SLOVENSKI STANDARD
SIST EN ISO 9080:2003

01-oktober-2003

Cevni in kanalski sistemi iz polimernih materialov - Določanje dolgotrajne hidrostatične trdnosti termoplastičnih materialov za cevi z metodo ekstrapolacije (ISO 9080:2003)

Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation (ISO 9080:2003)

Kunststoff-Rohrleitungs- und Schutzrohrsysteme - Bestimmung des Zeitstand-Innendruckverhaltens von thermoplastischen Rohrwerkstoffen durch Extrapolation (ISO 9080:2003)

Systemes de canalisations et de gaines en matieres plastiques - Détermination de la résistance hydrostatique a long terme des matieres thermoplastiques sous forme de tubes par extrapolation (ISO 9080:2003)

Ta slovenski standard je istoveten z: **EN ISO 9080:2003**

ICS:

23.040.20 Cevi iz polimernih materialov Plastics pipes

SIST EN ISO 9080:2003 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 9080

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English version

Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation (ISO 9080:2003)

Systèmes de canalisations et de gaines en matières plastiques - Détermination de la résistance hydrostatique à long terme des matières thermoplastiques sous forme de tubes par extrapolation (ISO 9080:2003)

Kunststoff-Rohrleitungs- und Schutzrohrsysteme - Bestimmung des Zeitstand-Innendruckverhaltens von thermoplastischen Rohrwerkstoffen durch Extrapolation (ISO 9080:2003)

This European Standard was approved by CEN on 28 February 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 9080:2003) has been prepared by Technical Committee ISO/TC 138 "Plastics pipes, fittings and valves for the transport of fluids" in collaboration with Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 9080:2003 has been approved by CEN as EN ISO 9080:2003 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

Annex ZA
(normative)

Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN	Year
ISO 3146	2000	Plastics - Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods	EN ISO 3146	2000

INTERNATIONAL STANDARD

ISO 9080

First edition
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Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation

Systèmes de canalisations et de gaines en matières plastiques — Détermination de la résistance hydrostatique à long terme des matières thermoplastiques sous forme de tubes par extrapolation

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9080 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

It cancels and replaces ISO/TR 9080:1992, which has been technically revised.

Introduction

General

ISO/TR 9080, upon which this International Standard is based, is the result of considerable discussion within working group 10 of subcommittee 5 of technical committee 138 of the International Organization for Standardization (ISO) (referred to hereafter as ISO/TC 138/SC 5/WG 10), which was entrusted with the development of the standard, which represents an agreed compromise incorporating features of several accepted national procedures.

Furthermore, it is emphasized that the standard extrapolation method (SEM) described is not intended to be used to disqualify existing procedures for arriving at design stresses or allowable pressures for pipelines made of plastics materials, or to disqualify pipelines made of materials proven by such procedures, which long years of experience have shown to be satisfactory. This SEM is meant to be used to qualify a material in pipe form prior to the introduction of such a material on the market.

A software package has been developed for the SEM analysis as described in Annex A and Annex B. A Windows-based programme is available on diskette (see Annex D).

NOTE Use of this software package is recommended.

Principles

The suitability for use of a plastics pressure pipe is first of all determined by the performance under stress of its material of construction, taking into account the envisaged service conditions (e.g. temperature). It is conventional to express this by means of the hydrostatic (hoop) stress which a plastics pipe made of the material under consideration is expected to be able to withstand for 50 years at an ambient temperature of 20 °C using water as the internal test medium. The outside environment can be water or air.

In certain cases, it is necessary to determine the value of the hydrostatic strength at either shorter lifetimes or higher temperatures, or on occasion both. The method given in this International Standard is designed to meet the need for both types of estimate. The result obtained will indicate the lower prediction limit (LPL), which is the lower confidence limit of the prediction of the value of the stress that can cause failure in the stated time at a stated temperature (the ultimate stress).

NOTE The MRS value (at 20 °C) is usually based on data obtained using water as the internal and external test medium. It is obvious that indeed all data are used for validation of regression curves at higher temperatures (e.g. 70 °C), including the data obtained with air as the external medium (e.g. at 110 °C).

This International Standard provides a definitive procedure incorporating an extrapolation using test data at different temperatures analysed by multiple linear regression analysis. The results permit the determination of material-specific design values in accordance with the procedures described in the relevant system standards.

This multiple linear regression analysis is based on the rate processes most accurately described by $\log_{10}$(stress) versus $\log_{10}$(time) models.

In order to assess the predictive value of the model used, it has been considered necessary to make use of the estimated 97,5 % lower prediction limit (LPL). The 97,5 % lower prediction limit is equivalent to the lower confidence limit of the 95 % confidence interval of the predicted value. This convention is used in the mathematical calculations to be consistent with the literature. This aspect necessitates the use of statistical techniques.

The method can provide a systematic basis for the interpolation and extrapolation of stress rupture characteristics at operating conditions different from the conventional 50 years at 20 °C. Taking into account the extrapolation factors (see 5.1.4), the extrapolation time limit can go up to 100 years.

It is essential that the medium used for pressurizing the pipe does not have an adverse effect on the pipe. In general, water is considered to be such a medium.

Long consideration was given to deciding which variable should be taken as the independent variable to calculate the long-term hydrostatic strength. The choice was between time and stress.

The basic question the method has to answer can be formulated in two ways as follows.

a) What is the maximum stress (or pressure) that a given pipe system can withstand at a given temperature for a defined time?

b) How long will a pipe system last when subjected to a defined stress (or pressure) at a given temperature?

Both questions are relevant.

If the test data for the pipe under study does not show any scatter and if the pipe material can be described perfectly by the chosen empirical model, the regression with either time independence or stress independence will be identical. This is never the case because the circumstances of testing are never ideal nor will the material be 100 % homogeneous. The observations will therefore always show scatter. The regressions calculated using the two optional independent variables will not be identical and the difference will increase with increasing scatter.

The variable that is assumed to be most affected by the largest variability (scatter) is the time variable and it has to be considered as a dependent variable (random variable) in order to allow a correct statistical treatment of the data set in accordance with this method. However, for practical reasons, the industry prefers to present stress as a function of time as an independent variable.

Use of the methods

This extrapolation method is designed to meet the following two requirements:

a) To estimate the lower prediction limit[1)] (at 97,5 % probability level) of the stress which a pipe made of the material under consideration is able to withstand for 50 years at an ambient temperature of 20 °C using water or air as the test environment.

b) To estimate the value of the lower prediction limit (at 97,5 % probability level) of the stress, either at different lifetimes or at different temperatures, or on occasion both.

There are several extrapolation models in existence, which have different numbers of terms. This SEM will use only models with two, three or four parameters.

Adding more terms could improve the fit but would also increase the uncertainty of the predictions.

The SEM describes a procedure for estimating the lower prediction limit (at 97,5 % probability level) whether a knee (which demonstrates the transition between type A and type B crack behaviour) is found or not (see Annex B).

The materials have to be tested in pipe form for the method to be applicable.

The final result of the SEM for a specific material is the lower prediction limit (at 97,5 % probability level) of the hydrostatic strength, expressed in terms of the hoop stress, at a given time and a given temperature.

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1) In various ISO documents, the lower prediction limit (LPL) is referred to as the lower confidence limit (LCL), where LCL is the 97,5 % lower confidence limit for the mean hydrostatic strength.