BUREAU OF INDIAN STANDARDS

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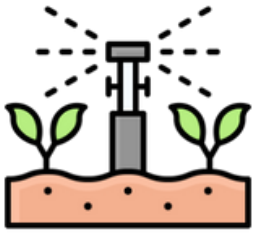
COMPENDIUM OF INDIAN STANDARDS

MICRO-IRRIGATION SYSTEMS



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1 INTRODUCTION

Irrigation refers to the artificial application of water to crops. It is a critical agricultural practice, especially in areas with irregular rainfall or arid climates. The main goal of irrigation is to ensure optimal water availability for crops, maximizing yield and productivity.

Water is the lifeline of agriculture, but with growing concerns over water scarcity, efficient use of this precious resource has never been more critical. As per report of Bureau of Water Use Efficiency, agriculture is the largest consumer of water in India, which accounts up to 80% of of the total freshwater withdrawals out which irrigation consumes the most.

There are various types of irrigation methods (Border Irrigation, flood irrigation, check basin irrigation, micro-irrigation), which may be adopted by the farmer based on various factors (environment, soil, crop, etc.,). But out all, Micro Irrigation is the most water efficient methods of irrigation.

Efficient water use in irrigation is not just a best practice—it is a necessity. Micro-Irrigation Systems ensures that water is delivered exactly where it's needed, in the right amounts, and at the right time, preventing wastage and promoting sustainability.

This compendium presents an overview of Indian Standards for micro-irrigation systems, highlighting the specifications of different components and their significance of important requirements.

By compiling together relevant standards on micro-irrigation systems, this compendium serves as a convenient reference for professionals involved in the manufacture of efficient, reliable, and safe micro-irrigation systems and components

BIS has developed several standards pertaining to micro-irrigation which includes standards for Emitters, Sprinklers, Pipes, Filters, Valves used in Drip and Sprinkler Irrigations Systems, Standards for fertigation unit, Code of practices for design, installation, operation, maintenance of sprinkler and drip irrigation, Quality of Irrigation Water, etc.

Adhering to these standards is essential for achieving long-term durability, efficiency, and compatibility of irrigation equipment.

2 DRIP IRRIGATION SYSTEM

Drip irrigation is an efficient watering method that delivers water directly to the roots of plants through a network of valves, pipes, tubing, and emitters. This system minimizes water wastage by reducing evaporation and runoff, making it ideal for areas with limited water resources. It ensures that plants receive a consistent and precise amount of moisture, which promotes healthier growth and higher crop yields. Drip irrigation is commonly used in agriculture, landscaping, and gardening due to its ability to conserve water and improve efficiency.

Key product Standards on Drip Irrigation

IS 12786 : 2024 Irrigation equipment — Polyethylene pipes for irrigation laterals — Specification (*first revision*)

Irrigation laterals are pipes that distribute water from the main irrigation line to individual plants or fields. They ensure even water delivery across the irrigated area. This standard covers the requirements and test methods for pipes of outside diameter from 12 mm up to 32 mm, working pressure 0.20 MPa, 0.25 MPa and 0.40 MPa to be used as irrigation laterals that act as branch supply lines on which sprayers or drippers or emitters are mounted directly or by means of a fitting or formed in the pipe during production.

IS 13487 : 2024 Irrigation Equipment — Emitters — Specification (first revision)

Emitters/Drippers are small devices in drip irrigation systems that deliver water directly to plant roots in a controlled and precise manner. IS 13487 covers the mechanical and functional requirements of irrigation emitters, test methods to evaluate their performance and the data to be supplied by the manufacturer to facilitate correct installation and operation in the field. The standard categories emitters into various categories: inline/online emitters, regulated/unregulated emitters, single/multiple outlets, and uniformity category A and B.

IS 13488 : 2008 Irrigation Equipment - Emitting Pipe Systems - Specification (*first revision*)

IS 13488 specifies the mechanical and functional requirements of the emitting pipes and their fittings, test methods to evaluate their performance and the data to be supplied by the manufacturer to facilitate correct installation and operation in the field. The standard is applicable to emitting and trickling pipes, hoses and tubings intended for irrigation. in which the emitting units form an integral part. This standard also applies to the fittings used for connecting these pipes, hoses and tubings, however it does not apply to continuously porous pipe (porous along its entire length and circumference).

IS 14482 : 1997 Irrigation Equipment — Polyethylene Micro Tubes for Drip Irrigation — Specification

Microtubes are alternatives to drippers and emitters. These are small-bore, black polyethylene tubes classified under long-flow-path emitters which could be operated at lower

pressure compared to other emitters, making them a practical and economical. IS 14482 standard specifies the requirements and methods of tests for polyethylene micro tubes of inside diameter 0.9 mm to 1.2 mm for drip irrigation system.

3 SPRINKLER IRRIGATION

Sprinkler irrigation is a method of watering crops and landscapes by spraying water through a system of pipes and rotating nozzles that mimic natural rainfall. This system distributes water evenly over a large area, making it suitable for various types of soil and crops. Sprinkler irrigation is especially effective for irrigating uneven terrain where traditional methods may not work well. It helps in maintaining consistent soil moisture, promoting healthy plant growth. However, it can lead to water loss through evaporation and wind drift, so it's most effective when used during cooler parts of the day or in less windy conditions.

Key product standards on Sprinkler Irrigation

IS 12232 : Part 1 : 1996/ISO 7749-1 : 1995 Irrigation equipment — Rotating sprinkler: Part 1 Design and operational requirements (*first revision*)

Sprinklers are irrigation devices that spray water through the air to water plants, crops, or grass. They consist of pipes and rotating nozzles that distribute water like rainfall, helping maintain soil moisture. **IS 12232 (Part 1**) specifies the design and operational requirements of rotating sprinklers and sprinkler nozzles for sprinkler irrigation system. It also covers the test methods to evaluate the performance of these sprinklers. The standard is applies to sprinklers intended for assembly in pipeline networks for irrigation and operation at the pressures recommended by the manufacturer.

IS 17425 : 2020 Irrigation Equipment — Quick Coupled Polyethylene Pipes and Fittings for Sprinkler Irrigation Systems — Specification

A vital component of MIS is the piping network, which transports water from the source to the sprinkler heads. Proper sizing, material selection, and installation of pipes are crucial to minimize pressure losses and optimize water distribution. IS 17425 lays down the general requirements for raw materials, manufacturing, method of tests and testing of quick coupled and plain polyethylene pipes and fittings of outside diameters 40 mm to 200 mm [working pressure 0.25 MPa, 0.32 MPa, 0.40 MPa and 0.60 MPa) used for portable sprinkler and drip irrigation systems as mains, sub mains or laterals. It covers requirements for sprinkler pipes, Quick Coupled Sprinkler Pipe, Male Coupler Female Coupler, etc.,

IS 14605 : 1998 Irrigation Equipment — Micro Sprayers — Specification

Micro sprayers are type of sprinklers used to deliver water to the crops as a fine spray or mist, ensuring efficient coverage with minimal water wastage. IS 14605 specifies the general requirements and test methods for micro sprayers. It applies to sprayers intended for assembly in pipeline networks for irrigation and for operation with irrigation water.

IS 18286 : 2023 Agricultural Irrigation Equipment — Manually Operated Serviceable Plastics Valves — Specification

Valves in irrigation systems are essential components used to control the flow and distribution of water. They help regulate water supply, direct it to specific zones, and enable efficient operation of the system. IS 18286 specifies the general requirements and test methods for manually operated serviceable plastics valves intended for operation in agricultural irrigation systems. It is applicable to manually operated plastics valves of diameter nominal (DN) 8 (1/4") to diameter nominal 110 (4") including angle, globe, diaphragm and ball valves.

4 FILTERS

Filters are an essential component of micro-irrigation systems, designed to ensure clean and clog-free operation by removing debris, sediments, and other impurities from water before it enters the irrigation network.

Key product standards on filters

IS 14743 : 2024 Irrigation equipment - Hydrocyclone filters - Specification (f*irst revision*)

Hydrocyclone filter is an essential component of micro-irrigation system used to separate sand from the river or tube-well water. It works on the principle of centrifugal force. it is also called centrifugal filter/sand separator. **IS 14743** covers the general constructional requirements and test methods for hydrocyclone filters, intended for operation in agricultural irrigation systems, however the standard does not deal with filtration ability, efficiency and capacity nor it deals with the hydrocyclone filters that integrate automatic or continued flushing of accumulated sand.

IS 14606 : 2022 Irrigation Equipment — Granulated Media Filters — Specification (f*irst revision*)

Media Filters also called as sand filters uses a bed of sand or granular media to trap particles/impurities, making them ideal for water sources with high organic loads, such as ponds or reservoirs. IS 14606 specifies construction and testing requirements for granulated media filters used in agricultural irrigation. It covers both manually cleaned and automatic self-cleaning filter systems (called as batteries). The standard applies to single units, complete systems, and multi-unit filter batteries. It defines inlet, outlet, and backflush connections for proper system function. Operation and performance of valves, backwash mechanisms, under-drains, and manifolds. However, it only applies to pressurized filters and does not cover filtration efficiency or capacity

IS 12785 : 1994 Irrigation equipment — Strainer-type filters— Specification (*first revision*)

Strainer type Filters use a fine mesh, screen, disc or combination of these to trap debris/impurities contained in the irrigation water to prevent clogging in micro-irrigation systems.

IS 12785 specifies the general construction requirements and test methods for strainer type filters (screen and disc filters) intended for operation in agricultural irrigation systems.

5 FERTIGATION

Fertigation is the process of delivering fertilizers/chemicals or nutrients directly to crops through an irrigation system. It ensures precise nutrient application, enhancing plant growth and minimizing waste.

The application of fertilizer or/and other chemicals via irrigation water to crops/plants is based on the principle that a swiftly moving stream of water is able to carry with it the dissolved substances and fine dispersed suspended particles of fertilizer material. **Venturi injector**, **injector pump**, **fertilizer tank** are such equipment used for this purpose

S.No.	IS No.	Title
1.	**IS 14483 (Part 1) : 2024**	Fertilizer and chemical injection system Part 1 Venturi injector — Specification (f*irst revision*)
2.	**IS 14483 (Part 2) : 2025**	Fertilizer and chemical injection system: Part 2 Water-driven chemical injector pump — Specification
3.	**IS 14483 (Part 3) : 2018**	Fertilizer and chemical injection system: Part 3 Fertilizer tank — Specification

Key product standards on fertigation systems

IS 14483 (Part 1) : 2024 Fertilizer and chemical injection system Part 1 Venturi injector — Specification (f*irst revision*)

Venturi Injector is an appliance used for fertigation or chemigation, chlorinating or injecting chemicals in the sprinkler and drip irrigation systems. It operates by converting pressurized fluid into a high-velocity jet, creating low pressure in the injection chamber. This pressure drop enables the suction of an additive liquid. The liquid then mixes with the main fluid stream for injection. IS 14483 (Part 1) prescribes the requirements and test method for venturi injectors used for injecting fertilizer and chemicals in the sprinkler and drip irrigation systems.

IS 14483 (Part 2) : 2025 Fertilizer and chemical injection system: Part 2 Water-driven chemical injector pump — Specification

Water-driven chemical injector pumps are used to inject chemicals into irrigation systems. The chemicals include liquid fertilizer, solutions of fertilizers and other soluble agricultural chemicals such as acids and pesticides. IS 14483 (Part 2) specifies the construction, operational requirements, and testing methods for water-driven chemical injector pumps. These

pumps are designed to operate with water temperatures up to 50°C and are suitable for use with the types and concentrations of chemicals commonly applied in irrigation systems.

IS 14483 (Part 3) : 2018 Fertilizer and chemical injection system: Part 3 Fertilizer tank — Specification

Fertilizer Tank is a component of fertigation systems used to mix and inject liquid or soluble fertilizers into irrigation water working on the principle of differential pressure. IS 14483 (Part 3) outlines the mechanical and functional requirements for fertilizer tanks used in irrigation systems. It includes test methods and the information manufacturers must provide to ensure proper installation and field operation. The standard applies to differential pressure-based fertilizer tanks and the fittings used to connect them to irrigation system

6 CODE OF PRACTICES

IS 14791 : 2024 Prevention and treatment of blockage problem in drip irrigation system — Code of practice (*first revision*)

IS 14791 standard specifies the guidelines for prevention and treatment of blockage problems in drip irrigation system. It provides guidelines on Quality of Water to be supplied, Chemical Injection System Installed with Drip irrigation systems (DIS), Different Blockage Problems associated with DIS, Method of Assessment of blockage problems., Prevention and treatment of blockage problem and Safety Requirements.

IS 14792: 2000 Irrigation equipment — Design, installation and operation of sprinkler irrigation systems — Code of practice

IS 14792 provides guidelines for the design, installation, and operation of sprinkler irrigation systems intended for use in agricultural lands, orchards, lawns, and landscaped areas. The standard ensures efficient water use by specifying proper system setup and performance. It helps achieve uniform water distribution and promotes healthy plant growth.

IS 11624 : 2019 Quality of irrigation water — Guidelines (*first revision*)

The quality of irrigation water is important because it directly affects crop growth, soil health, and overall agricultural productivity. Poor-quality water can introduce salts, toxins, or harmful elements into the soil, leading to reduced crop yields, soil degradation, and long-term fertility issues. Proper water quality ensures efficient nutrient uptake, sustainable farming practices, and minimizes environmental damage. The quality of irrigation water is evaluated in terms of degree of harmful effects on soil properties with respect to the soluble salts it contains in different concentrations and crop yield. IS 11624 prescribes the guidelines for assessing the quality of irrigation water. It covers water quality rating in relation to soil type, rainfall, crop tolerance to salts, based on boron content, etc.,