



Standard Practice for Field Collection of Organic Compounds from Surfaces Using Wipe Sampling¹

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1. Scope

1.1 This practice addresses sampling of organic compounds (i.e., PCBs, dioxins, many pesticides and similar compounds) from smooth nonporous surfaces using a solvent-wetted wipe sampling method. Samples are collected in a manner that permits the solvent extraction of the organic compound(s) of interest from the wipes and subsequent determination using a laboratory analysis technique such as gas chromatography with a suitable detector. This practice is, however, unsuitable for the collection of volatile organic compounds.

1.2 This practice should only be used to collect samples for the determination of organic compound(s) on a loading basis (e.g., mass per unit area). It cannot be used to collect samples for the determination of organic compounds on a concentration basis (e.g., mass per unit mass).

1.3 This wipe sampling practice is not recommended for collecting samples of organic compounds from rough or porous surfaces such as upholstery, carpeting, brick, rough concrete, ceiling tiles, and bare wood. It is also not intended for the collection of dust samples (see Practice E1278) or sampling to estimating human exposure to contaminated surfaces.

1.4 To ensure valid conclusions are reached, a sufficient number of samples must be obtained as directed by a sampling design (the number and location of samples including quality control samples) and a quality assurance/quality control plan. This practice does not address the sampling designs used to achieve the data quality objectives (see Practice D5792).

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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.*

¹ This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.02 on Sampling Techniques.

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2. Referenced Documents

2.1 ASTM Standards:²

D4687 Guide for General Planning of Waste Sampling

D5681 Terminology for Waste and Waste Management

D5792 Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives

E1278 Guide for Radioactive Pathway Methodology for Release of Sites Following Decommissioning (Withdrawn 2005)³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology D5681.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *wipe, n*—sorbent material (e.g., cotton gauze) that is rubbed on a surface to collect a sample for chemical analysis.

4. Summary of Practice

4.1 A wipe sample is collected from a smooth nonporous surface with a solvent-wetted wipe following a specified pattern of wiping to ensure complete coverage of an area of specified dimensions. The wipe is then extracted and analyzed to detect and quantify (at least semiquantitatively) the presence of organic compounds on surfaces.

5. Significance and Use

5.1 Wipe sampling is typically used by persons involved in hazardous waste site investigations to characterize the areal extent and the level of contamination on walls, floors, equipment, etc. Wipe sampling is also used to determine compliance with regulations.

5.2 There are many factors that contribute to variation in sampling results during wipe sampling including, the use of different pressures applied to the wipe, different kinds of wipes,

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Contaminant Recovery Data Using Common Solvents and TLC Pads⁴

| Compound | Solvent | Percent Recovery |
|--------------|-----------------|------------------|
| Chlordane | Acetone | 71 |
| | Isooctane | 54 |
| Chlorpyrifos | Acetone | 72 |
| | Isooctane | 56 |
| Malathion | Dichloromethane | 81 |
| | Isooctane | 80 |
| Diazinon | Isooctane | 70 |
| Aroclor 1260 | Isooctane | 80 |
| | Acetone | 76 |
| Bendiocarb | Acetone | 85 |
| | Isopropanol | 84 |
| Propoxur | Isopropanol | 96 |
| | Acetone | 90 |

different wiping patterns, the texture of the surface being wiped, and perhaps even the duration of wiping. The significance of this practice is that it standardizes wiping procedures to reduce sampling variability in the collection of samples from smooth, nonporous surfaces such as metal, glass, painted or sealed surfaces, tile, etc., in and around buildings, and from pipes, tanks, decontaminated equipment, etc.

6. Sampling Equipment and Supplies

6.1 Sample Containers—Airtight amber glass sample containers with PTFE-lined caps such as 40-mL volatile organic analysis vials are recommended. Larger 125-mL wide mouth bottles may also be used which eliminate the need for forceps to place or remove wipes from the sample container. To minimize solvent handling in the field, wipes may be wetted with solvent in the laboratory and shipped to the field in the sample container.

6.2 Wipes—Cotton gauze pads 7.6-cm square are to be used. Sterile surgical gauze pads are typically used without precleaning however, samples of the pads should be analyzed or otherwise determined to be free of the target compounds and substances that could interfere with the analytical method. If necessary, pads should be precleaned by solvent extraction in a laboratory prior to field use.

6.3 Solvent—A high purity solvent (one which is free of contaminants that might interfere with analysis), capable of solubilizing the target organic compound and compatible with the surface being wiped, should be used. For collecting PCBs and most pesticides (e.g., chlordane, chlorpyrifos and malathion) isooctane is an effective solvent. For carbamates or known polar pesticides, isopropanol is more effective. Some guidance on solvent selection (Table 1) was generated by EPA⁴ using thin layer chromatography (TLC) saturation pads (essentially a heavy filter paper) which generally performs similarly to cotton gauze pads. Hexane is another commonly used solvent to consider for PCB sampling. Some effective solvents such as acetone are not the most desirable because interfering compounds from some surfaces can also be recovered.⁴ The analytical laboratory should be able to assist in selecting a

proper wiping solvent compatible with the surface to be sampled and with the analytical procedures.

6.4 Disposable Gloves—Powderless gloves which protect the sampler's hands from the solvent and do not contribute any possibly interfering contaminants should be used. A new pair of gloves should be used for each wipe.

6.5 Sampling Template (Optional)—Templates made of stainless steel, aluminum, disposable heavy-duty aluminum foil or other inert material can be used to expose a 10-cm by 10-cm surface area to be wiped.

6.6 Other—Standard field sampling supplies are discussed in Guide D4687 and may include a copy of the sampling plan, chain-of-custody forms, custody seals, logbook, camera, field data sheets, sample labels, forceps, noncontaminating marker (e.g., pencil, scribe), decontamination supplies, and solvent dispenser. Additional detailed equipment lists are included in EPA publications.^{5, 6}

7. Procedure

7.1 Review the sampling plan and sampling procedures, assemble sampling equipment, ensure personnel are adequately trained for their tasks, arrange logistics, and ensure supplies will be available at the site when needed. Since sampling results can vary between operators sampling identical surfaces, the same person should collect all wipe samples at a given site⁵ to minimize variability and enhance comparison of results from various locations.

7.2 Locate the sampling points as specified in, or according to the guidance of, the sampling plan.

7.3 Install the sample template or otherwise delineate the area to be sampled, normally a 10-cm by 10-cm area. This can be achieved by either taping a template in place (caution, tape used to secure a template should not be wiped since this may contaminate the sample), or by drawing the boundary of the area to be sampled with a noncontaminating marker. Although a 10-cm by 10-cm area is the standard-size template, the area does not have to be square as long as a 100-cm² area is being sampled. If contaminant levels are expected to be low, greater sensitivity may be achieved by sampling a larger area. In all cases, the location and dimensions (e.g., length, width, diameter) of the area sampled must be recorded and possibly photographed.

7.4 Don a new glove and obtain a clean wipe. If precleaned wipes were shipped in sample containers, forceps can be used to remove the wipe from the container.

7.5 If solvent-wetted wipes were not shipped to the field, dispense solvent (2 mL recommended although somewhat more may be desired if shipping solvent-wetted wipes to the field in 125-mL bottles) onto the cotton gauze pad. A repeating dispenser can be used for dispensing the same amount of

⁴ Carr, B. L. and Hill, D. F., *Sampling of Common Pesticides and PCBs from Inert Surfaces*, EPA 330/1-90-001, National Enforcement Investigations Center, Denver, CO, 1989.

⁵ Smith, J. H., *Wipe Sampling and Double Wash/Rinse Cleanup as Recommended by the Environmental Protection Agency PCB Spill Cleanup Policy*, U.S. Environmental Protection Agency, Washington, DC, 1991.

⁶ U.S. Environmental Protection Agency, *Chip, Wipe and Sweep Sampling*, SOP#: 2011, Environmental Response Team, NJ, 1994.

solvent to each wipe. The EPA's PCB program specifies the use of a saturated, but not dripping, wipe (~5 mL of solvent),⁵ which may slightly increase contaminant recovery, but research has shown more consistent results using 2 mL of solvent.⁴

7.6 Wipe the entire surface to be sampled using firm strokes by pressing with the fingertips. Wipe vertically and then horizontally to ensure there is complete coverage in both directions with minimal overlap of the previous stroke. The objective is to systematically, thoroughly, and consistently wipe the entire target area twice, each time from a different direction.⁵ Excess wiping (e.g., more than single coverage in each direction) has been shown to reduce organic contaminant recovery.⁴

7.7 Fold the wipe with the sampled side inward, place it in the sample container, and cap the container. EPA's PCB program specifies air drying the saturated cotton gauze pad, either in the laboratory or the field. Field drying can be accomplished by placing wipes on clean aluminum foil or in the sample container with the lid off (ensure no liquid solvent is lost when placing wet wipes in the sample jar).

7.8 Label the sample container and complete standard documentation procedures.

7.9 Store the sample out of direct sunlight, cool to 4°C and ship or transport the sample(s) to the laboratory.

7.10 Quality control samples should be collected as specified in the sampling or quality assurance/quality control plan. The types of quality control samples may include blank,

second wipe, duplicate, and spiked samples⁵ as described below but may include other types as needed to achieve the objectives.

7.10.1 The first type of blank sample is a wipe in an unopened sample container (if provided to the field in this manner) or a clean wipe (with or without solvent) placed in a sample container. This type of blank is useful in determining whether the wipes and possibly the solvent are contaminated. The second type of blank is a wipe sample collected from a control area for each type of surface sampled. This type of blank is useful in determining whether contaminants may have been extracted from the surface sampled (e.g., target or interfering contaminants from painted, plastic, tile, etc. surfaces).

7.10.2 Two other types of quality control samples are second wipes and duplicate samples. A second wipe sample is collected from exactly the same area and immediately after the regular sample is collected. These sample results are used to estimate the residual contamination remaining after regular sampling. The data can be used to calculate an estimate of total surface contamination (this calculation is beyond the scope of this standard). This type of wipe is important for sampling relatively more porous surfaces such as vinyl tile. A duplicate sample is collected immediately adjacent to the regular sample and can be used to estimate sample collection precision (assuming the immediately adjacent area has the same level of contamination).

8. Keywords

8.1 sample collection; surface sample; wipe; wipe sample

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