

Indian Standard

GLOSSARY OF TERMS
RELATING TO RIVER VALLEY PROJECTS

PART 11 HYDROLOGY

Section 7 Quality of Water

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INDIAN STANDARDS INSTITUTION
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*Indian Standard*GLOSSARY OF TERMS
RELATING TO RIVER VALLEY PROJECTS

PART 11 HYDROLOGY

Section 7 Quality of Water

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(Continued on page 2)

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*Indian Standard***GLOSSARY OF TERMS
RELATING TO RIVER VALLEY PROJECTS****PART 11 HYDROLOGY****Section 7 Quality of Water****0. FOREWORD**

0.1 This Indian Standard (Part 11/Sec 7) was adopted by the Indian Standards Institution on 28 February 1984, 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 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 page 8.

0.3 (Part 11) covers the important field of hydrology which is a separate science by itself. In view of the vastness of this subject, the subject is being covered in different sections. Other sections will be the following:

- Section 1 General terms
- Section 2 Precipitation and runoff
- Section 3 Infiltration and water losses
- Section 4 Hydrograph
- Section 5 Floods
- Section 6 Ground water
- Section 7 Quality of water

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 the Far East.
1956. Bangkok.

INDIA. INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE.
Multilingual technical dictionary on irrigation 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 acknowledged by asterisk(*) in the standard.

1. SCOPE

1.1 This standard (Part 11/Sec 7) covers the definitions of terms relating to quality of water in hydrology.

2. QUALITY OF WATER

2.1 Acidic — A solution is acidic when its pH value is less than 7.

2.2 Alkaline — A solution is alkaline when its pH value is more than 7.

2.3 Alkalinity* — A term used to represent the content of carbonates, bicarbonates, hydroxides, and occasionally borates, silicates and phosphates in water. It is expressed in parts per million or mg/l of equivalent calcium carbonate.

2.4 Anion* — A negatively charged ion.

2.5 Brackish Water

- a) Water rendered unpalatable due to an excessive chloride content.
- b) A mixture of sea water and surface run off which occurs, in various proportions, at the lower reaches of streams that debouch into an ocean.

2.6 Cations — A positively charged ion.

2.7 Concentration — Amount of solid matter contained in liquid usually expressed in mass of solid per unit volume of liquid.

2.8 Critical Concentration — The level of concentration of an impurity in water above which it adversely affects its use for specific purpose, such as drinking, industrial and agriculture.

2.9 Hardness (of Water) — A measure of calcium, iron and magnesium salts (carbonates, nitrates, sulphates, chlorides, etc) expressed as parts of equivalent calcium carbonate per million parts of water or mg/l.

2.10 Ions* — Acids, bases and salts (electrolytes) when dissolved in certain solvents are more or less dissociated into electrically charged units or parts of the molecules called ions. Ions carry charges of electricity and in consequence have different properties from the uncharged radicals.

2.11 pH (Value) — The pH value of an aqueous solution is the logarithm to the base 10 of the reciprocal of hydrogen ion concentration (expressed in g/l) of the solution. Distilled water, which is neutral, has a pH value of 7.

2.12 Quality of Water — A term used to describe the chemical, physical and biological characteristics of water in respect to its suitability for a particular purpose, such as drinking, irrigation, industrial use, etc.

2.13 Salinity — The relative concentration of salts, usually sodium chloride, in a given water. It is usually expressed in terms of the number of parts per million or mg/l of equivalent chlorine.

2.14 Salinometer — An instrument for measuring the amount of salt in a solution; a hydrometer especially graduated so as to indicate directly the percentage of a particular salt (especially sodium chloride) in a solution.

2.15 Salt Balance — The complete salt balance is expressed by the following equation:

$$\Delta S + \Delta d = \left(n_1 + \frac{\alpha_1 \gamma_1 - \alpha_2 \gamma_2}{F} + \frac{\beta_1 Q_1 - \beta_2 Q_2}{F} - n_2 \right) \Delta t$$

where

ΔS = change in salt storage in the natural ground water system for the time interval Δt ,

Δd = change in salt storage in the top 1 to 5 m layer soil,

n_1 = quantity of salt introduced from the atmosphere in the form of solid or liquid salt particles,

n_2 = quantity of salt lost to the atmosphere,

α_1, α_2 = concentration of salts in surface water inflow and outflow,

β_1, β_2 = concentration of salts in ground water inflow and outflow,

γ_1, γ_2 = quantities of surface water inflow and outflow,

Q_1, Q_2 = quantities of unconfined ground water inflow and outflow,

Δt = time interval for which data are taken, and

F = area of the plot on which the data are taken.

2.15.1 The quantity of salt, that may develop in conjunction with weathering and soil forming process is neglected. While studying salt balance of irrigated areas, it is advisable in studies of moisture balance to include balance of the salt totals for the soils, the zone of aeration and the ground water system using the following equation for total salt balance:

$$S^{\circ}_2 - S^{\circ}_1 = S^{\circ}_3 + S^{\circ}_4 + S^{\circ}_5 + S^{\circ}_6 + S^{\circ}_7 - S^{\circ}_8 - S^{\circ}_9 - S^{\circ}_{10}$$

where

S°_1, S°_2 = initial and final amounts of salts stored in surface streams and reservoirs, in the zone of aeration and in the groundwater reservoir down to the underlying impervious bed (tonnes/hectare);

S°_3 = quantity of salt introduced with precipitation;

S°_4 = quantity of salt introduced with irrigation water;

S°_5 = quantity of salt introduced with groundwater inflow (comprised of lateral inflow in the unconfined reservoir and possible vertical leakage from deeper artesian aquifers);

S°_6 = quantity of salt introduced by process of cultivation;

S°_7 = quantity of salt introduced with fertilizers;

S°_8 = quantity of salt removed by groundwater outflow;

S°_9 = quantity of salt removed by drainage water; and

S°_{10} = quantity of salt removed by crop harvesting.

NOTE — In most irrigated areas, values of $S^{\circ}_3, S^{\circ}_6, S^{\circ}_7$ and S°_{10} may be neglected, thereby shortening and simplifying the expression.

2.16 Salt Index — A formula for ascertaining whether water is suitable for irrigation

$$\text{Salt Index} = (\text{Total Na} - 24.5) [\text{Total Ca} - \text{Ca in} \{ \text{CaCO}_3 + \text{Ca (HCO}_3 \text{)}_2 \} \times 4.85]$$

All quantities in the formula refer to parts per 100 000. The salt index is negative for all good waters and positive for those unsuitable for irrigation.

2.17 Sodium Adsorption Ratio (SAR) — A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reaction with soil:

$$\text{SAR} = \frac{\text{Na}^+}{\sqrt{\frac{(\text{Ca}^{++} + \text{Mg}^{++})}{2}}}$$

Where the ionic concentrations are expressed in m. eq/l.

2.18 Toxic (Water) — Poisonous; tending to reduce the yields of crops below the normal. It may also damage the soil.

2.19 Turbidity — Reduction of transparency of water due to presence of suspended particles. It is evaluated by comparison with standard suspension in a standard light intensity and expressed in terms of concentration of the material used in standard suspension, commonly silica or mg (silica)/litre. Alternatively it may also be expressed in terms of mg/l or parts per million of the suspended material present in the actual water sample.

INDIAN STANDARDS

ON

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

IS :

- 4410 (Part 1)-1967 Glossary of terms relating to river valley projects: Part 1
Irrigation practice**
- 4410 (Part 2)-1967 Glossary of terms relating to river valley projects: Part 2
Project planning**
- 4410 (Part 3)-1967 Glossary of terms relating to river valley projects: Part 3 River
and river training**
- 4410 (Part 4)-1967 Glossary of terms relating to river valley projects: Part 4
Drawings**
- 4410 (Part 5)-1968 Glossary of terms relating to river valley projects: Part 5 Canals**
- 4410 (Part 6)-1968 Glossary of terms relating to river valley projects: Part 6
Reservoirs**
- 4410 (Part 7)-1982 Glossary of terms relating to river valley projects: Part 7
Engineering geology**
- 4410 (Part 8)-1968 Glossary of terms relating to river valley projects: Part 8 Dams
and dam sections**
- 4410 (Part 9)-1982 Glossary of terms relating to river valley projects: Part 9
Spillways and syphons**
- 4410 (Part 10)-1969 Glossary of terms relating to river valley projects: Part 10
Civil works of hydro-electric generation system including water conductor
system**
- 4410 (Part 11/Sec 1)-1972 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 1 General terms**
- 4410 (Part 11/Sec 2)-1972 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 2 Precipitation and runoff**
- 4410 (Part 11/Sec 3)-1973 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 3 Infiltration and water losses**
- 4410 (Part 11/Sec 4)-1973 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 4 Hydrographs**
- 4410 (Part 11/Sec 5)-1977 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 5 Floods**
- 4410 (Part 11/Sec 7)-1984 Glossary of terms relating to river valley projects: Part 11
Hydrology, Section 7 Quality of water**
- 4410 (Part 12)-1973 Glossary of terms relating to river valley projects: Part 12
Diversion works**
- 4410 (Part 14/Sec 1)-1977 Glossary of terms relating to river valley projects: Part 14
Soil conservation and reclamation, Section 1 Soil conservation**
- 4410 (Part 14/Sec 2)-1977 Glossary of terms relating to river valley projects: Part 14
Soil conservation and reclamation, Section 2 Reclamation**

- 4410 (Part 15/Sec 1)-1973 Glossary of terms relating to river valley projects: Part 15
Canal structures, Section 1 General terms
- 4410 (Part 15/Sec 2)-1973 Glossary of terms relating to river valley projects: Part 15
Canal structures, Section 2 Transitions
- 4410 (Part 15/Sec 3)-1977 Glossary of terms relating to river valley projects: Part 15
Canal structures, Section 3 Flumes
- 4410 (Part 15/Sec 4)-1977 Glossary of terms relating to river valley projects: Part 15
Canal structures, Section 4 Regulating works
- 4410 (Part 15/Sec 5)-1977 Glossary of terms relating to river valley projects: Part 15
Canal structures, Section 5 Cross drainage works
- 4410 (Part 16/Sec 1)-1979 Glossary of terms relating to river valley projects: Part 16
Gates and valves, Section 1 Gates
- 4410 (Part 16/Sec 2)-1982 Glossary of terms relating to river valley projects: Part 16
Gates and valves, Section 2 Valves
- 4410 (Part 17)-1977 Glossary of terms relating to river valley projects: Part 17
Water requirements of crops

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemen	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

PUBLICATIONS OF INDIAN STANDARDS INSTITUTION

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Over 10 000 Indian Standards covering various subjects have been issued so far. Of these, the standards belonging to the Civil Engineering Group fall under the following categories:

Aggregates, concrete	Modular co-ordination
Apparatus for testing cement and concrete	Multi-purpose river valley projects
Asbestos cement products	Pipes
Bricks and blocks	Planning regulation and control
Builder's hardware	Plaster, paint and allied finishes
Cement	Plywood and allied products
Concrete design and construction	Poles
Concrete testing	Pozzolanas
Construction equipment	Reinforcement, concrete
Construction practices	Roof and roof coverings
Doors and windows	Safety in construction
Drawing office practice and equipment	Sieves and wire gauzes
Fire fighting equipment	Soil engineering
Fire safety	Stones, building
Flexible floor coverings	Structural design
Floor finishes	Tar and bitumen
Fluid flow measurement	Tiles
Fluid flow measuring instruments	Timber
Foundations engineering	Timber design and construction
Functional design of buildings	Timber stores
Furniture	Wall and ceiling finish
Gypsum products	Waterproofing and damp-proofing
Lime, building	Water supply, drainage and sanitation
Loading standards, structural safety	Water supply, sanitation and drainage fittings
Measurement and estimation of civil engineering	Wood-based materials
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