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Definitions:

- A dam is a structure which prevents the flow of water and accumulates it in a reservoir
- Dam is a solid barrier constructed at a suitable location across a river valley to store flowing water.
- A barrier constructed across a waterway to control

Purpose:

1. Drinking and domestic water supply
2. Flood control
3. Irrigation
4. Industrial water supply
5. Hydroelectric energy production
6. Retention and control of sediments
7. Inland navigation
8. Improvement of water quality

Classification of Dams

According to size of a Dam

Large dams

Small dams

- According to International commission on Large Dams, a dam is big if height is more than 15m.
- According to ICOLD, if the height is between 10m-15m the dams is big:

• If the crest length is bigger than 500m

According to Height of dam

- High Dam
 - If the height is more than 100m.
- Medium Dam
 - If the height is between 50-100m
- Low Dam
 - If the height is below 50

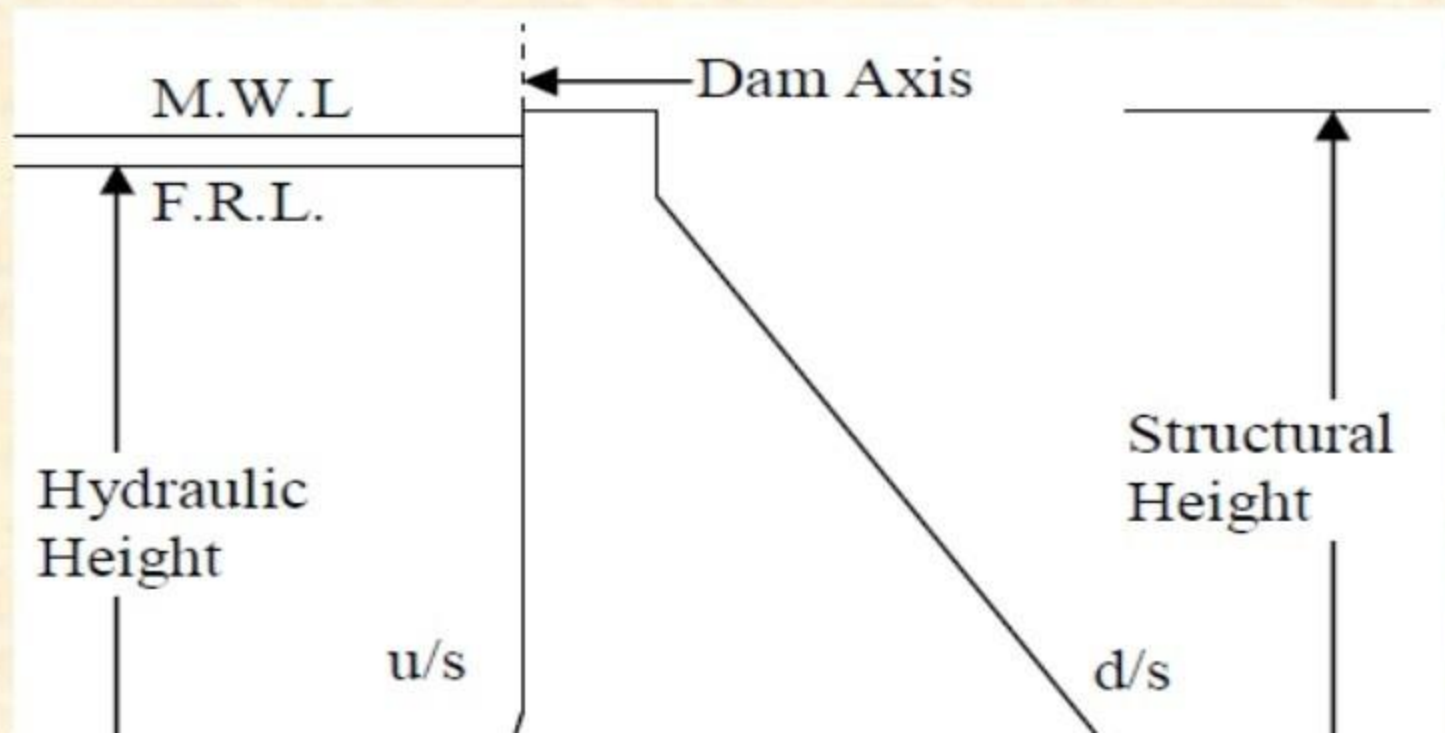
According to structure and materials used

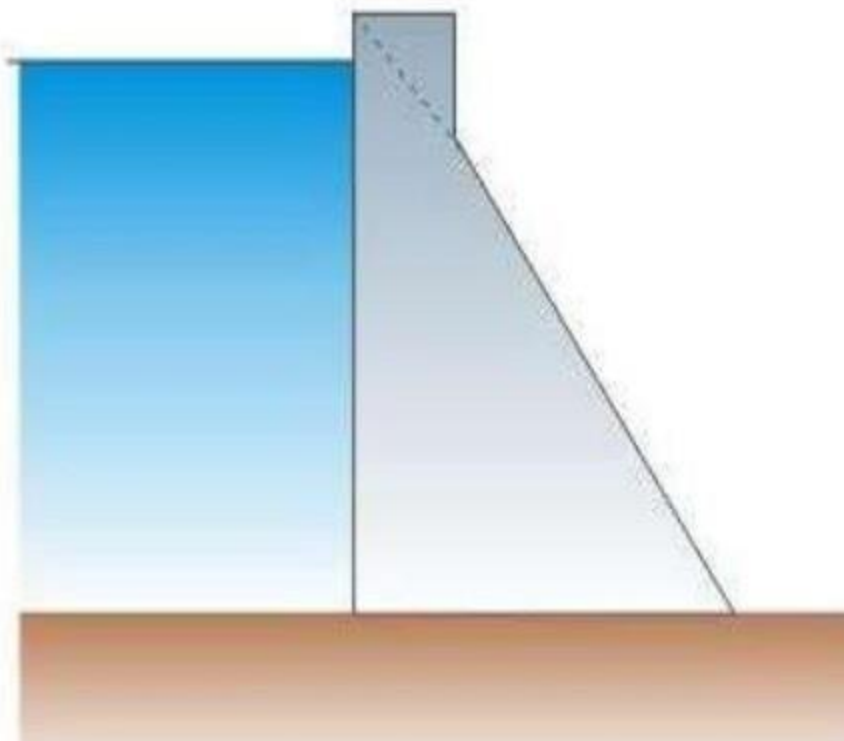
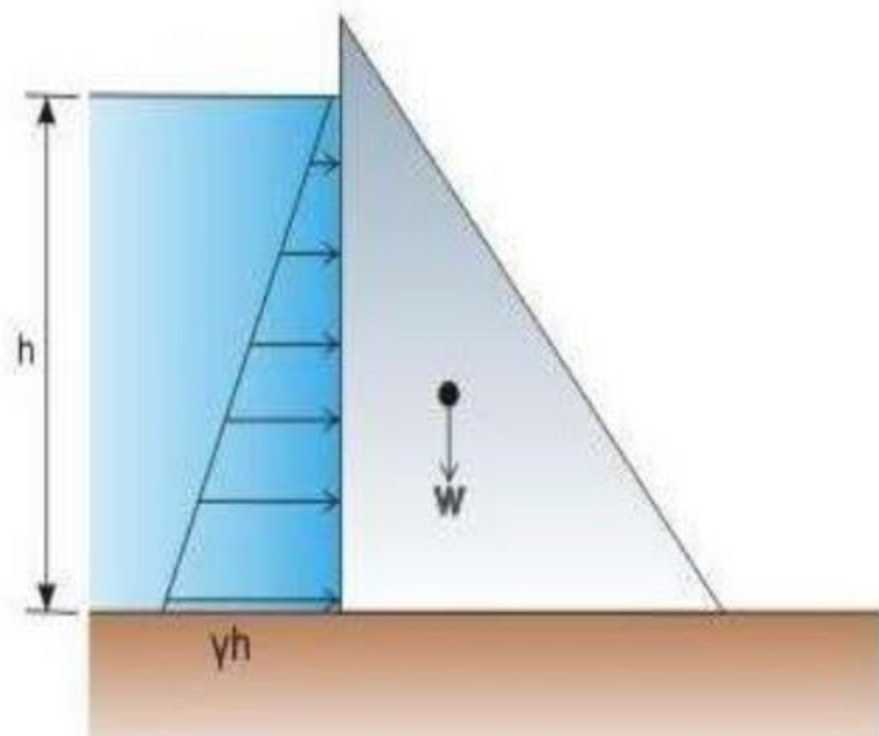
- Gravity dams
- Arch dams
- Arch-gravity dams
- Buttress dams
- Barrages
- Embankment dams
 - Homogeneous earth dams

Gravity Dams

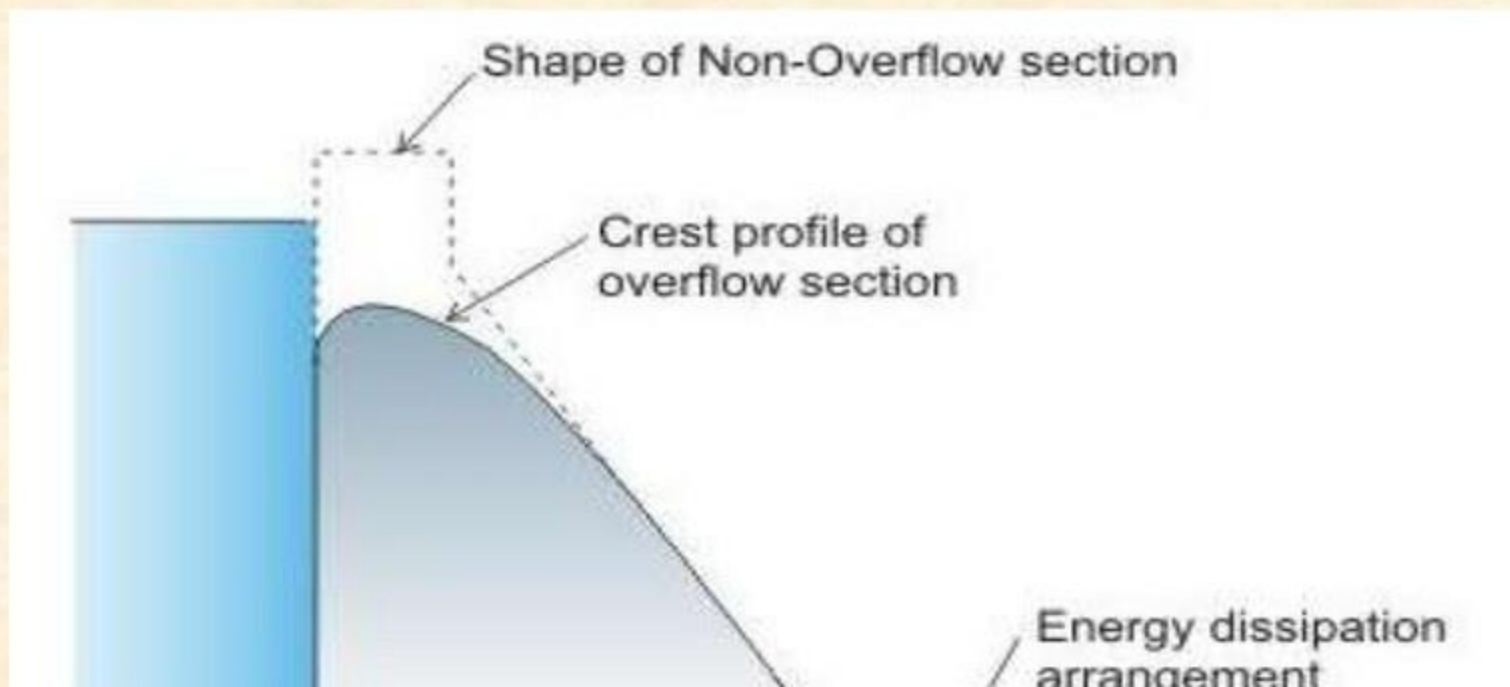
- Gravity dams are dams which resist the horizontal thrust of the water entirely by their own weight. They use their weight to hold back the water in the reservoir.
- The section of the gravity dam is approximately triangular in shape, with its apex at its top and maximum width at bottom.
- A gravity dam is generally straight in plan and, therefore, it is also called straight gravity dam.

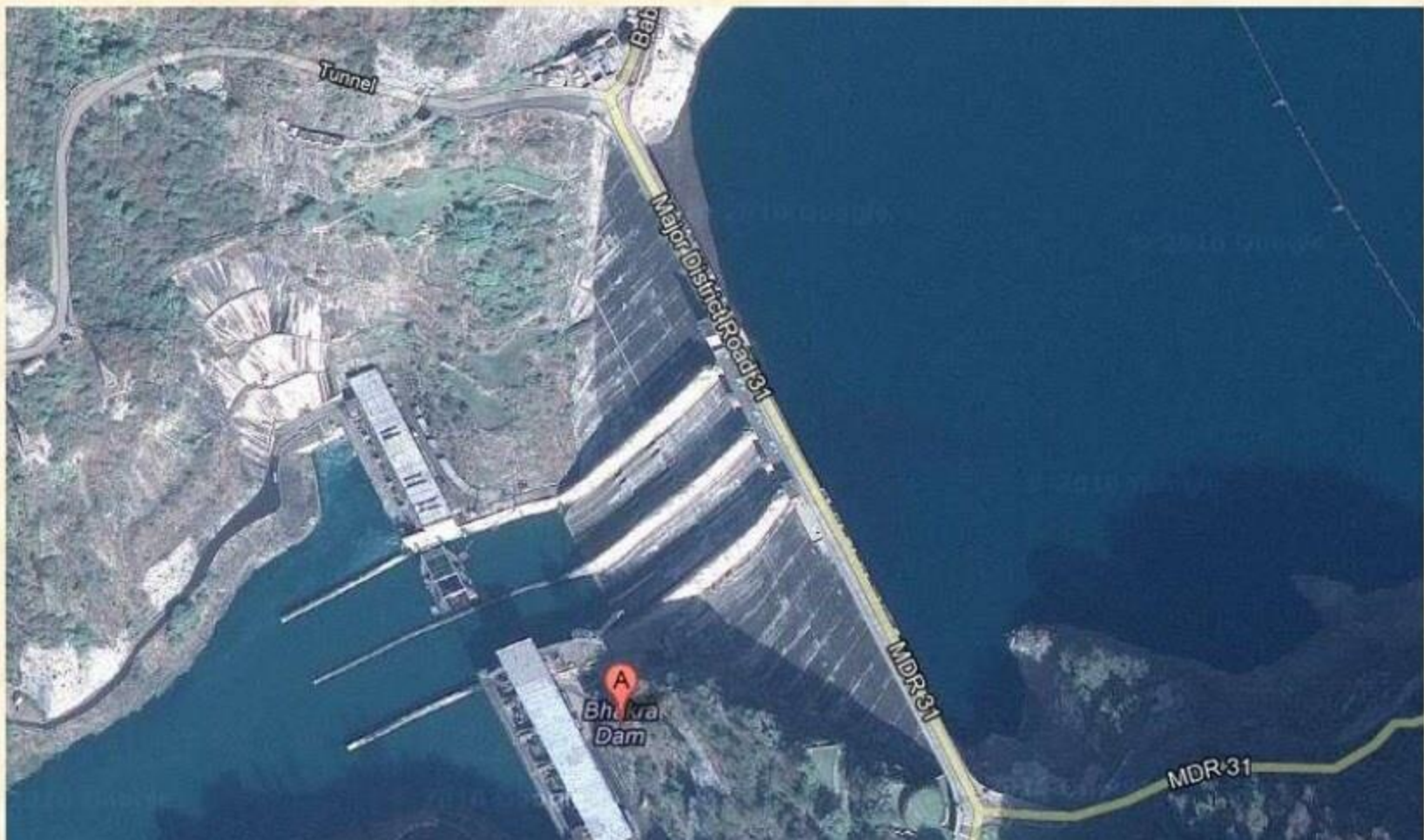
Section of a Gravity Dam





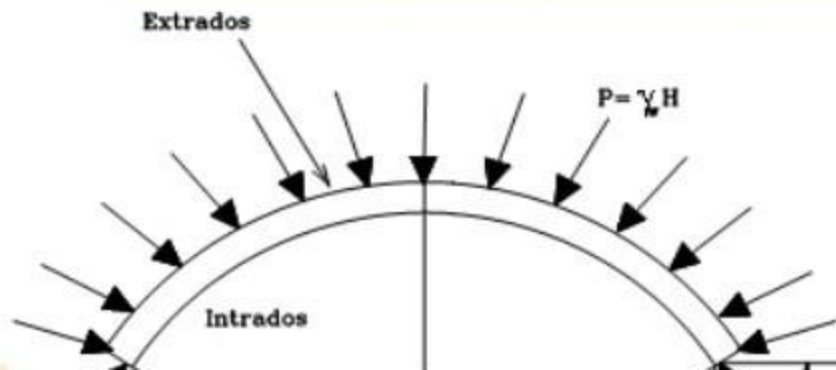
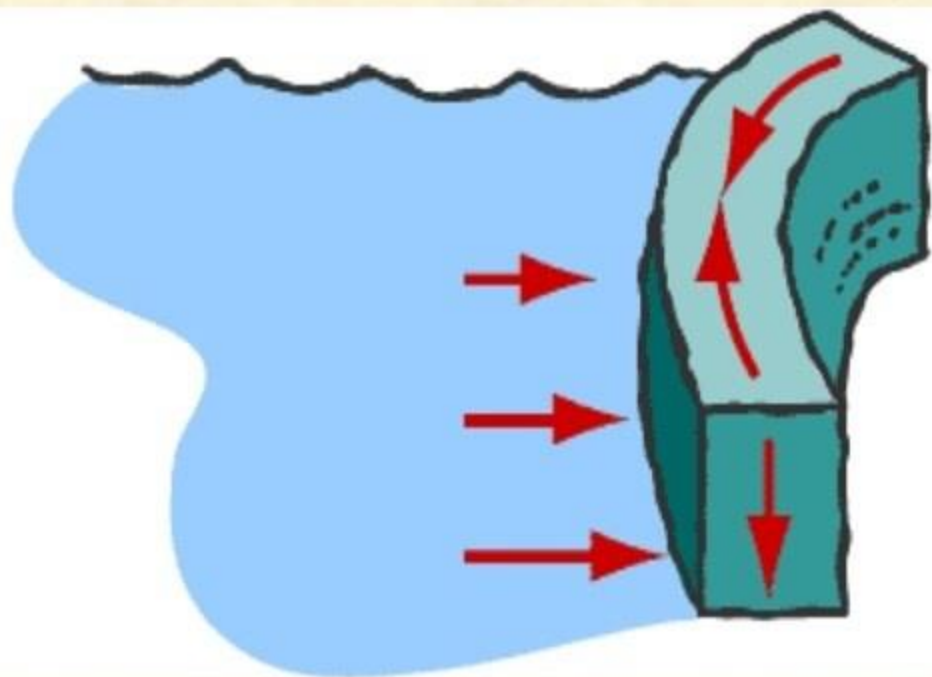
- The non-overflow section and
- The over flow section or spillway section.





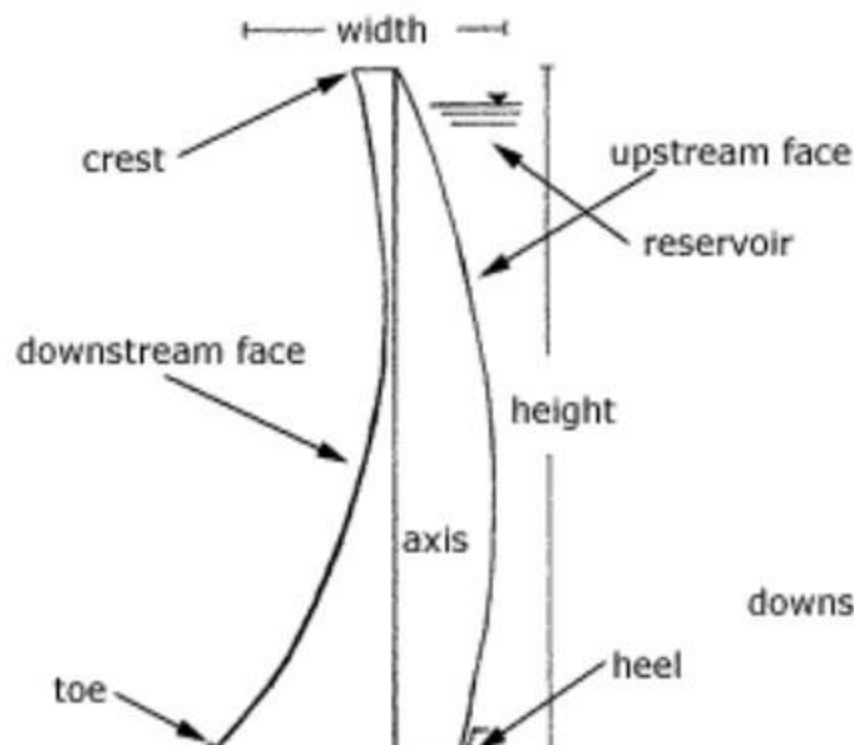
Arch Dam

- An arch dam is curved in plan, with its convexity towards the upstream side. They transfer the water pressure and other forces mainly to the abutments by arch action.

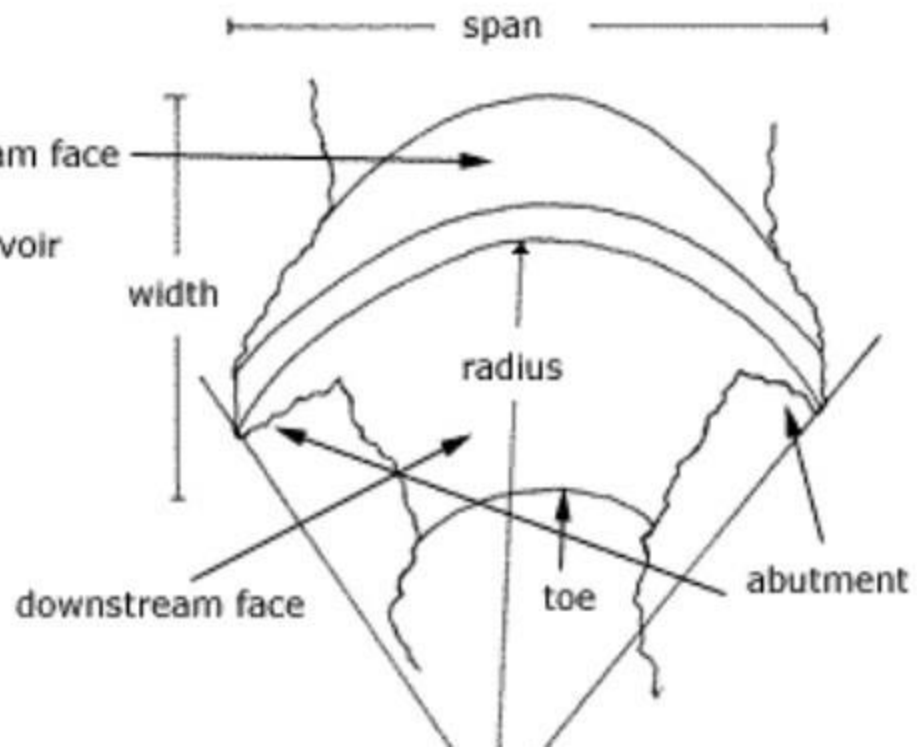


- An arch dam is quite suitable for narrow canyons with strong flanks.
- The section of an arch dam is approximately triangular like a gravity dam but the section is comparatively thinner.
- An arch dam is most suitable for narrow gorges.
- Since they are thinner than any other dam type, they require much less construction material, making them economical and practical in remote areas.

cross section

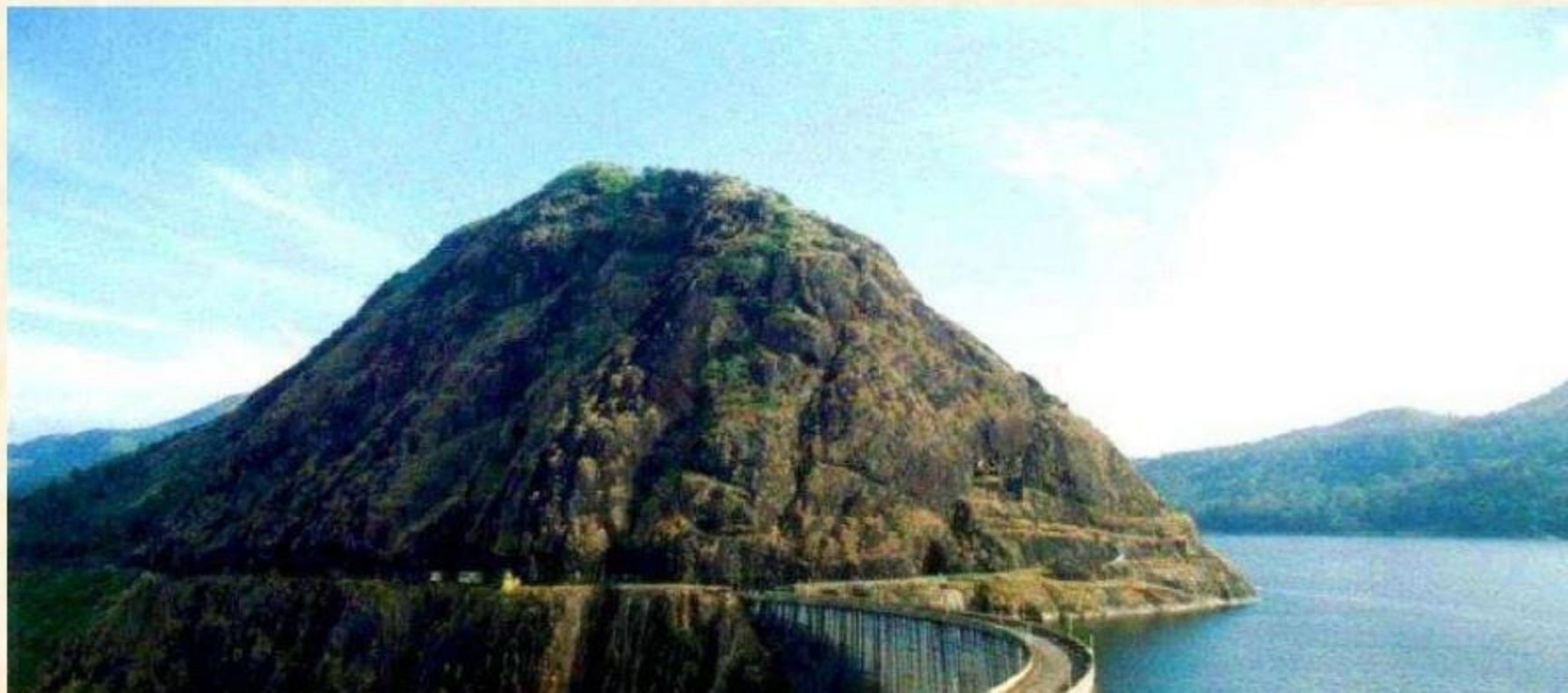


plan view



- There are two basic designs for an arch dam:
 - *constant-radius dams*, which have constant radius of curvature, and
 - *variable-radius dams*, which have both upstream and downstream curves that systematically decrease in radius below the crest
- A dam that is *double-curved* in both its

Idukki Dam, Kerala- First Arch dam in India



Arch-Gravity Dam

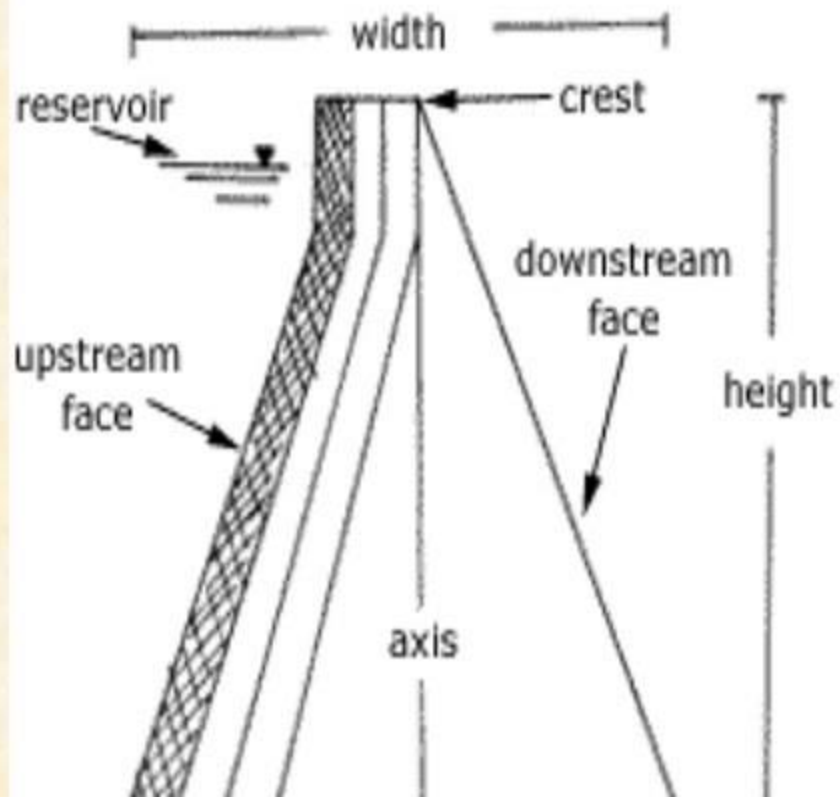
- An arch-gravity dam, curved-gravity dam or arched dam is a dam with the characteristics of both an arch dam and a gravity dam.
- It combines the strengths of two common dam forms and is considered a compromise between the two.
- A gravity dam can be combined with an arch dam into an arch-gravity dam for areas with massive



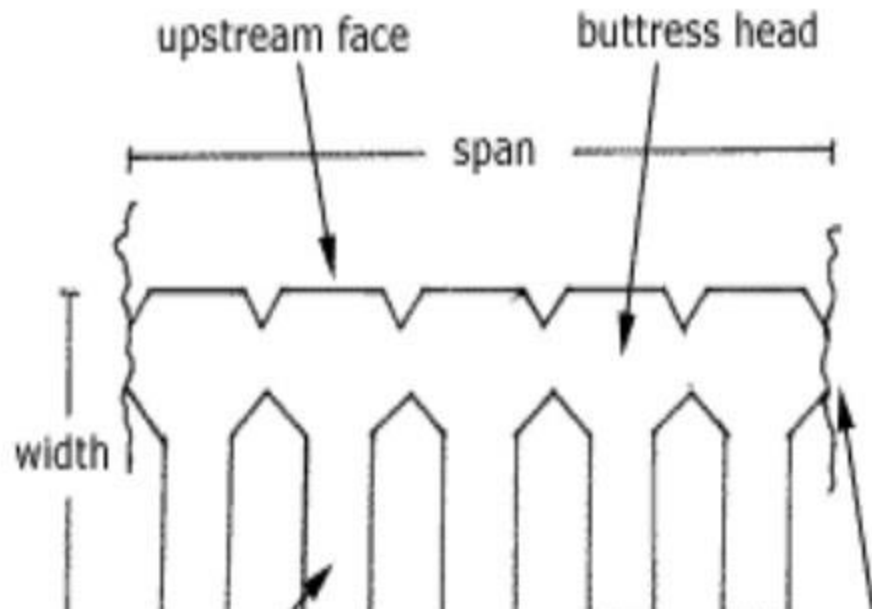
Buttress dams

- A buttress dam or hollow dam is a dam with a solid, water-tight upstream side that is supported at intervals on the downstream side by a series of buttresses or supports.
- The dam wall may be flat or curved.
- In comparison with massive gravity

cross section



plan view





Barrages

- A barrage dam is a special kind of dam which consists of a line of large gates that can be opened or closed to control the amount of water passing the dam.
- The gates are set between flanking piers which are responsible for supporting the water load.

Farakka barrage, WB



Embankment Dams



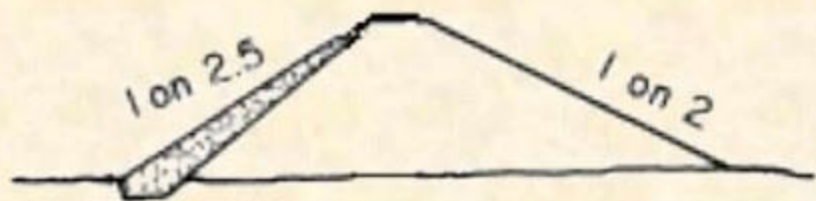
A dam composed of any type of soil including rock is known as embankment dams. These are classified into two main categories :

- Earth-fill dams
 - An earthfill dam is an embankment dam, constructed primarily of compacted earth, either homogeneous or zoned, and containing more than 50% of earth.
- Rock-fill dams
 - An embankment type of dam, dependent for its stability

Rock-fill Dam:

- An embankment consisting of various sizes of rock to provide stability and an impervious core of membrane to provide water-tightness.
- The impervious zone may be on the upstream face and made of masonry, concrete, plastic membrane, steel sheet piles, timber or other material.

Upstream core



Sloping core





Earthfill dams:

-
- Local available soil is the main construction material
- It must be sufficiently impervious to prevent excessive loss of water through the dam.
- The soil should develop a maximum practical shear strength under compaction and maintain most of it after the filling of the reservoir;



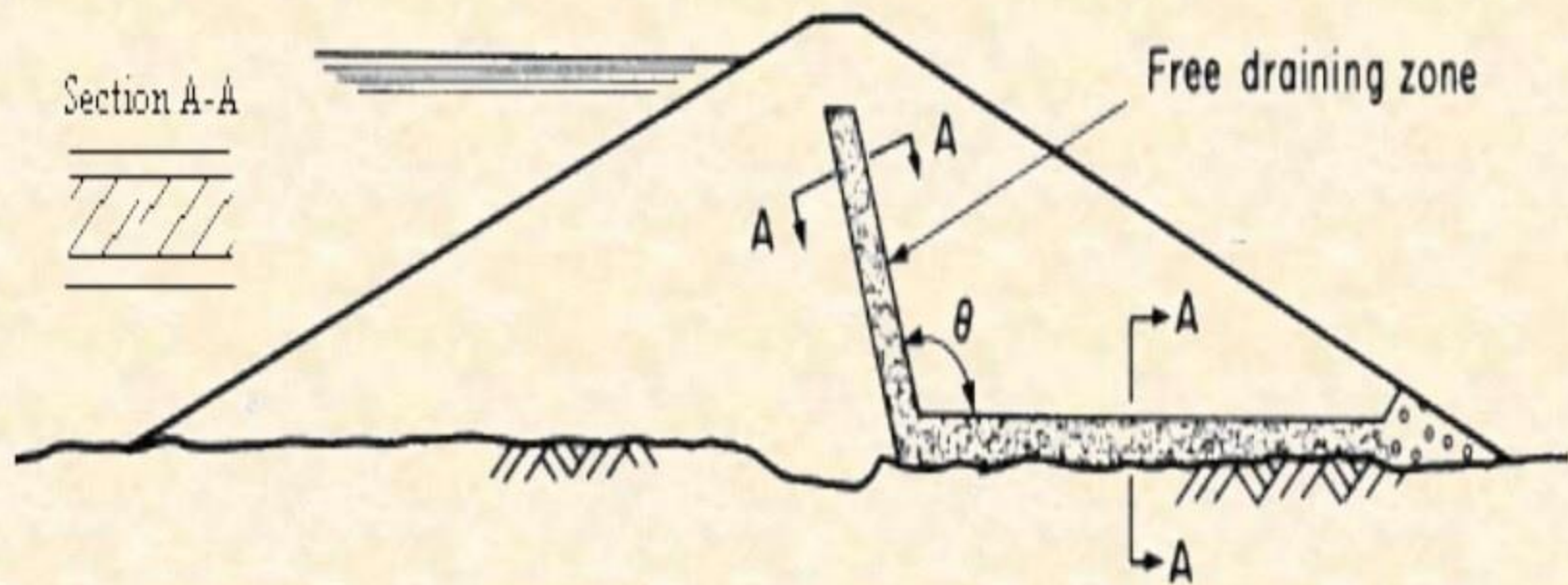
Types of Earthfill dams:

- Homogeneous earth dams
- Non-Homogeneous (zoned) earth dams
- Rolled fill earth dams
- Hydraulic fill dam

Homogeneous earth dams

- These dams are constructed with uniform and homogeneous materials. It is suitable for low height dams (up to 10m).
- The seepage action of such dams are not favourable, therefore, for safety in case of rapid drawdown, the upstream slope is kept relatively flat (3:1)

Section A-A



Non-Homogeneous (zoned) earth dams

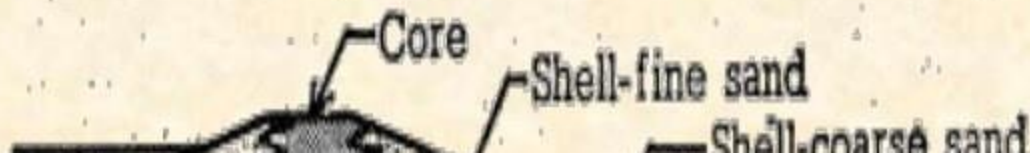
- These are dams with the central portions called core or hearting made from materials which are relatively impervious.
- The thickness of the core wall is made sufficiently thick to prevent leakage of water through the body

Rolled fill earth dams

- An embankment dam of earth or rock in which the material is placed in layers and compacted by the use of rollers or rolling equipment.
- In this type of dams, successive layers of moistened or damp soils are laid one over the other. Each layer not exceeding 20 cm in thickness is properly consolidated at

Hydraulic Fill dams

- During construction, a mixture of excavated materials in slurry condition is pumped and discharged at the edges.
- When it is discharged near the outer edges, the coarser materials settle first at the edges, while the finer materials move to the middle and settle there.
- Fine particles are deposited in the central portion to form a water tight central core. In this method, compaction is not required.



Rubber Dam

- Inflatable rubber dams are cylindrical rubber fabrics placed across channels, streams and weir or dam crests to raise the upstream water level when inflated.
- The membrane is a multi-layer fabric made of synthetic fibre (usually nylon) and rubberised on one or both sides.



Environmental Issues:

- Dams disturb natural fluctuations in water flow
- Dams block migratory fish species from their spawning and feeding sites
- Water quality can be degraded
- The transport of sediment along the river is disrupted
- Reservoirs can emit climate-changing greenhouse gases

References

- Varshney, R. S., Hydro Power Structures
- Wikipedia <http://en.wikipedia.org/wiki/Dam>
- http://www.idk.kerala.gov.in/index.php?option=com_content&view=article&id=85&Itemid=58
- <http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m4l06.pdf>
- <http://beengineeringinfo.blogspot.in/2012/04/types-of-dams-introduction-and.html>
- <http://www.dur.ac.uk/~des0www4/cal/dams/emba/emba.htm>

Thank You!

Questions..??