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Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the long-term ultimate bending strain and the long-term ultimate relative ring deflection under wet conditions

Tubes en plastiques thermodurcissables renforcés de verre (PRV) — Détermination de l'effort à la flexion ultime à long terme et réflexion annulaire relative ultime à long terme dans des conditions mouillées

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

This second edition cancels and replaces the first edition (ISO 10471:2003), which has been technically revised. It also incorporates the Amendment ISO 10471:2003/Amd1:2010.

The major changes to this edition include:

— reference to ISO 3126 for dimension measurement;

— clarification of accuracy statements;

— inclusion of calculation procedure for spring-line failures.

Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the long-term ultimate bending strain and the long-term ultimate relative ring deflection under wet conditions

1 Scope

This document specifies a method for determining by extrapolation the long-term ultimate ring bending strain and the calculation of the long-term ultimate relative ring deflection of glass-reinforced thermosetting plastics (GRP) pipes, under wet conditions.

Two methods of loading are given, one using plates the other beam bars.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 7685, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Determination of initial specific ring stiffness*

ISO 10928, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
vertical compressive force
F
vertical force, applied to a horizontal pipe to cause a vertical deflection

Note 1 to entry: Vertical compressive force is expressed in newtons.

3.2
mean diameter
d_m
diameter of the circle corresponding with the middle of the pipe wall cross-section and given by either of the following formulae:

$$d_m = d_i + e$$

$$d_m = d_e - e$$

where

d_i is the internal diameter, in metres (m);

d_e is the external diameter, in metres (m);

e is the wall thickness of the pipe, in metres (m).

Note 1 to entry: Mean diameter is expressed in metres.

3.3
vertical deflection
y
vertical change in diameter of a pipe in a horizontal position in response to a *vertical compressive force* (3.1)

Note 1 to entry: Vertical deflection is expressed in metres.

3.4
relative vertical deflection
y/d_m
ratio of the *vertical deflection*, y (3.3), to the *mean diameter* (3.2) of the pipe, d_m

3.5
ultimate vertical deflection under wet conditions
$y_{u,\,wet}$
vertical deflection (3.3) of the pipe, y, when failure occurs under wet conditions (see Clause 4)

Note 1 to entry: Ultimate vertical deflection under wet conditions is expressed in metres.

3.6
ultimate relative vertical deflection under wet conditions
$y_{u,\,wet}/d_m$
ratio of the *ultimate vertical deflection under wet conditions*, $y_{u,\,wet}$ (3.5), to the *mean diameter* (3.2) of the pipe, d_m

3.7
long-term ultimate ring deflection under wet conditions
$y_{u,\,wet,\,x}$
extrapolated value of the *ultimate vertical deflection under wet conditions* (3.5) of the pipe, $y_{u,\,wet}$, when failure is expected to occur at a time, x, specified in the referring standard

Note 1 to entry: Long-term ultimate ring deflection under wet conditions is expressed in metres.

3.8
long-term ultimate relative ring deflection under wet conditions
$y_{u,\,wet,\,x}/d_m$
ratio of the long-term *ultimate ring deflection under wet conditions* (3.7) of the pipe, $y_{u,\,wet,\,x}$, to the *mean diameter* (3.2) of the pipe, d_m

3.9
failure
loss of the structural integrity of a test piece as evidenced by the inability of the test piece to carry the load