

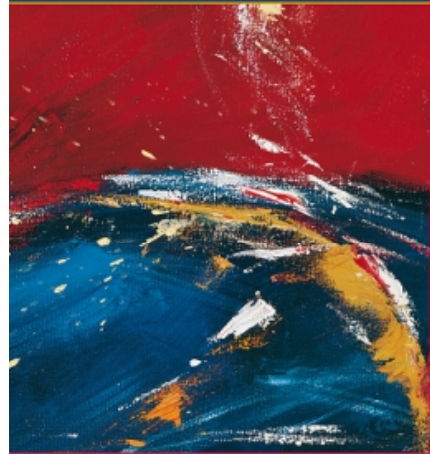
BRL K536 part A
15-12-2011

replaces

BRL K536, part A dated 06-11-2009

Evaluation guideline

for the Kiwa (technical approval-with-)product
certificate for plastics piping systems of
PVC-C (type 1) intended for transport of hot
and cold drinking water



Preface Kiwa

This evaluation guideline has been prepared by the Kiwa Board of Experts CWK, wherein all the relevant parties in the field of plastics piping systems of PVC-C intended for transport of hot and cold drinking water are represented. This Board of Experts also supervises the certification activities and where necessary requires the evaluation guideline to be revised. All references to the Board of Experts in this evaluation guideline pertain to the above mentioned Board of Experts.

This evaluation guideline will be used by Kiwa in conjunction with the Kiwa-Regulations for Product Certification. These regulations details the methods employed by Kiwa for conducting the necessary investigations prior to issuing the product certificate and the method of external control.

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The use of this evaluation guideline by third parties, for any purpose whatsoever, is only allowed after a written agreement is made with Kiwa to this end.

Validation

This evaluation guideline has been validated by Kiwa on 15 December 2011.

Amendment BRL K536 part A

Plastics piping systems of PVC-C intended for transport of hot and cold drinking water

March 10, 2015

Validation

Validated by Kiwa Board of Experts CWK on February 12, 2015.

Binding declaration

This amendment is declared binding by Kiwa starting March 10, 2015.

Validity of quality declarations

This amendment belongs to BRL K536 part A dated December 15, 2011.

The quality declarations issued based on that evaluation guideline lose their validity as from 6 months after the date of the binding declaration.

Right of use

The use of this amendment by third parties, no matter the purpose, is only permitted after this use is settled in a written agreement with Kiwa.

Description of the change

Due to the transition of the accreditation standard NEN-EN 45011 to the NEN-EN-ISO/IEC 17065 the changes are stated in this amendment which are related to the references to this accreditation standard and in relation to the qualification requirements of the certification staff.

Change the following paragraphs with the following text:

1.3 Acceptance of test reports provided by the supplier

If the supplier submits reports from research bodies or laboratories to show that the requirements of the Evaluation Guideline are met, it will have to be shown that such reports were prepared by a body meeting the applicable accreditation standard, i.e.:

- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN ISO/IEC 17021 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons.
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 or NEN-EN 45011 for certification bodies certifying products;

Explanation

NEN-EN-ISO/IEC 17065 is published on September 15, 2012 and will replace NEN-EN 45011. For this the transition period is 3 years.

The body is deemed to meet these criteria if an accreditation certificate can be submitted which has been issued by the Dutch Accreditation Council (RvA) or an accreditation body with which the Dutch Accreditation Council has signed a mutual acceptance agreement.

This accreditation shall relate to the tests required for this Evaluation Guideline.

If no accreditation certificate can be submitted, the certification body itself shall verify whether the accreditation standard has been met or (let) carry out the tests concerned itself.

Amendment BRL K536 part A

Plastics piping systems of PVC-C intended for transport of hot and cold drinking water





March 10, 2015

4.4.3 Marking

The products are marked with the Kiwa-mark.

Marking of the fittings


The minimum required marking on the fittings shall be:

- **KIWA**  or on small products  or  or **KK*** or **KK** * (if not possible **KIWA**  only on the smallest packaging unit)**;
- manufacturer's name, trade name or logo;
- nominal outside diameter of the corresponding pipe in mm;
- production code.

Location of the marks: on every fitting.

The realization of the marks is as follows: clear, durable and indelible.

The smallest packaging unit of the fittings are provided with at least the following information:

- **KIWA**  ;
- manufacturer's name, trade name, system name, logo or certificate number of the accompanying technical approval (system) certificate, in accordance with the marking of the connecting pipe;
- nominal outside diameter and nominal wall thickness of the corresponding pipe in mm;
- material identification in case the fitting body is made of plastics.

Location of the marks: on every package.

The realization of the marks is as follows: clear, durable and indelible.

*) for small fittings marking with only KK is permitted



***) only after approval by Kiwa

4.5.5 Marking

The products are marked with the Kiwa-mark.

Marking on the pipes

The minimum required marking on the pipes shall be:

- **KIWA**  or * + Class 2 / 8 or 10 bar;
- the manufacturer's name, trade name, system name, logo or certificate number of accompanying technical approval (system) certificate;
- material identification: PVC-C;
- nominal outside diameter and nominal wall thickness of the pipe in mm;
- production code.

Location of the marks: on every pipe at intervals of not more than 2 m.

The realization of the marks is as follows: clear durable and indelible.

*) for smaller diameters permitted by Kiwa.

Amendment BRL K536 part A

Plastics piping systems of PVC-C intended for transport of hot and cold drinking water

March 10, 2015

7.2 Certification staff

The staff involved in the certification may be sub-divided into:

- Certification assessors / Application reviewers / Reviewers: they are in charge of carrying out the design and documentation reviews, initial certifications, review of applications and assessing of conformation reviews.
- Site assessors: they are in charge of carrying out external inspections at the supplier's works;
- Decision makers: they are in charge of taking decisions in relation with the initial certification tests carried out, continuing the certification in relation with the inspections carried out.

7.2.1 Qualification requirements

Distinguished are:

- Qualification requirements for executive staff of a CI that fulfil the requirements of NEN-EN-ISO/IEC 17065 or NEN-EN 45011 (zie 1.3);
- Qualification requirements for executive staff of a CI that are in addition set up by the Board of Experts for the subject of this evaluation guideline.

The competence of the certification staff involved should be demonstrably recorded

	Certification assessor / Application reviewer / Reviewer	Location assessor	Decision maker
Basic competence			
Knowledge of production processes, skilled in assessing	<ul style="list-style-type: none"> • Bachelor thinking- and working level • 1 year relevant work experience 	<ul style="list-style-type: none"> • Intermediate vocational thinking- and working level • 1 year relevant work experience 	<ul style="list-style-type: none"> • Bachelor thinking- and working level • 4 year relevant work experience with at least 1 year in relation to certification
Audit skills	• n.a.	<ul style="list-style-type: none"> • Training audit skills • A minimum of 4 assessments whereof 1 assessment independently under supervision 	n.a.
Technical competence			
Knowledge of the guideline	<ul style="list-style-type: none"> • Detailed knowledge of the guideline and 4 assessments related to the specific guideline or related guidelines. 	<ul style="list-style-type: none"> • Detailed knowledge of the guideline and 4 assessments related to the specific guideline or related guidelines. 	• n.a.

Amendment BRL K536 part A

Plastics piping systems of PVC-C intended for transport of hot and cold drinking water

March 10, 2015

Relevant knowledge of: <ul style="list-style-type: none">• The technology for the production of the products to be inspected, the processing and the provision of services;• The application of the products, processes and the provision of services;• Every malfunction which can occur during the use of the product, every error during the process and every defectiveness during the provision of services.	<ul style="list-style-type: none">• Relevant tech. thinking and working level comparing to Bachelor• Specific courses and training (knowledge and skills)	<ul style="list-style-type: none">• Intermediate vocational thinking- and working level• Specific courses and training (knowledge and skills)	<ul style="list-style-type: none">• n.a.
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7.2.2 Qualification

Certification staff must be demonstrably qualified by evaluation of education and experience of the above-mentioned requirements.

The authority for qualification rests with the management of the certification institute.

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1 Introduction

1.1 General

This evaluation guideline includes all relevant requirements which are adhered to by Kiwa as the basis for the issue and maintenance of a (technical approval-with-) product certificate for plastics piping systems of PVC-C intended for transport of hot and cold drinking water.

This evaluation guideline replaces BRL K536, part A dated 06-11-2009. Certificates issued on the basis of that guideline remain valid.

For the performance of its certification work, Kiwa is bound to the requirements as included in EN 45011 and which are laid down in chapter 8 "Agreements on the performance of certification".

1.2 Field of application

The products are intended to be applied in piping systems for hot and cold water distribution at a design pressure (= maximum operating pressure) of 8 or 10 bar (9 or 11 bar absolute or 8 or 10 bar overpressure), under the conditions mentioned in table 1.

Remark:

Each pressure mentioned in this evaluation guideline is defined as overpressure. (So, with "10 bar" a "10 bar overpressure" is meant).

Table 1 – Temperature profile during 50 years

	Temperature [°C]	Lifetime	Overall service coefficient
T _{operation}	70	49 years	1,8
T _{max}	80	1 year	1,7
T _{malfunction}	95	100 hours	1,0
Remark: the mentioned temperature profile is in accordance with class 2 of ISO 10508.			

1.3 Acceptance of test reports provided by the supplier

In case the manufacturer provides reports from test institutions or laboratories showing confirmation that the product meets the requirements of this evaluation guideline, then the institute shall meet the applicable accreditation norms, being;

- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN 45004 for inspection bodies;
- NEN-EN 45011 for certification bodies certifying products;
- NEN-EN-ISO/IEC 17021 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons.

This requirement is considered to being fulfilled when a certificate of accreditation can be shown, either issued by the Board of Accreditation (RvA) or one of the institutions with which the RvA has concluded an agreement of mutual acceptance with.

This accreditation should relate to the tests required for this evaluation guideline.

If no accreditation certificate can be submitted, the certification body shall verify whether the accreditation standard has been met or carry out the tests concerned

1.4 Quality declaration

The quality declarations to be issued by Kiwa on the basis of this evaluation guideline are specified as Kiwa (technical approval-with-)product certificate.

The models of the quality declarations are included in this guideline as an annex .

2 Terms and definitions

2.1 General terms and definitions

2.1.1 *Evaluation guideline*

The agreements made within the Board of Experts on the subject of certification.

2.1.2 *Board of Experts*

The Board of Experts "CWK".

2.1.3 *Supplier*

The party responsible for ensuring that the products continuously meet the requirements of this evaluation guideline.

2.1.4 *IQC-scheme*

A description of the quality inspections carried out by the supplier as part of his quality system.

2.1.5 *Product requirements*

Requirements made specific by means of measures or figures, focusing on (identifiable) characteristics of products and containing a limiting value to be achieved, which limiting value can be calculated or measured in an unequivocal manner.

2.1.6 *Pre-certification evaluation*

The evaluation required to ascertain whether all the requirements of the evaluation guideline are met.

2.1.7 *Attestation tests*

Tests in order to ascertain that the product as applied meets the performance requirements of chapter 4.

2.1.8 *Surveillance inspections*

The inspections carried out after the certificate has been granted in order to ascertain whether the certified products continue to meet the requirements of the evaluation guideline. The frequency of inspections is hereby indicated.

Remark

The test matrix (see chapter 6) contains a summary showing which tests Kiwa will carry out in the pre-certification stage and in the event of surveillance inspections as well as showing the frequency of these inspections and tests.

2.1.9 *Technical approval-with-product certificate*

A document, in which Kiwa declares that a product may, on delivery, be deemed to comply with the product specification as recorded in the certificate.

2.1.10 *Tap water (origin NEN 1006)*

Water intended for drinking, cooking, food preparation or other domestic purposes.

2.1.11 *Piping system*

The total of pipes, protection pipes, fittings, bends, expansion pieces, valves and other piping components.

2.1.12 *Flexible piping system*

A piping system in which possible bends in the pipe can be made without any mechanical means and in which the pipe is not deformed and the flow capacity is not reduced due to the possible bends.

2.1.13 *Rigid piping system*

A piping system in which possible bends in the pipe has to be made by mechanical means.

2.1.14 *Mechanical joints*

A connection between a pipe and a fitting, made by means of pressing a ring or case over the outside diameter of the pipe, with or without extra sealing elements and possibly making use of a supporting ring in the pipe, according NEN EN ISO 6708.

2.1.15 *Manifolds*

An apparatus by which an incoming water flow (adjustabl) is divided over several outlets.

2.2 Geometrical terminology and definitions

2.2.1 *Nominal size DN*

Numerical designation of the size of a component, which is a convenient round number, approximately equal to the manufacturing dimensions in millimetres (mm).

2.2.2 *Nominal outside diameter (d_n)*

The specified outside diameter, in millimetres, assigned to a nominal size DN/OD.

2.2.3 *Outside diameter (at any point) (d_o)*

Measured outside diameter through its cross section at any point of a pipe or spigot end of a fitting, rounded up to the nearest 0,1 mm.

2.2.4 *Mean outside diameter (d_{em})*

Measured length of the outer circumference of a pipe or spigot end of a fitting in any cross section divided by π (3,142), rounded up to the nearest 0,1 mm.

2.2.5 *Minimum mean outside diameter ($d_{em, min}$)*

Minimum value for the mean outside diameter as specified for a given nominal size.

2.2.6 *Maximum mean outside diameter ($d_{em, max}$)*

Maximum value for the mean outside diameter as specified for a given nominal size.

2.2.7 Inside diameter (at any point) (d_i)

The measured inside diameter of the pipe at any point, rounded to the nearest 0,1 mm.

2.2.8 Out-of-roundness

The difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of a pipe, or spigot end of a fitting, or the difference between the measured maximum inside diameter and the measured minimum inside diameter in the same cross-sectional plane of a socket.

2.2.9 Nominal wall thickness (e_n)

Numerical designation of the wall thickness of a component, approximately equal to the manufacturing dimension in millimetres (mm).

2.2.10 Wall thickness (at any point) (e)

The measured value of the wall thickness of a component, measured at any point around the circumference, rounded up to the nearest 0,1 mm.

2.2.11 Minimum wall thickness (e_{min})

Minimum value of the measured wall thickness around the circumference.

2.2.12 Maximum wall thickness (e_{max})

Maximum value of the measured wall thickness around the circumference.

2.2.13 Tolerance

Permitted variation of the specified value of a parameter, expressed as the difference between the permitted maximum and the permitted minimum value of that parameter.

2.2.14 Pipe series (S)

Dimensional number for pipe designation conforming to ISO 4065.

2.2.15 Calculated pipe value (S_{calc})

Value for a specific pipe calculated according to the following equation, rounded up to the nearest 0,1 mm:

$$S_{calc} = \frac{d_n - e_n}{2 \times e_n}$$

In which:

d_n = the nominal outside diameter in millimetres;

e_n = the nominal wall thickness expressed in millimetres

2.2.16 Maximum calculated pipe value ($S_{calc,max}$)

The maximum value of the calculated S value for a specific application class.

2.3 Terms and definitions related to service conditions

2.3.1 *Lifetime*

The time during which the piping system has to function with a certain operating temperature.

2.3.2 *Operating temperature ($T_{operation}$)*

The temperature of the water in a piping system during service conditions.

2.3.3 *Maximum temperature (T_{max})*

The highest temperature of the water in a piping system during service conditions that occurs during a certain period of time (the highest occurring operating temperature during a short time).

2.3.4 *Malfunction temperature ($T_{malfunction}$)*

The highest temperature of the water in a piping system occurring under abnormal circumstances, for example because of malfunctioning of the system, during a short time (maximum 100 hours per 50 years).

2.3.5 *Cold water temperature (T_{cold})*

Temperature of the cold water with a maximum of 25 °C. For the calculation of the design pressure a water temperature of 20 °C is used.

2.3.6 *Design pressure (p_D).*

The allowable pressure in the piping system that, during continuous use, during 50 years may occur for a class 2 material with a temperature profile according table 1.

2.3.7 *Temperature profile*

The most frequently appearing operating temperatures that occur during a certain time during 50 years.

2.3.8 *Overall service coefficient (C)*

A coefficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower confidence limit, LPL.

2.3.9 *Hydrostatic stress s*

Stress in the circumference direction of the pipe wall caused by internal water pressure. This stress is deduced from the internal pressure according to the following formula:

$$s = p \times \frac{(d_{em} - e_{min})}{20 \times e_{min}}$$

In which:

σ = the stress in the circumference direction of the pipe wall in MPa

p = the internal pressure in bar;

d_{em} = the mean outside diameter of the pipe in mm;

e_{min} = the minimum wall thickness of the pipe in mm.

- 2.3.10** S_{DS}
The design stress in MPa, applicable for a class 5 material with a temperature profile according to table 1.
- 2.3.11** S_T
The stress in MPa, applied to a test piece for a certain temperature and time.
- 2.3.12** S_{LPL}
A unit expressed in wall stress, that represents the value of the 97,5% lower confidence interval of the predicted stress for a single value at a temperature T and a time t.
- 2.3.13** S_{LTHS}
A unit expressed in wall stress, that represents the value of the 50% lower confidence interval of the predicted stress for a single value at a temperature T and a time t.
- 2.3.14** LPL
The lower confidence interval. A statistical unit representing the point above which 97,5 % of all values are found.
- 2.3.15** *Reference line*
A general description of the expected minimum long-term stress of a specific material. The reference lines are parallel to the calculated σ_{LTHS} for a certain temperature. At least 97,5 % of all individual values found must have a value above the reference line.

2.4 Symbols

C	service (design) coefficient
d_e	outside diameter (at any point)
d_{em}	mean outside diameter
$d_{em,min}$	minimum mean outside diameter
$d_{em,max}$	maximum mean outside diameter
d_n	nominal diameter
e	wall thickness at any point
e_{max}	maximum wall thickness at any point
e_{min}	minimum wall thickness at any point
e_n	nominal wall thickness
p	pressure
p_D	design pressure
S_{calc}	calculated S value
$S_{calc,max}$	maximum calculated S value
T	temperature
T_{cold}	cold water temperature
$T_{operation}$	operating temperature
$T_{malfunction}$	malfunction temperature
T_{max}	maximum design temperature
t	time
σ	hydrostatic stress
σ_{cold}	design stress at 20 °C
σ_D	design stress
σ_{DF}	design stress of the plastics fitting material
σ_{DP}	design stress of the plastics pipe material
σ_F	hydrostatic stress of the plastics fitting material
σ_P	hydrostatic stress of the plastics pipe material
σ_{LPL}	lower confidence interval of the long-term strength

2.5 Abbreviations

CPD	Construction Products Directive
CvD	College van deskundigen (board of experts)
CKW	Commissie voor Kwaliteitseisen van Waterleidingartikelen (Committee for Quality requirements of drinking water commodities)
DN	nominal size
DN/OD	nominal size related to outside diameter
PVC-C	chlorinated polyvinylchloride
S	S-value
MFR	melt flow rate

3 Procedure for obtaining the quality declaration

3.1 Pre-certification evaluation

The pre-certification evaluation to be performed is based on the (product) requirements as described in this evaluation guideline, including the test methods and contain, depending on the nature of the product to be certified:

- type testing to determine whether the products comply with the product and/or functional requirements;
- Production process assessment;
- Assessment of the quality system and the IQC-scheme;
- Assessment of the presence and functioning of other required procedures.

3.2 Granting the quality declaration

After finishing the pre-certification evaluation, the results are presented to the person deciding on granting of the certificate. This person evaluates the results and decides whether the certificate can be granted or additional data and/or tests are necessary.

4 Product requirements and test methods

4.1 General

In this chapter the requirements imposed on the PVC-C piping system intended for the transport of hot and cold drinking water are included, as well as the test methods in order to be able to determine whether the requirements are fulfilled.

4.2 Requirements to avoid deterioration of the quality of drinking water

Products and materials, which (may) come into contact with water, drinking water or warm tap water, are not allowed to release substances in such quantities which can jeopardise the health of the consumer or the quality of the drinking water. For that, the products or materials have to meet the toxicological, microbiological and organoleptical requirements which are laid down in the valid "Ministerial Regulation materials and chemicals drinking water- and warm tap water supply" (published in the Government Gazette). This means that the procedure for obtaining a recognised quality declaration, as meant in the valid Regulation, has to be concluded with positive results.

Products and materials with a quality declaration*¹, issued by e.g. a foreign certification institute, are allowed to be used in the Netherlands, provided that the Minister has declared this quality declaration equivalent to the quality declaration as meant in the Regulation.

¹ * A quality declaration issued by an independent certification institute in another member state of the European Community than the Netherlands or another state party to the agreement to the European Economic Area, is equivalent to a recognised quality declaration, to the extent that, to the judgment of the Minister of the first mentioned quality declaration, at least equivalent requirements as meant in the Regulation materials and chemicals drinking water- and warm tap water supply, are fulfilled.

4.3 Requirements for the joints of the piping system

4.3.1 *General*

The joints in the piping system shall be tested with regard to their proper functioning. In this chapter all joint tests required for the joint system are included. The combination of a (possible) rubber seal, pipe, (possible) supporting insert and clamp construction in the fitting have to be tested with regard to the aspects as mentioned in table 2.

4.3.2 *Tightness and strength of the joints*

After testing in accordance with table 2, the pipe ends shall show no damages. If not otherwise stated, the testing temperature is (23 ± 2) °C.

4.3.3 *Manifolds*

Manifolds may form a part of the piping system and must in that case fulfil the requirements of clause 4.4.

4.3.4 *Installation instructions*

The supplier shall provide installation instructions. The instructions shall be in the Dutch language and must contain specific information for construction of the joints. Also information must be given with regard to storage, transport, processing temperature etc.

Table 2 - tightness and strength of the pipe joints

Aspect	Requirement	Test parameters	Joining System ³⁾	Test method
Temperature cycling test	no leakage	5000 cycles $T_{\max} = (90 \pm 2) \text{ }^\circ\text{C}$ $T_{\min} = (20 \pm 2) \text{ }^\circ\text{C}$ $t_{\text{cyclus}} = 30 \text{ min } ^1).$ $P_{\text{design}} \text{ (bar)}$ Preliminary stress = 3,4 MPa One test piece	SC M	EN 12293
Pressure cycling test	no leakage	Three test pieces 10.000 cycles (30 ± 5) cycles/min Test pressure (bar)	SC M	EN 12295
		$P_D = 8 \text{ bar}$ $P_D = 10 \text{ bar}$		
		$P_{\max} = 12,0$ $P_{\max} = 15,0$ $P_{\min} = 0,5$ $P_{\min} = 0,5$		
Resistance to tensile force	no separation of pipe and fitting no scratches or breakage within the distance d (= diameter of the pipe) on the pipe and fitting	$t = (60 \pm 1) \text{ min.}$ Three test pieces $F = 1,5 \times \pi/4 \times D_n^2 \times 1 \text{ (N)}$ $D_n \text{ in mm}$	M	EN 712
Resistance to vacuum	$\Delta P \leq 0,05 \text{ bar}$	$t = (60 \pm 1) \text{ min.}$ Three test pieces $P = -0,8 \text{ bar}$	SC M	EN 12294
Strength joints	no leakage	$t = 3000 \text{ h.}$ $T = 80^\circ\text{C}$ water in air Minimum of 3 connections Test pressures (bar) ²⁾	SC M	ISO 1167-series
		$P_D = 8 \text{ bar}$ $P_D = 10 \text{ bar}$		
		15,9 19,9		
1) $t_{\text{cyclus}} = t_{T_{\max}} + t_{T_{\min}} (= 15_0^{+1} + 15_0^{+1} = 30_0^{+2})$ minutes. Total time = 2500 hours) 2) For classification see clause 4.5.2. 3) SC = Solvent cemented fitting M = Mechanical fitting				

4.4 Product requirements: fittings

4.4.1 PVC-C fittings

The PVC-C fittings shall fulfill the requirements of table 3.

Table 3 – requirements for PVC-C fittings

Aspect	Requirement	Test parameter	Test method
Material	According IQC ¹⁾	According IQC ¹⁾	According IQC ¹⁾
Long-term Strength	\geq design stress (σ_D) according ISO 15877-3 at class 2	Resistance to internal hydrostatic pressure ²⁾ - at 20 °C - at 60 or 80 °C - at 95 °C - at 110 °C	ISO 1167-series with the help of ISO 9080
Dimensions	According to ISO 15877-3	Dimensions	ISO 3126
Vicat	$\geq 103^\circ\text{C}$	EN 727	EN 727
Strength joints	no leakage	t = 3000 h. T = 80°C water in air Minimum of 3 connections Test pressures (bar) ⁴⁾ P _D = 8 bar P _D = 10 bar 15,9 19,9	ISO 1167-series
Appearance	Smooth without any flaws	Soundness	Visual inspection
Thermal stability ³⁾	Test time ≥ 17520 hours	Resistance to internal hydrostatic pressure ²⁾ Water in air at 90 °C $\sigma = 2,85$ MPa	ISO 1167-series
Behaviour at heating	Damages around injection point ≤ 20 % of wall thickness No holes, bubbles or cracks	T = 150°C 15 minutes e _n ≤ 3 mm 30 minutes 3 mm < e _n ≤ 10 mm 60 minutes 10 mm < e _n ≤ 20 mm	EN 763 Method A: air
<p>1) IQC: is laid down as part of the certification agreement, after approval of the certification body</p> <p>2) Test pieces are blow moulded and are cylindrical shaped</p> <p>3) Results to be processed together with results “long-term strength”</p> <p>4) For classification see paragraph 4.5.2</p>			

4.4.2 Metal fittings

The fittings shall fulfill the requirements of table 4.


Table 4 – requirements for metal fittings

Aspect	Requirement	Test parameter	Test method
Material composition	NEN-EN 1254-3	IQC ¹⁾	Information manufacturer
Rubber	BRL 17504	BRL 17504	BRL 17504
Dimensions	NEN-EN 1254-3	Minimum thickness	ISO 228-1 or ISO 7-1
Construction	NEN-EN 1254-3	Construction drawings	ISO 3126
Strength fitting body	Resistance to internal hydraulic pressure	NEN-EN 1254-3 clause 5.1	ISO 1167-series
Resistance to stress corrosion	No cracks	PH 9,5	EN-ISO 6957
¹⁾ IQC: is laid down as part of the certification agreement , after approval of the certification body			


4.4.3 Certification mark

The following marks and indications must be provided on each product and product packaging in a clear, legible and indelible way:

The fittings shall be provided with at least the following marks:

- ◆ **KK**  (if not possible, then to be provided only on the smallest packaging);
- ◆ manufacturer's name, trade name or logo;
- ◆ nominal outside diameter in mm of the connecting pipe;
- ◆ production code.

The smallest packaging unit of the fittings must be provided with at least the following information:

- ◆ **KIWA**  ;
- ◆ manufacturer's name, trade name, system name, logo or certificate number of the accompanying technical approval(system)certificate, in accordance with the marking of the connecting pipe;
- ◆ nominal outside diameter and nominal wall thickness in mm of the connecting pipe;
- ◆ material identification in case the fitting body is made of plastics.

4.5 Product requirements: pipes

4.5.1 Introduction

This chapter embodies the requirements and test methods which are applicable to the pipe.

4.5.2 Classification of the PVC-C material

The PVC-C (type I) materials shall fulfill the requirements according to the specifications of ISO 15877-2.

The calculated values for σ_{DS} must be higher than or equal to the value as specified in table 5.

Table 5 - minimum required wall stress for class 2

	Design stress σ_D (N/mm ²)
PVC-C (type I)	4,16

4.5.3 Construction of the pipe

The pipe is composed of 1 layer.

4.5.4 Requirements for the pipes

4.5.4.1 Mechanical requirements for the pipe

The pipes shall fulfil the requirements of table 6.

Table 6 – requirements and test methods for PVC-C pipes

Aspect	Requirement	Test parameter		Test method
Appearance	Smooth without any flaws	Soundness		Visual inspection
Material	IQC ¹⁾	IQC ¹⁾		IQC ¹⁾
Dimensions of different layers	IQC ¹⁾	IQC ¹⁾		IQC ¹⁾
Vicat	> 110 °C	EN 727		EN 727
Resistance to internal pressure ²⁾	Test time (hour)	T (°C)	σ (MPa)	ISO 1167-series
	≥ 1	20	43	
	≥ 165	95	5,6	
Thermal stability	Test time (hour)	T (°C)	σ (MPa)	ISO 1167-series
	≥ 8760	95	3,6	
Resistance to impact	< 10% failures	Test temperature 0°C 10 test pieces		ISO 9854
Tensile strength	$\sigma_y \geq 50$ MPa	Speed of testing 5 mm/min		ISO 6259-1
Influence of heating of complete pipe	≤ 5 %	Change of length at 150°C 0,5 hour $e_n \leq 4$ mm 1 hour $4 \text{ mm} < e_n \leq 16$ mm 2 hours $e_n > 16$ mm		EN 743 Method B: air
1) IQC is laid down as part of the certification agreement, after approval of the certification body. 2) For initial evaluation and yearly inspection the 1000 hours test at 95°C is carried out. The other testing times can be applied during production control.				

4.5.4.2 Dimensions

Each class, nominal size and minimum wall thickness must be chosen in such a way according to table 8 and 9 that the corresponding S-series or the S_{calc} is equal or smaller than the $S_{calc, max}$ as indicated in table 7.

Table 7 - Calculated Maximum value of S ($S_{calc, max}$)

Design pressure (p _D)	Application class 2
	$S_{calc, max}$. a)
	PVC-C
8 bar	5,2
10 bar	4,2
a) Values rounded to the nearest decimals.	

Table 8 – Dimensions of the pipes for dimension group A (dimensions according ISO 4065 and applicable for all classes within the application conditions)

Dimensions in millimetres

Nominal size	Nominal outside Diameter d_n	Mean outside diameter		Pipe series		Absolute e_{min} PVC-C ¹⁾	
		$d_{em,min}$	$d_{em,max}$	S 5	S 4	P_D 8 bar	P_D 10 bar
				Wall thickness e_{min} and e_n			
12	12	12	12,3	1,4	1,4	1,1	1,3
14	14	14	14,3	1,4	1,6	1,3	1,5
16	16	16	16,3	1,5	1,8	1,5	1,8
20	20	20	20,3	1,9	2,3	1,8	2,2
25	25	25	25,3	2,3	2,8	2,2	2,7
32	32	32	32,3	2,9	3,6	2,9	3,5
40	40	40	40,4	3,7	4,5	3,6	4,3
50	50	50	50,5	4,6	5,6	4,4	5,4
63	63	63	63,6	5,8	7,1	5,6	6,8
75	75	75	75,7	6,8	8,4	6,6	8,0
90	90	90	90,9	8,2	10,1	7,9	9,6
110	110	110	111	10,0	12,3	9,7	11,8
125	125	125	126,5	11,4	14,0	11,0	13,3
140	140	140	141,3	12,7	15,7	12,3	14,9
160	160	160	161,5	14,6	17,9	14,1	17,1

¹⁾ Absolute minimum wall thickness of PVC-C material with a minimum of 1.0 mm

Table 9 – Tolerances for the wall thickness


Dimensions in millimetres

Minimum wall thickness		Tolerance ¹⁾	Minimum wall thickness		Tolerance ¹⁾
e_{min}		X	e_{min}		X
>	≤		>	≤	
1	2	0,4	10	11	1,3
2	3	0,5	11	12	1,4
3	4	0,6	12	13	1,5
4	5	0,7	13	14	1,6
5	6	0,8	14	15	1,7
6	7	0,9	15	16	1,8
7	8	1,0	16	17	1,9
8	9	1,1	17	18	2,0
9	10	1,2			

¹⁾ The tolerance is defined as (+X/0 mm) in which X is the value of the tolerance as mentioned in this table. The permitted tolerance corresponds to level 5 of ISO 11922-1.

4.5.5 *Certification mark*

The following marks and indications must be provided on each product and product packaging in a clear, legible and indelible way:

- ◆ **KIWA**  + Class 2 / design pressure (bar);
- ◆ manufacturer's name, trade name, system name, logo or certificate number of the accompanying technical approval (system)certificate;
- ◆ material identification : PVC-C;
- ◆ nominal outside diameter and nominal wall thickness in mm;
- ◆ production code.

5 Quality system requirements

This chapter contains the requirements which have to be met by the supplier's quality system.

5.1 Manager of the quality system

Within the supplier's organizational structure an employee must have been appointed who is in charge of managing the supplier's quality system.

5.2 Internal quality control/quality plan

The supplier shall have an internal quality control scheme (IQC scheme) which is applied by him.

The following must have been demonstrably recorded in this IQC scheme:

- what aspects are checked by the producer;
- according to what methods such inspections are carried out;
- how often these inspections are carried out;
- in what way the inspection results are recorded and kept.

This IQC scheme should at least be an equivalent derivative of the model IQC scheme included in the addendum.

5.3 Procedures and working instructions

The supplier shall be able to submit the following:

- procedures for:
 - dealing with products showing deviations;
 - corrective actions to be taken if non-conformities are found;
 - dealing with complaints about products and/or services delivered;
- the working instructions and inspection forms used.

5.4 Other quality system requirements

In case the quality system of the supplier is certified on the basis of ISO 9001, a combination can be made with the IQC-scheme.

6 Summary of tests and inspections

This chapter contains a summary of the following tests and inspections to be carried out in the event of certification:

- Pre-certification tests;
- Inspection test as to toxicological requirements and product requirements;
- Inspection of the quality system.

The frequency with which Kiwa will carry out inspection tests is also stated in the summary.

6.1 Test matrix

Description of requirement	Clause BRL	Test within the scope of			Change of raw material
		Pre-certification tests	Surveillance by CI after issue of the certificate ¹⁾		
			Inspection ²⁾	Frequency	
System requirements					
Temperature cycling test	4.3.2	X			X
Pressure cycling test		X			
Resistance to tensile force		X			
Resistance to vacuum		X			
Resistance to bending		X			
Strength joints		X	X	1x year	X
Requirements for plastics fittings/dividers					
Material (inclusive toxicological aspects)	4.4.1	X	X	1x year	X
Long-term strength		X	X ³⁾	1x year	X
Dimensions		X	X	1x year	X
Vicat		X	X	1x year	X
Strength joints (see system)		X	X	1x year	X
Appearance		X	X	1x year	X
Thermal stability fitting		X			X
Influence of heating		X	X	1x year	X
Requirements for metals fittings/dividers					
Material composition	4.4.2	X	X	1x year	X
Rubber		X			X
Dimensions		X	X	1x year	X
Construction		X			X
Strength body		X			X
Resistance to stress corrosion		X			X
Requirements for the pipe					
Long term strength	4.5	X	X ³⁾		X
Appearance		X	X	1x year	X
Material (inclusive toxicological aspects)		X	X	1x year	X
Dimensions		X	X	1x year	X
Vicat		X	X	1x year	X
Resistance to internal hydraulic pressure		X	X	1x year	X
Thermal stability pipe		X			X
Resistance to impact		X	X	1x year	X
Tensile strength at break		X			X
Influence of heating		X	X	1x year	X

- 1) In case the product or production process changes significantly, the performance requirements must be determined again.
- 2) All product properties that can be determined within the visiting time (maximum 1 day) are determined by the inspector or by the supplier in the presence of the inspector. In case this is not possible, an agreement will be made between the certification body and the supplier about how the inspection will take place.
- 3) This aspect is compared with the for this aspect ascertained acceptance parameters on the basis of the IQC inspection (indirect by means of direct related parameters)

6.2 Evaluation of the quality system

During each inspection visit the quality system of the supplier shall be examined and evaluated.

7 Agreements on the performance of certification

7.1 General

Beside the requirements included in these evaluation guidelines, also the general rules for certification as included in the Kiwa Regulations for Product Certification apply.

These rules are in particular

- The general rules for conducting the pre-certification tests, to be distinguished in:
 - the way suppliers are to be informed about an application is being handled;
 - how the test are conducted;
 - the decision to be taken as a result of the pre certification tests.
- The general directions for conducting inspections and the aspects to be audited;
- The measurements to be taken by Kiwa in case of Non Conformities;
- Measurements taken by Kiwa in case of improper Use of Certificates, Certification Marks, Pictograms and Logos;
- Terms for termination of the certificate;
- The possibility to lodge an appeal against decisions of measurements taken by Kiwa.

7.2 Certification staff

The staff involved in the certification may be sub-divided into:

- certification experts: they are in charge of carrying out the pre-certification tests and assessing the inspectors' reports;
- inspectors: they are in charge of carrying out external inspections at the supplier's works;
- decision-makers: they are in charge of taking decisions in connection with the pre-certification tests carried out, continuing the certification in connection with the inspections carried out and taking decisions on the need to take corrective actions.

7.2.1 *Qualification requirements*

Distinguished are:

- Qualification requirements for executive staff of a CI that fulfil the requirements of EN 45011;
- Qualification requirements for executive staff of a CI that are in addition set up by the Board of Experts for the subject of this evaluation guideline.

The level of education and the experience of the certification staff involved should be demonstrably recorded.

	Certification engineer	Inspector	Decision-maker
Education - general	<ul style="list-style-type: none"> • Relevant tech. thinking and working level comparing to Bachelor • Internal training in certification and Kiwa policies • Training in audit skills 	<ul style="list-style-type: none"> • Tech. thinking and working level at vocational education (intermediate level) • Internal training in certification and Kiwa policies • Training in audit skills 	<ul style="list-style-type: none"> • Thinking and working at Bachelor level • Internal training in certification and Kiwa policies • Training in audit skills
Education - specific	<ul style="list-style-type: none"> • For BRL relevant technical education • Specific courses and training (knowledge and skills) 	<ul style="list-style-type: none"> • For BRL relevant technical education • Specific courses and training (knowledge and skills) 	<ul style="list-style-type: none"> • not applicable
Experience - general	<ul style="list-style-type: none"> • 1 year of relevant work experience with at least 4 pre-certification tests of which 1 complete pre-certification test carried out independent under supervision 	<ul style="list-style-type: none"> • 1 year of relevant work experience with a minimum of 4 pre-certification tests of which 1 carried out independent under supervision 	<ul style="list-style-type: none"> • 4 years of working experience, with at least 1 year in certification
Experience - specific	<ul style="list-style-type: none"> • Detailed knowledge of the BRL and 4 certification tests carried out on the basis of the BRL or one related 	<ul style="list-style-type: none"> • Detailed knowledge of the BRL and 4 certification tests carried out on the basis of the BRL or one related 	<ul style="list-style-type: none"> • General knowledge of the BRL

7.2.2 *Qualification*

Certification staff must be demonstrably qualified by evaluation of education and experience of the above-mentioned requirements. In case qualification takes place on the basis of other criteria, then this has to be recorded in writing.

The authority for qualification rests with:

- Decision-makers: qualification of the certification experts and inspectors;
- Management of the certification body: qualification of the decision-makers.

7.3 **Report pre-certification tests**

Kiwa records the results of the pre certification tests in a report. This report shall comply with the following requirements:

- completeness: the reports verdicts about all requirements included in the evaluation guideline;
- traceability: the findings on which the verdicts have been based shall be recorded traceable;
- basis for decision: the decision maker shall be able to base his decision on the findings included in the report.

7.4 **Decision for granting of the certificate**

The decision for granting the certificate shall be made by a qualified decision maker which has not been involved in the pre certification tests. The decision shall be recorded traceable.

7.5 **Lay-out of the quality declaration**

The product certificate shall be conforming to the model included as an annex.

7.6 Nature and frequency of external inspections

The certification body shall carry out Audits at the supplier at regular intervals to check whether the supplier complies with his obligations. About the frequency of inspections the Board of Experts decides.

At the time this Evaluation Guideline took effect, the frequency was set at number of 4 inspection visits per year. In case the supplier is certified on the basis of ISO 9001 for the applicable scope, the frequency is set at a number of 2 inspection visits per year.

Inspections shall at least refer to:

- The suppliers IQC-scheme and the results obtained from inspections carried out by the supplier;
- The correct way of marking of certified products;
- Complying with required procedures.

The results of each inspection shall be traceable recorded in a report.

7.7 Interpretation of requirements

The Board of Experts may record the interpretation of requirements of these evaluation guidelines in one separate interpretation document.

8 List of mentioned documents

8.1 Rules by public law

Gazette of 13 December 2002, nr. 241, page 25 Regeling materialen en chemicaliën leidingwatervoorziening
(*Regulation materials and chemicals drinking water supply*)

8.2 Standards / normative documents:

ISO 7-1	Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation
ISO 161-1	Thermoplastics pipes for the conveyance of fluids – Nominal outside diameters and nominal pressures — Part 1: Metric series
ISO 228-1	Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation
EN-ISO 580	Plastic piping and ducting systems - Injection-moulded thermoplastic fittings - Methods for visually assessing the effects of heating
NEN-EN 681	Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber
EN 712	Thermoplastics plastics piping systems – End-load bearing mechanical joints between pressure pipes and fittings – Test method for resistance to pull-out under constant longitudinal force
EN 713	Plastics piping systems – Mechanical joints between fittings and polyolefin pressure pipes – Test method for leak tightness under internal pressure of assemblies subjected to bending
EN-ISO 1133	Determination of the melt mass flow rate (MFR) and the melt volume (MVR) of thermoplastics
EN-ISO 1167-serie	Plastics piping systems - Thermoplastics pipes - Determination of the resistance to internal pressure at constant temperature, 1995.
NEN-EN 1254-3	Copper and copper alloys - plumbing fittings - Part 3: Fittings with compression ends for use with plastic pipes
ISO 3126	Plastics piping systems – Plastics components – Determination of dimensions
ISO 4065	Thermoplastic pipes - Universal wall thickness table
ISO 6259-1	Thermoplastics pipes – Determination of tensile properties – Part 1: General test method
NEN-EN-ISO 6708	Pipework components. Definition and selection of DN (nominal size)

EN-ISO 6957	Copper alloys - Ammonia test for stress corrosion in resistance
ISO 9080	Plastics piping and ducting systems – Determination of long-term hydrostatic strength of thermoplastics material in pipe form by extrapolation
ISO 10508	Plastics piping systems for hot and cold water installations – Guidance for classification and design.
EN 12293	Plastics piping systems – Thermoplastics pipes and fittings for hot and cold water – Test method for the resistance of mounted assemblies to temperature cycling
EN 12294	Plastics piping systems for hot and cold water – Method of test for leak tightness under vacuum
EN 12295	Plastics piping systems – Thermoplastics pipes and fittings for hot and cold water – Test method for resistance of joints to pressure cycling
ISO 13760	Plastics pipes for the conveyance of fluids under pressure – Miner's rule – Calculation method for cumulative damage
ISO 15877 series	Plastic piping systems for hot and cold water installations - Chlorinated polyvinylchloride (PVC-C) - Part 1,2, 3 and 5

I Model Technical approval-with-product certificate

Technical approval-with-product certificate
KXXXXXXXX/OX



Issued

Replaces

Page 1 of 2

Name product

Name supplier

STATEMENT BY KIWA

This technical-approval-with-product certificate is issued by Kiwa on the basis of BRL K123 "title", in accordance with the Kiwa Regulations for Product Certification.

Kiwa declares that legitimate confidence exists that the by the producer manufactured plastics piping system comply with the technical specifications as laid down in this technical approval-with-product certificate, provided that the plastics piping system have been marked with the Kiwa®-mark in the manner as indicated in this technical approval-with-product certificate.

Within the framework of this technical approval-with-product certificate Kiwa does not impose any inspections with regard to the production of other parts of the plastics piping system nor the manufacturing of the plastics piping system itself.



Bouke Meekma

Publication of the certificate is allowed

Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid

Kiwa Nederland B.V.
Sir W. Churchill-laan 273
Postbus 70
2280 AB RIJSWIJK
The Netherlands
Tel. ++31 (0)70 414 44 00
Fax ++31 (0)70 414 44 20
www.kiwa.nl



Certificate holder/Supplier

Tel.

Fax

www.kiwa.nl

E-mail

Certification process consists of initial and regular evaluation of:

- quality system
- product

Name product

PRODUCT SPECIFICATION

The products mentioned below belong to this technical approval-with-product certificate.

Fill-out

Toxicological requirements

The pipes and fittings used in this system are approved on the basis of the requirements set in the "Regeling materialen en chemicaliën leidingwatervoorziening" ("Regulation materials and chemicals for drinking water supply"; published in the Government Gazette). The ATA-criteria are recorded in the respective product certificates.

MARKING

The products are marked with the KIWA[®]-mark.

The realization of the marks as follows:

The mark and the production date are placed on the product and/or packaging and/or delivery documents.

Application and use

Fill-out

RECOMMENDATIONS FOR USERS

Check at the time of delivery whether:

- the producer has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc..

If you should reject a production on the basis of the above, please contact:

- Company

And, if necessary:

- Kiwa Nederland B.V..

Consult the producer's processing guidelines for the proper storage, transport and processing methods.

II Model Product certificate

Product certificate
KXXXXXXXX/OX



Issued

Replaces

Page 1 of 2

Name product

Name supplier

STATEMENT BY KIWA

This product certificate is issued by Kiwa on the basis of BRL K123 "title", in accordance with the Kiwa Regulations for Product Certification.

Kiwa declares that legitimate confidence exists that the by the producer manufactured plastics piping system comply with the technical specifications as laid down in this product certificate, provided that the plastics piping system have been marked with the Kiwa®-mark in the manner as indicated in this product certificate.

Bouke Meekma

Publication of the certificate is **not** allowed.

Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid

Kiwa Nederland B.V.
Sir W. Churchill-laan 273
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2280 AB RIJSWIJK
The Netherlands
Tel. ++31 (0)70 414 44 00
Fax ++31 (0)70 414 44 20
www.kiwa.nl



Certificate holder/Supplier

Tel.

Fax

www.kiwa.nl

E-mail

Certification process consists of initial and regular evaluation of:

- quality system
- product

Name product

PRODUCT SPECIFICATION

Product specification

The products mentioned below belong to this product certificate.

Fill-out

Toxicological requirements

Application:

The pipes and fittings used in this system are approved on the basis of the requirements set in the "Regeling materialen en chemicaliën leidingwatervoorziening" ("Regulation materials and chemicals for drinking water supply"; published in the Government Gazette).

ATA criteria:

The ATA product certification is based on two main criteria. It should permanently comply with:

- The product recipe approved during the assessment procedure. The recipe is laid down in the for confidentiality reasons undisclosed appendix 1A to the certification agreement K12345. This recipe is not to be changed without prior approval by Kiwa according to the Kiwa-ATA-approval procedure;
- Specific ATA-product requirements, laid down in appendix 1A to the certification agreement K12345. For confidentiality reasons this appendix 1A is not public.

Field of application **(ONLY APPLICABLE FOR RUBBER SEALING RINGS)**

The rubber sealing rings are applied in cold water applications (≤ 25 °C) / warm water applications (≤ 60 °C) / hot water applications (> 60 °C). **(MAKE A CHOICE)**

Marking

The products are marked with the KIWA[®]-mark.

The products are provided with at least the following marking:

Fill-out

The realization of the marks is as follows: clearly and indelible on **place**

Application and use

Fill-out

RECOMMENDATIONS FOR USERS

Check at the time of delivery whether:

- the producer has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc..

If you should reject a production on the basis of the above, please contact:

- **Company**

And, if necessary:

- Kiwa Nederland B.V..

Consult the producer's processing guidelines for the proper storage, transport and processing methods.

III Model IQC-scheme

Subjects	Aspects	Method	Frequency	Registration
Raw materials or materials supplied: <ul style="list-style-type: none"> • Recipe sheets • Incoming inspection raw materials 				
Production process, production equipment, material; <ul style="list-style-type: none"> • Procedures • Work instructions • Equipment • Material 				
End products				
Measuring and testing equipment <ul style="list-style-type: none"> • Measuring equipment • Calibration 				
Logistics <ul style="list-style-type: none"> • Internal transport • Storage • Packaging • Preservation • Identification or marking of semi-finished and finished products 				