

I. DIVERSION HEADWORK.

• Any hydraulic structure, which supplies water to the off-taking canal, is called a headwork.

• A diversion headwork serves to divert the required supply in to the canal from the river.

1.1 The purposes of diversion headwork.

1. It raises the water level in the river so that the commanded area can be increased.
2. It regulates the intake of water in to the canal.
3. It controls the silt entry in to the canal.
4. It reduces fluctuations in the level of supply in the river.
5. It stores water for tiding over small periods of short supplies.

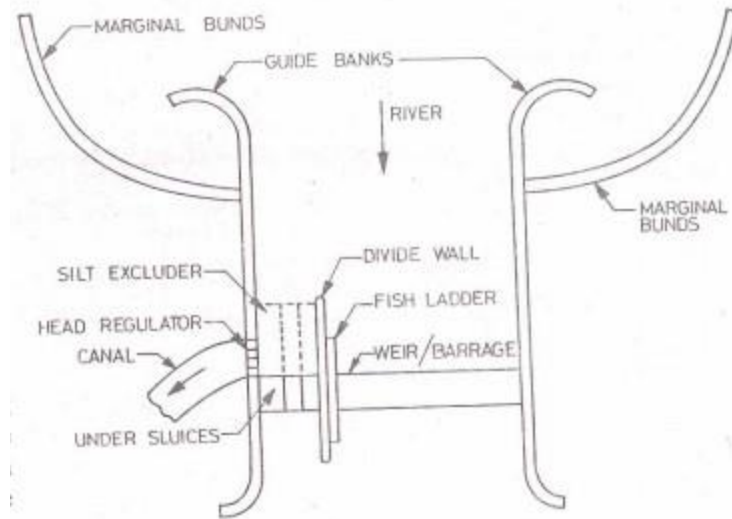
1.2 Weir

The weir is a solid obstruction put across the river to raise its water level and divert the water in to the canal. If a weir also stores water for tiding over small periods of short supplies, it is called a storage weir.

1.3 The component parts of diversion headwork

A diversion headwork consist of the following component parts

1. Weir or barrage
2. Undersluices
3. Divide wall
4. Fish ladder
5. Canal head regulator
6. pocket or approach channel
7. Silt excluders/ Silt prevention devices/
8. River training works (Marginal bunds and guide banks)

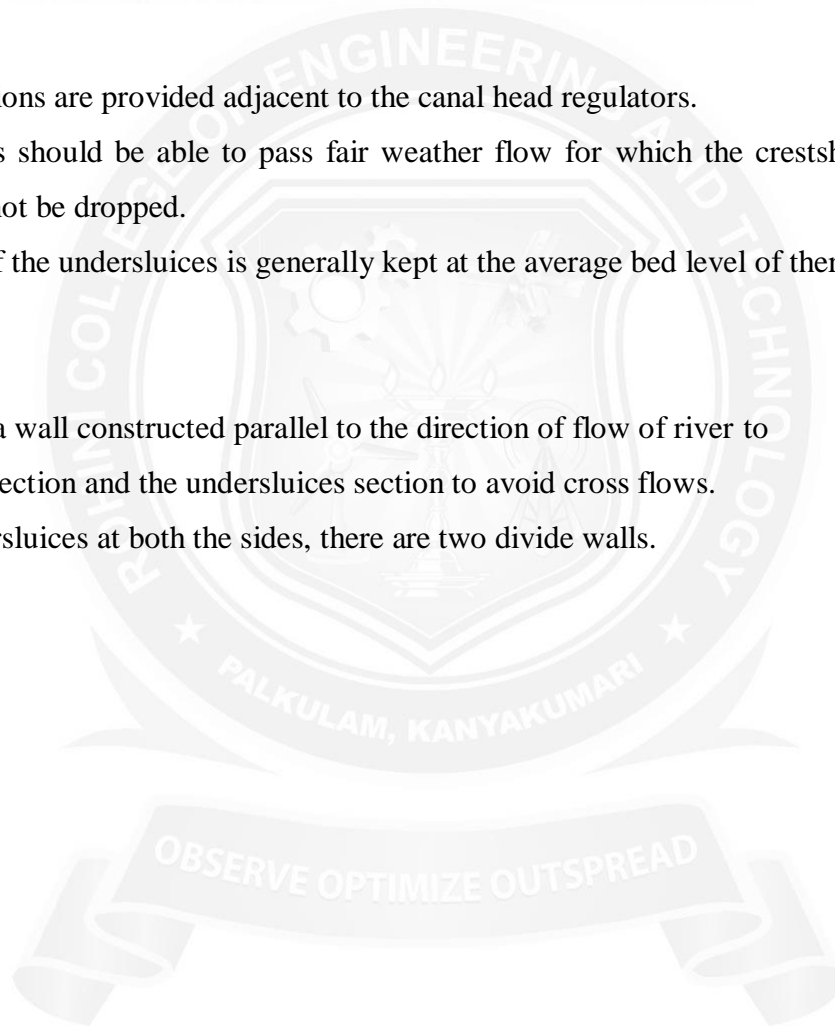


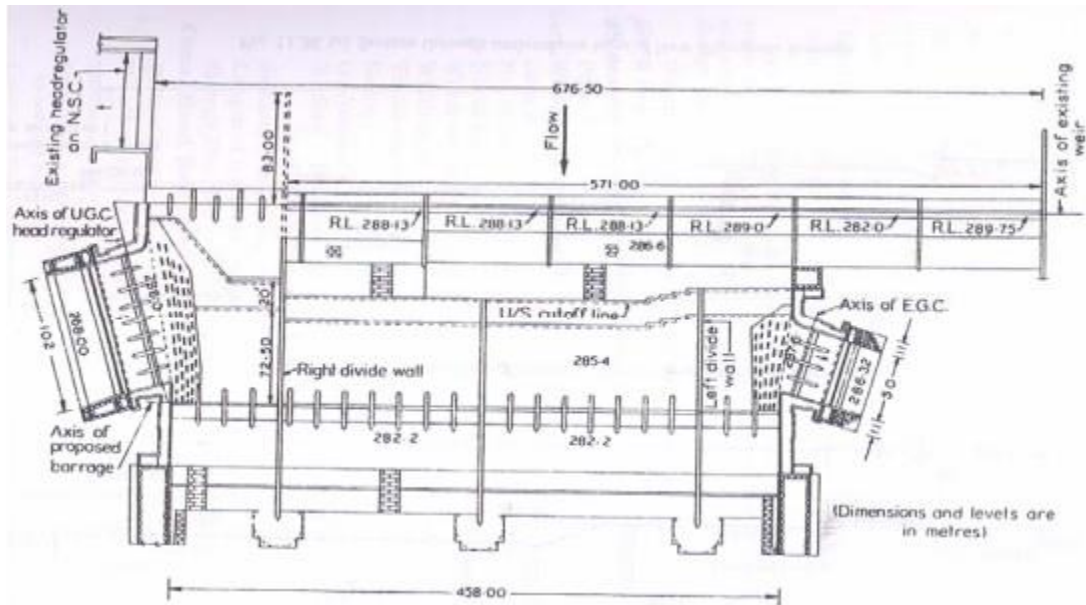
1.4 Undersluices

- Undersluice sections are provided adjacent to the canal head regulators.
- The undersluices should be able to pass fair weather flow for which the crestshutters on the weir proper need not be dropped.
- The crest level of the undersluices is generally kept at the average bed level of the river.

1.5 Divide Wall

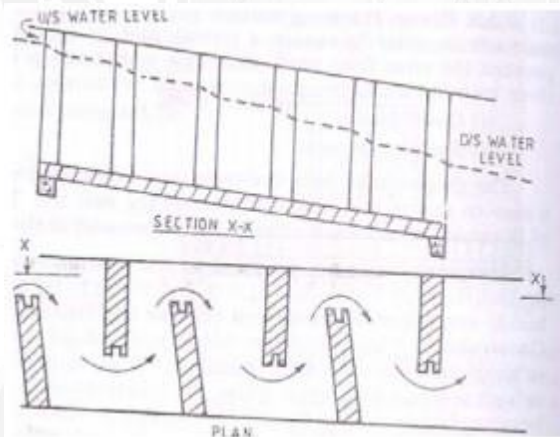
- A divide wall is a wall constructed parallel to the direction of flow of river to separate the weir section and the undersluices section to avoid cross flows.
- If there are undersluices at both the sides, there are two divide walls.





1.6 Fish Ladder

- A fish ladder is a passage provided adjacent to the divide wall on the weir side for the fish to travel from the upstream to the downstream and vice versa.
- Fish migrate upstream or downstream of the river in search of food or to reach them sprawling places.
- In a fish ladder the head is gradually dissipated so as to provide smooth flow at sufficiently low velocity.
- Suitable baffles are provided in the fish passage to reduce the flow velocity



1.7 Canal Head Regulator

- A canal head regulator is provided at the head of the canal off-taking from the diversion headworks.

- It regulates the supply of water into the canal, controls the entry silt into the canal, and prevents the entry of river floods into canal.

1.8 Silt Excluder

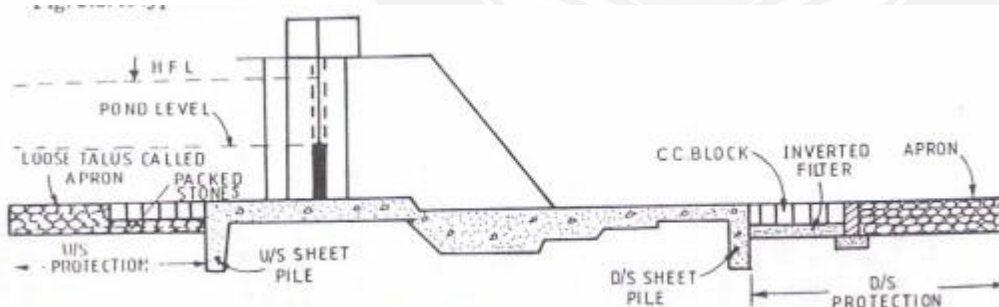
- A silt excluder is a structure in the undersluices pocket to pass the silt laden water to the downstream so that only clear water enters into the canal through head regulator.
- The bottom layer of water which are highly charged with silt pass down the silt excluder an escape through the undersluices.

1.9 Guide Banks and Marginal Bunds

- Guide banks are provided on either side of the diversion headworks for a smooth approach and to prevent the river from outflanking.
- Marginal bunds are provided on either side of the river upstream of diversion headworks to protect the land and property which is likely to be submerged during ponding of water in floods.

1.10 Weir or Barrage

- A diversion head works is a structure constructed across a river for the purpose of raising water level in the river so that it can be diverted into the offtaking canals.
- A weir is a raised concrete crest wall constructed across the river.
- It may be provided with small shutters (gates) on its top. In the case of weir, most of the raising of water level or ponding is done by the solid weir wall and little with by the shutters.



A weir maintains a constant pond level on its upstream side so that the water can flow

- A barrage has a low crest wall with high gates. As the height of the crest above the river bed is low most of the ponding is done by gates. During the floods the gates are opened so afflux is very small.

- A weir maintains a constant pond level on its upstream side so that the water can flow into the canals with the full supply level (F.S.L.). If the difference between the pond level and the crest level is less than 1.5 m or so, a weir is usually constructed.
- On the other hand, if this difference is greater than 1.50 m, a gate-controlled barrage is generally more suitable than a weir. In the case of a weir, the crest shutters are dropped during floods so that the water can pass over the crest.
- During the dry period, these shutters are raised to store water up to the pond level. Generally, the shutters are operated manually, and there is no mechanical arrangement for raising or dropping the shutters.
- On the other hand, in the case of a barrage, the control of pondage and flood discharge is achieved with the help of gates which are mechanically operated

ADVANTAGES AND DISADVANTAGES OF WEIRS AND BARRAGES

1. Weirs Advantages: The initial cost of weirs is usually low.

Disadvantages:

- i. There is a large afflux during floods which causes large submergence.
- ii. Because the crest is at high level, there is great silting problem
- iii. The raising and lowering of shutters on the crest is not convenient. Moreover, it requires considerable time and labour.
- iv. The weir lacks an effective control on the river during floods.

1.11 Barrages Advantages

- i. The barrage has a good control on the river during floods. The outflow can be easily regulated by gates.
- ii. The afflux during floods is small and, therefore, the submerged area is less.
- iii. There is a good control over silt entry into the canal.
- iv. There is a good control over flow conditions, shoal formations and crosscurrents on the upstream of the barrage.
- v. There are better facilities for inspection and repair of various structures.
- vi. A roadway can be conveniently provided over the structure at a little additional cost.

1.12 Disadvantages:

The initial cost of the barrage is quite high.

Conclusion: A barrage is generally better than a weir. Most of the diversion headworks these days

usually consist of barrages.

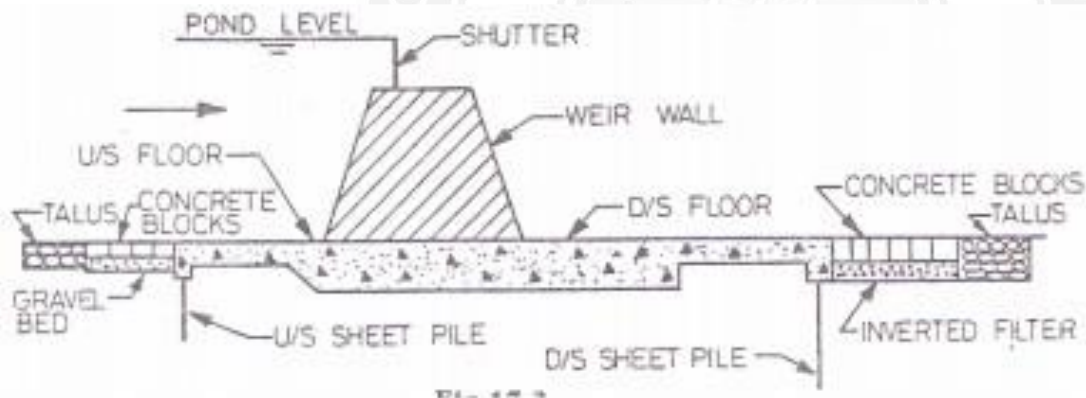
II TYPES OF WEIRS

The weirs may be broadly divided into the following types

1. Vertical drop weirs.
2. Rockfill weirs.
3. Concrete glacis or sloping weirs.

2.1. Vertical drop weirs

- A vertical drop weir consists of a masonry wall with a vertical (or nearly vertical) downstream face and a horizontal concrete floor.
- The shutters are provided at the crest, which are dropped during floods so as to reduce afflux. The water is ponded upto the top of the shutters during the rest of the period.
- Vertical drop weirs were quite common in early diversion headworks, but these are now becoming more or less obsolete.
- The vertical drop weir is suitable for hard clay foundation as well as consolidated gravel foundations, and where the drop is small.
- The upstream and downstream cutoffwalls (or piles) are provided upto the scour depth. The weir floor is designed as a gravity section.

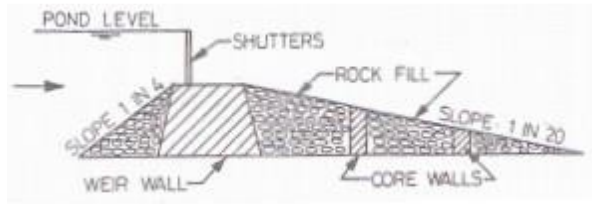


2. 2 Rockfill weirs:

- In a rockfill type weir, in addition to the main weir wall, there are a number of core walls. The space between the core walls is filled with the fragments of rock (called rockfill).
- A rockfill weir requires a lot of rock fragments and is economical only when a huge quantity

rockfill is easily available near the weir site.

- It is suitable for fine sand foundation. The old Okhla Weir across the Yamuna river is a rockfill weir.
- Such weirs are also more or less obsolete these days.

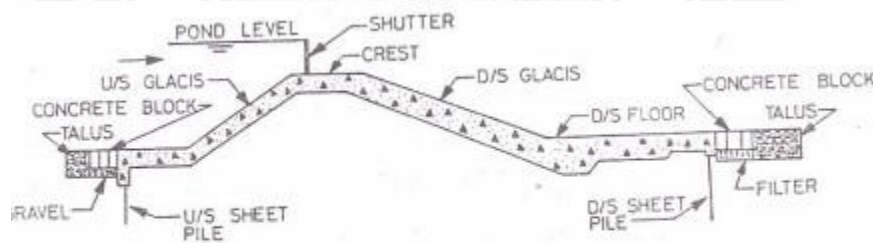


2.3. Concrete sloping weir :

- Concrete sloping weirs (or glacis weirs) are of relatively recent origin.
- The crest has glacis (sloping floors) on upstream as well as downstream.
- There are sheet piles (or cut off walls) driven upto the maximum scour depth at the upstream and downstream ends of the concrete floor.
- Sometimes an intermediate pile is also driven at the beginning of the upstream glacis or at the end of downstream glacis.

The main advantage of a sloping weir over the vertical drop weir is that a hydraulic jump is formed on the d/s glacis for the dissipation of energy.

- Therefore, the sloping weir is quite suitable for large drops.



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