

LAKE SHADY DAM  
OPERATION AND MAINTENANCE MANUAL

OLMSTED COUNTY  
BOARD OF COMMISSIONERS  
ROCHESTER, MINNESOTA

MARCH 1987

TABLE OF CONTENTS

	PAGE
INSTRUCTIONS FOR USE	1
FORWARD	8
PART I -- EXISTING FACILITIES	
Introduction	11
Structures	12
PART II -- STANDING OPERATING PROCEDURES	
Introduction	13
Normal Operating Procedures	13
Emergency Operating Procedures	17
PART III -- INSPECTION AND MAINTENANCE	
Introduction	25
Inspection	25
Maintenance	28
APPENDIX A -- Telephone Numbers--"Emergency Notification"	
U.S. Weather Service - Rochester Airport	289-4950
Oxbow Park	775-2451
Emergency number	911
Olmsted County Sheriff	285-8300
Olmsted County Emergency Services	285-8103
Rochester Public Utilities	
System Operations Center	280-1556 <del>285-8949</del>
<del>Ervin Mohlke - Dam Caretaker</del>	<del>367-4397</del> 2368
Steve Mohlke - Oranoco Park	367-4526
Jim Foote - Olmsted County Park Supt.	<del>533-8244</del> 287-0547
Kjellaug Ese - Campground operator	367-4925
DNK REGIONAL HYDROLOGIST	
Jim COOPER	275-7420

LAKE SHADY DAM  
OPERATION AND MAINTENANCE MANUAL  
INSTRUCTIONS FOR USE

INTRODUCTION

This manual for the operation and maintenance of the Lake Shady Dam represents an important instrument in the implementation of an on-going program designed to insure the safety and reliability of the dam. As such, it is imperative that the manual, at all times, reflect the best available information on the various aspects of operation and maintenance and that the personnel charged with the responsibility for the dam be supplied with this information in a manner which is current, clear, complete, and unambiguous. It is also imperative that the personnel charged with the responsibility for the dam fully understand the nature of that responsibility and all of the various aspects of operating and maintaining the Lake Shady Dam. The instructions in this part of the manual are the recommended procedures policy for maintaining and revising the manual and training the personnel charged with implementing the procedures described in the manual.

## REVISION

### Introduction

It has been mentioned that it is imperative that the Operation and Maintenance Manual at all times reflect the best information that is currently available. This goal can be achieved only through revision of the manual to take into account significant changes in, additions to, or modifications of:

- a. the dam and its appurtenant facilities and equipment
- b. the upstream watershed
- c. downstream development
- d. sources of operating information
- e. key County personnel
- f. applicable civil authorities.

Revisions may also be required for the purpose of clarification or correction. Revisions that are necessary to document significant changes in operation or maintenance procedures should be incorporated into the working copies of the manual at the time of the change. Revisions regarding procedures which do not have a significant effect on the safe maintenance and operation of the dam may be incorporated as a result of the periodic review.

### Periodic Review

The Operation and Maintenance Manual should be reviewed on an annual basis as a part of the regularly scheduled formal inspection of the dam. During this review, all pertinent information should be checked to insure that it is current and accurate and any recently developed information should be reviewed for possible incorporation into the manual.

### Revision to Procedure

In order to avoid potential conflicts, the following revision procedure is recommended:

- a. revisions should be issued only by the county official responsible for the dam
- b. all revisions should be in writing
- c. all working copies of subject matter which is superceded by a revision should be destroyed
- d. one file containing copies of all superceded material should be maintained, but clearly marked as superceded
- e. all revisions should be registered on the form provided in this manual.

### DISTRIBUTION

The county official responsible for the dam should maintain a master copy of the Operation and Maintenance Manual. The master

copy should at all times incorporate the latest revisions or alterations of the manual. All working copies distributed to county employees or others should be made from the master copy and the names of all people possessing working copies should be recorded on the distribution list maintained with the master copy.

#### TRAINING

All personnel responsible for operation or maintenance of the dam should be thoroughly familiar with their responsibilities and duties. New operators may be trained on-the-job by personnel experienced in operation and maintenance of the dam or through training sessions conducted by engineers experienced in dam engineering and familiar with the Lake Shady Dam. The county official responsible for the dam should periodically satisfy himself that the personnel assigned the responsibility for operation and maintenance are knowledgeable and proficient in the performance of their duties.





## FORWARD

The Minnesota Department of Natural Resources (MDNR), which is responsible for dam safety in Minnesota, has required that operational plans be developed for the Lake Shady Dam. To satisfy this requirement, the Olmsted County Park Department and the personnel responsible for operating the Lake Shady Dam have prepared this operation and maintenance manual.

The purpose of this manual is to provide the personnel of Olmsted County, who are responsible for the dam, with the information necessary to safely operate and maintain the Lake Shady Dam.

Olmsted County has the sole legal duty, obligation, and liability associated with ownership and operation of the dam. In addition, the County will be required to conform to the (MDNR) Rules for Dam Safety.

The County official responsible for the dam should understand all of the procedures necessary to safely operate and maintain the dam as established in this operation and maintenance manual and should know the requirements established in the Rules for Dam Safety and any other rules or regulations pertaining to the dam. In addition, the operator responsible for the day-to-day inspection and operation of the dam should have a working understanding of the requirements for safe operation and maintenance of the dam. This working understanding should be established by careful study of this manual and training in dam operation and maintenance. This training may be obtained by working over a period of several years

with an operator experienced with the operation and maintenance of the dam or through one or more training sessions with a professional engineer experienced in the operation and maintenance of dams.

PART I  
EXISTING FACILITIES

INTRODUCTION

The purpose of this section is to describe the major components of the Lake Shady Dam and the specific physical features which an operator will encounter in the performance of his duties. The components of the dam are described and the purpose and function of each component is explained. Specific information regarding operation and maintenance is contained in the corresponding sections of the manual. The operator or other personnel responsible for the operation and maintenance of the dam should familiarize themselves with each of the components discussed below.

STRUCTURES

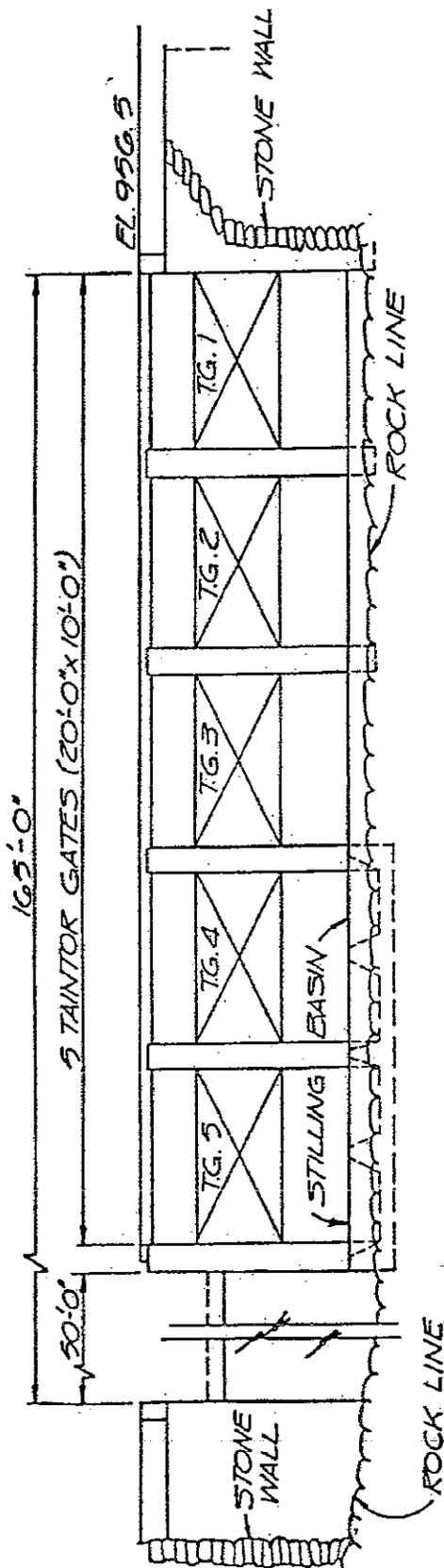
Introduction

The Lake Shady Dam is located on the middle fork of the Zumbro River on the southern edge of the City of Oranoco, Minnesota. The dam serves primarily for recreational purposes.

The Lake Shady Dam is a WPA concrete dam 165 feet in total width with a 50 foot spillway and control structures consisting of five 20 foot wide bays containing 10 foot high taintor gates. A site plan of the dam is presented as figure #1.

### Control Structures

The control structure consists of five 20 foot wide bays each containing a taintor gate and a winch and cable assembly for opening and closing the gates. An operator's bridge crosses above all five gates and the winches are anchored to this bridge. Each gate may be opened individually either by turning the winch by hand or by turning the winch with a gasoline powered portable drive unit which may be moved from winch to winch. Discharge is controlled by regulating the opening at the bottom of the taintor gates. Gates 4 and 5 may be equipped with infra-red heaters to allow for winter operation. Energy contained in the water discharged from gates 4 and 5 is dissipated by means of a stilling basin located immediately downstream from these gates.



DOWNSTREAM ELEVATION

SCALE : 1" = 20'

PLATE

1/4

DATE

AUG 1976  
K.M.A. NO

PROJECT

ORONOCO DAM  
SHADY LAKE



KIRKHAM,  
MICHAEL  
AND ASSOCIATES  
ARCHITECTS  
ENGINEERS  
PLANNERS

INSTALL STAINLESS STEEL  
RETAINER PLATE & BOLTS

INSTALL SOLID MOLDED  
RUBBER "J" TYPE SEAL

INSTALL 8"x1/2" STAINLESS  
STEEL R. CONT. W/ 1/2" φ x 4"  
WELDED STUD @ 1'-0" CTRS.

DRILL 2" φ x 1'-0" DP. HOLE INTO EXIST. CONC.  
FOR #5 DOWEL BAR @ 4'-0" CTRS.  
GROUT FULL

GATE BOTTOM SEAL ELEVATION

SCALE : 1/2" = 1'-0"

EXIST. TAINTOR GATE

EXIST. SEAL ANGLE

EXIST. CONC. PIER

EXIST. 3"x3 1/2" ± DEEP  
GROOVE.

INSTALL STAINLESS  
STEEL RETAINER  
PLATE & BOLTS

INSTALL SOLID  
MOLDED RUBBER  
"J" TYPE SEAL.

FLOW

GATE SIDE SEAL PLAN

SCALE : 1 1/2" = 1'-0"

PLATE	DATE
4/4	AUG 1976
K.M.A. NO	B760765

PROJECT	ORONOCO DAM
	SHADY LAKE
	ORONOCO, MINN. OLMSTED CO.

**KM** KIRKHAM,  
MICHAEL  
AND ASSOCIATES  
ARCHITECTS  
ENGINEERS  
PLANNERS

PART II  
STANDARD OPERATING PROCEDURES

INTRODUCTION

The Standard Operating Procedures encompass the recommended procedures for safe operation of the Shady Lake Dam during normal and emergency conditions.

The following two sections describe the recommended Normal Operating Procedures and Emergency Operation Procedures which have been formulated on the basis of the best information which is currently available. It is, however, unlikely that all aspects of operation of the dam are covered in this manual. As additional experience in operation of the dam is accumulated, or if physical changes which affect the operation of the dam are implemented, the Standard Operating Procedures should be updated through the revision process described elsewhere in this manual.

## NORMAL OPERATING PROCEDURES

### Introduction

Normal operations are routine procedures or operations performed during non-emergency conditions on a daily, seasonal, or yearly basis. The purpose of this section is to present the recommended Normal Operating Procedures for the Shady Lake Dam. The Normal Operating Procedures should be adhered to, to prevent or reduce the likelihood of accidental injury or death to persons, or damage to the dam or private property which could occur as a result of misoperation of the dam.

## TAINTOR GATES

### Function and Description

The primary function of the taintor gates is to control the reservoir elevation or drain the reservoir to allow for inspection and maintenance of the dam. A taintor gate changes discharge through the control structure by allowing water to flow under the gate at heads varying according to the position of the gate. The gate rotates about a hinge and is moved by a winch and cable system to the gate support structure. The gate winches are operated by hand or by a gasoline powered portable drive unit stored on the operator's bridge. Access to the winches and gates is obtained from the operator's bridge.

The tainter gates are numbered one through five from left to right looking downstream. Pertinent elevations are as follows:

Gate sill -- 940.0

Top of gate -- 950.0

Operating platform -- 956.5

Spillway -- 947.0

Spillway with 2'0" flashboards -- 949.0

A headwater gauge is installed on the upstream side of the dam on the left hand side looking downstream. A reading of 9.0 on this gauge corresponds to the top of flashboard normal pool elevation of 949.0.

#### SCHEDULED OPERATION

Briefly summarized, the plan of operation is as follows:

1. Maintain pool during open water season as nearly as practicable at 9.00 on the headwater gauge of the dam by manipulating the tainter gates to secure the necessary discharge.
2. Before freeze-up in the fall or by November at the latest, draw down the pool by means of the tainter gates below the level of the concrete crest of the spillway, corresponding to a reading on the headwater gauge of the dam of 6.00.

3. As soon as the pool has been drawn down to the crest, shut all gates and raise flashboards and pins from the structure to their normal winter position.
4. Replace flashboards on the dam as soon as practicable after the spring breakup but not earlier than May 1.
5. Install the infra-red heater on gate 4 by January 15 to insure operability of this gate during the winter.
6. Conduct a formal inspection of the dam and its associated equipment once per year on or near August 15.

#### NOTES

Whenever the reservoir level is to be changed for normal operation or maintenance the following steps should be taken:

1. Notify the DNR regional hydrologist.
2. Notify the Rochester Public Utilities (RPU) - System Operations Center.
3. Notify lake residents by means of a notice in the Rochester Post Bulletin at least three days prior to the planned change.
4. When refilling the reservoir, never close all gates completely until water begins flowing over the spillway.
5. When raising or lowering flashboards, draw the water down to 946, close the gates completely and have two men approach the spillway by boat while a third manipulates the flashboard raising mechanism.

Note! Never approach the dam by boat when a gate is open. Always wear life jackets when performing this operation.

6. Never allow spectators on the dam.
7. The boat, electric heaters, extra bulbs for the heaters, and extension cords are stored in the caretaker's garage at Oronoco County Park.
8. Complete key sets for the dam are in the possession of the following people:

~~STEVE WITTMER~~  
~~Ervin Mohlke~~ 367-4397 2368

Steve Mohlke 367-4526

Jim Foote 533-8244 287-0547 N  
287-2486 W

Telephone numbers are listed in appendix A

#### General Operation Requirements

The discharge capacity of the control structure covers a wide range. The structure will pass minimum flows if the gates are fully closed, or large flows if fully opened. Rapid opening of the gates to a full open position during periods of normal lower flows would potentially cause downstream erosion and a possible hazard for persons near the river downstream of the dam. In addition, such a rapid drawdown may cause a sudden rise in the level of Lake Zumbro. The rise could potentially exceed .5' resulting in wasted water passing over the Zumbro Dam spillway and prompting complaints from lake property owners due to high water. Therefore, it is important that the gates not be operated in this manner. If this type of operation is required, warning should be given to affected

downstream residents and dam owners and the downstream reach should be observed to watch for potential property damage or hazards to persons approaching the river. The gate full open position is intended to be used during large flood conditions when natural flooding conditions in the watershed are imminent, and a large discharge through the dam is required to prevent increased upstream flooding and overtopping of the dam. Conversely, the gates should not be fully closed to raise the lake level to the normal top of flashboard elevation of 949.0 as this will completely stop all flow below the dam. Leave at least one gate partially open when refilling the reservoir until water begins to flow over the spillway.

## EMERGENCY OPERATING PROCEDURES

### Introduction

Emergency operations are the procedures or operations which should be adhered to during conditions that represent an imminent danger to life and personal property or to the dam. The purpose of this section is to recommend Emergency Operating Procedures which are designed to prevent or minimize property damage, injury, and/or loss of life as the result of emergency conditions.

Emergencies may arise as the result of natural forces such as unusually severe floods or may be the result of misoperation or failure of some portion of the dam. In this section, some of the emergencies which may arise (i.e., unusually severe floods

and imminent failure of some portion of the dam) are discussed. However, there is the possibility that an emergency may be precipitated by forces or events that are not contemplated in this manual. For this reason, it is extremely important that the personnel charged with the responsibility for operation of the dam be fully aware of the nature of that responsibility and become thoroughly familiar with all of the aspects of maintenance and operation of the dam.

### Operating Procedure for Unusually Severe Floods

#### Introduction

Unusually severe floods are considered to be those floods which could threaten the safety of the dam or require the implementation of special procedures to insure the safety of the dam. The purpose of this section is to recommend the procedures to prevent or minimize the impact of an unusually severe flood on the people and property upstream and downstream of the dam.

When such an event occurs, it is likely to be the result of extremely intense summer rainstorms or snowmelt coupled with heavy rainfall, and definite measures are required to prevent failure of the dam, to minimize upstream flooding, and to minimize the loss of downstream life and property if failure of the dam cannot be prevented.

### Emergency Operating Procedures

Whenever rainfall exceeds 1 1/2" over a significant portion of the watershed, the operator should check the dam. If the level on the headwater gauge exceeds 9.5 and is rising, open gate #4 two feet and inform the RPU System Operations Center. If water continues to rise, open gate #3 two feet and notify affected downstream property owners and the RPU System Operations Center of the change in gate opening. As long as water continues to rise, open gates #3 and #4 to four feet and then gates #5, #2, and #1 the same amount. When the water level begins to recede begin closing the gates in the reverse order.

Needed telephone numbers are listed in Appendix A.

### ESTABLISHMENT OF FLOOD POTENTIAL

In order to provide the time necessary to implement the emergency procedures required in the event of an unusually severe flood, the operator must first be aware of the potential development of such a flood and anticipate its severity. The problems associated with flood forecasting and, in particular, flood forecasting for a watershed such as that tributary to the Shady Lake Dam, are many and complex. Therefore, it is the intention of this manual to provide the operator of the Shady Lake Dam with a conservative set of procedures for anticipating and reacting to floods which may potentially exceed the discharge capacity of the dam and, therefore, require emergency action. This means that emergency

procedures may be initiated in situations when the ultimate emergency conditions do not develop. This possibility, however, should not detract from the importance of following the recommended procedures in all situations which have the potential for developing into emergency conditions.

#### Sources of Information

The U.S. Weather Service provides information which can give an indication of the likelihood of a major flood. Weather reports predicting a severe rainfall or spring flooding should alert the operator of the potential for a major flood. In addition, contact with local weather stations located near or within the watershed during a severe rainstorm would also provide the operator with an indication of the potential severity. Contact Oxbow Park for information regarding the stage or discharge of the river upstream. Telephone numbers of the local weather stations that could have information regarding rainfall amounts, and the U.S. Weather Service at the Rochester Airport are provided in Appendix A.

#### Flood Due To Summer Storms

During intense rainstorms, the operator should notify the county official responsible for the dam and be on station at the dam. The operator and official responsible for the dam should prepare for a severe flood if the predicted or actual rainfall exceeds approximately four inches over appreciable portions of the watershed.

### Floods Due to Snowmelt and Rainfall

In the case of floods due to spring snowmelt or a combination of snowmelt and rainfall, the operator should prepare for a severe flood when floods in the area are predicted by the U.S. Weather Service flood forecaster. In addition to the flood predictions, the operator should monitor the daily and long-term forecasts. Forecasts predicting rapid warming trends in conjunction with rainfall should alert the operator to possible changes in the predictions of flood severity and timing. The name and telephone number of the U.S. Weather Service flood forecaster responsible for the Zumbro River watershed is given in Appendix A. The operator should contact the flood forecaster twice each week after February 15 and daily during the period of time that the spring flood is predicted for current estimates of the time and severity of the flood. This procedure should continue until the snow cover is depleted.

### Evacuation

Due to the mode of operation of the dam, the reservoir level will begin to rise almost immediately when snowmelt or rainfall occurs. Therefore, it is important to monitor the gate position and corresponding discharge during floods and the potential for flooding in the reach of the river upstream of the Shady Lake Dam. Operation of the dam and downstream evacuation are interrelated and constant monitoring is required to determine the level of flood

protection provided at a given time. If the flooding of the downstream area is forecasted, notification of downstream occupants to prepare for possible evacuation should be accomplished. If flood conditions occur in which the level of downstream flooding will be uncontrolled, evacuation should commence. Notification in the local newspapers and other media when a major flood is predicted by the U.S. Weather Service would also be beneficial. The names of individuals who should be notified if it appears that evacuation may be necessary and their telephone numbers are given in Appendix A entitled "Emergency Notification".

### Procedures for Dangerous Conditions

#### Definition and Introduction

Dangerous conditions are considered to be those conditions which could potentially result in failure of the dam or a component thereof. The purpose of this section is to describe some of the dangerous conditions which could lead to failure and recommend the procedures to be followed if any of these conditions or similar conditions should develop. However, it is possible that dangerous conditions that are not anticipated and described in this section may develop. Identification of these conditions and implementation of a suitable course of action must be based on the judgement and initiative of the operator and the county official responsible for the dam.

## Defects Which May Represent Dangerous Condition

Any sudden or rapid change in the condition of the dam should be considered as a dangerous condition until it is established otherwise. Normally, changing conditions should be observed during the course of the formal or informal inspections. Dangerous conditions will likely be the result of structural or geotechnical defects which have developed to the point at which failure of a component of the dam is imminent. Structural defects which could be indicative of imminent failure will often be evidenced by substantial changes in the structure such as the increase in size, amount and/or the new occurrence of the following:

1. cracks
2. displacements
3. deflection
4. leakage
5. other visible signs of distress

Geotechnical defects can exist in the underlying bedrock foundation. Bedrock defects which could lead to failure of the dam would probably be evidenced by increased or uncontrolled seepage and subsequent erosion of the bedrock, which would affect the stability of the main structures.

The dam could potentially fail as a result of one or a combination of the following:

1. overturning
2. cracking
3. erosion around the abutments

#### Available Courses of Action

The four courses of action available to the operator upon the detection of a potential dangerous condition are the following:

1. notify the county official responsible for the dam
2. notify the RPU System Operations Center
3. initiate protective measures
4. notify authorities to evacuate downstream residents.

One, two, or all four of these measures may be initiated depending on the severity of the defect and the rate at which the condition is changing. The operator must utilize a substantial amount of judgement in the selection of which courses of action he should initiate. However, he should keep in mind that it is much better to be conservative than to take unnecessary chances with the lives and property of the people downstream. The telephone numbers of the people responsible for implementing evacuation are given in Appendix A entitled "Emergency Notification".

The first course of action (notification of the county official) may be selected if it is certain that the defect does not represent an immediate threat to the safety of the dam.

The first, second, and third courses of action (notification of the county official, RPU System Operations Center, and initiation of protective measures) should be selected if

implementation of a protective measure, which would remove or substantially slow the progress of a dangerous condition, is possible, and it is certain that the safety of people and property downstream is not in immediate danger. The first, second, third, and fourth courses of action (notification of county officials, RPU System Operations Center, initiation of protective measures, and notification to evacuate, should be used if the safety of people and property downstream may be in immediate danger.

#### Protective Measures Available

Some of the protective measures the operator may initiate to alleviate a dangerous situation or reduce the consequences of failure are the following:

1. open taintor gates to lower the reservoir
2. place sand bags
3. install emergency erosion protection.

PART III  
INSPECTION AND MAINTENANCE

INTRODUCTION

The purpose of an inspection and maintenance program is to detect and repair defects before they become hazardous or significantly more expensive to correct. Such an on-going inspection and maintenance program is essential to the integrity of a water-retaining structure such as the Lake Shady Dam.

INSPECTION

Introduction

The inspection program forms the basis for the maintenance and operations program and should consist of informal and formal programs of inspection. The informal program, often the most important, requires operating personnel who are conscious of the normal day-to-day condition of the structure and of specific features which have been identified as potential problems. A good informal inspection program should insure that any change in the site conditions is noted and evaluated in a timely manner. The formal aspects of a continuing inspection program should consist of a regularly scheduled systematic inspection of all the features of the structure. Such inspections usually involve formal documentation and, in some cases, photographs of the structure. The formal inspection provides a frame of reference for evaluating future changes in

the condition of the structure. The recommended frequency for formal inspections is annually and during or after every instance of unusually high water or wave conditions.

### Informal Inspection Program

#### Introduction

The primary purpose of the informal inspection is to detect deteriorating conditions in a timely manner and provide the daily records which are necessary for monitoring the performance of the dam and the hydrologic conditions at the site. All portions of the dam should be visually inspected on a daily basis. The air temperature, rainfall, reservoir elevation, discharge and any significant conditions at the dam should be observed and recorded on a daily basis.

#### Concrete Structures

A failure of the concrete structures would likely result from structural overstress, instability, or excessive deterioration. Defects such as cracks, displacement, deflection, spalling, and leakage may indicate overstress or instability. However, these defects can also result from temperature changes, shrinkage, construction joints or movement of the form work during construction. Often these defects occur early in the life of the structure and remain relatively stable thereafter. However, any increase in the extent or severity of existing defects or the occurrence of new defects may indicate weakening of the structure and should be reported immediately.

Normal deterioration of concrete usually progresses gradually and is often the result of freeze-and-thaw cycles or erosion. Spalling or loss of surface concrete is symptomatic of this type of deterioration; however, in the case of deterioration caused by cyclic freezing and thawing, a substantial amount of concrete, which is beneath the surface and, therefore, invisible, may be seriously weakened. If allowed to continue over a long period, normal deterioration can significantly reduce the strength of the structure. Therefore, deteriorated concrete should be repaired before there is a significant loss of surface material. In general, concrete should be patched when the loss of surface material approaches two inches in depth; however, the location of deterioration and the importance of the component involved may establish the necessity for repair at lower levels of deterioration.

#### Daily Records

In the course of his duties, the operator should keep daily records for the dam. These records provide valuable information for future evaluation of the dam and should include temperature, rainfall, reservoir elevation, discharge and a daily diary. The diary should indicate that an inspection was performed, who performed the inspection, any significant condition observed, data such as operation of the taintor gates, and any other significant information regarding the dam.

### Formal Inspection

The formal aspects of a continuing inspection program should consist of a regularly scheduled systematic inspection of all features of the structure and review of the daily records maintained by the operator. Such inspections should involve formal documentation and photographs of the structure which will provide a frame of reference for evaluating future changes in the condition of the structure. The periodic formal inspection is also the primary basis for planning the annual maintenance program.

The recommended frequency for formal inspection is annually and during or after every instance of unusually high water or wave conditions. The formal inspection can be performed by the operator and county official responsible for the dam. However, it is recommended that a formal inspection be performed by a registered professional engineer.

The formal inspection should include special attention to the following:

1. cracks or spalling of concrete
2. shifting, deflection, or any other visible stressing of any component of the dam
3. erosion around abutments

4. gate seals
5. lubrication (gate pins, hoisting mechanisms)
6. flashboards
7. operate all gates to check hoisting mechanisms
8. review operation and maintenance manual.

## MAINTENANCE

### Introduction

The purpose of the maintenance program is to repair, lubricate, and otherwise maintain the various components of the dam to insure the safe, reliable operation of the facility and to minimize the need for major reconstruction or replacement of those components.

The need for periodic maintenance should be established by the previously discussed inspection program. The procedures and materials recommended for maintenance of the various components of the dam are discussed in this section.

### Concrete

Maintenance of the concrete structures of the Lake Shady Dam will involve several operations, including patching, application of surface finishes, and possibly the removal of stains.

Portions of concrete structures that require patching are those areas on which spalling has occurred, reinforcing bars have become exposed, joints have deteriorated and other areas in which patching would improve or restore the operating efficiency of the dam or the appearance of the structure.

The size of concrete repair projects undertaken without assistance should be limited to that which the available county maintenance crews can complete in the amount of time allowed. Repair projects undertaken by the county should be reasonably accessible to the personnel and equipment available.

#### Equipment Suppliers

The suppliers of equipment for the dam are listed in this section. These suppliers are not required to be used; however, they have supplied the original equipment for the dam and are familiar with the installation.

Tainter gates: Manufactured by St. Paul Structural Steel Company, St. Paul, Minnesota.

Gate Hoists: Type IxL 27 wt #49560-1, gear ratio 67.1, shafting 2 13/16 diameter cold rolled steel. Manufactured by Foote Bros. Gear & Machine Company, 521 South Seventh Street, Minneapolis, Minnesota.

Hoisting Chain: 3/4" Round Crown Dredge Iron Chain - safe working load 10,140 pounds.

Infrared heater: Nietz Electric  
Rochester, Minnesota

Gasoline powered hoist: Built by Pat Hall, Oranoga, MN  
- 3 1/2 HP Clinton Engine

Gate Seals: "J" Type molded seals manufactured by Huntington Rubber Mill.

Gate Paint: Hi-Build Epoxyline primer 4.1 dry mil thickness.  
Hi-Build Epoxyline Series 66 - 6.1 dry mil thickness.

Contractor for 1976 Repairs: Arcon Construction Company  
903 C. Forest  
Mora, MN 55051

Electrical Contractor: Squires Electric  
Rochester, Minnesota

Contractor For 1985 Repairs: W. G. Jacques Company  
2183 - N.W. 86th Street  
Des Moines, Iowa 50322  
(515) 276-5464