
DETAILED STUDY OF IRRIGATION CANAL

Sapan Kumar^{*1}, Chirag Sahu^{*2}, Aryan Kuber^{*3}, Aditya Ashish Patre^{*4},

Yogendra Sahu^{*5}, Mallika Jain^{*6}

^{*1,2,3,4,5}B.Tech Student, Department Of Civil Engineering, Bhilai Institute Of Technology, Durg, India.

^{*6}Assistant Professor, Department Of Civil Engineering, Bhilai Institute Of Technology, Durg, India.

DOI : <https://www.doi.org/10.56726/IRJMETS32364>

ABSTRACT

Water is becoming a scarce resource as a result of the growing demand in various purposes such as hydropower, irrigation, and water supply etc. Canal irrigation scheduling is an important activity that significantly influences production of crops compared to other aspects of agriculture. Irrigation canal scheduling is the activity of preparing an optimal schedule of outlets on supply canal as per need of user, subject to canal system constraints.

In India, food and fiber demand is increasing due to population growth, which compels us to optimize the irrigation system's performance to get more yield of food and fiber from the available resource. The high yielding varieties of crop requires a timely and adequate supply of water. A well-performing, well-managed irrigation system is a prerequisite to ensure a timely and proper water supply. The development of technology makes us ease in assessing the performance of the irrigation system. The availability of geospatial data in conjunction with the other ground data helps assess the performance minutely in spatial and temporal approaches. Performance evaluation of a canal irrigation system can be carried out by evaluating its actual water dynamics, water use, and productivity.

In the areas of Gadarjudda and Lakhnauta minor canal systems of the Upper Ganga Canal (UGC) are old systems and still performing in the right way with general maintenance works. The minor systems are decade old, and ungauged water management is carried out effectively. The physical condition of systems is not good; however, the canal carries the designed discharge.

Keywords: Irrigation Canal, Canal System, Command Area, UGC.

I. INTRODUCTION

The maximum vast irrigation system in India become undertaken in India within the medieval duration by way of the Sultanate rulers. Firoz Shah Tughlaq (1309-1388) built the maximum massive canal irrigation device around the Indo-Gangetic doab and the region west of the river Yamuna in the fourteenth century. those canals provided widespread assets of water to agricultural lands in northern India in addition to crucial components of water to city and rural settlements. The British built the colonial canal networks on these medieval canal structures.



Figure: Irrigation canal

A direction is a development of channels that run typically corresponding to the valley and stream mattress of an unchanged canal. A course always shares the waste bowl of the move. A vessel utilizes the quiet portions of the canal itself simply as upgrades, navigating similar changes in tallness.

A real canal is a channel that cuts across a seepage partition, making a safe channel interfacing two different waste bowls. usually, canals were critical to exchange and the flip of activities, development, and imperativeness of human progress. more than one channels nonetheless state of no activity in our slicing edge age are a small range of the numbers that after powered and empowered financial improvement, for sure were critical to additional urbanization and industrialization

At their simplest, channels incorporate a channel loaded up with water. Contingent upon the layer the canal is going through, it may be crucial to restore the cut with some kind of watertight cloth, as an example, earth or cement. on the point while this is finished with dust, it's miles known as puddling.

HISTORICAL BACKGROUND OF UPPER GANGA SYSTEM

Higher Ganga Canal - the construction of higher Ganga Canal turned into conceived & built by using Proby T. Cautley in the course of the duration 1840-1854. within the beginning one of the branches of river - a herbal channel flowing near Haridwar - become made use of to divert nearly the entire winter float by using creation of brief obstructions across other branches.

Mr. Proby T Cautley designed and built a flexible network incorporating nearly all styles of engineering cross-drainage marvels & regulating systems.. The UGC gadget then produced from 6190 km of fundamental canal, branches and distributaries to provide irrigation centers in the district of Muzaffarnagar, Meerut, Bulandshahr to Aligarh, Gadarjudda and Lakhnauta total area irrigated annually being zero.7 million hectares.

The top Ganga Canal takes off from the right bank of Bhimgoda barrage which replaced the antique weir al Haridwar in 1991-92. The canal with a head discharge of 370 cumecs currently offers irrigation in a gross command region of about 20 lakh ha. in 15 districts of Western Uttar Pradesh. There are 4 predominant go drainage works in initial 36 kms of the primary canal length of main canal (UGC) is 291.ninety four Km, even as the full network of device is 7073.09 Km, comprises of seven primary principal branches are Deoband & Anoopshahr branch, deliver channel, Mat, Parallel Mat, Hathras, Parallel Hathras branch with general duration of 624.762 Km.

A parallel lined canal (Parallel UGC) of 370 cumecs capacity from 6.04 to eleven.250 km,12.800 to 29.410 km (Jawalapur To Roorkee) and 177.five to 240.570 km (Distt. Bulandshahr) with four new cross drainage works on the Parallel upper Ganga Canal (PUGC) specifically Ranipur Syphon, Pathri great Passage, Ratmau & Solani Aqueduct had been commissioned in 12 months 2003.

however, the pinnacle capacity of UGC and channel potential upto 6.04 km, changed into once more improved to 370 cumecs to in shape with the downstream capability and commissioned in February, 2016 . The water availability from Tehri reservoir at some stage in rabi is being used for Agra canal (1100 cusecs), jap Ganga Canal (a thousand cusec), Delhi water deliver (three hundred cusec) and U.P water supply (two hundred cusecs) thru upper Ganga canal with expanded head capacity.

BASIC OF CANAL IRRIGATION

CLASSIFICATION OF CANAL

- Primarily based on different factors Canals are categorised into differing types based on factors which might be as follows:
 - Based on the nature of the supply supply
 - Based totally on features
 - Based totally at the sort of boundary surface soil
 - Primarily based at the monetary output
 - Based totally on discharge
 - Based totally on canal alignment

• Based on Nature of deliver

→ Everlasting Canal

A everlasting canal is a kind of canal wherein water is available at some stage in the 12 months. This sort of canal is commonly directed from a everlasting source of deliver water bodies ,additionally known as as a perennial canal.

→ Inundation Canal

Inundation canal is a form of canal wherein water is available handiest for the duration of the flood durations. Those styles of canals are taken off from rivers to control the water level in rivers at some point of floods.

• Primarily based on functions of Canal

→ Irrigation Canal

A canal aligned alongside the boundaries of cultivatable areas with the intention to deliver water for the reason of agriculture is said to be an irrigation canal.

→ Electricity Canal

A canal built particularly for the technology of hydraulic power is termed as electricity canal.

→ Feeder Canal

because the call says, a feeder canal is built to feed or more different canals or department canals.

→ Service Canal

A provider canal is multi-characteristic canal which serves the purposes of both irrigation canal and feeder canal. It method the service canal feeds the alternative canals as well as affords water for direct irrigation.

→ Navigation Canal

A canal that's built specifically for navigational functions is referred to as navigation canal. The water stage required in a navigation canal is typically loads higher to house large ships, vessels, and so on.

• primarily based on sort of Boundary surface of Canal

→ Alluvial Canal

If the canal is excavated in alluvial soils consisting of silt, sand, gravel, and so forth. then it is said to be an alluvial canal.

→ Non-alluvial Canal

If the boundary surface of the canal is of non-alluvial soils consisting of loam, clay, rock, etc. then it's far said to be a non-alluvial canal.

→ Inflexible floor Canal

Rigid surface canals additionally come beneath non-alluvial canals but right here the boundary floor of the canal is lined artificially with a hard layer of lining material including cement, concrete, stones, and so on.

BENEFITS OF IRRIGATION CANAL

- A right irrigation gadget will assist farmers within the loss of rain season for Cultivation.
- It allows expedite the cultivation paintings, speed up the financial system & increase the groundwater degree.
- Canals also help to supply electricity and deliver consuming water.
- less maintenance cost.

THREE RISKS OF IRRIGATATION CANAL

- The principle disadvantage is identifying the proper direction else, which may additionally cause increased construction fees.
- The non-stop waft of water may additionally cause form the mosquitos, worms, etc.
- Flawed layout or intake source point will result in the water shortage in other locations.
- Regular protection is required.

COMPONENTS AND ALIGNMENT

The additives of canal irrigation gadget are:

- ☐ Main Canal
- ☐ Branch Canal
- ☐ Essential Distribution
- ☐ Minor Distribution
- ☐ Water Deliver

CANAL ALIGNMENT

A Canal must be aligned in this type of manner that it covers the entire area proposed to be irrigated with shortest viable length and on the equal time its cost including price of drainage works is a minimal.

When designing the canal route, the subsequent matters might be considered.

- ♣ The canal path must cowl all farmlands to serve the water.
- ♣ The immediately canal route will assist preserve the proper pace of water waft, and it helps to lessen the head lack of water.
- ♣ The shorter period of the canal, which covers all cultivation land, will lessen construction fees and cross drainage paintings.
- ♣ The shorter and instantly canal direction will reduce the water loss occurring due to seepage, evaporation.
- ♣ The canal direction's design must now not be exceeded via the wooded area land, villages, towns, and others because it creates useless problems and delays in creation works.
- ♣ The canal path passing via the rock region should be prevented.
- ♣ Greater curves in the canal must be avoided as it reduces the velocity of water float.

II. CONCLUSION

1. An open canal, or ditch is an open waterway intended to carry water from one place to another. Channels and canals refer to major waterways that supply one or more farms with water. The ditch in the rice field is small and water flows directly from the farm entrance to the irrigated fields
2. Canals are very effective to reduce the agricultural water demand in an area. Canals can carry water easily from source to the destination.
3. In this report, we have tried to explain different types of canal, canal alignment, components, and basic classification with sub point concluded in this report.
4. Our main aim behind this report is analyze benefits of constructing irrigation canal basically in India.

III. REFERENCES

Textbooks

- [1] Engineering Hydrology – K. Subramanya (Tata McGraw Hill)
- [2] A Text Book of Hydrology – Dr. P. Jaya Rami Reddy (Laxmi Publications)
- [3] Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
- [4] Irrigation Engineering – B.C. Punmia (Laxmi Publications)
- [5] Applied Hydrology – Linsely R.K. Kohler, M.A. and J.L.H. Paulhus (McGraw Hill)
- [6] Hydrology for Engineers and Planners – Casidy W.C(Iowa State University Press)