Diaphragm type Earth dams

This type of dam is constructed with pervious material, with a thin impervious diaphragm wall or concrete) to reduce seepage as shown in Figure. The main difference between the type and the diaphragm type depends on the thickness of the impervious core or diaphragm.

Factors Governing the Selection of Earth Dams

The Conditions at a site leads to the selection of an earthen dam, rather than a concrete dam. Mowing are the reasons:

**Topography:** It is a most important factor which dictates the first choice of the type of a dam. A wide valley with deep overburden would suggest an earth dam.

**Geology and Foundation Conditions:**

- Gravel foundations, if well compacted is suitable for earth dams.
- Silt or fine sand foundations can be used for earth dams, the main problems include settlement, prevention of piping, excessive percolation losses.
- Clay foundation may be used for each dams but require flat side slopes, due to low shear strength of the foundation soil.
Materials available: The most economical type of a dam will often be one for which materials like soil; stone etc. can be found within the proximity. In other words if suitable soils are found nearby borrow pits, an earth dam may prove to be more economical.

Environmental: It is an important factor deciding the selection of the dam in terms of its dimensions, location of spillway and appurtenances facilities.

Economy: It is the final factor that decides the type of dam, including cost of spillway, power, control structure and foundation treatment.

Causes of failure of Earth dams

In practice earth dam failures are caused by improper design frequently based on insufficient investigations, lack of care in construction and maintenance.

Following are the major causes:

→ Hydraulic failures
→ Seepage failures
→ Structural failures

Hydraulic failures: They account for about 40% of the total failures.

Following are the various types of hydraulic failure.

Overtopping:
The earth dam way get overtopped if:

○ The design flood is under estimated
○ The spillway is of insufficient capacity
○ Faulty operation of spillway gates
○ Insufficient free board
○ Settlement of foundation and embankment
Following precautions are necessary to protect the embankment from overtopping.

- Providing Grass cover or turf for a low level of erosion stress and short duration.
- Geotextiles serve to an excellent level
- Providing soil cement and / or roller compacted concrete is proved to be more successfully
- Gabions or rock filled wire baskets can reduce the erosion to a large extent.
- Stone pitching or rip rap on steep slopes have been successfully adopted to reduce overtopping.

**Erosion of upstream face:** Strong winds blowing over the water surface generate huge waves that could knock out the soil from the upstream face of the dam, in the absence of proper protection and these waves can also cause the slip of the upstream slope leading to dam failure.

**Toe erosion:** Toe erosion may occur due to the following reasons:

- Erosion due to tail water
- Erosion due to cross currents.
- Toe erosion can be minimized or even avoided by providing thick rip rap on the downstream up to a height slightly above the tail water level.

**Erosion on Downstream side by Gully formation:**
- Gullies are formed due to the rundown of rainwater on the downstream face of the dam and formation can lead to dam failure.
- In order to prevent this failure, following preventive measures have to be adopted: The slopes/faces of the dam should be properly maintained.
- All cuts formed on the slopes, particularly on the downstream side should be filled as early as possible.
- Turf should be provided on the downstream slope.
- Berms (horizontal steps) should be provided at suitable intervals / heights.
- Good drainage should be provided on the downstream slope for discharging off the rainwater.