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GB/T 18742.1—2002

冷热水用聚丙烯管道系统 第1部分:总则

Polypropylene piping systems for hot and cold water installation—Part1:General

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Polypropylene piping systems for hot and cold water installation

Part 1: General

GB/T 18742.1-2002

Foreword

This series of documents is drawn on the base of close tracing back the International Standard Organization (ISO/TC138) documents of <plastic pipe systems for hot and cold water----Polypropylene> which is under drawing by the institute of plastic pipe, fitting, and valve for fluid transportation, and base on the domestic producing condition of PPR pipe and fitting. This documents is technically consist with < plastic pipe systems for hot and cold water----Polypropylene, part 1: general>.

The main difference is:

- Adopting the evaluation method for PPR pipes and fittings in ISO/DIS 15874.2: 1999, which will make the PPR series documents structurally integrity and will be convenient to use.
- Adopting the flow speed of melting substance for PPR pipes and fitting material in ISO/DIS 15874.2:1999, which fully present the requirement for the raw material.

The documents is composed by three parts:

- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 1: General
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 2: Pipes
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 3: Fittings

The annex A is for documents

This documents is put forward by China National Light Industry

This documents is drawn by: Qilu oil and chemical Co.LTD, Shanghai Baidie fitting Co.LTD, Shanxi huashang victory plastic Co. LTD, Yanshan oil and chemical institute.

The drawer: Xie Jianling, Xu Hongyue, Li Yangli, Wang Shuhua, Wang Xuemei.

Part 1: General

1. Scope

This documents specifies the definitions, terms, abbreviations and the requirements of utilization grade, material and sanitation function for the polypropylene piping systems for hot and cold water.

This documents as well as GB/T 18742.2 and GB/T 18742.3 are suitable for use in the pipe systems of cold and hot water in the buildings, including industrial and civilian pipe

systems of cold and hot water, drinking water and heating.
This documents is not suitable for fire fighting systems and water medium systems

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For the updated reference, the latest edition of the referenced documents (including any amendments) applies.

GB/T 1844.1-1996 Symbols of plastics and resins--Part 1: Basic polymers and their special characteristics (neq ISO 1043 1:1987)

GB/T 2035-1996 Terms and definitions for plastics (eqv ISODP 1167:1978)

GB/T 6111-1985 Thermoplastics pipes for the conveyance of fluids-Resistance to internal pressure--Test method

GB/T 10798-2001 Table of universal wall thickness of thermoplastics pipe

GB/T 17219-1998 Standard for safety evaluation of equipment and protective materials in drinking water system

GB/T 18252-2000 Plastics piping and ducting systems--Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation

GB/T18742.2-2002 Polypropylene piping systems for hot and cold water installations--Part 2: Pipes

GB/T18742.3-2002 Polypropylene piping systems for hot and cold water installations--Part 2: Fittings

ISO 10508:1995 Plastics piping systems for hot and cold water installations

3 Terms, definitions and abbreviations

The terms, definitions and abbreviations are as follows

3-1 Definitions

The definitions given in GB/T 2035 AND GB/T 1844.1, together with the following, apply.

3.1.1 Geometric Definition

3.1.1.1 Metric outside diameter(d n): the length unit of the outside diameter is millimeter

3.1.1.2 Optional point outside diameter(d c): the value from the optional point at the pipes or fittings faucet through section accurately pinpoints 0.1mm, carry if the second decimal place non-zero

3.1.1.3 Average outside diameter(d em): the valve, get from the outer circumference of the optional faucet section of pipes or fittings divides π ($\approx$3.142), accurately pinpoints 0.1mm, carry if the second decimal place non-zero

3.1.1.4 Minimums mean outside diameter (d em, min): the minimums value of the mean outside diameter, which equal normal outside diameter

3.1.1.5 Maximums mean outside diameter(d cm, max): the maximums value of the mean outside diameter

3.1.1.6 Mean inside diameter of the socket (d sm): the average value between the center point of the socket length and inter-vertical inside diameter.

3.1.1.7 Out-of-roundness: the deviation between the maximums optional section (or the socket section) outside diameter and the minimums of pipes or fittings, employing millimeter.

3.1.1.8 Normal wall thickness: the described value of the wall thickness of the pipes and fittings, using millimeter.

3.1.1.9 Optional wall thickness: the calculated wall thickness at the optional point of the pipes or fittings, accurately pinpoints 0.1mm, carry if the second decimal place non-zero.

3.1.1.10 Minimums wall thickness (e min): the minimums thickness of the optional point on a pipe or fitting circumference.

3.1.1.11 Maximums wall thickness(e max): the maximums thickness of the optional point on a pipe or fitting circumference.

3.1.1.12 Pipe Series S Classification: dimensionless series for pipe specification, according to GB/T 10798, can be calculated as follow:

$$S = \frac{d_n - e_n}{2e_n} \qquad (1)$$

d n: normal outside diameter, mm

e n: normal wall thickness, mm

3.1.2 Definition relating working condition

3.1.2.1 Normal pressure (PN): the maximums allowable working pressure at 20° C, employing Mpa

3.1.2.2 Designed pressure (P D): the maximums designed pressure in the pipe systems, employing Mpa

3.1.2.3 Hydrostatic tension(σ): the pressure of the inner pipe wall, at the medium of water, calculates as follow:

$$\sigma = P^* \frac{(d_{em} - e_{min})}{2e_{min}}$$

P: the inner pressure of the pipe wall, Mpa

d: the average outside diameter of the pipe, mm

e min: the minimums of the wall thickness, mm

3.1.2.4 Designed temperature (T D): the designed temperature or temperature combination for the water transportation.

3.1.2.5 Maximums designed temperature (T max): the maximums of T D at a short time.

3.1.2.6 Mal temperature (T mal): the maximums temperature when the systems beyond its control extreme.

3.1.2.7 Cold temperature: (T cold): the maximums temperature will be close to 25 ° C for cold water transportation. But the designed temperature is 20° C.

3.1.2.8 The treated water for heating equipment: if the additive-containing water for heating equipment do harm to the systems.

3.1.3 Definition relating materials

3.1.3.1 The lower predicting limit of long-time Hydrostatic tension(σ lpl): a same pressure with the dimensional value, using Mpa. It means, at the temperature T and time T, the 97.5% of the lower predicting limit of long-time Hydrostatic tension.

3.1.3.2 Designed pressure(σ D): the allowable pressure at the given situation, using Mpa. σ DP means pipe material, and σ DF plastic pipe material.

3.1.3.3 Overall usage coefficient (C): a coefficient which is great than 1, presents the pipe systems function and terms of use, in the condition of not at the lower limit of LPL.

3.1.4 The separate-layer-containing pipe: a plastic with a thin separate layer, e.g it is required that the pressure should be the same with the basic polymer (PP) fro the prevention or highly bringing down the gas leakage or light penetrating through the pipe walls.

3.2 Symbols

C: total use coefficient

d e: outside diameter (optional point)

d em: average outside diameter

d em, min: minimums average outside diameter

d em, max: maximums average outside diameter

d n: normal outside diameter

d sm: socket mean inside diameter

e: optional wall thickness

e max: optional maximums wall thickness

e min: optional minimums wall thickness

e n: normal wall thickness

P: internal hydrostatic tension

PN: normal pressure

P D: designed pressure

T: temperature

T cold: cold water temperature

T D: designed temperature

T mal: mal temperature

T max: the maximums designed temperature

t: time

σ : hydrostatic tension

σ cold: the designed pressure at 20 ° C

σ D: designed tension

σ DF: the designed tension for the plastic fitting materials

σ DP: the designed tension for the plastic pipe materials

σ F: hydrostatic pressure for the plastic fitting materials

σ P: hydrostatic pressure for the plastic pipe materials

σ LPL: the lower predicting limit of long-time Hydrostatic tension

3.3 Abbreviations

LPL: the lower predicting limit

MDP: the maximums designed pressure

PP: polypropylene

S: series pipes

4. the using condition grade

The PP pipe systems are divided into 4 grades depending on the using condition according to the ISO 10508 standard, as the table 1. Every grade represents a specifically

using range and 50-year service life. We also should consider the difference using pressure of 0.4 Mpa, 0.6 Mpa, 0.8 Mpa and 1.0 Mpa in the practical use.

Table 1

Grade	T D ° C	Time at the T D(year)	T max ° C	Time at the T max(year)	T mal ° C	Time at the T mal(h)	Typical use range
Grade 1	60	49	80	1	95	100	Hot water supple (60° C)
Grade 2	70	49	80	1	95	100	Hot water supple (70° C)
Grade 4	20 40 60	2. 5 20 25	70	2.5	100	100	Floor heating or low temperature radiator heating
Grade 5	20 60 80	14 25 10	90	1	100	100	High temperature radiator heating
PS: This table cannot be used when T n, T max and Tmal exceed the value listed in this table.							

All the use condition in table 1 should satisfy the requirement of 50-year service life for cold water supply at 20° C and 1Mpa.

Ps: plastic pipes or fittings manufacturer should provide the water treatment requirement, and the guidance of the characteristic, such as Oxygen leakage or others.

5. Materials

PP pipes, fittings should only use the following three types of colophony:

PP H: Homo Polypropylene

PP-B: Block Copolymerized Polypropylene. It is the two-phase or multi-phase polypropylene copolymer formed by PP-H and(or) PP-R and rubber phase. Rubber phase is a copolymerized compound formed by polypropylene and one kind (or many kinds) of alkene monomer. This alkene monomer has no other functional group.

PP-R: Random Copolymerized Polypropylene. It is a random copolymerized compound formed by polypropylene and one kind (or many kinds) of alkene monomer. This alkene monomer has no other functional group.

5.1 Polypropylene pipe and fitting material should has some necessary additive and the additive should be homogeneous distribution.

5.2 Polypropylene pipe and fitting materials should be made into a pipe, which should do the long-time hydrostatic pressure, test at four different temperature in accordance with GB/T 6111 testing method and GB/T 18252 requirement. Different temperature, σ LPL at different time will obtain from the testing value according to GB/T 18252 calculation method, also the creep rupture curve of this material will be drawn. The σ LPL at all time and temperature should be higher than the value on reference curve when the material creep rupture curve is compared with the predicted pressure reference curve in annex A of this document.

5.3 Polypropylene pipe and fitting material melt mass flow rate (MFR) should be ≤0.5

g/10 min(230 ° C,2.16kg)

5.4 The manufacturer can reuse the material, which is in accordance with this standard in the production by adding to the new material, but it is forbidden to reuse the other resource material.

6. Sanitation requirement

The pipe systems for the drinking water should be applied to GB/T 17219.

Annex A

Predicting Strength Reference Curve

PP-H predicting strength reference curve specifies in A1, PP-B predicting strength reference curve specifies in A2, and PP-R predicting strength reference curve specifies in A3.

The reference curve of 10° C ~95° C in A1, A2 and A3 uses the following formulas:

PP-H: $\log t = -46.364 - (9601.1 * \log \sigma) / T + 20381.5 / T + 15.24 * \log \sigma$ (A1)

PP-B: $\log t = -56.086 - (10157.8 * \log \sigma) / T + 23971.7 / T + 13.32 * \log \sigma$ (A2)

PP-R: $\log t = -55.725 - (9484.1 * \log \sigma) / T + 25502.2 / T + 6.39 * \log \sigma$ (A3)

The second branch line (the line right of the point of inflection in A1, A2 and A3)

PP-H: $\log t = -18.387 + 8918.5 / T - 4.1 * \log \sigma$

PP-B: $\log t = -13.699 + 6970.3 / T - 3.82 * \log \sigma$

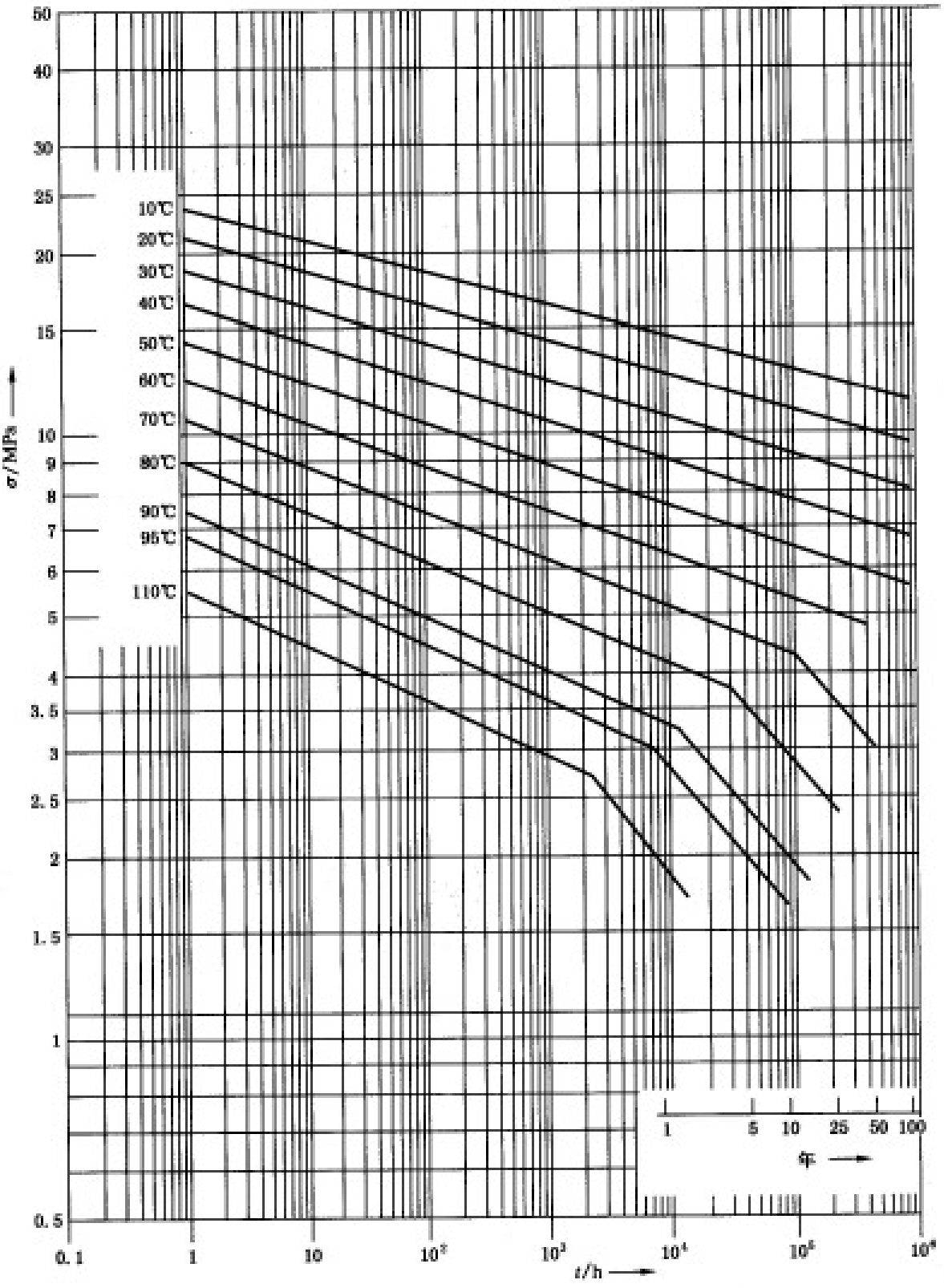
PP-R: $\log t = -19.98 + 9507 / T - 4.11 * \log \sigma$

Where:

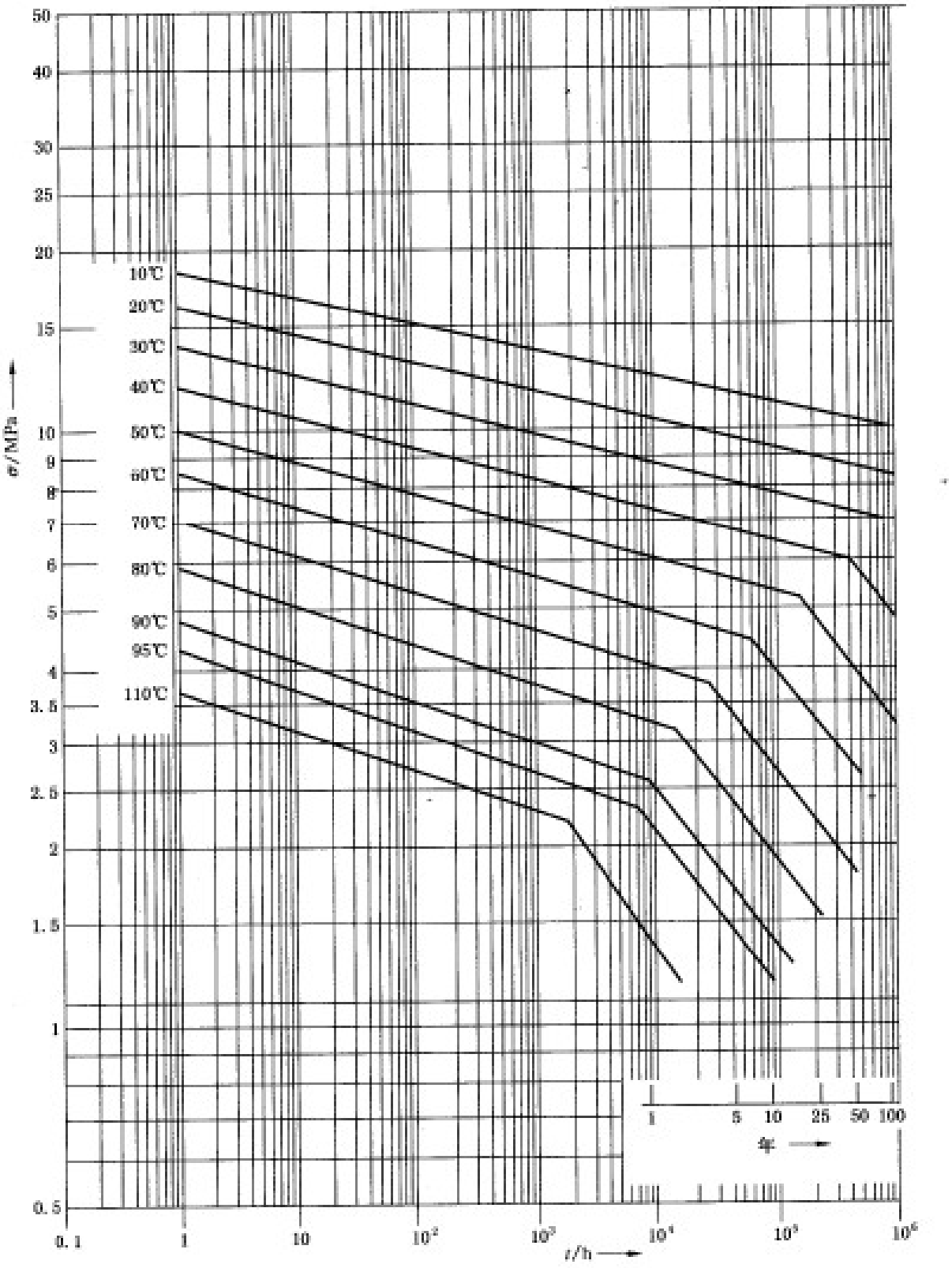
t --------- rupture time, h;

T--------- temperature, K;

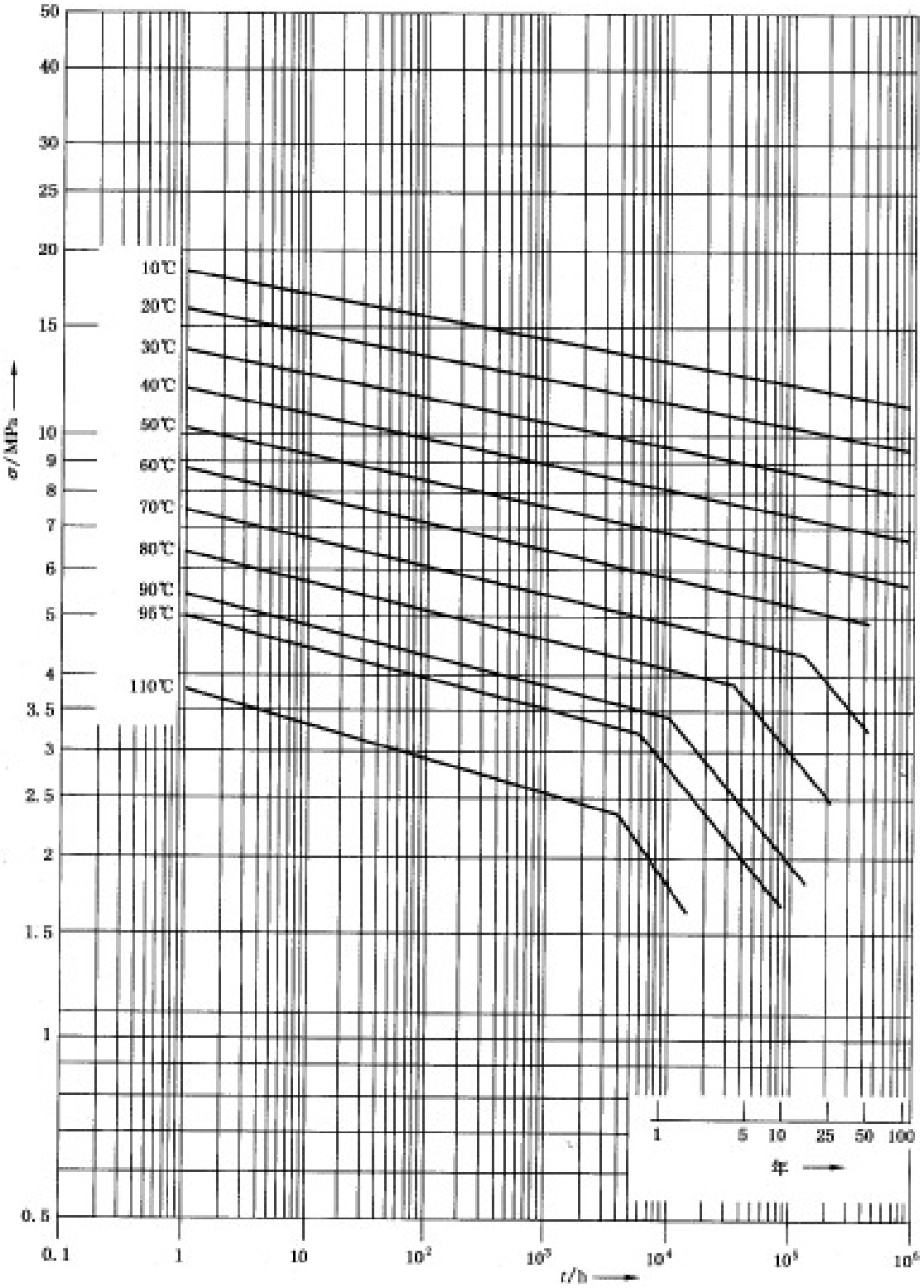
σ ------- hydrostatic pressure, Mpa



A1 PP-H predicting strength reference curve



A2 PP-B predicting strength reference curve



A3 PP-R predicting strength reference curve

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冷热水用聚丙烯管道系统 第2部分:管材

Polypropylene piping systems for hot and cold water installation—Part 2:Pipes

2002-05-29 发布　　2003-01-01 实施

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Polypropylene piping systems for hot and cold water installation----Part 2: Pipes

Foreword

This series of standard is drawn on the base of close tracing back the International Standard Organization (ISO/TC138) documents of <plastic piping systems for hot and cold water----Polypropylene> which is under drawing by the institute of plastic pipe, fitting, and valve for fluid transportation, and base on the domestic producing condition of PPR pipes and fittings. This documents is technically consistent with < plastic piping systems for hot and cold water----Polypropylene, part 2: Pipes>.

The main difference is:

- Pipe series S is added;
- The related content of part 5 and part 7 of ISO/DIS 15874: 1999 is added;
- The highest test condition is recommended over the testing condition of different using situation of the one pipe series S.
- This standard doesn't adopt the annex of ISO/DIS 1584.2: 1999 for the no relationship with this standard.
- The relationship between pipe series S and normal pressure is added.

The standard is composed by three parts:

- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 1: General
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 2: Pipes
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 3: Fittings

The annex A is the normal annex and B is hint annex.

This documents is put forward by China National Light Industry

This documents is drawn by: Qilu oil and chemical Co.LTD, Shanghai Baidie fitting Co.LTD, Shanxi huashang victory plastic Co. LTD, Yanshan oil and chemical institute.

The drawer: Xie Jianling, Xu Hongyue, Zhu Liping, Ni Zhilong, Qiu Qiang.

Part 2: Pipes

1 Scope

This standard specifies the definitions, symbols, abbreviations, materials, product classification, technical requirement, testing methods, inspections and marks, packages, transportation, preservation of PP pipes. PP pipes(called pipes blow) using polypropylene as the material, are extruded by a machine to form the pipe with round cutoff.

This standard together with GB/T 18742.1 and GB/T 18742.3 apply to the use of the piping systems of cold and hot water in the buildings, including industrial and civilian piping systems of cold and hot water, drinking water and heating.

This documents is not applied to fire fighting systems and water medium systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For the updated reference, the latest edition of the referenced documents (including any amendments) applies.

GB/T2828-1987 Sampling procedures and tables for lot-by-lot inspection by attributes (Apply to inspection of successive lots or batches)

GB/T 2918-1998 State adjustment and standard test environment of plastic specimen

GB/T 3682-2000 Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics. (ISO 1133: 1997)

GB/T 6111-1985 Thermoplastics pipes for the conveyance of fluids-Resistance to internal pressure--Test method (ISO/DP 1167: 1978)

GB/T 6671-2001 Thermoplastics pipes-determination of longitudinal reversion (ISO 2505: 1994)

GB/T 8006-1988 Method for dimension measuring of plastic pipes (ISO 3126: 1974)

GB/T 10798-2001 Thermoplastics pipes-Universal wall thickness table (ISO 4065:1996)

GB/T 17219-1998 Standard for safety evaluation of equipment and productive materials in drinking water system

GB/T18742.1-2002 Polypropylene piping systems for hot and cold water installations--Part 1: General

GB/T18742.3-2002 Polypropylene piping systems for hot and cold water installations--Part 3: Fittings

GB/T 18743-2002 Thermoplastics pipes for the transport of fluids - - Determination of impact by the Charpy method (ISO 9854.1~9854.2: 1994)

3 Definitions, symbols and abbreviate

This standard adopts the definitions, symbols and abbreviate of GB/T 18742.1.

4 Materials

The raw materials for the pipe production should be the polypropylene in a accordance with GB/T 18742.1

5 Product classification

5.1 Pipes can be divided into PP-H, PP-B and PP-R according to different raw material, specified in GB/T 18742.1.

5.2 Pipes can be divided into S5, S4, S3.2, S2.5, S2 five pipe series. The relationship between S and PN (normal pressure) is specified in Annex B.

6 The choice of pipe series S value

Pipes choose the corresponding S according to using condition grade (specified in GB/T 18742.1) and designed pressure, shown in table 1, table 2 and table 3. The other pressure specification should satisfy 50-year service life in designing

Table 1 the choice for PP-H pipe series S

	Pipe Series S

Design Pressure Mpa	Grade 1 σ d = 2.90 Mpa	Grade 2 σ d = 1.99 Mpa	Grade 4 σ d =3.24 Mpa	Grade 5 σ d = 1.83 Mpa
0.4	5	5	5	4
0.6	4	3.2	5	2.5
0.8	3.2	2.5	4	2
1.0	2.5	2	3.2	---

Table 2 choice for PP-B pipe series S

Design Pressure Mpa	Pipe Series S			
	Grade 1 σ d = 1.67 Mpa	Grade 2 σ d = 1.19 Mpa	Grade 4 σ d =1.95 Mpa	Grade 5 σ d = 1.19 Mpa
0.4	4	2.5	4	2.5
0.6	2.5	2	3.2	2
0.8	2	---	2	---
1.0	----	----	2	---

Table 3 choice for PP-R pipe series S

Design Pressure Mpa	Pipe Series S			
	Grade 1 σ d = 3.09 Mpa	Grade 2 σ d = 2.13 Mpa	Grade 4 σ d =3.30 Mpa	Grade 5 σ d = 1.90 Mpa
0.4	5	5	5	4
0.6	5	3.2	5	3.2
0.8	3.2	2.5	4	2
1.0	2.5	2	3.2	----

7 Technique Requirement

7.1 Color

The color usually is grey, other color could be negotiated by the buyers and sellers.

7.2 Appearance

The pipes color should be basically the same

The inside surface of the pipes should be smooth, plane, no sunken, no air bubble and other objection that will influence the function. The pipes should not contain the visible impurity. The pipes cuttoff should be plane and be vertical to the axial line.

7.3 Opacity

The pipes should be opacity

7.4 Specification and dimension

7.4.1 Pipe specification is expressed by pipes series S, normal outside diameter

* normal wall thickness e n.

e.g. The pipe series S5, which normal outside diameter is 32mm and normal wall thickness 2.9mm.

then: S5 d n32* e n 2.9 mm

7.4.2 The pipes normal outside diameter, average outside diameter and the corresponding wall thickness of pipe series S (not including the thickness of the separated layer), specified in table 4.

Table 4 Pipe series and specification dimension

Normal outside diameter d n	Average outside diameter		Pipe series				
			S5	S4	S3.2	S2.5	S2
	d em,min	d em, max	Normal wall thickness e n				
12	12.0	12.3	---	---	---	2.0	2.4
16	16.0	16.3	---	2.0	2.2	2.7	3.3
20	20.0	20.3	2.0	2.3	2.8	3.4	4.1
25	25.0	25.3	2.3	2.8	3.5	4.2	5.1
32	32.0	32.3	2.9	3.6	4.4	5.4	6.5
40	40.0	40.4	3.7	4.5	5.5	6.7	8.1
50	50.0	50.5	4.6	5.6	6.9	8.3	10.1
63	63.0	63.3	5.8	7.1	8.6	10.5	12.7
75	75.0	75.7	6.8	8.4	10.3	12.5	15.1
90	90.0	90.9	8.2	10.1	12.3	15.0	18.1
110	110.0	111.0	10.0	12.3	15.1	18.3	22.1
125	125.0	126.2	11.4	14.0	17.1	20.8	25.1
140	140.0	141.3	12.7	15.7	19.2	23.3	28.1
160	160.0	161.5	14.6	17.9	21.9	25.6	32.1

7.4.3 The length of the pipe usually is 4m or 6m, or depending on the customers requirement negotiated by the buyers and sellers. The length of the pipe should not allow the negative deviation.

7.4.4 The wall thickness deviation of a same pipe cutoff should accord with table 5

Table 5 deviation of wall thickness

Normal wall thickness e n	Allowable tolerance	Normal wall thickness e n	Allowable tolerance	Normal wall thickness e n	Allowable tolerance	Normal wall thickness e n	Allowable tolerance
1.0＜e n≤2.0	+0.3 0	9.0＜e n≤ 10.0	+1.1 0	17.0＜e n≤ 18.0	+1.9 0	25.0＜e n≤ 26.0	+2.7 0

2.0＜e n≤3.0	+0.4 0	10.0＜e n≤ 11.0	+1.2 0	18.0＜e n≤ 19.0	+2.0 0	26.0＜e n≤ 27.0	+2.8 0
3.0＜e n≤4.0	+0.5 0	11.0＜e n≤ 12.0	+1.3 0	19.0＜e n≤ 20.0	+2.1 0	27.0＜e n≤ 28.0	+2.9 0
4.0＜e n≤5.0	+0.6 0	12.0＜e n≤ 13.0	+1.4 0	20.0＜e n≤ 21.0	+2.2 0	28.0＜e n≤ 29.0	+3.0 0
5.0＜e n≤6.0	+0.7 0	13.0＜e n≤ 14.0	+1.5 0	21.0＜e n≤ 22.0	+2.3 0	29.0＜e n≤ 30.0	+3.1 0
6.0＜e n≤7.0	+0.8 0	14.0＜e n≤ 15.0	+1.6 0	22.0＜e n≤ 23.0	+2.4 0	30.0＜e n≤ 31.0	+3.2 0
7.0＜e n≤8.0	+0.9	15.0＜e n≤ 16.0	+1.7 0	23.0＜e n≤ 24.0	+2.5 0	31.0＜e n≤ 32.0	+3.3 0
8.0＜e n≤9.0	+1.0 0	16.0＜e n≤ 17.0	+1.8 0	24.0＜e n≤ 25.0	+2.6 0	32.0＜e n≤ 33.0	+3.4 0

7.5 The pipes physical mechanics and mechanical performance should accord with table 6

Table 6 The pipes physical mechanics and mechanical performance

Item	Material	Testing parameter			Testing quantity	Target
		Testing temperature ° C	Testing time h	Hydrostatic pressure Mpa		
Vertical shrink rate	PP-H	150±2	e n≤8 mm:1 8mm≤e n≤ 16mm:2 e n >16mm:4	---	3	≤2%
	PP-B	150±2		---		
	PP-R	135±2		---		
Impact test method (simple supporting beam method)	PP-H	150±2	----		10	damage rate< 10% of the samples
	PP-B	150±2				
	PP-R	150±2				
Hydrostatic pressure testing	PP-H	20	1	21.0	3	No damage, no leakage
		95	22	5.0		
		95	165	4.2		
		95	1000	3.5		
	PP-B	20	1	16.0	3	
		95	22	3.4		
		95	165	3.0		
		95	1000	2.6		
	PP-R	20	1	16.0	3	
		95	22	4.2		
		95	165	3.8		
		95	1000	3.5		

The melt mass-flow rate, MFR(230° C/2.16kg) g/10 min					3	Rate of change≤ 30%of the rough material
Hydrostatic Thermal Stability testing	PP-H	110	8760	1.9	1	No damage, no leakage
	PP-B			1.4		
	PP-R			1.9		

7.6 The pipes health performance should accord with CB/T 17219.

7.7 System applicability

It should pass the internal pressure and thermal cycling test after the pipe are connected with the pipe accorded with GB/T 18742.3.

7.7.1 The internal pressure test should accord with table 7

Table 7 the internal pressure test

Item / Pipe series	Material	Testing temperature ° C	Testing pressure Mpa	Testing time h	Testing quantity	Target
S5	PP-H	95	0.70	1000	3	No damage, no leakage
	PP-B		0.50			
	PP-R		0.68			
S4	PP-H	95	0.88	1000	3	No damage, no leakage
	PP-B		0.62			
	PP-R		0.80			
S3.2	PP-H	95	1.10	1000	3	No damage, no leakage
	PP-B		0.76			
	PP-R		1.11			
S2.5	PP-H	95	1.41	1000	3	No damage, no leakage
	PP-B		0.93			
	PP-R		1.31			
S2	PP-H	95	1.76	1000	3	No damage, no leakage
	PP-B		1.31			
	PP-R		1.64			

7.7.2 Thermal cycling test should accord with table 8

The pre-stress in annex A is PP-H: 3.6 Mpa, PP-B: 3.0 Mpa, PP-R: 2.4 Mpa.

The formula for pre-stress is :

$$\sigma t = \alpha * \triangle T * E \qquad (1)$$

where: σt pre-stress, Mpa

α thermal expansion coefficients

$\triangle T$ temperature difference

E Elastic modulus

In this standard: $\alpha = 1.5*10^{-4}k^{-1}$

$\triangle T = 20$ K

E =1200Mpa(PP-H),1000Mpa(PP-B),800Mpa(PP-R)

Pre-stress is equal to the pipe shrinkage stress when the temperature falls 20 ° C

Table 8 the thermal cycling test

Material	The highest testing temperature ° C	The lowest testing temperature ° C	Testing pressure Mpa	Cycling times	Testing quantity	Target
PP-H	95	20	1.0	5000	1	No damage, no leakage
PP-B						
PP-R						
A cycling is (30+2) min, including (15+1) min highest testing temperature, and (15+1) min lowest testing temperature.						

8 Testing method

8.1 The standard environment for sampling sate adjusting and testing

The sample should be 48h after production line. The testing should be taken at the temperature of (23±2) ° C, humidity of (50±10)%, and time of more than 24h.

8.2 Color and appearance

Check with eyes.

8.3 Opacity

Take a 400mm pipes, envelope an end with a opacity material; when there is natural light at one side of the pipe, hold the pipe at the light direction, see inside with the eyes from the open end; and it is qualified if the shadow of your hands can not been seen.

8.4 Dimensional inspection

8.4.1 Length

To test the samples one by one by steel tape ruler, accurate within 1mm.

8.4.2 Average outside diameter

The average outside diameter is the outside diameter 100mm-150mm from the pipe end according to GB/T 8806.

8.4.3 Wall thickness

Wall thickness is he maximums and minimums of the wall thickness around the pipe circle, accurate to within 0.1 mm, rounding up to the first decimal place.

8.5 Longitudinal reversion

According to the testing B in GB/T 6671-2001

8.6 charpy impact strength testing

According to GB/T 18743

8.7 Hydrostatic pressure testing

8.7.1 The temperature, time and hydrostatic pressure should accord with table 6, the testing medium should be water.

8.7.2 The testing method accords with GB/T 6111(using type A cap)

8.8 melt mass-flow rate

Cutting some granule about 2mm^3-5mm^3 as the sample, do the test according to table 6 and GB/T 3682.

Melt mass-flow rate Meter should be checked by the standard sample. When testing, blow azotes gas into the pipe for 5s-10s(azotes pressure is 0.05Mpa), and then quickly put the sample into the cylinder for testing in 20s.

8.9 Hydrostatic Thermal Stability testing

8.9.1 Testing equipment

Cyclic temp control baker.

8.9.2 Testing condition

The allowance in the baker should be (110+4/-2) according to the table 6. The testing medium is water inside and air outside.

8.9.3 Testing method

After adjustment, equip the pipe in the baker and do the testing according to GB/T 6111 (using Type A cap)

8.10 Sanitation function testing is according to GB/T 17219

8.11 System applicability testing

8.11.1 Internal pressure testing

The testing sample, combined of the pipe and at least two fittings, does the testing according to GB/T 6111. The testing medium is water inside and outside the cylinder.

8.11.2 Thermal cycle testing

Testing accords with annex A. Testing medium: water inside the cylinder, and air outside the cylinder.

9 Testing rule

9.1 The products only can leave the factory after the inspection of the quality department and with the certificate of conformity.

9.2 Batch

A batch is the continuous production of the same specification pipes using the same material, the same formula and technique. Every batch of pipes should not exceed 50 tons. If the amount does not reach 50 tons in 7 days, counted as a batch. A shipment can include a batch or several batches. The batch number should be written, and the same batch as a inspection batch.

9.3 Periodic inspection

9.3.1 Grouping

The pipes are divided into some groups according to the size in table 9.

Table 9 pipes dimension and the range of normal outside diameter

Dimension group	Range of normal outside diameter
1	12≤d n≤63
2	75≤d n≤160

9.3.2 Approval inspection

The item for the approval inspection includes the entire technical requirement in chapter 7. On the first production of the alike equipment produced by the same machinery factory or the change of material, the approval inspection should be taken in optional group in the table 9.

9.4 Final inspection

9.4.1 The items for final inspection are appearance, dimension, longitudinal reversion in 7.5, charpy impact strength testing and 20° C/1h and 95° C/22h(95° C/165h) in hydrostatic pressure testing.

9.4.2 Sampling for appearance and dimension adopts inspect once at normal standard, adopting common inspection level I, acceptable quality level 6.5, and the sampling plan shown in table 10.

Batch range N	Sampling number n	Acceptance number Ac	Rejection number Rc
<25	2	0	1
26-50	8	1	2
51-90	8	1	2
91-150	8	1	2
151-280	13	2	3
281-500	20	3	4
501-1200	32	5	6
1201-3200	50	7	8
3201-10000	80	10	11

9.4.3 In the acceptance products of appearance and dimension, choose enough many samples at random, and doing the longitudinal reversion testing, charpy impact strength testing and 20° C/1h hydrostatic pressure testing.

9.4.4 When choosing the 95° C/22h hydrostatic pressure testing, do it every 24h; however, if choosing the 95° C/165h hydrostatic pressure testing, do it every 168h

9.5 Approval inspection

9.5.1 The approval inspection items are entire technical requirement accept 7.5 Thermal Stability testing in hydrostatic pressure condition and 7.7.2.

9.5.2 Doing the appearance and dimension testing according to this standard and 9.4.2, choosing the enough many samples in the acceptance samples to do the opacity, longitudinal reversion, melt mass-flow rate, hydrostatic pressure,charpy impact strength and internal pressure of the system applicability testing.

In normal condition, the approval testing would be taken every two year.

Approval testing should be taken for any conditions below:

a) If there is a big change in structure, material or technics that might influence the products performance after regular production.
b) Restart producing after production inactive more than half a year for any reason.
c) The final inspection is greatly different from the former approval inspection
d) The approval inspection was asked to take by national quality control bureau

9.6 Judgment rule

Appearance and dimension are judged according to table 10. Any disqualification in sanitation judges this batch rejection batch. One disqualification in other technique guideline, choose the double samples for re-inspection, judge it as rejection batch if

the samples are still disqualified.

10 marks, packages, transportation and preservation

10.1 Marks

10.1.1 Permanence marks should be on the pipes, and the distance between the marks should be no more than 1m.

The marks should include:

a) The manufacturer
b) Product name: mark (PP-H, PP-B or PP-R) on the pipes
c) Brand
d) Specification and dimension: pipe series S, normal outside diameter d n and normal wall thickness e n.
e) This standard
f) Production date

10.1.2 Marks on pipes packing

a) Brand
b) Product name: mark (PP-H, PP-B or PP-R) on the pipes
c) Manufacturer name and address

10.1.3 To prevent confusion in usage, there should not be any PN value on the pipes.

10.2 Packing

Put the pipes with the same specification into the bags and seal the bags. The weight of the bag should not exceed 25kg, or according to the negotiation with customers.

10.3 Transportation

Any throw, solarization, dirt, press or damage are forbidden during the pipes load and transportation.

10.4 Preservation

Pipes should be suitably stock in the warehouse, far from hot resource, and are forbidden to put in the open air. The f piling up Height should be no more than 1.5m.

Annex A

Thermal cycling test

A1 Principle

After the combination of pipes and fittings according to certain requirement and endure certain internal pressure, checking the leakage at the joint of the pipes and fittings after alternate temperature change as required.

A2 Equipment

The testing equipments include cold and hot water alternate cycle equipment, flow control equipment, water temperature gauge, pipe prestressing and fix equipment, and all the equipment should accord with follows:

a) The cold water temperature should satisfy range ±5° C of the lowest temperature in this standard.
b) The hot water temperature should satisfy range ±2° C of the highest temperature in this standard.
c) The alternation between cold and hot water will be finish in 1 min.
d) The water temperature change in the combination system can be controlled n certain range, and the water pressure can retain range ±0.05Mpa of this

standard(except for water hammer in the alternation)

A3 The fix of testing combination system

The testing combination system is given in chart A1, and it should be equipped and fixed according to manufacturer recommendation method. All the pipes can not be bent like part C in chart A1, the part C should be equipped according to A2.

A4 Pre-processing of testing combination system

A4.1 place the full equipment of combination system in the room temperature condition at least 1h.

A4.2 add pressure to part A in the chart A1 to lock the two nogs to arouse a stable pressure (prestressing)

A4.3 Fill the combination system with the cold gas to drive the air out.

A5 Testing process

A5.1 connect the combination system with the testing equipment

A5.2 turn on the testing equipment and control the water temperature and water pressure in the required range

A5.3 Turn on the valve to start the cycling testing, first cold water and then hot water.

A5.4 For the former 5 cycles, do as follows:

a) Operating the balancing valve to control the flow speed to make the difference of water temperature at cycling entry and exit not exceed 5° C.

b) Seal and adjust the joint for any leakage

A5.5 Checking all the joints for leakage after the required cycling times, if there is leakage, write down the time, type and location.

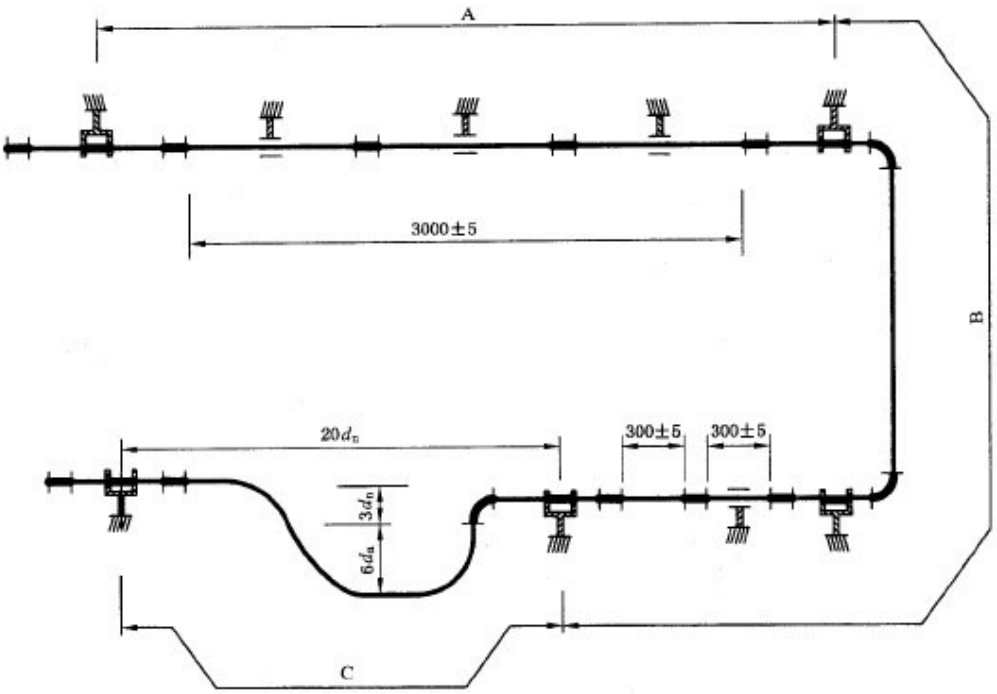
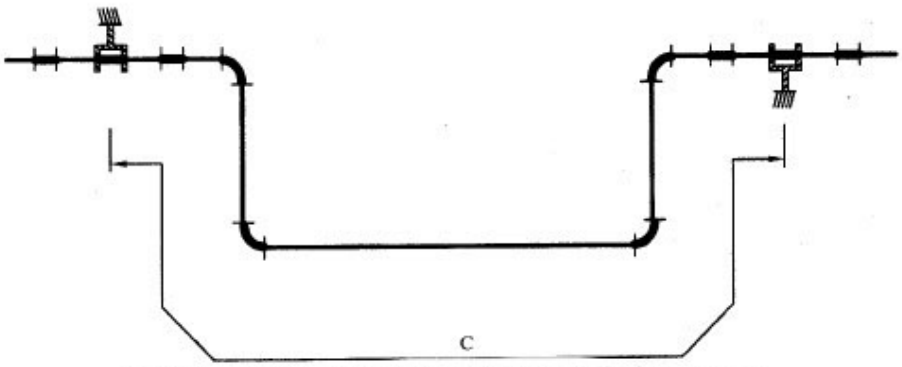


chart A1 testing equipment



ChartA2 equipment chart for displacement of Part C

A6 Testing report

The following items should be include in the testing report

a) Mark adopt this standard annex
b) Samples' name, specification, dimension, pipe series and source
c) Testing condition(including prestressing, testing water temperature, testing water pressure, a full cycling and the time for every part of the cycling)
d) Testing result, for any leakage, not the time, type and location.
e) Any element that may influence the result.

Annex B

Relation between pipe series S and normal pressure PN

B1 relation between pipe series S and normal pressure PN is given in table B1 when

pipe system usage coefficient is 1.25.

Table B1 the relation between pipe series S and normal pressure (C=1.25)

Pipe series	S5	S4	S3.2	S2.5	S2
Normal pressure PN/Mpa	1.25	1.6	2.0	2.5	3.2

B2 relation between pipe series S and normal pressure PN is given in table B1 when pipe system usage coefficient is 1.5.

Pipe series	S5	S4	S3.2	S2.5	S2
Normal pressure PN/Mpa	1.0	1.25	1.6	2.0	2.5

ICS 83.140.30
G 33

中华人民共和国国家标准

GB/T 18742.3—2002

冷热水用聚丙烯管道系统 第3部分:管件

Polypropylene piping systems for hot and cold water installation—Part3:Fittings

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Polypropylene piping systems for hot and cold water installation----Part 3: Fittings

Foreword

This series of standard is drawn on the base of close tracing back the International Standard Organization (ISO/TC138) document of <plastic piping systems for hot and cold water----Polypropylene> which is under drawing by the institute of plastic pipe, fitting, and valve for fluid transportation.

The standard is composed by three parts:

- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 1: General
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 2: Pipes
- GB/T 18742.1-2002 Polypropylene piping systems for hot and cold water installation Part 3: Fittings

This document is put forward by China National Light Industry

This document is drawn by: Shanghai Baidie fitting Co.LTD, Hebei Yuguang Indutry Trading Co.LTD, Zhejiang Weixing Pipes Co.LTD and Hangzhou Yongheng Pipes Co.LTD

The drawers: Xu Hongyue, Qiu Qiang, Zhu Liping, Feng Jinmao, Ni Zhilong.

1 Scope

This standard specifies the definitions, symbols, abbreviations, materials, product classification, technical requirement, testing methods, inspections and marks, packages, transportation, preservation of PP fittings. PP fittings(called fittings blow) using polypropylene as the material, are extruded by a machine.

This standard together with GB/T 18742.1 and GB/T 18742.2 apply to the use of the piping systems of cold and hot water in the buildings, including industrial and civilian piping systems of cold and hot water, drinking water and heating.

This document is not applied to fire fighting systems and water medium systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For the updated reference, the latest edition of the referenced documents (including any amendments) applies.

GB/T 2828-1987 Sampling procedures and tables for lot-by-lot inspection (Apply to inspection of successive lots or batches)

GB/T 2918-1998 State adjustment and standard test environment of plastic specimen

GB/T 3682-2000 Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics. (ISO 1133: 1997)