

MAIN TYPES OF REGULATING STRUCTURES AND THEIR CONSTRUCTION TECHNOLOGY

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Abstract: *This article analyzes the main types of regulating structures used for stabilizing riverbeds and managing water flow. In particular, the structural characteristics, advantages, and application areas of flow-guiding dikes, semi-dams, and bank protection methods are scientifically examined. In addition, their effective construction technologies and significance in water management practice are discussed.*

Keywords: *regulating structures, flow-guiding dikes, semi-dams, bank protection, hydraulic engineering.*

Introduction

Hydraulic processes occurring in river channels, seasonal changes in flow velocity, and sediment movement can lead to instability in the river's shape and alignment. Such processes often result in bank erosion, loss of structural stability, and difficulties in the efficient use of water resources. Therefore, the construction of regulating structures occupies an important place in water management systems.

Regulating structures serve to stabilize water flow, protect riverbanks, regulate sediment transport, and ensure efficient water utilization. These structures are designed in accordance with the natural morphological characteristics of rivers. This article examines three main types of regulating structures: flow-guiding dikes, semi-dams, and bank protection methods.

Flow-Guiding Dikes

Flow-guiding dikes are used to narrow river channels, provide them with a stable form, and artificially direct water flow into different paths. They are mainly constructed in river meanders or in areas where the channel is unstable.

When such dikes are relatively long, longitudinal flow forms behind them. This flow often causes rapid sediment accumulation and, in some cases, may even wash sediments away. Therefore, to reduce the flow velocity, transverse dikes known as traverses are constructed between the longitudinal dikes and the riverbank. The spacing between traverses is usually designed to be 2–3 times greater than their length.

To ensure long-term service life, flow-guiding dikes are constructed from strong and durable materials. Concrete, large stones, gabion blocks, and reinforced concrete are among the most commonly used materials. Their structural design is selected based on the hydrological conditions of the river, flow velocity, and the composition of the riverbank soil.

Such dikes can also be used to create a meandering river shape. The parameters of the meander form are determined based on observations of stable river sections or other rivers with similar hydrological conditions. According to experimental results, the distance between meanders is taken as equal to $(12-15)B$, where B represents the width of the river in its straight section.

Semi-Dams

Semi-dams are considered an effective means of controlling water flow and protecting riverbanks. They are constructed transversely across the river and allow direct regulation of the flow.

Semi-dams consist of two main elements:

- **Root** — the section connected to the riverbank. If the soil is weak, it is reinforced through deep excavation works at a depth of 2–4 meters and is usually protected by stone placement.
- **Head** — the end directly exposed to the water flow. Since it is subjected to strong hydraulic impact, it is constructed with high durability. Its slopes are generally laid at a ratio of 1:3. To prevent erosion, the head section is covered with brushwood, fascines, or special protective mattresses. Wire ropes and piles are used to increase structural stability.

The height of semi-dams is usually designed to be 0.5–0.7 meters above the water level, while the root section is constructed at a height of 1.0–1.2 meters. Due to their structural characteristics, semi-dams require frequent technical maintenance.

Bank Protection

Within the overall system of river regulation works, bank protection is considered one of the most important stages. In most cases, river channel regulation begins with bank stabilization measures.

Riverbank protection is carried out in two ways:

1. Direct reinforcement of the riverbank;
2. Construction of artificial protective structures.

Stone materials are commonly used for bank reinforcement. However, when flow velocity is high and large stone materials are unavailable, gabion structures are widely applied. Although gabion walls and mattresses provide good resistance against water flow, their service life is relatively shorter.

For reinforcing sandy and clayey riverbanks, reinforced asphalt mattresses are recommended. Their thickness ranges from 5–7 cm and they are reinforced with mesh made of 10 mm diameter steel wire. Such mattresses are prepared directly on site and provide effective protection even under high flow velocities.

Discussion

The effectiveness of regulating structures depends on proper design and high-quality construction. Flow-guiding dikes regulate the shape of the river channel, semi-dams control the flow, and bank protection measures reduce erosion processes.

Each type of structure has its own advantages and disadvantages:

- Flow-guiding dikes have a long service life; however, sediments may accumulate rapidly behind them.
- Semi-dams are effective in controlling water flow but require frequent maintenance and repair.
- Bank protection methods should be selected according to flow velocity and soil characteristics.

When applied in an integrated manner, these structures achieve maximum efficiency and ensure the stability of the river channel.

Conclusion

The main types of regulating structures — flow-guiding dikes, semi-dams, and bank protection methods — play a significant role in hydraulic engineering practice. Their proper design and high-quality construction ensure river channel stability, enable efficient use of water resources, and improve the safety of hydraulic structures.



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