

DRAFT INTERNATIONAL STANDARD

ISO/DIS 5667-10

ISO/TC 147/SC 6

Secretariat: BSI

Voting begins on:
2019-07-04

Voting terminates on:
2019-09-26

Water quality — Sampling —

Part 10: Guidance on sampling of waste water

Qualité de l'eau — Échantillonnage —

Partie 10: Lignes directrices pour l'échantillonnage des eaux résiduaires

ICS: 13.060.30

iTeh STANDARD PREVIEW
(standards.itih.ai)
Full standard:
<https://standards.itih.ai/catalog/standards/sist/3741febe-c17a-46de-90de-a375abecd417/iso-dis-5667-10>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.



Reference number
ISO/DIS 5667-10:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/3741febe-c17a-46de-90de-a375abecd417/iso-dis-5667-10>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

**COPYRIGHT PROTECTED DOCUMENT**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
copyright@iso.org
www.iso.org

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/3741febe-c17a-46de-90de-a375abecd417/iso-dis-5667-10>

Contents

	Page
Foreword	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 General aspects	7
4.1 Design of sampling programme	7
4.2 Sampling point selection - Representativeness	7
4.3 Frequency and time of sampling	8
5 Sampling at specific locations	9
5.1 Sampling from sewers, channels and manholes	10
5.2 Sampling from waste water treatments plants	10
5.3 Sampling from industrial sites	11
5.4 Sampling from cooling systems	12
6 Main types of waste water sampling	12
6.1 Spot sampling	12
6.2 Composite sampling	13
7 Waste water sampling	13
7.1 General aspects	13
7.2 Composite sampling for waste water quality monitoring	14
7.3 Spot sampling in an effluent stream	19
7.4 Spot sampling of tank — planned discharges	20
8 Sampling equipment	22
8.1 General	22
8.2 Automatic sampler	22
8.3 Manual sampling equipment	23
8.4 Tank sampling equipment	24
9 Homogenization, preservation, transport and storage of samples	24
9.1 Homogenization of collected volume	24
9.2 Distribution of collected volume into laboratory bottles	25
9.3 Preservation and packaging of samples	26
9.4 Transportation and reception	26
9.5 Security and traceability of samples during storage and delivery	27
10 Quality assurance	27
10.1 Avoidance of contamination	27
10.2 Sample identification and records	28
10.3 Assurance and quality control	28
11 Reports	28
11.1 Analytical reports	28
11.2 Sampling protocols	29
12 Safety precautions	29
12.1 General	29
12.2 Personnel safety	30

12.3	Equipment safety	30
Annex A (informative)	Nuclear section — Sampling of liquid radioactive effluents	32
Annex B (informative)	Advantages and disadvantages of main types of waste water sampling.....	35
Annex C (informative)	Example of cleaning protocol — Sampling equipment.....	38
C.1	General	38
C.2	Conditions of realisation.....	38
C.3	Methodology	39
Annex D (informative)	Example of field form — Waste water sampling.....	41
Annex E (informative)	Choice of compatible materials for automatic samplers.....	43
E.1	Parameters — Macro-pollutants.....	43
E.2	Micropollutants (e.g. priority hazardous substances, priority substances, emerging substances)	43
E.3	Synthesis of materials	43
Annex F (informative)	Comparison of types of pumping: peristaltic pump (PP) and vacuum pump (VAP).....	45
Annex G (informative)	Type of distribution of collected volume into laboratory bottle	47
Annex H (informative)	Quality control of sampling equipment.....	49
H.1	General.....	49
H.2	Quality Control for composite automatic sampling	49
Bibliography	51

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.

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 147/SC 6.

This second edition cancels and replaces the first edition (ISO 5667-10:1992), which has been technically revised.

A list of all parts in the ISO 5667 series can be found on the ISO website.

Water quality — Sampling — Part 10: Guidance on sampling waste water

1 Scope

This document contains details on the sampling of domestic and industrial waste water, i.e. the design of sampling programmes and techniques for the collection of samples. It covers waste water in all its forms, i.e. industrial waste water, radioactive waste water, cooling water, raw and treated domestic waste water.

It deals with various sampling techniques used and the rules to be applied so as to ensure the samples are representative.

Sampling of accidental spillages is not included, although the methods described in certain cases may also be applicable to spillages.

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.

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

ISO 5667-16, *Water quality — Sampling — Part 16: guidance on biotesting of samples*

ISO 19458, *Water quality — Sampling for microbiological analysis*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization, in particular all the terminology of the ISO 6107 series (Water Quality - Vocabulary), at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1

composite sample

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

Note to entry: The number of samples or sub samples are usually based on time, flow measurements, area or depth profile sampling.

Composite sample can be made in different ways:

- constant volume variable time sampling (C.V.V.T): flow proportional sampling based on collecting equal volumes of sample at frequencies proportional to flow
- constant time variable volume sampling (C.T.V.V): flow proportional sampling based on collecting samples at fixed time intervals but where the volume of sample is varied in proportion to the flow
- constant time constant volume sampling (C.T.C.V): equal volumes of sample or sub-sample collected at equal increments of time

3.2

sampling point

precise position within a sampling location from which samples are taken

3.3

spot sample

discrete sample taken randomly (with regard to time and/or location) from a body of water. Spot samples are usually taken manually, but may be taken by automatic sampling equipment or by event-triggered automatic samplers

3.4

qualified spot sample

special form of a composite sample, consisting of at least five spot samples, taken and mixed within a maximum period of two hours and at an interval of not less than two minutes

3.5

radioactive liquid effluent

water or waste water that contains radioactive substances, resulting from a process and that can be recycled, treated and/or discharged to the environment

Note to entry: The activity concentration of the radioactive liquid effluent is usually measured before being discharged in the environment to verify that it is lower than the authorized levels in order to comply with national regulation

3.6

supernatant

solid or liquid phase present on the surface of an effluent

3.7

planned discharge

discharge subject to prior agreement further to a consultation between several parties based on knowing certain predefined parameters and referring to limit values (regulatory or otherwise)

Note to entry: These parameters may, for example, be physicalchemical and radiological measurements, the estimated discharge volume, the discharge period or the maximum discharge flow rate

3.8

permanent discharge

direct discharge into a channel or collector or water body, which is not subject to a specific prior agreement, but which shall comply with limit values

3.9**tank**

hollow object, very variable in size, used to hold liquids. Covers the usual names such as tank, chamber and pool. The content of this tank is intended for direct and indirect liquid discharge to the environment or to a specific treatment

3.10**event-triggered sampling**

sampling which is triggered because a pre-determined criterion has been met (e.g. rainfall, change in electrical conductivity, pH or the introduction of a polluting substance), when samples should be taken manually or by automatic equipment

4 General aspects**4.1 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. General aspects for sampling programme design can be found in ISO 5667-1.

4.2 Sampling point selection - Representativeness

The sampling point selection should be representative of the waste stream to be examined. In some waste waters this representativeness may be difficult to obtain because of the spatial and temporal heterogeneity of the water body. It is necessary to carry out the sampling in the sections where the flow is well mixed and homogeneous.

The term “representativeness” encompasses two notions depending on the type of environment to be sampled:

- representativeness in a flow (canal, sewer, manhole, pressurised pipes, etc.);
- representativeness in a storage (tank, lagoons, basins, etc.).

These two notions should be treated in different ways, but the goal remains to obtain a representative sample of the water body.

Sampling points may be clearly identified (by regulatory text) or not, in which case a preliminary investigation is recommended. This is generally the case for the selection of sewer sampling locations. By studying drawings of the sewer system initially, possible locations can be identified. Subsequently, a site inspection should be conducted to ensure that the locations of the sewers and the path of the waste stream corresponds to the drawings, and to make sure that the selected location is representative for the sampling purpose. The tracer studies may be a helpful tool.

Each sampling point should be documented. It is important to gather, for example, the following information: identification, location of the site, photos, geographical coordinates, site location, type of flow (open, closed), access conditions and sampling technique.

If necessary, specifically describe and label the sampling site. Select the site so that representative samples can be obtained and the waste water flow (with the exception of fixed sampling equipment) is clearly visible from the sampling site.

The following facilities should be available for the fixed sampling sites:

- access for motor vehicles to the immediate vicinity of the sampling site;

- flat working surfaces and allowable height above the sampling point for the set-up of sampling devices;
- adequate lighting and power connection;
- water connection to clean the equipment after sampling;
- adequate safety precautions (e.g. grids, railings, fall arresting devices); and
- flow meters in the case of a flow-dependent sampling.

If the hydraulic conditions do not guarantee the representativeness of the sample (absence of flow, reduced activity, abnormal load rise), a sample should not be taken, and the client and the analytical laboratory informed. If the sampling is performed, this unusual situation should be noted on the sampling report.

4.3 Frequency and time of sampling

4.3.1 Number of samples

Analyses should be based on samples taken at regular intervals during a certain period (i.e. the sampling period). The samples should be composite samples, unless the determinands to be analysed prohibit the use of a composite sample. The decision on the required number of samples taken during each period should be decided based on statistical techniques (see ISO 2602 [1], ISO 3534 [2] and ISO 5667-1). But the number of samples to be taken may often be decided by the regulatory body or pollution control authorities.

4.3.2 Sampling time for effluent stream

The objective of a sampling programme often dictates when and how a sample is collected and is often determined by legislation or directives. Generally, when sampling sewages and effluents, it is normal to make allowances for the following sources of variation in quality:

- a) diurnal variations (i.e. within-day variability);
- b) variations between days of the week;
- c) variations between weeks and months;
- d) variations between seasons;
- e) variations due to storm water episodes; and
- f) trends.

If there is little or no diurnal variation, or day-to-day variations, then the particular time of day or day of the week for sampling is relatively unimportant.

If the identification of the nature and magnitude of peak load are important, sampling should be restricted to those periods of the day, week or month when peak loads are known to occur.

Relating the times of sampling to the particular process being monitored may be very important when considering industrial effluent discharges that are either seasonal or operated on a batch basis. In either case, the discharge will not be continuous, and the sampling programme will need to take this fact into account.

Sampling for the detection of trends needs careful planning. For example, when detecting trends on a month-to-month basis, it is appropriate to always sample on the same day of the week, in order that any diurnal and daily variations are eliminated from the overall variability of data, thus allowing trends to be more efficiently detected.

When the number of samples has been decided upon according to 4.3.1, the sampling times should be determined. The samples should normally be taken at fixed intervals during the whole control period. The sampling period may be one year, a number of months or weeks, or even shorter periods of time.

If the sampling period covers one year, the days of sampling may be determined using a formula. An example of this is:

Formula (1) for a number of samples (n), larger than about 25 and from formula (2) for a number of samples less than about 25.

Formula (1) indicates the day number during which sampling should take place.

$$A + \frac{365}{n}, A + \frac{365 \times 2}{n}, A + \frac{365 \times 3}{n}, \dots, A + \frac{365 \times n}{n} \quad (1)$$

where

n is the number of samples;

A is a random number in the interval between $-\frac{365}{n}$ and 0.

Formula (2) indicates the week number during which the sampling should take place. The day of each week should be determined so that samples are taken on every weekday.

$$B + \frac{52}{n}, B + \frac{52 \times 2}{n}, B + \frac{52 \times 3}{n}, \dots, B + \frac{52 \times n}{n} \quad (2)$$

where

n is the number of samples;

B is a random number in the interval between $-\frac{52}{n}$ and 0.

Similar formulae can be used for other periods, for example, one month, three months, six months, etc. The period chosen should cover any seasonal variations.

After determining the intervals and the day or week number, it should be ensured that the sampling does not lead to any risk of systematic error, for example by always taking samples on one day, or by systematically omitting weekdays.

5 Sampling at specific locations

The concentration profiles of dissolved substances and suspended solids measured in an effluent are often heterogeneous because they depend on the hydraulic conditions and transport conditions of the solid phase in the body of water. Observations are:

- A vertical gradient of concentration, due to the flow velocities or the shear stresses near the bottom are low;
- A very dense layer at the interface between the deposit of the bottom and the water circulating in the structure;
- An increase of the concentration near the walls;
- An increase of the concentration near the surface of the flow due to the presence of floating matter.

It is therefore necessary to define carefully the positioning of the sample taken within the body of water. To take a sample theoretically representative of the average concentration of the measured section, it is advisable to place the sampling point about halfway up the water column and at a sufficient distance from the walls and deposits to avoid measurement bias.

5.1 Sampling from sewers, channels and manholes

A location should be chosen where the effluent has a high turbulent flow to ensure good mixing. Often accessibility, lack of site security, or power unavailability may preclude the use of the best sites.

Since effluent channels are generally designed to cope with both effluent and storm-water discharge conditions and/or for higher flows than those actually occurring, laminar flow may often occur. In the absence of a location with turbulent flow conditions, such conditions should be induced by restricting the flow, for example with a baffle or weir. The restriction should be made in such a way that sedimentation upstream of the restriction does not occur (e.g. foresee enlargement of the downstream effluent channel compared to the upstream channel, to avoid any pressure increase of the effluent downstream).

The sampling intake point should always be located downstream from the restriction and, as a general rule, it should be located at least three times the pipe diameter, or width of the channel, downstream of the restriction. The inlet of the sampling probe should preferably face the direction of flow but may face downstream if too many blockages result.

The exact location of the sampling point should be evaluated with respect to variations in water level, types and concentrations of the determinands, etc. The sampling point should be at a minimum distance from the bottom and walls to avoid sample contamination by deposits or the biofilms that develop. Generally, a sampling point between one third and one half of the effluent water depth below the surface of the water may be recommended.

Whenever practicable, permanent sampling locations should be established, care being taken to ensure reproducible sampling conditions.

Before proceeding with the sampling of industrial discharges, the conditions inside the plant (e.g. processes and production rates) should be noted and recorded along with any potential hazards.

5.2 Sampling from waste water treatments plants

When choosing sampling locations for waste water treatment plants, it is again important to refer to the objective of the data collection programme, of which the sampling is a part.

Typical objectives are:

- control of the performance of the entire treatment plant: samples should be collected at the main inlet and main outlet points;
- control of the operation of individual processing units, or groups of units: samples should be collected at the inlet and outlet of the units in question.

When sampling at the waste water treatments plants, the importance, the relevance of any bypass flow should be evaluated, and sampling of such flows may also be needed for the sampling to be representative for the overall effluent.

When sampling at the inlets of plants, the objective of the sampling programme should be carefully considered. In some situations, there may be a need to sample raw sewage in the mixture with recirculated processing liquid (e.g. in the assessment of primary sedimentation tank loadings and efficiency). In other cases, it may be necessary to exclude the effect of these liquids (e.g. when collecting data designed to assess domestic/industrial loadings to a plant or to assist in industrial effluent control).

Representative sampling is often facilitated by using locations downstream of a measuring flume or weir (see also 5.1).

When sampling effluents from processes employing more than one individual treatment unit (e.g. several sedimentation tanks), care should be exercised in ensuring that the sample is representative of the overall effluent stream rather than any one specific treatment unit (unless that unit forms the basis of a specific study).

Frequent reviews of a plant's sampling locations need to be made to ensure that any relevant changes in the operation of unit processes are considered when sampling. For example, the percolating filter operation may be changed from a "single-pass" operation to a "recirculation" or "alternating-double-filtration" operation. Treatment plant operation may involve changes in the manner in which feed or return liquors are introduced to the plant (e.g. return of sewage from storm tanks, changes in the position at which processing liquors are returned to the treatment plant).

Whenever sampling waste waters, great care should be exercised to overcome or minimize the substantial heterogeneity caused by suspended solids that are often present. Similarly, thermal stratification of separate industrial effluent streams may be found when sampling effluents or discharges from industrial processes, and measures have to be taken to promote the mixing of such streams before sampling.

5.3 Sampling from industrial sites

Sampling liquid effluents involves sampling a certain representative amount before and/or after they are transferred to discharge channels or collectors.

The sampling method depends on the type of discharge or transfer taking place. The following should therefore be distinguished:

- planned discharges, which require a preceding inspection before the discharge takes place. These may be, for example, discharges from facilities' liquid effluent tanks prior to their transfer to general collectors or buffer pools before being discharged into the environment (refer to 7.4);
- permanent discharges, which concern effluents that are continuously discharged. They are monitored based on sequential or continuous sampling of the discharged effluent. These may be, for example, discharges from an effluent collector at the outlet of a nuclear site or a rainwater collector, prior to discharge into the environment.

As such, the kind of sampling and the creation of representative samples shall be adapted to suit the type of discharge and its potential heterogeneity (e.g. the presence of suspended matter or any density or thermal stratification).

For this, and to guarantee the representative nature, the samples shall be produced:

- ensuring sampling only takes place after obtaining suitable effluent homogeneity;
- ensuring there is no change to the nature of the effluent or cross-contamination; and