



सत्यमेव जयते

GOVERNMENT OF GUJARAT

MANUAL
ON
GLOSSARY OF IRRIGATION TERMS



PUBLIC WORKS DEPARTMENT
SACHIVALAYA
GANDHINAGAR

MANUAL ON GLOSSARY OF IRRIGATION TERMS

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GLOSSARY OF IRRIGATION TERMS

1. ACRE FOOT :

A unit of measure for the capacity of a reservoir. It is the volume of water required to cover an area of one acre to a depth of 1 foot. It is equivalent to 43,560 cft. and 1.98 acre/ft. (Usually taken as 2) are equal to one cusecs-day.

2. AFFLUX :

The heading up of water above its natural surface in a channel, caused by placing an obstruction in the water way.

3. AI/DC :

It is the ratio between the area irrigated and the discharge in day cusecs for a particular period. In other words it is the area (in acres) of mixed crops irrigated by one cusecs discharge flowing throughout the day. The value is taken as 3.5 to 4 at canal head.

4. APRON :

A floor or lining of concrete, stone, masonry etc., to protect a surface from erosion or to with-stand hydrostatic pressure. Aprons are provided on the downstream side of crest walls (weir), below chutes or spillways, at the toes of dam at the entrance or outlet of a culvert or water way etc. to prevent scour.

5. AQUEDUCT :

A structure through which a canal water is carried over a drainage without having to drop or depress the bed level of the drainage.

6. (a) AREA IRRIGATED :

The area to which water has been actually applied for irrigation.

(b) AREA CULTIVABLE COMMAND :

It is the portion of gross command area which is culturable.

(c) AREA CULTURABLE IRRIGABLE :

The gross irrigable area less the area not available for irrigation e. g. village areas, roads, and isolated patches of unculturable lands.

(d) AREA GROSS COMMAND :

The portion of the gross irrigable area which can be commanded by flow irrigation. In special cases this also includes the area irrigated by pumping or lifting the water by other devices.

(e) AREA GROSS :

It is the total area within the extreme limits for irrigation by a project system of irrigation or any channel. This includes higher areas to which water cannot flow by gravity.

(f) AREA IRRIGABLE :

Area within the command which can be irrigated (both by flow and by lift).

7. BAFFLE :

A cross wall or a set of vanes or some other device built in a channel, down stream of a hydraulic structure for dissipating the energy.

8. BALANCE DEPTH OF CUTTING :

The depth of cutting in an irrigation channel at which the quantity of earth available from cutting is equal to that required for banking.

9. BANDHARA :

A weir built across a stream ('a' nalla) for heading up of water and to divert it into a channel for irrigation.

10. BARRAGE :

A low dam, gated across its entire width, constructed across a river for raising the level of water for irrigation.

11. BASE DRAIN :

System of drainage provided at the base of earth dam to collect and drain away the water seeped through the earth work.

12. BASE PERIOD :

The number of days over which duty is reckoned, determined or measured, Generally it equals the crop period. The base period for different seasons in Gujarat is as under ;—

(a) KHARIF :

15th June or the break of Monsoon which-ever is later to 14th Nove. (153 days):—

One cusec/ in Kharif	= 13.219 Mcft.
i. e.	= 0.3743 Mcmt.
	= 303.5 Acre/ft.

(b) RABI :

15th Nov. to 14th Feb. (92 days) :—

One cusec in rabi	= 7.949 Mcft.,
i. e.	= 0.2251 Mcmt.
	= 182.3 Acre/ft.

(c) Hot weather 15th Feb. to 14th June (120 days) :—

One cusec in hot weather	= 10.368 Mcft.
i. e.	= 0.2935 Mcmt.
	= 240 Acre/ft.

13. BED OF CANAL :

It is the bottom of an irrigation channel.

14. BED GRADIENT :

It is the longitudinal slope of bed of the channel.

15. BERM :

(1) The space left between the upper edge of a cut and the toe of an embankment.

- (a) to allow for flattening of unstable slopes,
- (b) to arrest rain water run off and lead it away, or
- (c) to facilitate the use of heavy earth moving machinery :—

(2) A horizontal strip of shelf built into an embankment to break the continuity of an otherwise long slopes.

(3) The portion of bank with a horizontal top at a lower level than the top of the main bank.

(4) An addition to a bank at a lower level.

5. The space between the water edge and the inner toe of bank of a canal-usually formed by silt carried by the canal water. Berms below full supply level are not considered for calculating the water way for the irrigation channel below in an erodable strata.

16. BORROW PITS :

Borrow pits are the pits excavated outside the section of the work for obtaining the extra earth required for forming the earth banks.

17. BRANCH CANAL :

A Government channel taking its supply from the main canal or a branch and having a capacity of more than 100 cusecs at head. Continuation of the same channel is also called a branch even though the capacity gets reduced to below 100 cusecs.

18. CANAL :

A channel constructed or maintained for the conveyance of water to feed the branch canals or directly the distributaries, or for the purpose of navigation. Legally the term "Canal" includes :—

- (a) All canals, channels and reservoirs constructed, maintained or controlled by Govt. for the supply of storage of water.
- (b) All works, embankments, structures, supply and escape channels connected with such canals, channels or reservoirs.
- (c) All water courses.
- (d) Any part of a river stream, lake or natural collection of water or natural drainage channel.

19. CAPACITY :

(a) Capacity of Canal :

It is the authorised or designed full supply discharge of an irrigation channel.

(b) Capacity of Tank or Reservoir :

It is the quantity of water stored between the lowest sill level and full supply level.

20. CAPACITY FACTOR :

It is a fraction smaller than a unit and denotes the ratio of average supply drawn say during a month to the designed capacity of channel.

21. CAPACITY CO-EFFICIENT :

It is the figure of area of mixed crops (not reduced to any common basis) irrigated with a volume of water equal to one day cusec.

22. CATCHMENT OR CATCHMENT AREA :

The area from which a lake, stream or water way and reservoir receives surface flow which originates as precipitation.

23. CHUTE :

This is a conduit with a high velocity for conveying water to a lower level or an inclined drop or fall with a very steep gradient as compared to the normal bed gradient of the canal. Such a canal has to be lined to resist erosion, as well as dissipate the energy of the high velocity caused by the steep gradient of the chute. The energy dissipation below the chute is generally effected by a standing wave flume.

24. CLOSURE :

Shutting off water supplies into a canal system or part of a canal system on account of (i) Annual repairs or emergent repairs (ii) Accidents or breaches, (iii). High flood in the river (iv) No demand due to heavy rains in the area served (v) Rotational working and (vi) eliminating weed growths.

25. COMMAND :**(a) GROSS COMMAND :**

See 'Area' 6 (d)

(b) CULTURABLE OR CULTIVABLE COMMAND :

See 'Area' 6(b) & (C).

(c) IRRIGABLE COMMAND :

See 'Area' 6 (f).

26. CREEP :

(a) The movement of water under or around a structure built on permeable foundation.

(b) CREEP LINE :

It is the line of contact of the base of a hydraulic structure founded on a permeable soil and the cut off with the foundations.

(c) CREEP LENGTH :

The length measured along the 'Line of Creep.'

(d) CREEP RATIO :

The ratio of creep length to the effective head i. e. the difference in water levels at the upstream and downstream of a hydraulic structure.

27. CREST :

(a) It is the top of a dam, weir or spillway frequently restricted to the overflow portion.

(b) The summit of a wave or peak of a flood.

28. CRITICAL VELOCITY :

1. Reynold's critical velocity is that at which the flow changes from laminar to turbulent, and friction ceases to be proportional to the first power of the velocity and becomes proportional to a higher power practically the square.

2. Kennedy's critical velocity is that in open channels which will neither deposit nor pick up silt.

3. Belanger's critical velocity is that condition in open channels for which the velocity head equals one half the mean depth.

29. CROP :**(a) SEASONAL CROP :**

Crops which are planted and which mature in the same season.

(b) TWO SEASONAL CROPS :

Crops which are planted in one season and matured in the next season.

(c) PERENNIAL CROPS :

Crops which need irrigation (Watering) in all the three seasons.

(d) FOLLOW ON CROPS :

It is a seasonal crop grown on the same area after harvesting one seasonal crop on the same area.

(e) WET CROPS :

Crops which positively require irrigation for maturity e. g. rice.

30. CROP PATTERN :

The percentage of various mixed crops or seasonal crops proposed to be irrigated by the existing or proposed irrigation system to suit soils in the culturable command area.

CROP RATIO :

The crop ratio or Kharif Rabi Ratio is the ratio between the anticipated areas to be irrigated of the two crops during a year.

31. CROSS DRAINAGE WORKS :

A structure carrying the discharge of a drainage channel or a natural stream across a canal intercepting the channel or stream.

32. CURTAIN WALL :

A cross wall built under the floor of a hydraulic structure with the object of dividing the work into suitable compartments and/or at the upstream and down stream ends of the pavements to prevent scour and protect floors, abutments, wingwalls etc., These are usually carried upto the scour depth.

33. CUSEC :

A unit commonly used in irrigation practice to denote the discharge or rate of flow of water in cubic feet per second.

34. CUT OFF TRENCH :

A trench excavated in the base of a dam or other structure and filled with relatively impervious material to reduce percolation.

35. DAY CUSEC :

The volume of water resulting from a discharge of one cusec flowing for 24 hours. It amounts to 86400 cft. (2435.3 cmt.) or 1.98 (say 2) acre/ft. of water.

36. DELTA :

An expression used in irrigation practice to mean the depth of water that would result over a given area from a given discharge passed for a certain length of time. Alternatively delta may be defined as the total volume of water delivered divided by the area over which it has been spread. (A cusec day on one acre results in a delta of 2 ft. It is clear that owing to the total losses in a channel, the delta will vary with the place at which the discharge is measured which should be stated thus at field, at outlet or at head of channel or canal.) (b) This term also applies to the alluvial tract formed by the deposit of the sediment carried down by rivers, near their outfall into the sea.

37. DISCHARGE :

The quantity of water passing a particular site in unit time at any instant.

38. DISTRIBUTORY :

It is a Govt. channel taking its supply from a main canal or a branch and having head discharge between 100 and 25 cusecs.

39. DIVERSION WORKS :

A collective term for all works (diversion dams or weir head regulators, upstream and downstream river training works and their appurtenant structures) required at intakes of main or principal canals to divert and control river flows and to regulate water supplies into the main canal or canals.

40. DIVERSION RATIO :

The ratio of the flow diverted to the stream flow.

41. DUTY :

The relation between the area irrigated or to be irrigated and the quantity of water required to irrigate it for the purpose of maturing its crops. Duty is stated with reference to a base period and the place of its measurement. It is expressed in a number of ways :—

- (i) Water-depth units.
- (ii) Depth area units per unit area.
- (iii) Area per unit rate of flow or per unit volume of water.
- (iv) Volume of water or rate of flow per unit area.

42. ESCAPE :

It is a structure on a channel meant for the disposal of excess supplies from the canal from which it takes off. Excess supplies may be due to mistake in regulation or heavy rainfall on the up stream side.

43. FALL :

When the ground slopes exceeds the slopes given to the channel, the extra fall in the ground level has to be consumed by providing vertical falls. Thus a fall may be provided at a location where the FSL out strips the ground level but before the bed of the channel comes into filling.

44. FIELD CHANNEL :

A channel to lead water to fields from the Govt. outlets on a canal, branch, distributary or minor and subminor at the cost of cultivators, such channels in each irrigation block under outlet are owned and maintained by the cultivators of that block.

45. FLOAT GAUGING :

Measurement of the discharge of water by floats to determine velocities.

46. FLOAT RUN :

The fixed distance over which a surface float is timed.

47. FLUME :

An artificially constructed waterway narrower than the normal bed width of the channel used for measuring discharge.

48. FOLLOW ON CROPS :

See "Crop."

49. FREE BOARD :

It is the minimum available, vertical clearance between the maximum designed water level and the top of the earthen dam.

50. FRICTION BLOCKS :

Obstructions placed on the down stream floor of a spillway weir or a fall to dissipate the high velocity of the flowing water and maintain the standing wave on the glacis.

51. FULL SUPPLY CO-EFFICIENT :

The number of acres irrigable per cusec of capacity of a channel at its head or the area estimated to be irrigated during the base period divided by the designed full supply discharge of the channel at its head.

52. FULL SUPPLY DEPTH :

The depth of water column in an irrigation channel corresponding to the fully supply discharge.

53. FULL SUPPLY LEVEL :

The water level in an irrigation channel running with full supply discharge.

54. GUIDE BUND :

A protective and training bank constructed at the site of a bridge or weir to guide the flow of river through the waterway provided in the structure and to prevent out-flanking.

55. HEAD WORK :

See ' Diversion works '

56. HEAD REGULATOR :

See ' Regulator '

57. HYDRAULIC GRADE LINE :

In a closed conduit a line joining the levels to which water rises in pressure pipes (Mano-Meter tubes). In an open channel the hydraulic grade line is the water surface.

58. HYDRAULIC GRADIENT :

The decrease in hydraulic head per unit distance in the soil in the direction of flow.

In a closed conduit, the slope of the hydraulic line.

In an open conduit, the slope of the water surface.

59. HYDRAULIC JUMP :

The sudden and usually turbulent passage of water from low level below critical depth to high level above critical depth during which the velocity passes from supercritical to sub critical. It represents the limiting condition of the surface curve wherein it tends to become perpendicular to the stream bed.

60. HYDROGRAPH :

A graph showing the stage, discharge, velocity or some other features of water with respect to time.

61. INSPECTION PATH :

It is a road provided on the bank of an irrigation channel or on a natural ground on the opposite side of the service road for the use of the inspecting staff of the channel. It is also provided for inspection of smaller channels. It is narrower than the service road and does not permit vehicular traffic, but adequate for cycling.

62. INTENSITY

It is the percentage of the area irrigated to the cultivable Command area.

63. IRRIGATION :

The artificial application of water to lands for agricultural purpose.

64. LEACHING :

The washing out of salts from the upper zone of the soil by flooding. The salts dissolve in the water which is drained off through the sub soil.

65. LEVEL CROSSING :

A cross-drainage work provided when the bed levels of the drainage channel and the canal are nearly the same and the discharge carried by the former is, generally, large but intermittent. The drainage water is admitted into the canal allowed to mix with the canal water, and is then carried in the canal or passed out through an escape regulator or out-let into an outfall channel. A cross regulator is provided in the canal downstream of the outlet.

66. LIFT IRRIGATION :

Water raised by pumps or other devices and applied to an area in the supply system, the level of which is too high for flow irrigation.

67. LINE OF SATURATION :

It is a line across an embankment upto which water will theoretically saturate the material. The correct concept of the line of saturation is same as that understood by phreatic line in earthen dam.

68. LINING OF CANAL :

In order to save substantial quantity of water which is lost in transit, through seepage, percolation, etc. before water reaches fields, and to overcome further serious problems of water-logging, loosing fertility of soil, etc., lining of canals is adopted for various advantages and benefits. Lining is done to fill in the bed and side-slopes of canals with various suitable material like bricks, stones, concrete, short-crete, asphalt etc.,

69. LOSSES OF WATER :**(a) ABSORPTION LOSSES :**

Absorption losses are due to capillary action, the pressure in water films being less than atmospheric. The losses of water by infiltration from a canal, reservoir, or from a field.

(b) EVAPORATION LOSSES :

Evaporation losses are due to vaporization of water varying greatly under different climatic influences. These losses vary according to temperature in different seasons.

(c) PERCOLATION LOSSES :

These are due to water in tanks or canals finding its way into the pore space of sub soil strata under gravity and then flowing out into depression after filling the pores.

(d) LOSSES DUE TO SURFACE WASTE :

Losses due to surface waste are on account of indiscriminate use of water and the land to be irrigated not being properly levelled and bunded.

70. MAIN CANAL :

It is the principal Govt. channel of a canal system off taking from head works (or source of supply) upto the take-off the last distributory or branch therefrom—

71. MEAN DISCHARGE :

Mean discharge is the sum of the daily discharges during a period divided by the number of days in that period.

72. METER :

A measuring device and in irrigation engineering its use is restricted to structures installed for measuring discharge of channels.

73. MINOR :

A Govt. channel having a capacity below 25 cusecs at head right down to the last group of tail out-lets.

74. MODULE :

A device for ensuring a constant discharge of water passing from one channel to another irrespective of the water level in each within certain specified limits.

75. MODULAR LIMIT :

The upper and the lower limits of any factor beyond which a module or semi module ceases to be acting as such :—

76. OUT LET :

An outlet is a pucca opening in a Govt., channel for controlling the supply of water to field channels and is constructed at Govt. cost. These are numbered serially from head to tail of a distributory or minor or sub-minor. (Ordinarily, outlets are not built on the main line or branches. When built such outlets., are termed 'Direct Outlets')

77. PASS (Water Pass for Irrigation) :

A written order issued to any person authorising him to receive the supply of water from a canal.

78. PERCOLATION :

Flow through a porous medium.

79. PERCOLATION TANK :

A tank formed by an earthen dam to head up storm water, with the object of raising the sub soil water level in the surrounding wells and producing a small flow in the nalla down below ;—

80. PERENNIAL CROP :

See 'Crops'

81. PHREATIC LINE :

The line or surface separating the saturated materials through which seepage occurs, from the unsaturated materials above it :—

82. PICK UP WEIR :

A diversion weir constructed across a river for raising the level of water sufficiently high for it to flow into a channel.

83. PITCHING :

A protective covering of properly packed materials on earthen embankment or side slopes of channels to protect them from the action of water.

84. REGULATOR :

A structure through which the discharge can be regulated or varied as required also applied to a structure provided with mechanism for varying the water surface level above it.

(a) HEAD REGULATOR :

It is a structure to regulate and release water into an irrigation channel from a weir, reservoir or a parent channel. The control can be exercised through gates, needles or valves.

(b) CROSS REGULATOR :

It is a structure constructed across a channel to control the depth of water upstream and regulate the discharge passing to the off taking channel. The control can be exercised through gates, needles or valves.

85. REMISSION OF WATER CHARGES ;

Waiving of irrigation charges leviable in part or full on account of damage to a crop due to natural calamity or due to closure of a canal for repairs or for any cause connected with regulation.

86. RIGID MODULE :

Module passing a fixed supply.

87. RIP RAP :

Broken stone placed on earth surface, and large stones against a fill of small rocks etc., placed on the upstream slopes of embankment for protection against the action of water, particularly against wave wash.

88. ROTATION :

It is the cyclic time in which one turn is completed for watering to all the irrigators to whom supply is due in accordance with a fixed programme.

89. ROTATION INTERVAL :

Rotation interval is the number of days between successive waterings to the irrigated land under a block.

90. ROTATION OF CROPS :

When manures cannot be had in sufficient quantity, rotation of crops is the best way of keeping up the fertility of soil. This changing of crops in turn is called rotation of crops.

91. RUN OFF :

The portion of precipitation that appears as flow in streams. The volume of water discharged by a stream draining the area or into reservoir receiving the drainage.

92. RUN OFF CO-EFFICIENT :

The ratio of the maximum rate of run off to the uniform rate of rainfall with a duration equaling or exceeding the time of concentration which produced this rate of runoff.

93. RUN OFF PERCENTAGE :

The amount of run off expressed as a percentage of total rain fall on a given area.

94. SCOUR :

The erosive action of running water in streams, in excavating and carrying away material from the bed and banks.

95. SCOURING SLUICE :

An opening in a structure for passing debris or sediment or silt.

96. SEASONAL CROPS :

See (Crops).

97. SEEPAGE :

The slow movement of water through small Cracks., pores, interstrices etc. in the surface of unsaturated materials into or out of a body of surface or sub surface water.

98. SEMI MODULE :

A device that automatically delivers a discharge independent of fluctuations of water level or pressure on the delivery side and only varies with water level or pressure on the supply side in accordance with hydraulic laws.

99. SERVICE ROAD :

It is the road provided on bank of an irrigation channel or on a natural ground for the vehicular traffic of the authorities for the purpose of its inspection.

100. SLUICES :

It is an opening provided at the bed or at suitable level in the body of a dam or weir to wash away silt deposits or to pass a discharge.

101. SOUNDING :

Determining the depth of the river bed by an echosounder or sounding line.

102. SPILL - WAY :

A passage for overflow or excess water from a reservoir.

103. SPOIL BANK :

When the depth of cutting is more than the balanced depth of cutting, the extra earth is dumped on the sides to form what is called 'Spoil bank'.

104. SUPER PASSAGE :

A cross-drainage work, the reverse of a canal aqueduct when the canal is passed under the drainage channel or natural stream such that the full supply level of the canal leaves a sufficient freeboard from underside of the drainage through above it.

105. S.W.F. :

An abbreviated form the term, 'standing wave flume'. A masonry structure built in a canal, its branch or distributaries to measure the discharge passed at that point. It has bell mouth shaped vertical walls at the approaches (with gauge chamber at one of the approaches.) The walls are straight & vertical to the centre and expand at the tail portion, to coincide with the natural section of the canal.

106. STAUNCHING WALL :

A transverse wall projecting from an abutment usually at right angles, into the embankment to intercept seepage.

107. SYPHON :

A structure in which the bed level of the canal is depressed where it passes under a drainage or stream so that the canal passes through an inverted syphon.

108. TAIL TANK :

It is a reservoir supplied with water from a canal wherever water in excess of canal requirements is available having at times its own command and usually situated at the tail of a canal.

109. TAIL WATER :

The water just downstream of a hydraulic structure.

110. TOE WALLS :

A shallow wall constructed below the bed or floor level to provide a footing for the sloped pitching or the face of an embankment.

111. TWO-SEASONAL CROPS :

See (Crops).

112. UNDER SLUICES :

Opening provided at the bed or at suitable level in the body of a dam or weir to wash away silt.

113. UP LIFT :

The upward water pressure in the pores of a body (interstitial pressure) or on the base of a hydraulic structure.

114. VELOCITY OF APPROACH :

The mean velocity in the channel or stream immediately upstream of a weir, dam conduit or an orifice.

115. WASTE-WEIR :

The escape provided for the passage of surplus water from a reservoir or tank.

116. WATER COURSE :

The term is applied to an Irrigators channel taking supply from a Govt. channel, from which the fields are irrigated directly.

117. WATER CUSHION :

A pool of water maintained to take the impact of falling water below a dam, chute, fall or other structure.

118. WATER LOGGED :

A condition of land where the water table is at or near the ground level and becomes detrimental to plant life. Water logging may result from over irrigation or seepage due to inadequate drainage.

119. WATER RIGHT :

Under the irrigation rules a cultivator procures the right to use water, after he duly applies for it, gets sanction to his demand, which is subject to the specific terms & conditions agreed by the Govt. (Supplier) & the cultivator (consumer).

120. WATER SHED :

The boundary line separating the adjacent drainage basin.

121. WATER TABLE :

The level upto which the sub soil or ground water exists.

122. WEEP HOLES :

Opening left in retaining walls, aprons, linings etc to permit free drainage of water accumulating behind these structures thereby reducing pressure of the seepage.

123. WEIR :

A continuous solid barrier across a river or a stream for diverting, for control or for measuring flow.

124. WET CROPS :

See 'Crops'