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EVALUATION GUIDELINE

FOR THE KOMO PRODUCT CERTIFICATE FOR

PIPING AND FITTINGS WITH STRUCTURED (SMOOTH) WALLS FOR PLASTICS PIPING FOR NON-PRESSURE UNDERGROUND DRAINAGE AND SEWERAGE -PART 1 - TYPES A: PVC-U, PP

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Preface

This KOMO Evaluation Guideline (BRL) has been drawn up by the Board of Experts LSK, which counts with representatives from the interested parties on the subject matter of this BRL. This Board also supervises the certification activities based on this BRL and will make any necessary adjustments.

All references to the Board of Experts in this BRL pertain to the above mentioned Board of Experts.

This BRL will be used by certification bodies who have a license agreement with the KOMO Foundation in connection with the established certification procedures. This BRL details the requirements an applicant or an existing holder of a KOMO certificate must comply with, and the method employed by the evaluating certification body. The certification procedure established by the certification body includes a description of the working method as employed by the certification body in the implementation of:

- (pre)certification tests required for granting and renewing a KOMO product certificate based on the present BRL;
- periodic assessments for the maintenance of a previously issued product certificate based on the present BRL.

In the BRL the following parts have been changed:

- The entire document has been updated to the new KOMO template 28-7-2021,
- The underlying NEN-EN 13476-1:2007 has been updated to NEN-EN 13476-1:2018,
- The underlying NEN-EN 13476-2:2007 has been updated to NEN-EN 13476-2:2018+A1:2020,
- The underlying CEN/TS 13476-4:2013 has been updated to CEN/TS 13476-4:2019,
- Test matrix (tables 3-6, vs 2021) adapted due to witness testing and clarification requirements to IQS.
- Section 1.2 (vs 2021) has been clarified,
- Section 3 (vs 2021) with regard to CEN/TS 13476-4 has been added,
- Section 3 (vs 2021) with regard to temperatures has been added,
- Table 4.1 "Relationship between installed system performance and tested characteristics" (vs 2017) has been removed,
- Table 6.1 "Investigation matrix" (vs 2017) has been merged into tables 3-6 (vs 2021),
- Section 3.2.133 Mechanical strength or flexibility and watertightness (vs 2021) has been added,
- Section 3.2.134 Resistance to dichloromethane for PVC-U pipes (VS 2021) has been added,
- Section 3.2.145 Changes (vs 2021) has been added.

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1 Introduction, general provisions, and general requirements

1.1 Introduction

Based on the regulations laid down in this KOMO BRL a KOMO product certificate is issued for pipes or fittings with structured walls for non-pressure underground drainage and sewerage. This product certificate enables the certificate holder to prove their clients that an expert, independent organization supervises the certificate holder's production process, the quality of the product and its respective quality control. Thus it may be assumed that the product has the characteristics as established in the present BRL.

The requirements determined in this BRL are used by the certification bodies, which have been accredited as such by the Board of Accreditation, or have presented an application, and who have a license agreement with the KOMO Foundation, employed when processing an application for the issuance and maintenance of a KOMO product certificate for pipes or fittings with structured walls for non-pressure underground drainage and sewerage.

In addition to the requirements laid down in this BRL, certification bodies impose additional requirements in the sense of general procedure requirements for certification, as established in their internal certification procedures.

1.2 Subject matter and area of application

The pipes and fittings made from PVC-U or PP, with smooth internal and external surfaces, designated as Type A, will be used in non-pressure underground drainage and sewerage.

The temperature profile of the pipes and fittings must withstand can be found in EN 476 chapter 6.5.

This BRL only includes the UD application for the diameters from 110 mm up to and including 200 mm, with their respective requirements as laid down in NEN-EN 13476-2; the U-design for this diameter group is not included in this BRL.

Products to be used in accordance UD applications are suitable for loading with warm water in combination with ground forces.

Description of the application codes

- U: (underground) the area for underground products located at a distance of more than one meter from the building;
- D: (drainage) the area for underground products within the building structure and up to a meter within the range of influence of the building; affected by ground forces and drainage of warm water;
- UD: the area includes zones U and D.

1.3 Validity

This revision of the BRL replaces the version dated 30-08-2017.

All KOMO product certificates that have been issued based on that version of the BRL will expire/will remain in effect in any case on «datum (1 jaar na vaststelling)».

Based on the aforementioned previous version of this BRL, existing certificates may be issued at the very latest 3 months before the current product certificate must be replaced.

The KOMO product certificate does not expire.

Validity may be limited (terminated), among other reasons, because of:

- A modification of this BRL,
- Incompliance the certificate holder's obligations.

1.4 Relation with European Construction Products Regulation (No. CPR, EU 305/2011)

There is no harmonized European norm applicable to the products referred to in this BRL.

1.5 Requirements to be imposed on conformity assessing institutions

With regard to the requirements laid down in this BRL, the applicant may submit, in the scope of external inspections, reports issued by conformity assessing institutions to prove that the requirements of this BRL are being satisfied. It must be demonstrated that the respective analysis/inspection/test and/or evaluation reports have been drawn up by a body that complies with the respective applicable accreditation norm with regard to the subject matter,

- NEN-EN-ISO/IEC 17020 inspection institutions;
- NEN-EN-ISO/IEC 17021-1 institutions that certify management systems;
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 for institutions certifying products, processes, and service.

An organization will be considered as compliant with these criteria if an accreditation certificate for the respective subject matter can be submitted, issued by the Board of Accreditation (RvA) or another accreditation organization which has been accepted as a member of a multilateral agreement on the subject of mutual recognition and acceptance of accreditation, which have been drawn up within the EA, IAF and ILAC. If no accreditation certificate can be submitted, the certification organization itself will assess if compliance is given to the accreditation criteria.

1.6 KOMO product certificate

KOMO product certificates will be issued based on this BRL. Statements included in these product certificates are based on chapters, 3, 4 and 5 of this BRL.

Product certificates may be issued for the following type of products:

- PVC-U Pipe type A, in accordance with chapter 3, table 3 and chapter 4
- PVC-U Fitting for type A pipe, in accordance with chapter 3, table 4 and chapter 4.
- PP Pipe type A, in accordance with chapter 3, table 5 and chapter 4,
- PP Fitting for type A pipe, in accordance with chapter 3, table 6 and chapter 4,

The product certificate to be issued must be in accordance with the model product certificate as published for this version of the BRL on the KOMO website (www.komo.nl).

1.7 Markings and specifications

The following shall be indelible applied to the products:

- KOMO logotype or KOMO word mark
- Manufacturer's name or trademark*,
- Specification of material*,
- Specification of stiffness class,
- Nominal external diameter,
- Production period or production code.

Pipes shall be marked at intervals of maximum 2 m, at least once per pipe.

Additional marking for fittings:

- Nominal measurements based on the nominal external diameter of the matching pipe,
- Angle of the fitting, if applicable.

Optional marking:

- BRL 9208-1,
- Certificate number, without specifying the version, directly behind the KOMO logotype or KOMO word mark.

* If there is little space available on the products, these marks may be affixed to the smallest packaging unit.

The KOMO logo type must be applied as follows:



The KOMO word mark must be applied as follows:

KOMO®

Furthermore a QR mark may be applied which remits to the information of the respective product certificate on the KOMO website.

After issuance of the KOMO product certificate this KOMO logo/KOMO word mark may be also used by the certificate holder in public communications with regard to their certified activities, as specified in the "Rules and Regulations for the use of the KOMO marks" as published on the KOMO website.



2 Terminology

For an explanation of the terminology used in this BRL for certification, please go the glossary on the website of the KOMO Foundation (www.komo.nl).

2.1 General terminology and definitions

General terms and definitions related to the product see NEN-EN 13476-2 chapter 3.

Supplier

The party who is responsible for ensuring that products continuously meet the requirements of this BRL;

- IQC scheme
 A description of the quality controls performed by the provider as part of their quality system;
- Type A wall construction
 A pipe or fitting with external and internal smooth surfaces. The internal and external coatings
- are connected through a foam or non-foam intermediate layer (applicable to this BRL);
 Type B wall construction
 A pipe or fitting with a smooth internal surface and a corrugated external surface (not applicable to this BRL; applicable to BRL 9208-2);
- Internal or own rework materials Materials coming from rejected and unused pipes and fittings or trial productions, whose compound is known, intended to be reused in the same production location it was manufactured. The own rework material must not be contaminated;

• External rework material

Material coming from rejected and unused products^{*} or trial productions, whose specifications are known, intended to be re-used in a production location different from the manufacturing location where it has been produced. The external rework material must not be contaminated;

Recycled material

Thermoplastic material coming from used products* that have been cleaned and granulated. This could be:

- material from used pipes and fittings;
- material from used products other than pipes and fittings.
- * pipes or fittings or other

• Materials

Please refer to the description of materials in NPR-CEN/TS 14541.

 Note: for a detailed description about the use of mentioned materials, please refer to attachments A and C of NEN-EN 13476-2 and (diverting from it) 3.2.1 of this BRL.

2.2 Abbreviations

CI	Certification Body
DN	nominal dimension
DN/OD	nominal dimension related to external diameter

3 Requirements the product must meet

This chapter includes the requirements a product must meet, converted to the product characteristics of pipes and fittings made of PVC-U or PP with structured walls (type A), as well as the determination methods and the limit values to determine that these requirements are being met.

The tests are performed per product type and per size group as described in CEN/TS 13476-4, where the frequency can be adjusted according to footnote 3 under table 6.

Measurement inaccuracies have been taken into account when determining the requirements. Therefore they no longer need to be considered when drawing conclusions about whether or not the requirements are being met. Temperatures between 15 °C and 30 °C are permitted for tests performed at the production site. In case of dispute (23 ± 2) °C is used.

3.1 **Product characteristics**

The requirements for the product are laid down in:

- NEN-EN 13476-1 "Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 1:General requirements and performance characteristics",
- NEN-EN 13476-2 "Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A",
- Section 3.2 Additional and deviating properties.

Summarized in tables:

- table 3: Test matrix PVC-U pipes type A,
- table 4: Test matrix PVC-U fittings,
- table 5: Test matrix PP pipes type A,
- table 6: Test matrix PP fittings.

3.2 Additional and deviating properties

3.2.1 Re-use of material

3.2.1.1 Use of own re-processable material

For the inner and outer layer of the structured-wall pipes applies that the use of cleaned own reprocessable material in accordance with the conditions described in B.2, B.3 and D.2 of NEN-EN 13476-2 is allowed without limitations.

3.2.1.2 Use of external re-processable and recyclable material

For the intermediate layer the use of this material is determined by the manufacturer and will be verified by the certification body by means of the manufacturer's IQC scheme. For this purpose the manufacturer will demonstrably record the following:

- traceability of the supplier(s) of this material;
- specification of the material in accordance with Annex B and D of NEN-EN 13476-2;
- quantity of non-virgin material used (traceable);
- testing reports of tests performed by the manufacturer on this material.

3.2.2 Vicat

The vicat softening temperature for PVC pipes, determined according to

NEN-EN 13476-2 table 9, is > 78,5 °C.

The vicat softening temperature for PVC fittings, determined according to

NEN-EN 13476-2 table 10, is > 78,0 °C for UD applications and > 77,0 °C for U applications (this last part for diameter > 200 mm, see 1.2). For pipes apply that vicat is only carried out on PVC material from the outside and inside layer (not on the intermediate layer).

For pipes apply that vicat is only carried out on PVC material from the outside and inside layer (not on the intermediate layer).

3.2.3 Color of piping and fittings

The external color is grey (RAL 7037), orange-brown (RAL 8023). The colour black is only accepted for PP.

3.2.4 Rubber or TPE sealing elements

Rubber sealing rings must comply with BRL 2013 class I and TPE rings with BRL 2020-2.

3.2.5 Adhesive sealings

In case adhesive joints are applied, the adhesive shall meet the requirements of BRL-5221.

3.2.6 Stiffness nominal classes (SN) classes for piping and fittings SN classes

Considering the type of soil in the Netherlands and NEN-EN 1610, only the following (minimum) classes are permitted.

Class for PVC pipes

The class SN4 and SN8 with minimum wall thicknesses according to series SDR 41 and SDR 34 as mentioned in NEN-EN 1401-1 are allowed for $d_e \ge 110$ mm.

Class for PP pipes

The next classes for PP pipes are valid:

- for 110 mm $\leq d_e \leq$ 200 mm: class SN4 (S16) or SN8 (S12,5 or S13,3);

- for $d_e > 200 \text{ mm}$: class SN8 (S12,5 or S13,3).

Class for PVC and PP fittings

For the socket/spigot transition area applies that the sum of the initial stiffness of the socket and the spigot shall conform to the above mentioned classes. Further, the stiffness requirements according to table B.2 of NEN-EN 13476-1 are applicable.

Remark: when determining the creep factor (STES) for 3-layer pipes, there is a deviation from the R-value according to NEN-EN 13476-2.

3.2.7 Insertion depth

For diameters from 110 mm to 200 mm the insertion depths must be in accordance with type M of table 15 of NEN-EN 1329-1, see table 1. This applies to pipe molded sockets and fitting insertion depth.

Table 1 - Minimum insertion depth*

d _e (mm)	Insertion depth Amin (mm)
110	40
125	43
140	46
160	50
200	58

*Note: the insert depth for sockets with structured or fulfilled (smooth) wall inside the diameter range 110 up till land including 200 mm was raised regarding to the last version of this BRL (which by the way began with 160 mm) and therewith is leveled with other BRL's. The producers need to meet these insert depths within 1 year after publication of this BRL. This requirement for fittings with fulfilled wall was by the way already used for many years in previous BRL's.

3.2.8 Layer thickness e₆

The minimum thickness of the outer layer e_6 shall be in accordance with table 2. This is applicable to all types (A1 and A2).

Remark: NEN-EN 13476-2 imposes requirements to the thickness of the inner layer and not to the thickness of the outer layer. Because of solvent cement jointing, this requirement is necessary for the smaller diameters.

d _e (mm)	e ₆ (mm) outer layer
110	0,4
125	0,4
140	0,4
160	0,4
200	0,4
250	*
315	*
400	*
500	*
630	*
800	*
1000	*
1200	*
* the outer layer for diameters > 200 mm shall be homogene	ous, smooth and tight.

Table 2 - Minimum thickness e6 of the outer layer



e₄: thickness inner layer e₆: thickness outer layer

3.2.9 Bending test

Fittings must be resistant to real life circumstances in the Netherlands and exerted influences on them. Corresponding BRL's have been laid down in NEN-EN 1610. The fittings must satisfy the requirements in accordance with NEN 7146 "Bending test for thermoplastic materials".

3.2.10 Fixation of sealing rings

Every sealing ring must be soundly secured in the socket. Fixation must be in such a way that it is resistant against expected real life forces when sliding the pipes in or out. The socket will be deemed to satisfy this requirement, when, upon performing the following test:

a. fixation of the ring is not broken;

b. this ring does not stretch in such a way that it surpasses the space (which the rings must seal).



Testing method: fixation

Evaluation of fixation takes place by sliding a pipe into the socket.

The tube end that enters into the socket must not be beveled. Upon sliding the pipe into the socket no measures must be taken with regard to placing it in the center. Both tests must be performed in a method that simulates real life circumstances, with a crowbar or similar. Slide in speed must also be equal to usual real life installation speed.

No lubricant must be applied to the tube end nor the sealing ring. If upon performing this test the sealing element is forced out of the groove, it will be assumed that fixation does not satisfy the requirement.

If the sealing rings remains in place, but the pipe cannot be slidden into the socket with normal force, a second test must be performed. When performing the second test, a small amount of lubricant may be applied to the spigot end of the pipe.

To be able to satisfy the requirement, afterwards it must be possible to slide the pipe into the socket respectively it must be possible to slide the socket onto the pipe, in such a way that the sealing ring is not pushed out of the groove.

To verify location of the seal after the first as well as the second test, the socket must be sawn immediately behind the confinement space.

3.2.11 Aging caused by ultraviolet radiation (UV) when dealing with PP; does not apply to black PP tube

Tensile impact strength after exposition to a Xenon-arc lamp

After exposition of the test pieces to a Xenon-arc lamp in accordance with the following exposition test, the average tensile impact strength of the exposed piping material must not be inferior to 75% of the average tensile strength of the non-exposed piping material. The tensile impact strength must be determined in accordance with NEN-EN-ISO 8256.

Exposition may also take place using so called outdoor exposition. Exposition must start in the month of April and finalized after the products have received a global radiation dose of 2 GJ/m². In case of doubt, the outdoor exposition will be normative.

Testing method: exposition test

Determine the tensile impact strength of the adequate test pieces, which will be exposed in a piece of equipment in accordance with NEN-EN-ISO 4892 part 2 and in testing circumstances as stipulated in this norm in table 3, cycle number 1 (method A: exposition with the help of day light filters – simulation of outdoor exposition).

Exposition time in the equipment must be calculated on basis of the required global radiation dose and in accordance with EOTA TR 010, attachment C.

In this case the required exposition time is:

$$t = \frac{E}{I} = \frac{E_{sun} \times 0.06 \times 0.67}{I} = \frac{2 \times 10^9 \times 0.06 \times 0.67}{60} = 1.34 \times 10^6 \text{ (seconds)}$$

t = 372 hours

where:

E_{sun} represents the equivalent global radiation dose for outdoor exposition; and

I represents the intensity of the light source measured by the equipment between 300 and 400 nm.

Note 1

The calculation method describe above for the duration of the exposition represents a very global method of calculating, but it does provide a certain logical base when taking into consideration that natural weathering itself is a very variable phenomenon that depends on location, aspect, shelter, etc.



Test pieces

A length of smooth walled pipe of approx. 1 meter is required for this test. The thickness of the pipe must preferably be $(3 \pm 0,2)$ mm or $(4 \pm 0,2)$ mm and the diameter at least 110 mm. From this pipe 12 test pieces will be cut according to type 3 of NEN-EN-ISO 8256. Six of the test pieces must be exposed. The length direction of the test pieces must coincide with the extrusion direction of the pipe. The end of the test pieces that correspond to the outside of the pipe will be aimed at the light source during the exposition test.

3.2.12 Elevated temperature cycling test and air resistance

The elevated temperature cycling test will be performed in accordance with NEN-EN-ISO 13257, for air tightness NEN 7039:2003. There are 1500 cycles with a minimum temperature of 15 °C and a maximum temperature of 93 °C.

Requirement: there shall be no leakage or clear deformations during and after the test.

Note: this test is only applicable to diameters from 110 to 200 mm.

Before and after the elevated temperature cycling test, the assembled system must be tested with air applying an overpressure of 4 kPa for 5 minutes. During these 5 minutes the overpressure may not decrease beyond a value of 2,75 kPa. If this is not met, in a time frame of 15 minutes the overpressure may not have decreased beyond a value of 2,5 kPa.

Note: 100 kPa is equal to 1 bar

3.2.13 Mechanical strength or flexibility and watertightness

In deviation to CEN/TS 13476-4, the frequency for the manufacturer is set at 1x per batch.

3.2.14 Resistance to dichloromethane for PVC-U pipes

Shall be conform NEN-EN 13476-2:2018+A1:2020 Article 8.1.1.

If the resistance to dichloromethane cannot be performed, the uniaxial tensile strength or the DSC test according to NEN-EN-ISO 1452-2:2009 Article 9 can be used.

3.2.15 Changes

After a significant change to the product or the production process, it is necessary to determine whether the products still meet the properties. The supplier must notify the certification body in writing of all intended significant changes. The certification body determines what constitutes a significant change. After it has been established that the products with the proposed change comply with the properties of this BRL, the change can be implemented in the supplier's production process.

The following is used as a guideline for product changes: CEN/TS 13476-4.



«Concept-design»

		00		Res	search in the context	of 1,2	2.
							S ³
	6-1	6-2				Perf	formed by manufacturer
	47	47		ng			
8-1	13	13		esti		dn	
208	Z	Z		μΨ		Ц	
6	۳.	Щ 		þe		ste	
RL	Ш	Ξ	Description characteristic	Ì	Audit tosts	At	Frequency
Mater			Description characteristic		Audit lesis		Fiequency
3.1		421	Formulation RVC 11 material	V	1 por voor	1	1 nor batch
3.1		422	Porticiation FVC-0 material		1 per year	-	
0.1		7.2.2		^	i per 5 years	-	When using non-virgin every 6 months
3.2.1	4.2	4.2.3	Utilization of non-virgin materials	х	1 per year	-	1 per year
Desigr	nation	of wal	I constructions and examples of typical joint	ing m	ethods		
3.1	5	5.2	Wall constructions designated as Type A	х	-	-	1 per year
Appea	aranc	e and o	colour				
3.1	6.1	6	Appearance	х	1 per year	х	1 per 8 h
3.2.3	6.2	6	Colour	х	1 per year	Х	1 per 8 h
Geor	netric	al char	acteristics				
3.1 +		7.2	Dimensions	х	1 per year	х	1 per 8 h
3.2.7+					1 - 7		For dimensions which are
3.2.8	L						influenced by the process
Physic	cal ch	aracte	ristics	1	· ·	r —	
3.2.2		8.1.1	Vicat softening temperature	Х	1 per year	-	-
3.2.14		8.1.1	Resistance to dichloromethane	Х	1 per year	-	-
3.2.14		8.1.1	Uniaxial Tensile Test	х	1 per year	-	-
			Alternative test method to resistance to				
3.2.14		8.1.1	Differential Scanning Calorimetry (DSC)	v	1 per vear	-	
0.2		0	Alternative test method to resistance to	^	i per year	-	-
			dichloromethane				
3.1		8.1.1	Longitudinal reversion	х	1 per year	х	1 per week
			Not applicable for A 2 pipes				
Mecha	nical	charac	teristics	1	1	1	1
3.1+		9.1.1	Ring stiffness	х	1 per year	х	-
3.1		9.1.1	Impact strength	x	1 per vear	x	1 per week
3.1		9.1.1	Ring flexibility	x	1 per year	x	-
3.1		9.1.1	Creen ratio	x	1 per year	-	_
			Not applicable for pipes greater than DN/ID or	^	i per year	_	
			DN/OD 1200.				
Perfo	rmano	e/Syst	em tests				
3.1		10	Tightness of elastomeric ring seal joint	х	1 per year	-	1 per 2 years
3.2.12		10	Resistance to combined temp. cycling	-	-	-	-
			and external loading				
3.2.12		10	Elevated temperature cycling	-	-	-	-
Marki	ng						
1.7	10	11	Marking	Х	1 per year	Х	1 per 8h
BRLs	pecifi	с					
3.2.11		-	Aging (UV)	х	PP-C: 1x per 4	-	-
			Not for black products		years		
					PP-H: 1x per year		
3.2.12		-	Cyclic temperature test and airtightness	х	1 per 2 years	-	1 per 3 years
			110mm <dn< 200mm<="" td=""><td></td><td></td><td></td><td></td></dn<>				
Additic	onal fo	or Spira	ally formed pipe				
3.1		9.1.1	Tensile strength of seam	х	1 per year	х	-
Additio	onal fo	or Integ	ral sockets				
3.2.4	4.4	4.5	Sealing rings	х	1 per year	-	1 per batch
3.2.10		-	Fixing sealing rings	х	-	-	1 per year
3.2.5		4.7	Adhesives for PVC-U	х	1 per year	-	1 per batch
Additio	onal fo	or jointi	ng by fusion/welding				
3.1	4.5	4.6	Manufacturer's instructions for the	х	-	-	1 per year
			jointing process	1			
3.1		10	Tensile test of welded or fused joints	х	1 per year	-	1 per 2 years

Table 3: Test matrix PVC-U pipes type A



«Concept-design»

				Res	earch in the context o	of 1, 3	2.
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		9-2				Pe	rformed by manufacturer
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92	뽀	Щ		e		sta	
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ā	z	z	Description characteristic		Audit tests		Frequency
Mater	ial			1		1	
3.1		4.2.1	Formulation PVC-U material	Х	1 per year	-	1 per batch
3.1		4.2.2	Resistance to internal pressure	x	1 per 3 years	-	1 per year When using non-virgin every 6 months
3.2.1	4.2	4.2.3	Utilization of non-virgin materials	х	1 per year	-	1 per year
Gener	al		· · · · · · · · · · · · · · · · · · ·				
3.2.4	4.4	4.5	Sealing rings	Х	1 per year		1 per batch
3.2.5		4.7	Adhesives for PVC-U	Х	1 per year		1 per batch
3.1	6.1	6	Appearance	х	1 per vear	х	1 per 8 h
3.2.3	6.2	6	Colour	х	1 per vear	х	1 per 8 h
Geom	etrical	charact	teristics			I	
3.1 +		7.2	Dimensions	x	1 per vear	х	1 per 8 h
3.2.7+							For dimensions which are
3.2.8			-				influenced by the process
Physic	cal cha	racteris	stics	1	Γ.	1	
3.2.2		8.1.2	Vicat softening temperature	Х	1 per year	-	-
3.1		8.1.2	Effect of heating	Х	1 per year	-	1 per year
Mecha	anical o	characte	eristics	T	1		
3.2.6		9.2	Stiffness	Х	1 per 2 years	-	-
3.1		9.2	Impact strength -Drop test	Х	1 per year	-	-
Perfor	mance	/Syster	n tests	1	1		
3.1		10	Tightness of elastomeric ring seal joint	Х	1 per 2 years	-	1 per 2 years
3.2.12		10	Resistance to combined temp. cycling	-	-	-	-
			and external loading				
3.2.12		10	Elevated temperature cycling	-	-	-	-
Markir	ng						
1.7	10	11	Marking	х	1 per 8h	х	1 per 8h
BRL s	pecific						
3.2.9		-	Bending test	х	1 per year	-	1 per year
3.2.10		-	Fixing sealing rings	Х	-		1 per year
3.2.11		-	Aging (UV)	Х	PP-C: 1x per 4	•	-
			Not for black products		years		
					PP-H: 1x per year		
3.2.12		-	Cyclic temperature test and airtightness	Х	1 per 2 years	-	1 per 3 years
			110mm <dn< 200mm<="" td=""><td></td><td></td><td></td><td>-</td></dn<>				-
Additio	onal fo	r fabrica	ated fittings		Γ	1	
3.2.13		9.2	Mechanical strength or flexibility	Х	1 per year	-	1 per batch
3.2.13		10	Watertightness	Х	1 per year	-	1 per batch
Additio	onal fo	r jointin	g by fusion/welding				
3.1	4.5	4.6	Manufacturer's instructions for the	х	-	-	1 per year
			jointing process				
3.1		10	Tensile test of welded or fused joints	Х	1 per year	-	1 per 2 years

Table 4: Test matrix PVC-U fittings



Note Note <th< th=""><th></th><th></th><th>0.10</th><th></th><th>Ros</th><th>earch in the context</th><th>of 1,2</th><th>2.</th></th<>			0.10		Ros	earch in the context	of 1,2	2.
To No No Preformed by manufacturer To No Performed by manufacturer Preformed by manufacturer To No Performed by manufacturer Performed by manufacturer Material V Performed by manufacturer Performed by manufacturer 31 4.31 Compound PP material X 1 per year - 1 per year 31 4.32 Resistance to internal pressure X 1 per year - 1 per year - 1 per year 31 4.32 Thermal stability (orn) X 1 per year - - - - - 31 5 52 Wall constructions designated as Type A X 1 per year X 1 per year - - 1 per 8 h 32.3 62 6 Operatice X 1 per year X 1 per 8 h 32.3 62 6 Operatice X 1 per year X 1 per 8 h 32.4 72 Dimensions X 1 per year X 1 per 8 h 32.4 8 1 pe					T/Ca			23
B B B B B 1 2 2 2 2 2 31 43.1 Compound PP material x 1 per year - 1 per year 31 43.2 Resistance to internal pressure x 1 per year - - 31 43.2 Resistance to internal pressure x 1 per year - - 31 43.2 Thermal stability (orr) x 1 per year - - 32.1 43.2 Material x 1 per year - - 32.1 43.2 Thermal stability (orr) x 1 per year - 1 per year 32.1 61 6 Appearance x 1 per year x 1 per year 31.1 5 5.2 Wall constructions designated as Type A x - - 1 per year 32.3 62 6 Colour x 1 per year x 1 per sear 31.1 6.1 6 Appearance x 1 per year x 1 per 8 h 32.4 62 6 Colour x 1 per year x 1 per 8 h 32.4 82.6 Colour <		-1	-2				Perf	ormed by manufacturer
Total Production Prequency Material Prequency 31 4.3.1 Compound PP material x 1 per year - 1 per year 31 4.3.2 Resistance to internal pressure x 1 per year - 1 per year 31 4.3.2 Thermal stability (OT) x 1 per year - - 31 4.3.2 Thermal stability (OT) x 1 per year - - 31 4.3.2 Thermal stability (OT) x 1 per year - - 31 6.1 6 Appearance x 1 per year - - 1 per year 32.3 6.2 6 Colour x 1 per year x 1 per year 32.3 6.2 6 Colour x 1 per year x 1 per 8 h 32.3 7.2 Dimensions x 1 per year x 1 per weak 41 1.1 Ring stiffness x 1 per year x 1 per weak 32.4 1.1 Longitudinal rever		176	176		D		1 611	
Box Description characteristic Description characteristic Prequency Material 43.1 Compound PP material X 1 per year - 1 per year 31 43.2 Resistance to internal pressure X 1 per year - 1 per year 31 43.2 Resistance to internal pressure X 1 per year - - 31 43.2 Thermal stability (otr) X 1 per year - - 31 43.2 Thermal stability (otr) X 1 per year - - 321 42.3 Vali constructions and examples of typical joining methods - 1 per year 33 5 5.2 Wall constructions designated as Type A X - - 1 per year 34 61 6 Appearance X 1 per year X 1 per year 37 7 Dimensions X 1 per year X 1 per 8 h 32.4 62 Colour X 1 per year X 1 per 8 h 31.1 8.1 8.1 1 per year X 1 per 8 h 32.4 8.2 6 Colour X 1 per year X 31.1 8.1<	5	34	34		stir		d	
Solution Top Audit tests Frequency Material 4.3.1 Compound PP material x 1 per year - 1 per year 3.1 4.3.2 Resistance to internal pressure X 1 per year - 1 per year 3.1 4.3.2 Resistance to internal pressure X 1 per year - - 3.1 4.3.2 Melt mass-flow rate (wFR) X 1 per year - - 3.1 4.3.2 Thermal stability (oT) X 1 per year - - 1 per year 3.1 5.2 Vall constructions designated as Type A X - - 1 per year 3.1 6.1 6 Appearance X 1 per year X 1 per 8 h 3.2.3 6.2 6 Colour X 1 per year X 1 per 8 h 3.2.3 6.2 6 Colour X 1 per year X 1 per 8 h 3.2.7 3.2.7 5 8.1 Constructions designated as Type 3 X 1 per 8 h 3.2.7 1.1	08	7	7		Ĕ		- -	
\vec{x} x	92	Ē	Щ.		e		tai	
G Z Z Description characteristic Image: Compound PP material X 1 per year - 1 per batch 3.1 4.3.2 Resistance to internal pressure X 1 per year - 1 per year - 1 per year - 1 per year - - 3.1 4.3.2 Resistance to internal pressure X 1 per year - - - 3.1 4.3.2 Thermal stability (orn) X 1 per year - - - - - - - - - - 1 per year - - - 1 per year - - - 1 per year - - - - - - -	لے ب	Ż	Ż		yp.		ts	
Material visual 4.31 Compound PP material x 1 per year - 1 per batch 3.1 4.32 Resistance to internal pressure x 1 per year - 1 per year 3.1 4.32 Resistance to internal pressure x 1 per year - - 3.1 4.32 Melt mass-flow rate (MFR) x 1 per year - - 3.1 4.32 Thermal stability (ort) x 1 per year - - 3.1 5 5.2 Wall constructions and examples of typical jointing methods - - - 3.1 6.1 6 Appearance x 1 per year x 1 per year 3.1 6.1 6 Colour x 1 per year x 1 per 8 h 3.2.8 6 Colour x 1 per year x 1 per 8 h 3.1.9 7.2 Dimensions X 1 per year x 1 per 8 h 3.1.1 Ring stiffness	BA	Z	NE	Description characteristic	Τ	Audit tests	4	Frequency
3.1 4.3.1 Compound PP material x 1 per year - 1 per year 3.1 4.3.2 Resistance to internal pressure x 1 per year - - 3.1 4.3.2 Melt mass-flow rate (MFR) x 1 per year - - 3.1 4.3.2 Thermal stability (OT) x 1 per year - - 3.1 4.2.2 Thermal stability (OT) x 1 per year - - 2.1 4.2 4.3.4 Utilization of non-virgin materials x 1 per year - 1 per year 2.1 5.2 Wall constructions and examples of typical jointing methods - 1 per year X 1 per year 3.1 5.2 Gour x 1 per year X 1 per s h 3.2.3 6.2 6 Colour x 1 per year X 1 per s h 3.1 8.1 A.1 per year X 1 per s h For dimensions which are influenced by the proces 3.1 8.2.1 Longitudinal reversion X 1 per year X 1 p	Mater	ial						
3.1 4.32 Resistance to internal pressure x 1 per year - 1 per year - . I per year - . - . <t< td=""><td>3.1</td><td></td><td>4.3.1</td><td>Compound PP material</td><td>х</td><td>1 per year</td><td>-</td><td>1 per batch</td></t<>	3.1		4.3.1	Compound PP material	х	1 per year	-	1 per batch
Metropoly When using non-virgin every 6 months 3.1 4.3.2 Thermal stability (OIT) X 1 per year - 3.1 4.3.2 Thermal stability (OIT) X 1 per year - 3.1 4.3.2 Thermal stability (OIT) X 1 per year - - 3.1 5 5.2 Wall constructions and examples of typical jointing methods - - 1 per year 3.1 6.1 6 Appearance x 1 per year x 1 per 8 h 3.2.3 6.2 6 Colour X 1 per year X 1 per 8 h 3.2.4 6 Colour X 1 per year X 1 per 8 h 3.1.4 5.2 Wall constructions are theresion X 1 per year X 1 per 8 h 3.1.4 6.1.6 Appearance X 1 per year X 1 per demensions which are influenced by the process 3.1.4 Not applicable for A2 pipes X 1 per year X 1 per week <td>3.1</td> <td></td> <td>4.3.2</td> <td>Resistance to internal pressure</td> <td>х</td> <td>1 per 3 years</td> <td>-</td> <td>1 per year</td>	3.1		4.3.2	Resistance to internal pressure	х	1 per 3 years	-	1 per year
Image: state of the s				I I				When using non-virgin
3.1 4.3.2 Melt mass-flow rate (MFR) x 1 per year - 3.1 4.3.2 Thermal stability (ort) x 1 per year - - 3.2.1 4.2 4.3.4 Utilization of non-virgin materials x 1 per year - - - 3.1 5 5.2 Wall constructions and examples of typical jointing methods - - 1 per year - - 1 per year 3.1 6 Appearance ax 1 per year x 1 per year x 1 per sh 3.2.3 6.2 6 Colour x 1 per year x 1 per sh 3.1.4 5.2 6 Colour x 1 per year x 1 per sh 3.1.4 8.1 7.2 Dimensions x 1 per year x 1 per sh 3.1.4 8.2.1 Nongitudinal reversion X 1 per year x 1 per week 1.1 Rig stiffness x 1 per year x 1 per week - 3.1 9.1.1 Ring stiffness								every 6 months
3.1 4.3.2 Thermal stability (OT) x 1 per year - - 3.2.1 4.2 4.3.4 Utilization of novingin materials x 1 per year - 1 per year 3.1 5 5.2 Wall constructions designated as Type A x - - 1 per year 3.1 6.1 6 Appearance x 1 per year x 1 per 8 h 3.2.3 6.2 6 Colour x 1 per year x 1 per 8 h 3.2.7 3.2.7 0 Constructinstics x 1 per year x 1 per 8 h 3.2.7 3.2.7 1 7.2 Dimensions x 1 per year x 1 per 8 h 3.2.7 3.2.7 1 1 ber stability (CT) x 1 per year x 1 per 8 h 3.2.7 8.2.1 Longitudinal reversion x 1 per year x 1 per dimensions which are influenced by the process 3.1 9.1.1 Ring stiffness x 1 per year x 1 per week 3.1 9.1.1 Ring sti	3.1		4.3.2	Melt mass-flow rate (MFR)	Х	1 per year	-	-
3.2.1 4.2 4.3.4 Utilization of non-virgin materials x 1 per year - 1 per year 9esignation of wall constructions and examples of typical jointing methods 3.1 5 5.2 Wall constructions designated as Type A x - - 1 per year 3.1 6.1 6 Appearance x 1 per year x 1 per 8 h 3.2.3 6.2 6 Colour x 1 per year x 1 per 8 h Geometrical characteristics - 7.2 Dimensions x 1 per year x 1 per 8 h 7.2 Site 7.2 Dimensions x 1 per year x 1 per weak 8.1 8.2.8 Site - - 1 per year x 1 per weak 8.2.8 91.1 Ring stiffness x 1 per year x 1 per weak 8.1 8.2.1 Longitudinal reversion x 1 per year x 1 per weak 3.1 8.1.1 Ring stiffness x 1 per year x - 9.1.1	3.1		4.3.2	Thermal stability (OIT)	Х	1 per year	-	-
$\begin{array}{ $	3.2.1	4.2	4.3.4	Utilization of non-virgin materials	Х	1 per year	-	1 per year
3.1 5 5.2 Wall constructions designated as Type A x	Desigr	nation	of wal	constructions and examples of typical jointi	ng m	ethods		
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3.1 6.1 6 Appearance x 1 per year x 1 per 8 h 32.3 6.2 6 Colour x 1 per year x 1 per 8 h 32.7+ 32.7+ 32.7+ 32.7 7.2 Dimensions X 1 per year X 1 per 8 h Physical characteristics - Not applicable for A2 pipes X 1 per year X 1 per week 3.1 8.2.1 Longitudinal reversion Not applicable for A2 pipes X 1 per year X 1 per week 3.1 9.1.1 Ring stiffness X 1 per year X - 3.1 9.1.1 Ring stiffness X 1 per year X - 3.1 9.1.1 Ring flexibility X 1 per year X - 3.1 9.1.1 Ring stiffness X 1 per year X - 3.1 9.1.1 Crep ratio Not applicable tor pipes greater than DN/D or DNOO 1200. X 1 per year - 1 per 2 years 3.1	Appea	arance	e and c	colour				
3.23 6.2 6 Colour x 1 per year x 1 per 8 h Geometrical characteristics 3.1 + 3.2.78 7.2 Dimensions x 1 per year x 1 per 8 h 3.1 + 3.2.78 7.2 Dimensions x 1 per year x 1 per 8 h 7.2 Dimensions x 1 per year x 1 per week Not applicable for A2 pipes Mechanical characteristics 3.1.1 Ring stiffness x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year - - 3.1 10 Tightness of elastomeric ring seal joint x <td< td=""><td>3.1</td><td>6.1</td><td>6</td><td>Appearance</td><td>х</td><td>1 per year</td><td>х</td><td>1 per 8 h</td></td<>	3.1	6.1	6	Appearance	х	1 per year	х	1 per 8 h
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3.1 7.2 Dimensions x 1 per year x 1 per 8 h 3.2.7 3.2.8 8.2.1 Longitudinal reversion x 1 per year x 1 per 8 h 7.2.8 8.2.1 Longitudinal reversion x 1 per year x 1 per week 3.1 8.2.1 Impact strength x 1 per year x 1 per week 3.2.6 9.1.1 Ring stiffness x 1 per year x - 3.1 9.1.1 Impact strength x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year - - 3.1 9.1.1 Ring flexibility x 1 per year - - 3.1 9.1.1 Ring flexibility x 1 per year - 1 per 2 years 3.1 10 Tightness of elastomeric ring seal joint x	Geor	netric	al char	acteristics				
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3.2.8 influenced by the process Physical characteristics 3.1 8.2.1 Longitudinal reversion Not applicable for A2 pipes X 1 per year X 1 per week Mechanical characteristics 3.2.6 9.1.1 Ring stiffness X 1 per year X - 3.1 9.1.1 Ring stiffness X 1 per year X 1 per week 3.1 9.1.1 Ring stiffness X 1 per year X 1 per week 3.1 9.1.1 Ring stiffness X 1 per year X 1 per week 3.1 9.1.1 Ring stiffness X 1 per year X 1 per week 3.1 9.1.1 Ning getter than DN/ID or DNOD 1200. X 1 per year - - 3.2.12 10 Resistance to combined temp. cycling and external loading - - - - 3.2.12 10 Elevated temperature cycling - - - - 3.2.11 - Aging (UV) Not for black products X 1 per year X 1 per 3 years	3.2.7+				~	. por jour	~	For dimensions which are
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3.1 8.2.1 Longitudinal reversion Not applicable for A2 pipes x 1 per year x 1 per week 3.2.6 9.1.1 Ring stiffness x 1 per year x - 3.1 9.1.1 Impact strength x 1 per year x - 3.1 9.1.1 Ring flexibility x 1 per year x - 3.1 9.1.1 Creep ratio Not applicable for pipes greater than DN/ID or DN/OD 1200. x 1 per year - - 9.1.1 Tightness of elastomeric ring seal joint x 1 per year - - - 3.1 10 Tightness of elastomeric ring seal joint x 1 per year - 1 per 2 years 3.2.12 10 Resistance to combined temp. cycling and external loading - - - - 3.2.12 10 Elevated temperature cycling - - - - 3.2.12 10 Elevated temperature cycling x 1 per year x 1 per 8h BRL specific - - - - - -	Physi	cal ch	aracte	ristics				
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Mechanical characteristics32.69.1.1Ring stiffnessx1 per yearx-3.19.1.1Impact strengthx1 per yearx1 per week3.19.1.1Ring flexibilityx1 per yearx-3.19.1.1Creep ratio Not applicable for pipes greater than DN/ID or DN/OD 1200.x1 per year3.110Tightness of elastomeric ring seal joint and external loadingx1 per year-1 per 2 years3.110Resistance to combined temp. cycling and external loading3.2.1210Elevated temperature cycling and external loading3.2.1210Elevated temperature cycling and external loading3.2.1210To thor black productsx1 per yearx1 per 8hBRL specific3.2.11-Aging (UV) Not for black productsx1 per 2 years3.11 per yearx1 per year<				Not applicable for A2 pipes				
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3.19.1.1Ring flexibilityx1 per yearx- 3.1 9.1.1Creep ratio Not applicable for pipes greater than DN/ID or DN/OD 1200.x1 per year $Performarce/System testsx1 per year-1 per 2 years3.110Tightness of elastomeric ring seal jointand external loadingx1 per year-1 per 2 years3.2.1210Resistance to combined temp. cyclingand external loading3.2.1210Elevated temperature cyclingand external loading3.2.1210Karkingx1 per yearx1 per 8hBRL specific3.2.11-Aging (UV)Not for black productsx1 per year3.2.12-Cyclic temperature test and airtightness10m < DN < 200mmx1 per year-1 per 3 years3.2.11Cyclic temperature test and airtightness10m < DN < 200mmx1 per year-1 per 3 years3.2.12Cyclic temperature test and airtightness10m < DN < 200mmx1 per year-1 per year3.2.444.55Sealing ringsx1 per year1 per year1 per year3.2.444.55Sealing ringsx1 per year1 per year3.2.10-Fixing sealing ringsx1 per year-1 per year3.14.5$	3.1		9.1.1	Impact strength	х	1 per year	х	1 per week
3.1 9.1.1 Creep ratio Not applicable for pipes greater than DN/ID or DN/OD 1200. X 1 per year - - 3.1 10 Tightness of elastomeric ring seal joint X 1 per year - 1 per 2 years 3.1 10 Resistance to combined temp. cycling and external loading - - - - 3.2.12 10 Elevated temperature cycling - - - - 3.2.12 10 Elevated temperature cycling - - - - 3.2.12 10 Elevated temperature cycling - - - - 1.7 10 11 Marking x 1 per year x 1 per 8h BRL specific 3.2.11 - Aging (UV) Not for black products x PP-C: 1x per 4 years PP-H: 1x per year - - 3.2.12 - Cyclic temperature test and airtightness 110mm <dn< 200mm<="" td=""> x 1 per year x 1 per 3 years 3.2.12 - Cyclic temperature test and airtightness 110mm <dn< 200mm<="" td=""> x 1 per year x - 3.</dn<></dn<>	3.1		9.1.1	Ring flexibility	х	1 per year	х	-
Not applicable for pipes greater than DN/ID or DN/OD 1200.Not applicable for pipes greater than DN/ID or DN/OD 1200.3.110Tightness of elastomeric ring seal jointx1 per year-1 per 2 years3.2.1210Resistance to combined temp. cycling and external loading3.2.1210Elevated temperature cycling and external loading3.2.1210Elevated temperature cycling and external loadingMarking-1Markingx1 per yearx1 per 8hBRL specific3.2.11-Aging (UV) Not for black productsx1 per 2 years years PP-H: 1x per year3.2.12-Cyclic temperature test and airtightness 110mm <dn< 200mm<="" td="">x1 per 2 years years PP-H: 1x per year3.2.12-Cyclic temperature test and airtightness 110mm <dn< 200mm<="" td="">x1 per year-1 per 3 years3.2.12-Cyclic temperature test and airtightness 110mm <dn< 200mm<="" td="">x1 per year-1 per 3 years3.19.1.1Tensile strength of seamx1 per yearx1 per year-3.2.444.44.5Sealing ringsx1 per year1 per year3.1-Fixing sealing ringsx1 per year1 per year3.14.54.6Manufacturer's instructions for the jointing process1 per</dn<></dn<></dn<>	3.1		9.1.1	Creep ratio	х	1 per year	-	-
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Image: space state stat				Not for black products		years		
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3.2.4 4.4 4.5 Sealing rings x 1 per year 1 per batch 3.2.10 - Fixing sealing rings x 1 per year 1 per year Additional for jointing by fusion/welding - Fixing sealing rings x - 1 per year 3.1 4.5 4.6 Manufacturer's instructions for the jointing process x - - 1 per year 3.1 10 Tensile test of welded or fused joints x 1 per year - 1 per 2 years	Additic	onal fo	or Integ	ral sockets				
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3.1 10 Tensile test of welded or fused joints x 1 per year - 1 per 2 years	3.1	4.5	4.6	Manufacturer's instructions for the	x	-	-	1 per vear
3.1 10 Tensile test of welded or fused joints x 1 per vear - 1 per 2 vears				iointing process				
	3.1		10	Tensile test of welded or fused joints	х	1 per vear	-	1 per 2 years

Table 5: Test matrix PP pipes type A



«Concept-design»

		0. 103		Pos	earch in the context	of 1, 2	
				Res			•
	Σ.	-2				Porf	ormed by manufacturer
	176	971		D		Fell	
5	34	34		stir		d	
80				ĕ		t C	
92	Ē	Щ.		e l		tar	
Ľ.	ż	ż		y D		ts	
R R R	H H	뿌	Description characteristic	⊢ ⊢	Audit tests	∢	Frequency
Mater	rial						
3.1		4.3.1	Compound PP material	х	1 per vear	-	1 per batch
3.1		4.3.2	Resistance to internal pressure	х	1 per 3 vears	-	1 per vear
			·				When using non-virgin every 6 months
3.1		4.3.2	Melt mass-flow rate (MFR)	х	1 per vear	-	-
3.1		4.3.2	Thermal stability (OIT)	х	1 per vear	-	-
3.2.1	4.2	4.3.4	Utilization of non-virgin materials	x	1 per vear	-	1 per vear
Gener	al				i por jour		i por your
3.2.4	4.4	4.5	Sealing rings	x	1 per vear		1 per batch
3.1	6.1	6	Appearance	x	1 per year	x	1 per 8 h
3.2.3	6.2	6	Colour	x	1 per year	x	1 per 8 h
Geom	etrical	charact	teristics	~	i por your	~	1 por o n
3.1 +	Cincar	7.2	Dimensions	v	1 per vear	v	1 per 8 h
3.2.7+			Dimensions	^	i per year	^	For dimensions which are
3.2.8							influenced by the process
Physic	cal cha	racteris	stics				· · · · ·
3.1		8.2.2	Effect of heating	Х	1 per year	-	1 per year
Mecha	anical o	characte	eristics				· · · ·
3.2.6		9.2	Stiffness	х	1 per 2 years	-	-
3.1		9.2	Impact strength -Drop test	х	1 per vear	-	-
Perfor	mance	/Svster	n tests				1
3.1		10	Tightness of elastomeric ring seal joint	х	1 per 2 vears		1 per 2 vears
3.2.12		10	Resistance to combined temp, cycling	-	-	-	-
			and external loading				
3.2.12		10	Elevated temperature cycling	-	-	-	-
Markir	na		Elevated temperature systing				
1.7	10	11	Marking	v	1 ner 8h	v	1 ner 8h
BPI c	necific	<u> </u>	Marking	^		^	
329	pecilic	-	Bending test	v	1 per vear	-	1 per vear
3 2 10		-	Eiving cooling ringo	X	i per year	-	1 per year
3.2.10		-		X	- DD C: 1x par 4		i per year
3.2.11		-	Aging (UV)	x	PP-C. IX per 4	-	-
			Not for black products				
2 2 4 2			Onelia tanan anatuma tant an diairtinktuana		PP-H: Tx per year		4
3.2.12		-	Cyclic temperature test and airtightness	X	1 per 2 years		1 per 3 years
Additio	nal fo	r fabrica	ated fittings				
3.2.13		9.2	Mechanical strength or flexibility	v	1 per vear		1 per hatch
3.2 13		10	Watertightness	v	1 per year		1 per batch
Additie	nal fo	r iointin	a by fusion/welding	_ ^	i pei yeai		
3.1	1 a 10	46	Manufacturaria instructions for the	V			1 perveer
5.1	4.5	4.0		X	-	-	i per year
2.1		10	Jointing process		4		1
3.1		10	rensile test of welded of fused joints	Х	i per year	-	i per∠years

Table 6: Test matrix PP fittings

Notes on Tables 3 till 6:

- ¹ During the inspection visit, the Location assessor will check the product on the basis of a selection of the above-mentioned product properties. The frequency of inspection visits is laid down in Article 5.3 Type and frequency of periodic inspections;
- ² If, for whatever reason, it is not possible to perform a test in a specific for that activity ISO/IEC 17025 accredited and impartial laboratory, than, in consultation with the CI, to perform the test under 'witness'. The 'witness' must be carried out at a laboratory that is ISO/IEC 17025 certified;
- ³ The frequency can be adjusted in accordance with the CI, e.g.:
 - a. in the case of a continuous (automated) measurement;
 - b. if it can be demonstrated that a reduction in frequency does not affect quality.



4 Requirements for certificate holders and internal quality control

4.1 General

The management of the certificate holder is responsible at all times for the quality of the production process, internal quality control, and the quality of the product. The internal quality control must meet the requirements laid down in this chapter.

4.2 Internal quality control

The certificate holder must have an internal quality control scheme used by them (IQC-scheme).

This scheme must clearly establish:

- Which aspects are subject to inspections carried out by the organization of the certificate holder or an external organization contracted by them,
- Which methods are employed to carry out these inspections,
- The frequency of these inspections,
- If and if affirmative, the inspection results are recorded.
- The IQC-scheme must at least include the following main groups:
- Inspection of measuring equipment,
- Entrance inspection,
- Process inspection,
- Product inspection,
- Internal transportation and storage,
- Delivery,
- Procedures for:
 - \circ $\;$ The handling of products with deviations,
 - Processing of claims,
 - Processing of deviations and follow-up of corrective measures,
 - Controlling the work instructions and control forms used.

This IQC-scheme must be based on the IQC-scheme model, which is published on the website of the scheme manager, and detailed in such a way that the CI generates sufficient confidence that the requirements laid down in this this BRL are being continuously satisfied.

Internal quality control must enable the certificate holder to demonstrate that the requirements laid down in this BRL are being continuously satisfied.

4.2.1 Control measuring equipment

The supplier must determine which laboratory and measuring equipment is required on the basis of this BRL to demonstrate that the product meets the requirements. When necessary, the laboratory and measuring equipment should be calibrated at specified intervals.

The supplier must assess and record the validity of the previous measurement results if the calibration shows that the laboratory and measuring equipment is not functioning correctly.

The relevant measuring equipment must be provided with an identification with which the calibration status can be determined.

The supplier must register the results of the calibrations.



5 External conformity assessments

5.1 General

The certification body will carry out a pre-certification for the purpose of granting a KOMO product certificate. After issuance of the KOMO product certificate, the certification body will carry out periodic inspections.

5.2 **Pre-certification test**

The applicant of the product certificate will specify which products they want to be included in the product certificate to be issued. The applicant will provide all relevant information on these products for the formulation of the product specification and the declaration on the product characteristics, as they will be included in the product certificate to be issued.

The certification body will perform a pre-certification test for the purpose of issuing a product certificate in which:

- The certification body will assess if the applicant is able, by means of their internal quality control, to guarantee that the products will continuously have the characteristics, respectively perform as established in chapter 3 of this BRL. Assessment of the production process and the finished product are part of this,
- The certification body will assess if the operational system of the internal quality control meets the requirements laid down in chapter 4 of this BRL,
- The certification body assesses the processing instructions, application conditions and maintenance instructions,
- Determination of the product characteristics (of the fabricated products) as included in this BRL.

If applicable, it will be verified if the submitted documents with regard to the product and/or the internal quality control and the results specified in those documents, meet the requirements of this BRL.

A report will be made on the pre-certification test, based on which the product certificate may or may not be granted.

5.3 Type and frequency of periodic inspections

After issuing the product certificate, the certification body must carry out periodic inspections at the certificate holders' to verify compliance with their obligations. The College of Experts will decide the type, scope, and frequency of the periodic inspections.

At the time this BRL is entering into effect, the frequency has been determined on 4 annual periodic inspections.

If the supplier has a certified NEN-EN-ISO 9001 system, the frequency is set at 2 annual periodic inspections.

The audit program includes the type and frequency of the period inspections. These are related to:

- The certificate holder's IQC-scheme,
- The results of the inspections performed by the certificate holder,
- Measurements during the production process,
- Measurements of/to the final product,
- The correct method of marking of the certified products,
- Compliance with the required procedures,

and compliance of the requirements laid down in this BRL is verified.

The audit program is included in this BRL as part of Tables 2 to 5.

The results of each assessment carried out, will be recorded in a traceable manner in a report by the certification body.

5.4 Shortcomings and sanction procedure

The weighting and follow-up of shortcomings and the sanctions policy are laid down in an interpretation document accompanying this BRL, which is published on the website of the scheme manager.



5.5 Suspension of product certificate

In the event that (temporarily) no products are produced and/or delivered, in the event of a stop longer than 6 months, the validity of his KOMO product certificate can be (temporarily) suspended at the request of the certificate holder. Such suspension may be granted by the certification body for a maximum of 3 year in total.

After the suspension has been granted, a certificate holder can request that his suspension be terminated earlier.

In the event of a suspension period longer than 3 years or less, prior to the resumption of production and delivery under a product certificate, an additional assessment must be carried out to determine whether all the requirements in this BRL are still met and the suspended status can be converted to a valid status.

This also applies when there is temporarily no production or delivery.



6 Requirements for the certification body

6.1 General

The certification body must have a procedure that establishes the general rules employed for certification processes.

The certification body must have regulations, or an equivalent document, in which the general rules that are used for certification are laid down. In particular these are:

- The general rules for conducting the entrance examination, to be distinguished according to:
 - The way in which suppliers are informed about the processing of an application;
 - The execution of the investigation;
 - The decision as a result of the conducted investigation;
- The general rules with regard to the performance of checks and the control aspects involved;
- The measures to be taken by the certification body in the event of shortcomings;
- The measures to be taken by the certification body in the event of improper use of certificates, certification mark, pictograms and logos;
- The rules on termination of a certificate;
- The possibility to lodge an appeal against decisions or measures of the certification body.

6.2 Certification staff

Certification staff involved can be divided as follows:

- Certification assessor/Reviewer: in charge of preparing the design and documentation assessments, assessment of applications, and review of the conformity assessments,
- Location assessor: in charge of external conformity assessments at the certificate holders' location,
- Decision maker: in charge of making decisions with regard to pre-certification tests carried out and about continuity of certification based on performed inspections.

6.2.1 Competency criteria for certification staff

Qualification requirements for the certification staff consist of qualification requirements for the staff executing the certification activities as laid down in the following table. The competency of the involver certification staff must be demonstrably established.

Competencies	Certification assessor Reviewer	Location assessor	Decision maker	
Basis competencies				
 Knowledge of business processes Be able to assess professionally 	 HBO thinking and working level 1 year1of relevant experience 	 MBO thinking and working level 2 years of relevant experience 	 HBO thinking and working level 5 years of relevant experience of which at least 1 year in certification activities 	
Auditing competencies	N/A.	 Training in auditing competencies Participation in at least 3 of periodic visits, with a minimum of 1 of periodic visits carried out independently under supervision 	N/A	
Technical competencies				
 Relevant knowledge of: The technology for the manufacture of the products to be inspected, the execution of the processes and the providing of services The way products are applied, processes carried out and services provided. Existing defects that appear when using the product, during the execution of the processes as well as 	 Knowledge of one of the following disciplines: Relevant Techn. HBO work and thinking level Minimum of 1 year of experience in production, testing, inspection and/or installation, including: 2x inspections under supervision Or internal training program including: 	 Knowledge of one of the following disciplines: Tech. MBO work and thinking level Minimum of 1 year of experience in production, testing, inspection and/or installation, including: 3x inspections under supervision 1x independent inspection Or internal training program including: 	N/A	

shortcomings in provision of services.	- 2x inspections under supervision	 - 3x inspections under supervision - 1x independent inspection 	
Specific technical competencies	Specific knowledge of BRL at a detailed level on the specific BRL or on BRLs that are related to each other	 Specific knowledge of: witness inspection the BRL chapters related to the quality system and testing 	N/A

6.2.2 Qualification certification personnel

Qualification personnel must be demonstrably qualified by testing their knowledge and skills against the abovementioned requirements. If qualification takes place based on other criteria, this must be put down in writing.

The authority with regard to qualification must be established in the quality system of the certification body.

6.3 Communications about the pre-certification test and periodic inspections

The certification body will record the results of the pre-certification tests and periodic inspections in an unequivocal report. Such report must satisfy the following requirements:

- **Completeness:** the report will include a substantiated report of the determined grade of conformity with regard to the requirements laid down in this BRL,
- Traceability: the results on which statements are based must be recorded in a traceable way.

6.4 Decisions about the KOMO product certificate

The decision to grant a product certificate or imposing measures with regard to the product certificate must be based on the results laid down in the file.

The results of a pre-certification test and a periodic inspection (in case of a critical shortcoming) must be assessed by a reviewer.

Based on the review carried out, the decision maker will determine if:

- The product certificate can be granted,
- Sanctions must be imposed,
- The product certificate must be suspended or canceled.

The reviewer and the decision makers must not have been involved in the process of preparing the results, based on which the decision is being made.

The decision must be recorded in a traceable manner.

6.5 Reporting to the Board of Experts

The certification body will annually present a report to the Board of Experts about the activities carried out and the respective results with regard to the product certificates based on this BRL. This report must include at least the following matters::

- The number of inspections performed versus the determined frequency,
- The number of performed pre-certification tests,
- Results of assessments,
- Measures imposed in case of detected shortcomings,
- Complaints received from third parties about certified products.

6.6 Interpretation of requirements

The Board of Experts may establish the interpretation of the requirements of this BRL in one or more separate interpretation document(s). Interpretation documents are available for/from members of the CvD, certification bodies and the certificate holders who carry out activities based on this BRL.

Interpretation documents are published on the website of the plan administrator.

Every certification body that makes use of this BRL is under the obligation to employ the interpretations laid down in it.



7 List of documents

7.1 Public law and Rules and Regulations

There are no applicable public laws and rules and regulations.

7.2	Normative documents This BRL remits to the following normative documents:						
	EOTA TR 010:2004	Exposure procedure for artificial weathering					
	CPR EU 305/2011	European Construction Products Regulation					
	NEN-EN-ISO 580:2005	Plastic piping and ducting systems – Injection moulded thermoplastics fittings - Method for visually assessing the effects of heating					
	NEN-EN 744:1995	Plastic piping and ducting systems – Thermoplastics pipes - Beproevingsmethode voor de weerstand tegen uitwendige slagbelastingen op plaatsen kloksgewijs verdeeld langs de omtrek. Test method for resistance to external blows round-the- clock method					
	BRL 2013	Vulcanized rubber sealing elements for waste water piping systems					
	BRL 2020 deel 1 en 2	TPE pipe joint seals for non-pressure waste water: Part 1: Material Part 2: Seals					
	NEN-EN 1053:1995	Plastic piping systems – Thermoplastics piping systems for non-pressure applications – Test method for water tightness					
	NEN-EN-ISO 13257:2019	Thermoplastics piping systems for non-pressure applications – Test method for resistance to elevated temperature cycling					
	NEN-EN-ISO 1167-1,2:2006	Thermoplastics pipes, fittings and assemblies for the conveyance of fluids – Determination of the resistance to internal pressure - Part 1: General method - Part 2: Preparation of pipe test pieces					
	NEN-EN 1329-1:2020	Plastic piping systems for soil and waste discharge (low and high temperature) within the building structure – Unplasticized poly(vinyl chloride) (PVC-U) – Part 1: Specifications for pipes, fittings and the system					
	NEN-EN 1401-1:2019	Plastics piping systems for non-pressure underground drainage and sewerage – Unplasticized poly(vinyl chloride) (PVC-U) – Part 1: Specifications for pipes, fittings and the system					
	NEN-EN 1610:2015	External sewerage - Construction and testing of piping systems					
	NEN-EN-ISO 2505:2005	Thermoplastics pipes – Longitudinal reversion – Test method and parameters					
	NEN-EN-ISO 3126:2005	Plastics piping systems – Plastics components – Determination of dimensions					
	NEN-EN-ISO 4892-2:2013	Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps					
	NEN 7039:2003 (cancelled)	Plastics pipes and fittings for soil and waste water purposes – Elevated temperature cycling test – Test method for air tightness					
	NEN 7146:2001	Bending test for thermoplastics fittings – Test method and specifications					
	NEN-EN-ISO 8256:2004	Plastics – Determination of tensile-impact strength					
	NEN-EN-ISO 9001:2015	Quality management systems – Requirements					
	NEN-EN-ISO 9967:2016	Thermoplastics pipes – Determination of creep ratio					
	NEN-EN-ISO 9969:2016	Thermoplastics pipes – Determination of ring stiffness					
	ISO/TR 10358:1993	Plastics pipes and fittings – Combined chemical resistance classification table					
	NEN-EN-ISO 13260:2011	Thermoplastic piping systems for non-pressure underground sewerage – Test method for resistance to combined temperature cycong and external load					
	NEN-EN 13476-1:2018 en NEN-EN 13476-2:2018+ A1:2020	 Plastic piping systems for non pressure underground drainage and sewerage Structured wall piping systems unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE); Part 1: General requirements and performance characteristics 					
		- Part 2: Specifications for pipes and fittings with smooth					

	internal and external surface and the system, Type A
NEN-EN 13967:2012+ A1:2017	Flexible sheets for waterproofing – Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet – Definitions and characteristics
NEN-EN-ISO 13968:2008	Plastic piping and ducting systems – Thermoplastics pipes – Determination of ring flexibility
NPR-CEN/TS 14541:2013	Plastic pipes and fittings - Characteristics for utilization of non-virgin PVC-U, PP and PE materials - Additional element
NEN-EN-ISO/IEC 17020:2012	Conformity assessment – Requirements for the operation of various types of bodies performing inspection
NEN-EN-ISO/IEC 17021-1	Conformity assessment – Requirements for bodies providing audit and certification of management systems –
	Part 1: Requirements
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

Remarks:

Verification if normative documents are still up-to-date is carried out annually. Modifications of the applicable normative documents will be published on the services page on the website of the certification body which draw up the BRL.

7.3 Informative documents

This BRL remits to the following documents for information purposes:

CEN/TS 13476-4:2019

Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE)

- Part 4: Assessment of conformity