

Measurement of liquid flow in open channels —

Part 2: Dilution methods —

Part 2D: Methods of measurement using fluorescent tracers

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Industrial-process Measurement and Control Standards Policy Committee (PCL/-) to Technical Committee PCL/3, upon which the following bodies were represented:

- Clyde River Purification Board
- Department of the Environment
- Institute of Measurement and Control
- Institution of Water and Environmental Management
- National Rivers Authority
- Water Services Association of England and Wales
- Welsh Office

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Institute of Hydrology
- Water Research Centre

This British Standard, having been prepared under the direction of the Industrial-process Measurement and Control Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 March 1993

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Introduction	1
1 Scope	1
2 Normative reference	1
3 Definitions	1
4 Tracers used	2
5 Tracer measurement	2
6 Environmental factors affecting tracers	6
7 Techniques for tracer injection	7
8 Sampling techniques	7
9 Analysis and computations	7
10 Special requirements	7
Annex A (normative) General characteristics of commonly used fluorescent tracers	8
Figure 1 — Basic structure of most filter fluorimeters	3
Figure 2 — Excitation and emission spectra	4
Figure 3 — Temperature correction curves for acid yellow 7, rhodamine WT, sulfo, rhodamine B and pyranine	7
List of references	Inside back cover

National foreword

This Part of BS 3680 has been prepared under the direction of the Industrial-process Measurement and Control Standards Policy Committee. It is identical with ISO 9555-4:1992 *Measurement of liquid flow in open channels — Tracer dilution methods for the measurement of steady flow — Part 4: Fluorescent tracers*, published by the International Organization for Standardization (ISO).

This is one of a series of Parts of BS 3680 on dilution methods, as follows:

- *Part 2A: General*¹⁾²⁾;
- *Part 2B:1993: Radioactive tracers*;
- *Part 2C¹⁾: Chemical tracers*;
- *Part 2D:1993: Fluorescent tracers*.

These four Parts of BS 3680 supersede BS 3680-2A:1964, BS 3680-2B:1986, and BS 3680-2C:1983 which are withdrawn.

Cross-references. The Technical Committee has reviewed the provisions of ISO 772:1988 and ISO 9555-1¹⁾²⁾, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to ISO 772:1988 is BS 3680-1:1991 *Measurement of liquid flow in open channels — Part 1: Glossary of terms*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In preparation.

²⁾ It is envisaged that, when ISO 9555-1 is published, it will be implemented in the UK as BS 3680-2A.

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.

1 Scope

This part of ISO 9555 deals with the use of fluorescent tracers in discharge measurements by the dilution method. Apparatus and methods of general application are set out in ISO 9555-1 and are not repeated here, with the exception of those relating specifically to fluorescent tracers.

The use of fluorescent tracers is attractive because of the small amounts of tracer needed to make a discharge measurement. Certain fluorescent tracers can be measured at concentrations of less than 1 µg/l. Fluorescent tracers are easy to handle and their concentrations can be readily determined.

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 772:1988 and the following definitions apply.

3.1

fluorescence

the emission of electromagnetic waves of characteristic energy when atoms or molecules decay from an excited state to a lower energy state. The excitation may be induced by subjecting the substance to radiation of slightly higher energy (shorter wavelength) than that of the characteristic emission, and it ceases as soon as the external source is removed

3.2

fluorimeter; filter fluorimeter

instrument equipped with a lamp or other means of exciting fluorescent radiation in a sample, with filters and with a detector to measure relative fluorescent intensities caused by variations in concentration of the substance under examination. If the wavelengths are determined using a monochromator, the instrument is called a spectrofluorimeter

3.3

fluorescence quenching

the reduction of fluorescence intensity, due to an interaction of the dye molecules with other chemicals present in the water. Concentration quenching is a phenomenon which appears to be similar to fluorescence quenching but is not a true quenching. Instead, it is a reduction in the rate of increase of the flowmeter readout with increasing dye concentration due to the increasing optical density of the dye itself. Concentration quenching occurs only at very high concentrations