

**GRAVITY DRAINAGE SYSTEMS MADE OF  
THERMOPLASTIC MATERIALS**

**Technical document No. 442-04**

Specifications applicable to the mechanical saddles and  
inspection chambers group

Technical document: 442-04 rev. 00  
21/12/2018

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## MODIFICATION HISTORY

<b>Revision No.</b>	<b>Application date</b>	<b>Modifications</b>
<b>03</b>	21/12/2018	Update to the document layout and reference

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## Part 1

### SCOPE

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This Technical Document covers the mechanical saddles and inspection chambers group.

#### 1.1 APPLICABLE REFERENCE STANDARDS AND COMPLEMENTARY SPECIFICATIONS

##### 1.1.1 Reference standards:

**NF EN 13598-1** (avril 2011) Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) — Part 1: Specifications for ancillary fittings including shallow inspection chambers.

**- ICs with DN <600 designed to be used outside of vehicular and pedestrian areas must comply with standard NF EN 13598-1 and are covered in TD4.**

**- ICs with branches not exposed to traffic load have no vertical loads and are therefore without dividing slabs. The field of use for ICs not exposed to traffic load is a depth of < 1.25 m.**

**- ICs with  $600 \leq \text{DN} < 800$  designed to be used in vehicular and pedestrian areas must comply with standard NF EN 13598-2 and are covered in TD5. Those that meet the requirements of TD5 are considered to meet the requirements of TD4 (can be used outside of vehicular and pedestrian areas).**

**- ICs with  $600 \leq \text{DN} < 800$  designed to be used outside vehicular and pedestrian areas must comply with standard NF EN 13598-1 and are covered in TD4; they are subject to specific marking. Words: “NO TRAFFIC LOAD”.**

**- Manholes with DN/ID  $\geq 800$  designed to be used in vehicular and pedestrian areas compliant with standard NF EN 13598-2 are covered in TD5.**

### 1.1.2 Complementary specifications and additional requirements

The reference specifications and test methods for the NF mark – Gravity drainage systems made of thermoplastic materials are defined in the tables below. They are based on the abovementioned standards with possible additions or changes.

The holder declares the use of virgin or reformulated materials to the mandated body.

At this time, this reference system does not take inspection fees into account.

**TABLE 1:**

**Specifications for ICs  
Reference standard: NF EN 13598-1 (virgin materials)**

Material	Characteristics and test methods	Procedures						Colours
		Injection moulding		Rotomoulding		Extrusion		
		Initial (**)	Final (**)	Initial	Final	Initial	Final	
PP	MFR at 230°C and 2.16 kg (g/10min)					≤ 2 (230°C and 2.16 kg)		Orange-brown or black
	Density (kg/m <sup>3</sup> )							
	Tensile strength (MPa)		≥ 13					
	Modulus of elasticity (MPa)		≥ 800					
	Thermal stability (min)		≥ 8				≥ 8	
PE	Density (kg/m <sup>3</sup> )					≥ 925		Orange-brown or black
	MFR (g/10min)					Between 1.5 and 3.5 (190°C, 2.16 kg)		
	Tensile strength (MPa)				≥ 13			
	Modulus of elasticity (MPa)				≥ 550			
	Thermal stability (min)				≥ 10			
PVC see 4.1 of NF EN 13598-1 and NF EN 1401-1	K value		≥ 55					Homogeneous colour (clear, medium grey-blue between A624 and A625) in accordance with Standard NF X 08-002 and the walls must be opaque. (1)
	Density (kg/m <sup>3</sup> )		≥ 1360					
	VICAT Fittings (injection-moulded products)		≥ 77.0					

- \*\*: initial = raw material and final = finished product

**TABLE 3: INSPECTION CHAMBERS**  
**Mechanical specifications**

Characteristics and test methods	Specifications
Reference standard Dimensions	NF EN 13598-1 The inner surfaces between the inlets and outlets of manholes and inspection chambers must be leaktight, continuous and the uniform texture inherent to the manufacturing method as well as free of defects that may negatively impact their hydraulic performance.
Riser shaft ring stiffness NF EN ISO 9969	> 2 kN/m <sup>2</sup> When the vertical cylindrical section or reinforced section of the body of the inspection chamber has a length greater than 300 mm higher than the top generatrix of the service connections, this vertical section must have a minimum modulus of rigidity of 2 kN/m <sup>2</sup> , measured in accordance with NF EN ISO 9969. The spacing of these reinforcements, if they exist, must not exceed 150 mm.
Vacuum required for resistance to external pressure of the ground and water NF EN 13598-1 (Table 1 page 12)	No damage to the structure that could be considered to negatively impact function; no deformation >10 mm to the water channel.
Mechanical strength or flexibility NF EN 12256 (test method) only for fabricated ICs (service connection)	No signs of tears, separation or leaks

**Design:**

- (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) The inspection chambers must have internal and external surfaces that are smooth, clean and free of scratches, blisters, impurities and any other surface imperfections that may negatively impact use. They must be homogeneous in colour and similar to the references listed hereafter: grey for PVC, A605 or RAL 7037, or darker according to standard NF X 08-002 and grey, black or orange-brown, RAL 8023, for other products.  
The marking must be consistent with the requirements provided in this Technical Document.
- (3) The dimensions and the geometric shape of a straight-through inspection chamber's cunette must meet the following requirements:

- a) Minimum slope of the benching or channels inserted in the benching:
  - 3% when  $H/D \geq 1$  [see Figure 1 a)];
  - 8% when  $0.5 \leq H/D < 1$  [see Figure 1 a)];

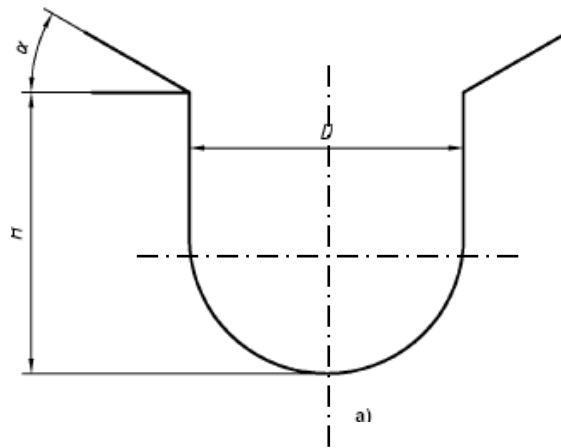


Diagram (CSTB source)

- b) Invert maintenance must be respected in accordance with the requirements of Standard NF EN 476;
  - c) Slope of the cunette:
    - No slope: no information;
    - With slope: the direction of the slope must be durably indicated for the user.
  - d) Installing blanking plugs in inspection chamber cunettes is permitted on the condition that invert continuity is preserved.
- (4) The dimensions of sockets must be compliant with the tolerances in standards NF EN 1401-1 and/or NF EN 13476-2, NF EN 13476-3, NF EN 1852-1 and NF EN 12666-1 and, where DN 100 sockets are concerned, the reference standards are NF EN 1329-1 or NF EN 1453-1.
  - (5) ICs with smooth walls: the wall thicknesses of the bodies of inspection chambers and sockets (inlets and outlets) must be sized as for the outlet dimensions of the main pipe according to the SN (CR) 2 class under standards NF EN 1401-1, NF EN 1852 and NF EN 12666-1. These thicknesses are repeated in Table 4 below:



**TABLE 4**

DN of inlets and outlets	Material								
	PVC			PP			PE		
	$e_{\min}^a$	$e_{2\min}^b$	$e_{3\min}^c$	$e_{\min}^a$	$e_{2\min}^b$	$e_{3\min}^c$	$e_{\min}^a$	$e_{2\min}^b$	$e_{3\min}^c$
100	2.0	1.8	1.5	2.5	2.3	1.9	3.1	2.8	2.4
110	2.2	2.0	1.7	2.7	2.5	2.1	3.4	3.1	2.6
125	2.5	2.3	1.9	3.1	2.8	2.4	3.9	3.6	3.0
160	3.2	2.9	2.4	4.0	3.6	3.0	4.9	4.5	3.7
200	3.9	3.6	3.0	4.9	4.5	3.7	6.2	5.6	4.7
250	4.9	4.5	3.7	6.2	5.6	4.7	7.7	7.0	5.8
315	6.2	5.6	4.7	7.7	6.9	5.8	9.7	8.8	7.3
400	7.9	7.1	6.0	9.8	8.8	7.4	12.3	11.1	9.3

- a) Minimum wall thickness (at any point).
- b) Minimum wall thickness of the socket.
- c) Minimum wall thickness in the wall area.

(6) ICs with corrugated or ribbed walls: the wall thicknesses of inspection chambers and sockets (inlets and outlets) must be greater than or equal to the dimensions as defined in chapter 7.2.5.3.5 of Standard NF EN 13476-3 + A1.

The wall thicknesses of spigots must comply with the specifications defined in chapter 7.2.5.2.

(7) Inspection chambers with inlets and outlets fitted with ball joints or integrated sleeves – these inspection chambers enabling angulation are authorised in this reference system under 2 conditions:

- 1- These inspection chambers must be in conformity with seal ring leak testing; the test is conducted according to conditions B and C of Standard NF EN 1277.
- 2- The minimum respective thicknesses of the ball joint and its shell must match  $e_{3\min}$  as defined in Table 4.

(8) The diameter measurements are taken using a circumference tape measure and, should there be any disagreement, using a slide caliper or inside micrometer.

**TABLE 5 : MECHANICAL SADDLES**  
**Dimensional characteristics**

Characteristics and test methods	Specifications
Reference standard	NF EN 13598-1
Dimensions DN	6.2 of NF EN 13598-1 The DN of the mechanical saddle's branch pipe must be smaller by at least 2 DN in relation to the DN of the header. (Example: 315 mm header DN, maximum 200 mm branch DN)

**Mechanical specifications**

Characteristics and test methods	Specifications
Reference standard	NF EN 13598-1
Mechanical strength or flexibility NF EN 12256	No signs of tears, separation or leaks

**Complementary mechanical specifications**

Characteristics and test methods	Specifications
Resistance to vertical loads	See NF EN 13598-1 Table 3 and Annex B: no cleavage or breaks, the vertical pipe must not protrude beyond the stop

**TABLE 6**  
**Suitability for use characteristics of inspection chambers**

Characteristics and test methods	Specifications
Leaktightness of elastomer sealing rings NF EN 1277 Conditions B and C at 23°C (1)	Deformation of the spigot: 10% Deformation of the socket: 5% Under P = 0.05 bar and 0.5 bar: No leaks Under P = -0.3 bar: Final P ≤ -0.27 bar  Inspection chambers with ball joints: see TD1 §2.18
Watertightness (hermetically sealed covers, assemblies with rigid pipes and mechanical saddles, this test does not concern inspection chambers) Condition A NF EN 1277	No leaks at -0.27 bar for 15 min
Watertightness (inspection chamber riser shaft assemblies) NF EN 476 Article 9.6.4	No leaks for 15 minutes when the inspection chamber assembly is filled with water up to 25 mm from the top of the chamber
Watertightness of saddle branches with plug NF EN 1053	No leaks
Quality of elastomer sealing rings (2)	NF EN 681-1, NF EN 681-2 or as the case may be

- (1) Instructions regarding the conditions for setting up assemblies must be made available to installation companies and the laboratory of the Mark and specify, in particular, the position of the seal on its spigot (paper documents, Internet, etc.).
- (2) 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  $(25 \pm 5)$  ppm instead of  $(50 \pm 5)$  ppm.

## Part 2

# MARKING CONDITIONS – REFERENCING THE NF MARK

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This Technical Document specifies the conditions for marking and referencing the NF mark provided in the certification reference system of the NF mark – Gravity drainage systems made of thermoplastic materials.

### 2.1 REPRODUCING THE NF LOGO ON THE CERTIFIED PRODUCT

#### 2.1.1 General

Refer to § 2.4.1 of the body of the reference system.




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

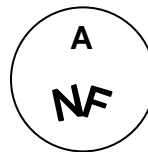
The NF logo must ensure identification of all certified products in accordance with the provisions set down in this technical document. The requirements relating to marking in the reference standards listed on page 2 of this Technical Document must also be followed.

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

#### 2.1.2 Marking inspection chambers

Holders have the option to use:

- Either the new logo  followed by the letter A, as follows:  A
- Or, as an exception, when using the logo  creates technical and/or material difficulties, the following monogram:



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

Each component of the inspection chamber (riser shaft and base) must bear the following information, written indelibly (labels are prohibited):

- ① - trademark or symbol filed by the applicant/holder with the mandated bodies,
- ② - NF logo and the symbol of the family: A,
- ③ - identification of the material of which the main components are composed (PVC/PE/PP),
- ④ - the holder's identification number assigned upon notification of admission and the production site designated upon notification of admission. Marking must be placed on the product or on labels:
  - If components are manufactured at a single site, marking the identification number is optional.
  - If 2 components provide the same function but are of different natures, the identification number of the factory is optional.
  - If components of the same nature are manufactured at multiple sites, the identification numbers are mandatory.
- ⑤ - mark enabling the production period during the year to be identified.  
*This mark may be in digits or a code; in the latter case, the definition of this number must be provided to the mandated body.*  
*In the case of forming, a new mark, such as previously defined, must be made.*

Additional mandatory information for:

Bases:

- The nominal diameter must be marked on the product,
- The connection angles and nominal diameters of connections must be marked on the product or label.

Riser shafts:

- The nominal diameter DN must be marked on the product.

**Note:** the location of the marking and the methods used are left to the applicant/holder. Any other additional marking is permitted on the condition that its location is separate from the NF marking and it causes no confusion during use.

Each mechanical saddle must bear the following information, marked indelibly:

- ① - trademark or symbol filed by the applicant/holder with the mandated bodies,
  - ② - Nominal diameter of conduit and nominal diameter of the tapping saddle,
  - ③ - NF logo and the symbol of the family: A,
  - ④- Identification of the material of which the main components are composed (PVC/PE/PP) or identification of the pipe material with which this mechanical saddle is intended to be used,
- If multiple trademarks are filed with the mandated bodies, the identification number of the holder, assigned upon notification of admission, must be mentioned in addition to the above information.

ICs with  $600 < DN < 800$  designed to be used outside vehicular and pedestrian areas must comply with standard NF EN 13598-1 and are covered in TD4; they are subject to specific marking. Words: “**NO TRAFFIC LOAD**” on the base.

**Note:** the location of the marking and the methods used are left to the applicant/holder. Any other additional marking is permitted on the condition that its location is separate from the NF marking and it causes no confusion during use.

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

- The following NF logo is to be used:



*or, by exception, due to technical difficulties, printing the NF logo on the packaging can be completed without the title of the application, in black and white:*



The NF logo must be associated with the symbol of the application in question, so that NF mark certified products can be distinguished from other products, without any risk of confusion, being:



### 2.3 MARKING CERTIFIED AND ASSOCIATED CHARACTERISTICS

All documentation relating to an NF - Gravity drainage system certified product must use the following form:

- name and address of the applicant/holder,
- 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),
- product designation (trade mark and trade reference),
- licence or certificate number,
- certified product characteristics:
  - Dimensional characteristics (diameter, thickness, out-of-roundness, sockets),
  - Ring stiffness of the riser shaft (only for Inspection Chambers, if claimed),
  - Resistance to vertical loads,
  - Resistance to negative pressure (only for Inspection Chambers),
  - Flexibility or mechanical strength,
  - Leaktightness of seal rings,
  - Leaktightness of riser shaft seals (only for Inspection Chambers).

### 2.4 REPRODUCING THE NF LOGO ON DOCUMENTATION AND IN PUBLICATIONS (technical and commercial documents, labels, posters, advertising, websites, etc.)

- The following NF logo is to be used:



## Part 3

### APPLICANT/HOLDER QUALITY REQUIREMENTS

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#### 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 the Certification Reference System specific to each product group, unless otherwise indicated in the tables.

#### For inspection chambers:

#### On raw material (virgin or reformulated materials):

Measurements or tests <sup>(1)</sup>	Minimum sampling frequency	PVC	PE Rotomoulding		PP Injection moulding	
			Initial	Final	Initial	Final
Density	1 x / batch		X			
MFR	1 x / batch		X		X	
Tension (strength)	1 x / batch			X		X
Modulus of elasticity	Upon approval of each new material		X	X	X	X
Thermal stability	Upon approval of each new material			X		X
K value	Upon approval of each new material	X				
Resistance to internal pressure	Upon approval of each new material	X				
VICAT	1 x / batch	X				

Material tests (initial) may be provided by the supplier of the material by means of a certificate of analysis or conformity; the tests on the finished product (final) are carried out by the holder of the NF mark according to the frequencies in the above table.

### On the finished product: inspection chambers

Measurements or tests <sup>(1)</sup>	Minimum sampling frequency	PVC	PE	PP
Dimensions: diameter, thickness, Appearance, colour, marking	1 every 4 hours; in the case of rotomoulded products, every 5 parts	X	X	X
Vacuum required for resistance to external pressure of the ground and water	1 type test	X	X	X
Ring stiffness of the riser shaft (2)	1 test per campaign with at least 1 test per week <sup>(1)</sup>	X	X	X
Mechanical strength or flexibility (only for fabricated inspection chambers)	1 test per campaign with at least 1 test per week <sup>(1)</sup>	X	X	X

### On the finished product: Mechanical saddles

Measurements or tests <sup>(1)</sup>	Minimum sampling frequency	PVC	PE	PP
Dimensions: diameter, thickness, Appearance, colour, marking	1 every 4 hours	X	X	X
Resistance to vertical loads	1 type test	X	X	X
Mechanical strength or flexibility (only for fabricated inspection chambers)	1 test per campaign with at least 1 test per week <sup>(1)</sup>	X	X	X

(1) Methods specified in Technical Document 1 Part 2.

(2) In case the riser shaft is not composed of a pipe admitted to the NF A mark

### 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 applicant/holder 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

##### a) For inspection chambers and mechanical saddles PVC / PE / PP:

Measurement or test	Tests conducted in the factory	Tests conducted in the laboratory	
Mean external diameter Appearance Marking Colour Thickness Assembly dimensions	All the types submitted for admission: by dimensional inspection of stock on at least half the range presented and by verification of the inspection registers for the entire range	-	
Sockets	all parts submitted for admission	-	
Virgin or reformulated material tests: Density (PE) Modulus of elasticity (PP/PE) MFR (PP / PE) Tension (PP / PE) K value (PVC-U)  Thermal stability (PP/PE) VICAT (PVC) Resistance to internal pressure (PVC-U)	Specifications accompanied by the certificate of conformity (type 2.1 defined in TD1 chap. 2.15) prepared during each delivery  - -  1 report of tests provided by the raw material supplier (this test can be carried out by the holder/manufacturer).	<i>1 test on the finished product</i> 1 test/material (except saddles) <i>1 test (except saddles)</i>	
Ring stiffness of the riser shaft (1)	1 test / shaft DN sampled	1 test / shaft DN sampled (2)	
Vacuum required for resistance to external pressure of the ground and water	-	1 test	
Mechanical strength or flexibility (only for fabricated inspection chambers) NF EN 12256	-	1 test	
Vertical load resistance (mechanical saddles)	-	1 test	
Mechanical strength or flexibility (mechanical saddles) (6)	-	1 test	
Assemblies	Watertightness of saddle branches with plug	-	1 diameter per model of seal ring
	Watertightness (hermetically sealed covers, assembly with rigid pipes and mechanical saddles) NF EN 1277 Condition A at 23°C	-	1 diameter per model of seal ring
	Leaktightness of seal rings (3) NF EN 1277 Conditions B and C at 23°C	-	1 diameter per model of connection system
	Quality of elastomer sealing rings <sup>(1) (5)</sup>	-	1 report of tests provided by the manufacturer of elastomer sealing rings.
	Watertightness (3) (inspection chamber riser shaft assembly)	-	1 diameter per model of seal ring (4)

- (1) This test is not conducted on inspection chambers derived from pipes with NF mark – Gravity drainage systems made of thermoplastic materials.
- (2) If the applicant already holds the NF mark for one or more families, only one test is conducted.
- (3) When watertightness tests of riser seals can be combined with those of seal rings, the tests are carried out simultaneously. However, if there is a non-conformity, the tests are conducted a second time, but separately.
- (4) If the applicant already holds the NF mark for one or more families, a test on one DN is conducted upon admission.

- (5) If the seals are made of elastomer identical in quality to that used for the NF-certified pipes, this test is not conducted.
- (6) In cases of extension applications without a change in formulation or raw materials, this test is not conducted.

## 4.2 TEST PROCEDURES DURING MONITORING OF CERTIFIED PRODUCTS

### d) For inspection chambers and mechanical saddles PVC / PE / PP:

Measurement or test	Tests conducted in the factory		Tests conducted in the laboratory-	
	Quality control	Quality management		
Appearance Marking Colour Length Any diameter Thickness Sockets (depth of groove)	3 types per visit divided between each family admitted and product category		-	
Virgin or reformulated material tests: Density (PE) Modulus of elasticity (PP/PE) MFR (PP / PE) Tension (PP / PE)  Thermal stability (PP/PE) VICAT (PVC)	Specifications accompanied by the certificate of conformity (type 2.1 defined in TD1 chap. 2.15) prepared during each delivery or type 3.1 in the case of reclaimed/reformulated materials		-  <del>1 test on the finished product:</del>  1 test/year/material 1 test/year	
Ring stiffness of the riser shaft (1)	1 type at each visit (choice of category)	1 type per year (choice of category)	1 type per year	
Vacuum required for resistance to external pressure of the ground and water	1 type at each visit (choice of category)	1 type per year (choice of category)	1 type per year	
Mechanical strength or flexibility (only for fabricated inspection chambers) NF EN 12256	1 type at each visit	1 type per year	1 type per year	
Vertical load resistance (mechanical saddles)	-	-	1 type per year	
Mechanical strength or flexibility (mechanical saddles)	-	-	1 type per year	
Assemblies	Leaktightness of seal rings NF EN 1277 Conditions B and C at 23°C	-	-	1 type every 3 years
	Watertightness of saddle branches with plug	-	-	1 type every 3 years
	Watertightness (hermetically sealed covers, assembly with rigid pipes and mechanical saddles)	-	-	1 type every 3 years
	Watertightness (inspection chamber riser shaft assembly)	-	-	1 type every 3 years
Technical and commercial documents and website (body of reference system, chap. 2.5.3.3)	All information and specifications mentioned on the certificate must be consistent with the technical and commercial documents and website of the holder.			

- (1) This test is not conducted on fabricated inspection chambers or riser shafts composed of pipes with NF mark 442 – Gravity drainage systems made of thermoplastic materials.