

DAM SAFETY RULES AND REGULATIONS

Louisiana Department of Transportation and Development

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Department of the Army Corps of Engineers

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National Research Council

Committee on the Safety of Existing Dams

United States Committee of Large Dams

Association of State Dam Safety Officials

PREFACE

The Public Works and Flood Control Directorate of the Department of Transportation and Development serves as the Water Resources agency for the State of Louisiana, providing engineering and technical support for the orderly planning and development of programs and projects related to flood control, drainage, irrigation, water diversions, reservoirs, navigation, port development, hurricane protection, coastal engineering, and management and development of water resources.

Act No. 733 of the 1981 Legislature provides for a Dam Safety and Regulatory Program. The Public Works and Flood Control Directorate is charged with the responsibility for administering the program. The program is operated by the DOTD's Water Resources Design and Development Section, with administrative and enforcement authority vested in the Director of the Public Works and Flood Control Directorate.

HISTORY

More than 100 large dams in the United States have failed since 1930. The Baldwin Hills Reservoir near Los Angeles, the Teton Dam in Idaho, and the Barnes Lake Dam in Georgia are some of the better known failures. Dam disasters in the early 1970's, resulting in approximately 355 deaths and extensive property damage, led to the passage of the 1972 National Dam Inspection Act (Public Law 92-367, August 8, 1972). The Secretary of the Army, through the U.S. Army Corps of Engineers, was directed to inspect the majority of the nation's dams for protection of life and property. Yet, through November of 1976 no inspections had been conducted and the Corps recommended to Congress a program which emphasized voluntary state actions to inspect and regulate the 43,000 non-federal dams covered by the act. But, without federal assistance, many states could not conduct such a program.

In the summer of 1977, Congress appropriated \$15 million, later increased to \$18 million, for inspection of non-federal dams. In December of 1977, following the Barnes Lake Dam disaster which killed 39 persons, the president announced a federal program to inspect non-federal dams under the authority of the 1972 Act. The program's goal was to inspect approximately 9,000 non-federal, highly hazardous dams, at a cost of approximately \$93 million. The president indicated that the federally-funded program could not be a substitute for effective dam safety action at the state level, and the program was intended to stimulate the states to action.

The Public Works and Flood Control Directorate was designated as Louisiana's representative in the program. A total of 343 dams were inventoried, of which 6 were classified as highly hazardous to downstream populations. In some instances, remedial measures were recommended to the dam owner for the protection of public safety. But, because Louisiana had no law relating to dam safety, the recommended measures could not be enforced.

With the passage of Act No. 733 of the 1981 Regular Session (LA. R.S. 38:21-28),

Louisiana acknowledged its responsibility of insuring the valuable resource of dams to their surrounding communities and also to protecting the life and property of the communities located downstream of dams, placing Louisiana in proper posture with the nationwide effort for dam safety.

PURPOSE

Simply stated, the purpose of Act No. 733 (LA. R.S. 38:21-28) is to recognize the inherent dangers posed by impoundments of significant volumes of water, and to require that owners of structures which impound water (or other liquids) assume the responsibility for that danger by ensuring that such structures are designed, constructed, and maintained so as to minimize the risk to life and property. Regardless of the circumstances of failure, the owner is ultimately responsible for loss of life and property damages that may occur from the failure of his dam.

The Department of Transportation and Development, Public Works and Flood Control Directorate, is charged with the responsibility for developing and enforcing a regulatory program to ensure that public safety and welfare is not compromised by the presence of dams or other impoundment facilities. The DOTD Dam Safety Program defines the minimum standards for the design, construction, operation, and maintenance of dams in the state of Louisiana, and DOTD has the responsibility and the authority to enforce the standards of the program. This manual documents the minimum standards for design, construction, operation and maintenance of dams and impoundment structures and the policies for the enforcement of those standards.

APPLICABILITY

The regulations of this program will govern the construction, enlargement, alteration or repair, maintenance and operation of all dams as defined by Act No. 733 (LA. R.S. 38:21-28) of the 1981 Regular Session of the Louisiana Legislature. The terms "dam" and "impoundment structure" are used interchangeably and shall mean the embankment, spillway(s), outlet works and other attendant parts. Included are all artificial barriers together with all appurtenant works which impound or divert water or any other liquid and which are:

1. Twenty-five feet or more in height and have an impounding capacity at maximum storage greater than fifteen acre-feet,
or
2. Have an impounding capacity at maximum storage of fifty acre-feet or more and are greater than six feet in height (see Figure 1, Appendix C).

All barriers which are six feet or more in height with maximum storage capacities of fifteen acre-feet or more must be submitted to DOTD for review (see Figure 2, Appendix C). The height of a dam is measured from the natural bed of the stream or watercourse at the downstream toe of the barrier, or if it is not across a stream or watercourse, the height from the lowest elevation of the outside limit of the barrier, to the top of the dam. The capacity at maximum storage is the volume in the reservoir in acre-feet when the water level in the reservoir is at top of dam elevation.

PERMITTING

APPLICATION FOR PERMIT -- A permit from the DOTD will be required prior to constructing any new impoundment structure or commencing any structural modifications to existing impoundment structures (see Appendix A). Permit forms may be obtained from the Director, Public Works and Flood Control Directorate, Louisiana Department of Transportation and Development, P.O. Box 94245, Baton Rouge, Louisiana, 70804-9245. The permitting process is designed to ensure that new structures and modifications to existing structures are designed and constructed in accordance with the requirements documented herein.

NATURAL RESOURCES CONSERVATION SERVICE -- The approval process may be abbreviated if dams meet the requirements of Pond Standard 378 of the Natural Resources Conservation Service National Handbook for Conservation Practices and the Natural Resources Conservation Service's engineering staff provides the design, layout, and construction inspection. In this case, the Natural Resources Conservation Service will certify that the dam design and construction meets the requirements of Pond Standard 378 and they will provide DOTD with the Pond Data Sheet, a map showing the location of the pond, and a letter signed by the owner of the dam (see Appendix D). The Natural Resources Conservation Service will agree to periodically inspect the structure to ensure that Pond Standard 378 is being maintained, and to inform the DOTD if the structure ever falls below Pond Standard 378.

NOTE: Natural Resources Conservation Service formerly the "Soil Conservation Service".

PUBLIC HEARINGS -- After an application has been filed and accepted, the public in the affected locale will be notified by publication in the local news publication. The Director of Public Works and Flood Control will prepare a notice, assigning a date and place for a public hearing of the application. The notice will contain information describing the application and the name and address of the applicant (see Appendix A). It will be the applicant's responsibility to have the notice published once a week for two consecutive weeks in the official journal of the parish in which the project will be constructed, and shall

provide notarized proof of publication on or before the hearing date. The applicant will bear the cost of the publication. The DOTD will conduct the public hearing, and the applicant will be required to attend to describe the nature and purpose of the proposed project and to answer questions.

ISSUANCE OF A PERMIT -- An "Impoundment Permit/Certificate of Completion" shall be issued for all dams, both existing and new construction. The "Impoundment Permit/Certificate of Completion" is not transferable. The owner of a dam must notify the DOTD 30 days prior to transferring ownership of the dam, and must return the "Impoundment Permit/Certificate of Completion" to the DOTD.

FAILURE TO OBTAIN APPROVAL -- If, prior to beginning construction, the owner fails to obtain approval, the owner will be cited and fined under the statutory authority of Louisiana Revised Statute, Title 38, Section 28. Also, the lake may be ordered to be drained until all approvals have been obtained.

SUBMITTALS

All designs for work to be permitted under the program will be submitted for review and approval with all necessary supportive documentation (See Appendix G). Normally, it is expected that an owner or prospective owner will establish contact with the DOTD to apply for a permit to construct or modify a dam. An example of a letter notifying the DOTD of intent to construct or modify a dam is provided in Appendix A. In some cases, however, structures are built and water is impounded without the knowledge or approval of the DOTD. When such structures are discovered, the owners will be contacted by the DOTD and required to furnish documentation that their structure meets the safety requirements of the program. In either case, the applicant will be guided by the Water Resources Design and Development Section throughout the review and approval process. The documentation required will be formal engineering designs and calculations, supported by sufficient field information, and certified by a professional civil engineer registered to practice in Louisiana. Because each step in the design of a dam is dependant upon the quality of the design judgements made in the previous steps, the applicant is advised to coordinate each of the three formal design stages, identified in the next section, with the DOTD review team prior to proceeding to the next step.

After general designs have been approved, the applicant may proceed with plans and specifications, which will also require approval before construction can begin. Plans and specifications will be of professional engineering detail and quality and will include all information and directions necessary to construct the dam in accordance with the design intent.

DESIGN

The proper design of a dam involves a complex combination of engineering applications. It is not within the scope or intent of this document, nor will it be the practice of the staff of DOTD, to instruct in the detailed procedures for the design of a dam. All dams and impoundment structures to be permitted under this program will be designed by a professional civil engineer(s), registered by the Louisiana State Board of Registration for Professional Engineers and Land Surveyors. The registered civil engineer will certify the designs and plans by professional seal. Designs must conform to nationally recognized standards, further explained in the following paragraphs and in the reference material. The completed design package will state the intended design life of the structure, and will include the operations and maintenance procedures necessary to ensure that the structure will function as designed for its stated design life.

Failure of an impoundment structure and the instantaneous release of large volumes of water is referred to as a dam breach and is the primary risk associated with dams, and is the fundamental reason for the state to assume regulatory authority over dams through the Dam Safety Program. Breaching may occur during fair weather due to the cumulative effects of erosion or seepage, or it may occur as a result of stresses caused by excess water produced during a storm event. The hydraulic and hydrologic (H&H) design will determine which of the two scenarios poses the greater hazard, the volume of water which is likely to be released, and the rate of flow.

It is the H&H design which determines the volumes and flow rates with which the impoundment structure(s) must contend. The geotechnical and structural designs must ensure that the impoundment structure(s) can safely accommodate the hydraulic forces imposed by the conditions predicted by the H&H design. Following are the sequential steps which are necessary in any dam/impoundment structure design, and each step must be documented with design calculations and all supporting data, certified by a Registered Professional Civil Engineer:

I. Hydrology and Hydraulics (H&H) Design

A. Impact (Hazard) Classification

B. Determination of controlling design condition and associated storm runoff.

C. Setting of spillway and stilling basin widths and elevations, top of embankment elevation, and normal pool stage.

II. Structural and Geotechnical Design of Embankment, Spillways, and Drawdown Structures.

III. Development and Documentation of Operations and Maintenance Procedures.

Note: For the purpose the Dam Safety Program, the "Emergency Spillway" shall be defined as being overtopped by the 100 year storm or greater and the "Principal Spillway" shall be defined as being overtopped by a storm less than the 100 year storm.

HYDROLOGY AND HYDRAULICS (H&H) DESIGN -- Before the structural design of the dam can begin, the requirements of hydraulic capacity must be determined. The height of the dam, the amount of freeboard above normal pool elevation, the size and

capacity of the principle and emergency spillways, must all be designed to balance the hydrological and hydraulic properties of the location of the reservoir. A properly designed drawdown structure, capable of reducing the stage of the reservoir at a suitable rate in the event of emergency, must also be designed to meet the capacity requirements of the site.

The H&H design begins with the Impact Classification (also referred to as Hazard Classification in some texts) of the dam (See Appendix F). The Impact Classification is determined by an evaluation of the probable maximum impacts of a dam breach. Low impact structures are those for which, because of size and/or location, little or no significant damage to life or property is likely to result from a failure of the structure. Significant impact structures are those which could cause appreciable damage to property or could pose possible threat to human life in the event of failure. High impact structures are those for which failure would cause excessive property damage or make loss of human life likely.

Note: The inflow design flood (IDF) is determined by the various Hydrograph Methods after the precipitation amount is developed. The major source of precipitation data is the National Weather Service (NWS). The DOTD has final authority for approval of the method to be utilized to determine the IDF.

TABLE I IMPACT CLASSIFICATION AND INFLOW DESIGN FLOOD			
IMPACT CATEGORY	POTENTIAL LOSS OF LIFE	POTENTIAL ECONOMIC LOSS	MINIMUM INFLOW DESIGN (IDF)
LOW	NOT LIKELY	MINIMAL	50-Yr. Freq.
SIGNIFICANT	POSSIBLE	APPRECIABLE	100-Yr. Freq.
HIGH	LIKELY	EXCESSIVE	1/2 PMF

Further guidance in assessing the potential hazards and associated impact classification for dams may be found in Reference 1. It is the responsibility of the owner/applicant to establish impact classification, and all dams will be considered to be of High Impact potential until demonstrated to be otherwise by a documented analysis provided by the applicant. The proposed impact classification must be supported by sufficient analysis and documentation, and DOTD will have final authority for assigning Impact Classification.

Having established the Impact Classification for the structure, the next step is to establish the magnitude of the meteorological event on which the entire design is to be based. Dams must be designed to be able to safely withstand the passage of a flood of design magnitude. The **Inflow Design Flood (IDF)** is the largest storm event to be considered in the design of the structure, and the magnitude of the storm event for which

the IDF is computed is related to the Impact Classification. The values shown for IDF in Table I are **minimums**, and the actual storm event to be used as the IDF will be determined by a site specific analysis. For low impact structures, the primary consideration is the protection against loss of the dam and its benefits in the event of failure, while for significant and high impact structures, adequate protection of life and property must be assured.

For dams classified as high impact, the IDF is defined as the flood event above which a breach of the dam does not increase hazard to downstream interests. The upper limit of the IDF for high impact structures is the **Probable Maximum Flood (PMF)**, which is the flood which may be expected from the most severe combination of critical meteorological and hydrological conditions which are reasonably possible. While the PMF is the upper limit for the IDF, the IDF for high impact dams may be an event of smaller magnitude, depending upon an incremental hazard assessment, which is a routing of floods of increasingly larger magnitude through the structure and downstream channel reaches, comparing conditions with and without a dam failure, until a flood magnitude is reached for which the dam failure condition does not appreciably increase the hazard potential.

Dams classified as having significant impacts may or may not require a formal incremental hazard evaluation, depending upon the extent of existing and potential downstream development, the size of the reservoir, and the type and use of the dam. The upper limit of the IDF for significant impact structures is the PMF.

For dams with low impact classification, the incremental hazard evaluation is not required, and the IDF can be based upon factors related to loss of service of the dam, potential maintenance costs, etc., but with the 50-Yr. frequency storm being the minimum design event.

The Water Resources Design and Development Section should be a partner in establishing the IDF, and designs should not proceed until agreement has been reached between the DOTD and the owner's engineer on the choice of the IDF. Establishing the IDF is the foundation for the entire design process, since the dam must be designed to safely pass and/or contain the IDF. A guideline for performing the incremental hazard evaluation necessary to establish the IDF is provided in Reference 1.

How the IDF is to be safely passed by the dam structure and the stability of the dam against the long-term effects of hydrostatic forces is the subject of the balance of the design effort, including the general configuration of the dam; length, elevation, and composition of principal and emergency spillways; freeboard above normal pool elevation; erosion protection; and stability design. The most practical way of assuring the integrity of the dam during an IDF

is to provide a concrete spillway which is capable of carrying the peak flow of the storm. Principal spillways are normally sized to carry flows from all but the largest of storms, with emergency spillways, which are not normally armored, functioning only during

major storm events. If the peak flow from the IDF can be contained within the principal and emergency spillways, the stability of the dam is not likely to be threatened by the erosive action of water flowing over the embankment. The designer may wish to balance the relative economy of providing spillway capacity versus storage capacity above normal pool stage. But, if design calculations indicate that the embankment will be overtopped by the IDF, provisions must be included in the design to prevent the embankment from failing under the erosive forces of the overtopping flows.

GEOTECHNICAL DESIGN -- It is essential to the stability of the structure that the material used in the impoundment structure, as well as the foundation and adjoining earth have the necessary structural properties to withstand the hydrostatic forces required by the design, that potential for destructive seepage is identified and appropriately dealt with, and that the surfaces of the structure are adequately protected from surface erosion.

Field investigations shall be adequate to define the soils and ground water conditions with respect to stability and seepage control. Stability analysis should consider after-construction conditions, based on the undrained shear strength parameters determined by laboratory tests. Long-term steady seepage, partial pool, and rapid drawdown analyses should also be performed, using shear properties appropriate to the subject materials and minimum safety factors shown in Table II.

TABLE II FACTOR OF SAFETY FOR STABILITY ANALYSIS	
ANALYSIS CONDITION	FACTOR OF SAFETY
Rapid Drawdown	1.25
Partial Pool	1.40
Steady Seepage	1.40
After Construction	1.30
Earthquake	1.15

STRUCTURAL DESIGN -- Structural Designs are to be prepared in accordance with generally accepted structural engineering practices such as those of the American Concrete Institute, the American Institute of Steel Construction and the American Institute of Timber Construction. Components of the spillway or other appurtenant structures shall be designed to resist the most critical loading combination of dead loads plus live loads that may occur during its construction or design life. Some of the loads which must be considered in the design are: buoyancy forces, sliding forces, hydrostatic uplift forces, bearing forces, overturning forces, water drag forces, wing drag forces, gate-lifting and closing forces, soil and water pressure forces, impact forces, uniform and point live load forces, etc. The minimum factors of safety for buoyancy and sliding shall be 1.5 and 2.0, respectively. The overturning analysis must indicate that the resultant force falls within the center 1/3 of the base. The minimum factor of safety for pile design shall be 2.0.

CONSTRUCTION

It will be the owner's responsibility to ensure by the presence of professional construction supervision personnel that the structure is built in strict compliance with the approved designs and specifications. Adequate records shall be maintained to document that all materials and construction procedures meet or exceed those specified. The owner shall report on the construction to the DOTD. The work of construction, enlargement, alteration, repair or removal of a dam or reservoir for which approved application, designs, plans and specifications are required shall be under the responsible charge of a registered civil engineer. Upon completion of the work and prior to the impoundment of water, the engineer shall certify that all work has been done in compliance with the approved plans and specifications (Appendix A).

During construction, periodic inspections may be made by representatives of DOTD. The owner will be required to provide such works or tests as may be needed to disclose sufficient information to enable DOTD to determine that conformity with approved plans and specifications is being maintained. Inspections made by DOTD are "limited inspections" and do not relieve the owner or the owner's engineer from their responsibilities for conformance to accepted designs and procedures.

MAINTENANCE AND OPERATION

Once in service, the integrity of the impoundment structure must be sustained by regular maintenance, in accordance with the approved Operations and Maintenance document provided by the designer. The Operations and Maintenance Manual should contain forms and schedules for records and documentation of inspections, maintenance procedures, and repairs. The owner will be responsible for certifying, through properly documented records, to the DOTD that the required periodic inspections have been made, for correcting any deficiencies revealed during such inspections, and for maintaining

records of all operations and maintenance activities, as well as of original construction and any subsequent modifications.

An Emergency Preparedness Plan is required for all dams and reservoirs. The plan shall comply with the guidelines of the current issue of Louisiana's "Emergency Action Plan Guidelines", available from the DOTD's Director of Public Works and Flood Control. The Emergency Preparedness Plan will be a condition of the permit for the project, and it will be the owner's responsibility to implement the provisions of the plan in the event of emergency.

INSPECTIONS

The DOTD will periodically inspect every dam in the jurisdiction of the program. The purpose of the DOTD inspections is to ascertain whether the structure is being properly maintained in accordance with the approved Operations and Maintenance procedures. DOTD inspections are limited inspections and do not relieve the owner of responsibility to perform and document periodic inspections. If an inspection by DOTD reveals that a dam is unsafe or in danger of becoming unsafe, the DOTD, through the Director of Public Works and Flood Control, shall direct the owner to take whatever action is necessary to restore the dam to its design condition.

The owner has the primary responsibility for insuring the safe condition of the structure by regular maintenance and periodic inspection. The owner is required to immediately inform the Director of Public Works and Flood Control of any unusual circumstances or occurrences which may affect the condition or safety of the reservoir. Also, the Director will be notified prior to any planned draw downs of the reservoir.

ENFORCEMENT

If any dam or impoundment structure is determined to be unsafe, the Director of Public Works and Flood Control for the Department of Transportation and Development, pursuant to La R.S. 38:21-28, shall direct any such repairs or remediations for a dam or impoundment structure as he deems necessary to ensure that life and property is not unduly threatened by the impoundment. Such remedial action may include (1) directing that the water level behind the structure be lowered to a safe level, or (2) that the impoundment be completely drained until all necessary corrections to the structure have been made.

EXISTING STRUCTURES

All dams constructed or under construction prior to the promulgation of these rules will be reviewed to assess their disposition under the program regulations. Each dam is unique and must be judged on the basis of its own particular set of circumstances. Based on the circumstances of each individual case, a judgement will be made of what modifications or repairs are necessary to meet program standards. It is the intent of the program to eventually have every dam upgraded to meet program standards. DOTD will be the sole judge of whether an existing deficiency creates an unacceptable risk to the

general public. While it is not the intent of this program to lower the standards for existing dams, DOTD recognizes that it is not practical to force all dam owners to immediately retrofit their structures to meet new minimum Inflow Design Flood standards.

An "Impoundment Permit" is required for existing dams and will be issued after reviewing all historical data (designs, plans, specifications, operation and maintenance records, etc.) and performing a technical inspection (or inspections) to adequately assess the safety of the dam. The owner shall provide all historical data, if available.

EMERGENCY PREPAREDNESS PLAN

An **Emergency Preparedness Plan** is required for all dams and reservoirs both existing and new construction (See page 21, "Existing Structures"). The plan will comply with the guidelines of the current issue of Louisiana's "Emergency Action Plan Guidelines", available from the Director of Public Works and Flood Control, and shall be submitted as a necessary component of the Maintenance and Operating Procedures as a condition of the permitting process. It is the owner's responsibility that the provisions of the Emergency Action Plan are implemented in the event of an emergency situation.

A breach analysis is required to develop the emergency preparedness plan. The breach analysis will establish the magnitude of the inundated area (inundation map), peak flood elevations and arrival times of the peak flood elevations at critical locations. The worst case scenario breaching event will be somewhere between the "sunny day" breach and that event above which a breach of the dam does not increase hazard to downstream interests. If the dam owner wants to perform only one breach analysis instead of doing incremental analyses to find the worst case scenario breaching event, he can perform a breach analysis where the tail water is at the average annual elevation and the reservoir is at maximum design surcharge.

REFERENCES

1. Jerrold W. Gotzmer, William C. Jenkins, Ramon G. Lee, Joseph R. McCormick, Harvey H. Richardson, and David L. Sveum, Training Aids for Dam Safety, Module: Evaluation of Hydrologic Adequacy, Interagency Committee on Dam Safety (Available from: Louisiana Transportation Research Center, 4101 Gourrier, Baton Rouge, Louisiana; telephone (504-767-9131).
2. Peter G. Grey, Terry G. Fairbanks, Tasso Schmigall, and Charles D. Wagner, Training Aids for Dam Safety, Module: Evaluation of Hydraulic Adequacy, Interagency Committee on Dam Safety (Available from: Louisiana Transportation Research Center, 4101 Gourrier,

Baton Rouge, Louisiana; telephone (504) 767-9131).



APPENDIX A
LETTERS, FORMS, PUBLIC NOTICE AND PERMITS

LETTER OF INTENT

Purpose: To notify the Louisiana State Dam Safety Program of the applicant's intent to construct, enlarge, alter, repair or remove a dam within the state.

Address To: Louisiana State Dam Safety Program
Louisiana Department of Transportation and Development
Public Works and Flood Control Directorate
Post Office Box 94245
Baton Rouge, Louisiana 70804-9245

- Contents: 1) Name of proposed or existing dam
- 2) Purpose of dam
- 3) Owner's:
Name

Address

Telephone
- 4) Location of dam (section, township, range, parish)
- 5) Brief description of proposed dam construction, enlargement, alteration, repair or removal
- *6) Height of Dam (height in feet from top of dam to lowest point at downstream toe of dam)
- *7) Reservoir Capacity (volume in acre-feet with water at top of dam)

*NOTE: Items 6 and 7 can be approximated at this time.

Letters of No Objection and Other Permits

The applicant must forward copies of the pre-application to the appropriate state, federal and local agencies to obtain letters of no objection and/or permits as required by these agencies. Copies of the letters of no objection and permits must be submitted to the Louisiana State Dam Safety Program as part of the applicant's application under this program.

Pursuant to the rules and regulations of the State Dam Safety Program as established by Act No. 733 of the 1981 Regular Session, interested parties are hereby notified that a "Letter of Intent" and a "Pre-Application for Construction of Dam" have been received by the Director, Public Works and Flood Control Directorate, Department of Transportation and Development to construct the proposed
Dam and Reservoir Pre-Application Number PA _____ located in Section ____ Township)
_, Range____, _____ Parish.

Applicant:

(Name)

(Address)

(Phone)

Purpose and Brief Description of Dam:

All interested parties are hereby notified that a public hearing on the application will be held at p.m. on _____ at ____ . Any interested party shall have the right to request a public hearing on the application. Requests for public hearings must be in writing and must be submitted no later than the close of the public hearing on _____. Letters must state, with particularity, the reasons for holding a public hearing, applicant's name and Pre-application number. Upon receiving a written request for a hearing within the time limits set forth in

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this notice, the Director, Public Works and Flood Control Directorate, shall set a date, time and place for conducting a hearing on the application. During the hearings, any interested party shall have the right to protest the application and to appear and present evidence and testimony in support of such protest.

Letter for Approval of Construction

Purpose: To notify the applicant of the "Approval for Construction" of his "Application for Construction of Dam".

Address To: Applicant with copy to applicant's consulting engineering firm.

Letter of “Notice of Completion and As-Built Drawing

Purpose: To notify the Louisiana State Dam Safety Program that the construction of the subject project is complete and to certify that said construction was done in accordance with the approved designs, plans, drawings and specifications.

From: Applicant's Consulting Engineering Firm (letter must be signed and sealed by a Registered Professional Civil Engineer licensed in the State of Louisiana).

Address To: Louisiana State Dam Safety Program
Louisiana Department of Transportation and Development
Public Works and Flood Control Directorate
Post Office Box 94245
Baton Rouge, Louisiana 70804-9245

Note: As-Built Drawings must be received by the Director, Public Works and Flood Control Directorate, within 30 days after completion.

Private Impoundment Permit (Certificate of Completion

Purpose: Authorizes the Owner of a Dam and Reservoir to impound water at his facility. Certifies that the applicant has met all requirements under the State Dam Safety Program (see sample next page).

APPENDIX B RECOMMENDED GLOSSARY

ABUTMENTS - Those portions of the valley sides which underlie and support the dam structure, and are usually also considered to include the valley sides immediately upstream and downstream from the dam.

AUXILIARY OR EMERGENCY SPILLWAYS - A secondary spillway designed to operate only during unusually large storm events. Louisiana's dam safety program defines "unusually large storm events" as being equal to the 100 year storm event or larger.

BAFFLE BLOCKS - Baffle blocks are blocks constructed in a stilling basin to dissipate the energy of fast flowing water.

BERM - The berm of the dam is a horizontal step in a sloping profile. The berm is usually constructed with a slight slope for drainage purposes. The berm is often referred to as a seepage or stability berm.

BLANKET DRAIN - The blanket drain is a horizontal pervious zone located downstream of the impervious core. This zone is often referred to as a sand blanket.

BREACH - An eroded opening through a dam that drains the reservoir. A controlled breach is an intentionally constructed opening. An uncontrolled breach is an unintentional opening that allows uncontrolled discharge from the reservoir.

CHIMNEY DRAIN - The chimney drain is a vertical pervious zone located just downstream of the impervious core. The chimney drain is usually constructed with a sand material.

COFFERDAM - A temporary structure enclosing all or part of the construction area so that the construction can proceed in the dry.

CONDUIT - A conduit is a closed channel to convey discharges through or under a dam. The conduit can be a reinforced concrete pipe, a corrugated metal pipe or a single or multi-barrel reinforced concrete box culvert.

CREST LENGTH OF DAM - The crest length of the dam is the length of the top of dam. This length includes the spillway(s) and other appurtenant structures. The crest length of dam is basically the length from where the top of dam terminates on one abutment to a similar point on the other abutment.

CUTOFF TRENCH - The cutoff trench is an impervious barrier built into the foundation to reduce seepage under the dam. A cutoff wall or slurry wall could be used as a seepage barrier. The slurry wall is relatively thinner in the horizontal direction when compared to a clay core cutoff trench.

DAM - A dam is any artificial barrier, including appurtenant works, which does or will impound or divert water or any other liquid substance.

DOWNSTREAM SLOPE - The inclined surface of an embankment dam that faces away from the reservoir.

DRAWDOWN STRUCTURE - A drawdown structure is a low level outlet which can be used to lower the reservoir below normal pool stage. This may be necessary for lake management purposes, routine repairs or dam safety purposes.

EARTHFILL DAM - A dam constructed predominantly of fine-grained material. Earthfill dams are also known as rolled fill dams where material is placed in layers and compacted by using rollers or rolling equipment.

END SILL - The end sill is the area at the upstream and downstream end of the stilling basin base slab.

FOUNDATION OF DAM - The foundation of the dam is the natural material on which the dam is placed.

HEEL OF DAM - The heel of the dam is the junction of the upstream slope with the foundation. The heel of the dam is often referred to as the upstream toe.

IMPERVIOUS CORE - The impervious core is a zone of low permeability material. This zone is the water or seepage barrier and is often referred to as the clay core.

INTAKE STRUCTURE - The structure placed at the beginning of an outlet works waterway. The intake structure establishes the ultimate drawdown level of the reservoir by the position of its opening(s) to the outlet works. Intake structures may be vertical or inclined towers (drop inlets).

MAXIMUM CROSS SECTION DAM - Cross section of a dam at the point where the height of the dam is a maximum.

NON-OVERFLOW WALL - Non-overflow walls are walls which are usually constructed parallel to the spillway crest at an elevation equal to the top of dam elevation. These wall

are not designed to be overtopped and are often referred to as a closed dam section.

NORMAL POOL STAGE - Normal pool stage for controlled spillways is defined as the water level at the dam to which water may rise under normal operating conditions. This does not include flood surcharge.

OUTLET GATE - The outlet gate is a gate on the drawdown structure or spillway which is used to control the outflow of water. These gates are usually located on the upstream end of the drawdown structure, however, they can be located of the downstream end.

RIPRAP - Riprap is a layer of large uncoursed stones, broken rock or precast blocks placed in a random fashion on the upstream slope of the dam and stilling basin outlets. Riprap is a flexible type of slope protection which will deform if material is displaced from beneath.

PIPING -The progressive internal erosion of an embankment, foundation, or abutment material. The erosion (piping) begins on the downstream side and progresses upstream.

PROBABLE MAXIMUM FLOOD (PMP) -The flood that may be expected from the most severe combination of critical meteorologic conditions that are possible in the region.

PRIMARY OR PRINCIPAL SPILLWAYS - Primary or principal spillways are the first used spillway during flood flows.

RETAINING/TRAINING WALLS - Retaining/training walls are walls which are usually constructed perpendicular to the spillway crest. Retaining walls are walls which support an overturning load. Training walls are walls which confine or guide the flow of water. In many instances, these walls serve both purposes and can be referred to as either a retraining or training wall.

RISER - A type of drop inlet spillway with a vertical section of metal or concrete pipe that allows the reservoir to rise to a predetermined level before water flows into the pipe.

SLOPE - The embankment slope is the inclined face of the embankment spillway, channel. The slope can be an upstream slope or a downstream slope. The upstream slope is on the lake or reservoir side of the dam.

SLOPE PROTECTION - Slope protection is protection against wave action or erosion. The two most common types of slope protection, are riprap and soil cement.

SLUICE - A low-level opening for releasing water from a dam.

SOIL CEMENT - Soil cement is a well compacted mixture of soil, portland cement and water that produces a hard pavement. Soil cement is usually placed in horizontal layers. Soil cement is a rigid type of slope protection which attempts to span voids.

SPILLWAY CREST - The spillway crest is the overflow section or weir section of the spillway.

STILLING BASIN - A stilling basin is a basin constructed to dissipate the energy of fast flowing water. The stilling basin area is located just downstream of the spillway crest between the training/retaining walls.

STRUCTURAL HEIGHT - The distance between the lowest point in the excavated foundation and the top of the dam.

SURCHARGE/FLOOD SURCHARGE - Surcharge/flood surcharge is the volume or space between normal pool and the maximum water level.

TAILWATER - Tailwater is the level of water immediately downstream of the dam.

TOE OF DAM - The toe of the dam is the junction of the downstream slope with the foundation. The toe of the dam is often referred to as the downstream toe.

TOP OF DAM/CROWN - The top of dam is the uppermost surface of the dam. The top of dam can also be referred to as the crest of the dam. When the term "crest" is used, it must be specified that it is the "crest of the dam" and not the "crest of the spillway".

UNCONTROLLED OR UNGATED SPILLWAYS - Uncontrolled or ungated spillways are spillways where the flows over the spillway crest are controlled only by the elevation of the spillway crest. This type of spillway is often referred to as a fixed crest spillway. Normal pool stage for uncontrolled spillways is defined as the lowest crest elevation of the principal spillway.

UPSTREAM SLOPE - The inclined surface of an embankment dam that is in contact with the reservoir.

APPENDIX C
FIGURES 1 and 2

FIGURE 1

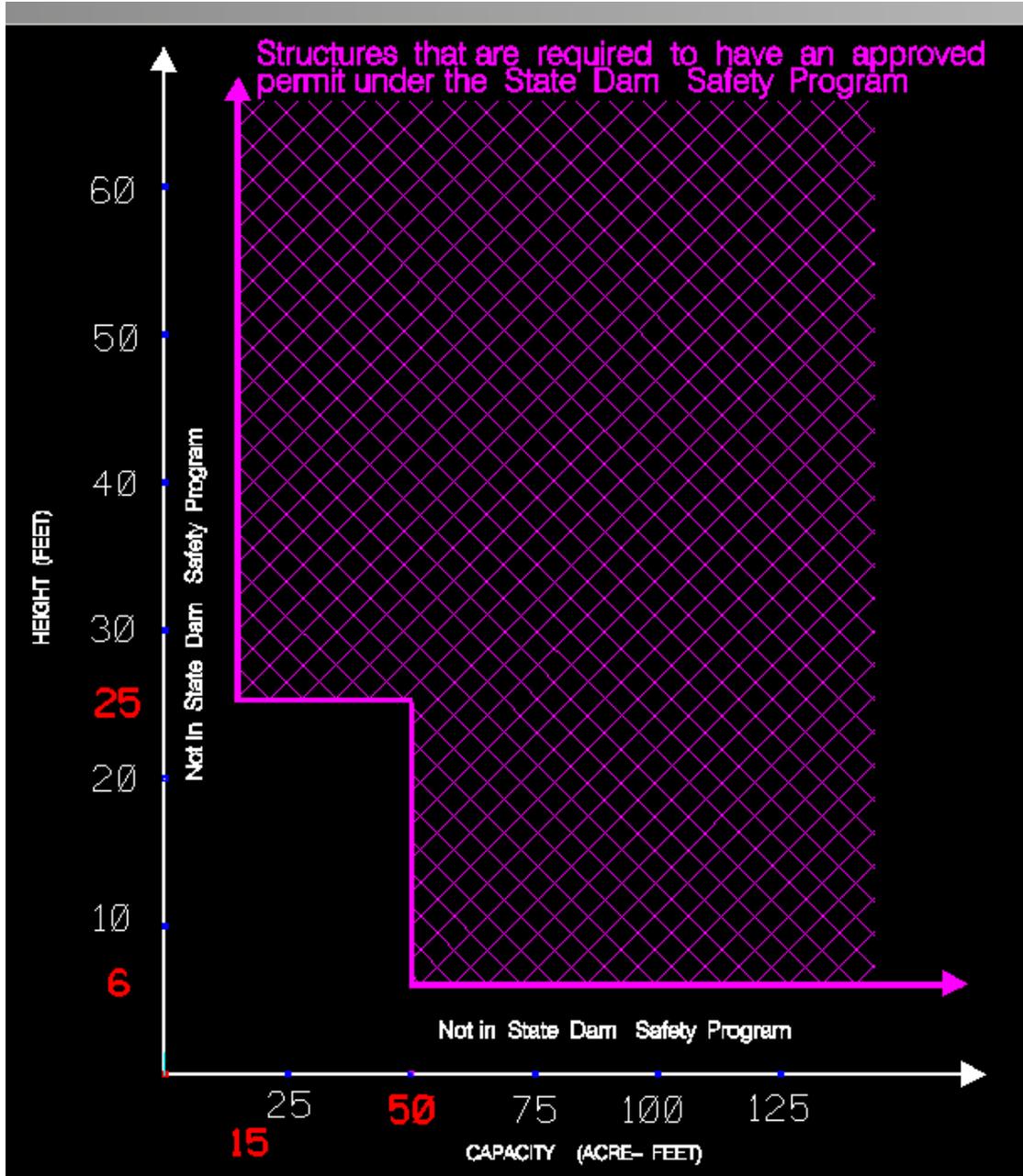
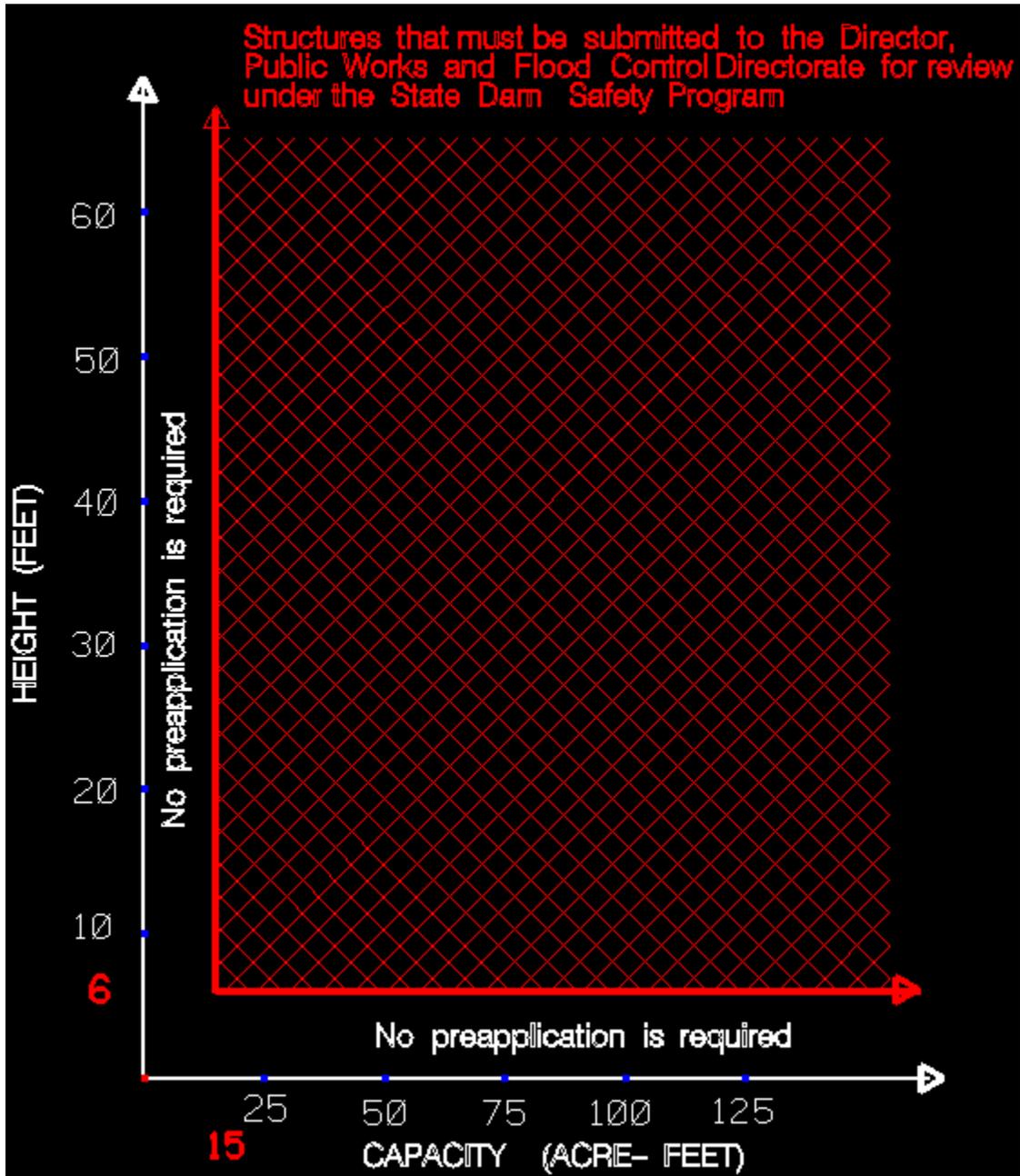


FIGURE 2



APPENDIX D
FORM LETTER FROM OWNER OF A DAM

DATE:

Dam Safety Administrator
Louisiana DOTD
P. O. Box 94245, Capitol Station
Baton Rouge, Louisiana 70804-9245

RE: Pond Construction

I am aware that the design, construction and operation of all dams within Louisiana is regulated by the Rules and Regulations for Dam Safety Program as developed by the State of Louisiana, Department of Transportation and Development. I am also aware of the liability that is associated with owning a dam.

Since I am receiving design and construction assistance from the Natural Resources Conservation Service, formerly Soil Conservation Service, the dam described below is excluded from the approval process outlined in the Dam Safety Regulations. However, if for some reason (such as a land use change) the dam no longer comes within the criteria of the Soil Conservation Service National Handbook for Conservation Practices - Standard 378, I agree to modify the structure if necessary to comply with the requirements of the Dam Safety Regulations. I also agree to allow access for inspection of this structure.

Sincerely,

OWNER

DAM LOCATION:

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APPENDIX E PROCEDURAL SEQUENCE

(New Construction)

1. Applicant or his Engineer submits "Letter of Intent"
2. Applicant or his Engineer submits "Pre-Application for Construction of Dam"
3. Applicant publishes "Notice of Application" and a "Public Hearing(s)" is (are) held
4. Applicant or his Engineer completes "Designs, Plans and Specifications" as follows and submit "Application for Construction of Dams"
 - a. "Impact (Hazard) Classification
 - b. Determination of controlling design condition and associated storm runoff
 - c. Setting of spillway and stilling basin widths and elevations, top of embankment elevation, and normal pool stage
 - d. Plans, Specifications, Designs and other Submittals
5. DOTD issues "Approval or Denial of Application"; Approval is an "Approval for Construction"
6. Construction begins; Applicant or his Engineer and DOTD performs "Construction Inspections"
7. If "Deficiencies" are found by DOTD, Applicant or Applicant's Engineer; Applicant or his Engineer correct the deficiencies
8. Supervision of Construction by Owner
9. Applicant or his Engineer submits "Notice of Completion" and "As-Built Drawings" and final "Application for Construction of Dam"
10. DOTD issues "Certificate of Completion/Impoundment Permit"
11. Applicant or his Engineer submits "Maintenance and Operation Procedures" for DOTD's approval
12. Applicant or his Engineer submits "Emergency Preparedness Plan" for DOTD's approval

APPENDIX F
MINIMUM HYDROLOGIC AND HYDRAULIC SUBMITTALS TO
ESTABLISH IMPACT CLASSIFICATION AND INFLOW DESIGN
FILE (IDF)

Since the required submittals may vary for each dam, we recommend that you obtain copies of references number 1 and 2 on page 25 of the Dam Safety Rules and Regulations. After reviewing these documents, we would advise that you contact the Hydraulic Unit of the DOTD for further guidance.

**APPENDIX G
MINIMUM REQUIRED SUBMITTALS**

- 1) All structural, geotechnical, hydrologic and hydraulic design calculations. An engineer's report shall also be submitted which summarizes the design analyses and shall include, but is not limited to, the following:
 - a) Formulas, methods and basic data assumptions used in the designs.
 - b) List of all pertinent design codes.
 - c) Summary tables which list design load cases, computed design factors of safety and required factors of safety as specified in these Rules and Regulations or required by pertinent design codes.
 - d) All other information which aided in evaluating the design, supported assumptions and conclusions, and will facilitate an independent review.
- 2) Plans with sufficient details to construct all features of the dam in accordance with the design intent. Also, the plans shall include details to construct a permanent reference mark (bench mark) near, but separate from, the project. The exact location and elevation above mean sea level must be noted on the "As-Built" plans.
- 3) Specifications with sufficient details to construct all features of the dam in accordance with the design intent. The specifications shall also provide that the plans and specifications may not be changed without prior written approval by the DOTD.
- 4) Document(s) to show proof of ownership.
- 5) An inspection plan specific to the construction activity. The inspection plan is to

detect deficiencies or situations that may result in a threat to life and property.

- 6) An emergency action plan specific to the construction activity. The inspection plan in item 5 is part of the emergency action plan under this item.
- 7) If the applicant has an agreement or contract with another entity who will be responsible for the operation and maintenance of the dam, the applicant must provide copies of the agreement or contract document(s).
- 8) If the applicant is constructing the dam for the specific purpose of transferring ownership to a homeowners' association, a landowners' association, or any other entity, the applicant must provide a document which clearly states his intent, i.e., a dam which is constructed for a subdivision development where ownership will be transferred to a homeowners' association.
- 9) All other "Permits" required to construct the dam and "Letters of No Objection" which were obtained from various regulatory entities.
- 10) "As-Built" plans.
- 11) "Operation and Maintenance Manual".
- 12) "Emergency Preparedness Plan".

NOTE: The applicant should submit 2 copies of all preliminary submittals. The applicant must submit 5 copies of all final submittals.