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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Polybutene Pipe Association (JPBPA)/The Japan Plastics Industry Federation (JPIF)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS K 6778:2009** is replaced with this Standard.

JIS K 6778: 2009 may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until August 21, 2017.

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Polybutene (PB) pipes

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **ISO 15876-2** published in 2003 and Amendment 1 : 2007 with some modifications of the technical contents. The last revision was made in 2009 and the revision at this time is to incorporate the contents of **JIS K 6792** and to follow the ordinance of the Ministry of Health, Labour and Welfare in describing the leaching criteria.

The portions given sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JF.

1 Scope

This Standard specifies polybutene pipes (hereafter referred to as “pipes”) to be used mainly for the conveyance of water at 90 °C or lower.

The polybutene pipes are intended to be used for installations within buildings for the conveyance of water whose working pressure is 0.75 MPa or lower.

NOTE : The International Standard corresponding to this Standard and the symbol representing the degree of correspondence are as follows.

ISO 15876-2 : 2003 *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 2 : Pipes and Amendment 1 : 2007* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7502 *Micrometer callipers*

JIS B 7507 *Vernier, dial and digital callipers*

JIS K 0050 *General rules for chemical analysis*

JIS K 6900 *Plastics — Vocabulary*

JIS K 6925-1 *Plastics — Polybutene (PB) moulding and extrusion materials — Part 1 : Designation system and basis for specifications*

JIS K 7112 *Plastics — Methods of determining the density and relative density of*

non-cellular plastics

JIS K 7161-2 *Plastics — Determination of tensile properties — Part 2 : Test conditions for moulding and extrusion plastics*

JIS K 7210-1 *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1 : Standard method*

JIS K 8001 *General rule for test methods of reagents*

JIS K 8005 *Reference materials for volumetric analysis*

JIS K 8051 *3-Methyl-1-butanol (Reagent)*

JIS K 8637 *Sodium thiosulfate pentahydrate (Reagent)*

JIS K 8659 *Starch, soluble (Reagent)*

JIS K 8913 *Potassium iodide (Reagent)*

JIS S 3200-1 *Equipment for water supply service — Test methods of hydrostatic pressure*

JIS S 3200-7 *Equipment for water supply service — Test methods of effect to water quality*

JIS Z 8102 *Names of non-luminous object colours*

JIS Z 8703 *Standard atmospheric conditions for testing*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS K 6900**, and the following apply.

3.1 working pressure

hydraulic pressure at ordinary working conditions, i.e. the maximum working pressure obtained by adding water hammer pressure to hydrostatic pressure

3.2 ordinary temperature

the temperature of $20^{\circ}\text{C} \pm 15^{\circ}\text{C}$, which is based on the standard temperature of 20°C specified in **JIS Z 8703** and the tolerance of grade 15 ($\pm 15^{\circ}\text{C}$) specified in 3.1 of **JIS Z 8703**

3.3 chlorine water test

test of chlorine water resistance, conducted by immersing a test piece in chlorine water and observing its internal surface condition

3.4 nominal diameter

designated numerical value based on the inside diameter

3.5 nominal outside diameter

designated numerical value based on the outside diameter

4 Classification

The classification of pipes shall be as follows.

- a) Take as Class J the dimensions of outside diameter and wall thickness conventionally used in Japan.
- b) Among pipe dimensions given in ISO standard, take S3.2 (ND12, ND16), S4 (ND20, ND25), S5 (ND32, ND40, ND50, ND63, ND75, ND90, ND110) as Class I.

5 Service temperature and working pressure

For the service conditions of pipes, the temperature and the pressure given in Table 1 shall be applied.

Table 1 Service temperature and working pressure of pipes

Service temperature °C	5 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90
Working pressure MPa	1.0	0.9	0.8	0.7	0.6	0.5	0.4

6 Performance

The performance of pipes shall be tested by 10.2 to 10.6, and shall conform to the requirements given in Table 2.

Table 2 Performance of pipes

Performance item		Performance	Applicable subclause
Tensile strength at yield point		16.0 MPa min.	10.2
Pressure resistance		No leakage or other defects.	10.3
Hot internal-pressure creep resistance		No leakage or other defects.	10.4
Leaching ^{a)}	Turbidity	As specified in Attached Table 1, “the criteria for leachate of water-supply implement installed anywhere except the end of water-supply facilities or leachate of water supply pipe” the Ordinance of the Ministry of Health and Welfare No. 14 of 1997.	10.5
	Chromaticity		
	Organics [total organic carbon (TOC)]		
	Taste		
	Odour		
	Loss of residual chlorine	0.7 mg/L max.	
Chlorine water resistance		No bubbles.	10.6
Note ^{a)} The test temperature of leaching shall be 95 °C. For the loss of residual chlorine, however, it shall be the ordinary temperature. Obtain the leaching by using the difference from a blank test value, except odour and taste.			

7 Appearance and shape

7.1 Appearance

When viewed without magnification, the pipes shall be smooth on internal and external surfaces and be free from detrimental defects such as flaws, fissures, twist and others. The colour of pipes shall be light-greyish reddish yellow (beige) specified in JIS Z 8102.

7.2 Shape

The pipe shall be a complete ring.

8 Dimensions and their tolerances

The dimensions of Class J pipes and their tolerances shall be as given in Table 3. The dimensions of Class I pipes and their tolerances shall be as specified in Annex JD.

Table 3 Dimensions of Class J pipes and their tolerances

Unit: mm

Nominal diameter	Outside diameter		Inside diameter		Thickness		Reference	
	Nominal	Tolerance on mean outside diameter	Nominal	Tolerance on mean inside diameter	Nominal	Tolerance	Length (m)	Mass (kg/m)
8	11.0	± 0.15	7.6	± 0.25	1.70	± 0.20	120	0.046
10	13.0		9.8		1.60			0.053
13	17.0		12.8		2.10			0.090
16	22.0		16.8		2.60			0.146
20	27.0		21.2	± 0.30	2.90			0.202
25	34.0	± 0.25	28.1		2.95	± 0.25	100	0.265
30	42.0	± 0.30	34.9	± 0.80	3.55		60	0.395
40	48.0	± 0.35	39.8	± 0.95	4.10	± 0.30	5	0.520
50	60.0	± 0.40	49.9	± 1.10	5.05	± 0.35		0.802
65	76.0	± 0.65	63.2	± 1.45	6.40	± 0.40		1.287
75	89.0	± 0.80	74.1	± 1.70	7.45	± 0.45		1.756
100	114.0	± 1.00	94.9	± 2.10	9.55	± 0.55		2.883

NOTE 1 The tolerances on mean outside diameter is a difference between the nominal dimension and the mean of measured outside diameters in two equidistant directions in any cross section.

NOTE 2 The tolerances on mean inside diameter is a difference between the nominal dimension and the value obtained by subtracting twice the mean thickness from the mean outside diameter.

The mean thickness is a mean of thicknesses at four equidistant points in a cross-section where the outside diameters are to be measured.

NOTE 3 The length may be changed upon agreement between the parties concerned with delivery.

NOTE 4 The mass is calculated by taking the dimensions of pipe as basic dimensions, and taking the density of material to be used for pipe as 0.92 g/cm³.

9 Materials

The pipe shall be mainly composed of 1-butene polymer, and be as specified in Annex JA.

10 Test method

10.1 Dimensions

After conditioning a test pipe at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for not less than 1 h, measure its dimensions by using a micrometer specified in **JIS B 7502**, vernier callipers specified in **JIS B 7507** or other means with equal or better accuracy.

10.2 Tensile test

The tensile test of pipes shall be as specified in Annex JB.

10.3 Hydrostatic pressure test

The hydrostatic pressure test of pipes shall be in accordance with **JIS S 3200-1**. The test pressure shall be 2.5 MPa, and the duration shall be 2 min.

10.4 Hot internal-pressure creep test

The hot internal-pressure creep test of pipes shall be as specified in Annex JC.

10.5 Leaching test

The leaching test of pipes shall be as follows.

- a) **Common conditions**, as specified in clause 5 of **JIS S 3200-7**.
- b) **Preparation of leachate**, as specified in clause 6 of **JIS S 3200-7**. The concentration of available chlorine in leachate shall be 1.0 mg/L to 1.2 mg/L, to be used for testing the loss of residual chlorine.
- c) **Preparation of sample solution**, as specified in 7.1.2 of **JIS S 3200-7**.
- d) **Turbidity**, obtained by the transmitted light measuring method or by the integrating-sphere electrophotometry specified in Annex 19 of **JIS S 3200-7**.
- e) **Chromaticity**, obtained by the transmitted light measuring method specified in Annex 18 of **JIS S 3200-7**.
- f) **Organics [total organic carbon (TOC)]**, as specified in Annex 14 of **JIS S 3200-7**.
- g) **Loss of residual chlorine** Measure the concentration of residual chlorine by DPD colorimetry or by amperometric analysis specified in Annex 21 of **JIS S 3200-7**, and obtain its loss by using a difference from a blank test value.
- h) **Odour**, as specified in Annex 17 of **JIS S 3200-7**.
- i) **Taste**, as specified in Annex 16 of **JIS S 3200-7**.
- j) **Length of test pipes**, as given in Table 4.

Table 4 Length of test pipes for leaching test

Unit: mm

Class J pipe		Class I pipe	
Nominal diameter	Length (m)	Nominal outside diameter	Length (m)
8	12	12	8
10	8	16	5
13	5	20	3
16	3	25	2
20	2	32 min.	1
25 min.	1		
NOTE : Before test, a pipe of length 2 m or longer may be sectioned into 1 m.			

10.6 Chlorine water test

The chlorine water test of pipes and the preparation of test water shall be as specified in Annex JE. In this case, cut three circular or strip-shaped samples of length about 50 mm from a test pipe. Finish the cross-section smoothly, wash the internal, external and edge surfaces of the samples sufficiently with water specified in Annex JE, and dry them on filter paper at ordinary temperature to take as test pieces.

10.7 Expression of test results

Obtain the test results in 10.2 and 10.5 to the decimals one place lower than the specified, and round off the value.

11 Inspection

The inspections of pipes are classified into type inspection ¹⁾ and delivery inspection ²⁾. The pipe shall be tested in accordance with clause 10, and conform to the requirements in clauses 5 to 9 and 12.

Inspection samples shall be taken as agreed between the parties concerned with delivery.

Notes ¹⁾ Type inspection is intended to confirm that the qualities of pipe meet all performance requirements given in the design.

²⁾ Delivery inspection is intended to confirm that the pipe meets the performance requirements when to be delivered.

a) **Type inspection** The following items shall be inspected.

The hot internal-pressure creep inspection shall be carried out at 20 °C and 95 °C as specified in Annex JC; for the test carried out at 95 °C, one of the durations given in Table JC.1 shall be applied.

- 1) Appearance and shape inspection
- 2) Dimensional inspection
- 3) Material inspection