INTERNATIONAL STANDARD

ISO 5667-21

First edition
2010-10-15

Water quality — Sampling —

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

Qualité de l'eau — Échantillonnage —

Partie 21: Lignes directrices pour l'échantillonnage de l'eau potable distribuée par camions-citernes ou d'autres moyens que les tuyaux de distribution

Reference number
ISO 5667-21:2010(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 5667-21 was prepared by Technical Committee ISO/TC 147, *Water quality*, Subcommittee SC 6, *Sampling (general methods)*.

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: Guidance on the 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 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*

Introduction

ISO 5667 deals with the general aspects of sampling (see ISO 5667-1 and ISO 5667-3) and with the sampling of specific types of water (ISO 5667-4 onwards). This part of ISO 5667 is one of the specific water-type sampling parts, and deals with the sampling of drinking water, with or without prior treatment, when the water is supplied by means other than a piped distribution system contiguous to a water source. This part of ISO 5667 should be read in conjunction with ISO 5667-1, ISO 5667-3 and ISO 5667-5.

Effective monitoring of drinking water requires collaboration between sampling programme designers, water operators including transporters and water couriers, sample collectors, laboratory analysts, and data users. This part of ISO 5667 gives guidance on the selection of sampling locations and the collection of samples when monitoring drinking water.

Understanding the purposes for monitoring drinking water and the principles behind the methods of analysis is important, since specific sampling protocols can vary widely in accordance with different purposes and different analytical methods.

Examples of sampling purposes include:

a) searching for the cause of pollution within the distribution chain (e.g. in response to customer complaints);

b) monitoring the quality of drinking water in storage and at the point of use on ships, aircraft and other vessels and vehicles that provide water for drinking, washing, cooking or other purposes;

c) assessing the effects of materials in contact with the water on its quality;

d) assessing the integrity of a non-contiguous distribution chain.

An important factor to take into account is that the potential for microbial regrowth due to faecal contamination of drinking water is always present and constitutes a genuine risk to human health. Chemical contamination events also occur, but these are likely to pose chronic hazards rather than the acute effects generated by faecal contamination.

Water quality — Sampling —

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

1 Scope

This part of ISO 5667 establishes principles to be applied to the techniques of sampling water provided for drinking and for use in the manufacture of food and beverage products.

The guidance given in this part of ISO 5667 is generally confined to those circumstances where water is drawn from municipal or similar public or private abstraction, treatment or distribution systems for which prior treatment or quality assessment has resulted in the water being classified as suitable for drinking or potable process purposes. Specifically, this part of ISO 5667 is applicable to water that is supplied by tanker or other non-contiguous bulk means, but not contiguously as part of a piped distribution system, during any stage of use up to and including the point of consumption or transfer to a piped distribution system. This part of ISO 5667 is also applicable to the distribution and bulk storage of water on aircraft, trucks, trains, ships, and other vessels and vehicles, as well as to sampling situations that can arise during the investigation of system defects, initiation of new systems, re-initiation of systems that have been unused for long periods or emergency situations where the safety of sampling operatives is not compromised.

This part of ISO 5667 does not provide guidance on:

a) the sampling of source water, e.g. groundwater and impoundments;

b) the sampling of potable water supplies derived from contiguous piped supplies covered by ISO 5667-5;

c) the sampling of beverage products (including bottled waters) or food containing potable water used in its preparation;

d) the sampling of drink vending machines.

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 documents (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: Guidance on the preservation and handling of water samples*

ISO 5667-5:2006, *Water quality — Sampling — Part 5: Guidance on sampling of drinking water from treatment works and piped distribution systems*

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

ISO/TS 13530, *Water quality — Guidance on analytical quality control for chemical and physicochemical water analysis*

ISO 15553, *Water quality — Isolation and identification of* Cryptosporidium *oocysts and* Giardia *cysts from water*

ISO 15839, *Water quality — On-line sensors/analysing equipment for water — Specifications and performance tests*

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

3 Terms and definitions

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

3.1
conventional water distribution
water distribution via a contiguous system of pipes and works from source to use

3.2
drinking water
water intended for human consumption

[ISO 24510:2007[3], 2.11]

3.3
non-contiguous water distribution
water distribution where there is no continuous system of pipes and works from source to use

EXAMPLE Distribution by tanker truck.

3.4
potable process water
water abstracted without treatment, or applied after treatment, in the food or beverage manufacturing industries, but excluding that contained within the end-product food and beverage, or the products themselves

NOTE Adapted from ISO 5667-5:2006, 2.3.

4 Monitoring programme design

Refer to ISO 5667-1 regarding the design of monitoring programmes, including statistical considerations.

5 Sampling equipment

Refer to ISO 5667-1 and ISO 5667-3 regarding sampling equipment, requirements for containers and materials in contact with the sample, and cleaning of sample containers.

Refer to ISO 15839 regarding performance characteristics for analysing equipment, and to ISO 19458 regarding equipment, bottles, and sterilization requirements specific to sampling for microbiological analysis.

6 Sampling programme design

6.1 General

Be aware that sampling locations, national regulations, and local safety regulations influence the methods of sample collection employed.

Before collection of samples, decide whether some of the analyses are to be performed on site. Be aware of any national regulations requiring on-site analysis.

When collecting samples for microbiological analysis, also be aware of ISO 19458.

6.2 Frequency and timing of sampling

The sampling frequency depends, among other factors, on:

a) the purpose for which sampling is being performed;

b) the number of consumers served;

c) the volume of water distributed;

d) the quality of the source water;

e) the variability of the raw-water quality;

f) the water treatment required;

g) the health hazard involved;

h) the complexity and characteristics of the specific distribution system being sampled;

i) specific parameters.

Detailed guidance, including statistical considerations, is given in ISO 5667-1. National or regional legislation, whichever has precedence, should be followed. Note that the minimum frequencies for different parameters need not be the same. For detailed guidance on assessment of hazards, see 6.5.

6.3 Location of sampling points

6.3.1 General

Choose sample collection locations to yield samples that are representative of the quality of the water contained in the bulk storage container and of the water quality at the point(s) where water is delivered to consumers, used as potable process water (e.g. in food and beverage processing) or transferred to a piped distribution system.

While the selection of each sampling point requires individual consideration, the following general criteria are usually applicable.

a) There should be at least one sampling point on the inlet to the bulk storage container and one sampling point on the outlet from the bulk storage container. Water extracted from these sampling points should represent water within the storage container and should not be extracted from the source or from a secondary distribution system.

b) In systems with more than one inlet or outlet, sample locations should reflect the potential differences in water quality, in accordance with the determination to be made.

c) Sampling points should include locations representative of the most unfavourable sources and locations considered vulnerable to contamination.

d) Where waters from different sources mix within the bulk storage container, sample locations should be chosen to be representative of the quality of the water from each source.

e) Where a container discharges to a piped distribution system on a ship, aircraft or other means of transport, or to a distribution system in a large building or group of buildings such as a hotel or an office block, sampling locations are required within each building, ship, aircraft or other vehicle.

f) If a distribution system includes many similar inlets or outlets, sample at least the most remote and the closest points to the reservoir.

g) Caution is required that the sampling process does not itself convey water into the system to avoid risk of injecting contaminants.

The presence of biofilms suggests problems with the materials used in the distribution system or the management of the delivery systems. If biofilms are suspected, use the methods of sampling and analysis specified in ISO 19458 to investigate the source of the problem. The sampling of biofilms is difficult, and the method employed is influenced by the specific sampling situation. Further guidance is given in Annex C.

6.3.2 Mobile tankers

Mobile tankers can be used either as temporary alternatives to piped or other supplies, or to fill other temporary or permanent non-contiguous supplies. They include tanks of drinking water transported by road, waterway, rail, and air. These transfer containers should be regarded as non-contiguous, non-piped sources of drinking or process water in their own right and be sampled accordingly (see 6.3.5). They should ideally be emptied, cleaned, and disinfected before refilling. If this is not done, enhanced sampling and analysis is recommended, commensurate with the increased risk of contamination (see Annex A).

6.3.3 Static tanks

Static tanks can be used as permanent sources of drinking water, process water supplying a piped distribution system or temporary alternatives to piped or other sources. When static tanks are used as integral parts of conventional water distribution systems, sample them according to ISO 5667-5. However, when static tanks are used as non-contiguous sources of drinking or process water in their own right, sample them accordingly (see 6.3.5).

Tanks which are emptied, cleaned and disinfected before refilling should be regarded as non-contiguous sources (see 6.3.5). If the cleaning is not done before refilling temporary tanks, enhanced sampling and analysis are recommended, commensurate with the increased risk of contamination or proliferation of micro-organisms, which could, for example, adversely affect taste and odour or give rise to more serious problems (see Annex A).

6.3.4 Bulk storage tanks on aircraft, trains and ships

Tanks on aircraft and trains should ideally be emptied, cleaned, and disinfected before refilling. If this is not done, enhanced sampling and analysis are recommended, commensurate with the increased risk of contamination. Where these tanks supply their own permanent distribution systems, sample both the tanks and their distribution systems in accordance with ISO 5667-5.

Tanks on ships, which are refilled from external sources of drinking water, should be sampled in a similar way to tanks on aircraft and trains. An exception is ships having their own treatment plants permanently connected to the storage tanks, in which case sample the treatment plant, storage tank(s), and distribution system(s) as a piped distribution system in accordance with ISO 5667-5.

6.3.5 Non-contiguous water distribution

On occasion, non-contiguous sources, such as road tankers, are used as a temporary alternative to piped supplies. Ideally, samples should be collected from outlet taps rather than by dip sampling. If dip sampling is necessary, then it is important to maintain the integrity of the water supply by thorough cleaning and disinfection of the sampling equipment.

NOTE Water is particularly vulnerable to contamination during filling and emptying operations.

Check that standpipes and hoses are protected from contamination and flushed before use. Also check that hose nozzles are kept immersed in suitable disinfectant solution prior to use, and that there is no cross-connection with non-potable water supplies. Back-flow from tank to storage tank, hoses or source water supply should be avoided.

6.3.6 Bottled water supplied in an emergency

On occasion, water is supplied on an emergency basis in bottles (or other small containers) directly to the consumer by the operator as a temporary alternative to piped supplies. A sample of filled bottles should be taken at random, at the point of filling and at the point of distribution, and taken to the laboratory for analysis. In such cases, sample the source water prior to bottling in accordance with ISO 5667-5.

6.4 Pre-collection cleaning, disinfection, and flushing

6.4.1 General

Cleaning, disinfection, and flushing prior to sample collection depend on the specific objectives of the monitoring programme. In general, sampling to ascertain the quality of the water delivered from the container, or to ascertain whether the quality of the water delivered within a building or transport vehicle is possibly altered by the service network within the building or vehicle, requires thorough cleaning and flushing of the sampling points. Investigation of water quality as delivered from a tap can require that samples be collected before cleaning and flushing, or samples can be required both before and after cleaning and flushing.

Be aware of local and national regulations. When samples are to be collected for microbiological analysis, also be aware of ISO 19458.

6.4.2 Tanks

Generally, not less than 2 min of free flow should be allowed to flush out any stagnant water within the sampling line before taking a sample. If this is insufficient or the volume of water stored in the tank is small, calculate the volume of water that needs to be displaced from the pipe, estimate the flushing time required at an appropriate flushing rate and then apply a flushing time of five times that value. Not more than 1 % of the volume of water in the tank should be discharged prior to sample collection. Take the precautions specified in ISO 5667-5:2006, 6.1 into consideration.

6.4.3 Taps

The procedure for sampling from taps[1)] is given in ISO 5667-5.

6.4.4 Dip sampling

Dip samples should only be collected where there is no appropriate alternative. A sampling tap should always be installed whenever regular sampling is planned.

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1) ISO 5667-5:2005 uses the US term “faucet”.