JYOTHISHMATHI INSTITUTE OF TECHNOLOGY & SCIENCE

CROSS DRAINAGE WORKS

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What is cross drainage works?

- Cross drainage works is a structure constructed when there is a crossing of canal and natural drain, to prevent the drain water from mixing into canal water.
- This type of structure is costlier one and needs to be avoided as much as possible.

The selection of its site depends upon various factors which can be summarized as follows:

- Nature of the foundation available at site.
- Existing condition of a natural drain.
- Bed levels of the irrigation canal and the drain.
- Relative water levels of the canal and the drain.
- Magnitude of the drain and the irrigation canal.
- Angle of crossing of the canal and the drain.
- Other available constructional facilities.

Types of Cross Drainage works:

Depending upon levels and discharge, it may be of the following types:

Type – 1: Cross drainage work carrying canal over the drain

- Aqueduct
- Syphon Aqueduct

Type – 2: Cross Drainage work carrying Drainage over the canal

- Super passage
- Canal Syphon

Type –3: Cross drainage works admitting canal water into the canal

- Level Crossing
- Canal inlets

Type – 1: Canal over drainage [HFL < FSL]

Aqueduct:

- In an aqueduct, the canal bed level is above the drainage bed level so canal is to be constructed above drainage.
- The canal water level is referred as full supply level (FSL) and drainage water level is referred as high flood level (HFL). The HFL is below the canal bed level.
- Aqueduct is similar to a bridge, instead of roadway or railway, canal water are carried in the trough and below that the drainage water flows under gravity and possessing atmospheric pressure.

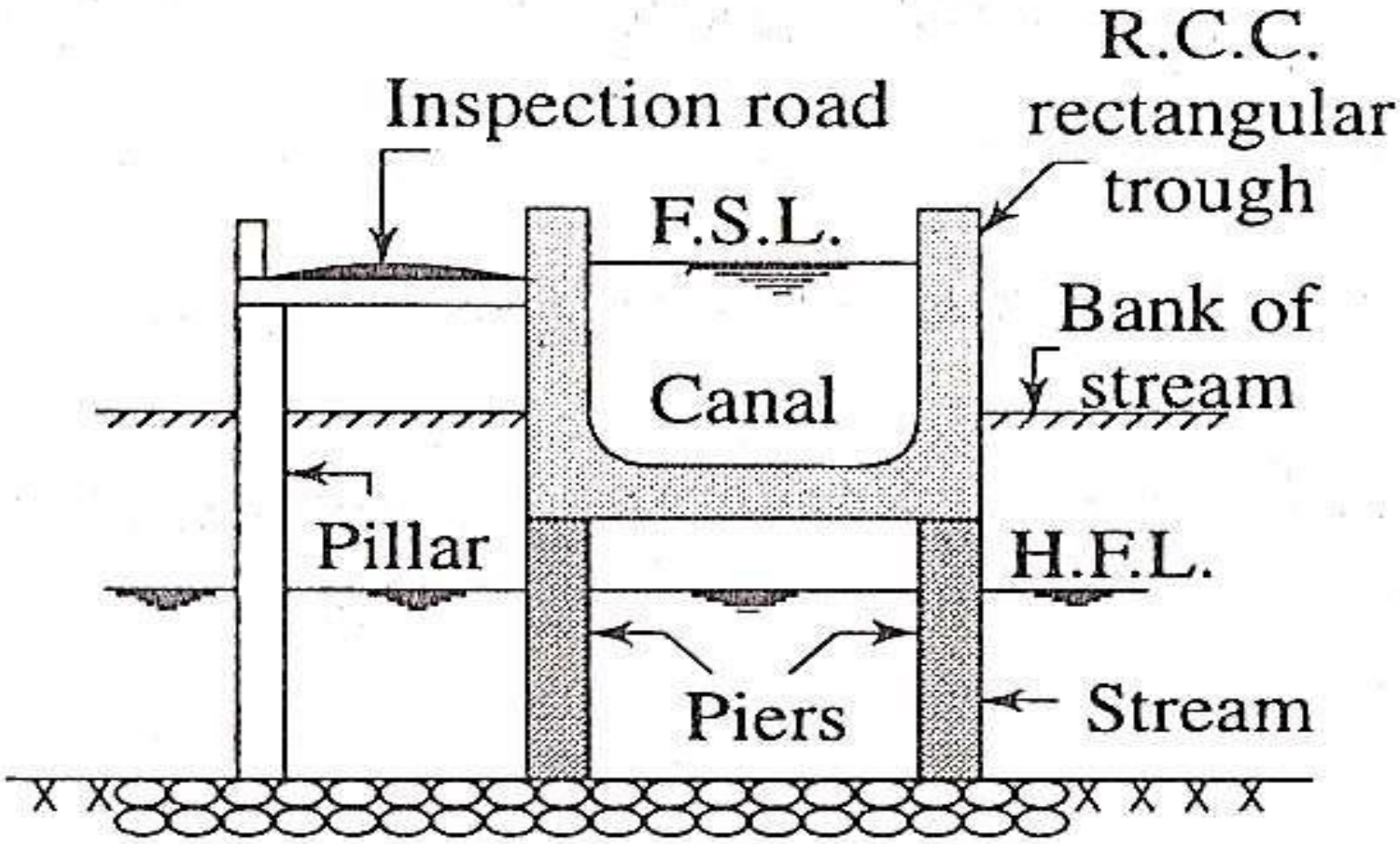


Fig: Aqueduct

AQUEDUCT

Syphon Aqueduct:

- In a hydraulic structure where the canal is taken over the drainage, but the drainage water cannot pass clearly below the canal. It flows under siphonic action. So, it is known as siphon aqueduct.
- This structure is suitable when the bed level of canal is below the highest flood level.

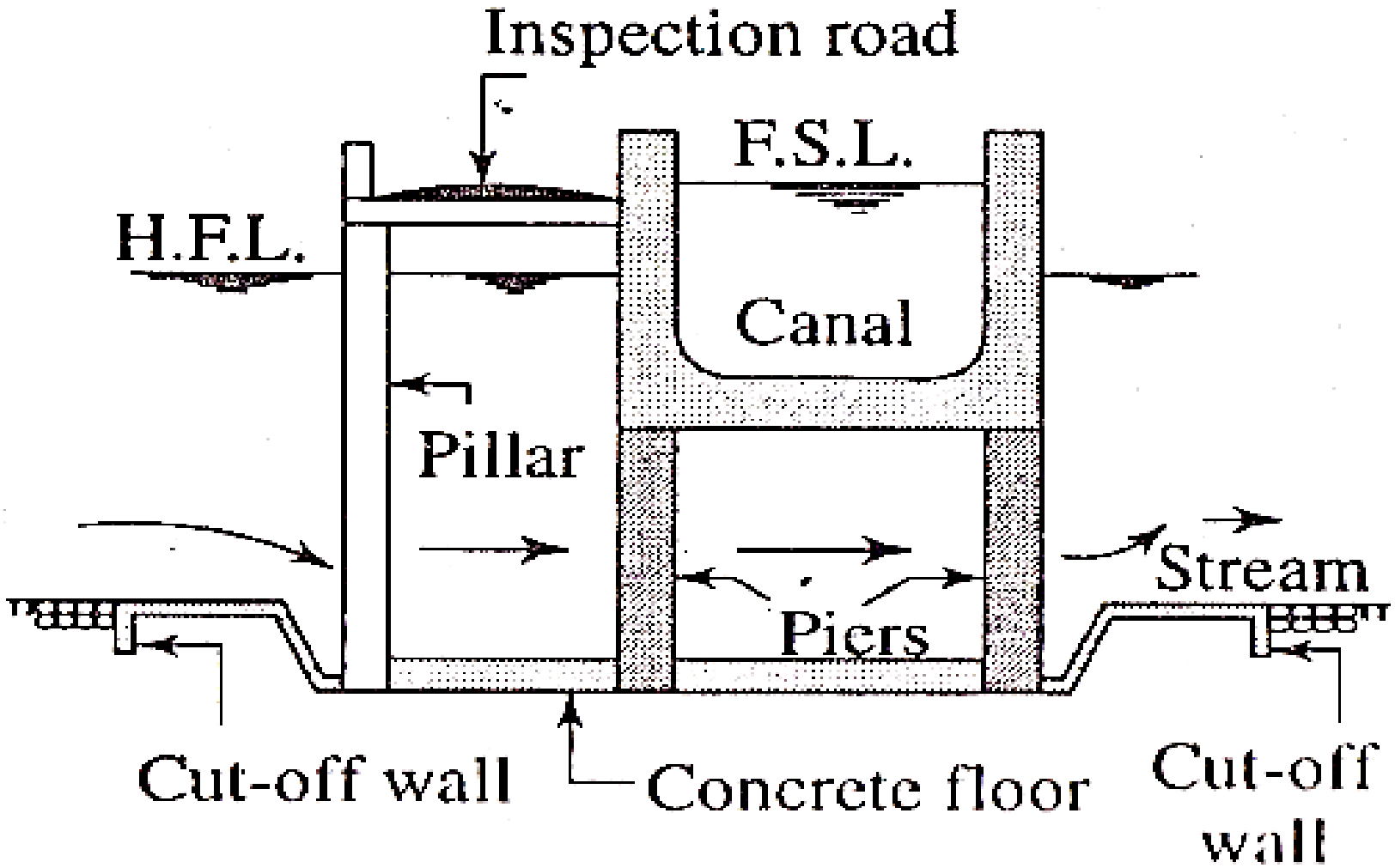
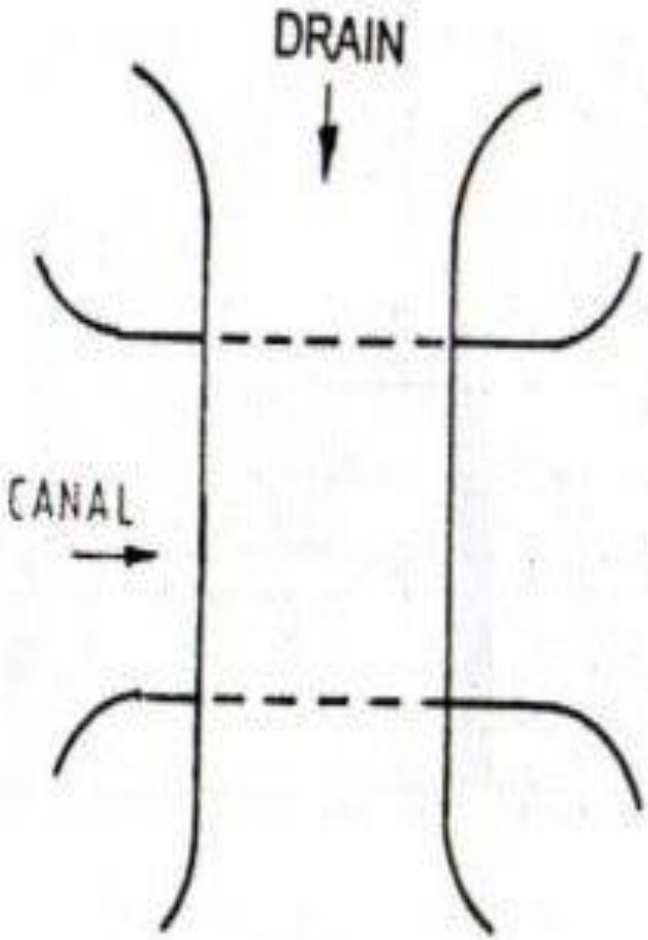


Fig: Siphon Aqueduct

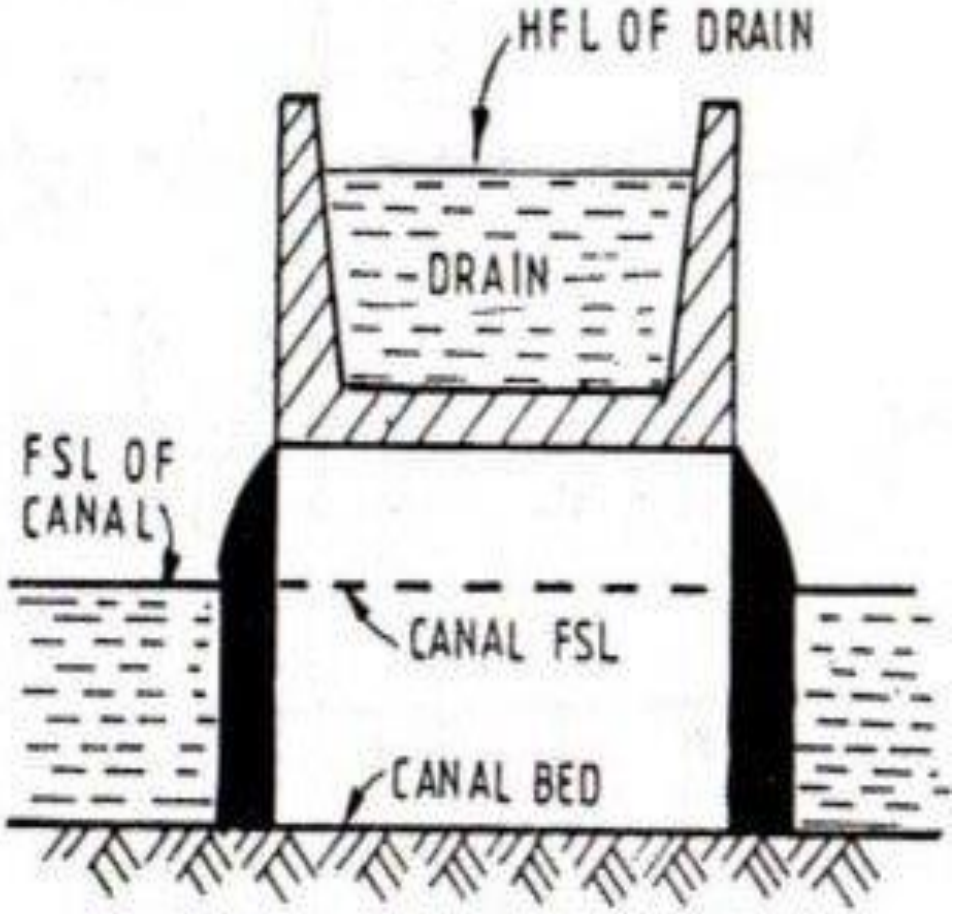
Type – 2: Drainage over canal (HFL > FSL)

Super Passage:

- The hydraulic structure in which the drainage is taken over the irrigation canal is known as super passage.
- The structure is suitable when the bed level of drainage is above the full supply level of the canal. The water of the canal passes clearly below the drainage.
- This is simply a reverse of Aqueduct structure.



Drain taken over the canal in a Superpassage or in a Syphon. (Line Plan of Crossing)



Typical cross-section of a Superpassage.

Canal Syphon:

- In a canal syphon, drainage is carried over canal similar to a super passage but the full supply level of canal is above than the drainage trough.so the canal water flows under syphonic action and there is no presence of atmospheric pressure in canal.
- When compared, super passage is more often preferred than canal Syphon because in a canal Syphon, big disadvantage is that the canal water is under drainage trough so any defective minerals or sediment deposited cannot be removed with ease like in the case of a Syphon Aqueduct.

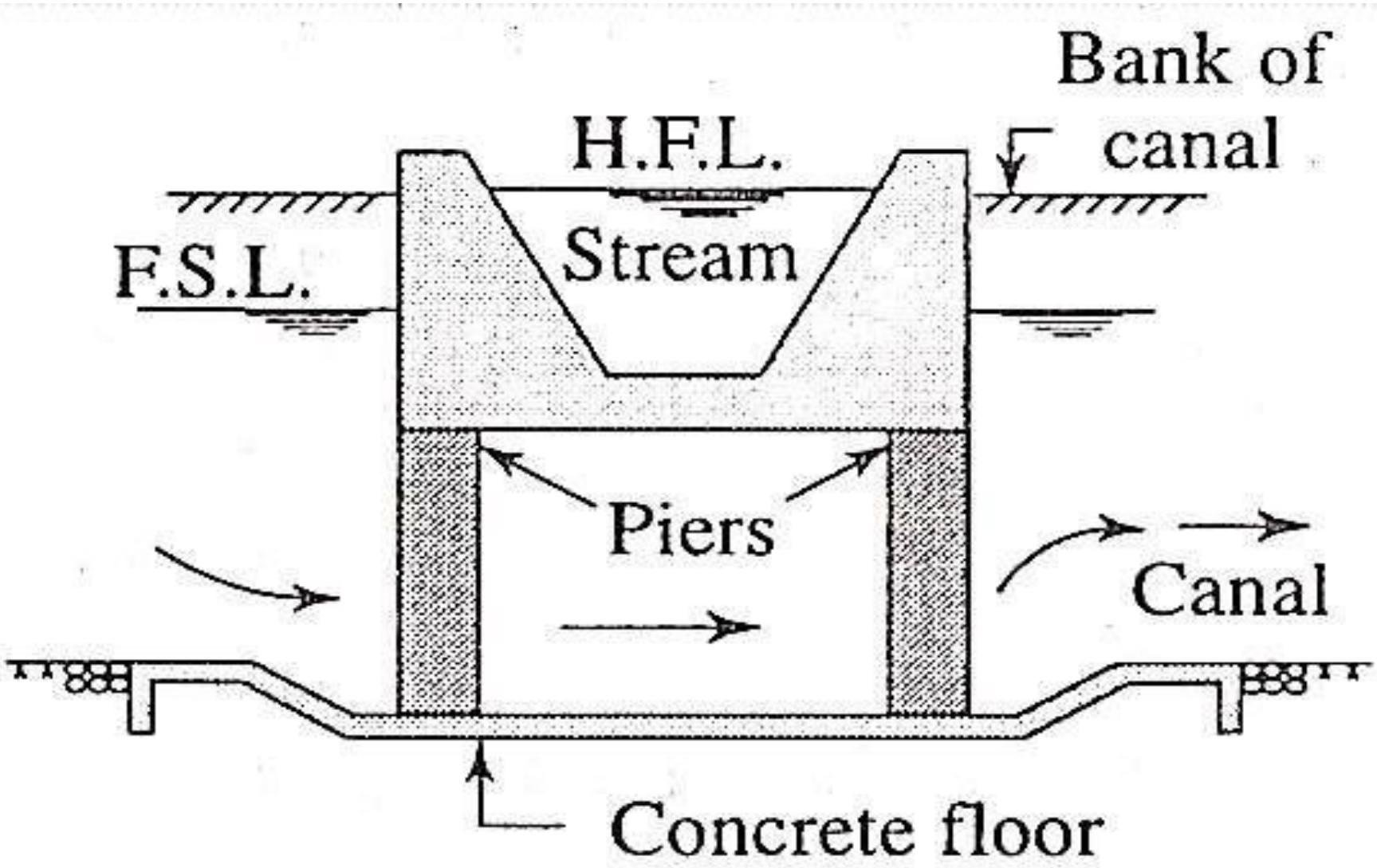
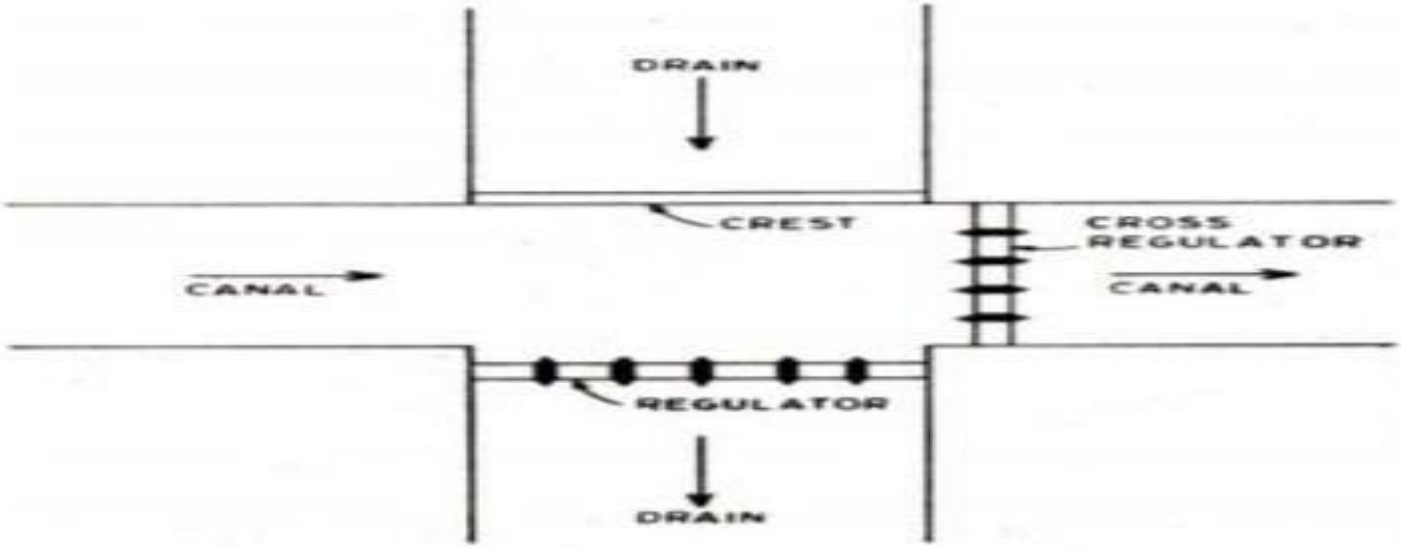


Fig: Siphon Super Passage

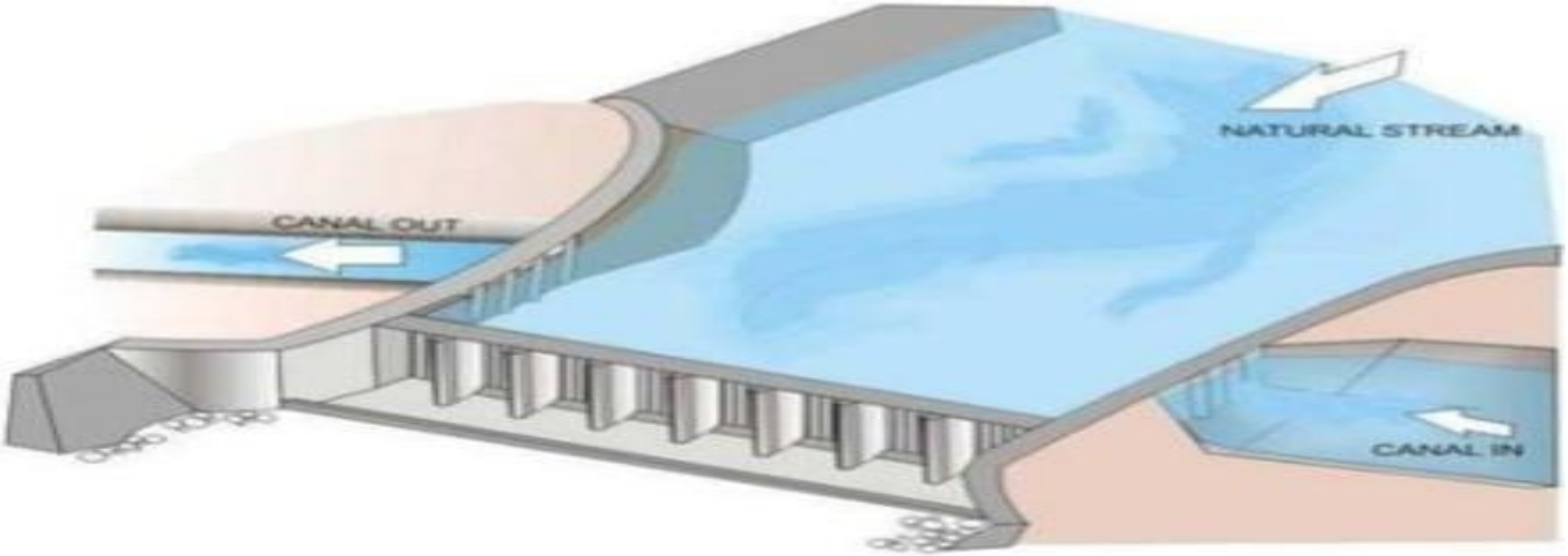
Type –3: Drainage admitted into canal (HFL = FSL)

Level Crossing:

- When the bed level of canal and the stream are approximately the same and quality of water in canal and stream is not much different, the cross drainage work constructed is called level crossing where water of canal and stream is allowed to mix. With the help of regulators both in canal and stream, water is disposed through canal and stream in required quantity.
- Level crossing consists of following components (i) crest wall (ii) Stream regulator (iii) Canal regulator



Level Crossing



Inlet and Outlet

- When irrigation canal meets a small stream or drain at same level, drain is allowed to enter the canal as in inlet. At some distance from this inlet point, a part of water is allowed to drain as outlet which eventually meets the original stream. Stone pitching is required at the inlet and outlet. The bed and banks between inlet and outlet are also protected by stone pitching. This type of CDW is called Inlet and Outlet.
- There are many disadvantages in use of canal inlet structure, because the drainage may pollute canal water and also the bank erosion may take place causing the canal structure deteriorate so that maintenance costs are high. Hence this type of structure is rarely constructed.

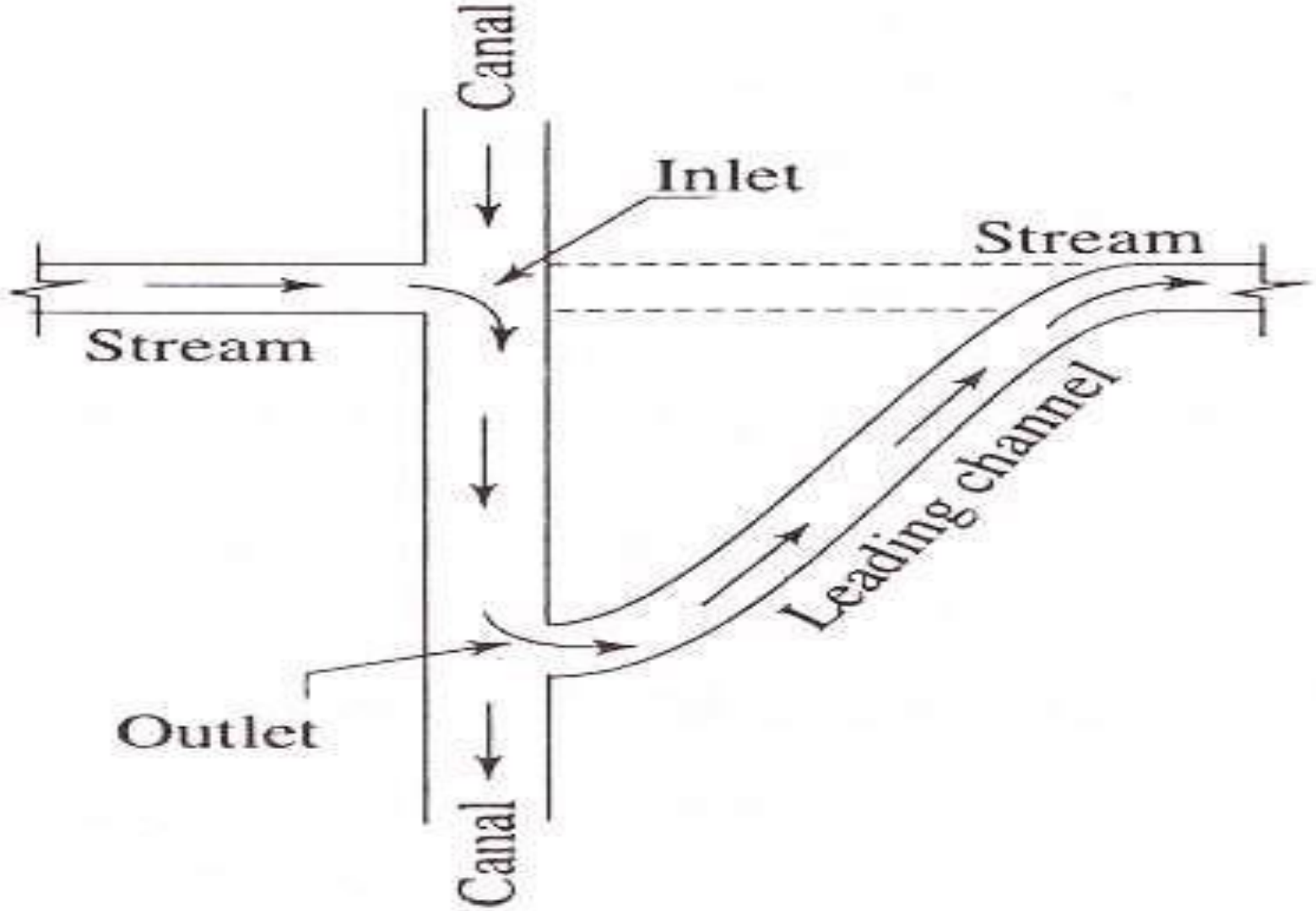


Fig: Inlet and outlet

Classification of aqueduct and siphon aqueduct

- Depending upon the nature of the sides of the aqueduct or siphon aqueduct it may be classified under three headings:

Type I:

- Sides of the aqueduct in earthen banks with complete earthen slopes. The length of culvert should be sufficient to accomodate both, water section of canal, as well as earthen banks of canal with aqueduct slope.

Type II:

- Sides of the aqueduct in earthen banks, with other slopes supported by masonry wall. In this case, canal continues in its earthen section over the drainage but the outer slopes of the canal banks are replaced by retaining wall, reducing the length of drainage culvert.

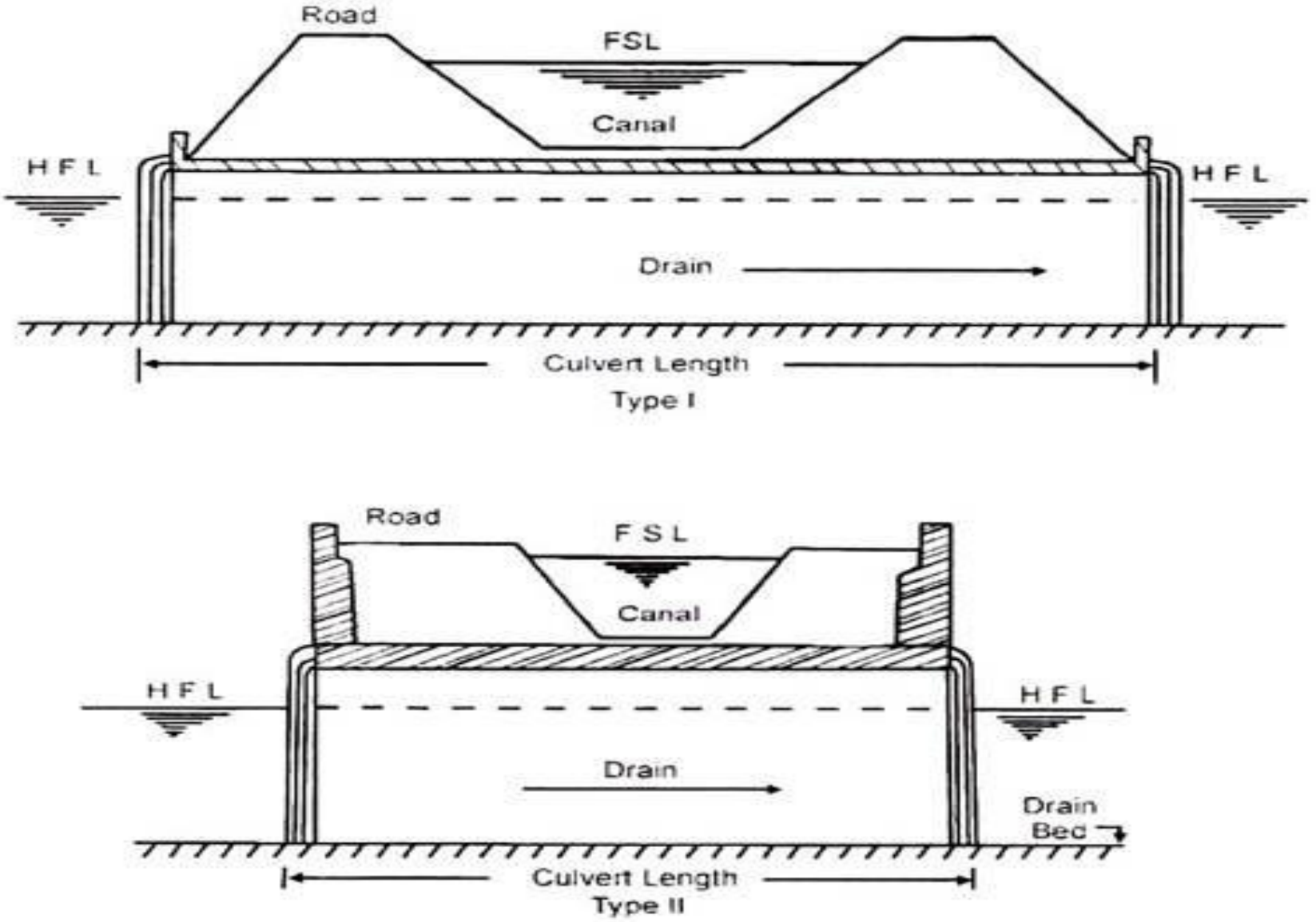


Fig. 25.2. *Aqueduct.*

Type III:

- Sides of the aqueduct made of concrete or masonry. Its earthen section of the canal is discontinued and canal water is carried in masonry or concrete trough, canal is generally flumed in this section

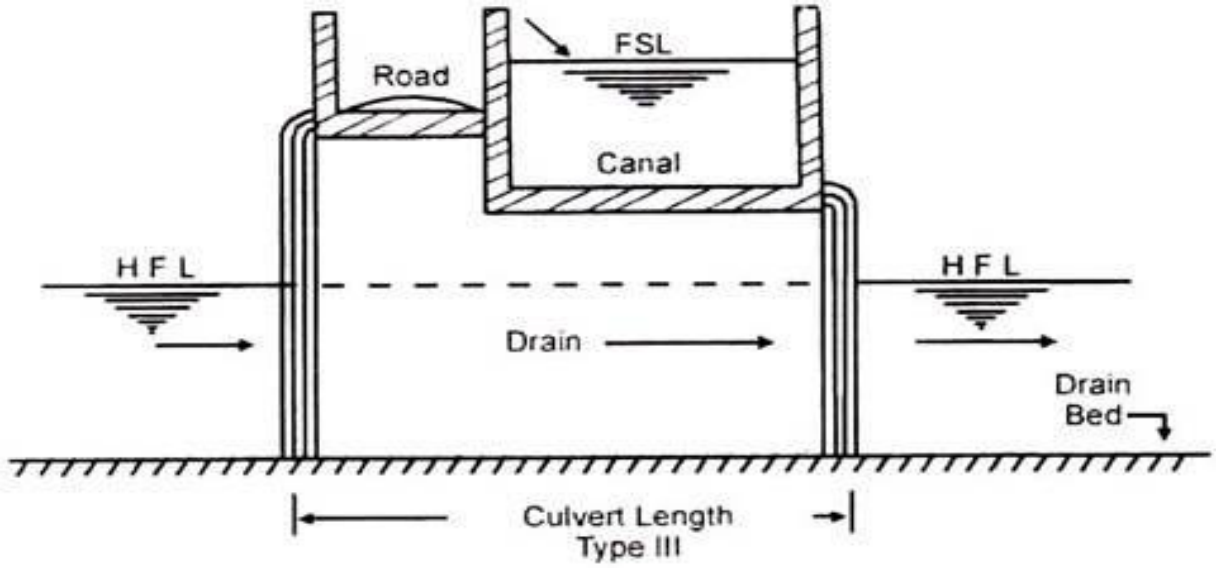


Fig. 25.3. *Aqueduct.*