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# TEST REPORT

## Requester data

Customer: **PLASTICS EUROPE**

Adress: **RUE BELLIARD, 40/16, BE-1040 Brussels, BELGIUM**

Customer reference: *Quotation* ***PO/1875***

Scope: **Classification according to UNE-EN ISO 12192:2009 "Thermoplastic materials for pipes and fittings for pressure applications. Classification, designation, and design coefficient" of PVC-u ADEQUA pipes manufactured by ADEQUA WATER SYSTEMS S.L. based upon methodology and statistical data analysis described in UNE-EN ISO 9080:2013 "Plastic piping and ducting systems. Determination of the long-term hydrostatic strength of thermoplastics**

Product: **PVC-u pipes (unplasticized polyvinyl chloride) for water or sewage transportation systems under pressure.**

Date of samples reception: 27/01/2020, 25/05/2023 Testing period: 27/02/2020 – *05/05/2026*

**General dispositions:**

✓ The reported results were obtained using only the samples that was the object of this study, at the moment and in the conditions in which the measurements were taken.

✓ This report can only be reproduced in its entirety, the partial reproduction of this report is prohibited.

**Report revised by:**
**Joaquin Lahoz Castillo**
**Product Manager**

The following test standards are covered under ENAC accreditation 1/LE149:

| | |
|---|---|
| UNE-EN ISO 1167-1:2006 | Tubos, accesorios y uniones en materiales termoplásticos para la conducción de fluidos – Determinación de la resistencia a presión interna – Parte 1: Método general |
| UNE-EN ISO 1167-2:2006 | Tubos, accesorios y uniones en materiales termoplásticos para la conducción de fluidos – Determinación de la resistencia a presión interna – Parte 2: Preparación de las probetas de las tuberías. |
| UNE-EN ISO 9080:2013 | Sistemas de canalización y conducción en materiales plásticos – Determinación de la resistencia hidrostática a largo plazo de materiales termoplásticos en forma de tuberías mediante extrapolación |

ENAC
ENSAYO
ISO 17025
Nº1 / LE149

# 1. SCOPE

This test report summarizes the results of the works related with the determination of the long-term hydrostatic strength based on the standard ISO 9080:2012 “Plastic piping and ducting systems. Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation”

The tests have been carried out at CEIS testing facilities using the test samples supplied and manufactured by ADEQUA WATER SYSTEMS S.L. at their factory site at Avda. del Romeral, 15, Industrial Area, 29200 Antequera, (Málaga) Spain, under direct supervision of CEIS own personnel and on behalf of PLASTICS EUROPE strictly for the purpose of the present study (non-commercial samples).

# 2. GENERALITIES

## 2.1 Test samples

The determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation have been done using the results of internal pressure tests carried out according to ISO 1167-1:2006 on PVC-u dark grey RAL 7011 pipes with 140 mm of external diameter and 5,4mm of nominal wall thickness and marked along their axis with the following legends:

| Reference | Marking | Notes |
|---|---|---|
| PLA0031/20 | “AENOR -logo N- 001/912 logo adequa PVC-U W+P 140x5,4 UNE EN ISO 1452 PN10 20 26402/40325 14:23” | Conical Extruder |
| PLA0090/23 | “-logo ADEQUA- AENOR -logo N- 001/001014 PVC-U W+P 140x5,4 PN10 16/05/23 17:10 110423051 UNE EN ISO 1452” | Parallel Extruder |

Raw materials and recipe mixing conditions used to produce both references are indicated in Table A4. The extrusion conditions used for both references are detailed respectively in Tables A5 & A6.

## 2.2 Internal pressure tests.

The pressure tests, carried out according to ISO 1167-1:2006 and ISO 1167-2:2006 standards, have been set up -following the customer request- at 20°C and 60°C. According to ISO 1167-1:2006, these tests have been done with the following test environments and pressure media:

| **Test temperature [°C]** | **Outside test environment** | **Pressure medium in pipes** |
|---|---|---|
| 20 | Water | Water |
| 60 | Water | Water |

The number of observations at each test temperature was as follows:

| Status | Total | 20ºC | 60ºC |
|---|---|---|---|
| All included | 70 | 36 | 34 |
| Failed | 66 | 35 | 31 |
| Stopped | 4 | 1 | 3 |
| On test | 0 | 0 | 0 |
| All excluded | 68 | 24 | 44 |

The time distribution of these observations meets the minimum requirements of ISO 9080:2024

| Requirement | Minimum | 20ºC | 60ºC |
|---|---|---|---|
| Total observations | 30 | 36 | 34 |
| Observations >7000h | 4 | 4 | 5 |
| Observations >9000h | 1 | 3 | 3 |

## 2.2 Data Analysis

The determination of the long-term hydrostatic strength has been done using the extrapolation of the logarithmic relationships of the applied stress (in MPa) and the failure time observations (In hours).

The model used for the extrapolation is the 4 parameters model mentioned in Annex A of the UNE-EN ISO 9080:2013, considering the results and data obtained from the failed observations at the internal pressure tests carried out at 20°C and 60°C. Annex 1 reflects data and failure type included in statistical regression.

The calculation of the extrapolation has been done using the software Pipeson Analyzer version 3.13.0 supplied to CEIS under license by PIPESON AB Company (Sweden).

## 3. GRAPHICAL PLOT

In the graph of the annex 2, regression lines are shown (with a 97,5 % confidence level) for the different temperatures (20°C and 60°C) using the average of the longest 5 times at 60°C to calculate the extrapolation time at 20°C.
Using calculation methods based on multiple linear regression, the long-term hydrostatic strength is determined.
Considering the observations listed in the annex 1, the statistical parameters of the 4 parameters regression model, as defined in the standard UNE-EN ISO 9080:2013, they are as follows:

**First branch**

Equation: Log10(time) = C1 + C2/T + C3*Log10(stress) + C4*Log10(stress)/T

| Parameter | Value | Std error | t-value | Pr (>\|t\|) |
|---|---|---|---|---|
| C1 | -178,799 | 11,196 | -15,970 | 0,000 |
| C2 | 65.142,790 | 3.633,294 | 17,929 | 0,000 |
| C3 | 93,226 | 7,816 | 11,927 | 0,000 |
| C4 | -35.024,567 | 2.500,693 | -14,006 | 0,000 |

| | |
|---|---|
| No of points | Total: 70 \| 20°C: 36 \| 60°C: 34 |
| No of parameters | 4 |
| Degrees of freedom | 66 |
| Residual variance | 0,032 |
| Correlation Coefficient (R2) | 0,956 |
| Chi-Squared | 2,138 |
| Test of fit | Pr[F(8;58) > 1,596] = 0,146 |

In this way, the equation that correlates the stress over time for characterized pipes will follow the equation:

$$\log_{10}(t) = -178{,}799+65.142{,}790/T+93{,}226\ \log_{10}(\sigma)-35.024{,}567\ \log_{10}(\sigma)/T$$

where:

t, observation time in hours.
T, temperature in Kelvin degrees (K=°C+273,15)
σ, stress in MPa

Time limits for extrapolation are calculated as follows:

**Extrapolation limits**

| Temperature | Extrapolation time [h] | Extrapolation time [y] | Test temperature used | Extrapolation time factor, ke |
|---|---|---|---|---|
| 20°C | 876.000 | 100,00 | 60°C | 100,0 |
| 60°C | 9.536 | 1,09 | 60°C | 1,0 |

With this model, the data relating to the long-term hydrostatic strength as well as to the prediction in years are as follows:

**Prediction 20°C**

| Time [h] | Time [y] | LTHS [MPa] | LPL [MPa] |
|---|---|---|---|
| 10 | 0,00 | 41,292 | 39,963 |
| 100 | 0,01 | 37,825 | 36,634 |
| 1.000 | 0,11 | 34,648 | 33,548 |
| 8.760 | 1,00 | 31,899 | 30,848 |
| 10.000 | 1,14 | 31,738 | 30,690 |
| 100.000 | 11,42 | 29,073 | 28,049 |
| 438.000 | 50,00 | 27,482 | 26,465 |
| 876.000 | 100,00 | 26,766 | 25,749 |

**Prediction 60°C**

| Time [h] | Time [y] | LTHS [MPa] | LPL [MPa] |
|---|---|---|---|
| 10 | 0,00 | 20,980 | 19,452 |
| 100 | 0,01 | 17,291 | 16,102 |
| 1.000 | 0,11 | 14,250 | 13,274 |
| 8.760 | 1,00 | 11,875 | 11,019 |
| 10.000 | 1,14 | 11,744 | 10,893 |
| 100.000 | 11,42 | 9,679 | 8,903 |
| 438.000 | 50,00 | 8,549 | 7,808 |
| 876.000 | 100,00 | 8,066 | 7,340 |

## 4. CLASSIFICATION ACCORDING TO ISO 12162:2009

Considering the value of $\sigma_{LPL,20°C,50y}$ = 26,465MPa (see §3), the PVC-u tested pipes could be classified according to Table 1 of international UNE-EN ISO 12162:2009 with an **MRS (Minimum Required Stress) of 25MPa** and could be designed as **PVC-u 250** according to ISO1452-1:2009.
Considering the value of $\sigma_{LPL,20°C,100y}$ = 25,749MPa (see §3), the **PVC-u** tested pipes conserve also the classification **$CRS_{20°C,100y\ 10MPa}$** of **25MPa** over **100years**.

| Temperature (°C) | Time (Years) | $\sigma_{LPL}$ (MPa) | Classification |
|---|---|---|---|
| 20 | 50 | **26,465** | PVC-u Class 250 |
| 20 | 100 | **25,749** | PVC-u Class 250 |

## 5. ANNEXES

ANNEX 1. Long-term hydrostatic test results.
ANNEX 2. Graphical plot of regression data analysis.
ANNEX 3. Graphical plot of regression data analysis vs PVC-u ISO1452-1:2009 (Figure 1).
ANNEX 4. Raw material description
ANNEX 5. Processing conditions PLA0031/20 pipe samples
ANNEX 6. Processing conditions PLA0090/23 pipe samples

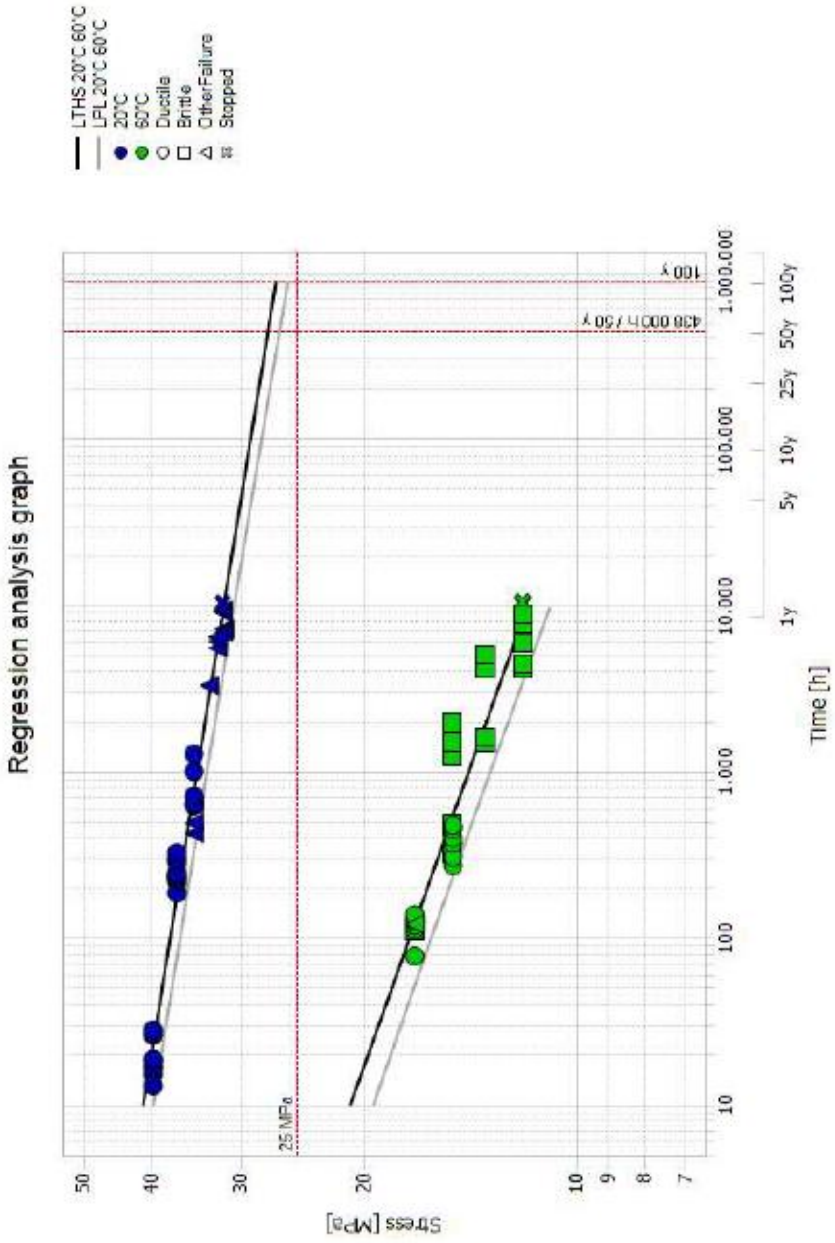
# ANNEX 1. Long-term hydrostatic test results

## Regression Data

| Id | T [°C] | Pressure [bar] | Stress [MPa] | Time [h] | Status | Regression | Data type |
|---|---|---|---|---|---|---|---|
| PLA031/20/07.01 | 20 | 0,00 | 35,00 | 427 | OtherFailure | Yes | A |
| PLA031/20/07.02 | 20 | 0,00 | 35,00 | 493 | OtherFailure | Yes | A |
| PLA031/20/07.03 | 20 | 0,00 | 35,00 | 642 | OtherFailure | Yes | A |
| PLA031/20/07.04 | 20 | 0,00 | 31,87 | 9.338,1 | OtherFailure | Yes | A |
| PLA031/20/07.05 | 20 | 0,00 | 31,87 | 9.093,43 | OtherFailure | Yes | A |
| PLA031/20/07.06 | 20 | 0,00 | 31,87 | 10.359,59 | Stopped | Yes | A |
| PLA031/20/07.10 | 60 | 0,00 | 17,00 | 116,35 | Brittle | Yes | A |
| PLA031/20/07.11 | 60 | 0,00 | 17,00 | 121,62 | OtherFailure | Yes | A |
| PLA031/20/07.12 | 60 | 0,00 | 17,00 | 110,53 | Brittle | Yes | A |
| PLA031/20/07.16 | 20 | 0,00 | 40,00 | 26,09 | Ductile | Yes | A |
| PLA031/20/07.17 | 20 | 0,00 | 40,00 | 27,11 | Ductile | Yes | A |
| PLA031/20/07.18 | 20 | 0,00 | 40,00 | 28,15 | Ductile | Yes | A |
| PLA031/20/07.19 | 20 | 0,00 | 37,00 | 187,19 | Ductile | Yes | A |
| PLA031/20/07.20 | 20 | 0,00 | 37,00 | 304,26 | Ductile | Yes | A |
| PLA031/20/07.21 | 20 | 0,00 | 37,00 | 232,14 | Ductile | Yes | A |
| PLA031/20/07.22 | 60 | 0,00 | 15,00 | 1.257 | Brittle | Yes | A |
| PLA031/20/08.01 | 20 | 0,00 | 35,00 | 632 | Ductile | Yes | A |
| PLA031/20/08.02 | 20 | 0,00 | 35,00 | 645 | Ductile | Yes | A |
| PLA031/20/08.03 | 20 | 0,00 | 35,00 | 716 | Ductile | Yes | A |
| PLA031/20/08.10 | 60 | 0,00 | 17,00 | 119,98 | Ductile | Yes | A |
| PLA031/20/08.11 | 60 | 0,00 | 17,00 | 113,91 | Ductile | Yes | A |
| PLA031/20/08.12 | 60 | 0,00 | 17,00 | 130,06 | Ductile | Yes | A |
| PLA031/20/08.16 | 20 | 0,00 | 40,00 | 17,03 | Ductile | Yes | A |
| PLA031/20/08.17 | 20 | 0,00 | 40,00 | 12,97 | Ductile | Yes | A |
| PLA031/20/08.18 | 20 | 0,00 | 40,00 | 15,1 | Ductile | Yes | A |
| PLA031/20/08.19 | 20 | 0,00 | 37,00 | 231,58 | Ductile | Yes | A |
| PLA031/20/08.20 | 20 | 0,00 | 37,00 | 218,91 | Ductile | Yes | A |
| PLA031/20/08.21 | 20 | 0,00 | 37,00 | 238,88 | Ductile | Yes | A |
| PLA031/20/08.22 | 60 | 0,00 | 15,00 | 1.498,79 | Brittle | Yes | A |
| PLA031/20/09.01 | 20 | 0,00 | 35,00 | 628 | Ductile | Yes | A |
| PLA031/20/09.02 | 20 | 0,00 | 35,00 | 1.006 | Ductile | Yes | A |
| PLA031/20/09.03 | 20 | 0,00 | 35,00 | 1.281 | Ductile | Yes | A |
| PLA031/20/09.10 | 60 | 0,00 | 17,00 | 77,93 | Ductile | Yes | A |
| PLA031/20/09.11 | 60 | 0,00 | 17,00 | 126,68 | Ductile | Yes | A |
| PLA031/20/09.12 | 60 | 0,00 | 17,00 | 138,13 | Ductile | Yes | A |
| PLA031/20/09.16 | 20 | 0,00 | 40,00 | 18,68 | Ductile | Yes | A |
| PLA031/20/09.17 | 20 | 0,00 | 40,00 | 16,41 | Ductile | Yes | A |
| PLA031/20/09.18 | 20 | 0,00 | 40,00 | 18,4 | Ductile | Yes | A |
| PLA031/20/09.19 | 20 | 0,00 | 37,00 | 287,93 | Ductile | Yes | A |
| PLA031/20/09.20 | 20 | 0,00 | 37,00 | 247,64 | Ductile | Yes | A |
| PLA031/20/09.21 | 20 | 0,00 | 37,00 | 326,93 | Ductile | Yes | A |
| PLA031/20/09.22 | 60 | 0,00 | 15,00 | 2.000 | Brittle | Yes | A |
| PLA090/23/01.23 | 20 | 25,60 | 32,34 | 6.445,82 | OtherFailure | Yes | A |
| PLA090/23/01.24 | 20 | 25,60 | 32,34 | 6.051,24 | OtherFailure | Yes | A |
| PLA090/23/01.25 | 20 | 25,60 | 31,78 | 6.883,11 | OtherFailure | Yes | A |
| PLA090/23/02.23 | 20 | 25,60 | 31,72 | 7.208,2 | OtherFailure | Yes | A |
| PLA090/23/02.24 | 20 | 25,60 | 33,31 | 3.298 | OtherFailure | Yes | A |
| PLA090/23/02/25 | 20 | 25,60 | 32,34 | 5.550,34 | OtherFailure | Yes | A |
| PLA090/23/03.01 | 60 | 11,94 | 15,00 | 493,93 | Brittle | Yes | A |
| PLA090/23/03.02 | 60 | 11,87 | 15,00 | 321,5 | Brittle | Yes | A |
| PLA090/23/03.03 | 60 | 11,94 | 15,00 | 470,21 | Brittle | Yes | A |
| PLA090/23/03.07 | 60 | 10,77 | 13,50 | 1.514,9 | Brittle | Yes | A |
| PLA090/23/03.09 | 60 | 10,62 | 13,50 | 1.597,04 | Brittle | Yes | A |
| PLA090/23/03.10 | 60 | 10,62 | 13,50 | 1.503,54 | Brittle | Yes | A |
| PLA090/23/04.01 | 60 | 11,73 | 15,00 | 453,29 | Ductile | Yes | A |
| PLA090/23/04.02 | 60 | 11,78 | 15,00 | 400,18 | Ductile | Yes | A |
| PLA090/23/04.03 | 60 | 11,76 | 15,00 | 476,23 | Ductile | Yes | A |
| PLA090/23/04.06 | 60 | 10,69 | 13,50 | 4.160,44 | Brittle | Yes | A |
| PLA090/23/04.08 | 60 | 9,27 | 11,95 | 4.447,6 | Brittle | Yes | A |
| PLA090/23/04.09 | 60 | 9,31 | 11,95 | 4.178,33 | Brittle | Yes | A |
| PLA090/23/04.11 | 60 | 9,27 | 11,95 | 8.911,53 | Brittle | Yes | A |
| PLA090/23/04.13 | 60 | 9,18 | 11,95 | 7.893,6 | Brittle | Yes | A |
| PLA090/23/04.14 | 60 | 9,18 | 11,95 | 5.926,86 | Brittle | Yes | A |
| PLA090/23/05.01 | 60 | 11,69 | 15,00 | 371,39 | Ductile | Yes | A |
| PLA090/23/05.02 | 60 | 11,76 | 15,00 | 273,34 | Ductile | Yes | A |
| PLA090/23/05.03 | 60 | 11,76 | 15,00 | 307,68 | Ductile | Yes | A |
| PLA090/23/05.04 | 60 | 10,64 | 13,50 | 5.082,29 | Brittle | Yes | A |
| PLA090/23/05.08 | 60 | 9,24 | 11,95 | 10.332,71 | Stopped | Yes | A |
| PLA090/23/05.09 | 60 | 9,26 | 11,95 | 10.332,61 | Stopped | Yes | A |

| Id | T [°C] | Pressure [bar] | Stress [MPa] | Time [h] | Status | Regression | Data type |
|---|---|---|---|---|---|---|---|
| PLA090/23/05.10 | 60 | 9,22 | 11,95 | 10.500 | Stopped | Yes | A |

# ANNEX 2. Graphical plot of regression data analysis




7

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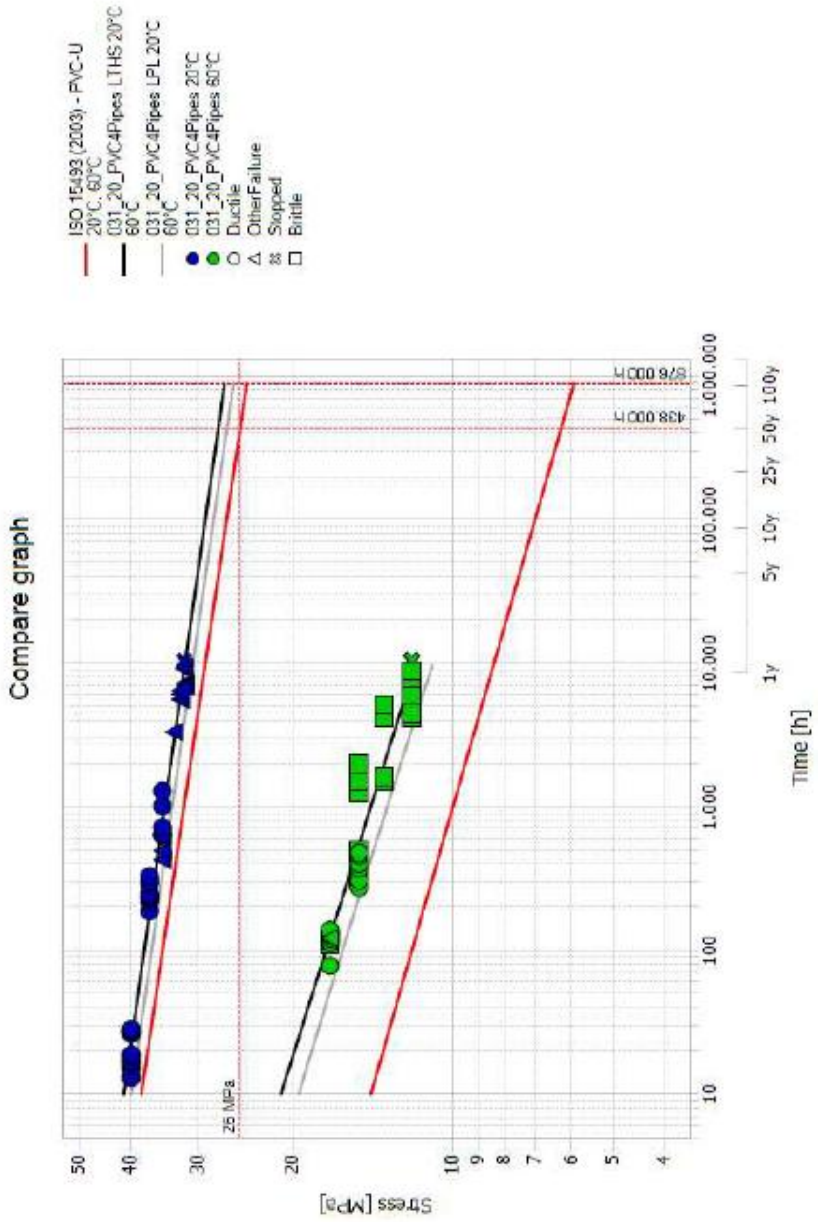
# ANNEX 3. Graphical plot of regression data analysis vs PVC-u 250 ISO 1452:20209 (Figure 1)




8

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# ANNEX 4. Raw materials and recipe mixing conditions

The compound used in these pipes consists of a mixture of Poly (vinyl chloride) (PVC), mineral filler (chalk) and a one-pack Ca/Zn stabilizer package and includes pigments to achieve desired colour (iron grey, RAL7011). The components of the mixture are pre-weighted and added into a two-stage hot (vertical) & cold (horizontal) mixer where mineral filler and additives are first well dispersed into the PVC powder that heats up to 120°C, and then slowly cooled down to 55°C. The ready-to-use compound (premix) is not sieve-screened prior to silo storage.

The references of used raw materials and their respective dosage levels in p.h.r. (per hundred resin) are indicated in Table A4.

| Component | Reference | Supplier | Dosage level (p.h.r.) |
|---|---|---|---|
| S-PVC (K66-68) | Solvin 267 RC(a) | Ineos Inovyn Ltd. | 100 |
| Filler (coated chalk) | Lubricarb 3TS(b) | Minera del Santo Angel S.L. | 6,0 |
| Additives (incl. pigment) | Cores SZ 7011(c) | Asua Products S.A. | 3,2 |

Table A4: PVC-U pipe compound composition and dosage level.

(a) S-PVC Solvin 267 RC is a well-known extrusion grade homopolymer with a bulk density of 0,580 g/cc and a viscosity index of 67 manufactured in the Ineos Inovyn Ltd.'s site at Martorell (Barcelona).

(b) The filler Lubricarb 3TS is a coated calcium carbonate with a D50 of 2,6µm, obtained from the limestone quarries of Minera del Santo Angel, S.L. (Sevilla).

(c) Cores SZ 7011 is a Ca based one-pack stabilizer package including Grey RAL 7011 pigment, developed by the well know Spanish stabilizer Asua Products S.A. in Sondika (Bilbao).

# ANNEX 5. Processing conditions PLA0031/20 pipe samples

After a silo storage period longer than 24 h, the premix compound is fed to a conical twin screw extruder (CM-80-SC, Milacron Inc.) with gravimetric dosage unit (SAVEOMAT, Inoex GmbH). The extruder adaptor is fitted with a pressure and temperature sensor probe (Gefran, spa) located in the melt stream. A standard spider type die-head LC250, (extrusion range DN140-250mm) is selected to shape the pipes. All pipes are extruded to comply with a S12,5 (C=2,0) DN 140x5,4mm PN10 classification, as defined in ISO 1452-2:2009.

Table A5: Extrusion trial 26/02/2020 (PLA0031/20)

| PVC-U DN140x5,4mm PN10 | | Time/Test Reference | | | | |
|---|---|---|---|---|---|---|
| Cincinnati Milacron CM80 SC | | 9:12 | 10:54 | 12:40 | 14:03 | 15:37 |
| Parameter | Unit | 05 (175ºC) | 06 (180ºC) | 07 (185ºC) | 08 (190ºC) | 09 (195ºC) |
| Dosing screw speed | rpm | 18,6 | 21,1 | 23,5 | 26,4 | 29,2 |
| Screw speed | rpm | 8,1 | 8,1 | 9,0 | 9,8 | 11,1 |
| Charge | % | 73 | 81 | 76 | 77 | 74 |
| Vacuum | bar | -0,9 | -0,9 | -0,9 | -0,9 | -0,9 |
| Zone 1 Extruder | °C | 150 | 148 | 175 | 185 | 183 |
| Zone 2 Extruder | °C | 165 | 164 | 166 | 175 | 186 |
| Zone 3 Extruder | °C | 160 | 159 | 163 | 170 | 179 |
| Zone 4 Extruder | °C | 155 | 155 | 162 | 166 | 169 |
| Zone 5 Extruder | °C | 152 | 152 | 153 | 161 | 162 |
| T melt | °C | 174/6 | 180/1 | 184 | 190/1 | 194/5 |
| P melt | bar | 178/9 | 203 | 189 | 199/202 | 189 |
| Zone 1 Die-head | °C | 161 | 162 | 168 | 164 | 165 |
| Zone 2 Die-head | °C | 176 | 175 | 178 | 179 | 179 |
| Zone 3 Die-head | °C | 190 | 190 | 190 | 190 | 189 |
| Zone 4 Die-head | °C | 180 | 180 | 186 | 181 | 183 |
| Zone 5 Die-head | °C | 199 | 196 | 198 | 194 | 200 |
| Zone 6 Die-head | °C | 202 | 196 | 205 | 200 | 207 |
| Pipe-meter-weight | kg/m | 3,310 | 3,298 | 3,334 | 3,322 | 3,322 |
| Output | kg/h | 160,8 | 184,0 | 202,0 | 227,2 | 249,1 |
| Line speed | m/min | 0,81 | 0,93 | 1,01 | 1,14 | 1,25 |

# ANNEX 6. Processing conditions PLA0090/23 pipe sample

After a silo storage period longer than 24 h, the premix compound is fed to a parallel twin screw extruder (KMD-2-130/26D, Krauss Maffei GmbH) with gravimetric dosage unit (SAVEOMAT M2, Inoex GmbH). The extruder adaptor is fitted with a pressure and temperature sensor probe (Gefran, spa) located in the melt stream. A standard spider type die-head LC250, (extrusion range DN140-250mm) is selected to shape the pipes. All pipes are extruded to comply with a S12,5 (C=2,0) DN 140x5,4mm PN10 classification, as defined in ISO 1452-2:2009.

Table A6: Extrusion trial 16/05/2023 (PLA0090/23)

| PVC-U DN140x5.4mm PN10 | | Time/Test Reference | | | | |
|---|---|---|---|---|---|---|
| Krauss Maffei KMD 2 130 26D | | | | 12:20 | 16:50 | 18:30 |
| Parameter | Unit | | | 03b (185ºC) | 04b (190ºC) | 05b (195ºC) |
| Dosing screw speed | rpm | | | 35,0 | 38,6 | 46,9 |
| Screw speed | rpm | | | 17,3 | 17,3 | 21.0 |
| Charge | % | | | 68 | 63 | 65 |
| Vacuum | bar | | | -0,9 | -0,9 | -0,9 |
| Zone 1 Extruder | °C | | | 163 | 185 | 197 |
| Zone 2 Extruder | °C | | | 160 | 185 | 194 |
| Zone 3 Extruder | °C | | | 160 | 185 | 191 |
| Zone 4 Extruder | °C | | | 160 | 179 | 188 |
| Zone 5 Extruder | °C | | | 160 | 173 | 175 |
| Zone 6 Extruder | °C | | | 155 | 163 | 165 |
| Die-Head Adaptor | °C | | | 155 | 160 | 160 |
| T melt | °C | | | 188 | 194 | 197 |
| P melt | bar | | | 221 | 195 | 198 |
| Zone 1 Die-head | °C | | | 165 | 165 | 165 |
| Zone 2 Die-head | °C | | | 175 | 176 | 177 |
| Zone 3 Die-head | °C | | | 192 | 192 | 192 |
| Zone 4 Die-head | °C | | | 184 | 184 | 184 |
| Zone 5 Die-head | °C | | | 200 | 200 | 200 |
| Zone 6 Die-head | °C | | | 205 | 205 | 205 |
| Pipe-meter-weight | kg/m | | | 3,229 | 3,248 | 3,255 |
| Output | kg/h | | | 252,6 | 279,2 | 339,2 |
| Line speed | m/min | | | 1,30 | 1,43 | 1,74 |