
Standard Practice for Collection and Preservation of Water Samples

AASHTO Designation: R 24-99 (2022)¹

Technically Revised: 1999

Reviewed but Not Updated: 2022

Tech Subcommittee: 5c, Quality Assurance and Environmental



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004**

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1. SCOPE

- 1.1. The objective of sampling is to collect a portion of material small enough in volume to be conveniently transported to and handled in the laboratory while still accurately representing the material being sampled. This implies, first, that the relative portions or concentrations of all pertinent components must be the same in the sample as in the material being sampled, and second, that the sample must be handled in such a way that no significant changes in composition occur before the tests are performed. Complete and unequivocal preservation of samples, whether domestic sewage, industrial waste, or natural waters, is a practical impossibility. Regardless of the nature of the sample, complete stability for every constituent can never be achieved. At best, preservation techniques can only retard the chemical and biological changes that inevitably continue after the sample is removed from the parent source.
- 1.2. The values stated in SI units are to be regarded as the standard.

2. TYPES OF SAMPLES

- 2.1. *Grab or Catch Samples*—Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specific point at which it was collected. In such circumstances, some sources may be quite well represented by single grab samples. Examples are some water supplies, some surface waters, and, rarely, some wastewater streams.
- 2.1.1. When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can be of great value in documenting the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as 5 min to as long as 1 h or more.
- 2.1.2. When the composition of a source varies in space rather than time, a set of samples collected from appropriate locations with less emphasis on timing may provide the most useful information.
- 2.1.3. Use great care in sampling wastewater sludges, sludge banks, and muds. No definite procedure can be given, but every possible precaution should be taken to obtain a representative sample.
- 2.2. *Composite Samples*—In most cases, the term *composite sample* refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term *time-composite* is used when it is necessary to distinguish this type of sample from others. Time-

composite samples are most useful for observing average concentrations that are used, for example, in calculating the loading or the efficiency of a wastewater treatment plant. As an alternative to the separate analysis of a large number of samples, followed by computation of average and total results, composite samples of this type represent substantial savings in laboratory effort and expense. For these purposes, a composite sample representing a 24-h period is considered standard for most determinations. Under certain circumstances, however, a composite sample representing one shift, or a shorter time period, or a complete cycle of a periodic operation, may be preferable. Evaluation of the effects of special, variable, or irregular discharges and operations may require composite samples representing the period during which such discharges occur.

- 2.2.1. For determination of components or characteristics subject to significant and unavoidable changes during storage, composite samples cannot be used. Perform such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Analyses for all dissolved gases, residual chlorine, soluble sulfide, temperature, and pH are examples of determinations of this type. Changes in components such as dissolved oxygen or carbon dioxide, pH, or temperature may produce secondary changes in certain inorganic components such as iron, manganese, alkalinity, or hardness. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the existing conditions of sample collection and preservation.
- 2.2.2. Take individual portions in a wide-mouth bottle having a diameter of at least 35 mm at the mouth and capacity of at least 120 mL. Collect these portions each hour—in some cases each half-hour or even every 5 min—and mix at the end of the sampling period or combine in a single bottle as collected. If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples may sometimes be necessary.
- 2.2.3. It is desirable, and often absolutely essential, to combine the individual samples in volumes proportional to the volume of flow. A final volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.
- 2.2.3.1. Automatic sampling devices are available but should not be used unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.
- 2.3. *Integrated Samples*—For certain purposes, the information needed is provided best by analysis of mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures are sometimes called *integrated samples*. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. For evaluation of average composition or total loading, a mixture of samples representing various points in the cross section, in proportion to their relative flows, may be useful. The need for integrated samples may also exist if combined treatment is proposed for several separate wastewater streams, the interaction of which may have a significant effect on treatability or even the composition of the mixture. Mathematical prediction of the interactions may be inaccurate or impossible, and testing of a suitable integrated sample may provide more useful information.
- 2.3.1. Both natural and artificial lakes often show variations of composition with both depth and horizontal location. However, under most conditions, neither total nor average figures are especially significant in these situations. The local variations are of more importance, and the samples are examined separately rather than integrated.
- 2.3.2. The preparation of integrated samples usually requires special equipment to collect a sample from a known depth, without contamination by the overlying water. Prior knowledge about the volume, movement, and composition of the various parts of the water being sampled is usually required.