

English version

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: Guidance for the assessment of conformity

Systèmes de canalisations en plastique pour les branchements et les collecteurs d'assainissement sans pression enterrés – Systèmes de canalisations à parois structurées en poly(chlorure de vinyle) non plastifié (PVC-U), polypropylène (PP) et polyéthylène (PE) – Partie 2: Guide pour l'évaluation de la conformité

Kunststoff-Rohrleitungssysteme für erdverlegte Abwasserkanäle und -leitungen – Rohrleitungssysteme mit strukturierter Wandung aus weichmacherfreiem Polyvinylchlorid (PVC-U), Polypropylen (PP) und Polyethylen (PE) – Teil 2: Empfehlungen für die Beurteilung der Konformität

This draft Technical Specification is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 155.

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## Foreword

This document prCEN/TS 13476-2:2002 has been prepared by Technical Committee CEN /TC 155, "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This document is currently submitted to the Formal Vote.

This Technical Specification is a Part of a System Standard for plastics piping systems of a particular material for a specified application. There are a number of such System Standards.

System Standards are based on the results of the work undertaken in ISO/TC 138 "Plastics pipes, fittings and valves for the transport of fluids", which is a Technical Committee of the International Organization for Standardization (ISO).

They are supported by separate standards on test methods to which references are made throughout the System Standard.

The System Standards are consistent with general standards on functional requirements and on recommended practice for installation.

The EN 13476-series consists of the following Parts, under the general title *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: Specifications for pipes, fittings and the system*
- *Part 2: Guidance for assessment of conformity (this technical specification)*
- *Part 3: Guidance for installation (CEN/TS)*

This Technical Specification includes a bibliography.

## Introduction

This Technical Specification gives guidance for the assessment of conformity. It is intended to serve as a guide for the assessment of conformity of products covered by prEN 13476-1.

It can be used integrally and/or be used for inclusion of conformity assessment in the manufacturer's quality plan as part of the quality system for attestation purposes. The use of this Technical Specification does not presume the involvement of a third party.

It can also be used to support the elaboration of national third party certification procedures for products conforming to prEN 13476-1. It is the responsibility of the manufacturer to choose or not to choose for the involvement of a third party for certification purposes.

## 1 Scope

This Technical Specification gives guidance for the assessment of conformity to be included in the manufacturer's quality plan as part of the quality system.

This Technical Specification includes:

- a) requirements for materials, components and joints given in prEN 13476-1;
- b) requirements for the manufacturer's quality.

NOTE 1 It is recommended that the quality system conforms to EN ISO 9001<sup>[1]</sup>, as applicable.

- c) definitions and procedures to be applied if third party certification is involved.

NOTE 2 If third party certification is involved, it is recommended that the certification body is accredited to EN 45011 <sup>[2]</sup> or EN 45012 <sup>[3]</sup>, as applicable.

This Technical Specification is applicable to structured wall piping systems made of poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) intended to be used for

- a) non-pressure underground drainage and sewerage outside the building structure (application area code "U");
- b) for non-pressure underground drainage and sewerage for both buried in ground within the building structure (application area code "D") and outside the building structure. This is reflected in the marking of products by "U" and "UD".

## 2 Normative references

This Technical Specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Technical Specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 13476-1:2002, *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: Specifications for pipes, fittings and the system*

## 3 Terms, definitions and abbreviations

For the purposes of this Technical Specification, the terms, definitions, symbols and abbreviations given in prEN 13476-1:2002 apply together with the following.

### 3.1 Terms and definitions

#### 3.1.1

##### **certification body**

impartial body, governmental or non-governmental, possessing the necessary competence and responsibility to carry out certification of conformity according to given rules of procedure and management

#### 3.1.2

##### **inspection body**

impartial organization or company, approved by a certification body as possessing the necessary competence to verify and/or to carry out initial type testing, audit testing and inspection of the manufacturer's factory production control in accordance with the relevant European Standard

**3.1.3**

**testing laboratory**

laboratory which measures, tests, calibrates or otherwise determines the characteristics of the performance of materials and products

**3.1.4**

**quality system**

organisational structure, responsibilities, procedures, processes and resources for implementing quality management (see EN ISO 9000:2000 [4])

**3.1.5**

**quality plan**

document setting out the specific quality practices, resources and sequence of activities relevant to a particular product or range of products

**3.1.6**

**type testing (TT)**

tests performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard

**3.1.7**

**preliminary type testing (PTT)**

type testing carried out by or on behalf of the manufacturer

**3.1.8**

**initial type testing (ITT)**

type testing carried out by or on behalf of a certification body for certification purposes

**3.1.9**

**batch release test (BRT)**

test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released

**3.1.10**

**process verification test (PVT)**

test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard

NOTE Such tests are not required to release batches of components and are carried out as a measure of process control.

**3.1.11**

**audit test (AT)**

test performed by or on behalf of a certification body to confirm that the material, component, joint or assembly continues to conform with the requirements given in the relevant standard and to provide information to assess the effectiveness of the quality system

**3.1.12**

**indirect test (IT)**

test performed by the manufacturer different from that specified for that particular characteristic, having verified its correlation with the specified test

**3.1.13**

**witness testing (WT)**

testing accepted by the certification body for initial type testing and/or audit testing which is carried out by or on behalf of the manufacturer and supervised by a representative of the certification body, qualified in testing

**3.1.14**

**material**

defined type of polymer or additive or constituent thereof

**3.1.15**

**compound (blend)**

recipe which defines types of polymer, additives and constituents at specified dosage levels

**3.1.16**

**material batch or compound batch**

a clearly identifiable quantity of a particular material or compound

**3.1.17**

**production batch**

clearly identifiable collection of units, manufactured consecutively under the same conditions, using material or compound conforming to the same specification

**3.1.18**

**lot**

clearly identifiable sub-division of a batch for inspection purposes

**3.1.19**

**sample**

one or more units of product drawn from a batch or lot, selected at random without regard to quality

NOTE The number of units of product in the sample is the sample size.

**3.1.20**

**group**

collection of similar components from which samples are selected for testing purposes

## 3.2 Abbreviations

NOTE For reasons of avoiding misunderstanding the following abbreviations are kept the same in each of the languages. For the same reason the terms are given in the three languages ("en" for English, "fr" for French and "de" for German).

AT	en: audit test fr: essai d'audit de: Überwachungsprüfung
BRT	en: batch release test fr: essai de libération de campagne de fabrication de: Freigabepfung einer Charge
IT	en: indirect test fr: essai indirect de: indirekte Prüfung
ITT	en: initial type testing fr: essais de type initiaux de: Erst-Typprüfung
PTT	en: preliminary type testing fr: essais de type préliminaires de: vorausgehende Typprüfung
PVT	en: process verification test fr: essai de vérification du procédé de fabrication de: Prüfung zur Prozessüberwachung
TT	en: type test fr: essai de type de: Typprüfung
WT	en: witness testing fr: essais de témoins de: Prüfung unter Aufsicht

## 4 Requirements

### 4.1 General

4.1.1 Materials, components, joints and assemblies shall conform to the requirements given in prEN 13476-1.

4.1.2 Components and/or assemblies shall be produced by the manufacturer under a quality system which includes a quality plan.

### 4.2 Testing and inspection

#### 4.2.1 Material specifications

In the following subclauses it is defined when a modification of a material is to be considered as a change of material.

##### 4.2.1.1 Material specification PVC

For the purposes of this Technical Specification the material specification consists of a recipe/compound which defines types of PVC and additives and their dosage levels.

The dosage level of ingredients of a material shall not exceed the tolerance bands given in Table 1. If any level exceeds the dosage band or if a type is changed, this variation in formulation constitutes a change in material.

The use of reprocessable and/or recyclable material with agreed specification shall be considered as a change in material when the change in addition exceeds the tolerance bands given in Table 1.

The values of the parts  $X$  to be added to 100 parts of PVC resin shall be specified by the manufacturer in his quality plan.

**Table 1 — Material specification PVC compound**

Ingredients	Type	Band
PVC resin	Nominal K-value: as specified	+3/-0 units
Type and content of stabiliser or master batch	1) Pb 2) Ca-Zn 3) Sn 4) Ca-Sn 5) others	$X_1: \pm 25 \%$
Lubricants	all	$X_2: \pm 50 \%$ for $X_2 \leq 0,2$ $X_2: \pm 0,1$ parts for $X_2 > 0,2$
Fillers	1) $\text{CaCO}_3$ 2) others	$X_3: +0,-6$ parts $X_{4,1}: +0,-50 \%$ $X_{4,n}: +0,-50 \%$
Impact modifiers	all	$X_5: \pm 1$ part
Flow agents	all	$X_6: \pm 25 \%$ for $X_6 \leq 2$ $X_6: \pm 0,5$ parts for $X_6 > 2$
Pigments		No requirement
Others	To be separately specified by the manufacturer	$X_{7,1}: \pm 25 \%$ $X_{7,n}: \pm 25 \%$

**Table 2 — Specification of PVC reprocessable and recycling material**

Ingredients	Type	Band
External reprocessable and recyclable material	With an agreed specification <sup>a</sup>	$X_8: +0/- X_8^b$
	External and internal layers	See limitations in B.2 of prEN 13476-1:2002
External reprocessable and recyclable material	With an agreed specification <sup>a</sup>	$X_9: +0/- X_9^b$
	Specified intermediate layers	See limitations in B.2 of prEN 13476-1:2002
<sup>a</sup> The specification shall be declared by the manufacturer to the certification body.		
<sup>b</sup> Provided the tolerances of Table 1 are still met.		

**4.2.1.2 Material specification PP**

For the purposes of this Technical Specification the material specification consists of a recipe/compound having a polypropylene with specific product name and grade and additives with known dosage level.

When master batch is used it shall be considered a change of material when modifications exceed the tolerance bands given in Table 3.

The use of reprocessable and/or recyclable material with agreed specification shall be considered as a change in material when the change in addition exceeds the tolerance bands given in Table 4.

**Table 3 — Material specification PP master batch**

Ingredients	Type	Band
Stabiliser	Per individual type	$X_1: \pm 25 \%$
Fillers	Per individual type	$X_{2,1}: +0/- X_{2,1}$
		$X_{2,n}: +0/- X_{2,n}$
Pigments		No requirement

**Table 4 — Specification of PP reprocessable and recycling material**

Ingredients	Type	Band
External reprocessable and recyclable material	With an agreed specification <sup>a</sup>	$X_3 +0/- X_3^b$
	External and internal layers	See limitations in D.2 of prEN 13476-1:2002.
External reprocessable and recyclable material	With an agreed specification <sup>a</sup>	$X_4 +0/- X_4^b$
	Specified intermediate layers	See limitations in D.2 of prEN 13476-1:2002.
<sup>a</sup> The specification shall be declared by the manufacturer to the certification body.		
<sup>b</sup> Provided the tolerances of Table 3 are still met.		

**4.2.1.3 Material specification PE**

For the purposes of this Technical Specification the material specification consists of a recipe/compound having a polyethylene with specific product name and grade and additives with known dosage level.

When master batch is used it shall be considered a change of material when modifications exceed the tolerance bands given in Table 5.

The use of reprocessable and/or recyclable material with agreed specification shall be considered as a change in material when the change in addition exceeds the tolerance bands given in Table 6.



Table 5 — Material specification PE master batch

Ingredients	Type	Band
Stabiliser	Per individual type	$X_1: \pm 25 \%$
Fillers	Per individual type	$X_{2,1}: +0/- X_{2,1}$ $X_{2,n}: +0/- X_{2,n}$
Pigments		No requirement

Table 6 — Specification of PE reprocessable and recycling material

Ingredients	Type	Band
External reprocessable and recyclable material	With an agreed specification <sup>a</sup> External and internal layers	$X_3 +0/- X_3$ <sup>b</sup> See limitations in F.2 of prEN 13476-1:2002
External reprocessable and recyclable material	With an agreed specification <sup>a</sup> Specified intermediate layers	$X_4 +0/- X_4$ <sup>b</sup> See limitations in F.2 of prEN 13476-1:2002
<sup>a</sup> The specification shall be declared by the manufacturer to the certification body.		
<sup>b</sup> Provided the tolerances of Table 5 are still met.		

#### 4.2.2 Grouping

For the purposes of this Technical Specification the following groups shall apply.

##### 4.2.2.1 Size group

A group of nominal sizes DN. Three size groups are defined as given in Table 7.

Table 7 — Definition of size groups

Size group no:	DN/OD	DN/ID
1	110 to 200	100 to 180
2	over 200 to 500	over 180 to 560
3	over 500 to 1200	over 560 to 1200

##### 4.2.2.2 Fitting group

A group of fitting types having a similar design. Three fitting groups are defined as follows:

- Fitting group 1: Bends;
- Fitting group 2: Branches;
- Fitting group 3: Other fittings.

Push-fit fittings and fusion fittings shall be considered separately for each group.

#### 4.2.3 Type tests (TT)

##### 4.2.3.1 General

Type tests shall demonstrate that products conform to all requirements for the characteristics given in Table 8, Table 9 and Table 10, as applicable.

Type test shall be carried out on products manufactured using virgin material and in case reprocessable and/or recyclable material according to Table 2, Table 4 or Table 6 is intended to be used also on products manufactured using the maximum amount of reprocessable or recyclable material which is intended to be used unless the addition is in accordance with B.3, D.3 or F.3 of prEN 13476-1:2002.

In addition relevant type tests shall be carried out whenever there is a change in design, in material including use of reprocessible or recyclable material, see Table 2, Table 4 or Table 6 and/or in the production method, other than routine in-process adjustments and to extensions of the product range as indicated in the same tables.

In the case of change of material or extended use of reprocessible or recyclable material the type testing (TT) can be carried out by the manufacturer on the characteristics specified for such occasions in Column M of Table 8, Table 9 and Table 10. An audit test shall be made within 6 months to verify the result of the TT.

**Table 8 — Characteristics of pipes that require type testing**

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Testing relevant to <sup>a</sup>					Sampling procedure (minimum sampling) Generally per design family
		N	D	M	P	E	
Melt mass-flow rate (MFR-value)	Table 2 or 3	+		+			one sample/material
Resistance to internal pressure <sup>b</sup>	Table 1, 2 or 3	+		+			one sample/material
Thermal stability (OIT) <sup>c</sup>	Table 2 or 3	+		+			one sample/material
Density	Table 3	+		+			one sample/material
Appearance	6.1	+	+	+	+	+	one sample/size group
Colour	6.2	+		+		+	one sample/size group
Dimensions	7.2; Tables 5, 6 and 7	+	+		+	+	one sample/size/stiffness class
Vicat softening temperature	Table 8	+		+			One sample/material
Resistance to dichloromethane	Table 8	+		+		+	one sample/size group/material
Longitudinal reversion Type A1 and A2 pipes	Table 8, 10 or 12	+	+	+	+	+	one sample/size group
Oven test, Type B pipes	Table 8, 10 or 12	+	+	+	+	+	one sample/size group
Impact resistance (round the clock method)	Table 14	+	+	+	+	+	one sample/size group/material
Impact strength (staircase method) <sup>d</sup>	Table 16	+	+	+	+	+	one sample/size group/material
Ring stiffness	Table 14	+	+	+	+	+	one sample/size group/ SN class and for each material
Ring flexibility	Table 14	+	+	+	+	+	one sample/ size group/ SN class and for each material
Creep ratio	Table 14	+	+	+	+	+	/design family <sup>e</sup> /material
Tensile strength of seam	Table 14	+	+	+	+	+	/dimension/material
Marking	Table 19	+				+	one sample/size group

<sup>a</sup> N: new system  
D: change of design (only for characteristics affected by the change)  
M: change of material  
P: change of production method (only for characteristics affected by the change)  
E: extension of the product range (except the products already covered by the minimum sampling procedure).

<sup>b</sup> On the smallest diameter produced.

<sup>c</sup> Only applicable for components for fused joints

<sup>d</sup> Only for pipes intended also to be installed at temperature below -10 °C. If this test is required, then the round-the-clock method is not necessary.

<sup>e</sup> By design family is understood designs with the same ratio between the neutral diameter of the pipe wall and the maximum distance to the outer or inner profile.

Table 9 — Characteristics of fittings that require type testing

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Testing relevant to <sup>a</sup>					Sampling procedure (minimum sampling) Generally per design family
		N	D	M	P	E	
Melt mass-flow rate (MFR-value) <sup>b</sup>	Table 2, 3 or 4	+		+			one sample/material
Resistance to internal pressure <sup>b</sup>	Table 1, 2, 3 or 4	+		+			one sample/material
Thermal stability (OIT) <sup>b</sup>	Table 2, 3 or 4	+		+			one sample/material
Density	Table 3 or 4	+		+			one sample/material
Appearance	6.1	+	+	+	+	+	one sample/size group/fitting group
Colour	6.2	+		+	+	+	one sample/size group/fitting group
Dimensions	7.2; Table 5 or Table 6	+	+		+	+	one sample of each fitting
Vicat softening temperature <sup>b</sup>	Table 9	+		+			one sample/material
Effect of heating	Table 9, 11, 13 as applicable	+	+	+	+	+	one sample/size group/fitting group
Stiffness	Table 17	+	+	+		+	/size/fitting group 1 and 2; largest degree of bend for the size, 45° branch
Impact strength (Drop test)	Table 17	+	+	+	+	+	one sample/size group/fitting group/socket design
Flexibility or mechanical strength	Table 17	+	+		+	+	one sample/size group/fitting group
Marking	Table 20	+			+	+	one sample/size group/fitting group

<sup>a</sup> See footnote 1 of Table 8.  
<sup>b</sup> Not to be repeated for fittings material when the material is the same as for pipes and already tested for that purpose.

Table 10 — Characteristics of fitness for purpose of the system that require type testing

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Testing relevant to <sup>a</sup>					Sampling procedure (minimum sampling)
		N	D	M	P	E	
Tightness of elastomeric sealing ring joints	Table 18	+	+	+ <sup>b</sup>		+	one sample/size group/joint design <sup>c</sup>
Resistance to combined temperature cycling and external loading	Table 18	+	+	+	+	+	once/size group/fitting group/ and pipe joint, lowest stiffness class.
Elevated temperature cycling	Table 18	+	+	+			one test assembly per joint design on the lowest produced stiffness class <sup>c</sup>
Long-term performance of TPE- seals	Table 18	+	+	+ <sup>b</sup>		+	one sample/sealing material/ size group/joint design <sup>c</sup>
Tensile test of welded or fused joint	Table 18	+	+	+	+	+	/joint design/size group

<sup>a</sup> See footnote 1 of Table 8.  
<sup>b</sup> Change of elastomeric material.  
<sup>c</sup> Joint design at least includes: seal design, groove geometry and seal hardness ( $\pm 5$  IHRD).

**4.2.3.2 Preliminary type testing (PTT)**

The manufacturer shall demonstrate that all products conform to all requirements for all the characteristics given in Table 8, Table 9 and Table 10, as applicable.

**4.2.3.3 Initial type testing (ITT)**

If third party certification is involved, the certification body shall assess the conformity of a product to all requirements for the characteristics given in Table 8, Table 9 and Table 10, as applicable.

The assessment shall be performed by validation or testing, using the sampling procedure in Table 8, Table 9 and Table 10, as applicable, and grouping according to 4.2.2, in an approved testing laboratory or by witness testing.

Validated preliminary test data including long-term characteristics, supplied by the manufacturer and traceable to material or compound and process shall be taken into account for initial type testing.

**4.2.4 Batch release tests (BRT)**

The production shall be considered at least one batch when reprocessable or recyclable material as specified in Table 11 is used.

**Table 11 — Specification of use of reprocessable and recyclable material that shall require the production to be considered at least as one batch.**

External reprocessable and recyclable material	Not covered by an agreed specification, ext. layers	max. 5 or 10 % See B.3.1 and B.3.2 of prEN 13476-1:2002, PVC See D.3.1 and D.3.2 of prEN 13476-1:2002, PP See F.3.1 and F.3.2 of prEN 13476-1:2002, PE
External reprocessable and recyclable material	Not covered by an agreed specification, int. layers	$\leq X_{11}$ See B.3.1 and B.3.2 of prEN 13476-1:2002, PVC See D.3.1 and D.3.2 of prEN 13476-1:2002, PP See F.3.1 and F.3.2 of prEN 13476-1:2002, PE

Those characteristics specified in prEN 13476-1 and listed in Table 12, Table 13 or Table 14, as applicable, shall be batch release tested with the minimum sampling frequency as given in these tables.

The manufacturer shall specify a batch or a lot size in his quality plan.

A batch or lot shall only be released for supply when all the relevant tests and inspections have been carried out at least once at the specified frequencies and the requirements have been conformed to.

If a product fails in respect of any characteristic given in Table 12, Table 13 or Table 14, the batch or lot shall be rejected or the retest procedures shall be performed for the characteristic on which the product failed. The following procedures shall be followed.

Find the last product, which conforms to the requirements as specified in prEN 13476-1. Release all products produced before that point and reject the products produced after that point.

Procedures for dealing with rejected products shall be detailed in the manufacturer's quality plan.

**Table 12 — Material characteristics that require BRT**

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Minimum sampling frequency
MFR	Table 2, 3 or 4	Material batch

**Table 13 — Characteristics of pipes and minimum sampling frequencies for BRT**

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Minimum sampling frequency
Appearance/colour	6.1 and 6.2	once/8 h/machine
Mean outside diameter and minimum inside diameter	Tables 5, 6, 7 7.2.3	once/8 h/machine and start up of machine
Wall thickness	Table 5 7.2.3; 7.2.5.1	once/8 h/machine and start up of machine
Length of pipe and where required chamfer	7.2.2	once/8 h/machine and start up of machine
Socket dimensions <sup>a</sup>	Table 6, 7 7.2.4	once/8 h/machine and start up of machine
Spigot dimensions <sup>a</sup>	Table 5, 6, 7 7.2.4	once/8 h/machine and start up of machine
Impact resistance <sup>b</sup> (round-the-clock method)	Table 14	once/24 h /machine and start up of machine
Impact resistance <sup>b</sup> (Stair case method)	Table 16	once/24 h /machine and start up of machine
Ring stiffness	Table 14	/start up
Ring flexibility	Table 14	/start up
Tensile strength of seam	Table 14	/start up
Longitudinal reversion, type A1 and A2 pipes	Table 8, 10 or 12	once/week/machine and start up of machine
Oven test, type B pipes	Table 8, 10 or 12	once/week/machine and start up of machine
Marking	Table 19	once/8 h/machine
<sup>a</sup> For dimensions which are influenced by the process.		
<sup>b</sup> Pipes marked with ❄ (ice crystal) shall be tested with the stair case method and do not have to be tested with the round the clock method.		

**Table 14 — Characteristics of fittings and minimum sampling frequencies for BRT**

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Minimum sampling frequency
Appearance/colour	6.1 and 6.2	one sample/cavity/8 h
Wall thicknesses <sup>a</sup>	7.2.5	one sample/cavity/8 h
Spigot dimensions <sup>a</sup>	Table 6, 7, 9, 11 and/or 13 7.2.3; 7.2.4 or 7.2.5	one sample/cavity/8 h
Socket dimensions <sup>a</sup>	Table 7 7.2.4	one sample/cavity/8 h
Effect of heating <sup>b</sup>	Table 9	one sample/cavity/24 h and start up
Water tightness	Table 18	One sample/8 h /fitting
Marking	Table 20	once /cavity at start up
<sup>a</sup> For dimensions which are influenced by the process.		
<sup>b</sup> Only PVC-U fittings		

#### 4.2.5 Process verification tests (PVT)

Those characteristics specified in prEN 13476-1 and listed in Table 15 shall be process verification tested with the minimum sampling frequency as given in this table, if not type tested in the same period.

**prCEN/TS 13476-2:2002 (E)**

If a product does not conform to the requirements in respect of any characteristic given in Table 15, the retest procedure detailed in the manufacturer's quality plan shall be performed. If third party certification is involved, the certification body shall be informed.

If the retest procedure does not confirm conformity of the product to the requirements, then the process shall be investigated and corrected in accordance with the procedures given in the manufacturer's quality plan, as well as to verify the characteristics given in Table 15.

**Table 15 — Characteristics and minimum sampling frequencies for PVT**

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Minimum sampling frequency
<b>Pipes</b>		
Resistance to internal pressure <sup>a</sup>	Table 1, 2 or 3	once/year/material currently used
<b>Fittings</b>		
Resistance to internal pressure <sup>a b</sup>	Table 1, 2, 3 or 4	once/year/material currently used
Effect of heating, only PP and PE	Table 11 or 13	once year/fitting group
Flexibility or mechanical strength (Only fabricated fittings)	Table 17	once year/fitting group/size group
<b>The system</b>		
Tightness of elastomeric sealing ring joints <sup>c</sup>	Table 18	once/2 years/size group/joint design
Elevated temperature cycling	Table 18	once/2 years/joint design/lowest SN and material currently used
Long-term performance of TPE-seals	Table 18	once/2 years/seal material/ size group
Tensile test of welded or fused joint	Table 18	once/2 years/size group/joint design
<sup>a</sup> To be tested in pipe form with an optional diameter. <sup>b</sup> Not to be repeated for fittings material when the material is the same as for pipes and already tested for that purpose. <sup>c</sup> Joint design at least includes: seal design, groove geometry and seal hardness ( $\pm 5$ IHRD).		

**4.2.6 Audit tests (AT)**

If third party certification is involved, those characteristics specified in prEN 13476-1 and listed in Table 16 are intended to be audit tested with the minimum sampling frequency as given in this table.

Table 16 — Characteristics and minimum sampling frequencies for AT

Characteristic	Reference to clauses and tables of prEN 13476-1:2002	Minimum sampling frequency
<b>Pipes</b>		
Resistance to internal pressure <sup>a</sup>	Table 1, 2 or 3	once/year
Thermal stability	Table 2 or 3	once/year/material currently used
Density	Table 3	once/year
Appearance/colour	6.1 and 6.2	once/year/size group
Dimensions	7.2.2; 7.2.3,7.2.4; 7.2.5.1; Tables 5, 6,	once/year/size group
<b>Fittings</b>		
Resistance to internal pressure <sup>a,c</sup>	Table 1, 2, 3 or 4	once/year
Thermal stability <sup>cd</sup>	Table 2,3 or 4	once/year/material currently used
Density	Table 3 or 4	once/year/material
Appearance/colour	6.1/6.2	once/year/size group/fitting group
Dimensions	7.2.3; 7.2.4; 7.2.5; Tables 5, 6	once/year/size group/fitting group
Vicat softening temperature <sup>c</sup>	Table 9	once/year/material
Effect of heating	Table 9, 11 or 13	once/year/size group
Impact strength, drop test	Table 17	once/2 years/size group/fitting group/joint design
Stiffness	Table 17	once/2 years/size group/fitting group/ stiffness class
Flexibility or mechanical strength <sup>d</sup>	Table 17	once/ year/size group/stiffness class
Marking	Table 20	once/ year/size group/fitting group
<b>The system</b>		
Tightness of elastomeric sealing ring joints	Table 18	once/year/size group/joint type
Resistance to combined temperature cycling and external loading	Table 18	once/2 years/joint type/lowest stiffness class
Elevated temperature cycling	Table 18	once/2 years/joint type
Long-term performance of TPE-seals	Table 18	once/2 years/size group
Tensile test of welded or fused joint	Table 18	once/ year/size group/joint design
NOTE 1 The sizes, types and classes selected for tests should be primarily those which have not previously been selected for AT. Samples should be preferably taken from the largest volume of production per group.		
NOTE 2 It is expected that AT will be carried out over at least two visits every year.		
NOTE 3 A test performed as an AT does not have to be repeated as a PVT.		
<sup>a</sup> To be tested in pipe form. <sup>b</sup> Only for pipes intended to be installed at temperature below -10 °C. If this test is required, then the round-the-clock method is not necessary. <sup>c</sup> Not to be repeated for fittings material when the material is the same as for pipes and already tested for that purpose. <sup>d</sup> Only applicable for components for fused joints		

#### **4.2.7 Indirect tests (IT)**

Generally testing shall be performed according to the test methods referred to in prEN 13476-1. Indirect testing may be used for BRT characteristics as given in Tables 12, 13 and 14. Indirect testing shall not be applied to TT, PVT and AT.

The indirect test method used and the correlation or safe relationship of the indirect testing to the specified testing shall be documented in the manufacturer's quality plan and the IT shall be agreed with the certification body. The continuing validity of the indirect testing shall be checked at regular intervals.

In case of dispute the BRT specified in Table 12, Table 13 or Table 14 shall be used.

If third party certification is involved, the IT shall be acceptable to the certification body.

NOTE Indirect testing can be used to reduce the frequency of the specified BRT, but it is not intended to replace these tests completely.

#### **4.2.8 Inspection records and test records**

Unless otherwise specified all records of BRT shall be maintained for a minimum of 2 years and all other records for a minimum of 4 years.



## Bibliography

- [1] EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*
- [2] EN 45011, *General requirements for bodies operating product certification systems (ISO/IEC Guide 65:1996)*
- [3] EN 45012, *General requirements for bodies operating assessment and certification/registration of quality systems (ISO/IEC Guide 62:1996)*
- [4] EN ISO 9000:2000, *Quality management systems - Fundamentals and vocabulary (ISO 9000:2000)*
- [5] Guidance Paper B (concerning the Construction Products Directive 89/106/EC): *The definition of factory production control and technical specifications for construction products*