

Dam Inspection by Owner – Fact Sheet

A dam safety inspection program is an important aspect of a successful dam safety program. This program typically consists of two types of inspection, a periodic engineering inspection and an operational inspection. The engineering inspection is typically a thorough evaluation of the structural and hydraulic condition of the dam. These inspections should be conducted by a licensed professional engineer experienced in dam construction and design. Engineering inspections are required every 3, 4, or 5 years, depending upon the hazard potential of the dam.

Regular operational inspections are typically conducted by the owner or the operator of a dam. These inspections should involve visual inspection of the dam, along with the recording of data obtained from staff gauges or other instrumentation on-site.

The Inspection

It is helpful to prepare an inspection route in advance to assure that every part of the dam will be observed. The following is a recommended sequence to assist in your inspection:

- * **CREST** - Walk across the crest from abutment to abutment.
- * **UPSTREAM/DOWNSTREAM SLOPE** - Walk across the slope in an up and down or zigzag pattern from abutment to abutment.
- * **EMBANKMENT-ABUTMENT CONTACTS** - Walk the entire length of the embankment-abutment contacts (groin).
- * **OUTLET CONDUIT** - Observe all accessible features of the outlet conduit.
- * **SPILLWAY** - Walk along the entire length of the spillway in a back and forth manner.
- * **DOWNSTREAM CHANNEL** - Travel the route of the stream below the dam to maintain familiarity with locations of residences and property which can be affected by dam failure.
- * **DOWNSTREAM TOE** - Walk the entire length of the downstream toe.

Things to Look for During an Inspection

Principal Spillway

The principal spillway may be a concrete or rock weir, or a concrete, plastic, or metal pipe. Concrete weirs should be checked for cracking, settlement, and deterioration. Pipes should be checked for corrosion, settlement, cracking, joint separation, and leakage.

Auxiliary Spillway

The auxiliary spillway, often referred to as an emergency spillway, is typically an overflow spillway designed to operate prior to overtopping the remainder of the earth embankment. The spillway should be checked for settlement and cracks, along with blockages caused by fences, logs, trees, brush, or other debris.

Inlet or Outlet Works

Inlet and outlet works may include gates, stoplog bays, valves, and other structures used to regulate water for a specific purpose. The operation of gates and valves should be checked, and gates and valves should be checked for rust, cracking, or misalignment. Stoplogs should be checked for deterioration and leakage.

Trashracks

Trashracks are typically found at the inlet of the principal spillway. The trashracks should be inspected frequently to make sure they are unobstructed, to provide for the free flow of water. Trashracks are also prone to rusting.

Earth Embankments

The majority of dams within the State of Michigan consist, at least in part, of earth embankments. These earth embankments are susceptible to deterioration by weathering and the erosive forces of wind, water, ice, and temperature change. Owner inspection of earth embankments should include observation for seepage, cracks, settlement, slumps, erosion, scour, vegetative growth, and animal burrows.

Seepage is the passage of water through or under the earth embankment, or the contact between the embankment and other structures. Nearly all dams will experience some seepage. In some cases, a drainage system has been installed at the downstream toe of the dam to collect seepage. Dam owners should monitor seepage for changes in the quantity of seepage, as well as for soil particles present in the seepage. If soil particles are observed with the seepage, internal erosion of the embankment (piping) may be occurring. Piping is a dangerous condition which could lead to failure of the dam. If piping is observed at your dam, you should immediately contact the Dam Safety Program or an engineer experienced in dam safety.

Cracking of an earthen embankment is an indication of differential movement of the dam. Settlement of an earthen embankment indicates either the loss of material from the embankment, or additional compression of the embankment or foundation materials. Both conditions are indicators of embankment instability; and if either condition is observed, you should immediately contact the Dam Safety Program or an engineer experienced in dam safety.

Scour is underwater erosion caused by the rapid flow and turbulence from a spillway or high velocity. Since this generally occurs underwater, observation of the condition is often difficult. In some cases, probing with a long rod can be used to detect and approximate the extent of scour.

Vegetative cover for dam embankments should consist of a suitable growth of grass. Bare embankment slopes are susceptible to erosion, and the presence of cattails and other water-loving vegetation is often indicative of a high water surface within the embankment. Tree and brush growth on embankments is also undesirable, as it provides cover for burrowing animals; prevents a thorough inspection of the embankment; provides an avenue for seepage as roots decay; and if trees tip over during windstorms, the loss of soil around the root mass can compromise the integrity of the embankment.

Animal burrows result in a loss of earth material and can provide seepage paths. Animals should be removed and holes backfilled with soil.

Keeping Records

It is important for the dam owner/operator to keep records throughout the existence of the dam. Accurate records can better illustrate the dynamic nature of the structure. The following items will aid the dam owner/operator in keeping good records.

Inspection Checklist - A convenient way of compiling inspection observations is by recording them directly onto an inspection checklist. The checklist should be attached to a clipboard and carried by the dam inspector as he/she traverses the entire structure. A sample checklist has been included as an addendum to this fact sheet.

A good practice to follow, along with filling out the inspection checklist, is to draw a field sketch of observed conditions. The field sketch is intended to supplement the information recorded on the inspection checklists; however, it should never be used as a substitute for clear and concise inspection checklists.

Photographs - Inspection photographs can be vitally important. Over time, photographs serve to provide a pictorial history of the evolving characteristics of a dam. The dam owner/operator often finds them to be great money savers because they can illustrate that some observed conditions (seepage, foundation movement, etc.) have existed for many years and may have reached a state of equilibrium. With this knowledge, quick and economical remedial actions can be developed and implemented. Photographs should be dated on the back and provided with brief descriptions of the locations shown in the pictures.

Monitoring Data - As previously indicated, it may become necessary to make measurements of various items during the course of a dam inspection. This may include measurements of seepage rates, spillway discharge rates, settlement, and for some dam owners, readings from instruments such as piezometers. It is important that this data also be compiled in a systematic manner and placed in a permanent file.