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ISO 9555-1:1994

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Measurement of water flow in open channels

Part 5.1: Tracer dilution methods for the measurement of steady flow — General (ISO 9555-1:1994, IDT)

AS 3778.5.1:2022

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Preface

This Standard was prepared by the Standards Australia Committee CE-024, Measurement of water flow in open channels and closed conduits, to supersede AS 3778.5.1:1991, *Measurement of water flow in open channels, Part 5: Dilution methods, Method 5.1: Constant-rate injection method for the measurement of steady flow.*

The objective of this document is to provide principles of the constant rate injection method and the sudden injection method (integration method), and the principles of injection, sampling and analysis which apply for all types of tracer. The tracers used and their concentrations should be compatible with the legislation of each country regarding the occasional and short-durations discharges of foreign substances into natural waters.

This document is identical with, and has been reproduced from, ISO 9555-1:1994, *Measurement of liquid flow in open channels — Tracer dilution methods for the measurement of steady flow — Part 1: General.*

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The terms "normative" and "informative" are used in Standards to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

Contents

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.

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.

International Standard ISO 9555-1 was prepared by Technical Committee ISO/TC 113, *Hydrometric determinations*, Subcommittee SC 4, *Dilution methods.*

ISO 9555 consists of the following parts, under the general title *Measurement of liquid flow in open channels — Tracer dilution methods for the measurement of steady flow.*

— *Part 1: General*

— *Part 2: Radioactive tracers*

— *Part 3: Chemical tracers*

— *Part 4: Fluorescent tracers*

Annexes A, B and C form an integral part of this part of ISO 9555. Annex D is for information only.

Introduction

The former standard series ISO 555 was subdivided into parts on the basis of the method of field measurement, i.e. constant-rate injection method and integration (sudden injection) method. Since the choice of the type of tracer to be used in a field measurement will often depend on the expertise and the laboratory facilities available, this new series of standards ISO 9555 is divided into parts based on the type of tracer used. This revision has enabled the unnecessary repetition of text of the various parts to be avoided and will, it is hoped, prove to be a more convenient form of presentation for the user.

ISO 9555 deals with the measurement of steady flow in open channels by dilution methods using tracers. The methods described may also be applied to the measurement of slowly varying flow, but they may only be used when flow conditions ensure adequate mixing of the injected solution throughout the flow.

For the measurement of very large flows, tracer methods can be onerous in terms of tracer costs and measurement times. However, the use of tracers often reduces danger to personnel during flood periods.

ISO 9555-1 presents the general principles of the methods of constant-rate injection and integration (sudden injection). ISO 9555-2, ISO 9555-3 and ISO 9555-4 deal with the specific aspects of the use of radioactive, chemical and fluorescent tracers, respectively, as well as specific analytical procedures.

This approach has been adopted for the following reasons:

— to facilitate subsequent updating, additions or revisions which concern only ISO 9555-2, ISO 9555-3 or ISO 9555-4;

— to provide a more practical document for the user, who is often obliged to choose the tracer best suited to the available analytical equipment.

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1 Scope

This part of ISO 9555 concerns principles of the constant rate injection method and the sudden injection method (integration method), and the principles of injection, sampling and analysis which apply for all types of tracer.

It is important to note that the tracers used and their concentrations should be compatible with the legislation of each country regarding the occasional and short-duration discharges of foreign substances into natural waters. They should also take into account possible short-term or long-term influences on flora and fauna, both natural and domestic. In the absence of appropriate regulations, the World Health Organization's (WHO) *Guidelines for drinking water quality* should serve as a guide, taking account of the brief nature of the measurement and of the use that is to be made of water receiving the injected tracer.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 9555. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9555 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 772:1988, *Liquid flow measurement in open channels — Vocabulary and symbols.*

3 Definitions

For the purposes of this part of ISO 9555, the definitions given in ISO 772 and the following definitions apply.

3.1
tracer
Ion, compound or radionuclide introduced into a flow system to follow the behaviour of some component of that system. It is necessary that the tracer, which can be observed, behave in exactly the same fashion as the component to be followed, whose behaviour cannot easily be observed.

3.2
dilution method
Method in which the discharge is deduced from the determination of the ratio of the concentration of the tracer injected to that of the tracer at the sampling cross-section (see also 3.9).

3.3
constant rate injection method
Method of measuring the discharge in which a tracer is injected at a constant and known rate at one cross-section and its dilution is measured at another section downstream where complete mixing has taken place and the concentration plateau has been reached.

3.4
sudden injection method; integration method
Method of measuring the discharge in which a known volume of tracer is injected over a short time at one cross-section and its dilution is measured at another cross-section downstream where complete mixing has taken place, over a period sufficient to allow all the tracer to pass that cross-section, so that the mean dilution of tracer during this period can be determined.