Canal Irrigation System

General:

A direct irrigation scheme which makes use of a weir or a barrage as well as a storage irrigation scheme which makes use of a storage dam or a storage reservoir, require necessary network of canals, as explained earlier. The entire system of main canals, branch canals, distributaries and minors is to be designed properly for a certain realistic value of peak discharge that must pass through them so as to provide sufficient irrigation to command areas. These canals have to aligned and excavated either alluvial soils or non alluvial soils; depending upon which they are called alluvial canals or non alluvial canals.

**Open channels:** an open channel is which water flows with free surface.

Classified to its origin at:

1-Natural channel.

2-artificial channel.

An engineering practice the artificial open channel is given different names:- canal, flume, chute, drops, culvert, open flow tunnel.

*classified in the following ways based on the function.*

1- **irrigation canal:** carrier water to the agricultural field.

2- **carrier canal:** besides doing irrigation it carrier water for a nether canal.

3- **feeder canal:** constructed with idea of feeding two or more canals.

4- **navigation canal**

5- **power canal**
Classification based on discharge and its relative importance irrigation net work canals:

1- **main canal (M.C):** Carrier water direct irrigation from the source. Its not used for direct irrigation but carry water only.

   *Some time there are two main canals which take from the reservoir, called left bank M.C and right bank M.C depend on the topography of catchments.*

**A- Main canal (head reach):** The canal head works generally situated in a valley in a short distance. In this reach must be aligned very carefully and has to be excavated in a deep cutting below (natural surface level).

**B- Main canal (portion below head reach):** Attempts are made to aligned the canal along the watershed and somewhat a central to commanded area. Sometimes watershed has to be sacrificed by pass towns and villages, etc.

2- **Branch canals (B.C):** The canals branches from M.C, feeder the distributaries canal. It s also don’t carry out any direct irrigation.

   (when a main canal leaves the high ground and must therefore, bifurcate into branches, covering the whole area required to be irrigated).

3- **distributary canals (D.C):** Smaller channels, which take off from the branch canals and distribute their supply through outlets into water courses are called distributaries.

4- **water courses (W.C):** The canals which feeds the water to the farm units.
5- farm channel (F.C): the channels which distribute water on the farm.

Curves in channels:

Attempt are made to align the channels straight as possible whenever a curve is proposed while aligning unlined channel it should be gentle as possible. A curve causes distribution of flow and results in silting on inside (i.e convex side) and scouring on the outside (i.e concave side).

Pitching is proposed on the concave side so as to avoid scouring. If the discharge is more, the curve should more gentle and should have more radius.

The min value of radius for different discharge are tabulated below:

<table>
<thead>
<tr>
<th>Discharge in (cumec)</th>
<th>Min. radius of curve (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 100</td>
<td>1500</td>
</tr>
<tr>
<td>30-100</td>
<td>900</td>
</tr>
<tr>
<td>15-30</td>
<td>600</td>
</tr>
<tr>
<td>3-15</td>
<td>300</td>
</tr>
<tr>
<td>0.5-3</td>
<td>150</td>
</tr>
<tr>
<td>&lt; 0.5</td>
<td>100</td>
</tr>
</tbody>
</table>

Certain important definition:
1- **Gross commanded area** (G.C.A): it’s the total area which can be economically irrigated without considering the limitation of the quantity of available water it include the cultivable as well as the non-cultivable area.

2- **Culturable commanded area** (C.C.A): cultivable area is the total area on which cultivation is possible. all of the cultivable area may not necessary be under cultivation at a time. pastures and fallow lands, which can be made cultivable are included in this area, but populated areas like ponds, reserved

3- **Intensity of irrigation** (I.I); the entire cultivable commanded area is not proposed to be brought under irrigation at the same time. This is because of two reasons. One reason is that the quantity of water is limited and therefore, extensive irrigation is preferred to intensive irrigation so as to ensure socialistic distribution of water. Another reason is that intensive irrigation (i.e. irrigating all the field of the same area at the same time causes over-irrigation and water logging; which reduces the crop yield.

Due to these reason only a certain percentage of the cultivable area is brought under irrigation annually.

4- **Area to be irrigated**: the area proposed to be irrigated at any one time is called the “area to be irrigated”. it is obtained by multiplying C.C.A by intensity of irrigation (I.I).

5- **Capacity factor**: it is the ratio of the mean supply discharge to the full capacity discharge.

   Area estimated to be irrigated during base period

6- **Full supply coe.** = ----------------------------------------------------------

   Design full supply discharge at its head during peack demand