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Polychlorinated Biphenyl Inspection Manual

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Chapter Six

Sampling

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6.0 Sampling

6.1 Sampling Guidelines

Inspectors should consider sampling for analysis an integral part of any PCB-related inspection. The purpose of sampling is to verify the presence and concentration of PCBs. Since it is impractical to sample everything that might contain PCBs, EPA has established sampling guidelines intended to assist the inspector in making sampling determinations. These guidelines set out general principles for sampling and prioritize the types of situations in which inspectors should undertake sampling. The wide variety of field situations an inspector can encounter make it impractical to specify in advance exactly when the inspector should or should not take samples. In addition, sampling policies may vary among the Regions. Considering the guidelines below and Region-specific policies, the inspector must make this determination.

1. **Take a sample whenever one is needed to prove a potential violation**.

   This means obtaining a sample of any material that the inspector needs to verify as containing PCBs. Sample results eliminate any uncertainty concerning whether or not the material at issue is a PCB.

2. **Sample only when there is reason to suspect PCB presence**.

   Unless there is some reason to believe that PCBs are present, there is little likelihood of finding them through indiscriminate sampling. These general rules ensure the best case preparation in all instances, but they are sometimes impractical to observe:

   - On many inspections, an inspector would need to take a very large number of samples, resulting in an unduly long inspection and an unreasonable backlog of sample analyses.

   - In some instances, it is not possible or advisable for an inspector to take a sample. For example, inspectors usually cannot sample transformers on poles, and should never sample energized transformers.

3. **Verify the presence of PCBs by sampling and other means**.

   The most common sources of such verification are the company's records, nameplate or label information, and statements by company representatives. Such sources may be contested, but experience to date indicates that they usually are not. Therefore, sampling becomes less important when there is other evidence of the presence of PCBs.

4. **Always be sure that a laboratory is available and capable of providing reliable and defensible analyses within the necessary time frame**.

   Verify with the laboratory prior to taking unusual samples or when anticipating the collection of an unusually large number (>10) of samples as part of an inspection or investigation. The laboratory should use an appropriate standard operating procedure (SOP) in conducting the analysis.

6.2 Priorities for Sampling

The following table lists the order of priority for taking samples. These priorities are based on the following:

- Potential exposure presented by the suspected violation
- Extent of the potential violation
- Need for independent proof of the presence of PCBs.

Table 6-1. Sampling Priority Table

(Level 1 is the highest priority, Level 7 is the lowest)
DISPOSAL VIOLATIONS
Level 1: *Improper disposal* (including leaks and spills)
MAJOR USE, STORAGE, MARKING, OR RECORDKEEPING VIOLATIONS
Level 2: *Items bearing no indication of PCB content that are suspected to contain PCBs* ! Transformers ! Large containers ! More than ten 55-gallon drums
Level 3: *Items claimed to be decontaminated that are suspected to contain PCBs* ! Transformers ! Large tanks
Level 4: *Other items claimed to be decontaminated that are suspected to contain PCBs*
Level 5: *Other unmarked or unidentified items that are suspected to contain PCBs*
MAJOR STORAGE OR RECORDKEEPING VIOLATIONS
Level 6: *Items bearing a mark or indication of PCB content when the concentration is unknown.* ! Transformers ! Large tanks ! More than ten 55-gallon drums
Level 7: *Other items bearing a mark or indication of PCB content*

The highest sampling priority is to prove disposal violations because they result in direct environmental contamination and present the highest risk of human exposure.

- **Level 1** includes sampling in all instances of improper disposal, including leaks and spills, with priority for potential exposure to the public or potential to contaminate water, food, or feed.

The next four levels involve major use, storage, marking, or recordkeeping violations. These violations are grouped together because they often occur together.

- **Level 2** calls for sampling in situations involving large amounts of material for which there is no independent proof of the presence of PCBs. These situations involve a risk of extensive environmental harm and require solid evidence.

- **Level 3** calls for sampling in situations where large numbers of items are claimed to be decontaminated. Although these situations pose a lower risk of environmental harm, there is a need for solid evidence because companies are likely to dispute claims of PCB presence.

- **Level 4** involves sampling other items claimed to be decontaminated. The need for evidence is high, but the risk of environmental harm is less than in Level 3, since the amount of material involved will be smaller.

- **Level 5** calls for the sampling of unmarked items suspected of containing PCBs. Although there is a strong need for evidence in such cases, the risk of harm is lower because smaller amounts of PCB materials will usually be involved.

The last group of priorities concerns situations where major storage or recordkeeping violations are suspected involving items that bear some indication of PCB content (such as a label). Sampling establishes concentration levels for determining compliance/noncompliance and the extent of the violation for penalty purposes.

- **Level 6** calls for sampling in situations where the risk of potential harm is high due to the large amount of PCB material.

- **Level 7** includes sampling in situations involving smaller amounts of PCB material.

Sampling is usually necessary where there is reason to determine compliance/noncompliance with the ban on unauthorized manufacture, process, distribution in commerce, or use of PCBs. Experience to date indicates that these violations are not usually encountered in routine inspections. Therefore, these violations are not included in the priority list. Because of the seriousness of such violations, the inspector should design in advance, in consultation with the appropriate EPA personnel to include EPA Headquarters, a sampling plan to document compliance/noncompliance.

Sampling is not required, in general, for situations involving only minor storage, marking, or recordkeeping violations. In these instances, independent evidence of PCB presence, either through records or marking, will usually exist. Moreover, the risk posed by these situations will usually be relatively small. Unusual circumstances sometimes will necessitate sampling in such cases. For example, the suspected violator may:

- Refuse access to records that would indicate PCB presence.

- Refuse to answer questions that would indicate PCB presence.

- Indicate, through past behavior or statements made to the inspector, reluctance to come into compliance.

Such actions indicate a need for more comprehensive evidence. The decision whether or not to sample in such situations rests with the inspector.

6.3 Sample Collection

The first step in any sample collection program is to determine the purpose of obtaining a sample for laboratory analysis. Samples collected for determining the PCB level of possible contaminated solvents or for establishing whether a transformer with unidentified dielectric fluid contains PCBs will require different sampling considerations than samples collected to confirm spills of PCBs or to identify the extent of PCB contamination of soil, surface water, or groundwater resulting from spills or improper disposal.

6.3.1 Sampling Collection Indicators

Inspectors should generally obtain samples when direct physical evidence indicates that contamination has taken place. Sample collection is in order when:

- Leaking PCB articles or equipment are present.
- Discoloration of soil adjacent to in-service or stored PCB articles, equipment, or containers is present.
- Oil films, sheens, or sheets in standing water or on banks of nearby streams is present.
- Soils are highly saturated and groundwater contamination from PCB leakage is suspected.
- The facility improperly stores PCB materials, such as rags and other debris.
- There is reason to believe PCBs are present in unmarked or improperly stored articles.
- Dead or stressed grass or other vegetation is present.

When sampling spills and/or leaks near equipment, the inspector should sample both the spill area and the equipment to verify the source of the PCB contamination unless a PCB mark or nameplate identifies the equipment as containing PCBs.

6.3.2 Sampling Plan

An effective sample collection program includes the development of a sample plan that is consistent with the requirements of the Region's quality assurance plan and contains at least the following items:

- An overall evaluation of the facility based on records of previous inspections and onsite observations
- An evaluation of the risk to sampling personnel
- Identification of proper equipment and procedures for safe, effective sampling
- Laboratory availability, capacity, capability, and reliability
- Identification of representative sampling sites (properly identified photographs are helpful)
- Procedures to collect sufficient volumes of the PCB mixtures, water, soil, or sludge to carry out the required analyses
- Procedures to preserve samples to maintain sample integrity (refer to sampling guidance tables at the end of this chapter)
- Proper labeling of the sample containers (including the exact location where the sample was taken)
- Procedures for identifying and handling potentially hazardous samples (PCBs in other hazardous substances)
- Procedures for maintaining and documenting chain-of-custody.

Inspectors should record the time, date, location, type of sample, sampling method, and reasons for obtaining the sample in their field logbook at the time of sample collection and, if possible, photograph the sampled area. If it is impossible to take photographs, the inspector should draw or sketch the contaminated area including a reference point. The drawing should indicate where the inspector takes any samples. Specific procedures for collecting PCB samples are detailed below.

6.3.3 Standard Operating Procedures

Specific regional procedures may exist on the collection of routine samples to ensure consistency and reconstructability, as well as serving as a training guide for new inspectors. Generally, these procedures take the form of SOPs. The inspector should review pertinent SOPs prior to the inspection.

6.3.4 Personal Protective Equipment

The inspector may take the following personal protective equipment to an inspection and sampling site depending on the situation. Please note that all equipment may not be available or necessary depending on the inspection type.

- Full face, air purifying, negative pressure respirator with organics cartridge(s)
- Disposable PCB-resistant gloves
- Disposable footwear covers
- Safety glasses with side shields or goggles
- Disposable full-body coveralls impervious to PCBs
- Hard hat
- Safety shoes/boots
- First-aid kit
- Other safety equipment specified by EPA and facility safety officers.

6.3.5 Suggested Sampling Equipment

The validity of PCB samples depends upon the integrity of sampling equipment. The following guidelines should be observed:

- Use appropriate containers.
    - Inspectors should use glass vials, bottles, or jars with Teflon-lined lids as sample containers. If cap is not Teflon-lined, cover vial, bottle, or jar with solvent-rinsed aluminum foil and cap. Do not use plastic as a primary container for PCB samples. PCBs will absorb in most plastics and can contaminate samples with plasticizers; however Teflon/Tedlar plastic bags can be used in place of poly or vinyl plastic.
    - An inspector may use new containers without additional treatment for samples where only PCB concentrations at or above 1 ppm are of concern. Keep the lids in place during storage and travel to the field. Do not reuse sample containers.
    - If the data objective is PCB concentration of less than 1 ppm, then clean the primary sample container with three rinses of acetone followed by three rinses of hexane. It is preferable that the laboratory that will conduct the analysis performs this rinsing.

- Prepare a field blank, which is an empty capped (and officially sealed) container of each type used in a sampling exercise, and submit it to the laboratory as a quality control check. Take this empty container to the sampling site, but do not uncap it. For surface samples, submit as a control a piece of the swabbing material, treated with the solvent used, in a vial or bottle.

- Choose from the following list of equipment customarily used to sample for PCBs:

  - Glass tubing or coliwassa samplers (solvent rinsed)
  - Glass pipettes, with squeeze bulbs
  - Disposable 10 ml pipettes and bulbs
  - Extra clean sample jars for scooping
  - Eye droppers
  - Aluminum foil
  - Container of solvent (hexane is recommended)
  - Pharmaceutical grade gauze pads (3" x 3")
  - Stainless steel forceps (several)
  - Stainless steel or disposable cardboard templates (10 cm x 10 cm)
  - Stainless steel trowels, or Teflon scoops
  - Laboratory spatulas (precleaned)
  - Soil coring devices (such as King-tube samplers, piston corers, or bulb planters)
  - Flashlight
  - Hammer and chisel
  - Hole saw and drill
  - Pruning shears
  - Precleaned stainless steel buckets
  - Disposable wiping cloths
  - Plastic disposal bags
  - Plastic secondary container bags and official seals
  - Survey stakes
  - 100 ft tape measure
  - Ice chests containing ice or ice packs and secured with padlocks (if required by the laboratory)
  - Compass and maps
  - Duct tape
  - Subsurface water sampling equipment (such as pumps, siphons, and glass sampling jars with attachments)
  - Container of distilled water
  - Stainless steel mixing bowls and spoons
  - Peterson dredge, Ekman dredge, weighted bottom dredge
  - 1/4" sieves
  - Adjustable wrench or channel lock pliers
  - Chain-of-custody forms
  - Sample labels
  - Evidence tape
  - Indelible markers.

- Take an adequate number of sampling tools (whether disposable or not) to each inspection site to avoid having to decontaminate such implements in the field.

- Notify the laboratory receiving the samples prior to the inspection to ensure availability of necessary analytical support.

6.4 General Considerations for Sampling

To minimize the likelihood of PCB spills and health hazards during sampling, the inspector should:

- Avoid contamination of the outside of the sample container.
- Ensure that the cap is tightly affixed.
- Wipe stop cocks, hard surfaces, etc., when sampling is complete.
- Dispose of all contaminated sampling equipment or store the equipment for decontamination.

The inspector should try to minimize the risk of cross-contamination at all times to protect sample containers. If glass tubing or dipping vessels are used to collect a sample, the inspector should use a separate clean unit for each sample and should not co-store samples suspected of containing greater than 50 ppm with environmental samples where less than 1 ppm is of interest.

Inspectors should not use tools (e.g., adjustable wrenches or channel lock pliers) on any of the facility's equipment. If necessary, the inspector should request that the facility representative use the facility's tools (e.g., to open a transformer drain cock).

6.4.1 Samples: Number and Volume

The inspector should prepare a field blank for each type of container used to collect samples and submit it to the laboratory as a quality control check. The inspector should also collect one duplicate sample for every ten samples collected.

Collect a sufficient volume of each sample obtained to perform all the required PCB analyses and to provide for any quality control needs, split samples, or repeat testing. The size of the sample depends on the type of material and the analyses to be performed. Suggested amounts required for each sample type are listed below.

Table 6-2. Suggested Sample Volumes from Inspectors and Program Office based on Sample Type

Sample Type	Required Volume
Transformer oil and other homogeneous PCB mixtures (i.e., hydraulic oil or heat transfer oil)	100 ml
Nonhomogeneous PCB mixtures, including waste oil	3 x 25 ml - 35 ml
Soil, sludge, sediment	Approximately 250 g (½ lb)
Water	4 L
Water-oil mixtures	3 x 100 ml
Solid PCB mixtures (nonhomogeneous, e.g., pigments)	3 x 50 g
Surfaces	3 cm x 10 cm x 10 cm areas

The inspector may collect the lower sample volume for uses where the target level is in the 50 ppm or greater range. Collect larger volumes where samples will be analyzed to identify environmental levels (1 ppm). The inspector should consult the laboratory in such cases.

The inspector may encounter some situations (e.g., condensate in natural gas lines or residual oil from drained drums) where the recommended sample size is not available; in these cases, the inspector should sample as feasible.

6.4.2 Sample Preservation

PCBs are normally stable in oil, soil, and surface samples, but the laboratory may require some or all of the following sample preservation procedures. To minimize the effects of temperature, pH, and bacterial action, protect all samples from high temperatures and sunlight. Keep water and other environmental samples (target levels < 1 ppm) below 4EC. Arrange for freezing of all soil, surface, and vegetation if lengthy storage periods are necessary before transfer to the laboratory. According to 40 CFR 136.3, the maximum holding time for samples to be analyzed for PCBs is seven days until extraction and 40 days after extraction.

6.4.3 Safety Procedures

The inspector should observe all facility safety requirements. In addition, the inspector should take special precautions, including the following, to avoid contact with PCBs or exposure to the fumes from hot PCBs:

- Wear clean or new disposable PCB-resistant gloves, coveralls, and safety goggles while taking samples suspected to contain PCBs.
- Wear disposable shoe covers when entering areas known or suspected to be contaminated with PCBs.
- Dispose of gloves, shoe coverings, and other disposable protective garments in a plastic bag after use. Final disposition of these items should be the same as for PCBs.
- Do not enter an area where there is an odor of fumes, solvents, or PCBs, unless wearing a full-face canister-type respirator.
- Ask facility personnel to obtain a sample, if required, from transformers. Observe and fully document the entire sample collection procedure. Photograph activities if possible.
- Do not attempt to obtain samples from transformers that are in operation or service.
- Ask facility personnel to obtain a sample, if required, from operating heat transfer systems. Have the liquid drained directly into the sample bottle, and leave the bottle open until cool enough to handle.
- Do not insist on samples of transformer or heat transfer system liquids if the facility is uncooperative, or if the sampling expertise is not available, but note in the report the problem and the reason for requesting a sample.
- Observe the safety regulations of the facility.
- Note that PCBs may pose a greater risk to pregnant women and nursing mothers.
- Leave power substations immediately when raining/lightning.

Treatment for PCB Contact with Skin
PCBs on the skin are likely not particularly hazardous if washed off within one-half hour. ! Do not touch and contaminate food or drink. ! Clean PCBs off skin and dispose of the wiping material as PCBs. ! Wash with soap and water. ! If PCBs get into the eyes, flush with water for several minutes and get immediate medical attention. ! If skin is blistering or symptoms of chloracne occur, see a physician immediately. Polychlorinated dibenzofurans are possible components of some PCB mixtures and may cause these symptoms.

6.5 Sample Documentation

Sample documentation procedures include the means of establishing both chain-of-custody and the precision, accuracy, and representativeness of the samples. The procedures discussed below cover the basic elements that should be a part of all sample documentation procedures for PCB inspections. Inspectors should also become familiar with any additional or different documentation procedures required by their Regional office. These procedures are designed to assure that an inspector will be able to testify that a particular sample was drawn from a particular location at a particular time, describe the procedures that were used to obtain the sample, and explain how the integrity of the sample was secured.

6.5.1 Documentation of Precision and Accuracy

Field Measurement and Sampling Process. The procedures used for collecting and handling samples and performing field measurements in the sampling process should be documented and included as a part of the Region's quality assurance project plan (QAPP). The Region should comply with the Region's Quality Management Plan (QMP). The inspector uses the field logbook to record the procedures undertaken during sampling. The documentation should identify:

- Type of sample matrix
- Exact location where each sample was collected
- Types of sample containers used for each parameter or group of parameters
- Sample container preparation process
- Sample collection process

- Sample preservation and handling
- Type and frequency of calibration and maintenance of field analytical procedures
- Calibration and maintenance of field instruments
- Identification and documentation of samples
- Custody of samples collected
- Decontamination of sampling equipment
- Date and time when each sample was collected.

6.5.2 Chain-of-Custody

The purpose of chain-of-custody procedures is to be able to trace possession of a sample from the time it was collected until the time it is introduced as evidence in a legal proceeding. Case development personnel should be able to demonstrate that none of the samples involved have been tampered with or contaminated during collection, transit, storage, or analysis. The various handlers should maintain an accurate written record to trace the possession of each sample from the moment of collection through its introduction as evidence. The concept of custody requires the maintenance of several procedures to ensure the authentication of the sample. These procedures begin with the identification of the sample and continue through the laboratory analysis process.

- Establishing Custody. Sample custody is initiated at the time of collection by sealing the sample with an official seal. The inspector should place evidence tape onto the sample and initial and date the tape in ink/waterproof pen.

- Preparing Sample Documentation. The inspector and lab personnel must prepare the documentation. Properly maintained, this documentation will serve as a clear and complete account indicating that the sample offered into evidence was the same one that was collected.

  The documentation includes the entries in the inspector's field logbook, the Official Sample Seal, and the Chain-of-Custody Record (see Appendix O for blank sample seals and a Chain-of-Custody Record). The inspector needs to assure that the relationship between the physical sample and the related documentation is clear, complete, and accurate. The sample number, date, and inspector's initials should appear on all documents, and the inspector should fully and accurately complete all forms.

- Ensuring custody during transit. Shipment of samples to the laboratory should involve the following procedures:

  - Samples must be accompanied by the Chain-of-Custody Record. The originator retains copies of documents.

  - If sent by common carrier, the inspector must obtain and keep a bill of lading.

- The inspector must keep all receipts and shipping documents and include them in the Chain-of-Custody documentation.

! Initiating Chain-of-Custody Record. Inspectors initiate the process that controls and records access to the sample once it has left their possession by filling out the Chain-of-Custody Record. The sample number relates the sample to the Chain-of-Custody Record which accompanies the sample through all the processing stages.

! Field Logbook Entry. The inspector's entry in the field logbook is the principal reference for the sample. Note this record may be maintained electronically such as in a PC tablet. The following information should be included about each sample collected:

- Sample identification number
- Any other unique identifying marks on the container
- Date and time of collection
- Type of matrix (e.g., oil, sludge, sediment, etc.)
- Description of specific location of collection
- Collection method (should include collection equipment; field analytical equipment; and all calculations, results, and calibration data for field sampling analytical and physical measurement equipment. All sampling and field analyses must be traceable to the type of equipment used and the inspector who did the work.)
- Rationale for selecting the sample and representativeness considerations
- Description of any deviations from standard protocols
- A note regarding provision to the facility of duplicate or split samples, if appropriate.

6.5.3 Sample Identification

Tag each sample container immediately upon collection with a standard EPA sample tag. In some cases, particularly with biological samples such as vegetation, the tag may have to be included with or wrapped around the sample. Fill out appropriate sample tag and/or field data sheet.

The following basic considerations govern identification of samples:

! Use one sample number for each sample. Assign only one number to one sample consisting of several subsamples or units.

! Inspectors may seal subsamples in a single bag if they are part of one sample and if adequate packaging protection is provided.

- The inspector must include sample numbers on all documentation relating to a sample: official seals, Chain-of-Custody Records, drawings, or photographs.

6.5.4 Sample Seal

Once the inspector collects and tags the sample, the inspector should place its container inside a plastic bag. The inspector should first write her/his name or initials and the date on the bag and then turn the bag inside out to prevent any means of tampering with its contents. Place the sample inside the inverted bag, then tape it closed in a secure manner with the Official Sample Seal (EPA Form 7500-2). Blank sample seals are provided in Appendix O. Seal the sample container or wrapper so that it may not be opened at any point without breaking the seal and/or the original unit package. Do not seal more than one sample under one seal. The inspector may choose to use evidence tape as well.

If the company declares a physical sample as confidential business information (CBI), the inspector should mark the seal "Confidential Business Information". Transfers of TSCA CBI must be conducted through the facility's DCO, in accordance with the following procedures:

- Inspectors may not deliver samples to a laboratory. Samples can only be mailed by: 1) inspectors cleared by the TSCA CBI DCO (this is on a case-by-case basis) to deliver samples/documents, or 2) by inspectors who are TSCA CBI DCO's.

- Inspectors must take the samples to their regional TSCA CBI DCO, who can deliver the samples to a CBI cleared laboratory for analysis.

For more details on how to transfer CBI materials, please refer to the TSCA Confidential Information Security Manual.

If it becomes necessary to break a seal, mount the seal on a piece of paper, properly initial and date it, and submit it with sample records to provide a continuous history. Reseal the sample with a new seal.

6.6 Sampling Strategies

EPA has developed guidance related to sampling strategies for 761 Subparts M, O, P, and R. This guidance provides an excellent source for inspectors developing a sampling strategy. The guidance is titled *Sampling Guidance for 40 CFR 761 Subparts M, O, P and R* and is available at http://www.epa.gov/pcb/guidance.html. The following tables provide additional information on sampling strategies.

Table 6-3. Guidance for Sampling Transformers, Heat Transfer Systems, and Hydraulic Systems

***CAUTION*:** Do not sample electrically live transformers or systems by yourself. If samples are required, experienced facility personnel should take them in the presence of the inspector and should use the facility's, not the inspector's, tools. The inspector should fully witness and document the procedures followed in obtaining these samples.

Equipment
- PPE - Disposable coveralls, footwear covers, safety goggles and disposable PCB-resistant gloves (one pair per sample)
- 40 ml volatile organic analysis (VOA) vials with Teflon (TFE)-lined 1 ml caps
- Secondary sample container bags, custody seals, and custody forms
- Disposable wiping clothes
- Plastic disposal bags
- Container labels and indelible pens
- Flashlight
- Disposable 10 ml pipettes and bulbs
- Extra clean sample jars for scooping.

Site Selection
- A sample from a transformer or system drain cock is assumed to be representative of the entire system.

Sampling Points
- Transformer drain cock *
- System drain cock *
- Expansion tank drain cock *
- Reservoir tank (hydraulic system)

Note: (1) Hydraulic fluid may also be sampled from barrels in storage or from drip pans and puddles.
(2) ***De-energized*** transformers may be sampled by unlocking the top cover or opening the refilling port.

Volume
- 25 - 35 ml

Procedures
- Use the PPE listed above.
- Have the facility personnel open the drain cock because it may be difficult to reclose.
- Drain 25 - 35 ml into the container.
- Identify, officially seal, and log samples. Place samples in an ice chest.**
- Wipe spills from the sampling point.
- Place contaminated equipment in a plastic bag for disposal or decontamination.

* Beware drain cocks may be difficult to reclose.
** Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-4. Guidance for Sampling Barrels and Drums

Since pure PCBs and chlorinated solvents used to dilute PCBs in electrical fluids are heavier than water, these materials will sink in water. However, PCBs in petroleum solvents as waste oils or rinsing solutions will be lighter than water and will float. For this reason, to the degree possible, drums of liquids suspected of containing PCBs should be representatively sampled from the top to the bottom.

Equipment

- PPE - Disposable coveralls, disposable PCB-resistant gloves (one pair per sample), footwear covers, and respiratory protection
- New glass tubing or coliwassa sampler
- Suitable size glass bottles with TFE-lined caps (new containers may be used as received)
- Secondary sample container bags, official seals, and custody forms
- Sample labels and indelible pens.

Volume

- As appropriate to the volume of the sample. Collect three samples from the drum, if nonuniformity is evident.

Procedures

- Use the PPE listed above.
- Open the sample container.
- Insert the glass sampler into a drum to just above the bottom of the drum or until solids are contacted. Allow the sampler to fill as the tub is lowered. Cap the sampler.
- Remove the sampling device.
- Place the bottom end of the sampler into the sample container and let the sample slowly drain by removing the cap.
- Identify, officially seal, and log samples. Place samples in an ice chest.*
- Decontaminate sampling equipment and dispose of the waste.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-5. Guidance for Sampling Drip Pans and Puddles

Drip pans and puddles may be present under equipment drains, barrel stop cocks, etc.

Equipment

- PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
- 40 ml VOA vials with TFE-lined 1 ml caps (new containers may be used as received)
- 25 ml clean glass sample containers (new containers may be used as received)
- Glass pipette and squeeze bulb
- Eye dropper
- Clean sampling spatula
- Secondary sample container bags, custody seal, and custody forms
- Disposable wiping cloths
- Plastic disposal bags
- Sample labels and indelible pens.

Site Selection

- Obtain a sample from the center of the pan or puddle.

Volume

- 25 ml (or whatever available, if less). Collect three samples, if the liquid is nonhomogenous.

Procedures

- Use the PPE listed above.
- Using a pipette, draw approximately 25 ml by means of a squeeze bulb. NEVER PIPETTE BY MOUTH. Use a separate pipette for each sample.
- Deposit the sample in a 40 ml VOA vial. Cap the container.
- Identify, officially seal, and log samples. Place samples in an ice chest.*
- Wipe any spills from the sampling point.
- Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-6. Guidance for Surfaces Sampling

Take wipe samples of any smooth surface that is considered relatively nonporous (e.g., metal, glass, or enameled wood). Take destructive samples of hard porous surfaces (e.g., cement, brick, asphalt, or bare wood). See also the definition of *standard wipe test* under §761.123.

Equipment

- PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
- Gauze pads (3" x 3" pharmaceutical grade)
- 40 ml VOA vials with TFE-lined caps (new containers may be used as received)
- Stainless steel forceps
- Container of hexane (e.g., eyedropper bottle)
- Steel template or disposable cardboard template (10 cm x 10 cm)
- Plastic disposal bags
- Secondary sample container bags, official seals, and custody forms
- Sample labels and indelible pens

Site Selection

- If the area of suspected contamination is small, take three co-located samples from the center of area, if possible. If large (e.g., a spill site), see *Sample Site Selection*.

Procedures

- Use the PPE listed above.
- Identify in the field logbook the size and location of the areas to be sampled. Photograph the area, if possible.
- Dip gauze pad into hexane or wet thoroughly with eyedropper.
- Using stainless steel forceps or a disposable rubber glove to hold the wool or pad, thoroughly swab a 100 cm^2 sample area as identified with the template. Swab in horizontal direction with one side of the swabbing material and repeat in the vertical direction with the other side.
- Place the pad in a clean sample container. Cap the container.
- Identify, officially seal, and log samples. Place samples in an ice chest.*
- Place contaminated equipment into a plastic bag for disposal or decontamination.
- At the end of the sampling prepare a control blank by going through the entire procedure without swabbing the surface.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-7. Guidance for Destructive Sampling (defined in glossary)

Equipment	!	PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
	!	Full face piece, supplied air (as specified by OSHA regulation 29 CFR Part 1915)
	!	8 oz glass jars with TFE-lined caps
	!	Hammer, chisel, drill, or hole saws
	!	Clean glass sample bottle
	!	Aluminum foil
	!	Plastic disposal bags
	!	Secondary sample container bags, official seals, and custody forms
	!	Sample containers labels and indelible pens.
Site Selection	!	If the area of suspected contamination is small, take three samples from the center. If the area is large (e.g., a spill site), follow the procedures outlined in *Sample Site Selection* in this chapter.
Procedures	!	Use the PPE listed above.
	!	Remove a sufficient sample for analysis (consult with the laboratory).
	!	Place samples of less than 1 cm in glass sample jars (8 oz) and cap or solvent-rinsed aluminum foil. Aluminum foil packets should be identified and placed in a secondary plastic bag.
	!	Identify, officially seal, and log samples. Place samples in an ice chest.*
	!	Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-8. Guidance for Sampling Surface Soil and Gravel

Equipment	!	PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
	!	Disposable or cleaned aluminum or Teflon scoop (washed with soap and water, rinsed with distilled water, acetone and hexane, and wrapped in aluminum foil)
	!	8 oz glass sample containers, with TFE-lined caps (New container may be used as received if PCB levels of concern > 1 ppm.)
	!	Secondary sample bags, custody seals, and custody forms
	!	Plastic disposal bags
	!	Stainless steel templates or disposable cardboard template (10 cm x 10 cm)
	!	Sample container labels and indelible pens
Site Selection	!	If the area of suspected contamination is small (less than 10 sq ft), collect three samples from near the center of the area. In larger areas (e.g., a spill site), follow the procedures outlined in *Sample Site Selection* in this chapter.
Volume	!	250 grams (approximately ½ lb)
Procedures	!	Use the PPE listed in Section 6.3.4 of this chapter.
	!	Remove foil from the sampler. Scoop to a depth of approximately 1 cm.
	!	Collect three 250 gram samples. Deposit them in a sample container. Cap the container.
	!	Identify, officially seal, and log samples. Place samples in an ice chest.*
	!	Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-9. Guidance for Taking Soil Core Samples

Equipment	! PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles ! Piston core, bulb planter, hand auger, or King-tube sampler ! New or clean sample containers of sufficient size to contain a cored sample of 5 cm (8 oz glass jar with TFE-lined cap or prepare an aluminum field packet) ! Aluminum foil (solvent-rinsed if environmental levels (< 1 ppm) are of concern) ! Secondary sample bags, custody seals, and custody forms ! Full face, negative pressure respirator, if necessary, for highly contaminated or enclosed area ! Plastic disposal bags ! Sample containers labels and indelible pens
Site Selection	! If the area is small, core samples should be taken at the center and edge of the area. In larger areas (e.g., a spill site), follow the procedures outlined in *Sample Site Selection* in this chapter.
Volume	! Cores of 5 cm should be taken initially. If there is visible contamination at the 5 cm level, deeper samples should be taken. Analytical results may also indicate the need for deeper samples to be taken later.
Procedures	! Use the PPE listed in Section 6.3.4 of this chapter. ! Take at least three surface samples as previously described.* ! Use the corer to obtain a 5 cm sample. Displace compacted surface soil with a trowel or laboratory spatula if necessary. ! Extrude the sample into hexane-rinsed foil and wrap. ! Label the top and bottom of the sample. ! Place the sample in a container. Cap the sample container. ! Identify, officially seal, and log samples. Store the samples in an ice chest.** ! Place contaminated equipment into a plastic bag for disposal or decontamination.

* Very high surface concentrations of PCBs may easily contribute to cross-contamination at lower depths during sampling, thus the results of surface sampling will indicate this possibility and the need to resample using a more sophisticated or careful technique.

** Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-10. Guidance for Sampling Water

Water sampling requires special attention. Because of the chemical properties of PCBs and because other substances may be in the water, PCBs may be present as a surface film (particularly when PCBs are dissolved in hydrocarbon oils) or sink to the bottom (particularly when PCBs are in askarel or other heavier-than-water materials). When a surface film is suspected (or visible), sample the water surface. Otherwise, take the water sample near the bottom.

Equipment

- PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
- Cleaned, capped sample containers (4 L bottles or jars with TFE-lined caps)
- Peterson dredge
- Ekman dredge
- Weighted bottom dredge
- 3-gallon hexane-rinsed steel bucket
- Plastic disposal bags
- Disposable wiping cloths.

Volume

- 4 Liters.

Surface Water Samples

Site Selection

- Stagnant, standing water (puddles, ponds, impoundments, etc.)

Procedures

- Use the PPE listed in Section 6.3.4 of this chapter.
- Slowly lower a tilted wide-mouth sample jar or bottle into the water until the water begins to run into it.
- Slowly turn the bottle upright keeping the lip just under the surface of the water so that the whole sample is surface water.
- Carefully lift the bottle out of the water and cap. Wipe the outside of the bottle with disposable wiping cloths.
- Identify, officially seal, and log the sample. Store samples in an ice chest.*
- Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-10. Guidance for Sampling Water (continued)

Subsurface Samples

Site Selection

- In **moving** water, choose the most turbulent area where the greatest amount of mixing is taking place. Avoid quiescent areas. In **still** water, choose areas that appear to have an oil film on the surface.

Procedures

- Use the PPE listed in Section 6.3.4 of this chapter.
- Immerse a **sealed** wide-mouth sample jar (1 L jar is recommended) to the required depth.
- Remove the bottle top to let the air escape and the bottle fill.
- Transfer the sample into a precleaned sample container (4 L jar or bottle). Repeat as necessary to fill sample container. Wipe the container with disposable wiping cloths.
- Use a separate dipping vessel for each sample to prevent cross-contamination.
- Identify, officially seal, and log samples. Store samples in an ice chest.*
- Place contaminated equipment into a plastic bag for disposal or decontamination.

Groundwater

Note: Take these samples only in consultation with a groundwater hydrological laboratory.

Site Selection

- Collect samples from a water well located downgradient from the area of suspected contamination.

Procedures

- Use the PPE listed in Section 6.3.4 of this chapter.
- Open the tap on the supply line from the well (or hand pump the well).
- Let water run about 2-3 minutes at full flow.
- Fill and cap the sample container.
- Seal, identify, and log samples. Store samples in an ice chest.*
- Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-10. Guidance for Sampling Water (continued)

Sediment (Bottom Samples)

Site Selection	!	Take samples from the same area that surface samples were taken.
Procedures	!	Use the PPE listed in Section 6.3.4 of this chapter.
	!	For lakes and slow-moving streams, use a weighted bottom dredge.
	!	For hard bottoms of sand, gravel, etc., use a Peterson dredge; for soft bottoms, use an Ekman dredge.
	!	Collect the sample.
	!	Empty the contents into a hexane-rinsed 3-gallon steel bucket. Stir to mix thoroughly. Pass the slurry through a 1/4 inch mesh sieve if necessary to remove sticks, leaves, etc.
	!	Allow the sediment to settle.
	!	Slowly pour off water.
	!	Transfer 1 liter of the sediment to a clean, wide-mouth sample jar. Cap the jar.
	!	Identify, officially seal, and log samples. Place samples in an ice chest.*
	!	Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with PCBs.

Table 6-11. Guidance for Sampling Vegetation

The sample design or visual observation may indicate that samples of vegetation (e.g., tree leaves, bushes, and flowers) are required.

Equipment

- PPE - Disposable PCB-resistant gloves (one pair per sample), disposable coveralls, footwear covers, and safety goggles
- Pruning shears, heavy duty scissors, or other suitable tools
- Cleaned glass sample containers (8 or 16 oz jars with TFE-lined caps)
- Plastic disposal bags
- Sample containers labels and indelible pens
- Secondary sample bags, custody seals, and custody forms.

Procedures

- Use PPE listed above.
- Place sufficient material (usually about 250 grams or ½ pound) into a clean glass sample jar. Cap.
- Identify, officially seal, and log samples. Place samples in an ice chest.*
- Place contaminated equipment into a plastic bag for disposal or decontamination.

* Placing samples in an ice chest is recommended when dealing with only PCBs.

Table 6-12. Composite Sampling

Compositing is the pooling of several discrete samples from different areas to form one sample for chemical analysis; usually, only soils lend themselves to this approach. In many circumstances, it may be desirable to composite samples to reduce the number of (often costly) analyses.

The following PCB regulation subparts specify compositing procedures for the analyses regulated by those subparts.

§761 Subpart	Compositing Procedures
Subpart O--Sampling to Verify Completion of Self-Implementing Cleanup and On-Site Disposal of Bulk PCB Remediation Waste and Porous Surfaces in Accordance with §761.61(a)(6)	§761.289
Subpart P--Sampling Non-Porous Surfaces for Measurement-Based Use, Reuse, and On-Site or Off-Site Disposal Under §761.61(a)(6) and Determination Under §761.79(b)(3)	§761.310
Subpart R--Sampling Non-Liquid, Non-Metal PCB Bulk Product Waste for Purposes of Characterization for PCB Disposal in Accordance With §761.62, and Sampling PCB Remediation Waste Destined for Off-Site Disposal, in Accordance With §761.61	§761.350

Table 6-13. Other Types of Sampling

For other types of sampling, such as that conducted under §761.130, the following compositing procedures may be used. These suggested strategies for compositing samples are taken from PCB spill sites sampled using the grid sampling methods described in the *Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup* (May 1986), available on the EPA webpage http://www.epa.gov/pcb/guidance.html. Consult with the laboratory prior to compositing to ensure regulatory levels can be validly achieved.

- Composite only samples of the **same type** (i.e., all soil or all water). Since the composite must be thoroughly mixed to ensure homogeneity, do not composite certain types of samples, such as asphalt, wipe samples, and other hard-to-mix matrices.

- Do not form a composite with more than 10 samples, since in some situations compositing a greater number of samples may lead to such low PCB levels in the composite that the recommended analytical method approaches its limit of detection and becomes less reliable.

- Keep in mind that the PCB concentration of interest (e.g., regulatory or clean-up level) for the composite will be equal to:

$$\frac{\text{Regulatory or clean-up concentration level}}{\text{Number of samples in composite}}$$

  It must be assumed that one sample at the target regulatory or clean-up level could be diluted by the remainder of the samples, which may be nondetectible or at very low levels with respect to the PCB concentrations.

- For each type of sample, determine the number of composites to be formed using the table below.

Number of Samples	Number of Composites
2-10	1
11-20	2
21-30	3
31-37	4

  As much as possible, try to form composites of equal size. For example, if 37 soil samples are taken, then 4 composites could be formed using 9, 9, 9, and 10 samples apiece.

- To the extent possible, composite adjacent samples. If residual contamination is present, it is likely that high PCB levels will be found in some samples taken close together.

Table 6-14. Sample Site Selection

Regulated facilities conducting sampling must follow the procedures set out in §761 Subparts M through R where the sampling activities are within the scope and applicability of those subparts. For example, a facility conducting abandonment-in-place or removal and disposal off-site of a natural gas pipeline in accordance with §761.60(b)(5) must use the procedures in Subpart M to select surface sampling sites for determining the pipe's PCB surface concentration. For further guidance on sample site selection, see:

- *Sampling Guidance for 40 CFR 761 Subparts M, O, P and R;*
- *Verification of PCB Spill Cleanup by Sampling and Analysis*; and
- *Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup*.

All are available at the EPA webpage http://www.epa.gov/pcb/guidance.html.

6.7 Sampling Hazardous Materials

During sampling, inspectors handle hazardous materials and are subject to Department of Transportation (DOT) requirements applicable to handling, packaging, and shipping hazardous material samples. Information regarding these requirements and where training for these procedures is available can be found in EPA's Fact Sheet titled the Department of Transportation Hazardous Materials Training (see Appendix P).

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