



DAM OWNERSHIP

FACT SHEET

TOPIC: INTERNAL EROSION OF EARTH DAMS

WHAT IS INTERNAL EROSION?

Internal erosion (called “piping” by dam engineers) of an earth dam takes place when water that seeps through the dam carries soil particles away from the embankment, filters, drains, foundation or abutments of the dam.

If the seepage that discharges at the downstream side of the dam carries particles of soil, an elongated cavity or “pipe” may be eroded backward (working upstream) toward the reservoir through the embankment, foundation or abutment. When a backward-eroding pipe reaches

the reservoir, a catastrophic breaching of the dam can occur.

Internal erosion usually takes place in episodes of erosion and discharge of muddy water interspersed with periods of clear-water discharge or no discharge at all depending on head and flow. Internal erosion may be taking place even if there is no visible discharge of water or if the water that is discharging from the soil on the downstream side of a dam is not muddy. Chemicals, salts, dissolved and suspended solids and dispersive clays can also erode unnoticed from the inside of



Failure at a dam caused by internal erosion of the soil abutment.

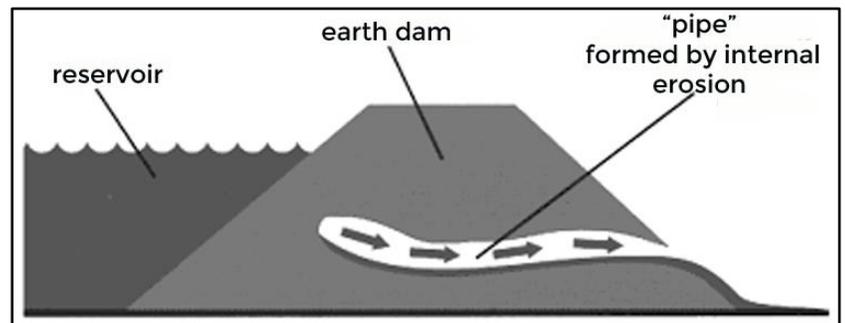


Illustration of internal erosion (piping) in an earth dam embankment.

a dam. The only way to monitor this, in the absence of visible erosion or sand boil deposits, is to send samples to a lab for testing.

INTERNAL EROSION BASICS

Internal erosion is one of the most common causes of failure of earth dams.

There may be no external evidence, or only subtle evidence, that it is taking place.

A dam may breach within a few hours after evidence of the internal erosion becomes obvious. Internal erosion may develop the first-time water is impounded behind a dam, or it may develop slowly over many years.

Higher water surface elevations and pressure may exacerbate or initiate internal erosion.

You cannot assume that your dam is safe against internal erosion just because it has performed satisfactorily for many years.

Internal erosion failures are often associated with "penetrations" of dams, such as outlet pipes buried in the embankment, rodent activity, and concrete spillways that cross the embankment.

An experienced dam engineer may be able to detect the subtle signs of internal erosion during routine periodic inspections, but you should be aware of what signs to look for between inspections.

If you do observe signs of internal erosion, you should get help from an experienced dam engineer.



Failure of an earth dam by internal erosion along concrete outlet pipe.

SIGNS OF A DEVELOPING SITUATION

What to Look For

- ✓ Water discharging on the downstream slope of an earth dam or within a few hundred feet downstream from the dam. Look for any accumulation of sediment downstream from the discharge.
- ✓ Water flowing along the outside of a pipe, concrete spillway, or other structure that penetrates the embankment.
- ✓ Water discharging near the roots of a living or dead tree.
- ✓ Corrosion or deterioration of the visible portion of a low-level outlet pipe or other structure that penetrates the embankment.
- ✓ Trees that are uprooted on the embankment or abutments or in the valley bottom immediately downstream from the dam.
- ✓ Water emanating from animal borrows.
- ✓ Dead trees (the rotting roots of which may become avenues of internal erosion) on the embankment or abutments or in the valley bottom immediately downstream from the embankment.

What to Do

As soon as possible, contact your qualified Professional Engineer or dam safety consultant to inspect the dam and then call your state dam safety engineer.

Research the history of seepage in previous dam inspection and monitoring reports. Look for changes of flow quality and quantity.

SIGNS OF IMMINENT DANGER

What to Look For

- ✓ Muddy water or large flow of clear water discharging (1) from soil anywhere on the downstream side of the dam, (2) next to a spillway, pipe or other structure that penetrates the embankment or abutments, or (3) from drain pipes in the embankment. Muddy water discharging from the downstream side of a dam or from a drain or low-level outlet pipe, which may indicate that the dam is failing.
- ✓ Sinkholes or subsidence anywhere on the embankment or an abutment. Water flowing into a sinkhole below the reservoir surface on the upstream slope of a dam is especially dangerous.



Seepage that developed where the root ball of a tree pulled out of the ground near the downstream toe of the dam.



Sinkhole on the crest of an earth dam. The reservoir was lowered and a cavity was found under the sinkhole.



Corroded corrugated-metal outlet pipe removed from a dam that had developed large sinkhole.

What to Do

Immediately call your emergency management, public safety officials or 911 for imminent dangers.

Activate your Emergency Action Plan and call your engineer and the State Dam Safety Program.

RESOURCES

All guidelines and tools for owners are available at the ASDSO website for owners:

DamOwner.org

To view an animation of a piping failure, go to ASDSO's YouTube site.