



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 6777 : 2007

(JPPFA/JPIF/JSA)

**Chlorinated poly (vinyl chloride)
(PVC-C) pipe fittings for hot and
cold water supply**

ICS 23.040.45; 83.140.30; 91.140.60

Reference number : JIS K 6777 : 2007 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 1984-02-01

Date of Revision: 2007-03-20

Date of Public Notice in Official Gazette: 2007-03-20

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Chemical Products

JIS K 6777:2007, First English edition published in 2007-10

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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

© JSA 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction.....	1
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Classification and symbols	3
5 Performance	3
6 Appearance and shape	6
6.1 Appearance.....	6
6.2 Shape	6
7 Dimensions and their tolerances	6
7.1 Dimensions of socket of fittings and their tolerances	6
7.2 Dimensions of fittings and their tolerance.....	6
8 Materials	6
9 Test methods	7
9.1 Performance test	7
9.2 Appearance and shape	8
9.3 Dimensions	8
9.4 Expression of test result values.....	8
10 Inspection	9
11 Marking	10
11.1 Colour of fittings	10
11.2 Marking on fittings	10
11.3 Precautions on handling	10
Annex JA (normative) Leaching test method of chlorinated poly (vinyl chloride) (PVC-C) pipe fittings for hot and cold water supply	28
Annex JB (informative) Comparison table between JIS and corresponding International Standards	30

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 PVC Pipe and Fittings Association (JPPFA)/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 6777 : 2004** is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Chlorinated poly (vinyl chloride) (PVC-C) pipe fittings for hot and cold water supply

Introduction

This Japanese Industrial Standard has been prepared based on the first editions of **ISO 15877-1** and **ISO 15877-3** published in 2003, with some modifications of the technical contents, including additions of requirements concerning the product dimensions, performance and test methods that are commonly used in the domestic market.

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

1 Scope

This Standard specifies the chlorinated poly (vinyl chloride) (PVC-C) pipe fittings (hereafter referred to as “fittings”) which are mainly used for adhesion-jointing chlorinated poly (vinyl chloride) (PVC-C) pipes (hereafter referred to as “pipes”) specified in **JIS K 6776**.

NOTE : The International Standards corresponding to this Standard and the symbol of degree of correspondence between **JIS** and the International Standards are as follows.

ISO 15877-1:2003 *Plastics piping systems for hot and cold water installations—Chlorinated poly (vinyl chloride) (PVC-C)—Part 1: General*

ISO 15877-3:2003 *Plastics piping systems for hot and cold water installations—Chlorinated poly (vinyl chloride) (PVC-C)—Part 3: Fittings* (Overall evaluation: MOD)

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

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For the standards with the indication of the Christian era, the edition of the indicated year shall apply and any revisions made thereafter (including amendments) shall not. For those with no indication of the year, the most recent edition (including amendments) shall apply.

JIS B 0203 *Taper pipe threads*

JIS B 7502 *Micrometer callipers*

JIS B 7507 *Vernier, dial and digital callipers*

JIS K 6776 *Chlorinated poly (vinyl chloride) (PVC-C) pipes for hot and cold water supply*

- JIS K 6815-1:2002 *Thermoplastics pipes—Determination of tensile properties—Part 1: General test method*
- JIS K 6815-2:2002 *Thermoplastics pipes—Determination of tensile properties—Part 2: Pipes made of unplasticized poly (vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C) and high-impact poly (vinyl chloride) (PVC-HI)*
- 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 8401 *Guide to the rounding of numbers*
- JIS Z 8703 *Standard atmospheric conditions for testing*
- ISO 580 *Plastic piping and ducting systems—Injection-moulded thermoplastics fittings—Methods for visually assessing the effects of heating*
- ISO 1167 *Thermoplastics pipes for the conveyance of fluids—Resistance to internal pressure—Test method*
- ISO 2507-1 *Thermoplastics pipes and fittings—Vicat softening temperature—Part 1: General test method*
- ISO 2507-2 *Thermoplastics pipes and fittings—Vicat softening temperature—Part 2: Test conditions for unplasticized poly (vinyl chloride) (PVC-U) or chlorinated poly (vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly (vinyl chloride) (PVC-HI) pipes*
- ISO 12092 *Fittings, valves and other piping system components made of unplasticized poly (vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and acrylonitrile-styrene acrylester (ASA) for pipes under pressure—Resistance to internal pressure—Test method*

3 Terms and definitions

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

3.1 chlorinated poly (vinyl chloride) (PVC-C)

polyvinyl chloride which has been chlorinated in order to increase its chlorine content so that the heat resisting property is improved compared to the original polyvinyl chloride

3.2 ordinary temperature

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

3.3 type A fittings

fittings manufactured by injection moulding machine

3.4 type B fittings

fittings manufactured by processing the original pipes specified in **JIS K 6776** obtained

3.5 type inspection

inspection to judge if the quality of fittings conforms to all the performance requirements indicated at the design

3.6 delivery inspection

inspection to judge if the fittings conform to the performance that is required at the delivery

4 Classification and symbols

The classification and symbols of fittings shall be in accordance with table 1.

Table 1 Classification and symbols

Classification	Symbols
Chlorinated poly (vinyl chloride) (PVC-C) pipe fittings	HT, IHT ^{a)}
Note ^{a)} IHT is a symbol of the type of fitting based on ISO 15877-3 .	

5 Performance

The performance of fittings shall conform to the requirements as shown in table 2.

Table 2 Performance of fittings

Performance item	Performance	Symbols of applicable fittings and applicable parts	Applicable subclause
Tensile strength at yield MPa	50 min. of tensile strength at yield at 23 °C	HT	9.1.1
Pressure resistance	Shall be free from leakage and other defects.	HT, IHT	9.1.2
Flattening resistance ^{a)}	Shall be free from fissures and cracking.	HT	9.1.3
Hot internal pressure creep property	Shall be free from breakage.	HT, IHT	9.1.4
Vicat softening temperature °C	95 min.	HT	9.1.5
	103 min.	IHT	

Table 2 (concluded)

Performance item		Performance		Symbols of applicable fittings and applicable parts	Applicable subclause
Leachability ^{b)}	Lead and its compounds mg/L	For the quantity of lead, 0.008 max.		HT, IHT Moulded part of chlorinated poly (vinyl chloride) (PVC-C)	9.1.6
	Zinc and its compounds mg/L	For the quantity of zinc, 0.5 max.			
	Organic matters (TOC) mg/L	1 max.			
	Taste	No abnormality.			
	Odour	No abnormality.			
	Chromaticity degrees	1 max.			
	Turbidity degrees	0.5 max.			
	Loss of residual chlorine mg/L	Leaching solution at 90 °C ± 2 °C ^{c)}	1 max.		
		Leaching solution at ordinary temperature ^{d)}	0.7 max.		
Leachability according to JA.4.2		Shall be in accordance with table 3.		HT, IHT Part other than chlorinated poly (vinyl chloride) (PVC-C) at water-contacting part	
Thermal relaxation property		Shall be free from any “defects” ^{e)} .		IHT	9.1.7
Thermal stability by hydrostatic pressure		Shall be free from breakage.		IHT	9.1.8
Notes					
^{a)} Applied to the original pipes to be processed to type B fittings.					
^{b)} Leachability shall be examined only on fittings that are intended for use in water works. Unless otherwise specified, the leaching test is carried out by using leaching solution at 90 °C ± 2 °C.					
^{c)} “Leaching solution at 90 °C ± 2 °C” means the case of the leaching test by using leaching solution at 90 °C ± 2 °C.					
^{d)} “Leaching solution at ordinary temperature” means the case of the leaching test by using leaching solution at ordinary temperature.					
^{e)} “Defect” means the crack produced in the range of radius 0.3× (nominal diameter d_n) centring around gate, the delamination or blister of which the depth exceeds 50 % of the wall thickness at production place, the crack or delamination produced outside this range of which the depth exceeds 10 % of the wall thickness and the blister exceeds the length of five times the wall thickness. When the weld is open, it means the open part of which the depth exceeds 50 % of the wall thickness.					

Table 3 Criteria for leaching performance of the part other than chlorinated poly (vinyl chloride) (PVC-C) polymer at water-contacting part

Performance item	Performance
Cadmium and its compounds	For the quantity of cadmium, 0.01 mg/L max.
Mercury and its compounds	For the quantity of mercury, 0.000 5 mg/L max.
Selenium and its compounds	For the quantity of selenium, 0.01 mg/L max.
Lead and its compounds	For the quantity of lead, 0.01 mg/L max.
Arsenic and its compounds	For the quantity of arsenic, 0.01 mg/L max.
Hexavalent chromium and its compounds	For the quantity of hexavalent chromium, 0.05 mg/L max.
Cyanogen and its compounds	For the quantity of cyanogen, 0.01 mg/L max.
Nitric acidic nitrogen and nitrous acidic nitrogen	10 mg/L max.
Fluorine and its compounds	For the quantity of fluorine, 0.8 mg/L max.
Boron and its compounds	For the quantity of boron, 1.0 mg/L max.
Carbon tetrachloride	0.002 mg/L max.
1,4-Dioxane	0.05 mg/L max.
1,2-Dichloroethane	0.004 mg/L max.
1,1-Dichloroethylene	0.02 mg/L max.
cis-1,2-Dichloroethylene	0.04 mg/L max.
Dichloromethane	0.02 mg/L max.
Tetrachloroethylene	0.01 mg/L max.
Trichloroethylene	0.03 mg/L max.
1,1,2-Trichloroethane	0.006 mg/L max.
Benzene	0.01 mg/L max.
Formaldehyde	0.08 mg/L max.
Zinc and its compounds	For the quantity of zinc, 1.0 mg/L max.
Aluminium and its compounds	For the quantity of aluminium, 0.2 mg/L max.
Iron and its compounds	For the quantity of iron, 0.3 mg/L max.
Copper and its compounds	For the quantity of copper, 1.0 mg/L max.
Sodium and its compounds	For the quantity of sodium, 200 mg/L max.
Manganese and its compounds	For the quantity of manganese, 0.05 mg/L max.
Chloride ion	200 mg/L max.
Evaporation residue	500 mg/L max.
Anionic surface active agent	0.2 mg/L max.
Non-ionic surface active agent	0.02 mg/L max.
Phenols	In conversion to the quantity of phenol, 0.005 mg/L max.
Organic matters (TOC)	5 mg/L max.
Taste	Shall be free from abnormality.
Odour	Shall be free from abnormality.

Table 3 (concluded)

Performance item	Performance
Chromaticity	5 degree max.
Turbidity	2 degree max.
Epichlorohydrin	0.01 mg/L max.
Amines	For the quantity of triethylenetetramine, 0.01 mg/L max.
2,4-Toluene diamine	0.002 mg/L max.
2,6-Toluene diamine	0.001 mg/L max.
Vinyl acetate	0.01 mg/L max.
Styrene	0.002 mg/L max.
1,2-Butadiene	0.001 mg/L max.
1,3-Butadiene	0.001 mg/L max.

6 Appearance and shape

6.1 Appearance

The fittings shall be smooth on the outer and inner surfaces and free from defects detrimental to use such as flaws, fissures, etc.

6.2 Shape

The shape of fittings shall be in accordance with tables 8 to 20 for HT and tables 22 to 27 for IHT. The jointing part shall be practically right-circular in cross-section and the end surfaces shall be right-angled to the axis of fittings.

Ribs for reinforcement may be attached at appropriate positions of the outer surface.

7 Dimensions and their tolerances

7.1 Dimensions of socket of fittings and their tolerances

The dimensions of socket of fittings and their tolerance shall be as shown in tables 6 and 7 for HT and table 21 for IHT.

7.2 Dimensions of fittings and their tolerance

The dimensions of fittings and their tolerances shall be as shown in tables 8 to 20 for HT, and tables 22 to 27 for IHT.

Moreover, when the tolerance is specified in “%”, the numbers under decimal point shall be rounded off as the result of calculation.

8 Materials

The materials of fittings shall be as follows.

- a) The materials of fittings shall be chlorinated poly (vinyl chloride) (PVC-C) as main component, and the stabilizer, pigment and others shall be added.

Plasticizer or any material containing plasticizer shall not be used.

- b) The materials of part other than chlorinated poly (vinyl chloride) (PVC-C) shall have sufficient strength and durability resisting ordinary using and installation.

9 Test methods

9.1 Performance test

9.1.1 Tensile test

The tensile test of fittings shall be carried out according to **JIS K 6815-1**:2002 and **JIS K 6815-2**:2002. Clauses 5 and 6 of **JIS K 6815-1**:2002 may be as follows.

a) Test pieces

Test pieces are adequately prepared from the test fittings for type A fittings, and from test original pipes for type B fittings, as agreed between the parties concerned with delivery.

b) Conditioning

The test piece shall be conditioned under the atmosphere of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for at least 60 min.

9.1.2 Pressure resistance test

The pressure resistance test of fittings shall be in accordance with **JIS S 3200-1**. The test hydraulic pressure shall be 4.0 MPa.

9.1.3 Flattening test

The flattening test of the original pipes to be processed to type B fittings shall be as follows: a ring-shaped test piece of 50 mm length is cut off from the original test pipe, and shall be conditioned in the atmosphere of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ temperature for at least 60 min. The test piece shall then be placed between two flat plates and compressed until its outside diameter becomes half the original at the rate of $10\text{ mm/min} \pm 2\text{ mm/min}$. The outside surface of the pipe shall be visually examined. The test temperature shall be $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$. The flat plates to compress the test piece shall be sufficiently larger than the deformed test piece that has been compressed to half.

9.1.4 Hot internal pressure creep test

9.1.4.1 Hot internal pressure creep test for HT

The hot internal pressure creep test for HT shall be performed as follows: The test fittings or the test fittings adhesion-jointed to the pipe specified in **10.1.4** of **JIS K 6776** are conditioned at the test temperature of $90\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 1 h, then filled with hot water of $90\text{ }^{\circ}\text{C}$ inside of them in an appropriate manner and pressurized at 1.5 MPa. Keep at the same temperature and pressure as it is for 1 h.

For the test temperature, the average of measured temperatures shall be within $\pm 1\text{ }^{\circ}\text{C}$ of the specified temperature and the maximum dispersion of measured temperatures shall be within the range of $\pm 2\text{ }^{\circ}\text{C}$. The test pressure shall be in the tolerance from minus 1 % to plus no restriction to the specified pressure.

9.1.4.2 Hot internal pressure creep test for IHT

The hot internal pressure creep test for IHT shall be in accordance with **ISO 12092**. The test conditions shall be as given in table 4.

Table 4 Test conditions for hot internal pressure creep test for IHT

Test temperature °C	Test pressure MPa	Test time h
60	2.69	1
80	0.78	3 000

9.1.5 Vicat softening temperature

The Vicat softening temperature test of fittings shall be in accordance with **ISO 2507-1** and **ISO 2507-2**.

9.1.6 Leaching test

The leaching test method for fittings designed for use in water works shall be in accordance with Annex JA.

9.1.7 Thermal relaxation test

The thermal relaxation test of fittings shall be in accordance with **ISO 580**.

9.1.8 Thermal stability by hydrostatic pressure test

The thermal stability by hydrostatic pressure test shall be in accordance with **ISO 1167**. The test condition shall be in accordance with table 5.

Table 5 Test conditions for thermal stability by hydrostatic pressure test of IHT

Test temperature °C	Circumferential stress MPa	Test time h
90	2.85	15 720

9.2 Appearance and shape

The appearance and shape of fittings shall be examined visually.

9.3 Dimensions

The dimensions of fittings shall be measured with a micrometer specified in **JIS B 7502**, vernier callipers specified in **JIS B 7507** or any instrument having at least the equal accuracy to these measures.

9.4 Expression of test result values

The test results in **9.1.1** and **9.1.5** and the test results of the “lead and its compounds”, “zinc and its compounds”, “total organic carbon (TOC) content” and “loss of residue chloride” in **9.1.6** shall be rounded off to one place lower than the specified

value in the performance of table 2, and rounded off in accordance with **JIS Z 8401** to the specified numerical value. The test results in **9.1.6** shall be treated in accordance with clause **9** of **JIS S 3200-7**.

10 Inspection

The inspection of fittings is classified into type inspection and delivery inspection. The respective inspection items shall be as follows and the result of each inspection shall satisfy the requirements in this Standard.

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

a) **Type inspection** The type inspection shall be carried out on the following items. The symbols in parenthesis indicate the type(s) of fittings to which the item is applicable.

- 1) Tensile strength at yield (HT)
- 2) Pressure resistance (HT, IHT)
- 3) Flattening resistance (applicable to type B fittings) (HT)
- 4) Hot internal pressure creep property (HT, IHT)
- 5) Vicat softening temperature (HT, IHT)
- 6) Leachability (HT, IHT)

NOTE : The leaching test is only performed on the fittings intended for use in water works.

- 7) Thermal relaxation (IHT)
- 8) Thermal stability by hydrostatic pressure (IHT)
- 9) Appearance and shape (HT, IHT)
- 10) Dimensions (HT, IHT)
- 11) Marking (HT, IHT)

b) **Delivery inspection** The delivery inspection shall be carried out on the following items. However, it is permissible to select only a part of the following items upon agreement between the parties concerned with delivery. The symbols in parenthesis indicate the type(s) of fittings to which the item is applicable.

- 1) Tensile strength at yield (HT)
- 2) Pressure resistance (HT, IHT)
- 3) Flattening resistance (applicable to type B fittings) (HT)
- 4) Leachability (HT, IHT)

The leaching tests are performed periodically only on the fittings intended for use in water works.

- 5) Thermal relaxation (IHT)