

Surveying for construction of dam projects

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ABSTRACT

Dam, structure built across a stream, a river, or an estuary to retain water. Dams are built to provide water for human consumption, for irrigating arid and semiarid lands, or for use in industrial processes. They are used to increase the amount of water available for generating hydroelectric power, to reduce peak discharge of floodwater created by large storms or heavy snowmelt, or to increase the depth of water in a river in order to improve navigation and allow barges and ships to travel more easily. Dams can also provide a lake for recreational activities such as swimming, boating, and fishing. Many dams are built for more than one purpose; for example, water in a single reservoir can be used for fishing, to generate hydroelectric power, and to support an irrigation system. Water-control structures of this type are often designated multipurpose dams.

1.INTRODUCTION

First step in construction of an irrigation project like dams, barrage or weir requires surveying of whole area. Surveying for an irrigation project is done to understand if the dams or other irrigation construction is required or not.

The area should benefit to its larger extent when the completion of irrigation structure is done. So, survey is needed to conclude this.

Surveying for Construction of Irrigation Projects

The steps involved in surveying to build an irrigation structure are

1. Examine the water availability
2. Examine the topography
3. Selection of site
4. River gauging
5. Marking of CCM

6. Marking of tentative alignment
7. Reconnaissance survey
8. Preliminary survey
9. Final location survey
10. Final Survey Report

Examine Availability of Water

To construct an irrigation project whether it is a dam or weir or barrage, first and foremost observation should be the presence of water and its availability.

The availability may be of different types, but proper examination is required before construction.

Some important observations are:

- If there is any river flowing in that area, we should know the type of river whether it is perennial or inundation type. If it is perennial, then the water is available throughout the year. If it is Inundation River, then study its previous yearly discharges.
- The river should meet the requirement of water in that area.
- Suitable site be available to construct an irrigation project.

Examine Topography

After investigating the water availability, topography map of the area is studied. This study is more useful when marking the tentative alignment for irrigation project. The behavior of agricultural lands are examined in this stage.

Selection of Construction Site

When plenty of water or major source of water is available then the location to construct an irrigation project is selected. The project may be dam or barrage or weir.

The selection of site is done by considering the following points.

- The soil survey is conducted by boring and pile testing to know about the foundation depth required.
- Sufficient basin area should be available and the capacity must fulfill the required demand.

- The site should be easily accessible. Materials and labor should be readily available.
- The allowable bed slope should be maintained as far as possible in the canal.
- The structure should not submerge valuable lands and areas.

River Gauging

River gauging is measuring of water discharge at point. The point in this case where river gauging is conducted is the site selected for project.

After river gauging following details are obtained:

- The discharge of river is calculated on daily basis and the yearly discharge records are studied.
- The HFL (high flood level) and LWL (lowest water level) are recorded based on the old observations.
- To find out the possible silting of river bed, silt analysis is conducted, and manorial value of fine silt is recorded.

Marking of CCM

CCM is the cultivable command area which is mainly fit for cultivation of crops. The area under this category should be marked on the topographic map. So, the construction should not disturb or damage this area and required demand discharge can also be known.

Marking of Tentative Alignment

After the selection of site for irrigation structure, it is time to select the tentative alignments for canals or branch canals. These alignments should be marked in topographical and contour maps.

Marking should be done by following considerations.

- The alignment marked should cover the whole area when it is cut into canal.
- The alignment should minimize the earth filling and cutting costs.
- It should not pass through valuable agricultural lands, religious places etc.
- It should cross rivers, roads, rails etc. perpendicularly.

Reconnaissance Survey of Irrigation Projects

After marking the tentative alignments, then reconnaissance survey is conducted for all the alignments. This survey provides the following details:

- Nature of ground slope along the alignment.
- Magnetic bearings of lines of the traverse along the alignment are recorded.
- Alignments passing through religious places, valuable lands are eliminated. If they are unavoidable, they are marked as special areas and suitable compensation is provided.
- Nature of ground up to a distance of 100m on both sides of alignment are noted.
- Alignments cutting the crossings perpendicularly are noted.
- Distances are measured by pacing.
- Past records of floods in that area are noted.
- Suitable cross drainage works should be noted.
- If there is any river across the alignment, the alignment should cut the river across its shortest width.

Preliminary Survey of Irrigation Projects

After completion of reconnaissance survey, a good alignment is selected, and they are allowed to conduct preliminary survey.

Following steps are involved in this survey.

- Pillars are constructed on both banks of river and they represent the center line of irrigation project.
- Similarly pillars are constructed to mark the center lines of head works for both bank canals.
- Boring is done along the center line of irrigation structure to determine the depth of foundation.
- A permanent benchmark is created and its value is noted by connecting it to the nearby GTS benchmark by fly leveling.
- Plane table survey or prismatic survey is conducted on the both sides of alignments up to 100m and route survey map is prepared.
- Longitudinal leveling is conducted with an interval of 20 m.
- Cross leveling is conducted with an interval of 100 m.
- Permanent bench marks are arranged with some interval gap along the alignment.
- Water table level is studied on both sides of alignment covering up to 200 m.

- Soil along the alignment is surveyed.
- The details of road and railway crossings are noted to design cross drainage works.
- At river crossings, the cross section details of river are noted. The cross sections of river are taken on both upstream and downstream sides with covering of 500 m distance.
- Drawings are prepared for all the maps and cross sections.
- Estimate sheets are prepared for earth works, compensations for lands etc.

II.CONCLUSION

Final Survey Report of Irrigation Project

It is the last stage of the whole process and in this stage a report should be prepared with the details of final alignment.

This report is submitted to higher authorities to get an approval for an irrigation project.

- Introduction
- Justification and necessity of project
- Justification for the selection of final alignment
- Detailed estimate sheets for earth works, compensation, head work, etc.
- Detailed specification for project
- Benefit of project
- Recommendation of the project

And following maps are to be submitted along with the above.

- General map of area through which canal passes
- Route survey map
- Longitudinal section of alignment
- Cross section of alignment
- Contour map of alignment
- Drawings of dam, head works, cross drainage works etc.