Report about

Dams and Reservoir

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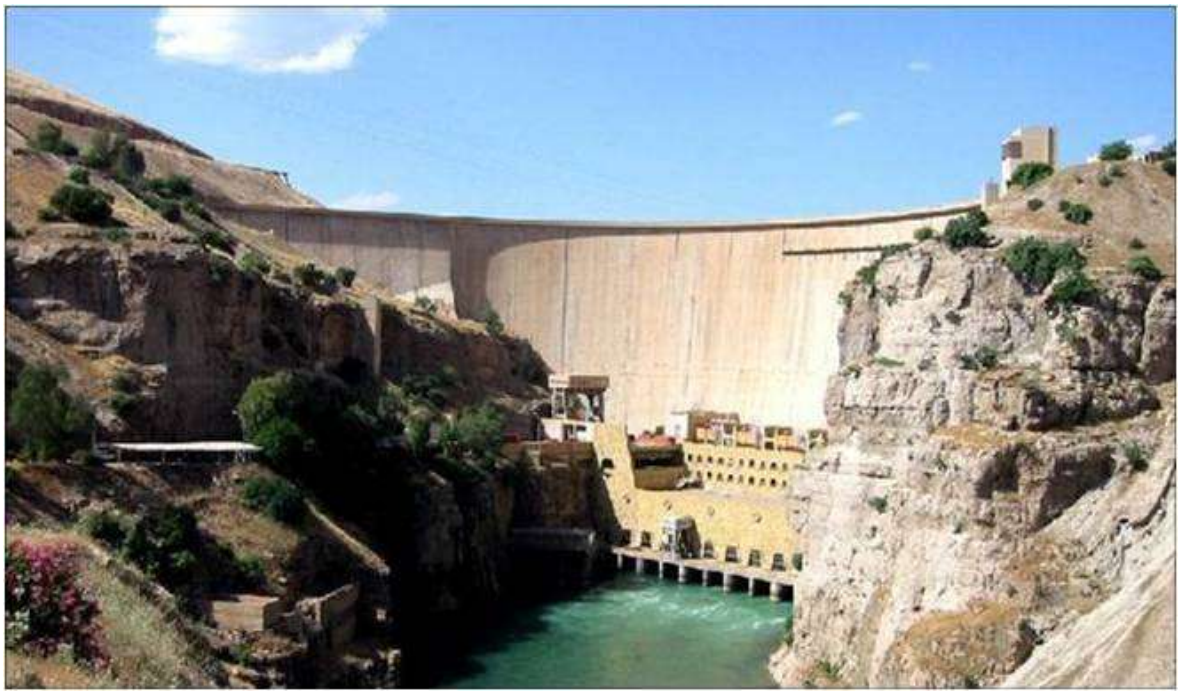


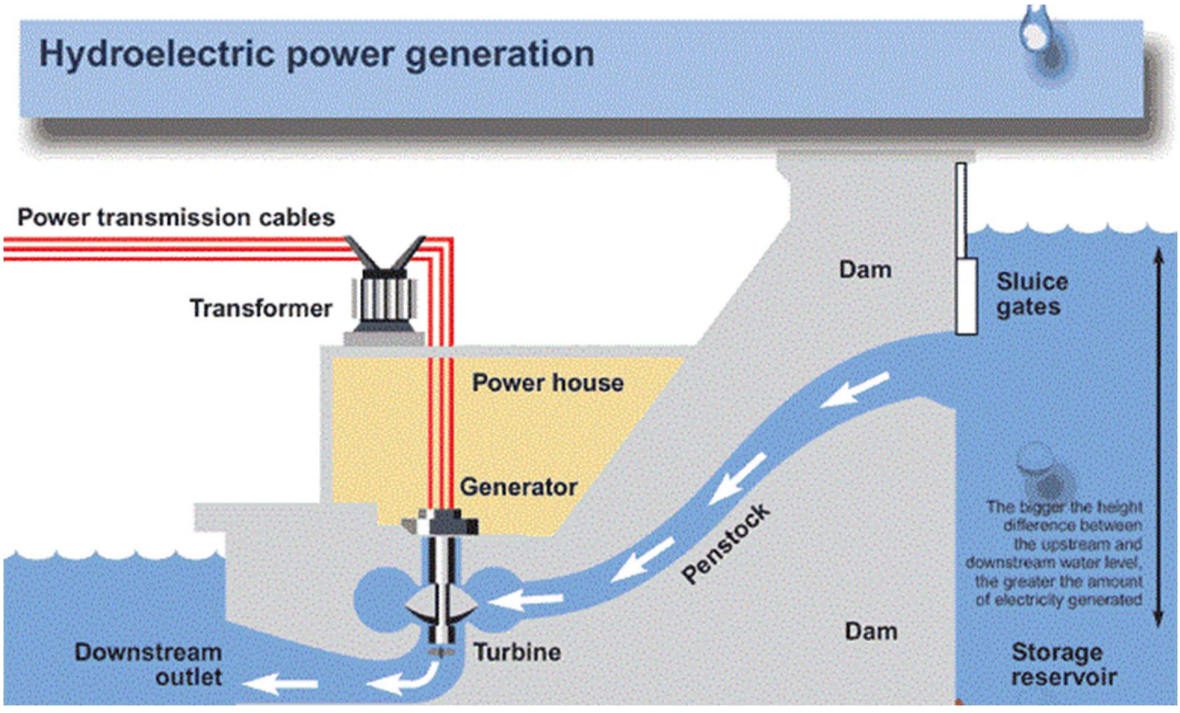
Dams and Reservoirs

Dams:

The dam is the structure that is erected on the watercourse, so that it retains the water and its width is the width of that waterway, and through it the amount of water that flows into the stream is controlled through gates placed
Below the dam, according to the needs of the city or region.

The purposes for which the dam is established:

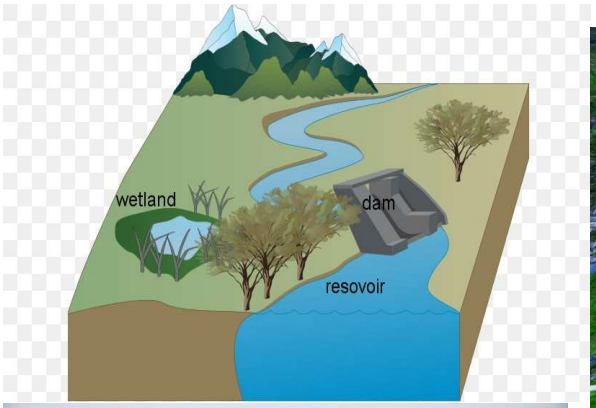
.1 Regulating the discharge (the amount of water passing through) into the waterway or river.
2. Avoid flooding by controlling the amount of water during the flood.
3. Obtaining electrical energy.
4. Obtaining the amount of water required for agriculture and industry.



Reservoirs:

It is the artificial lake that forms in the area behind the dam (Down Stream Side)

The state of the rivers, and in some cases, there are reservoirs in front of the dam, or they are independent reservoirs, as shown in the figures below.



Types of Dams

Dams are divided into different types according to the shape and materials used in the construction and according to the effect of the forces and as follows:

1-Building Dams:

They are dams in which building materials are used in their construction, and they are divided into:

A-Gravity Dams

B-Buttress Dams

C-Arch Dams

2-Earth Dams:

The material from which this dam is made is soil.

3-Rock Fill Dams:

The material from which this dam is made is fractured rock.

Why study the selection of dams and reservoirs sites?

Dams are considered unusual engineering facilities (of sensitive facilities) both in terms of their magnitude or in terms of the enormous external forces that affect them, as the collapse of any dam is considered a disaster because of the destruction and losses it causes as the water rushes with

force causing destruction during its passage, so it must Complete all studies.
Research and tests related to the geology of the area on which the dam is to be built, as shown in the figure below:

There are several considerations that must be taken into account when choosing the type of dam, including:

1. The materials from which the dam will be constructed, whether or not they are available in the area.
2. The nature of the layers of rocks or soil on which the dam will sit and be its base and foundation.

3. Circumstances that may surround the dam, is it in an area of ground movement, earthquakes, or storms etc…

4. The quantity of water to be stored or impounded by the dam.

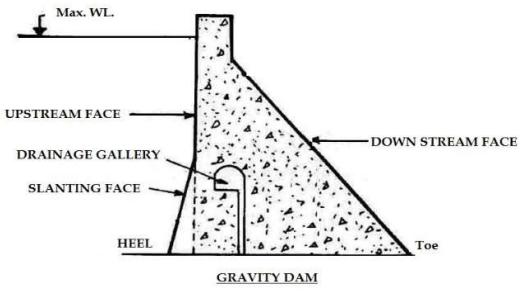
1-Building Dams

A-Gravity Dams: It is made of ordinary concrete and without the use of steel reinforcement, and the shapes of its sections are different, only controlling its shape according to the topography of the area. It is preferable that these dams be established

On layers of solid (impermeable) rocks and may arise over rocks with fissures. and depends

This type of dam has only its own weight in resisting the external forces to which it is exposed

(In other words, the weight of the dam leads to its stability)



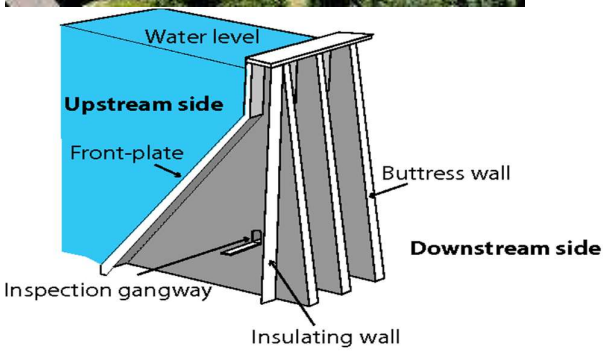
GRAVITY DAM

B-Buttress Dams: This dam consists of two parts, the first part is a reinforced concrete wall usually inclined and under the forces forces are usually tilted under the influence of the forces resulting from water pressure, as for the second part

It consists of shoulders or walls perpendicular to the armed wall (Part One), which is transmitted

Water forces from the wall in the first part to the foundations. This type of dam is economical as it saves a large amount of concrete compared to gravitational dams. The second part of this dam

The shoulders are of small sections, so these shoulders will transmit concentrated forces on the foundations.
Therefore, it required the engineer to pay great attention to the design and implementation of those foundations, asshown in the figures below.



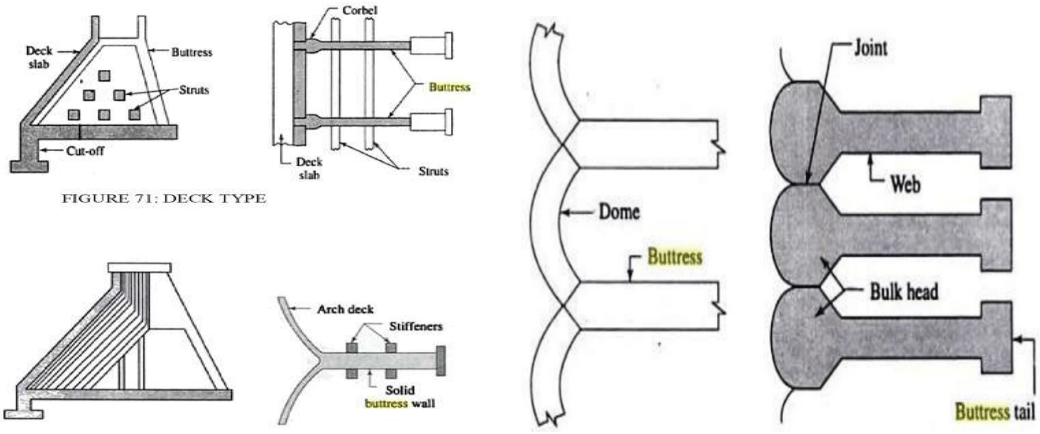
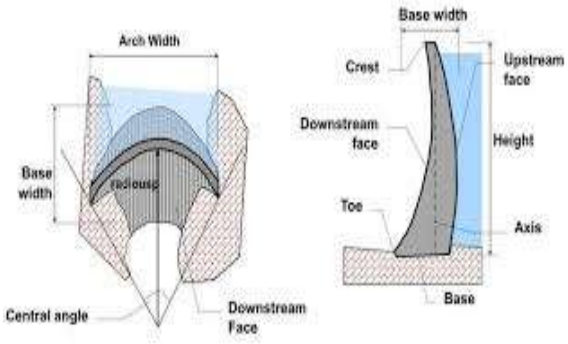
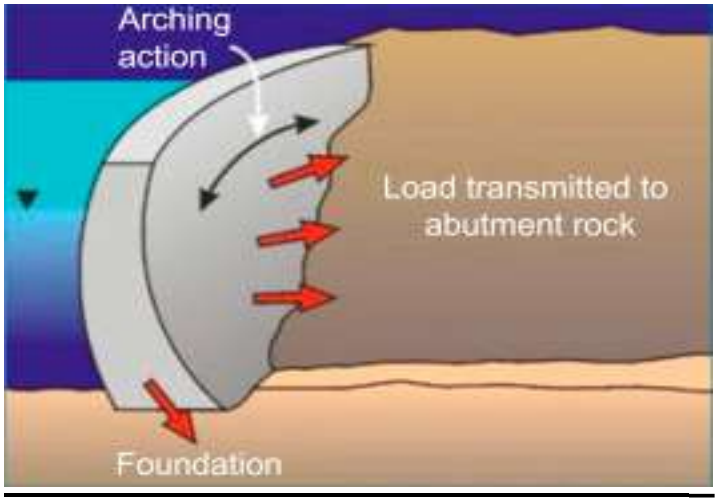


FIGURE 71: DECK TYPE

C-Arch Dams: This type of dam consists of a (convex concrete wall) is formed towards the source of the watercourse and the forces acting on this arc are distributed along its length from Its support areas are to its surface, and its attachment areas are usually (fixing its ends) of the rocks that It must be of high resistance that enables it to stabilize the ends of the arc and thus withstand the forces that Transfer to it and as in the figures below.





Forces affecting masonry dams:

1. A force resulting from the weight of the dam: The value of this force varies depending on the type of dam, so it will be as large as possible

in gravitational dams.

2. A force resulting from the pressure of the water in front and behind the dam: generated as a result of the hydrostatic pressure of the water and

It is perpendicular to the surfaces, so if the face of the dam is vertical, then this force is horizontal

The surface was tilted the force also tilted.

3. A horizontal force resulting from the silt deposited in the reservoir in front of the dam, and the silt is suspended material in the water.

The direction of this force is in the direction of the water pressure and works to slide and overturn the dam wall.

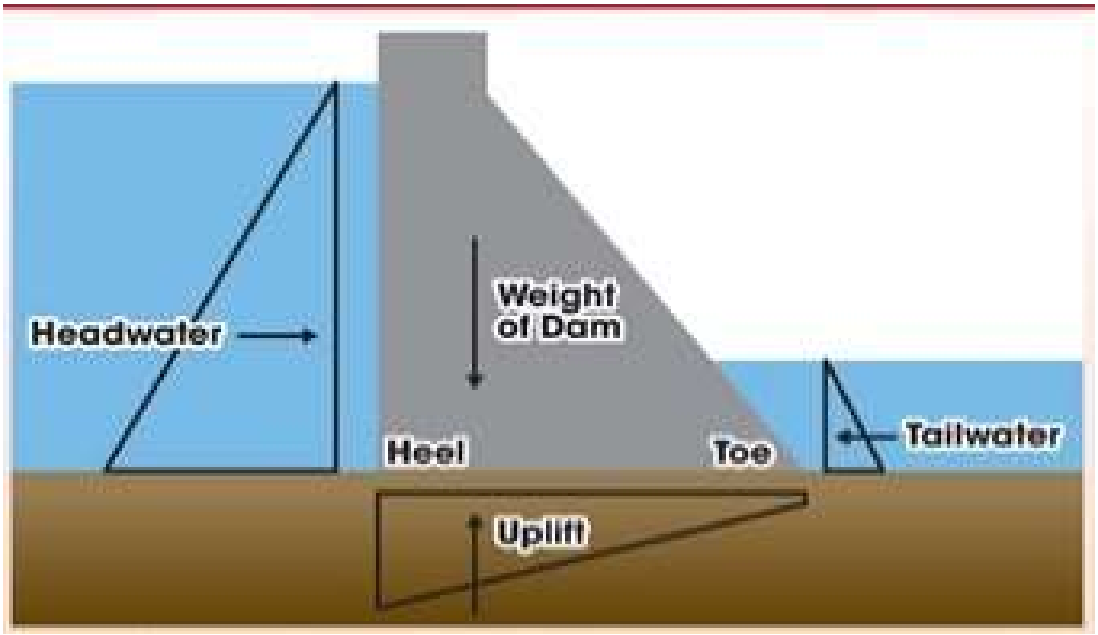
4. Forces resulting from snow pressure: depend on the thickness of the snow, and this force is often estimated at about 10 tons per square meter and affects horizontally at the water level in front of the dam.

5. Flotation force (rising pressure): this force affects the base of the dam and works to push the dam to higher and be equal to the hydrostatic pressure

at the same depth.

6. A force resulting from earth movements such as earthquakes: it is in all directions, but when designing Dams are taken horizontally.

7. The reaction force of the soil or rocks below the dam and the reaction force on the two sides in the case of Dams arch.



2- Earth Dams:

These dams are constructed from natural soil, which is loose materials of sand, silt, clay and gravel and crushed rocks. The section of these dams

is always trapezoidal, as shown in the figure below.

The inclined surfaces of the earth dam must be protected so that it is not affected by the waves that are generated in the reservoir as well as to protect these tendencies from other external factors such as rain, the soil must be formed.

The dam is limited (pressurized) so that it does not allow only a small amount of water to seep through it. And if it is available

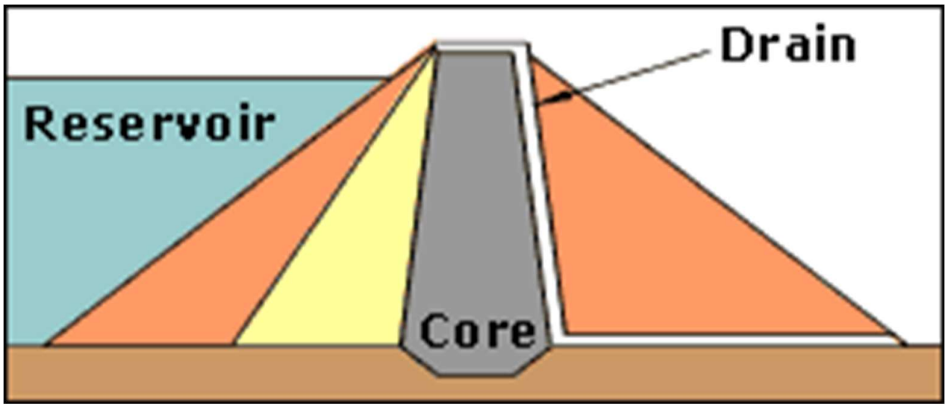
The quality of the soil suitable for the dam is in a place close to the construction, so this type of dam will have a lower cost

From the cost of constructing construction dams, as shown below

The problem of water leakage through the earthen dam can be overcome by making a nucleus (core) for it from clay or Concrete so that water is not

allowed to pass through it, and this type of dam has no gates for passage

Rather, the excess water is disposed of at the puncture tubes placed at the top of the dam, as shown in the figure below.



Methods of constructing earth dams:

1-**Hydraulic Fill**: In this method, soil is transferred (Materials

For the dismantling in which the dam will be built)by water, where the soil is suspended in the water and moves to where they are deposited in their

positions inside the body of the dam.

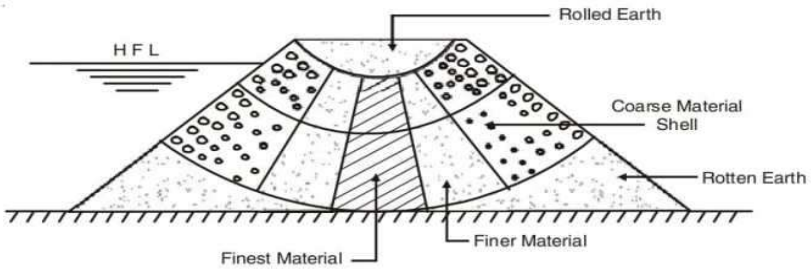


Fig. 12.2. *Hydraulic fill dam.*

2-Rolled Fill: It is the common method in which the loose soil is placed Inside the dam in the form of layers and the rollers pass on that soil until Reaching the required degree of limit (the amount of pressure of loose materials is controlled) and as shown in Figure below.

3: dams of aggregate

Cumulonimbus dams are similar to earthen dams in terms of the shape of the dam's cross-section, which is in the form of semi-oblique and in that

it is sitting on a foundation of loose materials or a foundation of rocky soil.

The difference between the two dams is that the loose materials used in the construction of the dam are crushed rocks.

then an interface is placed in (Rock fill). This dam is made of crushed rock

The area of the front of the dam, which is impermeable, is made of solid concrete, as shown in the figure below

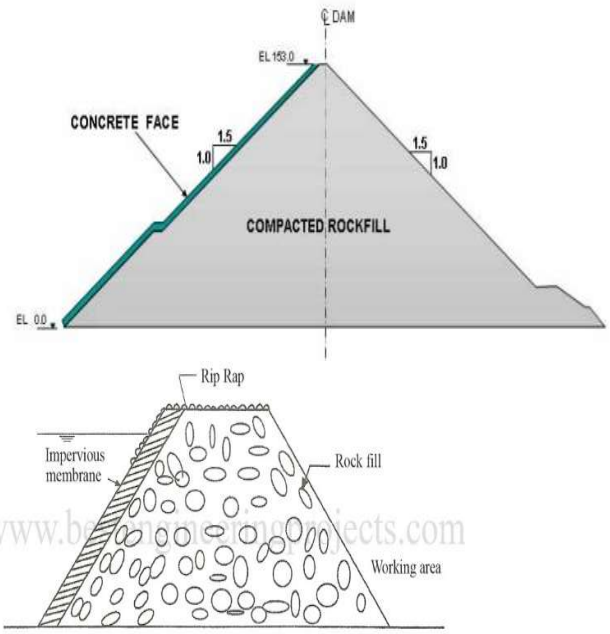


Fig 3 Rockfill Coffer Dam

geology of dam sites

Based on the following information, we can choose the correct location for the proposed dam, as well as its basis

Choose the type of dam.

1. There must be complete information about the forces that will affect the dam and their direction

A horizontal force trying to make the dam slip and a vertical force trying to keep the dam in place (resisting a force slip). A thin layer of water may form

on the surface of the rock, which reduces the value of the coefficient of friction Between the foundation of the dam and the rock. And there

may be uplifting forces trying to raise the base of the dam.

2. By preparing a geological map, we can determine the location of the dam so that it is close to the materials used in the dam and to determine the location of those materials. As well as determining the locations of

fractures or large cracks In the site where the dam is to be built, where

these fractures are considered areas of weakness for endurance, as they are

There shall be channels and channels through which water flows under the dam, where it is not permissible to build a dam over faults or

inclination to them

. As well as determining the locations of cities, mines, and archaeological sites, and their distance from the dam.

3. The soil or rocks on which the dam sits must not be eroded when the water passes

During it, and also, the passing water should not dissolve the carnivorous materials in the rocks or melt them

Salts and gypsum in the soil on which the dam is based, thus increasing the size of the gaps, which leads to

Increasing the descending or descending of the dam, so it is preferable that the dams be built on solid rocks. and in

The case that the material on which the foundation will sit is soil, so it must not be this material

Easy to compress, such as clay or water-repellent materials.

4. Soil or rock type: physical properties of soil and rocks and mechanical properties

The rocks and their thickness may affect the selection of the dam site through conducting examinations

A laboratory for rocks by taking samples from the site to be erected the dam so that the rocks

Or the soil is strong enough to bear the stresses and forces generated by the dam without causing those

The forces lead to the fragmentation, cracking or breaking of these rocks, and it is not preferable for dams to be erected on

Rocks of different layers of hardness.

5. If the layers of the earth that will be the foundation of the dam are inclined, it is preferable that that slope be

towards the source of the river.

6. The geological and topographical conditions (natural ground levels) must be such that they allow

Ease of construction and in arch dams, the rocks on both sides of the dam are required to be strong to bear

stresses;

Reservoir sites geology

The water in the tanks is lost by evaporation or seepage through the permeable layers of soil or when water runs through the water

Cracks or fissures that exist in the rocks, which have different shapes, and either the direction of the leakage

It is towards the sides or bottom of the reservoir, or it may occur through the layers of rocks located at the bottom of the dam. the level

The water in the reservoir area depends on the sides of the reservoir. If it is made up of permeable rocks, then in this

In this case, a large amount of tank water may be lost by leakage through the rocks and depending on the water level

within the region.

The water of the tank may be lost as a result of the melting of some rocks and the resulting formation of cracks or corridors

Aqua. Examples of these rocks are limestone, gypsum, and rock salt, and it is difficult to identify

Those lanes of tests and examinations. The tank may lose water if basalt rocks are found

They are superficial volcanic rocks so that the macama cools very quickly, resulting in cracks that form as corridors

for water flow. These corridors may be several kilometers long and may reach about

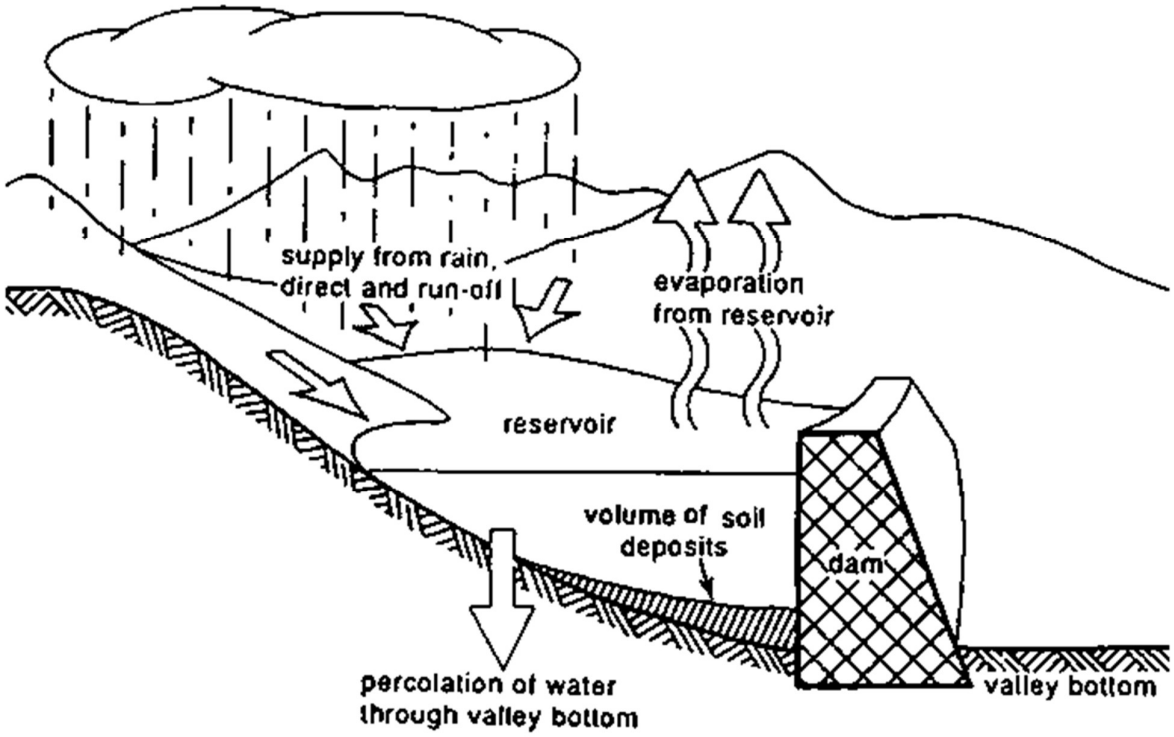
Nine metres.

And when these reservoirs are located above insoluble rocks, such as igneous or metamorphic rocks

Granite and sandstone, we do not have problems with leakage, but it has become necessary to determine

Locations of faults, breaks and cracks, as their presence leads to a large loss of water through

These cracks, so these cracks must be filled with concrete to prevent leakage.


supply from rain,
direct and run-off
evaporation
from reservoir
reservoir
volume of soil
deposits
dam
percolation of water
through valley bottom
valley bottom

References :

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P&I Division, WAPDA