

WATER DISTRIBUTION OR DRAINAGE PIPES**Technical document****08-02 Traditional**

Heating and/or domestic distribution
and/or distribution of chilled water –
PB pipes

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The English version is provided for information. In case of doubt or dispute, the French version only is valid.

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MODIFICATION HISTORY

Revision No.	Application date	Modifications
00	16/11/2018	Update to the document layout and reference Content modifications: Creation of technical document following transition of the products covered by this document to traditional status

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The requirements and provisions specified in this Technical Document will be updated in the case of new components or products.

1. STANDARDS

1.1. Product standards

NF EN ISO 15876-1: Plastics piping systems for hot and cold water installations - Polybutene (PB) - Part 1: General

NF EN ISO 15876-2: Plastics piping systems for hot and cold water installations - Polybutene (PB) - Part 2: Pipes

NF EN ISO 15876 3: Plastics piping systems for hot and cold water installations - Polybutene (PB) - Part 3: Fittings

NF EN ISO 15876-5: Plastics piping systems for hot and cold water installations - Polybutene (PB) - Part 5: Fitness for purpose of the system

XP CEN ISO/TS 15876-7: Plastics piping systems for hot and cold water installations - Polybutene (PB) - Part 7: Guidance for the assessment of conformity

1.2. Test standards

NF EN ISO 1133 (November 2005): Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics

NF EN ISO 1167-1: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 1: General method

NF EN ISO 1167-2: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 2: Preparation of pipe test pieces

NF EN ISO 1167-3: Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 3: Preparation of components

NF EN ISO 2505: Thermoplastics pipes - Longitudinal reversion - Test method and parameters

NF EN ISO 3126: Plastics Piping Systems - Plastics components - Determination of dimensions

NF EN ISO 6259-1: Thermoplastics pipes - Determination of tensile properties - Part 1: General test method

ISO 6259-3: Thermoplastics pipes – Determination of tensile properties – Part 3: Polyolefin pipes

NF EN ISO 11357-1: Plastics - Differential scanning calorimetry (DSC) - Part 1: General principles

NF EN 728: Plastics piping and ducting systems - Polyolefin pipes and fittings - Determination of oxidation induction time

NF EN ISO 527-1 - Plastics - Determination of tensile properties - Part 1: General principles

NF EN ISO 3501: Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for resistance to pull-out under constant longitudinal force

NF EN ISO 3503 Plastics piping systems — Mechanical joints between fittings and pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending

1.3. Associated implementation documents

Implementation must be carried out:

- For class 4 (heated floors): in accordance with DTU 65.14 “Implementation of heated floors with hot water”.
- For classes 2 and 5: in accordance with the “Technical Specifications (CPT) for the implementation of pipe systems based on synthetic pipes - Semi-rigid LWC pipes” (CSTB specification 2808_V2 – November 2011).

2. FIELDS OF APPLICATION

This Technical Document covers the applications indicated in the table below. These applications are drawn from the ISO 10508 standard.

Applications classes 2, 4 and 5 comply with the ISO 10508 standard. According to this standard, the reader is reminded that regardless of the application class selected, the system must also comply with conveyance of cold water at 20 °C for 50 years and a service pressure of 10 bar.

PB tubes shall be from series 5 of dimension class A defined in the NF EN ISO 15876 standard.

Dimension class C (class 4, underfloor heating only) is authorised.

It also covers the “Chilled water” application class corresponding to air conditioning and cooling systems with a minimum temperature of 5 °C.

Classes	Service conditions	Maximum conditions	Accidental conditions	Typical application
Class 2	70 °C 49 years	80 °C 1 year	95 °C 100 hours	Domestic hot and cold water supply
Class 4	20 °C - 2.5 years and 40 °C - 20 years and 60 °C - 25 years	70 °C 2.5 years	100 °C 100 hours	Low temperature radiators, underfloor heating
Class 5	20 °C - 14 years and 60 °C - 25 years and 80 °C - 10 years	90 °C 1 year	100 °C 100 hours	High temperature radiators

For a system that is not intended for class 2, the marking shall be supplemented by the phrase ‘heating only’.

For a system that is intended only for underfloor heating within class 4, the marking shall be supplemented by the phrase ‘underfloor heating only’.

The dimension groups are defined in §4.2.1.2. of standard XP CEN ISO/TS 15875-7:

Dimension group	Nominal diameter, dn
1	10 < dn < 63
2	63 ≤ dn < 160

The holder shall produce at least once in each dimension group in a 2-year cycle.

Contact with potable water

The pipes, fittings and components (particularly seals) must comply with French regulations currently in force for products designed to come into contact with potable water. In particular, they must have a currently valid ACS certification (or a self-declaration, if applicable). These documents must be presented during audits.

Additional requirements for pipes and fittings

The holder must make its installation instructions public in French, on its commercial documents, on its website or when delivering products (optional).

Specific implementation instructions

Prerequisite: crimp fittings must be associated with at least one crimper brand / crimp profile pair.

If special tools are required (crimping) to install the pipes and fittings, the holder shall indicate the specific crimper(s) used and the corresponding crimp profiles, as well as the crimping force to be applied, for which they shall have provided evidence of suitability for use in installing the fittings.

These instructions shall be defined in a manual associated to the holder's commercial documents or in the technical data sheets, as well as on its website.

These documents shall be provided to CSTB upon admission and whenever they are modified.

This requirement will be verified annually at each audit in order to ensure that the tests performed at the Mark laboratory are aligned with the holder's instructions.

In the holder's technical documents, the following points shall be precisely defined:

- Product reference for the crimper and associated crimp profiles (jaw references)
- The maintenance associated with this equipment

3. CERTIFIED CHARACTERISTICS AND TEST METHODS

3.1. Certified and optional characteristics

The characteristics listed in the table below will comply with the specifications given in paragraph 3.3.

Optional certified characteristics

The certification of the additional DURABILITY and FUNCTIONALITY characteristics “QB D”, “QB F” or “QB DF” guarantees the compliance of QB-certified products with the requirements of the CSTB Technical Guide (Specification 3597_V2). These options are based on a more detailed analysis of the durability and suitability for use of these products by means of the following tests and specifications:

“QB D” option:

- Tensile test on new pipes (durability)
- Resistance to oxidation (OIT) (durability)

“QB F” option:

- Experimental heating circuits at 110°C (functionality)

“QB DF” option:

This option is the combination of both options, “QB D” and “QB F”

Certified characteristics	Nature of the component or system
	Pipe PB
Dimensional characteristics *	X
Melt mass-flow rate (MFR)	X
Tensile properties (if QB D option)	X ⁽¹⁾
Resistance to oxidation (if QB D option)	X
Heat shrinkage	X
Thermal stability	X
Resistance to pressure	X
Opacity	X
Suitability for use	
Internal pressure	X
Bending under internal pressure	X
Pull-out	X
Thermal cycle	X
Cyclic pressure	X
Leaktightness under vacuum	X
Experimental heating circuits at 110°C (if QB F option)	X

*: These characteristics are certified based on verification of the holder's registers and recorded in the audit report.

3.2. Test methods

The conditions for verification of the characteristics certified at CSTB are listed in the tables below.

Certified characteristics	PB pipe
Dimensional characteristics	NF EN ISO 3126
Melt mass-flow rate (MFR)	NF EN ISO 1133 190°C – 2.16 kg or 5 kg
Tensile properties (if QB D option)	NF EN ISO 6259-1- ISO 6259-3 type 1 or 2 specimen for DN > 25 and 1 NF EN ISO 527 BA for DN ≤ 25
Resistance to oxidation (if QB D option)	NF EN 728 210°C 20 min
Heat shrinkage	NF EN ISO 2505 – In air 1 h for th ≤ 8mm 2 h min if 8 mm < th ≤ 16 mm 4 h if th > 16 mm
	110°C
	2 h min if 8 mm < th ≤ 16 mm
Opacity - Transmission	ISO 7686 with use of an integrating sphere
Thermal stability	NF EN ISO 1167 1-2-3 – at 110 °C
Resistance to pressure 1000 h	NF EN ISO 1167 1-2-3 – at 95 °C
	$\sigma = 6.0 \text{ MPa}$
Suitability for use	
Internal pressure	NF EN ISO 1167 1-2-3
Bending under internal pressure	NF EN ISO 3503
Pull-out	NF EN ISO 3501
Thermal cycle	NF EN 12293
Cyclic pressure	NF EN 12295
Leaktightness under vacuum	NF EN 12294
Experimental heating circuits at 110°C (if QB F option)	Experimental circuits are made up of pipes and fittings of different diameters representing the range proposed by the applicant. For crimp fittings, the full range of proposed tools must be represented.

3.3. Specifications

Measurements or tests	Test standards	Specifications	
		PB	
Dimensional characteristics	EN ISO 3126	Compliant with product standards of the class under consideration	
Fluidity index	NF EN ISO 1133	Material specification declared by manufacturer	
OIT (if QB D option)	NF EN 728	Material specification declared by manufacturer	
Tensile properties (if QB D option)	NF EN ISO 6259-1 - ISO 6259-3	Material specification declared by manufacturer	
Heat shrinkage	EN ISO 2505	110 °C (air) 1 hour < 2 %	
Thermal stability	EN ISO 1167	2.4 MPa - 110°C - 8760 h	
Opacity - Transmission	ISO 7686 with use of an integrating sphere	Transmission < 14%	
Resistance to internal pressure	EN ISO 1167	95°C - t > 1 h - 95°C - t > 22 h - 95°C - t > 165 h - 95°C - t > 1000 h -	} See Sigma in table below

PRODUCTS/TESTS	PB Sigma (MPa)
PRODUCT STANDARDS	NF EN ISO 15875-1-7
Pressure	
1000 h - 95°C	6.0
165 h - 95°C	6.2
22 h - 95°C	6.5
22h-20°C	15.2
1 h - 20°C	15.5

PRODUCTS/TESTS	PB
PRODUCT STANDARDS	NF EN ISO 15875-1-5 XP CEN ISO/TS 15876-7
Suitability for use	
Internal pressure	Part-5 §4.2
bending under internal pressure	Part-5 §4.3
Pull-out	Part-5 §4.4
Thermal cycle	Part-5 §4.5
Cyclic pressure	Part-5 §4.6
Leaktightness under vacuum	Part-5 §4.7
Experimental heating circuits at 110°C 1000 h – 4 bar (if QB F option)	Technical guide

4. VERIFICATION REGIME

	12 months following admission	After the 12 months following admission
PB pipes	Half-yearly	Annual

5. MARKING

5.1. Pipes

The pipes must be indelibly marked at least every 2 metres.

This marking must include at least the following elements:

- the number of the Standard EN ISO 15876,
- the name of the holder or the distributor ⁽¹⁾ (name or logo) and the commercial name of the product,
- identification of the material,
- the nominal diameter and the nominal thickness of the wall,
- the application classes (e.g. 2, 4, 5) completed by their corresponding service pressures ⁽²⁾, (e.g. “[Class 2 – 6 bar] [Class 4 – 6 bar] [Class 5 – 6 bar]”,
- the statement “UNDERFLOOR HEATING ONLY” when only class 4 underfloor heating is targeted,



- the statement “HEATING ONLY” or the logo when class 2 is not targeted
- the QB logo or “QB D”, “QB F” or “QB DF” if claimed, followed by the last two parts of the certificate number,
- the manufacturing references allowing traceability, including at least:
 - the production period, at least the month and year, in numbers or in code,
 - identification of the factory if there are several production sites, by name or code,
- metric marking.

Example (polybutene pipe intended for the production of hot and cold domestic water distribution and high and low temperature heating installations, “QB DF” option)

EN ISO 15876 - XXX - 20x1,9 / Class A - PB - [Class 2 – 6 bar] [Class 4 – 6 bar]
[Class 5 – 6 bar] – opaque aa-xyz - Manufacturing references - 100m

⁽¹⁾ A distributor is the beneficiary of a commercial extension.

⁽²⁾ For pipes intended only for the “Chilled Water” application class, the marking on the pipe will include the statement “Chilled Water”, the corresponding operating pressure and the minimum and maximum temperatures of the fluid conveyed.

5.2. Packaging

The packaging must include the QB logo or “QB D”, “QB F” or “QB DF” if claimed, followed by the last two parts of the certificate number.

The operating temperatures according to the usage classes which may be marked on synthetic pipes are as follows:

Classification of operating conditions (Classes)	Maximum operating temperatures (TD)	Scope of classes
2	70°C	Hot water supply
4	60°C	Underfloor heating Low temperature radiators
5	80°C	High temperature radiators

6. CHECKS PERFORMED BY THE MANUFACTURER

The checks performed by the manufacturer and the measurements of the various characteristics are carried out in accordance with the inspection plan and the operating procedures defined in the reference standards cited in paragraph 1.1 of this technical document no. 08-02 Traditional, and at least complying with the frequencies defined in the tables below:

6.1. For raw materials

Measurements or tests	Minimum sampling frequency
Supplier analysis certificate	At each delivery
OIT (NF EN 728) (if QB D option)	once per week and per line
Melt flow rate (EN ISO 1133)	once per week and per line

6.2. Pipes

Measurements or tests	Minimum sampling frequency
Dimensions, marking, appearance (EN ISO 3126)	Once every 8 hours per line
Heat shrinkage (EN ISO 2505)	once per week and per line
Tensile strength (NF EN ISO 6259-1-3) (if QB D option)	once per week and per line
Thermo-oxidation (NF EN ISO 6259-1-3) (if QB D option)	once per week and per line
Resistance to internal pressure (EN ISO 1167) 95°C - t > 1 h - 95°C - t > 22 h - 95°C - t > 165 h - 95°C - t > 1000 h - Sigma given in §3.3.1.	1 specimen per 24 h per machine 1 specimen per 24 h per machine 1 specimen per week per machine 1 specimen per year per dimension group

7. MONITORING ARRANGEMENTS BY CSTB

7.1. Tests performed for admission and extension at CSTB

For the ranges of pipes covered under the QB 08 certification application, the applicant must provide a type test report in accordance with the EN 15876 standard, established by a laboratory with ISO 17025 accreditation (from an EA member accreditation body) for carrying out tests.

PIPES

Measurement or test	PB pipe
Dimensional characteristics	All the types submitted for admission
OIT (if QB D option)	1 test / material
Tensile properties (if QB D option)	1 test / material
Resistance to oxidation	1 test / material
Heat shrinkage	3 DN
Opacity - Transmission	1 test / material
Resistance to pressure 1000 h	1 test / material
Resistance to pressure 165 h	1 test / material
Resistance to pressure 22 h	1 test / material
Resistance to pressure 1 h	1 test / material
Thermal stability	1 test / material
Verification of the regression curve	1 DN per dimension group 4000 h at 20°, 70°, 95° and 110° C or a test report from an EN ISO 17025 accredited body

SUITABILITY FOR USE	
PRODUCTS/TESTS	PB pipe
Internal pressure	1 test per dimension group or a test report from an EN ISO 17025 accredited body
Bending under internal pressure	1 test per DN or a test report from an EN ISO 17025 accredited body
Pull-out	1 test per dimension group or a test report from an EN ISO 17025 accredited body
Thermal cycle	1 test per DN or a test report from an EN ISO 17025 accredited body
Cyclic pressure	1 test per dimension group or a test report from an EN ISO 17025 accredited body
Leaktightness under vacuum	1 test per dimension group or a test report from an EN ISO 17025 accredited body
Experimental heating circuits 110°C 1000 h 6 bar (if QB F option)	1 assembly as defined below*

* Experimental heating circuits: Experimental circuits are made up of pipes and fittings of different diameters representing the range proposed by the applicant.

7.2. Tests performed during follow-up at CSTB

Tests performed half-yearly

Measurement or test	PB pipe
Dimensional characteristics	3 DN
OIT (if QB D option)	1 test / material
Fluidity index	1 test / material
Tensile properties (if QB D option)	1 test / material
Heat shrinkage	1 DN
Resistance to pressure 1000 h	1 DN

8. SAMPLING FOR TESTS AT CSTB

8.1. Sampling for admission or extension applications to the CSTB

Collection of samples in cases of admission or extension is left to CSTB's discretion.

8.2. Sampling for follow-up at CSTB

PB
Pipes
Coils 10 to 15 m of the same DN x th Straight rods 10 to 15 1m sections of the same DN x th