**BRL 52204**
**declared in force on 2016-12-19**

# Assessment directive

For the KOMO® technical approval with product certificate for

**Plastics piping systems for drainage and sewerage with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).**

Validated by Board of Experts Plastic Piping systems ("LSK") on 2016-10-20.

Accepted by the "KOMO Quality and Screening Committee" on 2016-12-19.

# Preface Kiwa

This assessment directive has been prepared by the Board of Experts “Plastics Piping Systems”, in which interested parties in the area of plastics piping systems for drainage and sewerage with or without pressure – glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) are represented. This Board of Experts guides the performance of the conformity assessment and adjusts this assessment directive where necessary. Wherever the term “Board of Experts” is used in this assessment directive, the above mentioned Board of Experts is meant.

Kiwa will use this assessment directive in conjunction with the Kiwa Regulations for Product Certification. These regulations embody the examination procedure laid down by Kiwa for the issue of a technical approval with product certificate as well the procedure for external inspection.

The product requirements and test methods comply with the requirements listed in NEN-EN 14364. The aspects of the assessment of conformity comply with NPR-CEN/TS 14632. This assessment directive includes additional requirements and test methods set by the Board of Experts.

**Declaration of validation**
This assessment directive is declared in force by Kiwa on 2016-12-19.

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# Content

# 1 Introduction

## 1.1 General

The requirements embodied in this assessment directive (BRL) shall be used by certification bodies that are accredited by the Dutch Accreditation Council (RvA) which have a license with KOMO when dealing with applications for the issue or maintenance a KOMO® technical approval with product certificate for plastics piping systems for drainage and sewerage with or without pressure – glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).

The technical field of this assessment directive is: F2 Plastics piping systems.

Besides the requirements embodied in this assessment directive, certification bodies impose additional requirements in the sense of requirements with regard to general procedures for certification as laid down in the general certification regulations of the respective certification body.

This assessment directive supersedes BRL 52204 dated 2014-03-07.
Technical approval with product certificates issued on the basis of that assessment directive lose their validity after 2017-12-19.

During the execution of certification activities, the certification bodies have to fulfil the requirements as laid down in the chapter 'Requirements imposed on the certification body'.

This BRL cannot be used to issue technical approval with product certificates that shall be recognized within the context of the Dutch Building Act ("Bouwbesluit").

## 1.2 Field of application

The field of application is underground piping systems and its components made from glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) intended to be used for drainage, sewerage, with or without pressure and is in agreement with the scope of NEN-EN 14364.

This means that the assessment directive is applicable to pipes, fittings and their joints of nominal diameters from DN 100 to DN 4000, which are intended to be used for the conveyance of surface or sewage 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.

Note: The product can be used under continuously varying load in internal pressure applications. In that case test should be carried out according to ISO 15306.

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

Fittings could 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 assessment directive 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 Relation with European regulation no 305/2011.

There is no harmonized European standard for the GRP products that fall within the scope of this assessment directive.

## 1.4 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 assessment directive are met, then these reports have to be prepared by a body meeting the prevailing accreditation standard, i.e.:

- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN-ISO/IEC 17065 for certification bodies certifying products;
- NEN-EN-ISO/IEC 17021-1 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons.

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 concluded a mutual acceptance agreement.
This accreditation shall relate to the tests required for this assessment directive.
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.
If it concerns a test laboratory then the certification body shall perform one or more audits at this laboratory to verify among others whether the execution of the tests in question is in accordance with the requirements of NEN-EN-ISO/IEC 17025.

## 1.5 Certificate

Based on the KOMO system that applies to this KOMO® assessment directive KOMO® issues a technical approval with product certificate.

On the website of the KOMO foundation (www.komo.nl) the model technical approval with product certificate is listed, which is applicable for this assessment directive. The technical approval with product certificate which will be issued is to be in accordance with this.

The products which fulfil the requirements listed in the chapters, 4, 5, 6, 7 and 8 shall be mentioned in the technical approval with product certificate.

# 2 Terminology

For terms related to the conformity assessment is referred to the website of the Foundation KOMO (www.komo.nl) and the regulations of the certification body.

## 2.1 General definitions

In this assessment directive the meanings of the following terms are:

### *2.1.1 Assessment directive (BRL):*

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

### *2.1.2 Board of Experts (BoE)*

The Board of Experts “Plastics Piping Systems”.

### *2.1.3 Supplier*

the party that is responsible for ensuring that the products meet and continue to meet the requirements on which the certification is based.

### *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 Fitting*

Pressure-tight, fluid-containing component with a geometry different from straight pipe.

### *2.1.6 Joint*

Means of connecting two or more components, for example: plain pipe to a fitting or plain pipe to plain pipe.

### *2.1.7 Requirements and determination methods*

In this assessment directive requirements and determination methods are included, by which the following is meant:

#### *2.1.7.1 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.

#### *2.1.7.2 Determination methods*

**Product investigation tests:** tests in order to ascertain that all the requirements recorded in the assessment directive are met.
**Inspection 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 assessment directive.

## 2.2 Terms and definitions related to this type of products

In this assessment directive the terms and definitions given in NEN-EN 14364 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, terms in English and Dutch.**

| Abbreviation | Term | |
|---|---|---|
| | **English** | **Dutch** |
| BRL | Assessment directive | Beoordelingsrichtlijn |
| BoE | Board of Experts | College van Deskundigen |
| CvD-LSK | Board of Experts - Plastic Piping Systems | College van Deskundigen - Leidingsystemen 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 | Specific ring stiffness | Specifieke ringstijfheid |
| $S_0$ | Initial specific ring stiffness | Specifieke initiële ringstijfheid |
| STIS (NEN 7037) | Specific tangential initial stiffness | Specifieke tangentiële initiële stijfheid |
| STES (NEN 7037) | Specific tangential end stiffness | Specifieke tangentiële eind stijfheid |
| α | Reduction factor, associated with creep, determined according to NEN 7037 | Reductiefactor die verband houdt met kruip en die wordt bepaald volgens NEN 7037 |
| β | Reduction factor, associated with ageing in water, determined according to NEN 7037 | Reductiefactor die verband houdt met veroudering in water die wordt bepaald volgens NEN 7037 |
| 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 |
| $d_m$ | Mean diameter | Gemiddelde diameter |
| $d_i$ | Mean internal diameter | Gemiddelde binnendiameter |
| $d_u$ | Mean outer diameter | Gemiddelde buitendiameter |
| e | Wall thickness | Wanddikte |
| $e_{0,tot}$ | Mean total wall thickness | Gemiddelde totale wanddikte |
| $e_{eff}$ | Mean structural layer thickness | Gemiddelde effectieve wanddikte |
| ω | Winding angle | Wikkelhoek |
| $\alpha_{x,creep,wet}$ | Wet creep factor | Natte kruipfactor |
| $S_{x,wet}$ | Calculated long-term specific ring stiffness | Berekende lange duur specifieke 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.<br>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.<br>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 |
| δ | 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 | Trekvaste mof en spie-eind verbinding |

# 3 Initial assessment

## 3.1 General

The certification is on a voluntary basis.
When the applicant / supplier has more production locations, the applicant / supplier shall specify which production locations are concerned.

## 3.2 Product investigation

For the purpose of obtaining the KOMO technical approval with product certificate the certification body executes an investigation. To this product investigation belong:

- verification of the documents provided by the supplier c.q. shall be provided by the suplier to assess if there is complaince with the requirements laid down in the assessment directive;
- determination of the characterictis of products of assemblies of products as listed in the assessment directive.
- Assessment of the processing instructions of the supplier.

## 3.3 Evaluation of the quality system

For the purpose of obtaining the KOMO technical approval with product certificate the certification body executes an investigation. To this entrance investigation program belong:

- assessment of the production process;
- assessment of the quality system and the IQC scheme;
- testing for the presence and functioning of the other required procedures.

It must be the extent to which the quality system complies with the requirements as laid down in the chapter 8 of this assessment directive.

## 3.4 Granting the quality declaration

After completion of the investigations (clause 3.2 and clause 3.3), results are laid down to the decision maker. The decision maker evaluates the results and determines whether the certificate can be issued or whether additional information and / or tests are required in order to be able to issue the certificate.

# 4 Performance requirements and test methods of the piping system

This chapter lists the general product requirements to which the constituent products must conform, as well as the determination methods in order to determine compliance with the requirements.

## 4.1 Demonstration of soundness of pipes, fitting and joints 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 assessment directive. The supplier shall declare its Fitting Type Test Groups in his quality plan.

## 4.2 Classification

Pipes and fittings 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 14364. 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 | - |

Note 1: Nominal stiffness classes higher than 10000 N/m$^2$ can 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.

Note 2: In Europe it is common practice to classify stiffness on the basis of the specific initial stiffness. In the Netherlands it is usual to classify pipes by means of their specific tangential end stiffness or long-term specific ring stiffness calculated on the basis of a period of use of 50 years.

For underground applications in the Netherlands a so-called specific tangential end stiffness (STES) of 2000 (N/m$^2$) is required. This STES value is defined by:

$$STES = STIS \times \alpha \times \beta \qquad (1)$$

where:
STIS is the specific tangential initial stiffness, determined according to NEN 7037;
α is the reduction factor, associated with creep, determined according to NEN 7037;
β is the reduction factor, associated with ageing in water, determined according to NEN 7037.

The STIS shall be determined according to NEN 7037. The STIS may also be determined according to ISO 7685. α the reduction factor, associated with creep, may also be determined according to ISO 7684. The STES shall be calculated using equation 1.

Note 3: In special cases, it is possible to apply a piping system with a STES lower than 2000 N/m$^2$. In these special cases, the manufacturer shall demonstrate to the CB applicability of the piping system.

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 | - |

Note 4: Components marked PN 1 are non-pressure (gravity) components.

## 4.3 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.

### *4.3.1 Reinforcement*

The glass used for the manufacture of the reinforcement shall be one of the types listed in NEN-EN 14364.

### *4.3.2 Resin*

*4.3.2.1 Resin type*

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

*4.3.2.2 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.

### *4.3.3 Particle size aggregates*

The size of particles in 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.

### *4.3.4 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.

## 4.4 Elastomers

Each elastomeric material of the sealing component shall conform to the applicable requirements of BRL 2013 ( class 1).

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

## 4.5 Thermoplastic lining materials

The *supplier* shall demonstrate to the CB that the thermoplastic lining material is able to meet the requirements for services conditions, including requirements for permeability, environmental stress cracking, mechanical properties, bond strength of the laminate and ability to manufacture (forming, welding etc.).

## 4.6 Fixation of the elastomeric sealing element

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.

Furthermore, flexible socket-spigot joints and flexible double socket couplings are considered to satisfy the requirements, if they can withstand the additional tests according to NEN-EN 1119, with maximum draw and angular deflection without leakage, after the joint is completed. See also clause 4.18 of this assessment directive.

## 4.7 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.

## 4.8 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 ± 2) °C.

## 4.9 Pipe 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.

## 4.10 Wall construction

The wall construction consists of:

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

and shall consist 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 14364.

## 4.11 Determination of dimensions

Measurements shall be made in accordance with clause 4.5.5 of NEN-EN 14364.

## 4.12 Appearance of pipes and fittings

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 assessment directive.

The *supplier* shall demonstrate to the CB which irregularities are allowable defects, repairable defects, and defects which shall impair the ability of the component to conform to the requirements of this assessment directive.

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

## 4.13 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 14364, clause 4.5.

## 4.14 Reference conditions for BRT and PVT

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.

## 4.15 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).

## 4.16 Temperature effects

When properties are determined at (23 ± 5) ºC their values are applicable to products used at temperatures up to and including 35 ºC. 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.

## 4.17 Joints requirements of the piping system

Joint performance shall conform to the requirements of chapter 7 of NEN-EN 14364:2013.

In table 4 a summary of tests required for the various types of joints is given.

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

| **Joint type / standard** | **Properties to be tested** | |
|---|---|---|
| Non-end-load-bearing flexible joint with elastomeric sealing rings. (NEN-EN 1119) | 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 |
| End-load-bearing flexible 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 | |

Test methods shall be used for type testing (TT) and audit tests (AT) and may be used for batch release test (BRT) and process verification test (PVT).

# 5 Product requirements: pipes

This chapter lists the product requirements to which the pipes must conform, as well as the determination methods in order to determine compliance with the requirements.

## 5.1 General

The pipes shall conform to the requirements listed in NEN-EN 14364.

## 5.2 Geometrical characteristics

### *5.2.1 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 14364:

- **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 14364.

### *5.2.2 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*.

### *5.2.3 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).

### *5.2.4 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

### *5.2.5 Length*

The pipe shall conform to the requirements of clause 5.1.3 of NEN-EN 14364.

### *5.2.6 Sockets and spigots formed at the pipe or formed on the pipe end provided with a 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.

#### *5.2.6.1 Out-of-roundness of the socket*

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 $d_i$

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 $d_i$

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

#### *5.2.6.2 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 $d_u$

### *5.2.7 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.

#### *5.2.7.1 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 de average outer diameter $d_u$

*5.2.7.2 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 bound 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 $d_u$.

## 5.3 Material composition of the pipe

See clause 4.3.4 of this assessment directive.

## 5.4 Mechanical characteristics

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

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

| Characteristic | Test method | Requirement |
|---|---|---|
| Initial specific ring stiffness | ISO 7685 | Declaration of nominal stiffness (SN) |
| Reducing factors α (creep) and β (ageing) | NEN 7037 | α x β > supplier's declared value. |
| Long-term specific ring stiffness under wet conditions and calculation of the wet creep factor | ISO 10468 | As mentioned in clause 5.2.2 of NEN-EN 14364: |
| Resistance to initial ring deflection | ISO 10466 | As mentioned in clause 5.2.3 of NEN-EN 14364. |
| Long-term resistance to ring deflection under wet conditions | ISO 10471 | As mentioned in clause 5.2.4 of NEN-EN 14364. |
| Initial longitudinal tensile strength | ISO 8513, method A, B or C | The requirements mentioned in clause 5.2.5 of NEN-EN 14364. |
| Initial tensile strength in circumferential direction | ISO 8521, method A, B, C, D, E or F | As mentioned in clause 5.2.6 of NEN-EN 14364. |
| Long-term resistance to internal pressure.<br><br>Extrapolation procedure. | NEN-EN 1447<br><br>ISO 10928 | As mentioned in clause 5.2.7 of NEN-EN 14364. |
| Resistance to chemical attack for the inside of a section in a deflected condition (only for septic sewers) | NEN-ISO 10952 | As mentioned in clause 5.2.8 of NEN-EN 14364 |
| Resistance to shock or impact | this assessment directive | see clause 5.4.1 of this assessment directive |
| Mean abrasion after a defined number of test cycles | NPR-CEN/TR 15729 | seen clause 5.4.2 of this assessment directive |

Tests listen in table 5 shall be performed and evaluated according to clause 5.2 of NEN-EN 14364.

### *5.4.1 Resistance to shock or impact*

For the determination of the resistance to shock or impact an apparatus with the following features is needed:

- feature to acquire a constant hydrostatic pressure in the test sample;
- pressure gauge with an accuracy of 0,05 MPa, preferable a manometer setup capable of recording the pressure signal ;
- end caps, to pursue an axial loading on the test sample;
- falling dart apparatus, an apparatus which is able to let a falling body fall down vertically without friction from a height varying from 500 to 1000 mm;
- the support of the test sample shall be a flat stiff plate;
- falling body having a mass of 500 g.
- the falling body shall be spherical at the bottom with a 12,5 mm radius.

The length of the test sample of the pipe between end caps shall be at least 1,5 m.

Attach the end caps to the test sample. Fill the test sample with water and remove any entrapped air from the test sample. Place the test sample onto the support of the falling dart test apparatus. Execute the test by hitting the test sample four times at distances equally divided over the length of the test sample. In table 6 the mass and falling height required are listed.

Raise the hydrostatic pressure at the inside to 1,5 times the nominal pressure of the pipe. Repeat the falling dart test with the test sample under hydrostatic pressure but hit the sample at another location than during the falling dart test without hydrostatic pressure by turning the test sample. Keep the test sample at a constant hydrostatic pressure of 1,5 times the nominal pressure of the pipe for 168 hours. After the test the sample shall be examined for any defects or leakage.

The pipe shall not show either any defects nor leakage.

**Table 6 - Mass of the falling body and falling height.**

| **Internal diameter (mm)** | **Mass of the falling body[1)] (g)** | **Falling height[1)] (mm)** |
|---|---|---|
| < 80 | 500 | 500 |
| 80 up and including to 150 | | 500 |
| 200 up and including 300 | | 500 |
| 350 up and including 700 | | 500 |
| 750 up and including 900 | | 1000 |
| 1000 up and including 3000 | | 1000 |

1) allowed deviation from mentioned value ($^{+5}/_{0}$)

### *5.4.2 Abrasion after a defined number of test cycles*

The abrasion after a defined number of test cycles shall be determined according to NPR-CEN/TR 15729.

After 200000 cycles the abrasion of the inner layer (liner) is evaluated according to:

- NPR-CEN/TR 15729, clause 9;
- measurement of the thickness of the inner layer according to clause 5.1.2 of this assessment directive in threefold, from cross-sections at the middle of the test piece and ± 250 mm from the middle from the invert of the test piece.

The changes (e.g. defects, layer thickness etc.) of the inner layer (liner) shall be declared in the certificate, whenever applicable.

The result is applicable on all pipes having the same liner receipt, liner wall construction as the tested pipe and which are produced in the same manner as the tested pipe.

Note: GRP pipes complying with NEN-EN 14364 have not been found to be susceptible to abrasion in typical sewerage or drainage applications. In the small number of situations where abrasion has been found to be a problem the conditions on site are found to be unusual and also difficult to reproduce in a laboratory and this leads to major difficulties in correlating the performance in the laboratory with those existing on such sites. Data is not currently available which shows a definite relationship between the test and actual pipe operation. However data obtained from this test could be used to establish the relationship if it exists.

## 5.5 Marking of pipes

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.

The marking details shall be on the outside of each pipe, and in the case of pipes of DN 600 or greater shall be either on the inside or on the outside surface and comply with clause 5.3 of NEN-EN 14364:2013 and the following:

- Number of this assessment directive, i.e. BRL 52204 or EN 14364.
- Certificate number.
- Quality mark: letters KOMO® or KOMO® logo.

Note: In some cases pipe is supplied by the factory with a coupling installed on one end. Pipe and coupling may also be supplied separately upon request.

KOMO® logo

# 6 Product requirements: fittings

This chapter lists the product requirements to which the pipes must conform, as well as the determination methods in order to determine compliance with the requirements.

## 6.1 General

Fitting shall comply with the requirements of clause 6 of NEN-EN 14364

## 6.2 Dimension 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 clause 6 of NEN-EN 14364.

Dimensions and tolerances are specified in drawings.

## 6.3 Structural design

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 14364.

## 6.4 Marking of fittings

Marking details shall be printed or formed directly on the fitting 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 fitting and comply with clause 6.7 of EN 14364:2013 and the following:

- Number of this assessment directive, i.e. BRL 52204 or EN 14364.
- Certificate number.
- Standard quality mark: letters “KOMO®” or, KOMO® logo.

KOMO® logo

Note: In this BRL a coupling is a type of fitting.

# 7 Assessment of conformity

## 7.1 General

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.

## 7.2 Audit testing

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

## 7.3 Quality contole tests

The supplier shall describe in his IQC scheme the limits used to defines a batch for testing purposes. For details see NPR-CEN/TS 14632, clause 6.4.

## 7.4 Manufacture of test pieces

### *7.4.1 Effect of change*

To determine the effect of change the required test pieces may be manufactured on various production locations under the conditions:

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

on the various production location is the same.

### *7.4.2 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 product investigation.

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

## 7.5 Product changes / production changes

In Table 7, the test methods are mentioned which have to be carried out at a product change.

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

Note: 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, annex C.

**Table 7 - Test to be performed to material changes.**

| Clause | Property to be tested | Standard |
|---|---|---|
| 7.2.1 | Amount of constituents | ISO 7510 |
| 7.2.2 | Initial specific ring stiffness | ISO 7685 |
| 7.2.3 | Initial resistance to ring deflection | ISO 10466 |
| 7.2.4 | Initial circumferential tensile wall strength | ISO 8521 |
| 7.2.5 | RLTT resistance to internal pressure | NEN-EN 1447 |
| 7.2.6 | RLTT resistance to chemical attack (for sewer pipes only) | NEN-ISO 10952 |
| 7.2.7 | 24 hours creep factor | NPR-CEN/TS 14632, annex E |
| 7.2.8 | α and β factors | NPR-CEN/TS 14632, annex E |

Tests to be performed to changes in design, process or joint materials are listed in table 8.

**Table 8 - Test to be performed to changes in design, process and joint materials.**

| Clause | Property to be tested | Standard |
|---|---|---|
| 7.2.1 | Amount of constituents | ISO 7510 |
| 7.2.2 | Initial specific ring stiffness | ISO 7685 |
| 7.2.8 | α and β factors | NPR-CEN/TS 14632, annex E |
| 7.2.3 | Initial resistance to ring deflection | ISO 10466 |
| 7.2.4 | Initial circumferential tensile wall strength | ISO 8521 |
| 7.2.5 | RLTT resistance to internal pressure | NEN-EN 1447 |
| 7.2.9 | Joint performance tests | NPR-CEN/TS 14632 |

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

## 7.6 Test methods

### *7.6.1 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 product investigationof the product or type test, whichever is applicable. The results before the change refer to the declared values.

### *7.6.2 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.

### *7.6.3 Initial resistance to ring deflection*

The initial resistance to ring deflection shall be determined according to ISO 10466 and shall fulfil the requirements of EN 14364 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.

### *7.6.4 Inital circumferential tensile wall strength*

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.

### *7.6.5 RLTT resistance to internal pressure*

The RLTT shall be carried out on six test pieces according to NEN-EN 1447.
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 2 000 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.

### *7.6.6 RLTT restistance to chemical attack*

The RLTT shall be carried out on six test pieces in conformity with the test procedures described in NPR-CEN/TS 14632, annex D.2.2 and NEN-ISO 10952.
The RLTT shall use the same basis as that used for TT i.e. failure times at specified strain levels. The test solution shall comprise sulphuric acid solution at a concentration of 0,5 mol/l. This shall be introduced into the test pieces within 2 h of deflecting in accordance with NEN-ISO 10952. This is the zero time from which the long-term properties are determined. The results shall be evaluated in accordance with NPR-CEN/TS 14632, annex D3.

### *7.6.7 Creep factor (24 h)*

The 24 hour dry creep factor is determined to assist in the evaluation of changes of resins and/or curing agents. The test shall be performed and evaluated according to NPR-CEN/TS 14632, annex E.

### *7.6.8 α and β factors*

The α and β factors are determined to assist in the evaluation of changes of resins and/or curing agents. The test shall be performed and evaluated according to NPR-CEN/TS 14632, annex E.

### *7.6.9 Joint preformance tests*

Joint performance shall comply with NPR-CEN/TS 14632:2012, clause 6.3.

# 8 Manufacturers quality system requirements

## 8.1 General

This chapter contains the requirements that have to be fulfilled by the manufacturer's quality system.

## 8.2 Manager of the quality system

Within the manufacturer's organisational structure an employee must be appointed who is responsible of managing the quality system.

## 8.3 Internal quality control/quality plan

As part of the quality system the manufacturer must implement an internal quality control schedule (IQC-scheme).

In this IQC-scheme the following must be demonstrably recorded:

- which aspects are inspected by the manufacturer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

The schedule must be in the format as shown in annex I listed model IQC scheme and must be detailed in such a way that it provides the CB sufficient confidence that requirements will be continuously fulfilled.

At the time of the assessment this schedule must function for a minimum of three months.

## 8.4 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 assessment directive. 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.

## 8.5 Procedures and work instructions

The manufacturer must be able to submit:

- procedures for:
  - the handling of non-conforming products;
  - corrective actions in case non-conformities are found;
  - the handling of complaints regarding the products and / or services supplied;
- the work instructions and inspection sheets in use.
- instructions for packaging and closing off of products during storage and transport.

## 8.6 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 9001:2015, clause 7.2.

# 9 Third party control

This chapter contains a summary of tests and inspections to be carried out during:

- **Product investigation**: the investigation necessary in order to determine whether all requirements of the assessment directive 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 assessment directive. 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.

## 9.1 Investigation matrix for type testing and inspections

During the product investigation, 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 tables 9, 10 and 11, column named product investigation. After certification the CB shall periodically inspect the manufacturer for compliance with this assessment directive.

In case the product or production process changes significantly, the performance requirements must be determined once again as listed in clause 7.1 of this assessment directive.

When the frequency is not mentioned in the tables 9, 10 and. 11, the frequency can be found in the supplier's IQC-scheme.

**Table 9 - Test and audit matrix – performance piping system.**

| Description of requirement | Clause BRL | Tests within the scope of: | | |
|---|---|---|---|---|
| | | Product investigation | Surveillance by CB after issue of the certificate | |
| | | | inspection | Frequency |
| Demonstration of the soundness of fittings and joints | 4.1 | x | - | - |
| Competence of personnel | 8.6 | x | x | 1 / year |
| Classification (STIS-STES) | 4.2 | x | x [b)] | 1 / 2 years |
| Materials | 4.3 | x | x [a)] | |
| Reinforcement | 4.3.1 | x | x [a)] | |
| Resin | 4.3.2 | x | x [a)] | |
| Particle size aggregates | 4.3.3 | x | x [a)] | |
| Constancy of the material composition | 4.3.4 | x | x [a)] | |
| Elastomers | 4.4 | x | x [a)] | |
| Thermoplastic lining materials | 4.5 | x | x [a)] | |
| Fixation of the elastomeric sealing element | 4.6 | x | x [a)] | |
| Locking key | 4.7 | x | x [a)] | |
| Metals | 4.8 | x | x [a)] | |
| Pipe type test groups | 4.9 | x | | |
| Wall construction | 4.10 | x | x [a)] | |
| Determination of dimensions | 4.11 | x | x [a)] | |
| Appearance | 4.12 | x | x [a)] | |
| Reference conditions TT and AT | 4.13 | x | - | |
| Reference conditions for BRT and PVT | 4.14 | x | x | |
| Joints requirements | 4.17 | x | x [b)] | |

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.

**Table 10 - Test and audit matrix (pipe).**

| Description of requirement | Clause BRL | Tests within the scope of | | |
|---|---|---|---|---|
| | | Product investigation | Surveillance by CB after issue of the certificate: | |
| | | | inspection | Frequency |
| Diameter | 5.2.1 | x | x a) | |
| Total wall thickness | 5.2.2 | x | x a) | |
| Thickness of layers of structural layer, inner and outer layer | 5.2.3 | x | x a) | |
| Winding angle (when applicable) | 5.2.4 | x | x a) | |
| Length | 5.2.5 | x | x a) | |
| Sockets and spigots at the pipe or formed on the pipe end provided with a elastomeric sealing | 5.2.6 | x | x a) | |
| Sockets and spigots formed on the pipe for the purpose of bonded joints | 5.2.7 | x | x a) | |
| Material composition | 5.3 | | x a) | |
| Initial specific ring stiffness | 5.4 | x | x a) | |
| Determination of α x β | 5.4 | x | x b) | 1 / 2 years |
| Long-term specific ring stiffness under wet conditions and calculation of the wet creep factor. | 5.4 | x | x b) | 1 / 5 years |
| Initial resistance to ring deflection | 5.4 | x | x a) | |
| Long-term resistance to ring deflection ultimate under wet conditions | 5.4 | x | x a,b) | 1 / 5 years |
| Initial longitudinal tensile strength | 5.4 | x | x a) | |
| Initial tensile strength in the circumferential direction | 5.4 | x | x a) | |
| Long-term resistance to internal pressure | 5.4 | x | x b) | 1 / 5 years |
| Resistance to chemical attack | 5.4 | x | x b) | 1 / 5 years |
| Resistance to shock or impact | 5.4.1 | x | - | |
| Mean abrasion after a defined number of test cycles | 5.4.2 | x | - | |
| Marking of pipe | 5.5 | x | x | 2 / 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 to audit testing according to NPR-CEN/TS 14632.

When the manufacturer fabricates fittings using pipes of the same classification from which the fittings are to be used, the audit test for the pipes covering mechanical and chemical characteristics cover these fittings.

**Table 11 - Test and audit matrix (fittings and joints)**

| Description of requirement | Clause BRL | Tests within the scope of | | |
|---|---|---|---|---|
| | | Product investigation | Surveillance by CB after issue of the certificate | |
| | | | inspection | Frequency |
| Dimension and tolerances | 6.2 | x | x [a)] | |
| Structural design | 6.3 | x | x [a)] | |
| Marking of fittings | 6.4 | x | x | 2 / 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 subject to audit testing according to NPR-CEN/TS 14632.

## 9.2 Inspection of the quality system

The CB controls the compliance with IQC scheme and the procedures.

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.

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

# 10 Requirements for the certification body

## 10.1 General

The certification body shall be accredited for the subject of this BRL according to NEN-EN-ISO/IEC 17065 by the Dutch Accreditation Council and which have a license agreement with KOMO.

The certification body must have the disposal of a regulation, or an equivalent document, in which the general rules for certification are laid down. In particular these are:

- The general rules for carrying out the product investigation, to be distinguished in:
  - The way suppliers are informed about the handling of the application;
  - execution of the product investigation;
  - the decision with regard to the product investigation executed.
- The general rules with regard to the execution of inspections and the inspection aspects to be employed;
- The measures to be taken by the certification body in the event of nonconformities;
- The rules for termination of the certificate;
- The possibility of lodging appeal against decisions or measures made by the certification body.

## 10.2 Staff involved in the conformity assessment

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

- Certification assessor / Reviewer: in charge of carrying out the design and document evaluations, applications and admission of applications and the review of conformity assessments;
- Site assessor: in charge of carrying out external inspections at the supplier's works;
- Decision-makers: in charge of taking decisions in connection with the precertification tests performed, continuing the certification in connection with the inspections performed and taking decisions on the need of corrective actions.

### *10.2.1 Competence requirements*

The competence requirements are composed of:

- Basic and technical competence requirements that comply with the NEN-EN-ISO/IEC 17065 requirements;
- Technical competence requirements established additionally by the Board of Experts for the subject of this BRL.

Education and experience of the executive staff involved in certification shall be demonstrably be documented (see table 12).

**Table 12 - Education and experience of certification personnel.**

| | Certification assessor / Reviewer | Site assessor | Decision maker |
|---|---|---|---|
| **Basic competence** | | | |
| Knowledge of company processes Can competently judge. | • Bachelor (HBO) thinking and working level<br>• 1 year relevant work experience | • High school (MBO) thinking and working level<br>• 1 year relevant work experience | • Bachelor (HBO) thinking and working level<br>• 5 years of working experience from which at least 1 year with respect to certification |
| Audit skills | • Detailed knowledge of the BRL or similar BRL's | • Knowledge about witness testing<br>• Knowledge of the parts of the BRL with respect to quality systems and testing | • Not applicable. |
| **Technical competence** | | | |
| Relevant knowledge of:<br>• the technology of the manufacture of the products to be inspected, the implementation of processes and services are provided;<br>• The way products are used, processes are performed and services are provided;<br>• Any defect which may occur during the use of the product, any error in the execution of processes and any inadequacy in the provision of services. | • HBO thinking and working level.<br>• Minimum of 1 year experience in manufacturing, testing, inspection and / or installation,<br>• including: - two inspections under supervision<br><br>Or<br><br>Internal training including: - two inspections under supervision. | • MBO thinking and working level.<br>• Minimum of 1 year experience in manufacturing, testing, inspection and/or installation.<br>• including three inspections under supervision<br><br>Or<br><br>Internal training including:<br>- three inspections under supervision | Not applicable. |

### *10.2.2 Qualification*

Certification staff must be demonstrably qualified by evaluation of education and experience with respect to 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 the management of the certification body: qualification of the decision makers.

## 10.3 Report Product investigation tests

The certification body records the results of the product investigation tests in a dossier. This dossier must fulfil the following requirements:

- completeness: the reports verdicts about all requirements included in the assessment directive;
- 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.

## 10.4 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 product investigation tests. The decision shall be recorded traceable.

## 10.5 Nature and frequency of external inspections

The certification body must enforce inspections at the supplier's site to investigate whether the obligations are met.
The Board of Experts advises about the number of inspection visits. At the time of validation of this assessment directive this frequency has been fixed at two inspection visits per year.

Inspections shall invariably include:

- The product specification as stated in the certificate;
- The production process of the supplier;
- The IQC-scheme of the supplier and the results of tests carried out by the supplier;
- The correct marking of the certified products;
- The compliance with the required procedures.

The findings of the inspection visits performed shall be traceably recorded, by the certification body, in a report.

## 10.6 Report to the Board of Experts

The certification body reports at least once a year about the conformity judging work performed. In this reporting, the following subjects must be addressed:

- Mutations in number of certificates (new/cancelled);
- Number of inspections carried out in relation to the fixed frequency;
- Results of the inspections;
- Measures imposed in case of non-conformities;
- Complaints received from third parties concerning certified products.

## 10.7 Interpretation of requirements

The Board of Experts may lay down the interpretation of this assessment directive in a separate interpretation document. The certification body is obliged to inform whether an interpretation document is available. If this is the case, then the interpretations as laid down in the interpretation document must be employed.

## 10.8 Corrective actions (sanctions)

When the certification requirements are not met, measures are taken by the certification body in accordance with the sanctions policy what is published on the certification body service portal in the corresponding BRL.

# 11 List of mentioned documents

**Table 13 – List of in assessment directive mentioned documents**

| Standard [1)] | Title |
|---|---|
| ASTM D 2563:2008 | Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts. |
| BRL 2013:2012 + AMD:2014 | Assessment directive for the KOMO® product certificate for vulcanized rubber products for cold and hot non-drinking water applications |
| DVS 2220:2011 | 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/DIS 7432:2015 | 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 7510:1997 | Plastics piping systems - Glass-reinforced plastics (GRP) components - Determination of the amounts of constituents using the gravimetric method. |
| ISO 7684:1997 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the creep factor under dry conditions |
| ISO 7685:1998 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness. |
| ISO 8483:2003+Amd 1:2012 | 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 8521:2009 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test methods for the determination of the apparent initial circumferential tensile strength. |
| ISO 8533:2003+Amd 1:2012 | Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of cemented or wrapped joints. |
| ISO 10466:1997 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test method to prove the resistance to initial ring deflection. |
| ISO 10468:2003+Amd 1:2010 | 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 10471:2003+Amd 1:2010 | 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 10928:2009+Amd 1:2013 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Methods for regression analysis and their use. |

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|---|---|
| ISO 15306:2003+Amd1:2012 | Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the resistance to cyclic internal pressure. |
| NEN-EN-ISO 75-2:2013 | Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite. |
| NEN-EN 1119:2009 | Plastics piping systems - Joints for glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods for leak tightness and resistance to damage of non-thrust resistant flexible joints with elastomeric sealing elements. |
| NEN-EN 1447:2009+A1:2010 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of long-term resistance to internal pressure. |
| NEN-EN 14364:2013 | Plastics piping systems for drainage and sewerage with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Specifications for pipes, fittings and joints |
| NEN 7037:1981 | Buizen van met glasvezel versterkte thermoharde kunststoffen voor buitenriolering - Eisen en beproevingsmethoden. |
| 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 17021-1:2015 | 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 17025:2005+C1:2007 | 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/TR 15729:2010 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Report on the determination of mean abrasion after a defined number of test cycles |
| 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 |
| NEN-ISO 10952:2014 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Determination of the resistance to chemical attack for the inside of a section in a deflected condition |
| NEN-ISO 18851:2015 | Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test method to prove the structural design of fittings |
| 1. for dated references the edition cited applies | |

# I Model IQC-scheme (informative)

<table>
<tr><td><u>IQC-schedule</u><br><br><u>INTERNAL QUALITY PLAN</u></td><td colspan="2">Manufacturer / supplier :<br>Production location address :</td><td>Number of appendices:</td></tr>
<tr><td colspan="4"><u>Field(s) of application</u><br><br><u>According Assessment directive(s)</u></td></tr>
<tr><td colspan="2"><u>Number of production shifts:</u></td><td colspan="2" rowspan="3"><u>Quality manual, procedures and working instructions</u><br>Is the Quality Management System (QMS) certified according to ISO 9001[1)]?<br>If yes, by which certification body:<br>If yes, is the certification body accredited for the particular scope of certification?<br><br>The following procedure for dealing with <u>complaints</u> applies:<br><br>In case the QMS is <u>not</u> certified according to ISO 9001:<br>• Working instructions, test instructions and procedures are documented as follows:<br>• The following procedure for <u>nonconformity review</u> applies:</td></tr>
<tr><td colspan="2"><u>Quality Control</u><br>Total number of employees in QC department :<br>Number of QC-operators per shift :<br><br>If no QC-inspections are carried out during night shifts, state the QC procedure(s)/instruction(s) to be followed: , documented in:</td></tr>
<tr><td colspan="2"><u>Inspection and test records</u><br>All records shall be maintained for a minimum of years.</td></tr>
</table>

| Specific agreements/comments/explanations | Signature of the manufacturer/supplier:<br><br>Date : |
|---|---|

[1)] 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.

**A. Calibration of measuring and test equipment**

Applicable procedure(s) nr(s):

| Equipment to be calibrated | Calibration aspect | Calibration method | Calibration frequency | Calibration file (name and location) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

**B. Raw material and additives**

Applicable procedure(s) nr(s):

**B.1 Receipt**

For each delivery of raw material or additives data with respect to dates, producers, types and quantities are recorded as follows:

**B.2 Entry control**

| Type of raw material | Inspection aspect | Inspection method | Inspection frequency | Registration file (name and location) |
|---|---|---|---|---|
| | | | | |
| | | | | |

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

Specific agreements/comments/explanations:

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

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

| **F.** | **Inspection with regard to packaging, storage and transportation of the finished product**<br>Applicable procedure(s) nr(s): | | | |
|---|---|---|---|---|
| Inspection aspects | | Inspection method | Inspection frequency | Registration file (name and location) |
| **F.1** | **Packaging/storage/ transportation etc** | | | |
| | | | | |
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Specific agreements/comments/explanations: