

Syllabus

- **Cross Drainage Works:** Types- selection of suitable type of CD works- aqueduct and Syphon
- **Aqueduct-** determination of maximum flood discharge and waterway for drain, fluming of canal- uplift pressure on underside of barrel roof and at the floor of the culvert- design of bank connections

What is Cross Drainage Works?

- In an Irrigation project, when the network of main canals, branch canals, distributaries, etc. are provided, then these canals may have to cross the natural drainages like rivers, streams, nallahs, etc. at different points within the command area of the project. The crossing of the canals with such obstacle cannot be avoided. So, suitable structures must be constructed at the crossing point for the easy flow of water of the canal and drainage in the respective directions. These structures are known as cross-drainage works.

Cross Drainage Works

- Irrigational Canals while carrying water from headworks to crop field, have to cross few natural drainage streams, nallaha, etc.. To cross those drainages safely by the canals, some suitable structures are required to construct. Works required to construct, to cross the drainage are called Cross Drainage Works (CDWs). At the meeting point of canals and drainages, bed levels may not be same. Depending on their bed levels, different structures are constructed and accordingly they are designated by different names.

Necessity of Cross Drainage Works

- The water-shed canals do not cross natural drainages. But in actual orientation of the canal network, this ideal condition may not be available and the obstacles like natural drainages may be present across the canal. So, the cross drainage works must be provided for running the irrigation system.
- At the crossing point, the water of the canal and the drainage get intermixed. So, for the smooth running of the canal with its design discharge the cross drainage works are required.
- The site condition of the crossing point may be such that without any suitable structure, the water of the canal and drainage can not be diverted to their natural directions. So, the cross drainage works must be provided to maintain their natural direction of flow.

Types of Cross Drainage Works

- **Type I (Irrigation canal passes over the drainage)**
 - (a) Aqueduct
 - (b) Siphon Aqueduct

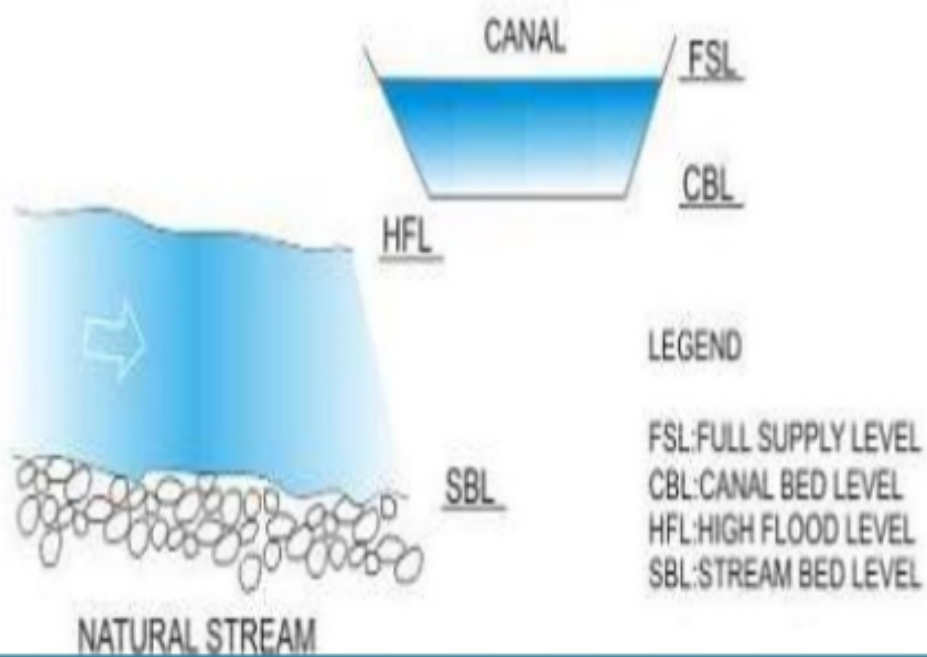
- **Type II (Drainage passes over the irrigation canal)**
 - (a) Super passage
 - (b) Siphon super passage

- **Type III (Drainage and canal intersection each other of the same level)**
 - (a) Level crossing
 - (b) Inlet and outlet

Types of Cross Drainage Works

- **Type-I Irrigation canal Passes over the Drainage.** This condition involves the construction of following:
 - **Aqueduct**
 - The hydraulic structure in which the irrigation canal is taken over the drainage (such as river, stream etc..) is known as aqueduct. This structure is suitable when bed level of canal is above the highest flood level of drainage. In this case, the drainage water passes clearly below the canal.

Aqueduct



Aqueduct

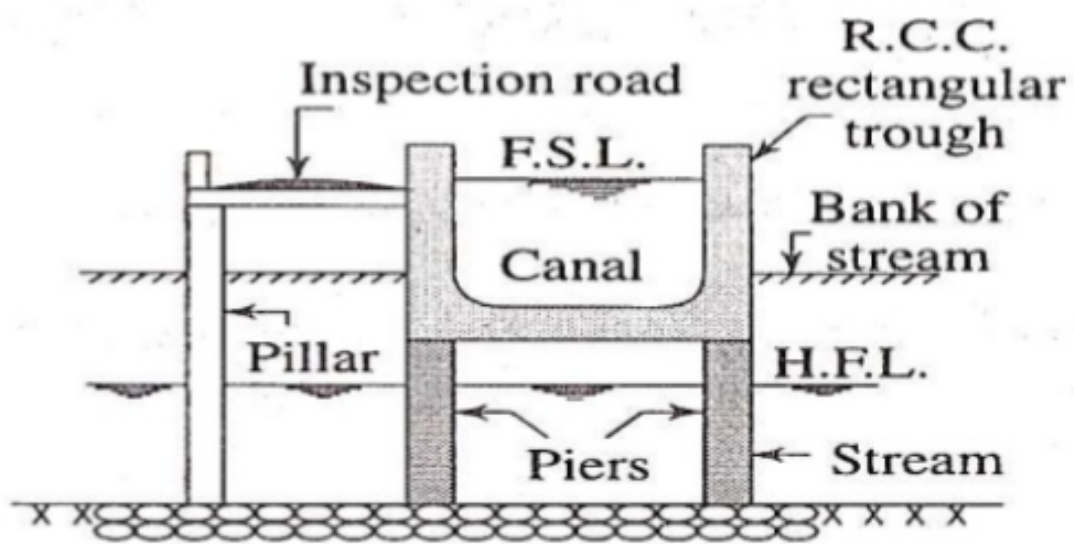


Fig: Aqueduct

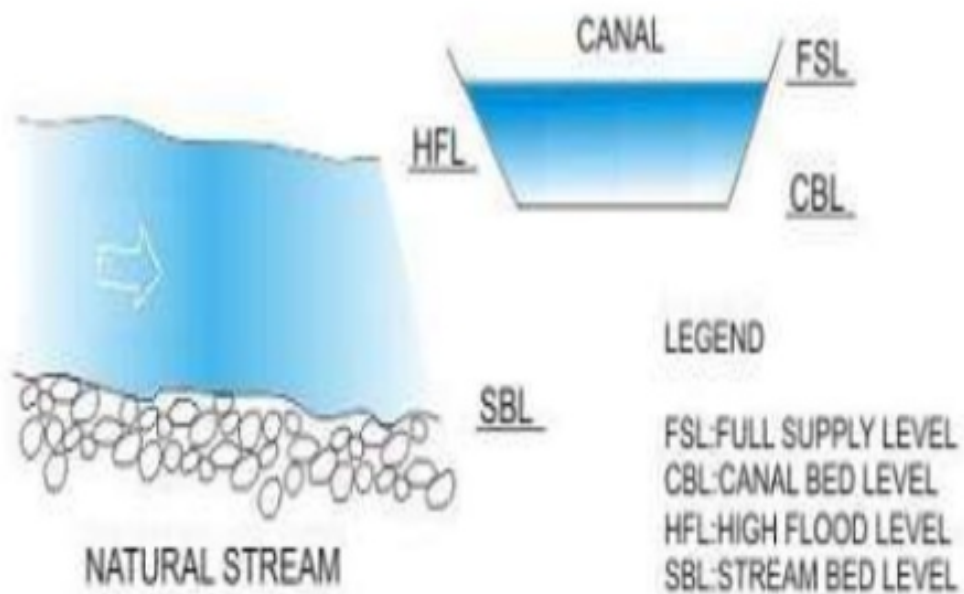
Aqueduct



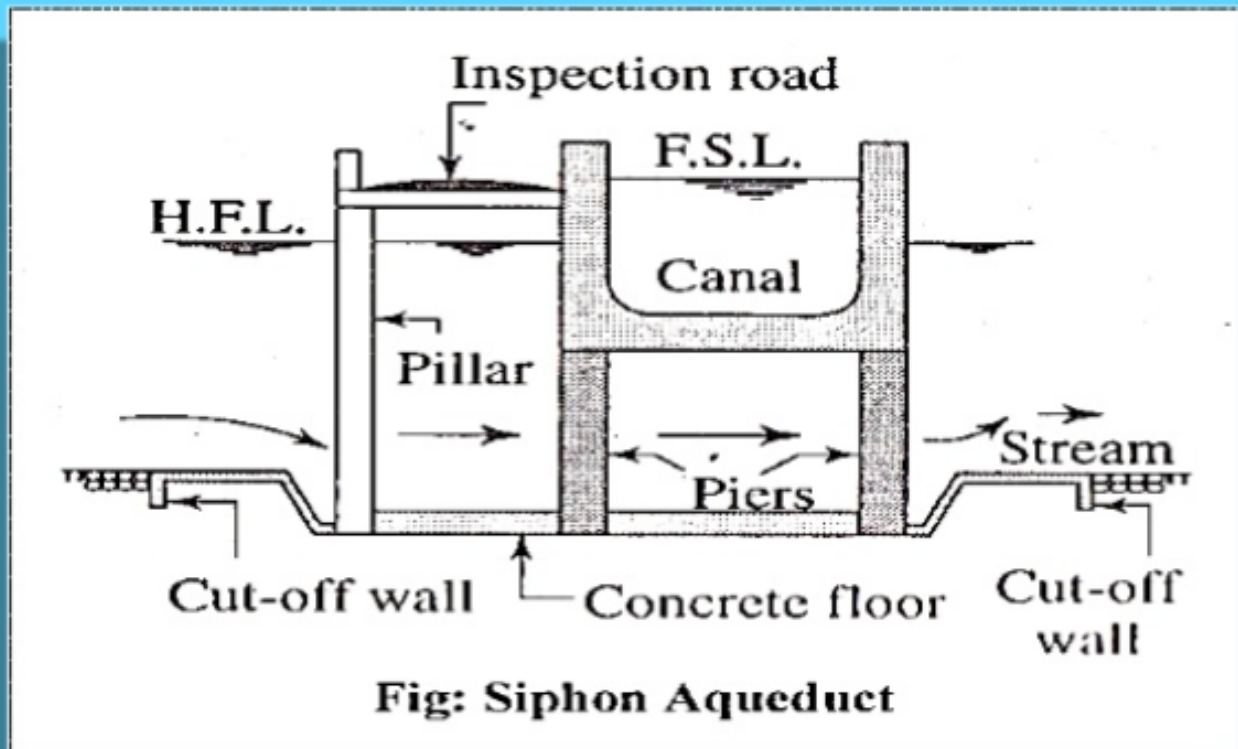
Siphon Aqueduct

- 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.

Siphon Aqueduct



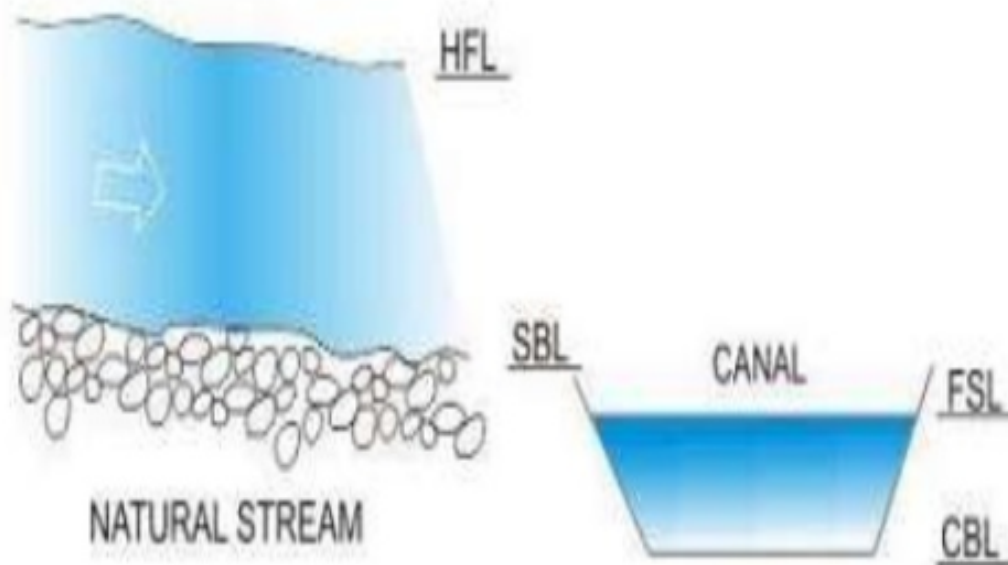
Siphon Aqueduct



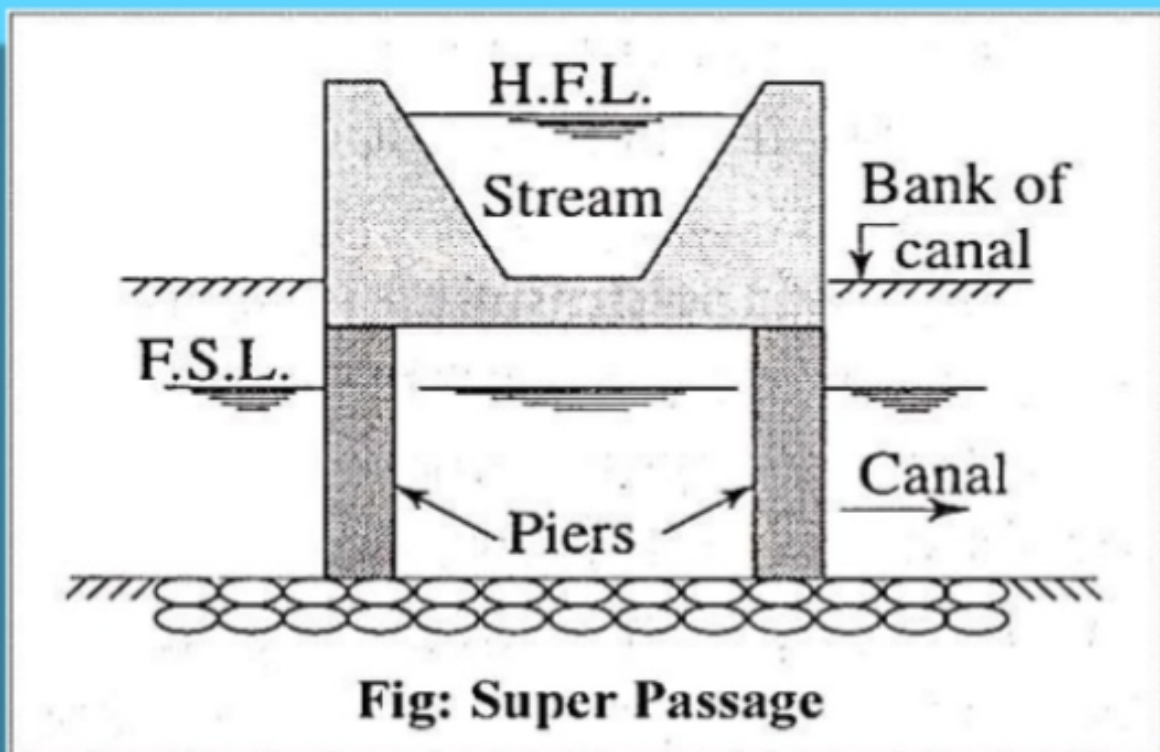
Types of Cross Drainage Works

- **Type-II Drainage Passes Over the irrigation Canal.**
- **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.

Super Passage



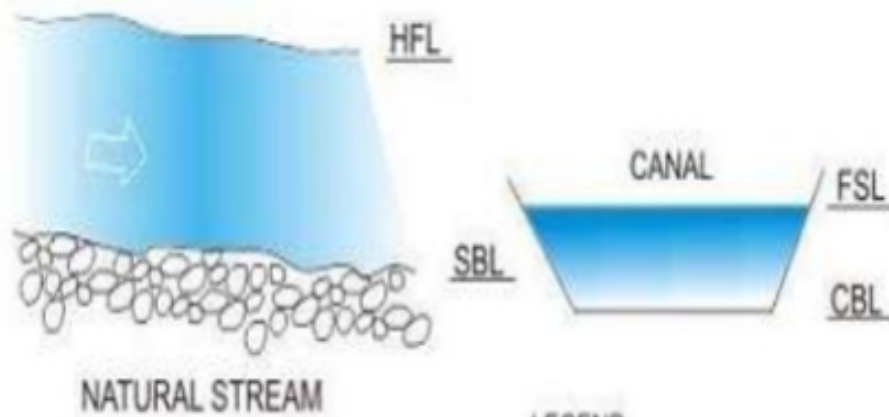
Super Passage



Siphon Super Passage

- The hydraulic structure in which the drainage is taken over the irrigation canal, but the canal water passes below the drainage under siphonic action is known as siphon super passage. This structure is suitable when the bed level of drainage is below the full supply level of the canal.

Siphon Super Passage



LEGEND

FSL: FULL SUPPLY LEVEL
CBL: CANAL BED LEVEL
HFL: HIGH FLOOD LEVEL
SBL: STREAM BED LEVEL

Siphon Super Passage

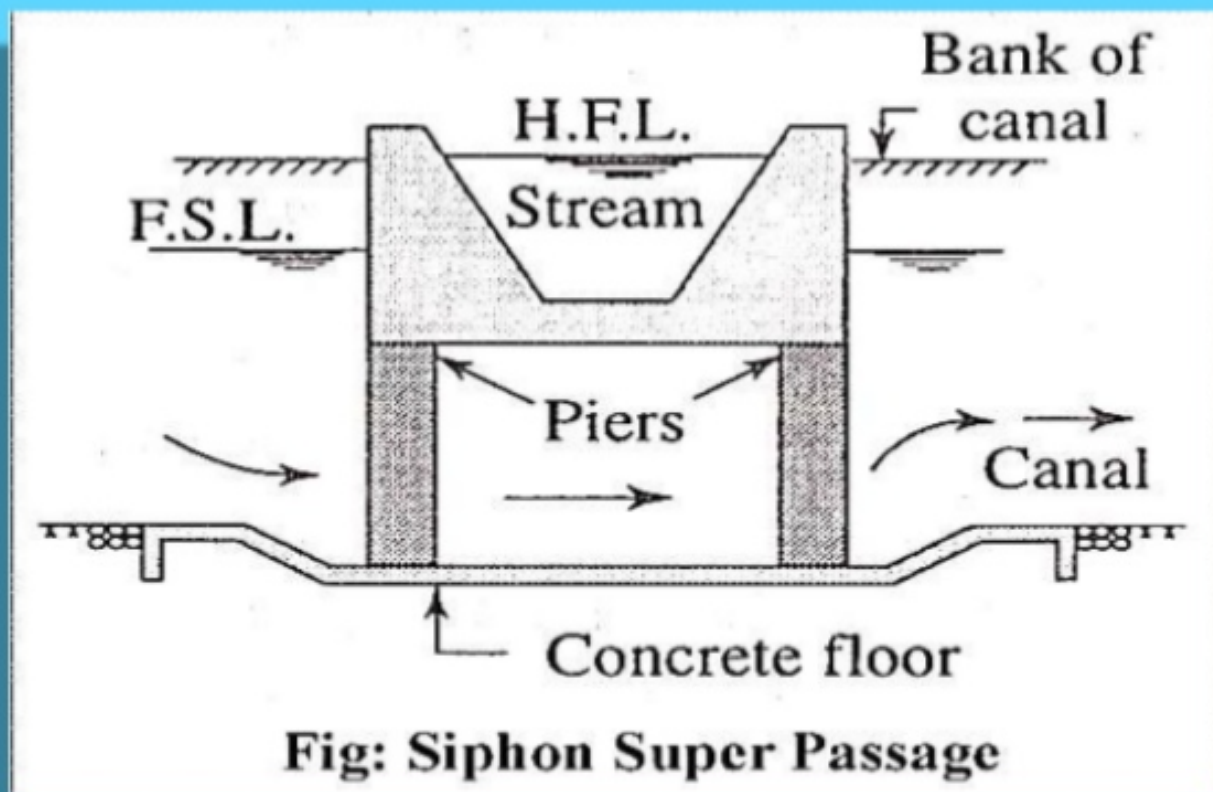
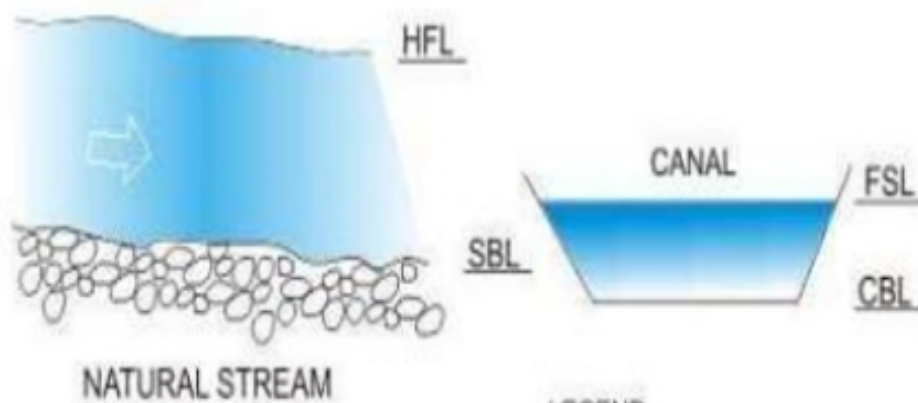


Fig: Siphon Super Passage

Types of Cross Drainage Works

- **Type III Drainage and Canal Intersect each other at the same level.**
- **Level Crossings**
- 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 Crossings



NATURAL STREAM

LEGEND

FSL: FULL SUPPLY LEVEL
CBL: CANAL BED LEVEL
HFL: HIGH FLOOD LEVEL
SBL: STREAM BED LEVEL

Level Crossing

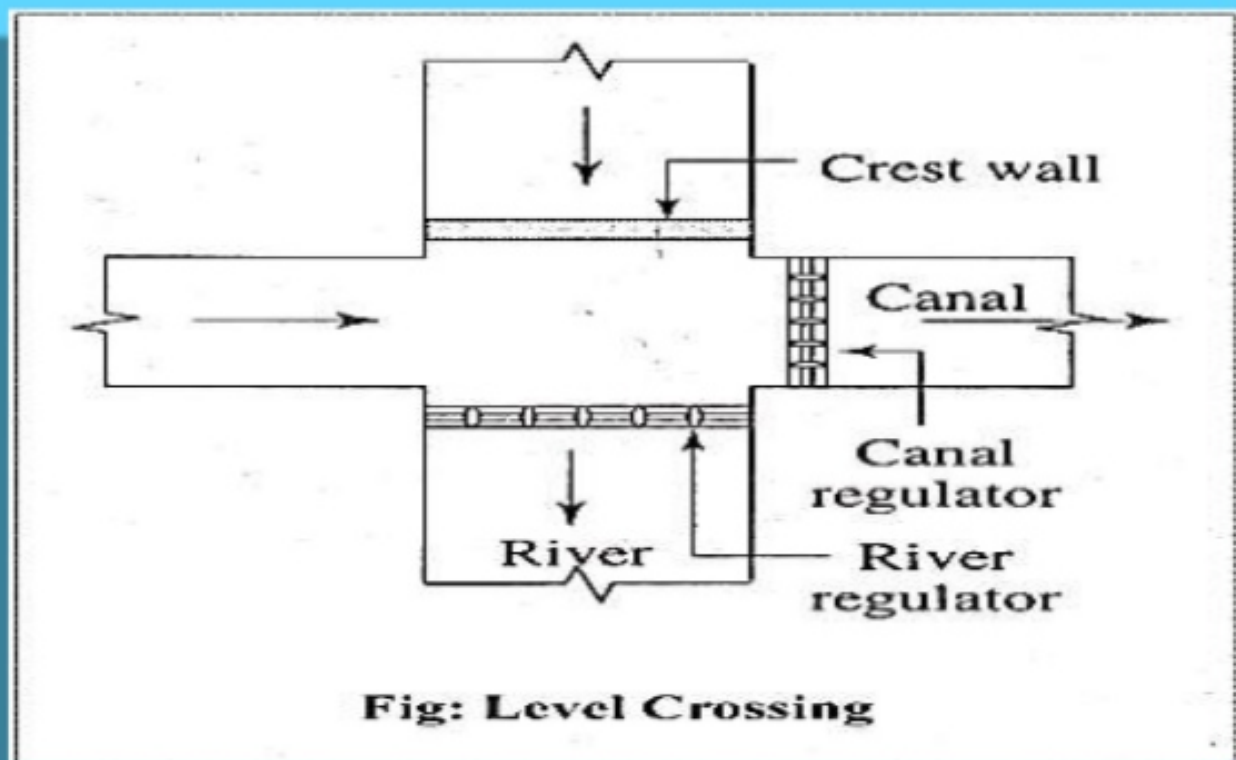


Fig: Level Crossing

Types of Cross Drainage Works

- **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.

Inlet and Outlet

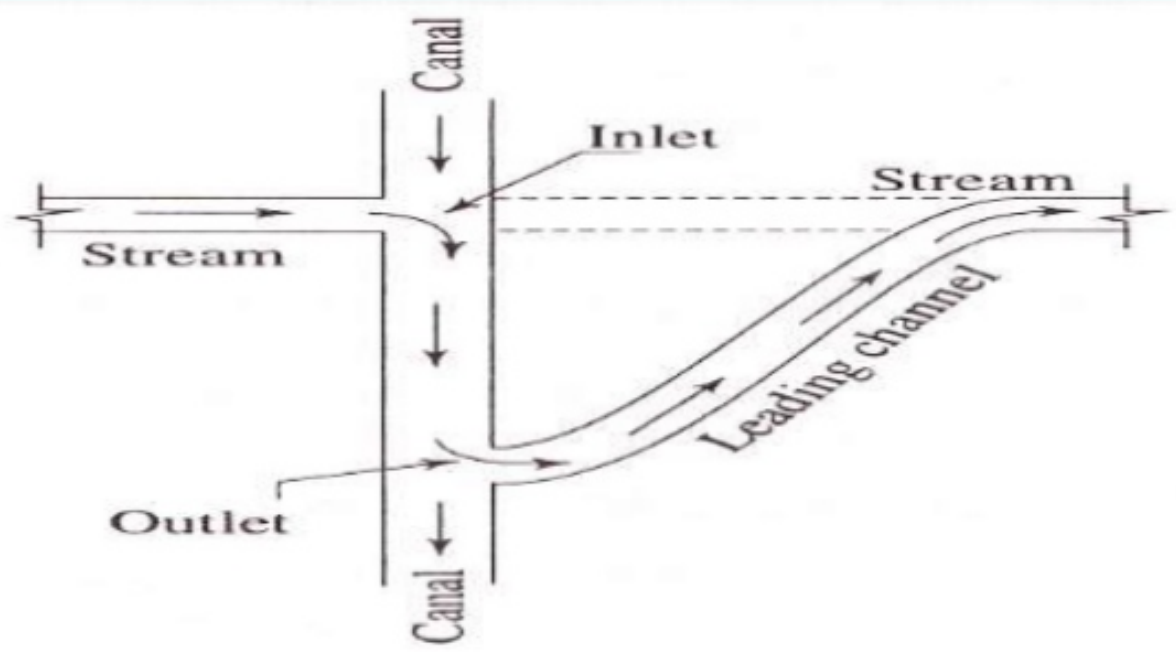


Fig: Inlet and outlet