INTERNATIONAL STANDARD

**ISO
8265**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Water quality — Design and use of quantitative samplers for benthic macro-invertebrates on stony substrata in shallow freshwaters

Qualité de l'eau — Conception et utilisation des échantillonneurs de macro-invertébrés benthiques sur substrat rocailleux dans les eaux douces peu profondes

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8265 was prepared by Technical Committee ISO/TC 147, *Water quality*.

Annex A forms an integral part of this International Standard.

Introduction

The "Surber"[1] and "cylinder" samplers described in this International Standard are designed to remove benthic macro-invertebrates from a defined shape and area of substrate of a bed of a water body. Hence these samplers are sometimes called quadrat samplers. They may be regarded as quantitative counterparts of the handnet sampling method described in ISO 7828, *Water quality — Methods of biological sampling — Guidance on handnet sampling of aquatic benthic macro-invertebrates*. They are usually used in water with a depth of less than 500 mm and are thus restricted to use in shallow water, particularly the "Surber" which should preferably not be submerged. Although the samplers can also be used in deeper water by a diver, it must be emphasised that they were not originally designed for that purpose. Their basic design is described as part of this International Standard. Modifications are presented in annex A.

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1) Named after the biologist, E. W. Surber, who originally designed this apparatus.

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Water quality — Design and use of quantitative samplers for benthic macro-invertebrates on stony substrata in shallow freshwaters

Safety precautions — Working alone in water is not recommended in view of the risks from high current velocities, deep waters and unstable beds.

1 Scope

This International Standard gives guidance on the equipment and procedures for the quantitative sampling of benthic macro-invertebrates by quadrat samplers in waters of depth less than 500 mm, although methods are described to permit sampling, under certain conditions, in a water depth of up to 1 m.

The procedures are applicable to the sampling of all accessible aquatic habitats in rivers, streams and estuaries where current velocities in excess of 0,1 m/s would be expected, but the samplers, with modifications, may be used in locations of low current velocity, such as ponds and lakes (see annex A). Sampling may be difficult or impossible where the substrate includes large stones and boulders or dense stands of macrophytes (rooted plants). The results of using the samplers provide quantitative data on the presence, diversity and relative abundance of taxa.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5667-3 : 1985, *Water quality — Sampling — Part 3: Guidance on the preservation and handling of samples.*

3 Principle

Sampling of benthic macro-invertebrates in shallow running water by collection using a quadrat sampler, which isolates a portion of the bed of the water body. Disturbance of the substrate leads to release of macro-invertebrates, from attachment or burial, and they are carried into the net by the current.

4 Apparatus

4.1 Surber sampler

The sampler [see figure 1a)] consists of two frames hinged together, one supporting the net and the other defining the sampling area. The whole sampler weighs about 2 kg, folds flat and is easy to carry. Each frame, and therefore the sampling area, is usually a square of dimensions 300 mm × 300 mm, to give a sampling area and a net mouth of 0,09 m² [see figure 1b)]. Two braces lock the two frames into the working position at right angles to each other, and two triangular wings of netting or canvas reduce the loss of invertebrates around the sides of the net.

NOTE — The surface of the sampling area is generally 0,09 m² but the frame dimensions can be modified in order to obtain a surface area that permits the sampler to fulfil the objectives of the sampling.

The net should be about 700 mm long, with a collar of heavier material (e.g. canvas or sail-cloth) for a short section around the mouth [see figure 1a)]. This collar increases the durability of the net, and may be extended under the net to protect it from abrasion. The original net was tapered slightly to a dome-shape at the rear end, but pocket-shaped and cone-shaped nets are now frequently used. In figure 1d) the net is shown with a collar of sail-cloth for a short section around the mouth and extended under the net.

Another and stronger construction of a Surber sampler is shown in figure 2, in which the two frames are replaced by a box with an open bottom and top, solid sides, a net on the downstream side and a screen on the upstream side. The box minimizes the loss of invertebrates and in addition gives the sampler additional strength and stability. The sampler is also easier to operate than the original in high current velocities.

The choice of mesh size depends on the objectives of the survey. Table 1 gives details of appropriate sizes.

4.2 Cylinder sampler

The sampler consists essentially of an open-ended cylinder, constructed of about 0,5 mm thick stainless steel, having the lower edge serrated with teeth, each 10 mm deep. The upper edge may be covered by a plastics edging strip to protect

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the operator. Handles on the sides facilitate pushing the sampler into the stream bed. To allow water to enter the sampler, an oval aperture should be cut in one side of the cylinder near the lower edge. To reduce the entry of drift organisms, this aperture is fitted with a stainless steel screen of coarse mesh of aperture about 1 mm diameter. Opposite this opening, a second hole is cut and is fitted with a short exit port to which a detachable collecting net is attached (see figure 3). Selection of the appropriate mesh size depends upon the nature of the investigation but guidance is given in table 1. The net should be 500 mm deep and is constructed of nylon with a 50 mm deep canvas collar which holds a draw cord for attachment to the exit port. A shallow flange on the distal edge of the exit port ensures secure attachment. Two sizes of cylinder are in general use, with horizontal cross-sectional areas of 0,05 m^2 and of 0,1 m^2. The depth of both cylinders is usually about 450 mm (figure 4). The mass of the 0,05 m^2 sampler is 3 kg and that of the 0,1 m^2 sampler is approximately 4 kg. Figure 4 gives a recommended pattern for marking out on a flat metal sheet, together with some details of construction, for a sampler of area 0,05 m^2.

5 Sampling procedure and samples

5.1 Choice of sampler

The choice between the Surber-type sampler and the cylinder-type sampler depends on personal preference based on operating experience and the prevailing conditions. In slow-flowing water, or in deep waters and among vegetation, the cylinder sampler has the advantage of being less dependent on velocity of flow to operate successfully. In difficult situations of inability to disturb effectively the area sampled by hand, it is often advantageous to use a stirrer with the cylinder. When the substrate makes it difficult to position the cylinder sampler, due to the presence of large boulders of bed-rock, the Surber-type sampler is to be preferred.

5.2 Surber sampler

After the net has been opened and the side braces secured, the first sampling position should be selected and approached from downstream. The sampler should be lowered into the water with the open end upstream so that the net is kept open by the current. The open quadrat frame should be placed firmly on the bed to define the sampling area. The operator should stand behind the sampler with feet astride the collecting net and knees resting on the upper part of the frame to which the net is attached. This position is convenient for the operator and also keeps the lower frame pressed against the substrate.

NOTE 1 — Gaps beneath the edge of the quadrat frame may be quickly filled with gravel to prevent the loss of invertebrates under the frame when the substrate within the quadrat is disturbed. Fastening a skirt of foam rubber (neoprene) to the lower frame enables a tighter fit to be obtained between the sampler and the substrate. The frame can be further secured to the substrate by mounting two small spikes in the corner where the frames are connected [see figure 1 c)].

The substrate within the quadrat should be disturbed carefully by hand; the wearing of rubber gloves is advisable if the water is very cold. Large stones should be scrubbed clean and discarded; small stones and gravel should be stirred and turned

over to a depth of between 50 mm and 100 mm, depending on the substrate. It is important to ensure that all dislodged materials enter the net. With the lightweight Surber sampler, one hand is normally required to hold the sampler in place.

NOTE 2 — A handle for maintaining the frame in place on the substrate can be screwed into a central brass T on the top of the upright frame. The handle can be modified to fit against the chest of the operator, who can thus press the lower quadrat frame against the substrate, a technique which is especially useful at high current velocities.

Alternatively, two extensions may be attached to the lower corners of the vertical frame. These can be folded out so that they lie flat on the bed, thereby allowing the operator to maintain the sampler in place with his feet.

It is essential that this sampler is used by two operators in water of high current velocity (about 0,8 m/s), one to hold the sampler and the other to disturb the substrate.

When no more material can be dislodged within the quadrat, the sampler should be lifted out of the water with the open end of the net facing upstream. The net may be immersed in the water to wash the materials in the net to its apex, but it is essential that the mouth of the net is not resubmerged as additional animals may enter the net. The net should be everted and its contents transferred to a container, such as a tray, bowl or jar, holding water collected from the water body being sampled. Some operators insert a collecting bottle at the apex of the sampling net. Some preliminary sorting can be performed in the field to remove unwanted debris (e.g. wood fragments and rocks), and to minimize sample weight. This can be further enhanced by using a small net [see figure 1 e)] together with a decanting technique, i.e. swirling the contents of the container and pouring into the small net, and repeating this operation until all the organic material together with the invertebrates is transferred to the small net. The small net should then be everted so that the contents can be transferred to a sample container. The remaining inorganic material should be inspected and any heavy organisms transferred to the sample. The sample should be preserved immediately to avoid underestimation of numbers. If sorting is to be delayed by only up to an hour, then the sample may be stored in water in an enclosed container.

The sample should be preserved in accordance with the instructions given in ISO 5667-3.

For modifications of the Surber sampler, see annex A.

5.3 Cylinder sampler

With the collecting net firmly attached to the cylinder, the sampling position should be approached on the river bed from downstream to avoid undue disturbance of the sampling area. The sampler should be placed on the stream bed so that the water inlet screen faces the current. The cylinder should be pushed, where possible, into the substrate to a maximum depth of 70 mm, using an alternating rotary motion. The collecting net should be so arranged that it is fully open and extends downstream of the cylinder with its opening facing upstream; this permits an unimpeded flow of water through the net. The operator should stand immediately downstream of the sampler with feet astride the collecting net, using both feet and legs to maintain the position of the sampler.

Large stones should be examined within the sampler and any attached animals dislodged into the water flowing through the cylinder. Small stones and fine substrate should be disturbed by stirring the substrate by hand to a depth of approximately 50 mm. The stirring should be repeated to ensure the removal of all organisms.

The water flowing through the cylinder carries the suspended animals into the net, where they are retained. In urban areas, where glass debris is often deposited in rivers, care is needed in this process, especially in polluted waters, where disturbing the finer substrate may be safely achieved using a rod. If the hands are used, rubber gloves should be worn. After allowing time for the dislodged material to be carried into the collecting net, the net should be removed. In doing so, the catch should be concentrated at the end of the net to facilitate removal. The net should be everted to transfer the catch to a tray for initial inspection and sorting, care being taken to ensure that all the animals in the net are removed.

The sample should be preserved as in 5.2.

For modifications of the cylinder sampler, see annex A.

Table 1 — Recommended mesh sizes

Survey objective	Maximum aperture size mm	Recommended minimum net depth mm	Comments
General/routine biological monitoring data for surveys using biotic scores/indices	0,5 or 0,75	400	May not capture first instar stages of many insects
For surveillance with more complete records of taxa present	0,5	475	More likely to capture first instar stages of many insects
For special surveys requiring complete taxa lists	0,25	625	Ensures capture of first instar stages and very small organisms which may prove of value in water quality determination
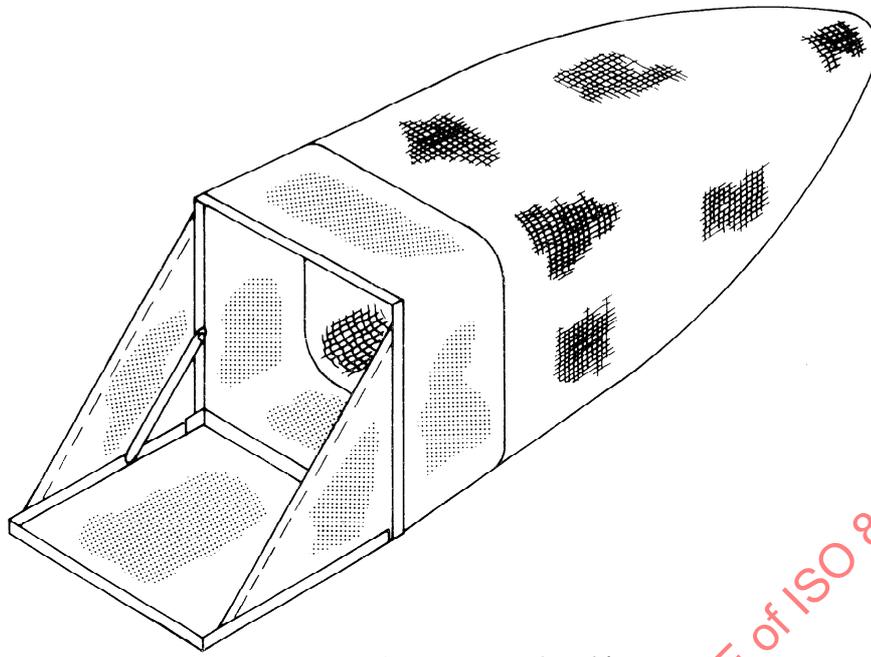
a) Complete sampler with net

Dimensions in millimetres
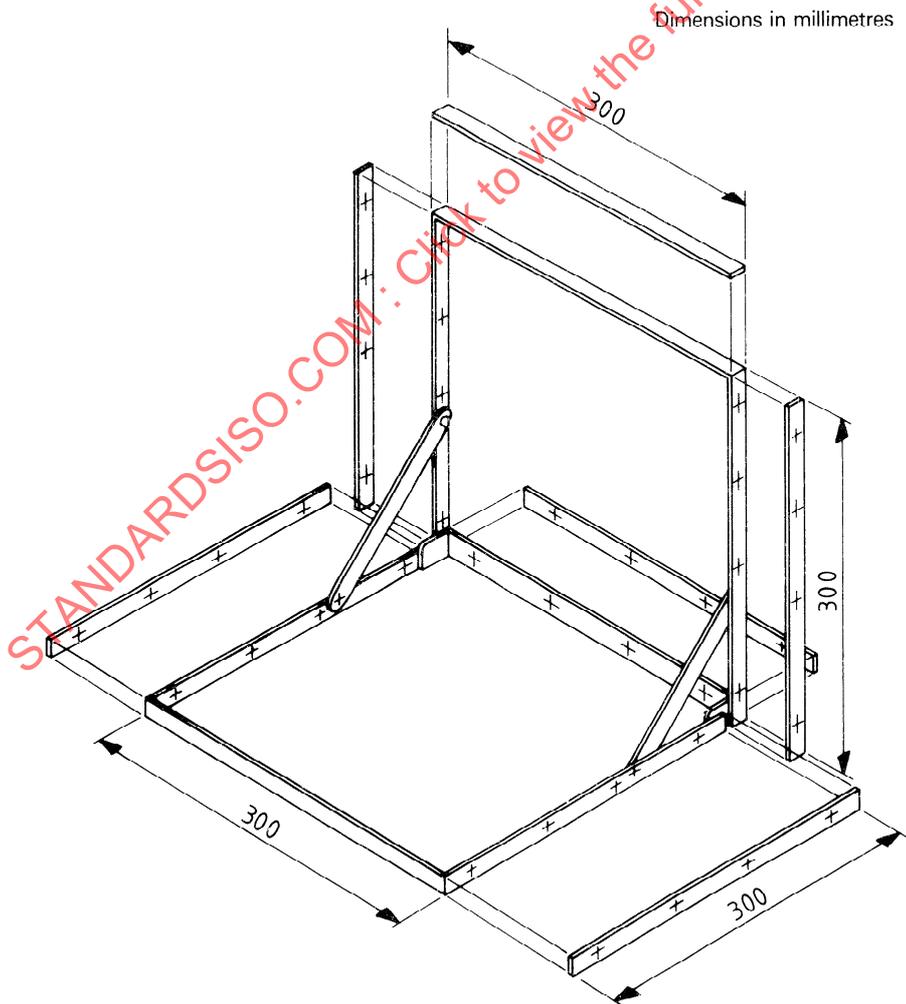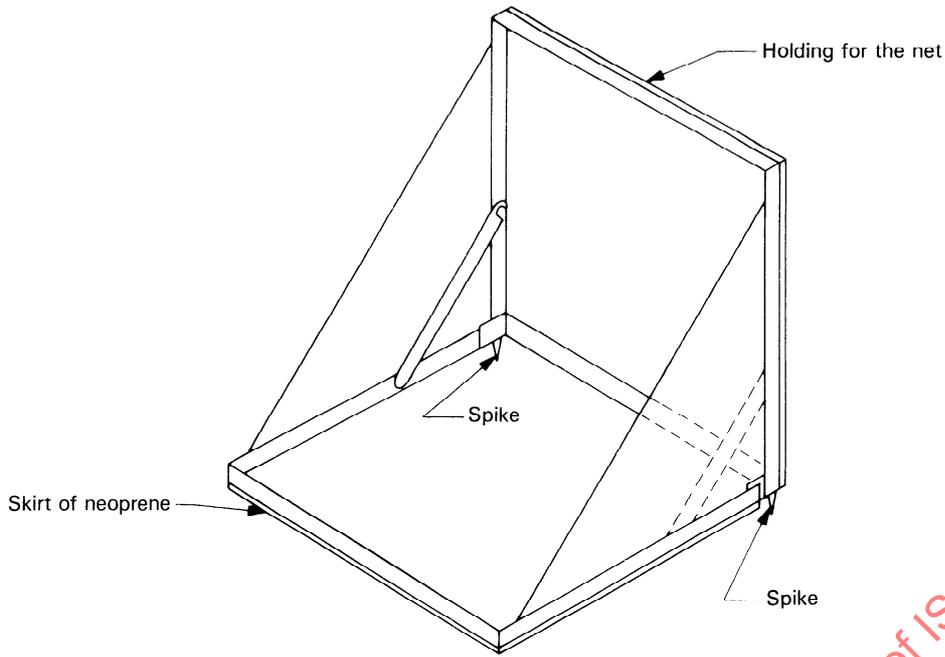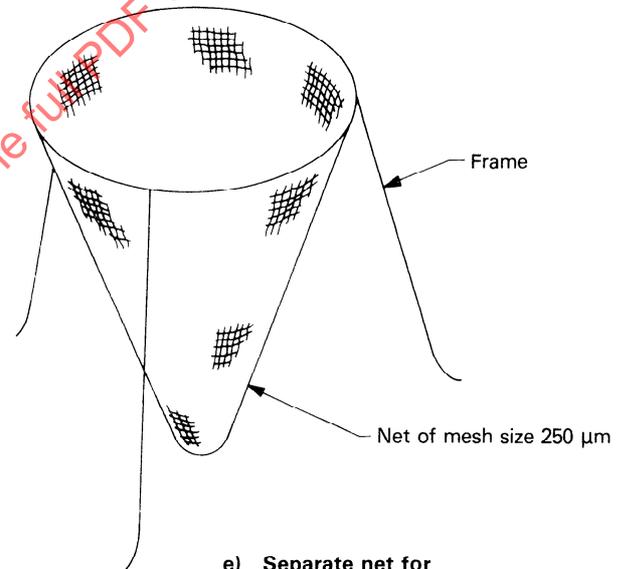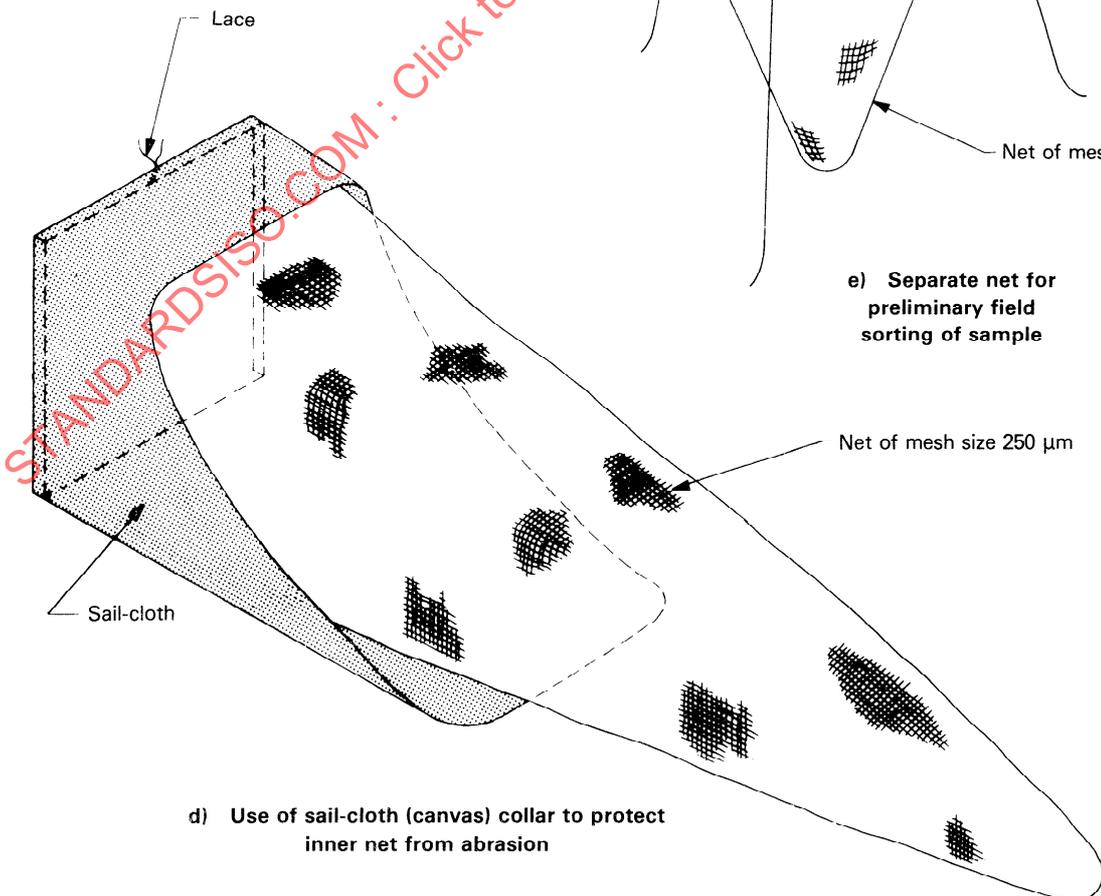

b) Details of metal frame

Figure 1 — Original Surber sampler

c) Frame modified with spikes
and neoprene skirt

e) Separate net for
preliminary field
sorting of sample

d) Use of sail-cloth (canvas) collar to protect
inner net from abrasion
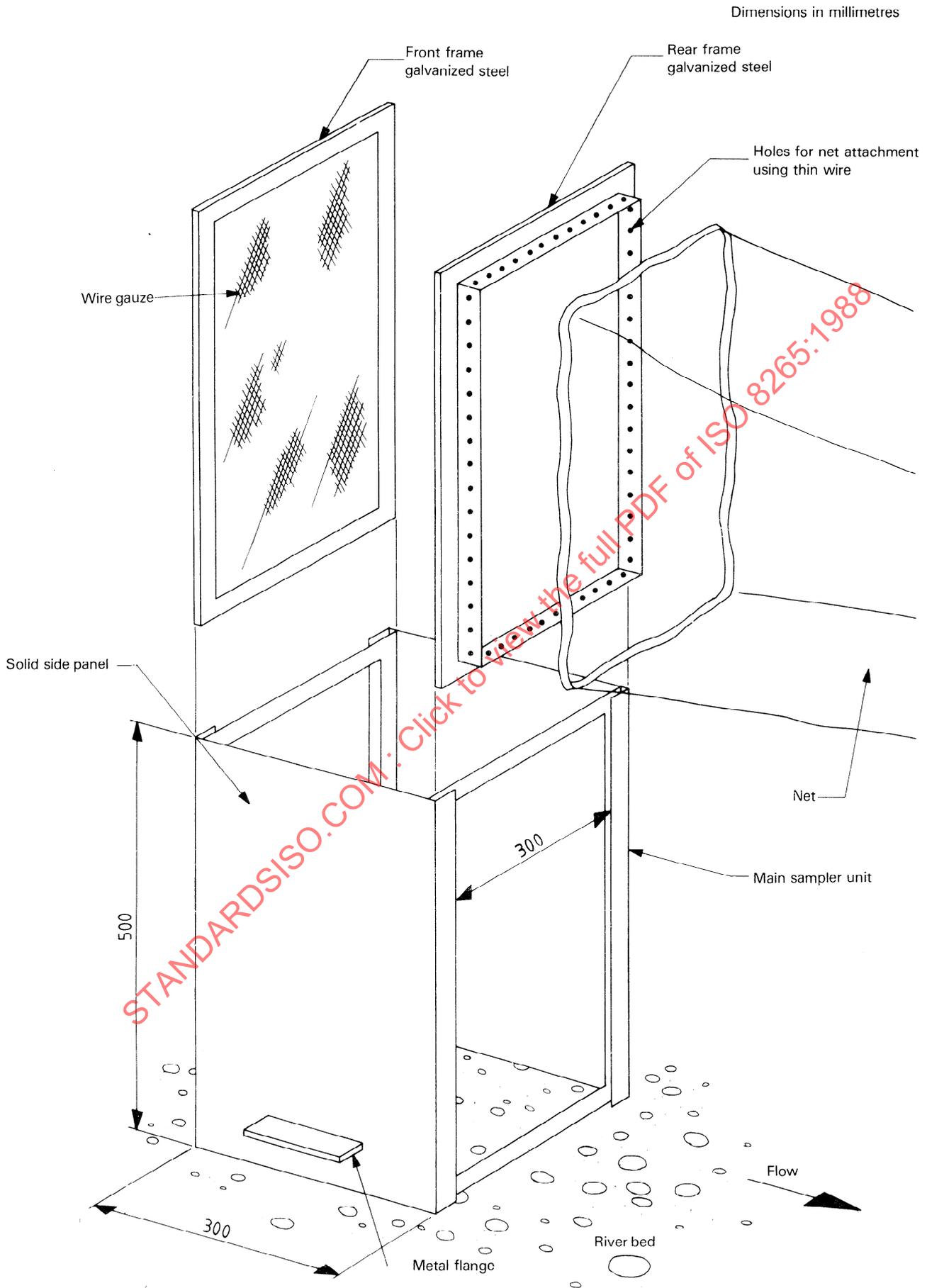
Figure 1 (concluded) — Original Surber sampler

Dimensions in millimetres

Figure 2 — Modified Surber sampler

Metal cylinder

Flow

Mesh screen

Collecting bag

Figure 3 — Cylinder sampler

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Dimensions in millimetres
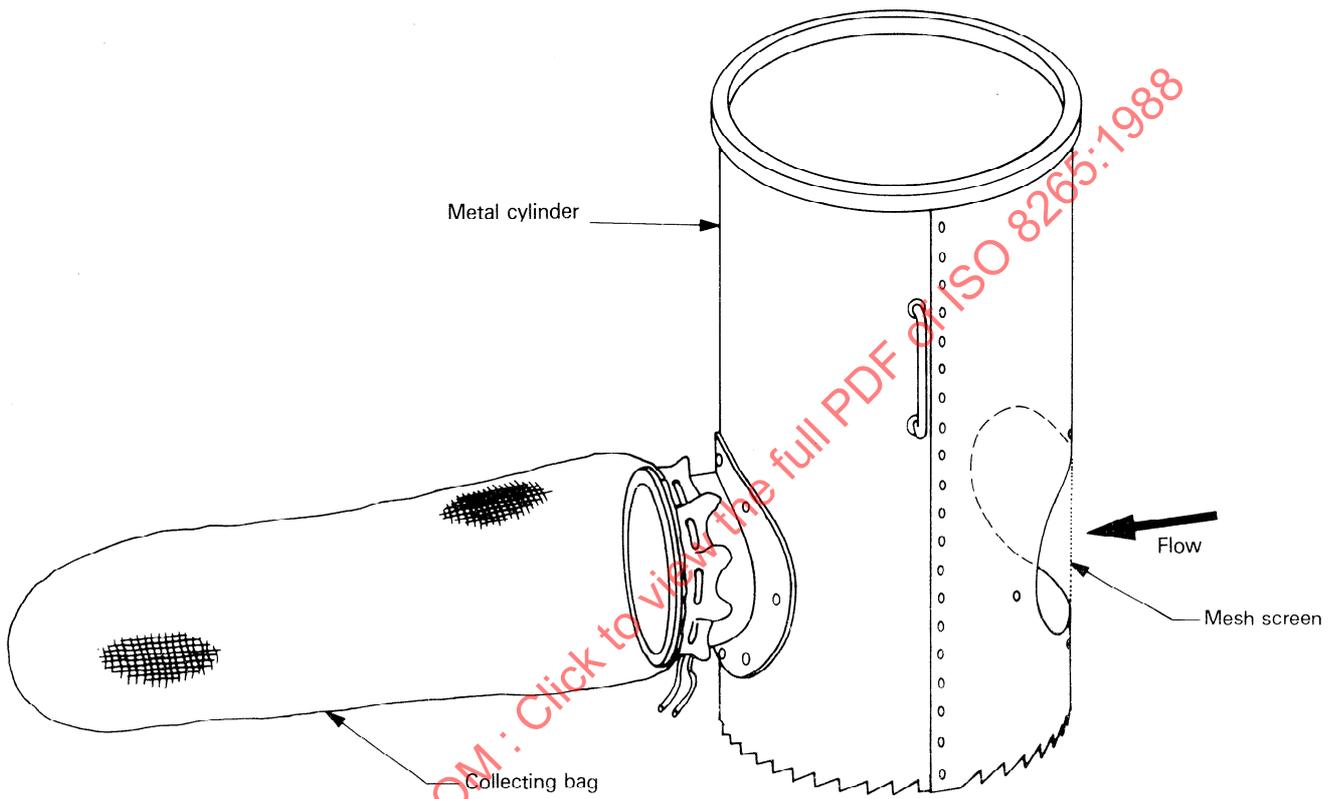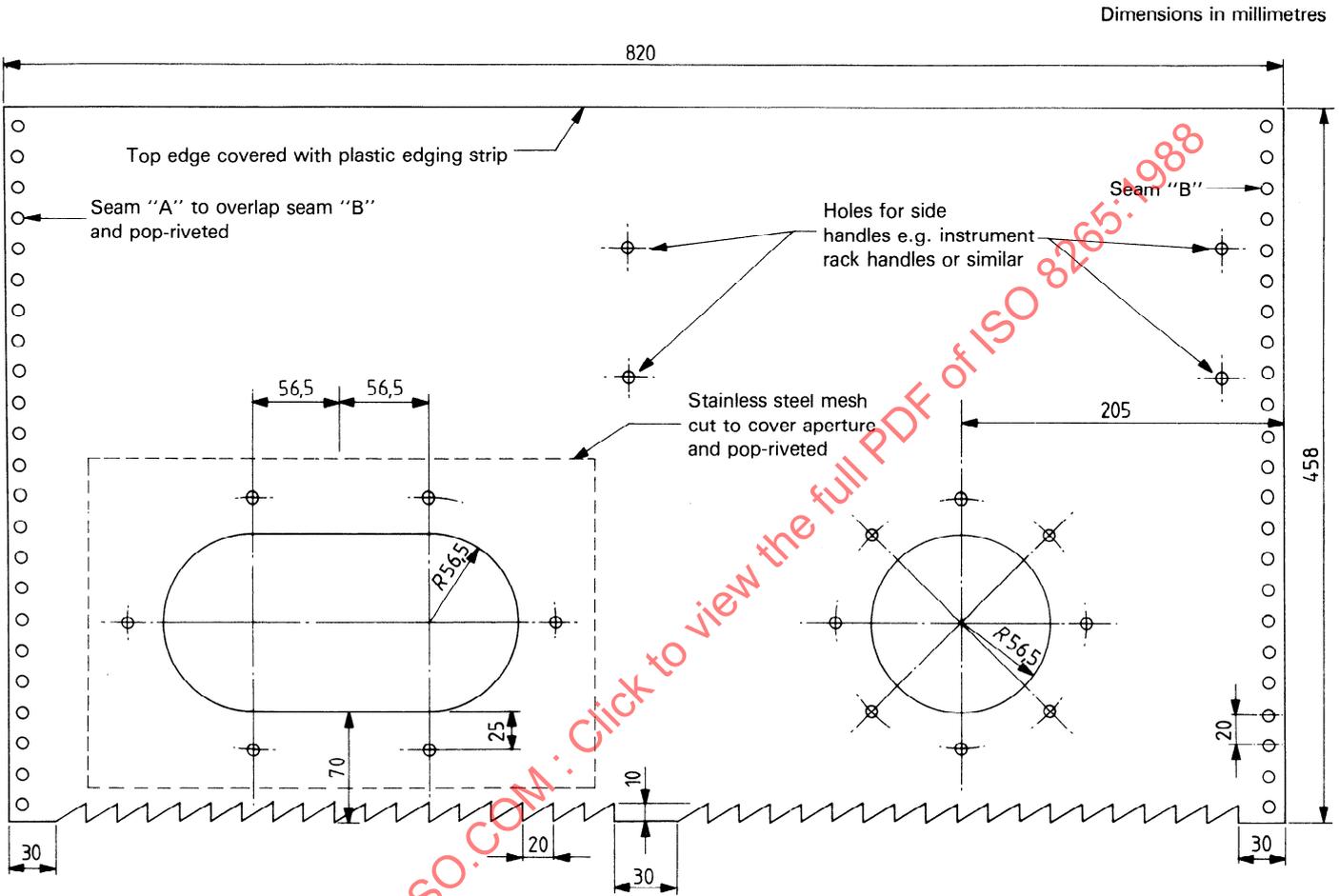

Figure 4 — Recommended pattern for a cylinder sampler for an area of 0,5 m²