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**Underground installation of flexible  
glass-reinforced pipes based  
on unsaturated polyester resin  
(GRP-UP) —**

**Part 3:  
Installation parameters and application  
limits**

*Installation enterrée de canalisations flexibles renforcées de fibres  
de verre à base de résine polyester insaturée (GRP-UP) —*

*Partie 3: Paramètres d'installation et limites d'application*



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Published in Switzerland

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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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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 10465-3 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 10465-3:1999), which has been technically revised to take into account changes made to methods in base documents ATV-A 127 and AWWA M-45 (see Introduction).

ISO 10465 consists of the following parts, under the general title *Underground installation of flexible glass-reinforced pipes based on unsaturated polyester resin (GRP-UP)*:

- *Part 1: Installation procedures* [Technical Specification]
- *Part 2: Comparison of static calculation methods* [Technical Report]
- *Part 3: Installation parameters and application limits* [Technical Report]

## Introduction

Work in ISO/TC 5/SC 6 (now ISO/TC 138) on writing International Standards for the use of glass-reinforced plastics (GRP) pipes and fittings was approved at the subcommittee meeting in Oslo in 1979. An ad hoc group was established and the responsibility for drafting various International Standards was later given to a Task Group (now ISO/TC 138/SC 6).

At the SC 6 meeting in London in 1980, Sweden proposed that a working group be formed to develop documents regarding a code of practice for GRP pipes. This was approved by SC 6, and Working Group 4 (WG 4) was formed for this purpose. Since 1982, many WG 4 meetings have been held which have considered the following matters:

- procedures for the underground installation of GRP pipes;
- pipe/soil interaction with pipes having different stiffness values;
- minimum design parameters;
- overview of various static calculation methods.

During the work of WG 4, it became evident that unanimous agreement could not be reached within the working group on the specific methods to be employed to address these issues. It was therefore agreed that all parts of the code of practice should be made into a type 3 Technical Report, and this was the form in which this part of ISO 10465 was first published in 1999. Since then the ISO rules dealing with the classification of document types have been revised and this has resulted in the three parts of ISO 10465 now being published as either a Technical Specification or a Technical Report.

ISO 10465-1, published as Technical Report in 1999 and revised as a Technical Specification in 2007, describes procedures for the underground installation of GRP pipes. It concerns particular stiffness classes for which performance requirements have been specified in at least one product standard, but it can also be used as a guide for the installation of pipes of other stiffness classes.

ISO 10465-2, published as a Technical Report in 1999 and revised in 2007, presents a comparison of the two primary methods used internationally for static calculations on underground GRP pipe installations.

These methods are

- a) the ATV method given in ATV-A 127, *Guidelines for static calculations on drainage conduits and pipelines*, and
- b) the AWWA method given in AWWA manual M-45, *Fiberglass pipe design*.

This part of ISO 10465, published as a Technical Report in 2007, gives additional information, which is useful for static calculations primarily when using an ATV-A 127 type design system in accordance with ISO 10465-2, on items such as:

- parameters for deflection calculations;
- soil parameters, strain coefficients and shape factors for flexural-strain calculations;
- soil moduli and pipe stiffness for buckling calculations with regard to elastic behaviour;
- parameters for rerounding and combined-loading calculations;
- the influence of traffic loads;
- the influence of sheeting;
- safety factors.

This Technical Report is not to be regarded as an International Standard. It is proposed for provisional application so that experience may be gained on its use in practice. Comments should be sent to the secretariat of TC 138/SC 6.

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# Underground installation of flexible glass-reinforced pipes based on unsaturated polyester resin (GRP-UP) —

## Part 3: Installation parameters and application limits

### 1 Scope

This part of ISO 10465 gives supplementary information on parameters and application limits for the underground installation of flexible glass-reinforced pipes based on unsaturated polyester resin (GRP-UP). It is particularly relevant when using an ATV-A 127 type design system.

Explanations for the long-term safety factors incorporated into the GRP system standards based on simplified probabilistic methods are provided in Annex G.

### 2 Normative references

The following referenced documents are indispensable for the application 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.

ATV-A 127, *Guidelines for static calculations on drainage conduits and pipelines*, 3rd edition, August 2000, (German Association for Water Pollution Control)

AWWA M-45, *Fiberglass pipe design manual M-45*, 2005 (American Water Works Association)

### 3 Symbols and abbreviated terms

For the purposes of this document, the following symbols apply.

NOTE 1 This clause also contains symbols and abbreviations from ISO 10465-1 and ISO 10465-3 for completeness.

NOTE 2 Several identical symbols are used in ATV-A 127 and AWWA M-45 to represent different quantities, and where this occurs, the origin of the symbol is given in the rightmost column.

NOTE 3 The format of the symbols listed here has been aligned as far as practicable with the *ISO/IEC Directives*, part 2, namely they appear in Times New Roman italic font. This format may differ slightly from the format used in ATV-A 127 and AWWA M-45.

Symbol	Unit	Meaning
<i>AQL</i>	—	acceptable quality level
<i>a'</i>	—	effective relative projection
<i>a<sub>f</sub></i>	—	ageing factor (ATV)
<i>a<sub>f</sub></i>	—	distribution factor (AWWA)