

**BRL K17605**

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# Evaluation Guideline

for the Kiwa-(technical-approval-with) product certificate for plastics piping systems for water supply with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).

# Preface

This evaluation guideline has been accepted by the Kiwa Board of Experts Watercycle (CWK), in which all relevant parties in the field of plastics piping systems for water supply with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) are represented. The Board of Experts also supervises the certification activities and where necessary requires the evaluation guideline to be revised. All references to 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 Certification.

The product requirements and test methods comply with the requirements listed in NEN-EN-ISO 23856. The aspects of the assessment of conformity comply with NPR-CEN/TS 14632. This guideline includes additional requirements and test methods set by the Board of Experts.

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## **Validation**

This evaluation guideline has been validated by the Director Certification and Inspection of Kiwa on

**Date**

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# 1 Introduction

## 1.1 General

This evaluation guideline includes all relevant requirements which are employed by Kiwa when dealing with applications for the issue and maintenance of a Kiwa- (technical-approval-with) product certificate for products used for water supply with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).

This guideline replaces the evaluation guideline BRL-K17605, dated 2016-10-06. The quality declarations issued and based on that guideline will lose their validity after 12 months after validation of this BRL.

The product requirements and test methods comply with the requirements listed in NEN-EN-ISO 23856. The aspects of the assessment of conformity comply with NPR-CEN/TS 14632. This evaluation guideline includes additional requirements and determination methods set by the Board of Experts.

For the performance of its certification work, Kiwa is bound to the requirements as included in NEN-EN-ISO/IEC 17065 “Conformity assessment - Requirements for bodies certifying products, processes and services”.

## 1.2 Field of application / scope

The products are intended to be used for underground piping systems and its components made from glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) intended to be used for water supply (drinking or raw), with or without pressure. In a pipework system, pipes and fittings of different nominal pressure and stiffness ratings may be used together.

The evaluation guideline is applicable to pipes, fittings and their joints (flexible or rigid) of nominal diameters from DN 100 to DN 4000, which are intended to be used for the conveyance of tap water at temperatures up to 50 °C.

In this application, the products are not intended for use under continuously varying load. With a continuously varying load is meant here cycling loads with a frequency of at least 1 cycle per minute varying between two load levels.

Pipes can be made according to different processes, e.g.: centrifugal casting, continuous filament winding or cross filament winding.

Fittings can be made using any of the following techniques:

- 1) Fabricated from straight pipe;
- 2) Moulded by:
  - i) filament winding;
  - ii) tape winding;
  - iii) contact moulding (hand lay-up);
  - iv) hot or cold press moulding.

This evaluation guideline is applicable to joints which are or are not intended to be resistant to axial loading:

- 1) Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint.
- 2) Locked socket-and spigot joint;
- 3) Cemented or wrapped joint;
- 4) Bolted flange joint.

### **1.3 Acceptance of test reports provided by the supplier**

If the supplier provides reports from test institutions or laboratories to prove that the products meet the requirements of this evaluation guideline, the supplier shall prove that these reports have been drawn up by an institution that complies with the applicable accreditation standards, namely:

- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN-ISO/IEC 17021-1 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 for certification bodies certifying products.

**Remark:**

This requirement is considered to be fulfilled when a certificate of accreditation can be shown, issued either by the Board of Accreditation (RvA) or by one of the institutions with which an agreement of mutual acceptance has been concluded by the RvA. The accreditation shall refer to the examinations as required in this evaluation guideline. When no certificate of accreditation can be shown, Kiwa shall verify whether the accreditation standard is fulfilled.

### **1.4 Quality declaration**

The quality declaration to be issued by Kiwa is described as a Kiwa (technical-approval-with) product certificate.

A model of the certificate to be issued on the basis of this evaluation guideline has been included for information as Annex I.

## 2 Terms and definitions

For the purpose of this document, the terms and definitions given in NEN-EN-ISO 23856 and NPR-CEN/TS 14632 and the following apply.

### 2.1 Definitions

In this evaluation guideline, the following terms and definitions apply:

- **Board of Experts:** the Board of Experts Watercycle (CWK).
- **Certification mark:** a protected trademark of which the authorization of the use is granted by Kiwa, to the supplier whose products can be considered to comply on delivery with the applicable requirements.
- **Drinking water:** water intended or partly intended for drinking, cooking or food preparation or other domestic purposes, but does not include hot water, and is made available by pipeline to consumers or other customers.
- **Evaluation Guideline (BRL):** the agreements made within the Board of Experts on the subject of certification.
- **Inspection (audit) tests:** tests carried out after the certificate has been granted in order to ascertain whether the certified products continue to meet the requirements recorded in the evaluation guideline.
- **IQC scheme (IQCS):** a description of the quality inspections carried out by the supplier as part of his quality system.
- **Initial investigation:** tests in order to ascertain that all the requirements recorded in the evaluation guideline are met.
- **Private Label Certificate:** A certificate that only pertains to products that are also included in the certificate of a supplier that has been certified by Kiwa, the only difference being that the products and product information of the private label holder bear a brand name that belongs to the private label holder.
- **Pre-certification tests:** Tests in order to ascertain that all the requirements recorded in the evaluation guideline are met.
- **Product requirements:** requirements made specific by means of measures or figures, focussing on (identifiable) characteristics of products and containing a limiting value to be achieved, which can be calculated or measured in an unequivocal manner.
- **Supplier:** the party that is responsible for ensuring that the products meet and continue to meet the requirements on which the certification is based.
- **(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 recorded in the product certificate.



## 2.2 Definitions

In this BRL, the abbreviations and symbols given in NEN-EN-ISO 23856 and NPR-CEN/TS 14632 and listed in table 1 apply. The following English terms shall be translated to Dutch as follows:

**Table 1 – Abbreviations and symbols in English and Dutch.**

Abbreviation	Term	
	English	Dutch
BRL	Evaluation Guideline	Beoordelingsrichtlijn
BoE	Board of Experts	College van Deskundigen
CvD-LSK	Board of Experts - Plastic Piping Systems	College van Deskundigen - Leidingssystemen Kunststof
CB	Certification body	Certificatie instelling
RvA	Dutch accreditation council	Raad voor de accreditatie
	Supplier	Leverancier
IQC scheme	Internal quality control scheme	Intern kwaliteitsbewakingsschema
UP	Unsaturated polyester	Onverzadigde polyester
GRP	Glass reinforced thermosetting plastics	Met glas versterkte thermohardende kunststof
	Filament winding	Kruislings wikkelen
	Tape winding	Tape wikkelen
	Centrifugally cast	Centrifugaal gegoten
	Contact moulding hand lay-up	Handlamineren
	Hot or cold press moulding	Warm of koud persen
	Cemented joint	Gelijmde verbinding
	Wrapped joint	Gelamineerde verbinding
	Fitting	Fitting, hulpstuk
	Joint	Verbinding
	Locking key	Borgsnoer
DN	Nominal size	Nominale afmeting
DN-ID	Nominal size, internal diameter	Nominale afmeting, binnendiameter
DN-OD	Nominal size, external diameter	Nominale afmeting, buitendiameter
PN	Nominal pressure	Nominale druk
SN	Nominal stiffness	Nominale stijfheid
CE	CE-marking	CE-markering
	Product investigation	Toelatingsonderzoek
	Certification	Certificatie
S	Ring stiffness	Ringstijfheid
S <sub>0</sub>	Initial ring stiffness	Initiële ringstijfheid
TT	Type testing	Type testing
AT	Audit test	Audit test
BRT	Batch release test	Batch release test
PVT	Process verification test	Proces verificatie test
RLTT	Reduced long-term test	Verkorte lange duur test
d <sub>m</sub>	Mean diameter	Gemiddelde diameter
d <sub>i</sub>	Mean internal diameter	Gemiddelde binnendiameter
d <sub>u</sub>	Mean outer diameter	Gemiddelde buitendiameter
e	Wall thickness	Wanddikte
e <sub>0,tot</sub>	Mean total wall thickness	Gemiddelde totale wanddikte

$e_{eff}$	Mean structural layer thickness	Gemiddelde effectieve wanddikte
$\omega$	Winding angle	Wikkelhoek
$\alpha_{x,creep,wet}$	Wet creep factor	Natte kruipfactor
$S_{x,wet}$	Calculated long-term ring stiffness	Berekende lange duur ring stijfheid
$R_{RF}$	Re-rating factor	Herwaarderingsfactor
$\sigma_{LA}^*, \sigma_{LB}^*, \sigma_{LC}^*$ . subscript A, B, C denote the method of test used	Initial longitudinal tensile strength	Initiële longitudinale treksterkte.
$\sigma_{cA}^*, \sigma_{cB}^*, \sigma_{cC}^*$ . subscript A, B, C denote the method of test used	Initial circumferential tensile wall strength	Initiële tangentiële treksterkte
	Nominal length	Werkende lengte
	Rubber seal (lock) joint	Mof en spie verbinding met rubber dichtingselement.
	Double bell coupler	Dubbele mof en spie verbinding met rubber dichtingselement
	Adhesive bonded joints	Lijmverbindingen
	Flange joints	Flensverbindingen
	Laminated joints	Laminaatverbindingen
	Flexible joint	Flexibele verbinding
	Rigid joint	Starre verbinding
	End-load-bearing	Trekvast
	Non-load-bearing	Niet-trekvast
	Fixation of the elastomeric sealing element. The fixation of the elastomeric sealing element means the preservation of the elastomeric sealing element in the groove while pushing the spigot end into the socket.	Fixering van het rubberdichtingselement. De fixering van het rubberdichtingselement is het in de groef houden van het rubberdichtingselement bij het inschuiven van het spieëind in de mof.
D	Draw	Longitudinale verplaatsing
T	Total draw	Totale longitudinale verplaatsing
M	Misalignment	Verkeerde uitlijning
$\delta$	Angular deflection	Vrije hoekverdraaiing
	Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint	Mof en spie-eind (hetzij integraal met buis of klemkoppeling) of mechanische verbinding.
	Locked socket-and spigot joint	Trekvast mof en spie-eind verbinding

## **3 Procedure for granting a Kiwa-(technical-approval-with) product certificate**

### **3.1 Initial investigation**

The initial investigation to be performed are based on the (product) requirements as contained in this evaluation guideline, including the test methods, and comprises the following:

- 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 on the presence and functioning of the remaining procedures.

### **3.2 Granting the Kiwa-(technical-approval-with) product certificate**

After finishing the initial investigation, the results are presented to the Decision maker (see 9.2) deciding on granting the certificate. This person evaluates the results and decides whether the certificate can be granted or if additional data and/or tests are necessary.

### **3.3 Investigation into the product and/or performance requirements**

Kiwa will investigate the to be certified products against the certification requirements as stated in the certification requirements.

The necessary samples will be drawn by or on behalf of Kiwa.

### **3.4 Production process assessment**

When assessing the production process, it is investigated whether the producer is capable of continuously producing products that meet the certification requirements. The evaluation of the production process takes place during the ongoing work at the producer.

The assessment also includes at least:

- The quality of raw materials, half-finished products and end products;
- Internal transport and storage.

### **3.5 Contract assessment**

If the supplier is not the producer of the products to be certified, Kiwa will assess the agreement between the supplier and the producer.

This written agreement, which is available for Kiwa, includes at least:

Accreditation bodies, scheme managers and Kiwa will be given the opportunity to observe the certification activities carried out by Kiwa or on behalf of Kiwa at the producer.

# 4 Requirements imposed on the materials and the design of the GRP piping system

## 4.1 General

This chapter includes the requirements for the characteristics of the employed raw materials, materials used for the production of the products to be certified according to this BRL as well as the requirements for the design of the piping system.

To the raw materials and additives used in the production, the requirements as stated in clause 4.2 are to be upheld.

The raw materials and additives applied shall be recorded by the supplier in the design (see clause 4.3) of the piping system, by means of a technical specification. The conformity of the applied raw materials and additives to the requirements is to be done by Kiwa.

Each intended change in thus named parameters, is to be reported to Kiwa. It is up to Kiwa to evaluate if the change possibly has influence on the attested performance(s), in which re-evaluation of said performance(s) can be required.

When the applicant / supplier has more production locations, the applicant / supplier shall specify which production locations are concerned.

## 4.2 Materials

The pipe or fitting shall be constructed using chopped and/or continuous glass filaments, strands, or rovings, mats, or fabric, glass or synthetic veils, and polyester resin with or without fillers and if applicable additives necessary to impart specific properties of the resin. The pipe and fitting may also incorporate aggregates.

### 4.2.1 Reinforcement

The glass used for the manufacture of the reinforcement shall be one of the types listed in NEN-EN-ISO 23856.

### 4.2.2 Resin

#### 4.2.2.1 Resin Type

Application of this evaluation guideline shall be limited to the manufacture of rigid components made from thermosetting resins (GRP components). Typical resins are polyester and vinyl ester.

#### 4.2.2.2 Temperature of deflection

The resin used in the structural layer shall have a temperature of deflection of at least 70 °C when the test specimen is tested in accordance with method A of NEN-EN-ISO 75-2.

### 4.2.3 Particle size aggregates

The particle size of aggregates and fillers shall not exceed 1/5 of the total wall thickness of the pipe or fitting or 2,5 mm, whichever is the lesser.

### 4.2.4 Constancy of the material composition

The constancy of the material composition of the wall construction of the product shall be determined according to ISO 7510. The following constituents can be distinguished: resin, aggregate and filler and type and arrangement of the glass

layers. The difference in mass of each constituent of two samples, taken in two diametrically opposite places in one cross-section shall not exceed 5%, when based on the lowest value determined.

The masses of the glass, aggregates and resin of a component shall be determined according to ISO 7510 and shall be declared by the supplier.

#### **4.2.5 Elastomers**

Each elastomeric material of the sealing component shall conform to the applicable requirements of BRL K17504 (class 1).

The supplier shall demonstrate to Kiwa possibilities of good mounting of the sealing component and GRP component(s) by means of drawings of all dimensions and tolerances of the components.

#### **4.2.6 Locking key**

The locking key of the rigid locked joint with elastomeric sealing ring shall be made of a pressure resistant and shear resistant material e.g. polyvinylchloride, polyamide or a material equivalent to it. In the latter case the equivalency shall be proved, either by documentation or by testing.

#### **4.2.7 Metals**

Where metal components are used, there shall be no evidence of corrosion of the components after the fitting has been immersed in an aqueous sodium chloride solution, 30 g/l for seven days at  $(23 \pm 2)$  °C.

### **4.3 Design of the GRP piping system**

#### **4.3.1 General**

The GRP piping system is to be designed for a life time expectancy of at least 50 years and at specified nominal pressure and temperature profile within the application. The piping system shall remain (water)tight and therefor the requirements according to clause 5.2 apply.

Aside from recording the raw materials to be used (see clause 4.1), the design contains a specification of the involved diameters with respective wall thicknesses of the products and records of other relevant geometrical characteristics. In case rubber sealants are used, then the applied type of rubber(s) is(are) to be specified as well as the hardness and dimensions of the rubber seals. The rubber sealing elements shall be certified according Kiwa evaluation guideline BRL K17504.

#### **4.3.2 Demonstration of the soundness of the GRP piping system design**

The supplier shall demonstrate to the certification body that the design and manufacturing of pipes, fittings and arrangements for the joints are in accordance with relevant design practices that results in a mechanical performance of the fitting or joint equal to or greater than that of a straight GRP-UP pipe of the same pressure and stiffness rating when installed in a piping system and, if appropriate, supported by anchor blocks or encasements.

The quality management system of the supplier shall document the procedures for designing and manufacturing the pipes, fittings and joints.

It also include the results of testing programs to verify performance and establish over what range the test results are applicable and how the design procedures are proven and how they apply across the product range.

It is likely that multiple tests will be required to qualify the full range of PN and DN for any given combination of fitting or joint configuration and loading condition and these results shall be documented as part of the quality management system.

The quality management system shall document the fabricated fitting and joint design procedures including materials, material properties, sequence of attaching and reinforcing layups, the process for applying layups and quality control procedures during and after fabrication for the entire range of fittings produced.

Remark: The soundness of the design procedure can be demonstrated by means of a (validated) calculation program.

In order to keep the total test burden within acceptable limits but at the same time to control the use of test data beyond their limits of application, the concept of Type Test Groups is used in this evaluation guideline. The supplier shall declare its Type Test Groups in his quality plan, see also clause 8.2.

#### 4.3.3 Classification of the GRP piping system design

The designed GRP piping system shall be classified according to nominal size (DN) and nominal pressure (PN) and joint type (e.g. flexible joint, rigid joint) according to NEN-EN-ISO 23856. In addition pipes shall include nominal stiffness (SN) in their classification (see table 2).

**Table 2 - Nominal stiffness class (SN)**

630	5000
1250	10000
2500	-

Remarks:

- Nominal stiffness classes higher than 10000 N/m<sup>2</sup> can be required in special piping systems like casings for wells subject to external load and/or offshore piping subject to possible large water heads, piping systems under runways of airports.
- Europe it is common practice to classify stiffness on the basis of the initial stiffness.

The nominal pressure (PN) shall conform to one of those given in table 3.

**Table 3 - Nominal pressure class (PN)**

1	12,5
2,5	16
4	20
6	25
8	32
10	-

Remark: components marked PN 1 are non-pressure (gravity) components.

#### 4.3.4 Wall construction design

The wall construction of the products consists of:

- inner layer (liner);
- structural layer;
- outer layer;

and shall consist of the following constituents in the individual layers, when appropriate:

- glass fibre reinforcement,
- thermosetting polyester resin;
- fillers;
- Aggregates.

The wall construction (the sequence and composition of the individual layers comprising the pipe or fitting) shall be documented by the supplier. The supplier shall translate the product design into detailed process specifications to control the amount and placement of material components.

The specifications of the constituents and semi-finished products shall be part of the IQC scheme of the supplier.

The minimal total wall thickness, including the inner layer, shall be declared by the supplier and shall not be less than 3 mm.

The inner, structural and outer layer shall comply with the requirements of NEN-EN-ISO 23856.

#### **4.3.5 *Structural design of fitting***

The structural design of a fitting shall be demonstrated according to NEN-ISO 18851. The required test parameters are set by the standard making reference to this international standard, i.e. NEN-EN-ISO 23856.

#### **4.4 Processing instructions**

The raw materials, materials, and semi-products employed must be applied/processed in accordance with the corresponding processing instructions and/or application conditions.

# 5 Requirements imposed on the GRP piping system

## 5.1 General

In this chapter the requirements are recorded in relation to the performance of the GRP piping system in its application as well as the determination methods to evaluate if these requirements are met.

A specification of the applicable nominal sizes, the classification (nominal pressure(s) and nominal stiffness(es)), the temperature profile and the parts to be used, are recorded in the Kiwa technical-approval-with-product certificate.

## 5.2 Requirements and test methods for the joints

### 5.2.1 General

For the connections of the GRP piping system, the following types of joints can be used, with or without end load:

- 1) Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint.
- 2) Locked socket-and spigot joint;
- 3) Cemented or wrapped joint;
- 4) Bolted flange joint.

Rubber sealing elements may be used as part of the joints, see also clause 5.3.

A specification of the jointing types shall be recorded in the Kiwa technical-approval-with-product certificate.

### 5.2.2 Joint requirements

Joint performance shall conform to the requirements of chapter 7 of NEN-EN-ISO 23856.

A summary of tests required for the various types of joints is given in table 4.



**Table 4 - Summary of tests required for various types of joints.**

<b>Joint type / standard</b>	<b>Properties to be tested</b>	
Flexible non-end-load-bearing joints with elastomeric sealing rings. (ISO 8639)	Initial leakage – initial pressure	
	External pressure differential - negative pressure	
	Misalignment and draw	Positive static pressure
		Positive cyclic pressure
	Angular deflection and draw	Initial pressure
Positive static pressure		
Flexible end-load-bearing joints with elastomeric sealing rings. (ISO 7432)	Initial leakage – initial pressure	
	External pressure differential	Maintained pressure
		Positive cyclic pressure
	Short duration resistance - Maintained pressure	
	Resistance to bending	Preliminary hydrostatic pressure
Maintained hydrostatic pressure		
Wrapped or cemented joints. (ISO 8533)	Internal leakage – initial pressure	
	External pressure differential – negative pressure	
	Resistance to bending and pressure	Preliminary pressure
		Maintained pressure
		Positive cycling pressure
Short duration resistance – maintained pressure		
Bolted flange joints. (ISO 8483)	Initial leakage – initial pressure	
	External pressure differential – negative pressure	
	Resistance to bending and pressure	Preliminary pressure
		Maintained pressure
	Resistance to internal pressure	Maintained pressure
		Positive cyclic pressure
Short duration resistance – maintained pressure		

### 5.3 Fixation of the elastomeric sealing element

The following applies in case elastomeric sealing elements are used.

For judgement of the fixation of the elastomeric sealing element, the end of a pipe shall be pushed into the socket after the elastomeric sealing element is mounted into the socket. The pipe shall have a length of at least 3 meters. The elastomeric sealing element shall be mounted into the inner side of the socket according to the instructions of the manufacturer. When pushing the pipe into the socket no measures concerning centring shall be taken, the test shall be carried out at a way similar to practice.

To meet the requirements concerning the fixation of the elastomeric sealing element, the pipe shall be able of being pushed into the socket without the elastomeric sealing element being pushed out of the groove.

### 5.4 Installation instructions

The supplier shall provide installation instructions in the Dutch and/or English language. The instructions must contain specific information with regard to storage, safety, transport, processing temperature, construction of the joints and specific installation guidelines. These aspects are checked by Kiwa. A reference to the installation instructions is made in the Kiwa technical-approval-with-product certificate.

## **5.5 Initial investigation and periodic assessment**

Of the GRP piping system to be certified, it must initially be determined if the performance requirements of this chapter are met. In the investigation matrix of clause 8.8 (table 8) this is detailed per clause. In the investigation matrix it is also stated which tests and checks are applicable when the periodic assessments take place, which are performed after the technical-approval-with-product certificate is issued.

# 6 Requirements imposed on the GRP products

## 6.1 General

In this chapter the requirements are recorded in relation to the products (pipes, fittings and couplings), translated to the product properties of the individual parts of the GRP piping system, as well as the determination methods and the critical limits to evaluate if these requirements are met.

In case that a specific property or specification is applicable to the product certificate, it will be stated as such in the clause.

The pipes, fittings and couplings are produced from unsaturated polyester resin (UP). The piping system can consist of pipes and fittings (without couplings) or pipes and couplings (without fittings) as well.

A specification of the applicable nominal sizes, the classification (nominal pressure(s) and nominal stiffness(es)) shall be included in the Kiwa product certificate.

## 6.2 Regulatory requirements

### 6.2.1 *Requirements to avoid deterioration of the quality of drinking water*

Products and materials which (may) come into contact with drinking water or warm tap water, shall not release substances in quantities which can be harmful to the health of the consumer, or negatively affect the quality of the drinking water.

Therefore, the products or materials shall meet toxicological, microbiological and organoleptic requirements as laid down in the currently applicable "Ministerial Regulation materials and chemicals drinking water and warm tap water supply", (published in the Government Gazette). Consequently, the procedure for obtaining a recognised quality declaration, as specified in the currently effective Regulation, has to be concluded with positive results.

Products and materials with a quality declaration, e.g. issued by 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.

## 6.3 Elapsed or extrapolated time for determination of the long-term properties, (x)

The subscript x, in for example  $S_{x,wet}$ , denotes the elapsed or extrapolated time for which the long-term property is to be determined. Unless otherwise specified, the long-term properties shall be determined at 50 years (438 000 h).

## 6.4 Temperature effects

When properties are determined at  $(23 \pm 5)$  °C their values are applicable to products used at temperatures up to, and including, 35 °C. For service temperatures over 35 °C type tests have to be carried out, at least at the design service temperature  $^{+5/0}$  °C, to establish re-rating factors for all properties used in design.

## 6.5 Requirements and test methods for pipes

### 6.5.1 *General*

The pipes shall conform to the requirements of chapter 5 of NEN-EN-ISO 23856.

## 6.5.2 **Appearance of pipes**

Both internal and external surfaces shall be free from irregularities, which can impair the ability of the component to conform to the requirements of this evaluation guideline.

The supplier shall demonstrate which irregularities are allowable defects, repairable defects, and defects which shall impair the ability of the component to conform to the requirements of this evaluation guideline.

Remark: Classifying visual defects in glass-reinforced plastics laminate parts could be carried out according to ASTM D 2563.

## 6.5.3 **Geometrical characteristics**

### 6.5.3.1 *Determination of dimensions*

Measurements shall be made in accordance with clause 5.2 of NEN-EN-ISO 23856.

### 6.5.3.2 *Diameter*

The diameter of the GRP-UP pipes shall be designated by nominal size (DN) in accordance with one of the following two series listed in NEN-EN-ISO 23856:

- **Series A** - which specifies the internal diameters in millimetres (mm), DN-ID;
- **Series B** - which specifies external diameters in millimetres (mm), DN -OD.

Note: In standardising the diameters of (GRP-UP) pipes, difficulties are encountered because of the varying methods of manufacture (e.g. filament winding, centrifugal casting or contact moulding). GRP-UP pipes are typically produced by controlling either the internal diameter, or the external diameter to a fixed value.

Tolerances on the internal diameter or external diameter shall conform to NEN-EN-ISO 23856.

### 6.5.3.3 *Total wall thickness*

The minimum total wall thickness, including the inner layer, shall be declared by the supplier and shall not be less than 3 mm.

The wall construction comprise an:

- inner layer;
- structural layer;
- outer layer.

The inner layer shall comprise one of the following:

- a thermosetting resin layer with or without aggregates or fillers and with or without reinforcement of glass or synthetic filaments;
- a thermoplastic liner.

The wall construction shall be declared by the supplier.

### 6.5.3.4 *Thickness of structural layer ( $e_{eff}$ ) and inner and outer layers*

The thickness of the structural layer (and when applicable its individual layers), inner and outer layer shall be determined as follows. Cut a piece of cross section from the pipe (or fitting) and measure the thicknesses of the separate layers using a magnifying glass with a minimum magnification of seven and an accuracy of 0,1 mm. Alternatively, the supplier may use its own test procedure. The test procedure shall be approved by the certification body and shall be implemented in the supplier's quality system (IQC-schedule).

### 6.5.3.5 *Winding angle*

When applicable, the winding angle of the pipes for each type is recorded in the quality system of the supplier.

The winding angle is determined using a representative glass filament and the following equation:

$$\tan \omega = a/b$$

where:

a is the outside circumference of the pipe

b is the pitch of the winding

#### 6.5.3.6 *Length*

The pipe shall conform to the requirements of clause 5.2.3 of NEN-EN-ISO 23856.

#### 6.5.3.7 *Sockets and spigots formed at the pipe or formed on the pipe end provided with an elastomeric sealing*

The socket-spigot joint may be end load bearing or not end load bearing, depending on the practical situation. The dimensions and tolerances of the socket, the spigot, sealing element and locking key shall be recorded on drawings.

##### Out-of-roundness of the socket with end load bearing joint with elastomeric sealing element.

Measure at one cross-section, at the place where the elastomeric sealing is located, the largest and the smallest internal diameter.

In any cross-section of the socket, the difference between the largest and smallest internal diameter may not exceed 0,007 times the average inner diameter  $d_i$ .

##### Out-of-roundness of the socket with not load bearing joint.

Measure at one cross-section, at the place where the elastomeric sealing is located, the largest and the smallest internal diameter at maximum draw.

In any cross-section of the socket, the difference between the largest and smallest internal diameter may not exceed 0,007 times the average inner diameter  $d_i$ .

Remark: Maximum draw (i.e. total draw) of flexible joints means: the maximum permissible displacement of the spigot in the socket, when the leak tightness is maintained.

##### Out-of-roundness of the spigot for elastomeric sealing elements

Measure at the groove for the elastomeric sealing the largest and the smallest outer diameter and determine from this the out-of-roundness.

In any cross-section of the spigot, the difference between the largest and smallest external diameter may not exceed 0,007 times the average outer diameter  $d_u$ .

#### 6.5.3.8 *Sockets and spigots formed on the pipe for the purpose of bonded joints*

The dimensions and tolerances of the inner diameter of the socket, outer diameter of the spigot, insertion depth and conical shape, as well as the dimensions of the socket and spigot shall be recorded on drawings.

##### Out-of-roundness of the spigot

At midway of the spigot the difference between the largest and the smallest measured outer diameter shall not exceed 0,007 times the average outer diameter  $d_u$ .

##### Out-of-roundness of the socket

The socket is always manufactured at the factory and the tolerances of the dimensions, among which the out-of-roundness, shall be recorded on drawings, taking into account the volume that could be taken by the adhesive making the bond.

In any cross-section of the socket, the difference between the largest and smallest external diameter may not exceed 0,007 times the average inner diameter  $d_u$ .

### 6.5.4 **Material composition of the pipe**

See clause 4.2.4 of this evaluation guideline.

### 6.5.5 Mechanical characteristics

In table 5 the required mechanical characteristics of a pipe are listed.

**Table 5 - Mechanical characteristics: test method and requirement.**

Characteristic	Test method	Requirement
Initial ring stiffness	ISO 7685	Declaration of nominal stiffness (SN)
Long-term ring stiffness under wet conditions and calculation of the wet creep factor	ISO 10468	As mentioned in clause 5.3.2 of NEN-EN-ISO 23856:
Resistance to initial ring deflection	ISO 10466	As mentioned in clause 5.3.3 of NEN-EN-ISO 23856.
Long-term resistance to ring deflection under wet conditions	ISO 10471	As mentioned in clause 5.3.4 of NEN-EN-ISO 23856.
Initial longitudinal tensile strength	ISO 8513, method A or B	The requirements mentioned in clause 5.3.5 of NEN-EN-ISO 23856.
Initial failure pressure	ISO 8521, method A, B, C, D, E or F	As mentioned in clause 5.3.6 of NEN-EN-ISO 23856.
Long-term resistance to failure pressure. Extrapolation procedure.	ISO 7509 ISO 10928	As mentioned in clause 5.3.7 of NEN-EN-ISO 23856.

The tests listed in table 5 shall be performed and evaluated according to clause 5.3 of NEN-EN-ISO 23856.

## 6.6 Requirements and test methods for fittings and couplings

### 6.6.1 General

Fittings and couplings shall comply with the requirements of chapter 6 of NEN-EN-ISO 23856.

### 6.6.2 Dimensions and tolerances

The relevant dimensions (i.e. diameter, angle, radius, length, laying length, body length, concentric/eccentric, wall thickness, etc.) and tolerances of fittings shall conform to the appropriate requirements according to chapter 6 of NEN-EN-ISO 23856.

Dimensions and tolerances shall be specified in drawings.

### 6.7 Protection of products during storage and transport

The products shall be protected during storage and transport to prevent contamination of all product-parts intended to be in contact with drinking water. See for information annex III.

## 6.8 Marking of the products

### 6.8.1 General

Marking details shall be printed or formed directly on the pipe in such a way that the marking does not initiate cracks or other types of failure. If printing is used, the colouring of the printed information shall differ from the basic colouring of the product and such that the markings shall be readable without magnification.

#### Marking of pipes

The marking details shall be on the outside of each pipe, and in the case of DN 600 or greater shall be either on the inside or on the outside surface of the pipes and shall comply with clause 5.5 of NEN-EN-ISO 23856 as well as the following shall be applied to the products:

- Number of this evaluation guideline, i.e. BRL-K17605 or NEN-EN-ISO 23856.
- Certificate number.

#### Marking of fittings (including couplings)


Marking details shall be printed or formed directly on the fitting and/or coupling in such a way that the marking does not initiate cracks or other types of failure. If printing is used, the colouring of the printed information shall differ from the basic colouring of the product and such that the markings shall be readable without magnification.

The marking details shall be on the outside of each product and comply with clause 6.7 of NEN-EN-ISO 23856 as well as the following shall be applied to the products:

- Number of this evaluation guideline, i.e. BRL-K17605 or NEN-EN-ISO 23856.
- Certificate number.

### **6.8.2 Certification mark**

After concluding a Kiwa certification agreement the certified products shall, beside the marks indicated in clause 6.9.1, be indelible marked with:

- the certification mark: KIWA 

### **6.9 Initial investigation and periodic assessment**

Of the GRP products to be certified, it must initially be determined if the requirements of this chapter can be met. In the investigation matrix of clause 8.8 (table 8) this is detailed per clause. In the investigation matrix it is also stated which tests and checks are applicable when the periodic assessments take place, which are performed after a the product certificate is issued.

# 7 Requirements in respect of the quality system

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

## 7.1 Manager of the quality system

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

## 7.2 Internal quality control/quality plan

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

The following must be demonstrably recorded in this IQC scheme:

- which aspects are checked by the supplier;
- 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 as shown in the Annex.

The manufacturer shall describe in his quality plan the limits used to define a batch for testing purposes. Typically, a quality control batch consists of products of a particular diameter, stiffness class and pressure class.

A batch may be released for supply when all the relevant tests and inspections have been carried out and the requirements have been met. If one or more items fail one or more tests or inspections, then the retest procedures detailed in NPR-CEN/TS 14632 shall be performed.

The manufacturer shall detail in his quality plan a verification procedures (PVT) and the frequency they are carried out. The frequency of these tests shall complement the frequency of audit tests (AT), if applicable. The manufacturer shall describe in his IQC-scheme the limits of the conditions for example temperature and relative humidity at which BRT's and PVT's shall be carried out in his laboratory.

Note: The purpose of PVT tests is to assess the conformity of the long-term properties of the product.

## 7.3 Control of test and measuring equipment

The supplier shall verify the availability of necessary test and measuring equipment for demonstrating product conformity with the requirements in this evaluation guideline.

When required the equipment shall be kept calibrated ( e.g recalibration at interval). The status of actual calibration of each equipment shall be demonstrated by traceability through an unique ID.

The supplier must keep records of the calibration results.

The supplier shall review the validity of measuring data when it is established at calibration that the equipment is not suitable anymore.



#### **7.4 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.

#### **7.5 Competence of personnel**

The supplier shall demonstrate in his quality plan education, training and/or work experience of the personnel.

It is recommended to demonstrated competence of the laminators by means of:

- certification of personnel according to NEN-EN-ISO/IEC 17024 or;
- DVS 2220 or;
- NEN-EN-ISO 9001, clause 6.2.

# 8 Summary of tests and inspections (assessment of conformity)

## 8.1 General

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

- Pre-certification: the investigation necessary in order to determine whether all requirements of the evaluation guideline are fulfilled;
- Inspection visit: the surveillance inspections carried out after issue of the certificate in order to determine whether the certified products continuously fulfil the requirements of this evaluation guideline. The inspections are carried out by Kiwa according to the indicated frequency;
- Inspection of the quality system of the supplier: inspection with regard to the correct implementation of the IQC-schedule and procedures.

The conformity assessment shall comply with NPR-CEN/TS 14632.

The manufacturer shall describe in his quality plan and IQC scheme all relevant procedures relating to BRT and PVT.

## 8.2 Type test groups

A type test group consists of a range or family of products made such that the results of the long-term type tests are applicable to all products in the group. A pipe type test group for example shall contain products:

- manufactured by the same process;
- with the same material specifications;
- with the same pipe wall construction (i.e. the sequence of layers, layer compositions, material properties);
- design method;
- tested with the same loading condition (end load bearing or not end load bearing).

The quality management system shall document all process details that could influence type test performance. The quality management system shall document the complete product design method and demonstrate how the results of the type tests are used to establish product designs and pipe type test groups.

## 8.3 Reference conditions for TT and AT

The reference conditions for type testing and audit testing, such as:

- 1) temperature;
- 2) properties of the water for testing;
- 3) loading conditions;
- 4) pre-conditioning;
- 5) measurements of dimensions;

shall conform to the requirements listed in NEN-EN-ISO 23856, clause 4.5.

## 8.4 Audit testing

Those characteristics specified in NPR-CEN/TS 14632:2012, clause 6.3 shall be audit tested at the given minimum sampling frequency.

## 8.5 Quality control tests

The supplier shall describe in his quality plan the limits used to define a batch for testing purposes. For details see NPR-CEN/TS 14632:2012, clause 6.4.

## 8.6 Assessment of conformity

For the assessment of conformity the required test pieces shall be manufactured by the supplier (certificate holder) under the conditions:

- the manufacture process;
- raw material receipt;
- design;

during the manufacture of the test pieces is the same as the manufacture of the test pieces used for the pre-certification.

It is not allowed to manufacture the test pieces for the assessment of conformity at different production locations.

## 8.7 Product changes / production technique changes

### 8.7.1 General

To determine the effect of e.g. a product change or change in production technique (process), the required test pieces may be manufactured on various production locations under the condition that:

- the manufacture process;
- raw material receipt;
- design of the test piece;

on the various production locations is the same.

In table 6, the tests to be performed are mentioned which have to be carried out in case of a product / production technique change.

The supplier shall not make any changes that may be related to the quality of the products before Kiwa has agreed to such changes. After the supplier's proposed changes have been reported to Kiwa, Kiwa assesses whether further investigation is required and informs the supplier thereof.

Remark: definitions of changes in material, design and process are listed in NPR-CEN/TS 14632 annex B.

The effects of changes shall be determined according to NPR-CEN/TS 14632:2012, annex C.

**Table 6 - Test to be performed for material changes.**

Property to be tested	Standard	Clause of BRL
Amount of constituents	ISO 7510	7.5.2
Initial ring stiffness	ISO 7685	7.5.3
Initial resistance to ring deflection	ISO 10466	7.5.4
Initial failure pressure	ISO 8521	7.5.5
RLTT failure pressure	ISO 7509	7.5.6
RLTT creep under wet conditions	ISO 10468	NPR-CEN/TS 14632, annex D

Tests to be performed to changes in design, process or joint materials are listed in table 7.

**Table 7 - Test to be performed for changes in design, process and joint materials.**

<b>Property to be tested</b>	<b>Standard</b>	<b>Clause of BRL</b>
Amount of constituents	ISO 7510	7.5.2
Initial ring stiffness	ISO 7685	7.5.3
Initial resistance to ring deflection	ISO 10466	7.5.4
Initial failure pressure	ISO 8521	7.5.5
RLTT failure pressure	ISO 7509	7.5.6
Joint performance tests	NPR-CEN/TS 14632	7.5.8

The proposed change shall be implemented only when the applicable requirements detailed in the evaluation guideline are fulfilled.

## **8.7.2 Test methods**

### **8.7.2.1 Amount of constituents (material composition)**

The resin, glass, aggregate and filler contents and the type and arrangement of the constituent glass layers shall be determined according to ISO 7510.

A difference of more than 10% between the results before and after the proposed change, does require a new pre-certification of the product or type test, whichever is applicable. The results before the change refer to the declared values.

### **8.7.2.2 Initial Specific ring stiffness**

The initial specific ring stiffness shall be determined according to ISO 7685. The initial specific ring stiffness shall not be less than the declared SN classification.

### **8.7.2.3 Initial resistance to ring deflection**

The initial resistance to ring deflection shall be determined according to ISO 10466 and shall fulfil the requirements of NEN-EN 1796 clause "Initial resistance to failure in a deflected condition". This means that the test pieces shall be free from bore cracks and are without structural failure: i.e. interlaminar separation, tensile failure of the glass fibre reinforcement, buckling of the pipe wall, if applicable separation of the thermoplastic liner from the structural wall.

The results shall be evaluated in accordance with NPR-CEN/TS 14632.

### **8.7.2.4 Initial failure pressure**

The initial circumferential tensile wall strength shall be determined according to ISO 8521.

The results shall be evaluated in accordance with NPR-CEN/TS 14632.

### **8.7.2.5 RLTT resistance to failure pressure**

The RLTT shall be carried out on six test pieces according to ISO 7509.

The internal pressure levels shall be selected from the relevant pressure design curve derived in accordance with the relevant procedures described in ISO 10928 for the following expected times to failure: 100 h, 600 h and 2000 h.

Two test pieces should be tested at each of the three determined pressures.

The results shall be evaluated in accordance with NPR-CEN/TS 14632, annex D.3.

### **8.7.2.6 Joint performance tests**

Joint performance shall comply with NPR-CEN/TS 14632, clause 6.3.

## **8.8 Investigation matrix for type testing and inspections**

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

- Pre-certification: the investigation necessary in order to determine whether all requirements of the evaluation guideline are fulfilled.
- Inspection visit: the surveillance inspections carried out after issue of the certificate in order to determine whether the certified products continuously fulfil the requirements of this evaluation guideline. The inspections are carried out according to the frequency indicated.
- Inspection of the quality system: inspection with regard to the correct implementation of the IQC-schedule and procedures.

During the pre-certification, type tests have to be performed to determine whether the product meets the specified performance and product requirements.

The requirements that must be fulfilled in order to qualify for certification are listed in the table 8, in the column named pre-certification. After certification Kiwa shall periodically inspect the manufacturer for compliance with this evaluation guideline.

In case the product or production process changes significantly, the performance requirements must be determined once again as listed in clause 8.5.

Table 8 – Investigation matrix

Description of requirement	Clause BRL	Tests within the scope of:		
		Product investigation	Surveillance by CB after issue of the certificate	
			inspection	Frequency
<b>Requirements imposed on the materials and the design of the GRP piping system</b>				
General	4.1	x	x	1 / year
Materials	4.2	x	x <sup>a)</sup>	1 / year
Design of the GRP piping system	4.3	x	x <sup>a)</sup>	1 / year
Type test groups	4.4	x	x <sup>a)</sup>	1 / year
Reference conditions for TT and AT	4.5	x	x <sup>a)</sup>	1 / year
Reference conditions for BRL and PVT	4.6	x	x <sup>a)</sup>	1 / year
Processing guidelines	4.7	x	x	1 / year
<b>Requirements imposed on the GRP piping system</b>				
General	5.1	x		
Requirements and determination methods for the joints	5.2	x	x <sup>b)</sup>	1 / 5 years
Fixation of the elastomeric sealing element	5.3	x		
Installation instructions	5.4	x	x	1 / year
<b>Requirements imposed on the GRP products</b>				
General	6.1	x		
Requirements to avoid deterioration of the quality of drinking water	6.2.1	x	x	1 / year
Elapsed or extrapolated time for determination of the long-term properties, (x)	6.3	x		
Temperature effects	6.4	x		
Requirements and determination methods for the pipes	6.5	x	x <sup>c)</sup>	1 / 5 years
Requirements and determination methods for the fittings and couplings	6.6	x		
Protection of products during storage and transport	6.7	x	x	1 / year
Marking of the products	6.8	x	x	1 / year
<b>Requirements in respect of the quality system</b>				
Manager of the quality system	7.1	x	x	1 / year
Internal quality control / quality plan	7.2	x	x	1 / year
Control of measuring and test equipment	7.3	x	x	1 / year
Procedure and working instructions	7.4	x	x	1 / year
Competence of personnel	7.5	x	x	1 / year

- a) Requirement is compared with the for this aspect ascertained values that are listed in the supplier's IQC scheme.
- b) Requirement that is part of audit testing according clause 5.2.2.
- c) Requirement that is part of audit testing for the following aspects:
- i) Amount of constituents, clause 8.5.2.1;
  - ii) Creep under wet condition (RLTT), NPR-CEN/TS 14632, annex D;
  - iii) Resistance to ring deflection (RLTT), NPR-CEN/TS 14632, annex D;
  - iv) Long term failure pressure (RLTT), clause 8.5.2.5;

**Remark:**

Reduced long-term type tests (RLTT) as detailed in NPR-CEN/TS 14632 may be used for satisfying the relevant audit test requirements, as well as proving that products still conform to the original specifications. Reduced long-term tests can thus be used as a comparison with existing long-term data, but not as a basis for a new design.

## **8.9 Inspection of the quality system**

The quality system will be checked by Kiwa on the basis of the IQC scheme.

The inspection contains at least those aspects mentioned in the Kiwa Regulations for Product certification. See also chapter 7.

# 9 Agreements on the implementation of certification

## 9.1 General

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

- the general rules for conducting the pre-certification tests, in particular:
  - the way suppliers are to be informed about how 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 rules for conducting inspections and the aspects to be audited,
- the measures to be taken by Kiwa in case of Non-Conformities,
- the measures 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 measures taken by Kiwa.

## 9.2 Certification staff

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

- Certification assessor (**CAS**): in charge of carrying out the pre-certification tests and assessing the inspectors' reports;
- Site assessor (**SAS**): in charge of carrying out external inspections at the supplier's works;
- Decision maker (**DM**): 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.

### 9.2.1 Qualification requirements

The qualification requirements consist of:

- qualification requirements for personnel of a certification body which satisfies the requirements EN ISO / IEC 17065, performing certification activities
- qualification requirements for personnel of a certification body performing certification activities set by the Board of Experts for the subject matter of this evaluation guideline

Education and experience of the concerning certification personnel shall be recorded demonstrably.



Basic requirements	Evaluation criteria
Knowledge of company processes Requirements for conducting professional audits on products, processes, services, installations, design and management systems.	<i>Relevant experience: in the field</i> <b>SAS, CAS</b> : 1 year <b>DM</b> : 5 years inclusive 1 year with respect to certification Relevant technical knowledge and experience on the level of: <b>SAS</b> : High school <b>CAS, DM</b> : Bachelor
Competence for execution of site assessments. Adequate communication skills (e.g. reports, presentation skills and interviewing technique).	<b>SAS</b> : Kiwa Audit training or similar and 4 site assessments including 1 autonomic under review.
Execution of initial examination	<b>CAS</b> : 2 initial applications under review.
Technical competences	Evaluation Criteria
Education	<b>General</b> : Education in one of the following technical areas: • Engineering.
Relevant testing knowledge	<b>General</b> : • Training (general and scheme specific) including measuring techniques.
Experience - specific	<b>CAS</b> • 2 complete applications self-reliant (to be evaluated by <b>PM</b> ) <b>SAS</b> • 2 inspection visits together with a qualified <b>SAS</b> )
Skills in performing witnessing	<b>SAS</b> Internal training witness testing

Legenda:

- Certification assessor (**CAS**)
- Decision maker (**DM**)
- Product manager (**PM**)
- Site assessor (**SAS**)

### 9.2.2 Qualification

The qualification of the Certification staff shall be demonstrated by means of assessing the education and experience to the above mentioned requirements. In case staff is to be qualified on the basis of deflecting criteria, written records shall be kept.

The authority to qualify staff rests with the:

- **PM**: qualification of **CAS** and **SAS**;
- management of the certification body: qualification of **DM**.

### 9.3 Report initial investigation

The certification body records the results of the initial investigation in a report. This report shall comply with the following requirements:

- completeness: the report provides a verdict about all requirements included in the evaluation guideline;
- traceability: the findings on which the verdicts have been based shall be recorded and traceable;

- basis for decision: the **DM** shall be able to base his decision on the findings included in the report.

#### **9.4 Decision for granting 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 in a traceable manner.

#### **9.5 Layout of quality declaration**

The product certificate shall be in accordance with the model included in the Annex.

#### **9.6 Nature and frequency of third party audits**

The certification body shall carry out surveillance audits on site at the supplier at regular intervals to check whether the supplier complies with his obligations. The Board of Experts decides on the frequency of audits.

At the time this BRL entered into force, the frequency of audits amounts two audit(s) on site per year.

The audit program on site shall cover at least:

- the product requirements;
- the production process;
- the suppliers IQC scheme and the results obtained from inspections carried out by the supplier;
- the correct way of marking certified products;
- compliance with required procedures;
- handling complaints about products delivered.

For suppliers with a private label certificate the frequency of audits amounts to one audit per two years. These audits are conducted at the site of the private label certificate holder and focusses on the aspects inserted in the IQC scheme and the results of the control performed by the private label holder. The IQC scheme of the private label holder shall refer to at least:

- the correct way of marking certified products;
- compliance with required procedures for receiving and final inspection;
- the storage of products and goods;
- handling complaints.

The results of each audit shall be recorded by Kiwa in a traceable manner in a report.

#### **9.7 Non conformities**

When the certification requirements are not met, measures are taken by Kiwa in accordance with the sanctions policy as written in the Kiwa Regulation for Certification.

The Sanctions Policy is available through the "News and Publications" page on the Kiwa website ["Kiwa Regulation for Certification"](#).

#### **9.8 Report to the Board of Experts**

The certification body shall report annually about the performed certification activities. In this report the following aspects are included:

- mutations in number of issued certificates (granted/withdrawn);
- number of executed audits in relation to the required minimum;
- results of the inspections;
- required measures for established Non-Conformities;
- received complaints about certified products.

## **9.9 Interpretation of requirements**

The Board of Experts may record the interpretation of requirements of this evaluation guideline in one separate interpretation document.

# 10 Titles of standards

## 10.1 Public law rules

“Staatscourant” (Dutch Government Gazette) from 1 July 2017	“Regeling Materialen en Chemicaliën drink- en warm tapwatervoorziening” (Regulation on materials and chemicals drinking water and warm tap water supply)
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## 10.2 Standards / normative documents

Standard	Title
ASTM D2563 08(2015)	Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
DVS 2220	Qualification testing of plastics laminators and adhesive bonders. Laminates as well as laminate and adhesive-bonded joints between GFRPs (UP-GF and EP-GF).
ISO 7432:2021	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals.
ISO 7510-2:2017	Plastics piping systems - Glass-reinforced plastics (GRP) components - Determination of the amounts of constituents using the gravimetric method.
ISO 7685 : 2019	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness.
ISO 8483 : 2019	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of bolted flange joints.
ISO 8513 : 2016	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of longitudinal tensile properties.
ISO 8521 : 2020	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test methods for the determination of the apparent initial circumferential tensile strength.
ISO 8533 : 2019	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of cemented or wrapped joints.
ISO 10466 : 2021	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test method to prove the resistance to initial ring deflection.
ISO 10468 : 2018	Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the long-term specific ring creep stiffness under wet conditions and calculation of the wet creep factor.
ISO 10471 : 2018	Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the long-term ultimate bending strain and the long-term ultimate relative ring deflection under wet conditions.

ISO 10928 : 2016	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Methods for regression analysis and their use.
NEN-EN-ISO 75-2 : 2013	Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite.
NEN-EN 1796:2006+A1:2008	Plastics piping systems for water supply with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP)
NEN-EN-ISO 9001:2015	Quality management systems - Requirements
NEN-EN-ISO/IEC 17020:2012	Conformity assessment -General criteria for the operation of various types of bodies performing inspection.
NEN-EN-ISO/IEC 17021	Conformity assessment - Requirements for bodies providing audit and certification of management systems
NEN-EN-ISO/IEC 17024:2012	Conformity assessment - General requirements for bodies operating certification of persons.
NEN-EN-ISO/IEC 17025:2018	General requirements for the competence of testing and calibration laboratories.
NEN-EN-ISO/IEC 17065:2012	Conformity assessment - Requirements for bodies certifying products, processes and services
NPR-CEN/TS 14632:2012	Plastics piping systems for drainage, sewerage and water supply, pressure and non-pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Guidance for the assessment of conformity

# I Model certificate (example)

	<b>Product certificate</b> KXXXXXX/0X	
	Issued Replaces Page 1 of 1	
<b>CERTIFICATE</b>	<b>Name product</b>	
	STATEMENT BY KIWA With this product certificate, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by	
	<b>Name customer</b>	
	as specified in this product certificate and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa evaluation guideline BRL-xxxx "xxxxxxxxxxxxxxxxxxxxxxxx" <b>dated [dd-mm-yyyy]</b> inclusive amendment sheet dated dd-mm-yyyy.	
	 Luc Leroy Kiwa	
	<small>Publication of this certificate is allowed. Advice: consult <a href="http://www.kiwa.nl">www.kiwa.nl</a> in order to ensure that this certificate is still valid.</small>	
<small>Kiwa Nederland B.V. Sir Winston Churchilllaan 273 P.O.Box 70 2280 AB RUISWIJK The Netherlands Tel. +31 88 998 44 00 Fax +31 88 998 44 20 <a href="mailto:info@kiwa.nl">info@kiwa.nl</a> <a href="http://www.kiwa.nl">www.kiwa.nl</a></small>	<small>Company Name customer Address customer  Phone number Fax number www. Email</small>	<div style="border: 1px solid black; padding: 5px;"><small>Certification process consists of initial and regular assessment of:<ul style="list-style-type: none"><li>• quality system</li><li>• product</li></ul></small></div>

## II Model IQC-scheme (informative)

<p><b><u>IQC-schedule</u></b></p> <p><b><u>INTERNAL QUALITY PLAN</u></b></p>	<p>Manufacturer / supplier :</p> <p>Production location address :</p>	<p>Number of appendices:</p>
<p><u>Field(s) of application</u></p> <p><u>According evaluation guideline(s)</u></p>		
<p><u>Number of production shifts:</u></p>	<p><u>Quality manual, procedures and working instructions</u></p>	
<p><u>Quality Control</u></p> <p>Total number of employees in QC department :</p> <p>Number of QC-operators per shift :</p> <p>If no QC-inspections are carried out during night shifts, state the QC procedure(s)/instruction(s) to be followed: , documented in:</p>	<p>Is the Quality Management System (QMS) certified according to ISO 9001<sup>1)</sup>?</p> <p>If yes, by which certification body:</p> <p>If yes, is the certification body accredited for the particular scope of certification?</p> <p>The following procedure for dealing with <u>complaints</u> applies:</p> <p>In case the QMS is <b>not</b> certified according to ISO 9001:</p> <ul style="list-style-type: none"> <li>• Working instructions, test instructions and procedures are documented as follows:</li> <li>• The following procedure for <u>nonconformity review</u> applies:</li> </ul>	
<p><u>Inspection and test records</u></p> <p>All records shall be maintained for a minimum of            years.</p>		
<p><u>Specific agreements/comments/explanations</u></p>	<p>Signature of the manufacturer/supplier:</p> <p>Date :</p>	

<sup>1)</sup> In case the QMS is ISO 9001 certified and covers the scope of the product certificate(s), reference to the applicable procedure(s) on the next pages is sufficient and the tables A till F do in principle not have to be further filled-out except for the frequency of tests/inspections (to be approved by CB) in tables B, C and D.

<b>A. Calibration of measuring and test equipment</b>				
Applicable procedure(s) nr(s):				
Equipment to be calibrated	Calibration aspect	Calibration method	Calibration frequency	Calibration file (name and location)

<b>B.Raw material and additives</b>				
Applicable procedure(s) nr(s):				
<b>B.1Receipt</b>				
For each delivery of raw material or additives data with respect to dates, producers, types and quantities are recorded as follows:				
<b>B.2Entry control</b>				
Type of raw material	Inspection aspect	Inspection method	Inspection frequency	Registration file (name and location)



<b>C. Batch release tests per machine (including in-process and finished product testing)</b>				
Applicable procedure(s) nr(s):				
Production process(es):				
Type of product	Type of test	Test method	Test frequency	Registration file (name and location)

Specific agreements/comments/explanations:

<b>D.Process verification tests</b>				
Applicable procedure(s) nr(s):				
Type of product	Type of test	Test method	Test frequency	Registration file (name and location)

<b>E. Control of nonconforming and/or rejected products</b>				
Applicable procedure(s) nr(s):				
<b>E.1 Method of registration</b>				
<b>E.2 Method of identification</b>				
<b>E.3 Method of nonconformity review and disposition</b>				

<b>F. Inspection with regard to packaging, storage and transportation of the finished product</b>			
Applicable procedure(s) nr(s):			
Inspection aspects	Inspection method	Inspection frequency	Registration file (name and location)
<b>F.1 Packaging, storage and transport</b>			

<b>List of technical drawings</b>			<b>Appendix II</b>
			Date:.....
Drawing title and number	Drawing date	Drawing title and number	Drawing date

# III Prevention of contamination (informative)

Products for transport of drinking water: Guidance for prevention of contamination during transport and storage

## **Importance of a hygienic operation**

A hygienic operation is since decades an important issue for the transport and distribution of drinking water in the Netherlands.

The impact of pollution can have big consequences for the water distribution<sup>1)</sup> (normally chlorine is not used) and need substantial efforts to clean the system.

Already in the 1983 published "guideline for installation of PVC-U piping systems", this is described with chapter § 4.2: " 'Opslag' van de 'Richtlijnen voor de aanleg van hoofdleidingen van ongeplastificeerd polyvinylchloride (PVC) voor het transport van drinkwater' "

Also the aspect hygiene is mentioned in the Dutch "Hygiëncode Drinkwater; Opslag, transport en distributie", 2010, including manuals for installers.

As result of the Hygienic code a wide range of courses for parties involved (installers, personnel of water companies, etc.) can be followed.

Last but not least the "Hygiëne code" is also mentioned in the drinking water law of 1 July 2011 and is therefore part of the Dutch law.

## **Protection of the used products**

In the 'Hygiëncode Drinkwater; Opslag, transport en distributie" the aspect how to work hygienically extensively is described. Here actions for all used parts as pipes, fittings and valves in the complete system, from construction until operation are described.

The primary task in this case is "prevention". Secondary is also important the preparation of the main for the actual drinking water transport.

For all products coming from the production location, until installation in the drinking water system the same "preventive" measurements shall be taken<sup>2)</sup> to prevent pollution.

Therefore manufacturers shall demonstrate a procedure how to prevent pollution of certified (drinking water) products during production, transport and storage.

## **Requirements for the protection of products**

For all preventive (protective) actions taken to protect the products against pollution it is important that the protection will last for the complete process of storage, transport and again storage.

remark :

<sup>1)</sup> mostly this is a microbiological contamination coming from the surrounding area on macro- and micro scale (like dust, but also faeces and dead beasts).

<sup>2)</sup> "protection" is the combination of packaging and closing the pipe/fitting ends.

### How to protect: General

The used packaging depends on the product itself (shape, dimensions, etc.)

Some packaging solutions are mentioned below:

- a plastic bag (in a box) for small fittings (couplings, rings, rubber seals);
- 'Protection fill with inserted bubbles in combination with tape for big(ger) fittings;
- the combination of bags of GRP material or crimp-foil and the use of a box for smaller part;
- end-caps of stern material of plastics bags for the pipe mouth (where the complete pipe package is wrapped in foil).

### How to protect: Pipes

In 2007 representatives of the manufacturers and the water companies organized in the commission 'Onderhandelings Commissie Kunststoffen' (OCK) have started a project to improve the packaging quality.

As result of this a guidance is made to use packaging products as shown with the pictures below.

The end cap is unmovable fixed in the pipe by using flaps in a labyrinth structure to let in air but prevent pollution.

The end cap is developed for a 110 mm PVC pipe but can also be developed for other diameters (50, 63, 75 , 90, 160, 200 and 250 mm), and for all used pipe materials.

For the protection of the pipe mouth for 315, 400, 500 and 630 mm PVC pipes a GRP foil with tape can be used (see the pictures below).



For smaller diameters this solution is not recommend