1 should be considered if overtopping is sustained for a long period of time.

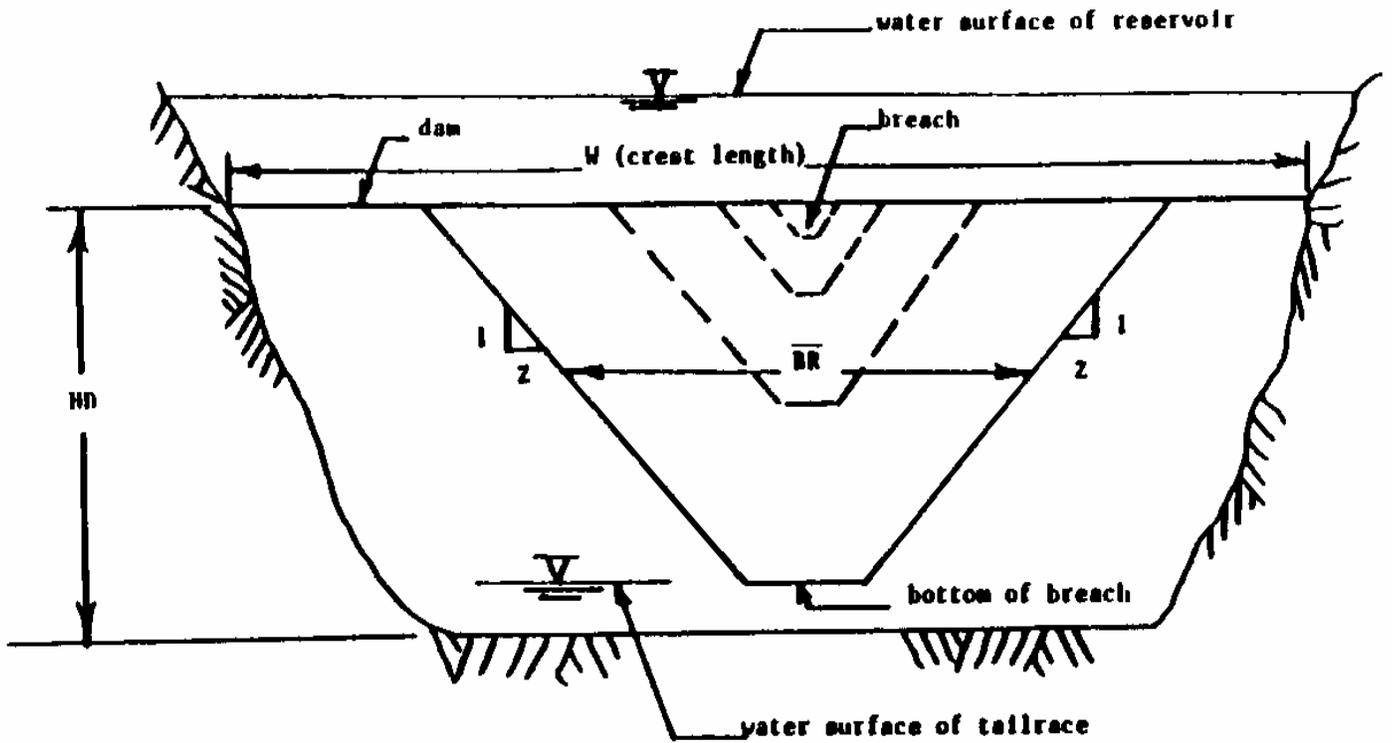


FIGURE 1. DEFINITION SKETCH OF BREACH PARAMETERS

6. Radiological Emergency Response Plan. Each owner of a hydroelectric project under jurisdiction of the Federal Energy Regulatory Commission located within a 10-mile radius of a nuclear plant licensed to operate shall prepare a radiological emergency response plan to be implemented in the event of a severe accident or incident resulting in the release of radioactive materials. A plan is required if the 10-mile radius includes any project structures such as the dam or powerhouse that are used in changing water flows, or project facilities that would be affected by radioactive materials in such a manner that would interfere with project operations. The plan will be a supplement to the Emergency Action Plan and made a part thereof. It should contain, but not necessarily be limited to:
 - A. Detailed procedures for: The evacuation of power plant personnel when advised or directed to do so by the appropriate State or local government official; setting of gate openings; continuation, curtailment or cessation of generation; coordination with, and notification of, customers, power pools, and other interconnected power suppliers; advance coordination with operators of upstream and downstream reservoirs; and/or other actions as considered appropriate.
 - B. A list of State and/or local government officials who are responsible for notification of hydroelectric project personnel that nuclear accident or incident is developing (or has occurred). This part of the plan should specifically identify the State or local government officials responsible for notifying individual(s) in the hydroelectric power plant owner's organization. It should also include provisions for keeping the owner's key personnel currently informed on the developing situation to allow timely action or response at the affected hydroelectric project. This portion of the plan should identify, if other than the officials noted above, the State or local government agency representatives authorized to direct or advise implementation of action, such as evacuation of the area, or other appropriate action.
 - C. Notification plans should be developed for alerting the following concerned individuals of proposed plan implementation. Reference can be made to the notification procedures contained in the main body of the emergency action plan if appropriate.

1. Local, State, and Federal government officials, including the FERC Regional Engineer or alternate.
2. Operators of water-related facilities.
3. Residents and owners of properties that could be endangered by the change in project operation.
4. Supervisors and other company officials.

The Radiological emergency response supplement to the emergency action plan shall be posted with the main body of the emergency action plan in a prominent location accessible to operating and supervisory personnel. Such personnel shall be familiar with their responsibilities under the plan. Training of these personnel shall be conducted to assure adequate and timely performance of their duties in the event of an emergency.

As with the other parts of the emergency action plan, all aspects of the plan are subject to continuous review and updating. At least once a year, a comprehensive review shall be made of the plan. Any revisions shall be made after consultation with Federal, State, and local agencies, and electric power producers and users, as appropriate. The need for an update shall be reported to the Regional Engineer no later than December 31, of each year.

The affected owner will be requested to file a plan no later than 3 months after the date of issuance of a license to operate a nuclear plant.

If the Regional Engineer determines that an emergency action plan is not required for the hydroelectric project, the radiological supplement shall, nevertheless, be filed. Evidence of coordination with the State or local director of civil defense, or the appropriate official responsible for emergency preparedness, should be obtained and forwarded with the plan. Three copies should be submitted to the Regional Office.

7. EAP at a Government Dam. When a project is located at a Federal dam, the licensee is to cooperate with the appropriate Federal agency in any emergency action planning which would provide procedures to be followed the case of an accident to or failure of water retaining structures or other structures under Commission jurisdiction that may affect the integrity and/or operation of the Federal project. Therefore, a documented procedure must be prepared for notifying the appropriate representatives of the Federal agency of an emergency

and should ensure that the operating personnel are familiar with these procedures. The EAP is to include the requirement that the Commission's Regional Director is notified immediately of the occurrence of an emergency situation. Also, the procedure should discuss the licensee/exemptee's responsibilities and plans to act under any EAP formulated by the Federal agency for that government facility. Three copies of the procedure for notifying the Federal agency as well as a written statement, verified in accordance with Section 12.13 of the Commission's regulation, indicating that the licensee/exemptee will cooperate in the implementation of that Federal agency's EAP and that it has instructed its operating personnel on how to respond to an emergency under the Federal agency's plan. The notification procedure is subject to the requirements for posting, training, testing and annual review and updating described on pages 18 through 21 of item no. 5 of these guidelines.