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Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use — Amendment 1

Systèmes de canalisation en matières plastiques — Tubes et raccords plastiques thermodurcissables renforcés de verre (PRV) — Méthodes pour une analyse de régression et leurs utilisations — Amendement 1

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Foreword

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The committee responsible for this document is ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use — Amendment 1

Page 49, Annex D

Replace Annex D with the following:

Annex D
(informative)

Calculation of Lower Confidence and Lower Prediction Limits for Method A

D.1 Introduction

The calculation of confidence limits is not required by any of the ISO or CEN test methods or referring standards. However, the calculation of lower confidence limit (*LCL*) and lower prediction limit (*LPL*) is required by other standards (ASTM for example) using the same basic covariant analysis procedures of test data collected by similar test methods.

D.2 Calculation of Quantities and Variances

Calculate the quantity B using Equation (D.1):

$$B = -D \times X(1+E) \tag{D.1}$$

Calculate the variance A of α using Equation (D.2):

$$A = D\left[X^2(1+E)+Q_{xy}/b\right] \tag{D.2}$$

Calculate the variance σ_n^2 of the fitted line at x_L using Equation (D.3):

$$\sigma_n^2 = A + Bx_L + Cx_L^2 \tag{D.3}$$

Calculate the error variance σ_ε^2 using Equation (D.4):

$$\sigma_\varepsilon^2 = 2\Gamma\sigma_\delta^2 \tag{D.4}$$

Calculate the total variance σ_y^2 for future values of y_L at x_L using Equation (D.5):

$$\sigma_y^2 = \sigma_n^2 + \sigma_\varepsilon^2 \tag{D.5}$$

Calculate the estimated standard deviation σ_y for y_L using Equation (D.6):

$$\sigma_y = (\sigma_n^2 + \sigma_\varepsilon^2)^{0,5} \tag{D.6}$$

D.3 Calculation of Confidence Intervals

Calculate the predicted value y_L for y at x_L using Equation (D.7):

$$y_L = a + bx_L \tag{D.7}$$

where a and b are as calculated by equations (D.8) and (D.9).

Calculate the lower 95% prediction interval $y_{L0,95}$ predicted for y_L:

$$y_{L0,95} = y_L - t_v \sigma_y \tag{D.8}$$

where t_v is the value from Table 2.

Calculate the corresponding lower 95% prediction limit for x_L using Equation (D.9):

$$x_{L0,95} = 10^{y_{L0,95}} \tag{D.9}$$

Setting $\sigma_y{}^2 = \sigma_n{}^2$ in Equation (D.5) will calculate a confidence interval for the regression line rather than a prediction interval for a future observation.

D.4 Validation of Procedures by a Sample Calculation

The data given in Table 3, analysed in 3.2.6 and summarized in Table 4 are extended for the sample calculation of confidence intervals.

Quantities and variances:

$B = -1{,}469 \times 10^{-5}$

$A = 4{,}667\,3 \times 10^{-5}$

at 50 years

$\sigma_n{}^2 = 4{,}0466 \times 10^{-5}$

$\sigma_\varepsilon{}^2 = 1{,}1601 \times 10^{-4}$

The estimated values for *LCL* and *LPL* are given in Table D.1 (see Table 4).

Table D.1 — Estimated values, V_m, *LCL* and *LPL* for *V*

Time h	V_m	*LCL*	*LPL*
0,1	45,76	43,86	42,83
1	42,39	41,05	39,93
10	39,28	38,41	37,16
100	36,39	35,91	34,53
1000	33,71	33,41	32,03
10 000	31,23	30,79	29,63
100 000	28,94	28,26	27,36
438 000	27,55	26,74	25,98

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