



BSI Standards Publication

Plastics piping systems — General rules for structural design of glass-reinforced thermosetting plastics (GRP) pipes

Part 1: Buried pipes

National foreword

This Published Document is the UK implementation of ISO/TS 20656-1:2017.

The UK participation in its preparation was entrusted to Technical Committee PRI/88/2, Plastics piping for pressure applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 92327 2

ICS 23.040.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2017.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

TECHNICAL
SPECIFICATION

ISO/TS
20656-1

First edition
2017-06

**Plastics piping systems — General
rules for structural design of glass-
reinforced thermosetting plastics
(GRP) pipes —**

**Part 1:
Buried pipes**

*Systèmes de canalisation en matières plastiques - Règles générales
pour la conception structurelle des*

*tubes et raccords plastiques thermodurcissables renforcés de verre
(PRV) —*

Partie 1: Tubes enterrés



Reference number
ISO/TS 20656-1:2017(E)

© ISO 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017. Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Partial factor method	2
4.1 General.....	2
4.2 Reliability index, β	2
4.3 Sensitivity index, α	4
4.4 Quality management.....	4
5 Partial factors for effects of actions	5
5.1 General.....	5
5.2 Partial factors for internal pressure.....	5
5.2.1 General.....	5
5.2.2 Model uncertainty.....	6
5.2.3 Uncertainty of pressure.....	7
5.2.4 Uncertainty of long-term pressure.....	7
5.2.5 Uncertainty of short-term pressure.....	8
5.2.6 Uncertainty of thickness and E-modulus.....	9
5.2.7 Uncertainty of diameter.....	9
5.2.8 Combined uncertainty and partial factor for effects of pressure.....	9
5.3 Partial factors for soil and traffic load.....	12
5.3.1 General.....	12
5.3.2 Uncertainty of installation parameters.....	14
5.3.3 Uncertainty of deflection model.....	14
5.3.4 Uncertainty in traffic load.....	15
5.3.5 Uncertainty in pipe stiffness.....	15
5.3.6 Uncertainty of deflection measurement.....	15
5.3.7 Deflection ratio.....	15
5.3.8 Uncertainty of model – Stress and strain calculation.....	15
5.3.9 Strain assessment through curvature measurement.....	16
5.3.10 Combined uncertainty of installation parameters.....	16
5.3.11 Partial factors for effects of bending.....	16
5.4 Combined effects of pressure and bending.....	17
6 Partial factors for resistance	17
6.1 Concept.....	17
6.2 Design value for resistance.....	18
6.2.1 General.....	18
6.2.2 Long-term resistance and conversion factor, η	18
6.2.3 Short-term resistance.....	19
Annex A (normative) Recommended values for pressure safety factors	21
Annex B (normative) Test data analysis	22
Bibliography	24

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 ISO/TC 138, *Plastics pipe fittings and valves for the transport of fluids*, SC 6, *Reinforced plastics pipes and fittings for all applications*.

A list of all the parts in the ISO 20656- series, can be found on the ISO website.

Introduction

This document provides general rules for structural design of buried glass-reinforced thermosetting plastics (GRP) pipes. It provides the necessary link between the requirements for safety, serviceability and durability of GRP pipe construction products and the technical provisions for civil works. The basis for design of structures, as specified in ISO 2394 and Eurocode EN 1990, are addressed in this document by providing partial factors for effects of actions and resistance for buried GRP pipes.

Currently in preview, click buy full version

Currently in preview, click buy full version

Plastics piping systems — General rules for structural design of glass-reinforced thermosetting plastics (GRP) pipes —

Part 1: Buried pipes

1 Scope

This document describes how partial factors for buried GRP pipes are developed, and are primarily intended to define the necessary safety measures for GRP pipes that meet the requirements of ISO 10639, ISO 10467 and ISO 25780, and EN 1796 and EN 14364. The same methodology can be utilised for other pipe product standards, although other parameters would apply.

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 2394:2015, *General principles on reliability for structures*

ISO 10639, *Plastics piping systems for pressure and non-pressure water supply — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin*

ISO 10467, *Plastics piping systems for pressure and non-pressure drainage and sewerage — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin*

ISO 25780, *Plastics piping systems for pressure and non-pressure water supply, irrigation, drainage or sewerage — Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin — Pipes with flexible joints intended to be installed using jacking techniques*

EN 1796, *Plastics piping systems for water supply with or without pressure — Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP)*

EN 1990:2002, *Eurocode — Basis of structural design*

EN 14364, *Plastics piping systems for drainage and sewerage with or without pressure — Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) — Specifications for pipes, fittings and joints*

EN, TS 15632, *Plastics piping systems for drainage, sewerage and water supply, pressure and non-pressure — Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) — Guidance for the assessment of conformity*

3 Terms and definitions

For the purposes of this document the terms and definitions given in ISO 2394 and EN 1990 apply.

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

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