

**WATER DISTRIBUTION OR DRAINAGE PIPES****Technical document****08-01 Traditional**

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

Technical document 08-01 Traditional rev. 00

16/11/2018

*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

<b>Revision No.</b>	<b>Application date</b>	<b>Modifications</b>
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 15875-1: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 1: General

NF EN ISO 15875-2: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 2: Pipes

NF EN ISO 15875-3: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 3: Fittings

NF EN ISO 15875-5: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 5: Fitness for purpose of the system

NF EN ISO 15875-7: Plastics piping systems for hot and cold water installations - Crosslinked polyethylene (PE-X) - Part 7: Guide for assessment of compliance

### 1.2. Test standards

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 ISO 10147: Pipes and fittings made of crosslinked polyethylene (PE-X) - Estimation of the degree of crosslinking by determination of the gel content

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.

PEX tubes shall be from series 5 of dimension class A, as defined in the NF EN ISO 15875 standard, with or without exterior plastic coating(s).

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)
- Tensile test on aged 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
	(2) Pipe PE-X
Dimensional characteristics *	X
Gel content	X
Tensile properties (if QB D option)	X <sup>(1)</sup>
Tensile properties after ageing (if QB D option)	X <sup>(1)</sup>
Resistance to oxidation (if QB D option)	X
Heat shrinkage	X
Thermal stability	X
Resistance to pressure	X
Opacity	X
<b>Suitability for use</b>	
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.

(1) for PEX pipes without coating.

### 3.2. Test methods

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

<b>Certified characteristics</b>	<b>PE-X pipe</b>
Dimensional characteristics	NF EN ISO 3126
Gel content	NF EN ISO 10147 (without oxygen barrier) on chip
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
Tensile properties after ageing (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  200°C 30 min
Heat shrinkage	1 h for $th \leq 8$ mm 2 h min if $8 \text{ mm} < th \leq 16$ mm 4 h if $th > 16$ mm
	120°C in drying oven
	2 h min if $8 \text{ mm} < th \leq 16$ 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
	$\sigma = 4.4$ MPa
<b>Suitability for use</b>	
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.

## Additions to test methods

### Specific case of polymer pipes with exterior plastic coating

The base pipe must meet the dimensional requirements of the corresponding product standard, and the exterior plastic coating(s) is/are an added element providing the finished product with a greater wall thickness and external diameter than those indicated in the standard.

**Dimension table for pipes in series 5**

<b>Dext x Thickness (mm)</b>	<b>PEX interior pipes (non-coated)</b>		<b>Pipes with exterior plastic coating(s)</b>	
	<b>Dext (mm)</b>	<b>Thickness (mm)</b>	<b>Dext (mm)</b>	<b>Thickness (mm)</b>
<b>12 x 1.1</b>	12 -0 +0.3	1.1 -0 +0.3	12 -0 +0.4	1.1 -0 +0.4
<b>16 x 1.5</b>	16 -0 +0.3	1.5 -0 +0.3	16 -0 +0.4	1.5 -0 +0.4
<b>20 x 1.9</b>	20 -0 +0.3	1.9 -0 +0.3	20 -0 +0.4	1.9 -0 +0.4
<b>25 x 2.3</b>	25 -0 +0.3	2.3 -0 +0.4	25 -0 +0.4	2.3 -0 +0.5
<b>32 x 2.9</b>	32 -0 +0.3	2.9 -0 +0.4	32 -0 +0.4	2.9 -0 +0.5
<b>40 x 3.7</b>	40 -0 +0.4	3.7 -0 +0.5	40 -0 +0.5	3.7 -0 +0.6
<b>50 x 4.6</b>	50 -0 +0.5	4.6 -0 +0.6	50 -0 +0.6	4.6 -0 +0.7
<b>63 x 5.8</b>	63 -0 +0.6	5.8 -0 +0.7	63 -0 +0.7	5.8 -0 +0.8
<b>75 x 6.8</b>	75 -0 +0.7	6.8 -0 +0.8	75 -0 +0.8	6.8 -0 +0.9
<b>90 x 8.2</b>	90 -0 +0.9	8.2 -0 +1.0	90 -0 +1.0	8.2 -0 +1.1
<b>110 x 10.0</b>	110 -0 +1.0	10.0 -0 +1.1	110 -0 +1.1	10.0 -0 +1.2
<b>125 x 11.4</b>	125 -0 +1.2	11.4 -0 +1.2	125 -0 +1.3	11.4 -0 +1.3
<b>140 x 12.7</b>	140 -0 +1.3	12.7 -0 +1.3	140 -0 +1.4	12.7 -0 +1.4
<b>160 x 14.6</b>	160 -0 +1.5	14.6 -0 +1.5	160 -0 +1.6	14.6 -0 +1.6

If the pipe provided includes an exterior plastic coating

Tests	Base pipe (without coating)	Pipe with coating	Comments
NF EN ISO 6259 Determination of tensile properties – Pipes (if QB D option)	X		
OIT Tests relating to resistance to oxidation (if QB D option)		X	
TENSILE Tests relating to resistance to oxidation (if QB D option)	X		
OIT NF EN 728 or NF EN ISO 11357 Determination of oxidation induction time (if QB D option)	X	X	
NF EN ISO 10147 Pipes made of crosslinked polyethylene (PE-X) – Determination of the gel content	X		
NF EN ISO 2505 Determination of longitudinal reversion – Pipes		X	
NF EN ISO 1133 Determination of melt flow rate	X		
NF EN ISO 1167 Determination of resistance to internal pressure	X	X	The tests must be carried out based solely on the thickness of the base pipe
Resistance of assemblies to alternating pressure cycles		X	
NF EN ISO 9080 Long-term hydrostatic strength of pipes by extrapolation	X	X	The tests must be carried out based solely on the thickness of the base pipe
Thermal stability 110°C - 8760 h		X	The tests must be carried out based solely on the thickness of the base pipe
Experimental heating circuit (if QB F option)		X	
NF EN 12293 Resistance of mounted assemblies to temperature cycling		X	

### 3.3. Specifications

		Specifications
Measurements or tests	Test standards	PEX
Dimensional characteristics	EN ISO 3126	<b>Compliant with product standards of the class under consideration</b>
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
Tensile properties after ageing (thermo-oxidation) (if QB D option)	NF EN ISO 6259-1 - ISO 6259-3	Loss of elongation less than 50% between initial elongation and elongation after 500 h in boiling water, then 100 h in oven at 160°C
Gel content	NF EN ISO 10147	Peroxide: > 70% Silane: > 65% Irradiation: > 60%
Thermal stability	EN ISO 1167	2.5 MPa - 110°C - 8760 h
Heat shrinkage	EN ISO 2505	120°C (air) 1 hour < 3%
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 - <span style="font-size: 2em; vertical-align: middle;">}</span> <b>See Sigma in table below</b>

PRODUCTS/TESTS	PEX Sigma (MPa)
<b>PRODUCT STANDARDS</b>	NF EN ISO 15875-1-7
<b>Pressure</b>	
<b>1000 h - 95°C</b>	4.4
<b>165 h - 95°C</b>	4.6
<b>22 h - 95°C</b>	4.7
<b>1 h - 95°C</b>	4.8
<b>1 h - 20°C</b>	12

PRODUCTS/TESTS	PEX
<b>PRODUCT STANDARDS</b>	NF EN ISO 15875-1-7
<b>Suitability for use</b>	
<b>Internal pressure</b>	Part-5 §4.2
<b>Bending under internal pressure</b>	Part-5 §4.3
<b>Pull-out</b>	Part-5 §4.4
<b>Thermal cycle</b>	Part-5 §4.5
<b>Cyclic pressure</b>	Part-5 §4.6
<b>Leaktightness under vacuum</b>	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
PE-X 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 from EN ISO 15875,
- the name of the holder or the distributor <sup>(1)</sup> (name or logo) and the commercial name of the product,
- identification of the material followed by crosslinking method (a, b or c),
- the nominal diameter and the nominal thickness of the wall,
- the application classes (e.g. 2, 4, 5) completed by their corresponding service pressures <sup>(2)</sup>, (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** (crosslinked polyethylene pipe intended for the production of hot and cold domestic water distribution and high and low temperature heating installations, “QB DF” option)

EN ISO 15875 - XXX - 20x1,9 - PE-Xa - [Class 2 – 6 bar] [Class 4 – 6  
[Class 5 – 6 bar] -  aa-xyz - Manufacturing references - 100m

<sup>(1)</sup> A distributor is the beneficiary of a commercial extension.

<sup>(2)</sup> Marking of the chilled water class is optional.

## 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. 08-01 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)	To be defined by the manufacturer

### 6.2. Pipes

Measurements or tests	Minimum sampling frequency
Dimensions, marking, appearance (EN ISO 3126)	Once every 8 hours per line
Gel content (EN ISO 579)	once per 24 h and 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 > 22 h – or 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 week per machine 1 specimen per year per DN

## 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 15875 standard, established by a laboratory with ISO 17025 accreditation (from an EA member accreditation body) for carrying out tests.

#### PIPES

Measurement or test	PEX pipe
Dimensional characteristics	All the types submitted for admission
OIT (if QB D option)	1 test / material
Gel content	1 test / material
Tensile properties (if QB D option)	1 test / material
Tensile properties after ageing (if QB D option)	1 test / material
Resistance to oxidation	1 test / material
Heat shrinkage	3 specimens / 1 DN / dimension group
Opacity - Transmission	1 test / material
Resistance to pressure 1000 h - 95°C	1 DN / dimension group
Resistance to pressure 165 h - 95°C	1 DN / dimension group
Resistance to pressure 22 h - 95°C	1 DN / dimension group
Resistance to pressure, 1 h at 20°C and 95°C	1 DN / dimension group
Thermal stability 8760 h – 110°C	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

<b>SUITABILITY FOR USE</b>	
<b>PRODUCTS/TESTS</b>	PEX 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 <b>(if QB F option)</b>	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.

*Processing of extensions: change of resin, change of additive, change of range treated as an admission*

## 7.2. Tests performed during follow-up at CSTB

### Tests performed half-yearly

<b>Measurement or test</b>	PEX pipe
Dimensional characteristics	1 DN
OIT <b>(if QB D option)</b>	1 test / material
Gel content	1 test / material
Tensile properties <b>(if QB D option)</b>	1 test / material
Tensile properties after ageing <b>(if QB D option)</b>	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

<b>PE-X -</b>
<b>Pipes</b>
Coils 10 to 15 m of the same DN x th  Straight rods 10 to 15 1m sections of the same DN x th