J-Researchers

JOURNAL OF CIVIL ENGINEERING RESEARCHERS

Three primary parts of construction embankment dams

Abbas Shayesteh Salehi [a*]

[a] *Nur department of Iran science and tecnology university,Mazandaran,Iran*

Abstract

All embankments dams construct of various parts. In this paper will describe to construct three primary parts of earth dams including: preliminary studies, diversion channels of river and foundation & aboutment. We focus on foundation and aboutment.

Keywords: Construct; Embankment dams; Preliminary studies; Foundation & Aboutment

1. Introduction

Embankment dam is one of the oldest buildings constructed by human. It make by earth natural materials without mortar and cement mortar especial. Hence dam cannot bear the tensile and bending forces and all loads bear by dam weight. On the other earth dams are noteworthy because more resistance against earthquake since earth dams have more flexibility than concrete dams.

* Corresponding author.Gmail:shayestehnaneva@gmail.com.

Embankment dam constructs when it has preference rather than concrete dam in terms of economic when construct near borrow area.

2. Preliminary studies

2.1. earth dam

Before beginning construction of earth dam, we have to be investigated environmental changes

caused by the construction. After construction dam we face a massive volume of water can be effective on earth slide and permeation water that can devastate ancient buildings and else.
One example is be salinization Karun river caused by lake-level rise of Gotvand embankment dam and be breakup rocks salt of Gachsaran's mountains in lake of the dam after beginning utilization, in Gotvand Khuzestan IRAN.

2.2. Other preliminary studies

Other primary studies is including estimation of the river's flow rate, geology studies in section place especially, preparing required maps and else.
Using Primary studies for selection dam's section location and axis, so selection kind of dam and diversion channels location.

3. Diversion channels of river

Diversion system has made of a long concrete Calvert for diversion and transportation water to downstream and upstream cofferdam for prevention of water arrival to dam's section construction location.
For constructing concrete Calvert require to a massive excavation and a massive concrete. Also for constructing upstream cofferdam require to a massive embankment. [Karkheh dam].

4. Foundation & Aboutment

4.1. Earth foundations

(1) The dams design and describe on earth foundations is based on the location shear strength of the foundation soils or sands. To weak foundations, use stage of construction, foundation reinforcing, or excavation of unfavourable material is more economical than utilizing flat slopes or stableness berms likely.

(2) Foundation preparing usually consists of cleaning, clearing, grubbing for removing stumps and coarse roots in approximately the top 3 foot, and stripping for removing sod, boulders, topsoil, rubbish fills, organic materials, and other damaging materials. It is not necessary to the removal of organic stained soils generally. Extremely compressible soils arise in a tenuous surface layer or in segregated pockets that constructor should be removed them.

(3) After stripping, the surface of foundation will be in a sleazy condition and should be condensed. However, if a clayey or silt foundation soil has a high water volume and high grade of saturation, attempting for compact the surface to heavy rubber-tired rollers or sheep foot will only disturb the soil and remould it, and just lightweight compression equipment should be utilized. Where feasible without disturbing the soils of foundation, traffic through foundation surface created with heaviest rollers or next construction equipment present is desirable to determine compressible material that may have been ignored in the stripping out, such as sinus of soft substance buried beneath a skin-deep cover. Stump openings should be stowed and compressed by power-driven hand tampers.

(4) To dams upon impervious foundations of earth not needing a cut-off, an inspection hole having a minimum profundity of 6 foot should be construct. This will allow inspection for obsolete pipes, soft pockets, pervious zones, tile fields, or next undesirable traits not discovered by sooner exploration.

(5) An embankment differential settlement may leading to tension zones along the over portion of the dam and to feasible cracking along the longitudinal axle in the proximity downhill abutment slopes at linkages or closure sectors, or where thick sediment of unfit foundation dusts have been removed (because in the second case, the compressed fill may have various compressibility characteristics than abutting foundation soils). Also results in transverse cracks in the embankment which can lead to undesirable seepage conditions result of the differential settlements along the dam axis may. For

minimizing this possibility, downhill abutment slants and foundation excavation slants should be platy, if feasible, solely underneath impervious embankment zone. This may be economically feasible by earth abutments merely. The part of the abutment surface under the impervious zone should not downhill intensity downstream or upstream, as well a surface might enable a weak plane.

(6) The demarche of a terrain foundation under a rock-fill dam should be significantly idem that for a terrain dam. The surface stratum of the foundation under the downstream rock-fill part must meet filter criteria of gradation, or a filter stratum must be prepared, so that penetration from the foundation does not carry material of foundation from inside the rock fill.

4.2. Rock foundations

(1) Foundations of rock should be cleaned of whole sleazy parts, containing semidetached surface blocs of rock spanning by open gaps relatively. Rock Projecting knobs ought to be removed to simplify operation of compression equipment and to eschew differential settlement. Joints, Cracks, and openings under the core and probable elsewhere (under seeing) ought to be filled with cement mortar or thin concrete in accordance the opening width.

The therapy of rock faults should not lead to layers of gunite or grout that coating surface areas of hale rock, because they might splite down fill placement and compression operations.

(2) Making core trenches or the excavation or blasting to shallow exploration may spoil the rock. Where this occur most probably, excavation to exploration trenches are not admissible, they only can be excavated sans blasting. Where core trenches beget cavities, joints and large cracks, making core trench ought to be backfilled by cement concrete to prevent probable ablation of core materials by water permeating across joints, next openings in the everywhere rock.

(3) Foundations of shale should not be allowed to make dry before pouring embankment, nor should foundations be allowed to swell before to fill placement. Consequently, it is desirable to postpone removal of the last amount of shale until just before beginning placement of embankment fill.

(4) Where an embankment dam is made on a rock foundation of joints, it is necessary to hamper embankment fill from arriving joints or next openings in the all rocks. It can be implemented in the core zone by expanding the zone into safe rock and with treating the rock as was told above. When shell materials have move into joints or openings in the rock foundation is probable, other openings and joints should be filled, as was told, under both downstream and upstream shells. To provide filter layers between the foundation and the shells of the dam is a remedy. Under shells of rock fill will not be usually essential such treatment.

(5) Foundation of Limestone rock may contain resolving cavities and essential detailed investigations, witnessing when making borings and study carefully special of aerial photographs, merged with surface identification to establish if surface sumps are present. However, the lack of surface sumps cannot be admitted as proving that a foundation does not contain resolving features. The need to removed soil or overlying of decomposed rock and jointed rock, under both downstream and upstream shells, for treatment the exposed joints, should receive exact study. If joints are latent and wide for treatment, materials filling them may be eluted from the joints whenever the repository pool rises, also the joint-filling materials may consolidate. In all cases, if embankment fill carry into the joint, it will result in excessive reservoir seepage or possible piping. This consideration exerts to both rock-fill and earth dams.

(6) Where wide joints or faults occur in the embankment foundations, they should be drilling, cleansed and backfilled with thin concrete, or otherwise be remedy as previously discussed, to profundities of minimum three times their breadths. This will create a structural pols over the joint or fault -filling materials and will hamper the embankment

fill to be lost into the fault or joint. In addition, the space under the concrete plug should be grouted at different profundities by grout cavities drilled at an angle to the space of intersect. This type of remedy is clearly required under cores of rock-fill and earth dams and also under shells of rock-fill.

4.3. Augmentation the Foundation

4.3.1. Weak rock

A foundation of weak rock requires individual study and investigation, and dams on such foundations need flatter slopes usually. Installation of pressure relief wells for developing probability artisan pressures in stratified rock may be required.

4.3.2. Liquefiable soil

Procedures to improvement of foundations with liquefiable soil conditions include vibratory probe, blasting, vibro-compaction, compaction piles, surcharge/buttress, heavy tamping (dynamic compaction), drains, compaction (displacement) grouting, chemical grouting, particulate grouting, electrokinetic injection, pressure-injected lime, jet grouting, walls and mix-in-place piles, vibro-replacement stone and in situ vitrification, and sand columns.

4.3.3. Foundations of compressible fine-grained soils

In strengthening foundations of compressible fine-grained soils can be used electroosmotic treatment, wick drains, stage construction to allow time for consolidation to occur or slow construction. Electro osmosis has been the most usage to strengthen foundations Because of its low cost, it was used at West Branch Dam.

4.4. Dewatering the Working Area

4.4.1. Trenches

Where drainage trenches or cut-off extend under the water table, a perfect dewatering is essential to compact the first lifts of embankment fill and to prepare properly the foundation. This may also be essential where there are sensitive materials to placement groundwater level. For example, this may occur in closure sections.

4.4.2. Excavation slopes

The contractor should be allowed methods of water control and a choice of excavation slopes subject to approval of the Contracting Official (but this must not relieve the contractor of his responsibility for satisfactory construction). In establishing payment lines, it is desirable to indicate the require for water control using well points, sheeted sumps, deep wells, slurry trench barriers, etc. Water control measures such as deep wells or other methods may have to be extended into rock to lower the groundwater level in rock foundations. If the groundwater is to be lowered to a required depth under the base of the excavation, this requirement shall be stated in the specifications.

Also in establishing payment lines for excavations, such as drainage trenches or cut-off under the water table, it is desirable to specify that slope limits shown are for payment purposes only and are not intended to depict stable excavation slopes.

5. Conclusion

Mentioned triple stages have high important in construction of an earth or embankment dam.

Primary studies specify important conditions such as construction location and environmental changes after making.

For making diversion systems require to a massive excavation and embankment and also a massive concrete to construction concrete culverts.

Significant proceedings mentioned for foundation and aboutmemt after description them. They usually require to strengthening.

References

[1] John.R.Mchahon," General Design and Construction cosiderations for earth and rock-fill dams", department of the army u.s.army corps of engineers washington,dc 20314-1000

[2] R.Idi, S.Pakzamir, M.Fakoor pour, M.Safai, "Kharkheh land of peace",Tehran publication.

[3] M.Zare,"Importance of Geohazard Studies in the Dam Design",published in: [7th International conference on Integrated Natural Disaster Management].

[4] H.Rahimi,"Emabankments Dams",University of Tehran Press.