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Water quality — Sampling —

Part 6: Guidance on sampling of rivers and streams

Qualité de l'eau — Échantillonnage —

Partie 6: Lignes directrices pour l'échantillonnage des rivières et des cours d'eau

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Foreword

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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 147, *Water Quality*, Subcommittee SC 6, *Sampling*.

This third edition cancels and replaces the second edition (ISO 5667-6:2005), which has been technically revised.

ISO 5667 consists of the following parts, under the general title *Water quality — Sampling*:

— *Part 1: Guidance on the design of sampling programmes and sampling techniques*

— *Part 3: Preservation and handling of water samples*

— *Part 4: Guidance on sampling from lakes, natural and man-made*

— *Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*

— *Part 6: Guidance on sampling of rivers and streams*

— *Part 7: Guidance on sampling of water and steam in boiler plants*

— *Part 8: Guidance on the sampling of wet deposition*

— *Part 9: Guidance on sampling from marine waters*

— *Part 10: Guidance on sampling of waste waters*

— *Part 11: Guidance on sampling of groundwaters*

— *Part 12: Guidance on sampling of bottom sediments*

— *Part 13: Guidance on sampling of sludges*

— *Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling*

— *Part 15: Guidance on the preservation and handling of sludge and sediment samples*

— *Part 16: Guidance on biotesting of samples*

— *Part 17: Guidance on sampling of bulk suspended solids*

— *Part 19: Guidance on sampling of marine sediments*

— *Part 20: Guidance on the use of sampling data for decision making — Compliance with thresholds and classification systems*

— *Part 21: Guidance on sampling of drinking water distributed by tankers or means other than distribution pipes*

— *Part 22: Guidance on the design and installation of groundwater monitoring points*

— *Part 23: Guidance on passive sampling in surface water*

Introduction

An understanding of the purpose of sampling is an essential prerequisite to identifying the principles to be applied to a particular sampling problem. Examples of the purposes of sampling programmes commonly devised for rivers and streams are as follows:

a) to determine the suitability of the water quality of a river or stream within a river basin for a particular use, such as

   1) a source of drinking water,

   2) for agricultural use (e.g. all types of irrigation, live-stock watering),

   3) for the maintenance or development of fisheries,

   4) for amenity use (e.g. aquatic sports and swimming), and

   5) for conservation and protection of aquatic life;

b) to assess the impact of human activities on the quality of water, such as

   1) study of the effects of waste discharge or accidental spillages on a receiving water,

   2) assessment of the impact of land use on river or stream quality,

   3) assessment of the effect of the accumulation and release of substances including contaminants from bottom deposits on aquatic biota within the water mass, or on bottom deposits,

   4) study of the effects of abstraction, river regulation, and river-to-river water transfers on the chemical quality of rivers and their aquatic biota, and

   5) study of the effects of river engineering works on the water quality (e.g. addition or removal of weirs, changes to channel or bed structure).

Water quality — Sampling —

Part 6:
Guidance on sampling of rivers and streams

WARNING — The focus of this part of ISO 5667 is the collection and integrity of water samples. The collection of these samples can be hazardous and attention is therefore drawn to the existence in some countries of legislative requirements for the safety of personnel. It is essential that all sampling personnel have had thorough health and safety training for the conditions they are likely to encounter.

1 Scope

This part of ISO 5667 sets out the principles to be applied to the design of sampling programmes, sampling techniques, and the handling of water samples from rivers and streams for physical and chemical assessment.

It is not applicable to the sampling of estuarine or coastal waters nor for microbiological sampling.

NOTE 1 Procedures for microbiological sampling are given in ISO 19458.[10]

This part of ISO 5667 is neither applicable to the examination of sediment, suspended solids or biota, nor to dammed stretches of rivers or streams. Also, it is not applicable to passive sampling of surface waters (see ISO 5667-23).

NOTE 2 In cases where naturally occurring or artificially constructed dams result in the retention or storage of water for several days or more, the stretch of the river or stream should be considered as a standing water body. For sampling purposes, see ISO 5667-4.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 5667-11, *Water quality — Sampling — Part 11: Guidance on sampling of groundwaters*

ISO 5667-14, *Water quality — Sampling — Part 14: Guidance on quality assurance and quality control of environmental water sampling and handling*

ISO 6107-2:2006, *Water quality — Vocabulary — Part 2*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5667-11, ISO 6107-2, and the following apply.

3.1
automatic sampling
process whereby samples are taken either discretely or continuously, independently of human intervention, and according to a predetermined programme

[SOURCE: ISO 6107-2:2006, 9]

3.2
composite sample
two or more samples or sub-samples, mixed together in appropriate known proportions (either discretely or continuously), from which the average value of a desired characteristic can be obtained

Note 1 to entry: The proportions are usually based on time or flow measurements.

[SOURCE: ISO 6107-2:2006, 29]

3.3
continuous sampling
process whereby a sample is taken continuously from a body of water

[SOURCE: ISO 6107-2:2006, 32]

3.4
discrete sampling
process whereby single samples are taken from a body of water

[SOURCE: ISO 6107-2:2006, 40]

3.5
incremental sampling
technique in which small samples are taken because of a low flow rate (with the possibility of contamination by bottom deposits) or because of restricted access (e.g. where a sample is obtained through a small aperture), these small samples then being aggregated to form a composite sample

Note 1 to entry: All the liquid contained in the small samples is used, unlike blending of aliquots used to make a flow-proportional sample (see 9.4).

3.6
isokinetic sampling
technique in which the sample from a water stream passes into the orifice of a sampling probe with a velocity equal to that of the stream in the immediate vicinity of the probe

[SOURCE: ISO 6107-2:2006, 56]

3.7
light non-aqueous-phase liquid
LNAPL
organic compound that has low water solubility and a density less than that of water

EXAMPLE Petroleum products.

[SOURCE: ISO 5667-11:2009, 3.15, modified — Singular forms replace plural forms.]

3.8
random sampling
form of sampling whereby the chances of obtaining different concentration values of a determinand are precisely those defined by the probability distribution of the determinand in question

3.9
river
natural body of water flowing continuously or intermittently along a well-defined course into an ocean, sea, lake, inland depression, marsh, or other watercourse

[SOURCE: ISO 6107-2:2006, 109]

3.10
sampling site
general area or location from which samples are taken

3.11
sampling point
precise position within a sampling location from which samples are taken

[SOURCE: ISO 6107-2:2006, 117]

3.12
stream
water flowing continuously or intermittently along a well-defined course, as for a river, but generally on a smaller scale

[SOURCE: ISO 6107-2:2006, 137]

3.13
sub-sample
portion removed from a sample and intended to be representative of that sample

3.14
systematic sampling
sampling whereby the samples are taken at predetermined intervals, often equally spaced in time

4 Design of sampling programme

Sampling is usually the first step in carrying out an investigation and largely determines the quality of the whole investigation. It is therefore recommended that a detailed sampling strategy be drawn up, often based upon a preliminary investigation in which an assessment has identified the important aspects. Both the purpose and the ambient situation determine the way in which the sampling is carried out. Consideration of time-of-travel data can influence choice of sampling locations depending on the objective of the survey. General aspects for sampling programme design can be found in ISO 5667-1.

The sampling plan should give consideration to at least the following aspects.

General aspects:

a) purpose of the investigation;

b) parameters to be analysed for each sampling point;

c) the measurements to be carried out at the sampling point (with specification of the methods to be used) such as temperature, dissolved oxygen, degree of acidity, or discharge;

d) frequency and times of sampling and the type of sample;

e) sampling site and the number and locations of sampling points (also see 5.1);

f) sampling equipment;

g) quality assurance procedures to be followed;

h) transport, preservation, and storage of samples.

Aspects relating to the ambient situation of the sampling point:

a) safety aspects;

b) hydrodynamic and morphological characteristics of the water to be sampled;

c) local circumstances such as water depth, floating layers, vegetation, and accessibility of the location;

d) the sampling depth(s);

e) anticipated composition and quantity of the water to be sampled, among other things whether there are any floating and/or sludge layers present.

In addition, many characteristics can influence the behaviour of contaminants in river systems. An understanding of the nature of these characteristics is important when planning and carrying out river sampling programmes. Important factors include temperature, turbidity, depth, velocity, turbulence, slope, changes in direction and in cross-sections, and the nature of the river bed.

These factors are so interrelated that it is difficult to assign more or less importance to each one. For example, slope and roughness of the stream channel affect both depth and velocity of flow, which together control turbulence. Turbulence in turn affects rates of mixing of effluents and tributary streams, re-aeration, sedimentation or scour of solids, growths of attached biological forms and rates of natural purification. In addition, chemical and biological processes can occur, e.g. photosynthesis, respiration, and metabolic effects.

Practical sampling issues, such as accessibility, can make the ideal sampling point impractical. It is essential that any change to the designated sampling point on any grounds be discussed and agreed with the sampling programme originator. The outcome of the deliberations should be recorded in a sampling point file which contains directions to the sampling site, the detailed location of the sampling point, the method of sampling, and specific details (e.g. keys required, health, and safety issues). It can differentiate between equivalent sampling points that can be used if, for instance, river conditions change. It can also specify the type of sampling to be carried out, e.g. the depth to sample.

5 Sampling location

5.1 Sampling point selection

5.1.1 Choice of sampling site

In choosing the exact point from which samples are required, two aspects are generally involved:

a) the selection of the sampling site (i.e. the location of the sampling cross-section within the river basin, river, or stream);

b) the identification of the precise point at the sampling site.

The purpose of sampling often defines sampling sites (as in the case of the determination of the quality of an effluent discharge), but sometimes the purpose only leads to a general idea of the sampling site, as in the characterization of quality in a river basin. Where possible, sampling site locations should be defined by a grid reference in accordance with the international grid system in ISO 19112.[9]

The choice of sampling sites for single sampling stations is usually relatively straightforward. For example, a monitoring station for a baseline record of water quality can be chosen to permit the use of a convenient bridge, or to allow an upstream effluent discharge or tributary to be well mixed laterally before the station. Stations for monitoring water supply abstraction points might need to be fixed within narrow limits (i.e. in proximity to the abstractions).

In regions that receive seasonal rainfall only, and that have long periods without rain, river volumes and flows can vary tremendously, and sampling sites for regular use should be chosen so as to ensure that

