

CANAL SECTION

CH-05

Terms relating to canal section -: The canal section may be in fully cutting or fully banking or partial cutting and partial banking according to the natural ground surface and the permissible bed slope of the canal. But there are several terms in the canal section with which a civil engineer should be acquainted to design the section and to execute the work.

→ The following are the different terms related to the canal section.

1. canal bank
2. Berm
3. Counter Berm
4. Hydraulic gradient
5. Free board
6. Side slop
7. Service road or inspection road
8. Dowel or Dowla
9. Borroopik
10. Spole bank
11. Land width

(1) CANAL BANK -: The canal bank is necessary to retain water in the canal to the full supply level. But the section of the canal bank is different for different site conditions. The following are the different forms for different site conditions.

(a) When the canal fully in cutting -!

In this case the bank are constructed on both sides of the canal to provide only an inspection road. Here the hydraulic gradient has no function. So the height of the bank will be low and the top width will be minimum just to provide the road. The side slope will be $1\frac{1}{2} : 1$ or $2 : 1$ according to the nature of the soil.

(b) When the canal is partial cutting & Banking

In this case the bank are constructed on sides of the canal to retain water. The height of the bank depends on the full supply level of the canal. Again the section of the canal depends on the hydraulic gradient. The top width and the side slope of the bank should be such that the hydraulic gradient should have a minimum cover of 0.5M.

(c) When the canal is full banking -:

In this canal, the canal and both the canal banks are constructed above the ground level. The height of the bank will be high and its section will be large due to the hydraulic gradient. But to minimise the cross-section of the bank a core wall of puddle clay is provided which deflects the hydraulic gradient downward.

2. BERM -: This distance between the toe of the bank and the top edge of cutting is termed as berm. The berm is provided for the following reasons.

- (a) To protect the bank from erosion.
- (b) To provide a space for widening the canal section in future if necessary.
- (c) To protect the bank from sliding down towards the canal section.
- (d) The side deposition on the berm makes an impervious lining.
- (e) If necessary borrow pit can be excavated on the berm.

4. COUNTER BERM - : When the water is retained by a canal bank the hydraulic gradient line passes through the body of the bank. For stability of the bank this gradient should not intersect the outer side of the bank. It should pass through the base and a minimum cover of 0.5M should always be maintained. Some times it may occur that the hydraulic gradient line intersects the outer side of the bank. In that case a projection is provided on the bank to obtain minimum cover. This projection is known as counter berm. The width of this berm depends on the site conditions.

5. FREE BOARD - : It is the distance between the full supply level and top of the bank. The amount of free board varies from 0.6M to 0.75M.

It is provided for the reason

(a) To keep a sufficient margin so that the canal water does not overtop the bank in case of heavy rainfall or fluctuation in water supply.

(b) To keep the saturation gradient much below the top of the bank.

6. SIDE SLOPE - : The side slope of the canal bank and canal section depend on the angle of repose of the soil existing on the site. So to determine the side slopes of different sections, the soil sample should be collected from the site and should be tested in the section testing laboratory. The necessity of such test is that if the permissible slope (to maintain angle of repose) is not provided in an embankment or cutting, then the soil in that place will go on sliding gradient until the angle of repose for that particular soil is attained.

For instance, suppose an embankment was constructed with side slope 1:1 but according to the nature of the soil, the side slope should be $1\frac{1}{2} : 1$. Then the initial shape ABCD will automatically take the final shape A_1, B_1, C_1, D_1 after slope in the due course.

Again, an opposite incident may occur. Suppose an embankment was constructed with side slope 2:1, but later it was found that the side slope of 1:1 was sufficient to maintain the angle of repose for that soil. In this case earthwork was done.

The permissible side slopes for some soil are given in the following table -:

Types of soil	side slope in cutting	side slope in banking
clayey soil	1:1	$1\frac{1}{2}:1$
Alluvial soil	1:1	2:1
Sandy loam	$1\frac{1}{2}:1$	2:1
sandy soil	2:1	3:1

7. SERVICE ROAD -: The roadway which is provided on the top of the canal bank for inspection and maintenance work is known as service road or inspection road. For main canal the service road are provided on the both the bank but for bench canals, the road is provided on one bank only. The width of service road for main canal varies from 4 to 6M.

The spoil bank run parallel to the main bank but are not continuous. Sufficient spaces are left between the adjacent spoil bank for proper drainage.

10. BORROWPIT :- When the canal is constructed in partial cutting and partial banking, the excavated earth may not be sufficient for forming the required bank. In such a case the extra earth required for the construction of bank is taken from some pits which known as borrowpits. The borrowpit may be inside or outside the canal.