International Journal of Advanced Mechanical Engineering.
ISSN 2250-3234 Volume 4, Number 2 (2014), pp. 239-244

http://www.ripublication.com/ijame.htm

Analysis on Dam-break Problems and Solutions

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Abstract

A dam is an engineering structure constructed across a valley or natural hollow to use as a water storage reservoir. Such reservoirs are required for three main purposes: provision of a dependable water supply for domestic and irrigation use; flood control and, generation of electric power.

In providing water supply, the reservoir storage is filled during the periods of average stream-flow i.e. in rainy session. For flood, the storage reservoir is kept nearly empty during no rainfall and low rainfall, so that when rainstorms occur, the storage volume available in the reservoir provides the impact against severe flooding events. For power generation, the storage reservoir water in dam play an important key role and by it the potential energy of stored water is converted first to kinetic and then to electrical energy.

A large dam has two essential requirements one of them is reasonably waterproof and second is stability. Movements and deformations of the dam and its foundations cannot be eliminated, but they must be predicted. Because of these requirements, the location and design of dams are undoubtedly effect to some extent by structural and geological features. Geological factor is one of important factor for providing the sight or select the place where dam can be constructed. Once a site has been selected form a dam, consideration has to be given to deciding which type of dam is most suited to the site.

Anyway three factors control this topic, the topography of the dam site and reservoir area; the strength and variability of the foundations and the availability and suitability of Construction materials.

Keywords: Importantance of dam, suitable area, construction material, dam failure.

1. Introduction

We know that dam is a important part of the engineering structure, which is use to restore the water for various reason. It play an important role in generating the electricity as per example DVC (Damodar valley corporation) etc. A dam is a barrier that underground streams and generally serves the primary purpose of retaining water, while other structures such as dikes are used to manage or prevent water flow specific land regions. It can be used to collect water or for storage of water which can be evenly distributed between locations. Today they continue to play a vital role in the productivity of the state. As the state's economy evolved, dams were used for manufacturing, , mechanical power, water supply and for fire protection. Since dams have been an important part of our state's infrastructure .This is being started in 1878. In addition to the historic economic benefits provided by Connecticut's dams, they are also used for flood control, water supply, recreation and for mitigating the impact of increased runoff typically caused by land use changes associated with property development. In simple way it can be defined as, Dams are man-made or artificial barriers usually constructed across a stream channel to impound water. Dams are typically provided with spillway systems to safely pass a broad range of flows over, around or through the dam. Dams also pose hazard in the event of its failure. The International Commission on Large Dams (ICOLD) has been pioneer in projecting various aspects of dam engineering to ensure proper design and construction of safe dams.

2. Literature Review

Various materials are used for construction such as timber, rock, concrete, earth, steel or a combination of these materials. However, in Connecticut, most dams are constructed of earth or combinations of earth and other materials. Spillways are commonly constructed of non-erosive materials such as concrete or rock. Dams are typically constructed with a drain or similar mechanism to control water levels in an impoundment for normal maintenance or emergency purposes. Once a site has been selected for a dam, consideration has to be given to deciding which type of dam is most suited to the site. Anyway, at any site, several types of dam should be considered. In general, three factors control this final decision: (1) the topography of the dam site and reservoir area; (2) the strength and variability of the foundations and (3) the availability and suitability of Construction materials. Topography represents the arrangement of physical features of an area .i.e. environmental condition about that area and variability of the foundations represents the flexibility according to situation and at it very important thing input i.e. Investment.

2.1 Different parts & terminologies of dams:

i. **Crest**: The top of the dam structure. These may in some cases be used for providing a roadway or walkway over the dam.
ii. **Parapet walls**: Low Protective walls on either side of the roadway or walkway on the crest.

iii. **Heel**: Portion of structure in contact with ground or river-bed at upstream side.
iv. **Toe**: Portion of structure in contact with ground or river-bed at downstream side.
v. **Spillway**: It is the arrangement made (kind of passage) near the top of structure for the passage of surplus/ excessive water from the reservoir.
vi. **Abutments**: The valley slopes on either side of the dam wall to which the left & right end of dam are fixed to.
vii. **Gallery**: Level or gently sloping tunnel like passage (small room like space) at transverse or longitudinal within the dam with drain on floor for seepage water. These are generally provided for having space for drilling grout holes and drainage holes. These may also be used to accommodate the instrumentation for studying the performance of dam.
viii. **Sluice way**: Opening in the structure near the base, provided to clear the silt accumulation in the reservoir.

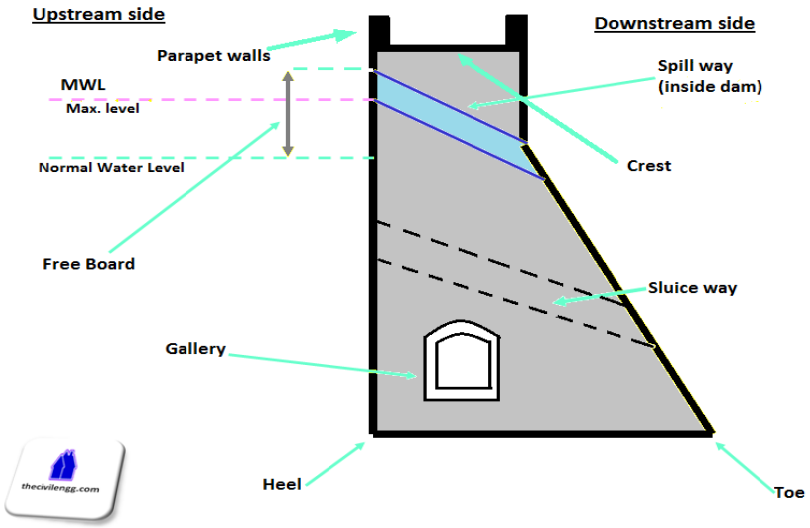

Fig. 1: Dam-parts in a typical.

2.2 Classification of Dams

i. Based on the functions of dams
ii. ***i* Storage dams**: They are constructed to store water during the rainy season when there is a large flow in the river
iii. **Diversion dams**: A diversion dam is constructed for the purpose of diverting water of the river into an off-taking
iv. **Detention dams**: Detention dams are constructed for flood control; always it is used in lower region.
v. **Coffer dams**: A coffer dam is thus a temporary dam constructed for facilitating construction.

3. Based on Structure and Design

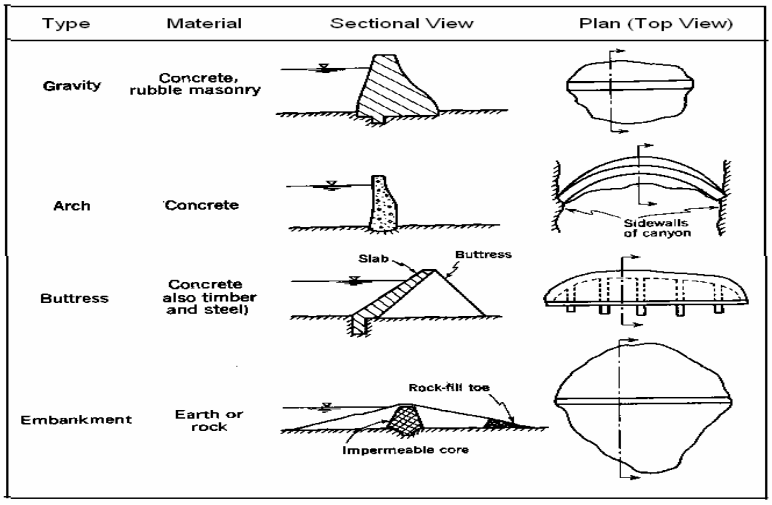

Fig. 2: Dam types on structure and design.

4. Finding/ Incident Occur

i. i.Where this problem or such problem happen i.e. dam brake. In Lakshmipur (Banka, Bihar) dam such problem created due to which so many destruction happen. Behind it the main reson is unawareness or we can say that it carelessness of that department.
ii. ii.In Koshi barrage such mistake happen.
iii. Gleno Dam Break

5. Reason

i. Lack of technology
ii. Unconscious or unawareness
iii. iii.Lack of knowledge iv Lack of monitoring report
iv. Lack of not fulfill the criteria as per dam requirement
v. Lack of maintenance
vi. Not good construction quality

6. The Objective

6.1 To strengthen the institutional frame work for Dam Safety assurance

a) To upgrade the physical features in and around the selected dams to enhance the safety status as required through basic safety facilities and remedial works.
b) To remove or stop the such incident and prevent the hazardless.
c) Adopt new technology and design as per requirement of physical condition.
d) Warning time is the most important parameter affecting potential loss of life due to dam failure.

7. Six Factors Affecting Embankment Erosion

1. Embankment configuration, materials, and densities of fill.
2. Maximum velocity attained by flow.
3. Discontinuities, cracks, or voids in the slope, and appurtenances or anomalies at the toe.
4. Presence and depth of tail water on the downstream slope.
5. Flow concentration at low points along the embankment or at abutment groins.
6. Toe drains, blanket drains, or highly erodible materials in the abutments or Foundation that will cause undercutting of cohesive fill materials and accelerate head cut advance.

8. Solution

i. At the base of external walls, not less than 150mm above ground level.
ii. Similarly at the base of internal walls that are built off foundations rather than a ground floor slab.
ii. Vertically at jambs to openings in external cavity walls.
iii. Horizontally over openings in external cavity walls
iv. Horizontally at window sills and door thresholds.
v. Vi Below copings and capping to free-standing, retaining and parapet walls
vi. Vii Phase-I Investigation :- record at the end of investigation, the assessment of safety of dam, need for additional study, investigation, analysis considered essential to assess the safety of dam, urgency of such additional investigation & advice for Phase-II investigation, if needed.
vii. The Phase-II investigation will be supplementary to Phase-I investigation and is conducted when the results of Phase-I investigation indicates the need for additional in-depth study, investigation and analysis
viii. ix.Pre-monsoon and Post-monsoon inspection are periodical inspection done every year by the field engineers as per the guidelines prescribed by the Central Water Commission.
ix. Hydrological review of all the large dams are essential with respect to the safety of dam
x. Emergency Action Plan
xi. xii The State Dam Safety Organization should conducted the workshops, trainings and seminars pertaining to Dam Safety.
xii. xiii. Expert Panels for Safety Review of Dams Once in ten Years should happen.

9. Conclusion

At last we conclude that by adopting above policy we can save the dam braking process. The paper wills help to review the dam brake position and how to keep it under control. This is a very challenging topic for world. With reference to these issues, dam-break problems, along with the main theoretical background and the practical aspects in dam failures, design of flood defense structures, prevention measures and the environmental, social, economic, can be removed. Disaster

management refers to programs and Strategies designed to prevent, mitigate, prepare for, respond to and recover from the effects of these phenomena.

To manage and minimize these risks, it is necessary to identify hazards and vulnerability by means of a deep knowledge of the causes, which lead to dam failures, and to understand the flow propagation process. Knowledge and advanced scientific tools play a role of paramount importance with flooding and other dam-break problems along with the capacity building in the context of political and administrative frame works. can also be reduce by integration of river.

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