Structure Audit of Irrigation Structure: Problems & Remedial Measures

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Abstract- *In government organisations, the Irrigation Department plays a very important role in water planning and supply. The main water source is rain that is stored in a dam. Stored water planning depends on the water available in dam storage on October 10. The irrigation department has planned for water utilisation for that particular year based on October 10 water availability. Water is supplied by various irrigation structures. Irrigation structure audit is one of the important things that gives a record of the present situation and information about health status. Now so many irrigation projects have been completed for more than 25 years. A structure audit is required to know the requirements for improvement in overall condition and suggest remedial measures for retrofitting to help the system function properly and continue to provide service.*

Keywords- Dam, Irrigation Structure audit, water.

I. INTRODUCTION

Following strong improvements in civil engineering equipment and the push of governments and international development organisations, global irrigation development increased in the twentieth century. Many developing nations, many of which were former colonies, shifted their perspective on irrigation, shifting from support for colonial agriculture to a national strategy for employment and poverty eradication [1]. Between 1970 and 1990, the global irrigation area rose from 184 to 258 million hectares. Irrigation development continued, and by 1992, the area irrigated had reached 324 million hectares [2]. Today's average irrigation project is situated in Asia (70%), depends on surface water resources (62%), employs surface irrigation (86%), achieves a cropping intensity of 130%, and plants cereals (61%). The majority of these irrigation projects were created by government irrigation agencies, which were responsible for construction and water delivery. Farmers were seldom consulted throughout the construction and maintenance stages of irrigation. The performance of these new irrigation schemes was dissatisfactory by the 1980s [4]. State-owned projects faced financial challenges as a result of low irrigation fees and difficulty collecting them [5]. Low operational and managerial funds resulted in irregular water supply [6], which made fee collection impossible.

These results urge a systematic approach to the real difficulties of irrigation governance in developing nations as well as solutions to those concerns. Mascote [7] is a contribution to problem-solution analysis that focuses on massive canal systems and a holistic approach to operation modernization. It is built on a rapid appraisal process that covers all areas of engineering, governance, maintenance, and operation in a methodical manner. While many wealthy nations have discovered a method to lower the public cost of irrigation governance by ensuring appropriate system maintenance and meeting the demands of users, the majority of developing countries remain locked in a cycle of repeated reforms that generate minimal improvement. Asthana [8] observed dissatisfaction with irrigation projects in underdeveloped nations, citing environmental concerns, relocation, schedule and expense overruns, inequality, and corruption as factors. According to this source, projects are producing less irrigation potential than anticipated.

Maharashtra is a state with a long agricultural history. Water is a necessity for survival. The Maharashtra government's Irrigation Department is always working on water issues. Water utilisation is technically accomplished through planning, controlling, designing, building, and auditing. Water is a scarce resource, yet if properly prepared, we can overcome the drought. The irrigation year runs from July 1 to June 30. In water planning, 80% of the water is used for irrigation, 12% for domestic use, and the remaining 4% is used for non-irrigation purposes. A larger percentage of such water is considered for irrigation. The failure of construction firms to realise the importance of construction audits and related practises in project management has been blamed for the poor project performance results [9]. According to [9], privately and publicly financed building and engineering construction projects in developed and developing countries face a slew of issues, including corruption, fraud, poor procurement practises, poor quality, design deficiencies, failure to achieve value for investors' and clients' monies, cost and time overruns, and project delivery issues. Clients,

investors, and other essential stakeholders in the construction business are eventually dissatisfied as a consequence of this. An audit is a planned and recorded exercise that involves investigating, evaluating objective evidence, determining conformity with established procedures and standards or related documentation, and determining the effectiveness of implementation [10].

II. IRRIGATION STRUCTURAL AUDIT

An irrigation structural audit is an overall health and performance checkup of a canal structure, like a doctor examines a patient. It ensures that the canal and its premises are safe and pose no risk. It analyses and suggests appropriate repairs, retrofitting, and reconstruction measures required for the canal to perform better in its service life. An irrigation structural audit is done by a sectional engineer.

Fig. 2.vegetation affects the structure's

Purpose of Structural Audit

1. To save human, animal and farm life.
2. To understand the condition of canal.
3. To find out the critical areas to repair, retrofit immediately.
4. To enhance life cycle of canal by suggesting preventive and corrective measures like repairs and retrofitting.

Bye-Laws of Government resolution

As per by G.R. published major and medium project information can be collected for 1st phase.

Water distribution network

Supply of water from head to tail by constructing various irrigation structures. A flow chart of the water distribution network is shown in Fig. 1.

Fig. 1. Water distribution network

Irrigation Structures on Canal

Irrigation A structure is constructed on the canal to pass water head-to-tail without any barrier from gravity. The list of structures explained is as follows:

1. Aqueduct

Aqueducts are structures that carry a stream of water over a depression or valley. However, in contemporary engineering, an aqueduct is a network of pipes, ditches, canals, tunnels, and supporting buildings designed to transport water from its source to its primary distribution point. These systems are often used to distribute water to towns and agricultural fields. Built over a natural stream or river.

2. Standing wave flume

A standing wave flume is an artificial structure installed in a canal to measure the discharge that flows through it. A standing wave flume is comparable to a venturimeter, which is used to measure the discharge of a canal.

3. Slab culvert

Slab culvert is a type of culvert, could be simply a deck slab. It is embedded in the soil on both sides. The slab provides a bridge over the canal. It is constructed below canal, height is less than 6m with wide span.

4. Pipe culvert

A pipe culvert is a canal construction that is built with pipes under a canal or tunnel to enable cross-drainage or to transport electrical or other wires from one side to the other. Pipe culverts are the most prevalent form of culvert found under canals, highways, trains, and tunnels. Pipe culverts are used in canal construction to allow water to flow from one side to the other.

5. Control gate

Canal water control structure gates are used to control the flow of water within irrigation, drainage, and natural waterway systems. The main function of the gate is to regulate the outflow of the canal.

6. Village road bridge (VRB)

The small bridge is constructed over canal for transportation people, animal, vehicles, cycle. Easy access to transportation over the canal.

7. Ramp

Ramp constructed as access from canal top to canal bed level .It is constructed for maintenance work, to remove debries from canal.

8. Super passage

Super passage refers to the canal construction in which natural drainage passes over the irrigation canal. This construction is appropriate when the drainage bed level is higher than the canal's flood surface level. The canal's water obviously flows under the drainage. The canal is filled with natural water.

Parameters used for Irrigation structure Audit

- Checking the data, drawing of irrigation structures.
- Visual Inspections of irrigation structure.
- Collection of information and checking the result.

III. RESULT OF STRUCTURE AUDIT

1. Confirm chainage of structure and year of construction are not available.
2. Accessibility to the various parts of canal structures is not available due to increasing vegetation, trees, silting, and scouring materials.
3. Previous records of audits are not available.
4. Usually, audits can be done before, after, and during irrigation rotations, requiring more time to complete the audit.
5. Many of the seasoned structural engineers develop their own forms or formats of the typical points to be observed, but for the irrigation structure audit, GR has included the particular format to collect information for a particular irrigation structure.
6. Major leakages are found through the pipe culvert structure at the pipe joint.
7. In an aqueduct, leakage occurs through construction joints, slabs, piers, and abutments.
8. Steel is exposed from the bottom of the super passage slab, and it has corroded.
9. Slabs are bent downward in the slab culvert structure.
10. Railings are not seen on VRB; there are dangerous chances of accidents.
11. Cracks are seen in structures, which affect the life of the structure due to increased trees near the foundation.

IV. CONCLUSION

After done the detailed survey for the irrigation structure audit, the following are some solutions to reduce the irrigation audit problems:

1. All irrigation structures shall be maintained through proper repairs. Any damage noticed from these reports shall be speedily repaired and retrofitted as per requirement.
2. In aqueducts, monolithic joints also require repairs. Sealing joint rubber gets damaged, which if repaired technically, helps save water through leakages. Automatically increases the structure's life span.
3. By removing muck and silt material from the canal By removing this rubbish, it helps to achieve the original design discharge of the canal.
4. The major part of the result shows that vegetation affects the structure’s life by cleaning it.

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