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Coastal Engineering Technical Note

SEDIMENT SAMPLE COLLECTION

PURPOSE: This note contains suggestions for packaging, marking and storing hand, grab, and core sediment samples from coastal and continental shelf sampling surveys.

SAMPLE CONTAINERS: Commonly used, sample containers are plastic and cloth bags, glass jars, metal cans, cardboard food cartons, and plastic jars. Metal cans and jars with metal caps are not satisfactory for samples from salt or brackish water because of corrosion. Glass containers are heavy and subject to breakage if not carefully handled and packed for shipment. Cardboard food cartons, if coated with wax or plastic to be impervious to water, are satisfactory, as are plastic jars, provided they are large enough for an adequate size sample. These two containers are, however, bulky and less easy to carry, ship, and store than plastic or cloth bags. Cloth bags are somewhat more expensive than plastic and will not retain moisture. They are unsuited for samples of the liquid muds and clays that occur frequently in back barrier and estuarine environments. Heavy-gage plastic "zip-lip" bags which come in a variety of sizes and have a self-sealing opening are most suited for general purposes. They should be of adequate thickness for the purpose. The most useful sizes are 6 x 6 inch (15.2 x 15.2 cm) and 8 x 8 inch (20.3 x 20.3 cm); 12 x 12 inch (30.5 x 30.5 cm) bags are useful for large samples and for packaging groups of smaller bags. The chief drawback of "zip-lip" bags is that they are hard to seal if overfilled, or if sediment gets into the sealing groove. This can be avoided by using large enough bags and exercising care in filling. The thin sandwich and freezer bags sold in food markets are generally too fragile for sample storage. Even the heavy gage plastic bags tend to become brittle and crack after about 10 years. Therefore, for long-term storage, use of another type container or repackaging after about 10 years of storage is

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advisable. Plastic "zip-lip" bags of sufficiently heavy material are available from commercial suppliers and from General Services Administration stock. Pertinent nomenclature is as follows:

Bag, plastic, flat, interlocking seal closure, 0.004 inch thickness:

6 x 6 inch	FSN 8105-00-837-7754
8 x 8 inch	FSN 8105-00-837-7755
12 x 12 inch	FSN 8105-00-837-7757

SAMPLE SIZE: Samples should be sufficiently large to represent the sediment properties and to furnish adequate material for any laboratory test contemplated. As a minimum, the sample must contain enough grains of each particle size class to accurately reflect the size distribution and constituent components. Consequently, samples of coarse heterogeneous material need to be substantially larger than samples of finer, well-sorted sediment.

Wentworth (1926) determined the amount of sample required for mechanical size analysis of sediments based on the size of the largest particles in the sample (see Table 1).

Table 1. Suggested Sample Sizes for Mechanical Analysis of Size Distribution

Size Description	Diameter of Coarsest Grains (mm)	Diameter of Coarsest Grains (ϕ)*	Suggested Sample Weight (pounds)	Suggested Sample Weight (grams)	Approximate Volume
Cobbles	256-64	-8 to -6	70	32,000	**
Pebbles	64-4	-6 to -2	35-4	16,000-2,000	**
Granules	4-2	-2 to -1	2	1,000	1 quart (1 liter)
Sand	2.0-0.062	-1 to +4	1-1/4	500-125	1 cup or 8 oz. (500 cc)
Silt	0.062-0.0039	+4 to +8	1/4	125	1/2 cup or 4 oz. (250 cc)
Clay	< 0.0039	+8	1/4	125	1/2 cup or 4 oz. (250 cc)

*Phi units (ϕ) = $-\log_2 d$, where d is grain diameter in millimeters (mm).

**The volume varies too much to be represented by one number.

In general, experience at CERC is that samples taken in the field are more often too small than too large. It is better to collect more than enough material, some of which can always be discarded later, than to have to either revisit the sample site or forego planned tests and analyses. Samples should usually not be smaller than one-half pint (approximately 400 grams weight of dry medium size sand). Samples of this size will fill

about 1/3 to 1/2 of a 6 x 6 inch plastic bag. It is desirable to obtain more material (about one pint) if tests other than mechanical analysis are planned. Samples of this size fill about 2/3 of a 6 x 6 inch plastic bag.

SAMPLE IDENTIFICATION: Samples should be clearly and completely identified using a permanent marking medium. The value of field samples is too often lost because their identity is not clear, or because the marks become illegible. There are three ways commonly used to identify a sample: (1) placing the identity on a card and inserting it in the sample container, (2) affixing a tag to the container, and (3) marking directly on the container itself. The first method should be used only on perfectly dry samples, if at all, and is the least satisfactory means of sample identification. Some sample bags come complete with a tag sewn into the edge of the bag, on which sample information can be recorded. Most containers, however, do not have special tags for this purpose. If tags are used they should be of waterproof material and marked in an indelible ink. They should be well secured to the container so that they are not torn off in handling and shipping. The practice of stapling tags to sample containers should be avoided, particularly for samples from salt or brackish water environments, because the staples corrode in a remarkably short time. The last named method of marking the sample identification directly on the body of the container is considered to be the best method. If the container has a separate cap or screw lid, the identification should be placed on the body of the container to prevent misidentification, should the caps or lids be inadvertently exchanged.

Regardless of the method used to identify samples, the necessary markings should be made with an indelible ink. Most pens and felt tip markers are not resistant to water or even relatively mild wear, and the loss of only a portion of a single character may be enough to make later identification impossible. Even some "indelible" markers are not truly resistant to moisture. Special markers made for permanent marking such as the Eberhard Faber Markette series have proven to give satisfactory results on most surfaces.

To be doubly sure of not losing sample identities, it is recommended that, in any case where the marking medium is of doubtful permanency, two separate identifications be made; for example, by direct marking of the container plus the addition of a tag.

PACKING FOR TRANSPORT AND STORAGE: Because sediment, especially when wet, is a heavy substance, it is not uncommon that the weight capacity of cartons used to ship or store samples is exceeded and the container ruptures. In addition, heavily loaded containers are difficult to handle. For these reasons, it is best to use relatively small containers that, when filled, do not exceed 60 pounds. Care should also be taken that all sample containers are sealed to prevent water leaking out and to contain objectionable odors in the sediment.

Samples should be arranged in sequential order in storage containers with the sample identities written clearly on the outside of the box, so that a specific sample can be located without searching through a number of boxes.

ADDITIONAL INFORMATION: For additional information please contact Dr. Donald K. Stauble at (601) 634-2056, Donald.K.Stauble@erdc.usace.army.mil.

REFERENCE:

WENTWORTH, C.K., "Method of Mechanical Analysis of Sediments," University of Iowa Studies in Natural History, Vol. II, No. 11, 1926.