AENOR N Mark Specific Rules for pipes made of oriented unplasticized poly (vinyl chloride) (PVC-O) for the conveyance of water under pressure_RP 001.53

Note: This document is a translation of the Spanish document RP 01.53 rev. 9 approved by the Plastics Technical Certification Committee (CTC-001). Spanish version always prevails over this translation.

RP 001.53

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1 Purpose and scope

This document aims to define the procedure for the application, granting and maintenance of the N Mark of pipes made of oriented unplasticized poly (vinyl chloride)(PVC-O), for piping systems intended to be used underground or above-ground where not exposed to direct sunlight, for water mains and services, pressurized sewer systems and irrigation systems, complementing the N Mark Specific Rules for plastic materials – common requirements (RP 001.00).

The General Rules always prevail over the present Specific Rules.

The N mark for pipes made of oriented unplasticized poly (vinyl chloride) (PVC-O), hereafter the Mark, denotes product compliance with the standard UNE-EN 17176-1:2019, UNE-EN 17176-2:2019+A1:2023, UNE-EN 17176-5:2019, ISO 16422-1:2024, ISO 16422-2:2024 e ISO 16422-5:2024 and SANS 16422:2016.

2 Definition and special requirements

Clasification of material: Depending on the degree of orientation determined that defines its properties: PVC-O 315; PVC-O 355; PVC-O 400; PVC-O 450; PVC-O 500.

Class: it is consider a class the set of pipes that have the same diameter and nominal wall thickness, inside the same classification of material.

Type: Depending on the connection system, the following types are established:

- Type 0: Plain pipes
- Type 1: Pipes with integrated socket by gluing (self-locking)
- Type 2: Pipes with smooth ends elastomeric sealing ring (not self-locking)

Together with the application form, the "provisional reference curve" will be presented according to Annex A of standart ISO 16422-2:2024 o UNE-EN 17176-2:2019+A1:2023, in order to classify the material with which the pipes are made. After 18 months the "final reference curve" will be presented.

Diameter group: Depending on the diameters, the following groups are established:

- Group 1: $dn < 75$
- Group 2: $75 \leq dn < 250$

- Group 3: 250≤dn<710
- Group 4: 710≤dn≤1000

WATER QUALITY FOR HUMAN CONSUMPTION

With regard to potential adverse effects on water quality for human consumption caused by the products covered by the products standards, the clients of the N Mark, will provide to AENOR during the inspection visit the evidence that their product complies with the RD 3/2023, either through migration tests in accordance with the UNE-EN 12873 standard carried out every 5 years and/or certificates issued by competent bodies

3 Sampling and testing for granting and maintaining the product N Mark certificate

3.1 Test to be carried out in factory (See RP 001.00)

AENOR will carry out the tests indicated in table 1 during the initial or surveillance inspection.

3.2 Sampling and tests to be carried out by the laboratory (See RP 001.00)

AENOR will select and marked the necessary samples to carry out in the laboratory the tests indicated in table 1.

The client will send the selected samples to the laboratories indicated by the AENOR, in a maximum term 7 days since the date of inspection. In case that the laboratory requested be necessary, the client of the certificate will send technical personnel for welds or assemblies needed to carry out the tests.

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TABLE 1

	TESTS	GRANTING/MAINTANING	VALUATION OF RESULTS
TESTS TO BE CARRIED OUT BY THE INSPECTOR IN THE FACTORY	Appearance	10 pipes at random	1
	Mean Outside diameter	1 pipe per class	2
	Wall thickness	1 pipe per class	3
	Ovality	1 pipe / diameter	2
	Mean inside diameter of the socket (type 1 and 2)	1 pipe / diameter	2
	Socket lenght (2)	Types 1: 1 pipe / diameter	2
	Pipe length (4)	10 pipes / type	2
TESTS TO BE CARRIED OUT BY THE LABORATORY	Opacity (5)	1 pipe, selecting the one with the lowest thickness	1
	Density (7) (Only UNE-EN 17176)	1 class randomly	1
	Orientation factor (Only UNE-EN 17176)	5% of the classes, minimum 1 DN per diameter group	1
	Impact resistance (Note 1)	15% of the classes minimum 2	1
	Ring stiffness	20% of the classes, minimum 2 per SN	1
	Uniaxial tensile strength (6)	5 % classes, minimum 2	1
	Vicat softening temperature (7)	1 class at random /clasification of the material	1
	Resistance to internal pressure 10 h-20°C (2) (*)	5% classes /clasification of the material	1
	Resistance to internal pressure 1000 h-20°C (2) (**)	1 class at random /clasification of the material	1
	Resistance to internal pressure 1000 h-60°C (2) (***)	1 class at random / clasification of the material (Only at granting and every five years)	1
	Resistance to internal pressure for pipes with integrated socket	1 class / type of assembly and joint	1
	FUNCTIONAL REQUIREMENTS		
	Short term pressure test for leaktighness of the assemblies and with angular deviation (UNE-EN ISO 13845, Only type 2)	1 class / type of assembly and joint	1
	Short term negative pressure test for leaktighness of the assemblies (UNE-EN ISO 13844, Only type 2)	1 class / type of assembly and joint	1
	Long term hydrostatic internal pressure (UNE-EN ISO 13846, Only type 2)	1 class / type of assembly and joint	1
	Pressure and bending test for leaktightness and strength (for end-load-bearing joints) (Only ISO 16422)	1 class / type of assembly	1

Note 1: Test carried out in accordance with standard UNE-EN ISO 3127 with the following additional specifications:

- The test may be interrupted if no failure occurs in the first 25 blows or if 8 breaks are achieved. In any other case, the test shall continue until at least 50 impacts have been completed.
  In both cases, all test specimens that have been started must be completed.

- The drop speed of the impact equipment's striker must be verified and/or measured. All masses and heights specified in the product standards must be verified so that a specific correction can be applied per machine: either to the mass of the striker or to its drop height. These corrections must be calculated at a minimum of 95% of the theoretical drop speed of the striker.

Example:

$$V_{\text{teórica}} = \sqrt{2 \cdot g \cdot h_{\text{teórica}}}$$

$$V_{\text{corregida}} = 0{,}950 \cdot V_{\text{teórica}}$$

$$h_{\text{corregida}} \geq \frac{V^2_{\text{corregida}}}{2g}$$

The following criterion shall apply:

If the TIR ≤ 10%; compliant.

If the TIR > 10%; non-compliant.

The IRR is calculated with the following formula with a confidence level of 90%.

TIR = (number of breaks/ total number of impacts) x 100 x 0.9

(2) According to Annex B of the ISO 16422-2 and UNE-EN 17176-2 standards.

(3) See table 5 according to UNE-EN 17176-2 and table 4 according to ISO 16422-2.

(4) It will be the length defined by the manufacturer. In case of UNE-EN 17176, tolerances of table 2 of the standard must be applied.

(5) When the manufacturer declares it.

(6) In case of dispute, conform ISO 16422 or SANS 16422, the method of resistance of dichloromethane should be used on preformed pipe. Conform UNE-EN 17176-2 and ISO 16422-2 the method of DSC should be used.

(7) It shall be performed on preformed pipe. During the inspection visit, the inspector will sample preformed pipe.

(*) For one of the classes that this test is applicable, the test of integrated pipe according to the point 9.1.3 of the standard ISO 16422-2 and UNE-EN 17176-2, in case of failure, it would not be necessary to perform the test on the pipe according to the point 9.1.1 of the standard ISO 16422-2 and UNE-EN 17176-2. It will only be applicable to the other classes that correspond 5% of the classes.

(**) For 20°C, it is necessary to perform this test on pipes with integral sockets, according to point 9.1.3 of the Product Standard ISO 16422-2 and UNE-EN 17176-2. If there is no evidence of the failure, it would

not be necessary to perform the test on the pipe according to point 9.1.1 of the product standard ISO 16422-2 and UNE-EN 17176-2.

(***) For 60°C, it is necessary to perform this test on plain pipes, according to point 9.1.2 of the Product Standard ISO 16422-2 UNE-EN 17176-2.

4 Manufacturer internal control

4.1 Characteristics under factory production control (See RP 001.00)

– Raw materials

The client must ensure that the mixtures and compounds involved in the manufacture of pipes having appropriate characteristics of the pipes have the appropriate characteristics to comply with the requirements of the standard.

– Controls on the final product

Tests and their frequency are stated in table 2, as proceed.

TABLE 2

TESTS	FREQUENCY
Appearance	Every 4 h / production line
Mean outside diameter	
Wall thickness	
Ovality	
Socket length	
Pipe lenght (4)	
Mean inside diameter of the socket (type 1 and 2)	
Opacity (2)	Whenever the formulation changes in any of the components that affect this feature
Value of K	Certificate of raw material per each delivery batch
Density (7) (Only UNE-EN 17176)	Once a year/ 1 class randomly
Orientation factor (Only UNE-EN 17176)	Once a year/ Group diameters and PN
Impact resistance (Note 1)	Once per production period
Ring stiffness	Once per production period
5 Markingensile strength or dichloromethane or DSC (5)	Once per production period
Resitance to internal pressure 10 h-20°C (3)	Once per production period. Minimum 1/week
Resistance to internal pressure 1000 h-20°C (3)	Once a year / 1 class/ clasification of the material
Resistance to internal pressure 1000 h-60°C (3)	
Vicat softening temperature (6)	
Resistance to internal pressure for pipes with integral sockets	Minimum once a year per type of assembly and joint
FUNCTIONAL REQUIREMENTS	
Short term pressure test for leaktighness of the assemblies and with angular deviation (UNE-EN ISO 13845, Only type 2)	Minimum once a year 1 class / type of assembly and joint
Short term negative pressure test for leaktighness of the assemblies (UNE-EN ISO 13844, Only type 2)	
Long term hydrostatic internal pressure (UNE-EN ISO 13846, Only type 2)	
Pressure and bending test for leaktightness and strength (for end-load-bearing joints) (ISO 16422)	

Note 1: Test carried out in accordance with standard UNE-EN ISO 3127 with the following additional specifications:

- The test may be interrupted if no failure occurs in the first 25 blows or if 8 breaks are achieved. In any other case, the test shall continue until at least 50 impacts have been completed.
  In both cases, all test specimens that have been started must be completed.

- The drop speed of the impact equipment's striker must be verified and/or measured. All masses and heights specified in the product standards must be verified so that a specific correction can be applied

per machine: either to the mass of the striker or to its drop height. These corrections must be calculated at a minimum of 95% of the theoretical drop speed of the striker.

Example:

$$V_{\text{teórica}} = \sqrt{2 \cdot g \cdot h_{\text{teórica}}}$$

$$V_{\text{corregida}} = 0{,}950 \cdot V_{\text{teórica}}$$

$$h_{\text{corregida}} \geq \frac{V^2_{\text{corregida}}}{2g}$$

The following criterion shall apply:

If the TIR ≤ 10%; compliant.

If the TIR > 10%; non-compliant.

The IRR is calculated with the following formula with a confidence level of 90%.

TIR = (number of breaks/ total number of impacts) x 100 x 0.9

2) When the manufacturer declares it.
3) See table 5 according to UNE-EN 17176-2 and table 4 according to ISO 16422-2.
4) It will be the length defined by the manufacturer. In case UNE-EN 17176-2, should apply tolerances according to table 2 of this standard.
5) The manufacturer may choose to perform the resistance test dichloromethane (on preformed pipe), the uniaxial tensile, or DSC.
6) It shall be performed on preformed or reversed pipe.

5 Marking of certified products

The marking of the pipes will be carried out every meter. The minimum required marking of the pipe is the following:

— Reference to the word AENOR.

— N Mark logotype, with a size not less than 5mm.

— Number of the contract signed with AENOR or certificate number: 001/XXX.

— Trademark.

— Material of the pipe (PVC-O) and its classification.

— Nominal external diameter x wall thickness.

— Nominal pressure (in bar).

— Service ratio (design) C.

— Manufacturer´s information (manufacturing period, year, month, etc).

— Number of the applicable standard ISO 16422, SANS 16422 o UNE-EN 17176.

Example:

AENOR - N - 001/XXX - Nº 001 / XXX – Trademark - PVC-O 400 - 160 x 4,9 - PN 16 - C 1,6 - Manufacturer's information – ISO 16422 or SANS 16422 or UNE-EN 17176

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Annex C

Description Questionnaire for PVC-O Pipes

CLIENT:

SITE OF MANUFACTURE:

PRODUCT:

STANDARD(S):

UNE-EN 17176 ☐ ISO 16422 ☐ SANS 16422 ☐

TRADEMARK (S):

DATE:

DIAMETER (mm)	PN (Bar)	MATERIAL CLASSIFICATION	DESIGN COEFFICIENT	JOIN SYSTEM

For any change of these date, the client will send on duplicate to the Committee Secretary this descriptive questionnaire updated.

…….…… on …… of …… 20……

SIGNATURE AND STAMP OF THE MANUFACTURER