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Glass-reinforced thermosetting plastics (GRP) pipes — Determination of initial ring stiffness

Tubes en plastiques thermodurcissables renforcés de verre (PRV) — Détermination de la rigidité annulaire initiale

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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For an explanation of 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 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 7685:1998), which has been technically revised. The main changes compared to the previous edition are as follows:

— added recommendations for the parallelism of the plates/bars;

— added preload dependent on DN sizes;

— taring requirements of load and deflection after preload have been added and before start of testing.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Glass-reinforced thermosetting plastics (GRP) pipes — Determination of initial ring stiffness

1 Scope

This document specifies methods for determining the initial ring stiffness of glass-reinforced thermosetting plastics (GRP) pipes. Two methods are given (constant load and constant deflection), and within the specified deflection limits, each is equally valid and can be used for any diameter.

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*

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:

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

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

3.1
compressive load
F
load applied to a pipe to cause a diametric deflection

Note 1 to entry: Compressive load is expressed in newtons.

3.2
vertical deflection
y
vertical change in diameter of a pipe in a horizontal position in response to a vertical *compressive load* (3.1)

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

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

3.4
mean diameter
d_m
diameter of the circle corresponding with the middle of the pipe wall cross-section

Note 1 to entry: It is given, in metres, by either of the following formulae:

$$d_m = d_i + e$$

$$d_m = d_e + e$$

where

d_i is the internal diameter (see 6.3.4), in metres;

d_e is the external diameter (see 6.3.4), in metres;

e is the wall thickness of the pipe (see 6.3.3), in metres.

3.5
ring stiffness
S
physical characteristic of the pipe, which is a measure of the resistance to ring deflection under external load

Note 1 to entry: This characteristic is determined by testing and is defined, in newtons per square metre, by the formulae.

$$S = \frac{E \times I}{d_m^3}$$

where

E is the apparent modulus of elasticity as determined in the ring stiffness test, in newtons per square metre;

I is the second moment of area in the longitudinal direction per metre length, expressed in metres to the fourth power per metre, i.e.

$$I = \frac{e^3}{12}$$

where

e is the wall thickness of the test piece, in metres;

d_m is the mean diameter (see 3.4) of the test piece, in metres.

3.6
initial ring stiffness
S_0
initial value of S obtained by testing in accordance with this document

Note 1 to entry: Initial ring stiffness is expressed in newtons per square metre.

4 Principle

A specified length of pipe is loaded along its length to compress it diametrically. Two ways are given for doing this, Method A (constant load) and Method B (constant deflection), either of which can be used:

— Method A: After applying the load necessary to give a relative deflection of (3 ± 0,5) %, the load is kept constant for a specified period of time and the final deflection is determined at the end of this period.

— Method B: After applying the load necessary to give the initial relative deflection specified in the referring standard, the deflection is kept constant for a specified period of time and at the end of this period the final load being applied is determined.

NOTE It is assumed that the following test parameters are set by the standard making reference to this document:

