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3. Explain in detail with the help of neat sketches the various 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

Selection of Type of Cross Drainage Works

- Relative bed levels
- Availability of suitable foundation
- Economical consideration

- Discharge of the drainage
- Construction problems

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.

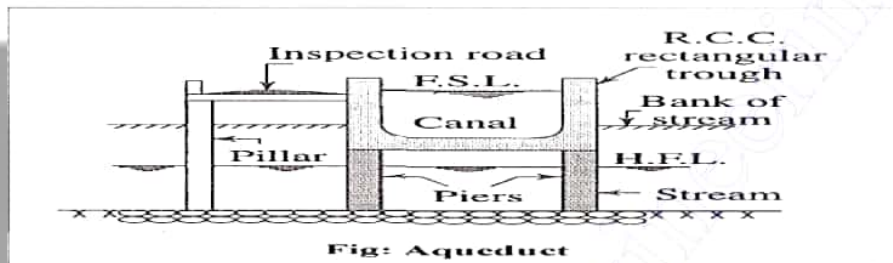


Fig: Aqueduct

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.

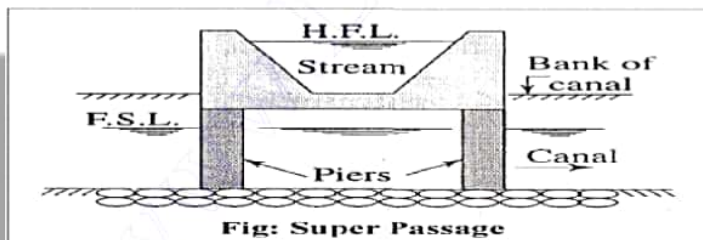


Fig: Super Passage

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.

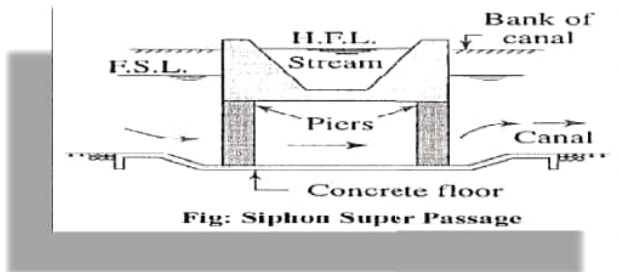


Fig: Siphon Super Passage

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.

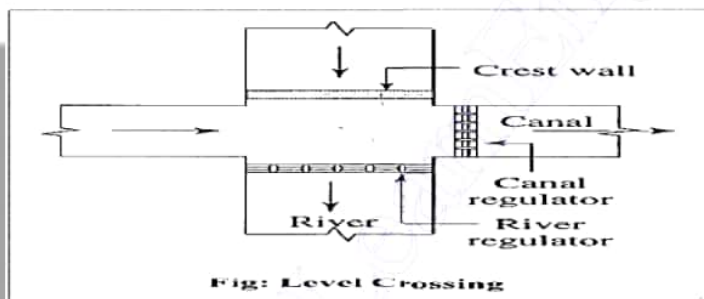
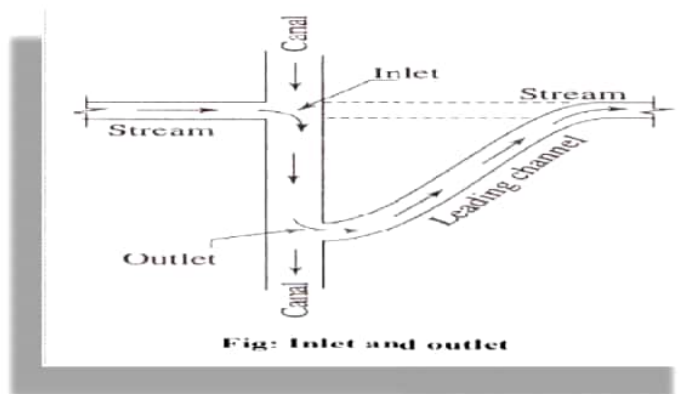


Fig: Level Crossing

Inlet and Outlet

When irrigation canal meets a small stream or drain at same level, drain is allowed to enter the canal as 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.



4. State how dams are classified and list the various types of dams.

Dams can be classified in number of ways. But most usual ways of classification of dams are mentioned below:

Based on the functions of dam, it can be classified as follows:

Storage dams: They are constructed to store water during the rainy season when there is a large flow in the river. Many small dams impound the spring runoff for later use in dry summers.

Storage dams may also provide a water supply, or improved habitat for fish and wildlife. They may store water for hydroelectric power generation, irrigation or for a flood control project.

Storage dams are the most common type of dams and in general the dam means a storage dam unless qualified otherwise.

Diversion dams: A diversion dam is constructed for the purpose of diverting water of the river into an off-taking canal (or a conduit). They provide sufficient pressure for pushing water into ditches, canals, or other conveyance systems. Such shorter dams are used for irrigation, and for diversion from a stream to a distant storage reservoir. A diversion dam is usually of low height and has a small storage reservoir on its upstream. The diversion dam is a sort of storage weir which also diverts water and has a small storage. Sometimes, the terms weirs and diversion dams are used synonymously.

Detention dams: Detention dams are constructed for flood control. A detention dam retards the flow in the river on its downstream during floods by storing some flood water. Thus the effect of sudden floods is reduced to some extent. The water retained in the reservoir is later released gradually at a controlled rate according to the carrying capacity of the channel