

*Indian Standard*

**GLOSSARY OF TERMS RELATING TO  
RIVER VALLEY PROJECTS**

**PART XVII WATER REQUIREMENTS OF CROPS**

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*Indian Standard***GLOSSARY OF TERMS RELATING TO  
RIVER VALLEY PROJECTS****PART XVII WATER REQUIREMENTS OF CROPS**


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## *Indian Standard*

# GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

## PART XVII WATER REQUIREMENTS OF CROPS

### 0. FOREWORD

**0.1** This Indian Standard (Part XVII) was adopted by the Indian Standards Institution on 31 March 1977, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** A number of Indian Standards have already been printed covering various aspects of river valley projects and a large number of standards are in the process of formulation. These standards include technical terms, the precise definitions of which are required to avoid ambiguity in their interpretation. To achieve this end, the Institution is bringing out this glossary of terms relating to river valley projects (IS: 4410) which is being published in parts. The other parts of this standard so far published are given on P 10.

**0.3** Part XVII covers the important field of water requirements of crops.

**0.4** In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

UNITED NATIONS. ECONOMIC COMMISSION FOR ASIA  
AND THE FAR EAST. Glossary of hydrologic terms used in  
Asia and Far East. 1956. Bangkok

INDIA. INTERNATIONAL COMMISSION ON IRRIGATION  
AND DRAINAGE. Multilingual technical dictionary on irriga-  
tion and drainage. 1967.

INDIA. CENTRAL BOARD OF IRRIGATION AND POWER.  
Glossary of irrigation and hydro-electric terms and standard  
notations used in India. 1954. Manager of Publications, Delhi  
Nomenclature for hydraulics. 1962. American Society of Civil  
Engineers, New York.

**0.4.1** All the definitions taken from ' Multilingual technical dictionary on irrigation and drainage ' are marked with asterisk ( \* ) in the standard.

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## **1. SCOPE**

**1.1** This standard ( Part XVII ) covers the definitions of terms relating to water requirements of crops.

## **2. WATER REQUIREMENTS OF CROPS**

### **2.1 Available Moisture**

- a) The amount of water in the soil at any time in excess of the wilting coefficient, expressed either as percentage by weight of dry soil, or as equivalent of water per unit depth of soil.
- b) The difference between the field capacity and permanent wilting point.

**2.2 Avoidable Losses\*** — The conveyance losses, delivery losses and farm losses.

**2.3 Base, Base Period or Base Days** — The number of days over which duty is measured, generally base period equals crop period.

**2.4 Consumptive Use ( or Evapotranspiration )** — The quantity of water used by the vegetative growth of a given area in transpiration and building of plant tissue and that evaporated from the adjacent soil or from intercepted precipitation on the area in any specified time. It is expressed in waterdepth units or depth area units per unit area and for specified periods such as days, months and seasons.

**2.5 Consumptive-Use Efficiency\*** — The ratio of consumptive water use by the crop of an irrigated farm or project and the irrigation water stored in the root zone of the soil on the farm or the project area.

**2.6 Conveyance Losses or Transmission Losses** — Losses of irrigation water in transit from the source of supply to the point of service in canals, distributaries, water courses or field ditches. They comprise evaporation from the water surface, seepage, and incidental transpiration by vegetation growing in the water or along the banks of natural channels, canals or water courses.

**2.7 Curve of Demand\*** — A graph showing the amount of water needed for irrigation at various times during a crop season, based on elements of time and quantity.

**2.8 Curve of Supply\*** — A graph showing the water available based on elements of time and quantity.

**2.9 Deep Percolation** — With respect to irrigation and precipitation, the amount of water which passes below the root zone of crop or other vegetation.

**2.10 Delivery Losses or Operational Losses\*** — Losses due to lack of efficiency in management and breaks in the conduits.

## **2.11 Delta**

- a) A term equivalent to duty of water when the latter is expressed in water-depth units and refers to irrigation projects under operation. It is stated with reference to the place at which it is measured, that is, 'delta at farm', 'delta at outlet', 'head of water course or lateral head', 'delta at distributary head', 'delta at head of main canal'.
- b) An expression used in irrigation practice to mean the depth of water that would result over a given area from a given discharge for a certain length of time. Alternatively, the delta may be defined as the total volume of water delivered, divided by the area over which it has been spread.

**2.12 Demand** — Amount of water needed for irrigation based on elements of time and quantity, and related to a particular point along the irrigation system, such as 'demand at farm', 'demand at outlet', 'demand at distributary head', 'demand at head of canal'.

**2.13 Designed Duty of Water\*** — Duty of water assumed in an irrigation project for designing capacities of channels.

**2.14 Double Cropping** — The growing of two crops in one year on the same field.

**2.15 Duty or Duty of Water** — The relation between the area irrigated, or to be irrigated, and the quantity of water used, or required to irrigate it for the purpose of maturing its crop. Duty is stated with reference to a base period and the place of its reckoning or measurement. It is expressed in a number of ways as given below:

- a) Water-depth units,
- b) Depth-area units per unit area,
- c) Area per unit rate of flow or per unit volume of water, and
- d) Volume of water or rate of flow per unit area.

**2.16 Duty at Distributary Head** — Duty of water measured at the head of a distributary.

**2.17 Duty at Outlet** — Duty of water measured at the outlet or head of a distributary.

**2.18 Duty Attained\*** — Duty of water as actually prevailing on an irrigation project under operation.

**2.19 Duty of Well** — The average annual area of land irrigated by a well.

**2.20 Economic Water Duty** — Duty of water which result in the maximum yield or maximum net profit:

- a) per unit area when land is the limiting factor, and
- b) per unit of irrigation water when water is the limiting factor.

**2.21 Effective Water Use\*** — Consumptive use less evaporation from rainfall. It includes transpiration and evaporation from irrigation and transpiration from effective rainfall.

**2.22 Farm Duty or Net Duty** — Duty of water measured at the farm.

**2.23 Farm Losses** — Losses of water on the farm due to uneven distribution, poor handling, evaporation and percolation below the root zone of crop or other vegetation.

**2.24 Field Capacity** — The amount of water held in the soil after the excess gravitational water has drained away and after the rate of downward movement of water has materially decreased, provided there is no water table within capillary reach of the root zone.

**2.25 Gross Duty** — Duty of water measured at the source of diversion of irrigation supplies.

**2.26 Gross Irrigation Requirements\*** — Irrigation requirement at the source of irrigation supplies. It is equal to net irrigation requirement plus water losses and operational wastes in transit, and is the same as 'gross duty of water' when the latter is expressed in similar units.

**2.27 Irrigation Efficiency** — The ratio or percentage of the irrigation water consumed by crops of an irrigated farm, field or project to the water diverted from the source of supply.

**2.28 Irrigation Requirements** — The amount of water, exclusive of effective precipitation and other contributing factors such as ground water, seepage from surrounding areas and carry over moisture required by a crop or crops in a given period of time, for normal growth under field conditions. This includes evaporation, conveyance and other unavoidable losses. It is usually expressed in water-depth units per unit area.

**2.29 Irrigation Water\*** — Water artificially applied to soils in the process of irrigation. It does not include precipitation.

**2.30 Moisture Deficit** — The amount of water that must be applied to the soil to bring it to field capacity.

**2.31 Moisture Equivalent** — Ratio of weight of water which a soil, after saturation, will retain against a centrifugal force of 1 000 times the force of gravity to weight of the soil when dry.

**2.32 Moisture Percentage\*** — The moisture content of soil in terms of the equivalent depth of free water per unit depth of soil.

**2.33 Net Irrigation Requirements** — Gross irrigation requirements minus conveyance losses of the irrigation water.

**2.34 Nominal Duty** — The duty sanctioned as per the schedule of an irrigation department.

**2.35 Non-beneficial Consumptive Use\*** — The water consumed by natural vegetation, evaporated from bare and idle land surfaces and from water surfaces.

**2.36 Optimum Consumptive Use** — Consumptive use which produces a maximum crop yield.

**2.37 Optimum Irrigation Requirements** — The seasonal depths of beneficial use of irrigation water that result in maximum yields.

**2.38 Optimum Water Requirements**

- a) The seasonal depths of beneficial use of irrigation water that result in maximum yields of different crops, where the depths include soil moisture supplied by effective precipitation as well as water delivered by irrigation.
- b) The seasonal depths of beneficial use of irrigation water that result in maximum yields.

**2.39 Percolation** — The downward movement of water within the soil in response to gravity forces.

**2.40 Potential Evapotranspiration** — The amount of evaporated water in unit time from a short uniform crop, growing actively and covering an extended surface and never short of water.

**2.41 Potential Transpiration** — The amount of water transpired by a green crop of about the same colour as green grass, which completely covers the ground, and which has an adequate supply of water.

**2.42 Ratio of Consumptive Use of Water to Evaporation\*** — Coefficient determined experimentally, and used in determining consumptive use of water from evaporation records from free water surface, or evaporation potential determined through the use of atmometer cups.



**2.43 Seasonal Consumptive Use** — Depths of water consumed by evapotranspiration during crop growth till maturity, including water used by accompanying weed growths.

#### **2.44 Surface Runoff**

- a) This term, as applied to crop fields, refers to that part of irrigation water or precipitation which runs off the lower end of the field as waste.
- b) That portion of the runoff of a drainage basin that has not passed beneath the surface since it was precipitated.
- c) Water flowing over land surface before it reaches definite channel of stream.

**2.45 Transpiration** — The process by which plants dissipate water into atmosphere from leaves and other surfaces.

**2.46 Transpiration Ratio** — The ratio of weight of water consumed by crops during the growing season to weight of dry matter harvested.

**2.47 Unit Water Requirement** — The weight of water actually used by plants in producing unit weight of dry matter.

**2.48 Valley Consumptive Use\*** — Consumptive use, when referred to a valley, includes all transpiration and evaporation from land on which there is growth of any kind, whether agricultural crops or native vegetation, plus evaporation from bare land and water surface.

**2.49 Water Application Efficiency** — The ratio of the volume of water that is stored in the crop root zone and ultimately consumed by transpiration or evaporation or both, to the volume of water delivered at the farm.

#### **2.50 Water Requirements**

- a) The quantity of water, regardless of its source, required by a crop or diversified pattern of crops in a given period of time, for normal growth under field conditions. It includes evaporation and other economically unavoidable waste. It may also be expressed as equal to seasonal consumptive use plus percolation as may be unavoidable. It is usually expressed in water-depth per unit area.

In case part of water supply ( supplementary to precipitation ) is from natural or artificial sources situated away from the farm area, the net quantity of water actually used which excludes conveyance losses, is termed 'net water requirements'. If conveyance losses are included, it is called 'total water requirements'.

- b) The total quantity of water, regardless of its source required by crops for their normal growth under field conditions.

**2.51 Water Storage Efficiency\*** — The ratio of the water stored in the root depth by irrigation to the water needed in the root depth to bring it to field capacity. It is also called 'water storage factor'.

**2.52 Wilting Percentage** — The percentage of moisture in a soil at which the plants wilt and fail to recover when placed in an atmosphere saturated with water vapour.

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## ON

### GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

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