

**RIGID NON-PLASTICISED
PVC PIPES AND FITTINGS****Technical document No.°055-05**

Specifications applicable to the Biaxially-Oriented
Pressure Group

Technical document: 055-05 rev 00
21/12/2018

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MODIFICATION HISTORY

| Revision no. | Application date | Modifications |
|---------------------|-------------------------|--|
| 00 | 21/12/2018 | Update to the document layout and reference |

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Part 1. SCOPE

This Technical Document deals with the biaxially-oriented pressure group.

1.1 APPLICABLE REFERENCE STANDARDS AND COMPLEMENTARY SPECIFICATIONS

1.1.1 Reference standards

NF T 54-948 (February 2010) Plastics piping systems for water transport under pressure — Pipes made of biaxial oriented poly(vinyl chloride) (PVC-BO) and their joints — Specifications.

1.1.2 Other Standards

NF EN ISO 3126 (September 2005) Plastics piping systems — Plastics components — Determination of dimensions.

NF EN ISO 1452 (January 2010) Plastic piping systems for water supply — Unplasticised poly (vinyl chloride) (PVC-U).

Part 1: General.

Part 2: Pipes.

Part 3: Fittings.

Part 4: Taps and Auxiliary Equipment.

Part 5: System's Suitability for Use.

NF T 54-029 (February 1981) – Non-plasticised moulded PVC fittings, pressure series — Specifications.

NF EN 545 (August 2002) Ductile iron pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods (Classification Index: A 48-801).

NF EN 12842 (May 2000) Ductile iron fittings for PVC-U or PE piping systems — Requirements and test methods (Classification Index: A 48-880).

NF EN 805 (June 2000) Water supply — Requirements for systems and components outside buildings.

1.1.3 Complementary specifications

The reference specifications and test methods for the NF Mark Rigid Non-plasticised PVC Pipes and Fittings are defined in the tables below. They are based on the abovementioned standards with possible additions or changes.

1.1.4 Admission ranges

The admission range presented during the first application must, at a minimum, include the following products: 5 types of tubes.

This range may be produced on 1 or multiple sites with the same trade name.

TABLE 1 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY

Specifications for pipes

| Characteristics and Test methods (3) | Specifications |
|--|---|
| Reference standard | NF T 54-948 |
| Appearance Marking | (1) |
| Dimensions (2) | Tables 4, 5 and 6 |
| Sockets | NF T 54-948 |
| Determining axial and tangential orientation coefficients Test in accordance with NF T 54-948 Appendix A | According to table 1 (classifying pipes) of Standard NF T 54-948 |
| Density (2) NF EN ISO 1183-1 (1987) | 1370 to 1430 kg/m ³ |
| Axial tension characteristics NF EN ISO 6259-1 and ISO 6259-2 (2) (maximum stress) | TS ≥ 48 MPa |
| Axial and tangential orientation coefficient | Lambda a: axial orientation coefficient ≥1.0 Lambda t: tangential orientation coefficient compliant with Table 1 of Standard NF T 54-948 |
| Resistance to pressure at 20°C – short duration Pipes NF EN ISO 1167-1-2 Type B end pieces (2) | Resistance ≥ 10 hours (stress given in table 5 of standard NF T 54-948 and calculated according to the nominal thickness and nominal diameter* Tables 4, 5, 6 and 7 of this technical document) *(option b from standard NF EN ISO 1167-1 paragraph 7.1) |
| Resistance to pressure at 20°C – long duration Pipes NF EN ISO 1167-1-2 Type B end pieces (2) | Resistance ≥ 1000 hours (stress provided in table 5 of standard NF T 54-948. Pressure calculated according to the minimum thickness measured and the average external diameter measured*) *(option a from standard NF EN ISO 1167-1 paragraph 7.1) |
| Resistance to pressure at 20°C – long duration Pipes NF EN ISO 1167-1-2 Type B end pieces (2) | Resistance ≥ 3000 hours (stress to be defined according to the different regression curves. The class of pipe is determined by the regression curve of the product in question) (Pressure calculated according the minimum thickness measured and the average external diameter measured*) *(option a from Standard NF EN ISO 1167-1 paragraph 7.1) |
| Resistance to pressure at 60°C long duration NF EN ISO 1167-1-2 (2) | Resistance ≥ 1000 hours (stress provided in table 5 of Standard NF T 54-948 and calculated according to the minimum thickness measured and the average external diameter measured*) *(option a from Standard NF EN ISO 1167-1 paragraph 7.1) |
| Impact resistance NF EN 744 - method (2) D90 Striker, 15 kg Mass, 2.0 m Height at 20°C NF T 54-948 specifications | TIR ≤ 10% |
| Ring stiffness NF EN ISO 9969 | The minimum values of ring stiffness (KN/m ²) according to DN are provided in table 6 of Standard NF T 54-948 |
| Verification of the absence of lead | ≤ 0.1% |

- (1) The internal and external surfaces of the pipes must be smooth, clean and free of streaks or other defects likely to prevent them from meeting the requirements of this technical document.
The ends of the pipes must be cut cleanly and perpendicular to the pipes' axis.

For pipes with wall thickness, t_h , greater than or equal to 3 mm, the spigots must be chamfered in accordance with Figure 1 of standard NF T 54-948 and the chamfer angle, α , must meet the following condition:
 $12^\circ \leq \alpha \leq 15^\circ$

For pipes with wall thickness, t_h , less than 3 mm, the spigots must be deburred.

Colour

The pipes must be blue or white in colour and may have blue or white stripes; slight variations in the appearance of the colour are permitted.

The colour blue is similar to the reference colour RAL 5012.

The colour white is similar to the reference colour RAL 9001 or RAL 9003.

The marking must be consistent with the requirements provided in this Technical Document.

- (2) With additional clarifications indicated in Part 2 of Technical Document 1.
- (3) The editions of the standards cited for use are those in force on the revision date of these Rules (see page 2 of this Technical Document), unless otherwise specified by the Mandated Body.

Additional requirements for pipes and fittings

Contact with potable water

The pipes, fittings and components (particularly seals) must comply with French regulations currently in force for products designed to come into contact with potable water. In particular, they must have ACS certification (or CLP, if applicable). These documents must be presented during audits.

Additional requirements for compatibility between iron Pipe/Accessory joints

- Joint compatibility between PVC-BO pipes and their accessories must be indicated in the holders'/manufacturers' sales manuals or technical guides or on their websites.
- The holder must submit a procedure that will include, as a minimum, the tests described in the table below and the assessment of deformations as provided for in ACT 54-985 (out-of-roundness, striction, kinking).
- The holder must suggest at least 2 tapping saddles as well as 2 self-anchoring flange joints validated in accordance with this procedure for 5 of the certified types of pipe. The test reports will be made available to CSTB.
- Under the same conditions, for the rest of the range admitted, the holder must suggest at least one tapping saddle and one self-anchoring flange joint per type for diameters up to and including DN200.
- The holder must make a compatibility table public on its sales manuals or on its website.
- These compatibility tables will be audited annually by CSTB.

Assessment of deformations

| Test | DN/OD | Criteria | Comments |
|------------------|------------|-------------------------------------|--|
| Out-of-roundness | ≤ 110 | Rate of out-of-roundness $\leq 7\%$ | After installing the fitting or saddle on the pipe and before performing the tests |
| | >110 | Rate of out-of-roundness $\leq 5\%$ | After installing the fitting or saddle on the pipe and before performing the tests |
| Striction | ≤ 110 | Rate of striction $\leq 7\%$ | After test 2 |
| | >110 | Rate of striction $\leq 5\%$ | After test 2 |
| Kinking | All | No kinking | After installing the fitting or saddle, before and after tests 1, 2, and 3. When installing a tap on the tapping saddles, ensure there is no kinking, regardless of the orientation of the tap |

Pipe/Accessory joint validation test table

| Caractéristique | | Exigences | Paramètres d'essai | Méthode d'essai |
|-----------------|--|---|--|-----------------------|
| Essai 1 | Étanchéité de l'assemblage à une pression interne négative | Variation maximale de la pression durant l'essai : 0,08 bar | Pression interne négative : 0,8 bar Durée d'essai : 2 h Effort tranchant : non appliqué | NF EN 12842:2000, 7.2 |
| Essai 2 | Étanchéité de l'assemblage à une pression interne positive | Aucune fuite visible de l'assemblage durant l'essai | Pression d'essai : 1,5 $p+5$ bar ^{a)} Durée d'essai : 2 h Effort tranchant : non appliqué | NF EN 12842:2000, 7.1 |
| Essai 3 | Étanchéité de l'assemblage à une pression interne cyclique | Aucune fuite visible de l'assemblage durant l'essai | Durée d'essai : 24 000 cycles entre 0 et p ^{a)} Chaque cycle comprenant : — une baisse progressive de la pression jusqu'à 0 — un palier de pression d'au moins 5 s à 0 — une augmentation progressive de la pression jusqu'à p ^{a)} — un palier de pression d'au moins 5 s à p ^{a)} Effort tranchant : non appliqué | NF EN 12842:2000, 7.3 |

a) p est la PFA la plus basse des composants de l'assemblage soumis à essai.

Les Essais 1, 2 et 3 peuvent être réalisés sur la même éprouvette. En cas de litige, seuls les résultats des essais effectués sur des éprouvettes distinctes doivent être pris en compte.

NOTE Le cycle de l'Essai 3 présente une plus grande amplitude de la plage de pression que celle spécifiée dans la NF EN 12842:2000, 7.3 ($0,5 p$ à p), afin de mieux prendre en compte le phénomène de relâchement des éléments d'étanchéité.

TABLE 2 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY
Specifications for PVC-BO/PVC-BO assemblies (Pipes/Pipes or Pipes / PVC-U Fittings)

| Characteristics and Test methods (1) | Specifications |
|--|--|
| Assembly composition and dimensional characteristics | Sealing Ring Assembly Category NF T 54-948, NF EN 1452-2 and NF EN ISO 1452-3 |
| Short-term internal hydrostatic pressure hermetic seal test - Test according to EN ISO 13845 | Test pressure: (see fig. 1 of NF EN ISO 1452-5) at a temperature of 15 to 25 °C - Deviation: 2° Test duration: 100 min |
| Short-term negative air pressure hermetic seal test - Test according to EN ISO 13844 | Test pressure: negative pressure (see fig. 2 of EN 1452-5) at a temperature of 15 to 25°C - Deviation: 2° Deformation: 5% - Test duration: compliant with fig. 2 |
| Cyclic pressure test (2) Test in accordance with NF EN 805 | Test pressure: from 0.5 PN to 1 PN* at a temperature of 15 to 25°C, without angular deviation or shear force Test duration: 24000 cycles Squarewave signal period of 5 to 10 seconds |
| Quality of elastomer sealing rings NF EN 681-1 (3) | NF EN 681-1 |

*: PN of biaxially-oriented pipe

- (1) The editions of the standards cited for use are those in force on the revision date of this Certification Reference System (see page 2 of this Technical Document), unless otherwise specified by the Mandated Body.
- (2) Test carried out on diameters between DN 75 and DN 160 inclusive.
- (3) Ozone resistance test: Rubber sealing elements that are protected and packaged separately until the time of their assembly must meet the same requirements, except using an ozone concentration of (25 ± 5) pphm instead of (50 ± 5) pphm.

TABLE 3 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY

Specifications for PVC-BO Pipe / Cast Iron Fitting assemblies

| Characteristics and Test methods (1) | Specifications |
|--|--|
| Assembly composition and dimensional characteristics | Sealing Ring Assembly Category |
| | NF T 54-948, NF EN ISO 1452-2, NF EN 545 and NF EN 12842 |
| Positive internal pressure hermetic seal test - Test according to EN ISO 12842 | Pressure: 1.5 PN +5 bars for 2 hours at a temperature of 15 to 25°C – Deviation: DN ≤300: 3°30, 350≤DN≤400: 2°30 |
| Negative internal pressure hermetic seal test - Test according to EN ISO 12842 | Vacuum: 0.8 bars for 2 hours at a temperature of 15 to 25°C – Deviation: DN ≤300: 3°30, 350≤DN≤400: 2°30 |
| Cyclic pressure test Test in accordance with NF EN 805 (2) | Test pressure: from 0.5 PN to 1 PN(*) at a temperature of 15 to 25°C, without angular deviation or shear force Test duration: 24000 cycles Squarewave signal period of 5 to 10 seconds |

(*): PN of biaxially-oriented pipe.

(1) The editions of the standards cited for use are those in force on the revision date of this Certification Reference System (see page 2 of this Technical Document), unless otherwise specified by the Mandated Body.

(2) Test carried out on diameters between DN 75 and DN 160 inclusive.

TABLE 4 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY
Dimensional characteristics of pipes in Class 355(*)

According to NF T 54-948

 - Preferred length: ≤ 12 m - tolerances ± 5 cm (or $\pm 1\%$ for lengths < 5 m).

- Sockets.

- Other dimensions.

| Nominal external diameter DN (mm) | External diameter tolerances (mm) | | Minimum thicknesses (mm) | Minimum average internal diameter of the socket | PN (MPa) |
|--------------------------------------|-----------------------------------|--------------|--------------------------|---|-------------|
| | Out-of-roundness (1) | Average (DN) | th min | $d_{im,min}$ | |
| 63 | 1.5 | 0.3 | 2.2 | 63.4 | 1.6 |
| 75 | 1.6 | 0.3 | 2.0 2.6 | 75.4 | 1.25 1.6 |
| 90 | 1.8 | 0.3 | 2.4 3.1 | 90.4 | 1.25 1.6 |
| 110 | 2.2 | 0.4 | 3.0 3.8 | 110.5 | 1.25 1.6 |
| 125 | 2.5 | 0.4 | 3.4 4.3 | 125.5 | 1.25 1.6 |
| 140 | 2.8 | 0.5 | 3.8 4.8 | 140.6 | 1.25 1.6 |
| 160 | 3.2 | 0.5 | 4.3 5.5 | 160.6 | 1.25 1.6 |
| 200 | 4.0 | 0.6 | 5.4 6.9 | 200.7 | 1.25 1.6 |
| 225 | 4.5 | 0.7 | 6.1 7.7 | 225.8 | 1.25 1.6 |
| 250 | 5.0 | 0.8 | 6.8 8.6 | 250.9 | 1.25 1.6 |
| 315 | 7.6 | 1.0 | 8.5 10.8 | 316.1 | 1.25 1.6 |
| 355 | 8.6 | 1.1 | 9.6 12.2 | 356.2 | 1.25 1.6 |
| 400 | 9.6 | 1.2 | 10.8 13.7 | 401.3 | 1.25 1.6 |
| 450 | 10.8 | 1.4 | 12.2 15.5 | 451.5 | 1.25 1.6 |
| 500 | 12.0 | 1.5 | 13.5 17.2 | 501.6 | 1.25 1.6 |
| 222 | 4.5 | 0.7 | 7.6 | 222.8 | 1.6 |
| 274 | 6.8 | 0.9 | 9.4 | 275.0 | 1.6 |
| 326 | 8.0 | 1.0 | 11.2 | 327.1 | 1.6 |
| 378 | 9.0 | 1.1 | 13.0 | 379.2 | 1.6 |

(1) Out-of-roundness is expressed as being the difference between the largest outside diameter and the smallest outside diameter in a straight section of the pipe ($x = DN \text{ max.} - DN \text{ min.}$), x being the value provided in the above table.

(*): A usage right request cannot be made on pipes with the same PN and the same DN on 2 different classes.

TABLE 5 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY
Dimensional characteristics of pipes in Class 400(*)

According to NF T 54-948

- Preferred length: ≤ 12 m - tolerances ± 5 cm (or $\pm 1\%$ for lengths < 5 m)
- Sockets
- Other dimensions

| Nominal external diameter DN (mm) | External diameter tolerances (mm) | | Minimum thicknesses (mm) | Minimum average internal diameter of the socket $d_{im,min}$ | PN (MPa) |
|--|-----------------------------------|--------------|--------------------------|---|-------------|
| | Out-of-roundness (1) | Average (DN) | th min | | |
| 63 | 1.5 | 0.3 | 2.0 | 63.4 | 1.25 / 1.6 |
| 75 | 1.6 | 0.3 | 2.0 2.3 | 75.4 | 1.25 1.6 |
| 90 | 1.8 | 0.3 | 2.2 2.7 | 90.4 | 1.25 1.6 |
| 110 | 2.2 | 0.4 | 2.7 3.3 | 110.5 | 1.25 1.6 |
| 125 | 2.5 | 0.4 | 3.0 3.8 | 125.5 | 1.25 1.6 |
| 140 | 2.8 | 0.5 | 3.4 4.2 | 140.6 | 1.25 1.6 |
| 160 | 3.2 | 0.5 | 3.9 4.8 | 160.6 | 1.25 1.6 |
| 200 | 4.0 | 0.6 | 4.9 6.1 | 200.7 | 1.25 1.6 |
| 225 | 4.5 | 0.7 | 5.5 6.8 | 225.8 | 1.25 1.6 |
| 250 | 5.0 | 0.8 | 6.1 7.6 | 250.9 | 1.25 1.6 |
| 315 | 7.6 | 1.0 | 7.7 9.5 | 316.1 | 1.25 1.6 |
| 355 | 8.6 | 1.1 | 8.7 10.8 | 356.2 | 1.25 1.6 |
| 400 | 9.6 | 1.2 | 9.8 12.1 | 401.3 | 1.25 1.6 |
| 450 | 10.8 | 1.4 | 11.0 13.6 | 451.5 | 1.25 1.6 |
| 500 | 12.0 | 1.5 | 12.2 15.2 | 501.6 | 1.25 1.6 |
| 222 | 4.5 | 0.7 | 6.7 | 222.8 | 1.6 |
| 274 | 6.8 | 0.9 | 8.3 | 275.0 | 1.6 |
| 326 | 8.0 | 1.0 | 9.9 | 327.1 | 1.6 |
| 378 | 9.0 | 1.1 | 11.5 | 379.2 | 1.6 |

(2) Out-of-roundness is expressed as being the difference between the largest outside diameter and the smallest outside diameter in a straight section of the pipe ($x = DN \text{ max.} - DN \text{ min.}$), x being the value provided in the above table.

(*): A usage right request cannot be made on pipes with the same PN and the same DN on 2 different classes.

TABLE 6 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY
Dimensional characteristics of pipes in Class 450(*)

According to NF T 54-948

- Preferred length: ≤ 12 m - tolerances ± 5 cm (or $\pm 1\%$ for lengths < 5 m)
- Sockets
- Other dimensions

| Nominal external diameter DN (mm) | External diameter tolerances (mm) | | Minimum thicknesses (mm) | Minimum average internal diameter of the socket <i>d</i> _{im,min} | PN (MPa) |
|--|-----------------------------------|--------------|--------------------------|--|-------------------|
| | Out-of-roundness (1) | Average (DN) | th min | | |
| 63 | 1.5 | 0.3 | 2.0 2.2 | 63.4 | 1.25 / 1.6 2.5 |
| 75 | 1.6 | 0.3 | 2.0 2.6 | 75.4 | 1.25 / 1.6 2.5 |
| 90 | 1.8 | 0.3 | 2.0 3.1 | 90.4 | 1.25 / 1.6 2.5 |
| 110 | 2.2 | 0.4 | 2.4 3.8 | 110.5 | 1.25 / 1.6 2.5 |
| 125 | 2.5 | 0.4 | 2.7 4.3 | 125.5 | 1.25 / 1.6 2.5 |
| 140 | 2.8 | 0.5 | 3.0 4.8 | 140.6 | 1.25 / 1.6 2.5 |
| 160 | 3.2 | 0.5 | 3.5 5.5 | 160.6 | 1.25 / 1.6 2.5 |
| 200 | 4.0 | 0.6 | 4.3 6.9 | 200.7 | 1.25 / 1.6 2.5 |
| 225 | 4.5 | 0.7 | 4.9 7.7 | 225.8 | 1.25 / 1.6 2.5 |
| 250 | 5.0 | 0.8 | 5.4 8.6 | 250.9 | 1.25 / 1.6 2.5 |
| 315 | 7.6 | 1.0 | 6.8 10.8 | 316.1 | 1.25 / 1.6 2.5 |
| 355 | 8.6 | 1.1 | 7.7 12.2 | 356.2 | 1.25 / 1.6 2.5 |
| 400 | 9.6 | 1.2 | 8.7 13.7 | 401.3 | 1.25 / 1.6 2.5 |
| 450 | 10.8 | 1.4 | 9.8 15.5 | 451.5 | 1.25 / 1.6 2.5 |
| 500 | 12.0 | 1.5 | 10.9 17.2 | 501.6 | 1.25 / 1.6 2.5 |
| 222 | 4.5 | 0.7 | 7.6 | 222.8 | 2.5 |
| 274 | 6.8 | 0.9 | 9.4 | 275.0 | 2.5 |
| 326 | 8.0 | 1.0 | 11.2 | 327.1 | 2.5 |
| 378 | 9.0 | 1.1 | 13.0 | 379.2 | 2.5 |

(1) Out-of-roundness is expressed as being the difference between the largest outside diameter and the smallest outside diameter in a straight section of the pipe ($x = \text{DN max.} - \text{DN min.}$), x being the value provided in the above table.

(*): A usage right request cannot be made on pipes with the same PN and the same DN on 2 different classes.

TABLE 7 - PVC-BO BIAXIALLY-ORIENTED PRESSURE FAMILY
Dimensional characteristics of pipes in Class 500(*)

According to NF T 54-948

- Preferred length: ≤ 12 m - tolerances ± 5 cm (or $\pm 1\%$ for lengths < 5 m)
- Sockets
- Other dimensions

| Nominal external diameter DN (mm) | External diameter tolerances (mm) | | Minimum thicknesses (mm) | Minimum average internal diameter of the socket <i>d</i> _{im,min} | PN (MPa) |
|--------------------------------------|-----------------------------------|--------------|--------------------------|---|------------|
| | Out-of-roundness (1) | Average (DN) | th min | | |
| 63 | 1.5 | 0.3 | 2.0 | 63.4 | 1.6 / 2.5 |
| 75 | 1.6 | 0.3 | 2.0 2.3 | 75.4 | 1.6 2.5 |
| 90 | 1.8 | 0.3 | 2.0 2.7 | 90.4 | 1.6 2.5 |
| 110 | 2.2 | 0.4 | 2.4 3.3 | 110.5 | 1.6 2.5 |
| 125 | 2.5 | 0.4 | 2.7 3.8 | 125.5 | 1.6 2.5 |
| 140 | 2.8 | 0.5 | 3.0 4.2 | 140.6 | 1.6 2.5 |
| 160 | 3.2 | 0.5 | 3.5 4.8 | 160.6 | 1.6 2.5 |
| 200 | 4.0 | 0.6 | 4.3 6.1 | 200.7 | 1.6 2.5 |
| 225 | 4.5 | 0.7 | 4.9 6.8 | 225.8 | 1.6 2.5 |
| 250 | 5.0 | 0.8 | 5.4 7.6 | 250.9 | 1.6 2.5 |
| 315 | 7.6 | 1.0 | 6.8 9.5 | 316.1 | 1.6 2.5 |
| 355 | 8.6 | 1.1 | 7.7 10.8 | 356.2 | 1.6 2.5 |
| 400 | 9.6 | 1.2 | 8.7 12.1 | 401.3 | 1.6 2.5 |
| 450 | 10.8 | 1.4 | 9.8 13.6 | 451.5 | 1.6 2.5 |
| 500 | 12.0 | 1.5 | 10.9 15.2 | 501.6 | 1.6 2.5 |
| 222 | 4.5 | 0.7 | 6.7 | 222.8 | 2.5 |
| 274 | 6.8 | 0.9 | 8.3 | 275.0 | 2.5 |
| 326 | 8.0 | 1.0 | 9.9 | 327.1 | 2.5 |
| 378 | 9.0 | 1.1 | 11.5 | 379.2 | 2.5 |

(1) Out-of-roundness is expressed as being the difference between the largest outside diameter and the smallest outside diameter in a straight section of the pipe ($x = \text{DN max.} - \text{DN min.}$), x being the value provided in the above table.

(*): A usage right request cannot be made on pipes with the same PN and the same DN on 2 different classes.

Part 2. MARKING CONDITIONS – REFERENCING THE NF MARK

This Technical Document specifies the conditions of marking and referencing the NF Mark provided in the certification reference system of the NF Mark - Rigid Non-Plasticised PVC Pipes and Fittings.

2.1 REPRODUCING THE NF LOGO ON THE CERTIFIED PRODUCT

2.1.1 General

The NF logo shall ensure the identification of each certified product.

The trade reference of the certified product must be reserved for the NF mark.

The manufacturer must not use the NF mark except to single out certified products without there being any risk of confusion whatsoever.

The logo's graphic tools are available from the CSTB Technical Department
(Tel.: + 33 (0)1 64 68 89 52 - E-mail: certification@cstb.fr).

It is recommended that the holder remit to CSTB, in advance, all the documents upon which the NF mark appears.

The NF logo, constituting certification identification by a third party with regards to the reference standards cited on page 2 of this Technical Document, must be affixed in accordance with the conditions defined in those standards.

The black and white version of the NF logo can be used.

2.1.2 Marking pipes

2.1.2.1 Cases of PVC pipes



a) Marking pipes

Marking of pipes must be carried out in a way that is visible and indelible and which can be read by the naked eye, on a generatrix and contain, every meter or less, the following set of information:

- ① - the trademark or symbol filed by the manufacturer with the mandated bodies if one trademark is admitted to the NF mark; if > 2 trademarks, then marking the trade name is required.
- ② - the manufacturer's identification number assigned upon notification of admission and possibly the production site designated upon notification of admission (if there are multiple factories).
- ③- the NF monogram with the Pressure family symbol = P



Holders have the option to use:

- Either the new  logo followed by the letter P, as follows:  P

- Or, as an exception, when using the  logo creates technical and/or material difficulties, the old  logo.

Note: a negative version of the logo can be used.

The new certified products shall comply with the NF graphic charter in force.

- ④ - the material identification symbol: PVC BO
- ⑤ - the nominal diameter of pipes DN
- ⑥ - the nominal pressure PN.
- ⑦ - mark for production identification: date (dd/mm/yy) or day number and year of manufacture (xxx/yy) (or batch no. indicating the manufacturing date: in this case, the definition of this number must be sent to the mandated body).


Note: the choice of marking method is left to the manufacturer. Any other additional marking is permitted on the condition that the sequence of NF information is not broken and it causes no confusion during use; in this case, the sequence of NF information must be framed by three lines of approximately 3 cm.

Unless specifically authorised by the mandated body after consultation with the Application Committee, double-marking products is prohibited when marking relates to an application that is not covered by the mark.

Example:

Pressure Group

PVC pipes for water systems under pressure

| | | | | | | | | |
|--|------------------|-------|---|-----------------|----|-----------|--------------------|--|
| | xxxx | 01/02 |  P | PVC BO | 75 | PN 16 bar | 01 02 11 or 032 11 | |
| | ↗ ↖ | | | | | | | |
| | manufacturer no. | | | production site | | | | |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | |

2.2 REPRODUCTION OF THE NF LOGO ON THE NF-CERTIFIED PRODUCT

- The following NF monogram is to be used:



The black and white version of the NF logo can be used.

2.3 MARKING CERTIFIED AND ASSOCIATED CHARACTERISTICS

All documentation relating to an NF - Rigid non-plasticised PVC pipes and fittings certified product must use the following form:

- Name and address of the manufacturer,
- Identification of the Reference System on which the certification is based (**see 2.4.2 of the body of the reference system**),
- (Name and address of the delegate in France, if applicable),
- Designation of the product (trademark and trade reference),
- Licence or certificate number,
- the name or company name of the certification body or its collective Certification mark as well as its address,
- certified product characteristics:
 - Dimensional characteristics (diameter, thickness, out-of-roundness, sockets)
 - Tensile strength
 - Impact resistance
 - Resistance to pressure
 - Ring stiffness
 - Pressure-tightness of the assemblies.

The certified manufacturer must indicate that it has the certificates (produced by CSTB) available to those clients who request them.

2.4 REPRODUCING THE NF LOGO ON DOCUMENTATION AND IN ADVERTISING (technical and commercial, labels, posters, advertising, Websites, etc.)

- The following NF monogram is to be used:



The black and white version of the NF logo can be used.

Part 3. APPLICANT/HOLDER QUALITY REQUIREMENTS

3.1 QUALITY CONTROL OPTION

The tests specified in these tables are to be performed with the number of specimens stipulated in the testing standards and addendums indicated in Technical Document 1 of this Certification Reference System specific to each product group, unless otherwise indicated in the tables.

| Measurements or tests (1) | Minimum sampling frequency |
|--|---|
| Dimensions: diameter, thickness, out-of-roundness Appearance Colour Marking | By extruder: 1 every 4 hours |
| Density | 1 test per month on 1 type at random |
| Tensile properties | At least 1 test per day, on 2 specimens taken from the same pipe |
| Resistance to pressure at 20°C – 10 hrs | 1 test per campaign |
| Resistance to pressure at 20°C – 1000 hrs | 1 test per year per diameter and per PN admitted to the NF mark (2) |
| Resistance to pressure at 60°C – 1000 hrs | 1 test per year per diameter and per PN admitted to the NF mark |
| Ring stiffness | 1 test per campaign |

(1) Methods specified in Appendix 1 of the rules of application.

(2) This test can be defined as a type test.

3.2 QUALITY MANAGEMENT OPTION

The implemented quality assurance plan must enable product compliance with the specifications of the standards and of these Rules.

Consequently, the manufacturer must complete or ensure completion of the specified tests per the frequencies defined in the quality assurance plan, certain tests being able to be considered "type" tests (for putting new equipment in place or using a new formulation, for example).

Part 4. MONITORING ARRANGEMENTS BY CSTB

4.1 TEST PROCEDURES DURING AN APPLICATION FOR ADMISSION

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|---|---|-----------------------------------|
| Average external diameter | All the types submitted for admission | - |
| Appearance Marking Colour Length Any diameter Thickness Sockets (depth of groove) | All the types submitted for admission | - |
| Density (1) | 1 test | 1 test |
| Tensile characteristics (maximum stress) (1) | 1 test | 1 test per type sampled |
| Axial and tangential orientation coefficient | 1 test | 1 test per type sampled |
| Impact resistance (1) NF T 54-948 specifications NF EN 744 | - | 1 test per type sampled |
| Resistance to pressure at 20°C – 10 hrs (1) | 1 test (choice of category) | 1 test per type sampled |
| Resistance to pressure at 20°C – 3000 hrs (1) | - | 1 test per class |
| Resistance to pressure at 60°C – 1000 hrs (1) | - | 1 test per class |
| Ring stiffness | 1 test (choice of category) | 1 test per type sampled |
| Verification of seals (ACS) | Verification of all types submitted for admission | |
| Verification of the absence of lead (1) | | 1 test per year |

(1) With additional clarifications indicated in Part 2 of Technical Document 1.

For PVC-BO/PVC-BO assemblies (Pipes/Pipes or PVC-BO Pipes / PVC-U Fittings)

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|--------------------------------|--|
| Short-term internal hydrostatic pressure hermetic seal test - Test according to EN ISO 13845 (1) | - | 1 test per type sampled up to 3DN |
| Short-term negative air pressure hermetic seal test (see fig. 2 of EN 1452-5) - Test according to EN ISO 13844 (1) | - | 1 test per type sampled up to 3DN |
| Cyclic pressure test Test in accordance with NF EN 805 (1) | - | 1 test per type sampled up to 3DN |
| Quality of elastomer sealing rings NF EN 681-1 | - | 1 report of tests provided by the manufacturer of elastomer sealing rings. |

(1) In cases of applications for extension for a same family and a same category, only one test for one type will be done if the manufacturer was not warned or suspended by the last committee.

For PVC-BO Pipe / Cast Iron Fitting assemblies

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|--------------------------------|-----------------------------------|
| Positive internal pressure hermetic seal test - Test according to EN ISO 12842 (1) | - | 1 test per type sampled up to 3DN |
| Negative internal pressure hermetic seal test - Test according to EN ISO 12842 (1) | - | 1 test per type sampled up to 3DN |
| Cyclic pressure test Test in accordance with NF EN 805 (1) | - | 1 test per type sampled up to 3DN |

(1) In cases of applications for extension for a same family and a same category, only one test for one type will be done if the manufacturer was not warned or suspended by the last committee.

Pipe/Accessory joint validation tests: the holder must present a record of the 3 tests defined in the Pipe/Accessory joint validation test table. These tests can be carried out in the holder's laboratory.

Change of pipe colour without modifying the MRS (specific risk materials) and without modifying the process: For applications to change the pipe colour, a 20°C/3000 hr pressure test must be carried out at the holder's site in order to prove that the sigma is unchanged, a 20°C/10 hr and 20°C/1000 hr pressure test at CSTB for the MRS in question – renewal of the ACS must be verified during the audit.

TEST PROCEDURES DURING AN APPLICATION FOR ADMISSION

Cases of pipes with DN between DN 250 and DN 500:

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|---|--|---|
| Average external diameter | All the types submitted for admission | - |
| Appearance Marking Colour Length Any diameter Thickness Sockets (depth of groove) | All the types submitted for admission | - |
| Density (1) | 1 test | 1 test |
| Tensile characteristics (maximum stress) (1) | 1 test | 1 test per type sampled |
| Axial and tangential orientation coefficient | 1 test | 1 test per type sampled |
| Impact resistance (1) NF T 54-948 specifications NF EN 744 | - | 1 test per type sampled |
| Resistance to pressure at 20°C – 10 hrs (1) | 1 test per type sampled | - |
| Resistance to pressure at 20°C – 3000 hrs (1) | - | 1 test per class on one DN < 250 manufactured using the same process, same class and same formulation |
| Resistance to pressure at 60°C and 20°C – 1000 hrs (1) | CSTB assessment of a control test at 20°C on an assembly and 60°C on a plain end | - |
| Ring stiffness | 1 test (choice of category) | 1 test per type sampled |
| Verification of seals (ACS) | Verification of all types submitted for admission | |
| Verification of the absence of lead (1) | | 1 test per year |

(1) With additional clarifications indicated in Part 2 of Technical Document 1.

For PVC-BO/PVC-BO assemblies (Pipes/Pipes or PVC-BO Pipes / PVC-U Fittings)

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|--------------------------------|---|
| Short-term internal hydrostatic pressure hermetic seal test - Test according to EN ISO 13845 (1) | - | 1 test per class on one DN < 250 manufactured using the same process, same class and same formulation |
| Short-term negative air pressure hermetic seal test (see fig. 2 of EN 1452-5) - Test according to EN ISO 13844 (1) | - | 1 test per class on one DN < 250 manufactured using the same process, same class and same formulation |
| Quality of elastomer sealing rings NF EN 681-1 | - | 1 report of tests provided by the manufacturer of elastomer sealing rings. |

- (1) In cases of applications for extension for a same family and a same category, only one test for one type will be done if the manufacturer was not warned or suspended by the last committee.

For PVC-BO Pipe / Cast Iron Fitting assemblies

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|--------------------------------|---|
| Positive internal pressure hermetic seal test - Test according to EN ISO 12842 (1) | - | 1 test per class on one DN < 250 manufactured using the same process, same class and same formulation |
| Negative internal pressure hermetic seal test - Test according to EN ISO 12842 (1) | - | 1 test per class on one DN < 250 manufactured using the same process, same class and same formulation |

In cases of applications for extension for the same family and the same category, only one test for one type will be done if the manufacturer was not warned or suspended by the last committee.

4.2 TEST PROCEDURES DURING MONITORING OF CERTIFIED PRODUCTS

| Measurement or test | Tests conducted in the factory | | Tests conducted in the laboratory |
|--|---|--|-----------------------------------|
| | Quality control | Quality management | |
| Average external diameter Appearance Marking Colour Length Any diameter Thickness Sockets (depth of groove) | 5 types per visit divided between each family admitted and product category | | - |
| Density | Inspection of test records | | 1 type per year |
| Tensile characteristics (maximum stress) | 1 type at each visit | 1 type per year, except in the case where this test is a type test | 1 type per year |
| Axial and tangential orientation coefficient | 1 type at each visit | 1 type per year, except in the case where this test is a type test | 1 type per year |
| Resistance to pressure at 20°C – 10 hrs | Inspection of test records | | 1 type per year |
| Resistance to pressure at 60°C – 1000 hrs | - | - | 1 type per year |
| Ring stiffness | 1 type at each visit | 1 type per year | 1 type per year |
| Verification of seals (ACS) | 1 type at each visit | | |
| Verification of the absence of lead (1) | - | | 1 test |

(1) With additional clarifications indicated in Part 2 of Technical Document 1.

For PVC-BO/PVC-BO assemblies (Pipes/Pipes or PVC-BO Pipes / PVC-U Fittings)

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|---------------------------------------|--|
| Short-term internal hydrostatic pressure hermetic seal test - Test according to EN ISO 13845 | - | 1 diameter per year |
| Short-term negative air pressure hermetic seal test (see fig. 2 of EN 1452-5) - Test according to EN ISO 13844 | - | 1 diameter per year |

For PVC-BO Pipe / Cast Iron Fitting assemblies

| Measurement or test | Tests conducted in the factory | Tests conducted in the laboratory |
|--|---------------------------------------|--|
| Positive internal pressure hermetic seal test - Test according to EN ISO 12842 | - | 1 diameter per year |
| Negative internal pressure hermetic seal test - Test according to EN ISO 12842 | - | 1 diameter per year |