

Measurement of liquid flow in open channels —

Part 10: Sediment transport —

Part 10E: Sampling and analysis of
gravel bed material

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 Freshwater Ecology
- Institute of Hydrology
- Institution of Civil Engineers
- University of Newcastle Upon Tyne

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 January 1993

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Introduction	1
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Sampling equipment and procedures	1
5 Assignment of grain sizes	2
6 Frequency	2
7 Grain size/frequency distributions	3
8 Selection of sampling procedure	4
9 Determination of sample size	6
10 Errors	8
Figure 1 — Pipe sampler	2
Figure 2 — Gravel-cutter sampler	3
Figure 3 — Sampling site selection hierarchy	5
Table 1 — Weighting factors for conversion of sampling procedures	6
Table 2 — Student's t values at 95 % confidence level for various initial sample sizes	6
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 9195:1992 *Liquid flow measurement in open channels — Sampling and analysis of gravel-bed material*, published by the International Organization for Standardization (ISO).

This standard is one of a series of Parts of BS 3680-10 on sediment transport. The other Parts are as follows.

- *Part 10B: Measurement of suspended sediment;*
- *Part 10C: Bed material sampling;*
- *Part 10D: Methods for determination of concentration, particle size distribution and relative density of sediment in streams and canals.*

Cross-references

International Standard	Corresponding British Standard
ISO 4364:1977	BS 3680 <i>Measurement of liquid flow in open channels</i> Part 10C:1980 <i>Bed material sampling</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 772:1988 to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

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 10, 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.

Introduction

Bed material sampling techniques are used to obtain samples of sediment from the bed of a water course.

Information with respect to sediment sizes is required for estimating resistance to flow in open channels and, together with hydraulic data, for calculating bed material load and in making morphological forecasts.

1 Scope

1.1 This International Standard specifies methods for sampling surface and subsurface gravel-bed material and the analytical procedures to determine the size distribution of gravel-bed material in open channels.

1.2 This International Standard applies to material having diameters of 2 mm and over.

1.3 In practice, gravel-bed material may consist of two components: a coarser layer on the surface and finer subsurface material. Surface material is particularly relevant to investigations of the initiation of bed material movement and flow resistance, while subsurface material is mainly relevant to investigations of bed material transport. This International Standard does not attempt to correlate these two distinct populations.

1.4 There are two sampling techniques applicable to graded gravel-bed material. One method is to collect a definable *in situ* volume of material which is subsequently dealt with as a bulk sample. The second method is to sample material from the surface using one of several procedures. These two methods are discussed separately in this International Standard, and conversion factors are presented which are derived from idealized homogeneous material.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards 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*.

ISO 4364:1977, *Liquid flow measurement in open channels — Bed material sampling*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 772 apply.

4 Sampling equipment and procedures

4.1 Surface samples

4.1.1 Grid sampling

A grid is established over the surface of the gravel deposit and the pebbles immediately below the grid intersection points constitute the sample. Variants on this method include the use of a set of regularly spaced points, for example footsteps, as grid points and collecting the stone immediately underfoot after one or more steps, by reaching down with eyes closed and collecting the stone first touched by an outstretched finger. For small square grid samples, less than 1 m², a vertical photograph can be taken of the grid-covered area or a scaled photograph can be taken and a grid applied to the photograph.

4.1.2 Areal sampling

All the surface pebbles within a selected area constitute the sample. If the gravel is exposed above water, it can be marked with spray paint to facilitate collection of the surface material.

4.1.3 Transect sampling

All the stones exposed under a straight line (wire or string) across the sampling area are collected.

4.2 Bulk samples

The samplers described in 4.2.1 to 4.2.4 are illustrative of the type that has been successfully used for bulk sampling. Actual dimensions of the pipe and gravel-cutter samplers may be modified to suit the size of material being sampled.

4.2.1 Pipe sampler

The sampler consists of a 0,4 m long × 0,15 m diameter open pipe fixed into the bottom of a 0,5 m high × 0,36 m diameter open-topped barrel (see Figure 1). The pipe, which protrudes 0,26 m below the base of the barrel, is worked into the gravel until the bottom of the barrel is flush with the surface of the bed. The material in the pipe can be removed by hand or by scoop into the base of the barrel. This prevents the fines in the sample from being washed away. On completion of sampling, the pipe sampler is removed by hand from the bed of the river. The sampler, which can be used in up to 0,4 m of water, enables the surface and subsurface material to be sampled separately.