

-: DAM'S :-

Introduction:- Purpose of dam -

① Multipurpose dams - eg - Nagarjun Sagar, Mangla, Hirakud

② Diversion dam -

③ Check dams -

TYPE'S OF DAM'S :-

1. Masonry Dam's - Are those dams that use masonry for their construction. Masonry dams are of three basic types.

① Gravity dams - Gravity dams are those dams in which the weight of the dam acts vertically 'downward' - The weight from the sidewalls are also transferred to a point.

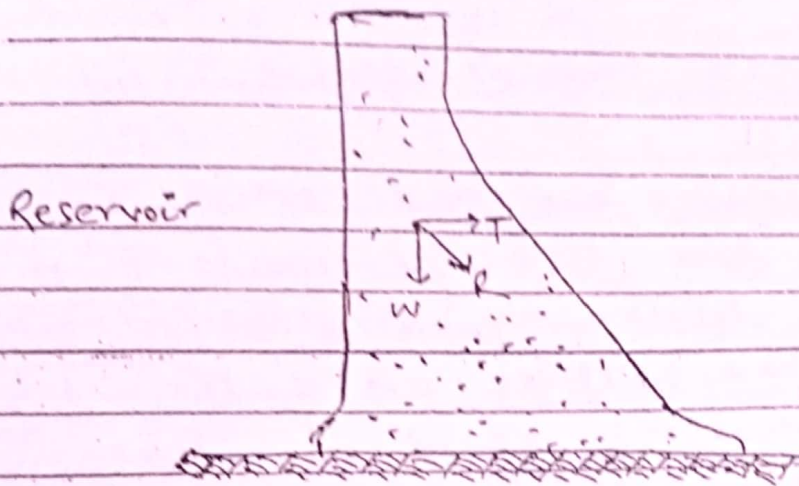
* Favourable condition for construction -

1. when the underlying beds are very hard and compact

2. when the canyon^{valley} is wide with gentle slope.

eg - Bhakra dam on Satlyj river (Gravity dam)

(Masonry dam) - Nagarjun Sagar on & Srisaïlam on Krishna R.
- Koyna dam

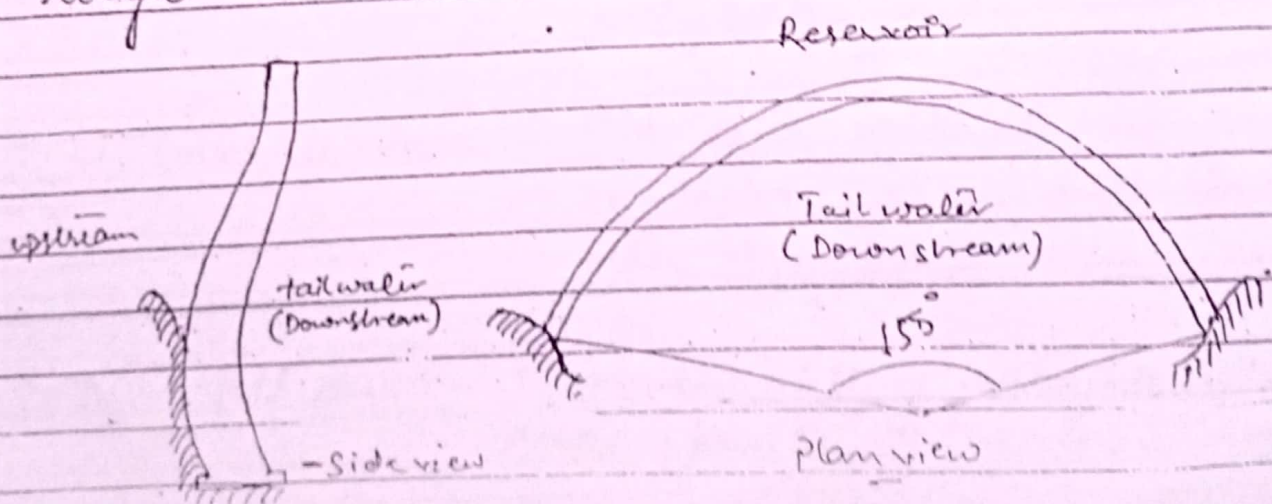


(b) Arch dam :- From the name only it's clear that this dam is arch in shape. The weight of the water is transferred to the abutment through the arch action of the dam.

In some of the curved dam: some of the ^{water load} weight is transferred to the abutment by the weight of the dam only & partly through arch action. Such type of dam is known as "Arch-Gravity" or "Gravity-arch dam". The convex side of is ^{upstream} upstream.

* Favourable condition for formation :-

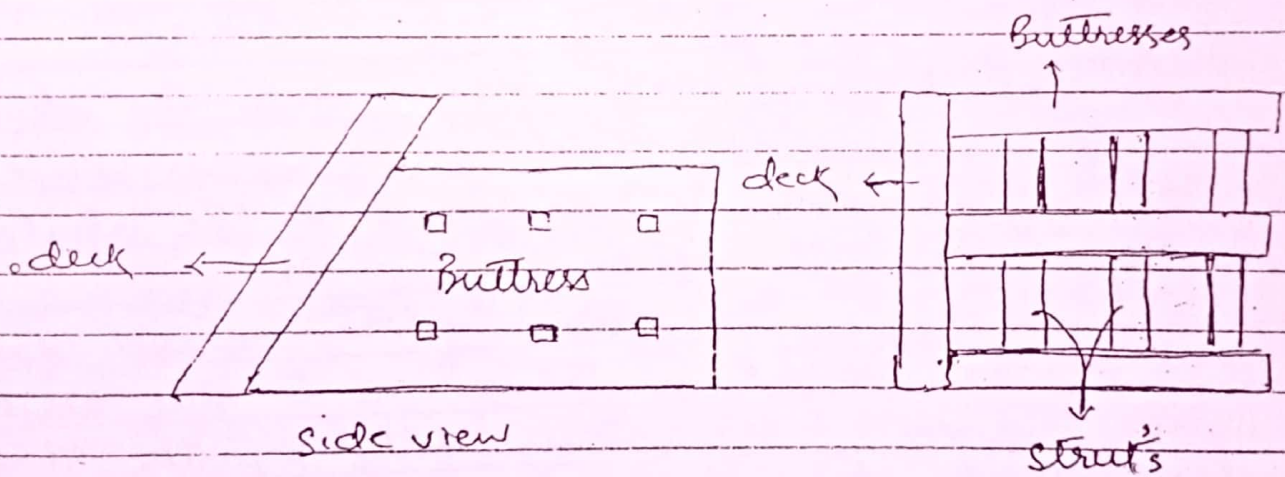
- when the valley is steep & narrow but the exposed side wall rock's should be very hard and tough and the basement rock also.



ex - Idduki dam on Periyar river, Kerala.

① Butress dam - In this type of dam a deck is used as an embankment which is inclined towards upstream side (as shown in fig below).

Butresses are used to give/provide support to the deck. Like wise several butresses are placed in direction parallel to the force of the water. These butresses are further supported by "struts" which is placed in a transverse direction to the butresses.

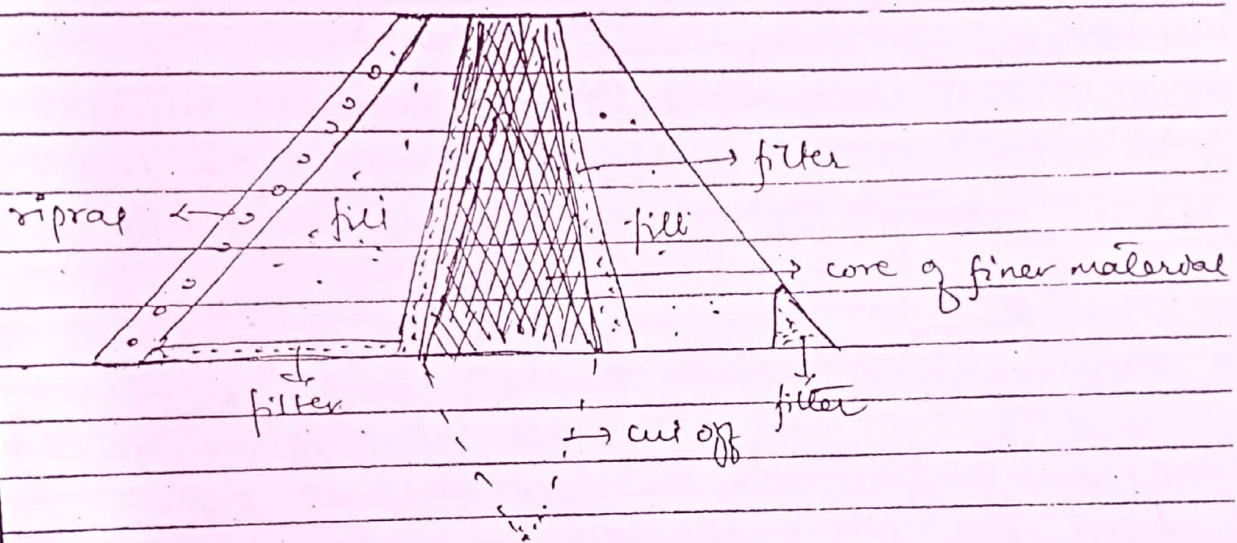


② Best & Favourable condition - when the valley is wide and the underlying rocks have varying strength butress dam is the best option.

② Earth Dams -

* Favourable condition - when the underlying material is ~~unconsolidated~~ ^{unconsolidated} earth dams is a good option.

The shape of earth dams are trapezoidal in nature.



Types:-

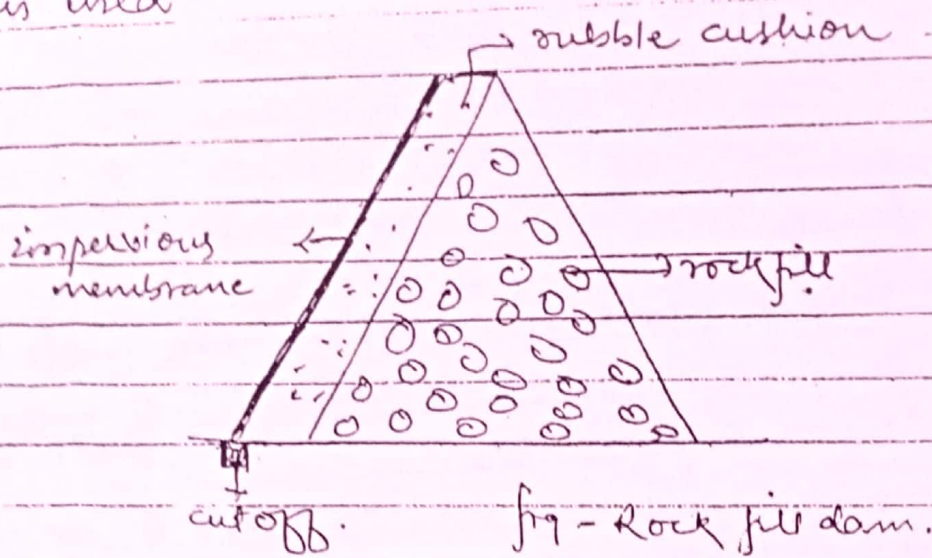
① Hydraulic fill dam - when the earth materials are filled by means of water

② Semihydraulic fill dam - when the earth material is transported mechanically & filled with water jets.

③ Rolled fill dam - The earth materials are filled & compacted through earth movers & other heavy machines.

* Rock fill dam - when the filling material is large rocks / boulders & the term rock fill

is used



ex - Farakka dam on Ganges in Bengal
ex - Tehri dam on Bhagirathi river.

Hirakud dam - Partly masonry/concrete & partly rock fill.

-: DAM FOUNDATION :-

Before starting up the construction work the whole area is well studied. It's rock type, shearing strength & other strength test is thoroughly analyzed. The soft unconsolidated materials are also removed from the abutment.

Rock types like limestones are properly analysed for their cavities & other solution cavities presence.

The presence of joints, fractures, fault's and other planes of weakness are fully understood. Then comes the turn for "GROUTING".

GROUTING is nothing but filling up of fractures, solution cavities and other planes of weakness

by the help of concretes or cement.

Aim - The basic aim of grouting is to provide a good monolithic abutment, the construction of dam.

- To avoid seepages

Materials for grouting - Basically mixture of cement and water is used for small fractures whereas for larger fractures cement + sand flour or cement + lime hydroxide or cement + cao or Bitumen is used for quick drying.

Equipment's for grouting :-

Pneumatic injector's

used for deep injection.

- Grouting holes - Generally ranges from 2.5 to 5 inches. The holes could be vertical or inclined.

Low - pr. grouting - This type of grouting is used prior to the construction of placing of concrete in order to provide a strong base for construction and to seal all the fractures & joints prior to and to provide a strong monolithic slab at the heel.

High pr. grouting - is used after the placing of concrete and low pr. grouting had been done in order to prevent leakage through the heel.

METHODS :-

① Stage method :- This type of grouting method

used for seams closer to surface.

① Packer method In Packer method the depth of the grout hole is determined earlier and grouting is done (using high pr.) from the bottom of the hole & then after certain thickness of the grout it is sealed. Again a second stage of grouting is done (using low pr.) followed by third stage & so on, till the grout hole is completely grouted. This method is used for deeper formations.

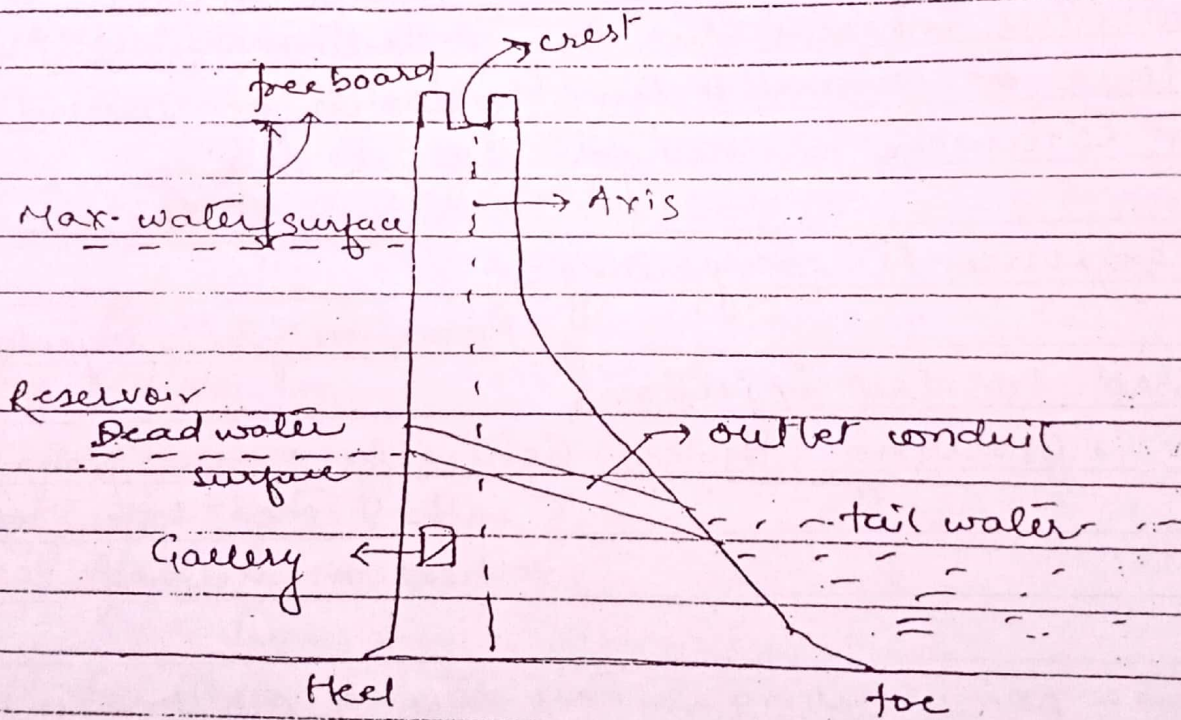
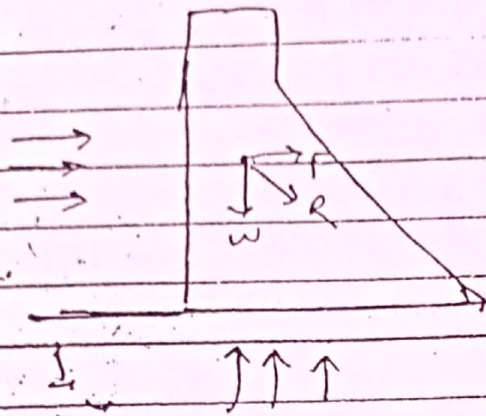


Fig Terminology of Dam. (At first).

② Geological consideration :-

③ Forces acting on dam :-



- ① Pore pressure
- ② Pressure of the dam's wt. (Vertical pressure)
- ③ uplift pressure
- (4) Earthquake forces.

- CONCRETE AGGREGATES :-

ASTM - (American society for testing ^{materials} machines) defines an aggregate as "An inert material which when bounded together form a conglomerate mass by the help of cements, grouts, mortars, plaster etc."

On the basis of size, we can divide aggregate as :-

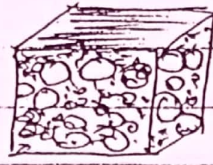
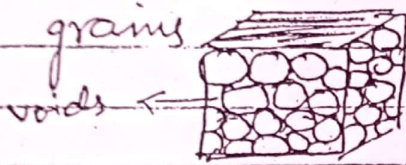
- ① Coarse aggregate - made up of gravels or pebbles.
- ② Fine aggregate - made up of sand particles.

• Shape of aggregate - depends on the cleavage of the minerals of a grain. A quartz grain with no cleavage generally makes a spherical shape whereas a feldspar grain with 2 sets of cleavage make bladed shape!

We can think of any rock like sth it will produce bladed shape whereas a granite produce more or less spherical shape.

- Size & sorting of aggregates - Size varies very widely i.e. from fine clay particles to pebbles.

Sorting is an important property for an aggregate. e.g. a well sorted grain's ^{will} when aggregated will produce numerous voids betⁿ the grain's as compared to ill sorted grains.



All voids filled with smaller grains.

- Surface smoothness of aggregate - A grain with smooth surface texture will not be easily aggregated as compared to a grain with rough surface texture for obvious reasons.