



Designation: D 4557 – 85 (Reapproved 1995)

Standard Practice for Collecting Benthic Macroinvertebrates with Surber and Related Type Samplers¹

This standard is issued under the fixed designation D 4557; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the procedures for obtaining a sample of macroinvertebrates inhabiting mud, sand, gravel, or rubble substrate.

1.2 The device is restricted to use in shallow streams or shallow areas of rivers, and it depends on a water velocity of not less than 0.05 m/s to wash the sample into a net.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For a specific hazard statement, see 6.8.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1129 Terminology Relating to Water²

D 4556 Guide for Selecting Stream-Net Sampling Devices for Collecting Benthic Macroinvertebrates³

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, see Terminology D 1129.

4. Summary of Practice

4.1 The Surber sampler consists of two 30.5-cm frames, hinged together; one frame rests on the substrate, the other remains upright and holds the nylon net. The sampler is positioned with its net mouth open, facing upstream.

4.2 When in use, the two frames are locked at right angles, one frame marking off the area of substrate to be sampled and the other frame supporting a net to strain out organisms washed into it from the sample area.

4.3 Modification of the Surber sampler to overcome some of the limitations of its use (for example, loss of organisms due to

backwash) has resulted in the design and construction of a number of related sampling devices, such as the four-sided (enclosed) portable invertebrate box sampler, the cylindrical Hess sampler, the cylindrical Hess stream bottom sampler, and the cylindrical stream-bed fauna sampler.

4.4 Operation of the portable invertebrate box, Hess, Hess stream bottom, and stream-bed fauna samplers are similar to the Surber sampler.

4.5 The net used to collect macroinvertebrates can vary in mesh size, length, taper, and material, for example, canvas, taffeta, or nylon monofilament.

4.6 The net is usually made of nylon, and a variety of mesh sizes is available. The mesh size used will depend on the objectives of the study. A mesh size of 0.35 mm, for example, will retain most instars of aquatic insects.

4.7 While a smaller mesh size might increase the number of smaller invertebrates and young instars collected, it will clog more easily and exert more resistance to the current than a larger mesh, possibly resulting in a loss of organisms due to backwashing from the sample net.

4.8 It should be noted that these samplers are specific for macroinvertebrates, and that many of the micro-components of the benthos will not be collected.

4.9 The Surber, portable invertebrate box, Hess, Hess stream bottom, and stream-bed fauna samplers sample an area of 0.1 m².

4.10 The polyester foam base of the portable invertebrate box sampler conforms to a variety of substrates to prevent the loss of organisms from beneath the sampler. The Hess, Hess stream bottom, and stream-bed fauna samplers can be “turned” into most sediment types to a depth of several centimetres. The Surber sampler rests on the surface of most sediments.

4.11 When sampling is completed, the net of the portable invertebrate box sampler slides out for cleaning or exchange with a different net. Hess-type samplers may have a mason jar ring and an adapter with a fixed or removable cloth net bucket.

4.12 These samplers are designed for use in shallow, flowing waters.

4.13 These samplers cannot be used as efficiently in still or deep water.

4.14 These samplers are best used in water of 30.48-cm (1-ft) depth or less.

¹ This practice is under the jurisdiction of ASTM Committee E47 on Biological Effects and Environmental Fate and is the direct responsibility of Subcommittee E47.03 on Terrestrial Assessment and Toxicology.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 11.05.

4.15 If the water depth is greater than 30.48 cm (1 ft), benthic organisms may wash over the top of the net rather than into it.

4.16 These samplers do not provide quantitative samples consistently, and the efficiency of the sampling device depends on the experience and ability of the user.

4.17 While there can be large sampling errors associated with their use by an inexperienced operator, these samplers can provide data which are accurate and comparable if they are used consistently by one experienced person in similar habitats.

4.18 If the water velocity is very great, resistance provided by the small mesh of the net or debris washed into it, or both, may result in a backwashing effect that washes benthic organisms out of the sample area of the Surber sampler or top of the other samplers.

5. Significance and Use

5.1 The Surber, portable invertebrate box, Hess, Hess stream bottom, and stream-bed fauna samplers are used to collect qualitative and quantitative samples from shallow flowing waters containing benthic macroinvertebrates living on or in various types of substrates.

5.2 The organisms in the sample are used to define macroinvertebrate community characteristics in water quality studies and ecological assessments.

6. Procedure

6.1 Position these samplers securely on the substrate, parallel to the flow of the water, with the net pointing downstream.

6.2 Bring the samplers down quickly to reduce the escape of rapidly moving organisms.

6.3 There should be no gaps under the edges of the frame that would allow for washing of water under the net and loss of benthic organisms.

6.4 Eliminate gaps that may occur along the edge of the Surber sampler frame by carefully shifting rocks and gravel along the outside edge of the sampler. This is also true of the cylindrical-type samplers if they are on rubble substrate that makes turning into the bottom difficult. The portable invertebrate box sampler polyester foam pad can conform to a relief of 7.6 cm (3 in.).

6.5 Take care not to disturb the substrate upstream from the sampler, to avoid excessive drift into the sampler from outside the sample area.

6.6 Once the sampler is positioned on the stream bottom, it should be maintained in position during sampling so that the area delineated remains constant.

6.7 Hold the Surber sampler with one hand or brace with the knees from behind. The Hess, Hess stream bottom, and stream-bed fauna samplers, and the portable invertebrate box samplers can be held with one hand or braced with the knees from the sides. The portable invertebrate box sampler also can be sat upon for convenience while sampling; this provides the collector with a stable sampling platform that allows maximum manipulation of the substrate with little sampler movement.

6.8 Heavy gloves may be required when handling dangerous debris, for example, glass or other sharp objects present in the sediment.

6.9 Turn over carefully all rocks and large stones and rub carefully in front of the net with the hands or a brush to dislodge the organisms clinging to them.

6.10 Examine each stone carefully for attached or clinging organisms, larval or pupal cases, etc. before discarding.

6.11 Scrape attached algae, insect cases, etc. from the stones into the sample net.

6.12 Wash larger components of the substrate within the enclosure; water flowing through the sampler should carry dislodged organisms into the net.

6.13 Stir the remaining gravel and sand vigorously with the hands to a depth of 10 cm (4.0 in.) where applicable, depending upon the substrate, to dislodge bottom-dwelling organisms.

6.14 It may be necessary to hand pick some of the heavier mussels and snails that are not carried into the net by the current.

6.15 If water level is too slow or low to allow continuous flow through the sampler, substrate can be washed in accordance with 6.12 and water hand-splashed into the net, although sampler efficiency will be reduced.

6.16 Remove the sample by inverting the net (or washing out sample bucket, if applicable) into the sample container (widemouthed jar) with 10 % buffered formalin fixative.

6.17 Examine the net carefully for small organisms clinging to the mesh, and remove them (preferably with forceps to avoid damage) for inclusion in the sample.

6.18 Rinse the sampler net after each use.

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