Design of Dams and Bridges

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What is a dam?

A dam is a barrier built across a stream, river or estuary to hold and control the flow of water for such uses as irrigation, hydropower generation, drinking water supplies, flood control etc.
Parts of a dam

- **Dam body**: Body forms the main part of a dam as an impervious barrier.

- **Reservoir**: It is the artificial lake behind a dam body.

- **Spillway**: Is that part of a dam to evacuate the flood water from reservoir.

- **Water intake structures**: Is a facility to withdraw water from a reservoir.

- **Diversion facilities**: To redirect the streamflow from construction area.
Parts of Dams

- Water intake structures
- Sluiceway
- Reservoir
- Dam body
- Spillway

Flow
Classification of dams:

Based on Construction Material:

- Earthfill dams
- Rockfill dams
- Composite dams
- Concrete Faced Rockfill Dams (CFRD)
Types of Embankment Dam

(a) Homogeneous Earth Dam

(b) Rockfill Dam with a Centrally Located Core

(c) Rockfill Dam with an Inclined Core

(d) Rockfill Dam with a Facing
Classification of dams:

Based on Capacity:

- Small Dams
- Large Dams
- High Dams
Classification of Dams

According to dams height

- If crest elevation and foundation level is greater than 15 m then it can be considered as a Large Dam.
- If dam height is less than 15 m then Small Dam.
- If dam height is greater than 50 m then High Dam.
FEASIBILITY STUDY

A) Determination of water demand
   - Estimate various types of demands through the life time

B) Determination of water potential
   - From available sources and available past data

C) Optimal plans
   - Check out the relation Demand versus Supply.
Characteristics of dam location:

- Topography
- Geologic formation
  - (faults and weak geologic formations should be avoided)
  - Type of soil affects the overall stability of dam body
- Seismic hazard
- Flood hazard
- Spillway location and capacity
- Diversion conditions
- Sediment condition
- Transportation facilities
- Structural design
- Availability of materials
Construction of Dams

Principal steps are followed during the construction:

1. **Evaluation of Time Schedule and Equipments**
   A work schedule is prepared using CPM.

2. **Diversion**
   Before the construction, river flow must be diverted from the site
River Diversion Facilities

(a) Diversion by tunnel

(b) Typical two-stage diversion
3. Preparation of Dam Sheet & Foundation Treatment

- Concrete & Rock-fill dams → hard formations
- Earth-fill dams → most of soil conditions
- Highly porous foundation → excessive seepage, uplift, settlement

“Grouting Operation” is applied to solidify the foundation & to reduce seepage.

4. Laying of Dam Materials
DAM CREST

PRIMARY holes
SECONDARY holes
TERTIARY holes

grout holes drilled to the base of high permeability rock

gROUT holes inclined to intersect fractures

SECTION ACROSS RIVER

SECTION THROUGH DAM

CONSOLIDATION grout holes
CURTAIN grout holes
Thanks!