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**Polybutene (PB) pipe fittings for
water supply**

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Reference number : JIS K 6793 : 2004 (E)

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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 Japan 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 6793 : 1999** is replaced with this Standard.

In order to conform to the International Standard, this revision has been prepared based on **ISO 15876-3 : 2003** *Plastics piping systems for hot and cold water installations—Polybutylene (PB)—Part 3 : Fittings*.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Polybutene (PB) pipe fittings for water supply

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 15876-3** *Plastics piping systems for hot and cold water installations—Polybutylene (PB)—Part 3 : Fittings* published in 2003 with some modifications of the technical contents.

Portions given sidelines or dotted underlines are the matters modified from the original International Standard. The list of modifications with their explanations is given in annex 5 (informative).

1 Scope This Standard specifies the pipe fittings (hereafter referred to as “fittings”) to be used for jointing polybutene (PB) pipe (hereafter referred to as “pipes”) for water works to be mainly used for indoor piping of which the working pressure is not more than 0.75 MPa specified in JIS K 6792.

- Remarks 1 The polybutene pipe fittings shall be in accordance with **JIS K 6779**.
2 The International Standard corresponding to this Standard is as follows.

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**.

ISO 15876-3 : 2003 *Plastics piping systems for hot and cold water installations—Polybutylene (PB)—Part 3 : Fittings* (MOD)

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

JIS B 0251 Limit gauges for metric screw threads

JIS B 0253 Gauges for taper pipe threads

JIS B 0254 Screw thread limit gauges for parallel pipe threads

JIS B 7502 Micrometer callipers

JIS B 7507 Vernier, dial and digital callipers

JIS K 6779 Polybutene (PB) pipe fittings

JIS K 6792 Polybutene (PB) pipes for water works

JIS K 6900 Plastics—Vocabulary

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 8401 *Guide to the rounding of numbers*

JIS Z 8703 *Standard atmospheric conditions for testing*

3 Definitions For the main terms used in this Standard, the definitions in **JIS K 6900** apply, and the rest of the terms are as follows:

- a) **mechanical type fittings** Fittings of which the watertightness is secured by tightening nuts, bands, sleeves and others after inserting pipes into fittings, or fittings of which the watertightness is secured by O-rings.
- b) **electric fusion type fittings** Inserting type fittings capable of electric fusion bonding in which the heating elements such as electric heating wire are built in the fitting body itself.
- c) **heat fusion type fittings** Inserting type fittings in which the joint is made by fusion-bonding by heating fittings and pipes with such heating tool as heating plate.
- d) **airtightness test** The test to confirm the existence of leakage or other abnormality by pressurizing the inside of metallic material after the both ends are sealed by an appropriate method.
- e) **negative pressure test** The test to confirm the existence of suction or other abnormality by jointing the fitting with the pipe an appropriate method and depressurizing the inside.
- f) **compression peeling test** The test to obtain the rate of peeled length to the length at fusion-bonded part (peel length ratio) by cutting the fitting jointed with pipe by fusion-bonding into halves and compressing until the inside surface of bonded pipe contacts.
- g) **ordinary temperature** The temperature condition at which the temperature of the standard condition specified in **JIS Z 8703** is 20 °C and the tolerances thereof is the temperature grade 15 (± 15 °C) in **3.1** of **JIS Z 8703**, that is, (20 ± 15) °C.

4 Classification The classification of fittings shall be classified by jointing method and in accordance with table 1.

Table 1 Classification of fittings

Classification of fittings	Abbreviation	
Mechanical type fittings	Class M	
Electric fusion type fittings (constant current system)	Class E	Type A
Electric fusion type fittings (constant voltage system)		Type B
Heat fusion type fittings	Class H	

Remarks : Class E fittings shall be two types, that is, type A and type B (see annex 3).

For the purpose of preventing misuse of type A and type B, the outside diameter of current-carrying terminals for the fitting shall be 2.0 mm for type A and 2.5 mm for type B.

5 Performance The performance of fittings shall be tested according to **9.3** to **9.10** and conformed to the requirements in table 2.

Table 2 Performance of fittings

Performance item		Performance	Classification of fittings	Applicable subclause
Airtightness property ⁽¹⁾		Free from leakage or any other defects.	Class M Class E Class H	9.3
Watertightness property		Free from leakage or any other defects.		9.4
Pressure resistance property		Free from leakage or any other defects.		9.5
Negative pressure resistance property		Free from any suction of air (or water) or other abnormalities.		9.6
Hot internal pressure creep property		Free from leakage or any other defects.		9.7
Pull-out property		Free from pull-out or other defects.		9.8
Compression peeling property		The peel length ratio of the fusion-bonded part is not more than 15 %.	Class E	9.9
Leaching property ⁽²⁾	Turbidity	2 degree max.	Applied to moulded part of polybutene.	9.10
	Chromaticity	5 degree max.		
	Consumption of potassium permanganate	10 mg/L max.		
	Total organic carbon (TOC)	5 mg/L max.		
	Loss of residual chlorine ⁽³⁾	0.7 mg/L max.		
	Odour	No abnormality.		
	Taste	No abnormality.		
	To be in accordance with 5.2 of annex 1	Annex 2 apply.	Apply to parts in which the material of the part of contact with water is other than polybutene.	

Notes (1) Airtightness shall apply to the fittings manufactured by sand mould casting, etc., except those by continuous casting.

(2) The test temperature for the leaching property shall be ordinary temperature. The properties except odour and taste shall be obtained from the difference from the blank test value. Consumption of potassium permanganate shall be applied until Mar. 31, 2005, and TOC shall be applied from Apr. 1, 2005.

(3) The decrement of residual chlorine shall apply to the part of resin and rubber except polybutene at the part of contact with water.

6 Appearance The appearance of fittings shall be as follows:

- a) The appearance of class M fittings, when observed visually without magnifying, shall be smooth on outside and inside surfaces and free from defects detrimental to use such as blowholes, cast flash, flaws, fissures.
- b) The appearance of class E fittings, when observed visually without magnifying, shall be smooth on outside and inside surfaces, except the part where a heating wire is built in, and free from defects detrimental to use such as flaws, fissures.
- c) The appearance of class H fittings, when observed visually without magnifying, shall be smooth on outside and inside surfaces and free from defects detrimental to use such as flaws, fissures.
- d) The colour of resin part of class E and class H fittings shall be bright beige with a tinge of greyish red specified in **JIS Z 8102**.

7 Structure, shape and dimensions Examples of the structure, shape and dimensions of the fittings are indicated in attached figures 1 to 3.

The structure, shape and dimensions other than those specified in attached figures 1 to 3 may be acceptable if they satisfy the requirements in clauses 5 and 6 above.

8 Material The material of the fittings shall have the strength and durability capable of sufficiently withstanding the normal use and working, and shall not adversely affect the water quality.

9 Test methods

9.1 Appearance, structure and shape The appearance, structure and shape of fittings shall be visually without magnifying checked.

Remarks : The fitting of class E, the fitting of class H and the pipe to be used for the tests of **9.1** to **9.10** shall be sampled after a lapse of 24 h or over from manufacturing.

9.2 Dimensions The dimensions of fittings shall be measured using the measuring instruments such as micrometer callipers specified in **JIS B 7502**, vernier, dial and digital callipers specified in **JIS B 7507**, gauges for taper pipe threads specified in **JIS B 0253**, screw thread limit gauges for parallel pipe threads specified in **JIS B 0254** and limit gauges for metric screw threads specified in **JIS B 0251**, or those with at least equivalent accuracy thereto, after the fittings of class M is conditioned at ordinary temperature and the fittings of class E and class H are conditioned at the temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for not less than 1 h.

9.3 Airtightness test For the airtightness test of fittings, both ends of the metallic part of fittings shall be sealed by an appropriate method, the air in ordinary temperature shall be applied inside under the pressure of 0.6 MPa for not less than 5 s, and defects such as leakage shall be visually checked.

9.4 Watertightness test For the watertightness test of fittings, a pipe of not less than 250 mm in length shall be jointed to the fittings, and the watertightness test shall be carried out in accordance with **JIS S 3200-1**. The hydraulic pressure for test shall be 0.02 MPa, and the holding time shall be 2 min.

9.5 Pressure resistance test For the pressure resistance test of fittings, a pipe of not less than 250 mm in length shall be jointed to the fittings, and the pressure resistance test shall be carried out in accordance with **JIS S 3200-1**. The hydraulic pressure for test shall be 2.5 MPa and the holding time shall be 2 min.

9.6 Negative pressure resistance test For the negative pressure resistance test of fittings, a pipe of not less than 250 mm in length shall be jointed to the fittings, and the inside of fitting shall be depressurized to -54 kPa, and kept for 2 min. The defects such as suction shall be checked according to change in pressure gauge.

9.7 Hot internal pressure creep test The hot internal pressure creep test of the fittings shall be carried out in accordance with annex 3 of **JIS K 6792**. As for the shape of the test piece, both ends of the pipe shall be cut with the effective length of not less than 250 mm so that both ends are at right angles to the axis of the pipe, and the fitting shall be jointed therewith.

9.8 Pull-out test For the pull-out test of fittings, a pipe of not less than 200 mm in length shall be jointed to the fittings, after 24 h have passed, the axial load which is calculated from the following formula shall be applied to the fitting at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ in temperature and held for 1 h. Then, pulling out and other abnormal defects shall be visually examined.

$$K = 1.5 \times \sigma_t \times \pi(d_o^2 - d^2)/4$$

where, K : axial load (N)

σ_t : axial stress acting on pipe material (MPa) = 6.8

d_o : mean outside diameter of pipe (mm)

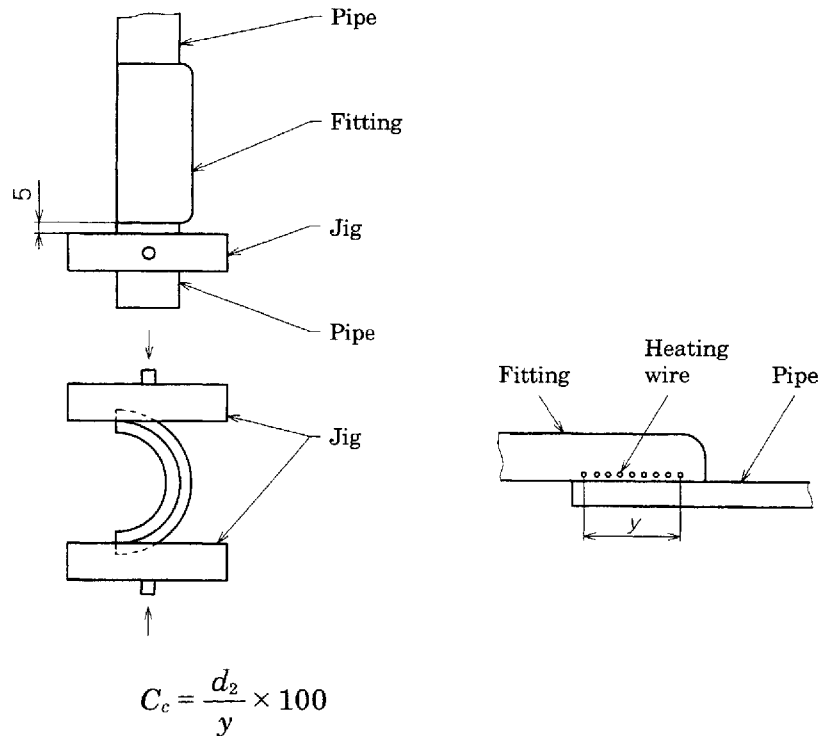
d : inside diameter of pipe (mm)

$$d = d_o - 2 \times t_o$$

t_o : minimum wall thickness of pipe (mm)

9.9 Compression peeling test For the compression peeling test of fittings, a pipe of not less than 150 mm in length shall be fusion-bonded to the fitting, and after 24 h or longer have elapsed, the fitting is cut into halves under the bonded condition, and the distance between the both ends of heating wire at the fusion-bonded part of test piece. Then the test piece shall be mounted on the jigs as shown in figure 1, and the jigs are tightened until the inner surfaces of pipe come into contact with each other and held for 10 min, and the condition of the interface shall be observed. The peel length at the heating wire part shall be measured, and the rate of the peel length to the distance between the both ends of heating wire at fusion-bonded part (peel length ratio) shall be obtained according to the following formula. In such a case, the test speed shall be $100\text{ mm} \pm 10\text{ mm}$ per minute, and the test temperature shall be $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

Unit: mm



where, C_c : peel length ratio (%)
 y : effective length between both ends of heating wire (mm)
 d_2 : peel length of heating wire part (mm)

Figure 1 Compression peeling test

9.10 Leaching test The leaching test of fittings shall be in accordance with annex 1.

9.11 Expression method for numerical value of test results The test results of 9.9 and 9.10 shall be obtained to one place lower than the specified numerical value, and rounded off according to JIS Z 8401. The test result of 9.10 shall be in accordance with clause 9 of JIS S 3200-7.

10 Inspection The inspection of fittings shall be classified into the type inspection⁽⁴⁾ and the delivery inspection⁽⁵⁾, and shall be tested in accordance with clause 9, and shall comply with the requirements of clauses 5 to 8 and 11.

The sampling method of the samples for the inspection shall be subjected to the agreement between the parties concerned with delivery.

Notes (4) The type inspection means the inspection to judge whether the quality of the fitting complies with every performance indicated in the design.

(5) The delivery inspection means the inspection to judge whether the fitting complies with the performances deemed necessary in delivery of the fitting.

a) **Type inspection** The type inspection shall be carried out on the following items.

- 1) Inspections for appearance, structure and shape
- 2) Dimension inspection
- 3) Material inspection
- 4) Airtightness inspection
- 5) Watertightness inspection
- 6) Pressure inspection
- 7) Internal negative pressure inspection
- 8) Hot internal pressure creep inspection⁽⁶⁾
- 9) Pull-out inspection
- 10) Compression peeling inspection
- 11) Leaching inspection
- 12) Marking inspection

Note ⁽⁶⁾ Hot internal pressure creep inspection shall be carried out at 20 °C and 95 °C in test temperature. Provided that the inspection at 95 °C shall be carried out for any one of the test times as shown in annex 3 table 1 of **JIS K 6792**.

b) **Delivery inspection** The delivery inspection shall be carried out on the following items.

- 1) Inspection for appearance, structure and shape⁽⁷⁾
- 2) Dimension inspection⁽⁷⁾
- 3) Airtightness inspection
- 4) Watertightness inspection
- 5) Pressure inspection
- 6) Heat internal pressure creep inspection⁽⁸⁾
- 7) Leaching inspection⁽⁹⁾
- 8) Marking inspection

Notes ⁽⁷⁾ The inspections on appearance, structure and shape, and the dimension shall be carried out based on the drawings of the products exchanged between the parties concerned with delivery.

⁽⁸⁾ The hot internal pressure creep test shall be carried out at the test temperature of 95 °C for 22 h or 1 h of test time.

⁽⁹⁾ The leaching test shall be periodically carried out.

11 Marking The following items shall be marked indelibly on the outer side of fittings. The items of clauses a), c) and e) can be marked on every package.