

**INSPECTION, OPERATION AND MAINTENANCE PLAN
HUSTISFORD DAM
DODGE COUNTY, WISCONSIN**

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I. INTRODUCTION AND DEFINITION OF GENERAL RESPONSIBILITIES

A. Introduction

This manual describes a plan of inspection, operation and maintenance for the Village of Hustisford Dam. This manual should be periodically reviewed and modified to reflect operational and structural changes.

This manual was prepared for the Village of Hustisford by the Advisory Committee for the Hustisford Dam. This manual was prepared to conform to Wisconsin Administrative Code, Chapter NR 333 Dam Design and Construction Standards, Paragraph NR 333.07, "Hydraulic Design and Safety Requirements (4) Safety Measures Requirements."

B. Purpose and Intent

The purpose of the Inspection, Operation and Maintenance Plan is to provide the operator of the Hustisford Dam and other officials with the following:

- Basic guidelines that assist the operator/officials to
 - Safely operate the dam
 - Perform routine and annual safety inspections
 - Properly document the inspections
 - Routinely observe river flows and determine gate operating levels
- Guideline inspection checklist items for routine and annual safety and maintenance inspections
- Contact information for dam operators and emergency offices

C. Description of the Hustisford Dam

The Hustisford Dam is owned by the Village of Hustisford. It is located about 500 feet downstream of the Highway R Bridge on the Rock River and impounds Lake Sinissippi. The dam is about 500 feet upstream of the existing low-hazard Hustisford Canning Company Dam, a small dam also owned by the village. The drainage basin upstream of the dam is 511 square miles; land use within the basin is primarily row crop and hay agriculture.

The Hustisford Dam was originally constructed in 1919 and was reconstructed in 1939 by the engineering firm Mead, Ward & Hunt, Madison, WI. The dam consists of

two tainter gates on the left side, a fixed-crest spillway on the right side and small earthen embankment sections on both sides. Dimensions include an 87-foot fixed-crest spillway at 855.0 (98.80) and two 30-foot tainter gates with the sill at 847.8. The tainter gates are operated by electric motors, with controls located on the motors on the dam. Fuses and circuit switches for the motors are located in the building immediately east of the dam. The dam has a structural height of 11 feet, a hydraulic height of 7 feet and impounds approximately 18,700 acre-feet at maximum pool.

D. **Key Personnel and Their Responsibilities**

The Village of Hustisford is the owner of the Hustisford Dam. The village and Hustisford Utilities are responsible for the operation of the dam as well as inspection and maintenance. Operation of the dam is in accordance with water levels established by the Public Service Commission of Wisconsin in 1952.

Only the dam operator and trained village and utility employees may operate the dam. The operator and village support staff are required to maintain and inspect the dam. The operator is responsible for routine, monthly and annual inspections. More thorough inspections are required after high river flow conditions have subsided. The operator is also responsible for routine daily and weekly monitoring when high-flow conditions exist.

The operator should notify adjacent upstream and downstream operators about changes to the gate levels. Flood water levels may require the operator to change gate operating levels. The operator should coordinate changes with adjacent dam operators.

An early warning system device is to be installed on the dam. In addition, the operator and trained officials must be able to identify potentially dangerous river flow conditions. Potential flood conditions are characterized by the following:

- Extended periods of greater than average precipitation or combined melting periods with greater than average precipitation.
- Rapidly increasing headwater levels (greater than 2" per hour).

II. **INSPECTION**

Inspection is a necessary part of operation since early detection of gradual changes can reduce maintenance costs. Routine inspections provide a way to monitor the dam performance. **All inspections should be performed by properly trained persons.** Listed below are several categories of inspections:

- Daily/Weekly
 - River flow observations
 - Precipitation records
- Monthly
 - Operating Equipment

- Safety Equipment
- Performance and Superficial Structure
- Yearly
 - Structural
 - Operating and Safety Equipment
- 10-Year Wisconsin Department of Natural Resources (WDNR)
- After High-Flow Conditions Have Subsided

The categories are time based with increasing considerations. **Daily/weekly and monthly inspections** require little time to perform. These inspections provide insight into how the dam is operating under current weather conditions. They also provide insight into whether the dam is mechanically operable for emergencies. River flow conditions should also be regularly monitored. The water depth measuring strip on the upstream abutment provides the easiest way to consistently monitor water levels.

Yearly inspections are designed to evaluate how the dam performed throughout the year and the condition of the dam. This inspection evaluates how the dam changed from its original as-built plan condition. Detailed photo documentation provides a permanent record of changing conditions. Cracking conditions can be carefully monitored by placing a ruler within the photo. Larger scale repair and maintenance items should be identified for correction. These inspections are best performed mid-year after the higher spring flows have subsided.

WDNR recommends that dams are inspected by an engineer on a multi-year interval: every 2 years for a high hazard dam, every 3 years for a significant hazard dam and every 5 years for a low hazard dam.

State code requires that copies of inspection reports be submitted to the WDNR.

A ten-year WDNR inspection is required by Ch. 31.19, Wis. Stats. The dam must be inspected by dam safety officials. This coordinated inspection thoroughly details a minimum of the following:

- Structure Integrity (concrete, piling, up/downstream conditions)
- Dam Equipment Operation (gate operators, winches, etc)
- Dam Safety Equipment Operation (fences, signage)

Post storm inspections should be made as soon as flood water conditions have subsided. Listed below are key elements to be inspected after storm flows have subsided:

- Vegetation: high flow damage
- Earthen Fill: slope, riprap and abutment stability, seepage
- Tainter Gates: operation

A. Water levels

From Public Service Commission orders for the Hustisford Dam, the maximum managed water elevation in the impoundment is 855.77 ft (99.50) 8.4" above spillway crest. During abnormal spring run-off or heavy rain events, this level may have to be exceeded to relieve downstream flooding. The minimum water level allowed is 854.55 (98.28) 6" below the crest of the spillway. During winter draw down the water may be lowered to a level of 854.05 (97.80) 12" below the crest of the spillway (after February 15). The amount that the impoundment is drawn down is dependent upon the amount of run-off anticipated. All draw downs are done in a gradual way to reduce downstream flooding.

B. Equipment

The dam operator and qualified officials should be adequately equipped for inspection. The following are recommended inspection-related equipment items:

- Camera with flash
- Ruler with graduations large enough to be identified on photos
- Knives for prying cracks and removing materials
- Boat with graduated rod to check upstream and downstream depths and scour locations
- Blueprint copy of site map or site plan to note locations of problems and changing conditions

III. OPERATION

A. Operational Procedures

The Hustiford Dam and flow conditions are routinely observed and monitored. Routine and required preventive maintenance is performed by the village and Hustisford Utilities. Site inspection and flow monitoring records are kept on file at the village and utilities office.

<u>Recording Water Levels</u>	<u>Minimum Frequency</u>
Winter/Ice Conditions	Daily
Open Water Conditions	Daily
Spring Run-off Period	Daily
Other Flood Events	Daily

In addition, the water levels should be checked and recorded the day following any measureable rain or opening of the upstream Horicon Dam. Flows discharged through the dam or over the spillway are calculated and recorded on monthly log

sheets and recorded on the Village of Hustisford website www.hustisford.com. The water level record sheet is attached for reference.

Standard Procedures

Summer (May to ~~October~~) February 15th.

Water levels should be maintained between 855.2 – 855.4 (99.0 – 99.20) to allow adequate water for recreation on Lake Sinissippi. Along with providing the wildlife adequate water to survive the winter.

~~Fall (Late November to early December)~~

~~Water levels are gradually lowered to the crest of the spillway at 855.0 (98.80).~~

Winter (~~December~~ to March)
February 15th

Begin winter draw down by gradually lowering water level to 854.5 (98.30). Once the level reaches 854.5, the gate should be lowered to allow only a slight amount of water to flow under the gate. Beginning February 15th the water level may be lowered to 854.0 (97.80) if a large amount of spring runoff is anticipated. A minimum of 2.5 cfs of water flow must be maintained at all times as required by WDNR WPDES permit for the Hustisford Wastewater Treatment Plant.

Spring (March to May)

Monitor run-off and rainfall and gradually allow water level to rise to 855.2 (99.0), while also allowing sufficient water to pass through. When Horicon Dam begins to close allow water level to rise to 855.4 (99.20).

Average Rain Events

Predicting the necessary gate movements to maintain any desired water level is largely a "best guess" that varies with the season. Frequent monitoring and adjustments seem the best course of action. Any gate adjustments made are recorded on the log sheet and reported along with the day's water level reading on the Village of Hustisford website. The Horicon Dam (upstream) and Watertown Dam (downstream) should also be notified when gate adjustments are made.

Flood Flow Procedures

Water levels should be read several times daily. When the level exceeds 99.30, one or both gates need to be opened a sufficient amount to get the level below 99.30 as soon as possible. All draw downs should be performed so as to minimize downstream flooding.

Close contact needs to be made with upstream and downstream dam owners. Emergency Management units for Dodge and Jefferson Counties should be notified if flooding appears particularly severe or of long duration.

Low Flow Procedures

When the water level drops to the point that there is no discharge over the spillway, one of the gates should be cracked open slightly to maintain a minimum flow.

Draw Down Procedures

Summer or winter draw downs may be scheduled to assist the Lake Sinissippi Improvement District and the Horicon WDNR with various restoration projects. Draw downs are very controversial with lake community residents.

Summer draw downs - one or both gates are left open until the desired water level is obtained.

February 15th.

Winter draw downs - begin winter draw down ~~November 30th~~ by gradually lowering water level to 98.30 by using West gate. Once the level reaches 98.30 the gate should be lowered to allow only a slight amount of water to flow under the gate while still maintaining the 98.30 water level. A minimum of 2.5 cfs of water flow must be maintained at all times as required by the WDNR WPDES permit for the Hustisford Wastewater Treatment Plant.

1. **Adjacent Upstream and Downstream Dams**

The adjacent upstream dam is the Horicon Dam in the City of Horicon. The dam is owned and operated by the WDNR.

The adjacent downstream dam is the Upper Watertown Dam in the City of Watertown. The dam is owned and operated by Reiss Industries.

Contact information for operators of the Horicon and Upper Watertown Dams is given in the attachments. The WDNR has requested that whenever the gate configuration of the Hustisford Dam is changed an email or other contemporaneous communication is sent to the operator of the Upper Watertown Dam. This will assist with the operations of the Upper and Lower Watertown Dams. The operator of the Horicon Dam has been requested by WDNR to notify the Hustisford Dam whenever gate configuration of the Horicon Dam is changed.

2. **Early Warning System**

High water levels or increasing floodwater levels can be monitored by the early warning system and by the measuring strip gage device on the left abutment. Upstream water levels (headwater) are controlled by the tainter gates. Adverse weather conditions may combine to create rising water conditions. The dam operator should be prepared to reconfigure the tainter gates in advance of high flow conditions.

The dam operator is responsible for initiating and maintaining constant communication with the Upper Watertown Dam operator. Operations of both dams, especially during flood flows, affect one another. Changes (and anticipated changes) in dam operations should be immediately communicated to the adjacent downstream dam.

B. Response During Periods of Darkness

The dam is equipped with two red and one white warning lights. Street and park lighting partially illuminate the dam. The village fire department and Dodge County Sheriff's Department have spotlight equipped vehicles. Hand-held flashlights could also aid night illumination.

C. Identification of Emergency

In addition to use of the early warning system and water depth strip gage, the dam operator and village officials will need to monitor weather to help identify potential floodwater conditions. Flood conditions are characterized by significant increases in depth over relatively short periods of time. Depth increases in excess of 2" per hour need to be carefully evaluated. Listed below are important factors that require consideration in light of potential emergency flood situations:

- Initial Water Elevation and Gate Operation
- Previous Weather History, which includes past rainfall
- Predicted Weather
- Upstream and Downstream Dam Operation Procedures

D. Emergency Repair Supplies and Resources

Dam repair materials are not stockpiled at the dam for emergencies. Minor repairs would be evaluated by the EAP coordinator and dam operator. The dam operator would coordinate repairs. Heavy equipment is available from the village, Dodge County Highway Commission and local contractors. Repair materials would need to be obtained from nearby sources. The operator should have an identified source of embankment repair materials for emergency use. Major repairs would be coordinated through the EAP coordinator and dam operator.

E. Coordination of Floodwater Flows

Upstream flows may be regulated from the adjacent upstream dam. The level of Lake Sinissippi (headwater) can only be lowered through the tainter gates during higher than normal flows. Adverse weather conditions may create rising water levels. The dam operator shall take action to release water when a 2" increase in the headwater level is recorded.

IV. MAINTENANCE

The Hustisford Dam is constructed of reinforced concrete and steel, fabricated components and earthen embankment materials. The dam has relatively few maintenance items and operating components. The dam has an estimated life of 100 years when properly maintained. Periodic maintenance and item replacements are expected and preventive maintenance activities will increase with time. The inspection and maintenance plan lists minimum items requiring maintenance.

Maintenance should be regularly performed. Routine, annual and post storm inspection results will dictate how often and to what degree maintenance is required. Most items can be repaired by the dam operator or village personnel. Larger repair items may require work by qualified contractors. Generally, questionable repair items should be inspected by a qualified engineer and, if required, repaired by contractors.

A. Maintenance Frequency

Maintenance should be routinely performed. Some items require more frequent attention than others. The inspection and maintenance plan provides a guideline for how often features may require maintenance and repair.

Waterproof filler materials may be removed from construction joints by flood waters and settling of the structure. Waterproof filler materials should be maintained as outlined by the contractors or product suppliers' specifications.

Both tainter gates should be fully exercised 1-2 times per year to ensure that they are completely functional and operable.

B. Budget Considerations

Periodic maintenance, repair and item replacement are expected. Preventive and regular maintenance items will increase with time. The dam contractor and component fabricators will be able to provide guidelines for routine maintenance and replacement. The dam operator should expect to use expendable items such as fencing, paint, lubrication, riprap materials, etc. Riprap, geotextile fabric and embankment fill materials should be stockpiled for both emergency and routine use. Other expendable items should be budgeted based on manufacturers' recommendations and dam operating experience. Funds should be allocated for larger overhaul items and repairs even though they may not always be predicted.

C. Construction Plans and Photo Documentation

Construction plans and photographs of as-built condition detail construction dimensions, materials and installed conditions. The photographs were selected to document how key features should be maintained. Construction plans and photo documentation are located with the dam operator and village hall.

V. EMERGENCY ACTION PLAN

An Emergency Action Plan (EAP) was created to comply with Wisconsin Administrative Code, Chapter NR 333.

The purpose of the EAP is to provide the Village of Hustisford, Dodge County and emergency management agencies with specific guidelines for emergency action in the event that of high flood water conditions and potential dam failure. The intent of the EAP is primarily to protect the lives of village and county residents and secondarily to minimize property damage.

The underlying intent of the plan is to provide a specific schedule of events to do the following:

- Monitor/assess dam structure conditions to help predict dam behavior at all water level conditions.
- Provide basic levels of required communication for various water level conditions (including dam overflow, dam failure, etc).
- Provide for a required yearly coordination meeting among all emergency contacts, landowners directly affected by immediate dam failure and designated safety officials.
- Define each agency's/person's duties for securing public notification.
- Provide detailed response actions for the particular emergency.

An observer other than the dam operator and designated officials may notice unexpected high flows, potential dam failure and dam failure. An observer noticing unusual behavior should immediately notify the Village of Hustisford Police Department or Dodge County Sheriff's Department. Further action/response will depend on whether failure of the dam has occurred or is imminent, or a potentially hazardous situation is developing at the dam.