DESIGN OF CANAL

DEFINITION

- An artificial channel filled with water and designed for navigation , or irrigating land, etc.
- An artificial water course or extensively modified natural channel used for inland water transport and/or the control and diversion of water for drainage or irrigation

TYPES OF CANAL

(BASED ON USE)

- There are two types of canals:
- Aqueduct: water supply canals that are used for the conveyance and delivery of portable for human consumption, municipal uses , and agriculture irrigation
- Water ways : navigable transportation canals used for carrying ships and boats shipping goods and conveying people.

TYPES OF CANALS

(BASED ON DISCHARGES)

- MAIN CANAL
- BRANCH CANAL
- MAJOR DISTRIBUTORY CANAL
- MINOR DISTRIBUTORY CANAL
- WATER COURSE OR FIELD CHANNEL

MAIN CANALS

- ✓ Main canal takes of directly from the upstream side of weir head works or dam.
- ✓ Usually no direct cultivation is proposed.

The Danube-Black Sea Canal in Romania

BRANCH CANAL

- ✓ All off takes from main canal with head discharge of 14-15 cumecs and above are termed as branch canals.

- ✓ Acts as feeder channel for major distributaries.

A BRANCH CANAL IN MADRAS

➢ MAJOR DISTRIDUTARY:

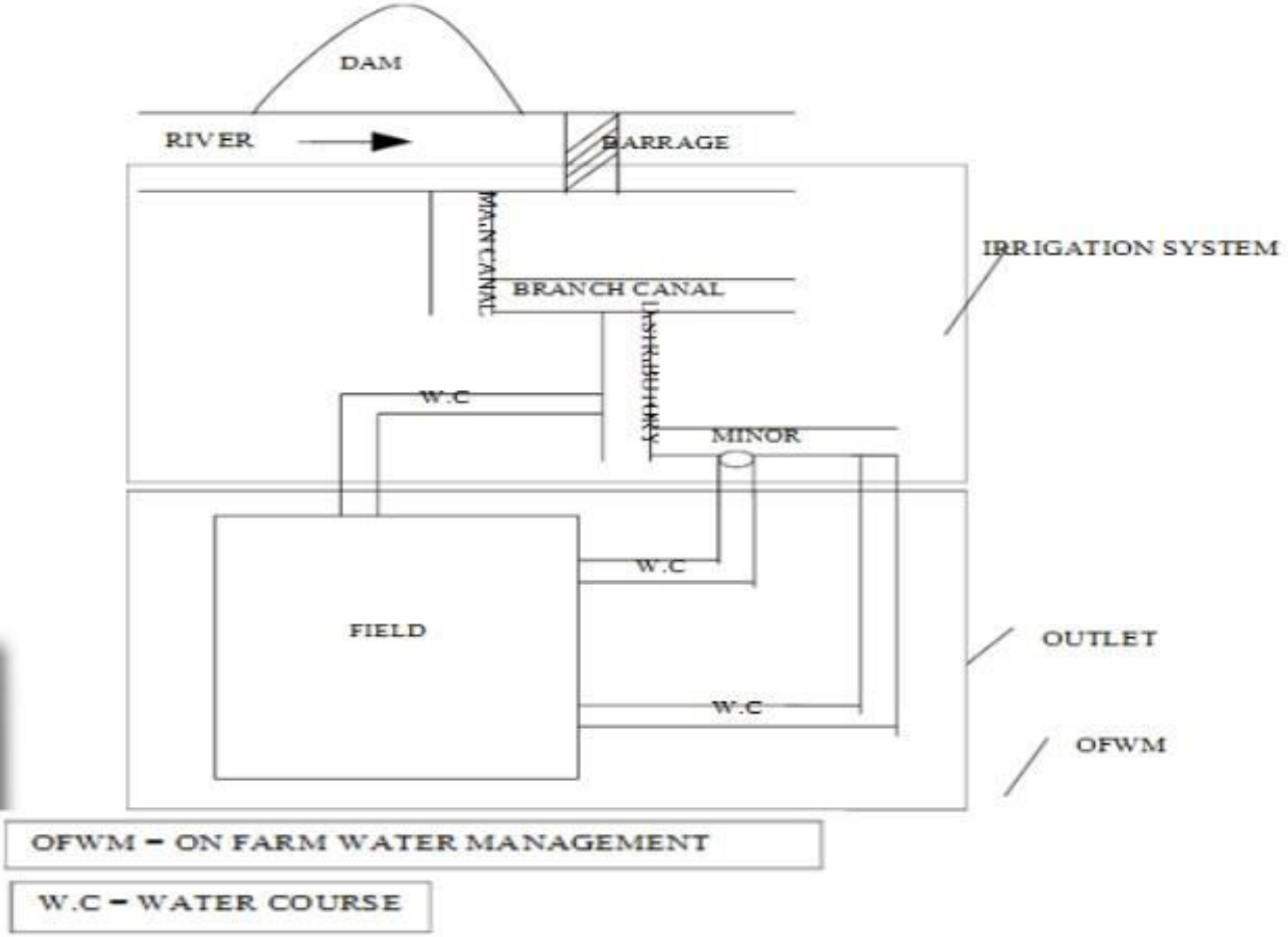
- ✓ All off takes from main canal or branch canal with head discharge from 0.028 to 15 cumecs are termed as major distributaries .

➢ MINOR DISTRIBUTARY:

- ✓ All off takes taking off from a measure distributary carrying discharge less than 0.25 cumec are termed as minor distributaries.

➢ WATER COURSE

- ✓ Small channels which carry water from the outlets of a major or minor distributary or a branch channel to the fields to be irrigated.



OFWM – ON FARM WATER MANAGEMENT

W.C – WATER COURSE

TYPES OF CANALS

(Based on lining being provided or not)

1.Lined canals

2.Unlined canals

SHAPES OF CANAL

1. CIRCULAR SHAPE
2. TRIANGULAR SHAPE
3. TRIPEZOIDAL SHAPE
4. PARABOLIC SHAPE
5. RECTANGULAR SHAPE

LINED CANAL

- A Lined canals is provided with a lining of imprevious material on its bed and banks to prevent the seepage of water.

A PICTURE OF A LINED CANAL

Types of canal lining

1. Concrete lining
2. Short crete lining
3. Brick or burnt clay tile lining
4. Boulder lining

Unlined canal

- An unlined canal is the one which as it bed and banks made of natural soil through which it is constructed and not provided with a lining of imprevious material.

Disadvantages of unlined canal

- Water velocities higher then 0.7m/sec or not tolerable because of erosion . The low operating velocities requires large cross-section area.
- High seepage and conveyance water losses result in water logging of adjacent land.
- Danger of canal bank breakage caused by overtopping , erosion and animal burrowing.
- Profuse growth of aquatic weeds retards the flow and causes heavy maintenances cost.

Canal side breakage due to animal burrowing

ILL-EFFECT OF WATER LOGGING

- Water seeping from canal down to the soil below may , head times , raise the ground water very close to the ground level .
- This may result in blocking all the voids in the soil and obstructing the plant roots to breathe.
- Normal cultivation operations , such as tilling , ploughing, etc. cannot be easily carried out in wet soils.

Irrigation canal layout

- As for a possible, curves should be avoided in the alignment of canals.
- The curves lead to disturbance of flow and a tendency to silt on the inner bend and scour the toe of the outer bend.
- If curves have to be provided ;they should be as gentle as possible.
- The permissible minimum radius of curvature for a channel curve is shorter for lined canals than unlined ones
- The alignment should be such that the cutting and filling of earth rock should be balanced , as far as possible.

Type of canal	Capacity of canal (m^3/s)	Minimum radius (m)
Unlined canals	80 and above	1500
	30 to 80	1000
	15 to 30	600
	3 to 15	300
	0.3 to 3	150
	Less than 3	90
Lined canals	280 and above	900
	200 to 280	750
	140 to 200	600
	70 to 140	450
	40 to 70	300
	10 to 40	200
	3 to 10	150
	0.3 to 3	100
	Less than 0.3	50

TYPES OF DRAINAGE SYSTEM

- Surface drainage

- ✓ These constitute open ditches , field drains, proper land grading and related structures.
- ✓ Land grading , or properly sloping the land towards the field drains, is an important method for effecting surface drainage.

TYPES OF DRAINAGE SYSTEM

- ❖ Sub surface drainage
- ✓ These are installed to lower the water table
- ✓ Consist of underground pipes which collect water and remove it through a network of such pipes.

conclusions

- Explicit design equation and sections shape co efficient have been present for the minimum cost design of lined canal of triangular, rectangular trapezoidal& circular shapes .
- These equation &co efficient have been obtained by applying the nonlinear optimization technique