

## **AENOR Certificate of Conformity Specific Rules for polypropylene random with modified crystal structure (PP-RCT) and fiber glass (FV) piping systems for hot and cold water installations inside buildings**

Note: This document is a translation of the Spanish document "RP 001.78 rev. 3" approved by the Plastics Technical Certification Committee (CTC-001). Spanish version always prevails over this translation.

### **RP 001.78**

Revision 3

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## 1 Purpose and Scope

The present Specific Rules describe the procedure for the application, granting and maintaining of the AENOR Certificate of Conformity for polypropylene random with modified crystal structure (PP-RCT)/polypropylene random with modified crystal structure + fiber glass (PP-RCT+FV)/polypropylene random with modified crystal structure (PP-RCT) piping systems for hot and cold water installations inside buildings, at the design pressure and temperature according to the application class, in accordance with the technical specifications attached to these Specific Rules.

The RP 01.00 applies except for the marking of certified products part that is defined in paragraph 5 of this document. All the mentions of the AENOR Mark in the RP 01.00 mean Certificate of Conformity AENOR in this document.

## 2 Definition and special requirements

**Reference:** It is called a reference of pipes to the set of the same ones that have the same diameter and nominal thickness.

**Groups of dimension:**

The following groups of dimension are considered depending on the diameter

- Group 1: nominal outside diameter  $dn \leq 63$
- Group 2: nominal outside diameter  $75 \leq dn \leq 160$
- Group 3: nominal outside diameter  $180 \leq dn \leq 450$

By applying this Regulation, it is possible to obtain the AENOR certificate of compliance for the following products:

- Polypropylene random with modified crystal structure pipes + fiber glass (PP-RCT/PP-RCT+FV/PP-RCT) for hot and cold water installations inside buildings in accordance with the technical specifications attached to these Specific Rules
- Polypropylene random with modified crystal structure and fiber glass (PP-RCT/PP-RCT+FV/PP-RCT) piping systems for hot and cold water installations inside buildings, in accordance with the technical specifications attached to these Specific Rules formed by polypropylene random with modified crystal structure pipes (PP-RCT/PP-RCT+FV/PP-RCT) and polypropylene fittings (PP-R) or polypropylene with modified crystal structure (PP-RCT).

The certificate applicant must address an independent application for each different product.

Due the length of the test is not considered necessary that the thermal stability test by hydrostatic pressure test is completed to grant the certificate.

## **WATER QUALITY FOR HUMAN CONSUMPTION**

With regard to potential adverse effects on water quality for human consumption caused by the products included in the scope of this certificate, the petitioners / licensees of the Mark, will provide to AENOR Technical Services during the inspection visit the evidence that their product complies with the RD 140/2003

Article 14 of the mentioned document states that "Products that are in contact with the water of human consumption, by themselves or by the practices that are used, shall not transmit to the water for human consumption, substances or properties that contaminate or get worse its quality, and involve a failure to comply the requirements specified in Annex I or a risk to the health of the population supplied

This evidence must be provided, either through migration tests and / or certificates issued by competent authorities of compliance with the RD / 140/2003.

## **3 Sampling and testing for granting and maintaining the AENOR product certificate**

### **3.1 Test to be carried out in factory (See RP 01.00)**

AENOR Services 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 01.00)**

AENOR Services will select and marked the necessary samples to carry out in the laboratory the tests indicated in tables 1 (pipes) and/or .2 (fittings and systems) as proceed.

**TABLE 1 (PIPES)**

|  | <b>TESTS</b>  | <b>GRANTING/MAINTENANCE</b>                               | <b>RESULTS EVALUATION</b> |
|--|---|---|---------------------------|
| <b>TESTS TO BE CARRIED OUT BY THE INSPECTOR IN THE FACTORY</b> | Appearance  | 10 pipes at random  | 1                         |
|  | Mean outside diameter   | 1 pipe per reference, minimum 10 pipes                    | 2                         |
|  | Total wall thickness  | 1 pipe per reference, minimum 10 pipes                    | 3                         |
|  | Minimum thickness of the inner layer ( $e_1$ ) $\geq 1/4$ of the $e_{min}$  | 1 pipe per reference                                      | 3                         |
| <b>TESTS TO BE CARRIED OUT BY THE LABORATORY</b>               | Opacity (only if declares it)   | 1 reference, selecting the one with lowest wall thickness | 1                         |
|  | Impact resistance ball drop   | 20% ref. minimum 2  | 1                         |
|  | Longitudinal retraction   | 20% ref. minimum 2  | 1                         |
|  | Melt flow index(compound + on internal and external layer of the pipe) (1)  | 1 reference   | 1                         |
|  | Resistance to internal pressure 1 h-20°C  | 20% references. Minimum 2                                 | 1                         |
|  | Resistance to internal pressure 22 h-95°C   | 20% references. Minimum 2                                 | 1                         |
|  | Resistance to internal pressure 165 h-95°C  | 20% references. Minimum 2                                 | 1                         |
|  | Resistance to internal pressure 1000 h-95°C   | 1 reference randomly                                      | 1                         |
|  | Thermal stability by hydrostatic pressure test (Only at the granting, every 5 years, or in case of formulation changes) | 1 reference randomly                                      | 1                         |
|  | Determination of the content of the total fiber glass and intermediate layer  | 1 reference per group of dimension                        | 1                         |

Note (1) When the manufacturer of the pipe pigment the raw material, he is not required to perform this test

**TABLE 2 (FITTINGS AND SYSTEM)**

| <b>TESTS TO BE CARRIED OUT BY THE LABORATORY</b> | <b>TEST</b>                                 | <b>FREQUENCY</b>               |
|--|---|--------------------------------|
|  | Resistance to internal pressure 20°C 1h     | 5% references per type of join |
|  | Resistance to internal pressure 95°C 1000 h | 2% references per type of join |
|  | Bending(2)                                  | 50% of the diameters           |
|  | Pull out (23°C and 80, 90 or 95°C 1h) (2)   | 50% of the diameters           |
|  | Thermal cycling (2)                         | 1 diameter                     |
|  | Pressure cycling (2)                        | 50% of the diameters           |
|  | Vacuum (2)                                  | 50% of the diameters           |

NOTE (2) The realization of these functional test will be done for those types of connection of fittings that are applicable.

In general, for systems consisting of fittings which system of union is mechanical, there will be necessary to realize all applicable tests defined in Table 2.

In case the union is for termofusion or electrofusion only it will be necessary to realize the test of cycles of temperature

## 4 Manufacturer internal control

### 4.1 Characteristics under factory production control

The manufacturer must guarantee that the mixtures, compounds involved in the manufacture of pipes have appropriate characteristics. In addition, will assure that the specifications provided in the Certificate of Analysis, comply with the purchase requirements established and that these are the compounds declared in the application forms of as raw materials.

### 4.2 Final products control

Tests and their frequency are stated in tables 3 and 4. Furthermore, all tests mentioned in the above table should be made any time under the following circumstances.

- change of the material supplier
- changing the polymerization process
- changing the chemical properties of co-monomer
- change of additives (eg: pigments, antioxidants)
- change of chemical or natural properties of the additive

- change of the supplier of fiber
- changing the chemical properties (eg. coating) on the fiber type
- changing the dimensions of the fiber type

**TABLE 3 (PIPES)**

| TESTS   | FREQUENCY   |
|---|---|
| Appearance  | Every 4 hours / production line                     |
| Mean outside diameter   |   |
| Total Wall thickness  |   |
| Minimum thickness of the inner layer ( $e_1$ )                          |   |
| Opacity only if the manufacturer declares its                           | At the granting and in case of formulation changes  |
| Impact resistance   | Per period of production, minimum twice a week      |
| longitudinal retraction   | Per line. Minimum twice a week                      |
| Melt flow rate (composite + internal and external layer of the pipe)(1) | Each batch of raw material                          |
| Resistance to internal pressure 1 h-20°C                                | Once a year per reference                           |
| Resistance to internal pressure 22 h-95°C                               | Once per period of production. Minimum once a week  |
| Resistance to internal pressure 165 h-95°C                              | Every 3 manufacturing period of the same reference  |
| Resistance to internal pressure 1000 h-95°C                             | One pipe per machine, minimum once per year         |
| Thermal stability by hydrostatic pressure test                          | At the granting and in case of formulation changes  |
| Determination of the total fiber glass content and intermediate layer   | Once per period of manufacture. Minimum once a week |

NOTE (1) When the manufacturer of the pipe pigment the raw material, he is not required to perform this test

**TABLA 4 (FITTINGS AND SYSTEM)**

| TESTS  | FREQUENCY   |
|--|---|
| Resistance to internal pressure 20°C<br>1 h    | Once per period of manufacture. Minimum 1 time per week |
| Resistance to internal pressure 95°C<br>1000 h | Once every 4 months                                     |
| Bending (2)                                    | Once per year   |
| Vacuum (2)                                     | Once per year   |
| Pull out (23°C and 80, 90 or 95°C 1 h)(2)      | Once per year   |
| Thermal cycling (2)                            | Once per year   |
| Pressure cycling (2)                           | Once per year   |

NOTE (2) The realization of these functional test will be done for those types of connection of fittings that are applicable. In general,

For systems consisting of fittings which system of union is mechanical, there will be necessary to realize all applicable tests defined in Table 4.

In case the union is for termofusion or electrofusion only it will be necessary to realize the test of cycles of temperature

## 5 Marking of certified products

### 5.1 Marking of the pipes

The minimum required marking of the pipes is the following:

- Reference to the word AENOR CC;
- Number of the contract signed with AENOR: 001 / XXX;
- Manufacturer identification and/or Trademark;
- Pipe material and its classification (PP-RCT+FV+PP-RCT);
- Nominal outside diameter x thickness nominal;
- Application class combined with design pressure;
- Opacity (only if the manufacturer has declared it);
- Manufacture's information (manufacturing period, year, month, etc.);

The marking on the pipes will carry out every meter as minimum.

# AENOR

Example:

AENOR CC Nº 001 / XXX – Trademark – PP-RCT+FV+PP-RCT - 20 x 2,8 –  
Application class 1/10; 2/10; 4/10; 5/8 - Manufacturer information

## 5.2 Marking of the fitting / packaging

### 5.2.1 Marking of the fitting

The minimum required marking of each fitting is the following:

- Trademark;
- Nominal diameter;
- identification of the material (only for fusion fittings);
- information provided by the manufacturer (year of manufacture).

### 5.2.2 Marking of the packaging

The minimum required marking of the fittings packaging is the following:

- Reference to the word AENOR;
- AENOR Mark logotype, with a size not less than 3 mm;
- Number of the contract signed with AENOR: 001/XXX;
- Reference to the applicable standard;
- application class and design pressure;
- reference to the word "opaque" (only if the manufacturer has declared it);
- month and year of manufacture if not marked on the fitting.

## 5.3 Marking of Systems

Where reference is made to the AENOR Certificate of the system in commercial or other documentation, indicate the type of application and pressure that appears in the AENOR Certificate.

## Annex C-1

### Pipes Description Questionnaire

APPLICANT COMPANY:

MANUFACTURER COMPANY:

SITE OF MANUFACTURE:

PRODUCT:

TRADEMARK (S):

CONTENT FIBERGLASS TOTAL (%):

GLASSFIBER CONTENT OF THE MIDDLE LAYER(%):

DATE:

| RANGE FOR WHICH THE MARK IS REQUESTED |           |                   |                 |                |
|---------------------------------------|-----------|-------------------|-----------------|----------------|
| SERIES                                | DIAMETERS | APPLICATION CLASS | DESIGN PRESSURE | OPACITY YES/NO |
|                                       |           |                   |                 |                |
|                                       |           |                   |                 |                |
|                                       |           |                   |                 |                |
|                                       |           |                   |                 |                |
|                                       |           |                   |                 |                |

For any modification of these data, the licensee company will send to the Committee secretary this descriptive questionnaire updated.

Manufacturer shall inform AENOR on all materials (formulations) used in order to ensure a clear identification of the materials for the purpose of the inspection. The manufacturer shall specify the glass fibers, description of the fiber, fiber type, fiber length, fiber diameter and fiber ratio (weight percent) of the intermediate layer and total.

**STAMP OF THE MANUFACTURER**



## Annex D

### **Technical Specifications for polypropylene random with modified crystal structure (PP-RCT)/polypropylene random with modified crystal structure + fiber glass (PP-RCT+FV)/polypropylene random with modified crystal structure (PP-RCT) piping systems for hot and cold water installations inside buildings**

#### 0 Prologue

These technical specifications, together with Specific Rules, are part of the documentation done by the AENOR Plastics Technical Certification Committee (CTC-001 "Plastics") for the obtaining the corresponding AENOR Certificate of Conformity, and both documents shall be applied on the whole.

This document is not a normative document.

#### 1 Scope

This Technical Specifications are based on the standard ISO/DIS 15874-2, in order to define the dimensions and characteristics that have to assembled the polypropylene random with modified crystal structure (PP-RCT)/ polypropylene random with modified crystal structure (PP-RCT) + glass fiber (FV) / polypropylene random with modified crystal structure (PP-RCT) systems for installation of hot and cold water inside the structure of buildings, to the temperatures and pressures of design according to the attached table, as well as its corresponding test method.

The value for  $Scalc, max$  for each application class is illustrated in table 1.

Note: For certification, when a plastic barrier layer is embedded in the wall of the polypropylene pipe, (for example to prevent or reduce the diffusion of gases and light transmission through the pipe wall), this structure will be covered by part 2 of the EN ISO 15874.

**Table 1**

| pD<br>[bar1]] | Application class    |         |         |         |
|---------------|----------------------|---------|---------|---------|
|               | Class 1              | Class 2 | Class 4 | Class 5 |
|               | Scale, max-values 2) |         |         |         |
| 4             | 8,2                  | 8,2     | 8,2     | 7,3     |
| 6             | 6,1                  | 5,7     | 6,1     | 4,9     |
| 8             | 4,5                  | 4,3     | 4,6     | 3,7     |
| 10            | 3,6                  | 3,4     | 3,7     | 2,9     |

<sup>1)</sup> 1 bar = 10<sup>5</sup> N/mm<sup>2</sup>

<sup>2)</sup> Values are rounded to the nearest one decimal place

## 2 Documentation references

- EN ISO 15874-1, 2, 3 y 5 – Plastic pipes system for installation of hot and cold water.
- UNE EN ISO 7686 – Determination of the opacity.
- UNE EN ISO 2505 – Longitudinal retraction.
- UNE EN ISO 3126 – Determination of the dimensions.
- UNE EN ISO 1167-1 y 2 – Determination of the resistance to internal pressure.
- EN 1411 – Determination of the impact resistance (ball drop method).
- ISO 3451-1 – Determination of the percentage of glass fiber of the intermediate layer.
- ISO 1133 – Determination of the melt flow index.
- UNE 53526 – Linear expansion coefficient.
- ISO 4065:1996 – Thermoplastic pipes – thickness universal table.
- ISO 11922-1:1997 – Thermoplastic pipes for fluids conduction – Dimensions and tolerances – Part 1 metric series.

## 3 Definitions and simbols

According to chapter 3 of EN ISO 15874-1

### 3.1 Characteristics of the pipes material

#### 3.1.1 General

The material of the pipes is composed of polypropylene random with modified crystal structure, as well as a reinforcement consisting of polypropylene random with modified crystal structure and fiber glass.

## 3.1.2 Influence of materials on water quality

When used in the manner for which they are designed, the materials that are in contact with drinking water should not constitute a toxic hazard, should not allow microbial growth and should not cause any smell or taste, or turbidity or water discoloration. Where applicable, the pipes should be in accordance with national regulations that may apply, in relation to materials in contact with drinking water.

## 3.1.3 Classification of the material

Do not use reprocessed material obtained from external sources or recycled materials.

The manufacturer will inform to AENOR about all materials (formulations) that it should use in order to assure a clear identification of the same ones during the inspection.

The manufacturer shall specify the glass fibers, description of the fiber, fiber type, fiber length, fiber diameter and fiber ratio (weight percent) of total and intermediate layer.

## 3.2 General characteristics of the pipes

### 3.2.1 Appearance

The internal and external surfaces of pipes shall be smooth, clean and free from scoring, cavities and other surface defects when viewed without magnification. The material shall not contain visible impurities. Each end of the pipe shall be cut clean and perpendicular to its axis.

### 3.2.2 Opacity

If it is required that the pipe is opaque for use in underground installations, the pipe wall will not transmit more than 0.2% of visible light, when tested in accordance with the UNE EN ISO 7686.

## 3.3 Geometrical characteristics of the pipes

### 3.3.1 General

The dimensions of the pipes have to measure up according to UNE EN ISO 3126.

### 3.3.2 Dimensions of the pipes

#### 3.3.2.1 Outside diameter.

The outside diameter of the pipe must be in accordance with Table 2.

**Table 2**

**Dimensions of the pipes for the dimension Class A (measures according to ISO 4065:1996 and applicable for all the classes and service conditions)**

| Nominal Dimension<br>DN/OD | Nominal outside diameter<br>(dn)(mm) | Minimum nominal outside diameter<br>(dem, min)<br>(mm) | Maximum nominal outside diameter<br>(dem,max)<br>(mm) | Pipes series          |       |      |      |       |       |      |
|----------------------------|--------------------------------------|--|---|-----------------------|-------|------|------|-------|-------|------|
|                            |                                      |  |   | S 8                   | S 6,3 | S5   | S4   | S 3,2 | S 2,5 | S 2  |
|                            |                                      |  |   | Thicknesses emin y en |       |      |      |       |       |      |
| 12                         | 12                                   | 12,0   | 12,3  | 1,8                   | 1,8   | 1,8  | 1,8  | 1,8   | 2,0   | 2,4  |
| 16                         | 16                                   | 16,0   | 16,3  | 1,8                   | 1,8   | 1,8  | 1,8  | 2,2   | 2,7   | 3,3  |
| 20                         | 20                                   | 20,0   | 20,30   | 1,8                   | 1,8   | 1,9  | 2,3  | 2,8   | 3,4   | 4,1  |
| 25                         | 25                                   | 25,0   | 25,30   | 1,8                   | 1,9   | 2,3  | 2,8  | 3,5   | 4,2   | 5,1  |
| 32                         | 32                                   | 32,0   | 32,30   | 1,9                   | 2,4   | 2,9  | 3,6  | 4,4   | 5,4   | 6,5  |
| 40                         | 40                                   | 40,0   | 40,40   | 2,4                   | 3,0   | 3,7  | 4,5  | 5,5   | 6,7   | 8,1  |
| 50                         | 50                                   | 50,0   | 50,50   | 3,0                   | 3,7   | 4,6  | 5,6  | 6,9   | 8,3   | 10,1 |
| 63                         | 63                                   | 63,0   | 63,60   | 3,8                   | 4,7   | 5,8  | 7,1  | 8,6   | 10,5  | 12,7 |
| 75                         | 75                                   | 75,0   | 75,70   | 4,5                   | 5,6   | 6,8  | 8,4  | 10,3  | 12,5  | 15,1 |
| 90                         | 90                                   | 90,0   | 90,90   | 5,4                   | 6,7   | 8,2  | 10,1 | 12,3  | 15,0  | 18,1 |
| 110                        | 110                                  | 110,0  | 111,00  | 6,6                   | 8,1   | 10,0 | 12,3 | 15,1  | 18,3  | 22,1 |
| 125                        | 125                                  | 125,0  | 126,2   | 7,4                   | 9,2   | 11,4 | 14,0 | 17,1  | 20,8  | 25,1 |
| 140                        | 140                                  | 140,0  | 141,3   | 8,3                   | 10,3  | 12,7 | 15,7 | 19,2  | 23,3  | 28,1 |
| 160                        | 160                                  | 160,0  | 161,5   | 9,5                   | 11,8  | 14,6 | 17,9 | 21,9  | 26,6  | 32,1 |
| 180                        | 180                                  | 180,0  | 181,7   | 10,7                  | 13,3  | 16,4 | 20,1 | 24,6  | 29,9  | 36,1 |
| 200                        | 200                                  | 200,0  | 201,8   | 11,9                  | 14,7  | 18,2 | 22,4 | 27,4  | 33,2  | 40,1 |
| 225                        | 225                                  | 225,0  | 227,1   | 13,4                  | 16,6  | 20,5 | 25,2 | 30,8  | 37,4  | 45,1 |
| 250                        | 250                                  | 250,0  | 252,3   | 14,8                  | 18,4  | 22,7 | 27,9 | 34,2  | 41,5  | -    |
| 280                        | 280                                  | 280,0  | 282,5   | 16,6                  | 20,6  | 25,4 | 31,3 | 38,3  | -     | -    |
| 315                        | 315                                  | 315,0  | 317,5   | 18,7                  | 23,2  | 28,6 | 35,2 | 43,1  | -     | -    |
| 355                        | 355                                  | 355,0  | 358,2   | 21,1                  | 26,1  | 32,2 | 39,7 | -     | -     | -    |
| 400                        | 400                                  | 400,0  | 403,6   | 23,7                  | 29,4  | 36,3 | 44,7 | -     | -     | -    |
| 450                        | 450                                  | 450,0  | 453,8   | 26,7                  | 33,1  | 40,9 | -    | -     | -     | -    |

The value of the tolerance is according to the Grade A of ISO 11922-1

## 3.3.2.2 Nominal wall thickness ( $e_n$ )

The wall thickness (minimum thickness ( $e_{min}$ ) and maximum thickness ( $e_{max}$ ) should be in accordance with Table 3

**Table 3**  
**Thickness tolerances**

| Minimum thickness  |      | Degree V tolerance | Minimum thickness  |      | Degree V tolerance |
|--------------------|------|--------------------|--------------------|------|--------------------|
| E <sub>y,min</sub> |      | t <sub>Y</sub>     | E <sub>y,min</sub> |      | t <sub>Y</sub>     |
| >                  | ≤    |                    | >                  | ≤    |                    |
| -                  | 1,0  | 0,2                | 23,0               | 24,0 | 2,5                |
| 1,0                | 2,0  | 0,3                | 24,0               | 25,0 | 2,6                |
| 2,0                | 3,0  | 0,4                | 25,0               | 26,0 | 2,7                |
| 3,0                | 4,0  | 0,5                | 26,0               | 27,0 | 2,8                |
| 4,0                | 5,0  | 0,6                | 27,0               | 28,0 | 2,9                |
| 5,0                | 6,0  | 0,7                | 28,0               | 29,0 | 3,0                |
| 6,0                | 7,0  | 0,8                | 29,0               | 30,0 | 3,1                |
| 7,0                | 8,0  | 0,9                | 30,0               | 31,0 | 3,2                |
| 8,0                | 9,0  | 1,0                | 31,0               | 32,0 | 3,3                |
| 9,0                | 10,0 | 1,1                | 32,0               | 33,0 | 3,4                |
| 10,0               | 11,0 | 1,2                | 33,0               | 34,0 | 3,5                |
| 11,1               | 12,0 | 1,3                | 34,0               | 35,0 | 3,6                |
| 12,0               | 13,0 | 1,4                | 35,0               | 36,0 | 3,7                |
| 13,0               | 14,0 | 1,5                | 36,0               | 37,0 | 3,8                |
| 14,0               | 15,0 | 1,6                | 37,0               | 38,0 | 3,9                |
| 15,0               | 16,0 | 1,7                | 38,0               | 39,0 | 4,0                |
| 16,0               | 17,0 | 1,8                | 39,0               | 40,0 | 4,1                |
| 17,0               | 18,0 | 1,9                | 40,0               | 41,0 | 4,2                |
| 18,0               | 19,0 | 2,0                | 41,0               | 42,0 | 4,3                |
| 19,0               | 20,0 | 2,1                | 42,0               | 43,0 | 4,4                |
| 20,0               | 21,0 | 2,2                | 43,0               | 44,0 | 4,5                |
| 21,0               | 22,0 | 2,3                | 44,0               | 45,0 | 4,6                |
| 22,,0              | 23,0 | 2,4                | 45,0               | 46,0 | 4,7                |

Tolerance is expressed as  $^{+x}_0$  mm where x is the value of the given tolerance

The tolerance value is according to Degree V of ISO 11922-1

### 3.3.2.3 Wall thickness of inner layer(e1)

The thickness of inner layer (e1) will be major or equal to 1/4 of the specified thickness (emin)

## 3.4 Mechanical characteristics of the pipes

On having realized the tests, according to method and parameters indicated in table 4, the mechanical characteristics of the pipes, must fulfill the requirements indicated in the above mentioned table

**Table 4**  
**Mechanical Characteristics**

| Characteristics                 | Requirements                         | Test parameters                     |                     |             |                       | Test method |
|---------------------------------|--------------------------------------|-------------------------------------|---------------------|-------------|-----------------------|-------------|
|                                 |                                      | Hydrostatic effort (tangential) MPa | Test temperature °C | Test time h | Number of test pieces |             |
| Resistance to internal pressure | Without fault during the test period | 15.0                                | 20                  | 1           | 3                     | ISO 1167    |
|                                 |                                      | 4.2                                 | 95                  | 22          | 3                     |             |
|                                 |                                      | 4.0                                 | 95                  | 165         | 3                     |             |
|                                 |                                      | 3.8                                 | 95                  | 1000        | 3                     |             |
|                                 |                                      | <b>General Test parameters</b>      |                     |             |                       |             |
|                                 |                                      | Sampling procedure                  | Unspecified 1)      |             |                       |             |
| Type of plug                    | Type a)                              |                                     |                     |             |                       |             |
| Orientation of the              | Unspecified                          |                                     |                     |             |                       |             |
| Type of test                    | Water-in-water                       |                                     |                     |             |                       |             |

1) As a guide see the Technical Specification CEN ISO/TS 15874-7

## 3.5 Physical characteristics of the pipes

On having realized the tests, according to method and parameters indicated in table 5, the physical characteristics of the pipe, must fulfill the requirements indicated in the above mentioned table.

**Table 5**  
**Physical characteristics**

| Characteristics   | Requirements  | Test parameters  |  | Test method                             |
|---|---|--|--|---|
|   |   | Characteristics  | Value  |   |
| Longitudinal retraction   | <b>≤ 1%</b>   | Temperature<br>Test time for<br>$e_n < 8$ mm<br>$8\text{mm} \leq e_n \leq 16\text{mm}$<br>$e_n > 16$ mm<br>Number of test pieces | 135°C<br><br>1h<br>2h<br>4h<br>3   | Method B of UNE EN ISO 2505 (oven test) |
| Thermal stability by hidrostatic pressure test                                      | Without break during the test (after realizing the test, should perform an analysis in order to check the adherence between the layers with a magnifying glass of 8 increases as minimum) | Sampling<br>Hydrostatic stress (tan)<br>Test temperature<br>Type of test<br>Plug<br>Length<br>Number of test pieces              | a)<br>2,6 Mpa<br>110°C<br>Water-in-Air<br>Plug a)<br>8760h<br>1                          | UNE EN ISO 1167-1 and 2                 |
| Impact resistance (BALL DROP)   | Serie S2, S2.5 and S3.2<br>Value H50 ≥ 1,0 m<br>Without break < 0,5 m<br><br>Serie S 4, S 5, S 6.3 and S.8<br>Value H50 ≥ 0,7 m<br>Without break < 0,5 m                                  | Hammer mass<br>Height<br>Temperature   | According to table 6 under point 3.5.1 of this RP  | EN 1411:1996                            |
| Melt flow index (COMPOSITE)   | ≤ 0.5 g/10 min  | Test Temperature<br>Mass<br>Number of test pieces  | 230°C<br>2,16 kg<br>3  | ISO 1133                                |
| Melt flow index (diference between composite and inner and outer layer of the pipe) | ≤ 30%   | Test temperature<br>Mass<br>Number of test pieces  | 230°C<br>2,16 kg<br>3  | ISO 1133                                |
| Determination of the percentage of glass fiber of the intermediate layer            | According to value declared by the manufacturer <b>± 3%</b> will not be able to be lower than <b>15%</b>  | Test temperature<br>Mass<br><br>Time<br>Test pieces  | verify for each reference.<br>According to the % of alleged fiber<br>30 min<br>Minimum 3 | UNE EN ISO 3451-1 (Method A)            |
| Determination of the percentage of the total fiber glass                            | According to value declared by the manufacturer <b>± 3%</b> will not be able to be lower than <b>5,0%</b>   | Test temperature<br>Mass<br><br>Time<br>Test pieces  | verify for each reference.<br>According to the % of alleged fiber<br>30 min<br>Minimum 3 | UNE EN ISO 3451-1 (Method A)            |

a) Not specify the sampling procedure. As a guide, see Technical Specification CEN ISO/TS 15874-7

## 3.5.1. Test method impact drop ball

**Tabla 6**  
**Method requirements of drop ball**

**(Series: S 2- S 2.5 - S 3.2)**

| <b>Diameter(mm)</b> | <b>20</b> | <b>25</b> | <b>32</b> | <b>40</b> | <b>50</b> | <b>63</b> | <b>75</b> | <b>90</b> | <b>≥ 110</b> |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| Temperature(°C)     | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0            |
| Hammer mass (Kg)    | 0,25      | 0,5       | 0,8       | 1,25      | 2,0       | 3,2       | 10,0      | 16,0      | 16,0         |
| Energy required     | 2,5       | 4,9       | 7,8       | 12,3      | 19,6      | 31,4      | 98,1      | 157,0     | 157,0        |
| H50 HeighT(m)       | ≥1,0      |           |           |           |           |           |           |           |              |

**(Series: S 4 - S 5 - S 6.3 - S 8)**

| <b>Diámetro(mm)</b> | <b>20</b> | <b>25</b> | <b>32</b> | <b>40</b> | <b>50</b> | <b>63</b> | <b>75</b> | <b>90</b> | <b>≥ 110</b> |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| Temperature(°C)     | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0         | 0            |
| Hammer mass (Kg)    | 0,25      | 0,5       | 0,8       | 1,25      | 2,0       | 3,2       | 10,0      | 16,0      | 16,0         |
| Energy required     | 1,7       | 3,4       | 5,5       | 8,6       | 13,7      | 22,0      | 68,7      | 109,9     | 109,9        |
| H50 HeighT(m)       | ≥ 0,7     |           |           |           |           |           |           |           |              |

## 4 Characteristics and system test method

It applies the established in the UNE-EN ISO 15874-3 and UNE-EN ISO 15874-5.