

CHAPTER – 8

Irrigation Structures – 1

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LECTURE 20



Diversion Head Works

Definition:

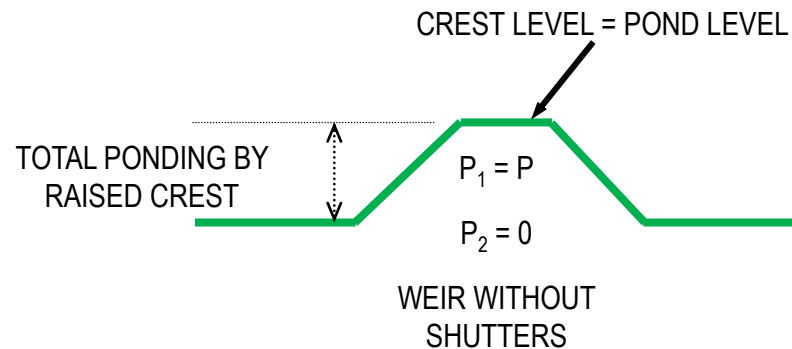
The works, which are constructed at the head of the canal, in order to divert the river water towards the canal, so as to ensure a regulated continuous supply of silt-free water with a certain minimum head into the canal, are known as ***diversion heads works***.

Objectives:

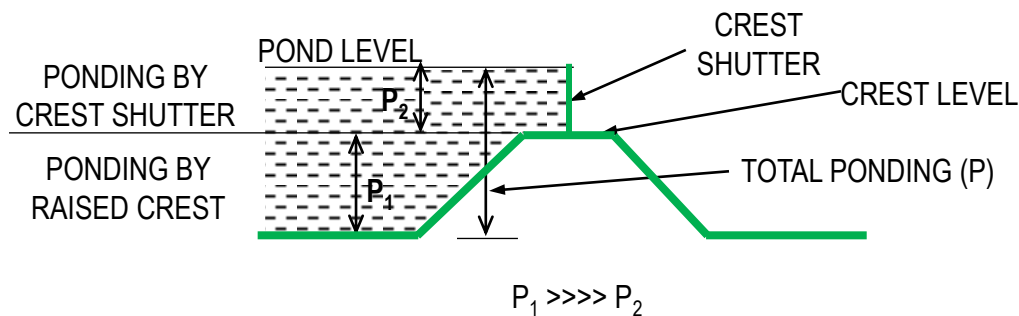
- ☐ To rise the water level at the head of the canal.
- ☐ To form a storage by constructing dykes (embankments) on both the banks of the river so that water is available throughout the year
- ☐ To control the entry of silt into the canal and to control the deposition of silt at the head of the canal
- ☐ To control the fluctuation of water level in the river during different seasons

Weir & Barrage

If the major part or the entire ponding of water is achieved by a raised crest and a smaller part or nil part of it is achieved by the shutters, then this barrier is known as a **weir**.

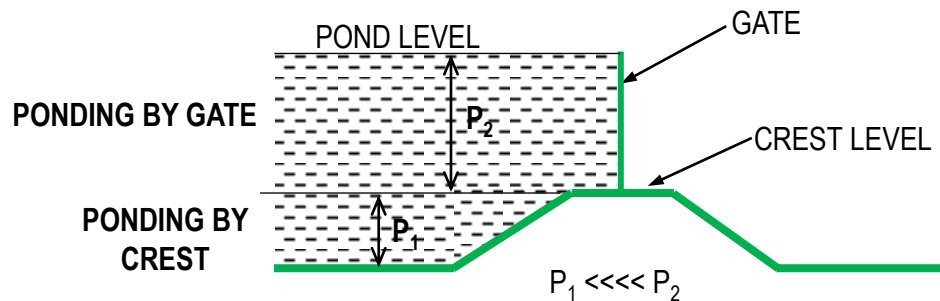


(a) Fig: Weir without shutters

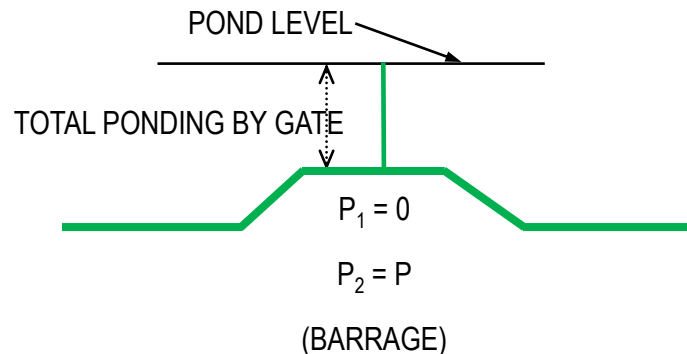


(b) Fig: Weir with shutters

If most of the ponding is done by gates and a smaller or nil part of it is done by the raised crest, then the barrier is known as a **barrage** or a *river regulator*.



(c) Fig: Barrage with a small raised crest



(d) Fig: Barrage without any raised crest

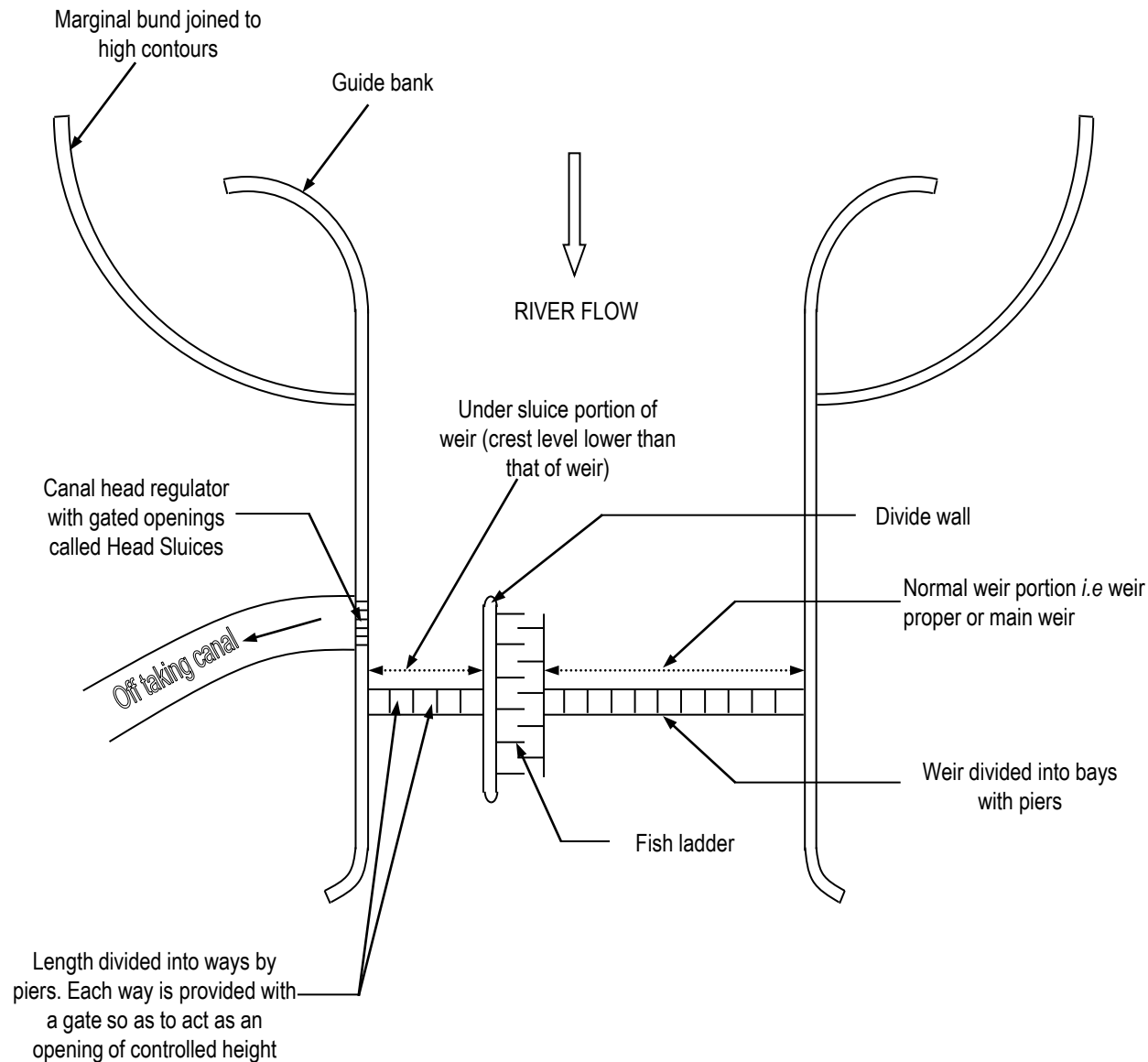
Layout of a Diversion Head Works and its components

A typical layout of a canal head-works is shown in the next slide.

Such a head-works consists of:

- (a) Weir portion
- (b) Under-sluices
- (c) Divide wall
- (d) River Training works
- (e) Fish Ladder
- (f) Canal Head Regulator
- (g) Weir's ancillary works, such as shutters, gates, etc.
- (h) Silt Regulation Works

Typical Layout of Diversion Head Works



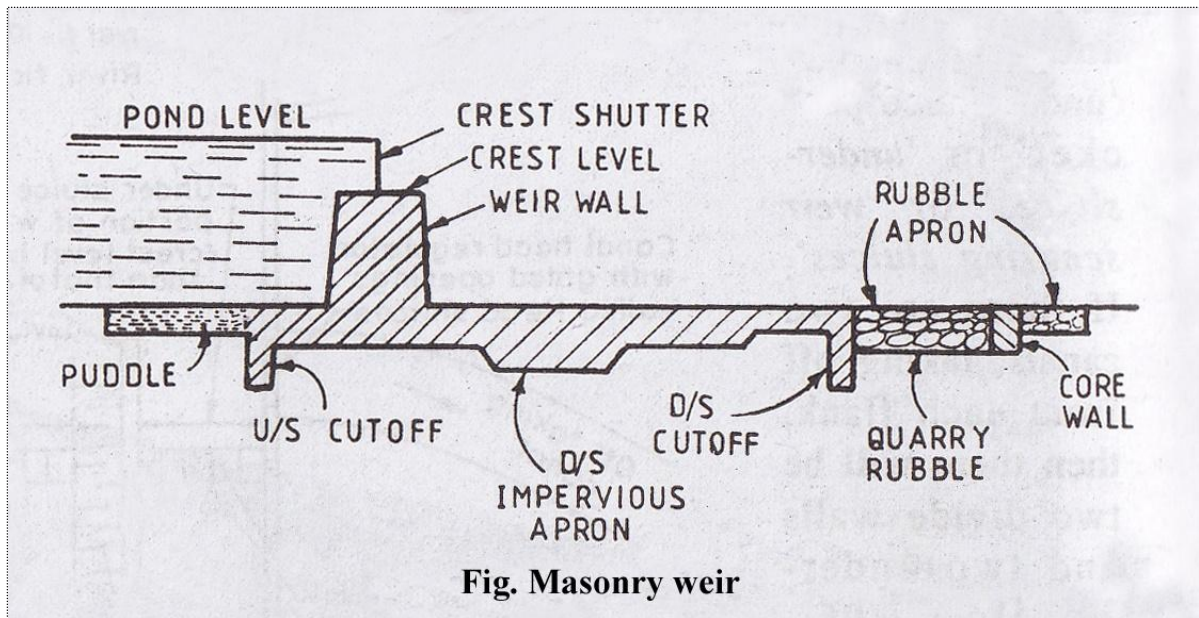
LECTURE 21



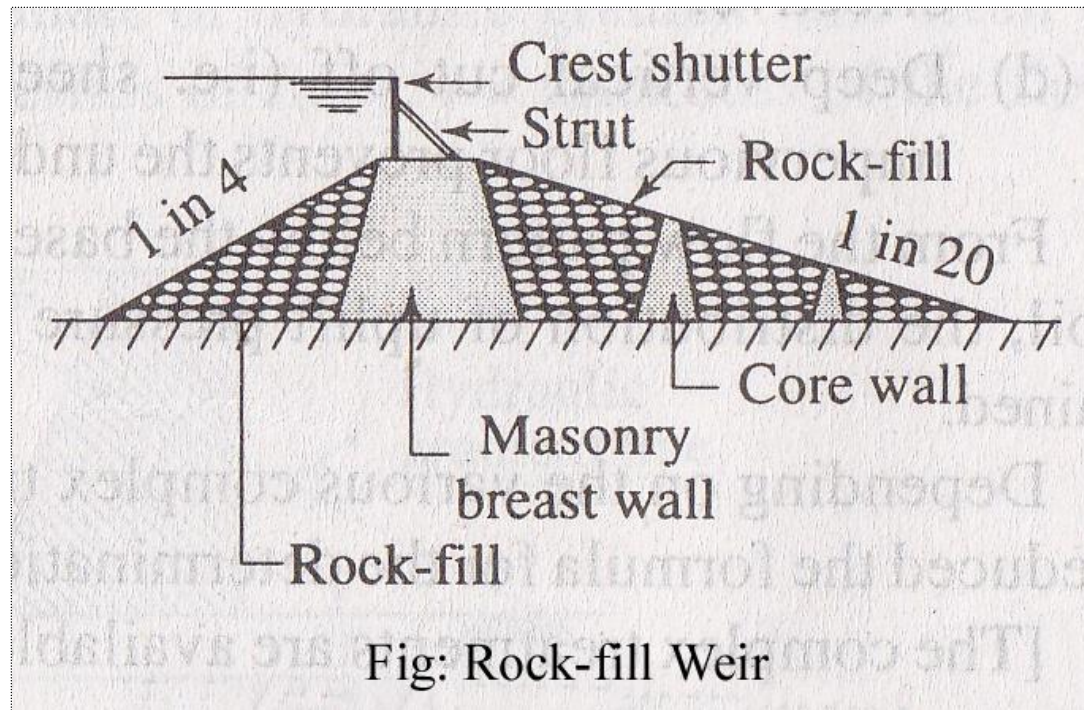
Types of Weirs

- (a) Masonry weirs with vertical drop
- (b) Rock-fill weirs with sloping aprons
- (c) Concrete weirs with sloping glacis

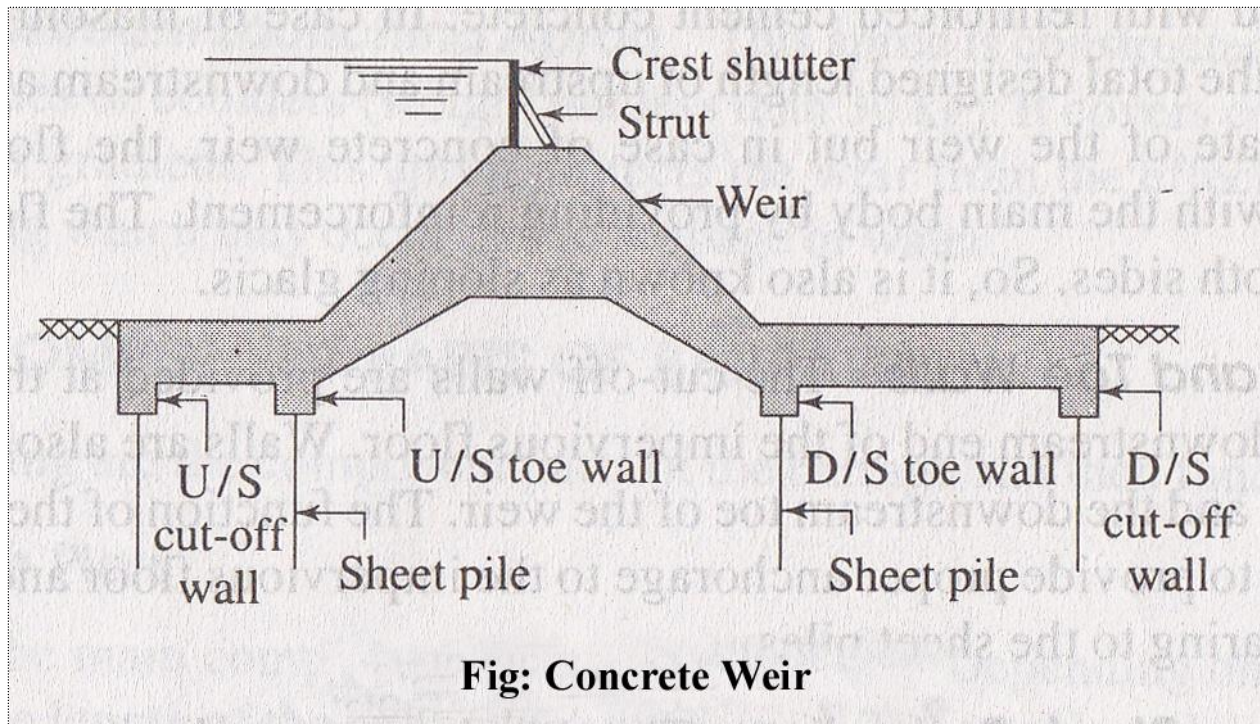
Masonry weirs with Vertical Drop



Rock-fill weirs with Sloping aprons



Concrete Weir



River Training Works

River training works are required near the weir site in order to ensure a smooth and an axial flow of water, and thus, to prevent the river from outflanking the works due to a change in its course.

The river training works required on a canal headwork are:

- (a) Guide banks
- (b) Marginal bunds
- (c) Spurs or groynes

Guide Bank

When a barrage is constructed across a river which flows through the alluvial soil, the guide banks must be constructed on both the approaches to protect the structure from erosion.

Guide bank serves the following purposes:

- ✓ It protects the barrage from the effect of scouring and erosion.
- ✓ It provides a straight approach towards the barrage.
- ✓ It controls the tendency of changing the course of the river.
- ✓ It controls the velocity of flow near the structure.

Marginal Bunds

The *marginal bunds* are earthen embankments which are constructed parallel to the river bank on one or both the banks according to the condition. The top width is generally 3 m to 4 m. The side slope on the river side is generally 1.5: 1 and that on the country side is 2:1.

The marginal bunds serve the following purposes:

- ☐ It prevents the flood water or storage water from entering the surrounding area which may be submerged or may be water logged.
- ☐ It retains the flood water or storage water within a specified section.
- ☐ It protects the towns and villages from devastation during the heavy flood.
- ☐ It protects valuable agricultural lands.

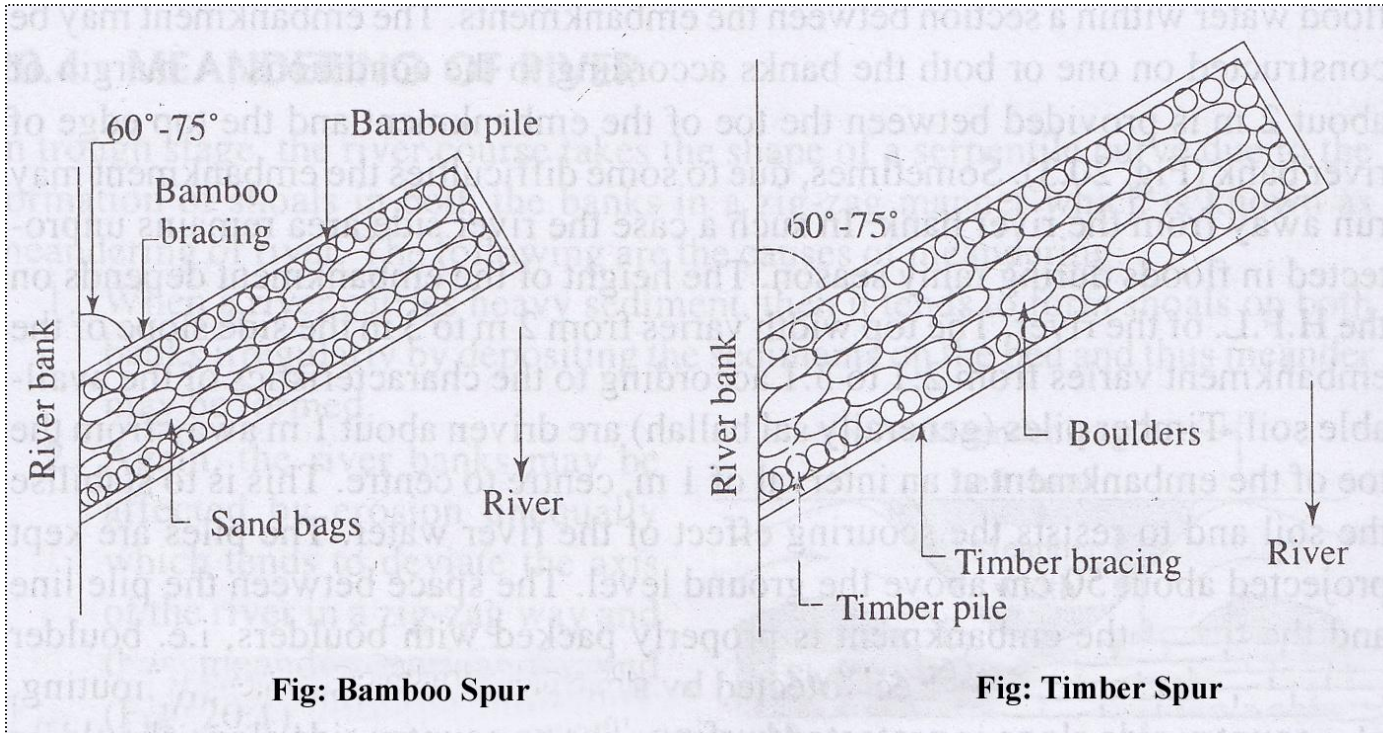
Spurs

These are temporary structures permeable in nature provided on the curve of a river to protect the river bank from erosion. These are projected from the river bank towards the bed making angles 60° to 75° with the bank of the river. The length of the spurs depends on the width of the river and the sharpness of the curve.

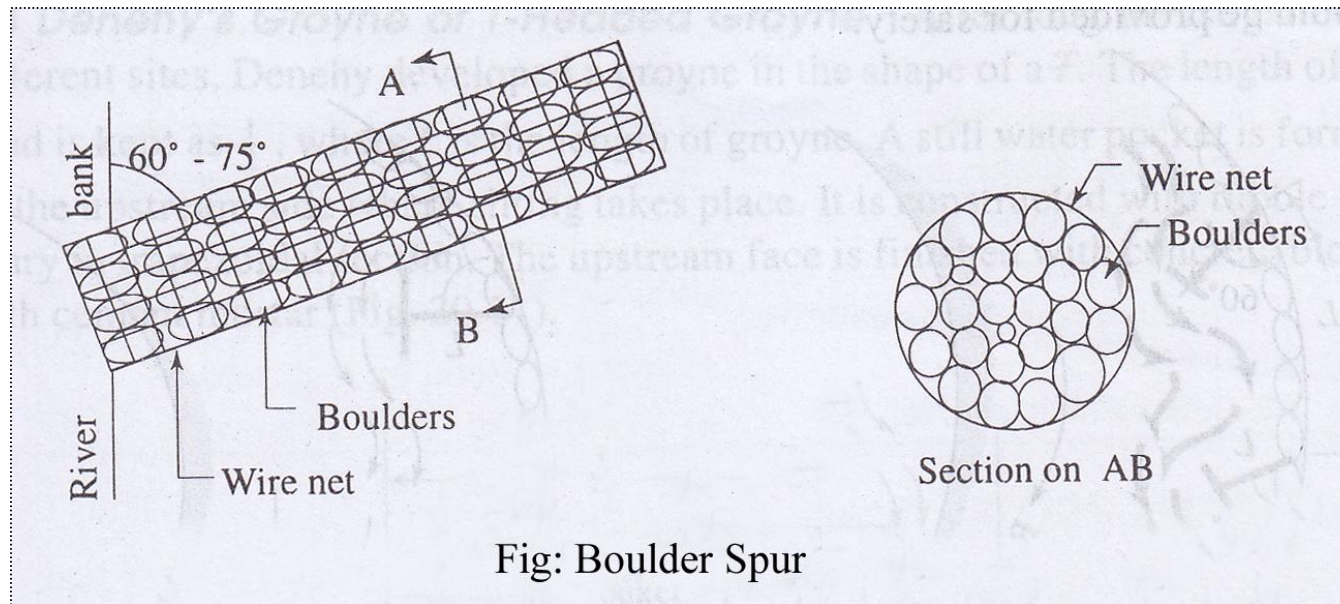
Types of Spur

- ☐ Bamboo spur
- ☐ Timber spur
- ☐ Boulder spur

Bamboo and Timber Spur



Boulder Spur



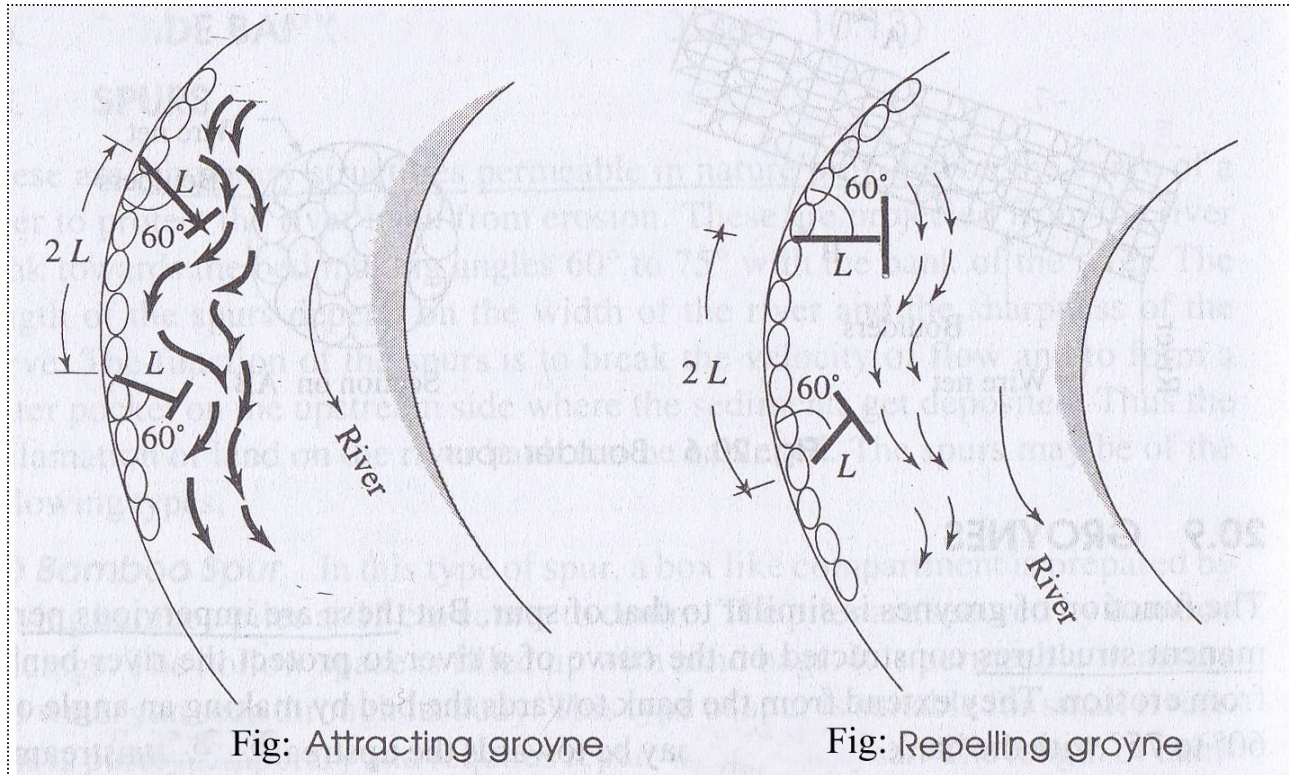
Groynes

The function of groynes is similar to that of spur. But these are impervious permanent structures constructed on the curve of a river to protect the river bank from erosion. They extend from the bank towards the bed by making an angle of 60° to 75° with the bank. The angle may be towards the upstream or downstream. Sometimes, it is made perpendicular to the river bank.

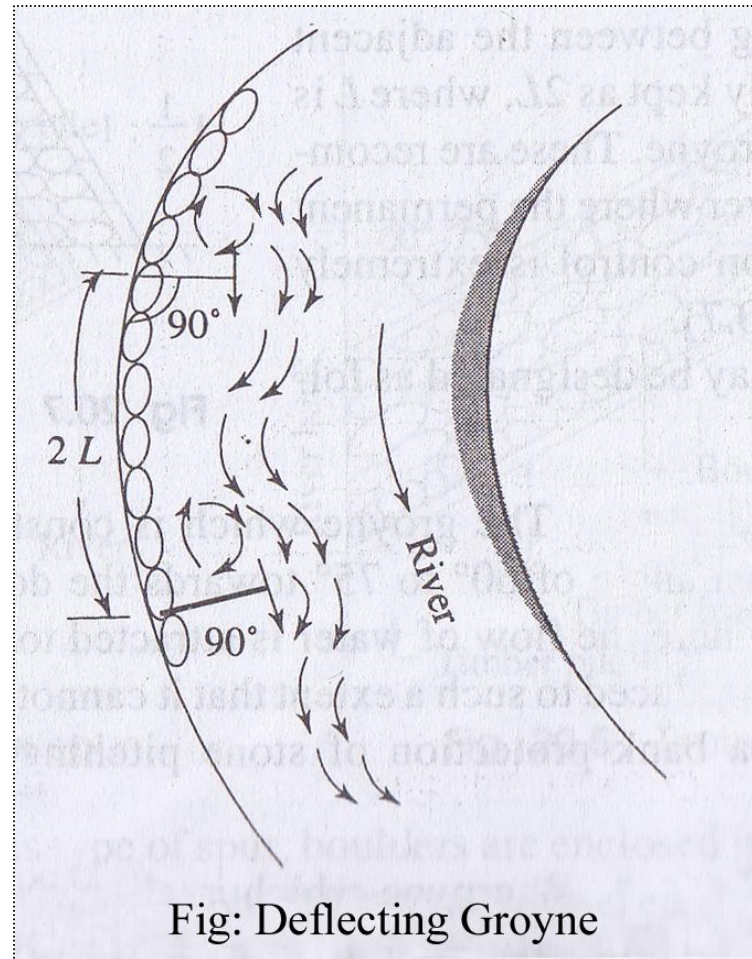
Types of Groyne

- (a) Attracting Groyne
- (b) Repelling Groyne
- (c) Deflecting Groyne

Attracting Groyne

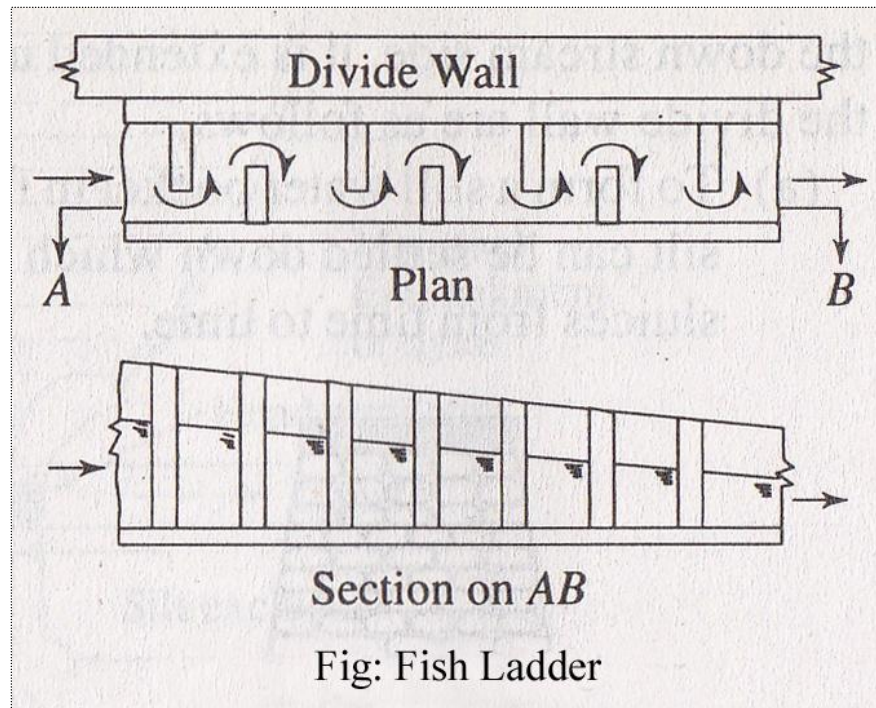


Deflecting Groyne



Fish Ladder

The fish ladder is provided just by the side of the divide wall for the free movement of fishes.





Fishpass at
Shariakandi Bogra



Fish Friendly Structure at Tangail



Fish Pass



Silt Regulation Works

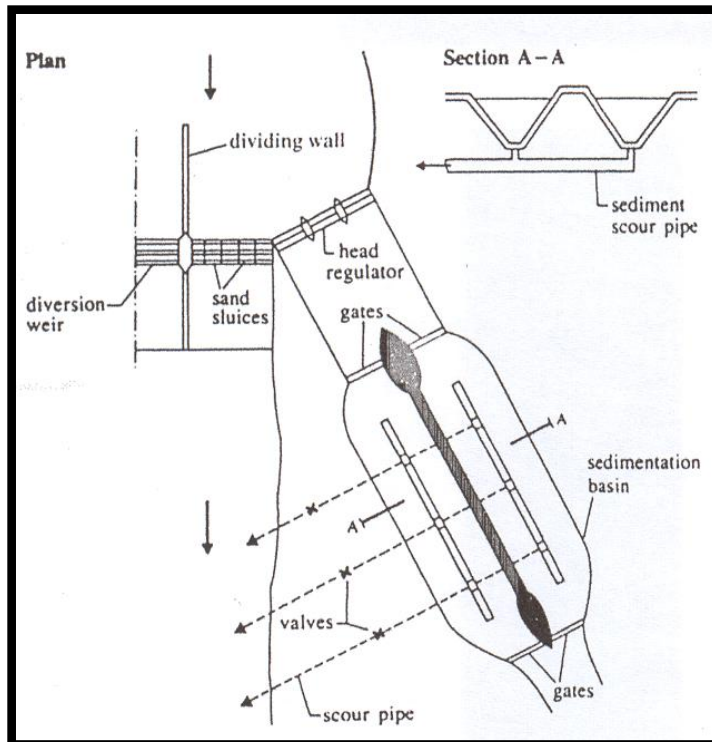
The entry of silt into a canal, which takes off from a head works, can be reduced by constructed certain special works, called silt control works.

Two types of Silt regulation works:

- (a) Silt Excluders
- (b) Silt Ejectors

(a) Silt Excluders

Silt excluders are those works which are constructed on the bed of the river, upstream of the head regulator. The clearer water enters the head regulator and silted water enters the silt excluder. In this type of works, the silt is, therefore, removed from the water before it enters the canal.



(b) Silt Ejectors

Silt ejectors, also called silt extractors, are those devices which extract the silt from the canal water after the silted water has traveled a certain distance in the off-take canal. These works are, therefore, constructed on the bed of the canal, and little distance downstream from the head regulator.

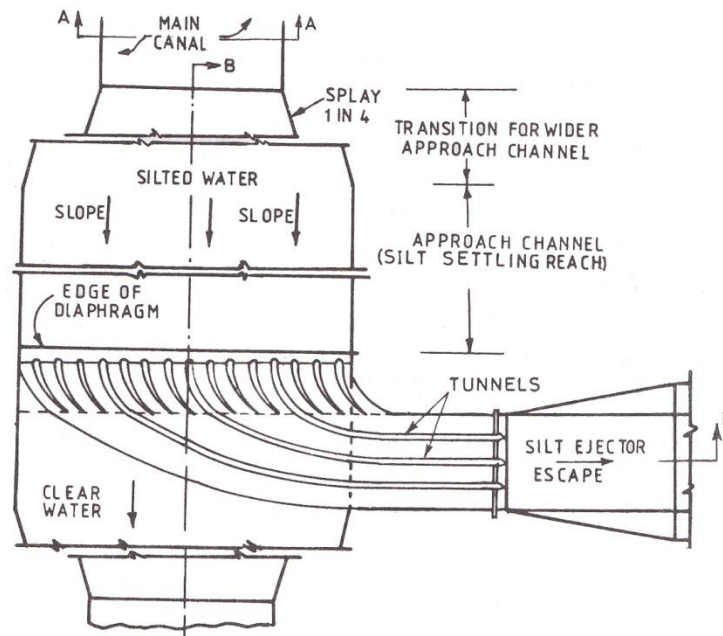
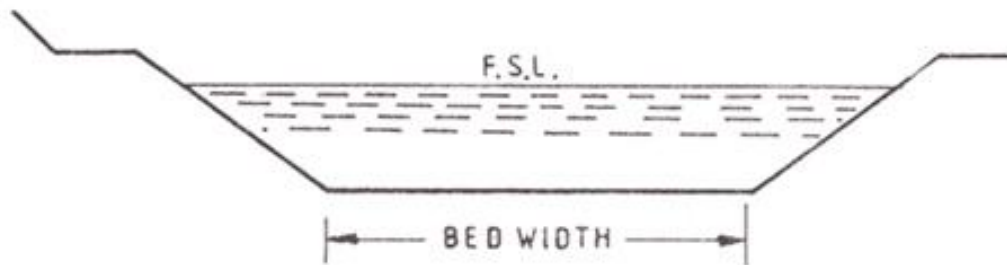
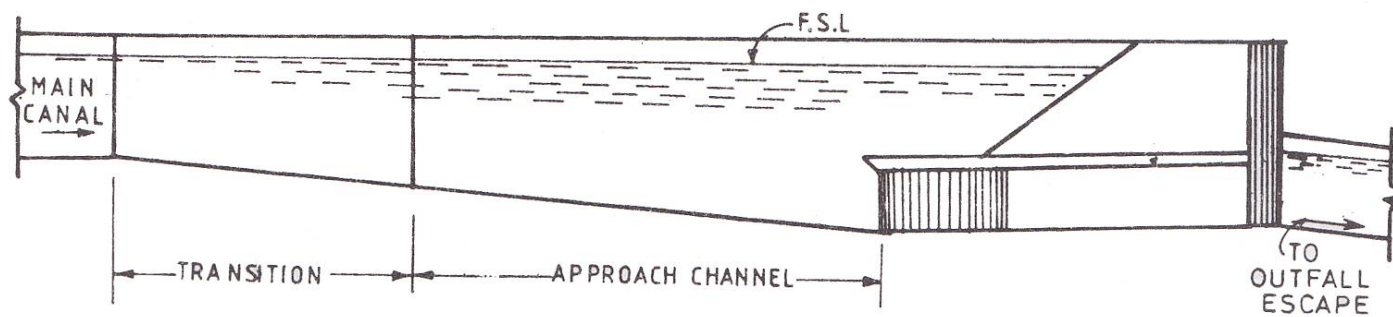


Fig: Plan of Silt Ejector



**Fig: Section A-A
(Main Canal)**



**Fig: L-section along tunnel
(Section B-B)**

Teesta Barrage



Head Regulator

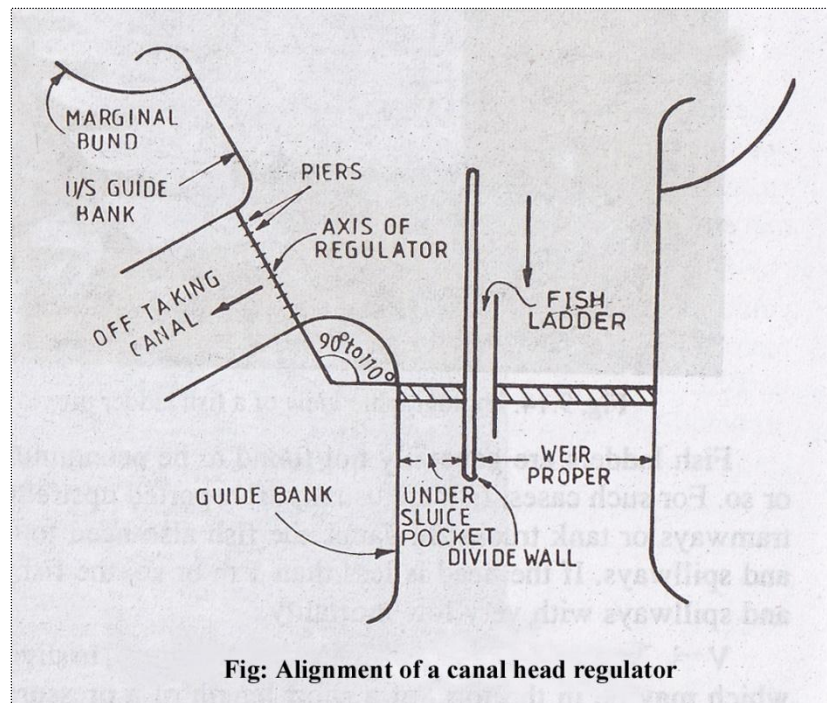


Head Regulator at teesta

Canal Head Regulator or Head Sluices

A canal head regulator (C.H.R) is provided at the head of the off-taking canal, and serves the **following functions**:

- ❑ It regulates the supply of water entering the canal
- ❑ It controls the entry of silt in the canal
- ❑ It prevents the river-floods from entering the canal



End of Chapter – 8

