मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS ON

PVC PIPES & FITTINGS

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Introduction

PVC Plastic Pipes have fundamentally transformed modern infrastructure, offering versatile, durable, and cost-effective solutions for fluid conveyance across a wide range of applications—potable water distribution, wastewater disposal, agricultural irrigation, underground sewerage, telecommunication ducting, and industrial services.

With increasing emphasis on sustainability, efficiency, and health safety, thermoplastic pipes such as Unplasticized PVC (UPVC), Chlorinated PVC (CPVC), and Flexible PVC have emerged as the materials of choice, replacing traditional systems made from galvanized iron, cast iron, asbestos cement, and steel. This compendium provides a comprehensive reference to key Indian Standards for plastic pipes and fittings, catering to the needs of engineers, architects, infrastructure developers, manufacturers, and quality assurance professionals.

Plastic pipes are widely used due to their

- **Corrosion and Chemical Resistance**

Plastic pipes are inherently resistant to most chemicals, acids, and alkaline substances. Unlike metal pipes, they do not corrode, scale, or react with water, making them ideal for potable water supply, chemical transfer, and agricultural uses.

- **Lightweight and Easy to Install**

The low density of plastic makes these pipes easy to transport, handle, and install—reducing manpower needs, cutting installation time, and eliminating the requirement for heavy equipment. This is especially advantageous in rural or remote areas.

- **Smooth Internal Surface**

The low roughness coefficient results in reduced friction loss, which means better water flow at lower energy consumption—translating to energy efficiency in pumping systems.

- **Thermal and Electrical Insulation**

UPVC and CPVC pipes are poor conductors of heat and electricity, making them safe for hot water systems and underground electrical/telecom conduit systems.

- **Customizable and Versatile**

Available in various grades, sizes, pressure ratings, and flexibility levels, plastic pipes are suited for custom applications—whether you need high-pressure transmission, flexibility for dynamic loads, or non-pressure sewer lines.

- **Cost-Effective and Long Life**

With minimal maintenance, plastic pipes offer a service life of 30 to 50 years or more under normal conditions, significantly reducing the life-cycle cost of pipeline infrastructure.

Applications of Piping Standards

- Potable Water Supply – Household and municipal networks for safe drinking water
- Hot and Cold Water Distribution – In-building plumbing systems, kitchens, geyser lines
- Drainage and Sewerage Systems – Internal soil/waste pipes and underground non-pressure sewer lines

- Borewells and Groundwater Extraction – Casing and screen pipes for tube wells
- Agricultural Pump Lines – Suction and delivery hoses for irrigation pumps
- Telecom and Utility Ducts – Protective conduits for underground communication cables
- Stormwater and Subsoil Drainage – Corrugated and flexible pipe systems in infrastructure projects

Applicable Indian Standards for PVC Pipes

Here is the complete list of IS codes applicable to the types of PVC pipes and fittings covered:

1.**IS 4985:2021-** Unplasticized PVC Pipes for Potable Water Supplies – Specification
2.**IS 9271:2004**– Unplasticized Polyvinyl Chloride (UPVC) Single Wall Corrugated Pipes for Drainage – Specification
3.**IS 12231: 1987**– Specification for Unplasticized PVC Pipes for Use in Suction and Delivery Lines of Agricultural Pump Sets
4.**IS 12818: 2010-** Unplasticized Polyvinyl Chloride (PVC-U) Screen and Casing Pipes for Bore/Tubewells – Specification
5.**IS 13592:2013**– Unplasticized Polyvinyl Chloride (PVC-U) Pipes for Soil and Waste Discharge System Inside and Outside Buildings Including Ventilation and Rain Water System – Specification
6.**IS 14787:2000**-Unplasticized PVC Pipes (Ducts) and Fittings for Underground Telecommunication Cable Installation – Specification
7.**IS 15265:2003**-Flexible PVC Pipes or Polymer Reinforced Thermoplastic Hoses for Suction and Delivery Lines of Agricultural Pumps – Specification
8.**IS 15328:2003**-Unplasticized Non-Pressure Polyvinyl Chloride (PVC-U) Pipes for Use in Underground Drainage and Sewerage Systems – Specification
9.**IS 15778:2007**– Chlorinated Polyvinyl Chloride (CPVC) Pipes for Potable Hot and Cold Water Distribution Supplies – Specification

As India moves toward sustainable and scalable infrastructure, the adoption of thermoplastic piping systems is crucial. This compendium serves as a quick-access resource for selecting and applying the right piping standards related to PVC Pipes and fittings, empowering stakeholders to build systems that are safe and efficient.

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IS 4985 :2021 Unplasticized PVC Pipes for Potable Water Supplies - Specification

Scope:

This standard covers requirements for plain as well as socket-ended pipes, including those for use with elastomeric sealing rings, for potable water supplies, including agricultural applications.

This standard does not cover unplasticized PVC pipes for use in suction and delivery lines of agricultural pumps, which have been covered in IS 12231.

The pipes covered here are not suitable for use as casing pipes in tube wells. Such pipes are covered in IS 12818.

Key Provisions

Classification:

- Pipes are categorized based on their pressure ratings and applications:

Class of Pipe | Working Pressure (PN)-Class 1: 0.25 MPa, Class 2: 0.4 MPa, Class 3: 0.6 MPa , Class 4: 0.8 MPa (8.0 kg/cm^2),Class 5: 1.0 MPa, Class 6: 1.25 MPa.

- Pipes shall be classified based on their application as follows: a) Type A — Pipes for water supply; and b) Type B — Pipes for agricultural use

As per IS 4985:2021, UPVC pipes must be manufactured from virgin unplasticized PVC with approved additives (per IS 10148), allowing only the manufacturer's own rework material and prohibiting external recycled content. The standard details dimensions for outside diameter, wall thickness, socket geometry, and effective lengths. Pipes may be joined using either solvent cement or elastomeric sealing rings, with clear specifications for engagement depth and socket dimensions. Performance requirements include smooth, defect-free surfaces, opacity and non-toxicity. Pipes must also pass thermal and chemical resistance tests, such as a Vicat softening point, reversion, and sulphated ash content

Uses: Potable water and agricultural applications

IS 9271:2004
Unplasticized Polyvinyl Chloride (UPVC) Single Wall Corrugated Pipes for Drainage – Specification

Scope:

This standard specifies the requirements and test methods for UPVC single wall corrugated pipes, both perforated and non-perforated, used for surface and sub-surface drainage systems.

Key Provisions:

Types

Classifies pipes into perforated and non-perforated types based on intended application

Performance requirements

The UPVC single wall corrugated pipes must conform to a series of physical performance criteria to ensure their durability and suitability for drainage applications. A key requirement is pipe stiffness, which must be verified through load-deflection testing. The requirements collectively ensure that the pipes are structurally sound, weather-resistant, and reliable under varied field conditions.

Uses: agricultural drainage, interceptor drains, road and highway drainage, and construction site dewatering.

IS 12231: 1987
Specification for Unplasticized PVC Pipes for Use in Suction and Delivery Lines of Agricultural Pump Sets

Scope:

This Indian Standard specifies the technical requirements for plain-end unplasticized polyvinyl chloride (UPVC) pipes used in suction and delivery lines of agricultural pump sets, which are often exposed to atmospheric conditions and sunlight.

Key Provisions

Types

Classifies pipes by pressure rating and color:

- Type 1W: 0.4 MPa (blue)
- Type 2W: 0.6 MPa (green)

Requirement: These tests ensure the pipe meets performance standards for large-scale agricultural use, verifying its durability under varying environmental conditions, resistance to mechanical stress, chemical exposure, and long-term reliability in field operations

IS 12818: 2010 Unplasticized Polyvinyl Chloride (PVC-U) Screen and Casing Pipes for Bore/Tubewells - Specification

Scope:

The is standard covers the requirements of ribbed screen, plain screen and plain casing pipes of nominal diameter 35 mm to 400 mm, produced from unplasticized polyvinyl chloride for bore/tubewells for water supply.

Key Provisions

Types and Classifications of Pipes

a. Types of Pipes

Screen Pipes: Used in the water-bearing zone; provided with slots for water intake.

- Ribbed: RMS (Ribbed Medium Screen), RDS (Ribbed Deep Screen)
- Plain: PMS (Plain Medium Screen), PDS (Plain Deep Screen)

Casing Pipes: These form the structural lining of the borehole, providing support and preventing the collapse of surrounding soil into the bore. They are unslotted, solid-wall pipes.

b. Classifications by Depth

Class	Type	Suitable Depth
CS	Shallow	Up to 80 m
CM	Medium	80 to 250m
CD	Deep	250 to 450m

Performance Requirements:

These pipes are subject to a series of critical performance and mechanical tests including thermal resistance, tensile strength, to ensure their suitability for use in bore and tubewells The pipe must not alter the chemical composition or sensory quality of the water; thus, it must not leach toxic or undesirable substances, ensuring compliance with standards for safe potable water use.

These pipes provide a reliable, cost-effective, and sustainable solution for groundwater extraction essential to India's agriculture and drinking water supply. IS 12818:2010 ensures this through strict provisions on material quality, dimensional accuracy, leak-proof joints, and performance tests for strength, durability, and water safety.

IS 13592 :2013 Unplasticized Polyvinyl Chloride (PVC-U) Pipes for Soil and Waste Discharge System Inside and Outside Buildings Including Ventilation and Rain Water System - Specification

Scope:

This standard covers requirements for plain and socket end unplasticized polyvinyl chloride (PVC-U) pipes with nominal outside diameters 40 mm to 315 mm for use for soil and waste discharge system inside and outside buildings including ventilation, rain water and rain water harvesting applications.

Key Provisions

Classifications of Pipes Classifies the pipes into two types: Type A, intended for ventilation and rainwater systems, and Type B, for soil and waste discharge systems.

Performance Requirements

This standard lays down requirements for material composition, dimensions, wall thickness, and performance tests. Additional tests such as effect on sunlight, stress relief, resistance to sulphuric acid, axial shrinkage, and tensile strength are included to address Indian environmental conditions.

Uses: Soil and Waste Discharge system, ventilation, rain water and rain water harvesting

IS 14787 :2000 Unplasticized PVC Pipes (Ducts) and Fittings for Underground Telecommunications Cable Installation

Scope:

This Indian Standard covers the requirements of unplasticized polyvinyl chloride (UPVC) pipes and fittings used as cable ducts for underground telecommunications cable installations.

Key Provisions

Pipes are categorized based on nominal outside diameter and installation method:

- CL 110A: For encasement in cement concrete
- CL 110B: For burial in sand
- CL 50: For encasement in cement concrete or for burial in sand

Performance Requirement:

The mechanical performance requirements for unplasticized PVC cable ducts ensure durability and structural integrity under underground installation conditions which includes adequate stiffness, crush resistance and recovery, heat distortion resistance, bending test among others. Pipes must resist salt, acid, and alkali exposure also.

Fittings:

Includes specifications for sockets and bends (30°, 45°, 60°, 90°), which must match the pipe class in material and performance.

Uses: For underground telecommunications cable installations

IS 15265: 2003
Flexible PVC Pipes or Polymer Reinforced Thermoplastic Hoses for Suction and Delivery Lines of Agricultural Pumps

Scope:

This Indian Standard specifies the technical requirements for flexible PVC pipes or polymer-reinforced thermoplastic hoses for suction and delivery lines of agricultural pump systems. The standard excludes hoses intended for conveying flammable or combustible materials and aromatic solvents.

Key Provisions

Performance Requirements

The hoses must demonstrate robust hydrostatic performance, resist cracking, remain flexible and show resistance to thermal and UV exposure.

Jointing and Installation:

Guidelines are provided for push-fit jointing using heated water and hose clamps for field installations.

Uses: Suction and delivery lines of agricultural pumps

IS 15328: 2003
Unplasticized Non-Pressure Polyvinyl Chloride (PVC-U) Pipes for Use in Underground Drainage and Sewerage Systems

Scope:

This Indian Standard specifies the requirements unplasticized PVC (PVC-U) pipes used for underground non-pressure gravity drain and sewer systems. These pipes are intended for the conveyance of domestic sewage, surface (storm) water, and industrial effluents. The standard covers pipes with nominal outside diameters ranging from 110 mm to 630 mm, which may be plain-ended or fitted with integral sockets for jointing by solvent cement or elastomeric sealing rings. In the case of industrial effluents, chemical and temperature resistance must be ensured.

Key provisions

Performance Testing

- Pipes undergo comprehensive performance testing to ensure reliability in underground drainage and sewerage systems including leak-tightness, ring stiffness tests, impact resistance, and Vicat softening temperature
- These pipes offer a reliable, durable, and leak-proof solution for underground drainage and sewerage systems, ensuring long-term performance under varied soil and environmental conditions.

Uses: Underground (buried) non pressure gravity drain and sewer applications for transportation of soil and waste discharge, surface water (storm water) and industrial effluent.

IS 15778: 2007
Chlorinated Polyvinyl Chloride (CPVC) Pipes for Potable Hot and Cold Water Distribution Supplies - Specification

Scope:

The Indian Standard IS 15778:2007 specifies the requirements for chlorinated polyvinyl chloride (CPVC) pipes used for potable hot and cold water distribution systems. The standard covers:

- Pipes made of CPVC material, suitable for temperatures up to 82°C.

Key Provisions

Classification:

Pipes are classified by working pressure at 27°C and 82°C under three pressure classes (SDR 11, 13.5, and 17).

This standard outlines the material composition, dimensions, wall thickness, and required performance tests. Performance tests are defined to ensure mechanical strength, thermal stability, and durability.

FITTINGS

Plastic pipe fittings are molded or fabricated components used to connect, redirect, branch, or terminate sections of plastic piping systems. These fittings include bends, tees, reducers, couplers, elbows, and adaptors—designed to ensure leakproof, pressure-resistant, and long-lasting fluid conveyance in varied systems. They play a critical role in maintaining hydraulic integrity, ensuring easy system assembly, and enabling future modifications or repairs.

The adoption of thermoplastics like Unplasticized PVC (UPVC), Chlorinated PVC (CPVC), and Flexible PVC has significantly advanced the design of fittings, enabling them to be fabricated or injection moulded in various configurations and pressure classes. Unlike traditional metal fittings, plastic fittings are lightweight, non-corrosive, chemically inert, and easy to install—making them ideal for rural, urban, and industrial projects alike. Their versatility and longevity contribute to lower lifecycle costs, ease of maintenance, and greater resilience in both aboveground and underground installations.'

Applicable Indian Standards for Fittings

1. IS 13593:1992 UPVC Pipe Fittings for Use with the UPVC Pipes in the Suction and Delivery Lines of Agricultural Pumps - Specification.
2. IS 14735:1999 UPVC Injection Moulded Fittings for Soil and Waste Discharge Systems - Specification
3. IS 17546:2021CPVC Fittings for Potable Hot and Cold Water Distribution Supplies - Specification
4. IS 7834 (Part 1 to 8):1987 Injection Moulded PVC Socket Fittings with Solvent Cement Joints - Specification
5. IS 10124 (Part 1 to 13):2009 Fabricated PVC-U Fittings for Potable Water Supplies - Specification

This compendium presents key Indian Standards (IS codes) applicable to plastic pipe fittings that align with modern infrastructure requirements. It serves as a quick-reference guide for engineers, planners, manufacturers, and quality inspectors, ensuring compliance with BIS-certified designs and practices.

IS 13593: 1992
UPVC Pipe Fittings for Use with the UPVC Pipes in the Suction and Delivery Lines of Agricultural Pumps -Specification

(Reaffirmed in 2022)

Scope:

This standard specifies the requirements for UPVC pipe fittings used in conjunction with UPVC pipes as per IS 12231 used in suction and delivery lines of agricultural pumps.

Types of Fittings

The fittings include couplers, 90° bends, end pieces (or tail pieces), reducer couplers, male threaded pieces (MTPs), female threaded pieces (FTPs), reducer threaded pieces, and end piece rings. These fittings are not interchangeable with standard UPVC fittings used in potable water systems due to the special service conditions they are subjected to.

Performance Requirements

Fittings must pass a vacuum test and a hydrostatic pressure test.

They provide reliable connectivity and long-term service in suction and delivery lines.

IS 14735: 1999
Unplasticized Polyvinyl Chloride (UPVC) Injection Moulded Fittings for Soil and Waste Discharge System for Inside and Outside Buildings Including Ventilation and Rain Water System - Specification

(Reaffirmed in 2024)

Scope:

This Standard specifies the requirements for unplasticized polyvinyl chloride (UPVC) injection-moulded fittings used in soil and waste discharge systems for both inside and outside buildings, including applications for ventilation and rainwater systems covered in IS 13592.

Key Provisions

Types of Fittings

The standard covers various fittings including tees (87.5°), wyes (45°), bends (87.5°, 45°, 22°), reducers, couplers, socket plugs, cleansing pipes, adaptors, vent cowls, pipe clips, and waste traps with strainers (nahani traps).

The tests specified in IS 14735 ensures that UPVC injection moulded fittings for soil, waste, ventilation, and rainwater systems are dimensionally accurate, UV resistant, and mechanically durable.

IS 17546: 2021
Chlorinated Polyvinyl Chloride (CPVC) Fittings for Potable Hot and Cold Water Distribution Supplies- Specification

Scope:

This standard specifies the material requirements, dimensions, test methods, inspection, and marking for injection moulded CPVC fittings used in hot and cold potable water distribution systems, with service temperatures up to 82°C. The fittings are intended for use with CPVC pipes conforming to IS 15778, and include fittings for solvent cement joints, mechanical joints, and fittings with incorporated inserts.

Key Provisions

Classification of Fittings

Fittings are classified based on Standard Dimension Ratio (SDR) and working pressure. SDR 11 fittings (15–50 mm) are rated for 2.76 MPa at 27°C and 0.68 MPa at 82°C, while SDR 17 fittings (65–150 mm) are rated for 1.73 MPa at 27°C and 0.42 MPa at 82°C. These fittings are suitable for water temperatures between 1°C and 82°C.

The requirements specified in IS 17546 ensures that CPVC fittings used in potable hot and cold-water systems meet stringent thermal, mechanical, and chemical safety standards, providing long-term durability and hygienic performance for building water supply networks.

IS 7834 Part 1-8: 1987 Specification for Injection Moulded PVC Socket Fittings with Solvent Cement Joints for Water Supplies

(Reaffirmed in 2024)

Part 1- General Requirements

Scope

This standard covers the general requirements for unplasticized polyvinyl chloride (UPVC) fittings intended for use in potable water supply systems. These fittings are used for jointing with UPVC pipes conforming to IS 4985. The standard applies to fittings manufactured by injection moulding or by fabrication from pipes and molded components.

Key Provisions

This standard covers various types of fittings including moulded and fabricated ones such as elbows, tees, reducers, end caps, couplers, and flanged adaptors

Physical Properties:

Fittings must satisfy specific physical properties, including minimum strength, pressure resistance, and impact performance, and must successfully pass hydrostatic pressure tests, Vicat softening temperature, and impact strength at 0°C.

Jointing Methods:

For jointing methods, solvent cement joints or elastomeric sealing ring joints are allowed, in accordance with IS 4985 guidelines.

Part 2 Specific Requirements for 45 Degrees Elbows

Scope

This standard specifies the manufacturing requirements, dimensions, tolerances, and marking for 45° elbow fittings made from injection moulded PVC designed for water supply systems using solvent cement joints.

IS 7834 Part 1-8: 1987 Specification for Injection Moulded PVC Socket Fittings with Solvent Cement Joints for Water Supplies

(Reaffirmed in 2024)

Part 3 Specific Requirements for 90 Degree elbows

Scope

This standard specifies the manufacturing requirements, dimensions, tolerances, and marking for 90° elbow fittings made from injection moulded PVC, intended for use in water supply systems with solvent cement joints.

Part 4 Specific Requirements for 90 Degree Tees

Scope

This standard specifies the manufacturing requirements, dimensions, tolerances, and marking for 90° tee fittings made from injection moulded PVC, designed for use in water supply systems with solvent cement joints

Part 5 Specific Requirements for 45 degree Tees

Scope

This standard specifies the manufacturing requirements, dimensions, tolerances, and marking for 45° tee fittings made from injection moulded PVC, designed for use in water supply systems with solvent cement joints

Part 6 Specific Requirements for Sockets

Scope

This standard specifies the manufacturing requirements, dimensions, tolerances, and marking for straight socket fittings made from injection moulded PVC, intended for use in water supply systems using solvent cement joints.

IS 7834 Part 1-8: 1987 Specification for Injection Moulded PVC Socket Fittings with Solvent Cement Joints for Water Supplies

(Reaffirmed in 2024)

Part 7 Specific Requirements for Unions

Scope

This part of IS 7834 specifies the technical requirements for PVC union fittings manufactured by injection moulding and intended for use in water supply systems with solvent cement joints. It covers aspects such as the product's dimensions, tolerances, and identification criteria.

Part 8 Specific Requirements for Caps

Scope

This part of IS 7834 specifies the technical requirements for caps made of injection moulded PVC for water supplies. It covers aspects such as the product's dimensions, tolerances, and marking requirements.

IS 10124 Part 1-13: 2009 Fabricated PVC-U Fittings for Potable Water Supplies - Specification: Part 1 General Requirements

Part 1- General Requirements

Scope

This standard covers the general requirements for unplasticized polyvinyl chloride (PVC-U) fabricated fittings intended for use in potable water supply systems. These fittings are designed for jointing with PVC pipes conforming to IS 4985, using either solvent cement or elastomeric sealing ring joints. The standard applies to fittings manufactured by fabrication from pipes and moulded components and covers nominal sizes ranging from 20 mm to 630 mm.

IS 10124 is a multi-part standard covering different types of fabricated PVC-U fittings used in piping systems for drinking water. The standard ensures structural integrity, hydraulic performance, and compatibility with piping systems.

Key provisions

Jointing Methods

Jointing is permitted by: Solvent cement welding, or Elastomeric sealing ring joints These methods must comply with specifications to ensure leak-proof and pressure-tight assemblies in service.

Fabricated PVC-U fittings covered under IS 10124 (Part 1) ensure durability, pressure performance, safety, and reliability for potable water applications. By adhering to stringent material, dimensional, and testing standards, these fittings provide secure and leak-proof joints, essential for the long-term performance of water supply systems.

Part 2 Specific Requirements for Sockets

Scope

This Indian Standard provides the specific technical requirements for fabricated PVC-U sockets used in potable water supply systems. It supports jointing with unplasticized PVC pipes conforming to IS 4985, using either solvent cement or elastomeric sealing ring joints. The standard aims to ensure consistency in manufacturing, compatibility with pipes, and reliability in pressurized water networks.

IS 10124 Part 1-13: 2009 Fabricated PVC-U Fittings for Potable Water Supplies - Specification: Part 1 General Requirements

Part 3 Specific Requirements for Straight Reducers

Scope

This Indian Standard provides the technical specifications for fabricated PVC-U straight reducers used in potable water supply systems. It defines the requirements for manufacture, dimensions, and marking of reducers used to connect pipes of different diameters made as per IS 4985.

Part 4 Specific Requirements for Caps

Scope

This Indian Standard specifies the technical requirements for fabricated PVC-U end caps used in potable water supply systems. These caps are designed to close the end of pipes conforming to IS 4985, and the standard covers their manufacture, dimensions, and marking.

Part 5 Specific Requirements for Equal Tees

Scope

This Indian Standard provides the technical specifications for fabricated PVC-U equal tees used in potable water supply systems. It defines the requirements for manufacture, dimensions, and marking of fittings that connect three pipes of equal diameter in a "T" configuration, intended for use with pipes conforming to IS 4985.

Part 6 Specific Requirements for Flanged Tail Pieces with Metallic Flanges

Scope:

This Indian Standard provides the technical specifications for fabricated PVC-U flanged tail pieces with metallic flanges, used in potable water supply systems. The standard outlines requirements for manufacture, dimensions, and marking of these fittings, which are intended for use with pipes conforming toIS 4985.

IS 10124 Part 1-13: 2009 Fabricated PVC-U Fittings for Potable Water Supplies - Specification: Part 1 General Requirements

Part 7 Specific Requirements for Threaded Adaptors

Scope

This Indian Standard provides the technical specifications for fabricated PVC-U threaded adaptors used in potable water supply systems. It defines the requirements for manufacture, dimensions, and marking of threaded adaptors that allow connection between PVC-U pipes and threaded fittings.

Part 8 Specific Requirements for 90 Degree Bends

Scope

This standard outlines the technical requirements for fabricated 90° bends made from unplasticized PVC (PVC-U) used in potable water supply systems. It applies to bends intended for use in stationary pipeline installations, with options for plain or socketed ends and elastomeric sealing ring joints.

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Part 9 Specific Requirements for 60 Degree Bends

Scope

TThis standard outlines the technical requirements for fabricated 60° bends made from unplasticized PVC (PVC-U) for use in potable water supply systems. It includes provisions for both plain-ended and socketed bends, including those fitted for elastomeric sealing ring joints.

Part 10 Specific Requirements for 45 Degree Bends

Scope:

This standard outlines the technical requirements for fabricated 45° PVC-U bends used in potable water supply systems. It applies to bends for stationary installations and includes both plain and socketed end configurations, including joints using elastomeric sealing rings

IS 10124 Part 1-13: 2009 Fabricated PVC-U Fittings for Potable Water Supplies - Specification: Part 1 General Requirements

Part 11 Specific Requirements for 30 Degree Bends

Scope

This standard specifies the technical requirements for the manufacture, dimensions, and marking of fabricated 30° bends made from unplasticized PVC (PVC-U) used in potable water supply systems. It applies to both plain-end and elastomeric sealing ring joint types.

Part 12 Specific Requirements for 22½ Degree Bends

Scope

TThis standard specifies the technical requirements for the manufacture, dimensions, and marking of fabricated 22 ½° bends made from unplasticized polyvinyl chloride (PVC-U), intended for use in potable water supply systems. It applies to both plain-end and elastomeric sealing ring joint fittings.

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Part 13 Specific Requirements for 11¼Bends

Scope

This standard specifies the requirements for manufacture, dimensions, and marking of fabricated 11¼° PVC-U bends used in potable water supply systems. It includes both plain-end fittings and those with elastomeric sealing ring joints

IS 12235 (Part 1-19): 2004 Thermoplastics Pipes and Fittings - Methods of Test

Part 1 Measurement of dimensions

Scope

This standard outlines standardized methods for the measurement of dimensional parameters of thermoplastics pipes and fittings, including those made from unplasticized PVC. It covers procedures for determining:

- Outside diameter (mean and at any point) (using Sliding vernier callipers)
- Wall thickness using various instruments including dial gauge and micrometre.
- Socket length (depth) and internal diameters by using vernier caliper and vernier depth gauge
- Overall pipe length by using Metric, woven metallic or glass fibre tape or steel tape

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Part 2 Determination of Vicat Softening Temperature

Scope

This standard specifies a standardized method for determining the Vicat Softening Temperature (VST) of thermoplastics pipes and fittings.

The VST test determines the temperature at which a thermoplastic material begins to soften under a standard load, indicating its suitability for use in high-temperature environments such as hot water systems or industrial piping.

By identifying the softening point, the test helps verify that pipes and fittings will maintain their shape and mechanical integrity under expected service temperatures.

Part 3 Test for Opacity

Scope

This standard (Part 3) specifies a method for determining the opacity of thermoplastics pipes and fittings. It provides a standardized procedure to measure the percentage of light transmission through the wall of a test specimen, using a light source and photoelectric detection apparatus. The method is applicable to plastics pipes and fittings used in water supply systems, particularly where exposure to visible light may lead to biological growth such as algae. This test help in promoting the use of non-toxic stabilizers and additives in PVC formulations by establishing benchmarks for acceptable contaminant release levels

IS 12235 (Part 1-19): 2004 Thermoplastics Pipes and Fittings - Methods of Test

Part 4 Determining the Detrimental Effect on the Composition of Water

Scope

This standard (Part 4) specifies the method of test for evaluating whether plastics pipes, particularly unplasticised PVC (PVC-U) pipes manufactured as per IS 4985, release toxic or harmful substances into water when in contact over time. The test assesses the leaching of metals such as lead, tin, cadmium, and mercury from the inner surface of the pipe into flowing or stagnant water. It uses a controlled procedure involving multiple extractions under specified temperature and chemical conditions to simulate real-world usage.

Part 5– Longitudinal Reversion

Scope

This standard (Part 5) specifies the methods of test for determining the longitudinal reversion of thermoplastics pipes, which is the tendency of a pipe to shrink or shorten along its length when exposed to elevated temperatures. The test can be performed using either an air oven or a liquid bath (such as polyethylene glycol, glycerol, or mineral oil) maintained at controlled temperatures. The methods apply to various thermoplastics pipe materials including PVC-U, PVC-C, PE, PB, PP, ABS, and ASA with prescribed conditions based on pipe wall thickness and material type.

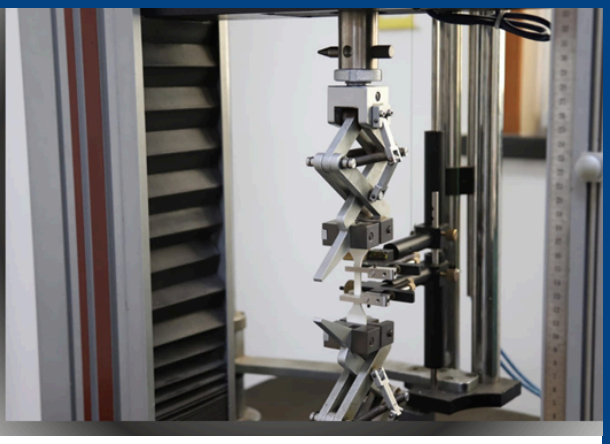
Pipes that exhibit excessive longitudinal reversion may cause fitting or joint problems during installation and service. This test helps identify such risks in advance.

Part 6– Stress Relief Test

Scope

This standard (Part 6) specifies the method of test for the stress relief of thermoplastics pipes and fittings. The test can be performed by exposing specimens to elevated temperatures either in an air oven or by immersion in a thermostatically controlled liquid bath. The method applies to pipe specimens consisting of the full socketed portion with a length of plain pipe, as well as entire fittings.

IS 12235 (Part 1-19): 2004 Thermoplastics Pipes and Fittings - Methods of Test



The test evaluates the ability of thermoplastic pipes and fittings to withstand thermal stress conditions without deformation or failure after exposure to high temperature (150 ± 2°C) for a specified period (1 hour), followed by natural cooling to room temperature. Stress relief testing is critical to ensure the dimensional stability and mechanical integrity of thermoplastics pipes and fittings when subjected to elevated temperatures during processing, storage, or in service conditions.

Part 7– Resistance to Sulphuric Acid Test

Scope

This standard (Part 7) specifies the method of test to evaluate the resistance of thermoplastics pipes and fittings, including those made from unplasticized polyvinyl chloride (PVC-U), to sulphuric acid. The test determines the material's ability to withstand prolonged exposure to a corrosive chemical environment (93 ± 0.5% sulphuric acid) at elevated temperature (55 ± 2°C) over a period of 14 days.

Ensuring resistance to sulphuric acid prevents material degradation, such as softening, swelling, cracking, or loss of mechanical strength, which can lead to leaks or failure.

Part 8 – Resistance to Internal Hydrostatic Pressure, covering

Section 1 (Constant Internal Water Pressure)

Scope:

Specifies the test method to determine the resistance of thermoplastic pipes, including unplasticized PVC (PVC-U) pipes, to constant internal water pressure at a controlled temperature. Applies to pipes intended for fluid conveyance, assessing their ability to withstand continuous internal pressure without failure.

The test helps to evaluate pipe strength and durability under long-term internal pressure, simulating real-life operating conditions. It also provides essential data for pressure rating, design validation, and quality assurance in piping systems.

IS 12235 (Part 1-19): 2004 Thermoplastics Pipes and Fittings - Methods of Test

Section 2: Leak-tightness of Elastomeric Sealing Ring Type Socket Joints Under Positive Internal Pressure and Angular Deflection

Scope:

Defines the test procedure for evaluating the leak-tightness of assemblies made of thermoplastic pipes (including PVC-U) with elastomeric sealing ring type socket joints under internal hydrostatic pressure and angular deflection. Applicable to single sockets of pipes, double sockets, and sockets of fittings, including ductile iron sockets used with PVC-U pipes. This test confirms the integrity and sealing performance of socket joints under pressure while subjected to angular deflections that simulate real-world pipe movements and misalignments.

Section 3: Leak-tightness of Elastomeric Sealing Ring Type Socket Joints Under Negative Internal Pressure and with Angular Deflection

Section 4: Leak-tightness of Elastomeric Sealing Ring Type Socket Joints Under Positive Internal Pressure Without Angular Deflection

Scope

The tests outlined in IS 12235 Part 8 Sections 3 and 4 define standardized methods for assessing the leak-tightness of elastomeric sealing ring type socket joints used in thermoplastics pressure piping systems, including unplasticized PVC (PVC-U) pipes and fittings. These tests cover:

- Leak-tightness under negative internal pressure (vacuum) with angular deflection of the pipe within the socket joint.
- Leak-tightness under positive internal pressure without angular deflection.
- The tests apply to:
- Single and double socket joints of pipes,
- Socket joints of fittings,
- Socket joints made from ductile iron when used with thermoplastics piping.

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Part 9— Resistance to External Blows (Impact Resistance) at 0°C

Scope:

This standard (Part 9) specifies the method of test to evaluate the impact resistance of thermoplastic pipes at low temperature (0°C). The test determines the pipe's ability to withstand sudden mechanical shocks without cracking or breaking, simulating real-world conditions during handling, transportation, and installation. The test helps assess the material's durability and ensures the integrity of piping systems under physical stress.

The test validates pipe quality by estimating the True Impact Rate (TIR), helping manufacturers and users detect batches prone to brittle failure before installation.

Part 10— Determination Of Organotin as Tin Aqueous Solution

Scope

TThis standard (Part 10) specifies the method for the determination of organotin as tin in aqueous solutions extracted from thermoplastic pipes, including unplasticized PVC pipes. It provides a spectrophotometric procedure to quantify tin content, ensuring compliance with safety and quality requirements for pipe materials.

- Ensures accurate detection of organotin content in thermoplastic pipes by using a sensitive spectrophotometric method, helping to monitor and control material safety.
- Validates the chemical safety of pipes by quantifying tin levels, ensuring compliance with environmental and health regulations.
- Minimizes risks related to toxic organotin leaching, protecting public health and maintaining integrity of thermoplastic piping systems.

Part 11—Resistance to Dichloromethane at Specified Temperature

Scope

This standard (Part 11) specifies a method for testing the resistance of unplasticized PVC (PVC-U) pipes to dichloromethane at a specified temperature. The test evaluates the degree of gelation and homogeneity of the pipe material by observing its reaction to chemical exposure under controlled thermal conditions, serving as an indicator of long-term mechanical performance and pressure resistance.

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- Assesses the quality of unplasticized PVC (PVC-U) pipes by determining their resistance to dichloromethane at a controlled temperature, which reflects the degree of gelation and homogeneity of the material.
- Identifies inadequately gelled pipes that may show surface whitening or disintegration, indicating poor manufacturing quality and reduced long-term mechanical performance.
- Reduces risk of failure in pressure pipelines by screening out pipes prone to chemical degradation, thereby enhancing system safety and performance reliability.

Part 12– Determination of Titanium Dioxide Content

Scope

This standard (Part 12) specifies a method for determining the titanium dioxide (TiO_2) content in unplasticized polyvinyl chloride (PVC-U) pipes and fittings. It describes a spectrophotometric procedure for quantifying TiO_2 following controlled ignition and chemical digestion, ensuring the accurate assessment of pigment content in PVC formulations.

- Ensures product consistency by verifying the TiO_2 content used as a pigment and UV stabilizer in PVC-U pipes and fittings.
- Enhances UV resistance by validating that sufficient TiO_2 is present to protect the pipe material from degradation under sunlight exposure.

Part 13– Determination of Tensile Strength and Elongation

Scope

This standard (Part 13) specifies a method for determining the tensile properties of thermoplastic pipes, including unplasticized PVC (PVC-U) pipes. It covers procedures for measuring tensile strength at yield, at break, and percentage elongation, using a universal testing machine under controlled conditions.

- Evaluates mechanical integrity by determining how the pipe material behaves under axial tensile load, which reflects its performance under installation and service conditions.
- Assesses ductility and toughness, helping to identify brittle behavior or material degradation that could compromise pipe performance.

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Part 14– Determination of Density/Relative Density (Specific Gravity)

Scope

This standard (Part 14) specifies a method for determining the density and relative density (specific gravity) of non-cellular thermoplastic pipes and fittings. The method involves using the displacement technique by weighing the specimen in air and in water under controlled conditions.

- Assessment of Quality and Uniformity: Variations in density can signal irregularities in raw materials, manufacturing defects, or improper processing.
- Density directly affects mechanical characteristics such as stiffness and strength, making it a critical parameter in product performance evaluation.

Part 15– Determination of Vinyl Chloride Monomer (VCM) Content

Scope

This standard (Part 15) prescribes a gas chromatographic method for the determination of vinyl chloride monomer (VCM) content in unplasticized polyvinyl chloride (PVC-U) pipes and fittings. The method involves dissolving the sample in NN-dimethylacetamide (DMA), equilibrating in sealed vials at 45°C, and analyzing the headspace vapors for VCM content.

- VCM is a known carcinogen, and its presence in PVC-U products used for water supply or food contact must be strictly controlled. This method helps ensure regulatory and safety compliance.
- The test confirms the adequacy of the polymerization process. High residual VCM indicates incomplete polymerization or poor process control.

Part 16– High Temperature Test

Scope

This standard (Part 16) specifies a test method for evaluating thermoplastics pipes and fittings, including those made of unplasticized PVC (PVC-U), under high temperature conditions. The test detects thermal decomposition effects, such as volatiles, gas bubbles, splits, delamination, or porosity, which may result from poor processing or inadequate formulation.

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Part 17– Determination of Ash and Sulphated Ash Content

Scope

This standard (Part 17) outlines the methods for determining the ash content and sulphated ash content of pipes and fittings made from unplasticized polyvinyl chloride (PVC-U). It includes:

- Method A for general ash content (unsulfated)
- Methods B and C for sulphated ash content, especially where lead-containing stabilizers are present.

These methods are also applicable to PVC resins and compounds.

- Abnormally high or low ash values may indicate excessive filler, decomposition, or loss of organic matrix, guiding troubleshooting of material or processing faults.

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Part 18– Determination of Ring Stiffness

Scope

This standard (Part 18) specifies the method for determining the ring stiffness of thermoplastic pipes, including unplasticized polyvinyl chloride (PVC-U) pipes with a circular cross-section. The test involves compressing a horizontal pipe specimen between two parallel plates at a constant rate and measuring the force and deflection to calculate the ring stiffness. This method applies to pipes subjected to parallel-plate loading and is essential for assessing pipe stiffness under simulated service conditions.

- Determining ring stiffness quantifies the pipe's resistance to external radial loads, which is critical for ensuring structural performance under soil and traffic loads in practical applications.
- Abnormal ring stiffness values may indicate manufacturing defects such as uneven wall thickness, poor material quality, or improper curing, enabling timely corrective actions

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Part 19—Flattening test

Scope

This standard (Part 19) specifies a method for determining the resistance of thermoplastic pipes, including unplasticized polyvinyl chloride (PVC-U) pipes, to damage caused by flattening under load. The test involves compressing pipe specimens between parallel plates until a specified flattening criterion is reached, then inspecting for physical damage such as splitting or cracking.

- The flattening test assesses the pipe's ability to withstand compressive deformation without structural damage, an important factor in handling, transportation, and installation stresses.
- Pipes that pass the flattening test are less likely to fail under external loads or soil pressure, reducing risk of leaks, bursts, or environmental contamination.

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IS 7634 (Part 1):1975
Code of Practice for plastic pipes work for potable water supplies Part 1 Choice of Materials and general recommendation

(Reaffirmed in 2024)

Scope:

This code (Part I) deals with the selection of plastic pipe systems for cold water services up to 37°C and general recommendations applicable to all types of plastic pipe systems using pipes extruded from thermoplastic materials.

Key Provisions

It covers the following materials: Low density Polyethylene (LDPE), High Density Polyethylene (HDPE) and Unplasticized PVC and prescribes comparison of their properties.

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IS 7634 (Part 3):2003 Plastics Pipe Selection, Handling, Storage and Installation for Potable Water Supplies - Code of Practice Part 3 Laying and Jointing of UPVC Pipes

Scope:

This code of practice (Part 3) gives guidance for the proper methods of laying and jointing of unplasticized polyvinyl chloride (UPVC) pipe work for potable water supplies (water mains and services buried in ground and for the conveyance of water above ground for both outside and inside buildings).

This standard is applicable for cold water supplies upto and including 45°C only.

Jointing Techniques:

Covers following types of joints:

a) Solvent welded joints These are permanent in nature and can withstand axial thrust (end-load bearing).

b) Integral elastomeric sealing ring joints,

c) Mechanical compression joints,

d) Flanged joints (for parts made from dissimilar materials)

e) Screwed or threaded joints (for thick walled)

f) Union coupled joints (flanged joint with faces held by screwed connection)

Provisions for transport, handling and storage are also given so that the pipes are not damaged.

Installation Guidelines: Detailed guidelines provided for the following types of installation.

Underground Installation

- Above Ground Installation
- Installation in ducts
- Information on preventing water hammer is also given.
- Repair and maintenance guidelines have also been provided.

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