SNS COLLEGE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

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COIMBATORE

Department of civil engineering

ENGINEERING

III YEAR / VI SEMESTER

Unit 2 : CANAL IRRIGATION

River Training works

River Training Works

River training works is a term used to stabilize a river channel with a certain alignment and certain cross-sections, a river can be trained by diverting its flow into a secondary channel or by performing artificial cutoffs on the main river to reduce flood levels.

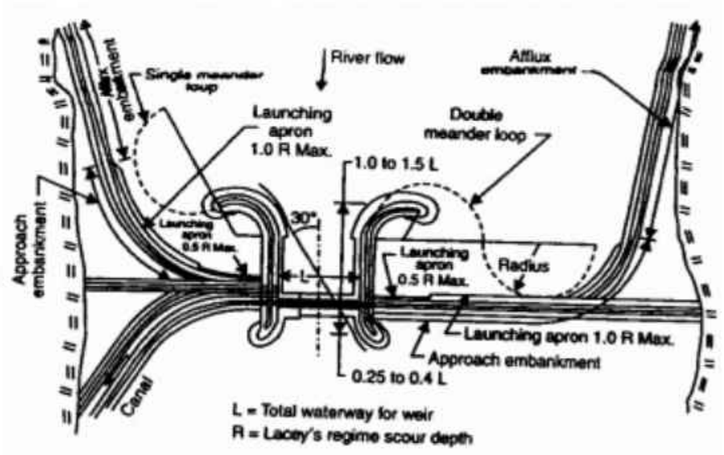


Figure: Typical layout of river training structures for canal head works

River training works includes all measures taken to control and regulate river flow and river configuration.

It is mainly required for rivers, which flow over fertile pains, it is often known to change its course.

Objectives of river training works:

- To provide a safe passage for the discharge of water without overflowing the banks, protection of farming, and inhabited areas.
- To prevent the outflow of work, bridges were constructed

1.High water training:

- The disposal of flood water due to such flooding and providing protection from any kind of damage is the main objective.
- This is mainly related to the elevation of marginal embankments for the most appropriate alignment and flood disposal.
- It is also connected to taking measures for channel improvement for the same purpose.
- In short, high water training is training for discharge.

2.Low water training:

- The purpose of river training works is to provide sufficient depth of water for inland navigation, during low water seasons i.e. during summers for non-perennial rivers mainly in South India.
- This is done by contracting the width of the channel in low water with the help of groynes, so low water training for depth.

Mean water training:

This is mainly carried for the smooth disposal of bed to maintain suspended sediment load and channel size, so that mean water training is training for sediments.

- More ever , fluming of water ways barrages results in afflux, which may some times be several feet.
- The effect of afflux is felt up to several miles up stream of the barrage . A high afflux may submerged large tracts of costly land and properties along the river, if these are not protected.
- Therefore to insure that the river flows through the barrage and protect the submerging of large tracts of costly land and property upstream , certain works upstream of barrage are constructed. These works are called river training works.

River training works

1. Guide banks
2. Marginal banks
3. Spurs
4. Pitched island

Guide banks

- The works required in the river to guide the passage of river water through weir or barrages are called guide banks.
- The guide banks consist of two heavily built set of embankments with heavily protected curved ends in the shape of bell mouth. The width of water way is kept equal to the width of the structure from abutments. The river side slops of guide banks are pitched with stones.

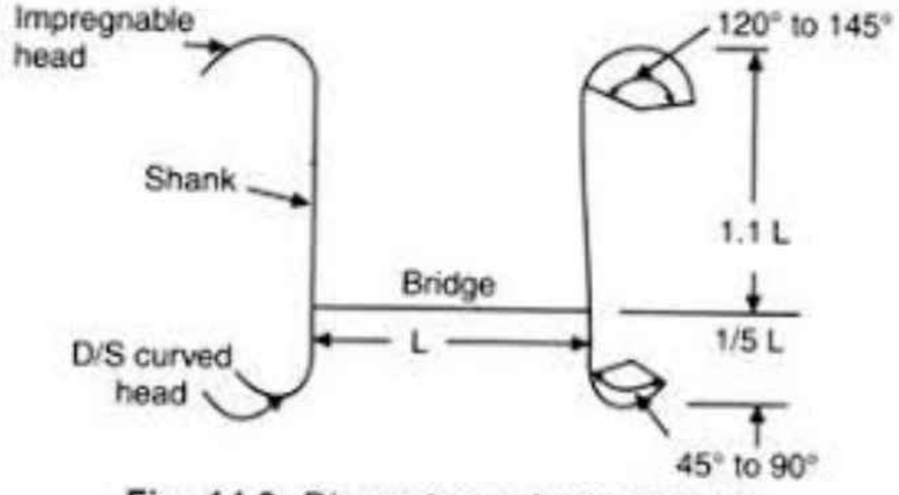


Fig. 14.6. Dimensions of guide banks

The marginal banks

- With the construction of weir or barrage, the level of water in the river upstream is raised by a few feet in all season. This is called afflux. The rise of water level is felt up to several miles upstream. If this rise is felt unattended, it will part from threatening the safety of structure , will submerge large areas upstream.

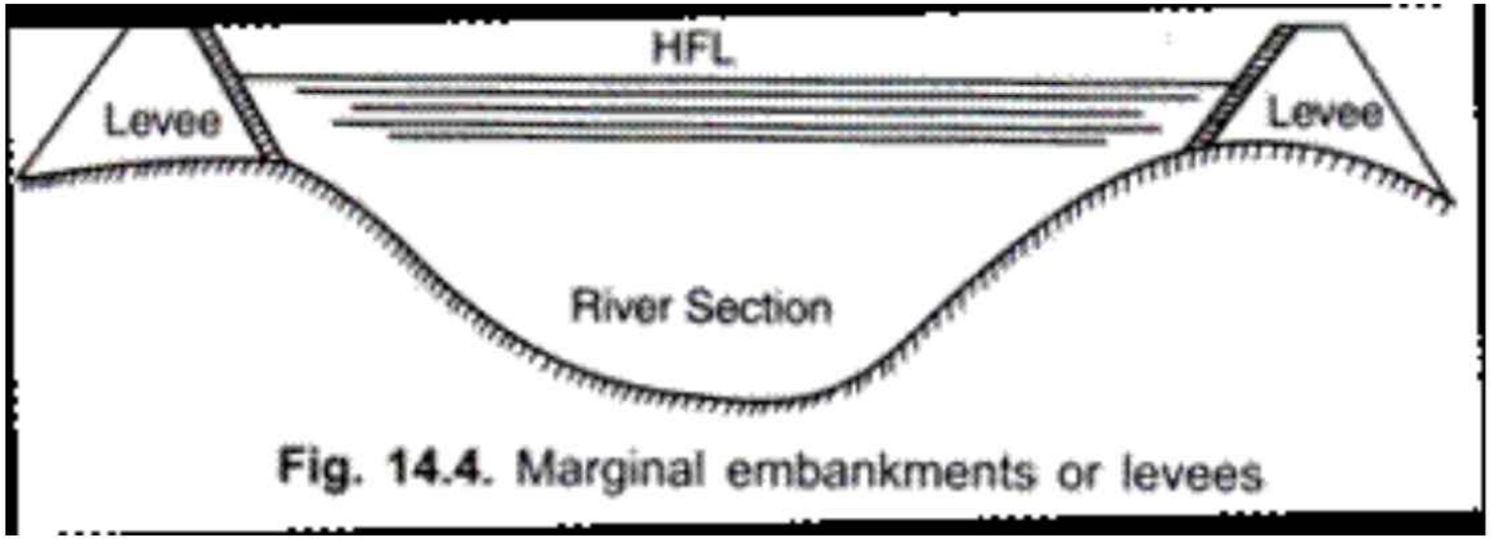


Fig. 14.4. Marginal embankments or levees

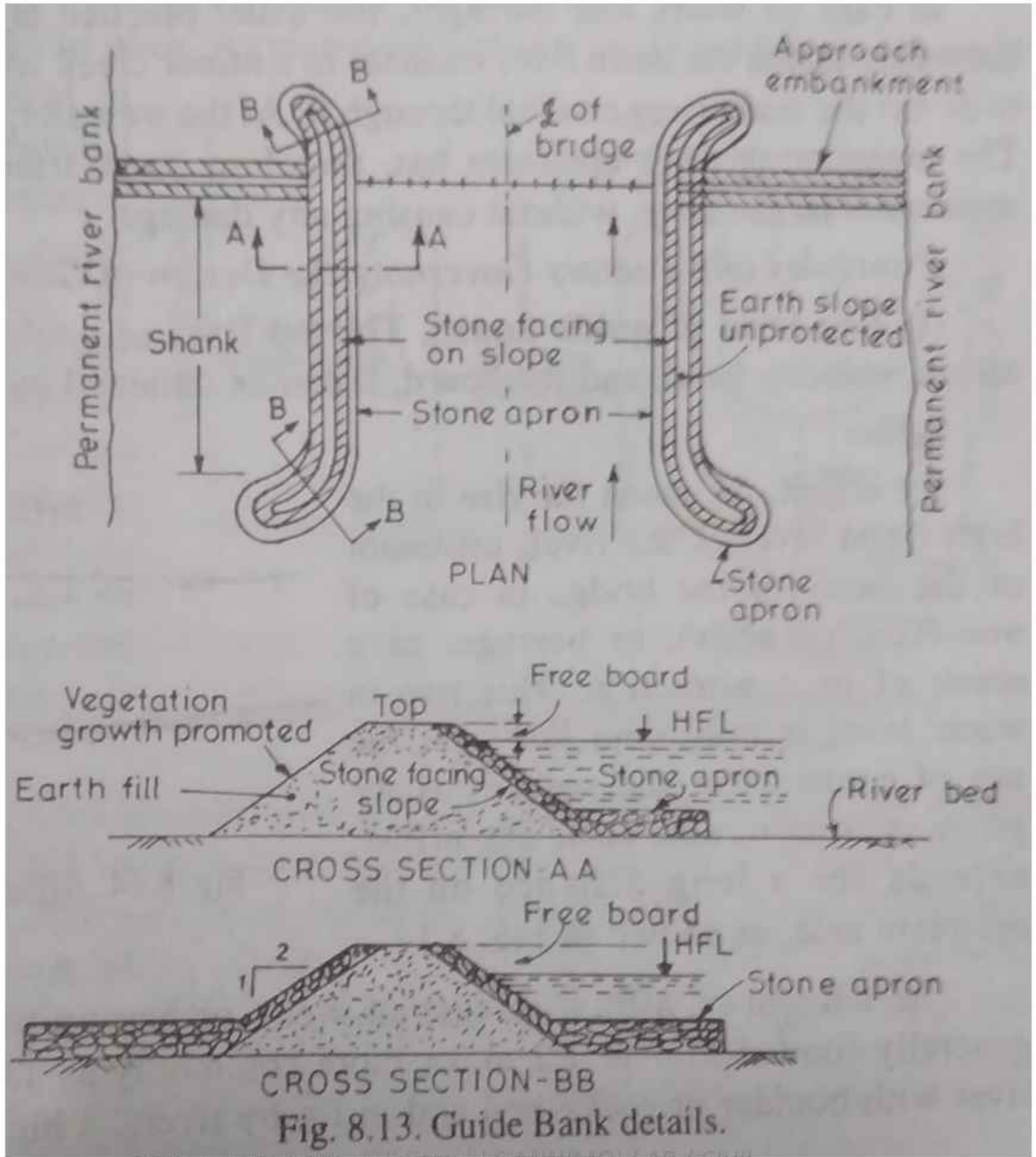
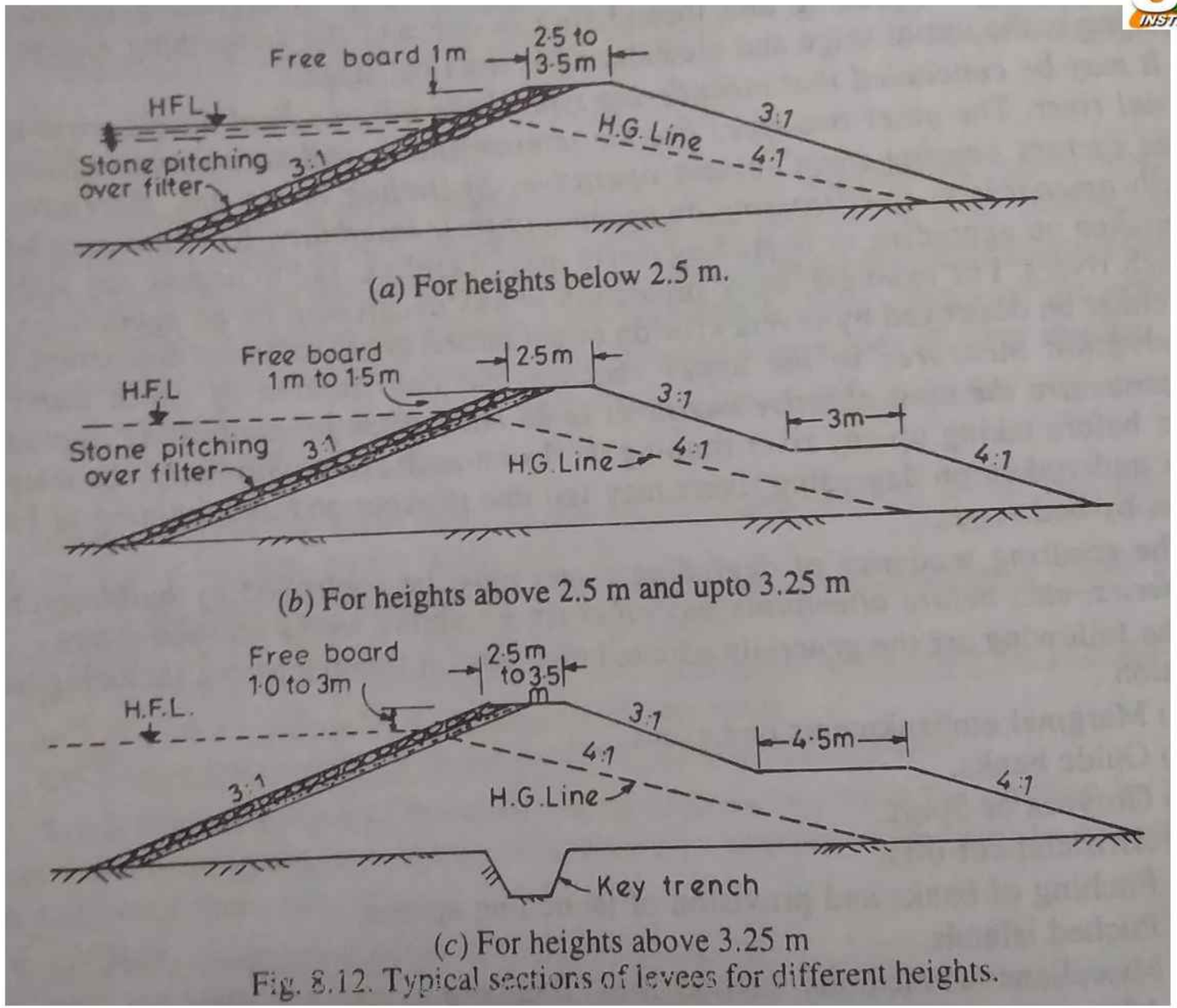


Fig. 8.13. Guide Bank details.



(*a*) For heights below 2.5 m.

(*b*) For heights above 2.5 m and upto 3.25 m

(*c*) For heights above 3.25 m

Fig. 8.12. Typical sections of levees for different heights.

- Marginal banks - to protect properties from submergence and destruction, a set of embankments are constructed both sides of the river upstream of the barrage.
- The marginal banks are permanent structures these are aligned in such a way that they do not interfere with the river meander.
- They are tied or joined to the high ground upstream so that the river flows with in the two marginal banks and is not allowed to out flank the barrage and also not submerged areas up stream.
- It is usually provided with a top width of 6m with river side slope 3:1 to 5:1 and land side slope of 4:1 to 6:1. the river side slope is protected with stone pitching and flexible stone apron.

Spurs

- Spurs are heavily fortified embankments constructed in the river bed transverse to the river banks.
- Their main function is to control the river channel so that it may run along a specified course and protect the river banks from scouring by keeping the river course away from it.
- Spurs may be aligned in such a way that they may hold, repel or attract a river course.

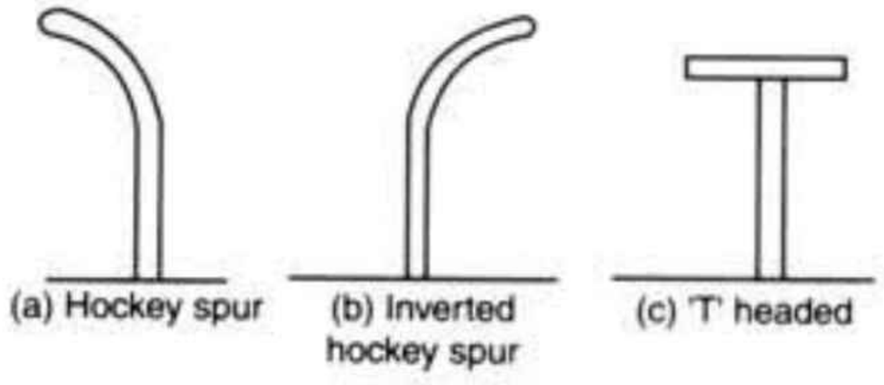


Fig. 14.11. Special types of spurs or groynes

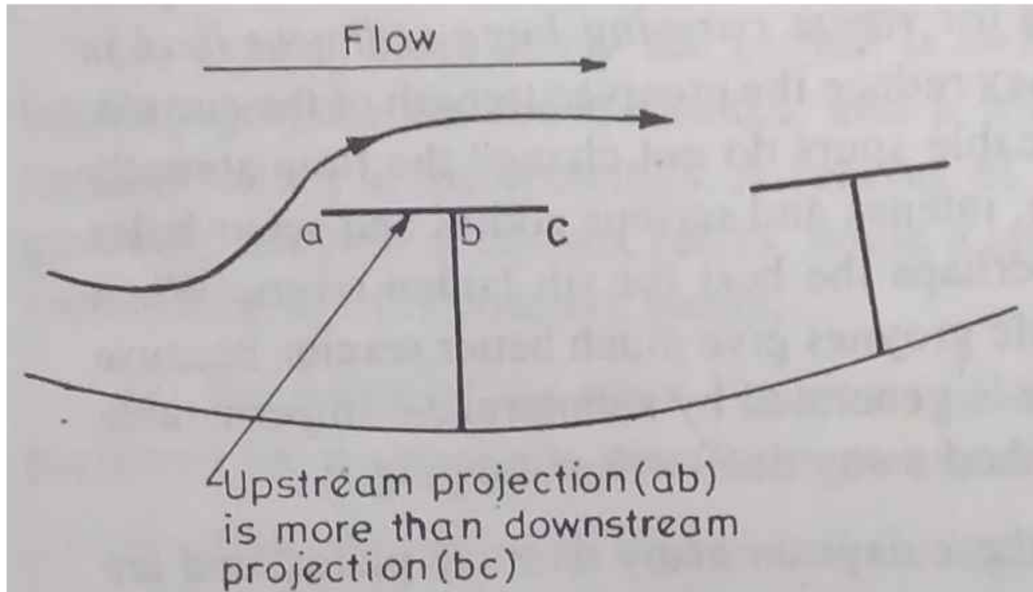


Fig. 8.26. T-shaped groyne

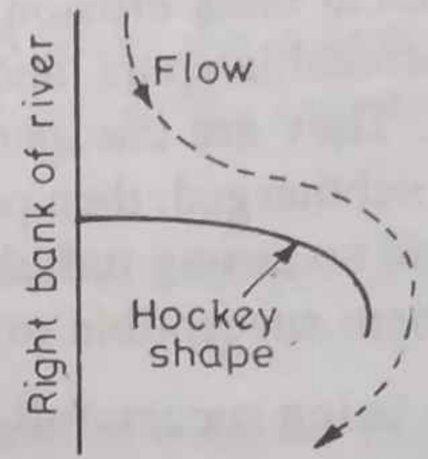
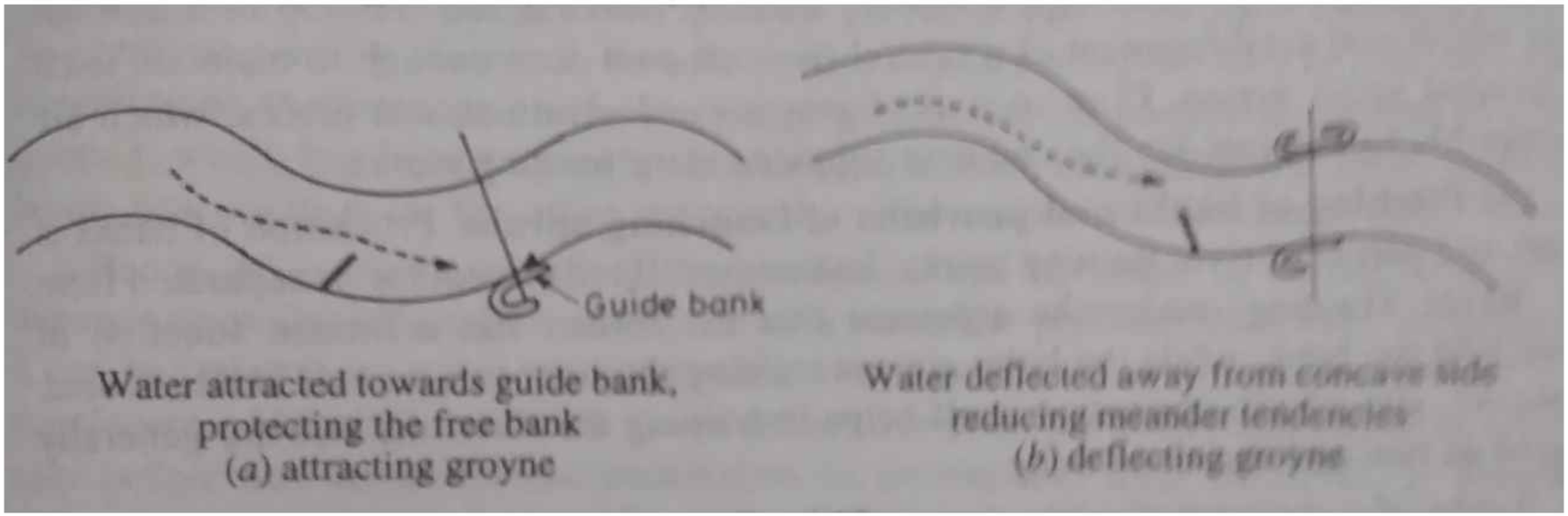
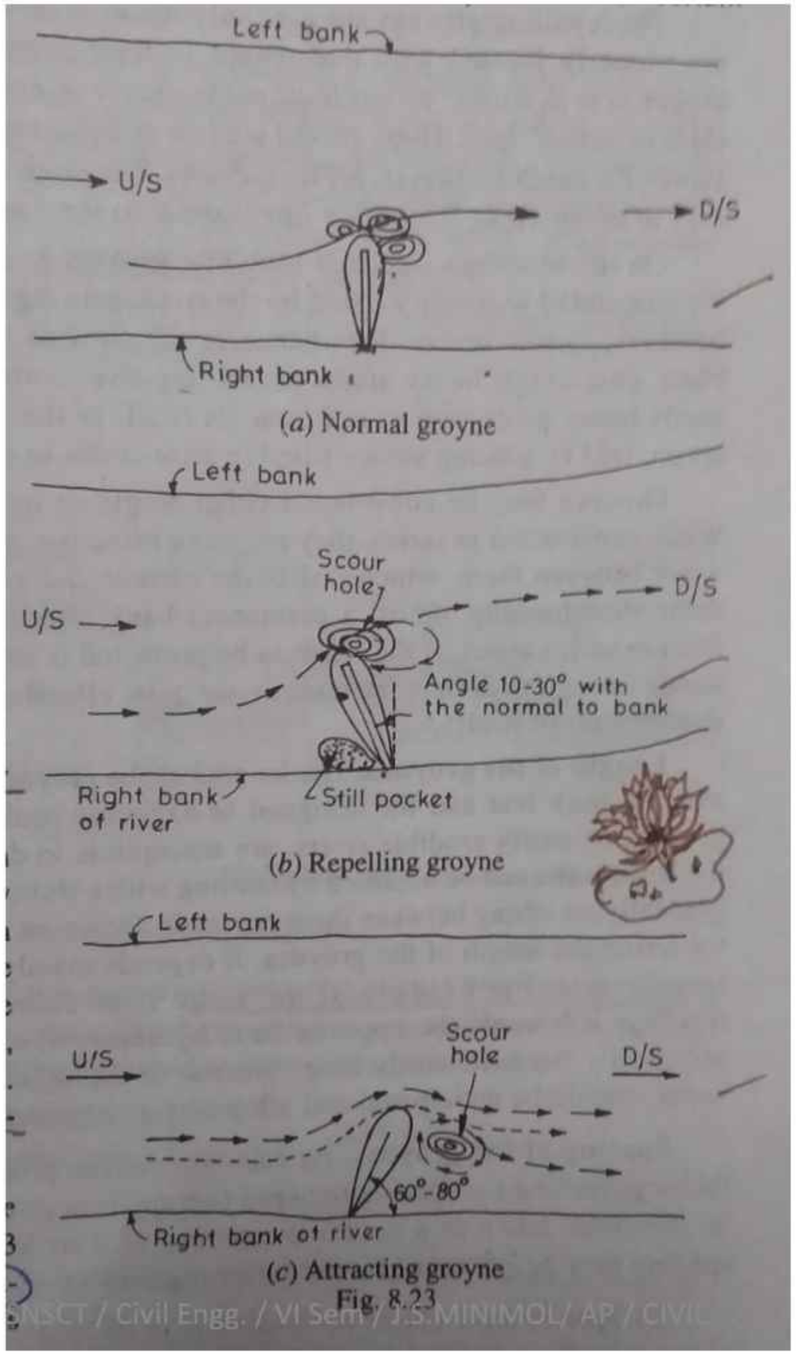


Fig. 8.27. Hockey shaped groyne.



Water attracted towards guide bank, protecting the free bank
(*a*) attracting groyne

Water deflected away from concave side reducing meander tendencies
(*b*) deflecting groyne


Left bank
U/S
D/S
Right bank
(a) Normal groyne
Left bank
Scour hole
U/S
D/S
Angle 10-30° with the normal to bank
Right bank of river
Still pocket
(b) Repelling groyne
Left bank
U/S
Scour hole
D/S
60°-80°
Right bank of river
(c) Attracting groyne
Fig. 8.23

Types of spurs according to alignment

- **Normal / Ordinary spurs:** spurs are constructed to the river current. They should be short in length and should be constructed perpendicular to the bank. Such spurs are utilized to hold the channel in position and protect the banks.

- **Attracting spurs:** spurs should be constructed pointing towards upstream of the flow to attract the river current towards the bank. The angle of inclination may vary from 60 degree to 80 degree. This attract river flow towards the banks from which the spurs are very strong in construction as they have to bear the full frontal attack of the river flow.

Repelling spurs: spurs constructed to repel the river current should be aligned pointing towards downstream. The angle of inclination with normal to bank varies from 40 to 60 degrees.

- The head of the spur should be heavily protected to resist swirling action of the current. The distance between the two spurs is kept 1 to 2 times the length of the spurs.
- On bends the distance between the spurs is kept more in case of convex banks and small for concave banks.

Types of the spurs

- Impermeable spurs
- Permeable spurs

Impermeable spurs

- Impermeable spurs as name implies are those spurs which do not allow water to seep through them.

- **Types:**
- Bar spurs
- Hockey spurs
- Inverted hockey spur
- T- head spur
- Sloping spur

Permeable spurs

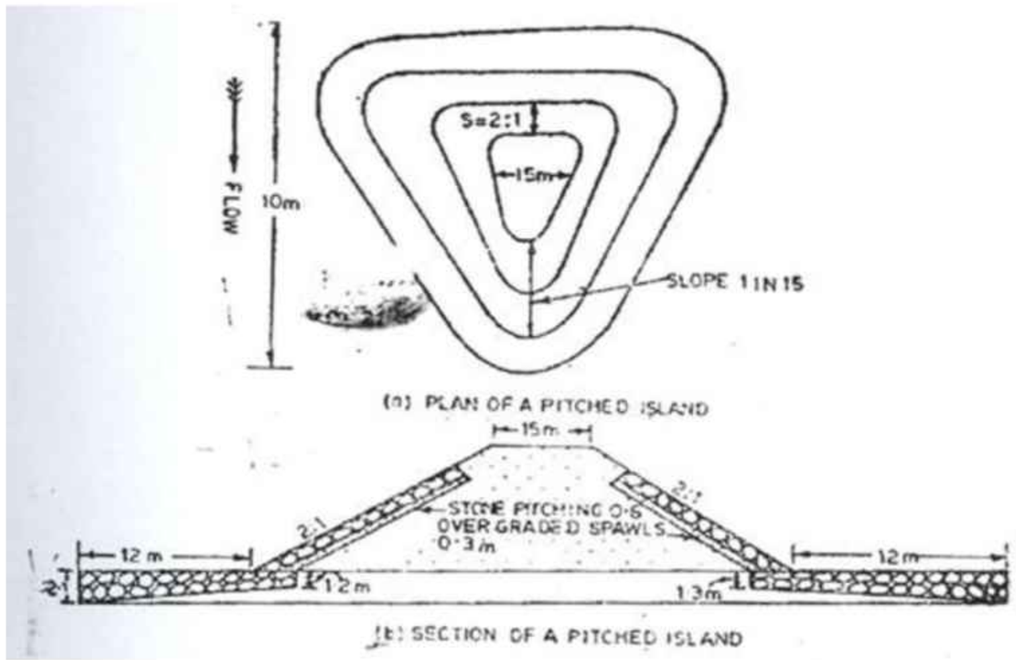
A permeable spurs allows water to seep through it. However, as the silt water passes through the voids in the material of such spurs, its velocity is reduced considerably, which allows water to drop its entire silt load in the pores of spurs gradually making it full impermeable.

Types :

- Tree spur
- Wire crated stone spur

The pitched Island

- A pitched island is an artificially created island in the river. It is made of earth with pitched side slopes and stone apron. Sometimes an existing natural island in the river is reshaped and pitched and provided with aprons.



hed island cause redistribution of tractive force, velocity and sediment charge of river flow.

The tractive force near a pitched island begins to increase rapidly after construction of island which creates a deep scour around the island thus drawing the river channel near it and holding it there permanently.

It is used to correct the river approach conditions by attracting the river course above the weir and holding it there.

It decreases the intensity of flow along a marginal banks and guide banks and protect them from damage. It also deepens the river channel, which helps the silt distribution before the head regulator of off-taking channels and navigation purposes.

It is particularly suitable in deep channels. In shallow channel with flash floods, they are not suitable.