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IS 7634-1 (1975): Code of practice for plastic pipes work for potable water supplies, Part 1: Choice of materials and general recommendations [CED 50: Plastic Piping System]



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IS 7634 (Part 1) : 1975
(Reaffirmed 2008)

Indian Standard

CODE OF PRACTICE FOR
PLASTICS PIPE WORK FOR POTABLE
WATER SUPPLIES

PART 1 CHOICE OF MATERIALS AND GENERAL
RECOMMENDATIONS

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CODE OF PRACTICE FOR
PLASTICS PIPE WORK FOR POTABLE
WATER SUPPLIES

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RECOMMENDATIONS

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(Continued on page 10)

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AMENDMENT NO. 2 SEPTEMBER 1977

TO

IS:7634(Part I)-1975 CODE OF PRACTICE FOR
PLASTICS PIPE WORK FOR POTABLE
WATER SUPPLIES

PART I CHOICE OF MATERIALS AND
GENERAL RECOMMENDATIONS

Alterations

(Page 4, clause 1.1, line 2) - Delete the words 'up to 37°C'.

(Page 4, clause 3.1.3) - Substitute the following for the existing clause:

"3.1.3 The tensile strength of plastics decreases with increase in temperature and impact strength tends to decrease with decrease in temperature. Thermoplastics in general deform under prolonged loading however small. Such a property of thermoplastics is called, 'cold flow'. Normally to prevent failure due to cold flow, it is advisable not to allow stresses in the pipe due to cold bending particularly when the radius is too short [*see* (Part II) of this code]. Therefore permanent thermoformed bends conforming to relevant Indian Standards on plastics fittings for potable water supplies are recommended to be used."

(Page 4, note under clause 3.1.3) - Delete.

(Page 6, clause 3.3, line 4) - Substitute 'pipe' for 'pump'.

(Page 6, clause 3.4.1, line 1) - Substitute 'plastics' for 'plastic'.

(Page 7, clause 5.1, line 1) - Substitute 'plastics' for 'plastic'.

(Page 8, note under clause 7.4, line 9) - Substitute 'steady' for 'study'.

(BDC 3)

Indian Standard

CODE OF PRACTICE FOR PLASTICS PIPE WORK FOR POTABLE WATER SUPPLIES

PART 1 CHOICE OF MATERIALS AND GENERAL RECOMMENDATIONS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 4 January 1975, after the draft finalized by the Sanitary Appliances and Water Fittings Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The preparation of a code of practice for plastics pipe work for potable water supplies was taken up to make available comparative physical, chemical and mechanical properties of different types of plastic pipes as well as to give guidelines for their selection for different situations arising in practical usage and also to recommend good practices for the installation and jointing and testing of such pipe systems. It is hoped that this code will assist in proper usage of plastic pipes. Part I covers choice of material and general recommendations.

0.2.1 The other parts of the standard are the following:

Part II Laying and jointing polyethylene (PE) pipes

Part III Laying and jointing of unplasticized PVC pipes

0.3 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 practice in the field in this country. This has been met by deriving assistance from BS:CP 312: Part 1: 1973 ' Code of practice for plastics pipe work (thermoplastics material): Part 1 General principles and choice of material '.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 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.

1.2 The code is limited to plastic pipes extruded from thermoplastic materials. In this code wherever the term ' polyethylene ' appears singly, it refers to both low density and high density polyethylene pipes.

2. MATERIALS

2.1 The thermoplastic material generally used for plastic pipe system and the relevant Indian Standards are listed below:

<i>Material</i>	<i>Relevant Indian Standards</i>
a) Low density polyethylene (LDPE)	IS : 3076-1968*
b) High density polyethylene (HDPE)	IS : 4984-1972†
c) Unplasticized PVC	IS : 4985-1968‡

2.2 Visual inspection is necessary for major defects before installation.

3. GENERAL CONSIDERATIONS

3.1 General

3.1.1 Plastic pipes are suitable for conveying water and have certain advantages over metal pipes, such as the resistance to corrosion, light weight, toughness, ease of joining, laying and flexibility.

3.1.2 Some of the plastics are to some extent permeable to many gases and care is thus required in the selection of material to be used and in siting of pipe work to avoid hazards.

3.1.3 The tensile strength of plastics decreases with increase in temperature and impact strength tends to decrease with decrease in temperature. Thermoplastics in general deform under prolonged loading however small. Such a property of thermoplastics is called, ' cold flow '. Normally to prevent failure due to cold flow, it is advisable not to allow stresses in the pipe due to cold bending (*see* Part II of this code). Therefore permanent thermoformed bends are recommended to be used as indicated in the ' draft Indian Standard Specification for moulded PVC socket fittings for potable water supplies ' (*under preparation*) §.

NOTE — The standard is under preparation and till it is published the use of thermoformed bends shall be subject to agreement between the concerned parties.

3.2 Relative Merits of Different Types of Plastics — The merits of different types of plastics relative to one another is given in Table 1.

*Specification for low density polyethylene pipes for potable water supplies (*first revision*).

†Specification for high density polyethylene pipes for potable water supplies (*first revision*).

‡Specification for unplasticized PVC pipes for potable water supplies.

§Since printed as IS : 7834 in eight parts.

TABLE 1 COMPARISON OF PROPERTIES OF PLASTICS PIPE MATERIALS

Sl. No.	CHARACTERISTIC	POLYETHYLENE			UPVC
		LDPE	HDPE		
(1)	(2)	(3)	(4)	(5)	
i)	Chemical resistance	Good all round chemical resistance	Good all round chemical resistance	Good chemical resistance	
ii)	Flexibility	Highly flexible; pipes can be coiled	Less flexible than LDPE, still pipes can be coiled	Relatively rigid	
iii)	Tensile strength	Low	Medium	High	
iv)	Impact strength	Not applicable (highly ductile)	Very good	Fair	
v)	Common jointing method	Insert type joints, compression fittings and threaded joints	Compression fittings, fusion weldings, flanged joints	Solvent welded joints, flanged joints, screwed or threaded joints, rubber ring joints	
vi)	Application	Internal plumbing of buildings, water supply and distribution lines	Underground water supply lines also for plumbing in buildings, flexible water supply connections in buildings, river crossings, highly corrosive applications, mainly and saline areas	For all applications like water services (except for hot water), highly corrosive applications, plumbing in buildings, river crossings, mainly and saline areas	

3.3 Locating Pipes After Laying — Accurate records of laying of plastic pipes are very essential as they cannot be located by conventional electronic pipe locators. However, copper or galvanized wire can be spiralled around, taped to or laid along side the pump during installation to permit the use of locating device.

3.4 Limitations

3.4.1 In house installations plastic pipes cannot be used for electrical earthing being a non-conductive material.

3.4.2 In colder climates plastic pipes cannot be thawed by conventional and electric equipment.

3.4.3 Where pumps are used with plastics, starting and stopping are the occasions when damage may occur. The water hammer causes compression of the water in the pipe and consequently results in stretching of the pipe and where necessary, pressure relief devices should be included in the pipe lines.

3.5 Provision Against Effect of Sunlight — In order to take care of the possible deteriorating effect of direct sunlight on plastic pipes, certain additives, one of which is carbon black or stabilizers are generally incorporated in their manufacture; however, it is advisable to take further precautions by burying such pipes or by laying them in ducts wherever possible or otherwise to prevent direct exposure to sunlight.

4. HYDRAULIC CHARACTERISTICS

4.1 The extrusion and injection moulding processes of manufacturing plastic pipes and fittings respectively ensure very smooth and generally highly polished bores. The effect of this is to give excellent hydraulic characteristics resulting in low frictional losses and high flow capacities.

4.2 Plastic pipes maintain the flow characteristics throughout their life due to resistance to corrosion. For calculation of flow rates using the Hazen-Williams equation, a constant 'C' of 140 (for dia 75 mm and less) and 150 (for dia greater than 75 mm) should be used. The following equation gives approximate values of frictional losses caused by injection moulded plastics fittings:

$$E = F \times D$$

where

E = equivalent pipe length in cm,

D = pipe bore in cm, and

F = constant as given below:

<i>Fitting</i>	<i>Value of Constant 'F'</i>
90° Elbow	21·6
Tee (straight through)	10·8
Tee (through branch)	42·0
Reduced tee (straight through)	21·6
Sweep bend (90°)	10·8
Angle valve	180·0
Globe valve	360·0

5. HANDLING AND STORAGE

5.1 The detailed precautions in handling and storing plastic pipes are given in the appropriate parts (*see* Parts II and III) of this code. There is a tendency for plastic pipes to be abused during handling and storage much more than metal pipes and this should be discouraged and proper care taken since plastic pipes are susceptible to damage.

6. LAYING AND JOINTING

6.1 This aspect of work also has its different requirements as compared to metal pipes and needs different techniques and skills. Details of laying and jointing are given in Part II and Part III of this code.

7. TESTING OF INSTALLATIONS

7.1 All pipe work, fittings and appliances shall be inspected and tested hydraulically after the completion of installation. Before starting any test the system shall be visually inspected to ensure that the recommendations for the correct installation procedure have been complied with, and that the pipe line together with appliances, valves and fittings are laid in the prescribed manner. Solvent welded pipe lines should not be pressure tested until at least 24 hours after the last solvent welded joint has been made.

7.2 All control valves shall be positioned 'open' for the duration of the test and open ends temporarily closed with water-tight fittings. The testing pressure should not be less than one and a half times the rated pressure of the pipe under use.

7.3 Pressure should be applied either by hand pump or power driven pump. Pressure gauges should be correctly positioned and closely observed to ensure that at no time are the test pressures exceeded. The system should be slowly and carefully filled with water, to avoid surge pressure of water hammer. Air vents should be open at all high points so that air may be expelled from the system during filling.

7.4 When the system has been fully charged with water and air displaced from the line, air vents should be closed and the line initially inspected for seepage at joints and the firmness of support under load. Pressure then may be applied until the required test pressure is reached (*see Note*).

NOTE— Thermoplastic pipes expand under pressure to a greater extent than pipes of asbestos cement or cast iron. This expansion is due to low modulus of elasticity of the material and results in initial fall of pressure even though there is no leakage for all the four pressure classification of pipes. The amount of water required to build up a steady test pressure for the plastics pipes is given in Table 2 and Table 3 for polyethylene and PVC pipes respectively. The values are only approximate to give a guideline as variations occur due to temperature fluctuation and variation in test pressure and wall thickness. The time taken to build up approximate study pressure is 12 hours. Without any additional requirement of make up water, the test pressure should not fall more than 0.2 kg/cm² at the end of one hour test duration. This extra quantity of water required is normally termed as make up water.

TABLE 2 MAKE UP WATER REQUIRED WHILE TESTING POLYETHYLENE PIPING

NOMINAL SIZE	LITRE/100 m LINE
mm	
25	1.1
32	1.6
40	2.6
50	4.0
65	5.9
80	8.5
100	16.4
125	26.9

TABLE 3 MAKE UP WATER REQUIRED WHILE TESTING PVC PIPING

NOMINAL SIZE	LITRE/100 m LINE
mm	
50	2.28
75	4.55
100	6.83
125	10.92
150	14.56
180	18.20
200	22.30

7.5 Long lengths of pipes may be tested in convenient sections of 1 000 to 1 500 m length.

8. EFFECT ON WATER QUALITY

8.1 For carefully executed installations using properly manufactured plastic pipes, no taste and odour problems should normally be encountered. The plastic pipes are safe from bacteriological point of view (see 0.3 of IS: 3076-1968*, IS: 4984-1972†, and IS: 4985-1968‡). New PVC installations should be flushed with fresh water for a period of about one hour in order to flush out any lead deposits on the inside surface left over from the extrusion process using lead stabilizers.

*Specification for low density polyethylene pipes for potable water supplies (*first revision*).

†Specification for high density polyethylene pipes for potable water supplies (*first revision*).

‡Specification for unplasticized PVC pipes for potable water supplies.

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